



**ICOM**

# **SERVICE MANUAL**

## **IC-U200**

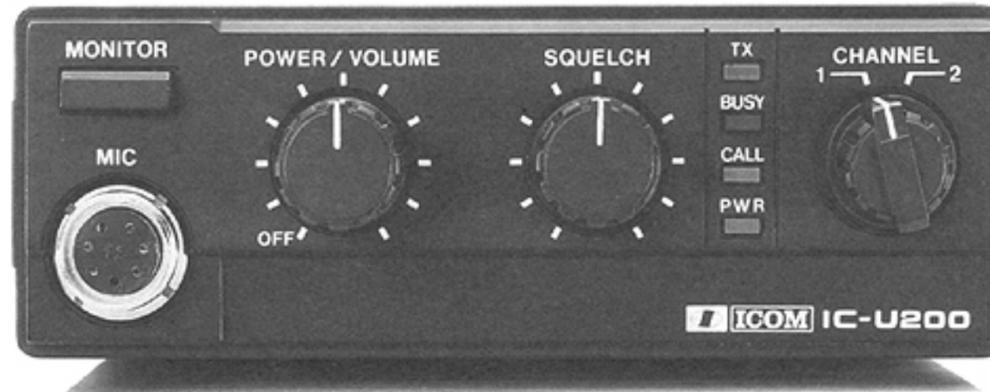
**UHF FM TRANSCEIVER**

**ICOM INCORPORATED**

## SCOPE OF THE SERVICE MANUAL

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This service manual covers all service information related to the theoretical, physical, mechanical and electrical characteristics of the **IC-U200** UHF FM TRANSCEIVER.



## ASSISTANCE

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If you require assistance or further information regarding the operation, capability and servicing of the **IC-U200**, contact your nearest authorized ICOM Dealer or ICOM Service Center. Addresses are provided on the inside back cover for your convenience.

## ORDERING PARTS

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Be sure to include the following five points when ordering replacement parts or requesting equipment information from your dealer or ICOM Service Center. This will ensure faster, more efficient service.

1. Equipment model and serial number
2. Schematic part identifier or service manual page number
3. Unit name and printed circuit board number (e.g., PA UNIT/B-1234)
4. Component part number and name (e.g., 2SC1971 Transistor)
5. Quantity required (e.g., 5pcs.)

## REPAIR NOTE

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1. **DO NOT** open transceiver covers until the transceiver is disconnected from a power source.
2. **DO NOT** connect the transceiver to an external power source of more than 15V.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts.
5. An insulated tuning tool **MUST BE** used for all adjustments.
6. **DO NOT** keep power ON for a long time when the transceiver is defective.
7. **DO NOT** transmit power into a signal generator or sweep generator. Always connect a 20dB or 30dB 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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## SECTION 1 SPECIFICATIONS

### ■ GENERAL

Frequency range	: 450 ~ 470MHz (#01) 470 ~ 490MHz (#02)
Number of channels	: 2
Usable temperature range	: -30°C ~ +60°C
Voltage polarity	: Negative ground
Channel spacing	: 25kHz
Frequency stability	: 0.0005% (-30°C ~ +60°C)
Antenna impedance	: 50Ω
Power supply requirement	: 13.8V DC
Current drain	: Transmit : 8.5A Receive Standby : 0.27A AF max. : 0.9A
Dimensions	: 140mm(W) × 50mm(H) × 179mm(D)
Weight	: 1.3 kg

### ■ RECEIVER

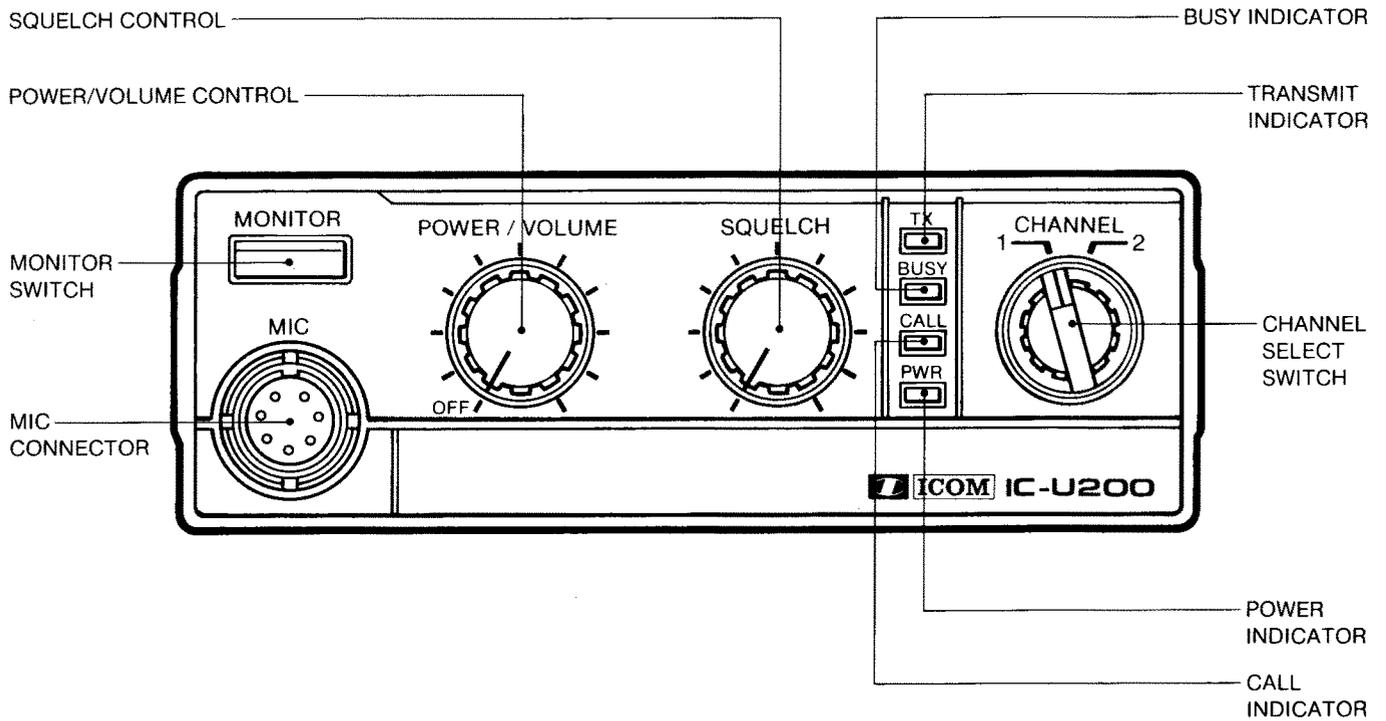
Receiving system	: Double-conversion superheterodyne
Modulation acceptance	: ±7kHz
Intermediate frequency	: 1st: 21.8MHz 2nd: 455kHz
Sensitivity	: Less than 0.35μV for 12dB SINAD
Threshold squelch sensitivity	: Less than 0.35μV
Spurious & image rejection	: 70dB minimum
Selectivity	: 70dB minimum at adjacent channel
Intermodulation rejection	: 70dB
Audio output power	: More than 3W at 10% distortion with a 4Ω load
Audio output impedance	: 4Ω

### ■ TRANSMITTER

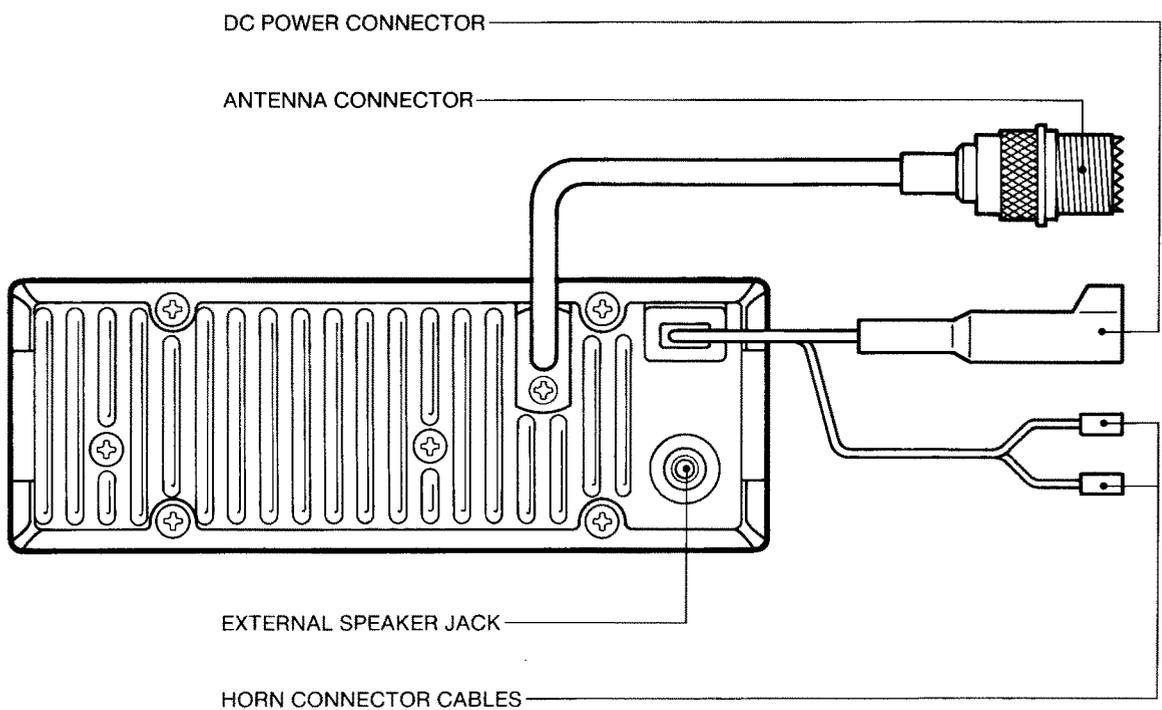
RF output power	: 25W
Emission mode	: 16K0F3E
Modulation system	: Variable reactance frequency modulation
Max. frequency deviation	: ±5kHz
Spurious & harmonic emissions	: More than 70dB below peak output power
Frequency tolerance	: 0.0005% (-30°C ~ +60°C)
Adjacent channel power	: More than 70dB
Audio frequency response	: -3dB ~ +1dB in a 6dB/octave range from 300Hz to 3000Hz
Audio harmonic distortion	: 10% maximum
Noise and hum	: More than 40dB
Limiting of modulator	: 70 ~ 100% of maximum deviation

## SECTION 2 OUTSIDE AND INSIDE VIEWS

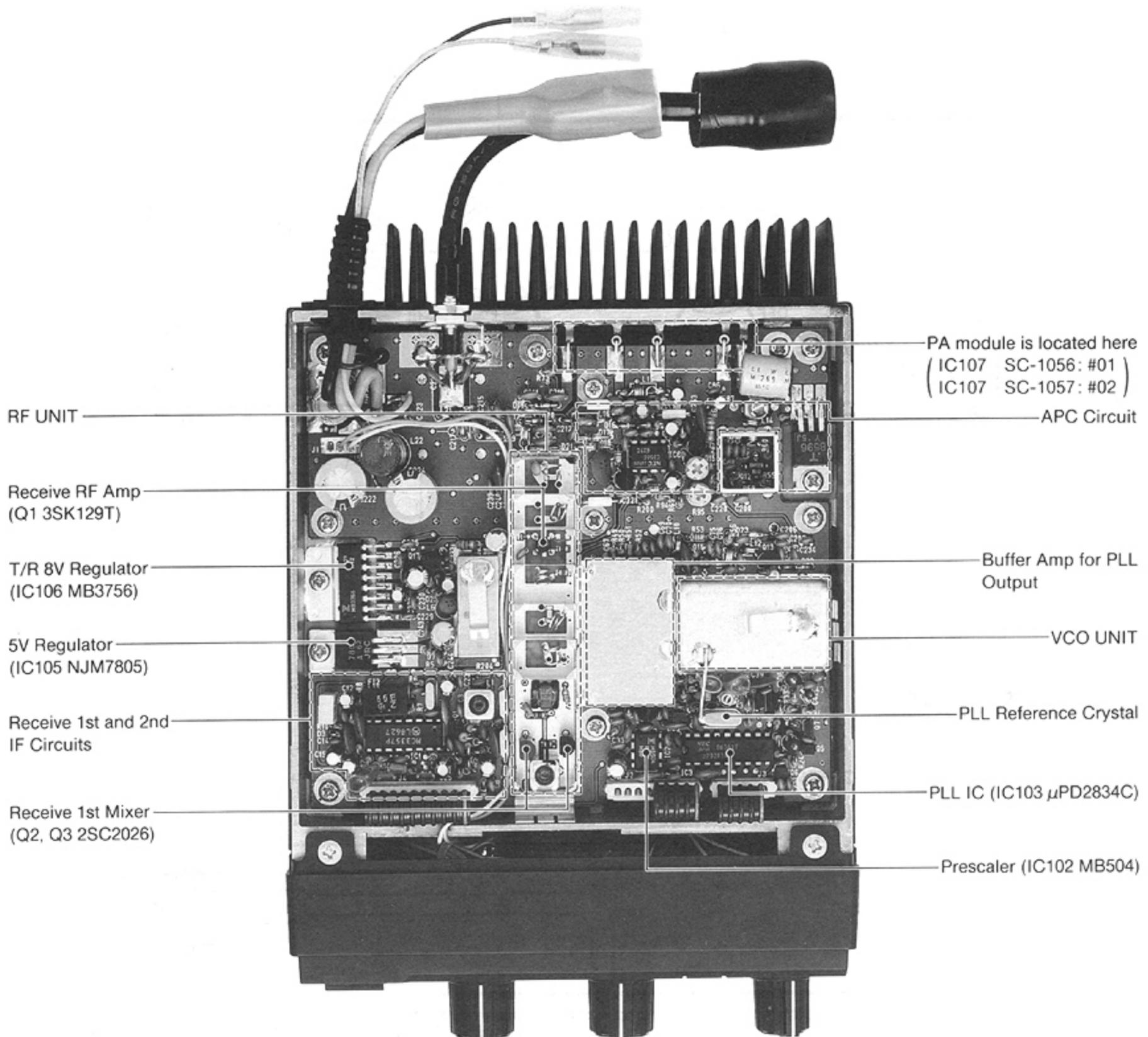
### 2-1 FRONT PANEL



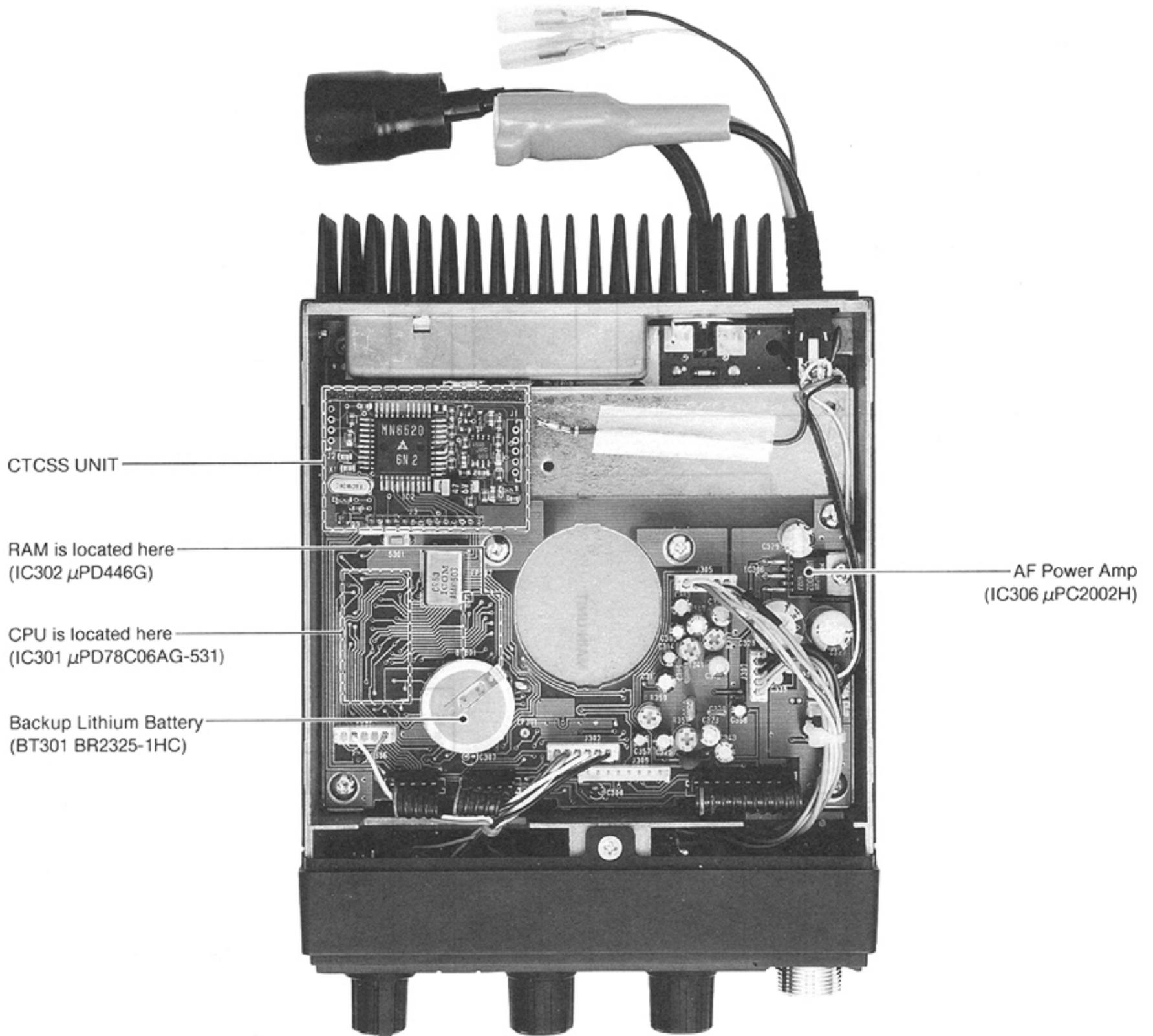
### 2-2 REAR PANEL



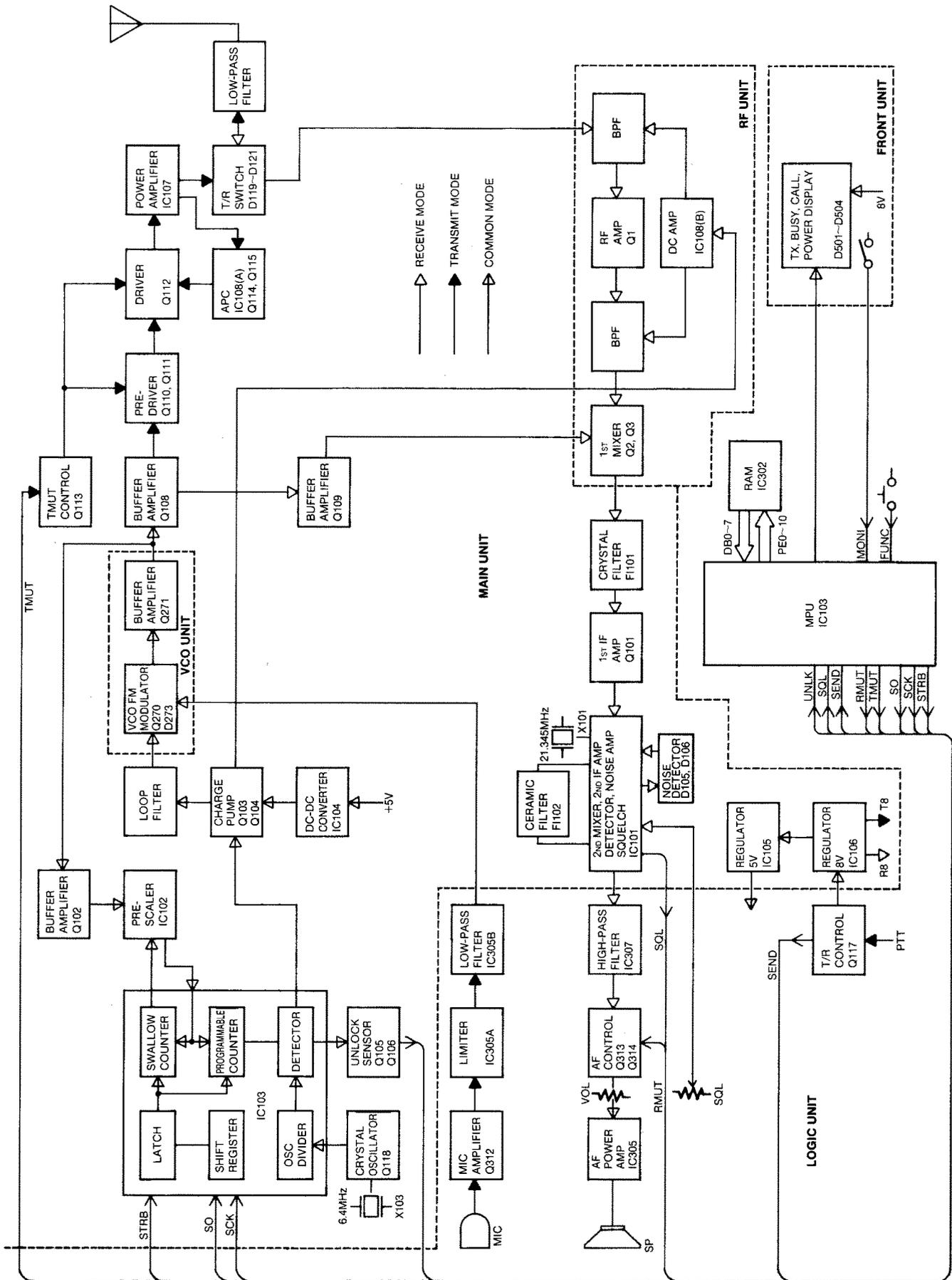
## 2-3 MAIN AND RF UNITS



## 2-4 LOGIC UNIT



SECTION 3 BLOCK DIAGRAM



## SECTION 4 CIRCUIT DESCRIPTION

### 4-1 RECEIVER CIRCUITS

#### 4-1-1 ANTENNA SWITCHING CIRCUIT (MAIN UNIT)

Incoming RF signals from the antenna connector pass through a low-pass filter consisting of C215~C219 and L119~L121, and are fed to an antenna switching circuit consisting of D119~D121.

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

Signals from the antenna switching circuit pass through a 2-stage bandpass filter consisting of L1, L2, C2, C3, C6, C7, D1, and D2, and are amplified by Q1. Signals then pass through a 3-stage bandpass filter consisting of L3~L5, C14~C23, and D3~D5. They are then converted to 1st IF signals at a 1st mixer circuit consisting of L6, L7, Q2 and Q3. A local oscillator signal from the VCO UNIT is amplified by Q108 and Q109 and fed to L6. The IF signals are output by Q2 and Q3 at 21.8MHz.

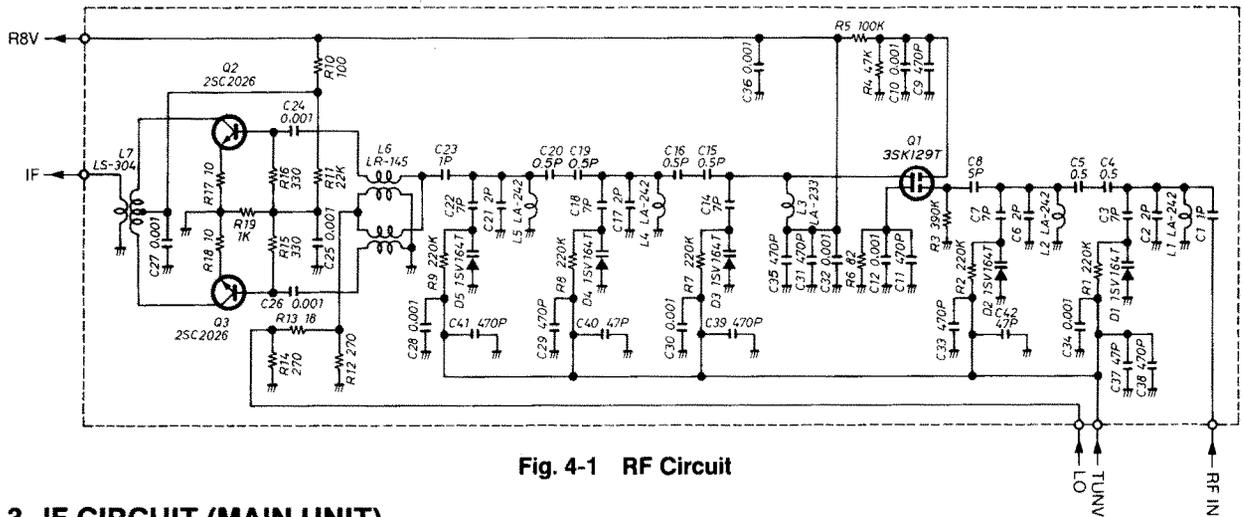


Fig. 4-1 RF Circuit

#### 4-1-3 IF CIRCUIT (MAIN UNIT)

1st IF signals from L7 in the mixer pass through FI101, a crystal filter, and are amplified by Q101. The amplified signals are fed to pin 16 on IC101 through C105 on the MAIN UNIT.

on a single chip (IC101). Signals from pin 16 on IC101 are mixed with the second oscillator signal of 21.345MHz and output 455kHz signals at pin 3 on IC101. The 455kHz signal from pin 3 is filtered by FI102 and is fed to pin 5 on IC101 in the limiter amplifier circuit. Amplified signals are fed to the discriminator circuit and output audio signals from pin 9 on IC101.

