



# SERVICE MANUAL

VHF TRANSCEIVER

# IC-H10

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## INTRODUCTION

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This service manual describes the latest service information for the **IC-H10** VHF TRANSCEIVER at the time of going to press.

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## DANGER

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**NEVER** connect the transceiver to an AC outlet or to a DC power supply that uses more than 16 V. This will ruin the transceiver.

**DO NOT** expose the transceiver to rain, snow or any liquids.

**DO NOT** reverse the polarities of the power supply when connecting the transceiver.

**DO NOT** apply an RF signal of more than 20 dBm (100 mW) to the antenna connector. This could damage the transceiver's front end.

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## ORDERING PARTS

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Be sure to include the following four points when ordering replacement parts:

1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

<SAMPLE ORDER>

1150000780	IC	SC1106	IC-H10 MAIN UNIT	5 pieces
8810005360	Screw	PH No. 0-1 M2 × 3 ZK	IC-H10 Rear plate	10 pieces

Addresses are provided on the inside back cover for your convenience.

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## REPAIR NOTE

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1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from a power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a signal generator or a sweep generator.
7. **ALWAYS** connect a 30 dB ~ 40 dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to the transceiver.



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To program the operating frequency, tone frequency, etc., see the separately available EX-704 PROGRAMMING MANUAL (A-8039-1EX).

**GENERAL**

- Frequency range : 150 ~ 174 MHz
- Type of emission : 16K0F3E
- Number of channels : Up to 10 channels
- Frequency stability :  $\pm 0.0005\%$
- Antenna impedance : 50  $\Omega$  unbalanced
- Power supply requirement : Icom battery packs  
CM-21, CM-23, CM-24, CM-87 and CM-88.  
(Negative ground)
- Usable temperature range :  $-30\text{ }^{\circ}\text{C} \sim +60\text{ }^{\circ}\text{C}$  ( $-22\text{ }^{\circ}\text{F} \sim +140\text{ }^{\circ}\text{F}$ )
- Dimensions (with CM-23) : 58 mm (W)  $\times$  155.5 mm (H)  $\times$  29.5 mm (D)  
2.3" (W)  $\times$  6.1" (H)  $\times$  1.2" (D)
- Weight (with CM-23) : 405 g (14.3 oz)

**TRANSMITTER**

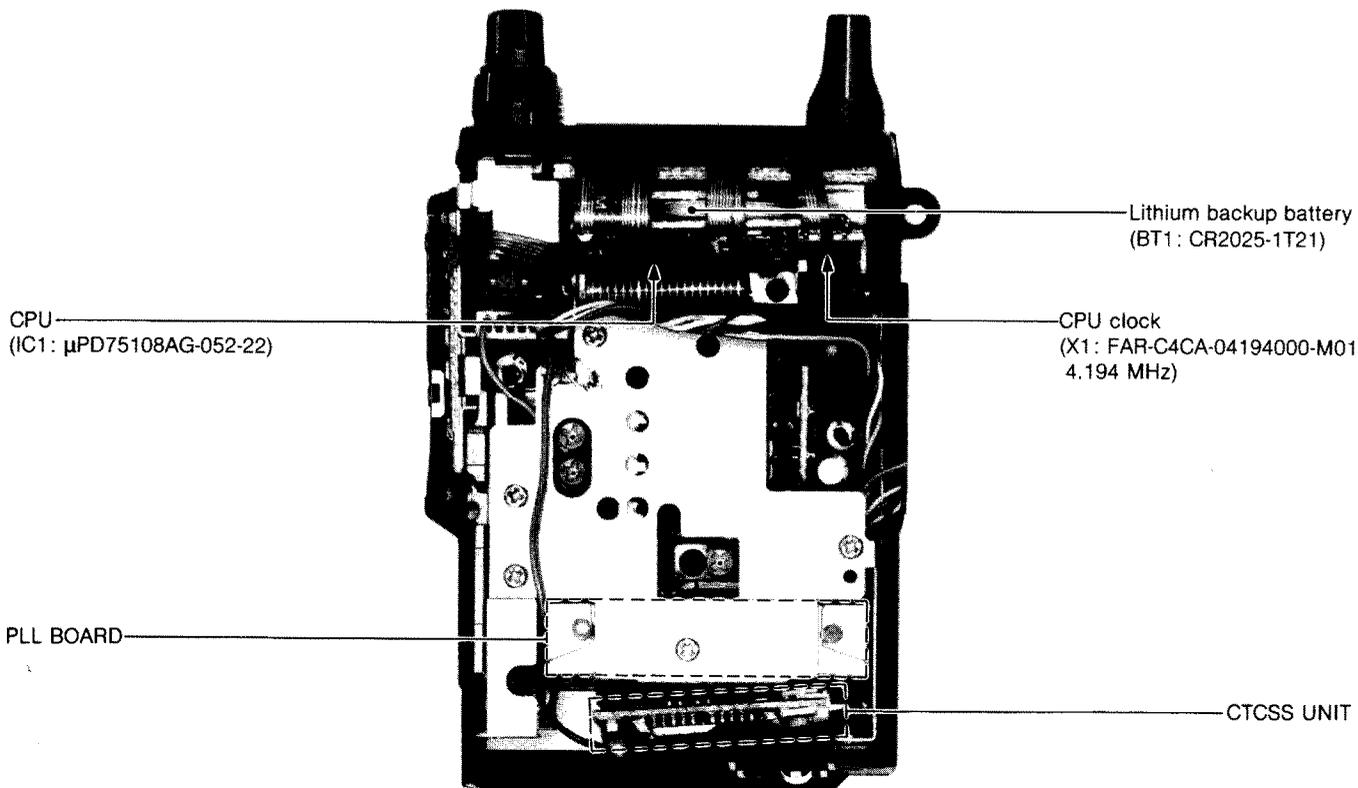
- RF output power : 2.5 W (with CM-23 supplied battery pack)  
4.0 W (with CM-88 optional battery pack)
- Modulation system : Variable reactance frequency modulation
- Current drain (at 12.5 V DC) : High power 1.4 A  
Low power 1.0 A
- Microphone impedance : 2 k $\Omega$
- Maximum deviation :  $\pm 5$  kHz
- Spurious emissions :  $-60$  dB
- FM hum and noise : 43 dB
- Audio response :  $+1$  dB  $\sim -3$  dB of  $+6$  dB/octave from 300 Hz  $\sim$  3000 Hz

**RECEIVER**

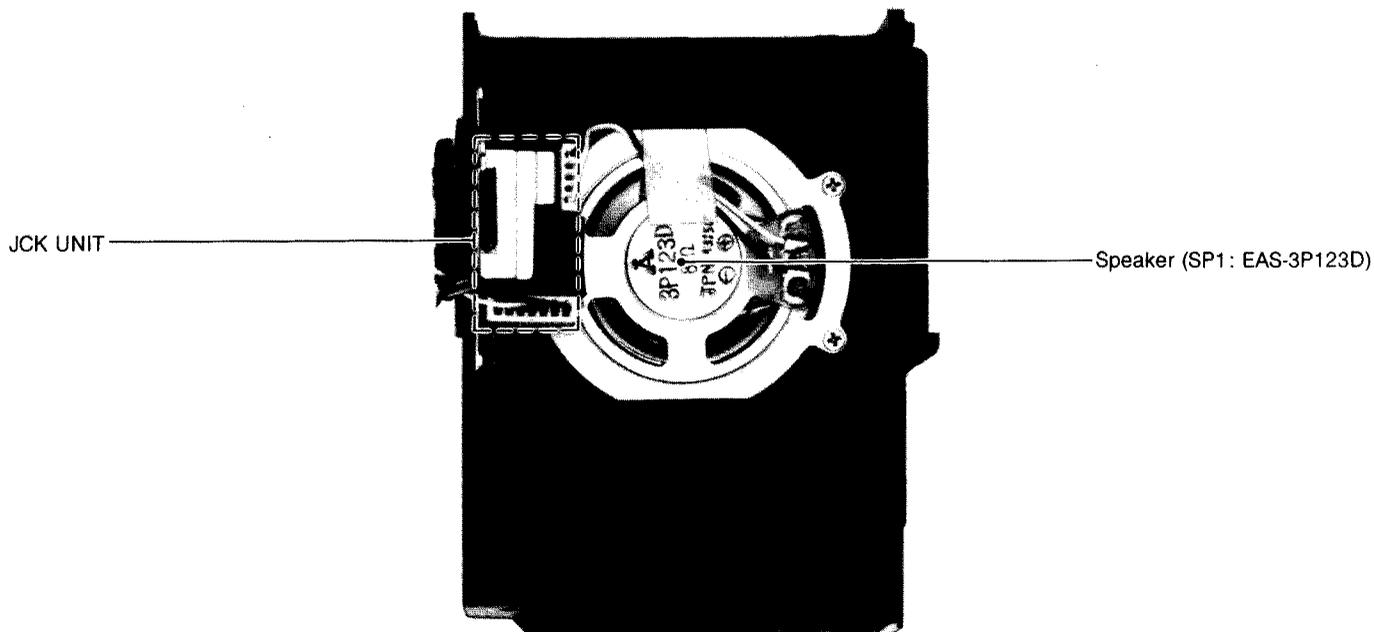
- Receiver system : Double-conversion superheterodyne
- Sensitivity : 0.25  $\mu\text{V}$  for 12 dB SINAD
- Squelch threshold sensitivity : 0.18  $\mu\text{V}$
- Intermediate frequencies : 1st 21.8 MHz  
2nd 455 kHz
- Current drain (at 12.5 V DC) : Audio max. 250 mA  
Standby 70 mA
- Audio output power : 250 mW
- Audio output impedance : 8  $\Omega$
- Adjacent selectivity : 60 dB
- Spurious frequency rejection : 60 dB
- Image rejection : 50 dB
- Intermodulation : 55 dB
- Noise and hum : 43 dB
- Audio response :  $+1$  dB  $\sim -3$  dB of  $-6$  dB/octave from 300 Hz  $\sim$  3000 Hz

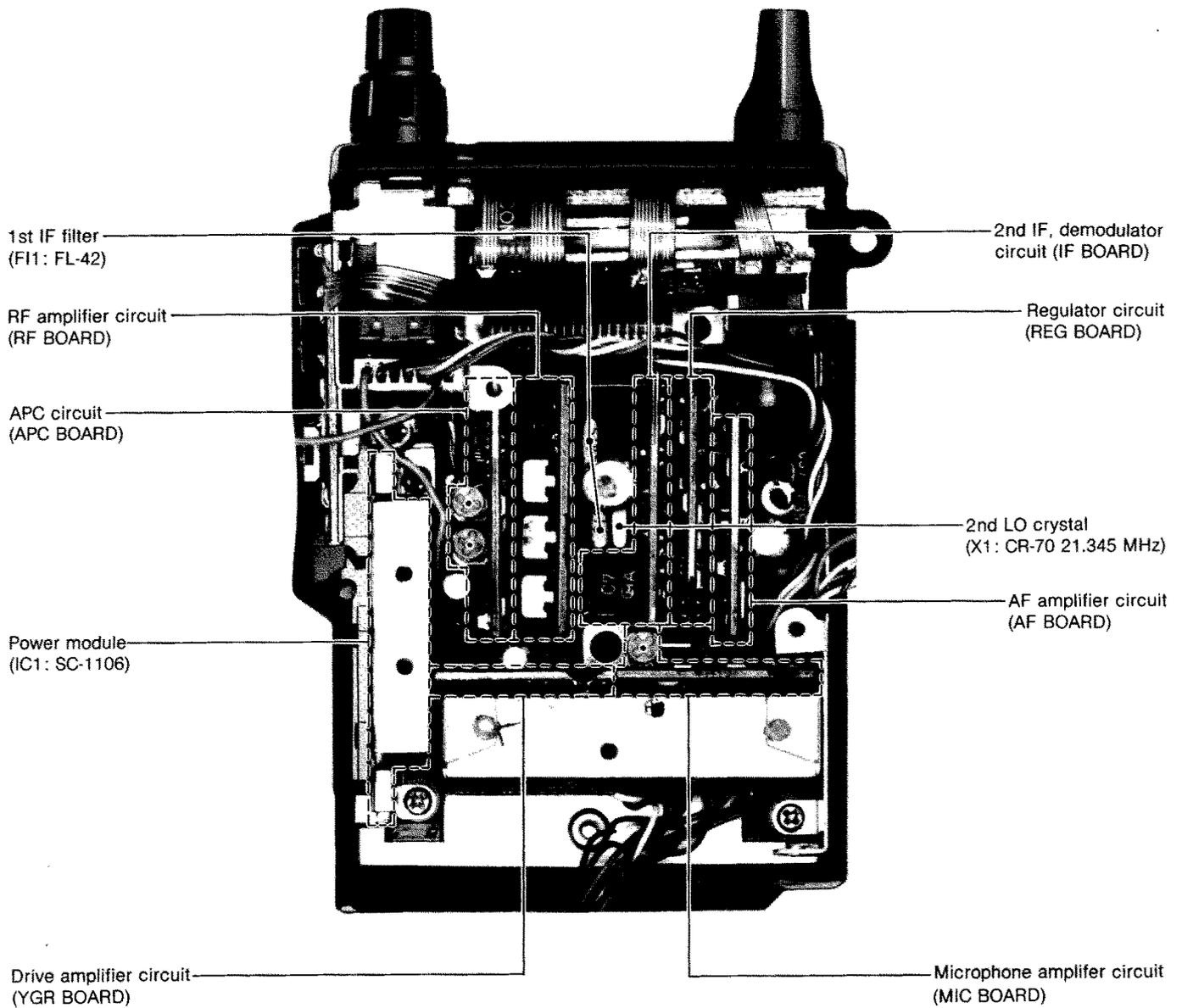
All specifications are per EIA RS316B (transmitter) and RS204C (receiver) procedures.  
All stated specifications are subject to change without notice or obligation.

• REAR PANEL

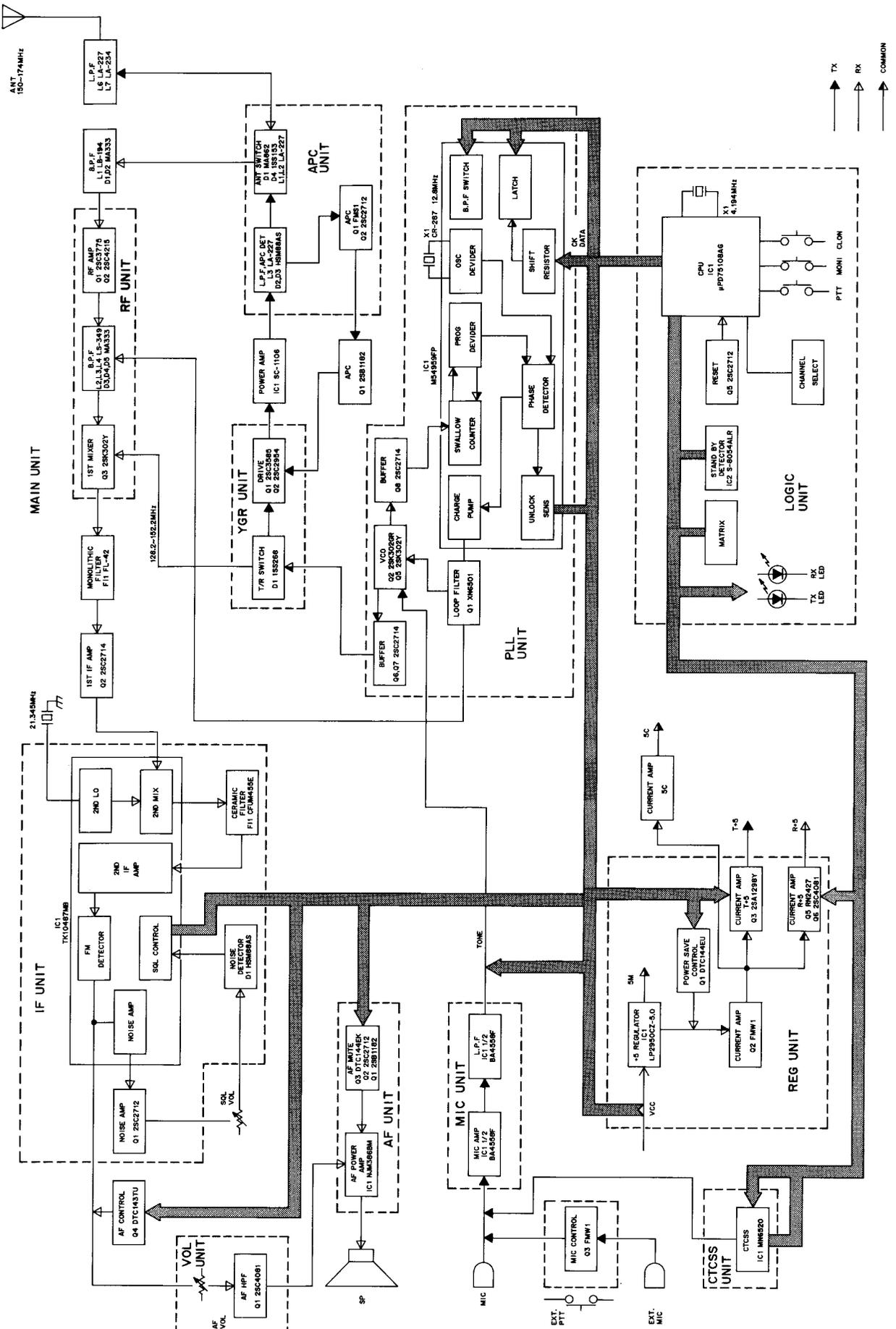


• FRONT PANEL





# SECTION 3 BLOCK DIAGRAM



## 4-1 RECEIVER CIRCUITS

### 4-1-1 ANTENNA SWITCHING CIRCUIT (MAIN UNIT AND APC BOARD)

Received signals enter the antenna connector and pass through a low-pass filter (L6~L8, C19~C23). The signals are applied to the antenna switching circuit (D1, D4) on the APC BOARD, and then to the RF circuit. The antenna switching circuit employs a  $\lambda/4$ -type diode switching system. The signals are applied to the RF BOARD via the ARX signal line.

### 4-1-2 RF CIRCUIT (RF BOARD)

The signals from the antenna switching circuit pass through a one-stage bandpass filter (L1, D1, D2), and are applied to the RF amplifier (Q1, Q2).

Amplified signals are reapplied to the three-stage bandpass filter (L2~L4, D3~D5) to suppress unwanted signals. The signals are applied to the 1st mixer circuit (Q3).

D1~D5 are varactor diodes that track the bandpass filters and are controlled by the lock voltage of the PLL. These diodes tune the center frequency of the bandpass filters for wide bandwidth reception and good image response rejection.

### 4-1-3 1ST MIXER CIRCUIT (RF BOARD)

The signals from the RF circuit are mixed with the 1st LO signal from the YGR BOARD to produce a 21.8 MHz 1st IF signal.

### 4-1-4 1ST IF CIRCUIT (MAIN UNIT)

After passing through the matching circuit (L9), the 1st IF signal is applied to a pair of crystal filters (F1) to suppress out-of-band signals. The 1st IF signal is amplified at the IF amplifier (Q2) and then applied to the 2nd mixer circuit on the IF BOARD.

### 4-1-5 2ND IF AND DEMODULATOR CIRCUITS (IF BOARD)

The 1st IF signal from Q2 on the MAIN UNIT is applied to the 2nd mixer section of IC1, and is mixed with the 2nd LO signal to be converted to a 455 kHz 2nd IF signal.

IC1 contains the 2nd mixer, local oscillator, limiter amplifier and quadrature detector circuits. The local oscillator section and X1 on the MAIN UNIT generate 21.345 MHz for the 2nd LO signal.

The 2nd IF signal from the 2nd mixer (IC1, pin 4) passes through the ceramic filter, F11, where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC1, pin 6) and applied to the quadrature detector section (IC1, pin 10) and ceramic discriminator X1) to demodulate the 2nd IF signal into an AF signal.

AF signal output from pin 11 of IC1 is applied to the squelch circuit and de-emphasis circuit (R10, C12). This de-emphasis circuit is an integrated circuit with frequency characteristics of  $-6$  dB/octave. The resulting signal is applied to the AF and subaudible tone circuits.

