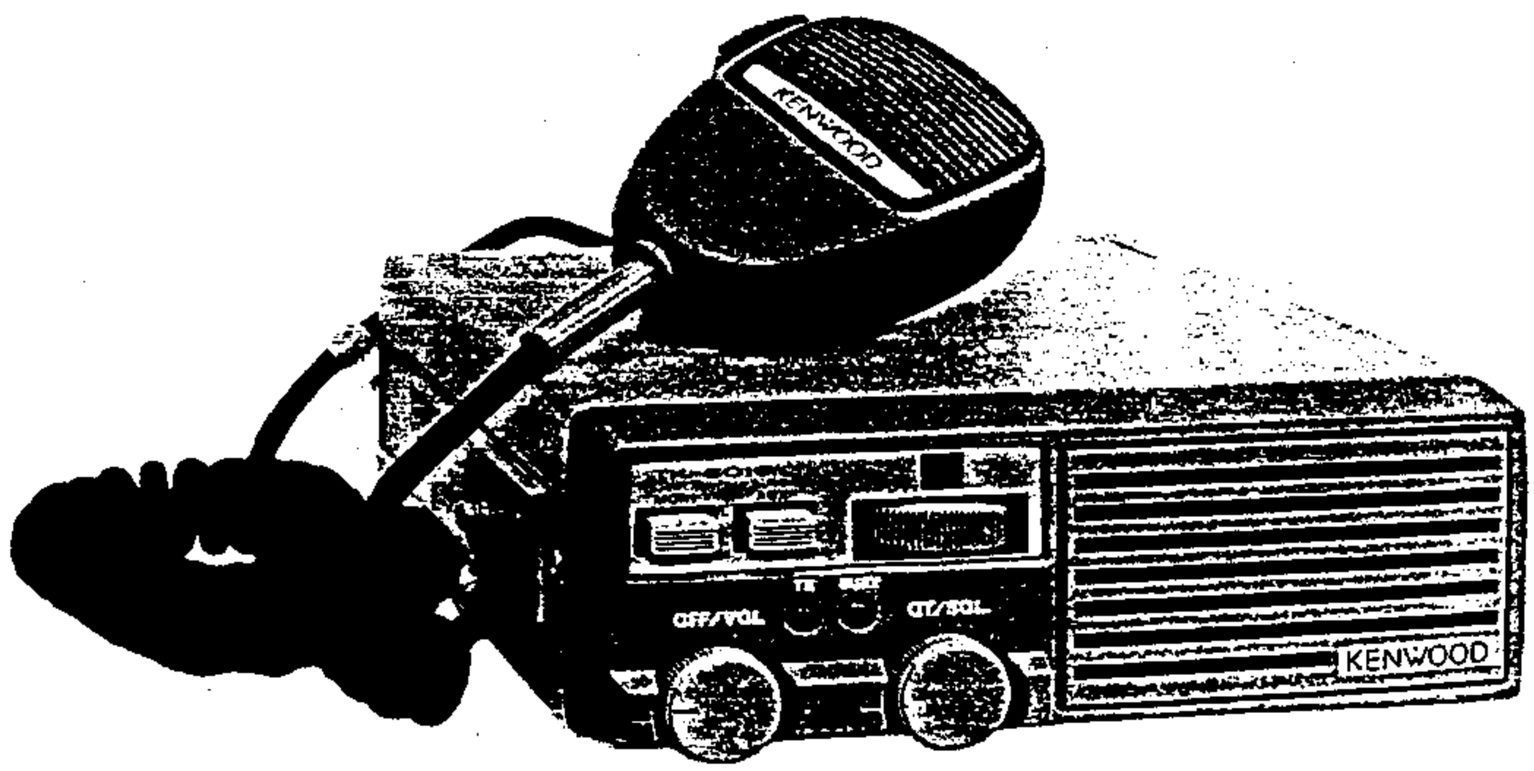
KENWOOD

Synthesized
FM Two-Way Radio
32 Channel Capability,
15-40W 450-512 MHz.

TK-801S

SERVICE MANUAL



CONTENTS

1. SPECIFICATIONS

(GENERAL)

Frequency Range ..... 450 ~ 512 MHz
Number of Channels ..... 6 channel on basic unit, 16 semi-duplex channels or 32 simplex channels adaptable.
Channel Spacing ..... 25 kHz (PLL channel step 12.5 kHz)
Input Voltage ..... 13.8V DC negative ground
Current Drain ..... 0.45A standby
1.0A receive
12.0A transmit
Duty Cycle ..... Receiver 100%, Transmitter 20%
Temperature Range ..... –30°C to +60°C (–22°F to +140°F)
Dimensions ..... 2.56" (65 mm) H × 7.29" (185 mm) W × 9.45" (240 mm) D
Weight ..... 4.9 lbs (2.2 kg)

(RECEIVER)

(Measurements made per EIA standard RS-204-C)
RF Input Impedance 50Ω
Sensitivity
EIA 12 dB SINAD 0.35μV
20 dB Quieting 0.45μV
Squelch Sensitivity ..... 0.2μV threshold
Modulation Acceptance ..... ±7 kHz
Selectivity ..... –80 dB
Intermodulation ..... –75 dB
Spurious and Image Rejection ..... –85 dB
Audio Power Output ..... 4 watts at less than 5% distortion
Frequency Stability ..... ±0.0005% from –30°C to +60°C
Channel Frequency Spread ..... 5 MHz

(TRANSMITTER)

(Measurements made per EIA standard RS-152-B)
RF Power Output ..... 40 watts adjustable to 15 watts
RF Output Impedance 50Ω
Spurious and Harmonics ..... –70 dB
Modulation
Direct FM Modulation ..... 16F3, ±5 kHz for 100% at 1000 Hz
FM Noise ..... –45 dB
Microphone Impedance ..... Low impedance
Audio Distortion ..... Less than 3% at 1000 Hz
Frequency Stability ..... ±0.0005% from –30°C to +60°C
Channel Frequency Spread ..... 10 MHz

2. GENERAL

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication date. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions. These are issued as required.

ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts: components, kits, or chassis. If the part number is not known, include the chassis or kit number of which it is a part, and a sufficient description of the required component for proper identification.

PERSONNEL SAFETY

The following precautions are recommended for personnel safety:

- DO NOT transmit if someone is within two feet (0.6 meter) of the antenna.
- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- All equipment should be properly grounded before power-up for safe operation.
- This equipment should be serviced by a qualified technician only.

OPERATING INSTRUCTIONS

Fig. 2-1 Operating Controls and Indicators

1. POWER-UP

To turn on the radio, rotate the OFF-VOLUME control clockwise until a click is heard. The channel lamp indicator will illuminate to indicate power is ON.

2. TO RECEIVE

Operation	Procedure
1. Disable QT (if so equipped)	Remove microphone from its hanger.
2. Unsqueich radio	Turn SQUELCH control counterclockwise until noise is heard.
3. Set VOLUME control	Adjust VOLUME control for a normal listening level.
4. Set SQUELCH control	Advance SQUELCH control clockwise until noise just stops.
5. Select operating frequency. (Multichannel models only)	Rotate CH selector switch to desired channel.
The radio will now receive all traffic on the selected channel.	
6. Enable QT (if so equipped)	Insert microphone back into its hanger to activate KQT-1 or -2.
You will now hear messages for your system only.	

3. TO TRANSMIT

Operation	Procedure
1. Disable QT (if so equipped)	Depress MONITOR button ON. – or – Remove microphone from hanger.
2. Select operating frequency. (Multichannel models only)	
3. LISTEN	DO NOT TRANSMIT if channel is in use.
4. Key transmitter	Press and hold the microphone PTT switch. The Red LED on the front panel will glow indicating the transmitter is ON.
5. Transmit message	Hold microphone at about 2 inches distance and speak at a normal voice level. Keep transmissions brief.
6. Receive reply	Release the microphone PTT switch.
7. Enable QT at end of the conversation. (if QT equipped)	Depress MONITOR to the out position. and Replace the microphone into its hanger.

PRE-INSTALLATION CONSIDERATIONS

1. UNPACKING

Unpack the radio from its shipping container and check for accessory items. If any item is missing, please contact TRIO-KENWOOD immediately.

2. LICENSING REQUIREMENTS

Federal regulations require a station license for each radio installation (mobile or base) be obtained by the equipment owner. The licensee is responsible for ensuring transmitter power, frequency, and deviation are within the limits permitted by the station license.

Transmitter adjustments may be performed only by a licensed technician holding an FCC first, second or general class commercial radiotelephone operator's license. There is no license required to install or operate the radio.

3. PRE-INSTALLATION CHECKOUT

3-1. Introduction

Each radio is adjusted and tested before shipment. However, it is recommended that receiver and transmitter operation be checked for proper operation before installation.

3-2. Testing

The radio should be tested complete with all cabling and accessories as they will be connected in the final installation. Transmitter frequency, deviation, and power output should be checked, as should receiver sensitivity, squelch operation, and audio output. QT equipment operation should be verified.

4. PLANNING THE INSTALLATION

4-1. General

Inspect the vehicle and determine how and where the radio antenna and accessories will be mounted.

Plan cable runs for protection against pinching or crushing wiring, and radio installation to prevent overheating.

4-2. Antenna

The favored location for an antenna is in the center of a large, flat conductive area, usually at the roof center. The trunk lid may also provide a good antenna location. If the trunk lid is prefered, bond the trunk lid and vehicle chassis using ground straps to ensure the lid is at chassis ground.

4-3. Radio

The universal mount bracket allows the radio to be mounted in a variety of ways. Be sure the mounting surface is adequate to support the radio's weight. Allow sufficient space around the radio for air cooling. Position the radio close enough to the vehicle operator to permit easy access to the controls when driving.

4-4. DC Power and wiring

1. This radio may be installed in negative ground electrical systems only. Reverse polarity will cause the cable fuse to blow. Check the vehicle ground polarity before installation to prevent wasted time and effort.
2. Connect the positive power lead directly to the vehicle battery positive terminal. Connecting the Positive lead to any other positive voltage source in the vehicle is not recommended.

CAUTION:

If DC power is to be controlled by the vehicle ignition switch, a switching relay should be used to switch the positive power lead. The vehicle ignition switch then controls DC to the relay coil.

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3. Connect the ground lead directly to the battery negative terminal.
4. The cable provided with the radio is sufficient to handle the maximum radio current demand. If the cable must be extended, be sure the additional wire is sufficient for the current to be carried and length of the added lead.

5. INSTALLATION PLANNING – CONTROL STATIONS

5-1. Antenna system

Control station. The antenna system selection depends on many factors and is beyond the scope of this manual. Your KENWOOD dealer can help you select an antenna system that will best serve your particular needs.

5-2. Radio location

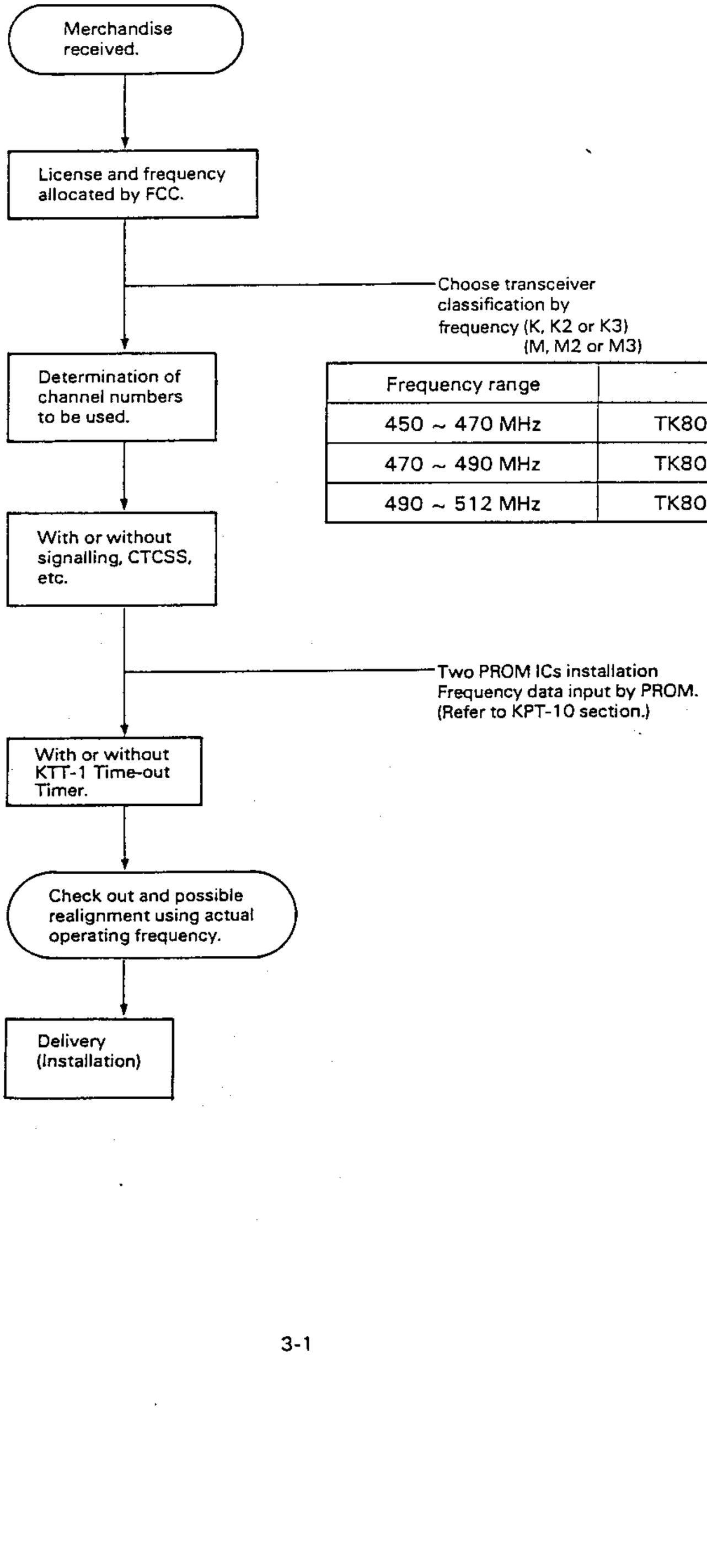
Select a convenient location for your control station radio which is as close as practical to the antenna cable entry point. Secondly, a source of 117 volt, 60 Hz power must be available. Make sure sufficient air can flow around the radio and power supply to allow adequate cooling.

SERVICE

This radio is designed for easy servicing. Refer to the schematic diagrams, printed circuit board views, and alignment procedures contained in this manual.

3. FIELD REALIGNMENT

1. DEALER SALES FLOW CHART



Frequency range	Type
450 ~ 470 MHz	TK801S K, M
470 ~ 490 MHz	TK801S K2, M2
490 ~ 512 MHz	TK801S K3, M3

Basic MODEL

6 CH
Duplex.

Frequency allocation.

See 3.1 Frequency PROM writer.

Need 32 channels?

NO

YES

RCC used?

NO

YES

See 3.2 Semi duplex conversion.

See 3.13 RCC conversion.

Other than CTCSS

No signalling.

Which signalling system is used?

See 3.4 Signalling other than KQT-1 or -2

Other than CTCSS.

Time-out timer used?

YES (KTT-1)

See 3.11 Time-out timer installation.

NO

See 3.12 Realignment using operating frequency.

Delivery (Installation)

See 3.4 Signalling other than KQT-1 or -2

See 3.5

See 3.9 Conversion to 32 channels.

See 3.10

Basic MODEL

6 CH Duplex.

Frequency allocation.

Frequency PROM writer.

Need 32 channels?

NO

YES

Other than CTCSS

Which signalling system is used?

Signalling other than KQT-1 or -2

See 3.4

YES (KTT-1)

See 3.11

Time-out timer installation.

Other than CTCSS.

Which signalling system is used?

No signalling.

See 3.9

Conversion to 32 channels.

CTCSS

CTCSS with ROM?

NO (KQT-2)

YES (KQT-1)

See 3.4

Signalling other than KQT-1 or -2

See 3.9

Conversion to 32 channels.

See 3.5

CTCSS ROM installation.

See 3.10

Conversion to 32 channels.

See 3.6

CTCSS unit installation.

See 3.9

Conversion to 32 channels.

Need 16 channels?

YES

Need duplex?

N(

YES

See 3.2

Duplex conversion.

Which signalling system is used?

No signalling.

See 3.9

Conversion to 32 channels.

CTCSS

CTCSS with ROM?

NO (KQT-2)

YES (KQT-1)

CTCSS ROM installation.

See 3.6

CTCSS unit installation.

Conversion to 32 channels.

See 3.9

Conversion to 32 channels.

Other than CTCSS.

Which signalling system is used?

No signa

See 3.

CTCSS

CTCSS with PROM?

NO (KQT-

YES (KQT-1)

See 3.4

Signalling other than KQT-1 or -2

See 3.5

CTCSS ROM installation.

See 3.6

See 3.7

Conversion to 16 channels.

See 3.8

Conversion to 16 channels.

See 3.7

Need 16 channels?

YES

Need duplex?

YES

See 3.2 Duplex conversion.

Which signalling system is used?

No signalling.

See 3.9 Conversion to 32 channels.

CTCSS

CTCSS with ROM?

NO (KQT-2)

YES (KQT-1)

CTCSS ROM installation.

See 3.6 CTCSS unit installation.

Conversion to 32 channels.

See 3.9 Conversion to 32 channels.

Other than CTCSS.

Which signalling system is used?

No sig

See

CTCSS

CTCSS with PROM?

NO (KC

YES (KQT-1)

See 3.4 Signalling other than KQT-1 or -2

See 3.5 CTCSS ROM installation.

See 3.6

See 3.7 Conversion to 16 channels.

See 3.8 Conversion to 16 channels.

See 3.7

Need 16 channels?
NO
YES
Need duplex?
NO
YES
See 3.2
Duplex conversion.
Which signalling system is used?
Other than CTCSS.
No signalling.
See 3.8
Conversion to 16 channels
CTCSS
CTCSS with PROM?
NO (KQT-2)
YES (KQT-1)
See 3.4
Signalling other than KQT-1 or -2
See 3.5
CTCSS ROM installation.
See 3.6
CTCSS unit installation.
See 3.7
Conversion to 16 channels.
See 3.8
Conversion to 16 channels.
See 3.7
Conversion to 16 channels.
See 3.4
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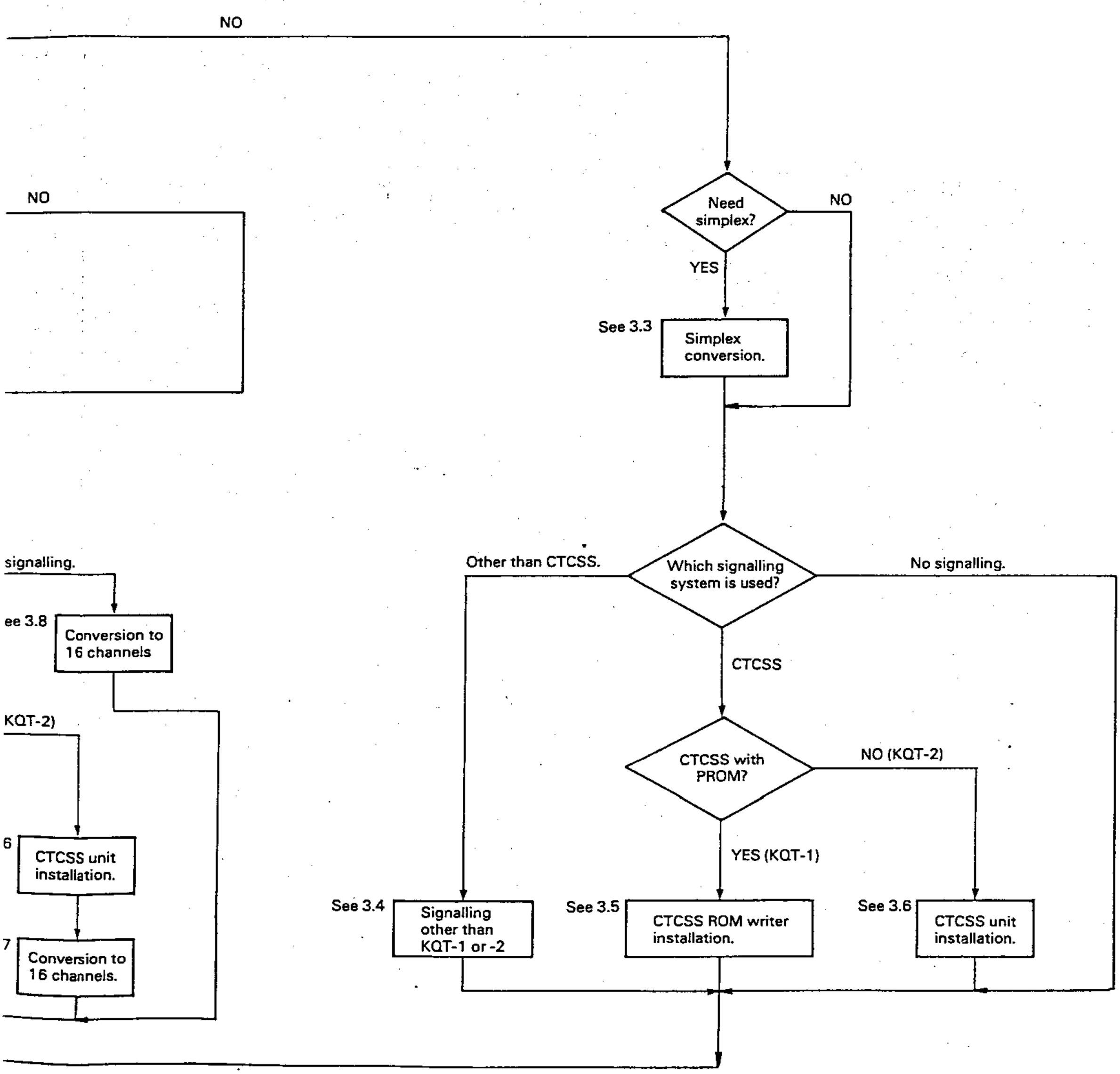
KQT-1 o

2. SYSTEM SET-UP



3. INSTALLATION AND CONVERSION

1: Writing a frequency into PROM (Fig. 3-1)
Input an allocated frequency with the PROM writer. For simplex, duplex, etc. input, refer to the PROM writer instructions.

2: To modify a 16CH transceiver for duplex, install JU14 on the PLL unit.

3: To modify a 6CH transceiver for simplex, open JU12 on the PLL unit.

4: Installing signalling other than KQT-1, -2.
Refer to the Manual supplied with the Signalling device.

5: Installing KQT-1 (Fig. 3-2, 3)
Connect plug P32 (E31-2181-05) to J32 on the CTCSS unit and that of E31-2181-05 supplied to PLL unit J9.
To install a CTCSS unit, remove the screws in the CTCSS mounting holes, secure the supplied hex bosses in their holes, remove P6 from PLL unit J6 and install the CTCSS plug in J6. Secure the CTCSS unit to the hex bosses with two machine screws.

6:

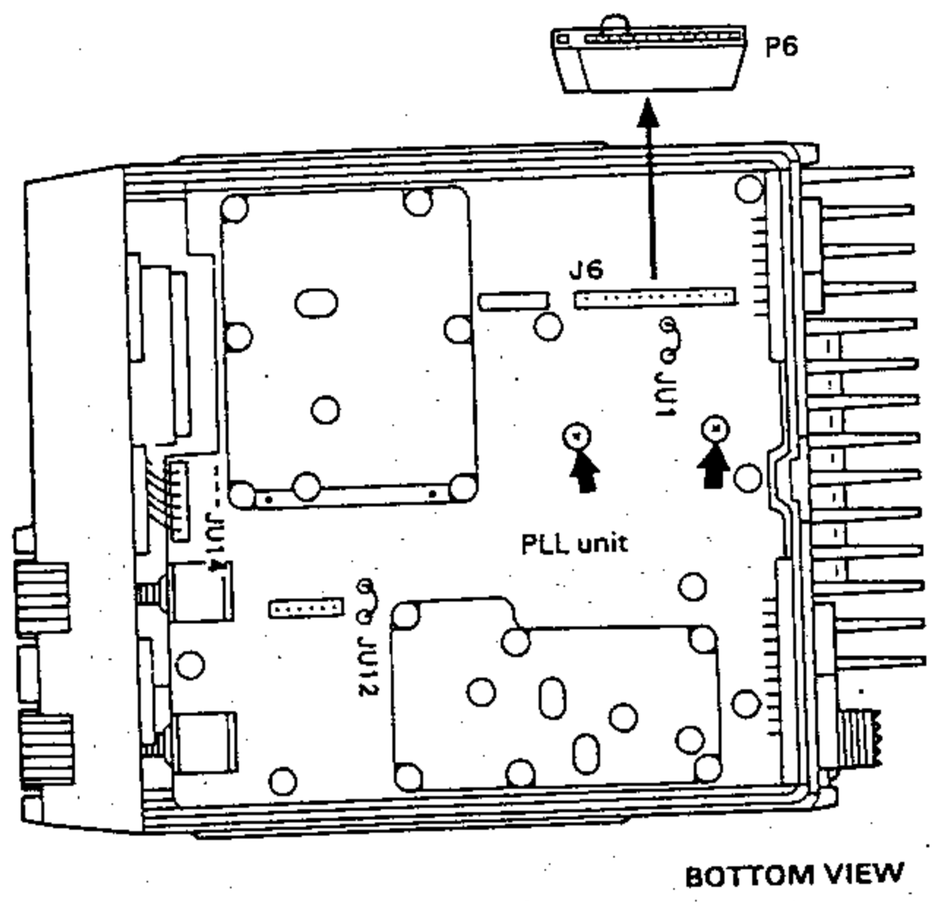


Fig. 3-1

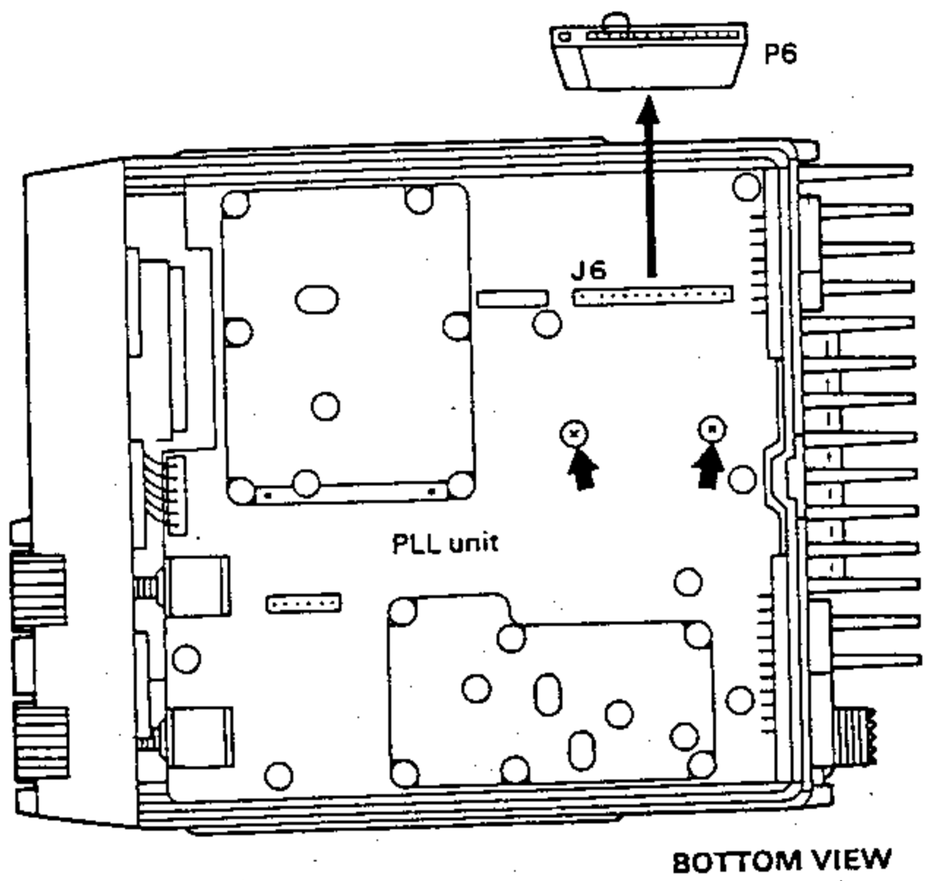


Fig. 3-2

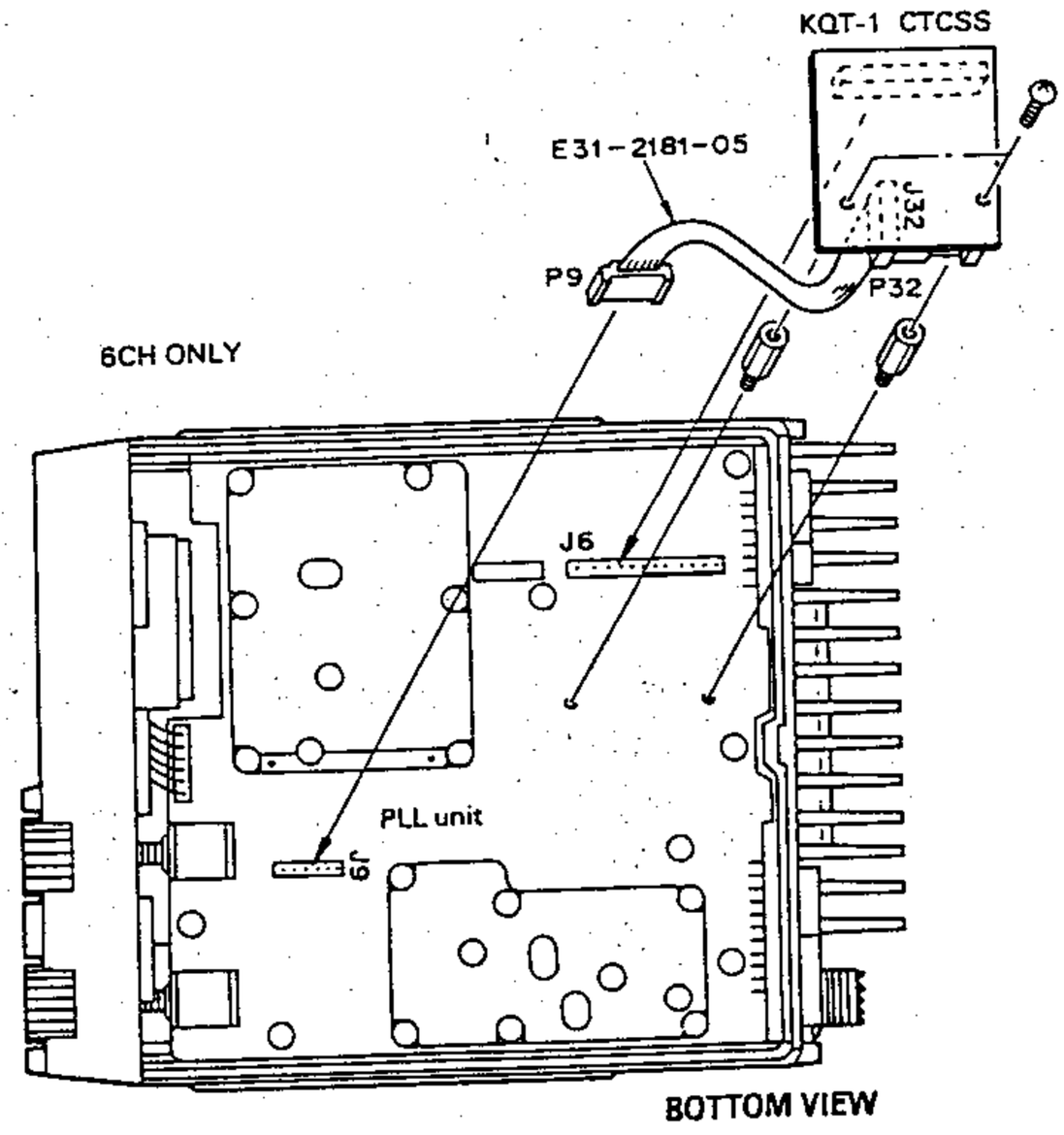


Fig. 3-3

5: Installing KQT-1 (Fig. 3-2, 3)

Connect plug P32 (E31-2181-05) to J32 on the CTCSS unit and that of E31-2181-05 supplied to PLL unit J9.

To install a CTCSS unit, remove the screws in the CTCSS mounting holes, secure the supplied hex bosses in their holes, remove P6 from PLL unit J6 and install the CTCSS plug in J6. Secure the CTCSS unit to the hex bosses with two machine screws.

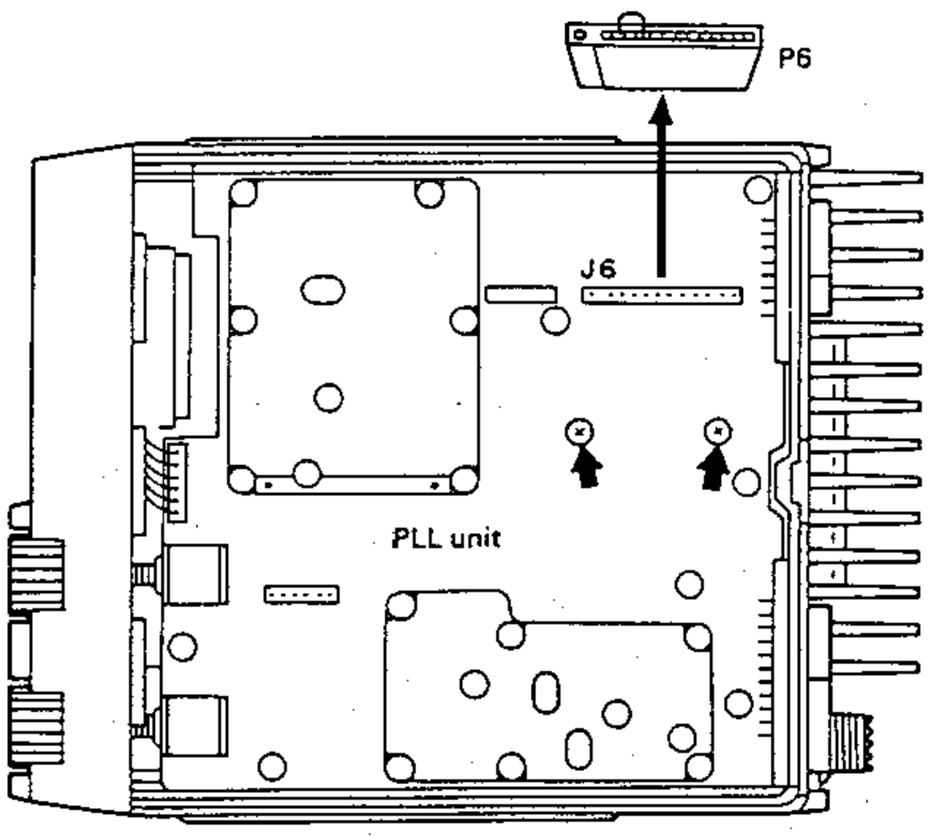


Fig. 3-2

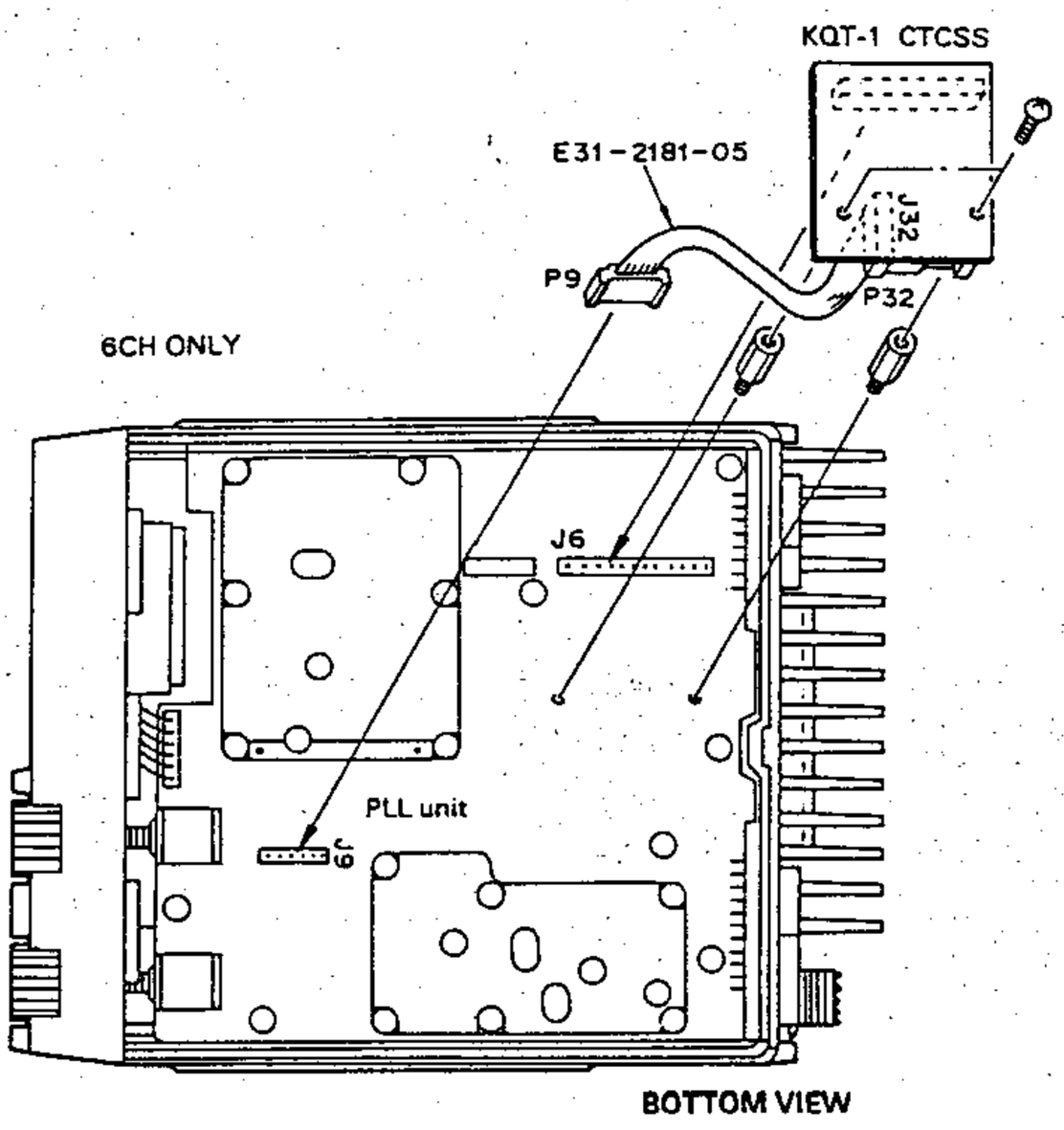


Fig. 3-3

6: Installing KQT-2 (Fig. 3-5)

For installation on the PLL unit, proceed as in item 5. In this case, the cable assembly with plug is not supplied with the CTCSS unit.

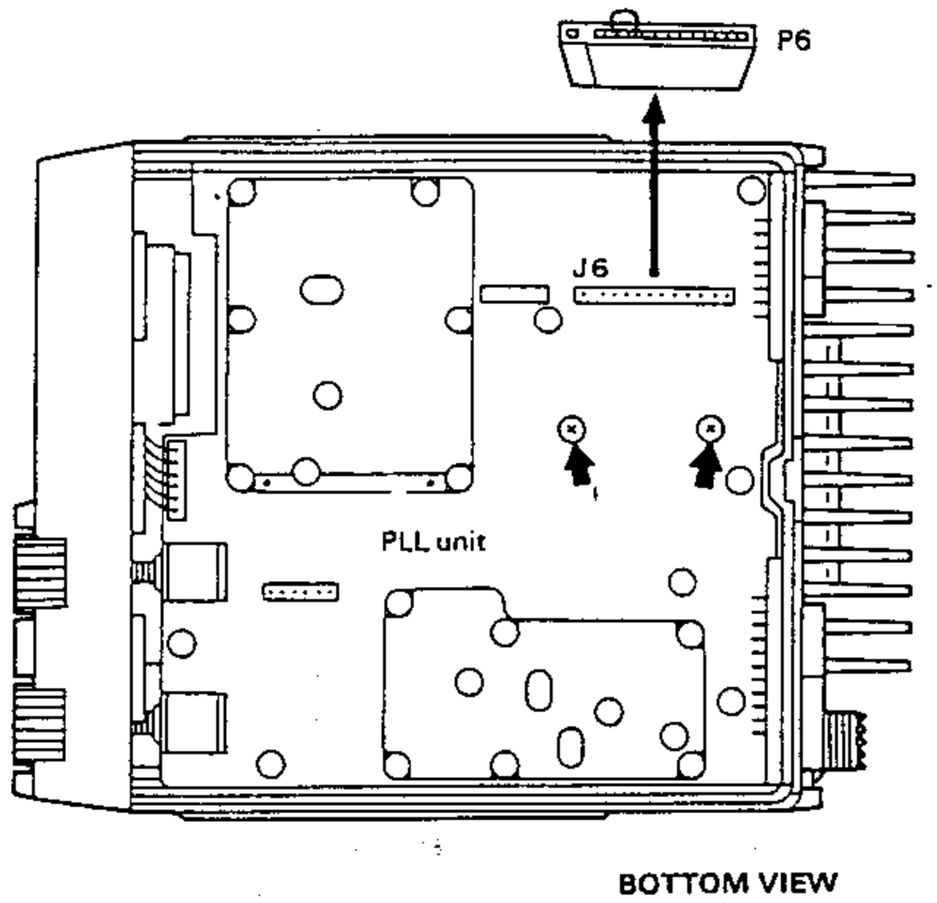


Fig. 3-4

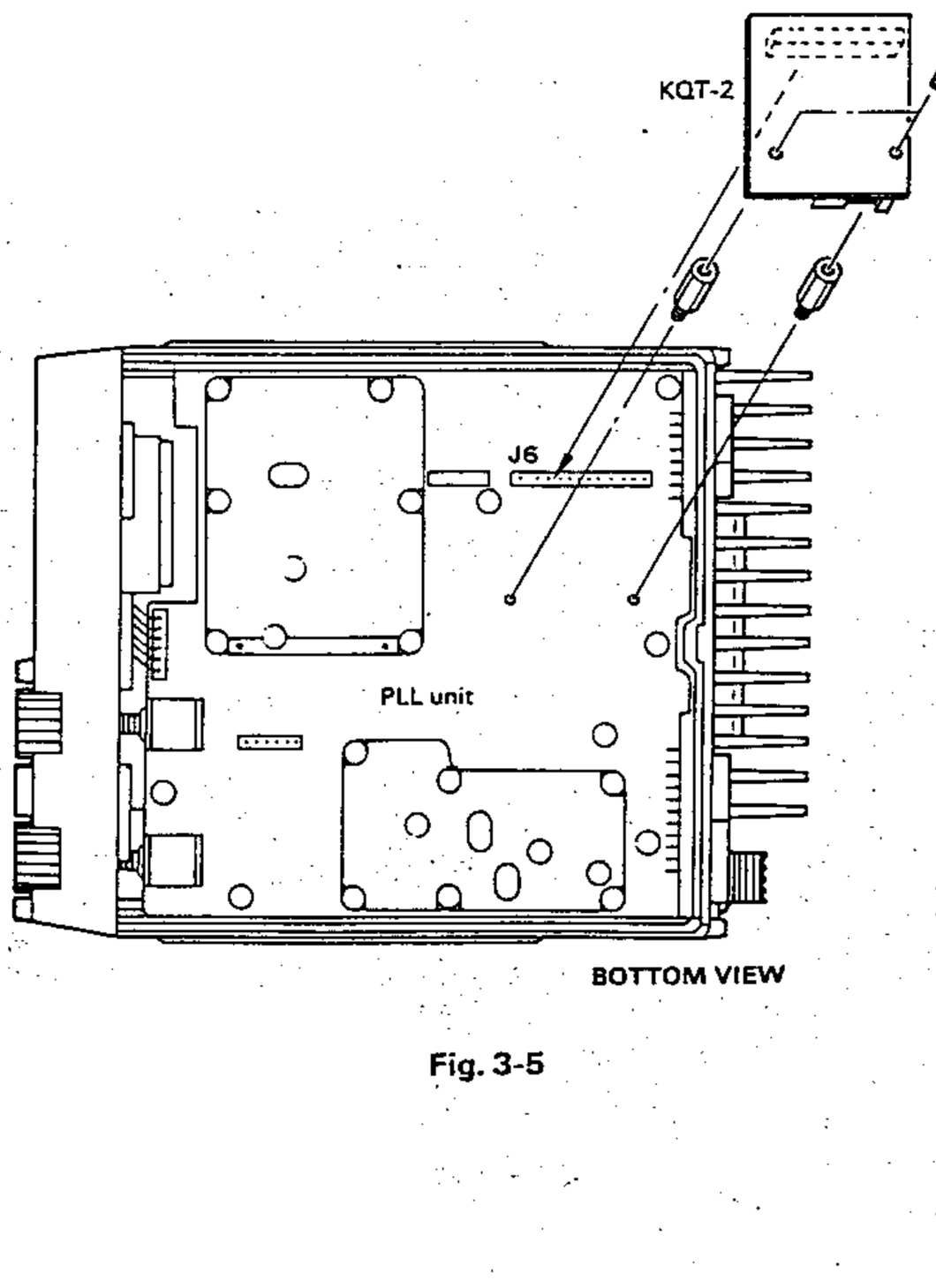


Fig. 3-5

6: Installing KQT-2 (Fig. 3-5)
For installation on the PLL unit, proceed as in item 5. In this case, the cable assembly with plug is not supplied with the CTCSS unit.

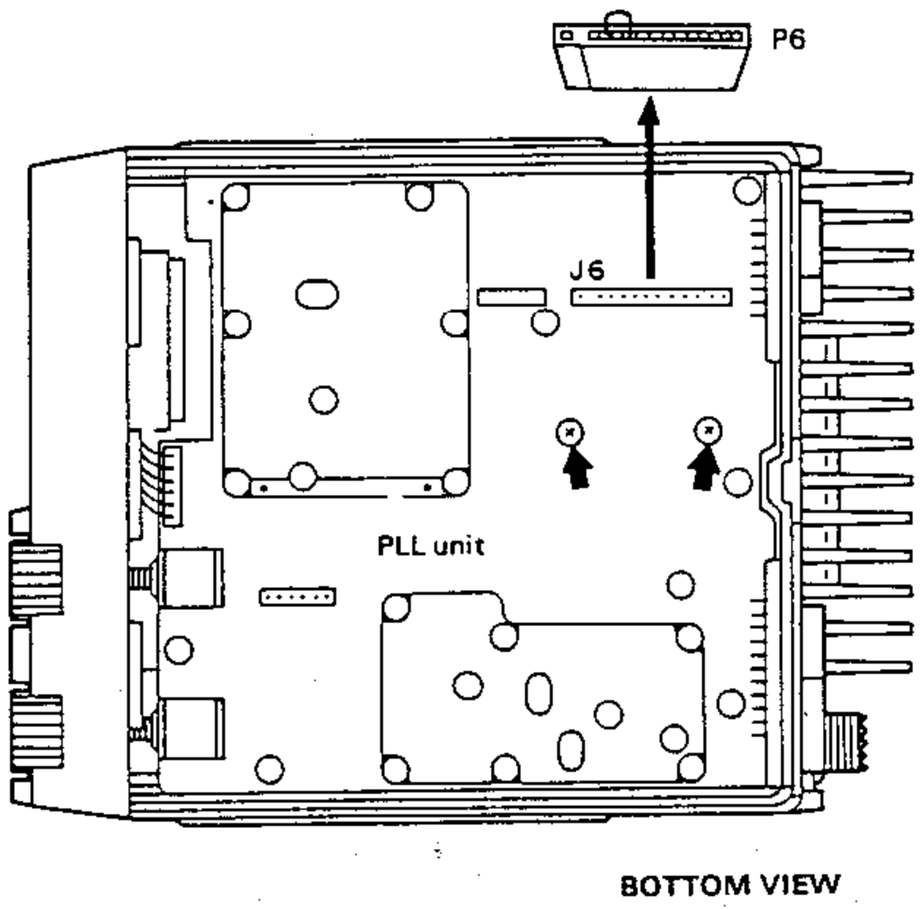


Fig. 3-4

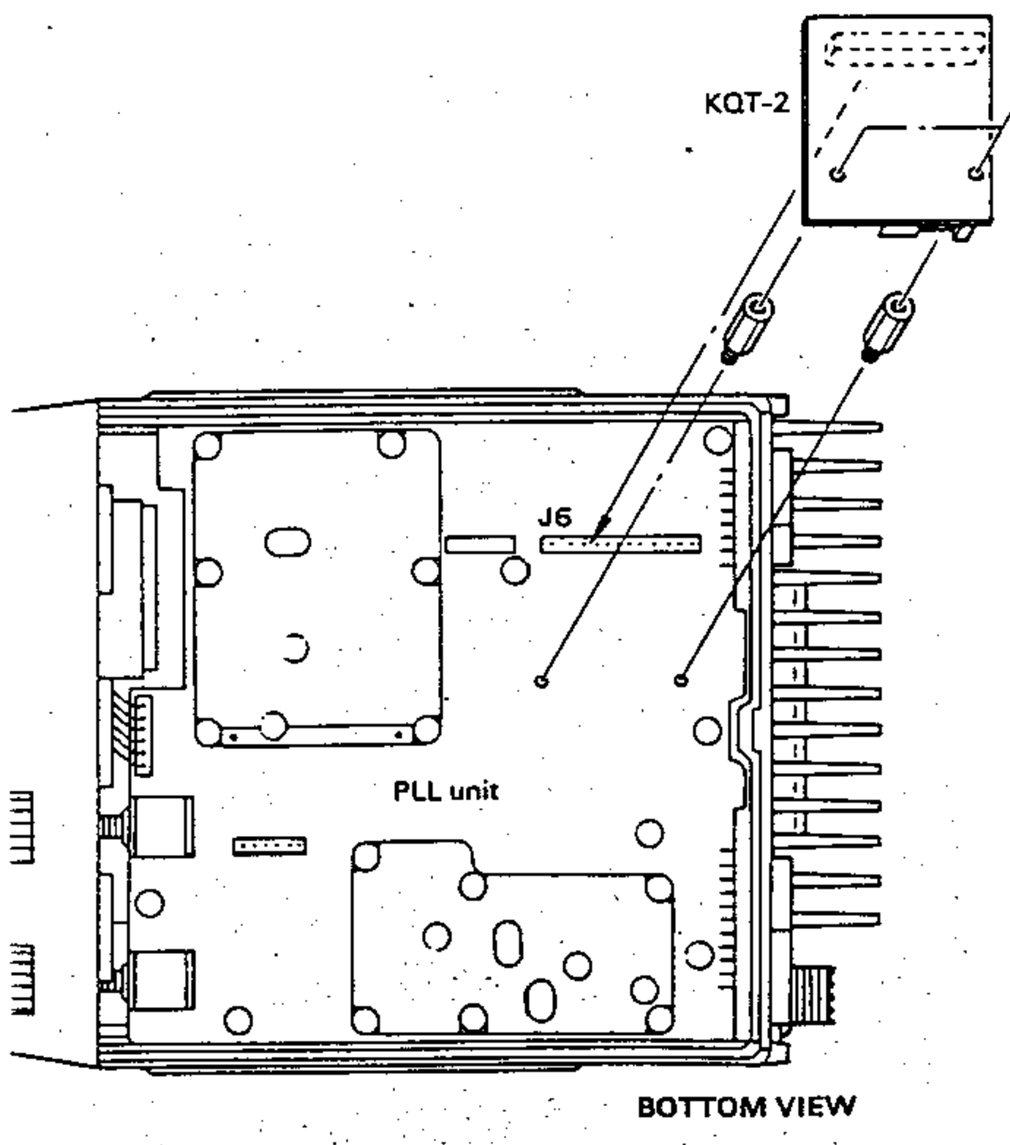


Fig. 3-5

7: Conversion to 16CH with KQT-2 or without CTCSS
Disengage the front panel, remove the 6CH rotary switch S01-1433-05 secured to the chassis, then disconnect the rotary switch plug connected to PLL unit J7. Install the new rotary switch S29-1432-05 and cable E31-2176-05 to the 16CH revision kit PC board. Secure the rotary switch to the chassis and connect the cable plug P9 to PLL unit J9. Cut off the brown and red wires from the plug, since these two wires are not used.

8: Conversion to 16CH with KQT-1
The only difference from item 7 is that cable plug P9 is now connected to CTCSS unit J13.

9: Conversion to 32CH without signalling or CTCSS
Basically the same as in item 7. Use the 32CH revision kit in lieu of the 16CH kit and connect the brown and the red leads (cut in item 7) to the S2 AUX switch on the TX-RX unit, as shown.

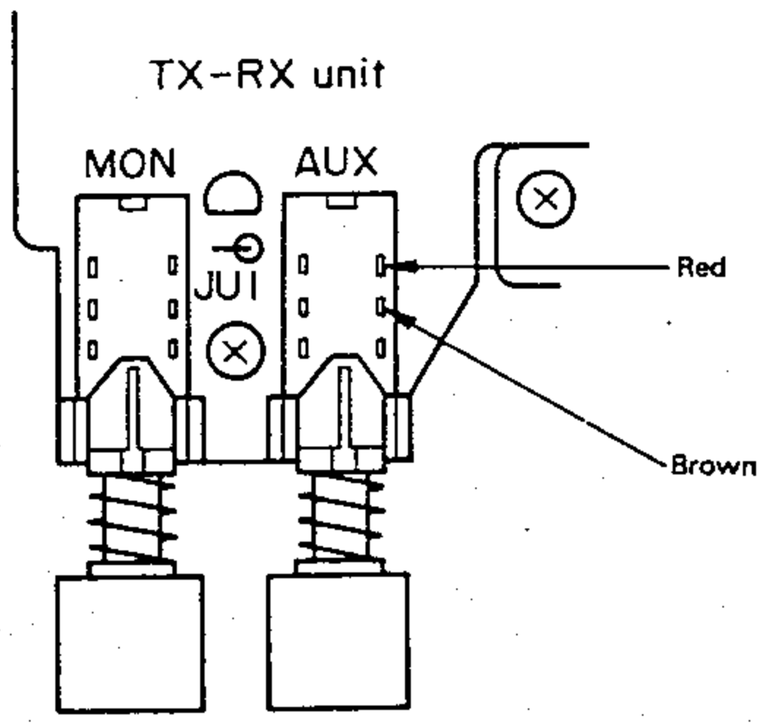


Fig. 3-6

6: Installing KQT-2 (Fig. 3-5)
For installation on the PLL unit, proceed as in item 5. In this case, the cable assembly with plug is not supplied with the CTCSS unit.