A second oscillator circuit, a second mixer circuit, a limiter amplifier circuit, and a discriminator circuit are incorporated

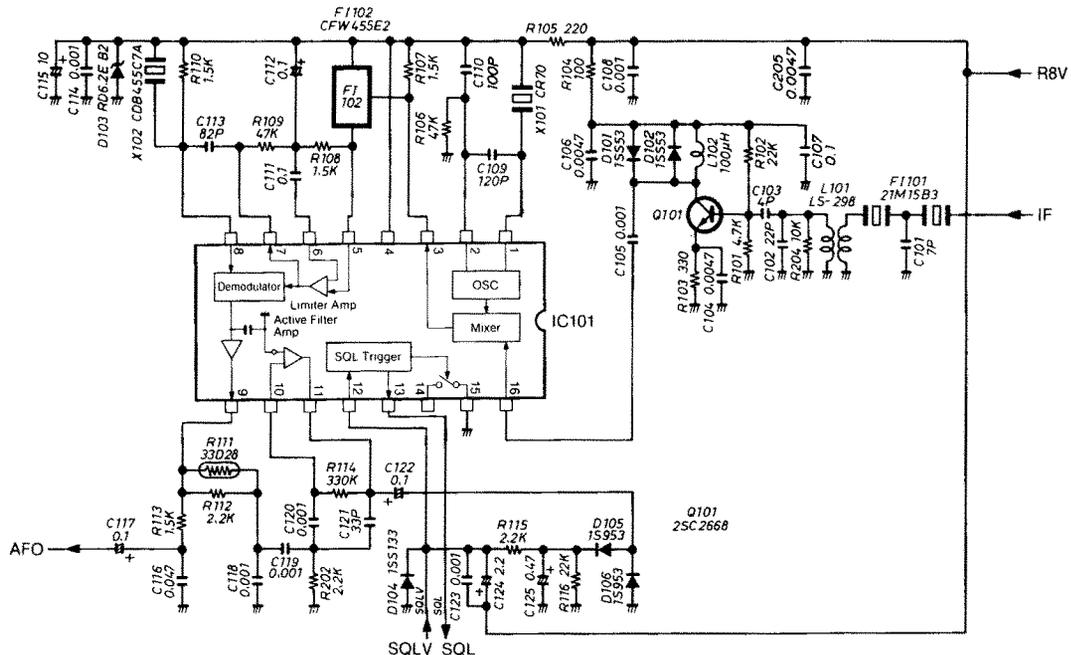


Fig. 4-2 IF Circuit

### 4-1-4 AUDIO AMPLIFIER CIRCUIT (LOGIC UNIT)

Audio signals from pin 9 on IC101 are fed to a de-emphasis circuit consisting of R113 and C116 and fed to a high-pass filter circuit consisting of IC307A and IC307B on the LOGIC UNIT to suppress a subaudible tone signal. The signals are then amplified by Q315.

Signals from Q315 are fed to Q313 through the [VOLUME] CONTROL on the FRONT PANEL and are fed to IC306, the audio amplifier. Signals from pin 4 on IC306 are output by speaker SP1 through J303 and J304. Q313 and Q314 create an electric switch which mutes audio signals when the R-MUTE circuit or squelch circuit is activated.

### 4-1-5 SQUELCH CIRCUIT (MAIN UNIT)

Audio signals from pin 9 on IC101 consist of noise components higher than 20kHz and are amplified by IC101 then output from pin 11 on IC101. Amplified noise signals are detected by D105 and D106, and are converted to DC voltage. This voltage is supplied to the squelch trigger circuit (pin 12 of IC101). The [SQUELCH] CONTROL is also connected to pin 12 of IC101 to adjust converted DC voltage.

A "HIGH" or "LOW" squelch control signal is output from pin 13 of IC101 and then applied to pin 15 of CPU IC301 on the LOGIC UNIT.

Pin 30 of IC301 becomes "HIGH" as the R-MUTE signal while pin 15 receives "LOW". The R-MUTE signal is applied to Q313 and Q314 to cut the audio signals.

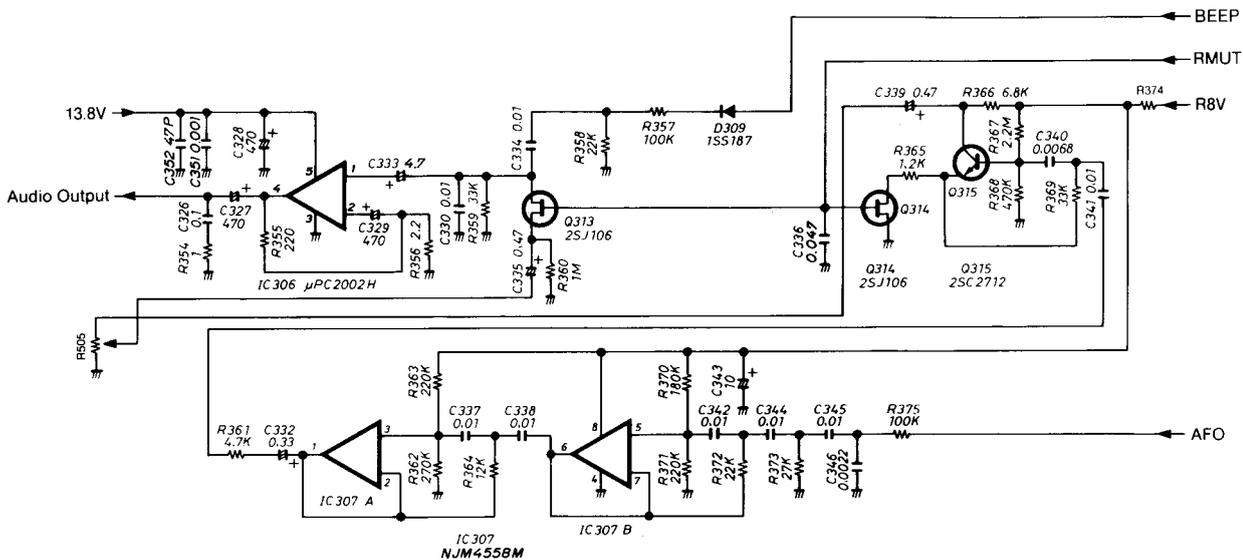


Fig. 4-3 Audio Amplifier and Squelch Circuits

## 4-2 TRANSMITTER CIRCUITS

### 4-2-1 MIC AMPLIFIER CIRCUIT (LOGIC UNIT)

Audio signals from the microphone are amplified by a limiter amplifier circuit consisting of Q312. This circuit also functions as the preemphasis circuit in the frequency range of 300MHz to 3kHz. Signals from the limiter amplifier are fed to pin 1 on IC305A through the mic gain adjustment pot in R337.

Signals from pin 2 on IC305A are fed to the spurious filter circuit on IC305B and are fed to the FM modulation circuit in the VCO UNIT through a deviation adjustment pot in R351.

### 4-2-2 VCO CIRCUIT (VCO UNIT)

The VCO, Q270, employs a Colpitts Oscillator Circuit. Audio mic signals are applied to the cathode of varactor diode D273. Modulated signals from Q270 are amplified by Q271 and are fed to L103.

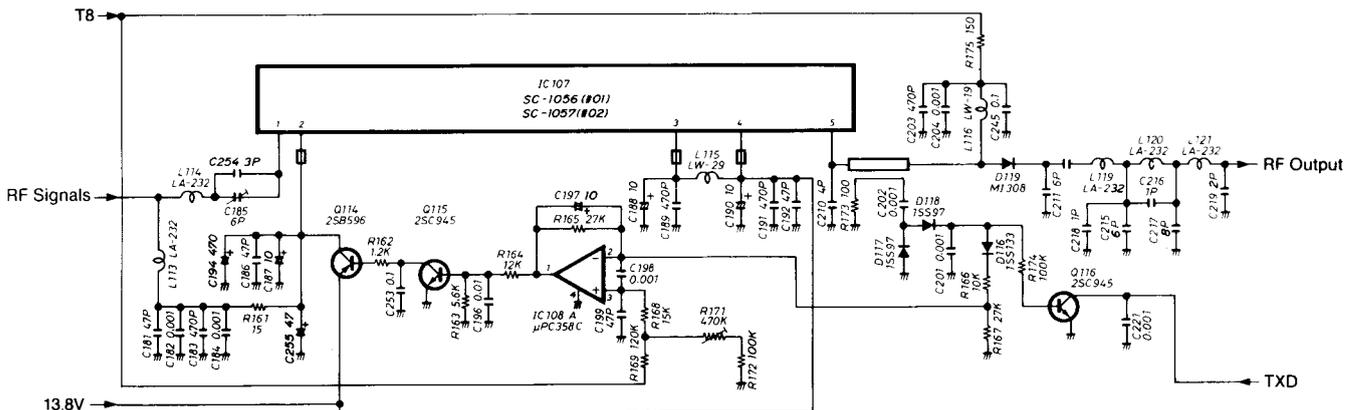


Fig. 4-4 RF Power Amplifier and APC Circuit

### 4-2-3 DRIVER CIRCUIT (MAIN UNIT)

Oscillated signals from the VCO UNIT are fed to L103 and are divided between the transmit signal and the prescaler signal. Transmit signals are fed to Q108 and are output to Q110 when D111 is ON. They are then amplified by Q111 and Q112 to get 200mW of RF output power. The APC circuit controls the collector current of Q112.

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

RF signals from Q112 are fed to pin 1 on IC107, and are then output at pin 5 on IC107. IC107 amplifies 200mW of 400~500MHz signals to more than 5W.

### 4-2-5 ANTENNA SWITCHING CIRCUIT (MAIN UNIT)

RF signals from pin 5 of IC107 are fed to the antenna connector through D119 and also through a low-pass filter consisting of L120, L121, and C215~C219.

### 4-2-6 APC CIRCUIT (MAIN UNIT)

RF signals from the output of IC107 are detected by D117 and D118 and are converted to DC voltage then fed to IC108A and Q116. Q116 controls the TRANSMIT INDICATOR using the detected signal. DC voltage for the APC circuit is fed to IC108A to control Q114, Q115. This results in the control of the input current of IC107 (pin 2) and Q112 for stable RF output power.

## 4-3 PLL CIRCUITS (MAIN UNIT)

The PLL circuit is designed so that the desired frequency can be generated directly by the VCO using a Dual Modulus PLL System. The PLL consists of a prescaler, IC102, and PLL IC chip, IC103.

N-data is determined by dividing the desired frequency by the reference frequency. The desired frequency is the transmit frequency in transmit mode, and the first local oscillator frequency in receive mode.

$$N\text{-data} = \frac{\text{Desired frequency}}{\text{Reference frequency}}$$

A reference frequency of 12.5kHz is acquired by oscillator Q118 and the divider inside IC103. Signals inside IC103 are phase detected and error signals are output from pin 13 of IC103. Error signals are applied to the cathode of varactor diodes D271 and D272 on the VCO UNIT to control the VCO frequency.

### 4-3-1 UNLOCK CIRCUIT (MAIN UNIT)

When the PLL is unlocked, pin 10 on IC103 is "LOW", turning Q105 OFF and Q106 ON to apply a "LOW" signal to the CPU.

### 4-3-2 DC-DC CONVERTER CIRCUIT (MAIN UNIT)

IC104 is a switching regulator IC chip and outputs 20V to a charge pump which maintains wideband PLL oscillation. When 5V is input to pin 3 on IC104, pin 8 on IC104 outputs 20V. This voltage is also used for bandpass tuning on the RF UNIT using a PLL lock voltage through DC amplifier IC108B.

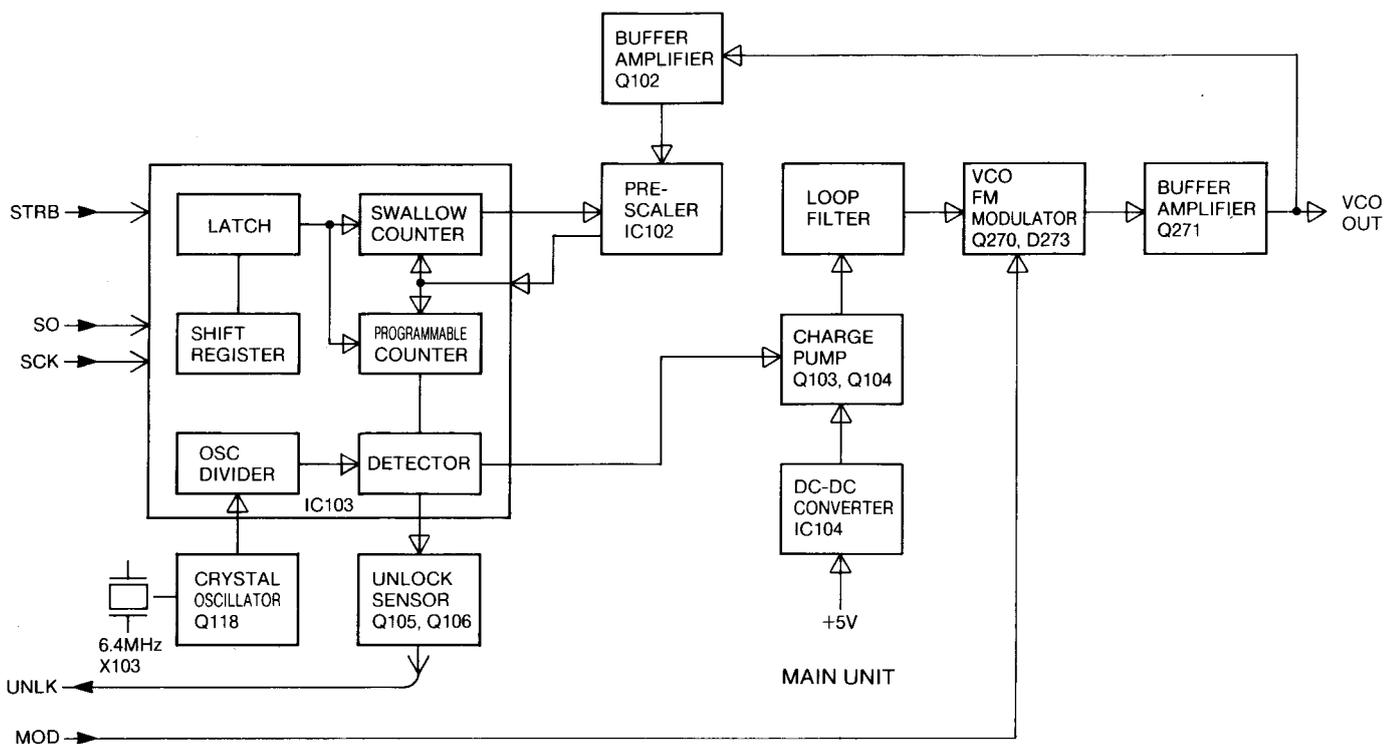


Fig. 4-5 PLL Circuit Diagram

## 4-4 LOGIC CIRCUITS

### 4-4-1 CPU PORT ALLOCATIONS (LOGIC UNIT)

PORT NUMBER	DESCRIPTION
DB0~DB7	These are data exchange ports between a 2k RAM and CPU. DB0~DB3 are also used as matrix input ports.
PE0~PE15	These are ports which can be programmed to change between address and output ports. PE15 is used for RAM selecting signals. PE0~PE10 are used for address signals. PE14 and PE0~PE3 are matrix output ports.
PA4 (TMUT)	Outputs at a HIGH level for approx. 80msec. when changing from receive to transmit mode. If the PLL is unlocked in transmit mode, it remains at a HIGH level.
PA3 (RMUT)	Outputs at a HIGH level when receive mute is operating.
PA0 (STRB)	Output port for latched PLL data.
PB7 ( $\overline{\text{MONI}}$ )	Input port for the MONITOR SWITCH.
PB6 ( $\overline{\text{T/R}}$ )	Output port for the T/R switching of the tone IC. At a LOW level in transmit mode and a HIGH level in receive mode. However, if the tone number is 0, the levels are reversed.
PB0~5(S0~S5)	Output port for tone data.
PC3 ( $\overline{\text{FUNC}}$ )	Input port for the function switch. At a LOW level when turning power ON and the CPU enters cloning mode. Can be cloned for receive mode.
PC2 (SEND)	Input port for the TX/RX switching signal. At a HIGH level in transmit mode and can also be used as an input port for cloning.
PC1 (SQL)	Input port for squelch signals. At a HIGH level when the squelch circuit is open.
PC0 (UNLK)	Input port at a LOW level when PLL is unlocked.
SO	An output port for the shift register inside the CPU.
$\overline{\text{SCK}}$	Output port of timing signal for SO data.
INT0	Input port for the tone IC.
INT1	Standby input port. At a HIGH level when turning power OFF.
TO	Output port for beep tones.
$\overline{\text{RD}}$	Output port. Outputs a timing signal when reading an external memory.
$\overline{\text{WR}}$	Output port. Outputs a timing signal when writing an external memory.

### 4-4-2 RAM (LOGIC UNIT)

RAM IC302 ( $\mu\text{PD446C}$ ) has an 8-bit CMOS 2048-word capacity. This RAM memorizes the current channel, priority channel, N-data of receive and transmit, tone numbers, shift frequencies, and tone frequency data.

### 4-4-3 RESET CIRCUIT (LOGIC UNIT)

After power is ON, Q310 turns ON via the charging current of C306. The collector of Q310 is then at a LOW level. After C306 is completely charged, the base bias of Q310 is at a LOW level and the collector of Q310 is at a HIGH level. The collector of Q309 is at a HIGH level when Q309 is ON.

When the collector of Q309 is HIGH, output from IC304D is at a LOW level and the output from IC304C is changed from a LOW level to a HIGH level. The CPU is then reset. When power is turned OFF, Q309 is OFF then output from IC304D is at a HIGH level and the CPU is in standby mode.

## 4-5 INDICATOR CIRCUIT

There are four indicators on the FRONT PANEL: POWER, TRANSMIT, BUSY, and CALL.

### 4-5-1 POWER INDICATOR (RED)

This indicator lights up when power to the transceiver is turned ON. It is powered by common 8V from IC106 on the MAIN UNIT.

### 4-5-2 TRANSMIT INDICATOR (RED)

This indicator lights up in transmit mode and uses part of the APC detector signals. Signals are fed to Q304 through Q116, lighting up the indicator.

### 4-5-3 BUSY INDICATOR (GREEN)

This indicator lights up when the squelch is open. When a signal is fed from pin 13 on IC101 to Q305, the indicator lights up.

### 4-5-4 CALL INDICATOR (YELLOW)

This indicator lights up when a specified tone is received by the IC-U200. It is used by the DOUT of the CTCSS UNIT.

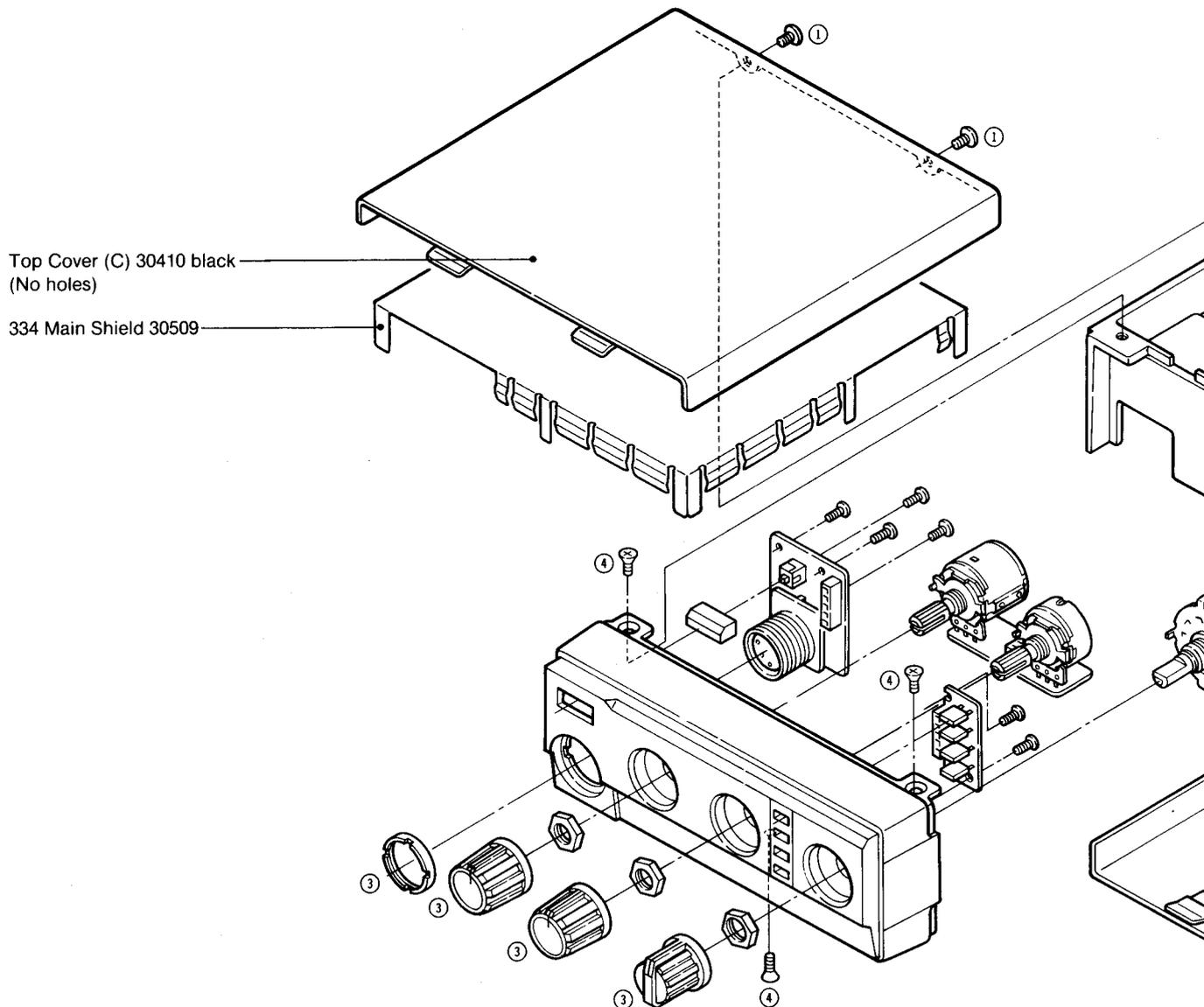
When the PLL is unlocked, the TRANSMIT and BUSY INDICATORS light up simultaneously. These indicators are controlled by signals from pin 10 on IC103.