## RECEIVER CIRCUIT BLOCK DIAGRAM

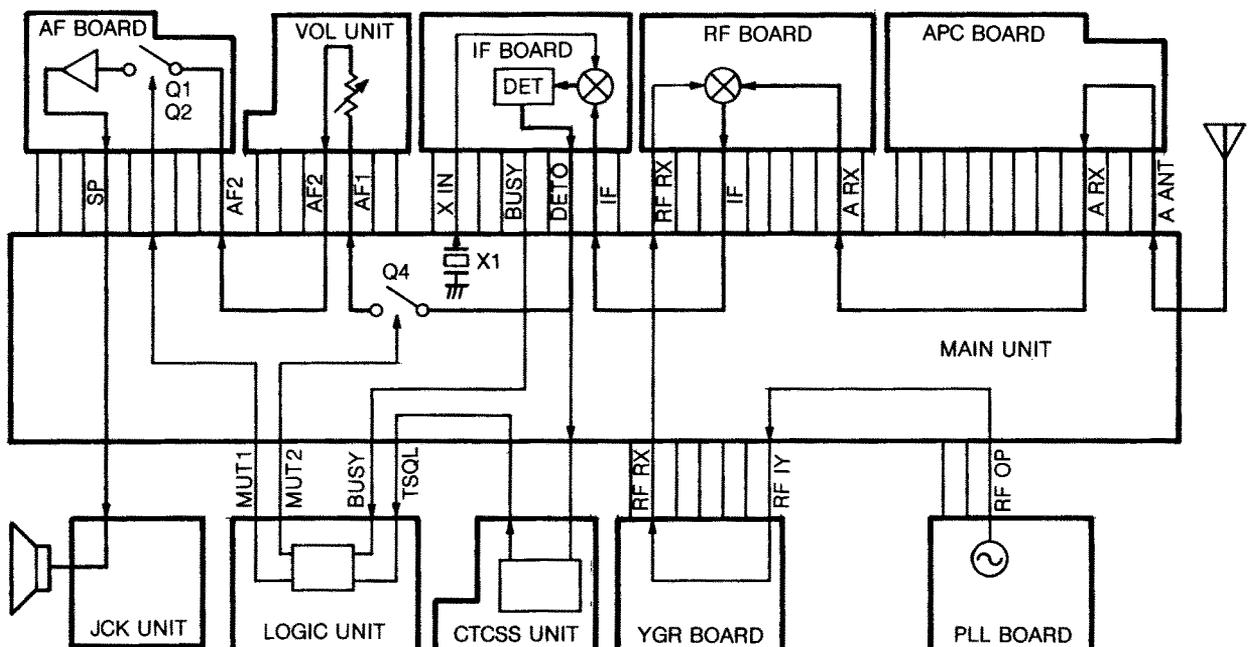


Fig. 1

### 4-1-6 AF CIRCUIT (VOL UNIT AND AF BOARD)

The AF signal is applied to Q1 on the VOL UNIT via the AF control circuit (Q4) on the MAIN UNIT. Q1 is an active filter that functions as a high-pass filter to suppress tone signals for the tone squelch operation. When the squelch is closed, Q4 cuts the AF signal as the AF mute switch.

The filtered signal is applied to the AF BOARD via the [VOL] control (R5). The AF signal is power-amplified at the AF power amplifier (IC1) and then applied to the speaker.

The AF voltage regulator (Q1, Q2) supplies power to the AF power amplifier. The MUT1 signal from the CPU controls Q3 and mutes AF output while receiving no signal or no specified tone signal.

### 4-1-7 SQUELCH CIRCUIT (IF BOARD)

Some of the noise components in the AF signal from pin 11 of IC1 are applied to pin 13 of IC1 via R8, R9 and C9.

The active filter section in IC1 amplifies noise components of frequencies of 20 kHz and above, and outputs the resulting signals from pin 14. Output signals are amplified at Q1, rectified by D1, and are converted to DC voltage. This voltage is applied to the squelch trigger circuit (pin 15). The [SQL] control (R5) on the VOL UNIT is also connected to pin 15 to adjust the DC voltage.

The DC voltage triggers the squelch circuit in IC1. Pin 16 of IC1 outputs the squelch signal. The signal is applied to the CPU (IC1, pin 58) on the LOGIC UNIT through the BUSY signal line. The CPU outputs the MUT1 and MUT2 signals. The MUT1 signal deactivates the AF voltage regulator (Q1, Q2) on the AF BOARD. The MUT2 signal activates the AF control circuit (Q4) on the MAIN UNIT to cut the AF signal from the IF BOARD.

## 4-2 TRANSMITTER CIRCUITS

### 4-2-1 MICROPHONE AMPLIFIER (MIC BOARD)

AF signals from the built-in condenser microphone or from the [MIC] jack are applied to IC1 pin 3, and are pre-emphasized to +6 dB/octave through C7 and R2 connected to pin 2. IC1 functions as the microphone amplifier and the limiter.

The output signals from IC1 pin 1 pass through the splatter filter circuit (IC1 pins 5 and 6) where signals of 3 kHz and above are attenuated. IC1 pin 7 then outputs the signals. The signals are applied to the modulation circuit (D3) in the VCO to produce an FM signal.

The VCO circuit (Q5, D2, D3) on the PLL BOARD oscillates the transmit frequency with AF signal modulation.

### 4-2-2 DRIVE AMPLIFIER (YGR BOARD)

The VCO output, buffer-amplified at Q7 on the PLL BOARD, is applied to the the transmit/receive switching circuit (D1) on the YGR BOARD. The VCO output is then amplified at the predrive amplifier (Q1) and the drive amplifier (Q2).

The voltage controlled by the APC circuit is applied to the collector of Q2 to protect the RF power module from damage by an antenna mismatch.

### 4-2-3 RF POWER AMPLIFIER (MAIN UNIT)

IC1 is a power module which provides stable 4 W output power.

An RF signal from the drive amplifier (Q2) on the YGR UNIT is applied to pin 1 of IC1. The amplified signal is output from pin 4, and applied to the antenna connector through the diode switching and low-pass filter circuits.

### TRANSMITTER CIRCUIT BLOCK DIAGRAM

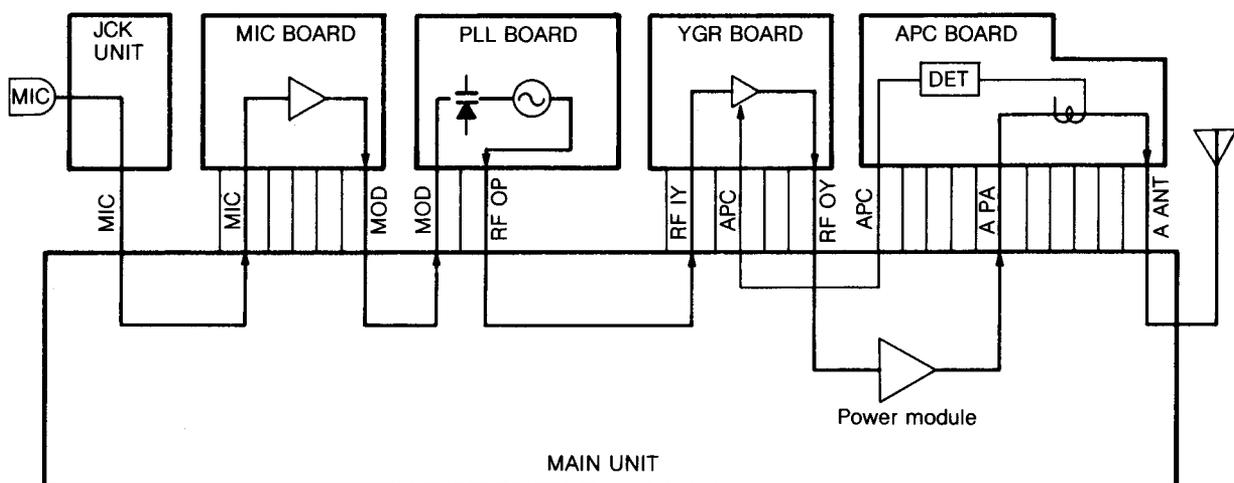


Fig. 2

## 4-2-4 APC CIRCUIT (MAIN UNIT AND APC BOARD)

The APC circuit protects the power module (IC1) from a mismatched output load and selects HIGH and LOW output power.

The output power level from the power module (IC1) is detected at the APC detector (D2, D3) on the APC BOARD. When antenna impedance is matched at 50  $\Omega$ , the detected level is at a minimum. However, when antenna impedance is mismatched, the detected voltage is higher than when matched.

When the antenna impedance is mismatched, the base voltage of Q1 is higher than the other base voltage of Q1 (reference voltage). Q1 decreases the collector current of Q1 on the MAIN UNIT using Q2. Collector current of Q1 on the MAIN UNIT is used at the drive amplifier (Q2) on the YGR BOARD. Hence, when the antenna impedance is mismatched, the output power is decreased.

The output power selecting circuit uses the APC circuit. The [HIGH/LOW] switch selects the reference voltage, changing the output power to HIGH or LOW.

## 4-2-5 ANTENNA SWITCHING CIRCUIT (APC BOARD)

When transmitting, D1 and D4 are turned ON. The RF output signal is not applied to the receiver circuit, passing through D4 and C10, the low-pass filter (L6~L8, C19~C23) on the MAIN UNIT and then to the antenna. The low-pass filter suppresses high harmonic components.

## PLL CIRCUIT

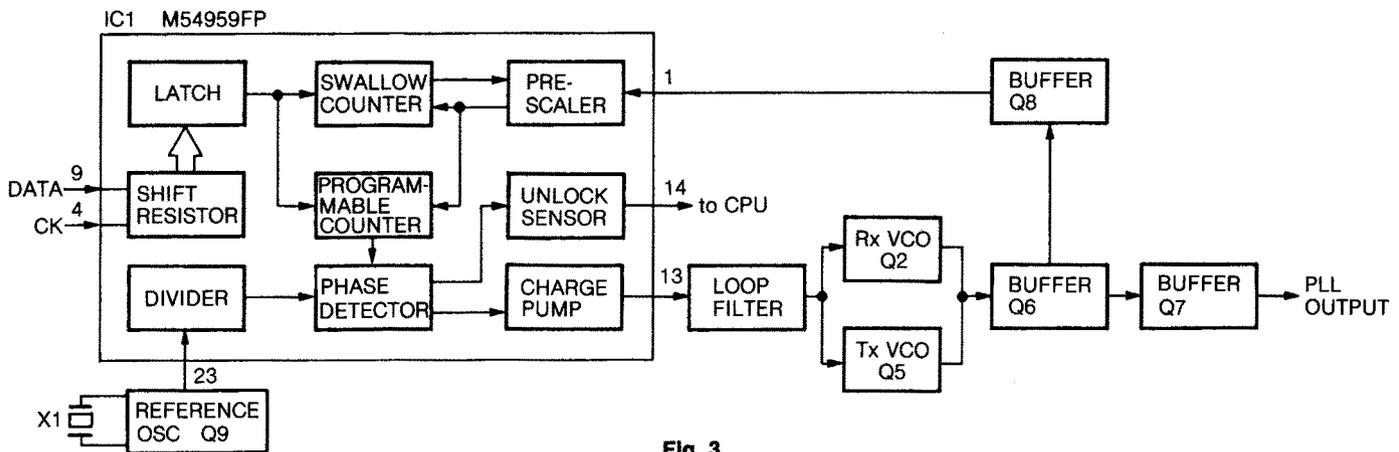


Fig. 3

## 4-3-4 VCO CIRCUIT (PLL BOARD)

IC-H10 has two VCO circuits for transmitting and receiving. IC1 pin 10 outputs a control signal for selecting the receive VCO circuit (Q2, L1, D1) or transmit VCO circuit (Q5, L3, D2). Varactor diodes (D1, D2) provide frequency control. The buffer amplifiers (Q6~Q8) do not affect the PLL output signal from VCO oscillation. Q3 and Q4 select the transmit or receive VCO circuit.

## 4-3 PLL CIRCUITS

### 4-3-1 GENERAL (PLL BOARD)

The PLL circuit, using a one chip modulus prescaler (IC1), directly generates the transmit frequency with the Tx VCO (Q5) and the 1st LO frequency with the Rx VCO (Q2). The modulus prescaler (IC1) sets the dividing ratio based on serial data from the CPU, and compares the phases of a VCO signal and the reference oscillator frequency. It detects the out-of-step phase and outputs it. The reference frequency oscillated at X1 is applied to the PLL IC (IC1 pin 23).

### 4-3-2 REFERENCE OSCILLATOR CIRCUIT (PLL BOARD)

A reference frequency is produced by the oscillator (Q9) and X1. D4, R29 and R32 provide frequency control. Thus, the output frequency of this circuit is stable over a wide temperature range.

### 4-3-3 LOOP FILTER CIRCUIT (PLL BOARD)

Phase-detected signals from pin 13 are converted to DC voltage by a loop filter consisting of an active filter (Q1).

The frequency at which the VCO oscillates is controlled by varactor diodes (D1, D2). DC voltage (PLL lock voltage) is provided through the integrator circuit (R7, C17).

### 4-3-5 UNLOCK SENSOR CIRCUIT (PLL BOARD)

When the PLL circuit is unlocked, IC1 pin 14 is "HIGH" and a "HIGH" signal is applied to the CPU pin 60 as an unlock signal.

## 4-4 OTHER CIRCUITS

### 4-4-1 RESET CIRCUIT (LOGIC UNIT)

The CPU (IC1) is reset when the  $\overline{\text{RESET}}$  port changes from "HIGH" to "LOW" and then becomes "HIGH." The  $\overline{\text{RESET}}$  port remains "HIGH" except when the CPU is reset.

#### RESET CIRCUIT

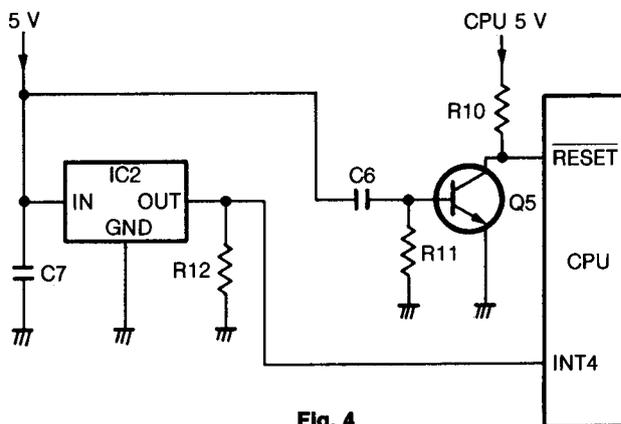


Fig. 4

### 4-4-2 CPU POWER SUPPLY CIRCUIT (LOGIC UNIT)

When the power switch is turned OFF, a voltage is applied to the CPU (IC1) pin 41 via D3 from the lithium backup battery installed in the transceiver to provide backup for the memory contents.

### SUBAUDIBLE TONE FREQUENCY AND DATA CHART

OUTPUT FREQUENCY [Hz]	IC1 INPUT PIN NUMBER						OUTPUT FREQUENCY [Hz]	IC1 INPUT PIN NUMBER						OUTPUT FREQUENCY [Hz]	IC1 INPUT PIN NUMBER					
	3	4	5	6	7	8		3	4	5	6	7	8		3	4	5	6	7	8
67.0	H	L	H	H	H	L	110.9	H	L	H	L	H	H	173.8	L	L	L	H	L	H
71.9	L	L	H	H	H	L	114.8	L	L	H	L	H	H	179.9	H	H	H	L	L	H
74.4	H	H	L	H	H	L	118.8	H	H	L	L	H	H	186.2	L	H	H	L	L	H
77.0	L	H	L	H	H	L	123.0	L	H	L	L	H	H	192.8	H	L	H	L	L	H
79.7	H	L	L	H	H	L	127.3	H	L	L	L	H	H	203.5	L	L	H	L	L	H
82.5	H	H	H	L	H	L	131.8	L	L	L	L	H	H	210.7	H	H	L	L	L	H
85.4	H	H	H	L	H	L	136.5	H	H	H	H	L	H	218.1	L	H	L	L	L	H
88.5	L	H	H	L	H	L	141.3	L	H	H	H	L	H	225.7	H	L	L	L	L	H
91.5	H	L	H	L	H	L	146.2	H	L	H	H	L	H	233.6	L	L	L	L	L	H
94.8	H	L	L	H	H	H	151.4	L	L	H	H	L	H	241.8	H	H	H	H	H	L
100.0	L	L	L	H	H	H	156.7	H	H	L	H	L	H	250.3	L	H	H	H	H	L
103.5	H	H	H	L	H	H	162.2	L	H	L	H	L	H	OFF	H	H	H	H	H	H
107.2	L	H	H	L	H	H	167.9	H	L	L	H	L	H	—	—	—	—	—	—	—

H: HIGH L: LOW

## 4-4-3 VOLTAGE LINES

LINE	DESCRIPTION
Vcc	The connected battery pack voltage passed through the power switch.
+5	Common 5 V regulated from Vcc at IC1 on the REG BOARD.
+5S	5 V controlled by the power saver function. This voltage is regulated from Vcc at Q3 on the MAIN UNIT.
R+5	Receive 5 V supplied from +5S. This voltage switched by Q5 and Q6 on the REG BOARD using the "T/R" line from the CPU.
T+5	Transmit 5 V supplied from +5S. This voltage switched by Q3 and Q4 on the REG BOARD using the "T/R" line from the CPU.

### 4-4-4 SUBAUDIBLE TONE CIRCUIT (CTCSS UNIT)

IC1 encodes and decodes subaudible tone frequency signals of 67 Hz~250.3 Hz. A tone is set by serial data from the CPU.

IC2 functions as a serial/parallel converter, applying 6-bit parallel data to IC1. The following table shows the relation between input data and the output frequency of IC1.

## 4-5 CPU PORT ALLOCATIONS (LOGIC UNIT)

### • MATRIX

NAME	DESCRIPTION
[BEEP]	Selects a 1 kHz beep tone or 500 Hz/1 kHz beep tone.
[VHF/UHF]	Selects the VHF program when the matrix is OFF and turning the power ON.
[PSAV]	Activates the power saver function when the matrix is OFF and turning the power ON.

### • INPUT PORT

PORT NUMBER	PIN NUMBER	DESCRIPTION
P00 [INT4]	27	Detects a signal for the standby mode of the CPU. The CPU enters the standby mode when the port becomes "LOW."
P10~P13	10~13	These are input ports for the channel selector.
P60 [UL]	60	Detects a PLL unlock signal. When the signal is "HIGH," the PLL is unlocked.
P61 [TSQL]	59	Inputs a resulting signal from the CTCSS UNIT. This port becomes "HIGH" when the received signal includes the programmed tone frequency.
P62 [BUSY]	58	Detects a squelch signal. The signal is "HIGH," when the squelch opens.
P140 [PTT]	39	Inputs a signal on the PTT line. This port becomes "LOW" when the PTT switch is pushed. This port is also used for cloning input.
P142 [MONI]	37	This is an input port for the [MONITOR] switch. The transceiver enters the monitor mode when the port is "LOW."
P143 [CLON]	36	This is an input port for the clone switch. The transceiver enters the cloning mode when this port and the MONI port are "LOW" and turning the power ON.

### • OUTPUT PORT

PORT NUMBER	PIN NUMBER	DESCRIPTION
P20 [BEEP]	23	Outputs 500 Hz or 1 kHz beep tones.
P21	22	This port becomes "HIGH" when single tone is turned ON.
P30	45	Outputs a strobe signal for serial data to the initial matrix.
P70 [TSTB]	64	Outputs a strobe signal for serial data to the subaudible tone IC.
P71 [STB]	63	Outputs a strobe signal for serial data to the PLL IC.
P72 [CK]	62	Outputs clock signals for serial data.
P73 [DATA]	61	Outputs serial data synchronized with the CK signal.
P80 [CPO]	4	Outputs cloning data.
P81 [PSC]	3	This port becomes "HIGH" while the power saver function is activated.
P82 [MUT1]	2	Outputs an AF mute signal for AF power amplifier.
P83 [MUT2]	1	Outputs a receive mute signal for AF control circuit. When emitting a beep tone, this port outputs the mute signal and the MUT1 port does not output it.
P120	31	Outputs a strobe signal for serial data to the channel selector.
P121 [TX LED]	30	Outputs a signal for lighting up in red the [TX/BUSY] indicator. This port becomes "LOW" while transmitting.
P122 [BUSY LED]	29	Outputs a signal for lighting up in green the [TX/BUSY] indicator. This port becomes "LOW" while receiving. (squelch opens)
P123 [T/R]	28	Outputs transmit/receive switching signals. This port becomes "LOW" while transmitting.