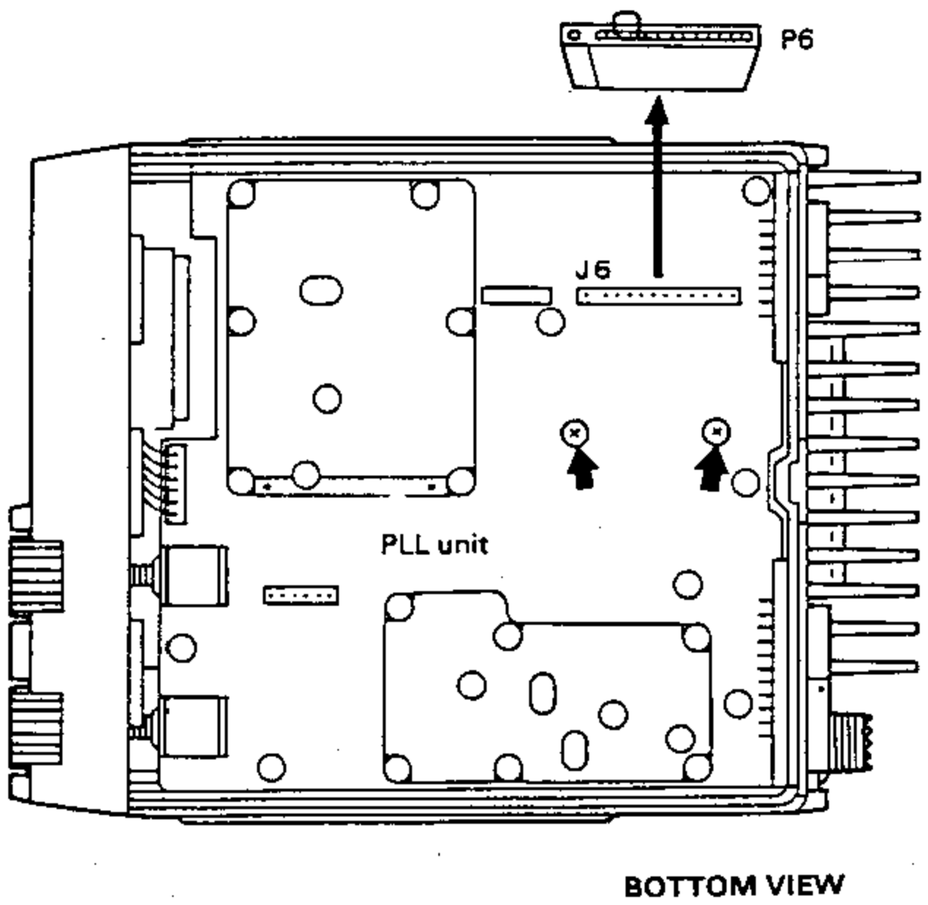


Fig. 3-4

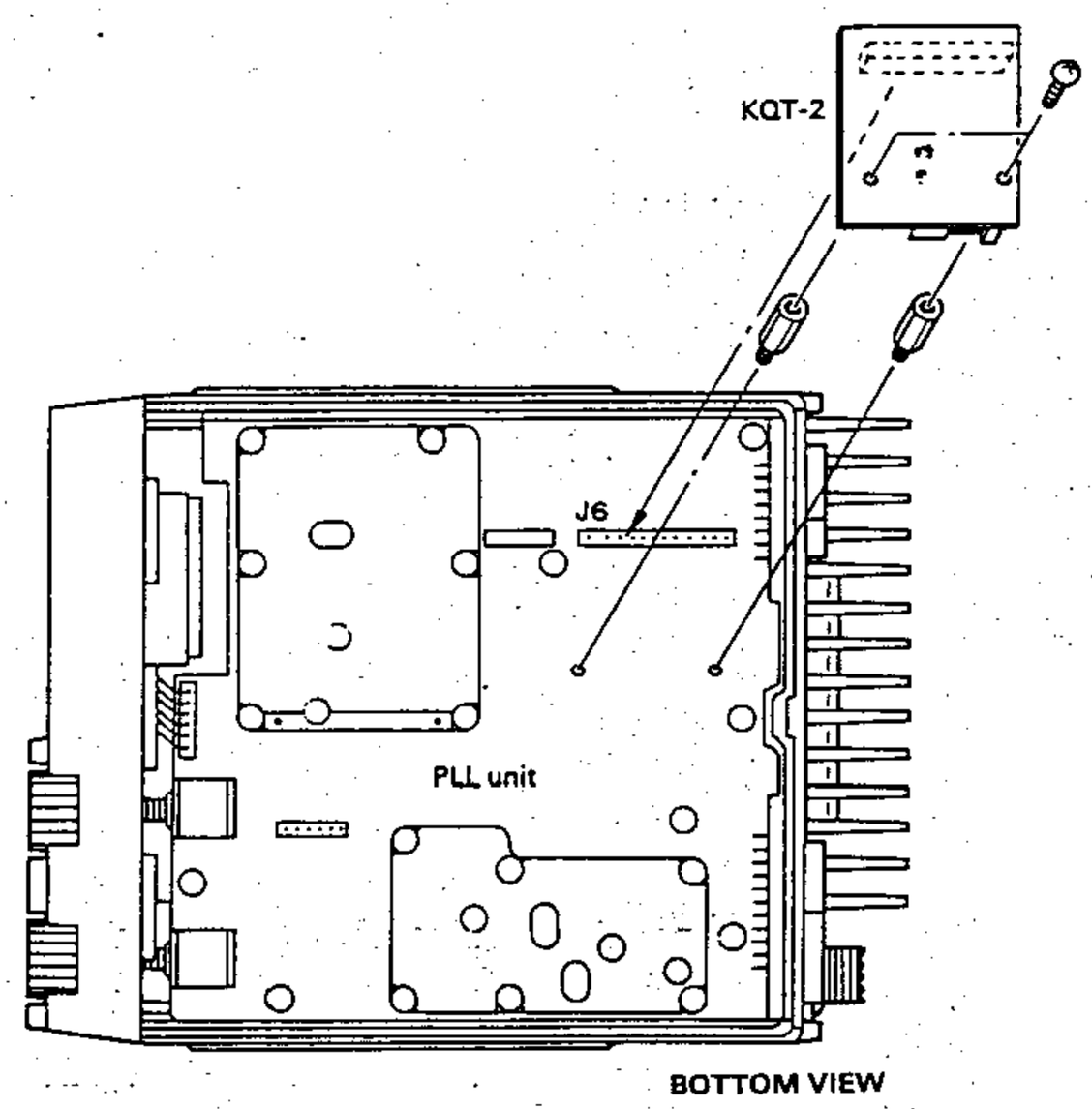


Fig. 3-5

7: Conversion to 16CH with KQT-2 or without CTCSS
Disengage the front panel, remove the 6CH rotary switch S01-1433-05 secured to the chassis, then disconnect the rotary switch plug connected to PLL unit J7. Install the new rotary switch S29-1432-05 and cable E31-2176-05 to the 16CH revision kit PC board. Secure the rotary switch to the chassis and connect the cable plug P9 to PLL unit J9. Cut off the brown and red wires from the plug, since these two wires are not used.

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The only difference from item 7 is that cable plug P9 is now connected to CTCSS unit J13.

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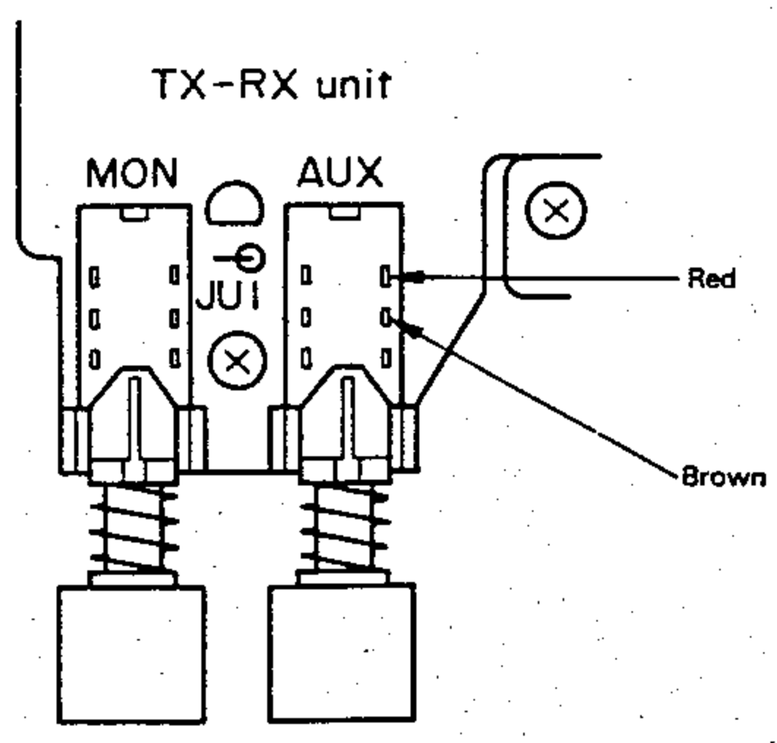


Fig. 3-6

10: Conversion to 32CH with KQT-1
Connecting the cable plug P9 to CTCSS unit J31 is the only difference from item 9.

11: Installing time-out timer KTT-1. (Fig. 3-7)
Install the Time-out timer in place on the PLL unit as shown. Connect Time-out timer plug P45 to PLL unit J5, then open PLL unit JU3.

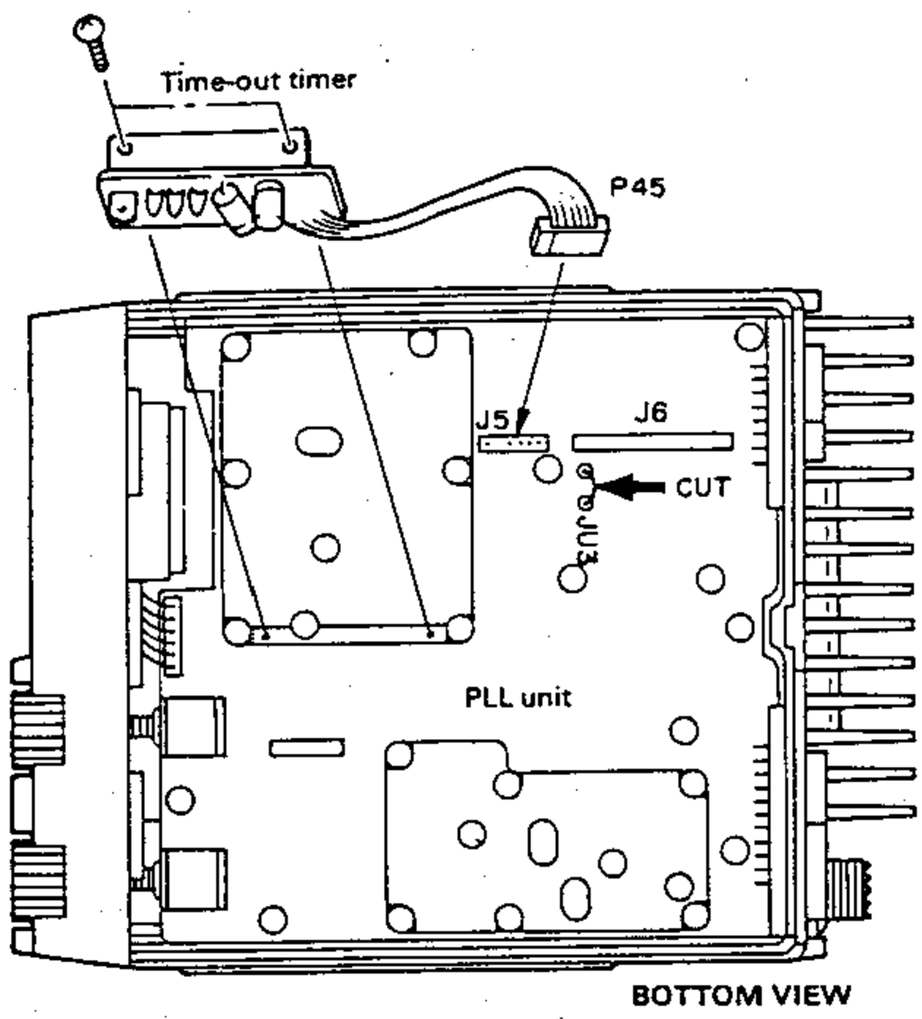


Fig. 3-7

12: Perform operating frequency realignment, following the alignment procedure, page 5-7.

13: For RCC
(1) Obtain kit;
KCH-1C (RCC kit for TK-801S)
KCH-1D (RCC kit for TK-701S)
(2) Cut off the red lead ③ from the 16 channel switch.
Cut off the brown lead ② from the 16 channel switch.
(3) Install the rotary switch to the chassis.
(4) Pass the brown lead ⑥, cut in item (2), under the VOL and SQL bracket and solder it to panel side of AUX switch.
Solder the brown lead ① to the common side.
Install the channel knob.
(5) Install PLL unit (X50-1970-21) JU14.

(6) Replace the escutcheon panel with the RCC panel.
TK-801S: A21-0758-04
TK-701S: A21-0759-04
Attach the escutcheon panel with double-faced adhesive tape.

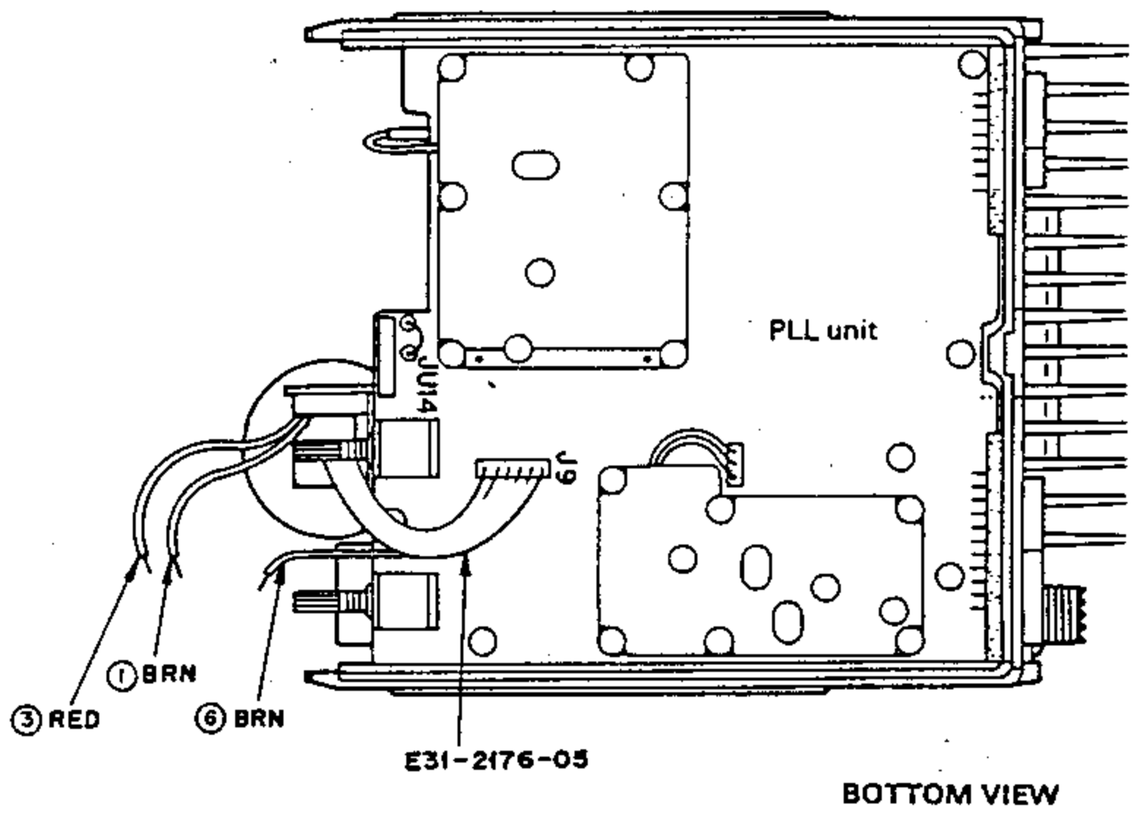


Fig. 3-8

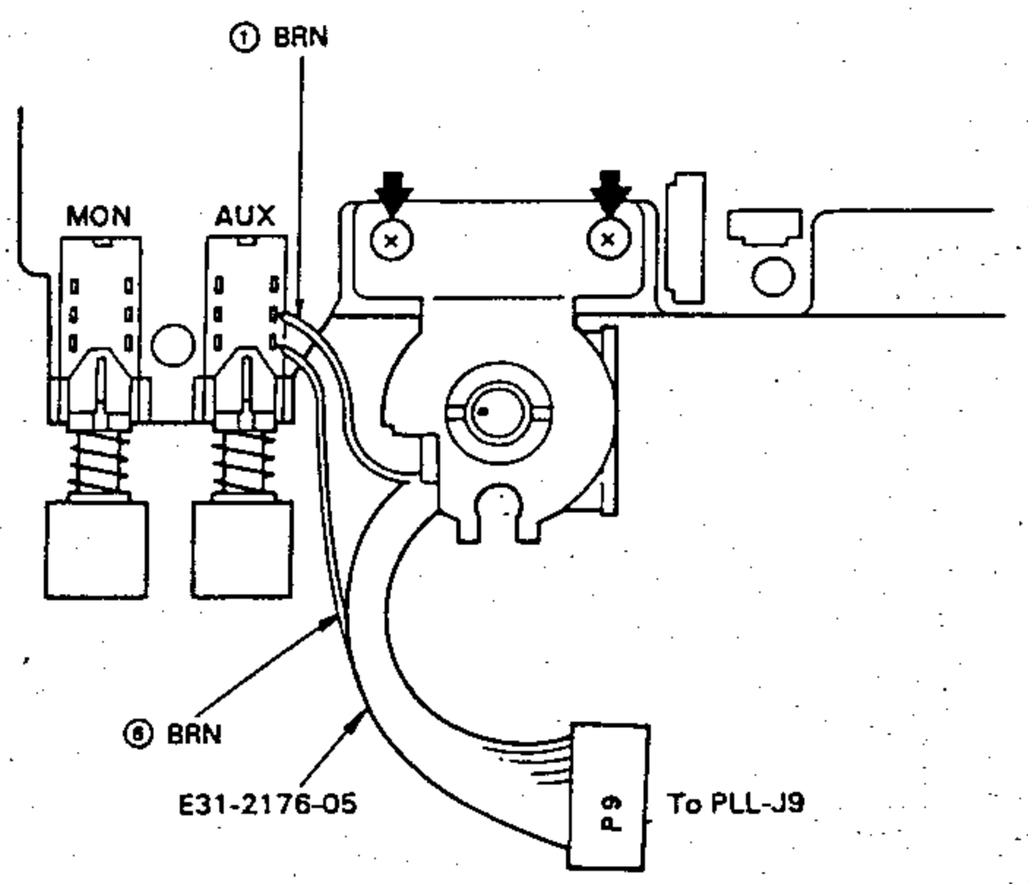


Fig. 3-9

(7) Operation
ROM (out position):
Pre programmed frequencies change by the 16 channel switch.
HOME (in position):
Pre programmed HOME frequency pair is automatically selected at "H".

4. CIRCUIT DESCRIPTION

1. TX (Transmitter)

The transmitter drive signal is delivered from the PLL unit to the TXO input terminals, at a VHF frequency level. This is tripled by Q1: 2SC2026. Following this stage, 2/3 and 4/3 harmonic components are filtered out by helical resonator assembly Z2. The signal is then amplified to approximately the 50W level by Q2: 2SC2570A, Q3: 2SC3019, Q4: 2SC3020, Q5: 2SC3022 and Q6: 2SC2905. This 50W RF output signal goes through the antenna switching diode D4: MI407 and then to the dual section Low Pass Filter (LPF) to obtain a 40W RF output signal at the antenna terminal.

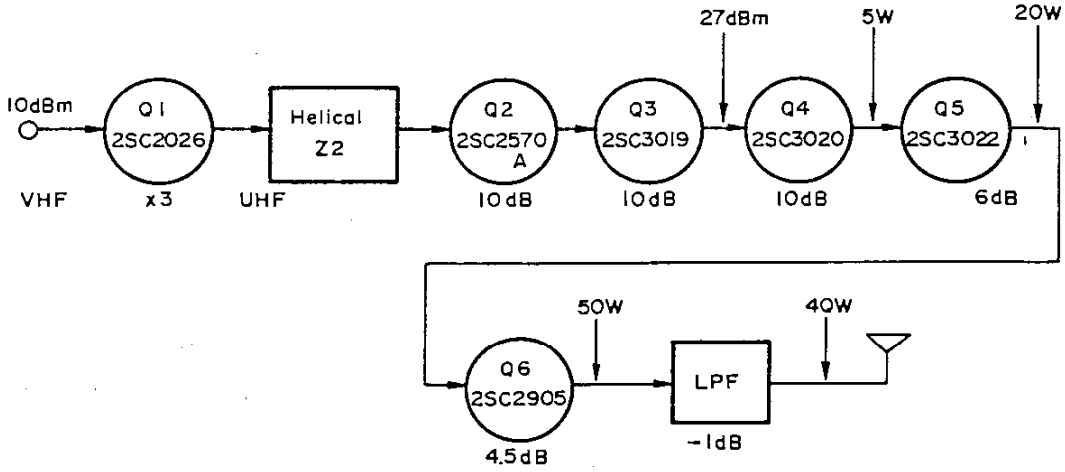


Fig. 4-1 Transmitter Block Diagram

The output of final amplifier Q6: 2SC2905 is detected by rectifier D3: 1SS97 and is fed to Q7: 2SC1815 through potentiometer R301. Q7 and Q8: both 2SC1815 form a differential amplifier circuit. The reference voltage for this differential circuit is established by resistor divider R19 and R20, which is connected across the T8 (8V DC during TX) supply line and ground. The divided DC voltage provides base bias for Q8. Therefore, Q8 and Q9 control the output of regulators Q9: 2SC1815 and Q10: 2SB946, as adjusted by R301. This controls the DC voltage, and therefore the amplification level of Q3 and Q4.

When the UNL (unlock) line is HIGH (8V, if the PLL unlocks), Q11: 2SA1015 is cut off and Q1 loses T8 and is deactivated. This results in no RF output power.

2. RX (Receiver)

Receiver input supplied through the antenna terminal passes through the low pass filter and 1/4 λ antenna switching circuit, and is initially UHF-filtered by helical assembly Z18. The filtered signal is RF amplified by Q13: 2SC3037 and is further filtered by helical Z19 and Z20. This is then input to the 1st mixer Q14: J310. The 1st oscillator injection signal is supplied from the PLL unit to the RXO input. This is multiplied by tripler Q12: 2SC2026, filtered by helical Z17, and coupled to the 1st mixer Q14: J310.

The 1st IF signal frequency (21.4 MHz) output from the 1st mixer is filtered by Monolithic Crystal Filter (MCF) Z24 and Z25: 21F15B, and is post-amplified by Q15: 2SK241(GR)-1. This is coupled to U16: MC3359P which contains the 2nd local oscillator, mixer, 2nd IF amp, quadrature detector, noise amp and squelch switch.

The 2nd local osc. operates at 20.945 MHz to convert the 1st IF from 21.4 MHz to the 2nd IF at 455 kHz. This 2nd IF signal is filtered by ceramic filter Z28: CFV455D, is limiter amplified, and is then quadrature detected.

The detected audio frequency signal output from U16 is amplitude-limited by diode limiters D13 and D14: both 1S1555, and amplified by Q18: 2SC1815(Y), then coupled through the PLL unit for optional tone signalling use. The audio signal returned from the PLL unit is de-emphasized by R68 and C126, and is actively high-pass filtered by Q24: 2SC1815(Y). This is fed to the volume control on the PLL unit.

Again returned from the PLL unit, the signal is amplified by audio PA U20: μPC1242H, and then fed to both the built-in speaker and the external speaker terminals.

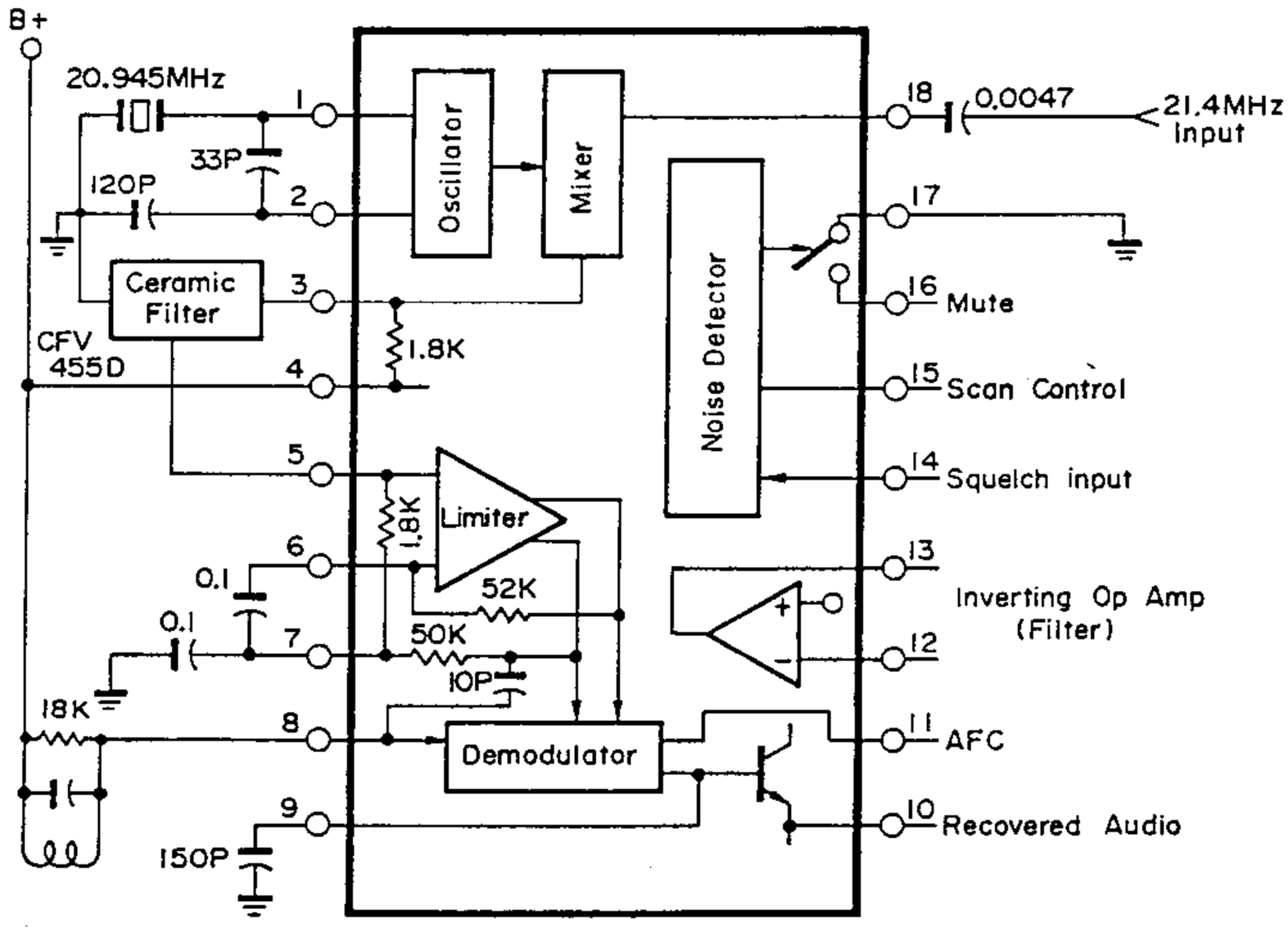


Fig. 4-2 Functional Block Diagram of U16 (MC3359P)

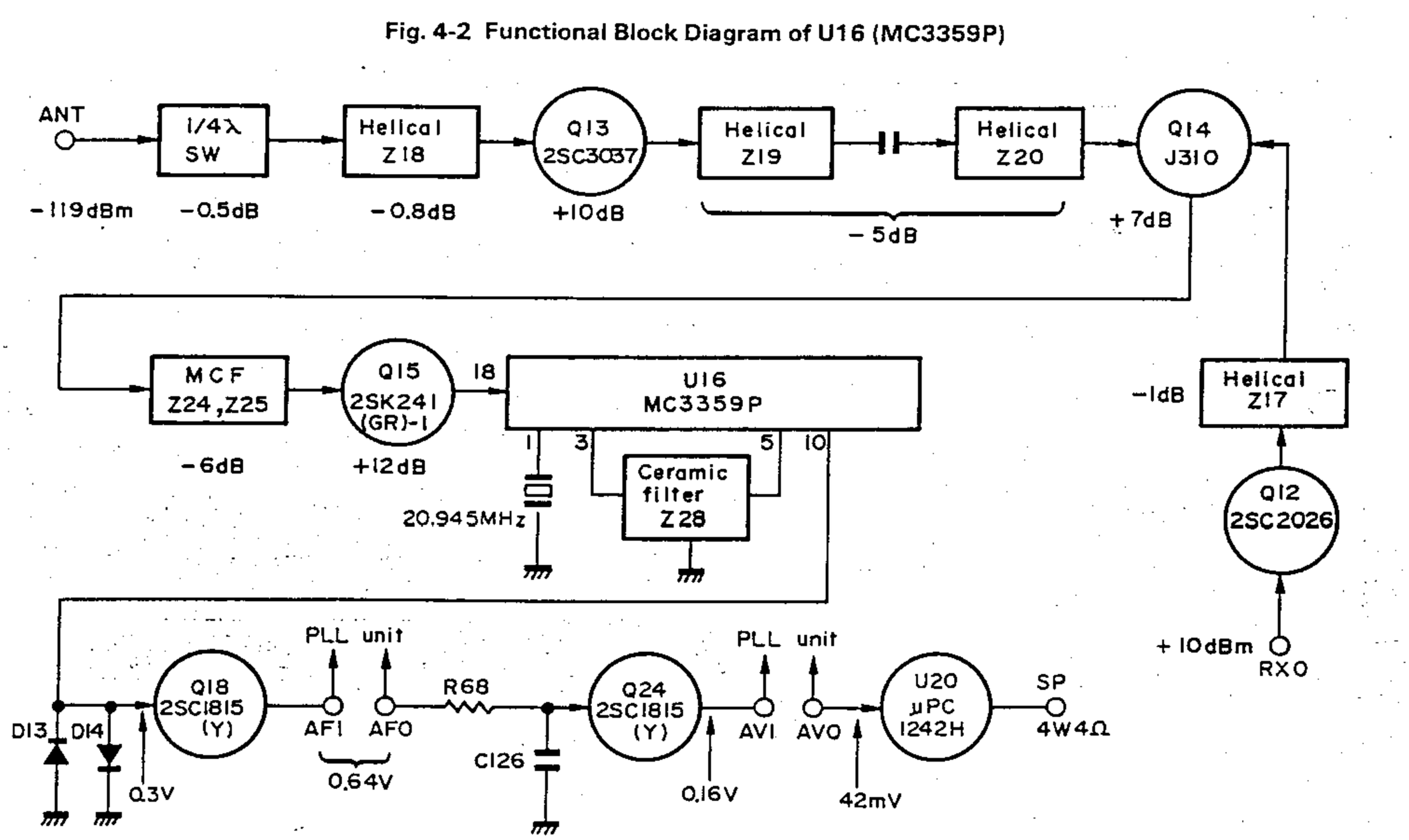


Fig. 4-3 Receiver Block Diagram

Squelch circuit

There are four inputs which activate the squelch gate: noise squelch, signalling squelch, muting and monitor.

Noise squelch is supplied from the audio output of U16: MC3359P to noise amp Q17: 2SC1815(Y) and then to the squelch control located on the PLL unit.

Noise from the squelch control is returned to the noise amplifier section of U16: MC3359P pin 12.
Output from pin 13, it is then rectified and used to control U16 pin 14. Pin 16, mute output is fed to squelch switch Q27: 2SC1815(BL).

Signalling squelch from the PLL unit via the AC terminal is achieved along with microphone hanger switch logic by U200: TC4001BP, and is then supplied to squelch switch Q27: 2SC1815(BL). Muting is directly connected to squelch switch Q27: 2SC1815(BL). These three inputs are all squelched at logic low: that is, no sound is output.

Muting is performed by squelch switch Q27: 2SC1815(BL) and is fed to squelch gate Q25 and Q26: both 2SC1815(BL). The monitor is also coupled to the inputs of Q25 and Q26. When the monitor is opened, squelch is switched on.

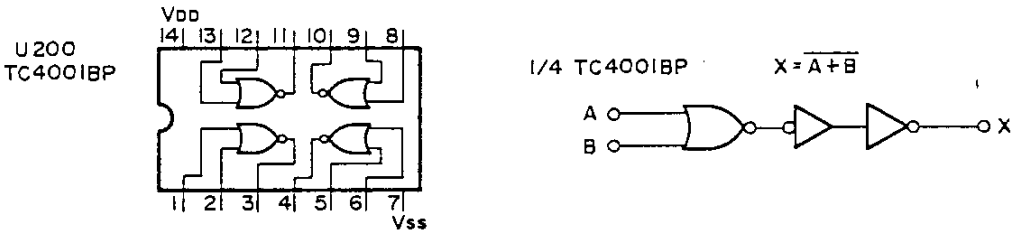


Fig. 4-4 TC4001BP

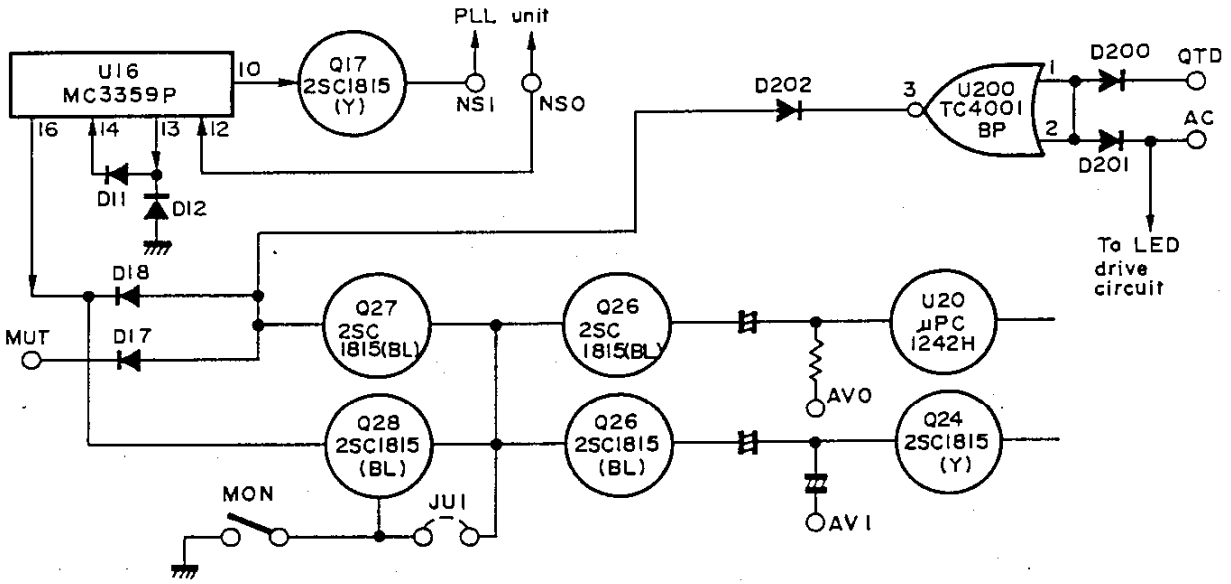


Fig. 4-5 Squelch Circuit

The priority order of each input over the squelch is listed in the following table.

JU1 closed		JU1 opened	
Priority	Input	Priority	Input
1	Monitor	1	Noise squelch
2	Noise squelch	2	Monitor
2	Signalling squelch	3	Signalling squelch
2	Muting	3	Muting

The input level for squelch operation is listed in the following table.

Input	"L" level	"H" level or opened
Monitor	Sound output (Squelch OFF)	No sound (Squelch ON)
Noise squelch (Cathode of D18)	No sound (Squelch ON)	Sound output (Squelch OFF)
Signalling squelch (Cathode of D202)	No sound (Squelch ON)	Sound output (Squelch OFF)
Muting (MUT terminal)	No sound (Squelch ON)	Sound output (Squelch OFF)

The relationship between AC, QTD and signalling squelch output is:

QTD	AC	Signalling squelch (D202 Cathode)
H	H	L
H	L	H
L	H	H
L	L	H

Status indicators

There are two supplied and one optional indicator LEDs; TX and BUSY, and an optional CALL LED. The TX LED is red and lights only when transmitting. The BUSY LED lights green while the noise squelch is opened. The CALL LED flashes yellow while the tone squelch is opened.

Power supply

The power supply section consists of RX/TX switch U19: MB3756, Q21 channel indicator lamp regulator, 9.4V and Q22 "COM" line regulator, 7.4V in receive both 2SC1815(BL).

U19: MB3756 alternately switches R8 and T8 by grounding the key line, and supplies C8 (common, or always ON) output, all at 8V.

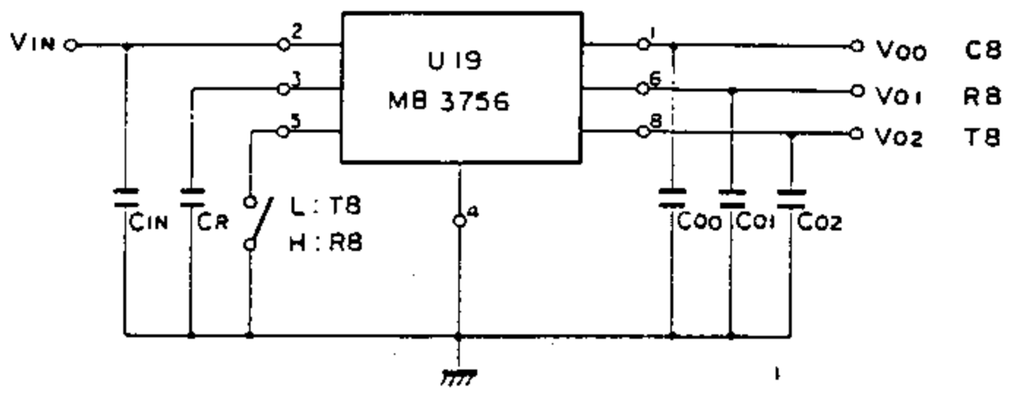


Fig. 4-6 Operational Diagram of U19: MB3756

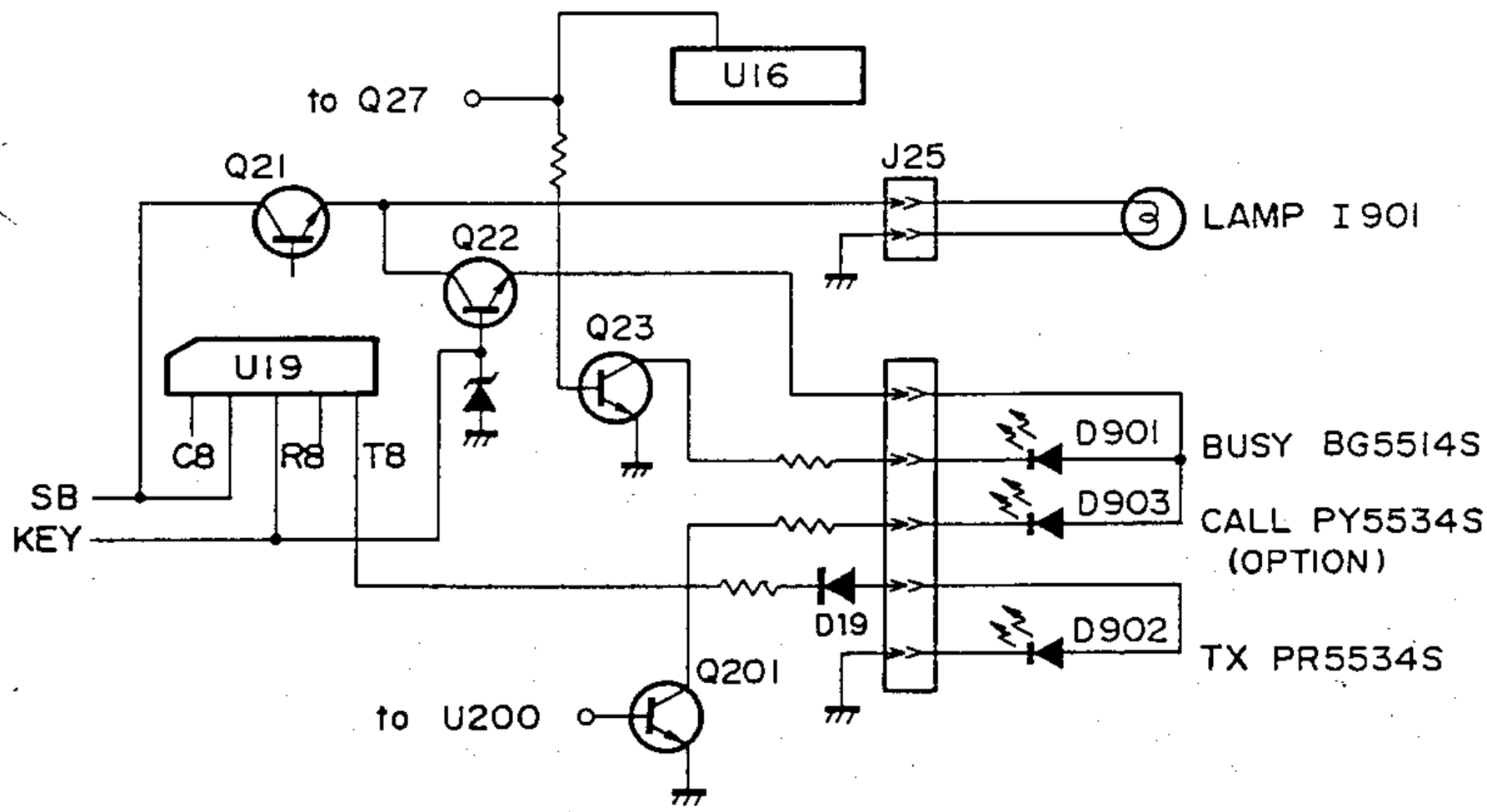


Fig. 4-7 Power Supply and LED Circuit

3. Common PLL

The VCO output from Q1: 2SK125 is buffered by Q2 and Q3: 2SC2668(Y), is switched by diode D2: 1S2588, and is then sent to the RX unit as the RXO signal (receiver 1st local osc.). A sample of this signal is coupled to prescaler U21: μPC571C from the output of Q2 through buffer Q5: 2SC2668(Y).

The prescaler acts as a 1/64 or 1/65 divider controlled by the pulse generated by PLL IC U18 pin 9 (MC145152) and its output is further divided by the ÷ N-counter U18; then it is coupled to the phase comparator.

The output of the reference oscillator Z1: TCXO is divided by U18 after buffering by Q6 and is coupled to the phase comparator. The dividing ratio is determined by 16-bit parallel data set by PROM ICs U22 and U23: M54730AP. The dividing ratio of the reference oscillator output is locked. The output of the phase comparator is fed through the charge pump U20: TC4007UBP and the loop filter and is then coupled back to varicap diode D1: 1SV50E as the VCO control voltage.

RXO frequency range: f_L (MHz)

	f_L (MHz)
F1	142.8666 ~ 149.5333
F2	149.5333 ~ 156.2000
F3	156.2000 ~ 163.5333

f_L formula:

If the TX frequency is f_T

$$f_L = \frac{1}{3}(f_T - 21.4)$$

N value range (f_t: PLL TXO output):

$N = 34288 \sim 39248$

formula:

$$N = \frac{3f_t - 21.4}{12.5} \times 1000$$

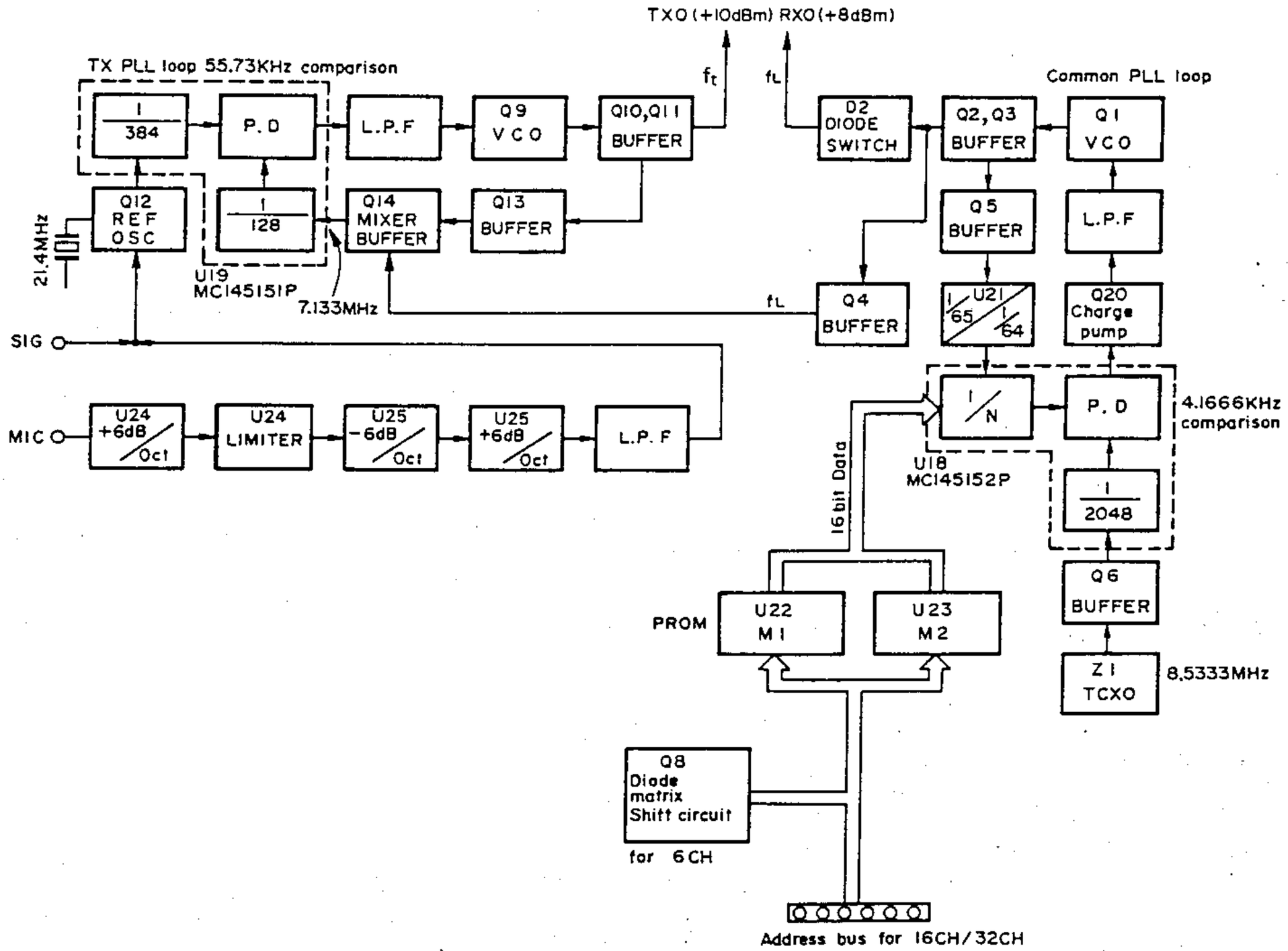


Fig. 4-8 PLL Block Diagram

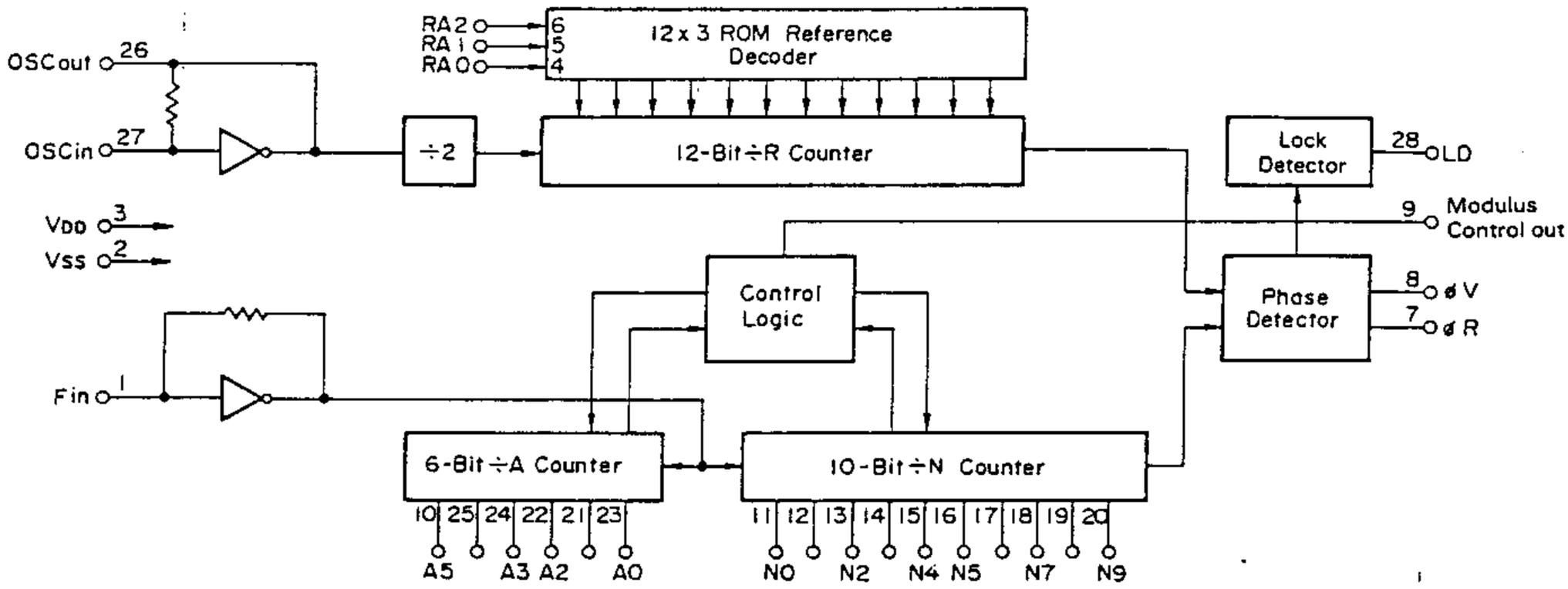


Fig. 4-9 MC145152 (PLL unit U18)

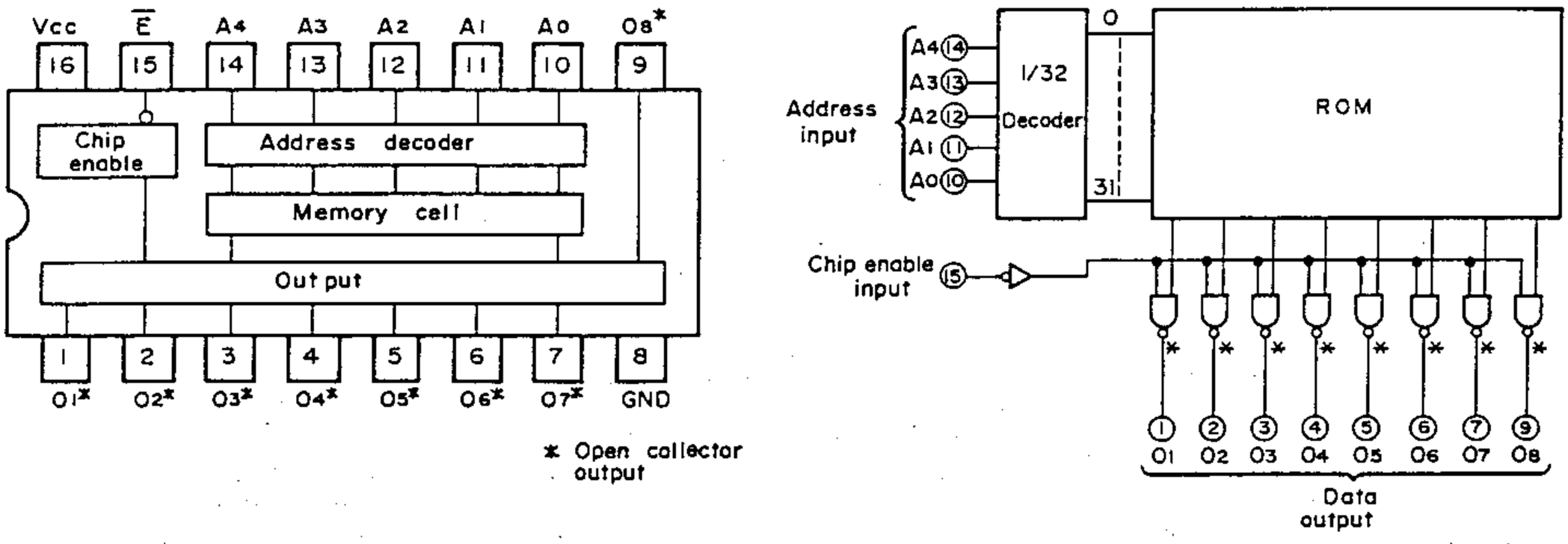


Fig. 4-10 M54730AP (PLL unit U22, 23)

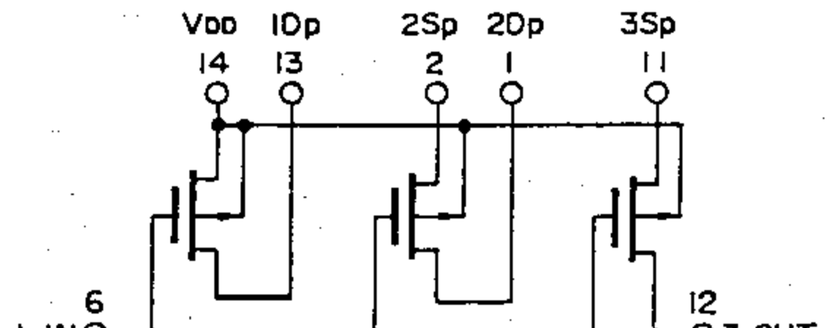


Fig. 4-11 TC4007UBP (PLL unit U20)

4. Transmitter PLL

The output signal from VCO Q9: 2SK241(GR)-1 is buffered by Q10 and Q11: 2SC2668(Y) and is output as the TXO signal (1/3 transmit frequency). A part of this signal from Q10 is coupled through buffer Q13: 2SC2668(Y) to mixer Q14: 2SC2668(Y). A part of the RXO output fed from the common PLL is also supplied through isolation amp Q4: 2SC2668(Y) to mixer Q14: 2SC2668(Y). The mixer output (7.1333 MHz) is amplified by Q15, divided by PLL IC U19: MC145151 and coupled to the phase detector. The 21.4 MHz OFFSET (and modulator) oscillator output is also divided by U19 and coupled to the phase detector.

The output of the phase detector is supplied to the loop filter and then to varicap diode D3: 1S2208 as the VCO control voltage.