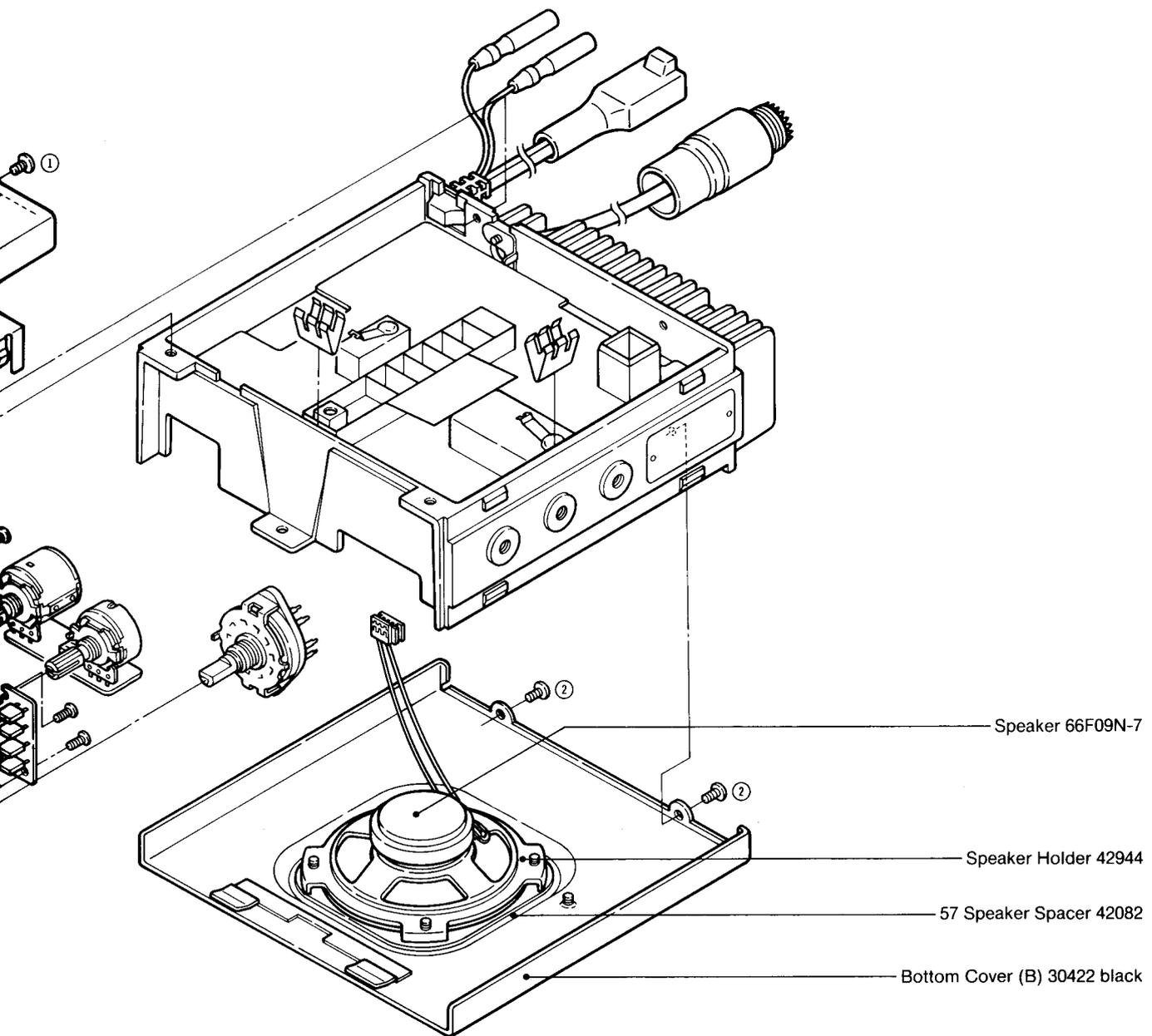
### 4-5-5 POWER SUPPLY CIRCUIT (MAIN UNIT)

A CMOS 8-terminal regulator, IC106, is an 8V regulator for T8V, R8V, and common 8V. Output voltage is kept at 8V constantly. T8V and R8V are controlled by the voltage level of pin 5 on IC106, and common 8V is output from pin 1 on IC106. When the PTT SWITCH on the microphone is pushed, pin 5 on IC106 will be at a low level and T8V is output from pin 8 on IC106. Pin 6 on IC106 for R8V does not output voltage. IC105 is a CMOS 3-terminal regulator. 5V is fed to IC102 and IC103.

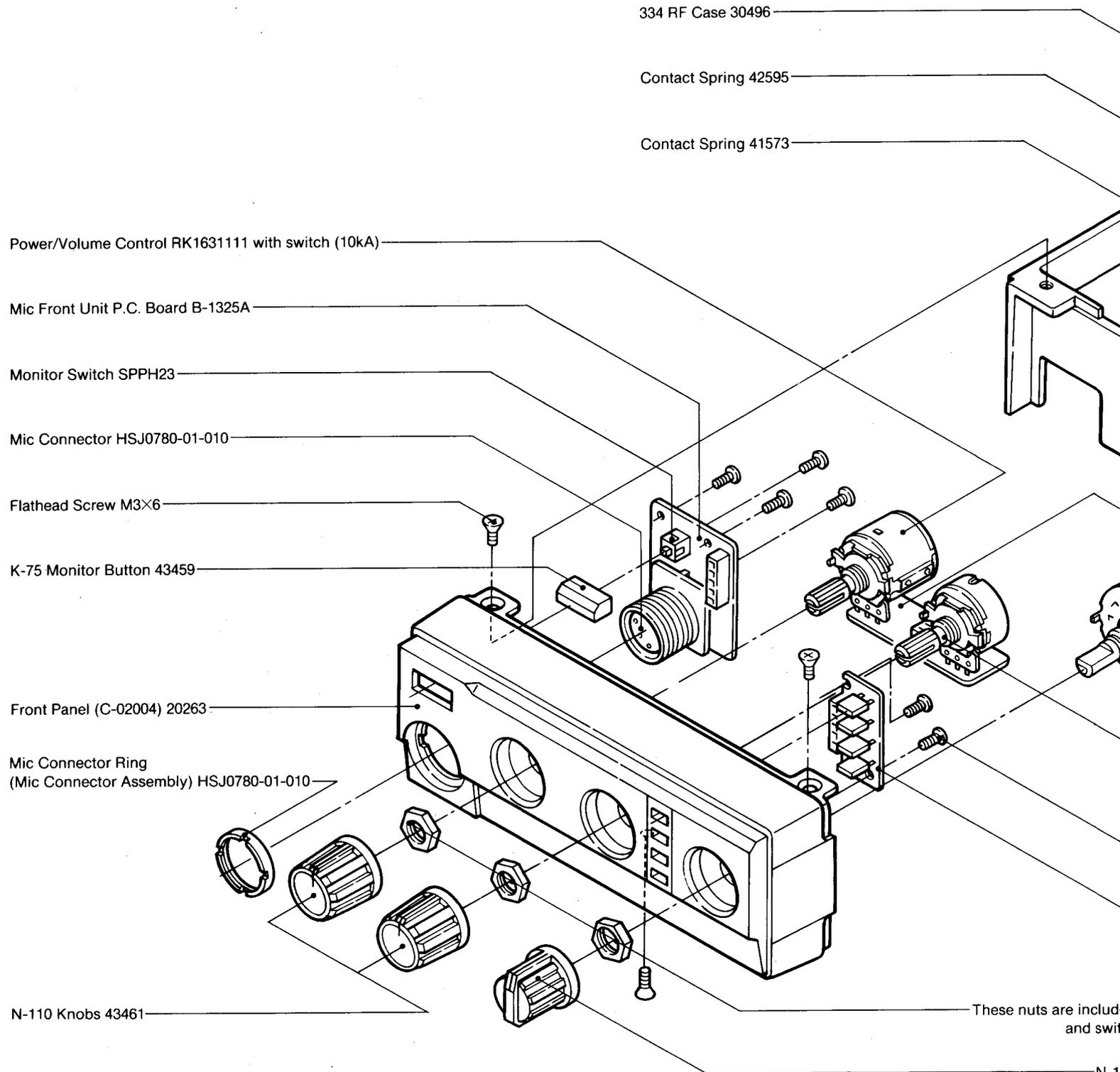
**SECTION 5 DISASSEMBLY AND ASSEMBLY DIAGRAMS****5-1 FRAME DISASSEMBLY**

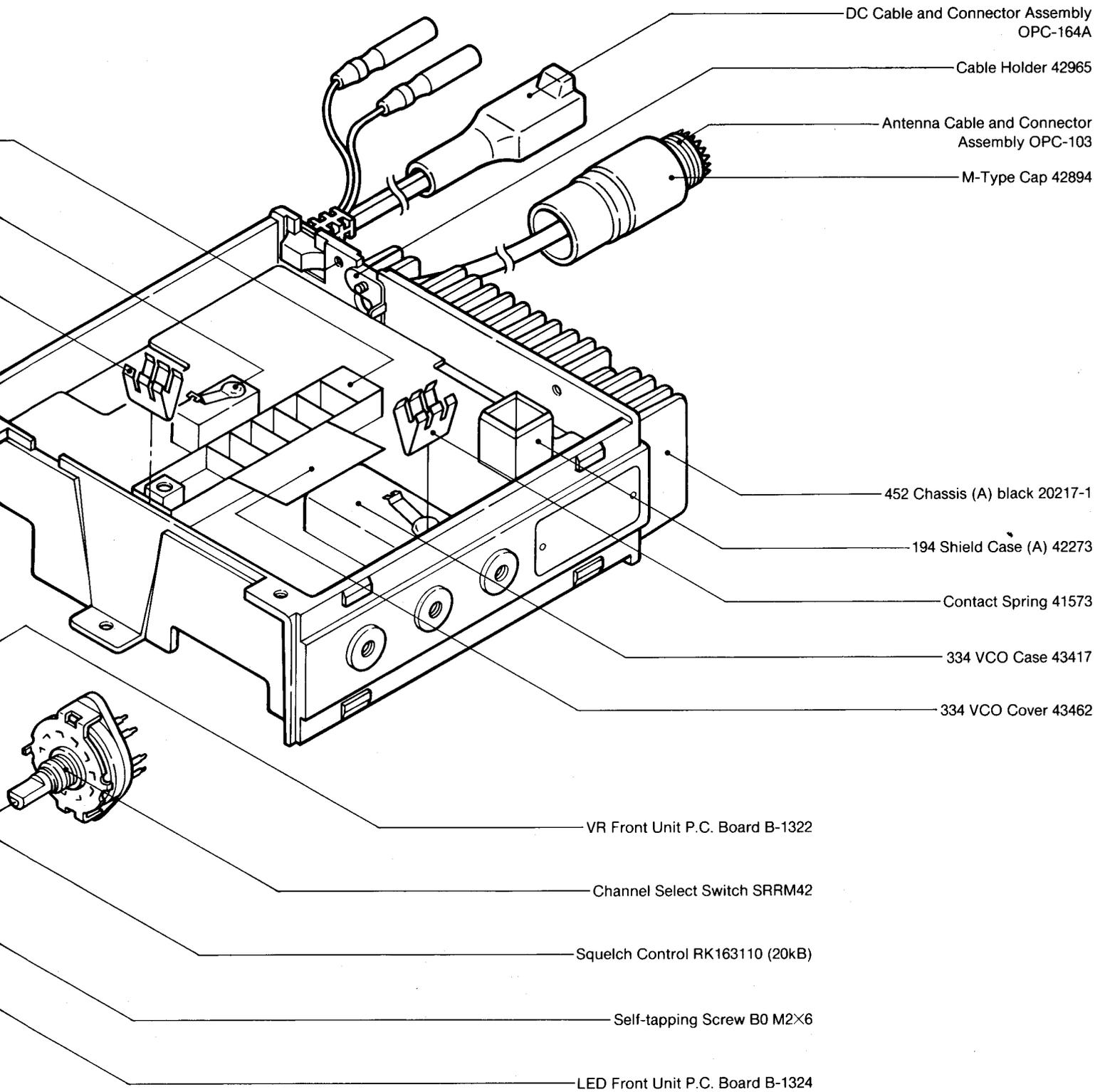
- ① Remove Top Cover (2 screws)
- ② Remove Bottom Cover (2 screws)
- ③ Remove the Mic Connector Ring, knobs, and switch from the FRONT PANEL (Pull knobs and switch forward)
- ④ Remove FRONT PANEL from chassis (3 screws) by pulling it forward





## 5-2 FRONT PANEL DISASSEMBLY

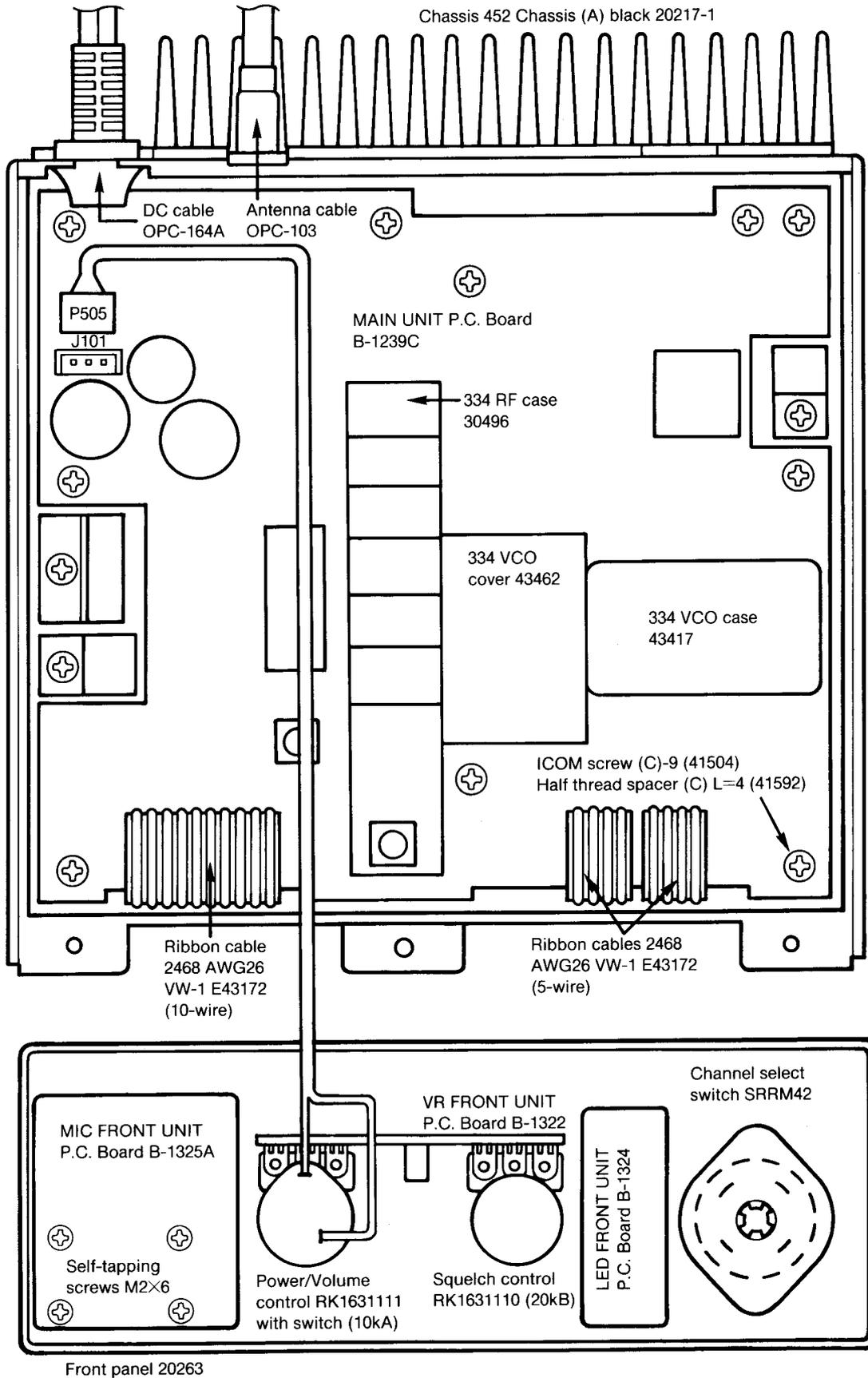




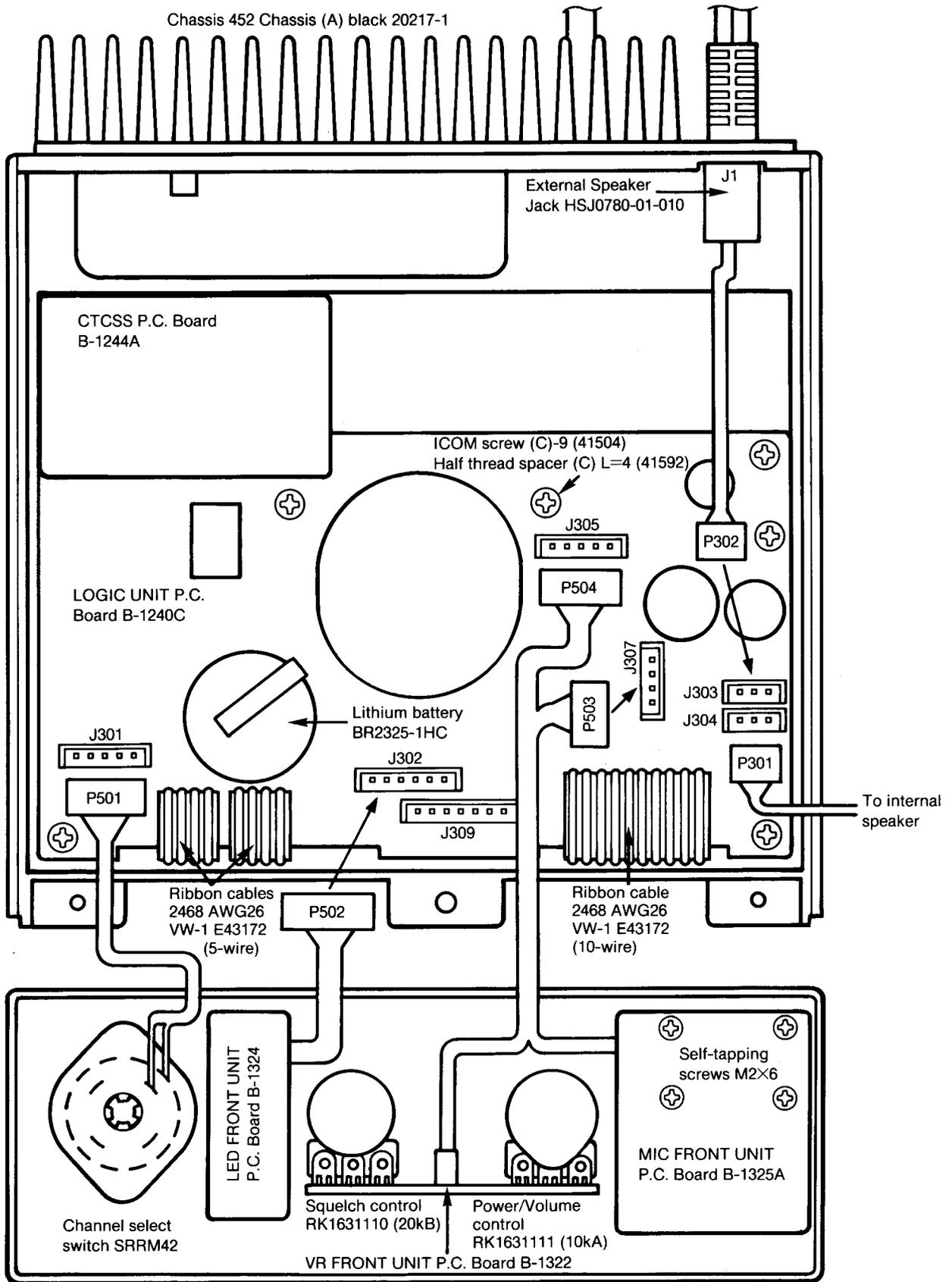
is included with control  
and switch assemblies.

N-109 Knob 43460

### 5-3 MAIN AND FRONT UNITS CONNECTOR ASSEMBLY



# 5-4 LOGIC AND FRONT UNITS CONNECTOR ASSEMBLY



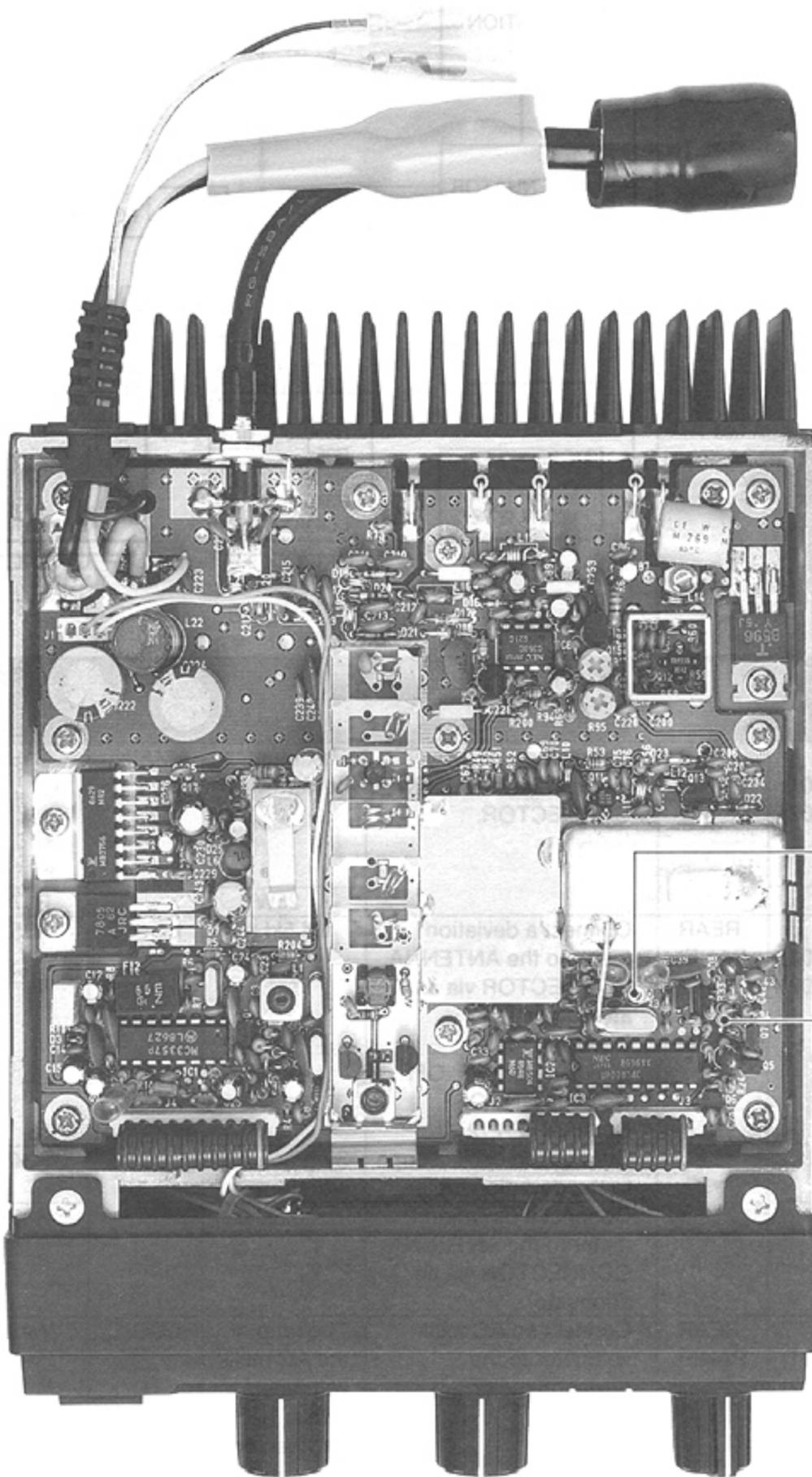
Front panel 20263

## SECTION 6 MAINTENANCE AND ADJUSTMENT

### 6-1 PLL ADJUSTMENT

TEST INSTRUMENTS REQUIRED		MEASUREMENT CONNECTION LOCATION				
(1) VOLTAGE REGULATED POWER SUPPLY <ul style="list-style-type: none"> <li>• Output voltage : 13.8V DC <math>\pm</math>10%</li> <li>• Current capacity : 10A or more</li> </ul> (2) RF POWER METER <ul style="list-style-type: none"> <li>• Terminated type</li> <li>• Measuring range : 5 ~ 25W</li> <li>• Frequency minimum : At least 500MHz</li> <li>• Impedance : 50<math>\Omega</math></li> </ul> (3) VOLTMETER <ul style="list-style-type: none"> <li>• Input impedance : 40k<math>\Omega</math>/V DC or better</li> </ul> (4) FREQUENCY COUNTER <ul style="list-style-type: none"> <li>• Frequency minimum : At least 500MHz</li> <li>• Frequency accuracy : 1ppm or better</li> <li>• Sensitivity : 100mV or better</li> </ul>						
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1 <ul style="list-style-type: none"> <li>• Operating frequency: 450.00MHz (#01) 470.00MHz (#02)</li> <li>• Receive mode</li> </ul>	MAIN	Connect a voltmeter to the cathode of D110. (See diagram on p. 6-2 for exact location.)	Approx. 6.5V (#01) 8.9V (#02)		Verify
	2 <ul style="list-style-type: none"> <li>• Transmit mode</li> </ul>					Approx. 8.4V (#01) 10.0V (#02)
REFERENCE OSCILLATOR	1 <ul style="list-style-type: none"> <li>• Transmit mode</li> </ul>	MAIN	Make a loose coupling between a frequency counter and the ANTENNA CONNECTOR.	Same as the operating frequency	MAIN	C145

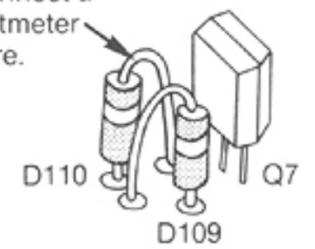
MAIN UNIT



C145 Reference Oscillator Frequency Adj.

D110 measurement location  
(See diagram below)

Connect a  
voltmeter  
here.