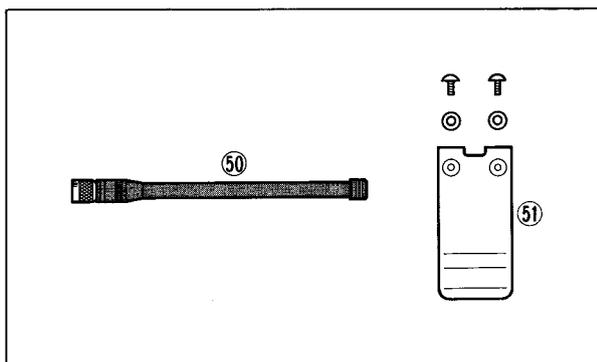
## 5-1 TRANSCEIVER

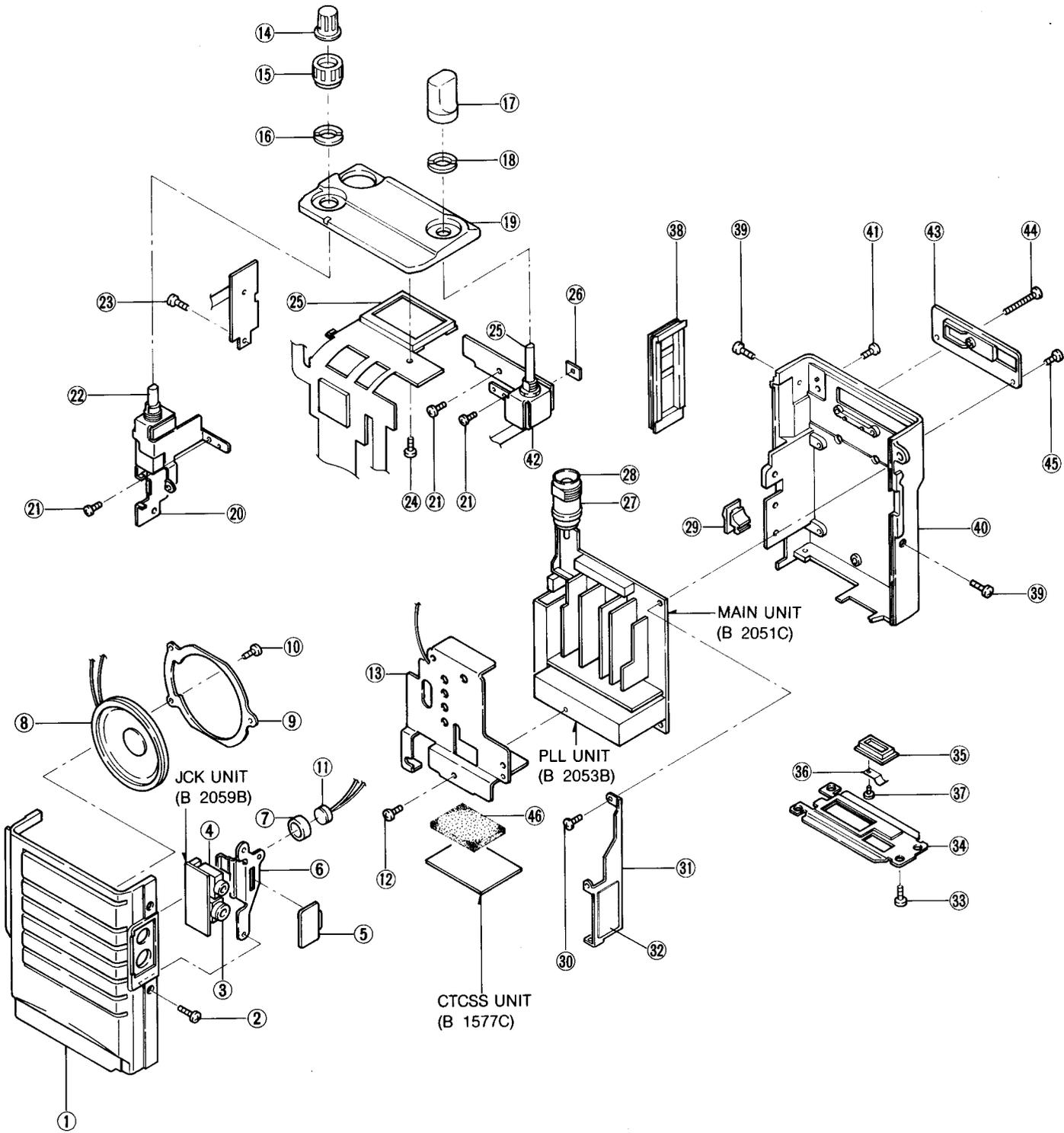
LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.	LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8210005191	Front panel-1	1	②4	8810004040	PH B0 No. 0 M2 × 5 ZU	1
②	8810005360	PH No. 0 M2 × 3 ZK	3	②5	2250000040	[CHANNEL] selector switch KSR16-0-20	1
③	6450000110	[EXT SP] jack HSJ0836-01-010	1	②6	8610004610	[HIGH/LOW] knob K124	1
④	6450000130	[MIC] jack HSJ1102-01-540	1	②7	8930017050	Antenna ring (A)	1
⑤	8930013680	Jack cap	1	②8	6510008930	Antenna connector TNC-R108	1
⑥	8930013710	Connector plate	1	②9	8930013650	643 Release button	1
⑦	8930013760	Microphone holder	1	③0	8810005320	PH M2 × 4 Ni FE	4
⑧	2510000450	Speaker EAS-3P123D	1	③1	8930013740	Side plate	1
⑨	8930013700	Speaker plate	1	③2	8930013570	Insulator for side plate	1
⑩	8810005830	PH B0 No. 0 M2 × 3	3	③3	8810002330	FH M2 × 6 Ni BS	4
⑪	7700000860	Microphone element WM-62A	1	③4	8010007711	Sliding guide plate (C) -1 Assembly	1
⑫	8810004210	PH M2 × 3	6	③5	8930009690	Contact holder	1
⑬	8510005380	MAIN shield plate	1	③6	8930009660	Charging terminal	1
⑭	8610004600	[PWR/VOL] knob N138	1	③7	8810001710	PH B0 No. 0-3 M1.4 × 3.5	1
⑮	8610004590	[SQL] knob N137	1	③8	8930016360	643 PTT switch rubber	1
⑯	8830000570	Nut (A)	1	③9	8810005360	PH No. 0 M2 × 3 ZK	2
⑰	8610006120	[CHANNEL] knob N150	1	④0	8010007691	Rear panel-1	1
⑱	8830000590	VR nut (F)	1	④1	8810005820	OH M2 × 5 ZK	1
⑲	8210005201	Top panel-1	1	④2	8930013731	MD plate-1	1
⑳	8930013720	VR plate	1	④3	8930016351	643 Rear plate-1	1
㉑	8810005360	PH No. 0 M2 × 3 ZK	3	④4	8810000740	PH A M2 × 15 ZK	1
㉒	7210001510	[PWR/VOL] variable resistor RK0972211007A1	1	④5	8810005360	PH No. 0 M2 × 3 ZK	2
㉓	8810004850	PH No. 0 M2 × 4	1	④6	8930012200	Sponge (BC)	1

**Screw abbreviations**

PH: Pan head FH: Flat head OH: Oval countersunk head  
 B0: Self-tapping screw No. 0: Precision-type screw  
 ZK: Black Ni: Nickel BS: Brass

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
⑤0	Optional product	FA-150TB Flexible antenna	1
⑤1	Optional product	MB-20 Belt clip	1

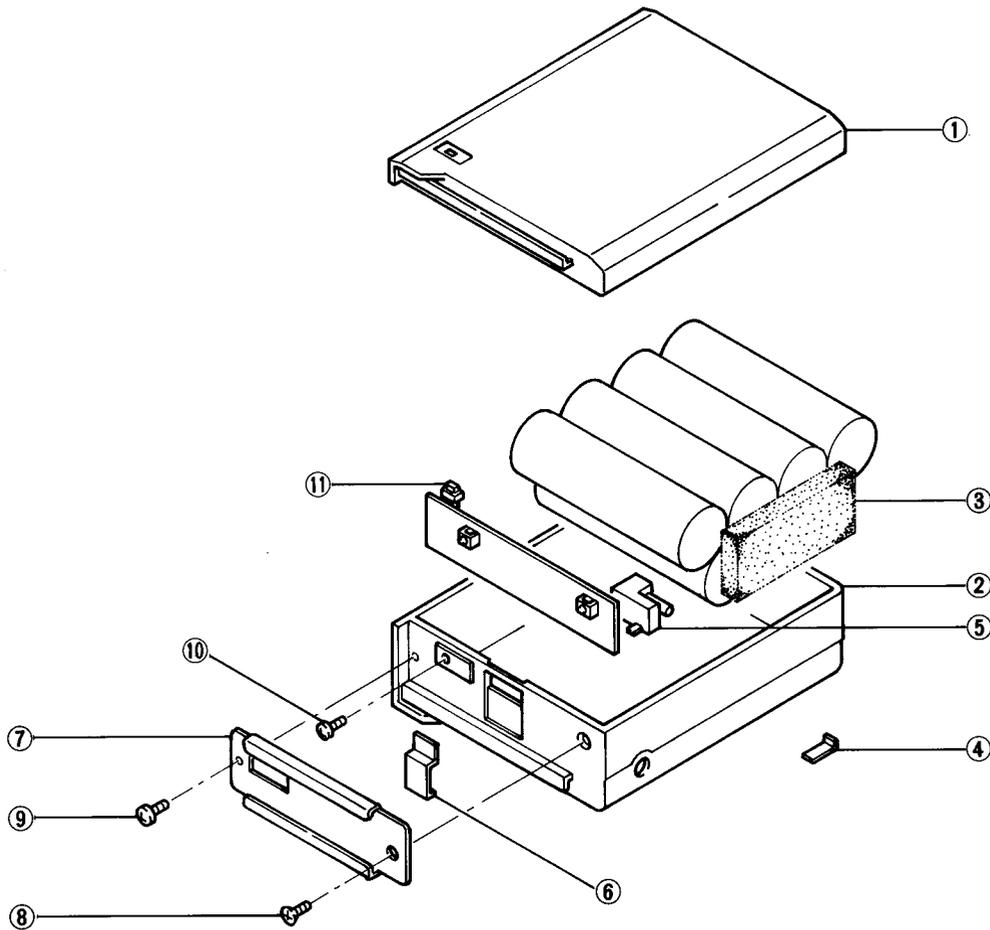




## 5-2 BATTERY PACKS

• CM-21, CM-23, CM-24

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8010005390	Front case (2) A-1 (CM-21)	1
	8010005430	Front case (4) A-1 (CM-23)	
	8010005450	Front case (5) A (CM-24)	
②	8010007750	Rear case (2) F-2 (CM-21)	1
	8010007770	Rear case (4) F-2 (CM-23)	
	8010007780	Rear case (5) F-1 (CM-24)	
③	8930001920	Sponge (G)	1
④	8930009590	Charging terminal	2
⑤	8930009600	Charging jack	1
⑥	8930010110	Case metal latch	1
⑦	8010005491	Sliding guide plate (C) -1	1
⑧	8810002310	FH M2 × 4 Ni BS	1
⑨	8810000980	PH B0 M2 × 4	1
⑩	8810004671	FFH with looseness stopper M2 × 4 Ni	1
⑪	5040000390	LED SLB-23VR 5F	1



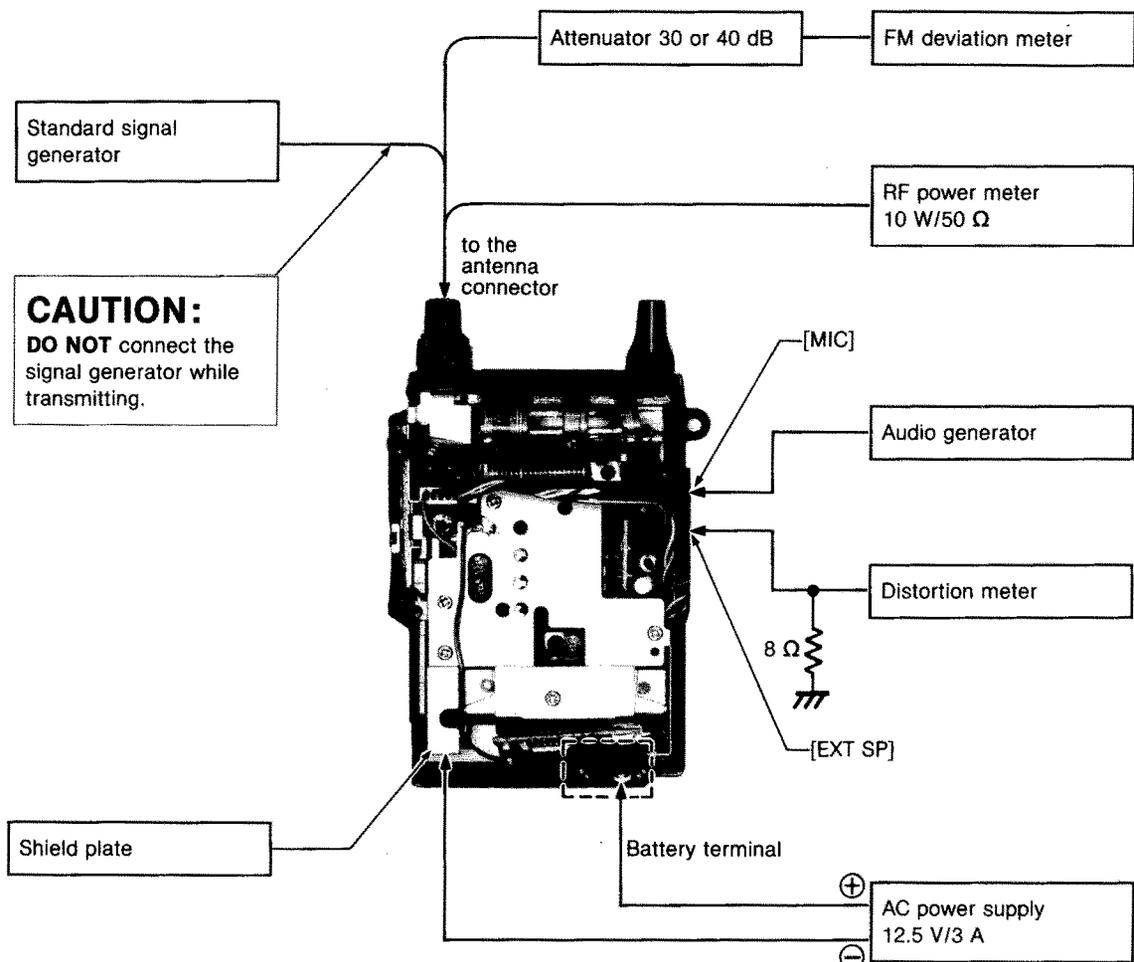
Battery packs CM-87 and CM-88 cannot be disassembled.

## 6-1 PREPARATION BEFORE SERVICING

## ■ REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
AC power supply	Output voltage : 12.5 V DC Current capacity : 3 A or more	Standard signal generator (SSG)	Frequency range : 0.1~200 MHz Output level : -127~-17 dBm (0.1 $\mu$ V~32 mV)
RF power meter (terminated type)	Measuring range : 1~10 W Frequency range : 0.1~200 MHz Impedance : 50 $\Omega$ SWR : Less than 1.2 : 1	Distortion meter	Measuring range : 0~20 %
Frequency counter	Frequency range : 0.1~200 MHz Frequency accuracy : $\pm 1$ ppm or better Sensitivity : 100 mV or better	Audio generator	Frequency range : 200~2000 Hz Output level : 0~200 mV
DC voltmeter	Input impedance : 50 k $\Omega$ /DC or better	FM deviation meter	Frequency minimum : 200 MHz Measuring range : 0~ $\pm 10$ kHz
		Attenuator	Power attenuation : 30 or 40 dB Capacity : 10 W or more

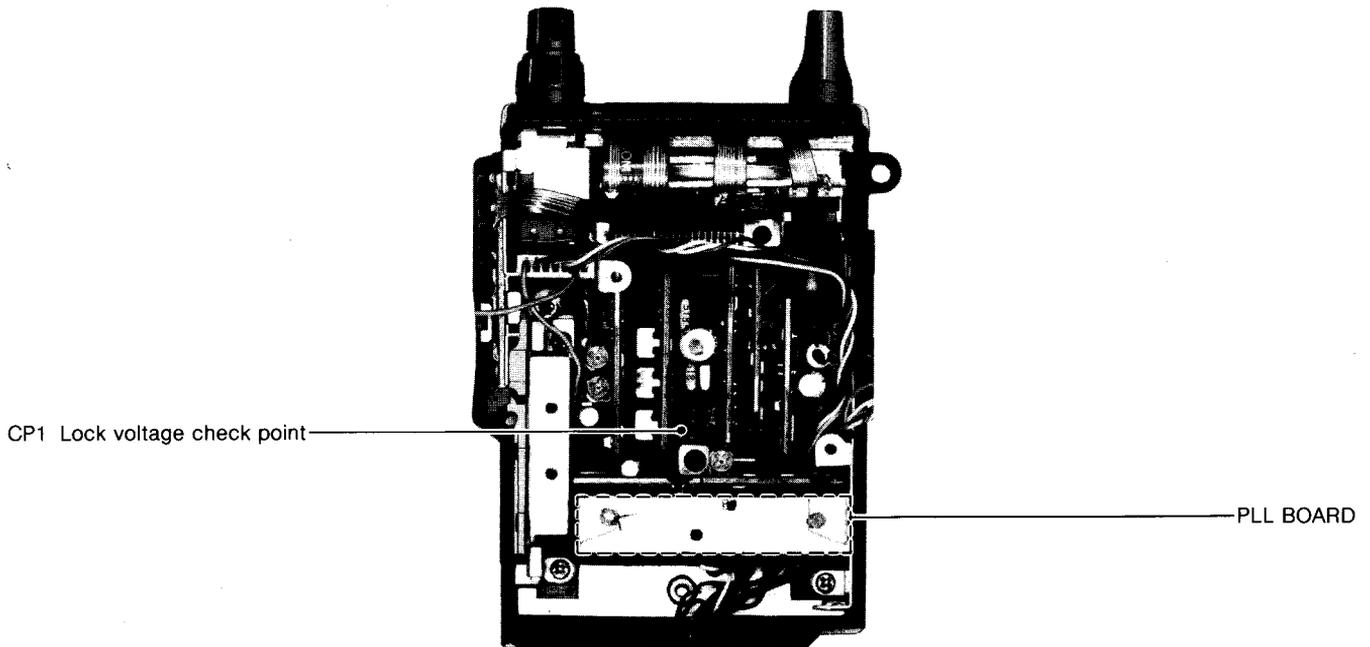
## ■ CONNECTION



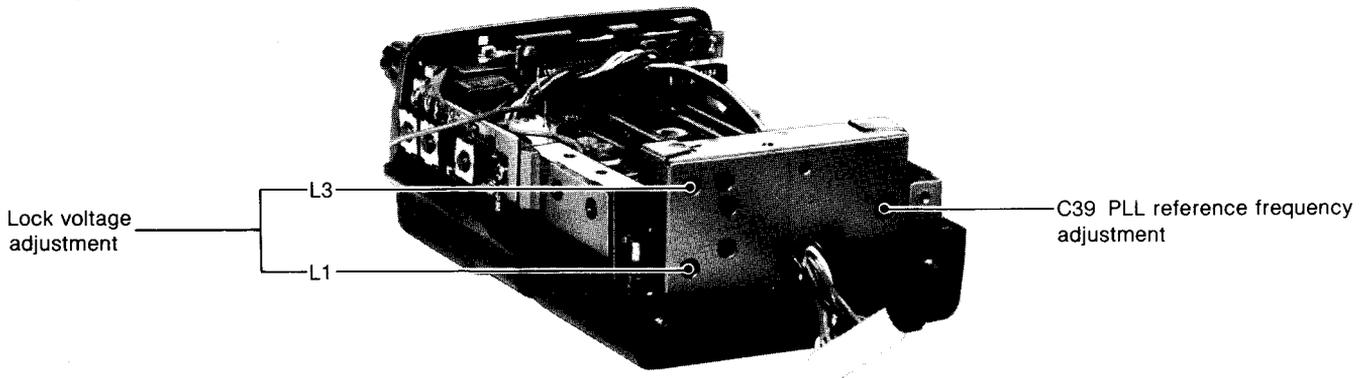
## 6-2 PLL ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
PLL REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> <li>• Select any channel.</li> <li>• Connect a dummy load.</li> <li>• Transmitting</li> </ul>	Top panel	Loose couple the frequency counter to the antenna connector.	Same frequency as the programmed one. To check the programmed frequency, use the EX-704.	MAIN (PLL BOARD)	C39
LOCK VOLTAGE	NOTE: Lock voltage affects the C/N ratio. If you adjust the lock voltage, set the frequency with the EX-704.					
	1 <ul style="list-style-type: none"> <li>• Operating frequency: 174.000 MHz</li> <li>• Receiving</li> </ul>	MAIN	Connect the DC voltmeter to CP1.	4.5 V	MAIN (PLL BOARD)	L1
	2 <ul style="list-style-type: none"> <li>• Transmitting</li> </ul>			5.5 V		L3