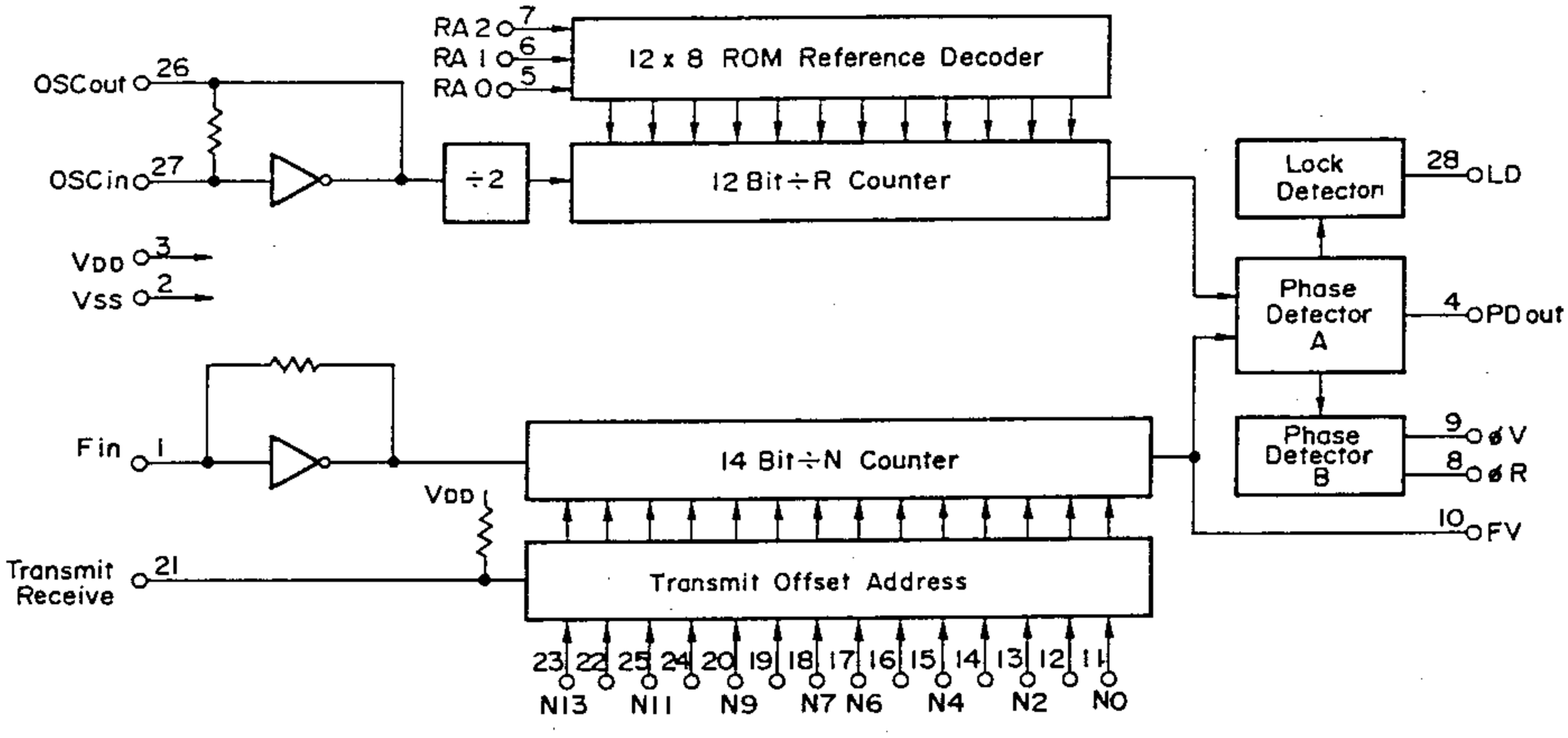


Fig. 4-12 MC145151P (PLL unit U19)

5. Modulator circuit

The transmitter PLL reference (or OFFSET) oscillator Q12: 2SC2668(Y) is directly frequency modulated. An EIA (RS-152-B) frequency modulation characteristic is obtained by mic amplifier-limiter U24 and U25 (both μPC4558C).

6. PLL unlock detection circuit

Unlock condition is detected in the common PLL by Q7: 2SC2603(E) and in the transmit PLL by Q16: 2SC2603(E). When either PLL unlocks, an "UNL" voltage at J1 pin 16 of approximately 8V deactivates the transmitter driver stages to prevent "illegal" output.

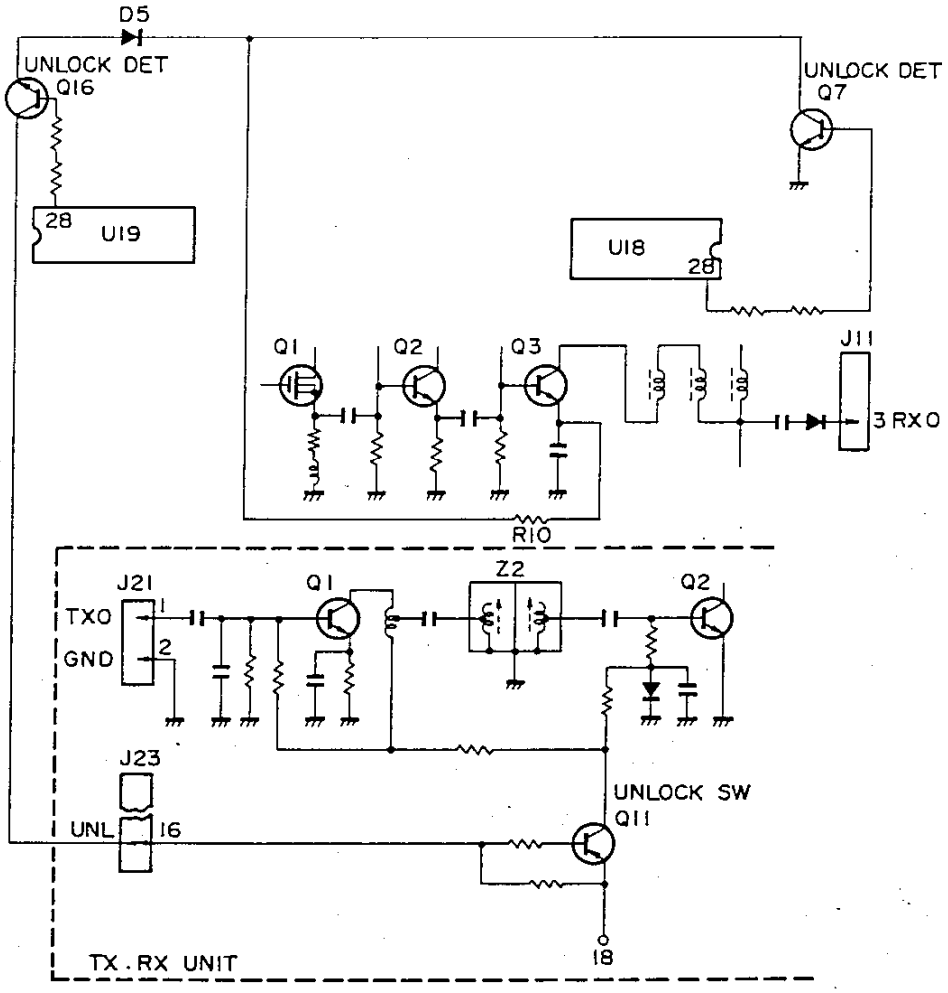


Fig. 4-13 Unlock Detection Circuit

7. QTD invert circuit

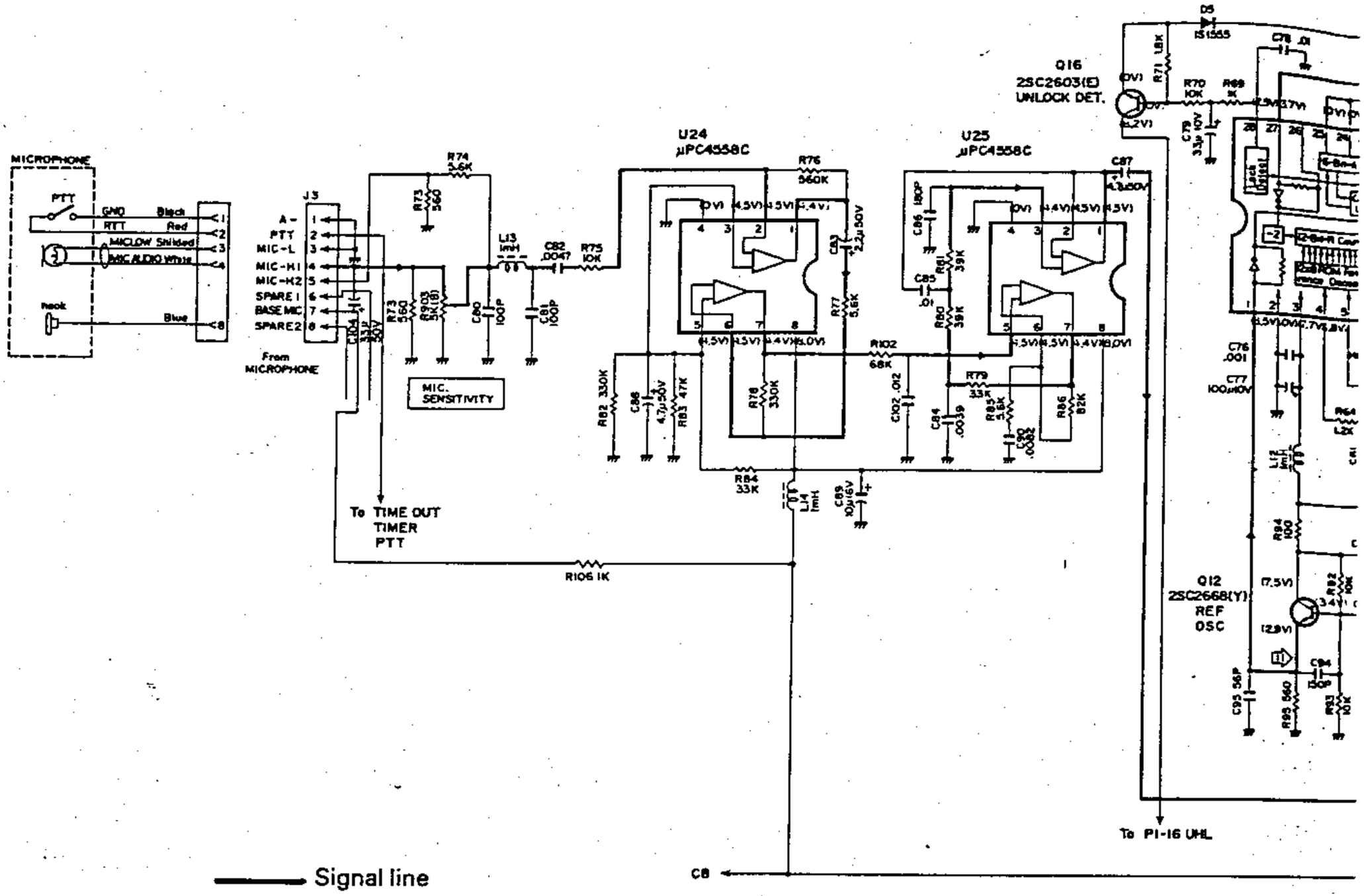
To select polarity (active Low or active High) to control QTD, Q17: 2SC2603(E) can be un-strapped to operate as an inverter.

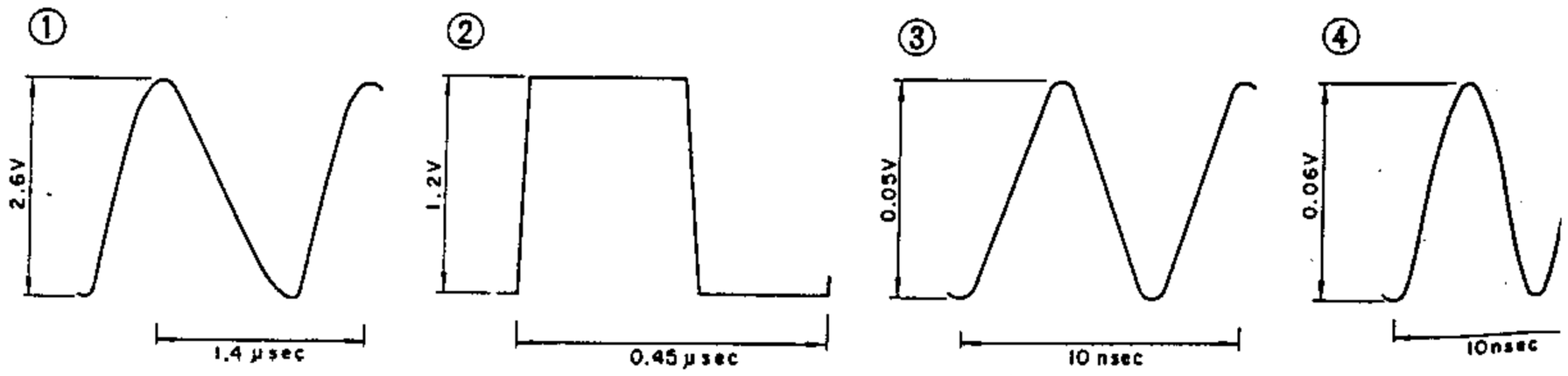
8. TX frequency shift circuit

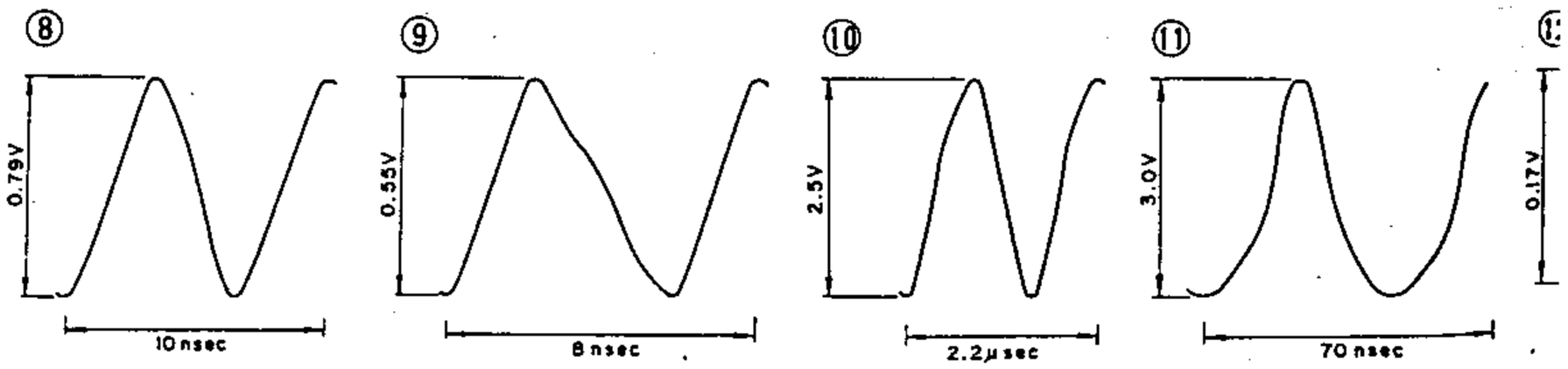
In the duplex mode, the first address bit (B4) is set to logic high by Q8: 2SC2604(E) in order to change the data (i.e. change address) in the PROM during transmission. In 6-channel operation, the duplex channel can be selected only from CH1 through CH6 by shift diodes D10 to D15: all 1S1555. (Channels slots in which diodes are installed are duplex.)

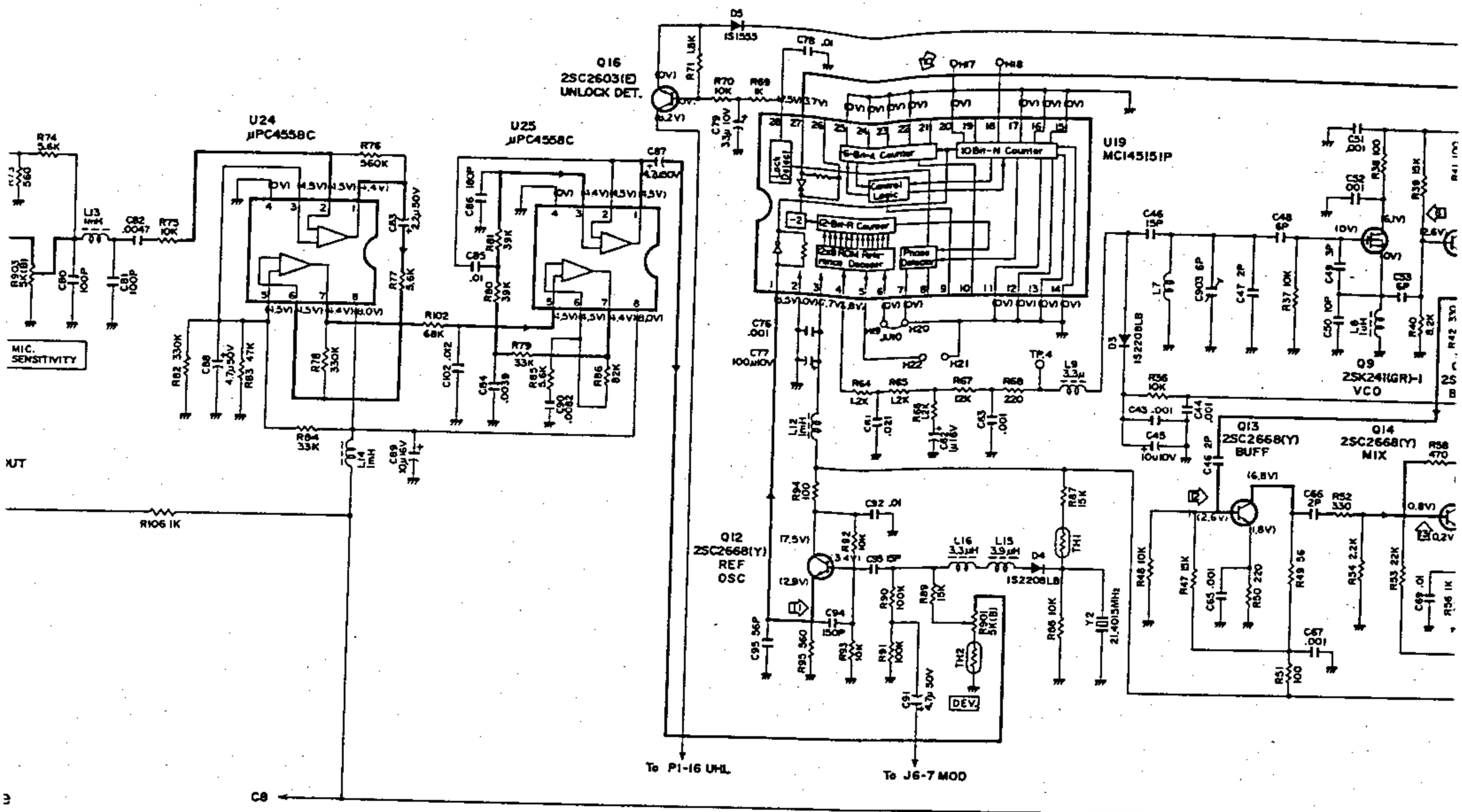
9. Diode matrix

Diodes D16 through D22 (all 1S1555) form a matrix circuit which converts the rotary channel switch status to PROM address data during 6-channel operation.

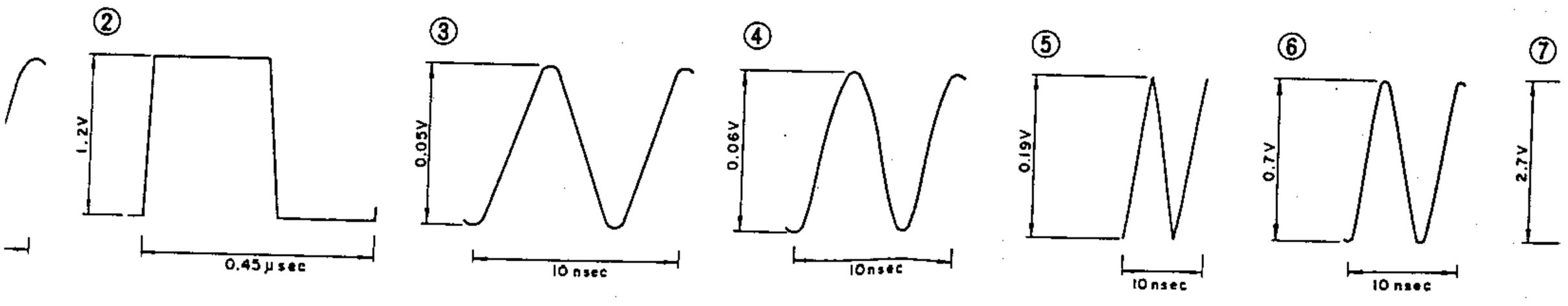

MICROPHONE
PTT
GND Black
RTT Red
MICLOW Shilded
MIC AUDIO White
hook
Blue
J3
A-
PTT
MIC-L
MIC-H1
MIC-H2
SPARE1
BASE MIC
SPARE2
From MICROPHONE
MIC. SENSITIVITY
To TIME OUT TIMER PTT
R106 1K
U24 µPC4558C
U25 µPC4558C
Q16 2SC2603(E) UNLOCK DET.
Q12 2SC2668(Y) REF OSC
To PI-16 UNL
CB
Signal line
Adjusting points

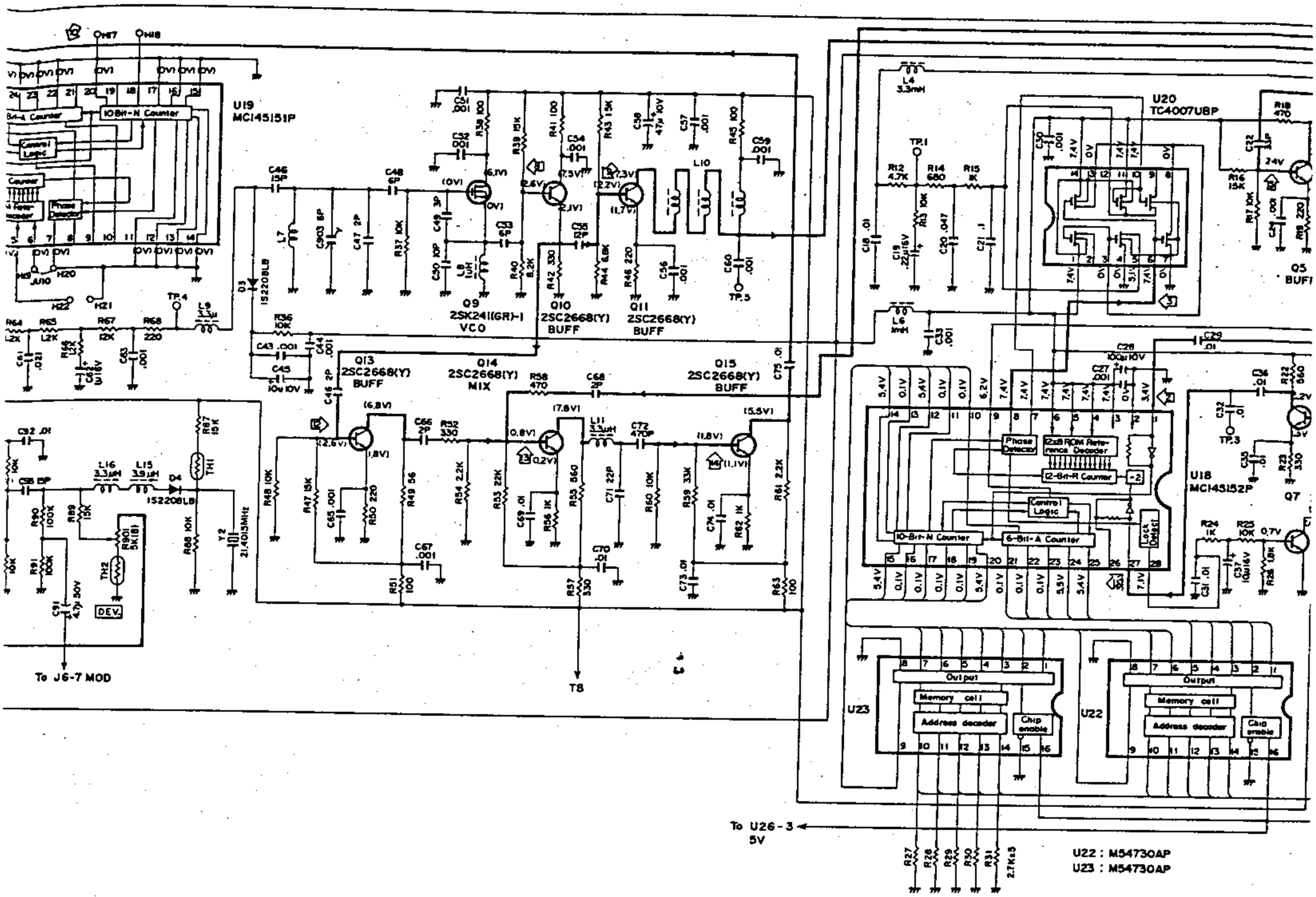

①
2.6V
1.4 µsec
②
1.2V
0.45 µsec
③
0.05V
10 nsec
④
0.06V
10nsec


⑧
0.79V
10 nsec
⑨
0.55V
8 nsec
⑩
2.5V
2.2µsec
⑪
3.0V
70 nsec
0.17V


U24
μPC4558C
U25
μPC4558C
U19
MC14515IP
Q16
2SC2603(E)
UNLOCK DET.
D5
1S1555
MIC. SENSITIVITY
R74 5.6K
R76 560K
R102 68K
R106 1K
C8
To P1-16 UHL
To J6-7 MOD
Q12
2SC2668(Y)
REF OSC
Q13
2SC2668(Y)
BUFF
Q14
2SC2668(Y)
MIX
Q9
2SK241(GR)-1
VCO
D3
1S2208LB
D4
1S2208LB
Y2
21.4013MHz
TH1
TH2
DEV.
Lock Detect
Control Logic
÷2
Dual Modulus Prescaler
Phase Detector
TP4

points

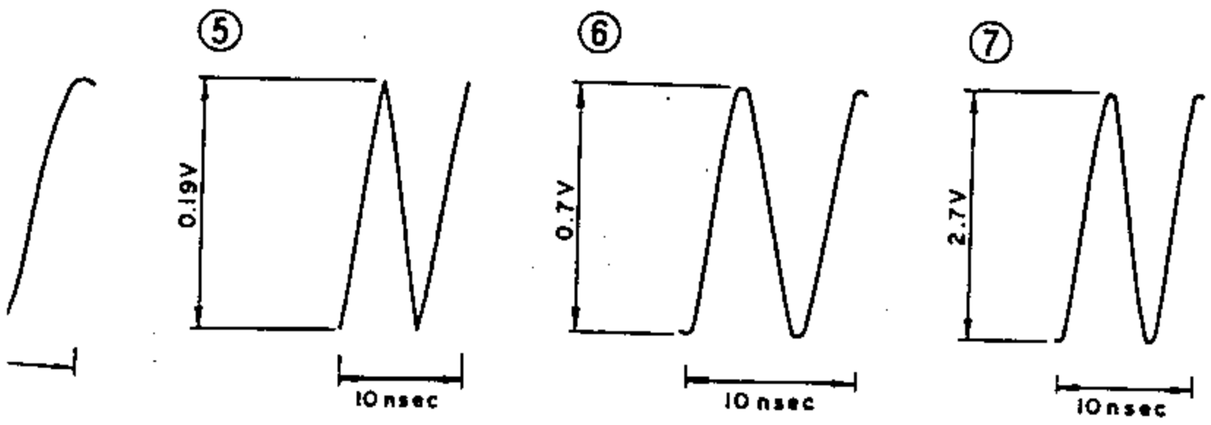

②
1.2V
0.45μsec
③
0.05V
10nsec
④
0.06V
10nsec
⑤
0.19V
10nsec
⑥
0.7V
10nsec
⑦
2.7V
⑨
0.55V
8nsec
⑩
2.5V
2.2μsec
⑪
3.0V
70nsec
⑫
0.17V
10nsec
⑬
0.19V
10nsec
⑭
0.21

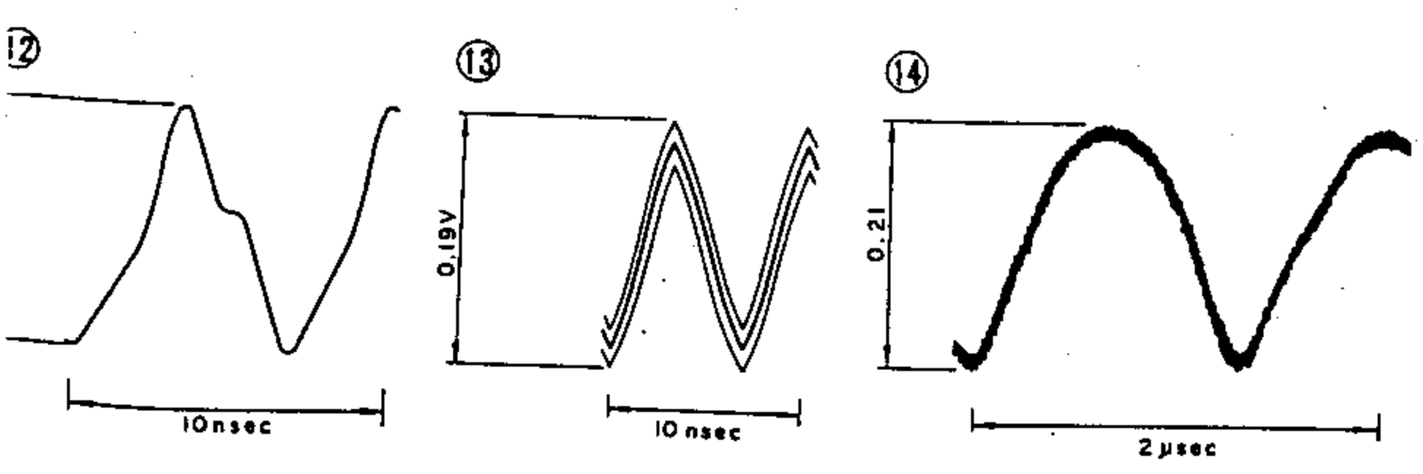


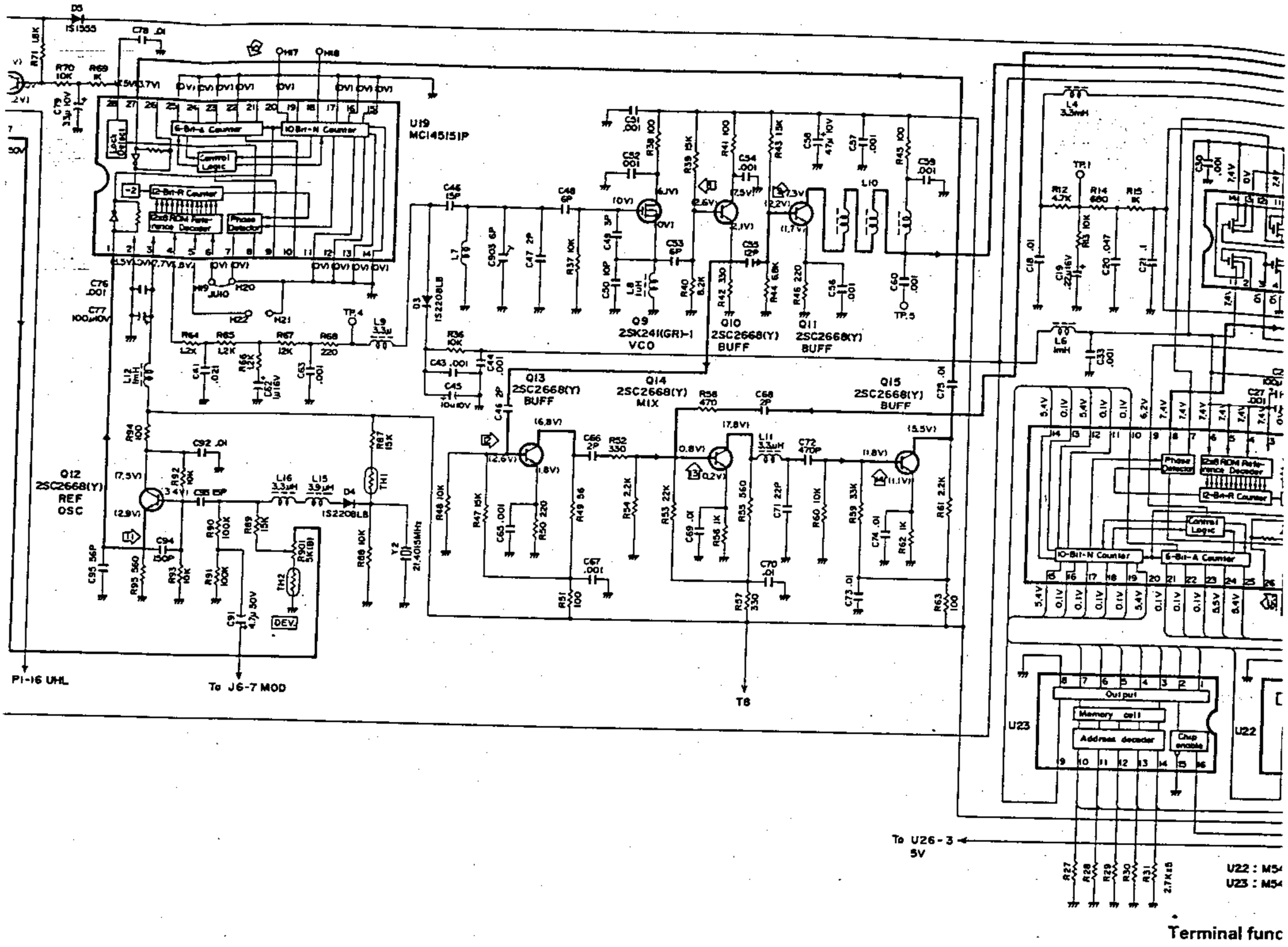
Terminal functions

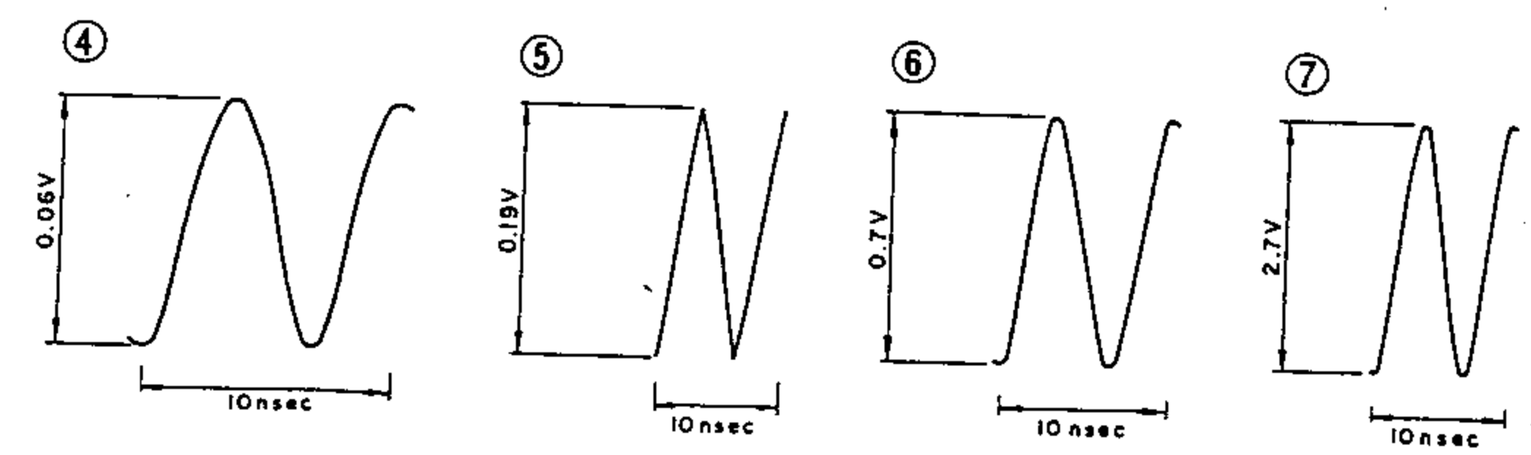
PLL unit

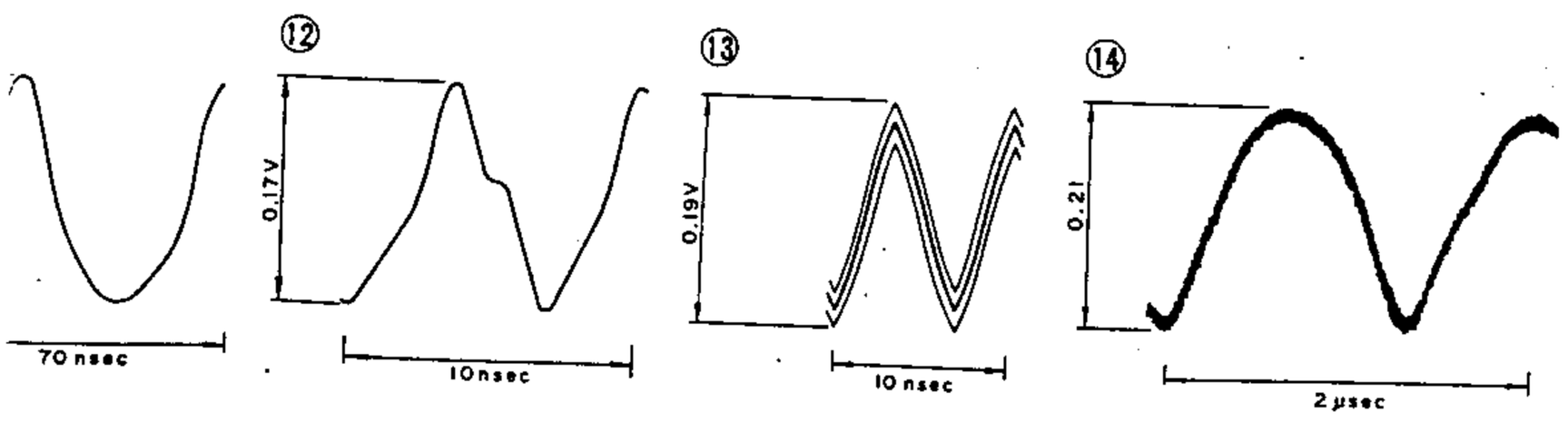
Connector No.	Terminal No.	Terminal name	Term
P1	1	ESP	External speal
	2	C8	8V common p
	3	SB	Switched B to source
	4	KEY	TX/RX data in
	5	R8	8V when recei
	6	T8	8V when trans
	7	AVO	Audio output f
	8	AVI	Audio input to
	9	AFO	Audio signal o
	10	NSO	Noise squelch
	11	NSI	Noise squelch
	12	AFI	Audio signal in
	13	MUT	Mute signal inp
	14	QTD	Quiet Tone Dis
	15	AC	Audio Control
	16	UNL	Unlock signal o
P2	1	B	Transmitting fi
	2	B	Transmitting fi
	3	B	Transmitting fi
	4	B	Transmitting fi
J3	1	A⁻	Microphone PT
	2	PTT	Microphone PT
	3	MIC-L	Microphone gro
	4	MIC-H1	Microphone inp (low impedance
	5	MIC-H2	Microphone inp (high impedance
	6	SPARE 1	Spare
	7	BASE MIC	Base Mic 8V DC
	8	SPARE 2	Spare







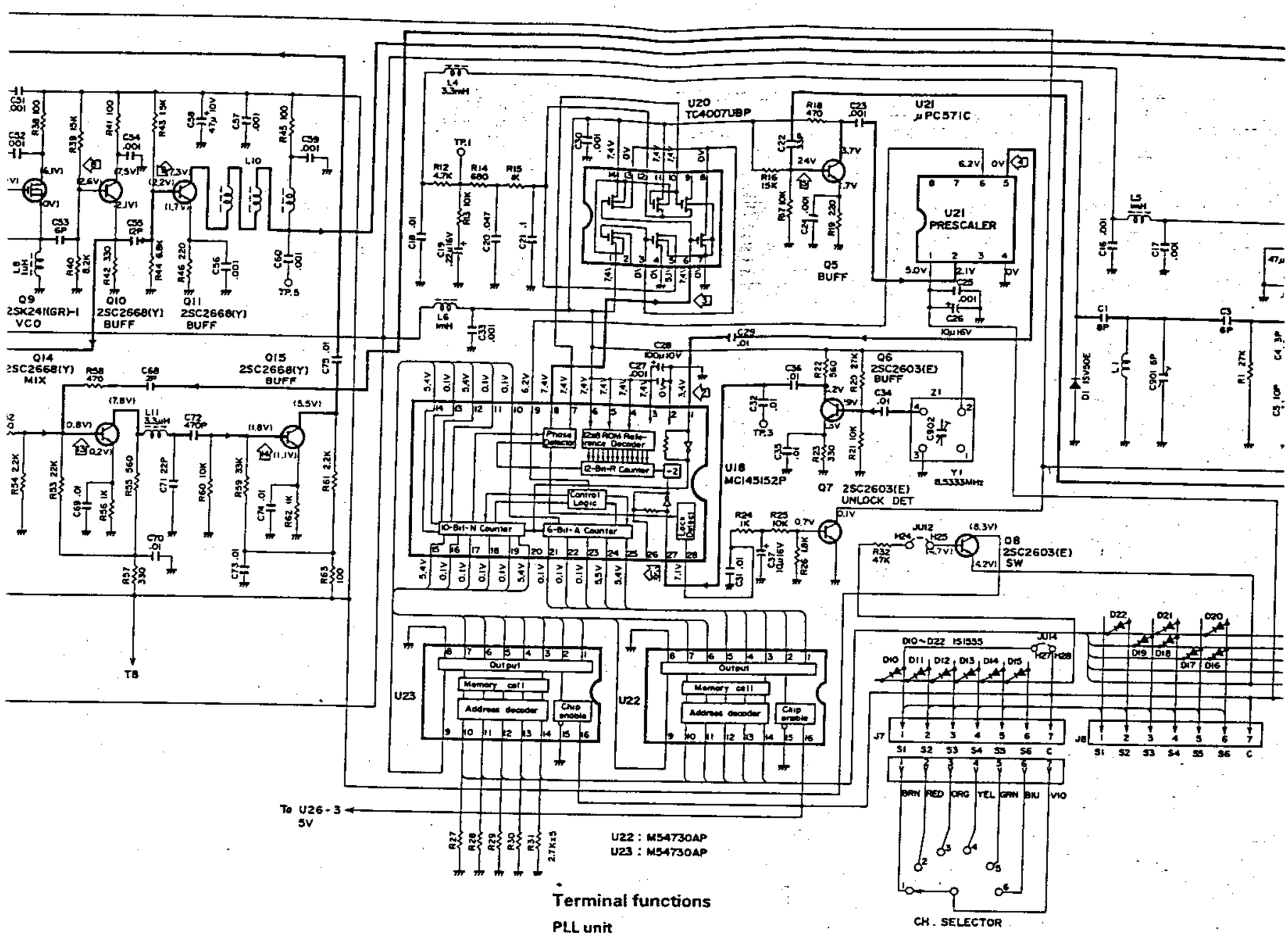


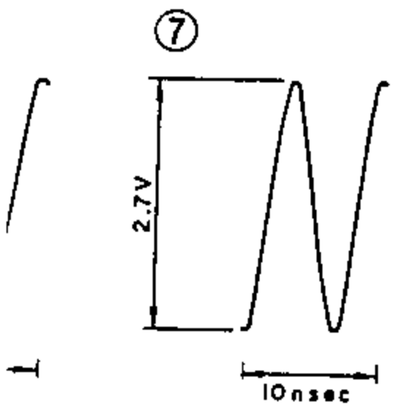


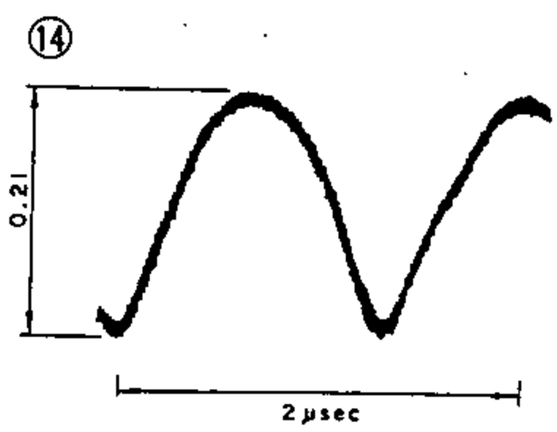
Terminal func

PLL unit

Connector No.	Termin. No.
P1	1
	2
	3
	4
	5
	6
	7
	8
	9
	10
	11
	12
	13
	14
	15
	16
P2	1
	2
	3
	4
J3	1
	2
	3
	4
	5
	6
	7
	8







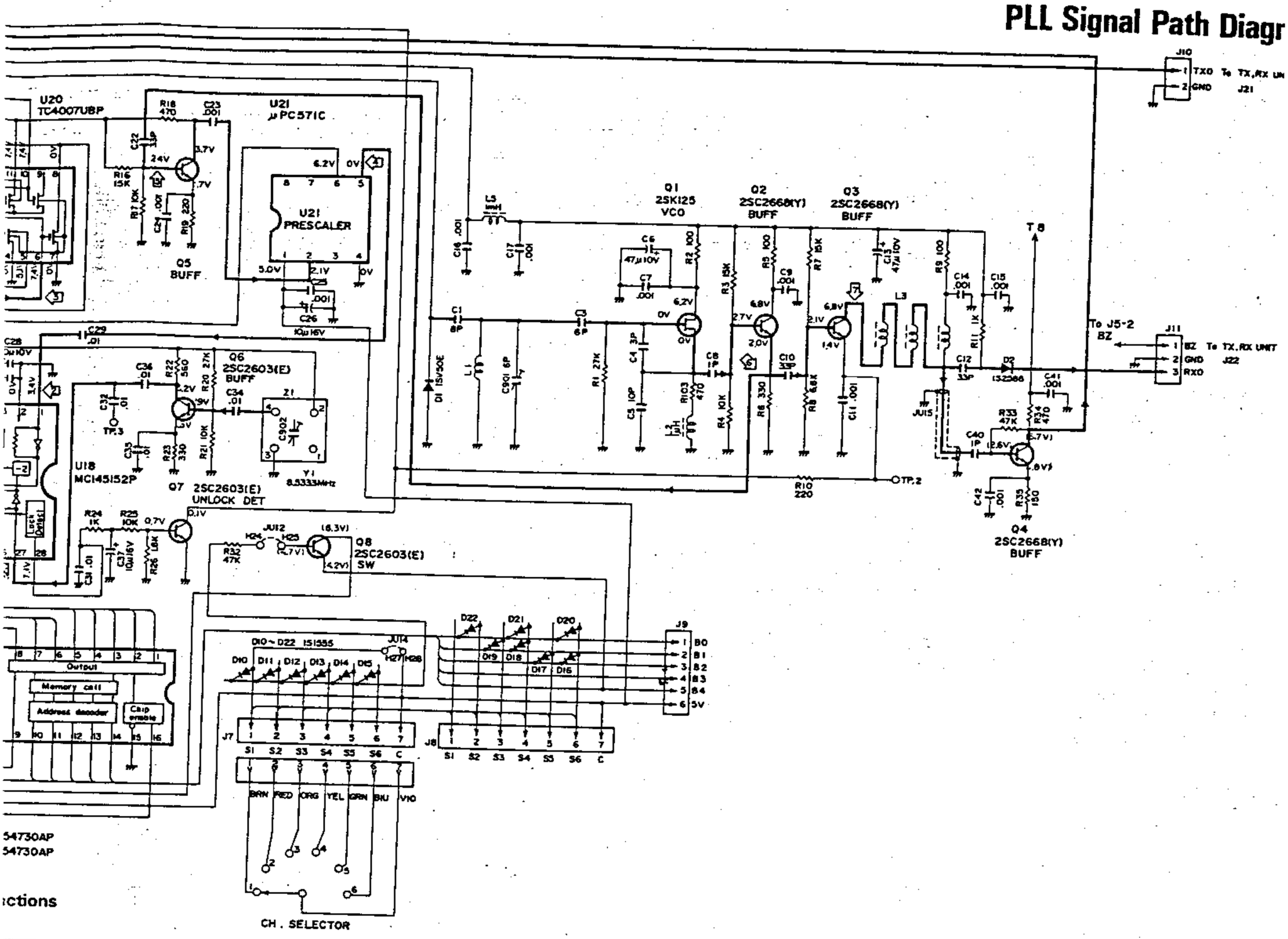
Terminal functions

PLL unit

Connector No.	Terminal No.	Terminal name	Terminal function
P1	1	ESP	External speaker input
	2	C8	8V common power source line
	3	SB	Switched B to regulated power source
	4	KEY	TX/RX data input (L for TX; H for RX)
	5	RB	8V when receiving
	6	TB	8V when transmitting
	7	AVO	Audio output from AF volume
	8	AVI	Audio input to AF volume
	9	AFO	Audio signal output
	10	NSO	Noise squelch output
	11	NSI	Noise squelch input
	12	AFI	Audio signal input
	13	MUT	Mute signal input
	14	QTD	Quiet Tone Disable input
	15	AC	Audio Control output
	16	UNL	Unlock signal output
P2	1	B	Transmitting final B^+
	2	B	Transmitting final B^+
	3	B	Transmitting final B^+
	4	B	Transmitting final B^+
J3	1	A^-	Microphone PTT grounded
	2	PTT	Microphone PTT input
	3	MIC-L	Microphone grounded
	4	MIC-H1	Microphone input 1 (low impedance)
	5	MIC-H2	Microphone input 2 (high impedance)
	6	SPARE 1	Spare
	7	BASE MIC	Base Mic 8V DC
	8	SPARE 2	Spare

Connector No.	Terminal No.	Terminal name	
J4	1	A^+ (REC)	B^+ for re (when in
	2	RX MUT	RX MUTI
	3	ESP-H	External
	4	FLTED VOL. SQ-H	Audio ou control
	5	SPARE (A^-)	Spare (GI
	6	A^-	GND
	7	ESP-L	External s
	8	A^-	GND
	9	QTD	Quiet Ton
	10	SPARE	Spare (B l
	11	A^+	B^+ line inp
J5	1	GND	GND
	2	BZ	Beeper lin
	3	C8	8V comm
	4	KEY	TX/RX dat ting; H wh
	5	PTT	Microphor
J6	1	GND	GND
	2	DET	RX CTCSS
	3	AFI	Audio Freq
	4	AC	Audio cont
	5	AFO	Audio outp
	6	SB	Switched E source
	7	MOD	Tone signa
	8	KEY	TX data ou ting; L whe
	9	PTT	Microphon
	10	C8	8V commo

PLL Signal Path Diagr

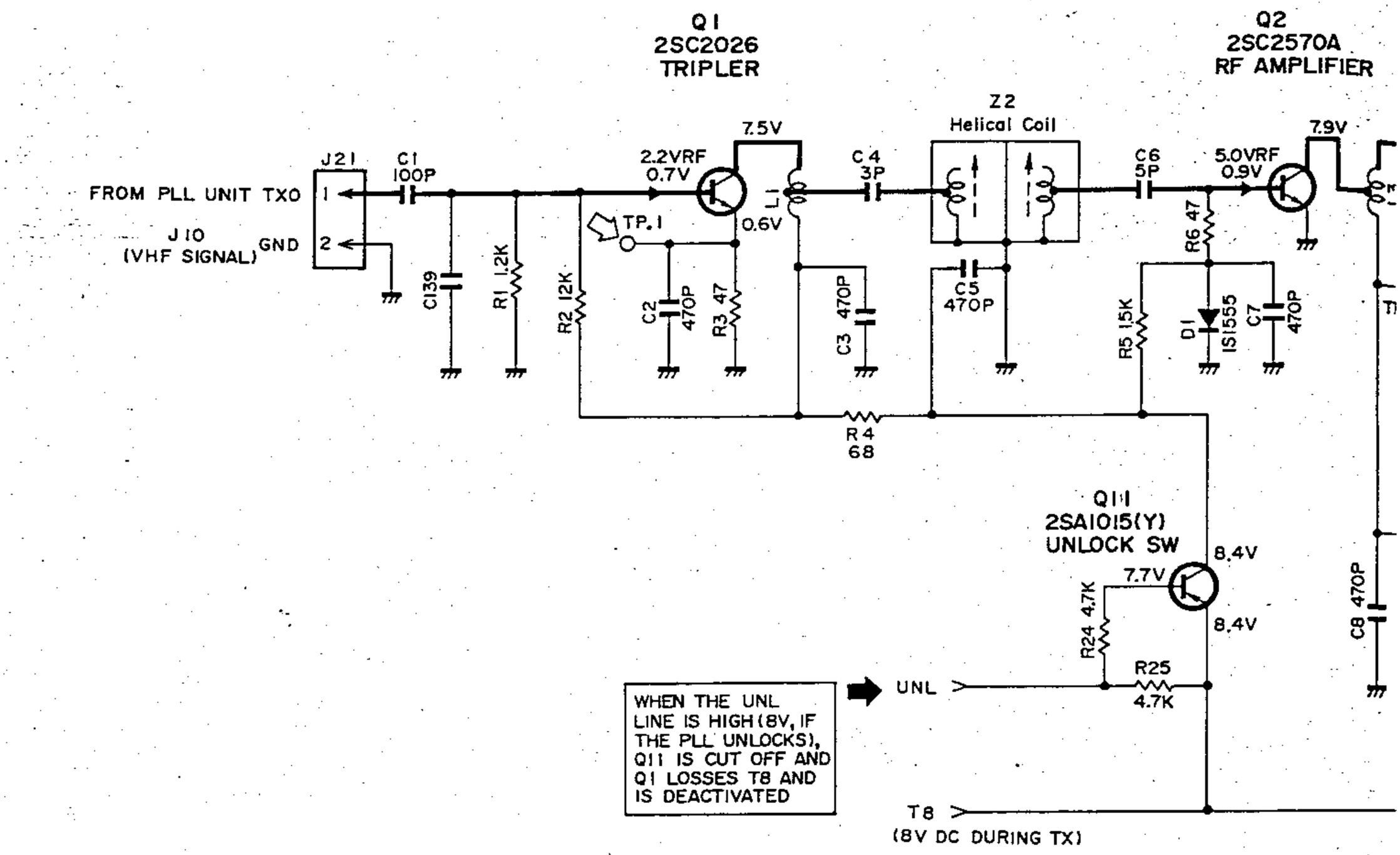


ctions

nal	Terminal name	Terminal function
	ESP	External speaker input
	C8	8V common power source line
	SB	Switched B to regulated power source
	KEY	TX/RX data input (L for TX; H for RX)
	R8	8V when receiving
	T8	8V when transmitting
	AVO	Audio output from AF volume
	AVI	Audio input to AF volume
	AFO	Audio signal output
	NSO	Noise squelch output
	NSI	Noise squelch input
	AFI	Audio signal input
	MUT	Mute signal input
	QTD	Quiet Tone Disable input
	AC	Audio Control output
	UNL	Unlock signal output
	B	Transmitting final B+
	B	Transmitting final B+
	B	Transmitting final B+
	B	Transmitting final B+
	A−	Microphone PTT grounded
	PTT	Microphone PTT input
	MIC-L	Microphone grounded
	MIC-H1	Microphone input 1 (low impedance)
	MIC-H2	Microphone input 2 (high impedance)
	SPARE 1	Spare
	BASE MIC	Base Mic 8V DC
	SPARE 2	Spare