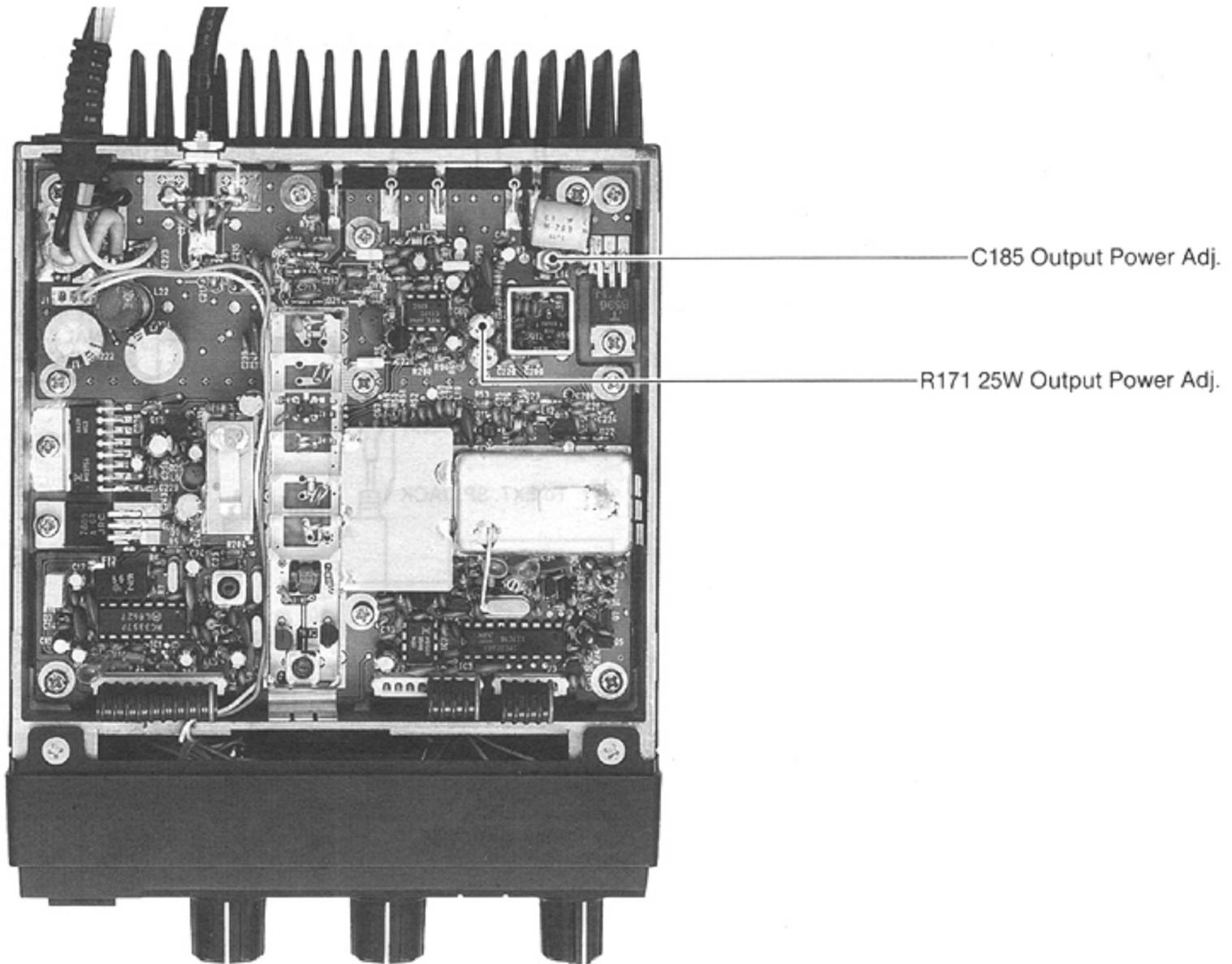


NOTE: IC3 is to the left when  
viewing D110 from this angle.

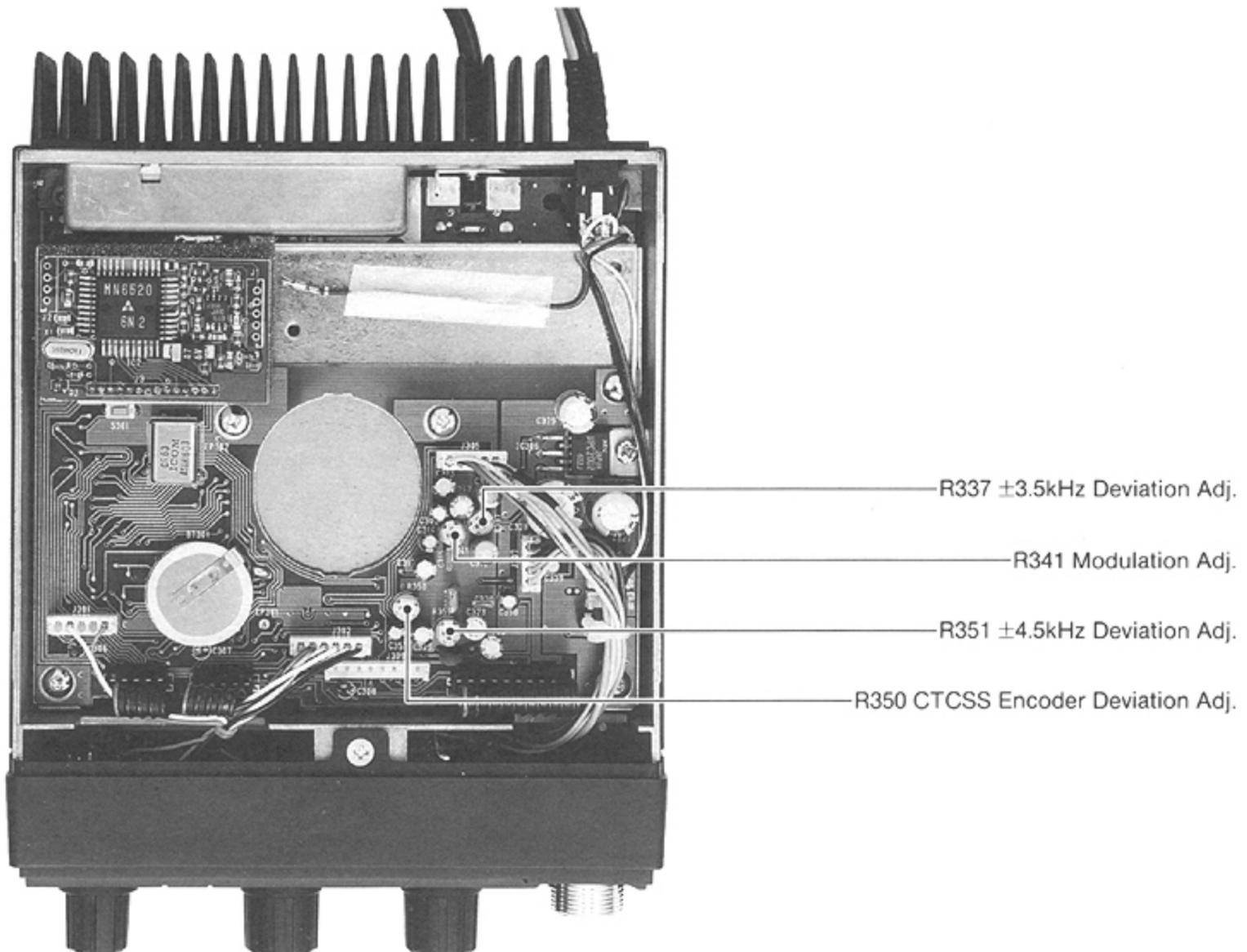
## 6-2 TRANSMITTER ADJUSTMENT

TEST INSTRUMENTS REQUIRED		MEASUREMENT CONNECTION LOCATION						
(1) VOLTAGE REGULATED POWER SUPPLY • Output voltage : 13.8V DC $\pm$ 10% • Current capacity : 10A or more  (2) RF POWER METER • Terminated type • Measuring range : 5 ~ 25W • Frequency minimum : At least 500MHz • Impedance : 50 $\Omega$  (3) DEVIATION METER • Frequency range : 400 ~ 500MHz • Measuring range : 0 ~ $\pm$ 5kHz  (4) AC MILLI-VOLTMETER • Measuring range : 5mV ~ 10V  (5) ATTENUATOR • Attenuation : 20dB or 30dB		<p>The diagram shows the measurement connection locations for the transmitter. It features two units: a LOGIC UNIT (IC-U200) and a MAIN UNIT (IC-U200). The LOGIC UNIT has an antenna connector (ANT.) with components R350, R351, R337, and R341. The MAIN UNIT has an antenna connector (ANT.) with components C185 and R171. A VOLTAGE REGULATED POWER SUPPLY is connected to the MAIN UNIT. An ATTENUATOR is connected between the LOGIC UNIT and the DEVIATION METER. The DEVIATION METER is also connected to the OSCILLOSCOPE. The AC MILLI-VOLTMETER is connected to the LOGIC UNIT. The RF POWER METER is connected to the MAIN UNIT.</p>						
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT			VALUE	ADJUSTMENT POINT		
		UNIT	LOCATION	UNIT		ADJUST		
OUTPUT POWER	1	REAR PANEL	Connect an RF power meter to the ANTENNA CONNECTOR.	Maximum power	MAIN	C185		
	2					25W	R171	
MODULATION	1	REAR PANEL	Connect a deviation meter to the ANTENNA CONNECTOR via an attenuator. Deviation meter: LPF: 20kHz HPF: OFF Deemphasis: OFF Detector: P-P/2	$\pm$ 4.5kHz	LOGIC	R351		
	2					Connect an oscilloscope to the deviation meter.	Symmetrical waveform.	R341
	3					Connect a deviation meter to the ANTENNA CONNECTOR via an attenuator.	$\pm$ 3.5kHz	R337
TRANSMIT S/N RATIO	1	REAR PANEL	Connect an AC millivoltmeter to the deviation meter.	The ratio of the AC millivoltmeter levels between 5mV input and no signal input should be more than 40dB.	LOGIC	Verify		
	2						Apply no AF signal to the MIC CONNECTOR.	
CTCSS ENCODER	1	REAR PANEL	Connect a deviation meter to the ANTENNA CONNECTOR.	$\pm$ 0.5kHz	LOGIC	R350		

MAIN UNIT



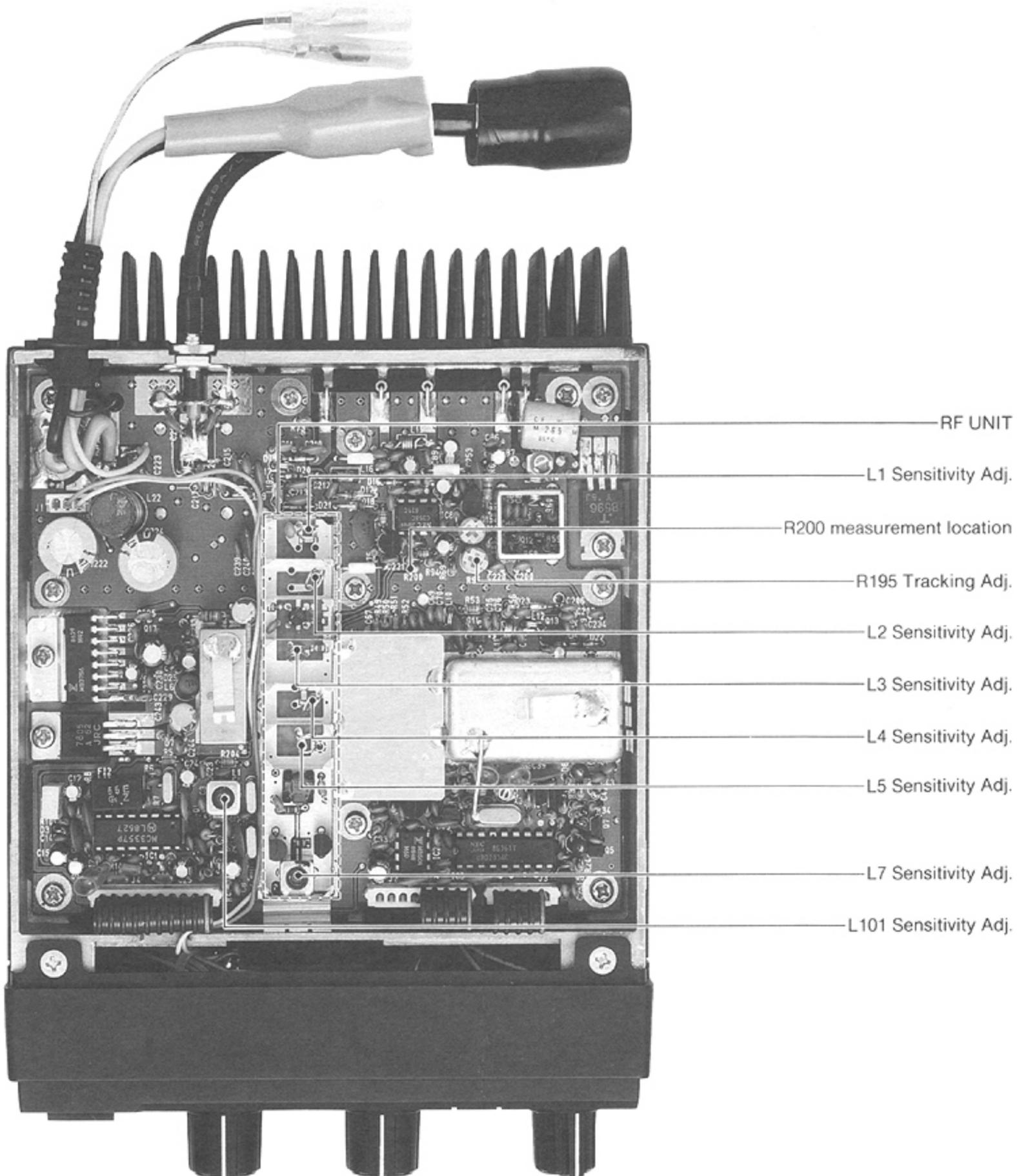
LOGIC UNIT



## 6-3 RECEIVER ADJUSTMENT

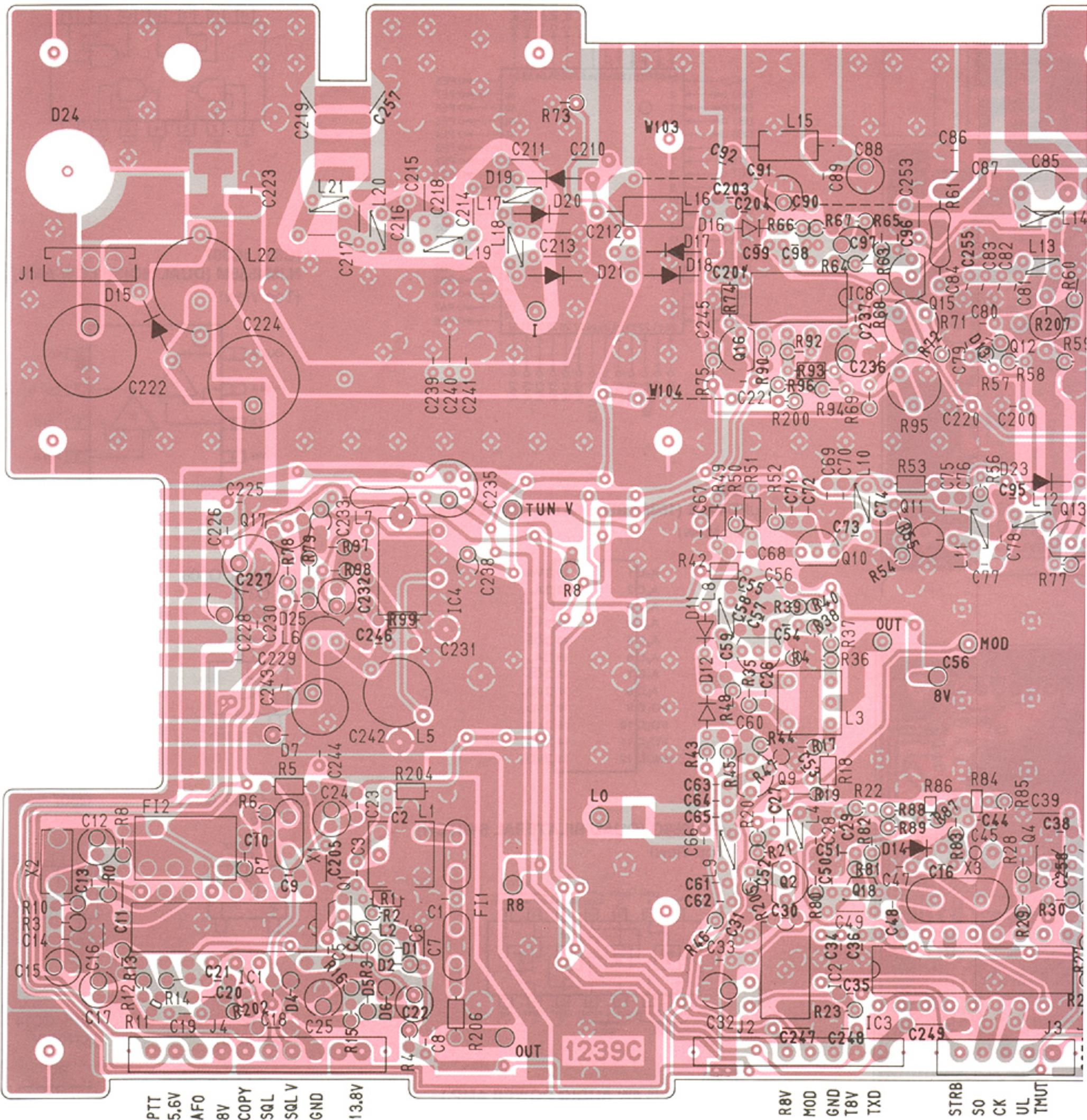
TEST INSTRUMENTS REQUIRED		MEASUREMENT CONNECTION LOCATION					
(1) VOLTAGE REGULATED POWER SUPPLY • Output voltage : 13.8V DC $\pm$ 10% • Current capacity : 10A or more  (2) RF SIGNAL GENERATOR • Frequency range : 400 ~ 500MHz • Output level : 0.1 $\mu$ V ~ 100mV  (3) DISTORTION METER • Frequency range : 1kHz $\pm$ 10Hz • Measuring range : 1% ~ 100%  (4) VOLTMETER • Input impedance : 50k $\Omega$ /V DC or better  (5) SPEAKER • Impedance : 4 $\Omega$							
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT		
		UNIT	LOCATION		UNIT	ADJUST	
RF TRACKING	1 • Operating frequency: 450.00MHz (#01) 470.00MHz (#02)	MAIN	Connect a voltmeter to R200.	6.0V (#01) 8.7V (#02)	MAIN	R195	
SENSITIVITY	1 • Operating frequency: 450.00MHz (#01) 470.00MHz (#02)  • Apply an RF signal to the ANTENNA CONNECTOR. Level : 0.5 $\mu$ V (-113dBm) Mod. : 1kHz Dev. : $\pm$ 3.5kHz • MONITOR SWITCH: ON • SQUELCH CONTROL: Max. CCW	REAR PANEL	Connect a distortion meter with a 4 $\Omega$ load to the EXTERNAL SPEAKER JACK.	Minimum distortion level	MAIN	L101	
					RF	L7 L5 L4 L3 L2 L1	

MAIN UNIT



# SECTION 7 BOARD LAYOUTS

## 7-1 MAIN UNIT



PTT 5.6V AF0 8V COPY SQL V SQL V GND 13.8V R8V MOD GND T8V TXD STRB S0 CK UL TMUT

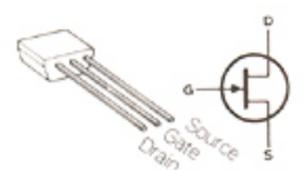
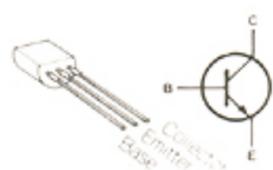
Q101  
2SC2668-O

Q102, Q108-Q110  
2SC2026

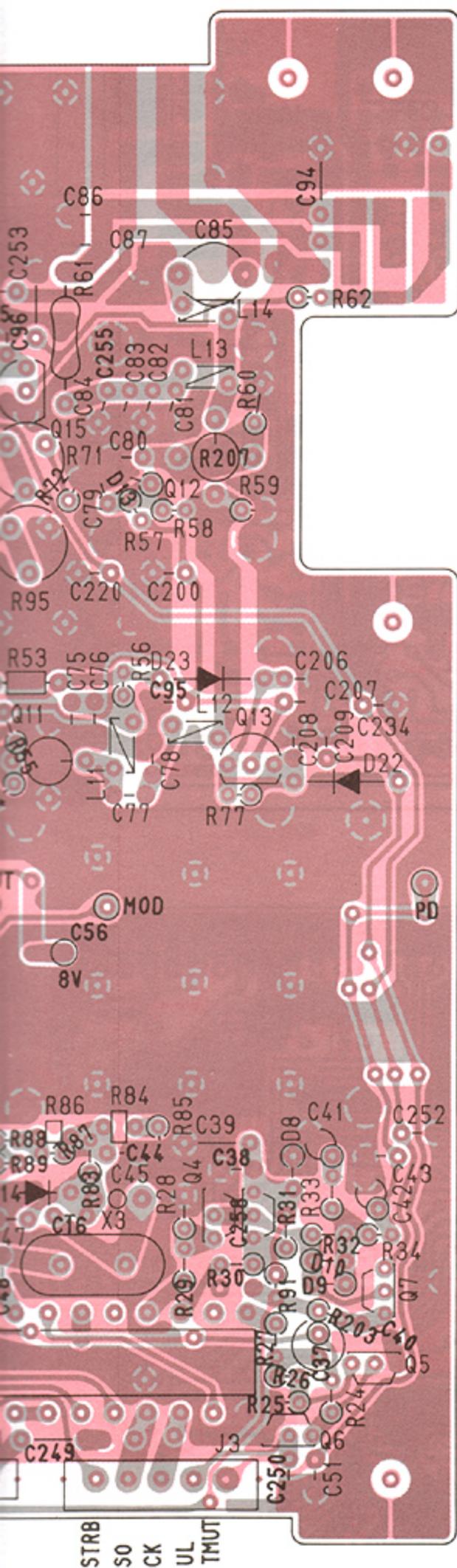
Q103  
2SA1048-GR

Q104-Q106, Q118  
2SC2458-GR

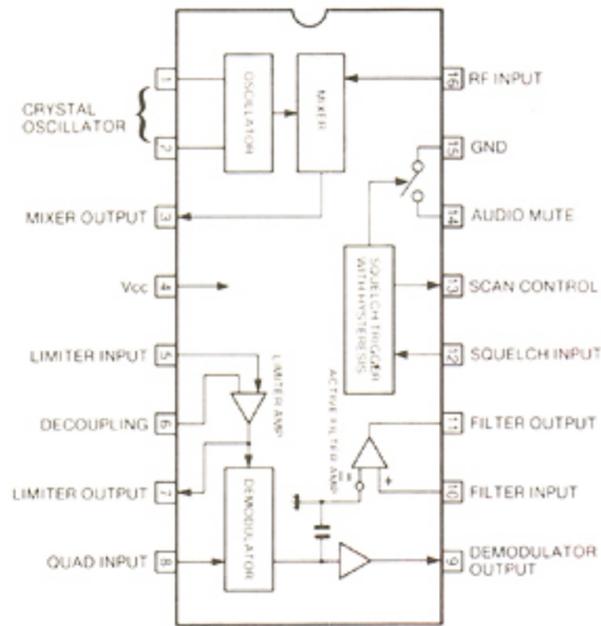
Q107  
2SK184-Y



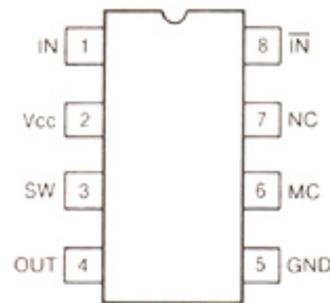
Emi



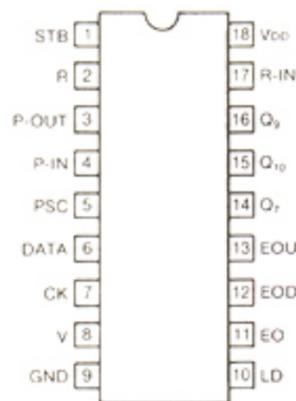
**IC101**  
**MC3357 (LOW POWER FM IF)**  
(Top View)



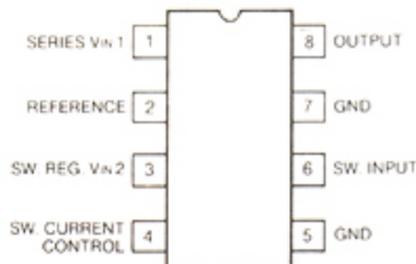
**IC102**  
**MB504 (HIGH SPEED PRESCALER)**  
(Top View)



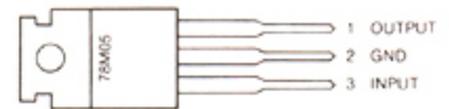
**IC103**  
**μPD2834C (PLL FREQUENCY SYNTHESIZER)**  
(Top View)



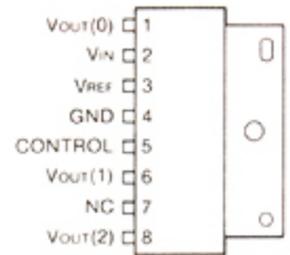
**IC104**  
**TL499A CP (WIDE RANGE POWER SUPPLY CONTROLLER)**  
(Top View)