### MAIN UNIT



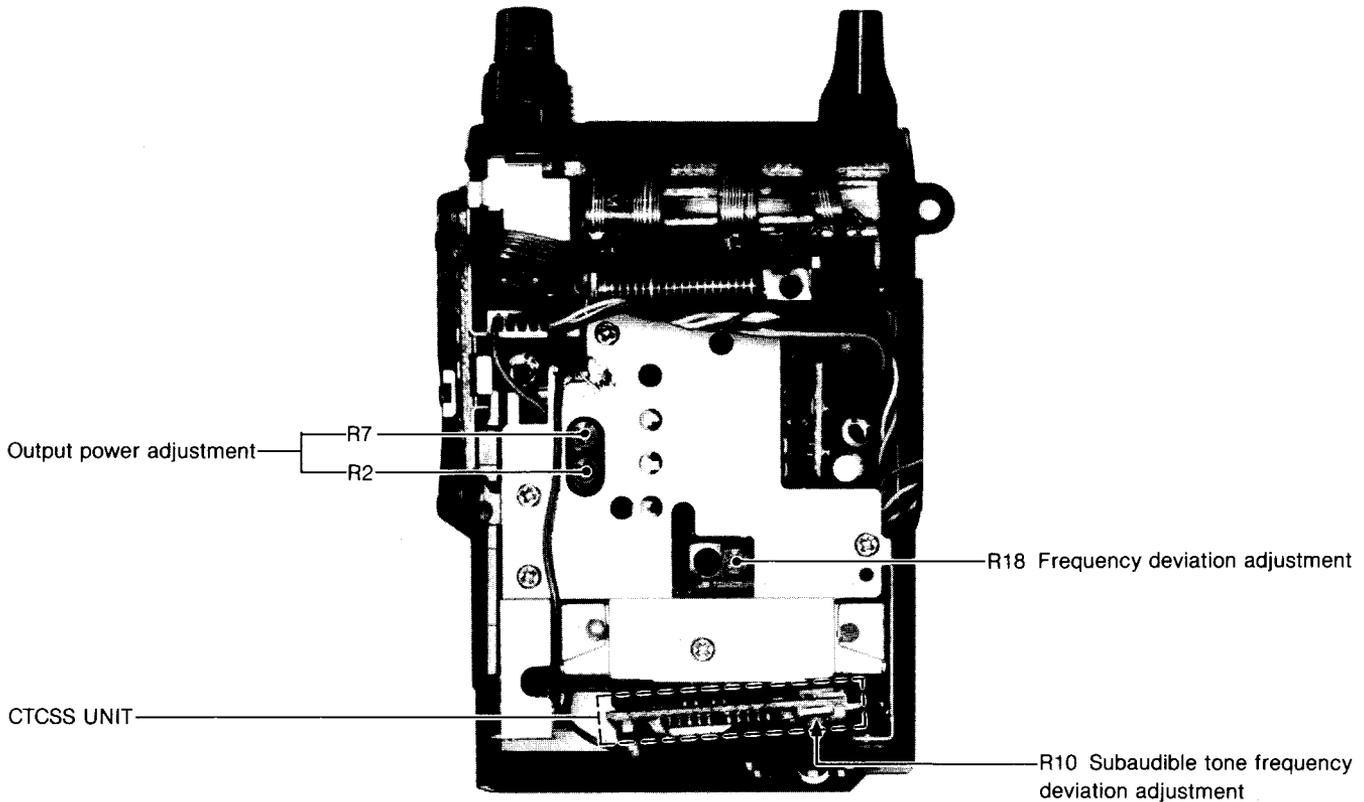
### PLL BOARD





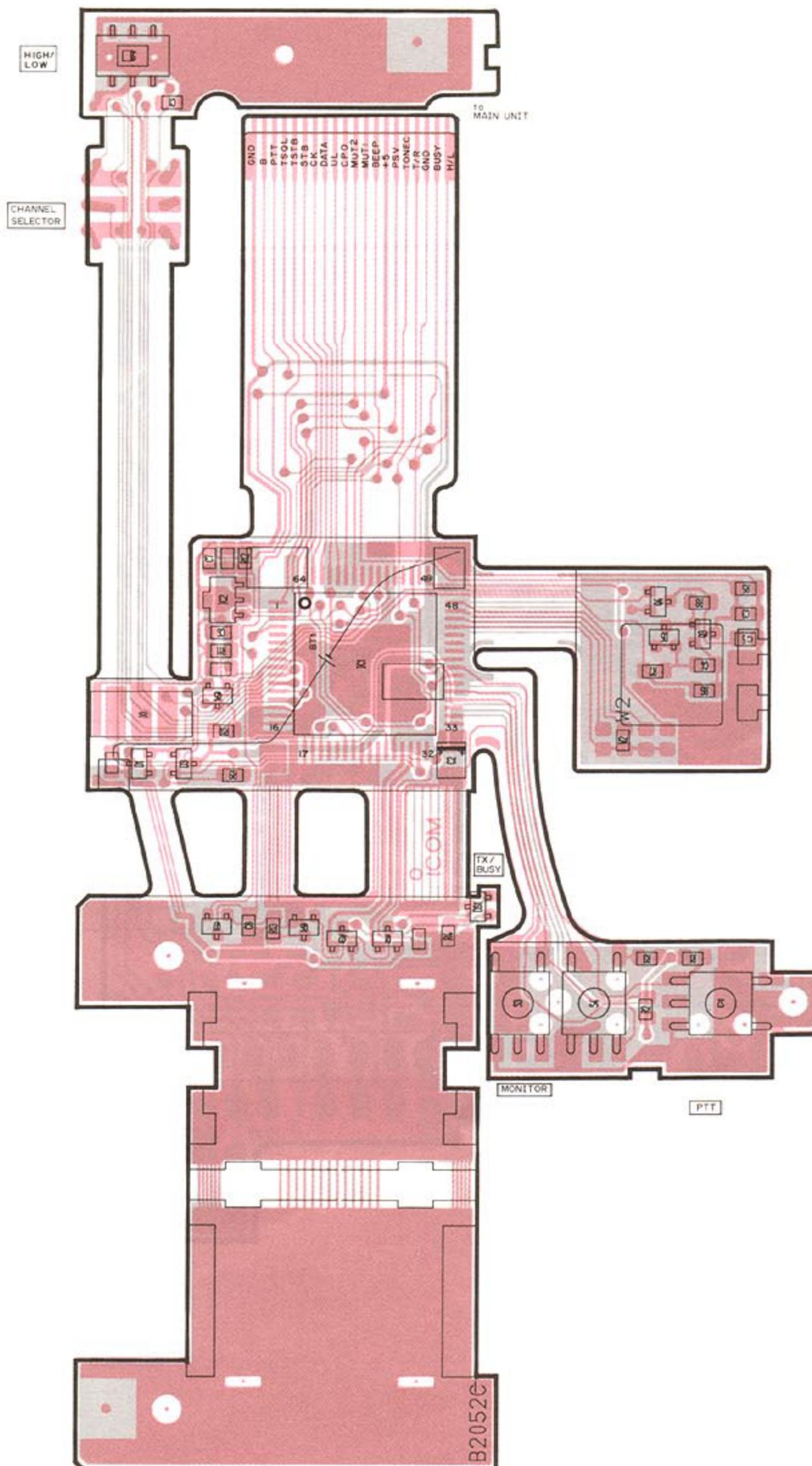
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1 <ul style="list-style-type: none"> <li>• Select any channel.</li> <li>• [HIGH/LOW] switch: HIGH</li> <li>• Transmitting</li> </ul>	Top panel	Connect the RF power meter to the antenna connector.	4.0 W	MAIN (APC BOARD)	R2
	2 <ul style="list-style-type: none"> <li>• [HIGH/LOW] switch: LOW</li> </ul>			1.0 W		R7
FREQUENCY DEVIATION	1 <ul style="list-style-type: none"> <li>• Select any channel.</li> <li>• Apply an AF signal to the [MIC] jack.: 1 kHz/250 mV</li> <li>• Set the FM deviation meter.</li> <li>HPF : OFF</li> <li>LPF : 20 kHz</li> <li>De-emphasis: OFF</li> <li>Detector : (P-P)/2</li> <li>• Transmitting</li> </ul>	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	±4.2 kHz	MAIN (MIC BOARD)	R18
	2 <ul style="list-style-type: none"> <li>• Apply an AF signal to the [MIC] jack.: 1 kHz/25 mV</li> </ul>			±2.4~3.6 kHz		Verify
SUBAUDIBLE TONE FREQUENCY DEVIATION	1 <ul style="list-style-type: none"> <li>• CHANNEL SELECTOR: Tone encoder programmed channel, if programmed.</li> <li>• Apply no AF signal to the [MIC] jack.</li> <li>• Transmitting</li> </ul>	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	±0.75 kHz	CTCSS	R10

## MAIN AND CTCSS UNITS

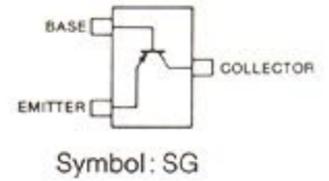


# SECTION 7 BOARD LAYOUTS

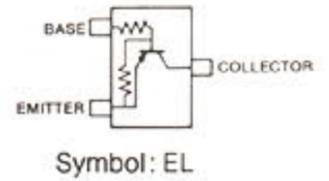
## 7-1 LOGIC UNIT



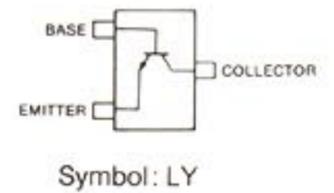
**2SA1162 GR**  
Q3, Q7



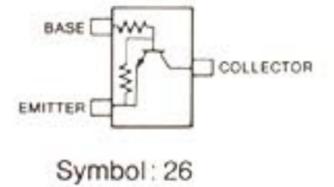
**2SA1344**  
Q1, Q2



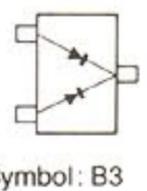
**2SC2712 Y**  
Q5



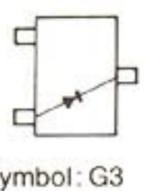
**DTC144EK**  
Q4, Q6



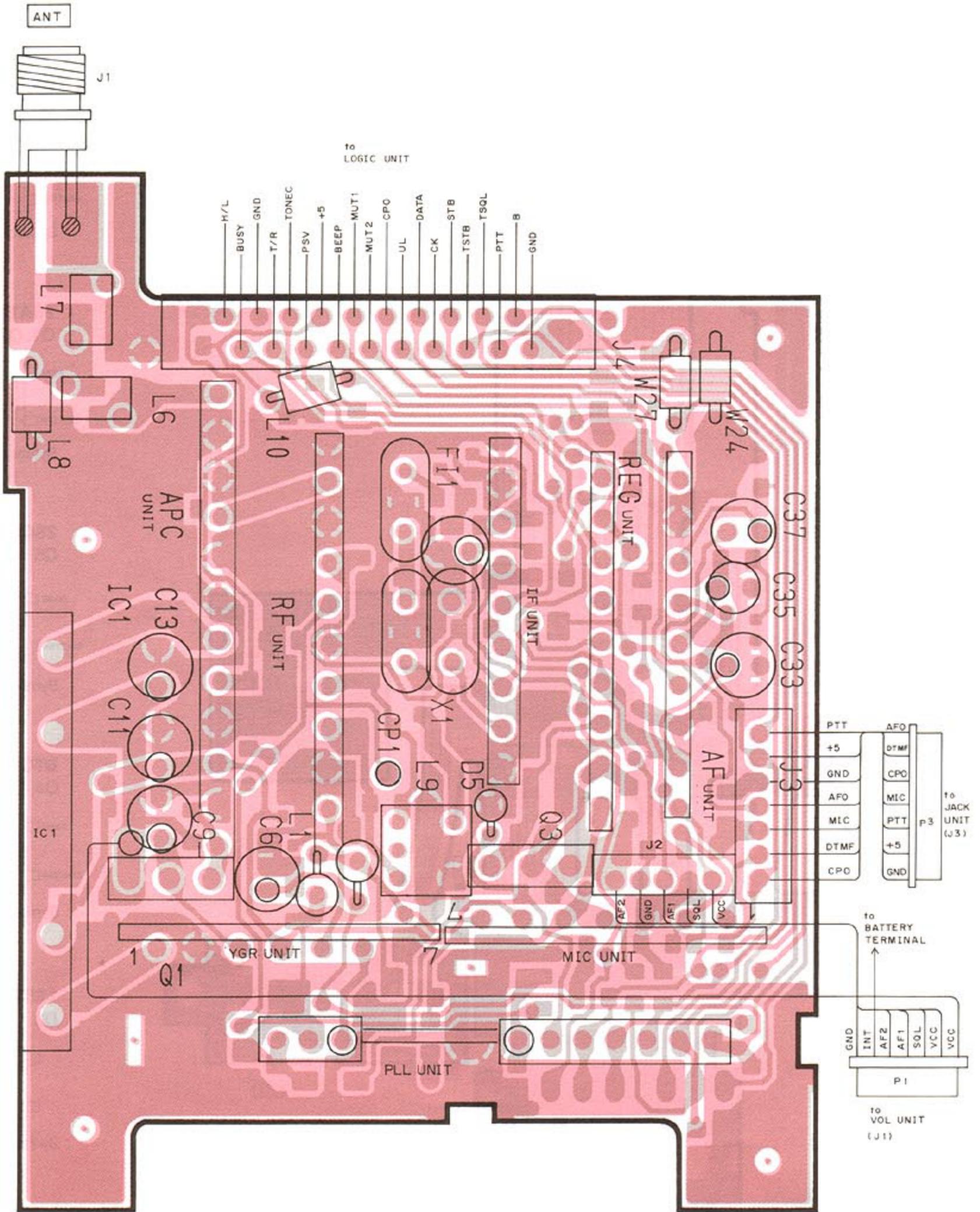
**1SS184**  
D3



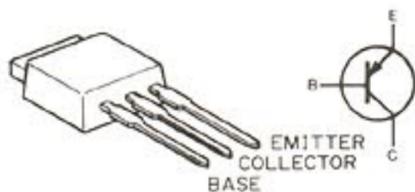
**1SS196**  
D1, D5



COMPONENT SIDE

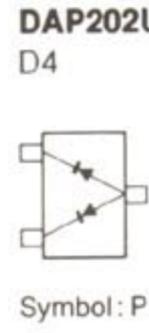
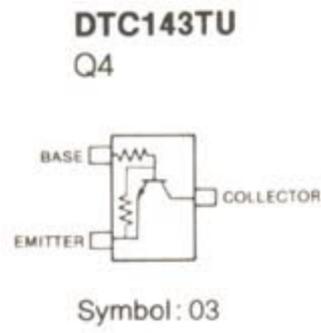
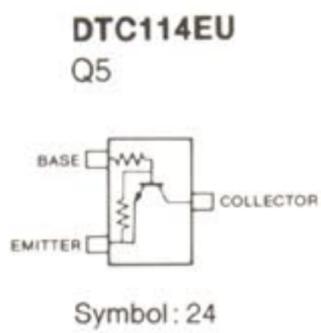
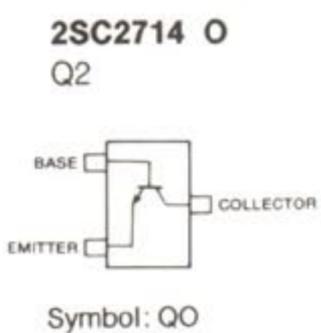
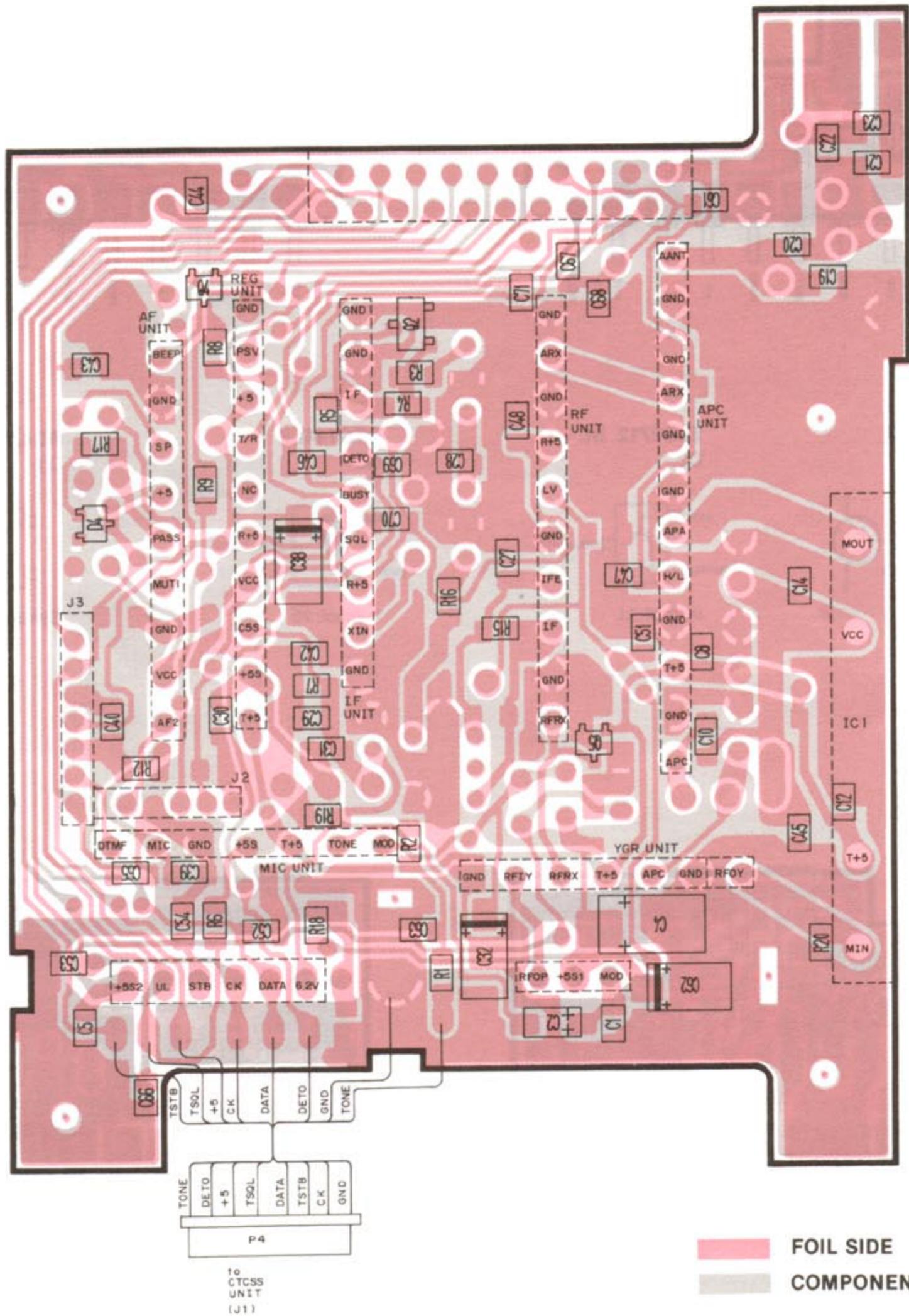