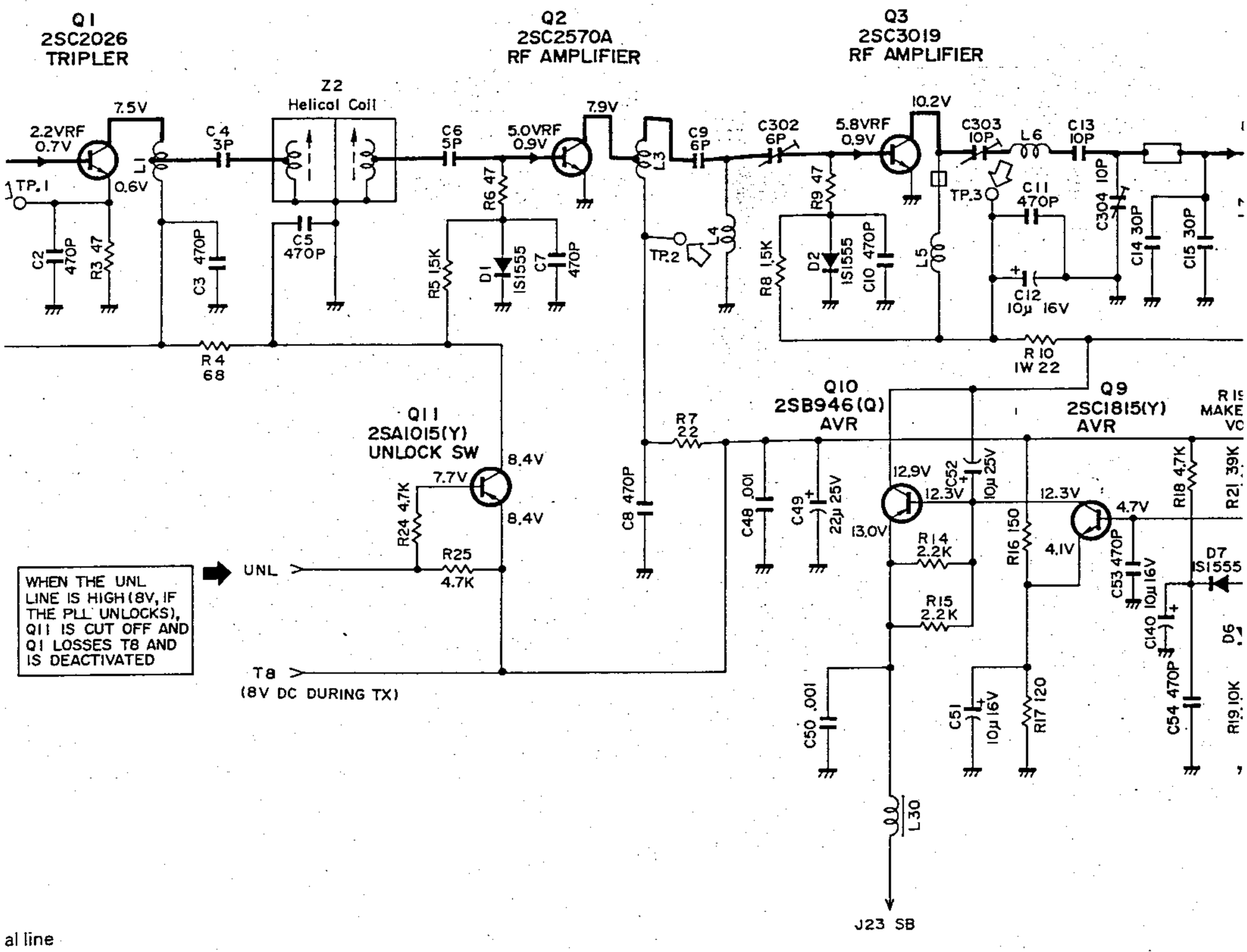
Connector No.	Terminal No.	Terminal name	Terminal function
J4	1	A+ (REC)	B+ for reception only (when internal jumper is cut)
	2	RX MUT	RX MUTE signal output
	3	ESP-H	External speaker output
	4	FLTED VOL SQ-H	Audio output bypassed volume control
	5	SPARE (A−)	Spare (GND)
	6	A−	GND
	7	ESP-L	External speaker GND (−)
	8	A−	GND
	9	QTD	Quiet Tone Disable control
	10	SPARE	Spare (B line input: 13.6V)
	11	A+	B+ line input (13.6V)
J5	1	GND	GND
	2	BZ	Beeper line input
	3	C8	8V common power source line
	4	KEY	TX/RX data input (L when transmitting; H when receiving)
	5	PTT	Microphone PTT input
J6	1	GND	GND
	2	DET	RX CTCSS input
	3	AFI	Audio Frequency signal input
	4	AC	Audio control output
	5	AFO	Audio output
	6	SB	Switched B to regulated power source
	7	MOD	Tone signal output
	8	KEY	TX data output (L when transmitting; L when receiving)
	9	PTT	Microphone PTT input
	10	C8	8V common power source line

Connector No.	Terminal No.	Terminal name	Terminal function
	11	OPT.1	Spare
	12	OPT.2	Spare
	13	OPT.3	Spare
	14	OPT.4	Spare
	15	T8	Approx. 8V when transmitting
J7	1	S1 VIO	Channel switch 1
	2	S2 BLU	Channel switch 2
	3	S3 GRN	Channel switch 3
	4	S4 YEL	Channel switch 4
	5	S5 ORG	Channel switch 5
	6	S6 RED	Channel switch 6
	7	C BRN	5V common line
J8	1	S1 VIO	Channel switch 1
	2	S2 BLU	Channel switch 2
	3	S3 GRN	Channel switch 3
	4	S4 YEL	Channel switch 4
	5	S5 ORG	Channel switch 5
	6	S6 RED	Channel switch 6
	7	C BRN	5V common line
J9	1	B0 BLU	ROM address input
	2	B1 GRN	ROM address input
	3	B2 YEL	ROM address input
	4	B3 ORG	ROM address input
	5	B4 RED	ROM address input
	6	5V BRN	5V common line
J10	1	TXO	Transmit local signal output to TX/RX unit
	2	GND	GND
J11	1	BZ BLU	Audio output
	2	GND	GND
	2	RXO shield	Receive local signal output to TX/RX unit

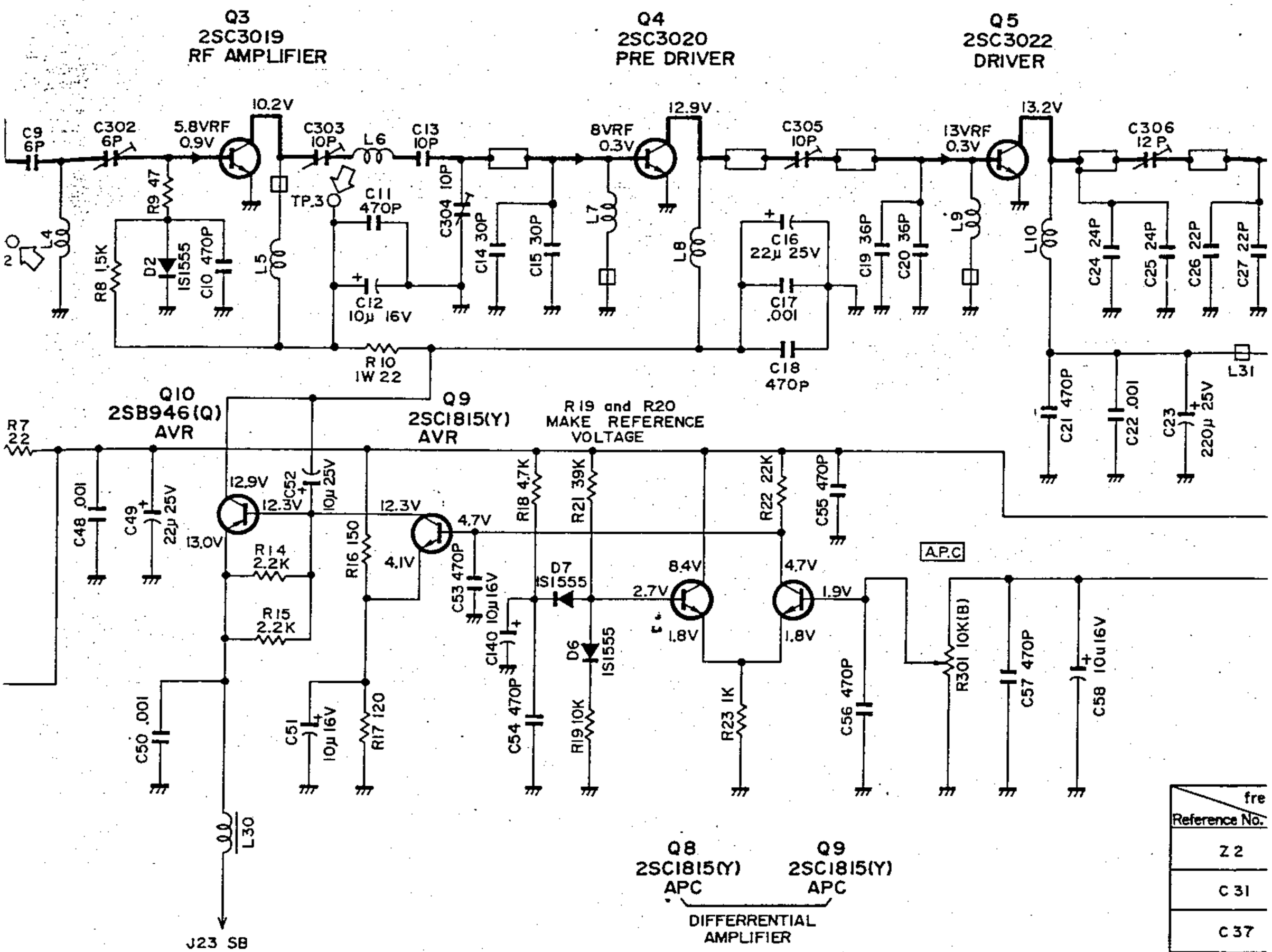


——— Signal line

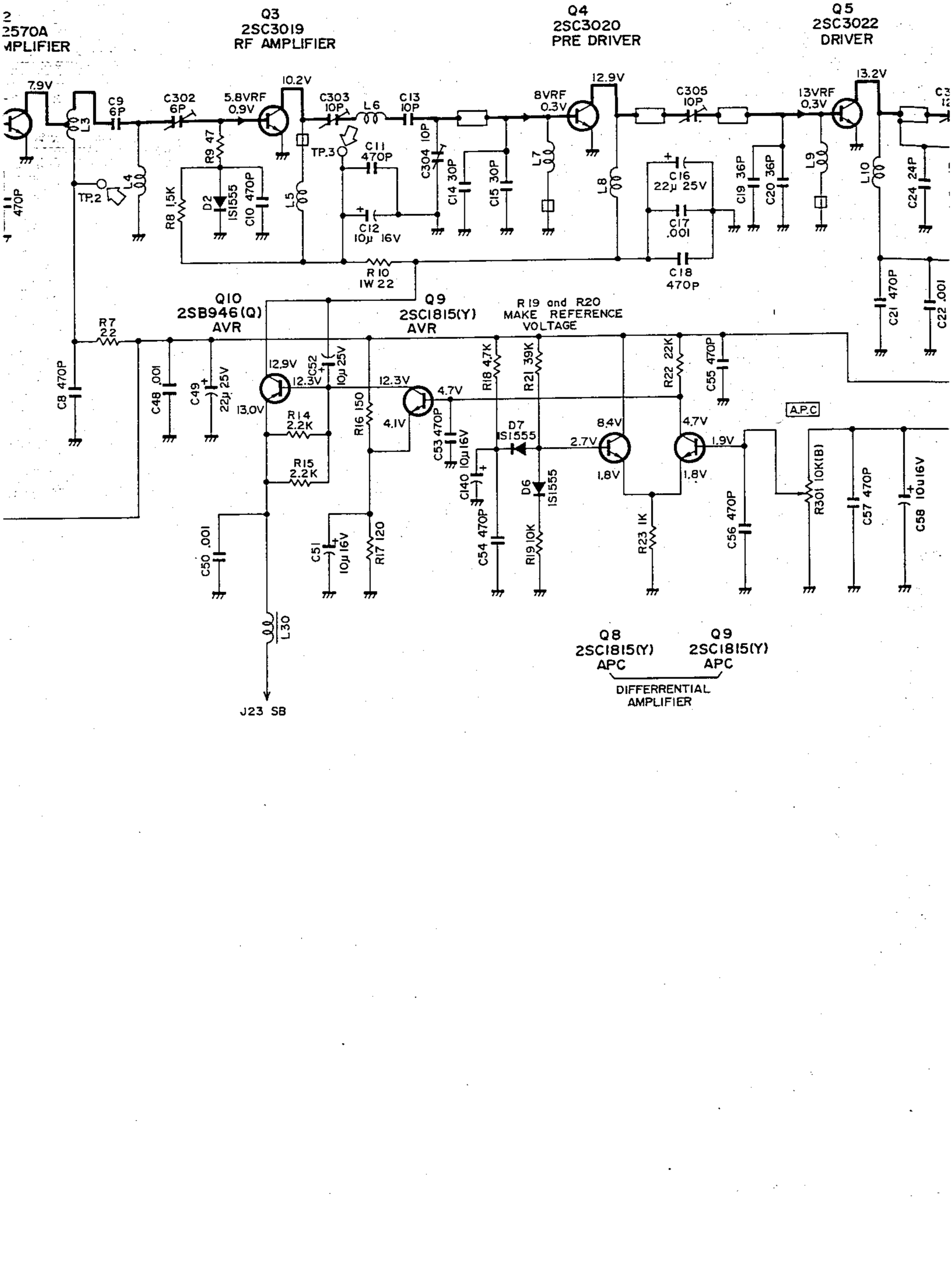
Adjusting points

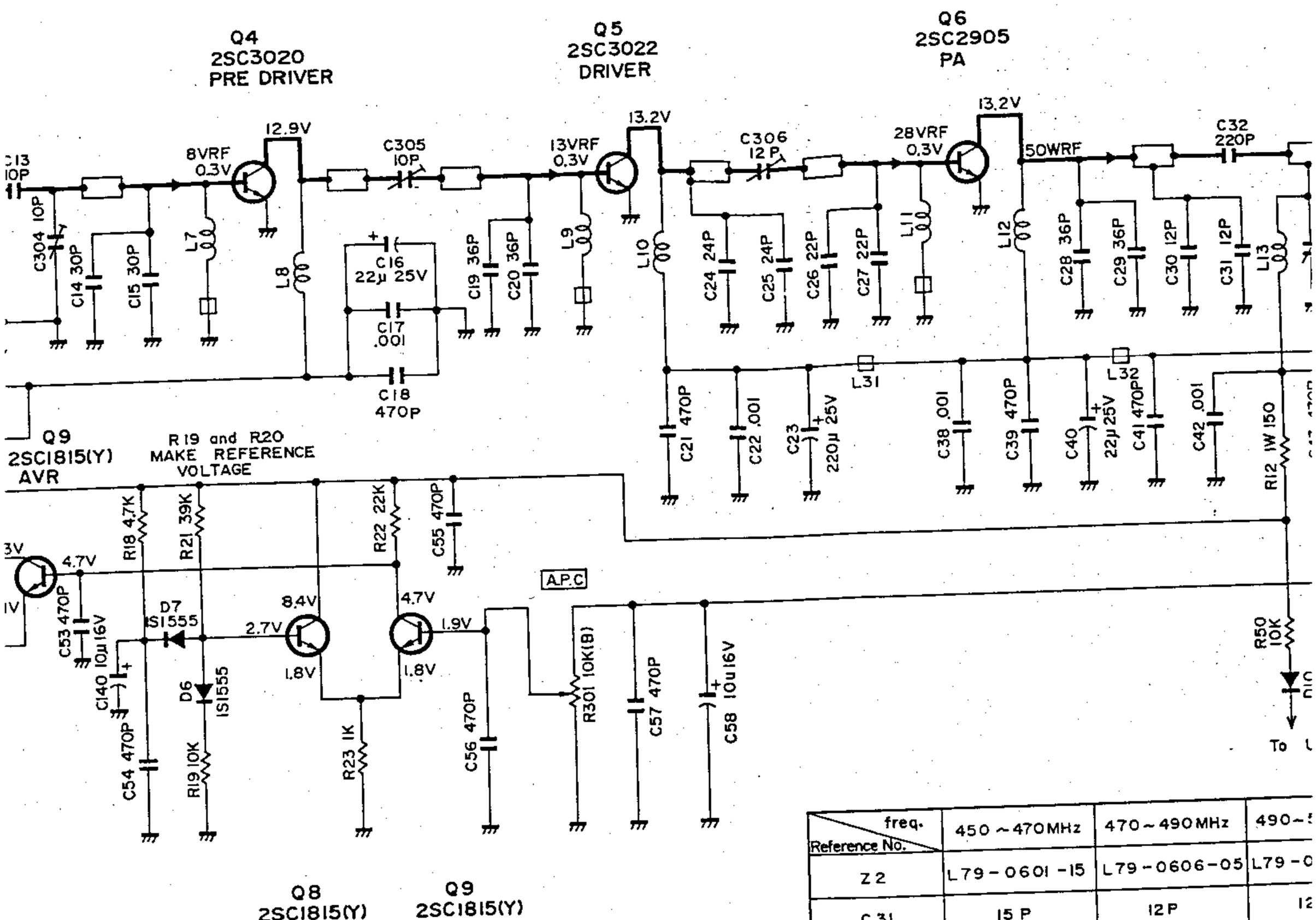


al line
ısting points



Reference No. \ fre	
Z 2	
C 31	
C 37	
C 35	
C139	

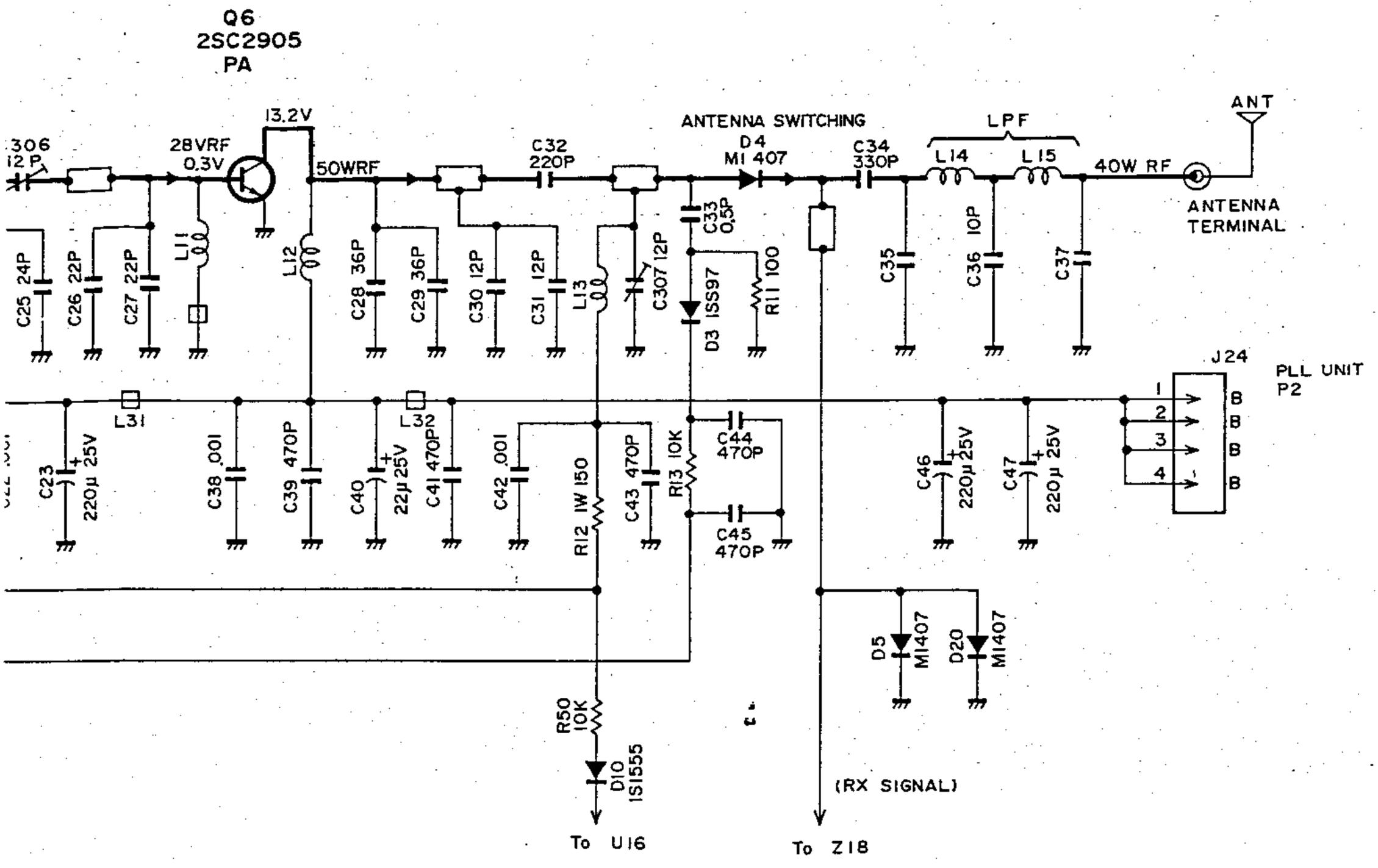

2
2570A
MPLIFIER
Q3
2SC3019
RF AMPLIFIER
Q4
2SC3020
PRE DRIVER
Q5
2SC3022
DRIVER
7.9V
10.2V
12.9V
13.2V
5.8VRF
0.9V
8VRF
0.3V
13VRF
0.3V
C9 6P
C302 6P
C303 10P
L6
C13 10P
C305 10P
C3
L3
L4
L5
L7
L8
L9
L10
TP.2
TP.3
R9 47
R8 1.5K
D2 1S1555
C10 470P
C11 470P
C12 10µ 16V
C304 10P
C14 30P
C15 30P
C16 22µ 25V
C17 .001
C18 470P
C19 36P
C20 36P
C24 24P
C21 470P
C22 .001
470P
R10 1W 22
Q10
2SB946(Q)
AVR
Q9
2SC1815(Y)
AVR
R19 and R20
MAKE REFERENCE
VOLTAGE
R7 22
C8 470P
C48 .001
C49 22µ 25V
C52 10µ 25V
12.9V
12.3V
13.0V
12.3V
4.7V
4.1V
R14 2.2K
R15 2.2K
R16 150
R17 120
R18 4.7K
R21 39K
R22 22K
C55 470P
C53 470P
C140 10µ16V
C54 470P
C50 .001
C51 10µ16V
D7 1S1555
D6 1S1555
R19 10K
R23 1K
8.4V
2.7V
1.8V
4.7V
1.9V
1.8V
A.P.C
C56 470P
R301 10K(B)
C57 470P
C58 10µ16V
L30
J23 SB
Q8
2SC1815(Y)
APC
Q9
2SC1815(Y)
APC
DIFFERRENTIAL
AMPLIFIER



freq. / Reference No.	450 ~ 470MHz	470 ~ 490MHz	490~
Z2	L79-0601-15	L79-0606-05	L79-0
C31	15 P	12P	12
C37	7P	5P	5
C35	8P	8P	
C139	10P	10P	1

TK-801

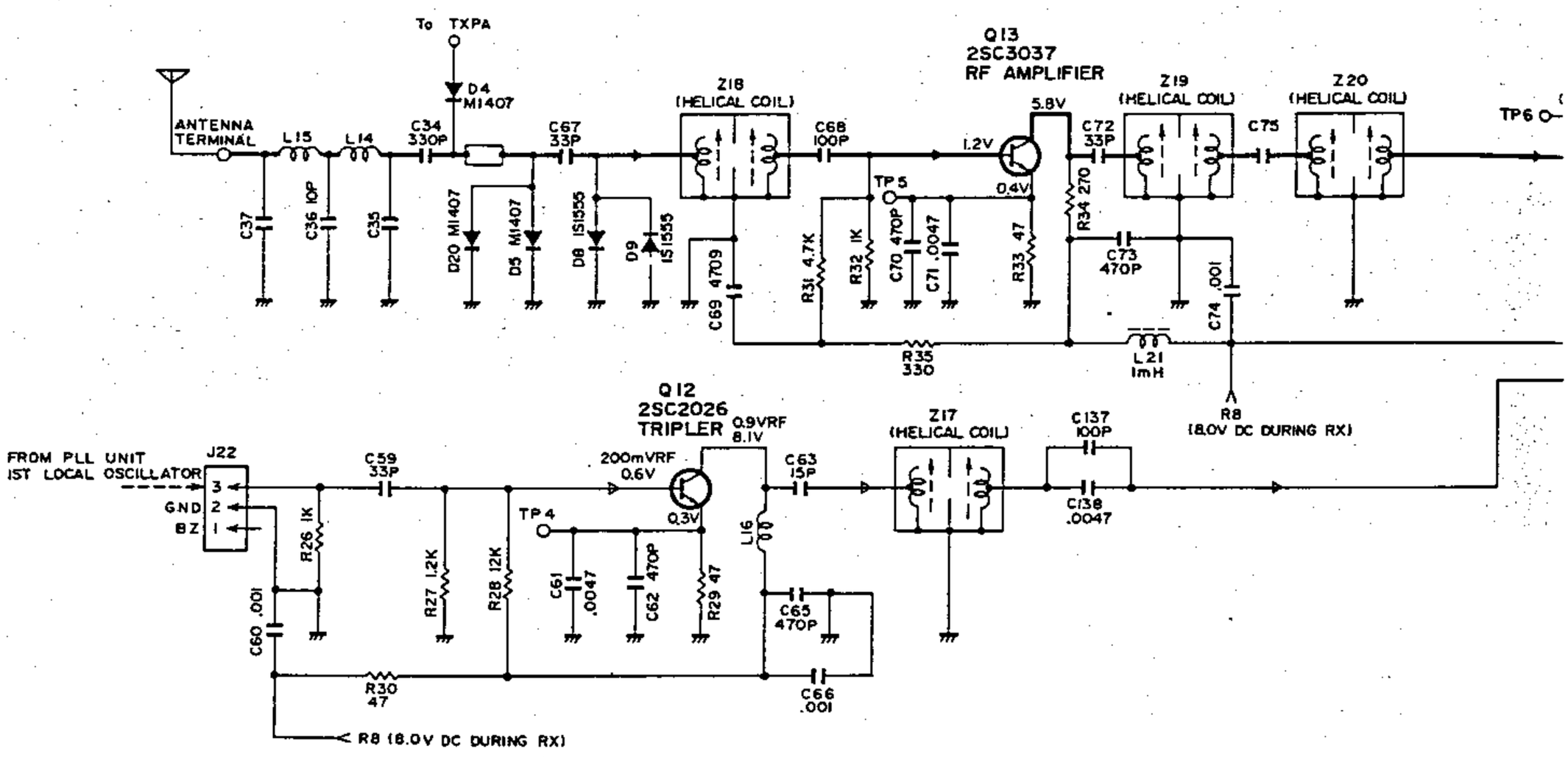
TX Signal Path Diagram



freq. / Reference No.	450 ~ 470 MHz	470 ~ 490 MHz	490 ~ 512 MHz
Z 2	L79 - 0601 - 15	L79 - 0606 - 05	L79 - 0611 - 15
C 31	15 P	12 P	12 P
C 37	7 P	5 P	5 P
C 35	8 P	8 P	6 P
C139	10 P	10 P	15 P

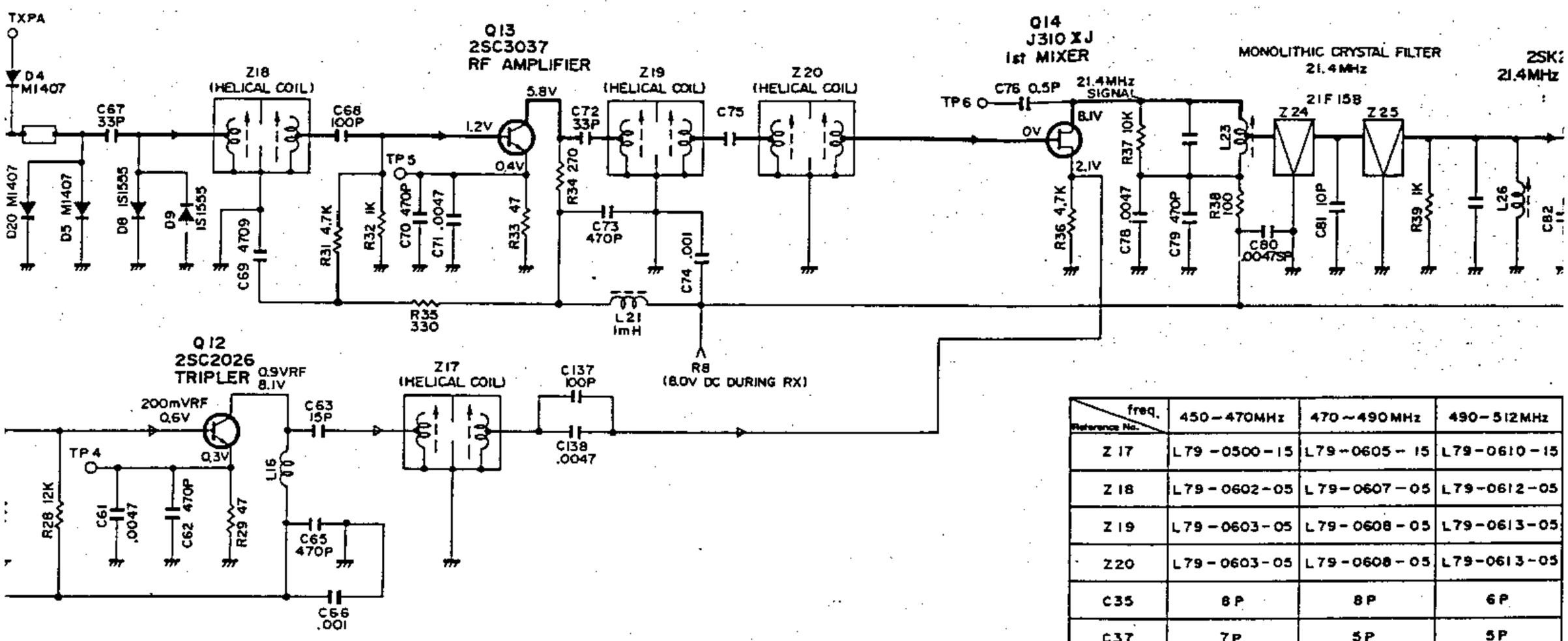
TX unit

Connector No.	Terminal No.	Terminal name	Terminal function
J21	1	TXO	Transmit signal input from PLL unit
	2	GND	GND
J22	1	BZ	Voice signal output
	2	GND	GND
	3	RXO	Receive signal input from PLL unit
J23	1	ESP	External speaker line output
	2	C8	8V common power source line
	3	SB	Switched B^+ to regulated power source
	4	KEY	TX/RX data output (L when transmitting; H when receiving)
	5	R8	8V when receiving
	6	T8	8V when transmitting
	7	AVO	Voice signal output from AF volume cont.
	8	AVI	Voice signal input to AF volume cont.
	9	AFO	Voice signal output
	10	NSO	Noise squelch signal output
	11	NSI	Noise squelch signal input
	12	AFI	Voice signal input
	13	MUT	Mute signal input
	14	QTD	Quiet Tone Disable output
	15	AC	Audio control output
	16	UNL	Unlock signal input
J24	1	B	B^+ line to transmit final stage
	2	B	B^+ line to transmit final stage
	3	B	B^+ line to transmit final stage
	4	B	B^+ line to transmit final stage
J25	1	LMP(RED)	Channel illumination lamp ⊕
	2	GND(BLK)	GND ⊖
J26	1	COM(BRN)	Common power source for LED
	2	BSY(RED)	BUSY indication LED B
	3	CAL(ORG)	Call indication LED CAL
	4	TX(YEL)	TX indication LED
	5	GND(BLK)	GND



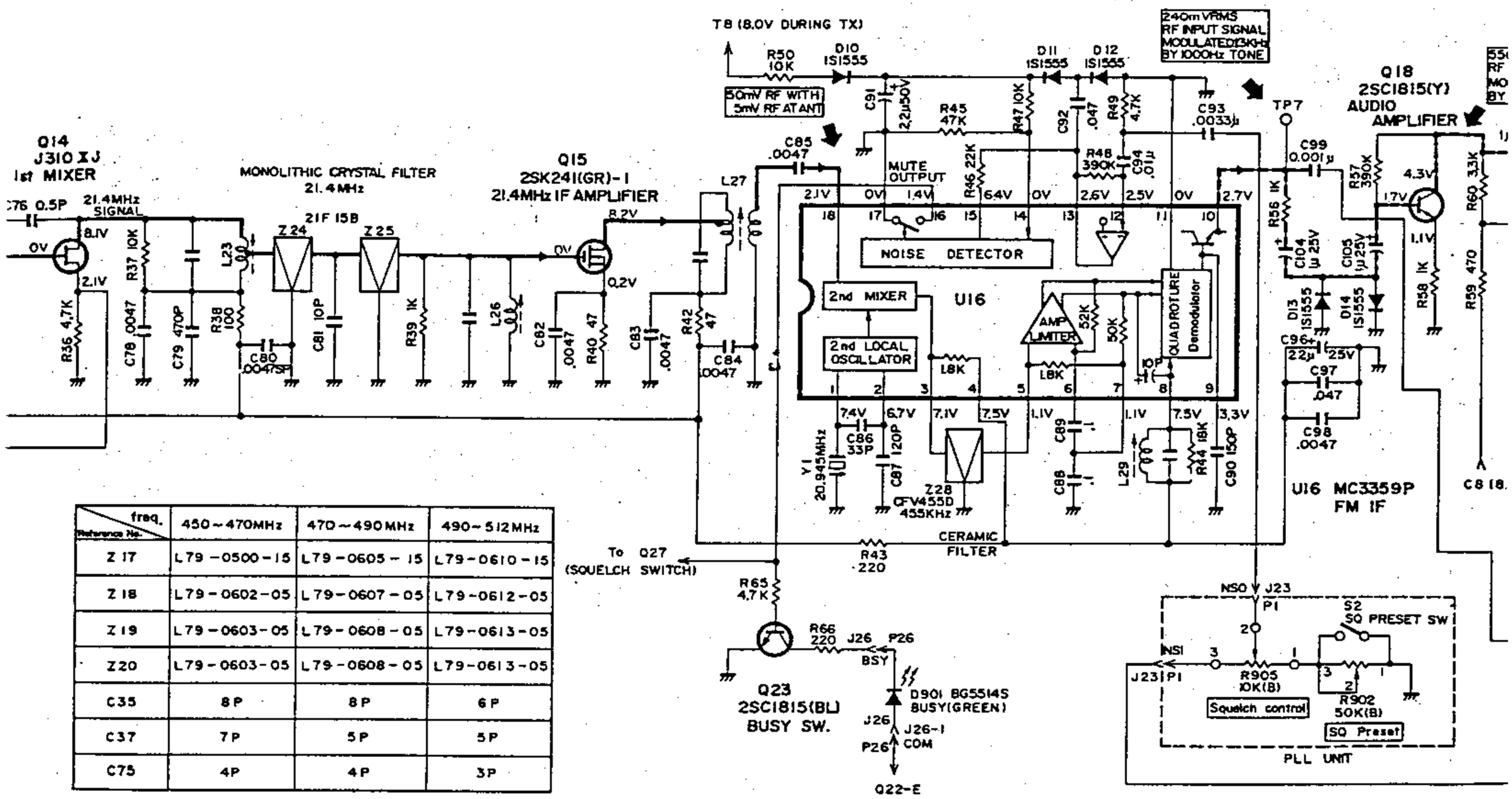
Signal line

Adjusting points

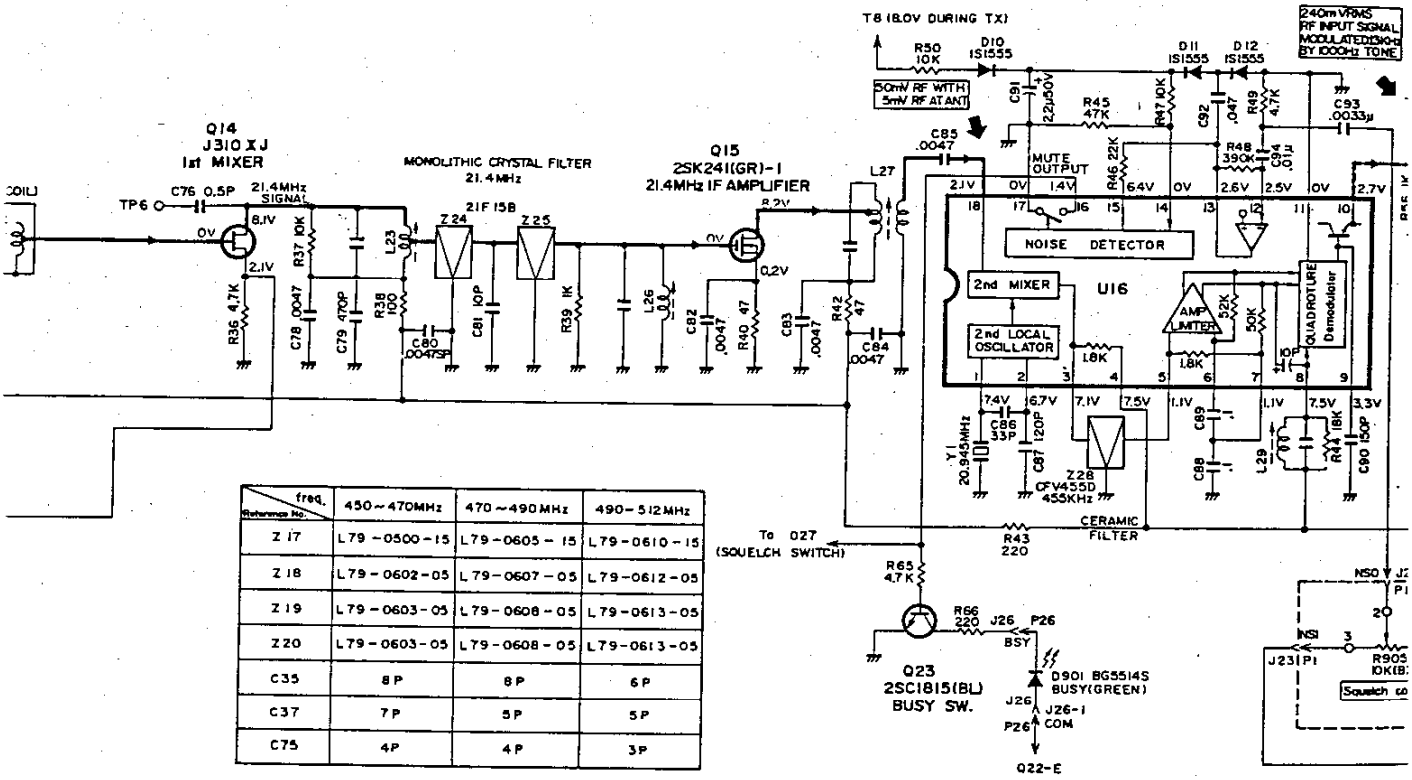


freq. / Reference No.	450–470MHz	470–490MHz	490–512MHz
Z17	L79-0500-15	L79-0605-15	L79-0610-15
Z18	L79-0602-05	L79-0607-05	L79-0612-05
Z19	L79-0603-05	L79-0608-05	L79-0613-05
Z20	L79-0603-05	L79-0608-05	L79-0613-05
C35	8P	8P	6P
C37	7P	5P	5P
C75	4P	4P	3P

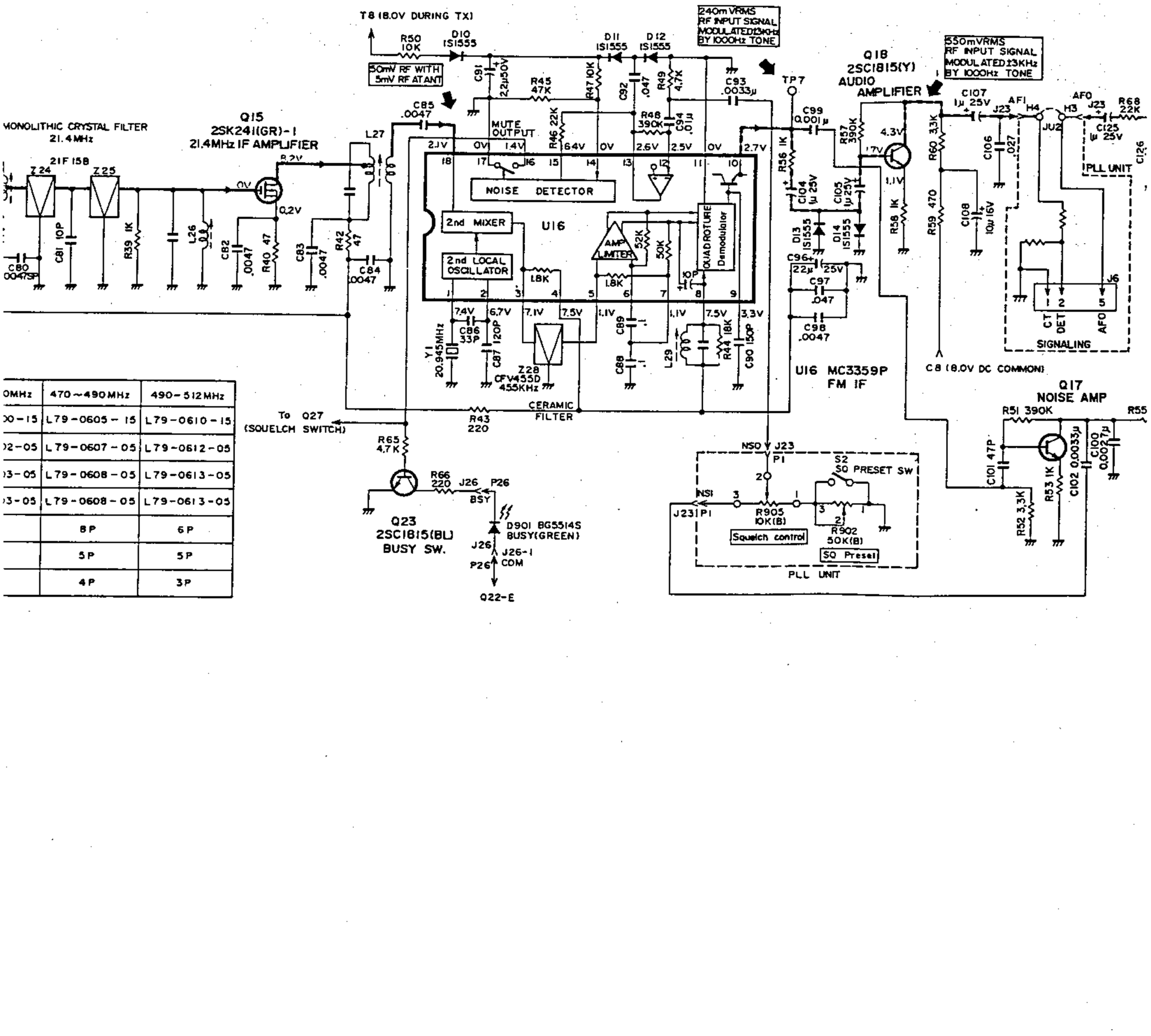
— Signal line
Adjusting points



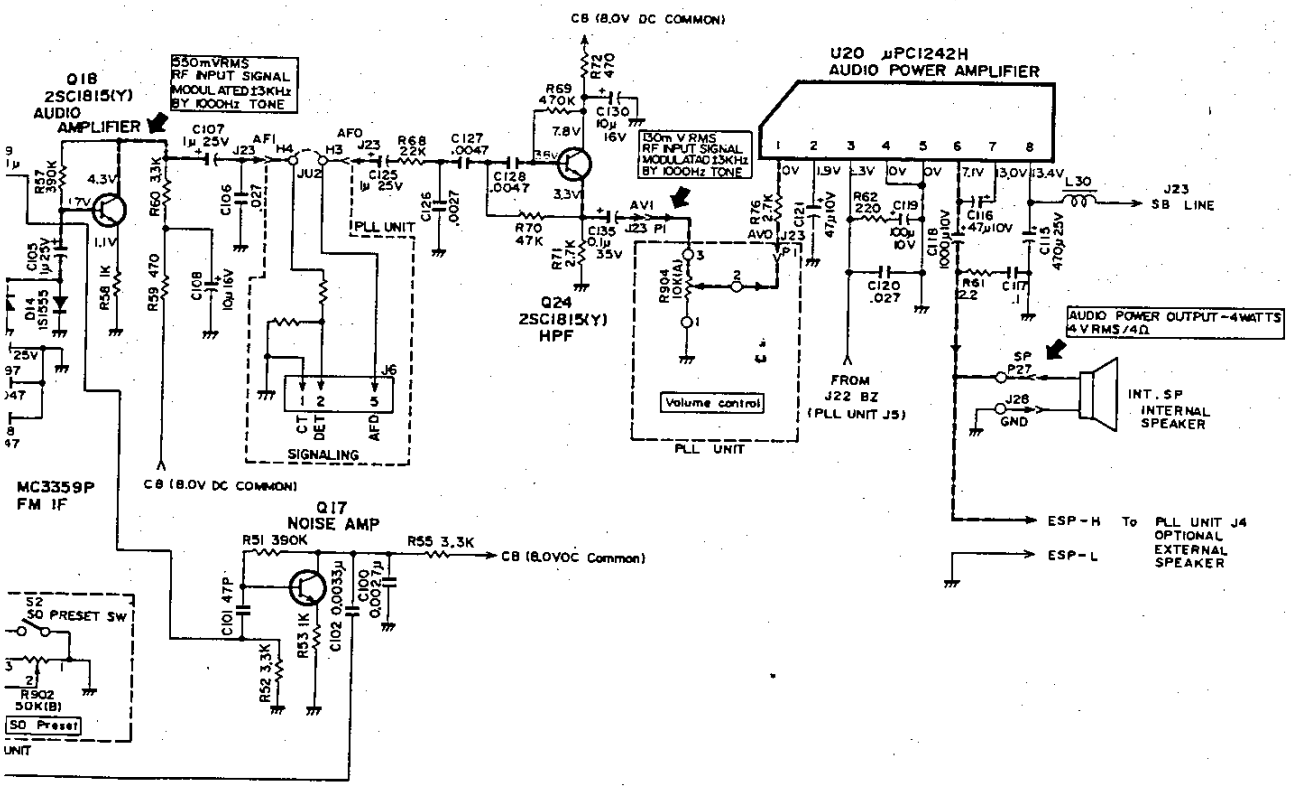
freq. / Reference No.	450~470MHz	470~490MHz	490~512MHz
Z17	L79-0500-15	L79-0605-15	L79-0610-15
Z18	L79-0602-05	L79-0607-05	L79-0612-05
Z19	L79-0603-05	L79-0608-05	L79-0613-05
Z20	L79-0603-05	L79-0608-05	L79-0613-05
C35	8P	8P	6P
C37	7P	5P	5P
C75	4P	4P	3P



freq. / Reference No.	450~470MHz	470~490MHz	490~512MHz
Z17	L79-0500-15	L79-0605-15	L79-0610-15
Z18	L79-0602-05	L79-0607-05	L79-0612-05
Z19	L79-0603-05	L79-0608-05	L79-0613-05
Z20	L79-0603-05	L79-0608-05	L79-0613-05
C35	8P	8P	6P
C37	7P	5P	5P
C75	4P	4P	3P



OMHz	470~490MHz	490~512MHz
00-15	L79-0605-15	L79-0610-15
02-05	L79-0607-05	L79-0612-05
03-05	L79-0608-05	L79-0613-05
03-05	L79-0608-05	L79-0613-05
	8P	6P
	5P	5P
	4P	3P



VOLTAGE MEASUREMENT CONDITIONS

1. WITHOUT RECEIVING SIGNAL
2. SQUELCH : QT

5. DISASSEMBLY

1. Case screw removal

Remove one screw each securing the top and bottom covers at the rear.

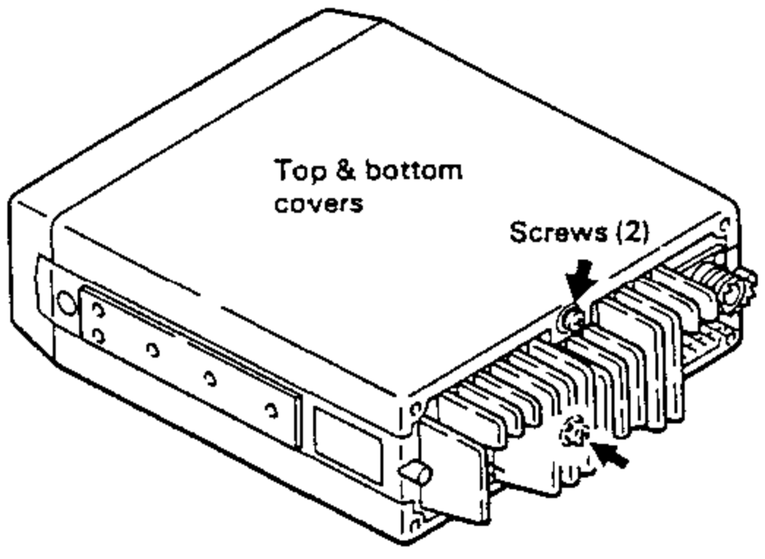


Fig. 5-1

2. Cover removal

1) Remove one screw securing the top cover.
2) Slide the cover to the rear, as shown.

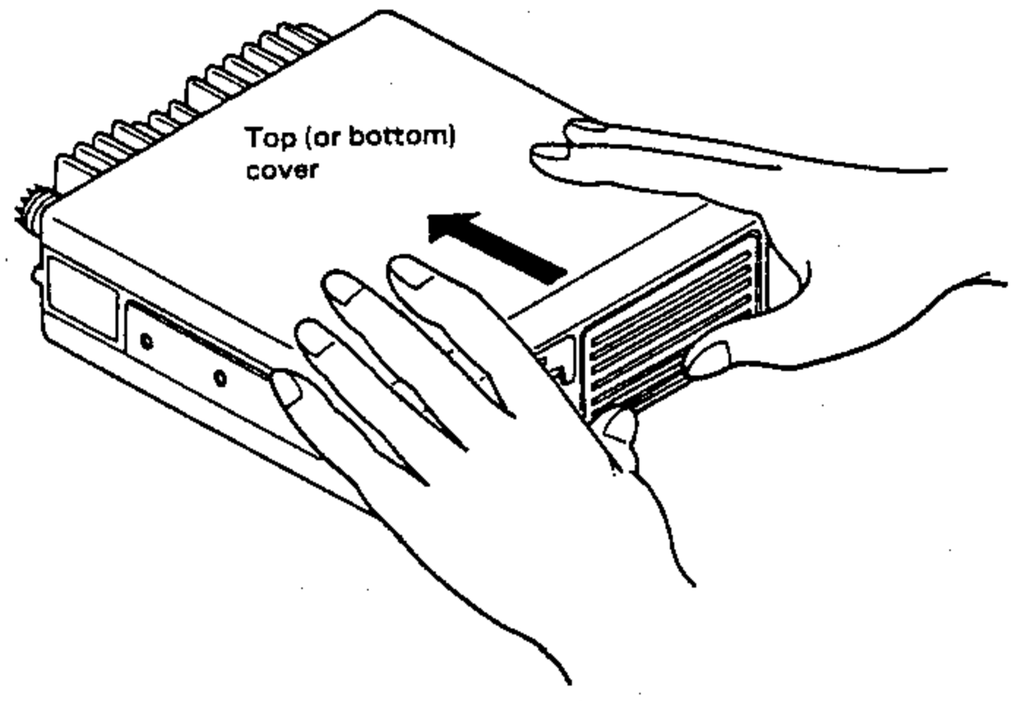


Fig. 5-2

3. Front panel removal

1) To remove the OFF/VOL and QT/SQL knobs from the front panel, pull forward.
2) Remove two screws securing the right and left sides of the front panel.

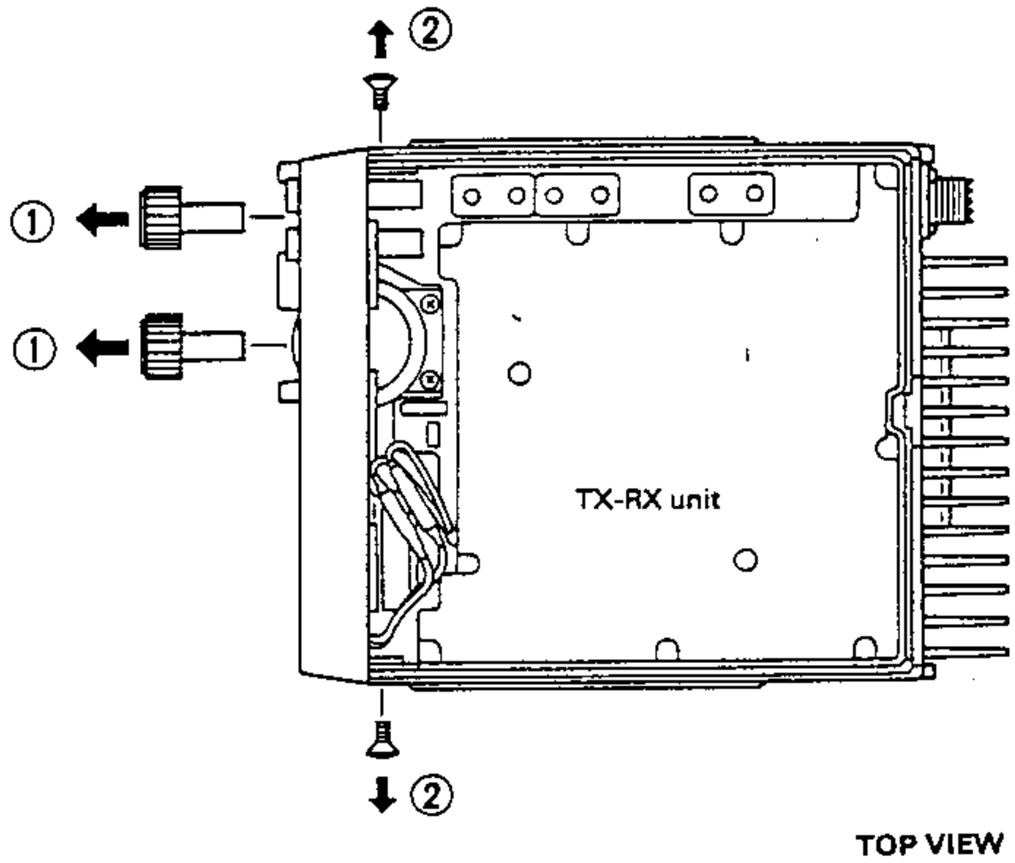


Fig. 5-3

3) Unplug three connectors to the front panel.

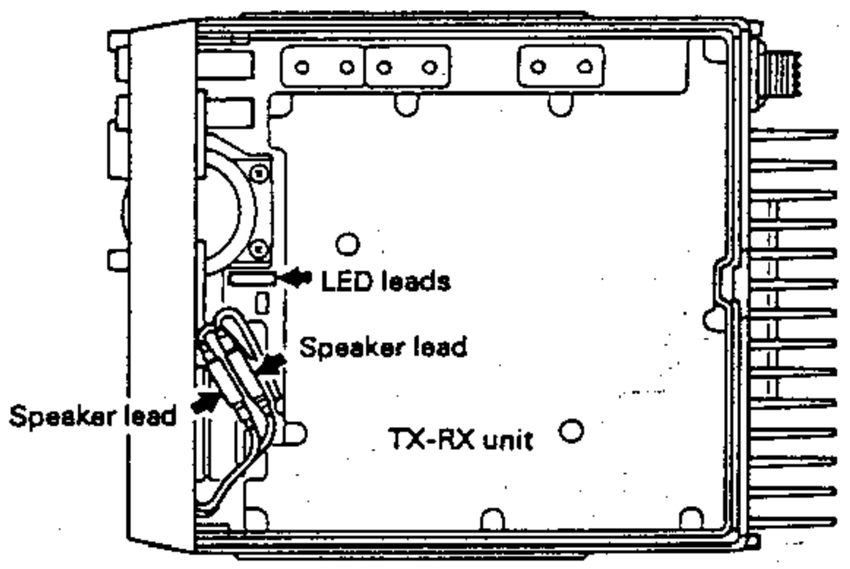


Fig. 5-4

4) Remove the front panel by pulling forward.