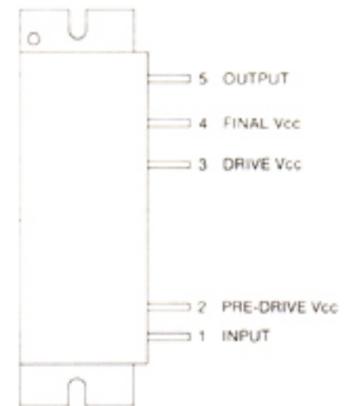
**IC105**  
**NJM78M05 (3-TERMINAL 5V REGULATOR)**  
(Top View)



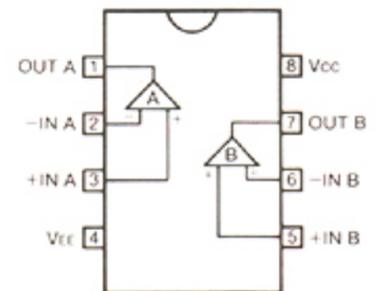
**IC106**  
**MB3756 (VOLTAGE REGULATOR)**  
(Top View)



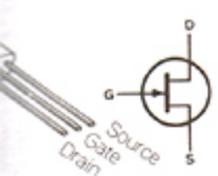
**IC107**  
**SC-1056 (#01 450~470MHz)**  
**SC-1057 (#02 470~490MHz)**  
**(UHF POWER MODULE)**  
(Top View)



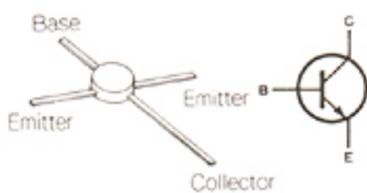
**IC108**  
**μPC358C (DUAL DRIVER)**  
(Top View)



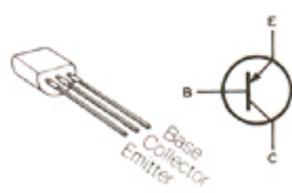
Q7  
K184-Y



Q111 2SC3358  
Q112 TRF559



Q113  
2SB561-C



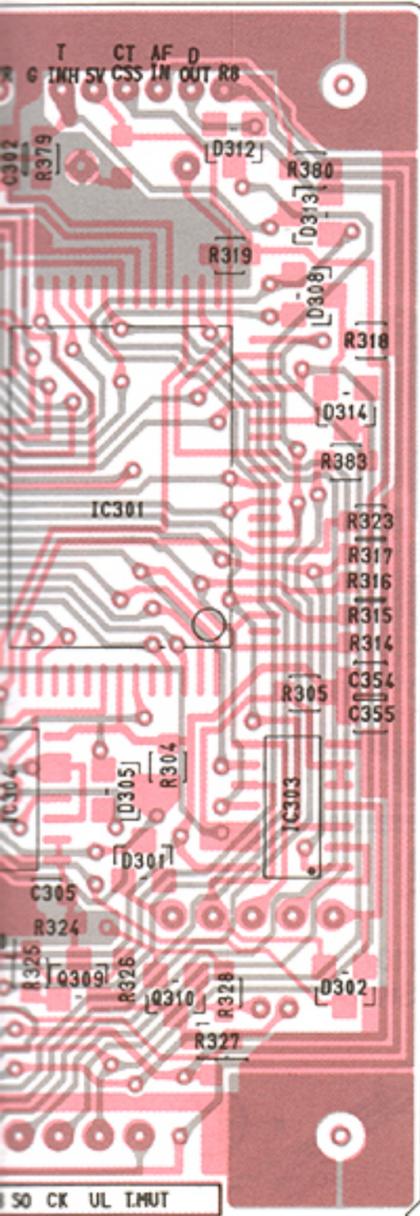
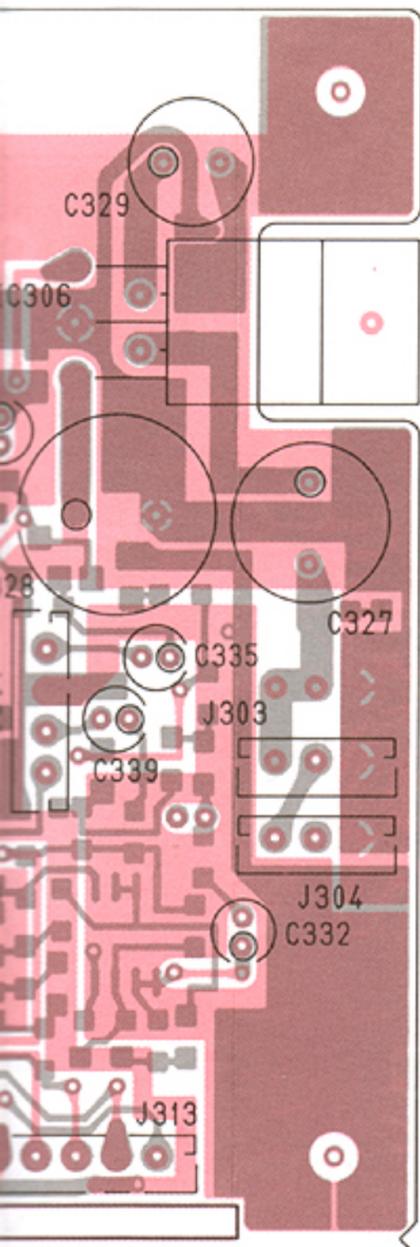
Q114  
2SB596-Y



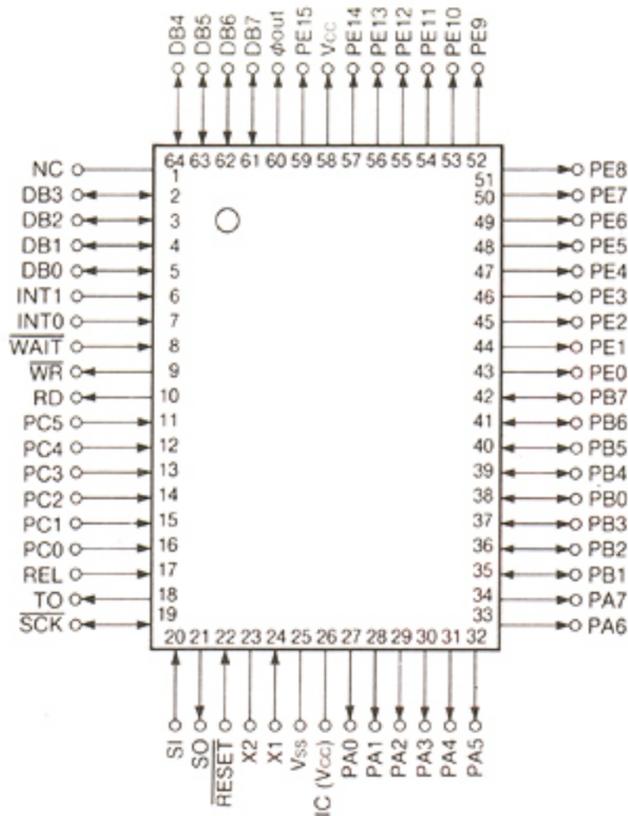
Q115~Q117  
2SC945-P



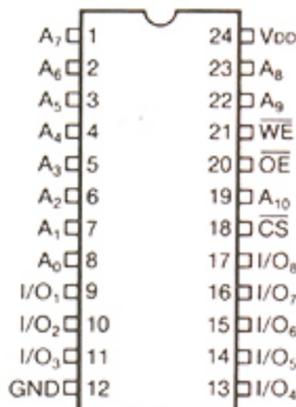




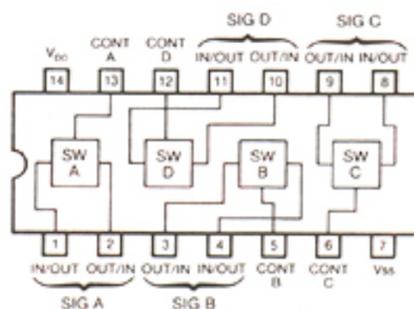
**IC301**  
**μPD78C06AG-570-12 (MPU)**  
(Top View)



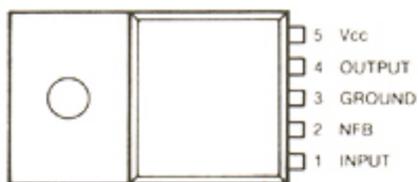
**IC302**  
**μPD446G (16384 BIT STATIC CMOS RAM)**  
(Top View)



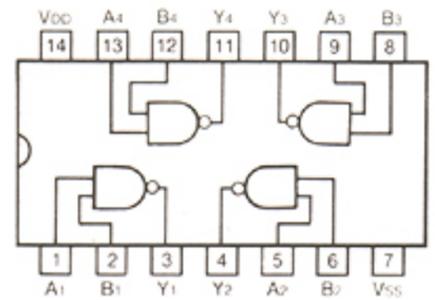
**IC303**  
**μPD4066G (QUAD BILATERAL SWITCH)**  
(Top View)



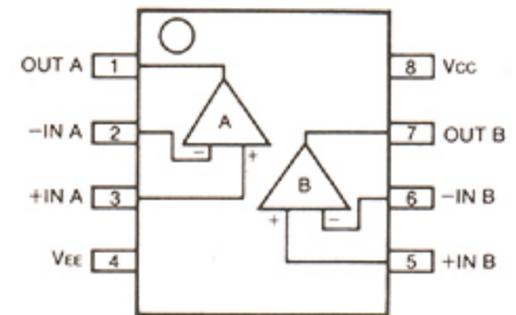
**IC306**  
**μPC2002H (5.4W AUDIO POWER AMP.)**  
(Top View)



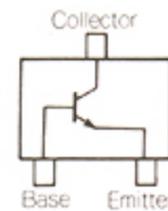
**IC304**  
**μPD4011G (QUAD 2-INPUT NAND GATE)**  
(Top View)



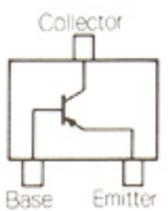
**IC305, IC307**  
**NJM4558M (DUAL NOISE LOW AMP)**  
(Top View)



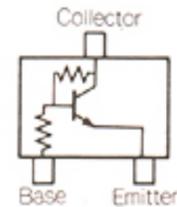
Q301, Q303, Q308,  
Q310, Q315  
2SC2712-Y



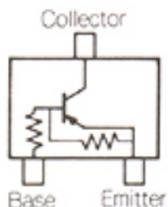
Q302, Q309  
2SA1162-Y



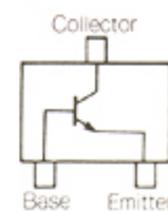
Q304~Q306, Q311  
2SC3395



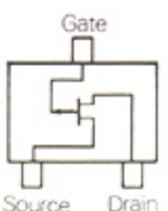
Q307  
2SA1341



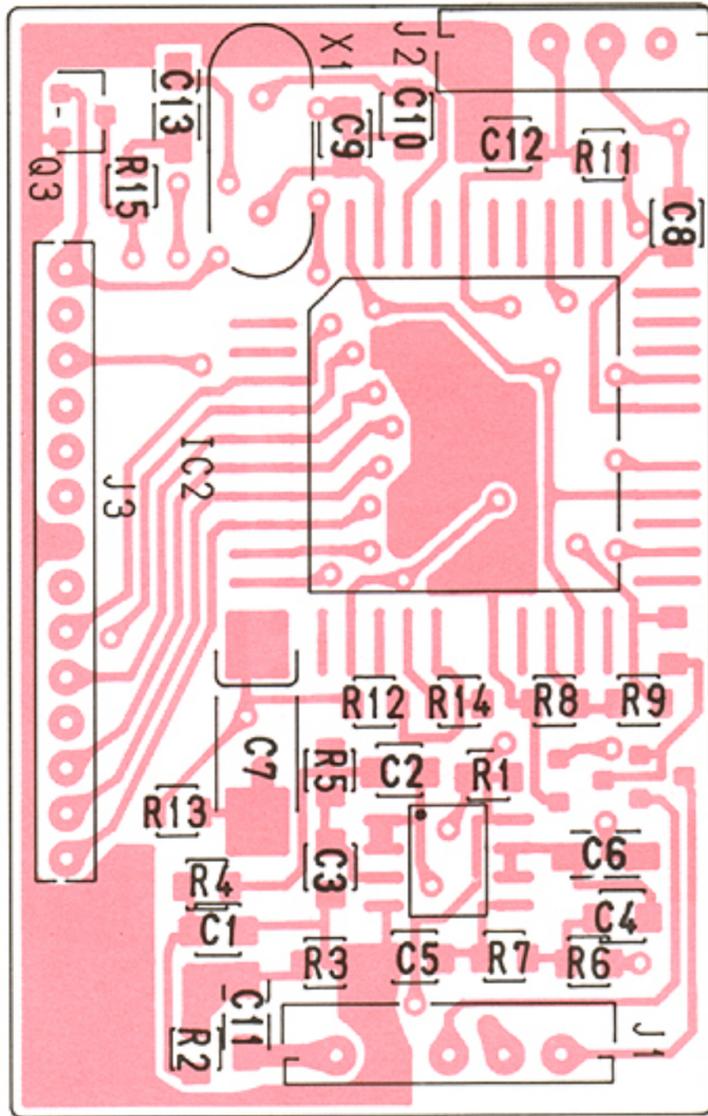
Q312  
2SC3661



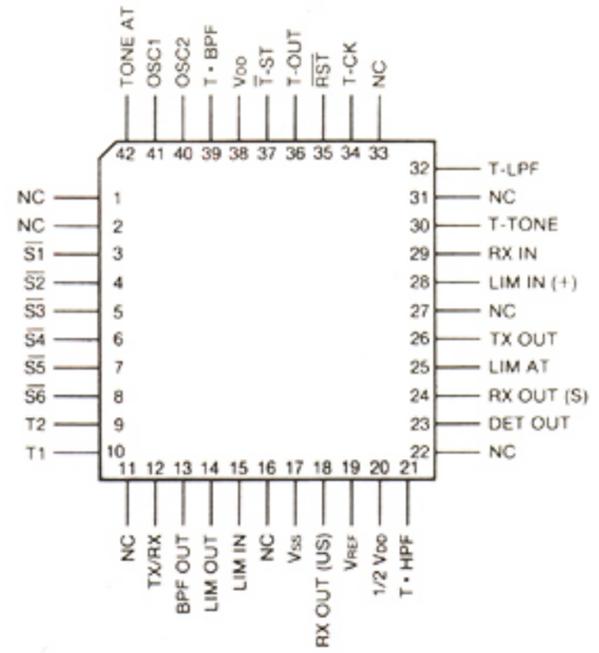
Q313, Q314  
2SJ106-Y



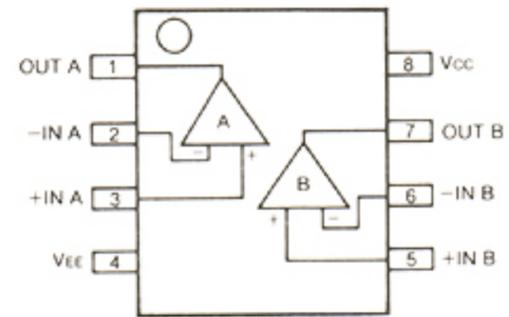
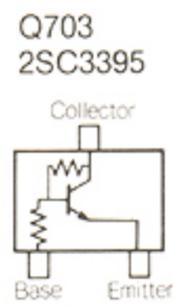
### 7-3 CTCSS UNIT



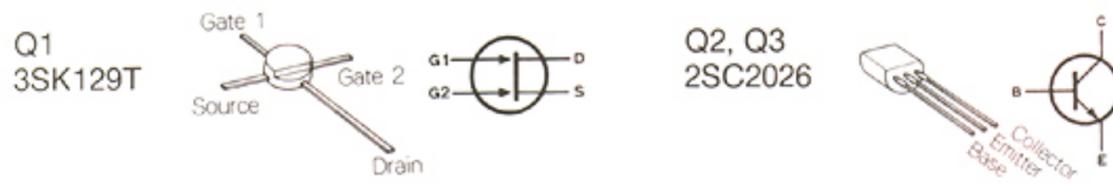
IC702  
MN6520 (CTCSS ENCODER/DECODER)  
(Top View)



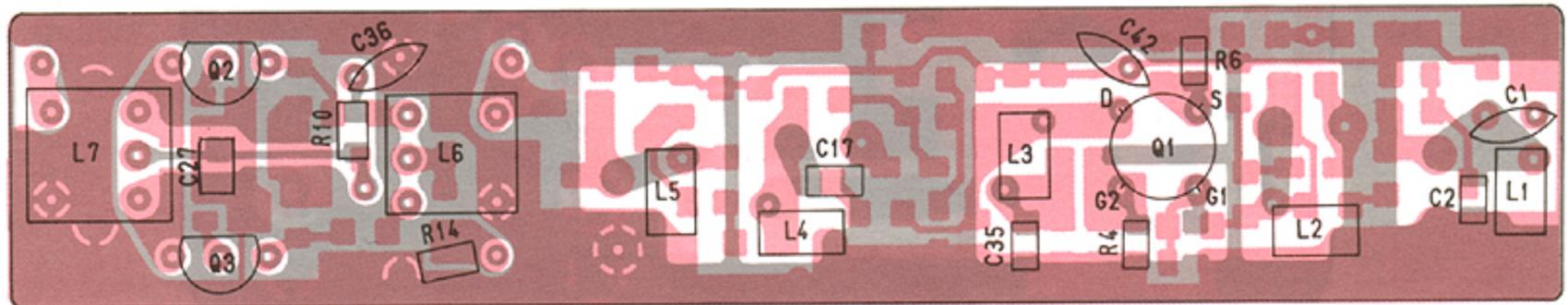
IC701  
NJM4558M (DUAL NOISE LOW AMP)  
(Top View)



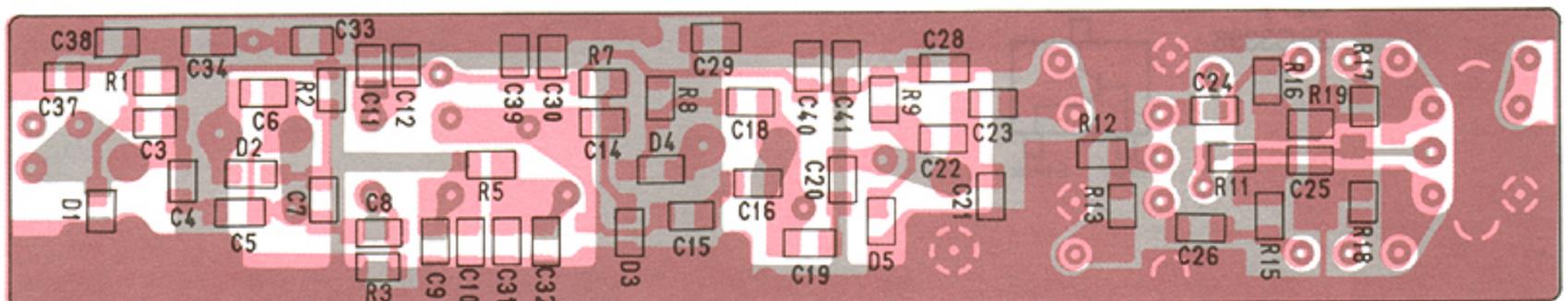
### 7-4 RF UNIT



(Top View)

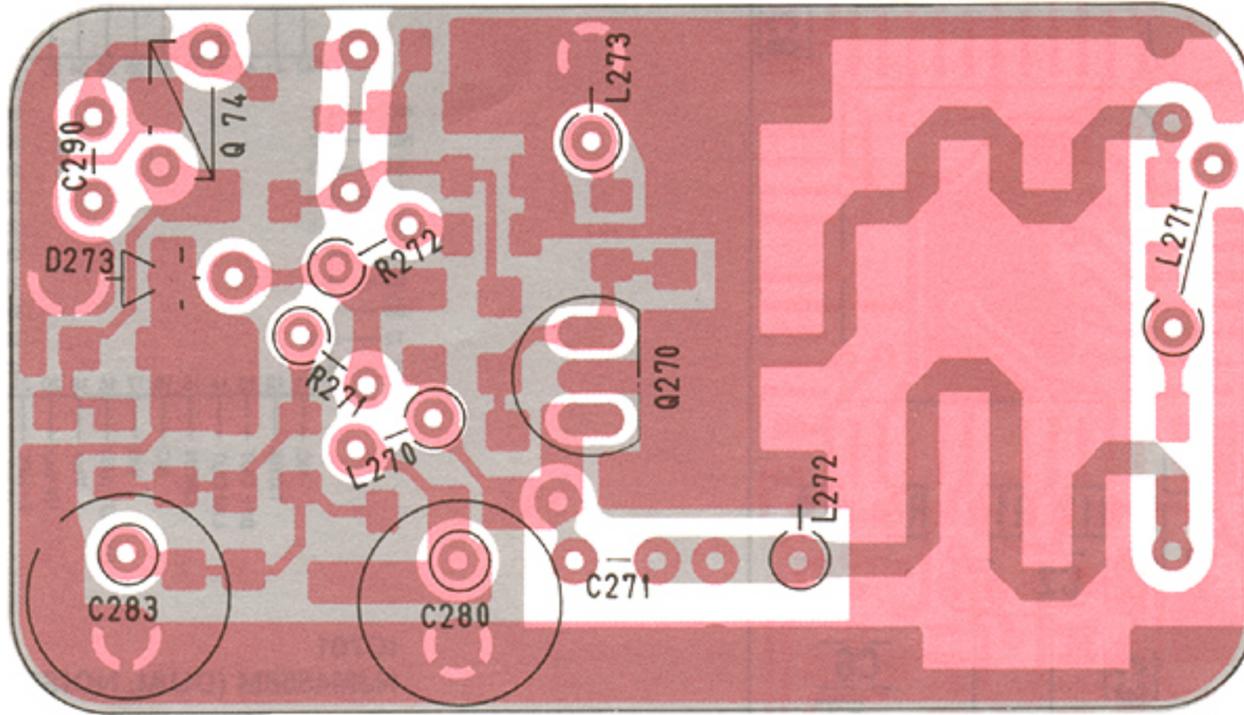


(Bottom View)

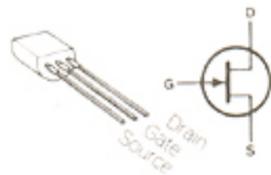


7-5 VCO UNIT

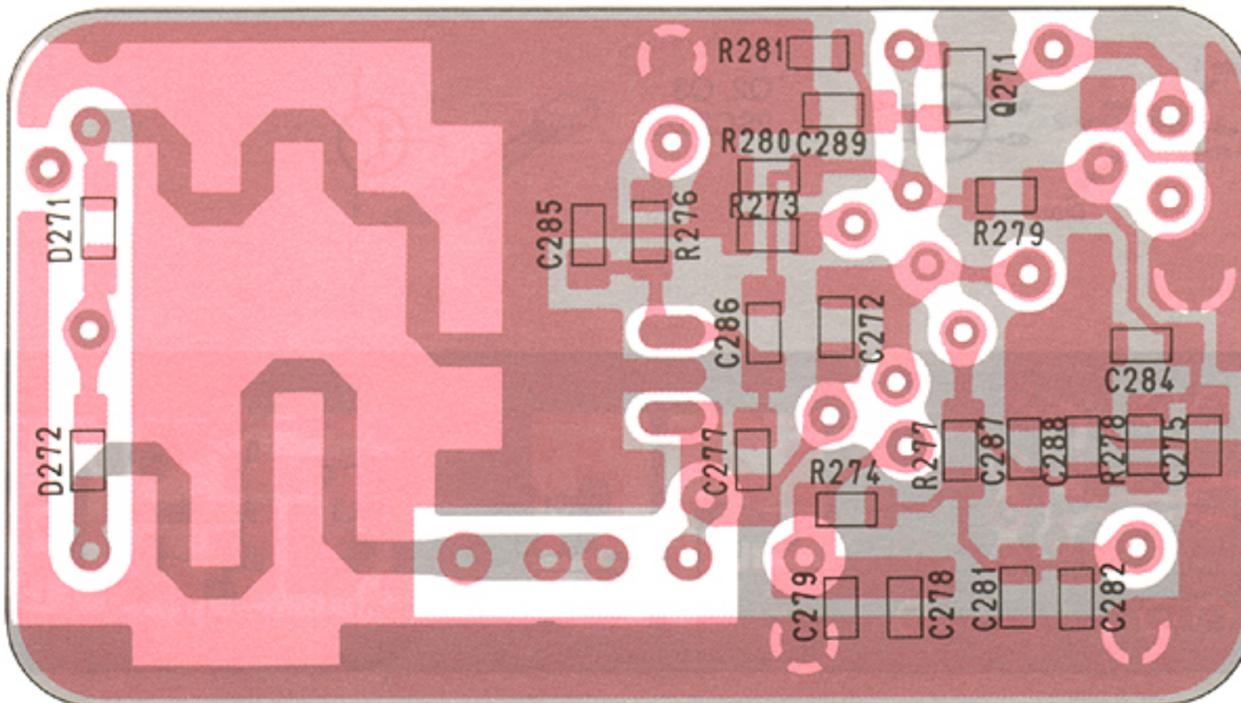
(Top View)