2SB1182 Q  
Q1, Q3



FOIL SIDE  
COMPONENT SIDE

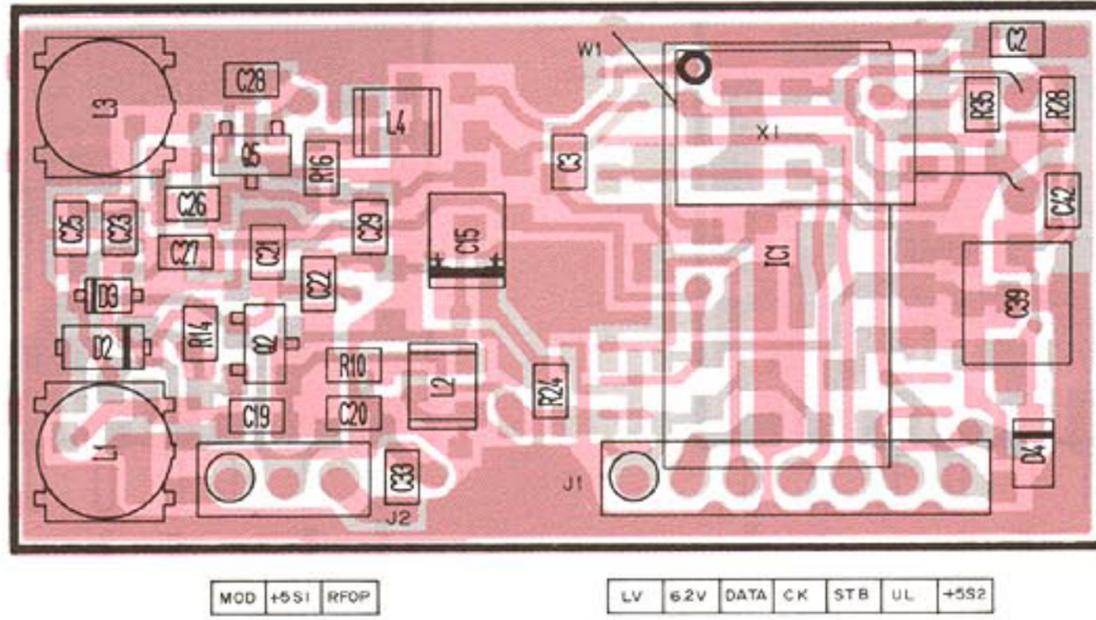
FOIL SIDE



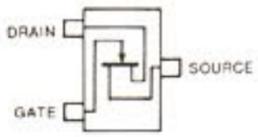




## • PLL UNIT

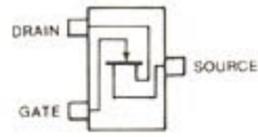


**2SK302 GR**  
Q2

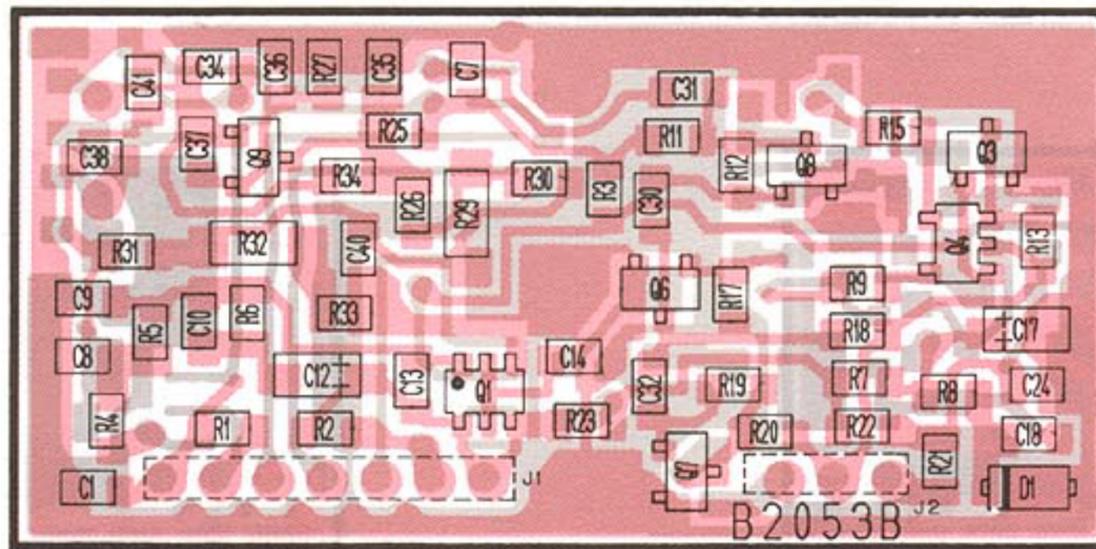


Symbol: TG

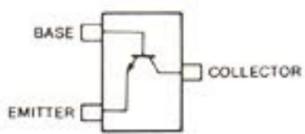
**2SK302 Y**  
Q5



Symbol: TY

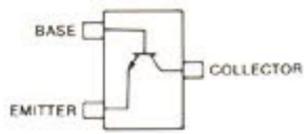


**2SC2712 Y**  
Q9



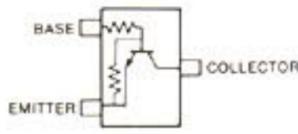
Symbol: LY

**2SC2714 Y**  
Q6, Q7, Q8



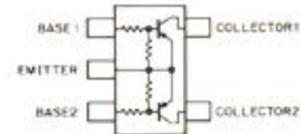
Symbol: QY

**DTC144EK**  
Q3



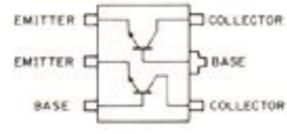
Symbol: 26

**FMA2**  
Q4



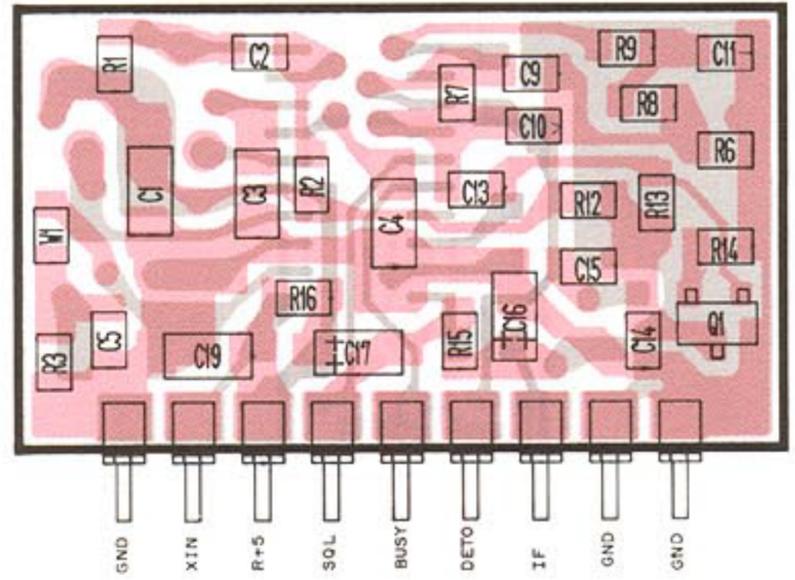
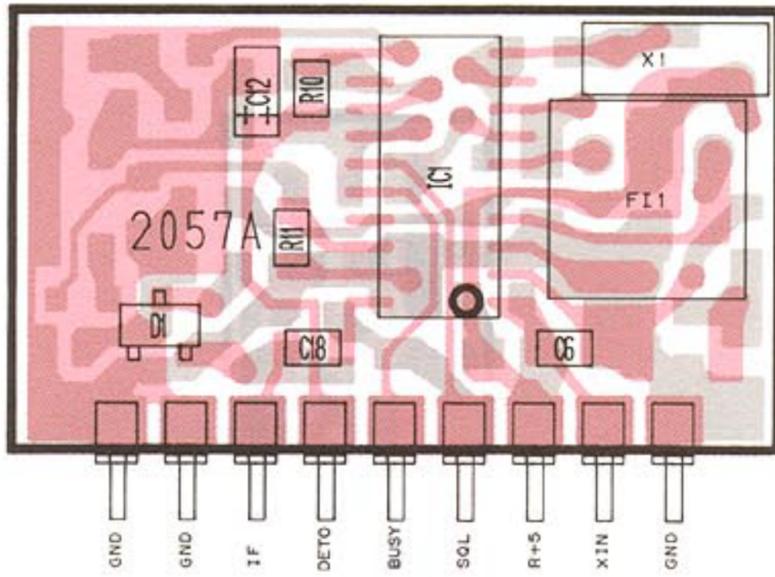
Symbol: A2

**XN6501**  
Q1

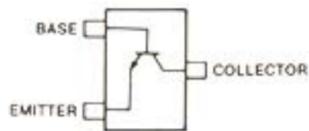


Symbol: 5N

## • IF UNIT

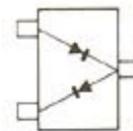


**2SC2712 GR**  
Q1



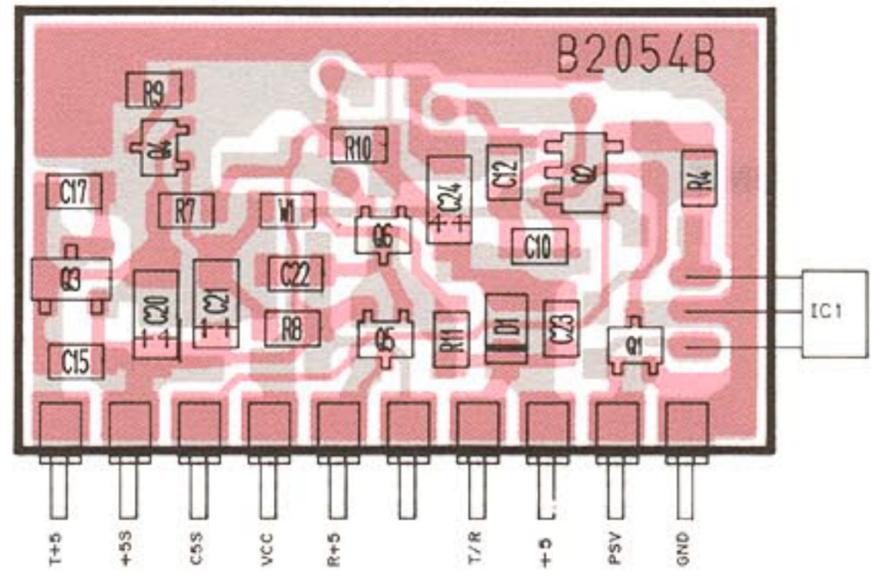
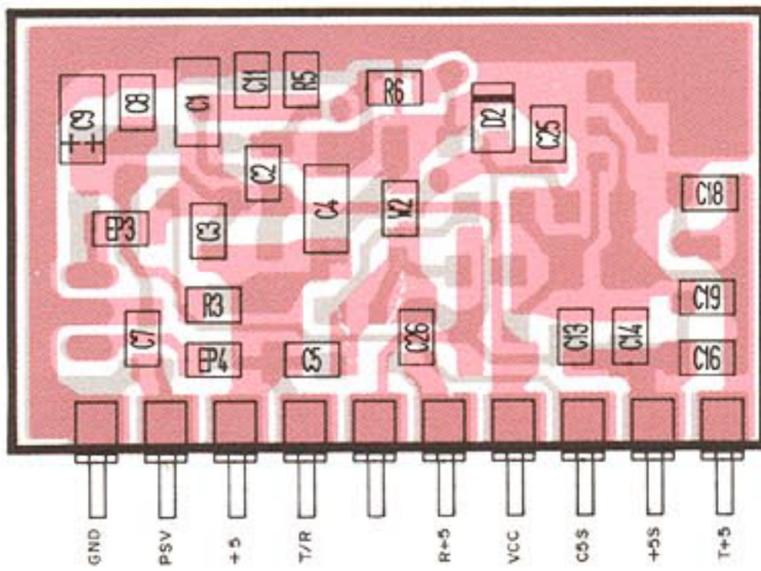
Symbol: LG

**HSM88AS**  
D1

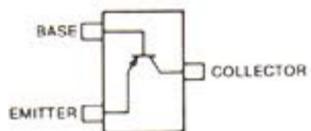


Symbol: C1

## • REG UNIT

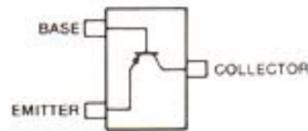


**2SA1298 Y**  
Q3



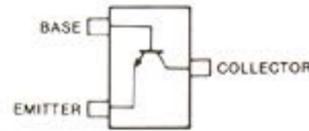
Symbol: IY

**2SA1576 R**  
Q4



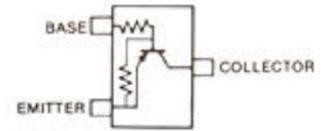
Symbol: FR

**2SC4081 R**  
Q6



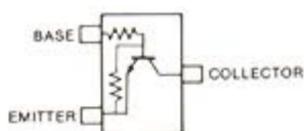
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**DTA113ZU**  
Q5



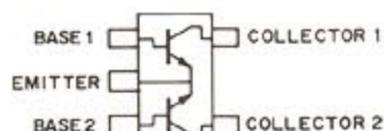
Symbol: 111

**DTC144EU**  
Q1



Symbol: 26

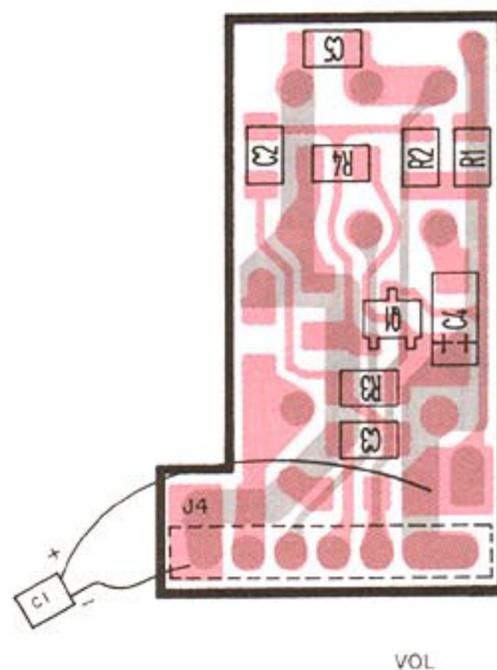
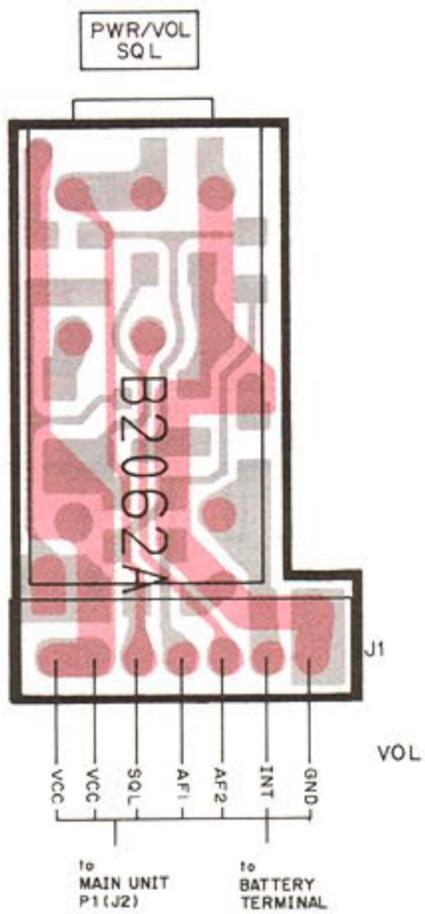
**FMW1**  
Q2



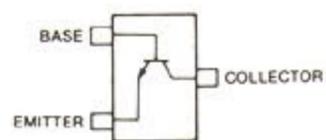
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# 7-7 VOL AND MIC UNITS

## • VOL UNIT

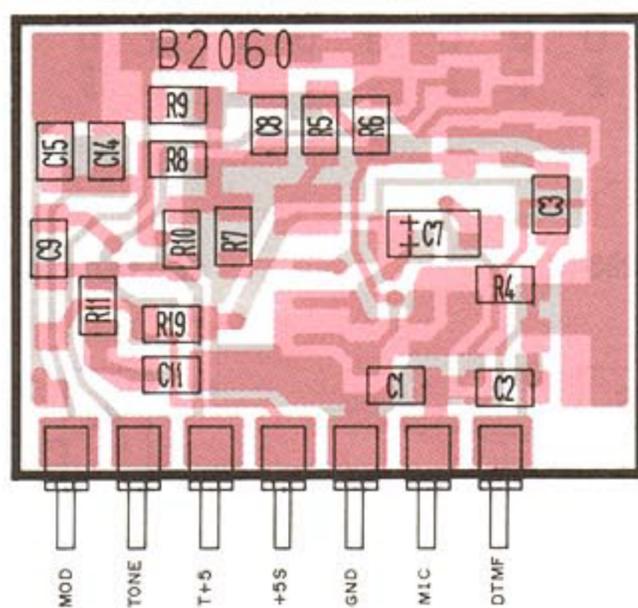
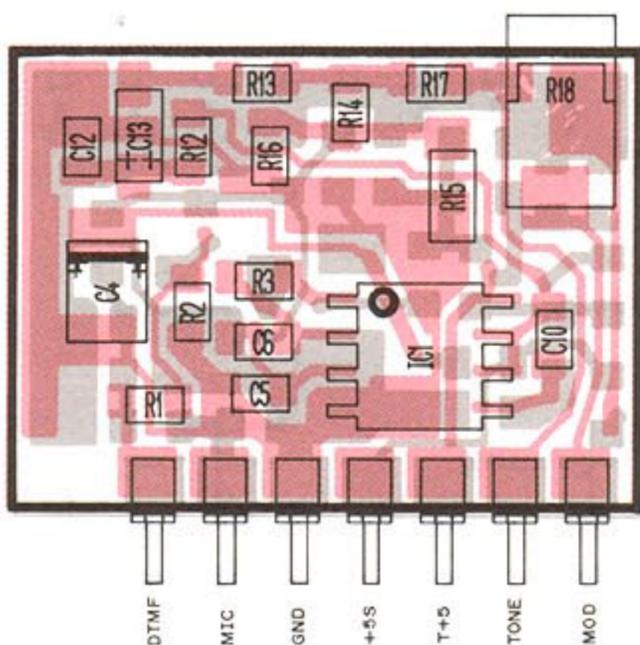


**2SC4081 R**  
Q1

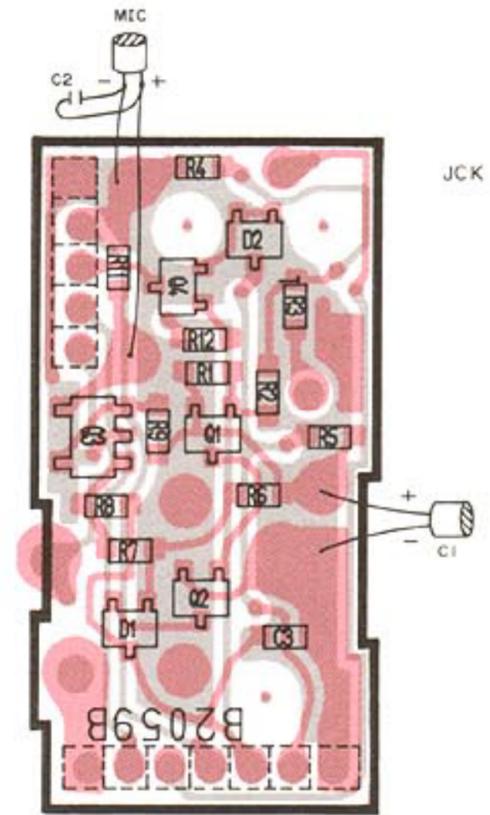
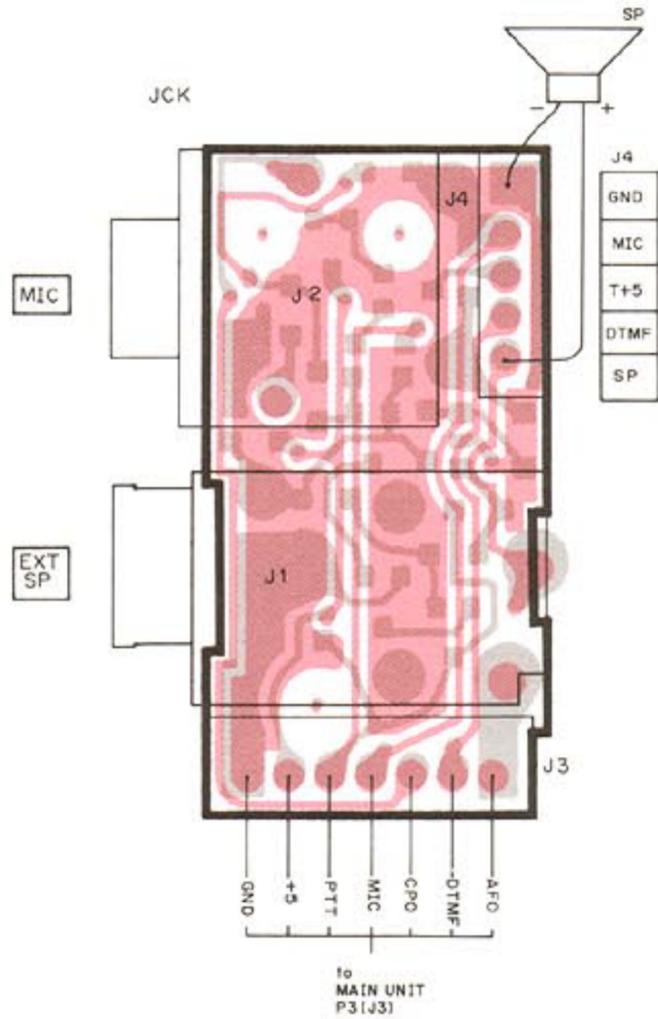


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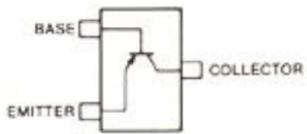
## • MIC UNIT



## • JCK UNIT

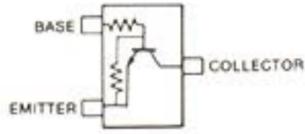


**2SA1576 R**  
Q1, Q4



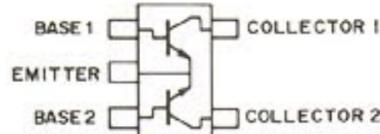
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**DTC144EU**  
Q2



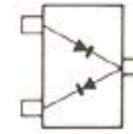
Symbol: 26

**FMW1**  
Q3



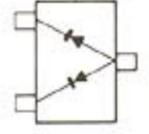
Symbol: W1

**DA204U**  
D1



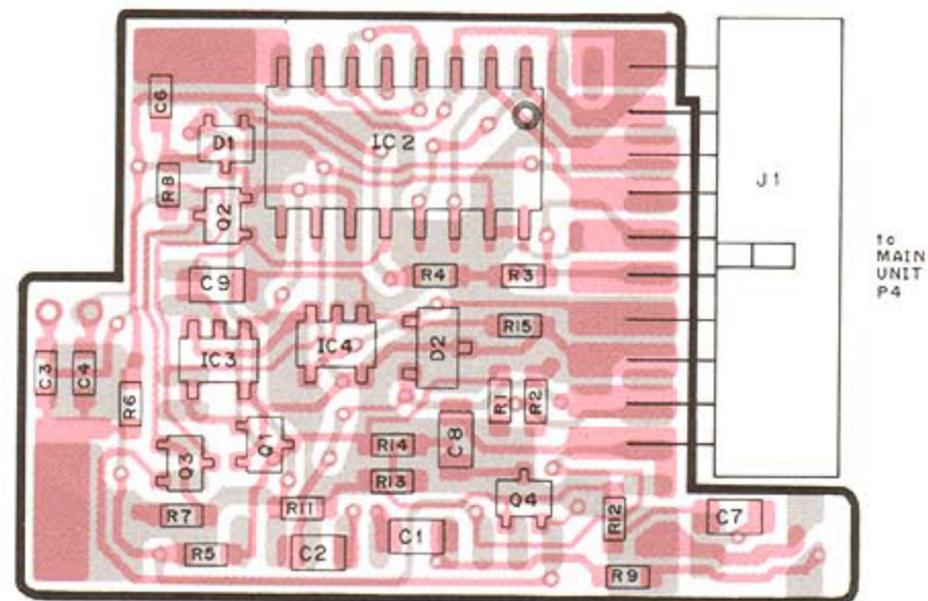
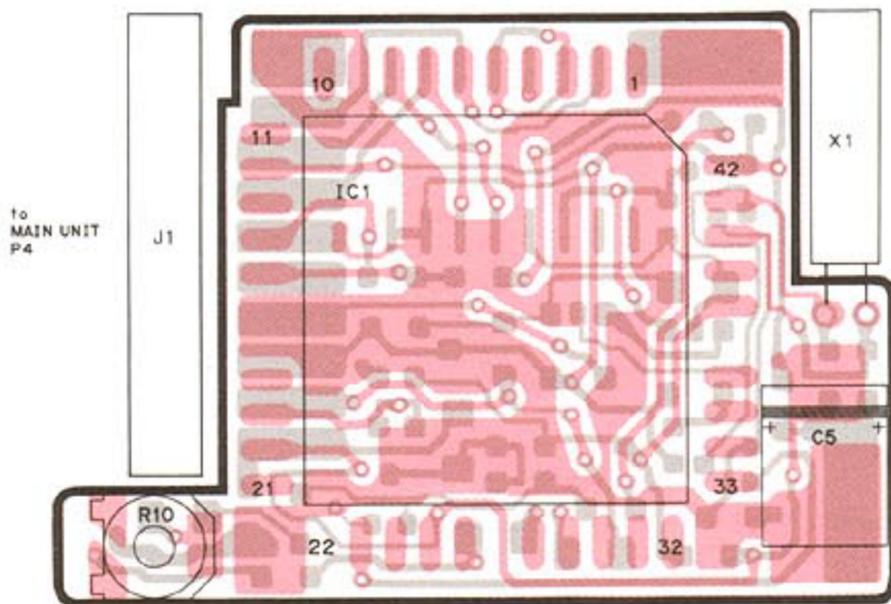
Symbol: K