4. TX-RX unit removal

1) Remove 12 screws securing the cast shield.

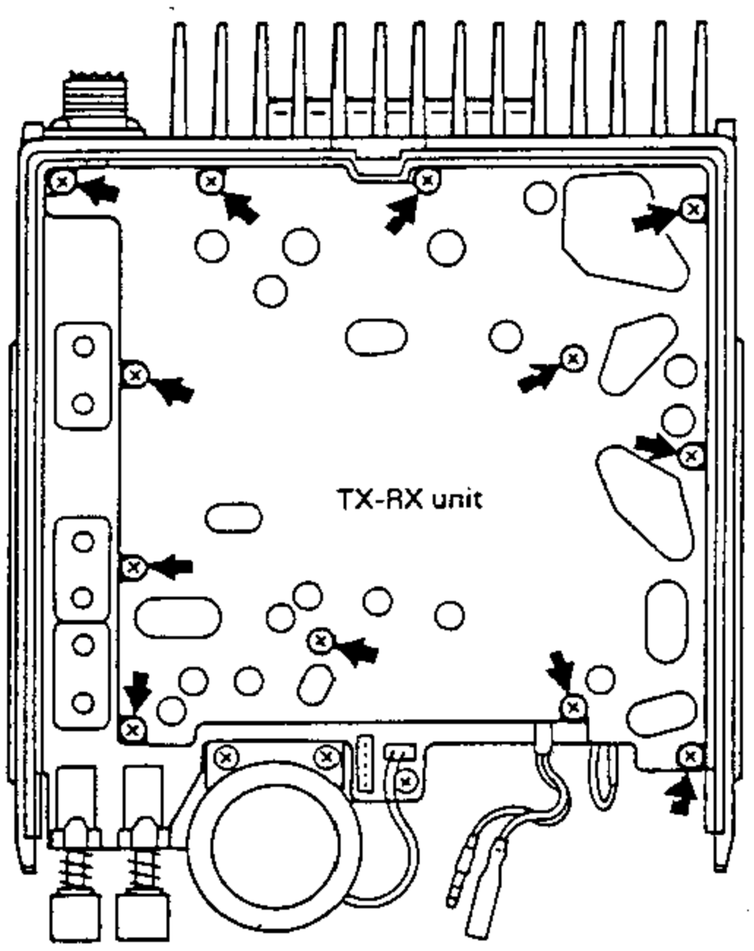


Fig. 5-5

2) Remove 12 screws securing components to chassis.
3) Unplug connectors J21, J22 and J25.

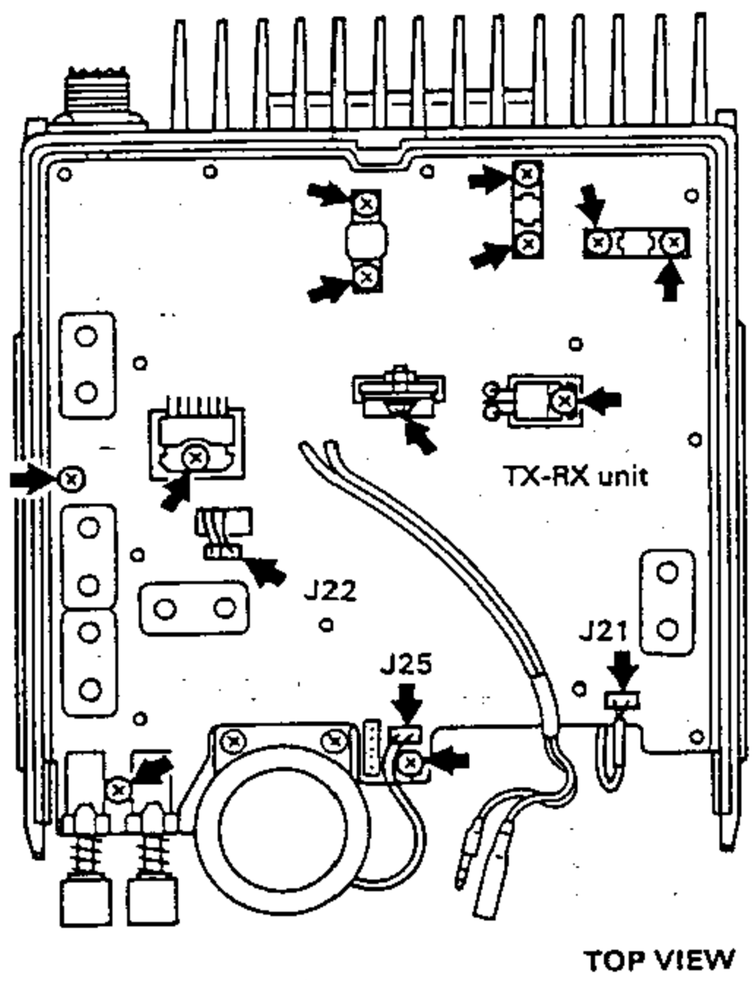


Fig. 5-6

4) Remove two screws securing the UHF connector to the rear panel.

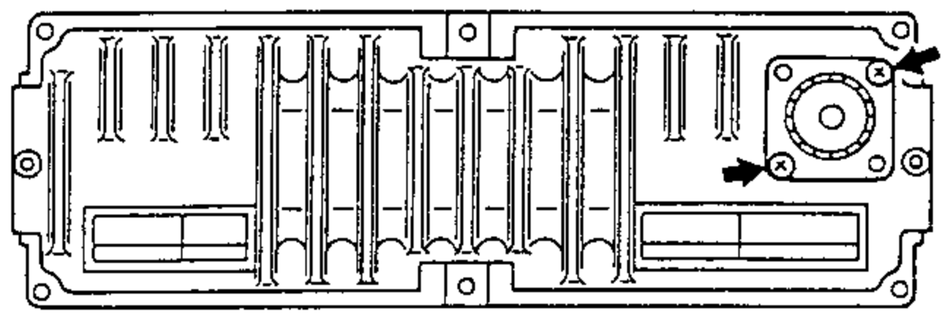


Fig. 5-7

5) Desolder the UHF connector from the TX-RX unit.

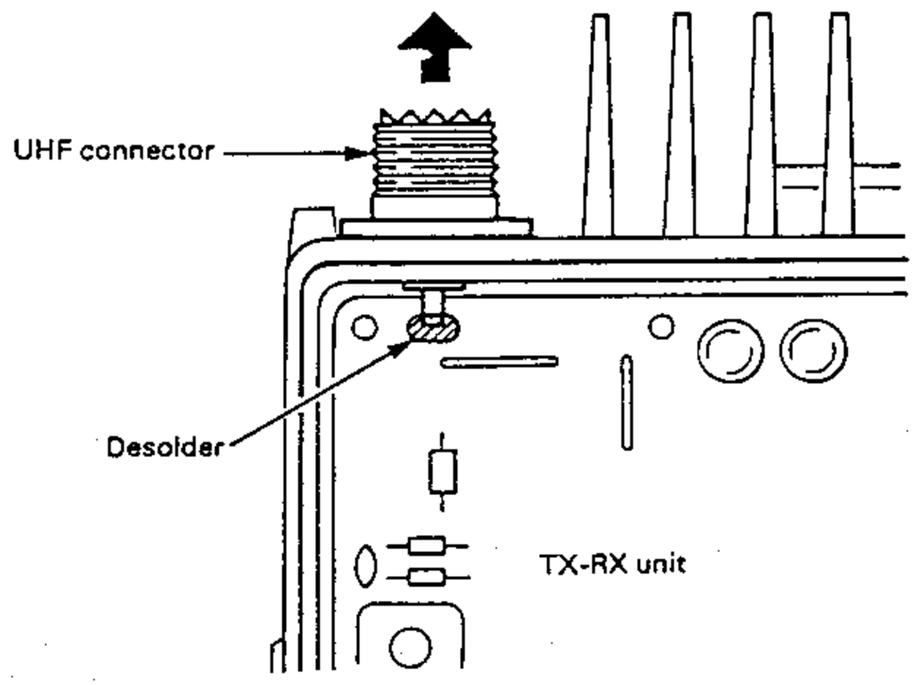


Fig. 5-8

Note: *When reassembling the unit, do not forget to solder the UHF connector. When soldering the connector, press the pin downward.*

6) Remove the TX-RX unit. Lift the front first and then withdraw the circuit board.

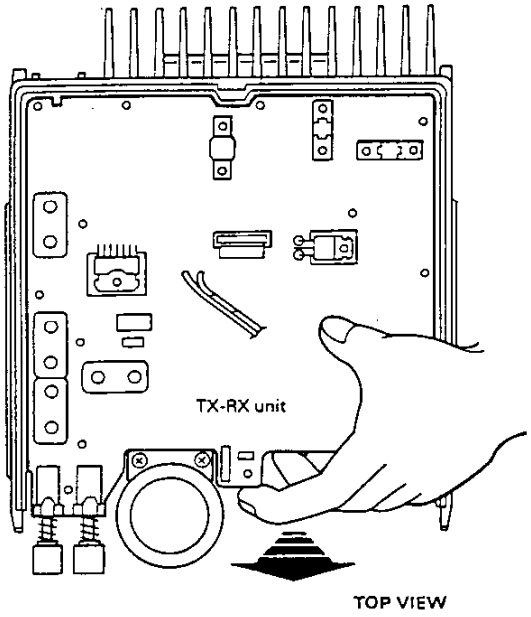


Fig. 5-9

2) Unplug three connectors as shown.

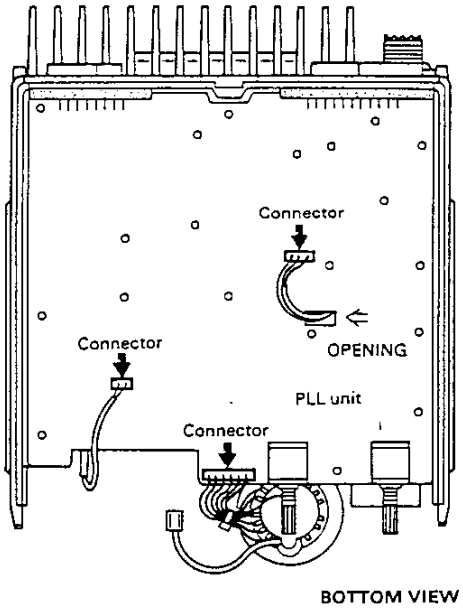


Fig. 5-11

5. PLL unit removal

(Front panel must be removed. Perform step 3 first)

To remove the PLL unit, perform steps 1, 2 and 3.

1) Remove all screws as shown.

Cast shield A:	7 screws
Cast shield B:	7 screws
PLL unit:	9 screws

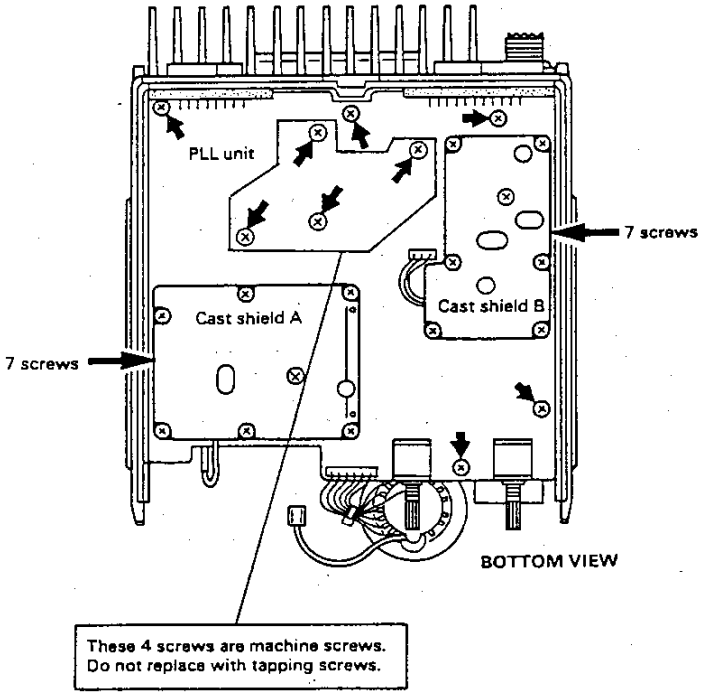


Fig. 5-10

When reinstalling the connector, note that it must be passed through this opening.

3) First lift the front of the unit, then remove.

6. Speaker removal

Perform front panel removal step 3 first.

1) Remove four screws holding the speaker.
2) When replacing the speaker, desolder and reuse the speaker leads.

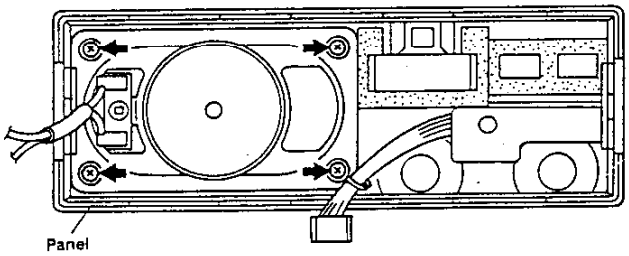


Fig. 5-12a

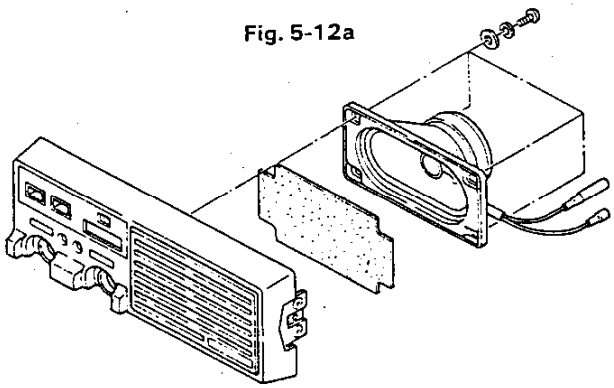


Fig. 5-12b

7. LED replacement

(Proceed after step 3.)

Replacement:

1) Remove one screw holding the LED circuit board to the front panel.

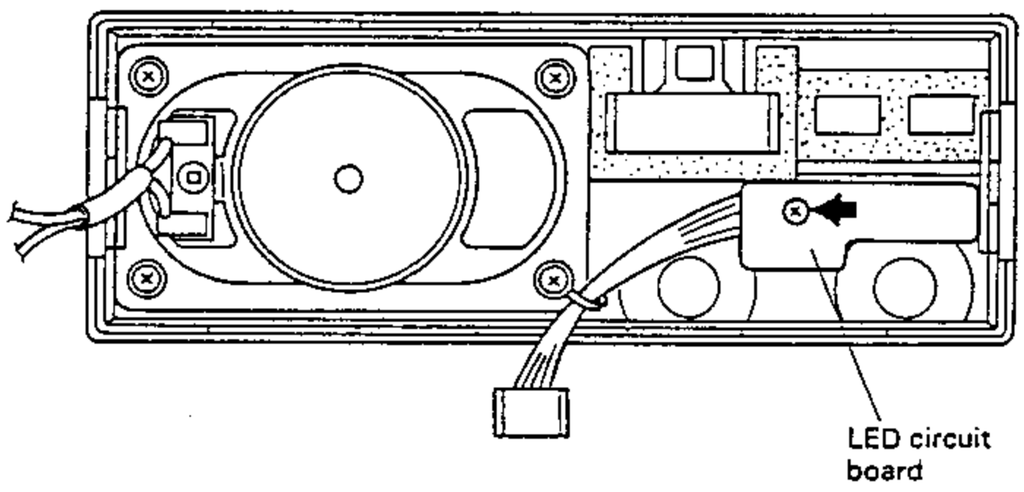


Fig. 5-13

2) Replace the LED as required. Note terminal polarity when replacing.

8. Installing a Yellow CAL (CALL) LED: PY5534S for D903

1) Remove one screw securing the LED PCB to the front panel.
2) Solder the CAL LED to the LED circuit board. Observe polarity.

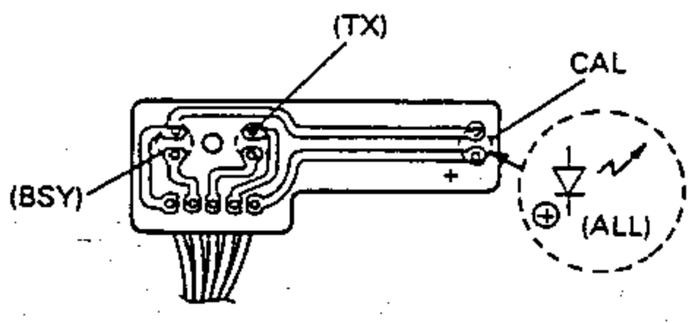


Fig. 5-14

3) Remove the metal plate securing the panel.
4) Using a 5 mm or 13/64 inch drill, carefully open the CALL LED mounting on the front panel. Protect the panel face from scratching.

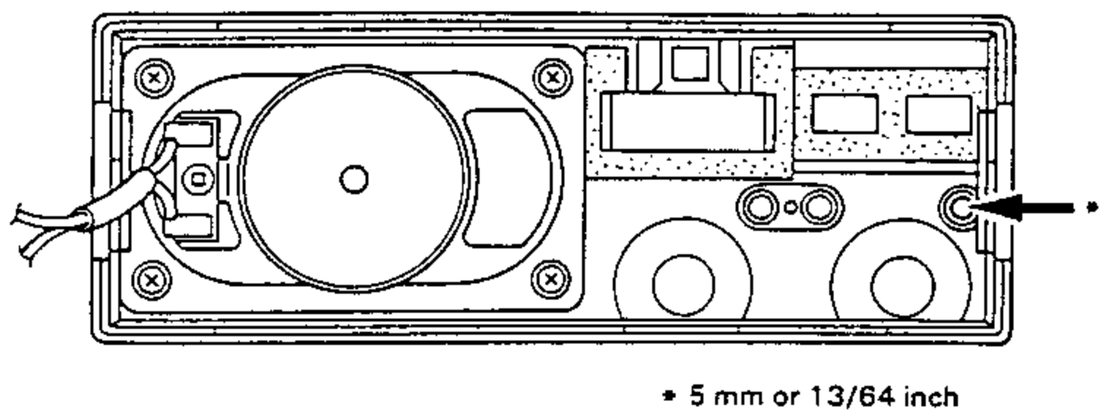


Fig. 5-15

5) Use a countersink to finish the outside edge of the hole on the front panel.
6) Reinstall the LED PCB board. (Now has three LEDs)
7) Reinstall the threaded metal plate to the front panel.

9. Channel illumination lamp replacement

1) To remove the channel knob from the switch, pull UP.
2) Remove the old lamp from the keyway on the channel switch mounting plate and replace with a new lamp assembly.

Illumination lamp: B30-0829-05

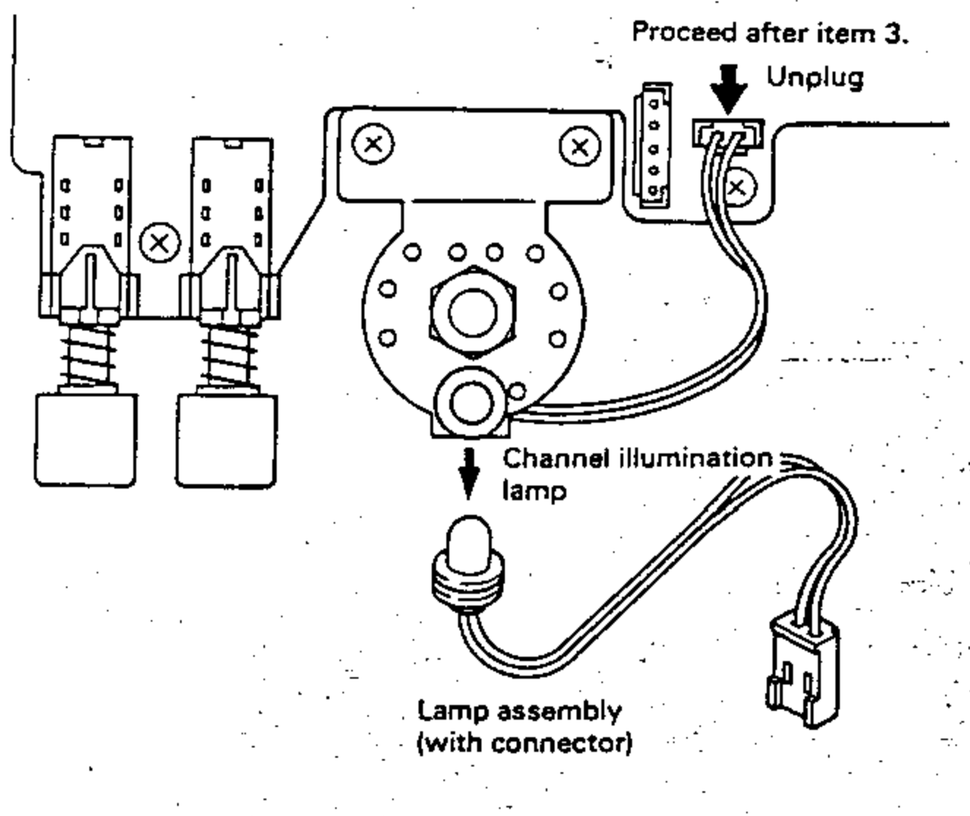


Fig. 5-16

10. Channel switch replacement (1 ~ 6 CH)

Note: *For replacement of the 16 CH or 32 CH switches, refer to item 16/32 channel conversion kit.*

Proceed after item 3.

1) Pull the channel knob UP from the channel switch.
2) Remove and replace the rotary switch assembly as shown.

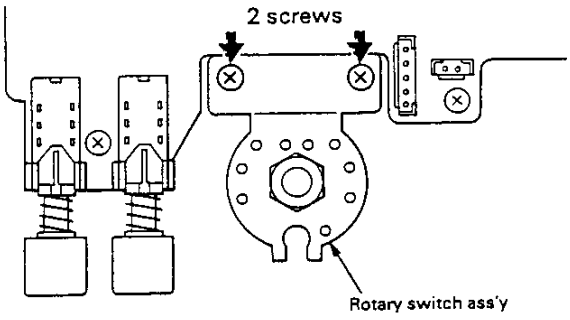


Fig. 5-17a

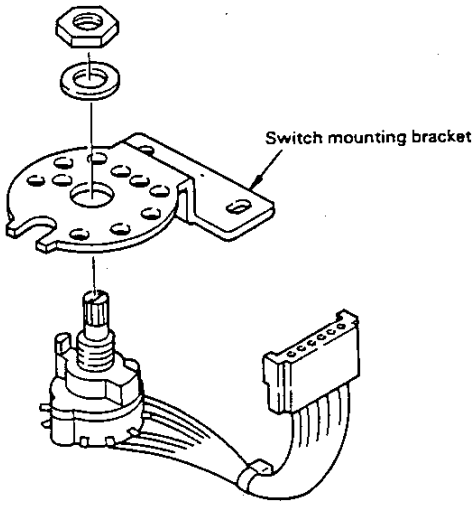


Fig. 5-17b

11. Channel limit switch stop screw placement

Proceed after item 3. Installing the stop screw in the specified channel hole limits the number of channels available from the channel switch.

1) Remove the channel selector knob.
2) Reposition the stop screw in the designated channel hole.

Note: *For six channel configuration, the stop screw is not needed and may be stored as shown.*

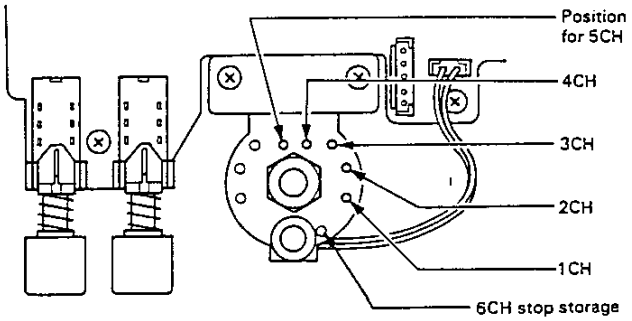


Fig. 5-18

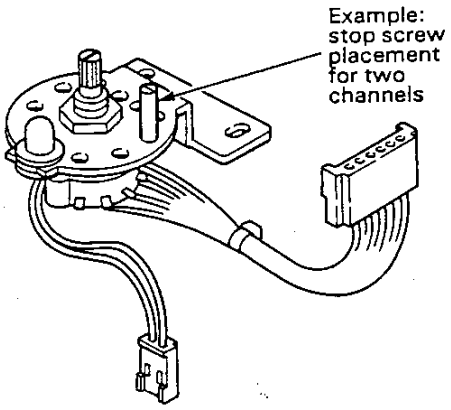


Fig. 5-19

Location stop	Channels					
	1	2	3	4	5	6
for CH1						
for CH2						
for CH3						
for CH4						
for CH5						
None						

Fig. 5-20

12. Test equipment required

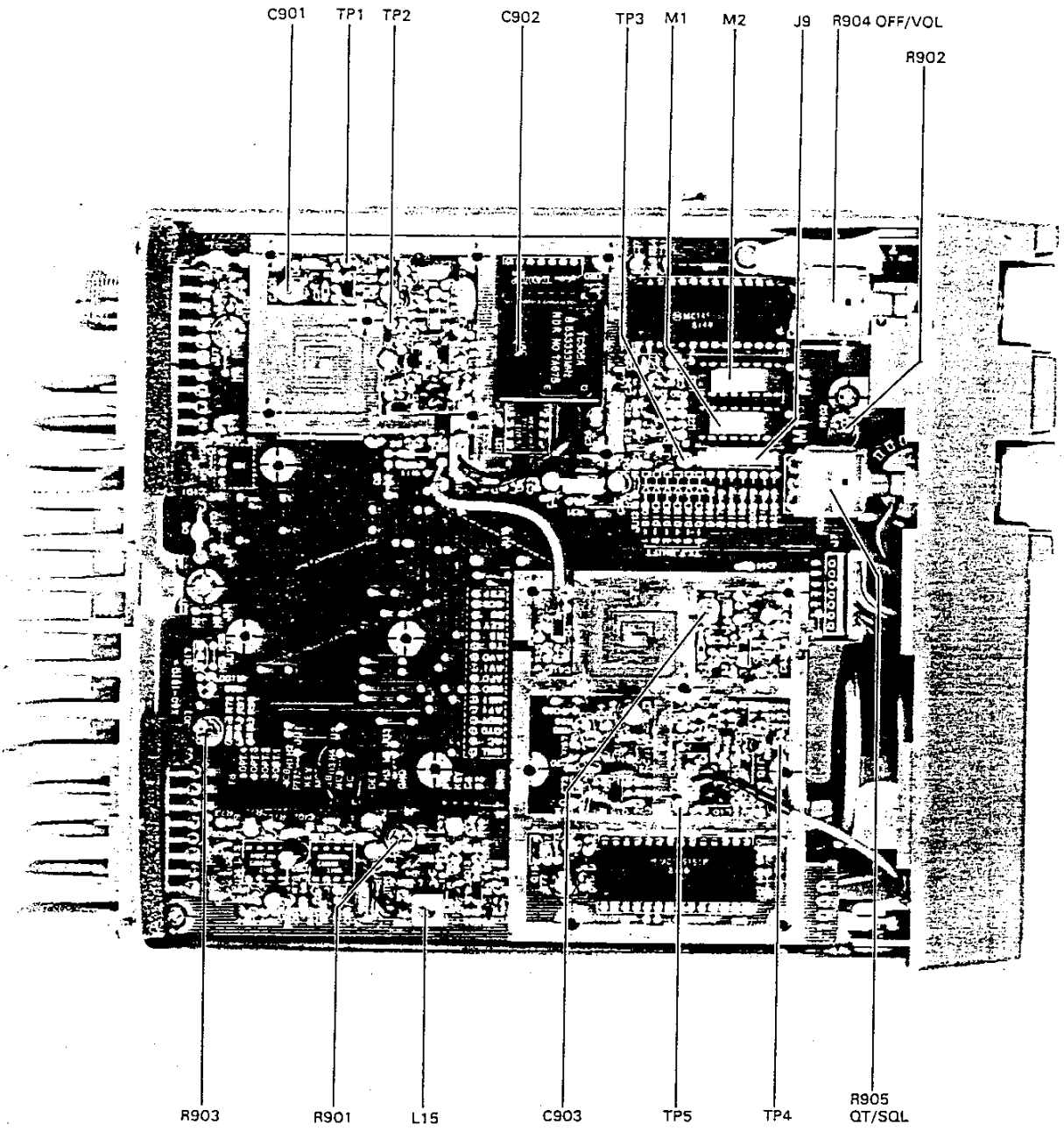
Test Equipment		Major Specifications
1. Standard Signal Generator (SSG)	Frequency range Modulation Output	450 ~ 512 MHz Frequency modulation and external modulation. 0.1μV to greater than 1 mV.
2. Power meter	Input impedance Operation frequency Measurement capability	50 ohms 450 to 512 MHz or more. Vicinity of 60W and 10W.
3. Deviation meter	Frequency range	450 ~ 512 MHz
4. Digital volt meter (DVM)	Measuring range Accuracy	1 ~ 10V DC. High input impedance for minimum circuit loading.
5. Oscilloscope		DC through 30 MHz.
6. High sensitivity frequency counter	Frequency range Frequency stability	10 MHz to 600 MHz. 0.2 ppm or less.
7. Ammeter		15A.
8. AF volt meter	Frequency range Voltage range	50 Hz to 10 kHz. 3 mV to 30V.
9. Audio generator	Frequency range Output	50 Hz to 5 kHz or more. Fine adjustment capable between 0 and 1V.
10. Distortion meter	Capability Input level	3% or less at 1 kHz. 50 mV to 10V rms.
11. VOM	Measuring range Input impedance	Measurable between 10 ~ 1.5V DC or less. 50kohms/V or greater.
12. 4 ohm dummy load		Approx. 4 ohm, 10W.
13. Regulated power source		13.8V, approx. 15A (adjustable from 9 to 17V) Useful if ammeter equipped.

13. Alignment

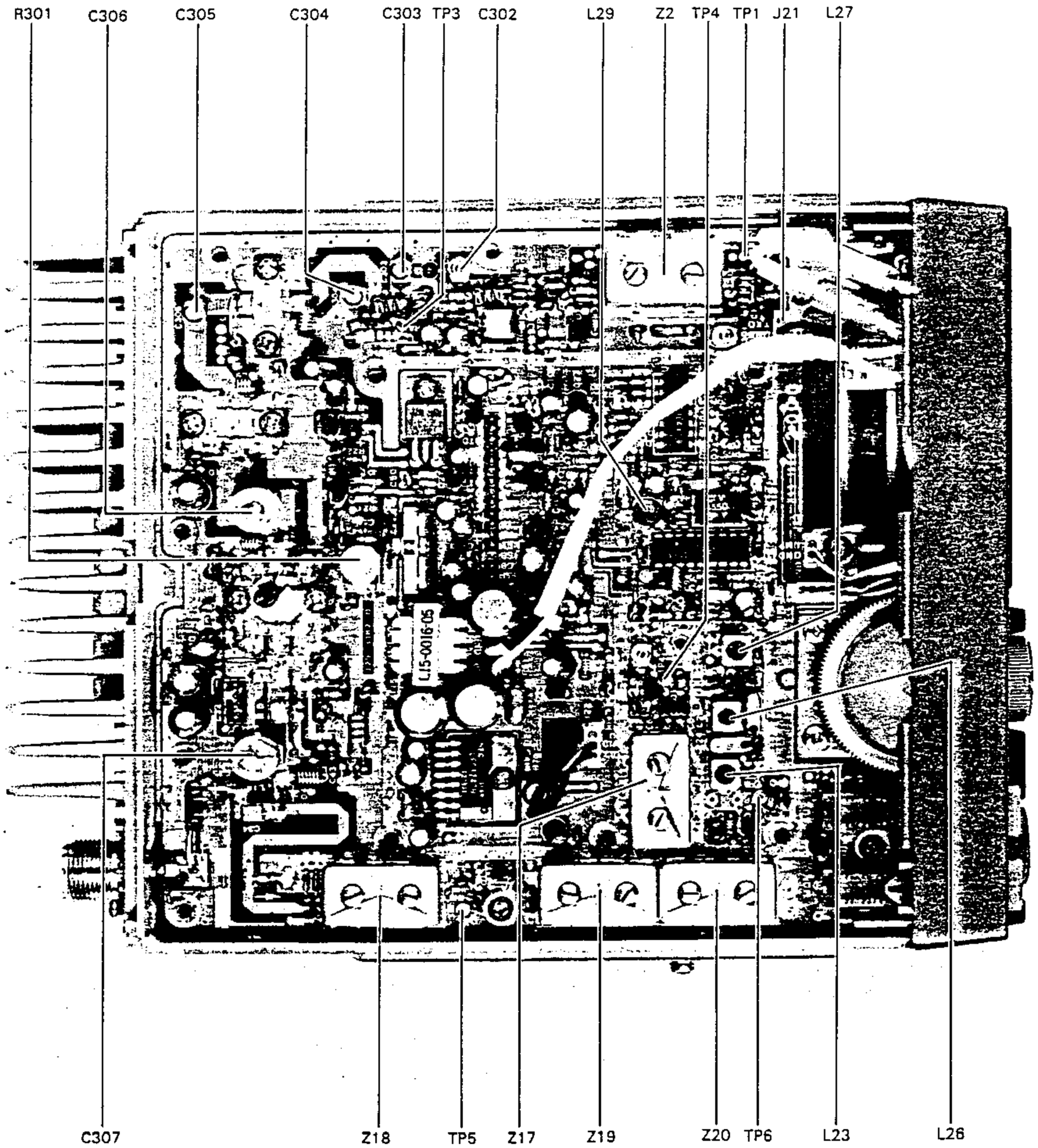
Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. Initial set up	1) PLL unit: Insert PROM (M1, M2 frequency stored).						If the PROM is installed backwards, it may be damaged. Always install correctly.	
	2) The CH knob should not be loose. The MONI, AUX, VOL/SQL knobs should be secure.							
	3) Front panel: MONI switch set to out position. QT/SQL opened.							
	4) Rear panel: Connect power cable and microphone cable.							
2. Common PLL lock voltage	1) CH: Channel in the vicinity of TX center frequency. PTT: ON	Digital volt meter	PLL	TP1	PLL	C901	4V ADJ	4V ± 0.2V
3. TCXO frequency adjustment	1) PTT: OFF 2) CH: Channel vicinity of RX center frequency.	Frequency counter	TX-RX	TP6	PLL	C902	RX frequency minus 21.4 MHz adjustment	Within ± 100 Hz DO NOT adjust if in-spec!
	3) CH: Check other channels storing frequencies.	Frequency counter					Verify RX frequency: −21.4 MHz	
4. Transmit PLL lock voltage	1) CH: Channel in the vicinity of TX center frequency. 2) PTT: ON	Digtal volt meter	PLL	TP4	PLL	C903	3V ADJ	3V ± 0.2V
5. Sensitivity	1) CH: Channel in the vicinity of RX center frequency. QT/SQL: Opened	Oscilloscope	Rear panel	ESP (J4-3.7)	Front panel	OFF/VOL	0.78 V/4Ω (noise)	
	2) SSG frequency: Channel 1) Output: 1000 μV/−47 dBm Modulation: OFF				TX-RX	Z17 Z18 Z19 Z20 L27	Repeat three times in the order Z18, Z19, Z20, Z17. (Lower the SSG output level as noise level decreases.) Then lower the noise level by L27 to obtain maximum sensitivity.	
	3) SSG Output: 1000 μV/-47 dBm Modulation: 1 kHz/ ± 3 kHz dev.	Oscilloscope Distortion meter	Rear panel	ESP (J4-3.7)	TX-RX	L29 L26 L23	Adjust L29 for maximum AF output. Adjust L26 and L23 for minimum distortion.	Repeat twice. 33 dB or better SINAD
	4) SSG Output: 0.5 μV/−113 dBm				TX-RX	L23	Adjust for minimum distortion.	
	5) SSG Output: 0.4 μV/−115 dBm						Check	16 dB or better SINAD

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
6. Squelch preset	1) Front panel QT/SQL (R905): Counterclockwise (OFF) PLL unit (R902): Clockwise	SP			PLL	R902	Turn CCW and adjust until squelch just closes.	
7. Squelch and BUSY lamp	1) Front panel QT/SQL (R905): Threshold	Oscilloscope BUSY	Rear panel Front panel	ESP (J4-3.7)			Check	11 : 00 – 1 : 00 threshold.
	2) ANT SSG Output: 0.2μV/–121 dBm Modulation: 1 kHz/ ± 3 kHz Dev.	Oscilloscope BUSY	Rear panel Front panel	ESP (J4-3.7)			Check	Squelch should open. Busy Light on.
	3) QT/SQL (R905): MAX (clockwise)	BUSY	Front panel				Check	Busy Light off.
	4) SSG Output: 3.5 μV/96 dBm	Oscilloscope					Check	Squelch should open.
	5) SSG Output: OFF MONI SW: OFF MONI SW: ⊓ → ⎓						Check	Squelch should open.
8. Drive	1) CH: Channel vicinity of TX center frequency. ANT: Power meter TX-RX unit R301: Full CW TX-RX unit C302: MIN PTT: ON	TX lamp Power-meter					Check	TX lamp lights.
		VOM	RX-TX	TP2	TX-RX	Z2	Minimum	Approx. 7V
9. Final	1) CH: Channel vicinity of TX center frequency PTT: ON	Power meter	Rear panel	ANT	TX-RX	C302 C303 C304 C305 C306 C307	Maximum. Repeat twice.	45W or greater (K, K₂, M, M₂), 38W or greater (K₁, M₁)
						R301	MIN (counterclockwise)	20W or less
							40W ADJ (K, K₂, M, M₂) 37W ADJ (K₁, M₁)	
		Ammeter					Specified power ADJ	12A or less
10. Transmit frequency adjustment	1) CH: Channel vicinity of TX center frequency PTT: ON	Frequency counter	TX-RX	ANT	PLL	L1S	Frequency adjustment of TX	± 100 Hz
	2) CH: Check other channels.						Verify TX frequency.	
11. Maximum deviation adjustment	1) MIC-H1 AG: 1 kHz/50 mV Deviation meter filter: LPF 20 kHz, HPF 50 Hz DE EMPHASIS: 750 μsec. PLL unit R903: MAX (clockwise)	Deviation meter	TX-RX	ANT	PLL	R901	± 4.4 kHz ADJ Adjust one more than the other by switching between –P and +P.	± 100 Hz
12. Deviation adjustment	1) MIC-H1 (Rear panel J3-4) AG: 1 kHz/5 mV	Deviation meter				R903	± 3 kHz ADJ	± 50 Hz
	2) MIC-H2 (Rear panel J3-5) AG: 1 kHz/5 mV						Check	± 3 kHz or less

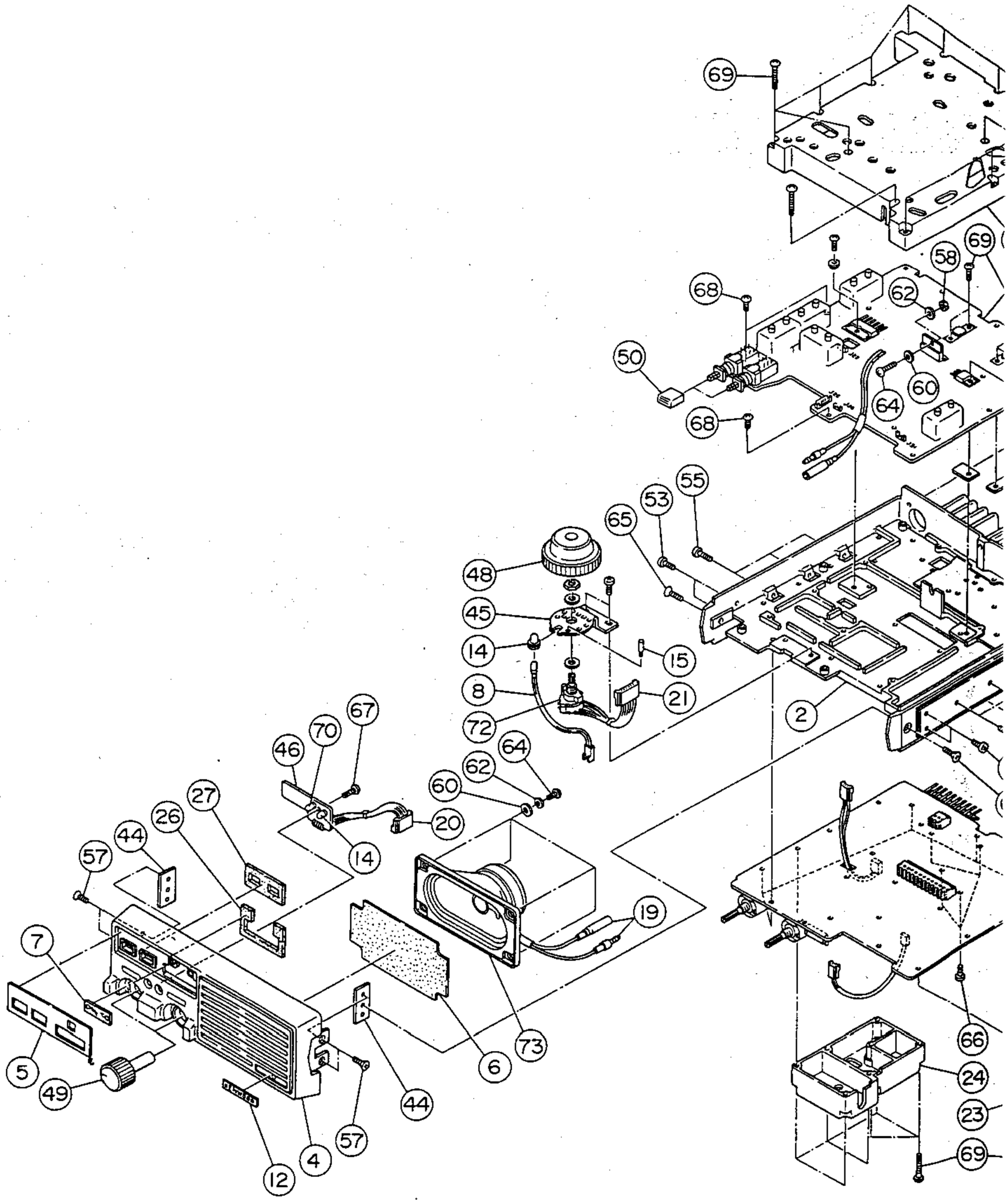
14. Adjustment parts



PLL UNIT (X61-1190-21)
BOTTOM VIEW



TX-RX UNIT (X61-1180-XX)
TOP VIEW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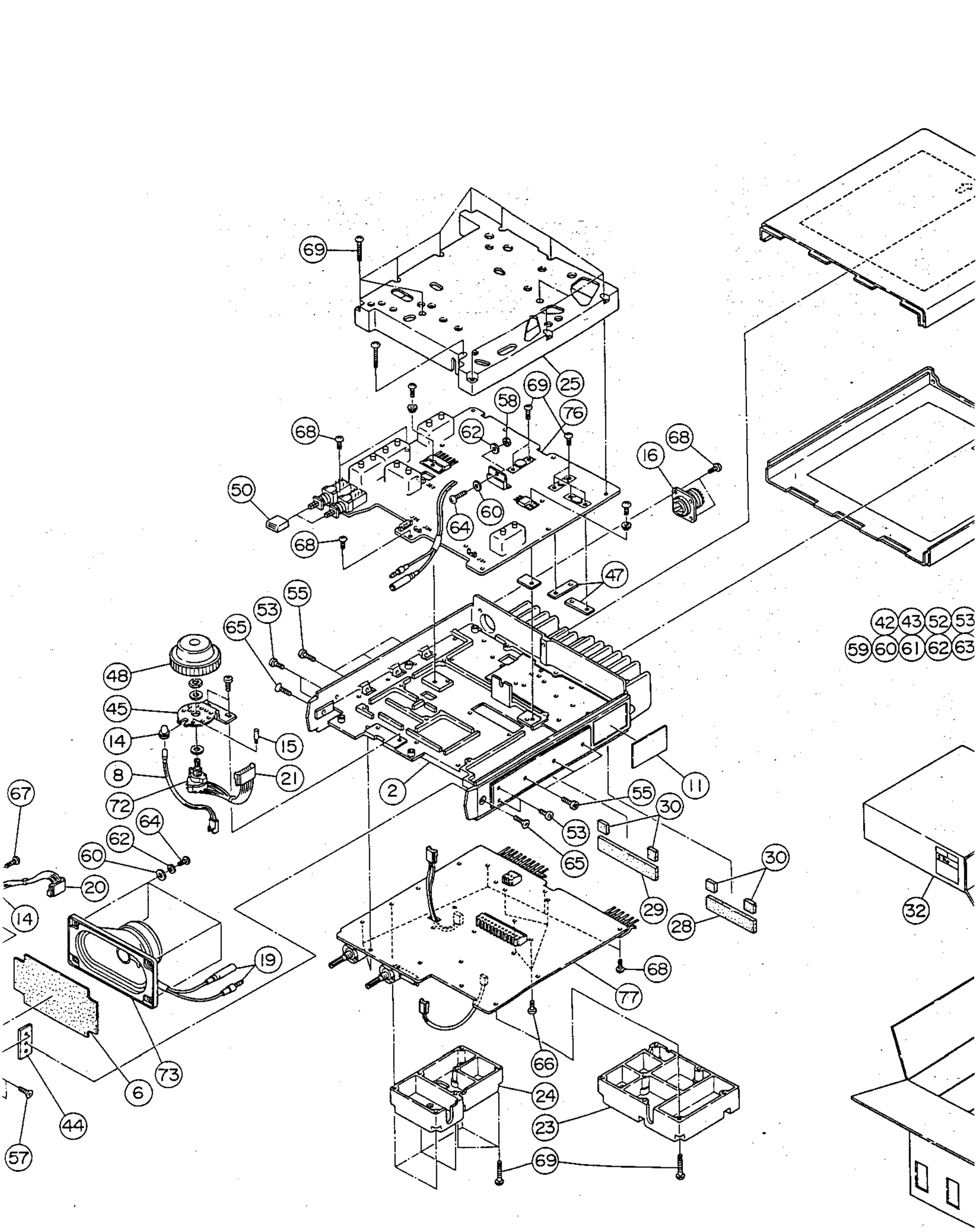
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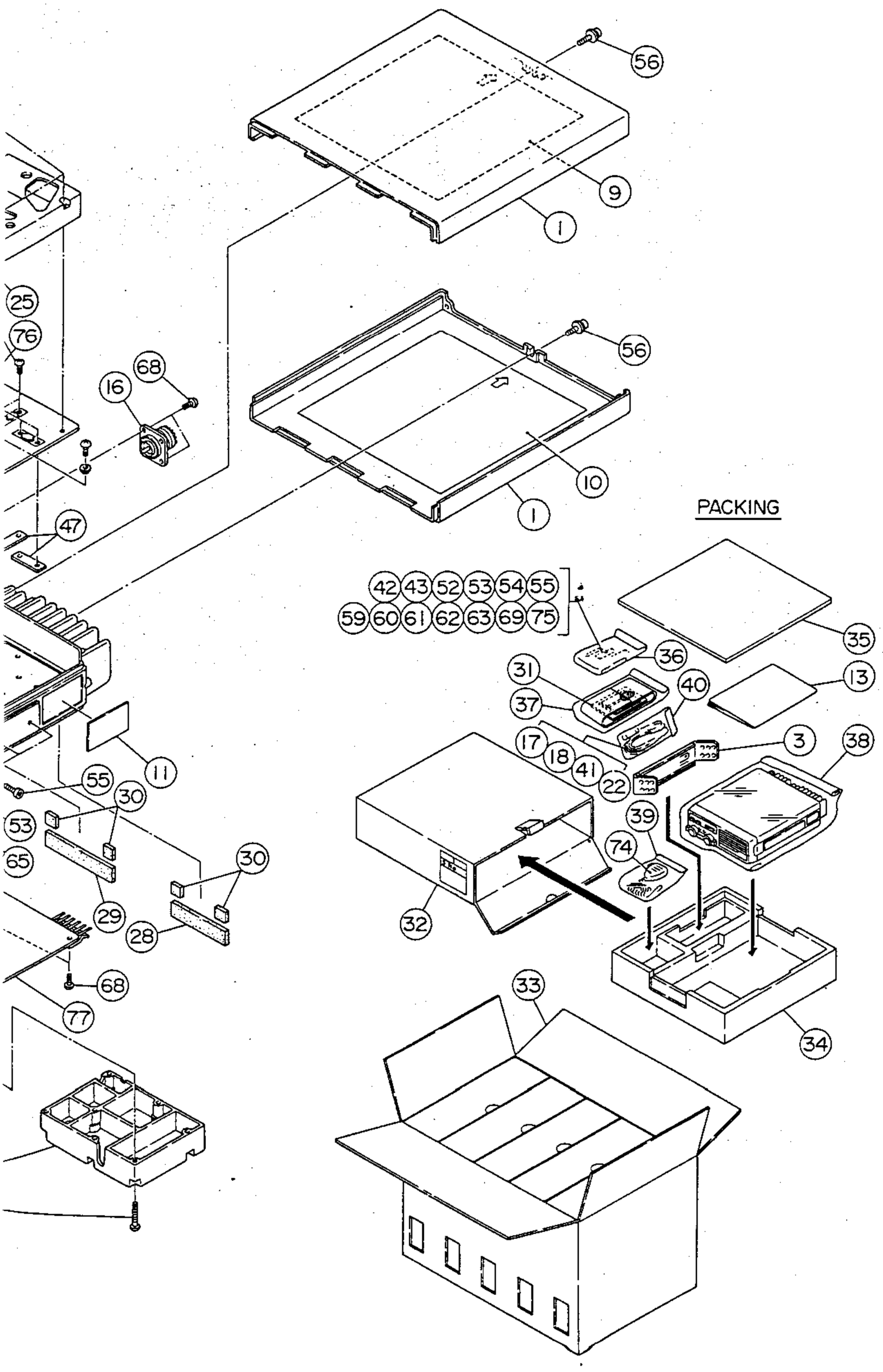

GENER.