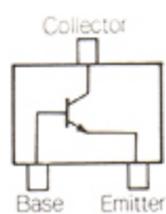
Q270  
2SK125



(Bottom View)

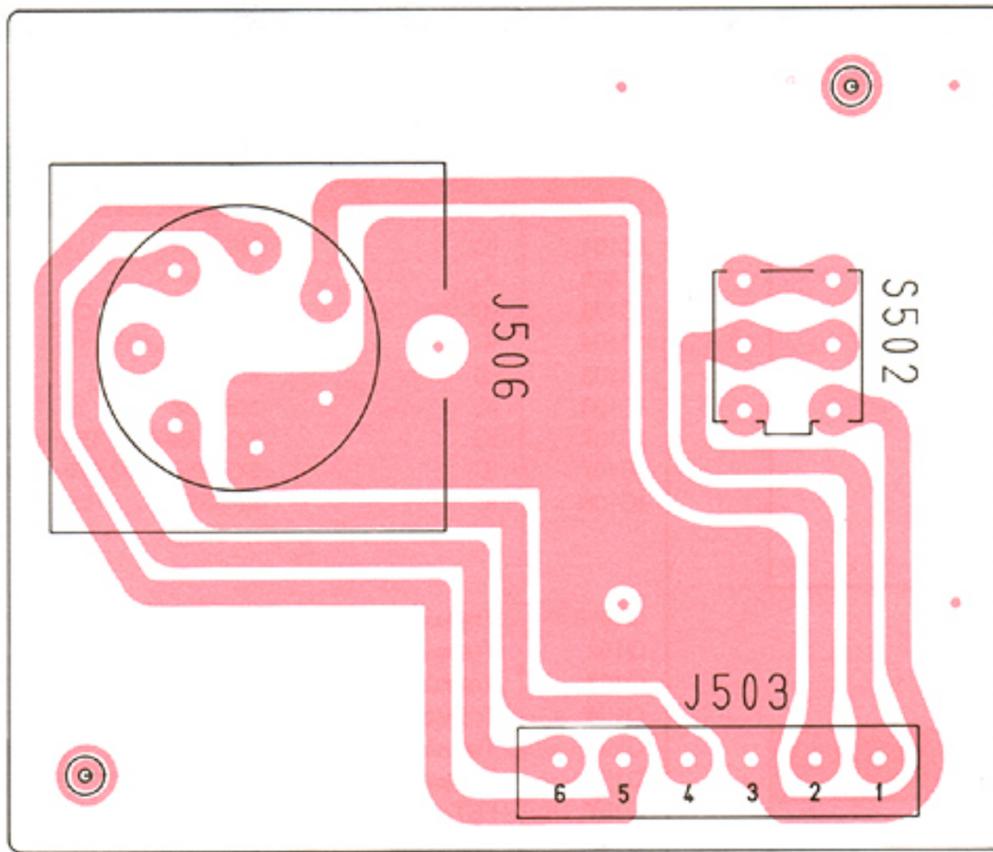


Q271  
2SC3356

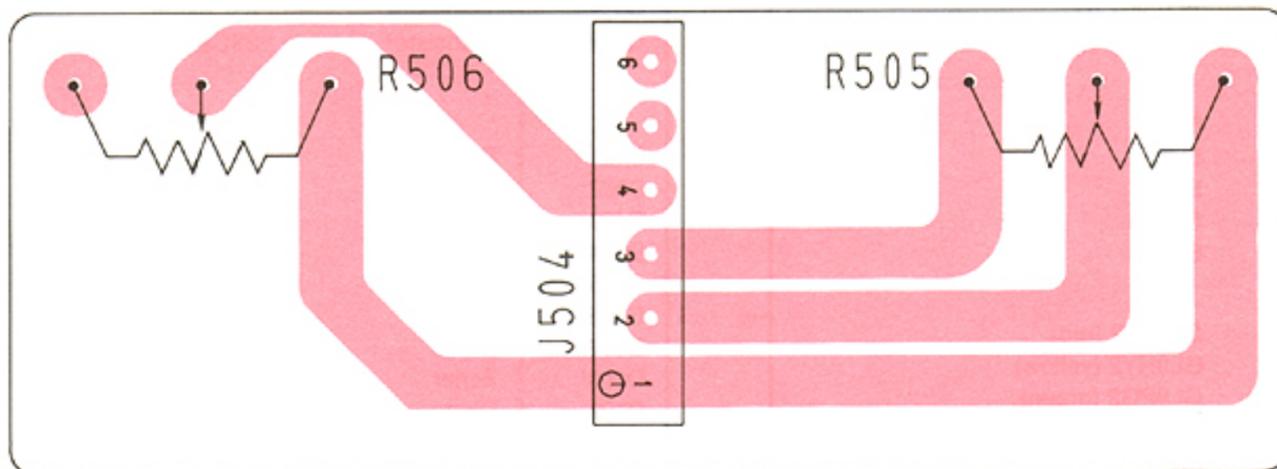


### 7-6 FRONT UNIT

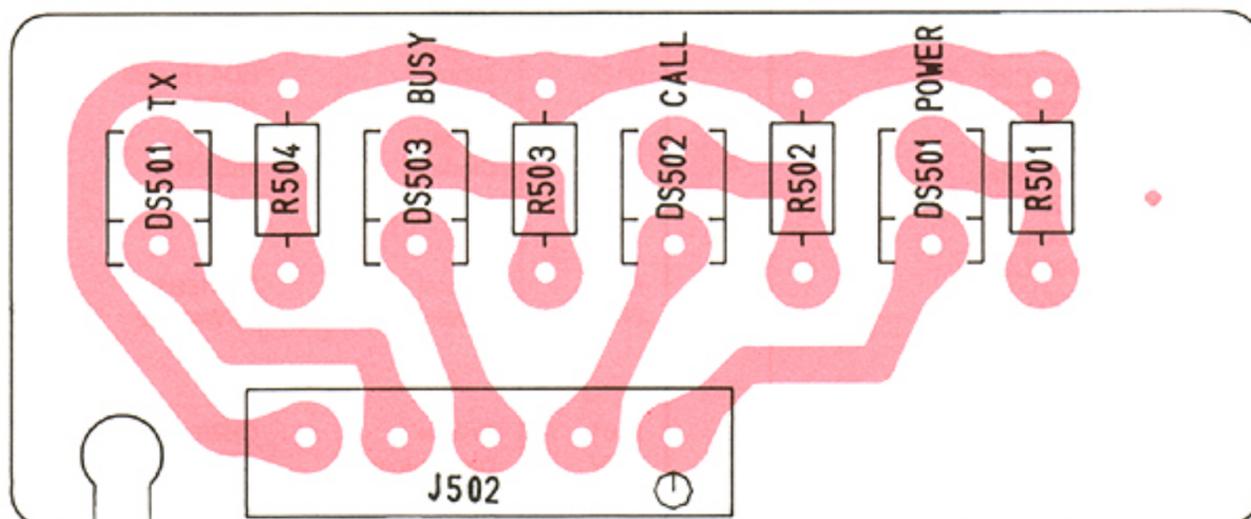
(MIC)



(VR)



(LED)



## SECTION 8 PARTS LIST

### 8-1 EF UNIT

REF. NO.	DESCRIPTION	PART NO.
C601	Ceramic	0.0047 $\mu$ F 50V
J1	Connector	HSJ0780-01-010
SP1	Speaker	66F09N-7
W1	Antenna Cable	OPC-103
W2	DC Cable	OPC-164A

### 8-2 FRONT UNIT

REF. NO.	DESCRIPTION	PART NO.
R501	Resistor	680 $\Omega$ R20
R502	Resistor	680 $\Omega$ R20
R503	Resistor	680 $\Omega$ R20
R504	Resistor	680 $\Omega$ R20
R505	Variable	RK1631111 (10kA)
R506	Variable	RK1631110 (20kB)
J502	Connector	TLB05H-B1
J503	Connector	TLB06H-B1
J504	Connector	TLB06H-B1
J506	Connector	FM14RS-7SS
P501	Connector	EHR-5
P502	Connector	EHR-6
P503	Connector	EHR-4
P504	Connector	EHR-5
P505	Connector	EHR-3
DS501	LED	GL9PR2 (red)
DS502	LED	GL9HY2 (yellow)
DS503	LED	GL9PG2 (green)
S501	Switch	SRRM42
S502	Switch	SPPH23
EP501	P.C. Board	B-1322B
EP503	P.C. Board	B-1324
EP504	P.C. Board	B-1325A
W501	Wire	31/07/090/B06/X04
W502	Wire	31/09/090/B06/X04
W503	Wire	31/02/090/B06/C22
W504	Wire	31/05/090/B06/C22
W505	Wire	31/15/090/B06/C22
W506	Wire	31/09/160/B06/C22
W507	Wire	31/14/090/B06/C22
W508	Wire	31/00/090/B06/C22
W509	Wire	31/06/140/B06/C22
W510	Wire	31/00/140/B06/C22
W511	Wire	31/08/140/B06/C22
W512	Wire	31/03/140/B06/C22
W513	Wire	31/12/160/B06/C22
W514	Wire	31/16/160/B06/C22
W515	Wire	31/08/160/B06/C22
W516	Shield cable	[51/99/160/B06A/C22A]
W517		08
W518	Wire	22/02/200/B06/X04
W519	Wire	22/03/200/B06/X04
W520	Wire	IPS-1041-4

### 8-3 MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
IC101	IC	MC3357P
IC102	IC	MB504
IC103	IC	$\mu$ PD2834C
IC104	IC	TL499A CP
IC105	IC	NJM7805
IC106	IC	MB3756
IC107	IC	SC-1056 (#01 450~470MHz)
IC107	IC	SC-1057 (#02 470~490MHz)
IC108	IC	$\mu$ PC358C
Q101	Transistor	2SC2668-O
Q102	Transistor	2SC2026
Q103	Transistor	2SA1048-GR
Q104	Transistor	2SC2458-GR
Q105	Transistor	2SC2458-GR
Q106	Transistor	2SC2458-GR
Q107	FET	2SK184-Y
Q108	Transistor	2SC2026
Q109	Transistor	2SC2026
Q110	Transistor	2SC2026
Q111	Transistor	2SC3358
Q112	Transistor	TRF559
Q113	Transistor	2SB561-C
Q114	Transistor	2SB596-Y
Q115	Transistor	2SC945-P
Q116	Transistor	2SC945-P
Q117	Transistor	2SC945-P
Q118	Transistor	2SC2458-GR
D101	Diode	1SS53
D102	Diode	1SS53
D103	Zener	RD6.2E B2
D104	Diode	1SS133
D105	Diode	1S953
D106	Diode	1S953
D107	Diode	1SS133
D108	Zener	RD13E B2
D109	Diode	1SS133
D110	Diode	1SS133
D111	Diode	1SS216
D112	Diode	1SS216
D113	Diode	1SS211
D114	Varicap	1SV50E (1)
D115	Diode	1S953
D116	Diode	1SS133
D117	Diode	1SS97
D118	Diode	1SS97
D119	Diode	MI308
D120	Diode	MI308
D121	Diode	MI308
D122	Zener	RD4.7E B3
D123	Diode	1S953
D124	Diode	15CD11
D125	Diode	1SS133
F101	Crystal	21M15B3
F102	Ceramic	CFW455E2
X101	Crystal	CR70
X102	Discriminator	CDB455C7A
X103	Crystal	CR85

## [MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
L101	Coil	LS-298	
L102	Coil	LAL03NA	101K
L103	Coil	LR-116	
L104	Coil	LA-232	
L105	Coil	LW-12A	
L106	Coil	FL5H	101K
L107	Coil	LAL03NA	101K
L108	Coil	LA-232	
L109	Coil	LA-232	
L110	Coil	LA-232	
L111	Coil	LA-233	
L112	Coil	LA-232	
L113	Coil	LA-232	
L114	Coil	LA-232	
L115	Coil	LW-29	
L116	Coil	LW-19	
L117	Coil	LA-232	
L118	Coil	LA-232	
L119	Coil	LA-232	
L120	Coil	LA-232	
L121	Coil	LA-232	
L122	Coil	LW-16	
R101	Resistor	4.7k $\Omega$	R20
R102	Resistor	22k $\Omega$	ELR20
R103	Resistor	330 $\Omega$	ELR20
R104	Resistor	100 $\Omega$	ELR20
R105	Resistor	220 $\Omega$	R20
R106	Resistor	47k $\Omega$	ELR20
R107	Resistor	1.5k $\Omega$	ELR20
R108	Resistor	1.5k $\Omega$	ELR20
R109	Resistor	47k $\Omega$	ELR20
R110	Resistor	1.5k $\Omega$	ELR20
R111	Thermistor	33D28	
R112	Resistor	2.2k $\Omega$	ELR20
R113	Resistor	1.5k $\Omega$	ELR20
R114	Resistor	330k $\Omega$	ELR20
R115	Resistor	2.2k $\Omega$	ELR20
R116	Resistor	22k $\Omega$	ELR20
R117	Resistor	150 $\Omega$	ELR20
R118	Resistor	33 $\Omega$	R20
R119	Resistor	150 $\Omega$	ELR20
R120	Resistor	6.8k $\Omega$	ELR20
R121	Resistor	1.8k $\Omega$	ELR20
R122	Resistor	330 $\Omega$	ELR20
R123	Resistor	1k $\Omega$	ELR20
R124	Resistor	470k $\Omega$	ELR20
R125	Resistor	39k $\Omega$	ELR20
R126	Resistor	33k $\Omega$	ELR20
R127	Resistor	120k $\Omega$	ELR20
R128	Resistor	47k $\Omega$	ELR20
R129	Resistor	82k $\Omega$	ELR20
R130	Resistor	82k $\Omega$	ELR20
R131	Resistor	5.6k $\Omega$	ELR20
R132	Resistor	4.7k $\Omega$	ELR20
R133	Resistor	2.7k $\Omega$	ELR20
R134	Resistor	22k $\Omega$	ELR20
R135	Resistor	15 $\Omega$	ELR20
R136	Resistor	330 $\Omega$	ELR20
R137	Resistor	22 $\Omega$	ELR20
R138	Resistor	330 $\Omega$	ELR20
R139	Resistor	2.2k $\Omega$	ELR20
R140	Resistor	3.3k $\Omega$	ELR20
R141	Resistor	220 $\Omega$	ELR20
R142	Resistor	100 $\Omega$	R20
R143	Resistor	2.2k $\Omega$	ELR20
R144	Resistor	2.2k $\Omega$	ELR20
R145	Resistor	3.3k $\Omega$	ELR20
R146	Resistor	100 $\Omega$	ELR20
R147	Resistor	220 $\Omega$	ELR20
R148	Resistor	1k $\Omega$	ELR20
R149	Resistor	2.2k $\Omega$	R20
R150	Resistor	2.2k $\Omega$	ELR20
R151	Resistor	3.3k $\Omega$	R20

## [MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R152	Resistor	220 $\Omega$	ELR20
R153	Resistor	100 $\Omega$	R20
R154	Resistor	2.2k $\Omega$	ELR20
R155	Resistor	15k $\Omega$	ELR20
R156	Resistor	100 $\Omega$	ELR20
R157	Resistor	1k $\Omega$	ELR20
R158	Resistor	100 $\Omega$	ELR20
R159	Resistor	1k $\Omega$	ELR20
R160	Resistor	12 $\Omega$	ELR25
R161	Resistor	15 $\Omega$	R50X
R162	Resistor	1.2k $\Omega$	ELR20
R163	Resistor	5.6k $\Omega$	ELR20
R164	Resistor	12k $\Omega$	ELR20
R165	Resistor	27k $\Omega$	ELR20
R166	Resistor	10k $\Omega$	ELR20
R167	Resistor	27k $\Omega$	ELR20
R168	Resistor	15k $\Omega$	ELR20
R169	Resistor	120k $\Omega$	ELR20
R171	Trimmer	RH0651CS5J10A	470k $\Omega$
R172	Resistor	100k $\Omega$	ELR20
R173	Resistor	100 $\Omega$	ELR20
R174	Resistor	100k $\Omega$	R20
R175	Resistor	150 $\Omega$	ELR20
R177	Resistor	10k $\Omega$	ELR20
R178	Resistor	47k $\Omega$	ELR20
R179	Resistor	470 $\Omega$	ELR20
R180	Resistor	2.2k $\Omega$	ELR20
R181	Resistor	100k $\Omega$	ELR20
R182	Resistor	100k $\Omega$	ELR20
R183	Resistor	10k $\Omega$	ELR20
R184	Thermistor	33D28	
R185	Resistor	15k $\Omega$	ELR20
R186	Thermistor	33D28	
R187	Resistor	2.2k $\Omega$	ELR20
R188	Resistor	6.8k $\Omega$	ELR20
R189	Resistor	100 $\Omega$	ELR20
R190	Resistor	10k $\Omega$	ELR20
R191	Resistor	560 $\Omega$	ELR20
R192	Resistor	18k $\Omega$	ELR20
R193	Resistor	10k $\Omega$	R20
R194	Resistor	47k $\Omega$	ELR20
R195	Trimmer	RH0651CS4J25A	47k $\Omega$
R196	Resistor	47 $\Omega$	ELR20
R197	Resistor	4.7k $\Omega$	ELR20
R198	Resistor	82k $\Omega$	ELR20
R199	Resistor	1.5k $\Omega$	R20
R200	Resistor	10k $\Omega$	R20
R202	Resistor	2.2k $\Omega$	ELR20
R203	Resistor	1k $\Omega$	ELR20
R204	Resistor	10k $\Omega$	R20
R205	Resistor	100 $\Omega$	ELR20
R206	Resistor	1k $\Omega$	R20
R207	Resistor	100 $\Omega$	R20
R208	Resistor	2.2k $\Omega$	R20
C101	Ceramic	7pF	50V
C102	Ceramic	22pF	50V
C103	Ceramic	4pF	50V
C104	Barrier Layer	0.0047 $\mu$ F	25V
C105	Ceramic	0.001 $\mu$ F	50V
C106	Barrier Layer	0.0047 $\mu$ F	25V
C107	Barrier Layer	0.1 $\mu$ F	16V
C108	Ceramic	0.001 $\mu$ F	50V
C109	Ceramic	120pF	50V
C110	Ceramic	100pF	50V
C111	Barrier Layer	0.1 $\mu$ F	16V
C112	Electrolytic	0.1 $\mu$ F	50V MS7
C113	Ceramic	82pF	50V
C114	Ceramic	0.001 $\mu$ F	50V
C115	Electrolytic	10 $\mu$ F	16V MS7
C116	Barrier Layer	0.047 $\mu$ F	16V
C117	Electrolytic	0.1 $\mu$ F	50V MS7
C118	Mylar	0.001 $\mu$ F	50V
C119	Mylar	0.001 $\mu$ F	50V

## [MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.		
C120	Mylar	0.001 $\mu$ F	50V	
C121	Ceramic	33pF	50V	
C122	Electrolytic	0.1 $\mu$ F	50V	MS7
C123	Ceramic	0.001 $\mu$ F	50V	
C124	Electrolytic	2.2 $\mu$ F	50V	MS7
C125	Electrolytic	0.47 $\mu$ F	50V	MS7
C126	Ceramic	15pF	50V	
C127	Ceramic	0.001 $\mu$ F	50V	
C128	Ceramic	0.001 $\mu$ F	50V	
C129	Barrier Layer	0.01 $\mu$ F	25V	
C130	Ceramic	10pF	50V	
C131	Ceramic	2pF	50V	
C132	Electrolytic	47 $\mu$ F	6.3V	MS7
C133	Ceramic	0.001 $\mu$ F	50V	
C134	Ceramic	0.001 $\mu$ F	50V	
C135	Ceramic	0.001 $\mu$ F	50V	
C136	Barrier Layer	0.01 $\mu$ F	25V	
C137	Tantalum	4.7 $\mu$ F	35V	MS7
C138	Ceramic	0.001 $\mu$ F	50V	
C139	Barrier Layer	0.1 $\mu$ F	16V	
C140	Ceramic	0.001 $\mu$ F	50V	
C141	Tantalum	4.7 $\mu$ F	35V	DN
C142	Tantalum	0.22 $\mu$ F	35V	DN
C143	Ceramic	470pF	50V	
C144	Ceramic	0.001 $\mu$ F	50V	
C145	Trimmer	CV38D2001	20pF	
C146	Ceramic	33pF	50V	CH
C147	Ceramic	4pF	50V	CH
C148	Ceramic	47pF	50V	
C149	Ceramic	220pF	50V	
C150	Ceramic	100pF	50V	
C151	Barrier Layer	0.01 $\mu$ F	25V	
C152	Ceramic	470pF	50V	
C153	Ceramic	0.001 $\mu$ F	50V	
C154	Ceramic	0.001 $\mu$ F	50V	
C155	Ceramic	470pF	50V	
C156	Ceramic	0.001 $\mu$ F	50V	
C157	Ceramic	470pF	50V	
C158	Ceramic	0.001 $\mu$ F	50V	
C159	Ceramic	8pF	50V	
C160	Ceramic	4pF	50V	
C161	Ceramic	470pF	50V	
C162	Ceramic	0.001 $\mu$ F	50V	
C163	Ceramic	470pF	50V	
C164	Ceramic	0.001 $\mu$ F	50V	
C165	Ceramic	6pF	50V	
C166	Ceramic	2pF	50V	
C167	Ceramic	0.001 $\mu$ F	50V	
C168	Ceramic	4pF	50V	
C169	Ceramic	0.001 $\mu$ F	50V	
C170	Ceramic	470pF	50V	
C171	Ceramic	0.001 $\mu$ F	50V	
C172	Ceramic	470pF	50V	
C173	Ceramic	6pF	50V	
C174	Barrier Layer	0.1 $\mu$ F	16V	
C175	Ceramic	0.001 $\mu$ F	50V	
C176	Ceramic	470pF	50V	
C177	Ceramic	2pF	50V	
C178	Ceramic	2pF	50V	
C179	Ceramic	470pF	50V	
C180	Ceramic	470pF	50V	
C181	Ceramic	47pF	50V	
C182	Ceramic	0.001 $\mu$ F	50V	
C183	Ceramic	470pF	50V	
C184	Ceramic	0.001 $\mu$ F	50V	
C185	Trimmer	CV05A0601	6pF	
C186	Ceramic	47pF	50V	
C187	Electrolytic	10 $\mu$ F	16V	MS7
C188	Electrolytic	10 $\mu$ F	16V	MS7
C189	Ceramic	470pF	50V	
C190	Electrolytic	10 $\mu$ F	16V	MS7
C191	Ceramic	470pF	50V	
C192	Ceramic	47pF	50V	
C194	Electrolytic	470 $\mu$ F	16V	MS5
C195	Ceramic	470pF	50V	

## [MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.		
C196	Barrier Layer	0.01 $\mu$ F	25V	
C197	Electrolytic	10 $\mu$ F	16V	MS5
C198	Ceramic	0.001 $\mu$ F	50V	
C199	Ceramic	47pF	50V	
C200	Ceramic	47pF	50V	
C201	Ceramic	0.001 $\mu$ F	50V	
C202	Ceramic	0.001 $\mu$ F	50V	
C203	Ceramic	470pF	50V	
C204	Ceramic	0.001 $\mu$ F	50V	
C205	Ceramic	0.0047 $\mu$ F	50V	
C206	Ceramic	0.001 $\mu$ F	50V	
C207	Ceramic	47pF	50V	
C208	Ceramic	0.001 $\mu$ F	50V	
C209	Ceramic	47pF	50V	
C210	Ceramic	4pF	500V	
C211	Ceramic	6pF	500V	
C212	Ceramic	12pF	500V	
C213	Ceramic	5pF	500V	
C214	Ceramic	39pF	500V	
C215	Ceramic	6pF	500V	
C216	Ceramic	1pF	500V	
C217	Ceramic	8pF	500V	
C218	Ceramic	1pF	500V	
C219	Ceramic	2pF	500V	
C220	Ceramic	470pF	50V	
C221	Ceramic	0.001 $\mu$ F	50V	
C222	Electrolytic	470 $\mu$ F	16V	MS16
C223	Barrier Layer	0.01 $\mu$ F	25V	
C224	Electrolytic	470 $\mu$ F	16V	MS16
C225	Ceramic	0.001 $\mu$ F	50V	
C226	Ceramic	0.001 $\mu$ F	50V	
C227	Electrolytic	47 $\mu$ F	16V	MS7
C228	Electrolytic	4.7 $\mu$ F	25V	MS7
C229	Ceramic	0.001 $\mu$ F	50V	
C230	Ceramic	0.001 $\mu$ F	50V	
C231	Electrolytic	22 $\mu$ F	6.3V	MS5
C232	Electrolytic	0.1 $\mu$ F	50V	MS7
C233	Tantalum	0.1 $\mu$ F	35V	DN
C234	Ceramic	470pF	50V	
C235	Electrolytic	10 $\mu$ F	50V	
C236	Electrolytic	3.3 $\mu$ F	50V	MS7
C237	Ceramic	470pF	50V	
C238	Tantalum	0.1 $\mu$ F	35V	DN
C239	Ceramic	0.001 $\mu$ F	50V	
C240	Barrier Layer	0.1 $\mu$ F	16V	
C241	Ceramic	0.001 $\mu$ F	50V	
C242	Electrolytic	100 $\mu$ F	10V	
C243	Ceramic	0.001 $\mu$ F	50V	
C244	Ceramic	0.001 $\mu$ F	50V	
C245	Barrier Layer	0.1 $\mu$ F	16V	
C246	Barrier Layer	0.01 $\mu$ F	25V	
C247	Ceramic	0.0047 $\mu$ F	50V	
C248	Ceramic	0.001 $\mu$ F	50V	
C249	Ceramic	0.0047 $\mu$ F	50V	
C250	Ceramic	0.001 $\mu$ F	50V	
C251	Ceramic	0.001 $\mu$ F	50V	
C252	Ceramic	470pF	50V	
C253	Barrier Layer	0.1 $\mu$ F	16V	
C254	Ceramic	3pF	50V	
C255	Electrolytic	47 $\mu$ F	25V	
C256	Ceramic	47pF	50V	
C257	Ceramic	2pF	500V	
C258	Ceramic	33pF	50V	
J101	Connector	B03B-EH-S		
J102	Connector	WH8D-1		
J103	Connector	WH5D-1		
J104	Connector	WH10D-1		
EP101	P.C. Board	B-1239C		
EP103	Ferrite Bead	DL2-OP2.6-3-1.2H		
EP104	Ferrite Bead	DL2-OP2.6-3-1.2H		
EP105	Ferrite Bead	DL2-OP2.6-3-1.2H		