**DAP202U**  
D2

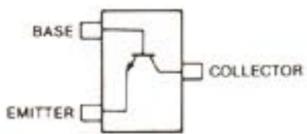


Symbol: P

## • CTCSS UNIT

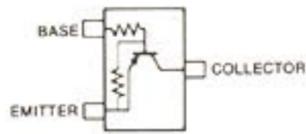


**2SC4081 R**  
Q4



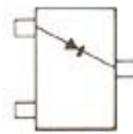
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**DTA144EU**  
Q1, Q2, Q3



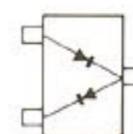
Symbol: 16

**1SS193**  
D2



Symbol: F3

**DA204U**  
D1



Symbol: K

## [LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140001080	IC	UPD75108AG-052-22
IC2	1110001500	IC	S-8054ALR-LN-T1
Q1	1510000660	Transistor	2SA1344-TA
Q2	1510000660	Transistor	2SA1344-TA
Q3	1510000500	Transistor	2SA1162-GR (TE85R)
Q4	1590000700	Transistor	DTC144EK T97
Q5	1530000160	Transistor	2SC2712-Y (TE85R)
Q6	1590000700	Transistor	DTC144EK T97
Q7	1510000500	Transistor	2SA1162-GR (TE85R)
D1	1750000060	Diode	1SS196 (TE85R)
D3	1750000020	Diode	1SS184 (TE85R)
D5	1750000060	Diode	1SS196 (TE85R)
X1	6060000230	Crystal	FAR-C4CA-04194000-M01
R1	7030000460	Resistor	MCR10EZHZ 4.7 K $\Omega$ (472)
R2	7030000580	Resistor	MCR10EZHZ 47 K $\Omega$ (473)
R3	7030000580	Resistor	MCR10EZHZ 47 K $\Omega$ (473)
R4	7030000290	Resistor	MCR10EZHZ 180 $\Omega$ (181)
R5	7030000580	Resistor	MCR10EZHZ 47 K $\Omega$ (473)
R6	7030000190	Resistor	MCR10EZHZ 27 $\Omega$ (270)
R7	7030000470	Resistor	MCR10EZHZ 5.6 K $\Omega$ (562)
R8	7030000580	Resistor	MCR10EZHZ 47 K $\Omega$ (473)
R9	7030000560	Resistor	MCR10EZHZ 33 K $\Omega$ (333)
R10	7030000580	Resistor	MCR10EZHZ 47 K $\Omega$ (473)
R11	7030000590	Resistor	MCR10EZHZ 56 K $\Omega$ (563)
R12	7030000530	Resistor	MCR10EZHZ 18 K $\Omega$ (183)
R13	7030000540	Resistor	MCR10EZHZ 22 K $\Omega$ (223)
C1	4030004720	Ceramic	C2012 B 1H 102K-T
C2	4550000740	Tantalum	TESVB2 0J 685M-8L
C3	4030004570	Ceramic	C2012 SL 1H 470J-T
C4	4030004570	Ceramic	C2012 SL 1H 470J-T
C5	4030004570	Ceramic	C2012 SL 1H 470J-T
C6	4030005090	Ceramic	C2012 B 1H 223K-T
C7	4030006450	Ceramic	C2012 F 1H 103Z-T
C8	4030004720	Ceramic	C2012 B 1H 102K-T
DS1	5040001110	LED	SLM-23VMWS T97 [TX/BUSY]
S1	2220000330	Switch	HSW0880-01-210 [HIGH/LOW]
S2	2260000600	Switch	SKHMPD004A [PTT]
S3	2260000600	Switch	SKHMPD004A [MONITOR]
S4	2260000600	Switch	SKHMPD004A [CLONE]
S5	2250000040	Switch	KSR16-0-20 [CHANNEL SELECTOR]
BT1	3020000100	Lithium Battery	CR2025-1T21
W2	7030000010	Jumper	MCR10EZHZ JPW (000)
EP1	0910021583	P.C. Board	B 2052C FX-768

## [MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1150000780	IC	SC1106
Q1	1520000350	Transistor	2SB1182 Q
Q2	1530002370	Transistor	2SC2714-O (TE85R)
Q3	1520000350	Transistor	2SB1182 Q
Q4	1590000790	Transistor	DTC143TU T107
Q5	1590000680	Transistor	DTC114EU T107
D4	1160000050	Diode	DAP202U T107
D5	1730001210	Zener	RD6.2JS B2
L1	6180000960	Coil	LAL 03NA 102K
L2	6180000960	Coil	LAL 03NA 102K
L6	6110002070	Coil	LA-227
L7	6110001540	Coil	LA-234
L8	6180001730	Coil	LAL 02NA 1R8K
L9	6150003140	Coil	LS-330
L10	6180001490	Coil	LAL 02KR 101K
Fl1	2010000200	Filter	21M15B3 (FL-42)
X1	6050002000	Crystal	CR-70
R1	7030000500	Resistor	MCR10EZHZ 10 K $\Omega$ (103)
R2	7030000690	Resistor	MCR10EZHZ 390 K $\Omega$ (394)
R3	7030000400	Resistor	MCR10EZHZ 1.5 K $\Omega$ (152)
R4	7030000720	Resistor	MCR10EZHZ 680 K $\Omega$ (684)
R5	7030000400	Resistor	MCR10EZHZ 1.5 K $\Omega$ (152)
R6	7030000580	Resistor	MCR10EZHZ 47 K $\Omega$ (473)
R7	7030000440	Resistor	MCR10EZHZ 3.3 K $\Omega$ (332)
R8	7030000380	Resistor	MCR10EZHZ 1 K $\Omega$ (102)
R9	7030000420	Resistor	MCR10EZHZ 2.2 K $\Omega$ (222)
R12	7030000140	Resistor	MCR10EZHZ 10 $\Omega$ (100)
R15	7030000430	Resistor	MCR10EZHZ 2.7 K $\Omega$ (272)
R16	7030000260	Resistor	MCR10EZHZ 100 $\Omega$ (101)
R17	7030000520	Resistor	MCR10EZHZ 15 K $\Omega$ (153)
R18	7030000380	Resistor	MCR10EZHZ 1 K $\Omega$ (102)
R19	7030000400	Resistor	MCR10EZHZ 1.5 K $\Omega$ (152)
R20	7030000280	Resistor	MCR10EZHZ 150 $\Omega$ (151)
C1	4030004610	Ceramic	C2012 SL 1H 101J-T
C2	4550002890	Tantalum	TESVA 1A 225M1-8L
C4	4550003060	Tantalum	TEMSVC 0J 336M1-12L
C5	4030004720	Ceramic	C2012 B 1H 102K-T
C6	4510003190	Electrolytic	6.3 RC2 47UF (D=4.0)
C8	4030004720	Ceramic	C2012 B 1H 102K-T
C9	4550000010	Tantalum	DN 1C 4R7M
C10	4030004720	Ceramic	C2012 B 1H 102K-T
C11	4510003350	Electrolytic	6 SC 6R8UF M
C12	4030004720	Ceramic	C2012 B 1H 102K-T
C13	4510003260	Electrolytic	16 SC 6R8UF M
C14	4030004720	Ceramic	C2012 B 1H 102K-T
C19	4030004470	Ceramic	C2012 SL 1H 100D-T
C20	4030004400	Ceramic	C2012 SL 1H 030C-T
C21	4030008480	Ceramic	C2012 SL 1H 240J-T
C22	4030004440	Ceramic	C2012 SL 1H 070D-T
C23	4030004460	Ceramic	C2012 SL 1H 090D-T
C27	4030004720	Ceramic	C2012 B 1H 102K-T
C28	4030004410	Ceramic	C2012 SL 1H 040C-T
C29	4030004720	Ceramic	C2012 B 1H 102K-T
C30	4030004720	Ceramic	C2012 B 1H 102K-T
C31	4030004720	Ceramic	C2012 B 1H 102K-T
C32	4550003050	Tantalum	TEMSVB 0J 156M1-12L

**[MAIN UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
C33	4510003260	Electrolytic	16 SC 6R8UF M
C34	4510003300	Electrolytic	6 SC 33UF M
C35	4510003190	Electrolytic	6.3 RC2 47UF (D=4.0)
C37	4550001950	Tantalum	DN 0J 101M
C38	4550003050	Tantalum	TEMSVB 0J 156M1-12L
C39	4030004720	Ceramic	C2012 B 1H 102K-T
C40	4030004720	Ceramic	C2012 B 1H 102K-T
C42	4030004720	Ceramic	C2012 B 1H 102K-T
C43	4030004720	Ceramic	C2012 B 1H 102K-T
C44	4030006450	Ceramic	C2012 F 1H 103Z-T
C45	4030004720	Ceramic	C2012 B 1H 102K-T
C46	4030005110	Ceramic	C2012 B 1E 473K-T
C47	4030004720	Ceramic	C2012 B 1H 102K-T
C48	4030004720	Ceramic	C2012 B 1H 102K-T
C51	4030004720	Ceramic	C2012 B 1H 102K-T
C52	4030004610	Ceramic	C2012 SL 1H 101J-T
C53	4030004610	Ceramic	C2012 SL 1H 101J-T
C54	4030004610	Ceramic	C2012 SL 1H 101J-T
C61	4030004570	Ceramic	C2012 SL 1H 470J-T
C62	4550003050	Tantalum	TEMSVB 0J 156M1-12L
C63	4030004750	Ceramic	C2012 B 1H 103K-T
C65	4030004710	Ceramic	C2012 B 1H 471K-T
C66	4030004710	Ceramic	C2012 B 1H 471K-T
C67	4030004570	Ceramic	C2012 SL 1H 470J-T
C68	4030004570	Ceramic	C2012 SL 1H 470J-T
C69	4030004710	Ceramic	C2012 B 1H 471K-T
C70	4030004710	Ceramic	C2012 B 1H 471K-T
C71	4030004570	Ceramic	C2012 SL 1H 470J-T
W24	7120000380	Jumper	JPW 01 R-01
W25	7120000380	Jumper	JPW 01 R-01
W27	7120000380	Jumper	JPW 01 R-01
J1	6510008930	Connector	TNC-R108
J4	6510007780	Connector	FCN-154J020-G/AA
CP1	6510003080	Check Point	RT01T-1.0B
EP5	0910021473	P.C. Board	B 2051C FX-768

**[AF UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110001720	IC	NJM386BM (T1)
Q1	1520000270	Transistor	2SB1182 F5 T201 Q
Q2	1530001940	Transistor	2SC2712-BL (TE85R)
Q3	1590000700	Transistor	DTC144EK T97
D1	1730000010	Zener	RD4.7M-T2B3
R1	7030000420	Resistor	MCR10EZHZ 2.2 KΩ (222)
R2	7030000320	Resistor	MCR10EZHZ 330 Ω (331)
R3	7030000140	Resistor	MCR10EZHZ 10 Ω (100)
R4	7030000570	Resistor	MCR10EZHZ 39 KΩ (393)
R5	7030000420	Resistor	MCR10EZHZ 2.2 KΩ (222)
R6	7030000520	Resistor	MCR10EZHZ 15 KΩ (153)
R7	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
R8	7030000340	Resistor	MCR10EZHZ 470 Ω (471)
R10	7030000520	Resistor	MCR10EZHZ 15 KΩ (153)

**[AF UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
C2	4030008490	Ceramic	C2012 B 1H 682K-T
C3	4030005110	Ceramic	C2012 B 1E 473K-T
C4	4550002960	Tantalum	TESVA 1C 155M1-8L
C5	4030004720	Ceramic	C2012 B 1H 102K-T
C7	4550003250	Tantalum	TEMSVA 1V 474M1-8L
C8	4550003150	Tantalum	TEMSVC 1C 156M1-12L
EP1	0910022411	P.C. Board	B 2061A
EP2	6910002720	Lead Frame	HFB2.54-0.9-8

**[APC UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1590000620	Transistor	FMS1 T98
Q2	1530001940	Transistor	2SC2712-BL (TE85R)
D1	1790000450	Diode	MA862 (TX)
D2	1790000490	Diode	HSM88AS-TR
D3	1790000490	Diode	HSM88AS-TR
D4	1750000080	Diode	1SS153-T2
L1	6110002070	Coil	LA-227
L2	6110002070	Coil	LA-227
L3	6110002070	Coil	LA-227
L4	6200000060	Coil	LQH 3N 1R5M
R1	7030000610	Resistor	MCR10EZHZ 82 KΩ (823)
R2	7310003050	Trimmer	RV-130 (RH04AVC15J 104)
R3	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
R4	7030000540	Resistor	MCR10EZHZ 22 KΩ (223)
R5	7030000620	Resistor	MCR10EZHZ 100 KΩ (104)
R6	7030000540	Resistor	MCR10EZHZ 22 KΩ (223)
R7	7310003010	Trimmer	RV-127 (RH04AVGJ4J 223)
R8	7030000460	Resistor	MCR10EZHZ 4.7 KΩ (472)
R9	7030000710	Resistor	MCR10EZHZ 560 KΩ (564)
R10	7030000470	Resistor	MCR10EZHZ 5.6 KΩ (562)
R11	7030000510	Resistor	MCR10EZHZ 12 KΩ (123)
R12	7030000410	Resistor	MCR10EZHZ 1.8 KΩ (182)
R13	7030000410	Resistor	MCR10EZHZ 1.8 KΩ (182)
R14	7030000510	Resistor	MCR10EZHZ 12 KΩ (123)
R15	7030000270	Resistor	MCR10EZHZ 120 Ω (121)
C1	4030004710	Ceramic	C2012 B 1H 471K-T
C2	4030004710	Ceramic	C2012 B 1H 471K-T
C3	4030004710	Ceramic	C2012 B 1H 471K-T
C4	4030004710	Ceramic	C2012 B 1H 471K-T
C5	4550000450	Tantalum	TESVC 1C 106M-12L
C7	4030004520	Ceramic	C2012 SL 1H 220J-T
C8	4030004560	Ceramic	C2012 SL 1H 390J-T
C9	4030004520	Ceramic	C2012 SL 1H 220J-T
C10	4030004720	Ceramic	C2012 B 1H 102K-T
C11	4030004720	Ceramic	C2012 B 1H 102K-T
C12	4030004720	Ceramic	C2012 B 1H 102K-T
C13	4030004480	Ceramic	C2012 SL 1H 120J-T
C14	4030004480	Ceramic	C2012 SL 1H 120J-T
EP1	0910022382	P.C. Board	B 2056B
EP2	6910002720	Lead Frame	HFB2.54-0.9-8 (N)

**[RF UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002240	Transistor	2SC3775-3-TA
Q2	1530002600	Transistor	2SC4215-O (TE85R)
Q3	1560000270	Transistor	2SK302-Y (TE85R)
D1	1790000530	Diode	MA333 (TW)
D2	1790000530	Diode	MA333 (TW)
D3	1790000530	Diode	MA333 (TW)
D4	1790000530	Diode	MA333 (TW)
D5	1790000530	Diode	MA333 (TW)
L1	6130001900	Coil	LB-194
L2	6150003420	Coil	LS-349
L3	6150003420	Coil	LS-349
L4	6150003420	Coil	LS-349
R1	7030000630	Resistor	MCR10EZHZ 120 KΩ (124)
R2	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
R3	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
R4	7030000300	Resistor	MCR10EZHZ 220 Ω (221)
R5	7030000260	Resistor	MCR10EZHZ 100 Ω (101)
R6	7030000380	Resistor	MCR10EZHZ 1 KΩ (102)
R7	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
R8	7030000220	Resistor	MCR10EZHZ 47 Ω (470)
R9	7030000630	Resistor	MCR10EZHZ 120 KΩ (124)
R10	7030000630	Resistor	MCR10EZHZ 120 KΩ (124)
R11	7030000630	Resistor	MCR10EZHZ 120 KΩ (124)
R12	7030000220	Resistor	MCR10EZHZ 47 Ω (470)
R13	7030000330	Resistor	MCR10EZHZ 390 Ω (391)
R14	7030000220	Resistor	MCR10EZHZ 47 Ω (470)
R15	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
C1	4030004590	Ceramic	C2012 SL 1H 680J-T
C2	4030004450	Ceramic	C2012 SL 1H 080D-T
C3	4030004720	Ceramic	C2012 B 1H 102K-T
C4	4030004720	Ceramic	C2012 B 1H 102K-T
C5	4030004720	Ceramic	C2012 B 1H 102K-T
C6	4030004380	Ceramic	C2012 SL 1H 010C-T
C7	4030004460	Ceramic	C2012 SL 1H 090D-T
C8	4030004370	Ceramic	C2012 SL 1H 0R5C-T
C9	4030004470	Ceramic	C2012 SL 1H 100D-T
C10	4030004390	Ceramic	C2012 SL 1H 020C-T
C11	4030004370	Ceramic	C2012 SL 1H 0R5C-T
C12	4030004470	Ceramic	C2012 SL 1H 100D-T
C13	4030004720	Ceramic	C2012 B 1H 102K-T
C14	4030004720	Ceramic	C2012 B 1H 102K-T
C15	4030004720	Ceramic	C2012 B 1H 102K-T
C16	4030004720	Ceramic	C2012 B 1H 102K-T
C17	4030004720	Ceramic	C2012 B 1H 102K-T
C18	4030004720	Ceramic	C2012 B 1H 102K-T
C19	4030004720	Ceramic	C2012 B 1H 102K-T
C20	4030004720	Ceramic	C2012 B 1H 102K-T
C21	4030004710	Ceramic	C2012 B 1H 471K-T
W1	7030000010	Jumper	MCR10EZHZ JPW (000)
EP1	0910021762	P.C. Board	B 2055B (#768-1A)
EP2	6910002720	Lead Frame	HFB2.54-0.9-8 (N)

**[YGR UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530001750	Transistor	2SC3585-T2B
Q2	1530002340	Transistor	2SC2954-T2B
D1	1750000140	Diode	1SS268 (TE85R)
D2	1750000070	Diode	1SS226 (TE85R)
L1	6200000770	Coil	LQN 2A 68NM
L2	6200000770	Coil	LQN 2A 68NM
R1	7030000420	Resistor	MCR10EZHZ 2.2 KΩ (222)
R2	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
R3	7030000220	Resistor	MCR10EZHZ 47 Ω (470)
R4	7030000230	Resistor	MCR10EZHZ 56 Ω (560)
R5	7030000420	Resistor	MCR10EZHZ 2.2 KΩ (222)
R6	7030000380	Resistor	MCR10EZHZ 1 KΩ (102)
R7	7030000220	Resistor	MCR10EZHZ 47 Ω (470)
R8	7030000140	Resistor	MCR10EZHZ 10 Ω (100)
R9	7030000420	Resistor	MCR10EZHZ 2.2 KΩ (222)
C1	4030004720	Ceramic	C2012 B 1H 102K-T
C2	4030004710	Ceramic	C2012 B 1H 471K-T
C3	4030004720	Ceramic	C2012 B 1H 102K-T
C4	4030004480	Ceramic	C2012 SL 1H 120J-T
C5	4030004720	Ceramic	C2012 B 1H 102K-T
C6	4030004710	Ceramic	C2012 B 1H 471K-T
C7	4030004480	Ceramic	C2012 SL 1H 120J-T
C8	4030004710	Ceramic	C2012 B 1H 471K-T
C9	4030004710	Ceramic	C2012 B 1H 471K-T
W1	7030000010	Jumper	MCR10EZHZ JPW (000)
EP1	0910022401	P.C. Board	B 2058A
EP2	6910002720	Lead Frame	HFB2.54-0.9-8 (N)

**[PLL UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1120001550	IC	M54959FP
Q1	1590000810	Transistor	XN6501 (TX)
Q2	1560000430	FET	2SK302-GR (TE85R)
Q3	1590000700	Transistor	DTC144EK T97
Q4	1590000970	Transistor	FMA2 T98
Q5	1560000270	FET	2SK302-Y (TE85R)
Q6	1530002360	Transistor	2SC2714-Y (TE85R)
Q7	1530002360	Transistor	2SC2714-Y (TE85R)
Q8	1530002360	Transistor	2SC2714-Y (TE85R)
Q9	1530000180	Transistor	2SC2712-Y (TE85R)
D1	1790000540	Diode	MA338 (TX)
D2	1790000460	Diode	MA334B (TX)
D3	1790000640	Diode	MA363B (TX)
D4	1720000220	Diode	1SV166-T2B
L1	6130002000	Coil	LB-204
L2	6200000860	Coil	LQH 3N 1R8M
L3	6130002000	Coil	LB-204
L4	6200000860	Coil	LQH 3N 1R8M