Ref. No
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GENERAL

K: USA market, M: Others

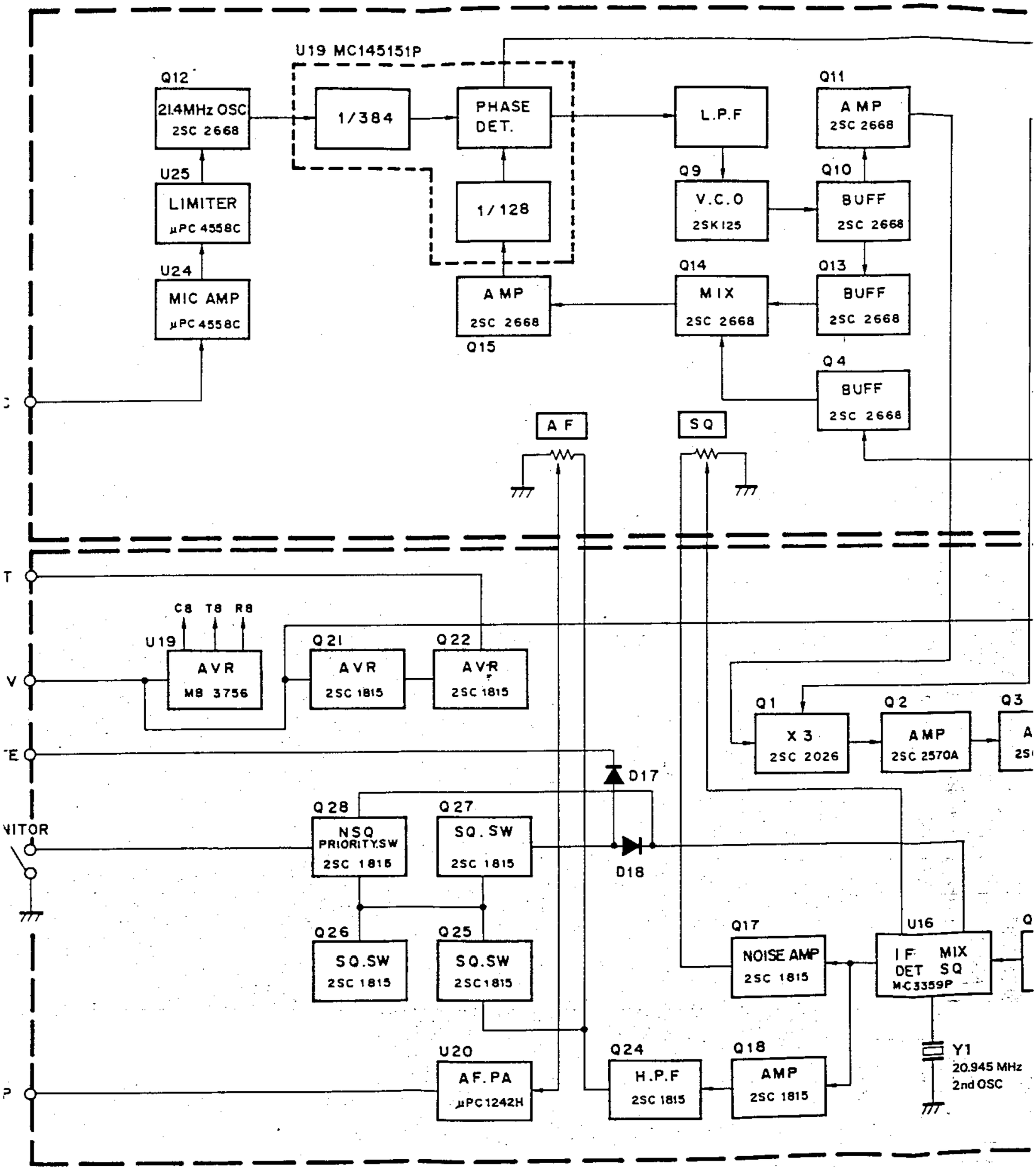
Ref. No.	Part No.	Description
1	A01-0951-02	Case, 2 used
2	A10-1248-05	Chassis
3	A13-0641-03	Bracket, mobile, Mounting hardware kit
4	A20-2477-02	Panel
5	A21-0752-04	Escutcheon
6	B05-0728-04	Speaker grill cloth
7	B08-0303-04	Display window
8	B30-0829-05	Lamp with connector, 14V, 480mA, for I901
9	B42-1783-04	Adjustment label, TX, RX
10	B42-1784-04	Adjustment label, PLL
11	B40-2679-04	Model name plate (K, M)
11	B40-2680-04	Model name plate (K_1, M_1)
11	B40-2681-04	Model name plate (K_2, M_2)
12	B43-0691-04	Nameplate
13	B50-4039-00	Instruction manual
14	BG5514S	LED, green, BUSY, 2.1V, 50mA, for D901
15	D32-0406-04	Stop screw, Channel
16	E04-0109-15	UHF receptacle
17	E30-1731-25	DC cable ass'y
18	E30-1733-05	Cable with connector
19	E31-2173-05	Connector with lead, SP
20	E31-2178-05	Connector with lead, LED
21	E31-2186-05	Connector with lead, Channel switch
22	F05-1031-05	Fuse, 10A
22	F05-1031-05	Fuse, 10A (spare)
23	F11-0832-05	Shield cover (A)
24	F11-0833-05	Shield cover (B)
25	F11-0834-05	Shield cover (C)
26	G13-0673-04	Dust seal (A), Channel
27	G13-0674-14	Dust seal (B), Pushswitch
28	G13-0675-04	Dust seal (C), Connector
29	G13-0676-04	Dust seal (D), Connector
30	G13-0677-04	Dust seal (E), Connector, 4 used
31	G13-0682-04	Conductive seal
32	H01-4487-03	Packing carton (inside)
33	H03-2129004	Packing carton (outside)
34	H10-2574-02	Packing fixture
35	H10-2575-04	Packing fixture
36	H25-0029-04	Poly. bag, Screw, Stopper, Hex. wrench 2.5mm
37	H25-0029-04	Poly. bag, Fuse, ROM, 2 used
38	H25-0105-04	Protective bag, Body
39	H25-0079-04	Protective bag, Microphone
40	H25-0104-04	Poly. bag, DC cable
41	J13-0404-05	Fuse holder
42	J19-1376-05	Mic hanger (A)
43	J19-1382-05	Nylon lead holder, 2 used
44	J21-2795-04	Bracket, Panel, 2 used
45	J21-2797-04	Bracket, Switch
46	J25-3179-04	PCB, LED
47	J30-0524-04	Spacer, 2 used
48	K23-0758-03	Knob, Channel
49	K23-0759-04	Knob, VOL, SOL, 2 used
50	K27-0448-04	Knob, Push, MONI, AUX, 2 used
51	M54730AP	IC, 2 used
52	N09-0008-04	Hex. bolt, Mounting hardware kit, 6 used
53	N35-4006-41	Bind screw, Mic hanger 4 used
54	N09-0633-05	Tapping screw, Mic hanger, 4 used
55	N09-0648-05	Screw, Hex. socket pan head
56	N09-0649-05	Screw with washers, 2 used
57	N09-0650-05	Screw, Pan head, Panel-bracket, 4 used
58	N10-2030-46	Nut, TR
59	N14-0510-04	Nut, Flange, Mounting hardware kit, 6 used
60	N15-1030-46	Washer, plat, TR, SP, 9 used
61	N15-1060-46	Washer, plat, Mounting hardware kit, 6 used
62	N16-0030-46	Washer, Spring, TR
63	N16-0060-46	Washer, Spring, Mounting hardware kit, 6 used
64	N30-3008-46	Screw, Pan head, TR
65	N33-4010-41	Screw, Pan head, Round, Panel, 2 used
66	N35-3008-46	Screw, Fillister head, Channel bracket, 6 used
67	N87-3006-46	Screw, Blazer tap tight, LED PCB, SP, 5 used
68	N87-3008-46	Screw, Truss-head tapping, PCB, ANT, 14 used
69	N87-3010-46	Screw, Truss-head tapping, TR, 8 used
70	PR5534S	LED, Red, TX, for D902
72	S01-1433-05	Switch, Rotary, Channel
73	T07-0227-05	Speaker, 4Ω, 3W, for SP901
74	T91-0330-05	Microphone, 400Ω
75	W01-0407-05	Hex. wrench 2.5mm
76	X61-1180-10	TX-RX unit, 450 ~ 470MHz (K, M)
	X61-1180-11	TX-RX unit, 470 ~ 490MHz (K_2, M_2)
	X61-1180-12	TX-RX unit, 490 ~ 512Mhz (K_3, M_3)
77	X61-1190-21	PLL unit
	B46-0409-00	Warranty card (K_1, K_2, K_3)
	B50-4088-00	Installation manual

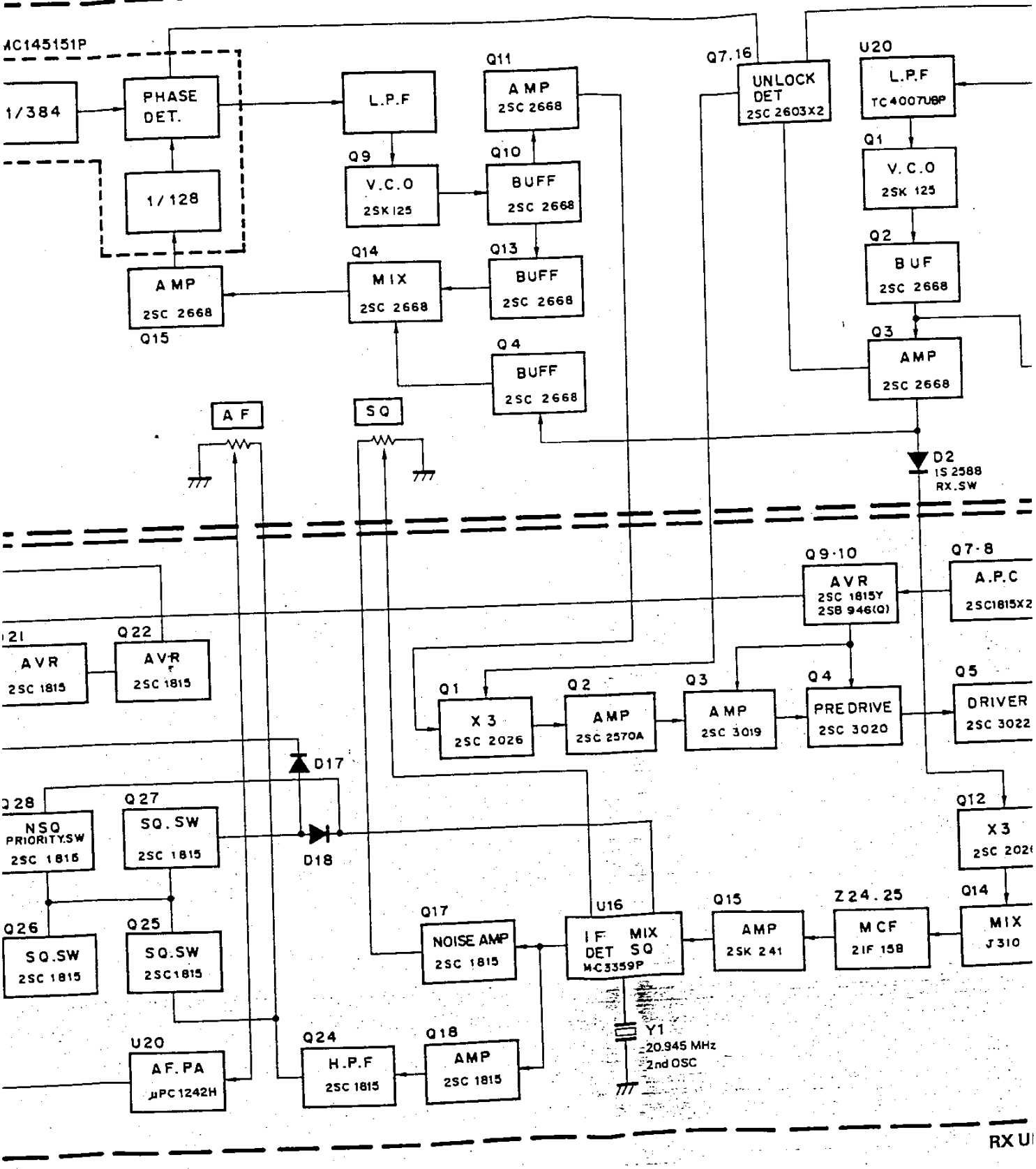
6. DIAGRAM AND PARTS LIST

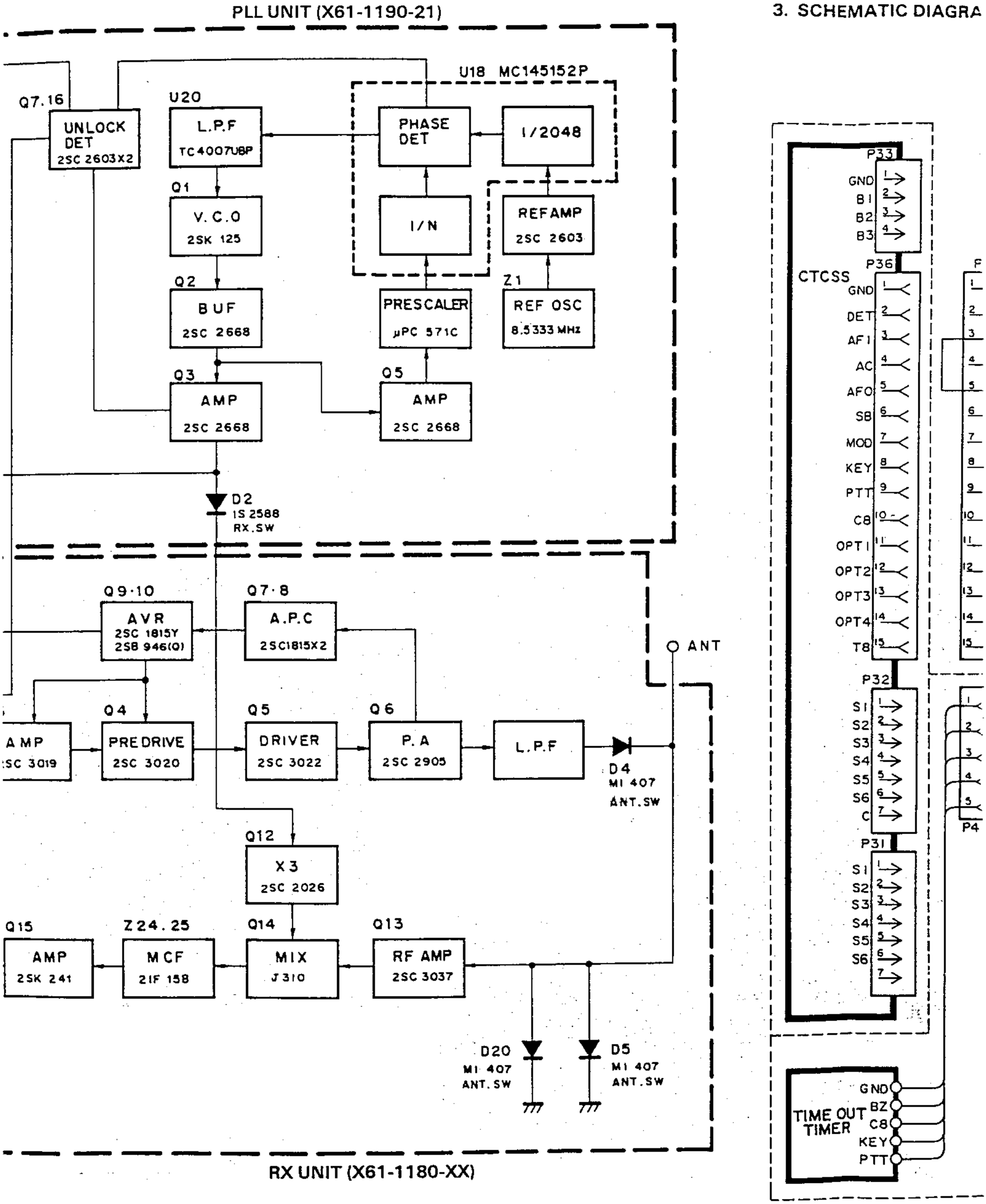
1. DISASSEMBLY DIAGRAM AND PARTS LIST

801S

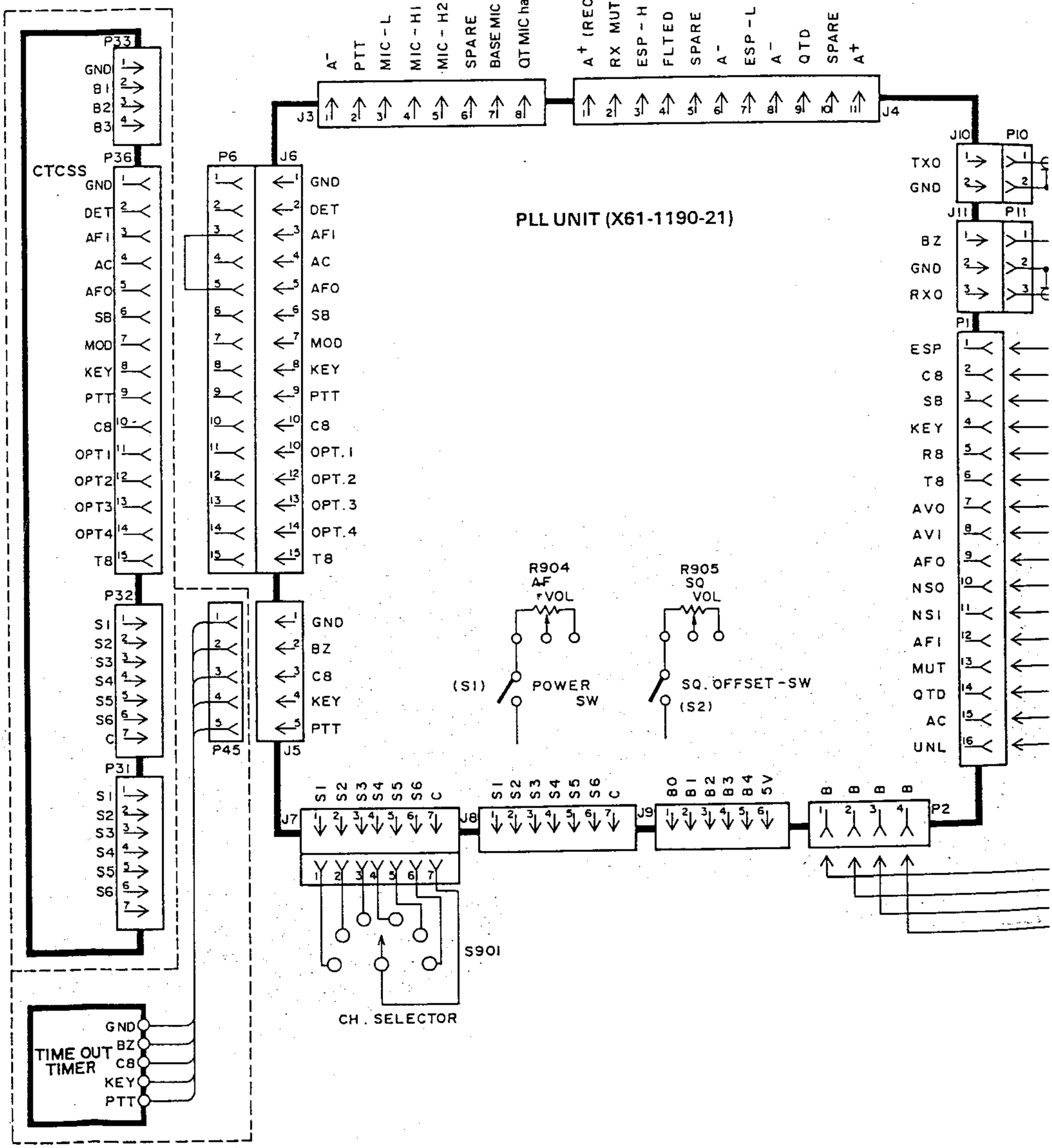
CIRCUIT BLOCK DIAGRAM

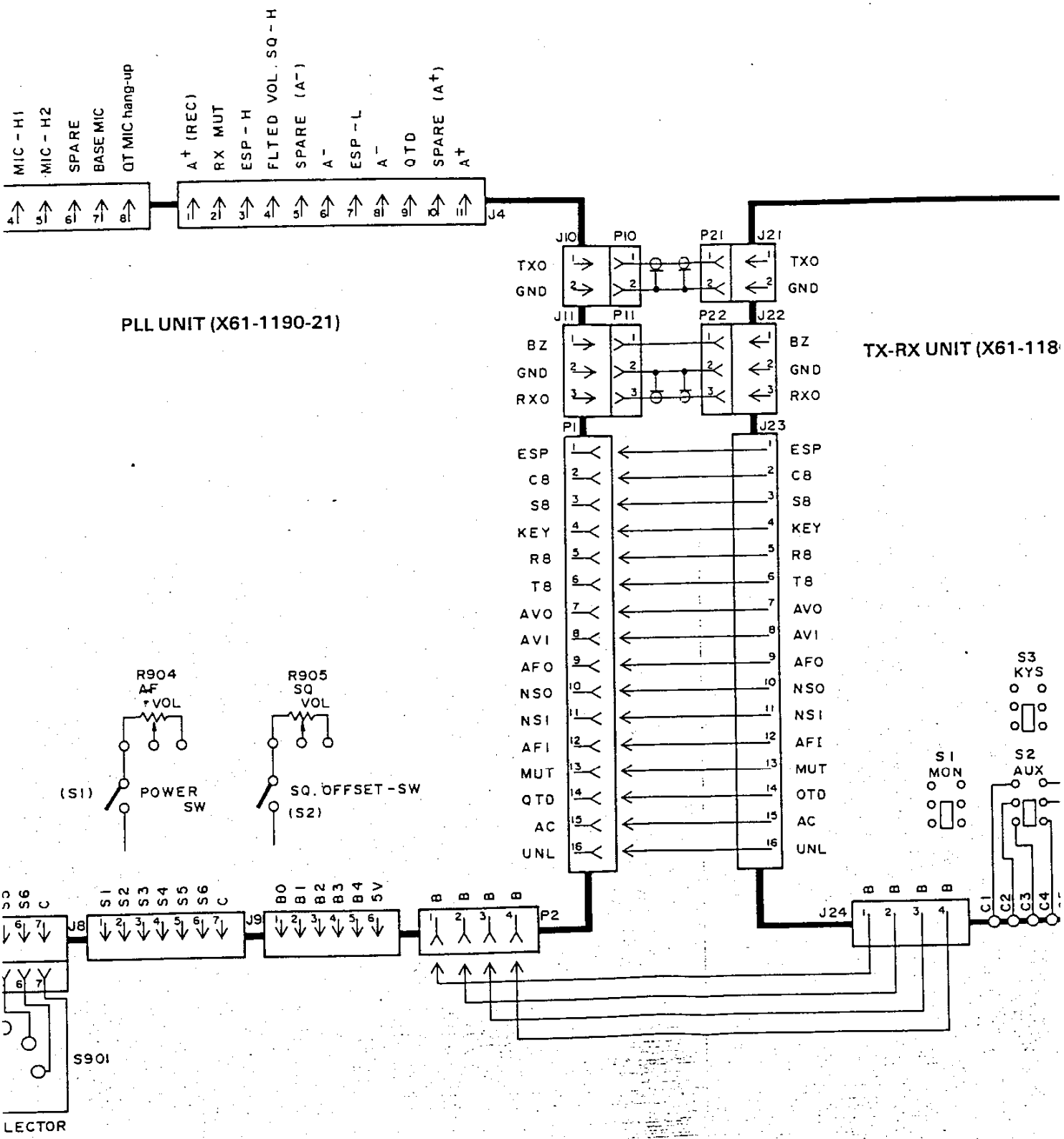


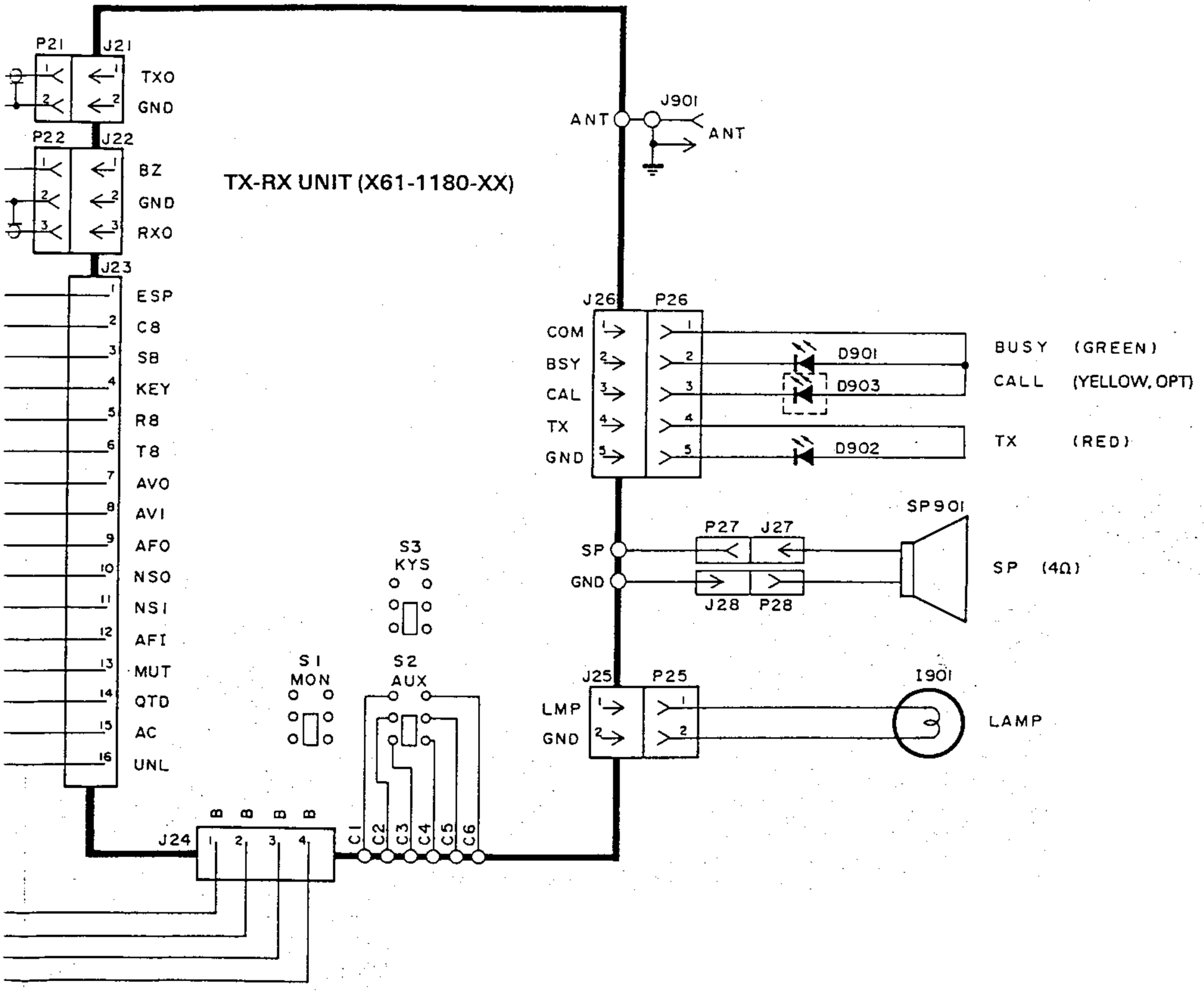

MC145151P
1/384
PHASE DET.
1/128
L.P.F
Q9
V.C.O 2SK125
Q10
BUFF 2SC 2668
Q11
AMP 2SC 2668
Q14
MIX 2SC 2668
Q13
BUFF 2SC 2668
AMP 2SC 2668
Q15
Q4
BUFF 2SC 2668
Q7.16
UNLOCK DET 2SC 2603X2
U20
L.P.F TC4007UBP
Q1
V.C.O 2SK 125
Q2
BUF 2SC 2668
Q3
AMP 2SC 2668
AF
SQ
D2
1S 2588
RX.SW
Q9·10
AVR 2SC 1815Y 2SB 946(Q)
Q7·8
A.P.C 2SC1815X2
Q22
AVR 2SC 1815
Q1
X 3 2SC 2026
Q2
AMP 2SC 2570A
Q3
AMP 2SC 3019
Q4
PRE DRIVE 2SC 3020
Q5
DRIVER 2SC 3022
D17
D18
Q28
NSQ PRIORITY SW 2SC 1815
Q27
SQ.SW 2SC 1815
Q12
X3 2SC 202
Q26
SQ.SW 2SC 1815
Q25
SQ.SW 2SC1815
Q17
NOISE AMP 2SC 1815
U16
IF MIX DET SQ MC3359P
Q15
AMP 2SK 241
Z24.25
MCF 21F 15B
Q14
MIX J310
Y1
20.945 MHz
2nd OSC
U20
AF.PA μPC1242H
Q24
H.P.F 2SC 1815
Q18
AMP 2SC 1815


PLL UNIT (X61-1190-21)
U18 MC145152P
Q7.16
UNLOCK DET 2SC 2603X2
U20
L.P.F TC4007UBP
PHASE DET
1/2048
Q1
V.C.O 2SK 125
1/N
REFAMP 2SC 2603
Q2
BUF 2SC 2668
PRESCALER µPC 571C
Z1
REF OSC 8.5333 MHz
Q3
AMP 2SC 2668
Q5
AMP 2SC 2668
D2 1S 2588 RX.SW
Q9·10
AVR 2SC 1815Y 2SB 946(O)
Q7·8
A.P.C 2SC1815X2
ANT
Q4
AMP 2SC 3019
PRE DRIVE 2SC 3020
Q5
DRIVER 2SC 3022
Q6
P.A 2SC 2905
L.P.F
D4 MI 407 ANT.SW
Q12
X3 2SC 2026
Q15
AMP 2SK 241
Z24.25
MCF 21F 158
Q14
MIX J 310
Q13
RF AMP 2SC 3037
D20 MI 407 ANT.SW
D5 MI 407 ANT.SW
RX UNIT (X61-1180-XX)
P33
GND 1
B1 2
B2 3
B3 4
P36
CTCSS
GND 1
DET 2
AF I 3
AC 4
AFO 5
SB 6
MOD 7
KEY 8
PTT 9
C8 10
OPT I 11
OPT2 12
OPT3 13
OPT4 14
T8 15
P32
S1 1
S2 2
S3 3
S4 4
S5 5
S6 6
C 7
P31
S1 1
S2 2
S3 3
S4 4
S5 5
S6 6
F
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
P4
1 2 3 4 5
TIME OUT TIMER
GND
BZ
C8
KEY
PTT

3. SCHEMATIC DIAGRAM




MIC - H1
MIC - H2
SPARE
BASE MIC
QT MIC hang-up
A+ (REC)
RX MUT
ESP - H
FLTED VOL. SQ - H
SPARE (A-)
A-
ESP - L
A-
QTD
SPARE (A+)
A+
J4
PLL UNIT (X61-1190-21)
TX-RX UNIT (X61-118
J10
P10
P21
J21
TXO
GND
J11
P11
P22
J22
BZ
GND
RXO
P1
J23
ESP
C8
S8
KEY
R8
T8
AVO
AVI
AFO
NSO
NSI
AFI
MUT
QTD
AC
UNL
R904
AF
VOL
R905
SQ
VOL
(S1)
POWER
SW
SQ. OFFSET-SW
(S2)
S3
KYS
S1
MON
S2
AUX
J8
J9
P2
J24
C1
C2
C3
C4
S901
LECTOR


TX-RX UNIT (X61-1180-XX)
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TXO
GND
P22
J22
BZ
GND
RXO
J23
ESP
C8
SB
KEY
R8
T8
AVO
AVI
AFO
NSO
NSI
AFI
MUT
QTD
AC
UNL
J24
B B B B
C1 C2 C3 C4 C5 C6
S1
MON
S2
AUX
S3
KYS
ANT
J901
ANT
J26
P26
COM
BSY
CAL
TX
GND
D901
D903
D902
BUSY (GREEN)
CALL (YELLOW, OPT)
TX (RED)
SP
GND
P27 J27
J28 P28
SP901
SP (4Ω)
J25
P25
LMP
GND
I901
LAMP

PLL UNIT Parts List (X61-1190-21)

Ref. No.	Part No.	Description
	CAPACITORS	CC: Ceramic E: Electrolytic ML: Mylar T: Tantalum
C1	CC45CH1H080D	CC, 8pF, ±0.5pF
C3	CC73FCH1H060D	Chip, 6pF, ±0.5pF
C4	CC73FCH1H030C	Chip, 3pF, ±0.25pF
C5	CC73FCH1H100D	Chip, 10pF, ±0.5pF
C6	CE04W1A470M	E, 47μF, 10V
C7	CK45B1H102K	CC, 0.001μF
C8	CC45CH1H040C	CC, 4pF, ±0.25pF
C9	CK45B1H102K	CC, 0.001μF
C10	CC45CH1H330J	CC, 33pF
C11	CK45B1H102K	CC, 0.001μF
C12	CC45CH1H330J	CC, 33pF
C13	CE04W1A470M	E, 47μF, 10V
C14~17	CK45B1H102K	CC, 0.001μF
C18	C91-0131-05	CC, 0.01μF
C19	CS15E1VR22M	T, 0.22μF, 35V
C20	CQ92M1H473K	ML, 0.047μF
C21	CQ92M1H104K	ML, 0.1μF
C22	CC45CH1H330J	CC, 33pF
C23~25	CK45B1H102K	CC, 0.001μF
C26	CE04W1C100M	E, 10μF, 16V
C27	CK45B1H102K	CC, 0.001μF
C28	CE04W1A101M	E, 100μF, 10V
C29	C91-0131-05	CC, 0.01μF, SP
C30	CK45B1H102K	CC, 0.001μF
C31,32	C91-0131-05	CC, 0.01μF,SP
C33	CK45B1H102K	CC, 0.001μF
C34~36	C91-0131-05	CC, 0.01μF, SP
C37	CE04W1C100M	E, 10μF, 16V
C38,39	CE04W1A470M	E, 47μF, 10V
C40	CC45CH1H010C	CC, 1pF, ±0.25pF
C41~43	CK45B1H102K	CC, 0.001μF
C44	CK73FB1H102K	Chip, 1000pF
C45	CE04W1C100M	E, 10μF, 16V
C46	CC45CH1H150J	CC, 15pF
C47	CC73FCH1H020C	Chip, 2pF, ±0.25pF
C48	CC73FCH1H060D	Chip, 6pF, ±0.5pF
C49	CC73FCH1H030C	Chip, 3pF, ±0.25pF
C50	CC73FCH1H100D	Chip, 10pF, ±0.5pF
C51,52	CK45B1H102K	CC, 0.001μF
C53	CC45CH1H060D	CC, 6pF, ±0.5pF
C54	CK45B1H102K	CC, 0.001μF
C55	CC45CH1H120J	CC, 12pF
C56,57	CK45B1H102K	CC, 0.001μF
C58	CE04W1A470M	E, 47μF, 10V
C59,60	CK45B1H102K	CC, 0.001μF
C61	CQ92M1H123K	ML, 0.012μF
C62	CS15E1C010M	T, 1μF, 16V
C63	CK45B1H102K	CC, 0.001μF
C64	CC45CH1H020C	CC, 2pF, ±0.25pF
C65	CK45B1H102K	CC, 0.001μF
C66	CC45CH1H020C	CC, 2pF, ±0.25pF
C67	CK45B1H102K	CC, 0.001μF
C68	CC45CH1H020C	CC, 2pF, ±0.25pF
C69,70	C91-0131-05	CC, 0.01μF, SP
C71	CC45CH1H220J	CC, 22pF
C72	CC45SL1H471J	CC, 470pF
C73~75	C91-0131-05	CC, 0.01μF, SP
C76	CK45B1H102K	CC, 0.001μF
C77	CE04W1A101M	E, 100μF, 10V
C78	C91-0131-05	CC, 0.01μF, SP
C79	CE04W1A330M	E, 33μF, 10V
C80,81	CC45SL1H101J	CC, 100pF
C82	CQ92M1H472K	ML, 0.0047μF
C83	CE04W1HR22M	E, 0.22μF, 50V
C84	CQ92M1H392K	ML, 0.0039μF
C85	CQ92M1H103K	ML, 0.01μF
C86	C91-1009-05	Layer, 180pF
C87,88	CE04W1H4R7M	E, 4.7μF, 50V
C89	CE04W1C100M	E, 10μF, 16V
C90	CQ92M1H822K	ML, 0.0082μF
C91	CE04W1H4R7M	E, 4.7μF, 50V
C92	C91-0131-05	CC, 0.01μF, SP
C93	CC45UJ1H150J	CC, 15pF
C94	C91-0479-05	Layer, 150pF
C95	CC45CH1H560J	CC, 56pF
C96	C91-0131-05	CC, 0.01μF, SP
C97	CE04W1H010M	E, 1μF, 50V
C98~101	CK45B1H102K	CC, 0.001μF
C102	CQ92M1H123K	ML, 0.012μF
C104	CE04W1HR33M	E, 0.33μF, 50V
C901, 903	C05-0062-05	Ceramic trimmer, 6pF
	DIODES	
D1	1SV50E	Voltage variable, 25mW
D2	1S2588	Silicon 30V, 150mA
D3,4	1S2208LB	Silicon 30V
D5	1S1555	Silicon 35V 100mA
D6	U05B	Silicon 100V 2.5A
D7	U15B	Silicon 100V, 3A
D8~22	1S1555	Silicon 35V, 100mA
	JUMPERS	
JU1,3,4,6	E31-2170-05	Wire jumper, pitch 5mm, 0.6mm dia.
JU8	R92-0150-05	Wire jumper
JU10	E31-2170-05	Wire jumper, pitch 5mm, 0.6mm dia.
JU12	E31-2170-05	Wire jumper, pitch 5mm, 0.6mm dia.
JU13	R92-0150-05	Wire jumper (K)
	CONNECTORS	
J1	E18-1651-05	Pin socket, 16P
J2	E18-0452-05	Pin socket, 4P
J3	E40-7203-05	Connector, 3P (Fem.)
J3,4	E40-7205-05	Connector, 5P (Fem.)
J4	E40-7206-05	Connector, 6P (Fem.)
J5	E40-0564-05	Pin connector, 5P (Male.)
J6	E40-1564-05	Pin connector, 15P (Male.)
J7,8	E40-0773-05	Mini connector, 7P
J9	E40-0673-05	Mini connector, 6P
J10	E40-0273-05	Mini connector, 2P
J11	E40-0373-05	Mini connector, 3P
J12	E31-2187-15	Connector with lead
	COILS	
L2	L40-1092-14	Inductor, 1μH
L3	L19-0345-05	Broad band transformer
L4	L40-3391-14	Inductor, 3.3μH
L5,6	L40-1021-14	Inductor, 1mH
L8	L40-1092-14	Inductor, 1μH

Ref. No.	Part No.	Description
L9	L40-3391-14	Inductor, 3.3μH
L10	L19-0345-05	Broad band transformer
L11	L40-3391-14	Inductor, 3.3μH
L12~14	L40-1021-14	Inductor, 1mH
L15	L34-0872-05	OSC coil, 3.9μH
L16	L40-3391-14	Inductor, 3.3μH

TRANSISTORS

Q1	2SK125	n-channel MOS FET	
Q2~5	2SC2668(Y)	Si NPN RF amp.	
Q6~8	2SC2603(E)	Si NPN AF amp.	
Q9	2SK241(GR)-1	n-channel MOS FET	
Q10~15	2SC2668(Y)	Si NPN RF amp.	
Q16	2SC2603(E)	Si NPN AF amp.	
Q17	2SC2603(E)	Si NPN AF amp.	(M)

RESISTORS

R1	RD14CB2C273J	Carbon	27kΩ	1/6W
R2	RD14CB2C101J	Carbon	100Ω	1/6W
R3	RD14CB2C153J	Carbon	15kΩ	1/6W
R4	RD14CB2C103J	Carbon	10kΩ	1/6W
R5	RD14CB2C101J	Carbon	100Ω	1/6W
R6	RD14CB2C331J	Carbon	330Ω	1/6W
R7	RD14CB2C153J	Carbon	15kΩ	1/6W
R8	RD14CB2C682J	Carbon	6.8kΩ	1/6W
R9	RD14CB2C101J	Carbon	100Ω	1/6W
R10	RD14CB2C221J	Carbon	220Ω	1/6W
R11	RD14CB2C102J	Carbon	1kΩ	1/6W
R12	RD14CB2C472J	Carbon	4.7kΩ	1/6W
R13	RD14CB2C103J	Carbon	10kΩ	1/6W
R14	RD14CB2C681J	Carbon	680Ω	1/6W
R15	RD14CB2C102J	Carbon	1kΩ	1/6W
R16	RD14CB2C153J	Carbon	15kΩ	1/6W
R17	RD14CB2C103J	Carbon	10kΩ	1/6W
R18	RD14CB2C471J	Carbon	470Ω	1/6W
R19	RD14CB2C221J	Carbon	220Ω	1/6W
R20	RD14CB2C273J	Carbon	27kΩ	1/6W
R21	RD14CB2C103J	Carbon	10kΩ	1/6W
R22	RD14CB2C561J	Carbon	560Ω	1/6W
R23	RD14CB2C331J	Carbon	330Ω	1/6W
R24	RD14CB2C102J	Carbon	1kΩ	1/6W
R25	RD14CB2C103J	Carbon	10kΩ	1/6W
R26	RD14CB2C182J	Carbon	1.8kΩ	1/6W
R27~31	RD14CB2C272J	Carbon	2.7kΩ	1/6W
R32,33	RD14CB2C473J	Carbon	47kΩ	1/6W
R34	RD14CB2C471J	Carbon	470Ω	1/6W
R35	RD14CB2C151J	Carbon	150Ω	1/6W
R36,37	RD14CB2C103J	Carbon	10kΩ	1/6W
R38	RD14CB2C101J	Carbon	100Ω	1/6W
R39	RD14CB2C153J	Carbon	15kΩ	1/6W
R40	RD14CB2C822J	Carbon	8.2kΩ	1/6W
R41	RD14CB2C101J	Carbon	100Ω	1/6W
R42	RD14CB2C331J	Carbon	330Ω	1/6W
R43	RD14CB2C153J	Carbon	15kΩ	1/6W
R44	RD14CB2C682J	Carbon	6.8kΩ	1/6W
R45	RD14CB2C101J	Carbon	100Ω	1/6W
R46	RD14CB2C221J	Carbon	220Ω	1/6W
R47	RD14CB2C153J	Carbon	15kΩ	1/6W
R48	RD14CB2C103J	Carbon	10kΩ	1/6W
R49	RD14CB2C560J	Carbon	56Ω	1/6W
R50	RD14CB2C221J	Carbon	220Ω	1/6W
R51	RD14CB2C101J	Carbon	100Ω	1/6W

Ref. No.	Part No.	Description		
R52	RD14CB2C331J	Carbon	330Ω	1/6W
R53	RD14CB2C223J	Carbon	22kΩ	1/6W
R54	RD14CB2C222J	Carbon	2.2kΩ	1/6W
R55	RD14CB2C561J	Carbon	560Ω	1/6W
R56	RD14CB2C102J	Carbon	1kΩ	1/6W
R57	RD14CB2C331J	Carbon	330Ω	1/6W
R58	RD14CB2C471J	Carbon	470Ω	1/6W
R59	RD14CB2C333J	Carbon	33kΩ	1/6W
R60	RD14CB2C103J	Carbon	10kΩ	1/6W
R61	RD14CB2C222J	Carbon	2.2kΩ	1/6W
R62	RD14CB2C102J	Carbon	1kΩ	1/6W
R63	RD14CB2C101J	Carbon	100Ω	1/6W
R64~66	RD14CB2C122J	Carbon	1.2kΩ	1/6W
R67	RD14CB2C123J	Carbon	12kΩ	1/6W
R68	RD14CB2C221J	Carbon	220Ω	1/6W
R69	RD14CB2C102J	Carbon	1kΩ	1/6W
R70	RD14CB2C103J	Carbon	10kΩ	1/6W
R71	RD14CB2C182J	Carbon	1.8kΩ	1/6W
R72,73	RD14CB2C561J	Carbon	560Ω	1/6W
R74	RD14CB2C562J	Carbon	5.6kΩ	1/6W
R75	RD14CB2C103J	Carbon	10kΩ	1/6W
R76	RD14CB2C564J	Carbon	560kΩ	1/6W
R77	RD14CB2C562J	Carbon	5.6kΩ	1/6W
R78	RD14CB2C334J	Carbon	330kΩ	1/6W
R79	RD14CB2C333J	Carbon	33kΩ	1/6W
R80,81	RD14CB2C393J	Carbon	39kΩ	1/6W
R82	RD14CB2C334J	Carbon	330kΩ	1/6W
R83	RD14CB2C473J	Carbon	47kΩ	1/6W
R84	RD14CB2C333J	Carbon	33kΩ	1/6W
R85	RD14CB2C562J	Carbon	5.6kΩ	1/6W
R86	RD14CB2C823J	Carbon	82kΩ	1/6W
R87	RD14CB2C153J	Carbon	15kΩ	1/6W
R88	RD14CB2C103J	Carbon	10kΩ	1/6W
R89	RD14CB2C153J	Carbon	15kΩ	1/6W
R90,91	RD14CB2C104J	Carbon	100kΩ	1/6W
R92,93	RD14CB2C103J	Carbon	10kΩ	1/6W
R94	RD14CB2C101J	Carbon	100Ω	1/6W
R95	RD14CB2C561J	Carbon	560Ω	1/6W
R96	RD14CB2C102J	Carbon	1kΩ	1/6W
R97,98	RD14CB2C273J	Carbon	27kΩ	1/6W
R99	RD14CB2C103J	Carbon	10kΩ	1/6W
R100	RD14CB2C103J	Carbon	10kΩ	1/6W (M
R101	RS14AB3D270J	Metal film	27Ω	2W
R102	RD14CB2C683J	Carbon	68kΩ	1/6W
R103	RD14BB2C471J	Carbon	470Ω	1/6W
R106	RD14CB2C102J	Carbon	1kΩ	1/6W
R901	R12-2409-05	Trimmer Pot. 5kΩ (B)		
R902	R12-4408-05	Trimmer Pot. 50kΩ (B)		
R903	R12-2409-05	Trimmer Pot. 5kΩ (B)		
R904	R01-3427-05	Pot. 10kΩ (A) with S, 16mm dia.		
R905	R01-3428-05	Pot. 10kΩ (B) with S, 16mm dia. SQ		

THERMISTORS

TH1	112-201-2	200Ω
TH2	112-301-2	300Ω

TERMINALS

TP1,2	E23-0435-05	Round terminal
TP3	E23-0428-05	Round terminal
TP4,5	E23-0435-05	Round terminal

	Description		
arbon	330Ω	1/6W	
arbon	22kΩ	1/6W	
arbon	2.2kΩ	1/6W	
arbon	560Ω	1/6W	
arbon	1kΩ	1/6W	
arbon	330Ω	1/6W	
arbon	470Ω	1/6W	
arbon	33kΩ	1/6W	
arbon	10kΩ	1/6W	
arbon	2.2kΩ	1/6W	
arbon	10kΩ	1/6W	
arbon	2.2kΩ	1/6W	
arbon	1kΩ	1/6W	
arbon	100Ω	1/6W	
arbon	1.2kΩ	1/6W	
arbon	12kΩ	1/6W	
arbon	220Ω	1/6W	
arbon	1kΩ	1/6W	
arbon	10kΩ	1/6W	
arbon	1.8kΩ	1/6W	
arbon	560Ω	1/6W	
arbon	5.6kΩ	1/6W	
arbon	10kΩ	1/6W	
arbon	560kΩ	1/6W	
arbon	5.6kΩ	1/6W	
arbon	330kΩ	1/6W	
arbon	33kΩ	1/6W	
arbon	39kΩ	1/6W	
arbon	330kΩ	1/6W	
arbon	47kΩ	1/6W	
arbon	33kΩ	1/6W	
arbon	5.6kΩ	1/6W	
arbon	82kΩ	1/6W	
arbon	15kΩ	1/6W	
arbon	10kΩ	1/6W	
arbon	15kΩ	1/6W	
arbon	100kΩ	1/6W	
arbon	10kΩ	1/6W	
arbon	100Ω	1/6W	
arbon	560Ω	1/6W	
arbon	1kΩ	1/6W	
arbon	27kΩ	1/6W	
arbon	10kΩ	1/6W	
arbon	10kΩ	1/6W	(M)
etal film	27Ω	2W	
arbon	68kΩ	1/6W	
arbon	470Ω	1/6W	
arbon	1kΩ	1/6W	

immer Pot. 5kΩ (B)
immer Pot. 50kΩ (B)
immer Pot. 5kΩ (B)
ot. 10kΩ (A) with S. 16mm dia.
ot. 10kΩ (B) with S. 16mm dia. SQ

TORS

00Ω
00Ω

ALS

ound terminal
ound terminal
ound terminal

Ref. No.	Part No.	Description
ICS		
U18	MC145152P	CMOS LSI
U19	MC145151P	CMOS freq. synthesizer
U20	TC4007UBP	Si, Inverter
U21	μPB571C	CMOS LSI
U24,25	μPC4558C	
U26	L78M05	5V regulator
U22,23	M54730AP	PROM Accessory
CRYSTALS		
Z1	L77-0992-05	8.5333 MHz
Y2	L77-0993-05	21.4015 MHz
NON-REFERENCED ITEMS		
	E02-0120-05	IC socket, 16P, U22, U23
	E31-2170-05	Short jumper, Pitch 5mm, 0.6mm dia.
	J21-2798-04	Bracket, potentiometer
	352-6002-05	Glass fiber tube, 6mm dia. 40mm
	212-1019-05	Instruction tube, 1mm dia.

Ref. No.	Part No.	Description
ICS		
U18	MC145152P	CMOS LSI
U19	MC145151P	CMOS freq. synthesizer
U20	TC4007UBP	Si, Inverter
U21	μPB571C	CMOS LSI
U24,25	μPC4558C	
U26	L78M05	5V regulator
U22,23	M54730AP	PROM Accessory
CRYSTALS		
Z1	L77-0992-05	8.5333 MHz
Y2	L77-0993-05	21.4015 MHz
NON-REFERENCED ITEMS		
	E02-0120-05	IC socket, 16P, U22, U23
	E31-2170-05	Short jumper, Pitch 5mm, 0.6mm dia.
	J21-2798-04	Bracket, potentiometer
	352-6002-05	Glass fiber tube, 6mm dia. 40mm
	212-1019-05	Instruction tube, 1mm dia.

CAPACITORS

CC 45 TH 1H 220 J
1 2 3 4 5 6

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ..... round, square, etc
3 = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

● **Temperature coefficient**

1st Word	C	I.	P	R	S	T
Color ※	Black	Red	Orange	Yellow	Green	Bl
ppm/℃	0	− 80	− 150	− 220	− 330	− 4

2nd Word	G	H	J	K	L
ppm/℃	± 30	± 60	± 120	± 250	± 500

Example CC45TH = − 470 ± 60ppm ℃

● **Tolerance**

Code	C	D	G	J	K	M
(%)	± 0.25	± 0.5	± 2	± 5	± 10	± 20

PLL UNIT Parts List

CAPACITORS

CC 45 TH 1H 220 J
1 2 3 4 5 6

1 = Type .... ceramic, electrolytic, etc
2 = Shape .... round, square, etc
3 = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

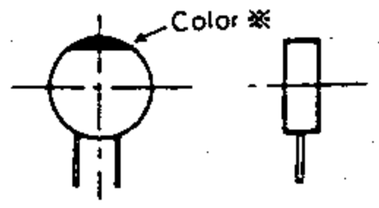
● **Temperature coefficient**

1st Word	C	I.	P	R	S	T	U
Color ※	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm/℃	0	−80	−150	−220	−330	−470	−750

2nd Word	G	H	J	K	L
ppm/℃	±30	±60	±120	±250	±500

Example CC45TH = −470 ± 60ppm/℃

CC45



● **Tolerance**

Code	C	D	G	J	K	M	X	Z	P	No code
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10μF −10− +50 Less than 4.7μF −10− +75

● **Rating voltage**

1st word \ 2nd word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	—
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	—
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	—

● **Capacitor value**

0 1 0 = 1pF
1 0 0 = 10pF
1 0 1 = 100pF
1 0 2 = 1000pF = 0.001μF
1 0 3 = 0.01μF

2 2 0 = 22pF
1st number | Multiplier
2nd number

Less than 10 pF

Code	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

PLL unit (X61-1190-21)

Terminal functions

Connector No.	Terminal No.	Terminal name	Terminal function
P1	1	ESP	External speaker input
	2	C8	8V common power source line
	3	SB	Switched B to regulated power source
	4	KEY	TX/RX data input (L for TX; H for RX)
	5	R8	8V when receiving
	6	T8	8V when transmitting
	7	AVO	Audio output from AF volume
	8	AVI	Audio input to AF volume
	9	AFO	Audio signal output
	10	NSO	Noise squelch output
	11	NSI	Noise squelch input
	12	AFI	Audio signal input
	13	MUT	Mute signal input
	14	QTD	Quiet Tone Disable input
	15	AC	Audio Control output
	16	UNL	Unlock signal output
P2	1	B	Transmitting final B^+
	2	B	Transmitting final B^+
	3	B	Transmitting final B^+
	4	B	Transmitting final B^+
J3	1	A^-	Microphone PTT grounded
	2	PTT	Microphone PTT input
	3	MIC-L	Microphone grounded
	4	MIC-H1	Microphone input 1 (low impedance)
	5	MIC-H2	Microphone input 2 (high impedance)
	6	SPARE 1	Spare
	7	BASE MIC	Base Mic 8V DC
	8	QT	MIC hang-up
J4	1	A^+ (REC)	B^+ for reception only (when internal jumper is cut)
	2	RX MUT	RX MUTE signal output
	3	ESP-H	External speaker output
	4	FLTED VOL SQ-H	Audio output bypassed volume control
	5	SPARE (A^-)	Spare (GND)
	6	A^-	GND
	7	ESP-L	External speaker GND (–)
	8	A^-	GND
	9	QTD	Quiet Tone Disable control
	10	SPARE	Spare (B line input: 13.6V)
	11	A^+	B^+ line input (13.6V)
J5	1	GND	GND
	2	BZ	Beeper line input
	3	C8	8V common power source line
	4	KEY	TX/RX data input (L when transmitting; H when receiving)
	5	PTT	Microphone PTT input
J6	1	GND	GND
	2	DET	RX CTCSS input
	3	AFI	Audio Frequency signal input
	4	AC	Audio control output
	5	AFO	Audio output
	6	SB	Switched B to regulated power source
	7	MOD	Tone signal output
	8	KEY	TX data output (L when transmitting; H when receiving)
	9	PTT	Microphone PTT input
	10	C8	8V common power source line
	11	OPT.1	Spare
	12	OPT.2	Spare
	13	OPT.3	Spare
	14	OPT.4	Spare
	15	T8	Approx. 8V when transmitting
J7	1	S1 VIO	Channel switch 1
	2	S2 BLU	Channel switch 2
	3	S3 GRN	Channel switch 3
	4	S4 YEL	Channel switch 4
	5	S5 ORG	Channel switch 5
	6	S6 RED	Channel switch 6
	7	C 8RN	5V common line
J8	1	S1 VIO	Channel switch 1
	2	S2 8LU	Channel switch 2
	3	S3 GRN	Channel switch 3
	4	S4 YEL	Channel switch 4
	5	S5 ORG	Channel switch 5
	6	S6 RED	Channel switch 6
	7	C BRN	5V common line
J9	1	B0 BLU	ROM address input
	2	B1 GRN	ROM address input
	3	B2 YEL	ROM address input
	4	B3 ORG	ROM address input
	5	B4 RED	ROM address input
	6	5V BRN	5V common line
J10	1	TXO	Transmit local signal output to TX/RX unit
	2	GND	GND
J11	1	BZ BLU	Audio output
	2	GND	GND
	2	RXO shield	Receive local signal output to TX/RX unit

Jumper wire function

JU1		Cut off during key control by signalling unit.
JU2	×	Short-circuits the CTCSS AF signal input and output terminals.
JU3		Cut off during key control by timer-out timer.
JU4		Outputs AVI signal.
JU5	×	Grounds the QTD.
JU6		Cut off when using Rx power supply.
JU7		Grounds the spare terminal.
JU8		Connects the power and spare terminals.
JU9	Δ	Installed in TK-701S. } Determines the
JU10	Δ	Installed in TK-801S. } Tx-PLL dividing
JU11	Δ	Installed in TK-701S. } ratio.
JU12		Cut off to disable the duplex.
JU13	×	Install to disable the QTD reverse circuit.
JU14	×	Install to convert the 16CH unit to duplex.

× indicates jumper wire not supplied.

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Connector No.	Terminal No.	Terminal name	Terminal function
	11	OPT.1	Spare
	12	OPT.2	Spare
	13	OPT.3	Spare
	14	OPT.4	Spare
	15	T8	Approx. 8V when transmitting
J7	1	S1VIO	Channel switch 1
	2	S2BLU	Channel switch 2
	3	S3GRN	Channel switch 3
	4	S4YEL	Channel switch 4
	5	S5ORG	Channel switch 5
	6	S6RED	Channel switch 6
	7	C BRN	5V common line
J8	1	S1 VIO	Channel switch 1
	2	S2 BLU	Channel switch 2
	3	S3 GRN	Channel switch 3
	4	S4 YEL	Channel switch 4
	5	S5 ORG	Channel switch 5
	6	S6 RED	Channel switch 6
	7	C BRN	5V common line
J9	1	B0 BLU	ROM address input
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	3	B2 YEL	ROM address input
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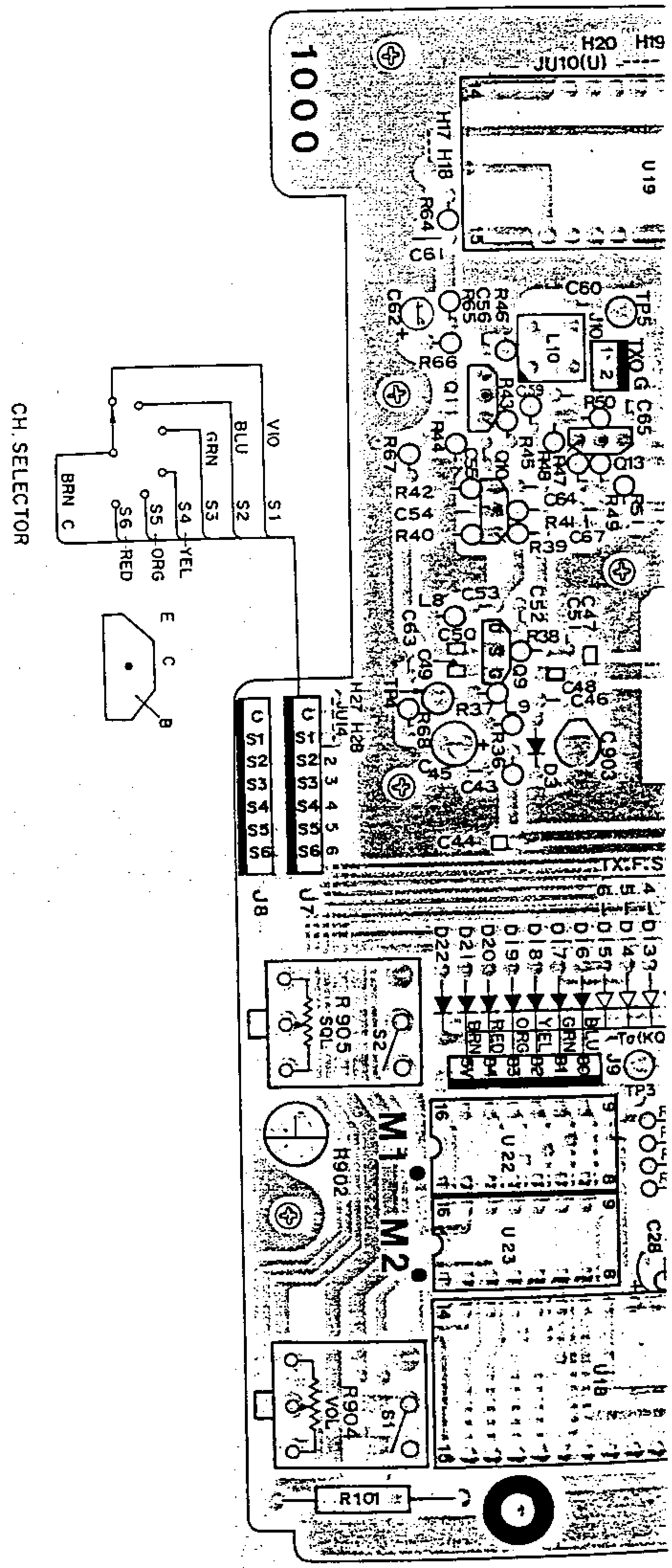
JU6		Cut off when using Rx power supply.
JU7		Grounds the spare terminal.
JU8		Connects the power and spare terminals.
JU9	△	Installed in TK-701S. } Determines the Tx-PLL dividing ratio.
JU10	△	Installed in TK-801S. }
JU11	△	Installed in TK-701S. }
JU12		Cut off to disable the duplex.
JU13	×	Install to disable the QTD reverse circuit.
JU14	×	Install to convert the 16CH unit to duplex.