**[MAIN UNIT]**

REF. NO.	DESCRIPTION	PART NO.
W101	Ribbon Cable	2468 AWG26 VW-1 E43172 (10)
W102	Ribbon Cable	2468 AWG26 VW-1 E43172 (5)
W103	Jumper	JPW-02A
W104	Jumper	JPW-02A
W105	Jumper	JPW-02A
W106	Ribbon Cable	2468 AWG26 VW-1 E43172 (5)
W107	Wire	74/98/015/X98/X98
W108	Wire	72/98/005/X98/X98

**[RF UNIT]**

REF. NO.	DESCRIPTION	PART NO.
C17	Monolithic	2pF GRM40
C18	Monolithic	7pF GRM40
C19	Monolithic	0.5pF GRM40
C20	Monolithic	0.5pF GRM40
C21	Monolithic	2pF GRM40
C22	Monolithic	7pF GRM40
C23	Monolithic	1pF GRM40
C24	Monolithic	0.001 $\mu$ F GRM40
C25	Monolithic	0.001 $\mu$ F GRM40
C26	Monolithic	0.001 $\mu$ F GRM40
C27	Monolithic	0.001 $\mu$ F GRM40
C28	Monolithic	0.001 $\mu$ F GRM40
C29	Monolithic	470pF GRM40
C30	Monolithic	0.001 $\mu$ F GRM40
C31	Monolithic	470pF GRM40
C32	Monolithic	0.001 $\mu$ F GRM40
C33	Monolithic	470pF GRM40
C34	Monolithic	0.001 $\mu$ F GRM40
C35	Monolithic	470pF GRM40
C36	Ceramic	0.001 $\mu$ F 50V
C37	Monolithic	47pF GRM40
C38	Monolithic	470pF GRM40
C39	Monolithic	470pF GRM40
C40	Monolithic	47pF GRM40
C41	Monolithic	470pF GRM40
C42	Ceramic	47pF 50V
J1	Connector	
EP1	P.C. Board	B-1241B

**8-4 RF UNIT**

REF. NO.	DESCRIPTION	PART NO.
Q1	FET	3SK129T
Q2	Transistor	2SC2026
Q3	Transistor	2SC2026
D1	Varicap	1SV164T 2B
D2	Varicap	1SV164T 2B
D3	Varicap	1SV164T 2B
D4	Varicap	1SV164T 2B
D5	Varicap	1SV164T 2B
L1	Coil	LA-242
L2	Coil	LA-242
L3	Coil	LA-233
L4	Coil	LA-242
L5	Coil	LA-242
L6	Coil	LR-145
L7	Coil	LS-304
R1	Chip	220k $\Omega$ MCR10
R2	Chip	220k $\Omega$ MCR10
R3	Chip	390k $\Omega$ MCR10
R4	Chip	47k $\Omega$ MCR10
R5	Chip	100k $\Omega$ MCR10
R6	Chip	82 $\Omega$ MCR10
R7	Chip	220k $\Omega$ MCR10
R8	Chip	220k $\Omega$ MCR10
R9	Chip	220k $\Omega$ MCR10
R10	Chip	100 $\Omega$ MCR10
R11	Chip	22k $\Omega$ MCR10
R12	Chip	270 $\Omega$ MCR10
R13	Chip	18 $\Omega$ MCR10
R14	Resistor	270 $\Omega$ R20
R15	Chip	330 $\Omega$ MCR10
R16	Chip	330 $\Omega$ MCR10
R17	Chip	10 $\Omega$ MCR10
R18	Chip	10 $\Omega$ MCR10
R19	Chip	1k $\Omega$ MCR10
C1	Ceramic	1pF 50V
C2	Monolithic	2pF GRM40
C3	Monolithic	7pF GRM40
C4	Monolithic	0.5pF GRM40
C5	Monolithic	0.5pF GRM40
C6	Monolithic	2pF GRM40
C7	Monolithic	7pF GRM40
C8	Monolithic	5pF GRM40
C9	Monolithic	470pF GRM40
C10	Monolithic	0.001 $\mu$ F GRM40
C11	Monolithic	470pF GRM40
C12	Monolithic	0.001 $\mu$ F GRM40
C14	Monolithic	7pF GRM40
C15	Monolithic	0.5pF GRM40
C16	Monolithic	0.5pF GRM40

**8-5 VCO UNIT**

REF. NO.	DESCRIPTION	PART NO.
Q270	FET	2SK125
Q271	Transistor	2SC3356
D271	Varicap	1SV166T 2B
D272	Varicap	1SV166T 2B
D273	Varicap	1T25
L270	Coil	LAL03NA R39 M
L271	Coil	LAL03NA R39 M
L272	Coil	LAL03NA R39 M
L273	Coil	LAL03NA R27 M
L274	Coil	LA-233
R271	Resistor	150k $\Omega$ R20
R272	Resistor	270 $\Omega$ R20
R273	Chip	47k $\Omega$ MCR10
R274	Chip	10 $\Omega$ MCR10
R276	Chip	47 $\Omega$ MCR10
R277	Chip	22 $\Omega$ MCR10
R278	Chip	100 $\Omega$ MCR10
R279	Chip	3.3k $\Omega$ MCR10
R280	Chip	2.2k $\Omega$ MCR10
R281	Chip	220 $\Omega$ MCR10
C271	Ceramic	56pF 50V
C272	Monolithic	0.5pF GRM40 CK
C275	Monolithic	470pF GRM40
C277	Monolithic	7pF GRM40 UJ

## [VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.	
C278	Monolithic	470pF	GRM40
C279	Monolithic	0.1 $\mu$ F	GRM40 F
C280	Electrolytic	100 $\mu$ F	10V MS7
C281	Monolithic	0.001 $\mu$ F	GRM40
C282	Monolithic	470pF	GRM40
C283	Electrolytic	100 $\mu$ F	10V MS7
C284	Monolithic	0.001 $\mu$ F	GRM40
C285	Monolithic	6pF	GRM40 UJ
C286	Monolithic	0.5pF	GRM40
C287	Monolithic	470pF	GRM40
C288	Monolithic	0.001 $\mu$ F	GRM40
C289	Monolithic	0.001 $\mu$ F	GRM40
C290	Ceramic	4pF	50V
EP270	P.C. Board	B-1243C	

## 8-6 LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.	
IC301	IC	$\mu$ PD78C06AG-570-12	
IC302	IC	$\mu$ PD446G	
IC303	IC	$\mu$ PD4066G	
IC304	IC	$\mu$ PD4011G	
IC305	IC	NJM4558M	
IC306	IC	$\mu$ PC2002H	
IC307	IC	NJM4558M	
Q301	Transistor	2SC2712-Y	
Q302	Transistor	2SA1162-Y	
Q303	Transistor	2SC2712-Y	
Q304	Transistor	2SC3395	
Q305	Transistor	2SC3395	
Q306	Transistor	2SC3395	
Q307	Transistor	2SA1341	
Q309	Transistor	2SA1162-Y	
Q310	Transistor	2SC2712-Y	
Q312	Transistor	2SC3661	
Q313	FET	2SJ106-Y	
Q314	FET	2SJ106-Y	
Q315	Transistor	2SC2712-Y	
D301	Diode	1SS187	
D302	Diode	1SS181	
D303	Diode	1SS184	
D304	Zener	RD6.2M	B2
D305	Diode	1SS181	
D306	Diode	1SS181	
D307	Diode	1SS196	
D308	Diode	1SS184	
D309	Diode	1SS187	
D310	Zener	RD5.1M	B2
D311	Diode	1SS187	
D312	Diode	1SS193	
D313	Diode	1SS184	
D314	Diode	1SS190	
X301	Crystal	CR-63	
R301	Chip	47k $\Omega$	MCR10
R302	Chip	1M $\Omega$	MCR10
R303	Chip	47k $\Omega$	MCR10
R304	Chip	47k $\Omega$	MCR10
R305	Chip	47k $\Omega$	MCR10
R306	Chip	47k $\Omega$	MCR10
R307	Chip	47k $\Omega$	MCR10
R308	Chip	470 $\Omega$	MCR10
R309	Chip	47k $\Omega$	MCR10

## [LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R310	Chip	47k $\Omega$	MCR10
R311	Chip	47k $\Omega$	MCR10
R312	Chip	47k $\Omega$	MCR10
R313	Chip	47k $\Omega$	MCR10
R314	Chip	10k $\Omega$	MCR10
R315	Chip	10k $\Omega$	MCR10
R316	Chip	10k $\Omega$	MCR10
R317	Chip	10k $\Omega$	MCR10
R318	Chip	18k $\Omega$	MCR10
R319	Chip	470k $\Omega$	MCR10
R320	Chip	1M $\Omega$	MCR10
R323	Chip	22k $\Omega$	MCR10
R324	Chip	120k $\Omega$	MCR10
R325	Chip	180k $\Omega$	MCR10
R326	Chip	15k $\Omega$	MCR10
R327	Chip	1k $\Omega$	MCR10
R328	Chip	47k $\Omega$	MCR10
R330	Chip	4.7k $\Omega$	MCR10
R331	Chip	330k $\Omega$	MCR10
R332	Chip	3.9k $\Omega$	MCR10
R333	Chip	82k $\Omega$	MCR10
R334	Chip	4.7k $\Omega$	MCR10
R335	Chip	560 $\Omega$	MCR10
R336	Chip	100 $\Omega$	MCR10
R337	Trimmer	RH0651C14J2WA 10k $\Omega$	
R338	Chip	47 $\Omega$	MCR10
R339	Chip	1.5k $\Omega$	MCR10
R340	Chip	100k $\Omega$	MCR10
R341	Trimmer	RH0651CS5J10A 470k $\Omega$	
R342	Chip	470k $\Omega$	MCR10
R343	Chip	6.8k $\Omega$	MCR10
R345	Chip	12k $\Omega$	MCR10
R346	Chip	12k $\Omega$	MCR10
R347	Chip	47 $\Omega$	MCR10
R349	Chip	33k $\Omega$	MCR10
R350	Trimmer	RH0651CS5J10A 470k $\Omega$	
R351	Trimmer	RH0651C14J2WA 10k $\Omega$	
R352	Chip	12k $\Omega$	MCR10
R353	Chip	100k $\Omega$	MCR10
R354	Chip	1 $\Omega$	MCR10
R355	Chip	220 $\Omega$	MCR10
R356	Chip	2.2 $\Omega$	MCR10
R357	Chip	100k $\Omega$	MCR10
R358	Chip	22k $\Omega$	MCR10
R359	Chip	33k $\Omega$	MCR10
R360	Chip	1M $\Omega$	MCR10
R361	Chip	4.7k $\Omega$	MCR10
R362	Chip	270k $\Omega$	MCR10
R363	Chip	220k $\Omega$	MCR10
R364	Chip	12k $\Omega$	MCR10
R365	Chip	1.2k $\Omega$	MCR10
R366	Chip	6.8k $\Omega$	MCR10
R367	Chip	2.2M $\Omega$	MCR10
R368	Chip	470k $\Omega$	MCR10
R369	Chip	33k $\Omega$	MCR10
R370	Chip	180k $\Omega$	MCR10
R371	Chip	220k $\Omega$	MCR10
R372	Chip	22k $\Omega$	MCR10
R373	Chip	27k $\Omega$	MCR10
R374	Chip	100 $\Omega$	MCR10
R375	Chip	100k $\Omega$	MCR10
R377	Chip	27k $\Omega$	MCR10
R378	Chip	82k $\Omega$	MCR10
R379	Chip	18k $\Omega$	MCR10
R380	Chip	12k $\Omega$	MCR10
R381	Chip	1k $\Omega$	MCR10
R382	Chip	10k $\Omega$	MCR10
R383	Chip	12k $\Omega$	MCR10
R384	Chip	1k $\Omega$	MCR10
C301	Monolithic	0.1 $\mu$ F	GRM40 F
C302	Monolithic	18pF	GRM40
C303	Monolithic	18pF	GRM40
C304	Monolithic	0.001 $\mu$ F	GRM40

**[LOGIC UNIT]**

REF. NO.	DESCRIPTION	PART NO.
C305	Monolithic	0.01 $\mu$ F GRM40
C306	Tantalum	0.47 $\mu$ F 35V DN
C308	Tantalum	0.47 $\mu$ F 35V DN
C309	Electrolytic	4.7 $\mu$ F 25V MS7
C310	Monolithic	0.0033 $\mu$ F GRM40
C311	Electrolytic	4.7 $\mu$ F 25V MS7
C312	Electrolytic	0.47 $\mu$ F 50V
C313	Electrolytic	22 $\mu$ F 16V MS7
C314	Electrolytic	0.47 $\mu$ F 50V MS7
C315	Mylar	0.01 $\mu$ F 50V
C316	Monolithic	0.001 $\mu$ F GRM40
C317	Electrolytic	22 $\mu$ F 16V MS7
C318	Mylar	0.033 $\mu$ F 50V
C319	Monolithic	470pF GRM40
C320	Mylar	0.001 $\mu$ F 50V
C321	Monolithic	0.001 $\mu$ F GRM40
C322	Monolithic	0.001 $\mu$ F GRM40
C323	Electrolytic	4.7 $\mu$ F 25V
C324	Barrier Layer	UAT06X 153k
C325	Electrolytic	4.7 $\mu$ F 50V MS7
C326	Monolithic	0.1 $\mu$ F GRM40
C327	Electrolytic	470 $\mu$ F 16V SS
C328	Electrolytic	470 $\mu$ F 16V MS16
C329	Electrolytic	470 $\mu$ F 6.3V SS
C330	Monolithic	0.01 $\mu$ F GRM40
C332	Electrolytic	0.33 $\mu$ F 50V MS7
C333	Electrolytic	4.7 $\mu$ F 25V
C334	Monolithic	0.01 $\mu$ F GRM40
C335	Electrolytic	0.47 $\mu$ F 50V
C336	Monolithic	0.047 $\mu$ F GRM40
C337	Monolithic	0.01 $\mu$ F GRM40
C338	Monolithic	0.01 $\mu$ F GRM40
C339	Electrolytic	0.47 $\mu$ F 50V MS7
C340	Monolithic	0.0068 $\mu$ F GRM40
C341	Monolithic	0.01 $\mu$ F GRM40
C342	Monolithic	0.01 $\mu$ F GRM40
C343	Electrolytic	10 $\mu$ F 16V
C344	Monolithic	0.01 $\mu$ F GRM40
C345	Monolithic	0.01 $\mu$ F GRM40
C346	Monolithic	0.0022 $\mu$ F GRM40
C347	Electrolytic	0.47 $\mu$ F 50V
C348	Monolithic	47pF GRM40
C349	Monolithic	47pF GRM40
C350	Monolithic	47pF GRM40
C351	Monolithic	0.001 $\mu$ F GRM40
C352	Monolithic	47pF GRM40
C353	Monolithic	47pF GRM40
C354	Monolithic	0.1 $\mu$ F GRM40 F
C355	Monolithic	0.001 $\mu$ F GRM40
C356	Electrolytic	4.7 $\mu$ F SVB0J475M
C357	Electrolytic	1 $\mu$ F 50V MS7
C358	Electrolytic	4.7 $\mu$ F 25V MS7
CP301	Check Point	RT-01T-1.0B
J301	Connector	B05B-EH-S
J302	Connector	B06B-EH-S
J303	Connector	B03B-EH-S
J304	Connector	B03B-EH-S
J305	Connector	B05B-EH-S
J307	Connector	B04B-EH-S
J308	Connector	5512-14A
J309	Connector	B08B-EH-S
J312	Connector	HBRB5S-IJ
J313	Connector	HBRB10S-IJ
J314	Connector	HBRB5S-IJ
S301	Switch	SKHLAB064A
BT301	Lithium Battery	BR2325-1HC

**[LOGIC UNIT]**

REF. NO.	DESCRIPTION	PART NO.
EP301	P.C. Board	B-1240C
W301	Wire	72/98/005/X98/X98

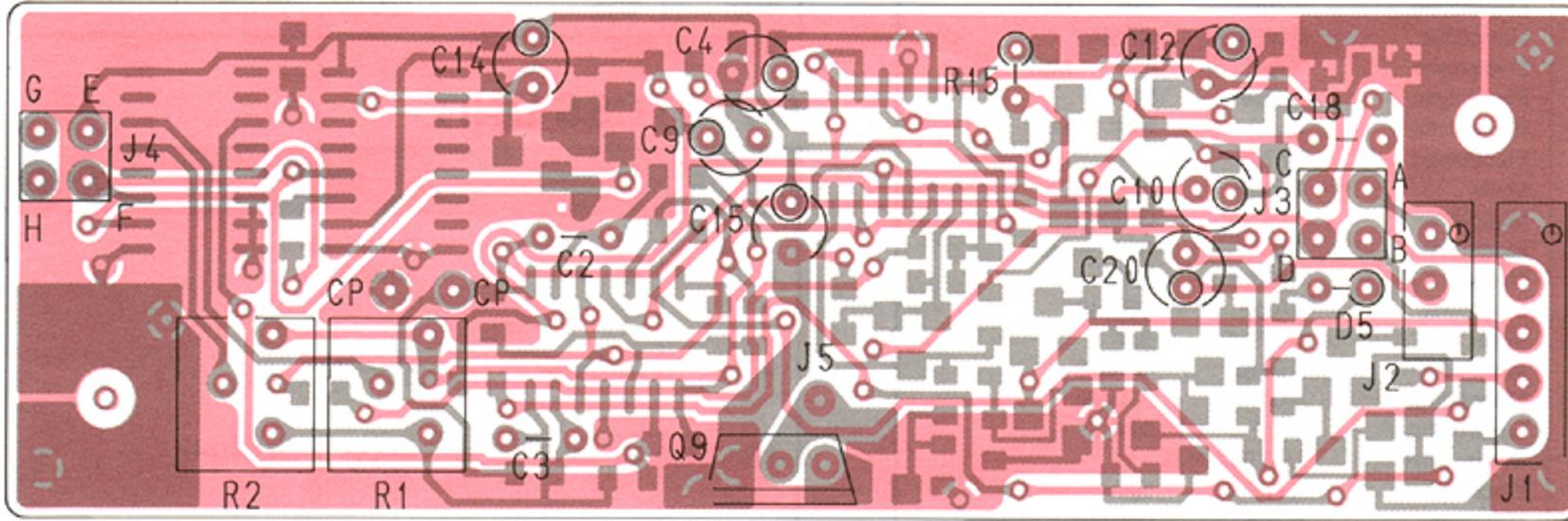
**8-7 CTCSS UNIT**

REF. NO.	DESCRIPTION	PART NO.
IC701	IC	NJM4558M
IC702	IC	MN6520
Q703	Transistor	2SC3395
X701	Crystal	RF4A3 4.194304MHz
R701	Chip	220k $\Omega$ MCR10
R702	Chip	220k $\Omega$ MCR10
R703	Chip	220k $\Omega$ MCR10
R704	Chip	220k $\Omega$ MCR10
R705	Chip	270k $\Omega$ MCR10
R706	Chip	220k $\Omega$ MCR10
R707	Chip	180k $\Omega$ MCR10
R708	Chip	10k $\Omega$ MCR10
R709	Chip	15k $\Omega$ MCR10
R711	Chip	10k $\Omega$ MCR10
R712	Chip	2.2k $\Omega$ MCR10
R713	Chip	10k $\Omega$ MCR10
R714	Chip	150k $\Omega$ MCR10
R715	Chip	1k $\Omega$ MCR10
C701	Monolithic	0.01 $\mu$ F GRM40 F
C702	Monolithic	0.022 $\mu$ F GRM40 B
C703	Monolithic	470pF GRM40
C704	Monolithic	0.033 $\mu$ F GRM40 F
C705	Monolithic	270pF GRM40
C706	Electrolytic	SVA1D474M1
C707	Electrolytic	SVD0J476M
C708	Monolithic	0.1 $\mu$ F GRM40 F
C709	Monolithic	18pF GRM40
C710	Monolithic	18pF GRM40
C711	Electrolytic	SVA1D474M1
C712	Monolithic	0.1 $\mu$ F GRM40 F
C713	Electrolytic	0.47 $\mu$ F SV1DO 474 M1
J703	Connector	5513-14CPB
EP701	P.C. Board	B-1244A

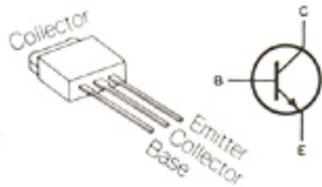
# SECTION 9 OPTIONAL UNITS

## 9-1 UT-32 BOARD LAYOUTS

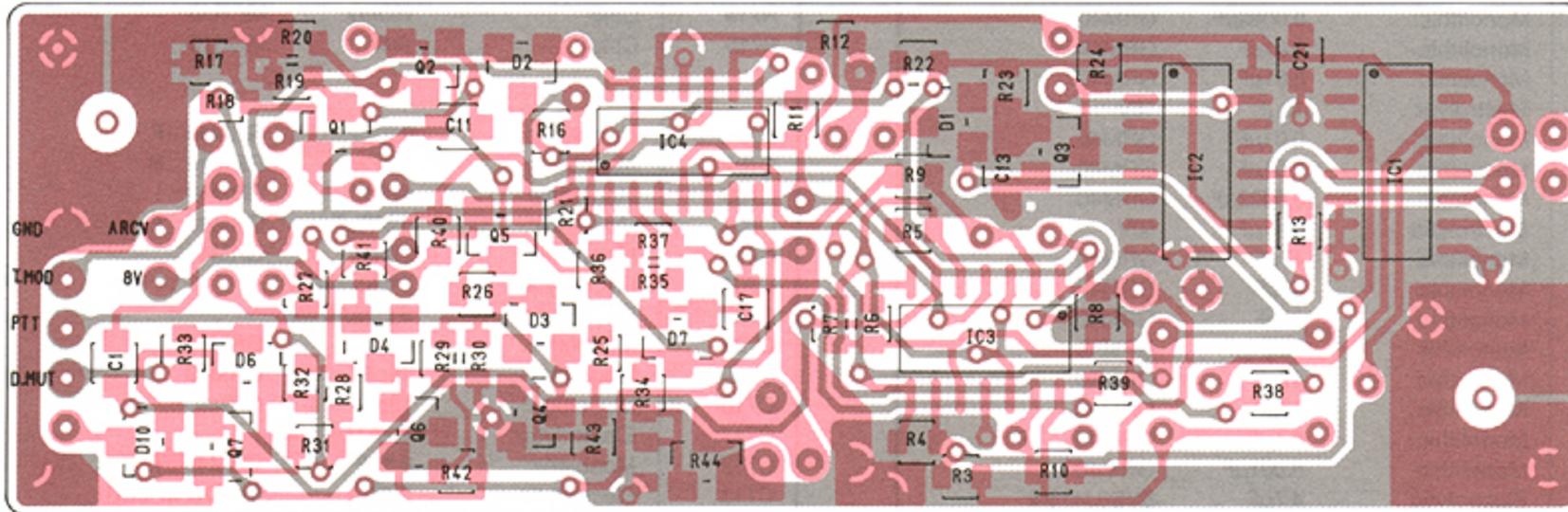
(Top View)