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
X1	6050005970	Crystal	CR-287
R1	7030000620	Resistor	MCR10EZHJ 100 KΩ (104)
R2	7030000500	Resistor	MCR10EZHJ 10 KΩ (103)
R3	7030000540	Resistor	MCR10EZHJ 22 KΩ (223)
R4	7030000430	Resistor	MCR10EZHJ 2.7 KΩ (272)
R5	7030000430	Resistor	MCR10EZHJ 2.7 KΩ (272)
R6	7030000520	Resistor	MCR10EZHJ 15 KΩ (153)
R7	7030000470	Resistor	MCR10EZHJ 5.6 KΩ (562)
R8	7030000390	Resistor	MCR10EZHJ 1.2 KΩ (122)
R9	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R10	7030000140	Resistor	MCR10EZHJ 10 Ω (100)
R11	7030000360	Resistor	MCR10EZHJ 680 Ω (681)
R12	7030000600	Resistor	MCR10EZHJ 68 KΩ (683)
R13	7030000580	Resistor	MCR10EZHJ 47 KΩ (473)
R14	7030000390	Resistor	MCR10EZHJ 1.2 KΩ (122)
R15	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
R16	7030000140	Resistor	MCR10EZHJ 10 Ω (100)
R17	7030000620	Resistor	MCR10EZHJ 100 KΩ (104)
R18	7030000380	Resistor	MCR10EZHJ 1 KΩ (102)
R19	7030000620	Resistor	MCR10EZHJ 100 KΩ (104)
R20	7030000340	Resistor	MCR10EZHJ 470 Ω (471)
R21	7030000650	Resistor	MCR10EZHJ 180 KΩ (184)
R22	7030000710	Resistor	MCR10EZHJ 560 KΩ (564)
R23	7030000390	Resistor	MCR10EZHJ 1.2 KΩ (122)
R24	7030000360	Resistor	MCR10EZHJ 680 Ω (681)
R25	7030000230	Resistor	MCR10EZHJ 56 Ω (560)
R26	7030000480	Resistor	MCR10EZHJ 6.8 KΩ (682)
R27	7030000400	Resistor	MCR10EZHJ 1.5 KΩ (152)
R28	7030000620	Resistor	MCR10EZHJ 100 KΩ (104)
R29	7510000170	Thermistor	157-252-13013-TP
R30	7030000460	Resistor	MCR10EZHJ 4.7 KΩ (472)
R31	7030000500	Resistor	MCR10EZHJ 10 KΩ (103)
R32	7510000170	Thermistor	157-252-13013-TP
R33	7030000520	Resistor	MCR10EZHJ 15 KΩ (153)
R34	7030000620	Resistor	MCR10EZHJ 100 KΩ (104)
R35	7030000640	Resistor	MCR10EZHJ 150 KΩ (154)
C1	4030004750	Ceramic	C2012 B 1H 103K-T
C2	4030004720	Ceramic	C2012 B 1H 102K-T
C3	4030004720	Ceramic	C2012 B 1H 102K-T
C7	4030004720	Ceramic	C2012 B 1H 102K-T
C8	4030005090	Ceramic	C2012 B 1H 223K-T
C9	4030004610	Ceramic	C2012 SL 1H 101J-T
C10	4030004750	Ceramic	C2012 B 1H 103K-T
C12	4550000420	Tantalum	TESVA 1A 105M1-8L
C13	4030004750	Ceramic	C2012 B 1H 103K-T
C14	4030004710	Ceramic	C2012 B 1H 471K-T
C15	4550000280	Tantalum	TESVB2 1A 475M-8L
C17	4550000530	Tantalum	TESVA 1V 104M1-8L
C18	4030004610	Ceramic	C2012 SL 1H 101J-T
C19	4030004870	Ceramic	C2012 CH 1H 100D-T
C20	4030004850	Ceramic	C2012 CH 1H 080D-T
C21	4030004720	Ceramic	C2012 B 1H 102K-T
C22	4030004370	Ceramic	C2012 SL 1H 0R5C-T
C23	4030004620	Ceramic	C2012 SL 1H 121J-T
C24	4030004820	Ceramic	C2012 CH 1H 050C-T
C25	4030004800	Ceramic	C2012 CH 1H 030C-T
C26	4030004880	Ceramic	C2012 CH 1H 120J-T
C27	4030004820	Ceramic	C2012 CH 1H 050C-T
C28	4030004720	Ceramic	C2012 B 1H 102K-T
C29	4030004370	Ceramic	C2012 SL 1H 0R5C-T
C30	4030004410	Ceramic	C2012 SL 1H 040C-T
C31	4030004440	Ceramic	C2012 SL 1H 070D-T
C32	4030004470	Ceramic	C2012 SL 1H 100D-T
C33	4030004500	Ceramic	C2012 SL 1H 180J-T
C34	4030004720	Ceramic	C2012 B 1H 102K-T
C35	4030004720	Ceramic	C2012 B 1H 102K-T
C36	4030004610	Ceramic	C2012 SL 1H 101J-T
C37	4030004660	Ceramic	C2012 SL 1H 221J-T
C38	4030004930	Ceramic	C2012 CH 1H 330J-T
C39	4610001260	Trimmer	ECRJA020E12W
C40	4030004720	Ceramic	C2012 B 1H 102K-T

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C41	4030004810	Ceramic	C2012 CH 1H 040C-T
C42	4030004800	Ceramic	C2012 CH 1H 030C-T
W1	7120000380	Jumper	JPW 01 R-01
J1	6510007870	Connector	TKX-P07P-A1
J2	6510007880	Connector	TKX-P03P-A1
EP1	0910021222	P.C. Board	B 2053B

[IF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110001960	IC	TK10487M B
Q1	1530001950	Transistor	2SC2712-GR (TE85R)
D1	1790000490	Diode	HSM88AS-TR
F11	2020000550	Filter	CFUM455E
X1	6070000060	Crystal	CDBM455C7
R1	7030000420	Resistor	MCR10EZHJ 2.2 KΩ (222)
R2	7030000390	Resistor	MCR10EZHJ 1.2 KΩ (122)
R3	7030000620	Resistor	MCR10EZHJ 100 KΩ (104)
R6	7030000400	Resistor	MCR10EZHJ 1.5 KΩ (152)
R7	7030000610	Resistor	MCR10EZHJ 82 KΩ (823)
R8	7030000360	Resistor	MCR10EZHJ 680 Ω (681)
R9	7030000440	Resistor	MCR10EZHJ 3.3 KΩ (332)
R10	7030000480	Resistor	MCR10EZHJ 6.8 KΩ (682)
R11	7030000340	Resistor	MCR10EZHJ 470 Ω (471)
R12	7030000440	Resistor	MCR10EZHJ 3.3 KΩ (332)
R13	7030000670	Resistor	MCR10EZHJ 270 KΩ (274)
R14	7030000380	Resistor	MCR10EZHJ 1 KΩ (102)
R15	7030000550	Resistor	MCR10EZHJ 27 KΩ (273)
R16	7030000260	Resistor	MCR10EZHJ 100 Ω (101)
C1	4030005140	Ceramic	C3216 B 1E 104K-T
C2	4030004600	Ceramic	C2012 SL 1H 820J-T
C3	4030005140	Ceramic	C3216 B 1E 104K-T
C4	4030005140	Ceramic	C3216 B 1E 104K-T
C5	4030004590	Ceramic	C2012 SL 1H 680J-T
C6	4030004610	Ceramic	C2012 SL 1H 101J-T
C9	4030004720	Ceramic	C2012 B 1H 102K-T
C10	4030004720	Ceramic	C2012 B 1H 102K-T
C11	4030004720	Ceramic	C2012 B 1H 102K-T
C12	4550000530	Tantalum	TESVA 1V 104M1-8L
C13	4030004720	Ceramic	C2012 B 1H 102K-T
C14	4030004720	Ceramic	C2012 B 1H 102K-T
C15	4030005090	Ceramic	C2012 B 1H 223K-T
C16	4550002960	Tantalum	TESVA 1C 155M1-8L
C17	4550000460	Tantalum	TESVA 1C 105M1-8L
C18	4030005090	Ceramic	C2012 B 1E 223K-T
C19	4030005140	Ceramic	C3216 B 1E 104K-T
W1	7030000010	Jumper	MCR10EZHJ JPW (000)
EP1	0910022391	P.C. Board	B 2057A
EP2	6910002720	Lead Frame	HFB2.54-0.9-8

**[REG UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1180000510	IC	LP2950CZ-5.0
Q1	1590000430	Transistor	DTC144EU T107
Q2	1590000670	Transistor	FMW1 T98
Q3	1510000600	Transistor	2SA1298-Y (TE85R)
Q4	1510000510	Transistor	2SA1576 T107 R
Q5	1590001040	Transistor	DTA113ZU T107
Q6	1530002060	Transistor	2SC4081 T107 R
D1	1790000590	Diode	MA110 (TW)
D2	1790000590	Diode	MA110 (TW)
R3	7030000460	Resistor	MCR10EZHZ 4.7 KΩ (472)
R4	7030000380	Resistor	MCR10EZHZ 1 KΩ (102)
R5	7030000430	Resistor	MCR10EZHZ 2.7 KΩ (272)
R6	7030000460	Resistor	MCR10EZHZ 4.7 KΩ (472)
R7	7030000580	Resistor	MCR10EZHZ 47 KΩ (473)
R8	7030000500	Resistor	MCR10EZHZ 10 KΩ (103)
R9	7030000430	Resistor	MCR10EZHZ 2.7 KΩ (272)
R10	7030000540	Resistor	MCR10EZHZ 22 KΩ (223)
R11	7030000530	Resistor	MCR10EZHZ 18 KΩ (183)
C1	4030005140	Ceramic	C3216 B 1E 104K-T
C2	4030004710	Ceramic	C2012 B 1H 471K-T
C3	4030004710	Ceramic	C2012 B 1H 471K-T
C4	4030005140	Ceramic	C3216 B 1E 104K-T
C5	4030004710	Ceramic	C2012 B 1H 471K-T
C7	4030004710	Ceramic	C2012 B 1H 471K-T
C8	4030004710	Ceramic	C2012 B 1H 471K-T
C9	4550000460	Tantalum	TESVA 1C 105M1-8L
C10	4030004720	Ceramic	C2012 B 1H 102K-T
C11	4030004720	Ceramic	C2012 B 1H 102K-T
C12	4030004720	Ceramic	C2012 B 1H 102K-T
C13	4030004760	Ceramic	C2012 F 1E 104Z-T
C14	4030004710	Ceramic	C2012 B 1H 471K-T
C15	4030004710	Ceramic	C2012 B 1H 471K-T
C16	4030004710	Ceramic	C2012 B 1H 471K-T
C17	4030004710	Ceramic	C2012 B 1H 471K-T
C18	4030006450	Ceramic	C2012 F 1H 103Z-T
C19	4030004710	Ceramic	C2012 B 1H 471K-T
C20	4550000460	Tantalum	TESVA 1C 105M1-8L
C21	4550002960	Tantalum	TESVA 1C 155M1-8L
C22	4030004710	Ceramic	C2012 B 1H 471K-T
C23	4030004710	Ceramic	C2012 B 1H 471K-T
C24	4550003290	Tantalum	TESVA 0G 475M1-8L
C25	4030004710	Ceramic	C2012 B 1H 471K-T
C26	4030004710	Ceramic	C2012 B 1H 471K-T
W1	7030000010	Jumper	MCR10EZHZ JPW (000)
W2	7030000010	Jumper	MCR10EZHZ JPW (000)
EP1	0910022372	P.C. Board	B 2054B

**[VOL UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002060	Transistor	2SC4081 T107 R
R1	7030000380	Resistor	MCR10EZHZ 1 KΩ (102)
R2	7030000620	Resistor	MCR10EZHZ 100 KΩ (104)
R3	7030000480	Resistor	MCR10EZHZ 6.8 KΩ (682)
R4	7030000420	Resistor	MCR10EZHZ 2.2 KΩ (222)

**[VOL UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
R5	7210001510	Variable Resistor	RK0972211007A [POW/VOL SQL]
C1	4510003170	Electrolytic	16 RC2 47UF (D=5.0)
C2	4030005110	Ceramic	C2012 B 1E 473K-T
C3	4030005090	Ceramic	C2012 B 1H 223K-T
C4	4550000460	Tantalum	TESVA 1C 105M1-8L
C5	4030004710	Ceramic	C2012 B 1H 471K-T
J1	6510007860	Connector	PI28A-07M
EP1	0910022621	P.C. Board	B 2062A

**[MIC UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110001220	IC	BA4558F T1
R1	7030000540	Resistor	MCR10EZHZ 22 KΩ (223)
R2	7030000350	Resistor	MCR10EZHZ 560 Ω (561)
R3	7030000640	Resistor	MCR10EZHZ 150 KΩ (154)
R4	7030000580	Resistor	MCR10EZHZ 47 KΩ (473)
R5	7030000650	Resistor	MCR10EZHZ 180 KΩ (184)
R6	7030001750	Resistor	MCR10EZHZ 240 KΩ (244)
R7	7030000630	Resistor	MCR10EZHZ 120 KΩ (124)
R8	7030000630	Resistor	MCR10EZHZ 120 KΩ (124)
R9	7030000660	Resistor	MCR10EZHZ 220 KΩ (224)
R10	7030000610	Resistor	MCR10EZHZ 82 KΩ (823)
R11	7030000610	Resistor	MCR10EZHZ 82 KΩ (823)
R12	7030000460	Resistor	MCR10EZHZ 4.7 KΩ (472)
R13	7030000470	Resistor	MCR10EZHZ 5.6 KΩ (562)
R14	7030000440	Resistor	MCR10EZHZ 3.3 KΩ (332)
R15	7510000170	Thermistor	157-252-13013-TP (3)
R16	7030000420	Resistor	MCR10EZHZ 2.2 KΩ (222)
R17	7030000590	Resistor	MCR10EZHZ 56 KΩ (563)
R18	7310003090	Trimmer	RV-134 (RH04AVCS5J 474)
R19	7030000380	Resistor	MCR10EZHZ 1 KΩ (102)
C1	4030004720	Ceramic	C2012 B 1H 102K-T
C2	4030005090	Ceramic	C2012 B 1H 223K-T
C3	4030006450	Ceramic	C2012 F 1H 103Z-T
C4	4550000280	Tantalum	TESVB2 1A 475M-8L
C5	4030004710	Ceramic	C2012 B 1H 471K-T
C6	4030004710	Ceramic	C2012 B 1H 471K-T
C7	4550000530	Tantalum	TESVA 1V 104M1-8L
C8	4030004720	Ceramic	C2012 B 1H 102K-T
C9	4030004730	Ceramic	C2012 B 1H 222K-T
C10	4030004710	Ceramic	C2012 B 1H 471K-T
C11	4030004610	Ceramic	C2012 SL 1H 101J-T
C12	4030004750	Ceramic	C2012 B 1H 103K-T
C13	4550003290	Tantalum	TESVA 0G 475M1-8L
C14	4030006450	Ceramic	C2012 F 1H 103Z-T
C15	4030004710	Ceramic	C2012 B 1H 471K-T
EP1	0910023880	P.C. Board	B 2060
EP2	6910002720	Lead Frame	HFB2.54-0.9-8

**[JCK UNIT]**

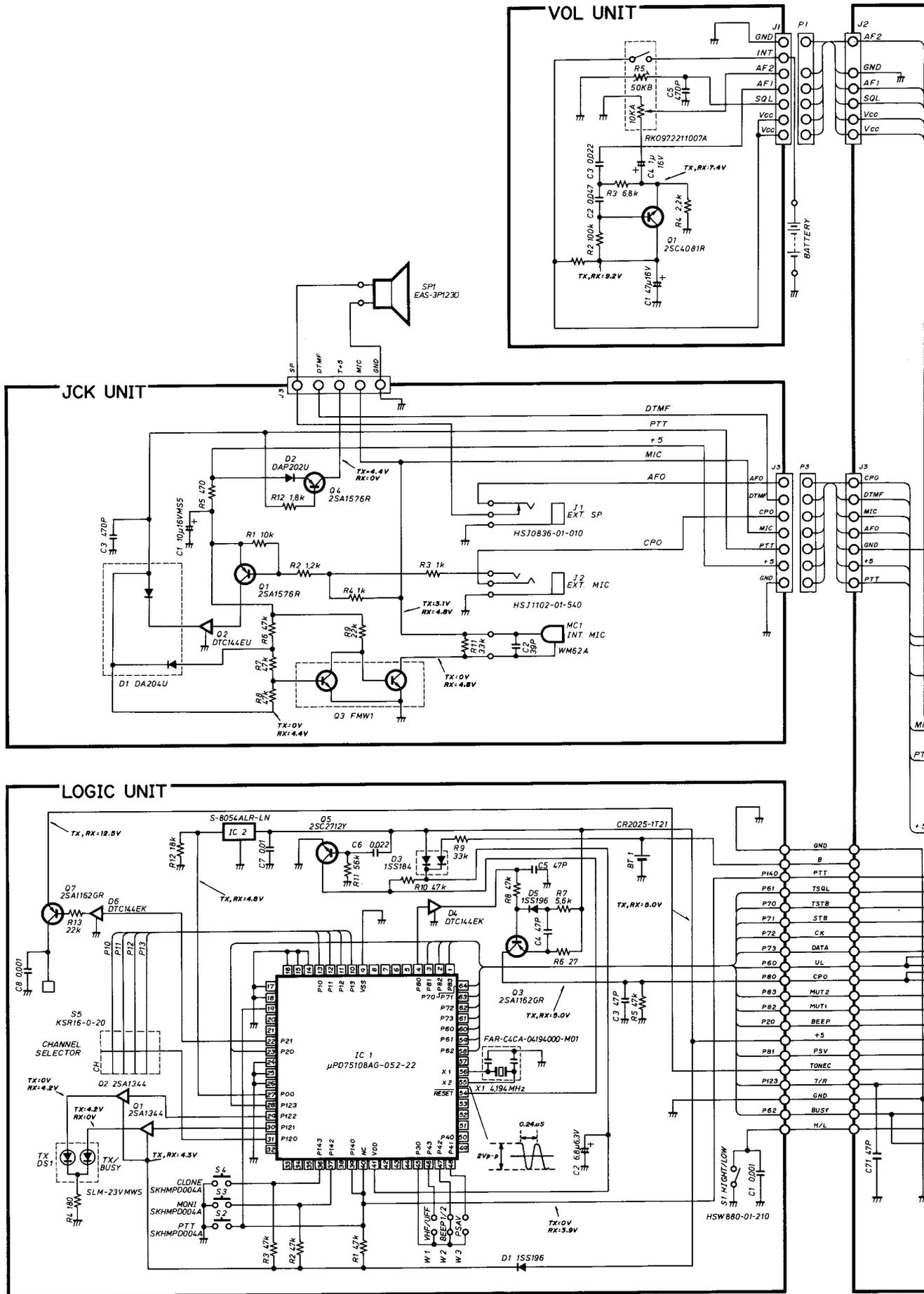
REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1510000510	Transistor	2SA1576 T107 R
Q2	1590000430	Transistor	DTC144EU T107
Q3	1590000670	Transistor	FMW1 T98
Q4	1510000510	Transistor	2SA1576 T107 R
D1	1750000130	Diode	DA204U T107
D2	1160000050	Diode	DAP202U T107
R1	7030002280	Resistor	MCR03EZHZ 10 KΩ (103)
R2	7030002160	Resistor	MCR03EZHZ 1.2 KΩ (122)
R3	7030002150	Resistor	MCR03EZHZ 1 KΩ (102)
R4	7030002150	Resistor	MCR03EZHZ 1 KΩ (102)
R5	7030002110	Resistor	MCR03EZHZ 470 Ω (471)
R6	7030002360	Resistor	MCR03EZHZ 47 KΩ (473)
R7	7030002360	Resistor	MCR03EZHZ 47 KΩ (473)
R8	7030002360	Resistor	MCR03EZHZ 47 KΩ (473)
R9	7030002320	Resistor	MCR03EZHZ 22 KΩ (223)
R11	7030002340	Resistor	MCR03EZHZ 33 KΩ (333)
R12	7030002180	Resistor	MCR03EZHZ 1.8 KΩ (182)
C1	4510001350	Electrolytic	16 MS5 10UF
C2	4030004560	Ceramic	C2012 SL 1H 390J-T
C3	4030003890	Ceramic	GRM39 B 471K 50PT
MC1	7700000860	Microphone	WM-62A
J1	6450000110	Connector	HSJ0836-01-010 [EXT SP]
J2	6450000130	Connector	HSJ1102-01-540 [EXT MIC]
J3	6510007860	Connector	PI28A-07M
EP1	0910021232	P.C. Board	B 2059B (#768-1A)