× indicates jumper wire not supplied.

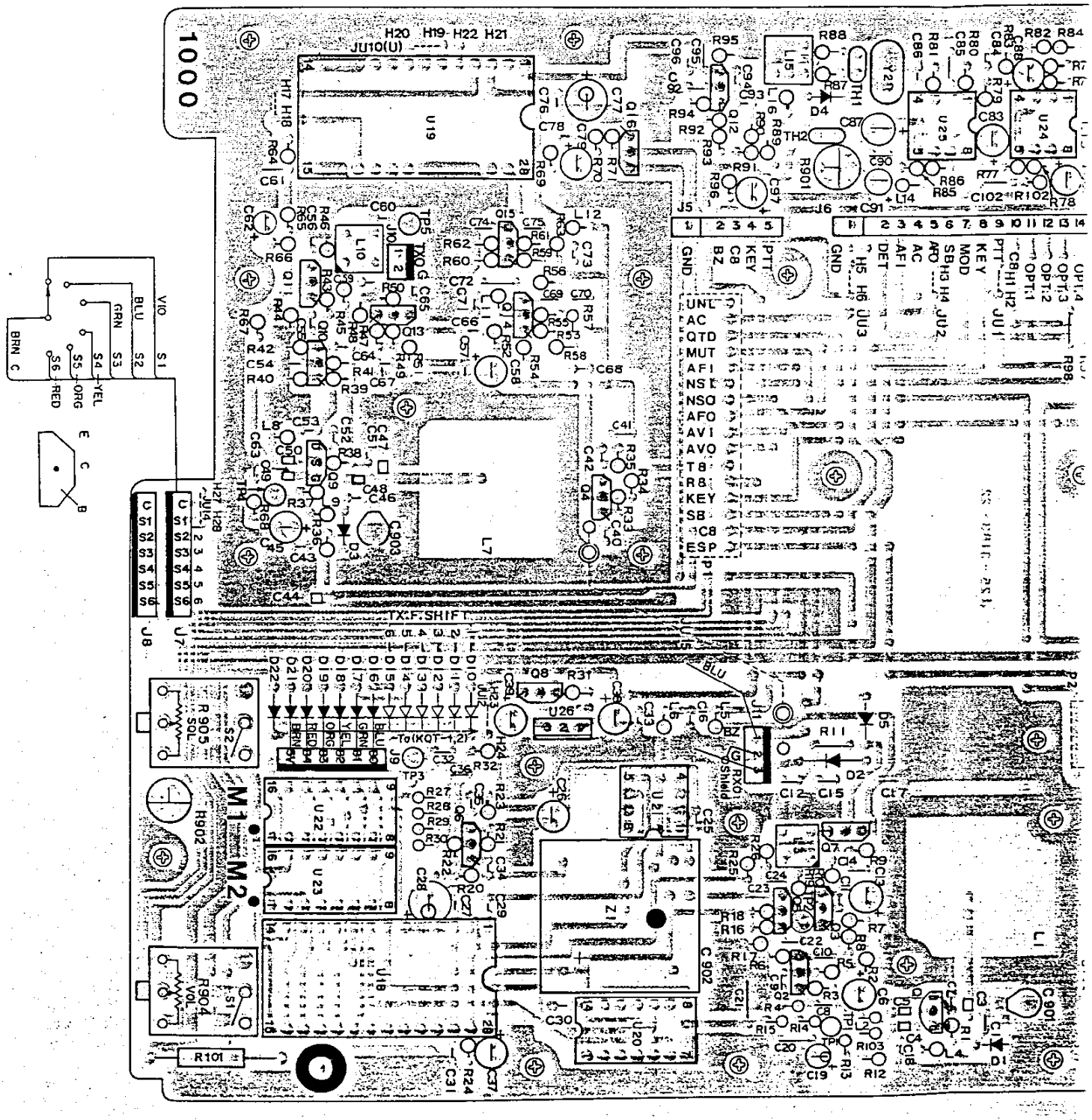
PLL unit (X61-1190-21)

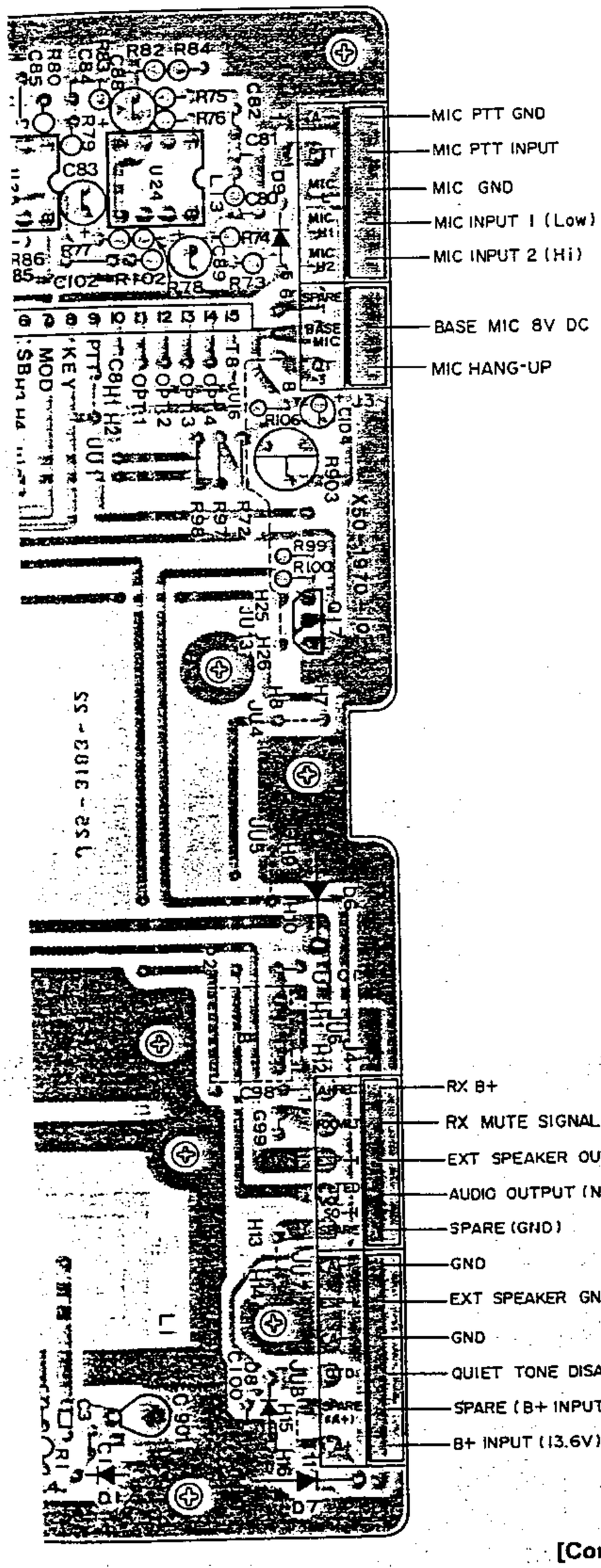
Printed Circuit Board

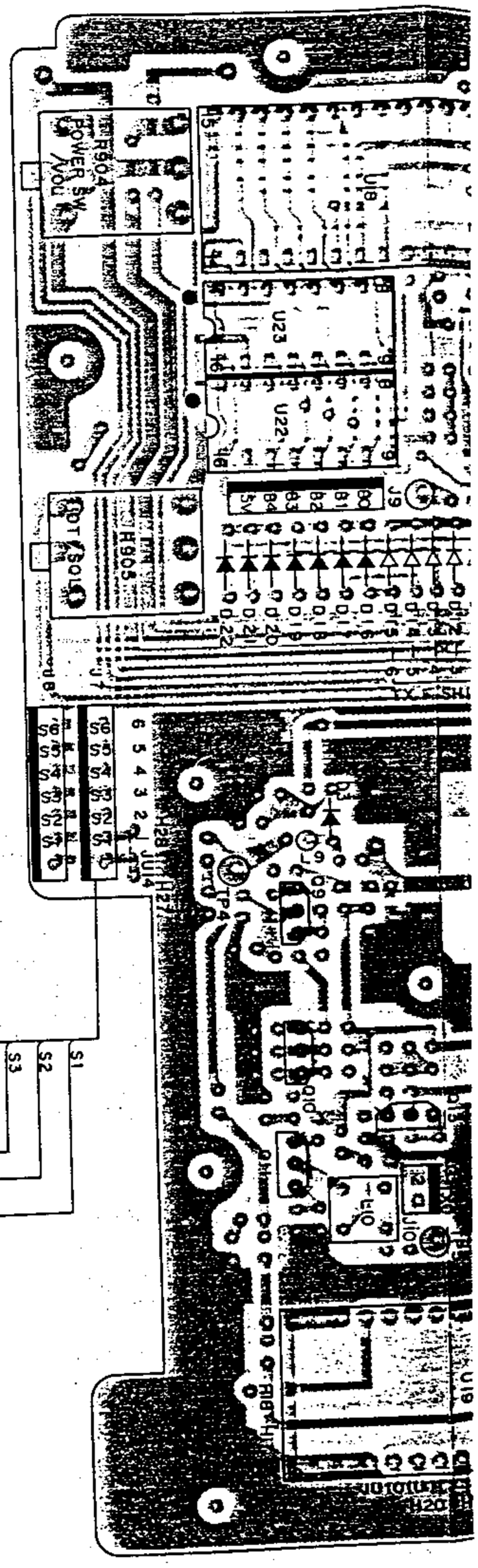


PLL unit (X61-1190-21)

Printed Circuit Board



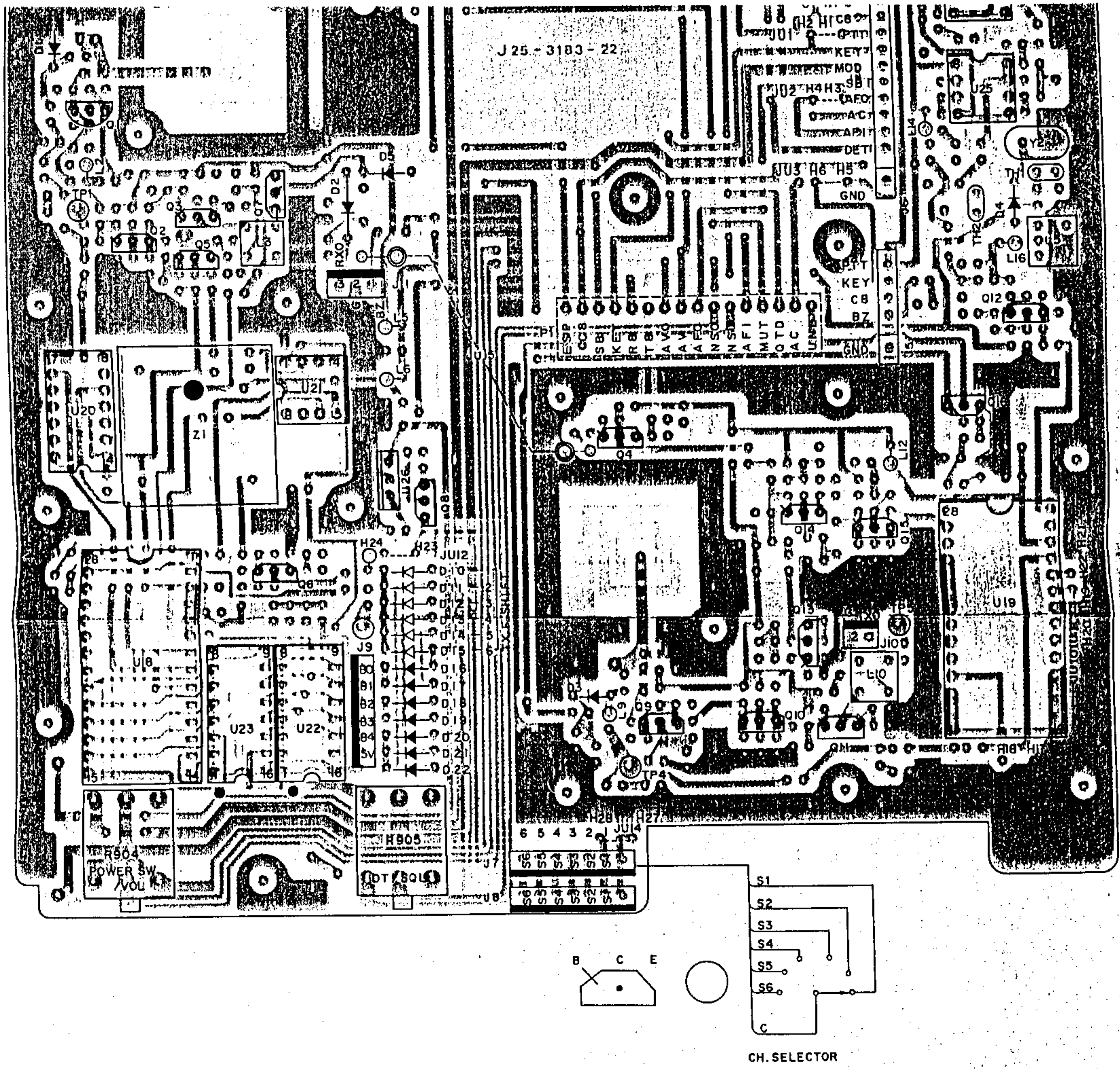




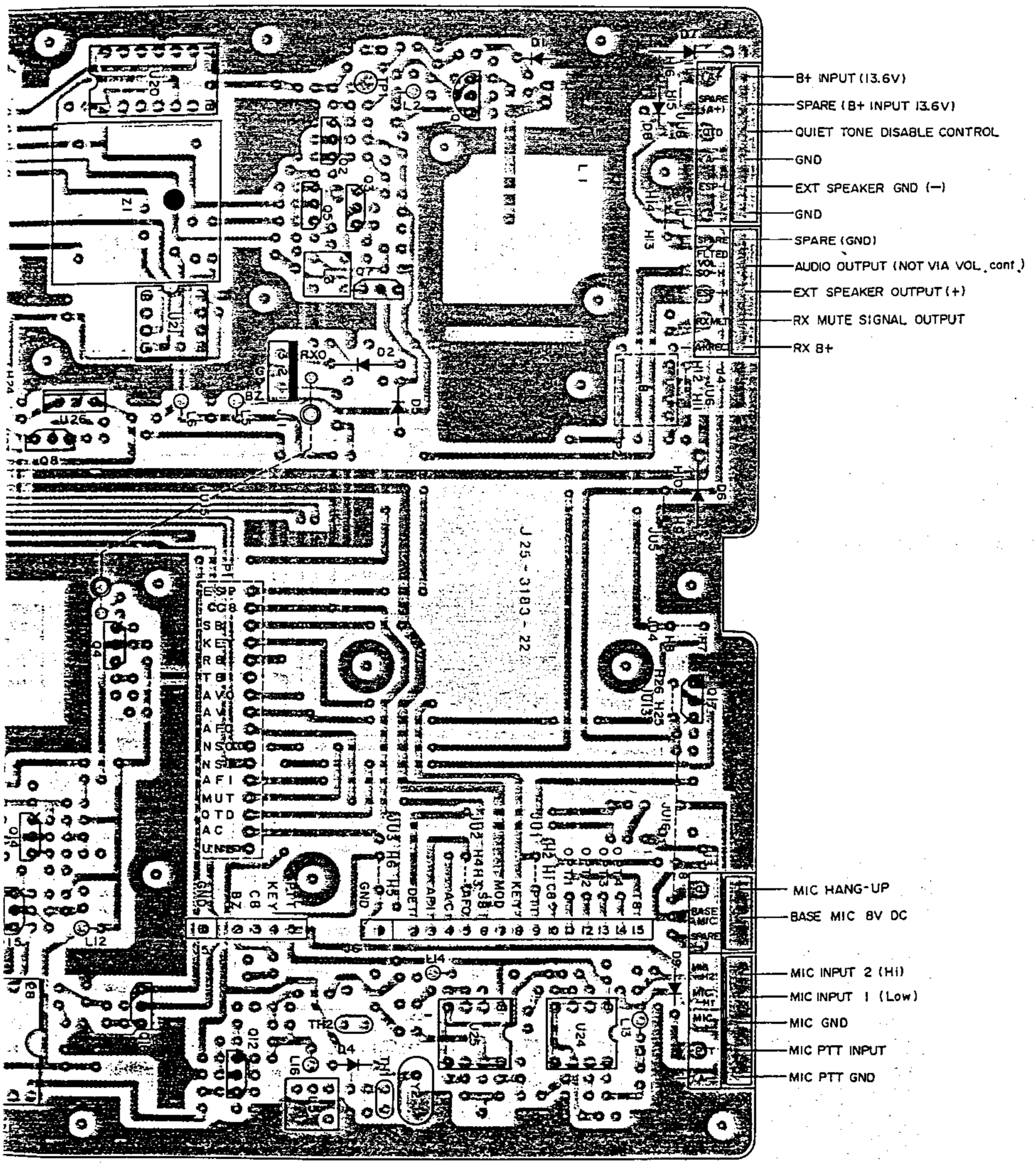
[Component side view]

Foil side

Component side

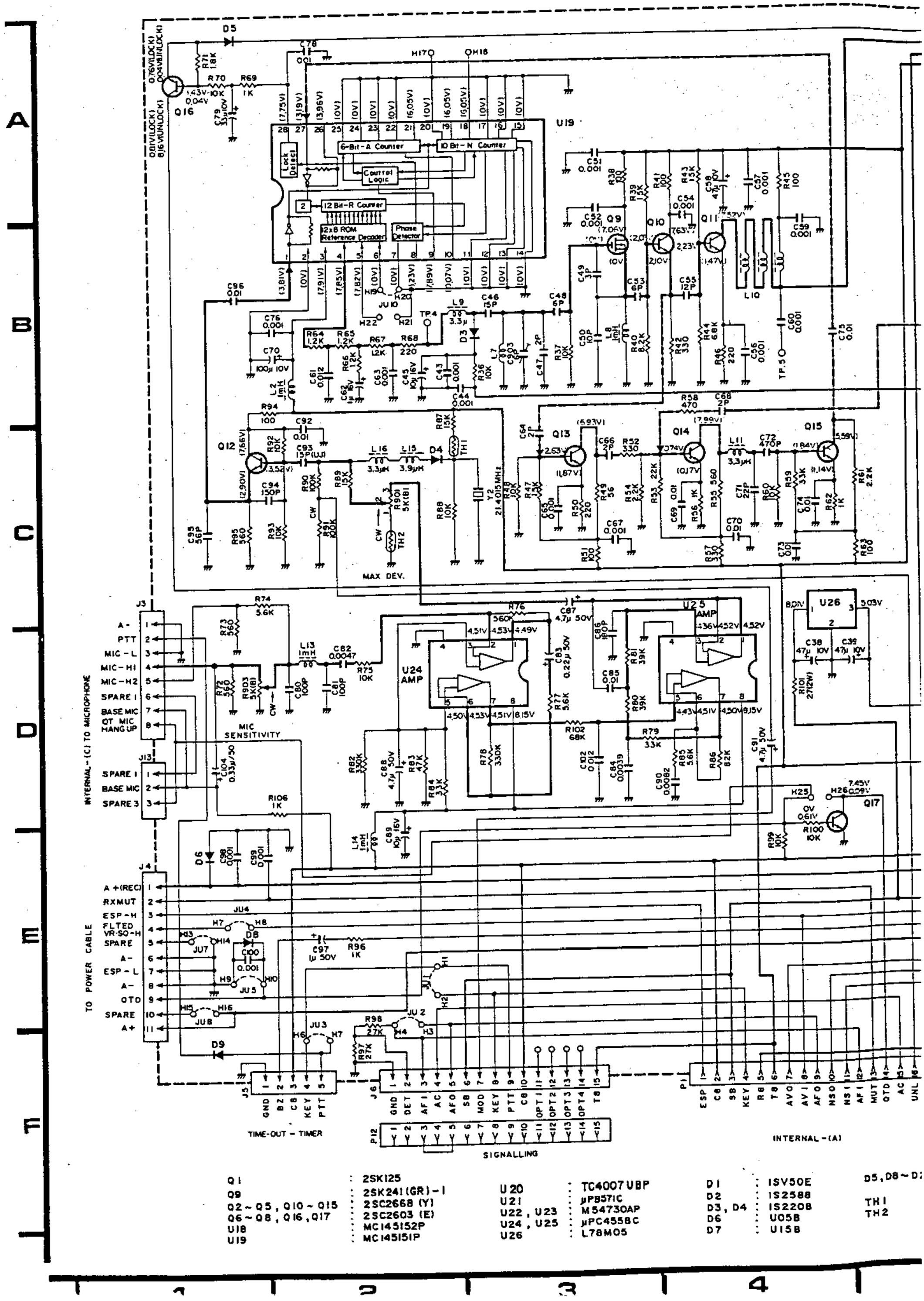


J 25 - 3183 - 22
U20
Z1
U21
U26
U18
U23
U22
J9
B0
B1
B2
B3
B4
5V
H24
H23
JU12
R904
POWER SW
/VOL
R905
TX F SHIFT
RXO
D2
D5
BZ
TP1
Q2
Q3
Q5
Q7
Q8
Q4
Q9
Q10
Q14
Q15
Q12
L12
L10
J10
TP4
D3
U19
H18
H17
H20
H19
H22
H21
JU3
H6
H5
GND
PTT
KEY
C8
BZ
JU2
H4
H3
JU1
H2
H1
MOD
SB
AFO
AC
AP
DET
U25
Y2
TH1
TH2
D4
L16
L14
ESP
CC8
SB
KE
R8
T8
AVO
AV
AFO
NSQ
AFI
MUT
QTD
AC
UNB
S1
S2
S3
S4
S5
S6
H28
JU14
H27
B
C
E
C
CH.SELECTOR

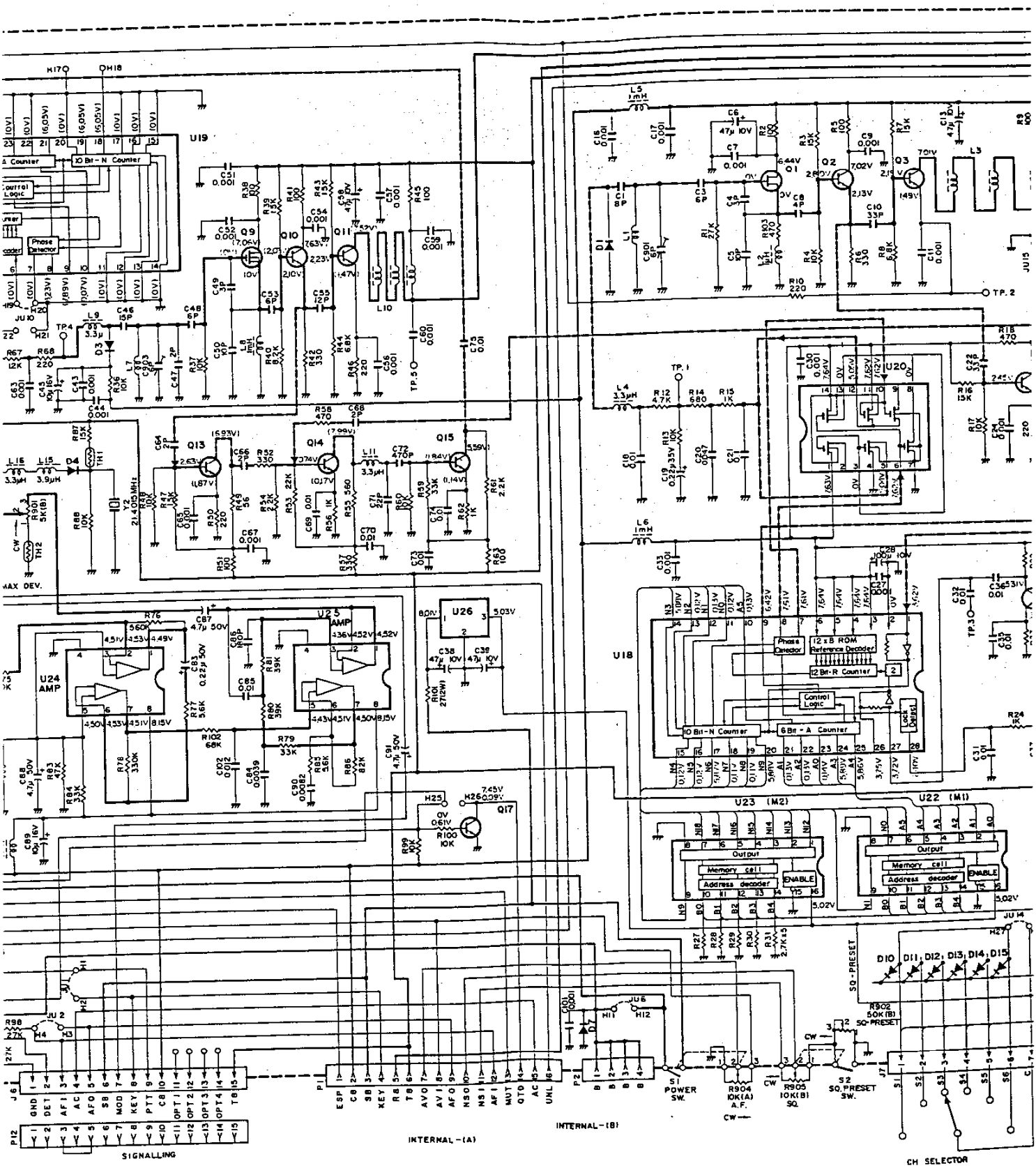


[Foil side view]

Foil side
Component side



Q1	: 2SK125	U20	: TC4007UBP	D1	: ISV50E	D5, D8~D2	
Q9	: 2SK241(GR)-1	U21	: µPB571C	D2	: 1S2588		
Q2~Q5, Q10~Q15	: 2SC2668 (Y)	U22, U23	: M54730AP	D3, D4	: 1S2208	TH1	
Q6~Q8, Q16, Q17	: 2SC2603 (E)	U24, U25	: µPC4558C	D6	: U05B	TH2	
U18	: MC145152P	U26	: L78M05	D7	: U15B		
U19	: MC145151P						

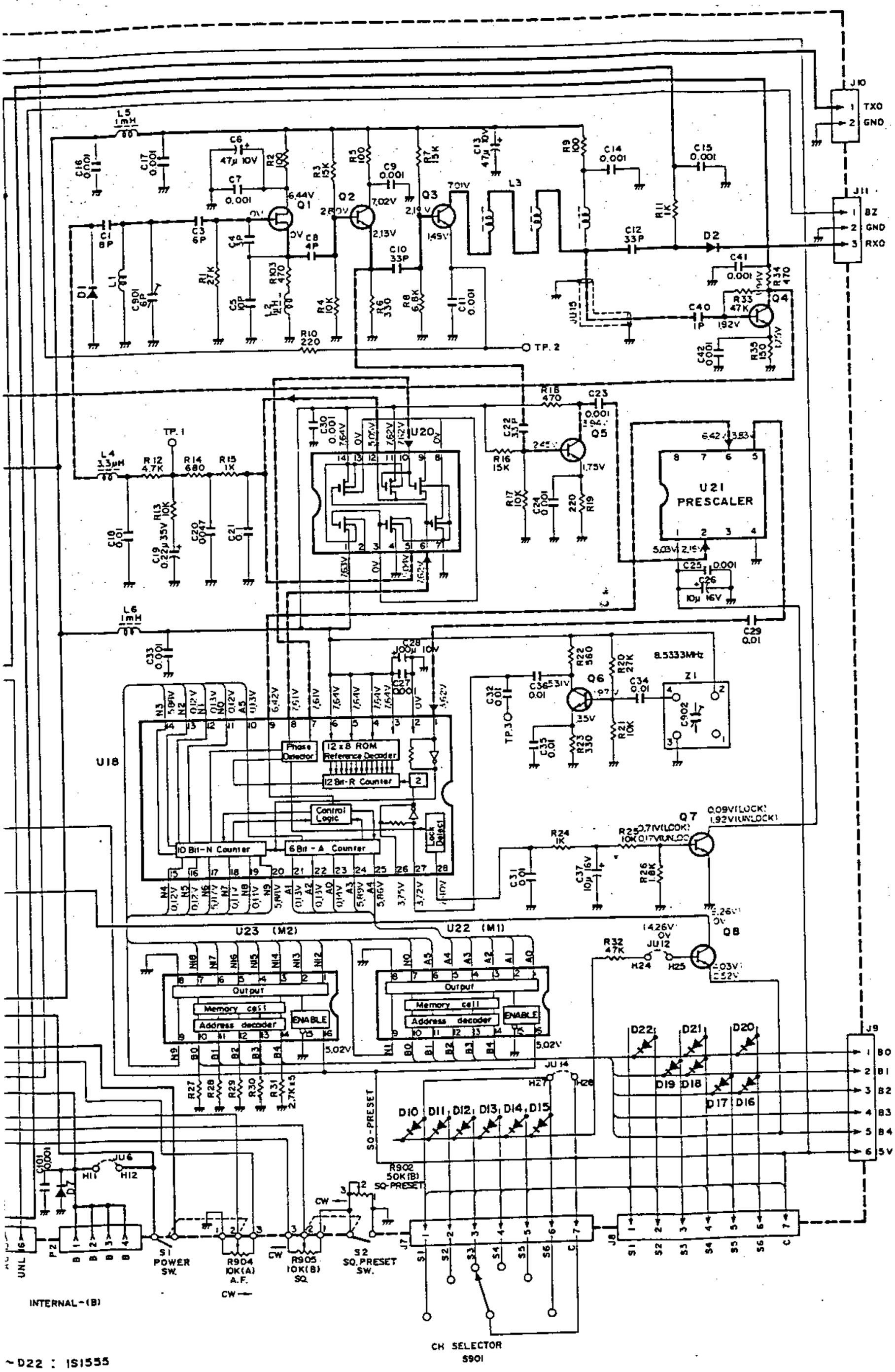


2SK125	U20	: TC4007UBP	D1	: 1SV50E	D5,D8~D22 : 1S1555
2SK241(GR)-1	U21	: μPB571C	D2	: 1S2588	
2SC2668 (Y)	U22, U23	: M54730AP	D3, D4	: 1S2208	TH1 : 112-201-2
2SC2603 (E)	U24, U25	: μPC4558C	D6	: U05B	TH2 : 112-301-2
MC145152P	U26	: L78M05	D7	: U15B	
MC145151P					

TK-801

PLL unit

Schematic Diagram



~D22 : IS1555

: 112-201-2

: 112-301-2

——— Signal line

- - - - - Control line

——— Common DC line

Adjusting points

Ref. No.	Part No.	Description
C200	C91-0105-50	CC, 0.0047μF
C201,202	CS15E1VR47M	T, 0.47μF, 35V
C203	CK73FSL1H471K	Chip, 470pF
C302	C05-0062-05	Ceramic trimmer, 6pF
C303~305	C05-0031-05	Ceramic trimmer, 10pF
C306,307	C05-0330-05	Air-variable trimmer, 15pF

DIODES

D1,2	1S1555	Silicon, 35V, 100mA
D3	1SS97	Silicon, 10V, 35mA
D4,5	MI407	Silicon, 50V, 100mA
D6,8~10	1S1555	Silicon, 35V, 100mA
D11,12	1N60A	Germanium, 60V, 50mA
D13,14	1S1555	Silicon, 35V, 100mA
D15	WZ-100	Zener diode, 10V, 500mW, 10%
D16	WZ-081	Zener diode, 8.1V, 500mW, 10%
D17,18	1S1555	Silicon, 35V, 100mA
D19	MTZ3.9J8	Silicon, 10V, 35mA
D20	MI407	Silicon, 50V, 100mA
D200~202	1S1555	Silicon, 35V, 100mA

CONNECTORS

JU1	R92-0150-05	Jumper(0Ω)
J21	E40-0273-05	Mini connector, 2P
J22	E40-0373-05	Mini connector, 3P
J23	E19-1651-05	Pin connector, 16P
J24	E19-0452-05	Pin connector, 4P
J25	E40-0273-05	Mini connector, 2P
J26	E40-0573-05	Mini connector, 5P

COILS

L1	L34-1077-05	Air – core coil	(K_2, K_3, M_2, M_3)
L1	L34-1122-05	Air – core coil	(K, M)
Z2	L79-0601-15	Helical block (2)	(K, M)
Z2	L79-0606-05	Helical block (7)	(K_2, M_2)
Z2	L79-0611-15	Helical block (12)	(K_3, M_3)
L3	L34-0824-05	Air – core coil 3mm dia, 2.5T tapped	
L4~6	L34-1078-05	Air – core coil 3mm dia, 2.5T	
L7	L34-0742-05	Air – core coil 3mm dia, 5T	
L8	L34-0736-15	Air – core coil, 1/2T	
L9	L34-0499-05	Air – core coil 3mm dia, 4T	
L10	L34-0736-15	Air – core coil, 1/2T	
L11	L34-0499-05	Air – core coil 3mm dia, 4T	
L12	L34-0736-15	Air – core coil, 1/2T	
L13	L34-0452-05	Air – core coil 3mm dia, 6T	
L14,15	L34-1090-05	Air – core coil, 1/2T	
L16	L34-1079-05	Air – core coil 3mm dia, 1.5T	
Z17	L79-0500-15	Helical Ass'y (1)	(K, M)
Z17	L79-0605-15	Helical Ass'y (6)	(K_2, M_2)
Z17	L79-0610-15	Helical Ass'y (11)	(K_3, M_3)
Z18	L79-0602-05	Helical Ass'y (3)	(K, M)
Z18	L79-0607-05	Helical Ass'y (8)	(K_2, M_2)
Z18	L79-0612-05	Helical Ass'y (13)	(K_3, M_3)

Ref. No.	Part No.	Description	
Z19,20	L79-0603-05	Helical Ass'y (4)	(K, M)
Z19,20	L79-0608-05	Helical Ass'y (9)	(K_2, M_2)
Z19,20	L79-0613-05	Helical Ass'y (14)	(K_3, M_3)
L21	L40-1021-03	Inductor, 1mH	
L23	L30-0520-05	IFT, 21.4 MHz	
Z24, 25	L71-0242-05	MCF, 21F15B	
L26	L34-2160-05	Tuning coil, 21.4 MHz	
L27	L30-0508-05	IF transformer	
Z28	L72-0339-05	Ceramic filter, CFV455D	
L29	L30-0503-05	IF transformer	
L30	L15-0016-05	Hash choke	
L31,32	L33-0666-05	Choke coil	

TRANSISTORS

Q1	2SC2026	Si NPN RF amp	
Q2	2SC2570A	Si NPN RF Low Noise	
Q3	2SC3019	Si NPN RF amp.	
Q4	2SC3020	Si NPN RF amp	
Q5	2SC3022	Si NPN RF amp.	
Q6	2SC2905	Si NPN RF amp.	(K,K_2, M,M_2)
Q6	2SC2905-21A	Si NPN RF amp.	(K_3, M_3)
Q7~9	2SC1815(Y)	Si NPN AF amp.	
Q10	2SB946(Q)	Si PNP switching of PWR	
Q11	2SA1015(Y)	Si PNP AF amp.	
Q12	2SC2026	Si NPN RF amp	
Q13	2SC3037ʀK	Si NPN UHF Low Noise	
Q14	J2685	n – channel JFET Mixer	
Q15	2SK241(GR) – 1	n – channel MOS FET	
Q17,18	2SC1815(Y)	Si NPN AF amp.	
Q21~23	2SC1815(BL)	Si NPN AF amp.	
Q24	2SC1815(Y)	Si NPN AF amp.	
Q25~28	2SC1815(BL)	Si NPN AF amp.	
Q201	2SC1815(BL)	Si NPN AF amp.	

RESISTORS

R1	RD14BB2C122J	Carbon	1.2kΩ	1/6W
R2	RD14BB2C123J	Carbon	12kΩ	1/6W
R3	RD14BB2C470J	Carbon	47Ω	1/6W
R4	RD14BB2C680J	Carbon	68Ω	1/6W
R5	RD14BB2C152J	Carbon	1.5kΩ	1/6W
R6	RD14BB2C470J	Carbon	47Ω	1/6W
R7	RD14BB2C220J	Carbon	22Ω	1/6W
R8	RD14BB2C152J	Carbon	1.5kΩ	1/6W
R9	RD14BB2C470J	Carbon	47Ω	1/6W
R10	RS14GB3A220J	Metal film	22Ω	1W
R11	RD14BB2E101J	Carbon	100Ω	1/4W
R12	RS14GB3A151J	Metal film	150Ω	1W
R13	RD14BB2C103J	Carbon	10kΩ	1/6W
R14,15	RD14BB2C222J	Carbon	2.2kΩ	1/6W
R16	RD14BB2C151J	Carbon	150Ω	1/6W
R17	RD14BB2C121J	Carbon	120Ω	1/6W
R18		not used		
R19	RD14BB2C103J	Carbon	10kΩ	1/6W
R21	RD14BB2C393J	Carbon	39kΩ	1/6W
R22	RD14BB2C223J	Carbon	22kΩ	1/6W
R23	RD14BB2C102J	Carbon	1kΩ	1/6W
R24,25	RD14BB2C472J	Carbon	4.7kΩ	1/6W
R26	RD14BB2C102J	Carbon	1kΩ	1/6W
R27	RD14CB2C122J	Carbon	1.2kΩ	1/6W
R28	RD14CB2C123J	Carbon	12kΩ	1/6W
R29,30	RD14CB2C470J	Carbon	47Ω	1/6W
R31	RD14BB2C472J	Carbon	4.7kΩ	1/6W

TX-RX UNIT Parts List

Ref. No.	Part No.	Description		
R32	RD14BB2C102J	Carbon	1kΩ	1/6W
R33	RD14BB2C470J	Carbon	47Ω	1/6W
R34	RD14BB2C271J	Carbon	270Ω	1/6W
R35	RD14BB2C331J	Carbon	330Ω	1/6W
R36	RD14BB2C472J	Carbon	4.7kΩ	1/6W
R37	RD14BB2C103J	Carbon	10kΩ	1/6W
R38	RD14CB2C101J	Carbon	100Ω	1/6W
R39	RD14CB2C102J	Carbon	1kΩ	1/6W
R40,42	RD14CB2C470J	Carbon	47Ω	1/6W
R43	RD14CB2C221J	Carbon	220Ω	1/6W
R44	RD14CB2C183J	Carbon	18kΩ	1/6W
R45	RD14BB2C473J	Carbon	47kΩ	1/6W
R46	RD14BB2C223J	Carbon	22kΩ	1/6W
R47	RD14BB2C103J	Carbon	10kΩ	1/6W
R48	RD14BB2C394J	Carbon	390kΩ	1/6W
R49	RD14CB2C472J	Carbon	4.7kΩ	1/6W
R50	RD14BB2C103J	Carbon	10kΩ	1/6W
R51	RD14CB2C394J	Carbon	390kΩ	1/6W
R52	RD14CB2C332J	Carbon	3.3kΩ	1/6W
R53	RD14CB2C102J	Carbon	1kΩ	1/6W
R54	RD14CB2C471J	Carbon	470Ω	1/6W
R55	RD14CB2C332J	Carbon	3.3kΩ	1/6W
R56	RD14BB2C102J	Carbon	1kΩ	1/6W
R57	RD14CB2C394J	Carbon	390kΩ	1/6W
R58	RD14CB2C102J	Carbon	1kΩ	1/6W
R59	RD14CB2C471J	Carbon	470Ω	1/6W
R60	RD14CB2C332J	Carbon	3.3kΩ	1/6W
R61	RD14BB2C2R2J	Carbon	2.2Ω	1/6W
R62	RD14BB2C221J	Carbon	220Ω	1/6W
R63	RD14BB2C102J	Carbon	1kΩ	1/6W
R64	RD14CB2C332J	Carbon	3.3kΩ	1/6W
R65	RD14CB2C472J	Carbon	4.7kΩ	1/6W
R66	RD14CB2E221J	Carbon	220Ω	1/4W
R67	RD14CB2C221J	Carbon	220Ω	1/6W
R68	RD14CB2C223J	Carbon	22kΩ	1/6W
R69	RD14CB2C474J	Carbon	470kΩ	1/6W
R70	RD14CB2C473J	Carbon	47kΩ	1/6W
R71	RD14CB2C272J	Carbon	2.7kΩ	1/6W
R72	RD14CB2C471J	Carbon	470Ω	1/6W
R73,74	RD14BB2C102J	Carbon	1kΩ	1/6W
R75	RD14CB2C272J	Carbon	2.7kΩ	1/6W
R76	RD14BB2C272J	Carbon	2.7kΩ	1/6W
R77	RD14CB2C333J	Carbon	33kΩ	1/6W
R78,79	RD14CB2C103J	Carbon	10kΩ	1/6W
R80	RD14CB2C333J	Carbon	33kΩ	1/6W
R81	RD14BB2C472J	Carbon	4.7kΩ	1/6W
R82	RD14CB2C684J	Carbon	680Ω	1/6W
R83	RS14AB3A4R7J	Metal film	4.7Ω	1W
R200,201	RD14CB2C473J	Carbon	47kΩ	1/6W
R202	RD14CB2C103J	Carbon	10kΩ	1/6W
R203	RD14CB2C225J	Carbon	2.2MΩ	1/6W
R204	RD14CB2C473J	Carbon	47kΩ	1/6W
R205	RD14CB2E221J	Carbon	220Ω	1/4W
R301	R12-3413-05	Trimmer Pot. 10kΩ (B)		
SWITCHES				
S1	S40-2447-05	Push switch, MON		
S2	S40-2447-05	Push switch, AUX		
S3	S40-2446-05	Push switch, KYS		
ICS				
U16	MC3359P	FM, IF		
U19	M83756	8.2V regulator		
U20	μPC1242H	Si AF amp., 5.8W		
U200	TC4001BP	(QUAD NAND)		
CRYSTALS				
Y1	L77-0991-05	20.945 MHz		
NON-REFERENCED ITEMS				
	E23-0435-05	Round terminal		
	E31-2174-15	Connector (SP) with lead		
	L92-0110-05	Ferrite core, 4 used		
	N87-2606-41	Screw, Truss-head tapping, for helical, 10 used		

TX-RX UNIT Parts List

[X61-1180-10 450 ~ 470 MHz (K, M)]
[X61-1180-11 470 ~ 490 MHz (K_2, M_2)]
[X61-1180-12 490 ~ 512 MHz (K_3, M_3)]

Ref. No.	Part No.	Description
	CAPACITORS	CC: Ceramic E: Electrolytic ML: Mylar T: Tantalum
C1	CC45SL1H101J	CC, 100pF
C2		not used
C3	CK45B1H471K	CC, 470pF
C4	CC45CH1H050C	CC, 5pF, ±0.25pF
C5	CC45B1H471K	CC, 470pF
C6	CC45CH1H050C	CC, 5pF, ±0.25pF
C7	CK73FSL1H471K	Chip, 470pF
C8	CK45B1H471K	CC, 470pF
C9	CC45CH1H060D	CC, 6pF, ±0.5pF
C10	CK73FSL1H471K	Chip, 470pF
C11	CK45B1H471K	CC, 470pF
C12	CE04W1C100M	E, 10μF, 16V
C13	CC45CH1H100D	CC, 10pF, ±0.5pF
C14,15	CC73ECH1H300J	Chip, 30pF
C16	CE04W1E220M	E, 22μF, 25V
C17	CK45B1H102K	CC, 0.001μF
C18	CK73FSL1H471K	Chip, 470pF
C19,20	CM73F2H360J	Chip mica, 36pF
C21	CK73FSL1H471K	Chip, 470pF
C22	CK45B1H102K	CC, 0.001μF
C23	C90-0870-05	E, 220μF, 25V
C24,25	CM73F2H240J	Chip mica, 24pF
C26,27	CM73F2H220J	Chip mica, 22pF
C28,29	CM73F2H360J	Chip mica, 36pF
C30	CM73F2H120J	Chip mica, 12pF
C31	CM73F2H120J	Chip mica, 12pF (K_2, K_3, M_2, M_3)
C31	CM73F2H150J	Chip mica, 15pF (K, M)
C32	CM73F2H221J	Chip mica, 220pF
C33	CC73FCH1H0R5C	Chip, 0.5pF, ±0.25pF
C34	CM73F2H331J	Chip mica, 330pF
C35	CM73F2H060D	Chip mica, 6pF, ±0.5pF (K_3, M_3)
C35	CM73F2H080D	Chip mica, 8pF, ±0.5pF (K, K_2, M, M_2)
C36	CM73F2H100D	Chip mica, 10pF, ±0.5pF
C37	CM73F2H050C	Chip mica, 5pF, ±0.25pF (K_3, K_2, M_2, M_3)
C37	CM73F2H0700	Chip mica, 7pF, ±0.25pF (K, M)
C38	CK45B1H102K	CC, 0.001μF
C39	CK73FSL1H471K	Chip, 470pF
C40	CE04W1E220M	E, 22μF, 25V
C41	CK45B1H471K	CC, 470pF
C42	CK45B1H102K	CC, 0.001μF
C43	CK73FSL1H471K	Chip, 470pF
C44,45	CK45B1H471K	CC, 470pF
C46,47	C90-0870-05	E, 220μF, 25V
C48	CK45B1H102K	CC, 0.001μF
C49	CE04W1E220M	E, 22μF, 25V
C50	CK45B1H102K	CC, 0.001μF
C51	CE04W1C100M	E, 10μF, 16V
C52	CS15E1E100M	T, 10μF, 25V
C53	CK45B1H471K	CC, 470pF
C54		not used
C55~57	CK45B1H471K	CC, 470pF
C58	CE04W1C100M	E, 10μF, 16V
C59	CC45CH1H330J	CC, 33pF
C60	CK45B1H102K	CC, 0.001μF
C61	C91-0105-05	CC, 0.0047μF, SP
C62	CK73FSL1H471K	Chip, 470pF
C63	CC45CH1H150J	CC, 15pF
C65	CK73FSL1H471K	Chip, 470pF
C66	CK45B1H102K	CC, 0.001μF

Ref. No.	Part No.	Description
C67	CC45CH1H330J	CC, 33pF
C68	CC45SL1H101J	CC, 100pF
C69,70	CK73FSL1H471K	Chip, 470pF
C71	C91-0105-05	CC, 0.0047μF, SP
C72	CC45CH1H330J	CC, 33pF
C73	CK73FSL1H471K	Chip, 470pF
C74	CK45B1H102K	CC, 0.001μF
C75	CC73FCH1H030C	Chip, 3pF, ±0.25pF (K_3, M_3)
C75	CC73FCH1H040C	Chip, 4pF, ±0.25pF (K, K_2, M, M_2)
C76	CC45CH1H0R5C	CC, 0.5pF, ±0.25pF
C78	C91-0105-05	CC, 0.0047μF, SP
C79	CK73FSL1H471K	Chip, 470pF
C80	C91-0105-05	CC, 0.0047μF, SP
C81	CC45CH1H100D	CC, 10pF, ±0.5pF
C82~85	C91-0105-05	CC, 0.0047μF, SP
C86	CC45CH1H330J	CC, 33pF
C87	C91-1012-05	Layer, 120pF
C88,89	C91-0431-05	Layer, 0.1μF
C90	CC45SL1H151J	CC, 150pF
C91	CE04W1H2R2M	E, 2.2μF, 50V
C92	CQ92M1H473K	ML, 0.047μF
C93	CQ92M1H332K	ML, 0.0033μF
C94	CQ92M1H103K	ML, 0.01μF
C96	CE04W1E220M	E, 22μF, 25V
C97	CQ92M1H473K	ML, 0.047μF
C98	C91-0105-05	CC, 0.0047μF
C99	CQ92M1H102K	ML, 0.001μF
C100	CQ92M1H272K	ML, 0.0027μF
C101	CC45SL1H470K	CC, 47pF
C102	CQ92M1H332K	ML, 0.0033μF
C103	CE04W1C100M	E, 10μF, 16V
C104,105	CS15E1E010M	T, 1μF, 25V
C106	CQ92M1H273K	ML, 0.027μF
C107	CS15E1E010M	T, 1μF, 25V
C108	CE04W1C100M	E, 10μF, 16V
C109	CE04W1A470M	E, 47μF, 10V
C110	C90-0818-05	E, 470μF, 25V
C111	C91-0105-05	CC, 0.0047μF, SP
C112	CE04W1C330M	E, 33μF, 16V
C113	CE04W1C100M	E, 10μF, 16V
C114	CE04W1A470M	E, 47μF, 10V
C115	C90-0818-05	E, 470μF, 25V
C116	CE04W1A470M	E, 47μF, 10V
C117	CQ92M1H104K	ML, 0.1μF
C118	C90-0869-05	E, 1000μF, 10V
C119	CE04W1A101M	E, 100μF, 10V
C120	CQ92M1H273K	ML, 0.027μF
C121	CE04W1A470M	E, 47μF, 10V
C122	C91-0105-05	CC, 0.0047μF, SP
C123	CE04W1C330M	E, 33μF, 16V
C124	CE04W1A470M	E, 47μF, 10V
C125	CS15E1E010M	T, 1μF, 25V
C126	CQ92M1H273K	ML, 0.027μF
C127,128	CQ92M1H472K	ML, 0.0047μF
C129	CE04W1A101M	E, 100μF, 10V
C130	CE04W1C100M	E, 10μF, 16V
C131,132	CE04W1A470M	E, 47μF, 10V
C133,134	CE04W1A101M	E, 100μF, 10V
C135	CS15E1V0R1M	T, 0.1μF, 35V
C136	CK45B1H471K	CC, 470pF
C137	CC45SL1H101J	CC, 100pF
C138	C91-0105-05	CC, 0.0047μF
C139	CC73FCH1H100D	Chip, 10pF ±0.5pF (K, K_2, M, M_2)
C139	CC73FCH1H150D	Chip, 15pF±0.5% (K_3, M_3)
C141	CC73FSL1H471J	Chip, 470pF
C142	CC45SL1H101J	CC, 100pF

Ref. No.	Part No.	Description
C200	C91-0105-50	CC, 0.0047μF
C201,202	CS15E1VR47M	T, 0.47μF, 35V
C203	CK73FSL1H471K	Chip, 470pF
C302	C05-0062-05	Ceramic trimmer, 6pF
C303~305	C05-0031-05	Ceramic trimmer, 10pF
C306,307	C05-0330-05	Air-variable trimmer, 15pF

DIODES

D1,2	1S1555	Silicon, 35V, 100mA
D3	1SS97	Silicon, 10V, 35mA
D4,5	MI407	Silicon, 50V, 100mA
D6,8~10	1S1555	Silicon, 35V, 100mA
D11,12	1N60A	Germanium, 60V, 50mA
D13,14	1S1555	Silicon, 35V, 100mA
D15	WZ-100	Zener diode, 10V, 500mW, 10%
D16	WZ-081	Zener diode, 8.1V, 500mW, 10%
D17,18	1S1555	Silicon, 35V, 100mA
D19	MTZ3.9JB	Silicon, 10V, 35mA
D20	MI407	Silicon, 50V, 100mA
D200~202	1S1555	Silicon, 35V, 100mA

CONNECTORS

JU1	R92-0150-05	Jumper(0Ω)
J21	E40-0273-05	Mini connector, 2P
J22	E40-0373-05	Mini connector, 3P
J23	E19-1651-05	Pin connector, 16P
J24	E19-0452-05	Pin connector, 4P
J25	E40-0273-05	Mini connector, 2P
J26	E40-0573-05	Mini connector, 5P

COILS

L1	L34-1077-05	Air – core coil	(K_3, K_3, M_3, M_3)
L1	L34-1122-05	Air – core coil	(K, M)
Z2	L79-0601-15	Helical block (2)	(K, M)
Z2	L79-0606-05	Helical block (7)	(K_3, M_3)
Z2	L79-0611-15	Helical block (12)	(K_3, M_3)
L3	L34-0824-05	Air – core coil 3mm dia, 2.5T tapped	
L4~6	L34-1078-05	Air – core coil 3mm dia, 2.5T	
L7	L34-0742-05	Air – core coil 3mm dia, 5T	
L8	L34-0736-15	Air – core coil, 1/2T	
L9	L34-0499-05	Air – core coil 3mm dia, 4T	
L10	L34-0736-15	Air – core coil, 1/2T	
L11	L34-0499-05	Air – core coil 3mm dia, 4T	
L12	L34-0736-15	Air – core coil, 1/2T	
L13	L34-0452-05	Air – core coil 3mm dia, 6T	
L14,15	L34-1090-05	Air – core coil, 1/2T	
L16	L34-1079-05	Air – core coil 3mm dia, 1.5T	
Z17	L79-0500-15	Helical Ass'y (1)	(K, M)
Z17	L79-0605-15	Helical Ass'y (6)	(K_3, M_3)
Z17	L79-0610-15	Helical Ass'y (11)	(K_3, M_3)
Z18	L79-0602-05	Helical Ass'y (3)	(K, M)
Z18	L79-0607-05	Helical Ass'y (8)	(K_2, M_2)
Z18	L79-0612-05	Helical Ass'y (13)	(K_3, M_3)

Ref. No.	Part No.	Description	
Z19,20	L79-0603-05	Helical Ass'y (4)	(K, M)
Z19,20	L79-0608-05	Helical Ass'y (9)	(K_2, M_2)
Z19,20	L79-0613-05	Helical Ass'y (14)	(K_3, M_3)
L21	L40-1021-03	Inductor, 1mH	
L23	L30-0520-05	IFT, 21.4 MHz	
Z24, 25	L71-0242-05	MCF, 21F15B	
L26	L34-2160-05	Tuning coil, 21.4 MHz	
L27	L30-0508-05	IF transformer	
Z28	L72-0339-05	Ceramic filter, CFV455D	
L29	L30-0503-05	IF transformer	
L30	L15-0016-05	Hash choke	
L31,32	L33-0666-05	Choke coil	

TRANSISTORS

Q1	2SC2026	Si NPN RF amp	
Q2	2SC2570A	Si NPN RF Low Noise	
Q3	2SC3019	Si NPN RF amp.	
Q4	2SC3020	Si NPN RF amp	
Q5	2SC3022	Si NPN RF amp.	
Q6	2SC2905	Si NPN RF amp.	(K,K_2, M,M_2)
Q6	2SC2905-21A	Si NPN RF amp.	(K_3, M_3)
Q7~9	2SC1815(Y)	Si NPN AF amp.	
Q10	2SB946(Q)	Si PNP switching of PWR	
Q11	2SA1015(Y)	Si PNP AF amp.	
Q12	2SC2026	Si NPN RF amp	
Q13	2SC3037MK	Si NPN UHF Low Noise	
Q14	J2685	n – channel JFET Mixer	
Q15	2SK241(GR) – 1	n – channel MOS FET	
Q17,18	2SC1815(Y)	Si NPN AF amp.	
Q21~23	2SC1815(BL)	Si NPN AF amp.	
Q24	2SC1815(Y)	Si NPN AF amp.	
Q25~28	2SC1815(BL)	Si NPN AF amp.	
Q201	2SC1815(BL)	Si NPN AF amp.	

RESISTORS

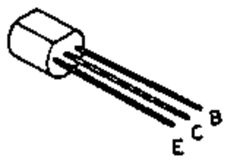
R1	RD14BB2C122J	Carbon	1.2kΩ	1/6W
R2	RD14BB2C123J	Carbon	12kΩ	1/6W
R3	RD14BB2C470J	Carbon	47Ω	1/6W
R4	RD14BB2C680J	Carbon	68Ω	1/6W
R5	RD14BB2C152J	Carbon	1.5kΩ	1/6W
R6	RD14BB2C470J	Carbon	47Ω	1/6W
R7	RD14BB2C220J	Carbon	22Ω	1/6W
R8	RD14BB2C152J	Carbon	1.5kΩ	1/6W
R9	RD14BB2C470J	Carbon	47Ω	1/6W
R10	RS14GB3A220J	Metal film	22Ω	1W
R11	RD14BB2E101J	Carbon	100Ω	1/4W
R12	RS14GB3A151J	Metal film	150Ω	1W
R13	RD14BB2C103J	Carbon	10kΩ	1/6W
R14,15	RD14BB2C222J	Carbon	2.2kΩ	1/6W
R16	RD14BB2C151J	Carbon	150Ω	1/6W
R17	RD14BB2C121J	Carbon	120Ω	1/6W
R18		not used		
R19	RD14BB2C103J	Carbon	10kΩ	1/6W
R21	RD14BB2C393J	Carbon	39kΩ	1/6W
R22	RD14BB2C223J	Carbon	22kΩ	1/6W
R23	RD14BB2C102J	Carbon	1kΩ	1/6W
R24,25	RD14BB2C472J	Carbon	4.7kΩ	1/6W
R26	RD14BB2C102J	Carbon	1kΩ	1/6W
R27	RD14CB2C122J	Carbon	1.2kΩ	1/6W
R28	RD14CB2C123J	Carbon	12kΩ	1/6W
R29,30	RD14CB2C470J	Carbon	47Ω	1/6W
R31	RD14BB2C472J	Carbon	4.7kΩ	1/6W

TX-RX unit

Terminal functions

Connector No.	Terminal No.	Terminal name	Terminal function
J21	1	TXO	Transmit signal input from PLL unit
	2	GND	GND
J22	1	BZ	Voice signal output
	2	GND	GND
	3	RXO	Receive signal input from PLL unit
J23	1	ESP	External speaker line output
	2	C8	8V common power source line
	3	SB	Switched B+ to regulated power source
	4	KEY	TX/RX data output (L when transmitting; H when receiving)
	5	R8	8V when receiving
	6	T8	8V when transmitting
	7	AVO	Voice signal output from AF volume cont.
	8	AVI	Voice signal input to AF volume cont.
	9	AFO	Voice signal output
	10	NSO	Noise squelch signal output
	11	NSI	Noise squelch signal input
	12	AFI	Voice signal input
	13	MUT	Mute signal input
	14	QTD	Quiet Tone Disable output
	15	AC	Audio control output
	16	UNL	Unlock signal input
J24	1	B	B+ line to transmit final stage
	2	B	B+ line to transmit final stage
	3	B	B+ line to transmit final stage
	4	B	B+ line to transmit final stage
J25	1	LMP(RED)	Channel illumination lamp ⊕
	2	GND(BLK)	GND ⊖
J26	1	COM(BRN)	Common power source for LED
	2	BSY(RED)	BUSY indication LED
	3	CAL(ORG)	Call indication LED
	4	TX(YEL)	TX indication LED
	5	GND(BLK)	GND

2SA1015
2SC1815



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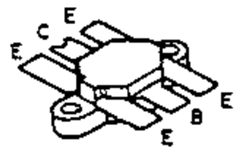

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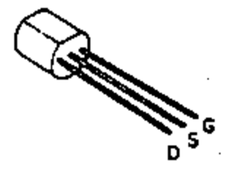

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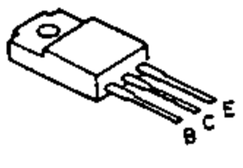

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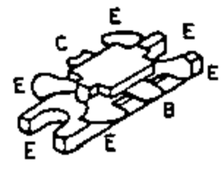

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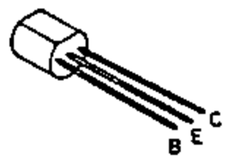

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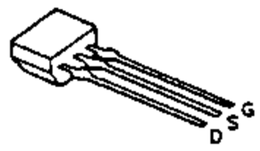
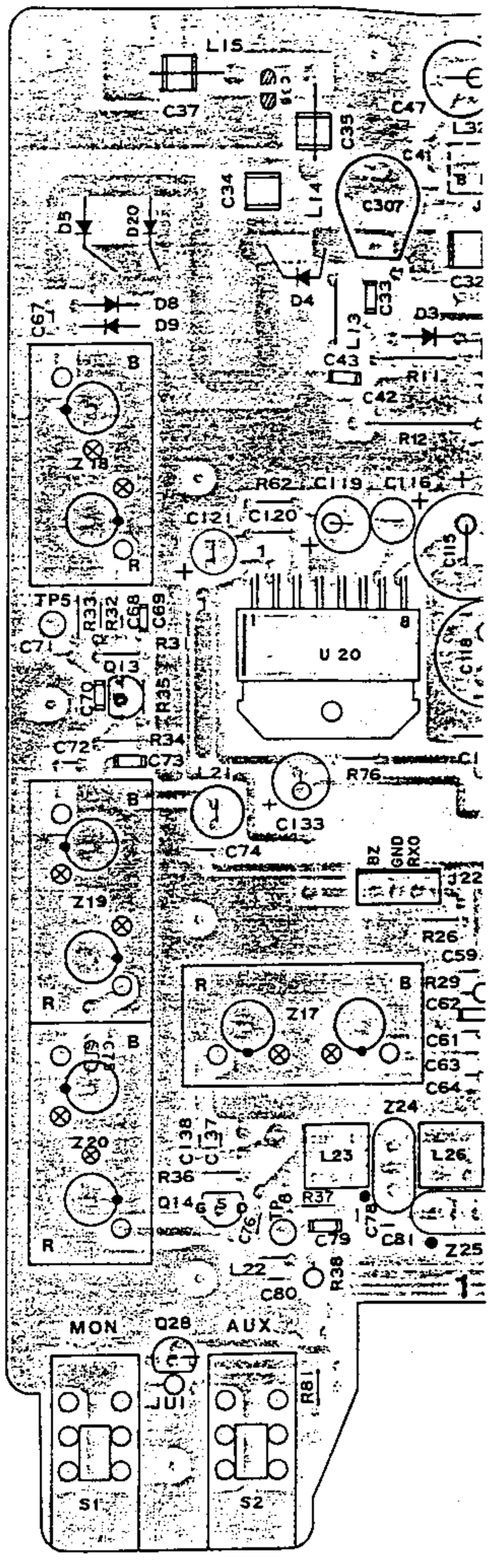
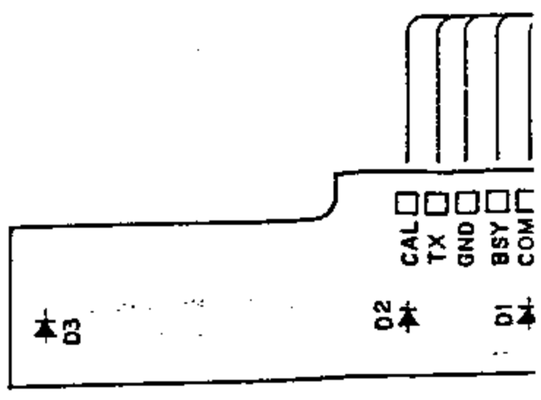


TX-RX unit (X61-1180-XX)

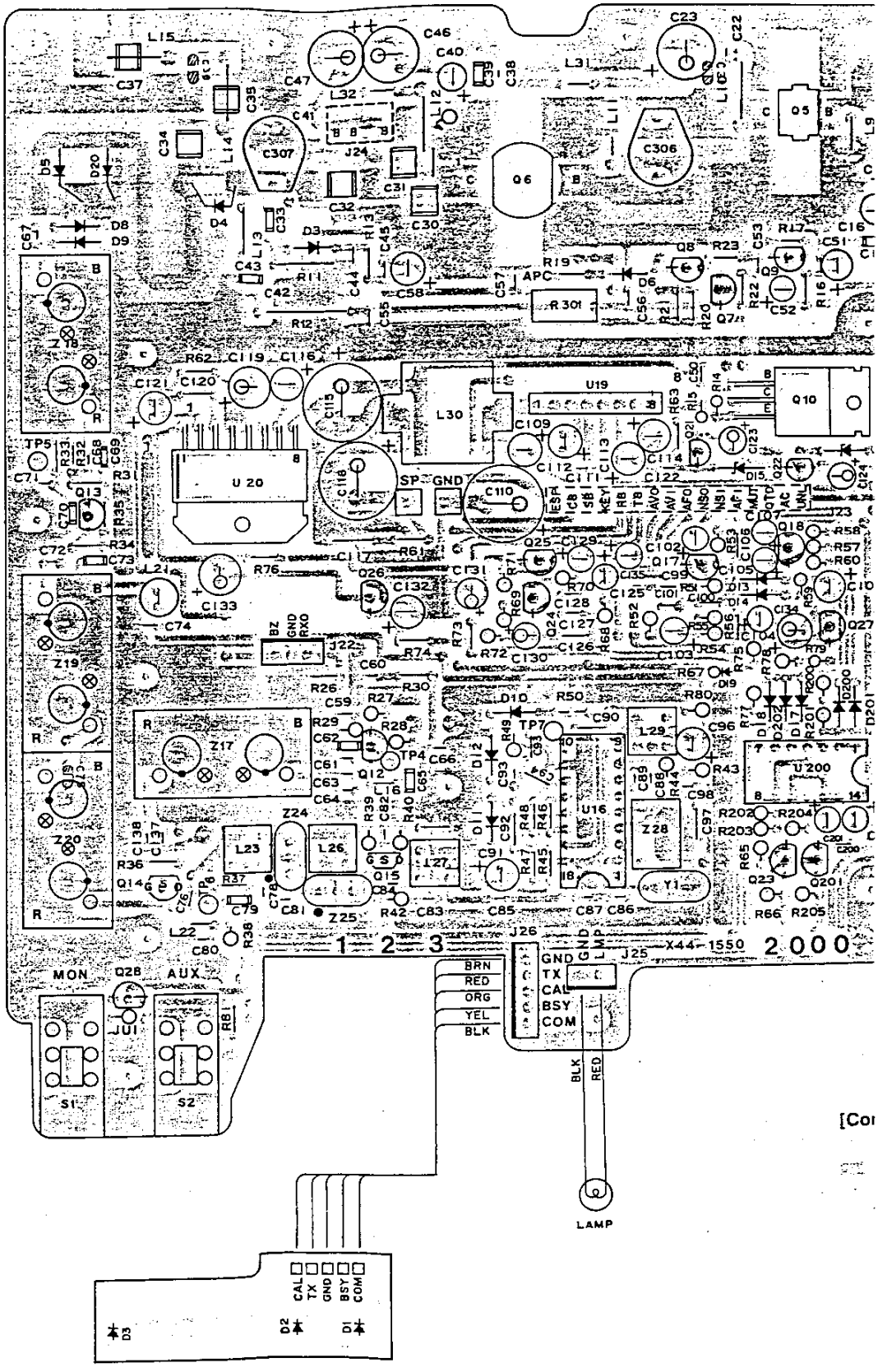
Printed Circuit Board

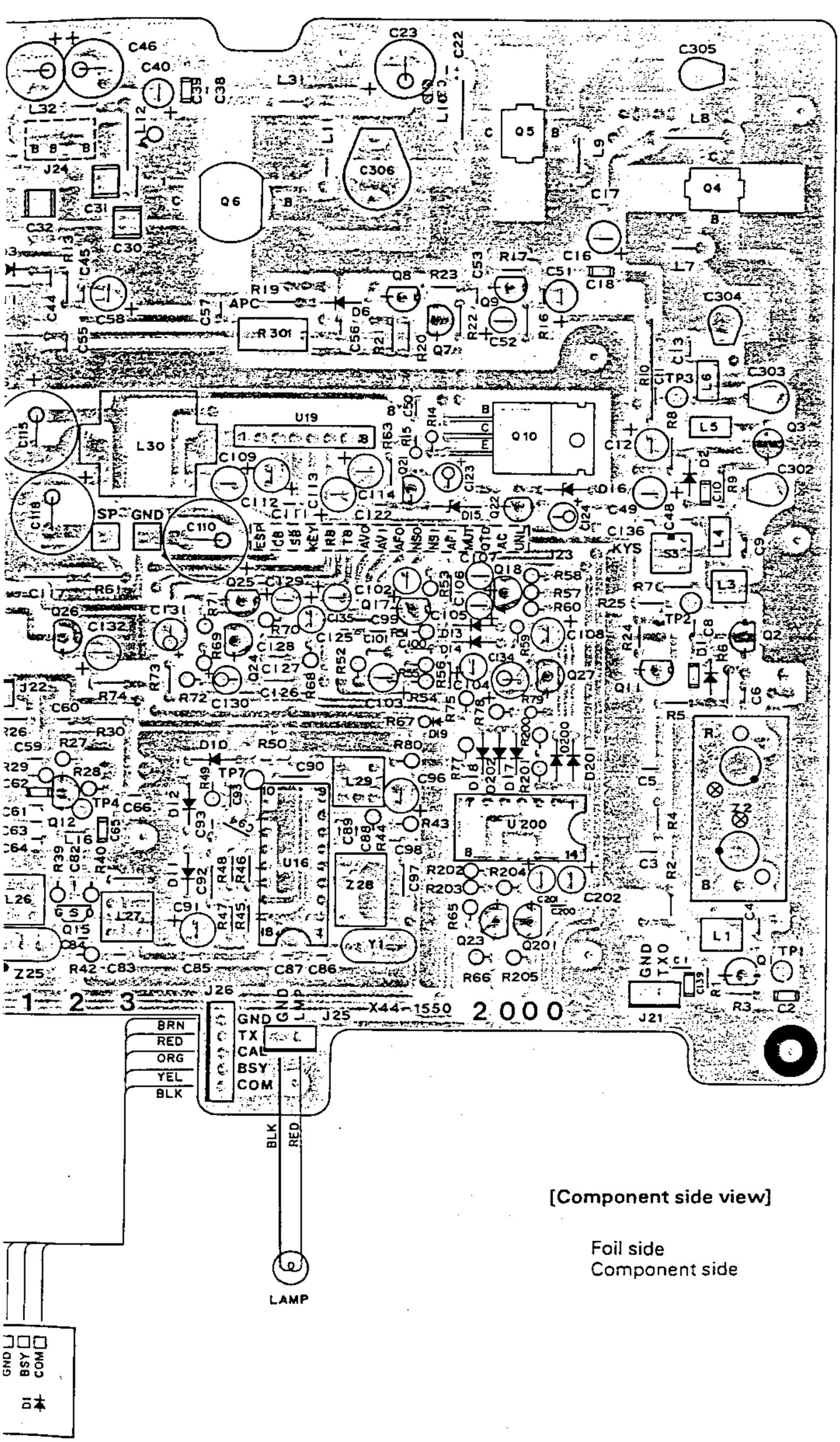




TX-RX unit (X61-1180-XX)

Printed Circuit Board





[Component side view]

Foil side
Component side

[Foil side view]

Foil side
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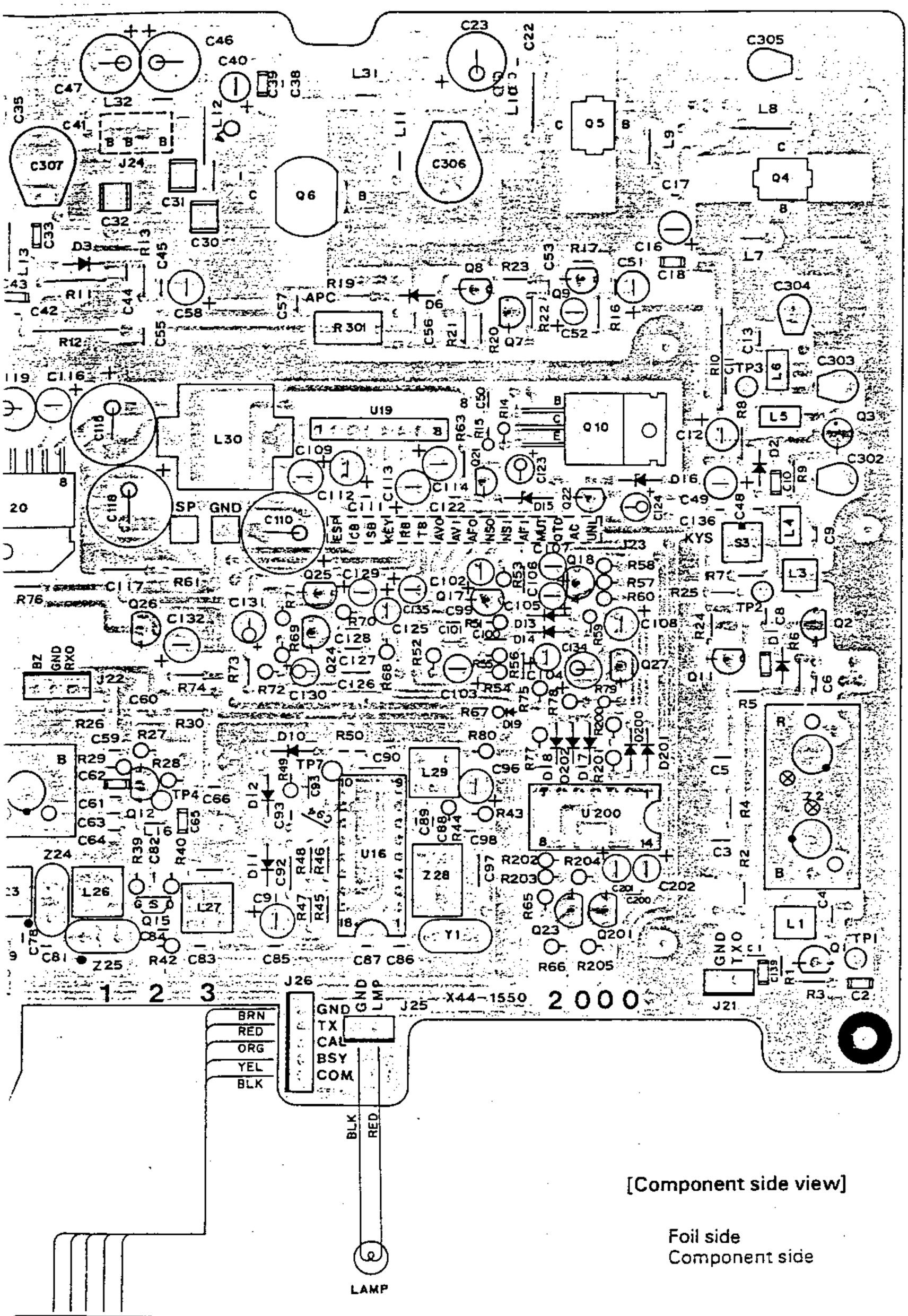

[Component side view]

Foil side
Component side

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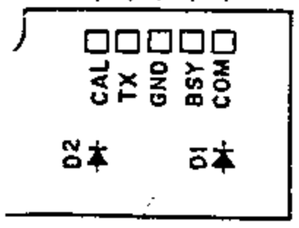
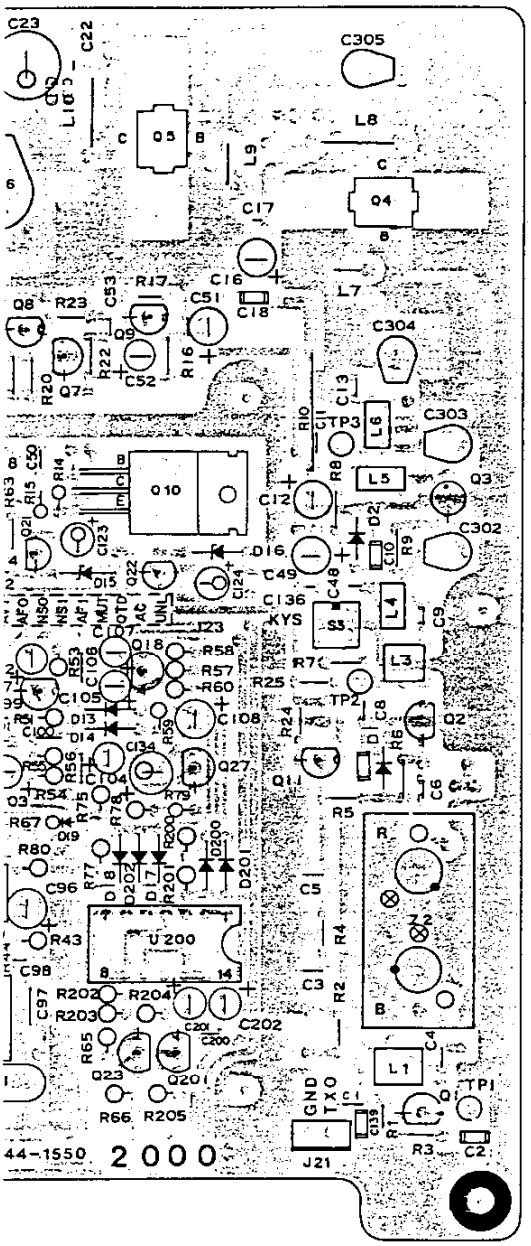
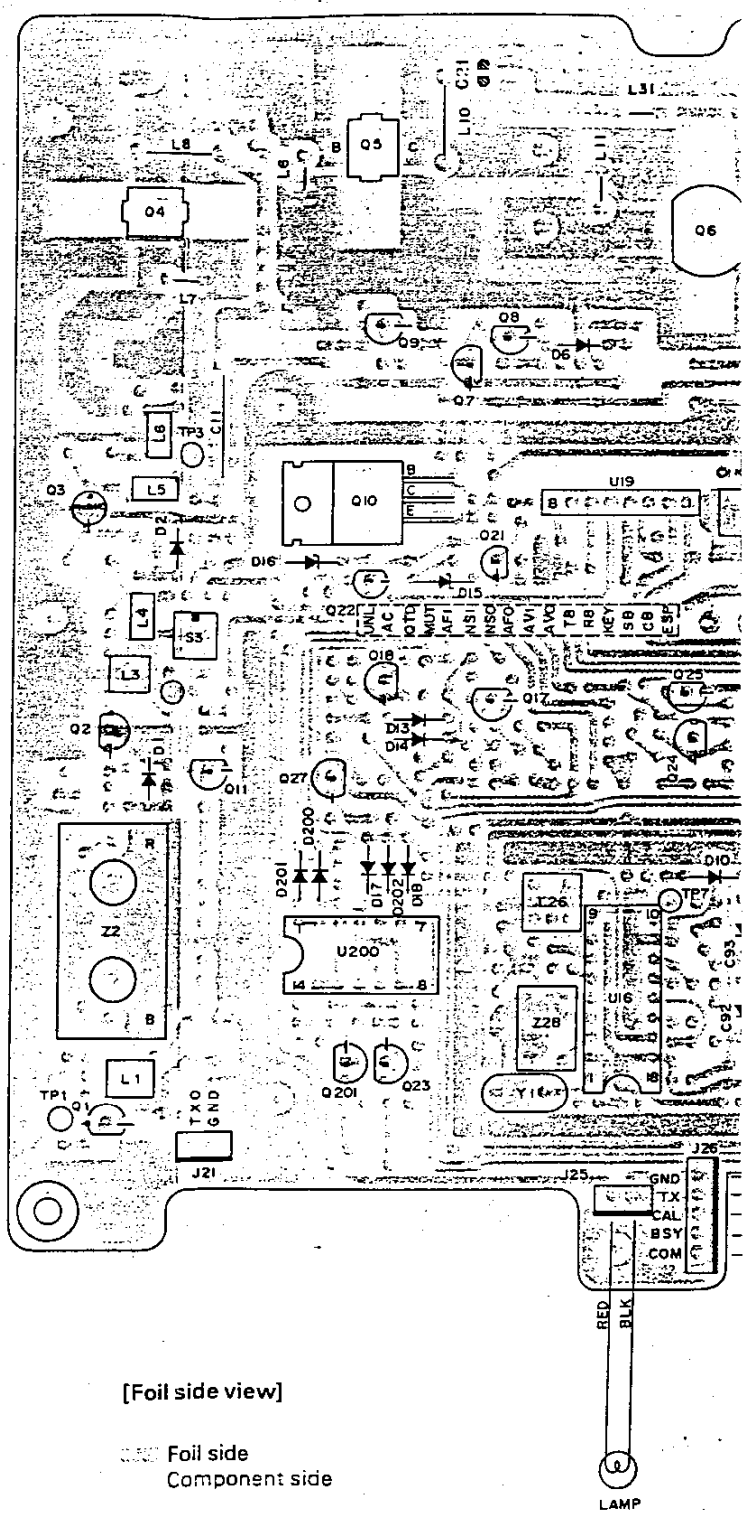




[Component side view]

Foil side
Component side



[Foil side view]

Foil side
Component side

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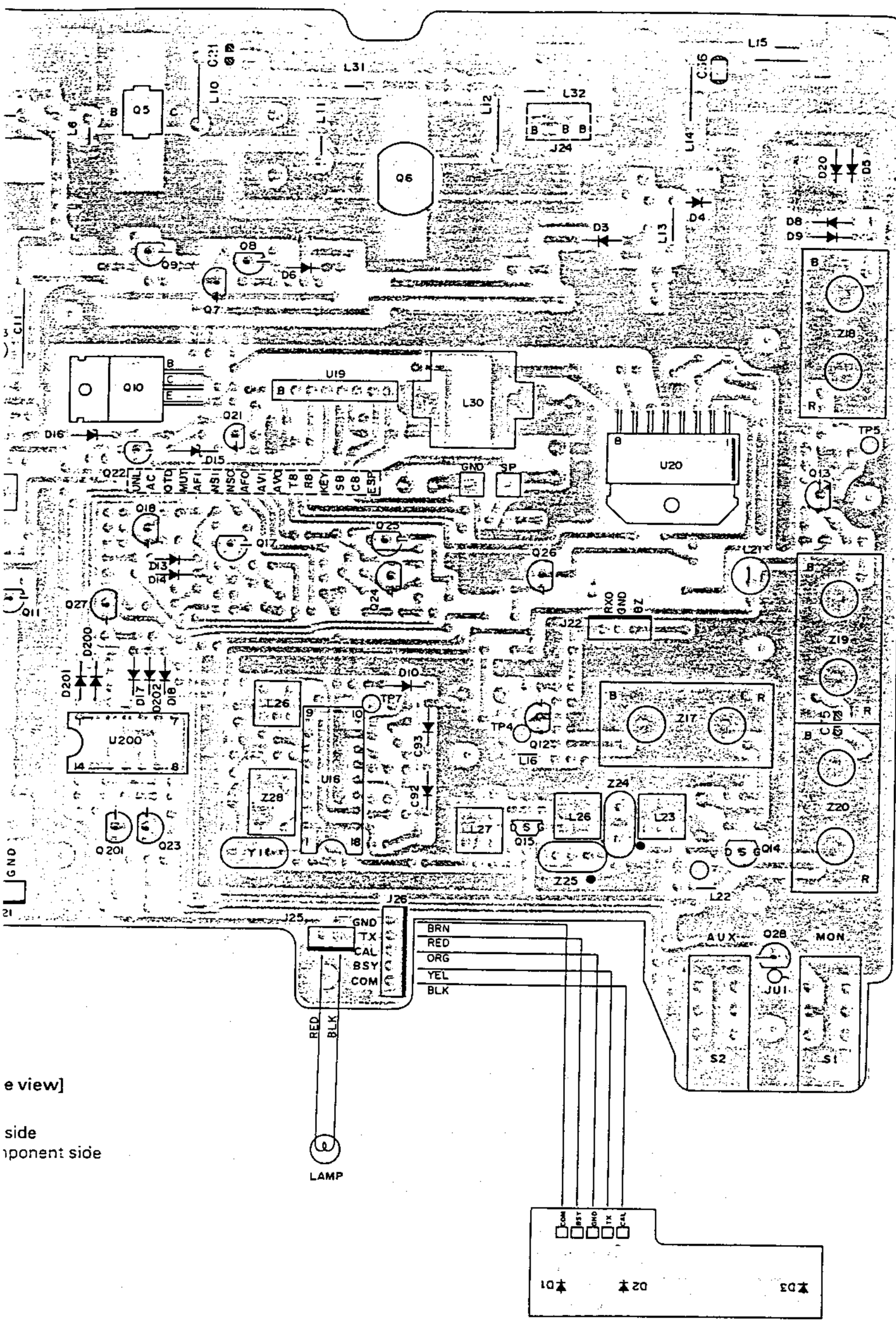

TX-RX unit

Terminal functions

Connector No.	Terminal No.	Terminal name	Terminal function
J21	1	TXO	Transmit signal input from PLL unit
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	2	GND(BLK)	GND ⊖
J26	1	COM(BRN)	Common power source for LED
	2	BSY(RED)	BUSY indication LED
	3	CAL(ORG)	Call indication LED
	4	TX(YEL)	TX indication LED
	5	GND(BLK)	GND

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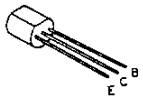
2SC1815



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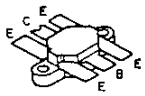
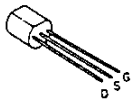
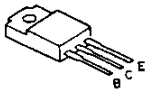


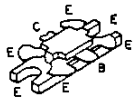
J310



2SB946



2SC3020
2SC3022



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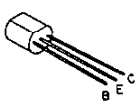
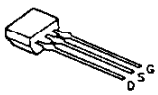
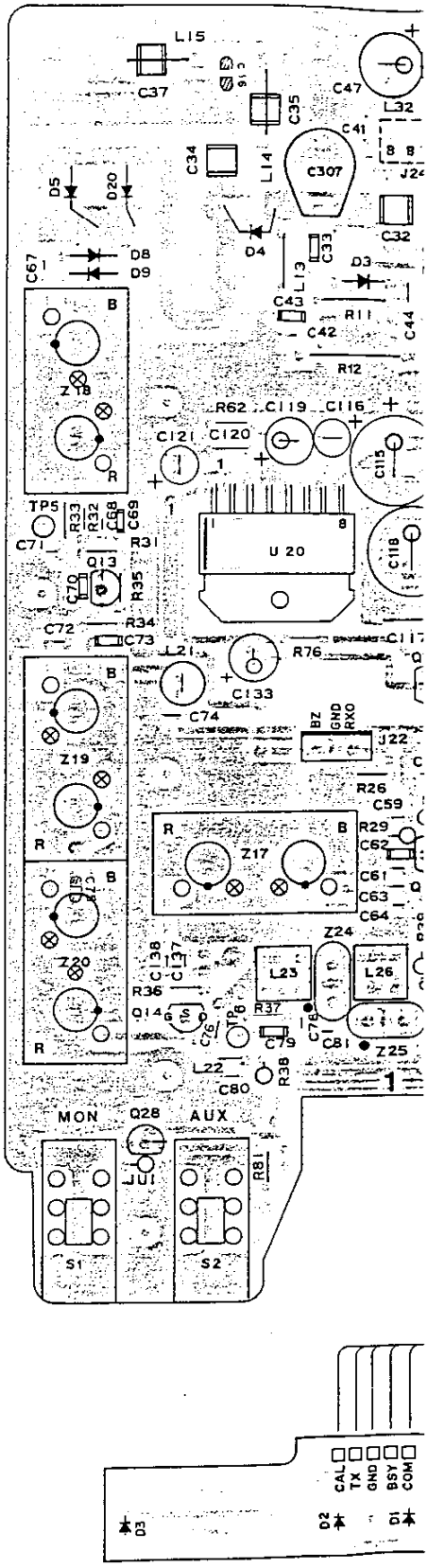


2SK241



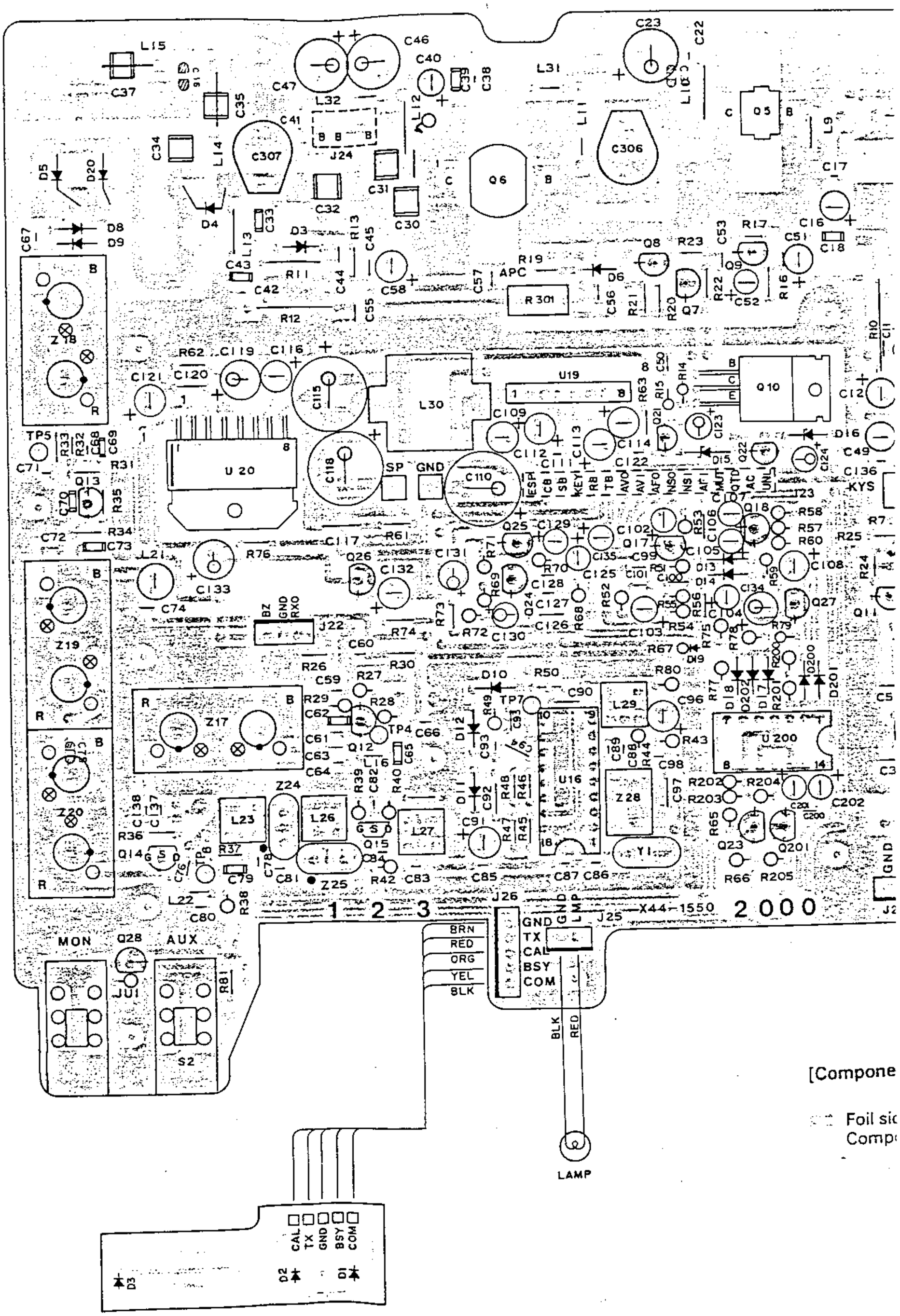
TX-RX unit (X61-1180-XX)

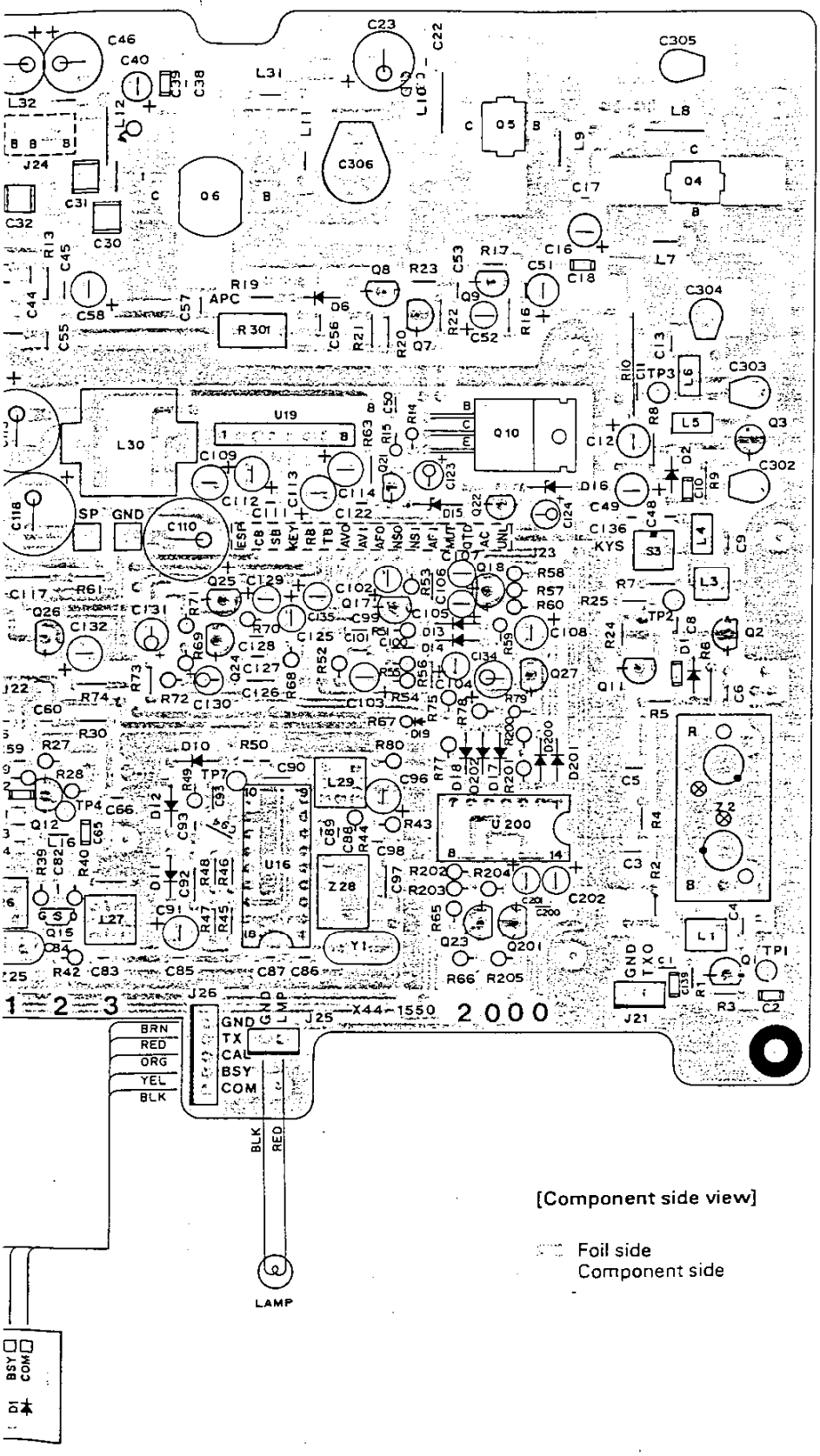
Printed Circuit Board



RX unit (X61-1180-XX)

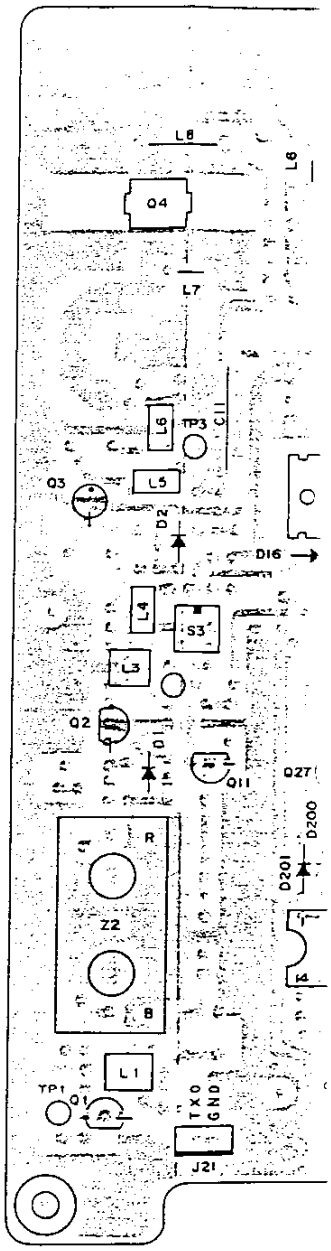
ed Circuit Board





[Component side view]

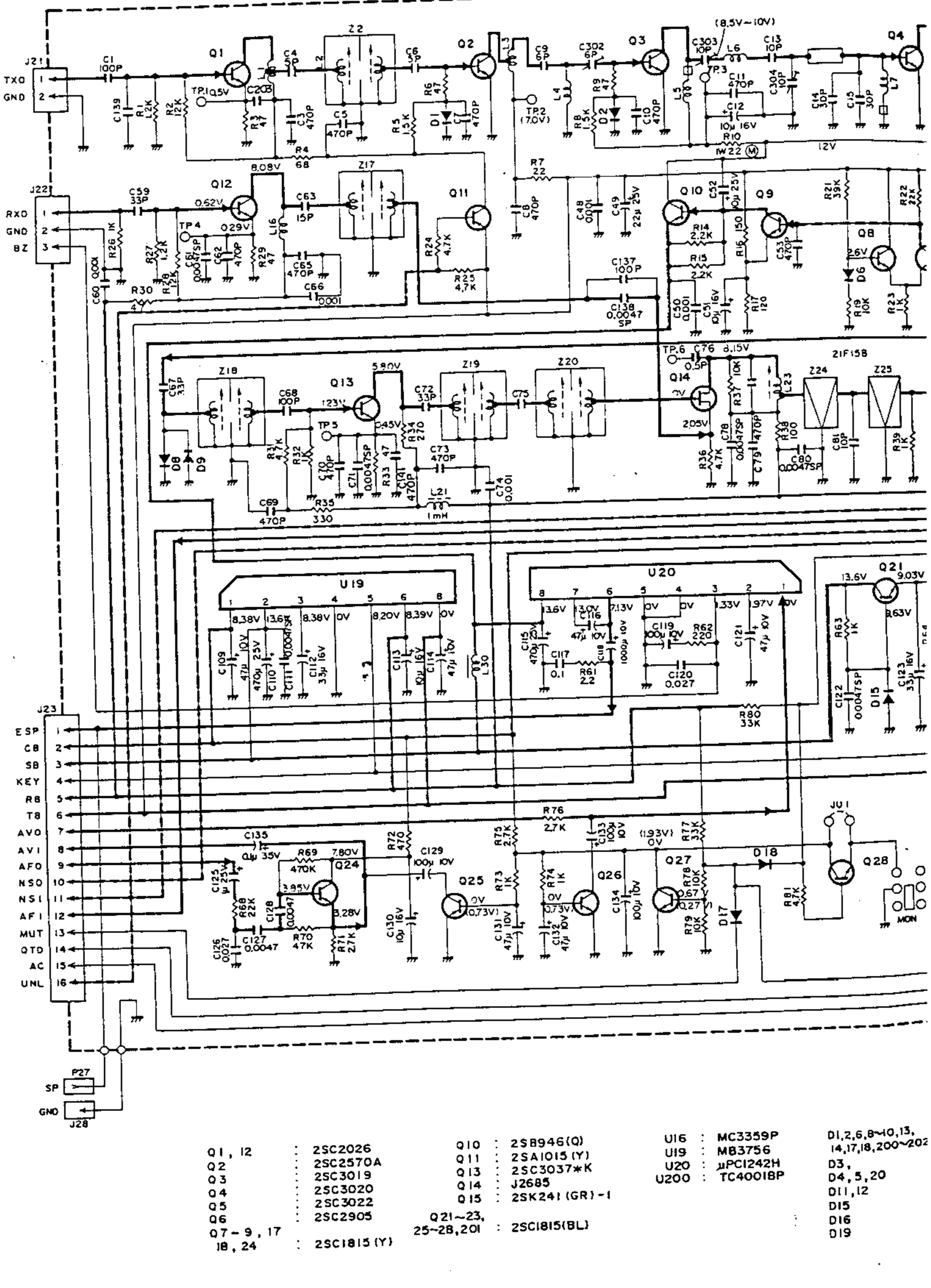
Foil side
Component side



[Foil side view]

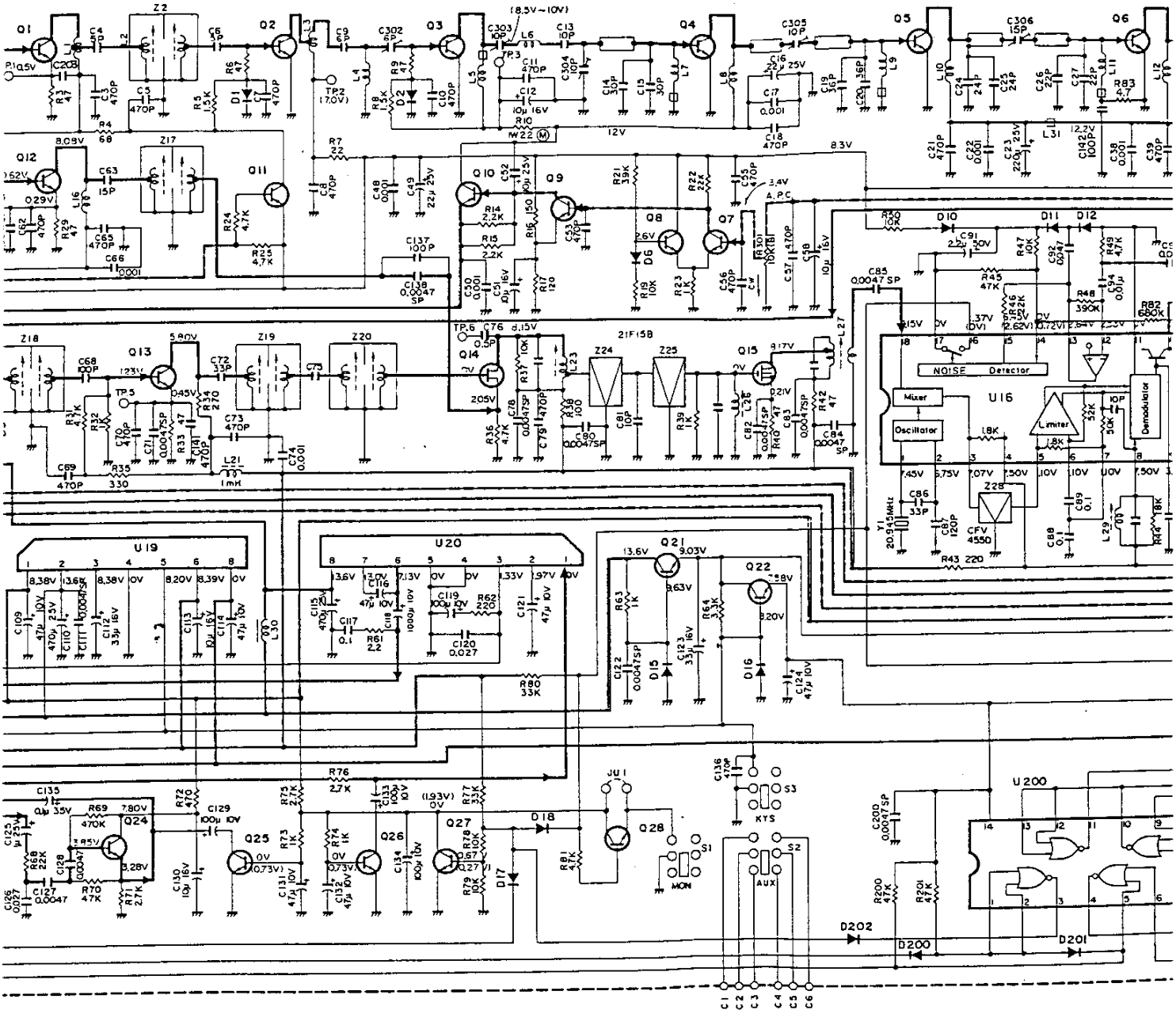
Foil side
Component sic

LR No. / UNIT No.	L1	Z2	Z17	Z18	Z19	Z20	C31	C35	C37	C1
450 ~ 470 MHz X61-1180-10	L34-1122-05	L79-0601-15	L79-0500-15	L79-0602-05	L79-0603-05	L79-0603-05	15P	8P	7P	1(
470 ~ 490 MHz X61-1180-11	L34-1077-05	L79-0606-05	L79-0605-15	L79-0607-05	L79-0608-05	L79-0608-05	12P	8P	5P	1(
490 ~ 512 MHz X61-1180-12	L34-1077-05	L79-0611-15	L79-0610-15	L79-0612-05	L79-0613-05	L79-0613-05	12P	6P	5P	1



Q1, 12	: 2SC2026	Q10	: 2SB946(Q)	U16	: MC3359P	D1,2,6,8~10,13,	
Q2	: 2SC2570A	Q11	: 2SA1015(Y)	U19	: M83756	14,17,18,200~202	
Q3	: 2SC3019	Q13	: 2SC3037*K	U20	: μPC1242H	D3,	
Q4	: 2SC3020	Q14	: J2685	U200	: TC40018P	D4,5,20	
Q5	: 2SC3022	Q15	: 2SK241(GR)-1			D11,12	
Q6	: 2SC2905	Q21~23,				D15	
Q7-9, 17		25~28,201	: 2SC1815(BL)			D16	
18, 24	: 2SC1815(Y)					D19	

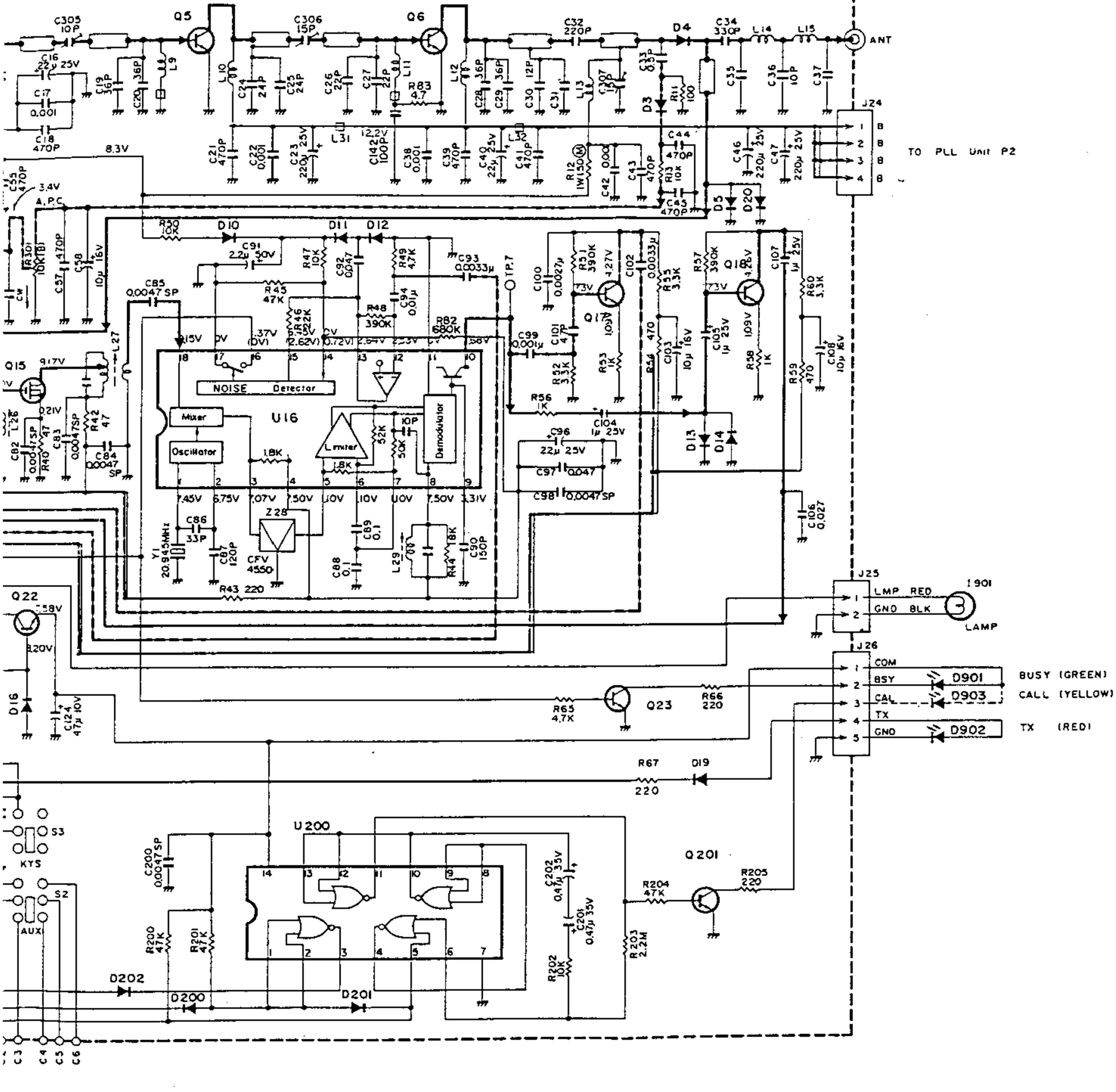
L1	Z2	Z17	Z18	Z19	Z20	C31	C35	C37	C139	C75	C203
-1122-05	L79-0601-15	L79-0500-15	L79-0602-05	L79-0603-05	L79-0603-05	15P	8P	7P	10P	4P	470P
-1077-05	L79-0606-05	L79-0605-15	L79-0607-05	L79-0608-05	L79-0608-05	12P	8P	5P	10P	4P	-
-1077-05	L79-0611-15	L79-0610-15	L79-0612-05	L79-0613-05	L79-0613-05	12P	6P	5P	15P	3P	-



1, 12	: 2SC2026	Q10	: 2SB946(Q)	U16	: MC3359P	D1,2,6,8~10,13, 14,17,18,200~202	: 1SI555	D901 : BG5514S
2	: 2SC2570A	Q11	: 2SA1015(Y)	U19	: MB3756		: 1SS97	D902 : PR5534S
3	: 2SC3019	Q13	: 2SC3037*K	U20	: μPC1242H	D3,	: M1407	D903 : PY5534S
4	: 2SC3020	Q14	: J2685	U200	: TC40018P	D4,5,20	: IN60A	
5	: 2SC3022	Q15	: 2SK241(GR)-1			D11,12	: WZ-100	
6	: 2SC2905	Q21~23, 25~28,201	: 2SC1815(BL)			D15	: WZ-061	
7~9, 17						D16	: MTZ3.9JB	
18, 24	: 2SC1815(Y)					D19		

TX-RX Schematic diagram
(X61-1180-XX)

3	C75	C203
	4P	470P
	4P	–
	3P	–



D901 : BG5514S
D902 : PR5534S
D903 : PY5534S

	Signal line
	Control line
	Common DC line
	Adjusting points