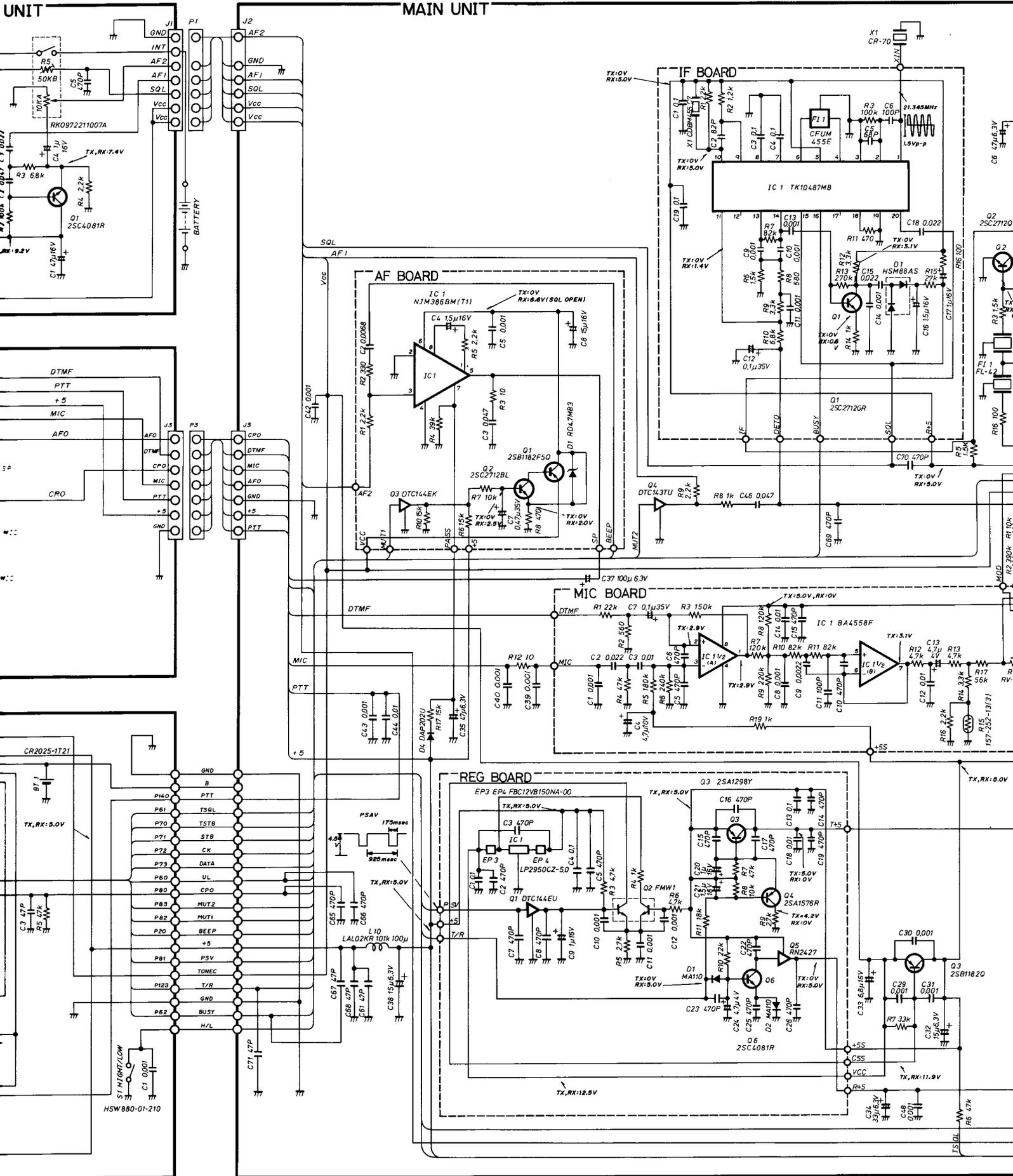
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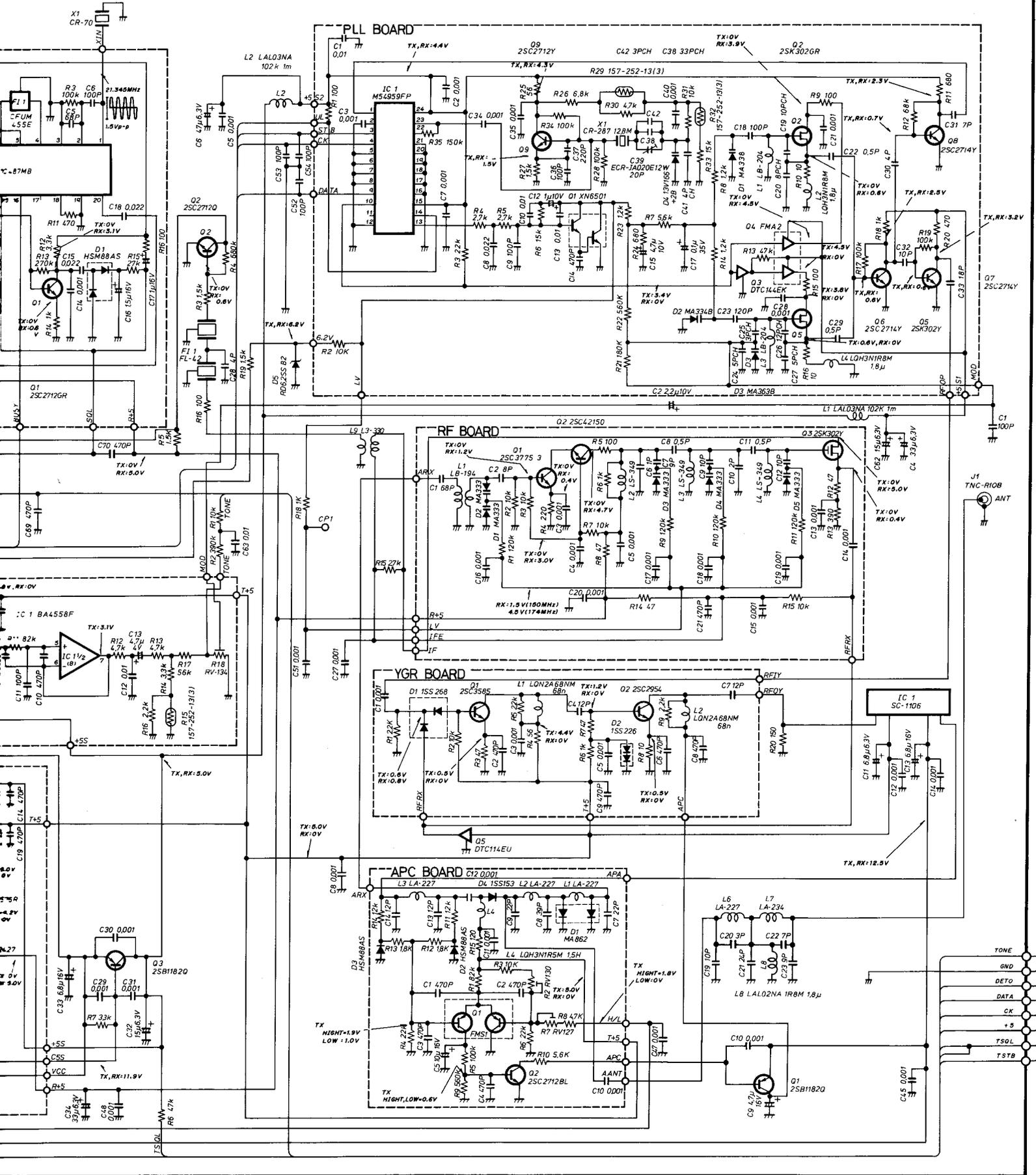
REF. NO.	ORDER NO.	DESCRIPTION	
R10	7310001410	Trimmer	RH04A3AJ4J01A (223)
R11	7030002420	Resistor	MCR03EZHZ 100 KΩ (104)
R12	7030002420	Resistor	MCR03EZHZ 100 KΩ (104)
R13	7030002550	Resistor	MCR03EZHZ 1 MΩ (105)
R14	7030002240	Resistor	MCR03EZHZ 4.7 KΩ (472)
R15	7030002590	Resistor	MCR03EZHZ 2.2 MΩ (225)
C1	4030001150	Ceramic	GRM40 F 104Z 25PT
C2	4030001150	Ceramic	GRM40 F 104Z 25PT
C3	4030003880	Ceramic	GRM39 SL 180J 50PT
C4	4030003880	Ceramic	GRM39 SL 180J 50PT
C5	4550000700	Tantalum	TESVC 0G 336M-12L
C6	4030003890	Ceramic	GRM39 B 471K 50PT
C7	4030001150	Ceramic	GRM40 F 104Z 25PT
C8	4030001150	Ceramic	GRM40 F 104Z 25PT
C9	4030001150	Ceramic	GRM40 F 104Z 25PT
J1	6510007110	Connector	PI28A-10M
EP1	0910016583	P.C. Board	B 1577C

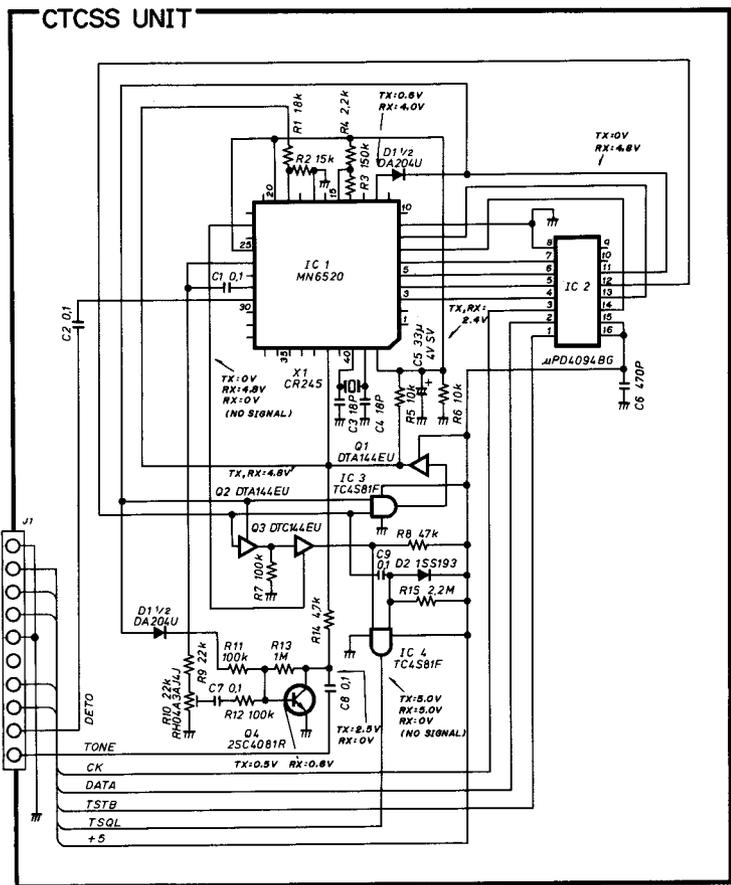
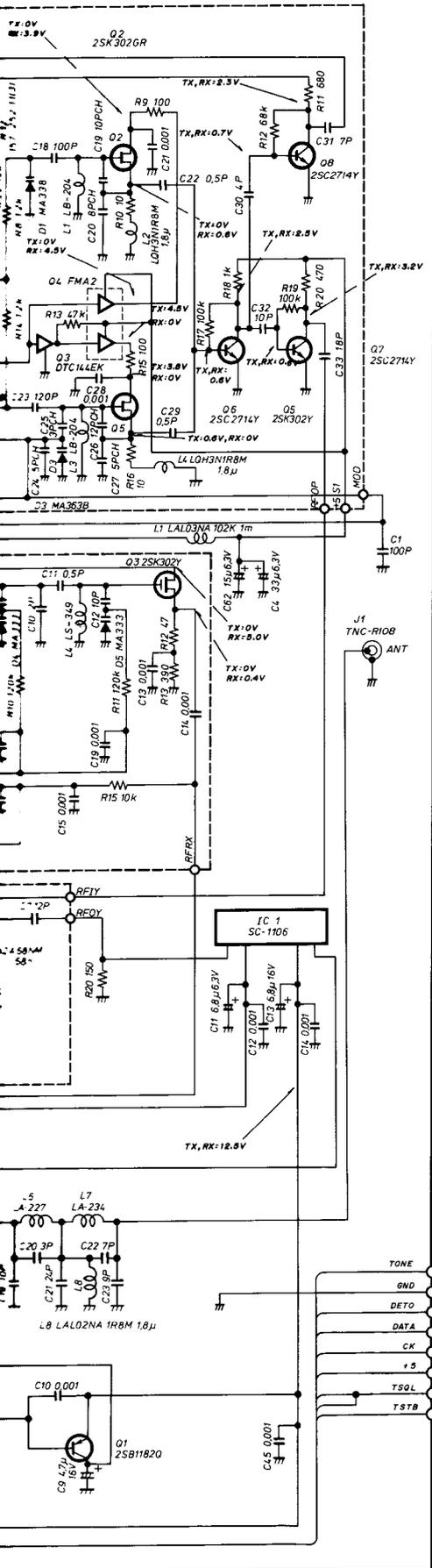
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REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1130001830	IC	MN6520
IC2	1130000830	IC	UPD4094BG-T1
IC3	1130003760	IC	TC4S81F (TE85R)
IC4	1130003760	IC	TC4S81F (TE85R)
Q1	1590000720	Transistor	DTA144EU T107
Q2	1590000720	Transistor	DTA144EU T107
Q3	1590000430	Transistor	DTC144EU T107
Q4	1530002060	Transistor	2SC4081 T107 R
D1	1750000130	Diode	DA204U T107
D2	1750000050	Diode	1SS193 (TE85R)
X1	6050005090	Crystal	CR-245
R1	7030002310	Resistor	MCR03EZHZ 18 KΩ (183)
R2	7030002300	Resistor	MCR03EZHZ 15 KΩ (153)
R3	7030002440	Resistor	MCR03EZHZ 150 KΩ (154)
R4	7030002200	Resistor	MCR03EZHZ 2.2 KΩ (222)
R5	7030002280	Resistor	MCR03EZHZ 10 KΩ (103)
R6	7030002280	Resistor	MCR03EZHZ 10 KΩ (103)
R7	7030002420	Resistor	MCR03EZHZ 100 KΩ (104)
R8	7030002360	Resistor	MCR03EZHZ 47 KΩ (473)
R9	7030002320	Resistor	MCR03EZHZ 22 KΩ (223)

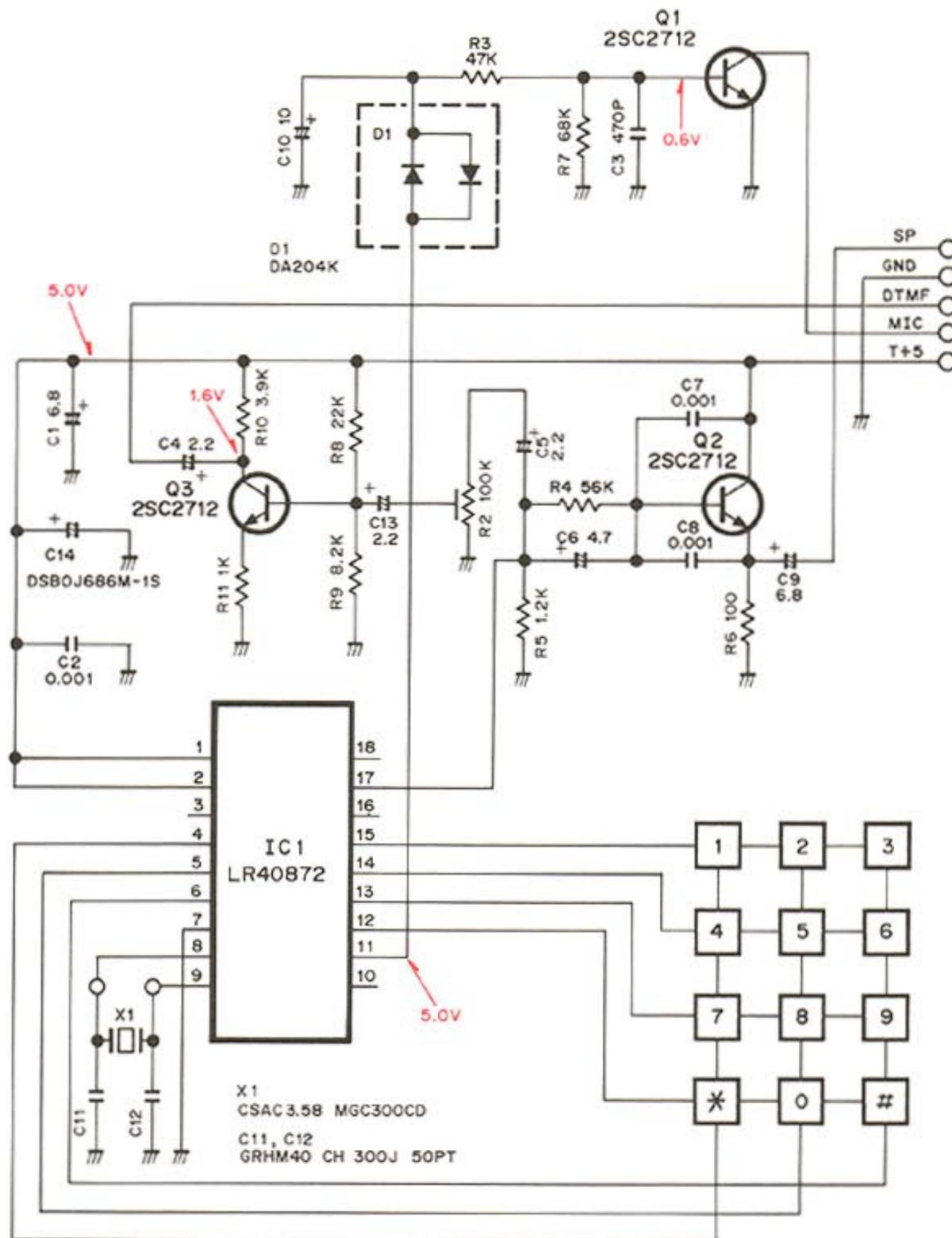
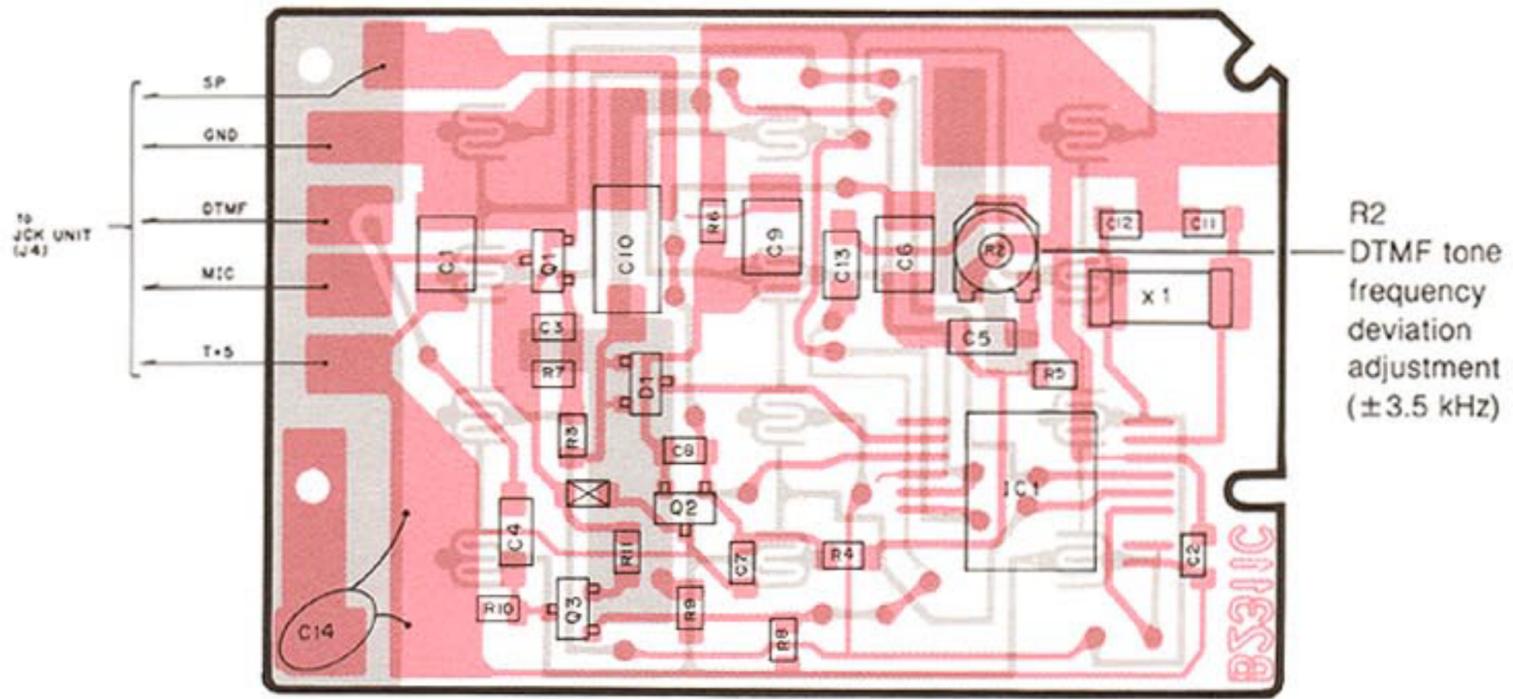








SECTION 10 UT-53 OPTIONAL UNIT



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