Q9  
2SD1286-L

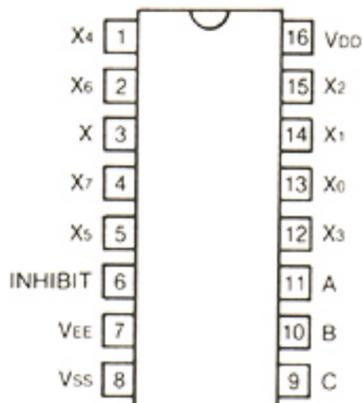


(Bottom View)



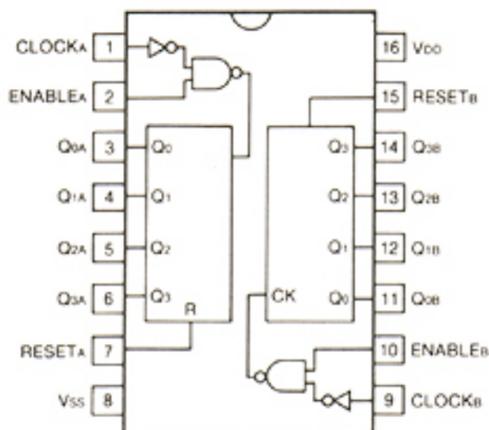
IC1  
μPD4051BG  
(SINGLE 8-CHANNEL  
MULTIPLEXER)

(Top View)



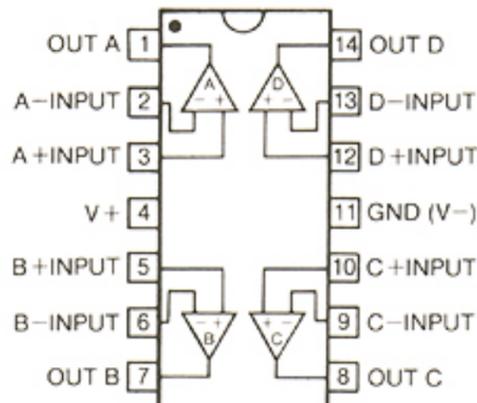
IC2  
μPD4518BG  
(DUAL BCD UP  
COUNTER)

(Top View)

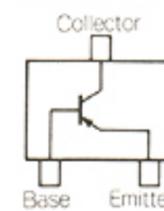


IC3, IC4  
μPC324G  
(QUAD OPERATIONAL  
AMPLIFIER)

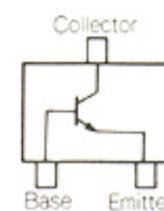
(Top View)



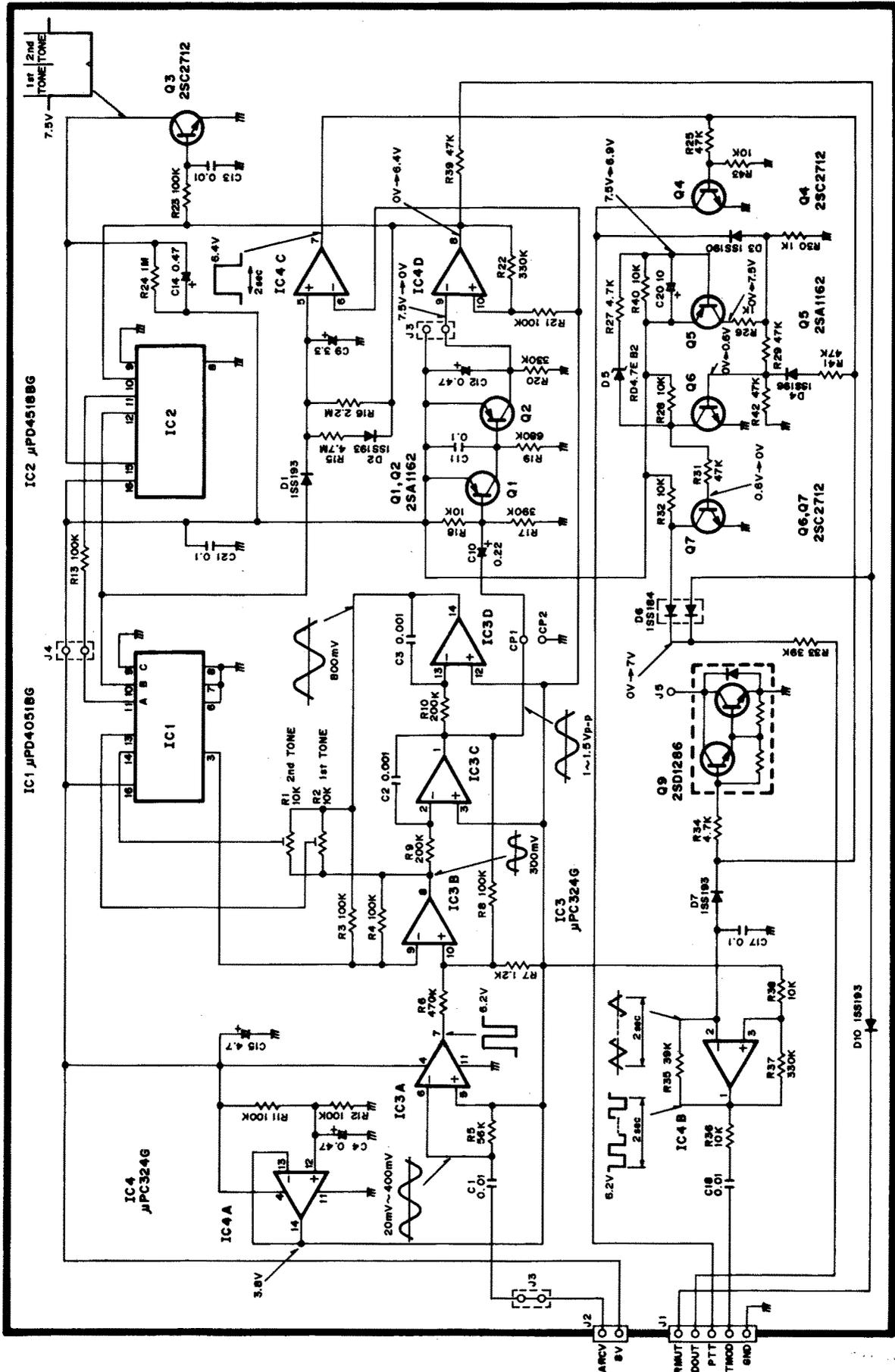
Q1, Q2, Q5  
2SA1162-Y



Q3, Q4, Q6, Q7  
2SC2712-Y

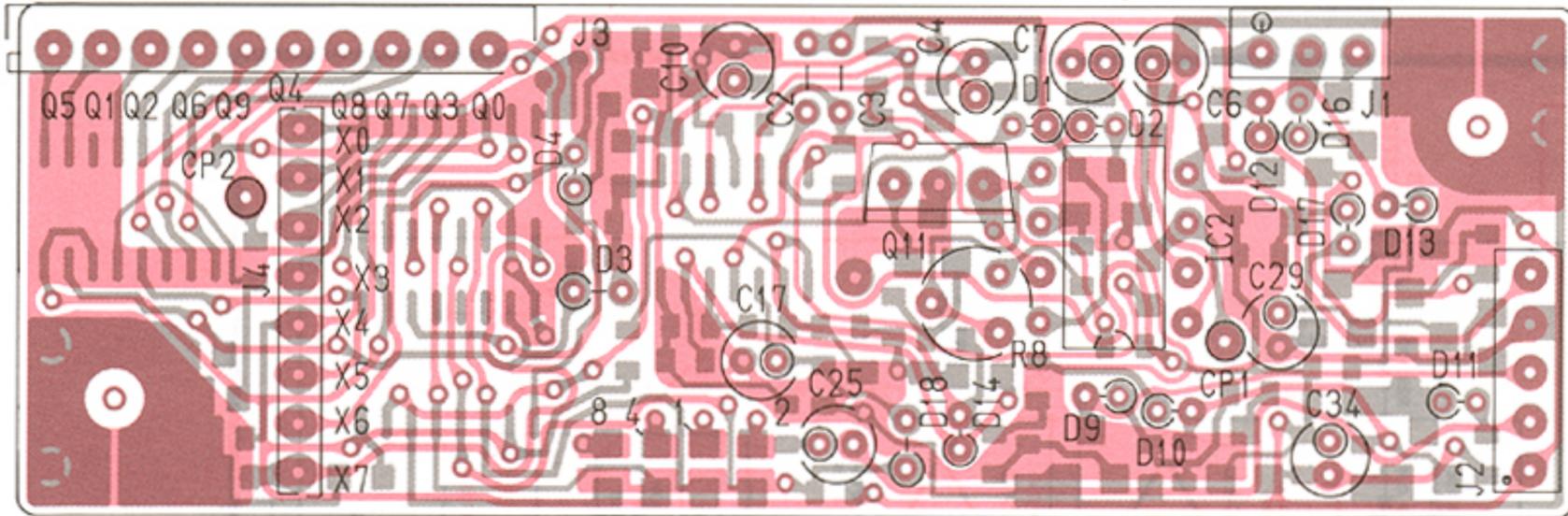


# 9-2 UT-32 VOLTAGE/CIRCUIT DIAGRAM

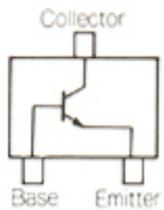


# 9-3 UT-33 BOARD LAYOUTS

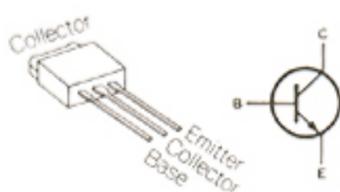
(Top View)



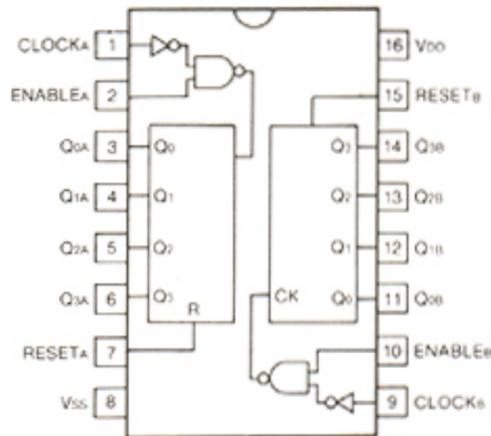
**Q4**  
2SC2712-Y



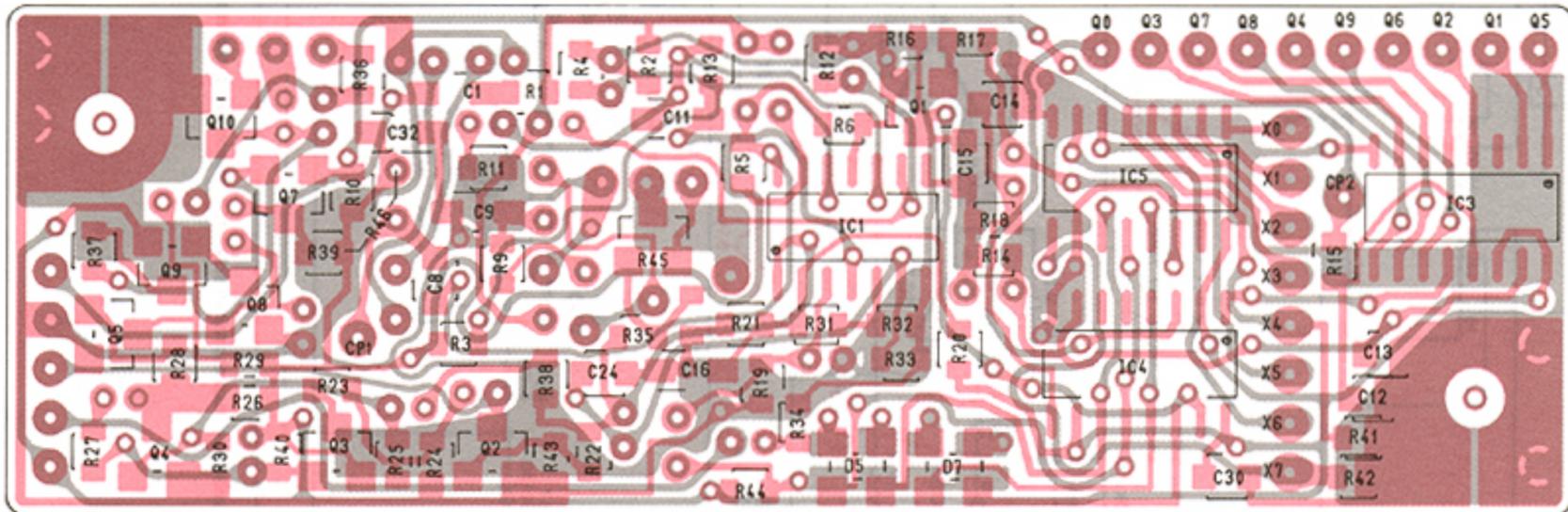
**Q11**  
2SD1286-L



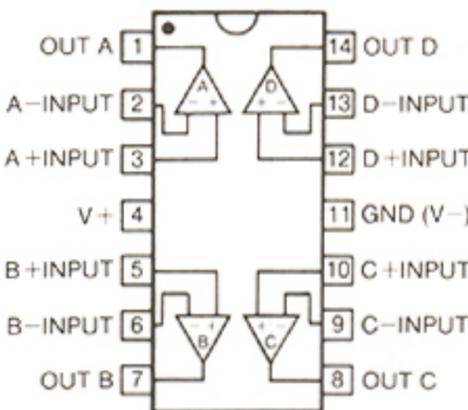
**IC4**  
 $\mu$ PD4518BG  
(DUAL BCD  
UP COUNTER)  
(Top View)



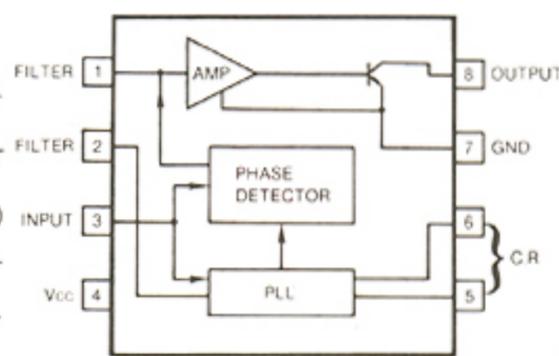
(Bottom View)



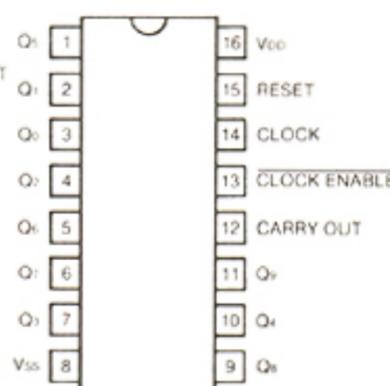
**IC1**  
 $\mu$ PC324G  
(QUAD OPERATIONAL  
AMPLIFIER)  
(Top View)



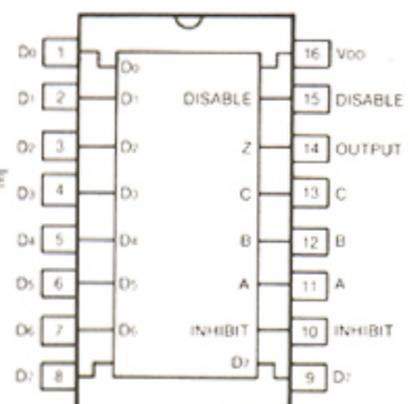
**IC2**  
BA1604  
(TONE ENCODER)  
(Top View)



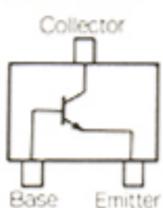
**IC3**  
 $\mu$ PD4017BG  
(DECADE COUNTER/  
DIVIDER)  
(Top View)



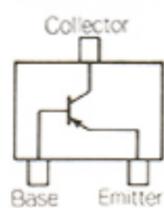
**IC5**  
 $\mu$ PD4512BC  
(8-CHANNEL DATA  
SELECTOR)  
(Top View)



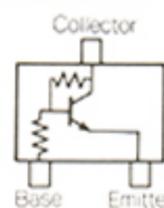
**Q1, Q2, Q4, Q5**  
2SC2712-Y



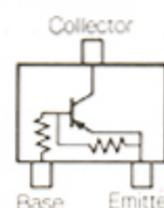
**Q3**  
2SA1162-Y



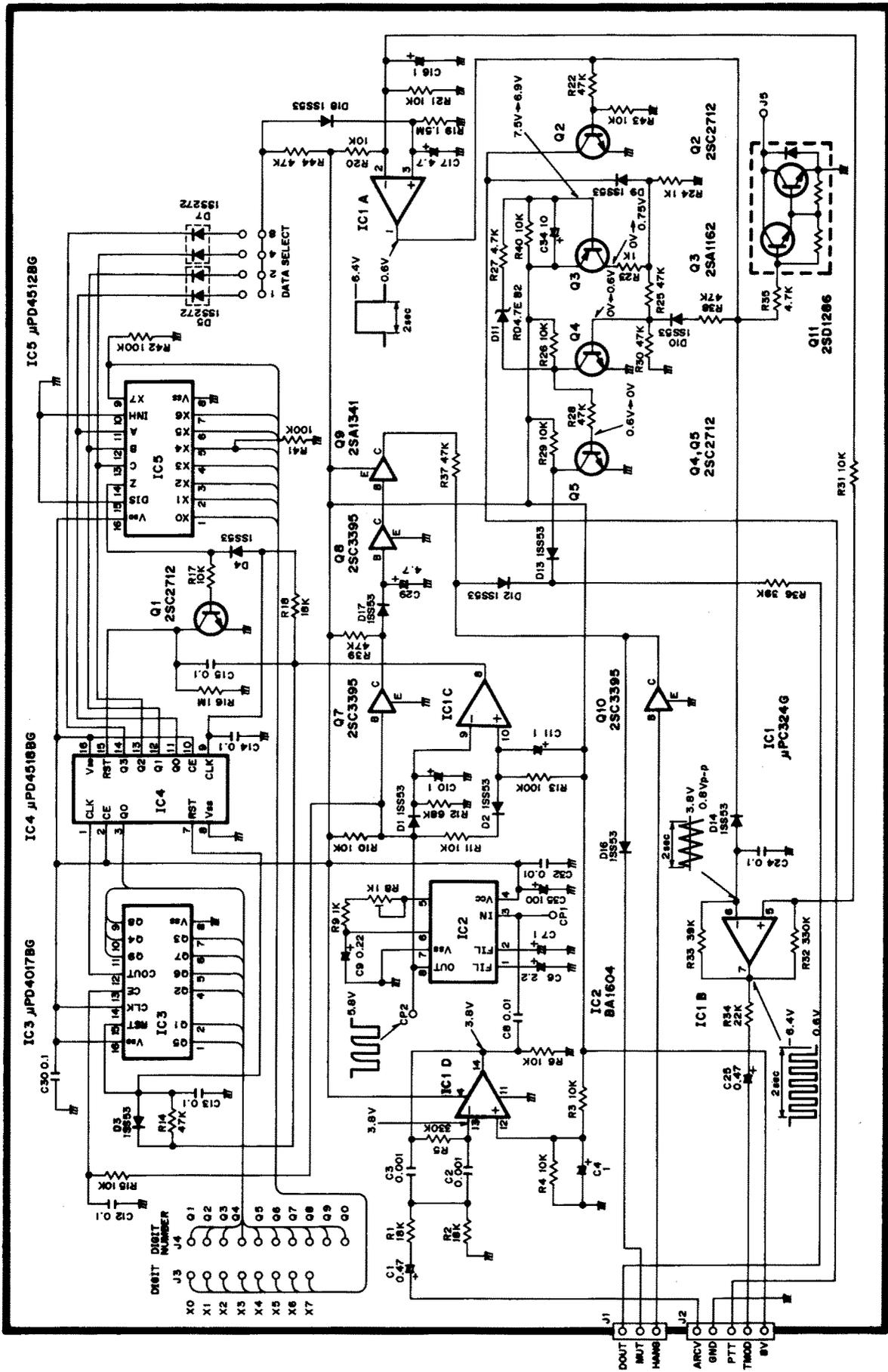
**Q7, Q8, Q10**  
2SC3395



**Q9**  
2SA1341



9-4 UT-33 VOLTAGE/CIRCUIT DIAGRAM



## 9-5 UT-32 PARTS LIST

REF. NO.	DESCRIPTION	PART NO.	
IC1	IC	$\mu$ PD4051BG	
IC2	IC	$\mu$ PD4518BG	
IC3	IC	$\mu$ PC324G	
IC4	IC	$\mu$ PC324G	
Q1	Transistor	2SA1162-Y	
Q2	Transistor	2SA1162-Y	
Q3	Transistor	2SC2712-Y	
Q4	Transistor	2SC2712-Y	
Q5	Transistor	2SA1162-Y	
Q6	Transistor	2SC2712-Y	
Q7	Transistor	2SC2712-Y	
Q9	Transistor	2SD1286-L	
D1	Diode	1SS193	
D2	Diode	1SS193	
D3	Diode	1SS190	
D4	Diode	1SS196	
D5	Zener	RD4.7E B2	
D6	Diode	1SS184	
D7	Diode	1SS193	
D10	Diode	1SS193	
R1	Trimmer	RG06P 103	10k $\Omega$
R2	Trimmer	RG06P 103	10k $\Omega$
R3	Chip	100k $\Omega$	MCR10
R4	Chip	100k $\Omega$	MCR10
R5	Chip	56k $\Omega$	MCR10
R6	Chip	470k $\Omega$	MCR10
R7	Chip	1.2k $\Omega$	MCR10
R8	Chip	100k $\Omega$	MCR10
R9	Chip	200k $\Omega$	MCR10
R10	Chip	200k $\Omega$	MCR10
R11	Chip	100k $\Omega$	MCR10
R12	Chip	100k $\Omega$	MCR10
R13	Chip	100k $\Omega$	MCR10
R15	Resistor	4.7M $\Omega$	ERC14GJ
R16	Chip	2.2M $\Omega$	MCR10
R17	Chip	390k $\Omega$	MCR10
R18	Chip	10k $\Omega$	MCR10
R19	Chip	680k $\Omega$	MCR10
R20	Chip	330k $\Omega$	MCR10
R21	Chip	100k $\Omega$	MCR10
R22	Chip	330k $\Omega$	MCR10
R23	Chip	100k $\Omega$	MCR10
R24	Chip	1M $\Omega$	MCR10
R25	Chip	47k $\Omega$	MCR10
R26	Chip	1k $\Omega$	MCR10
R27	Chip	4.7k $\Omega$	MCR10
R28	Chip	10k $\Omega$	MCR10
R29	Chip	47k $\Omega$	MCR10
R30	Chip	1k $\Omega$	MCR10
R31	Chip	47k $\Omega$	MCR10
R32	Chip	10k $\Omega$	MCR10
R33	Chip	39k $\Omega$	MCR10
R34	Chip	4.7k $\Omega$	MCR10
R35	Chip	39k $\Omega$	MCR10
R36	Chip	10k $\Omega$	MCR10
R37	Chip	330k $\Omega$	MCR10
R38	Chip	10k $\Omega$	MCR10
R39	Chip	47k $\Omega$	MCR10
R40	Chip	10k $\Omega$	MCR10
R41	Chip	47k $\Omega$	MCR10
R42	Chip	47k $\Omega$	MCR10
R43	Chip	10k $\Omega$	MCR10
R44	Chip	0 $\Omega$	MCR10
C1	Monolithic	0.01 $\mu$ F	GRM40
C2	Mylar	0.001 $\mu$ F	50V
C3	Mylar	0.001 $\mu$ F	50V
C4	Electrolytic	0.47 $\mu$ F	50V MS5

REF. NO.	DESCRIPTION	PART NO.
C9	Electrolytic	3.3 $\mu$ F 50V MS5
C10	Electrolytic	0.22 $\mu$ F 50V MS7
C11	Monolithic	0.1 $\mu$ F GRM40
C12	Electrolytic	0.47 $\mu$ F 50V MS7
C13	Monolithic	0.01 $\mu$ F GRM40
C14	Electrolytic	0.47 $\mu$ F 50V MS7
C15	Electrolytic	4.7 $\mu$ F 50V MS7
C17	Monolithic	0.1 $\mu$ F GRM40
C18	Mylar	0.01 $\mu$ F 50V
C20	Electrolytic	10 $\mu$ F 16V MS7
C21	Monolithic	0.1 $\mu$ F GRM40
CP1	Check Point	IPS-1136
CP2	Check Point	IPS-1136
J1	Connector	TLB-P05-A1
J2	Connector	TLB-P03-A1
J3	Connector	IMSA-9201B-2-04-T
J4	Connector	IMSA-9201B-2-04-T
J5	Connector	RT-01T-1.0B
P1	Connector	EHR-8
P3	Connector	IMSA-9201-HT
P4	Connector	IMSA-9201-HT
EP1	P.C. Board	B-1346B

## 9-6 UT-33 PARTS LIST

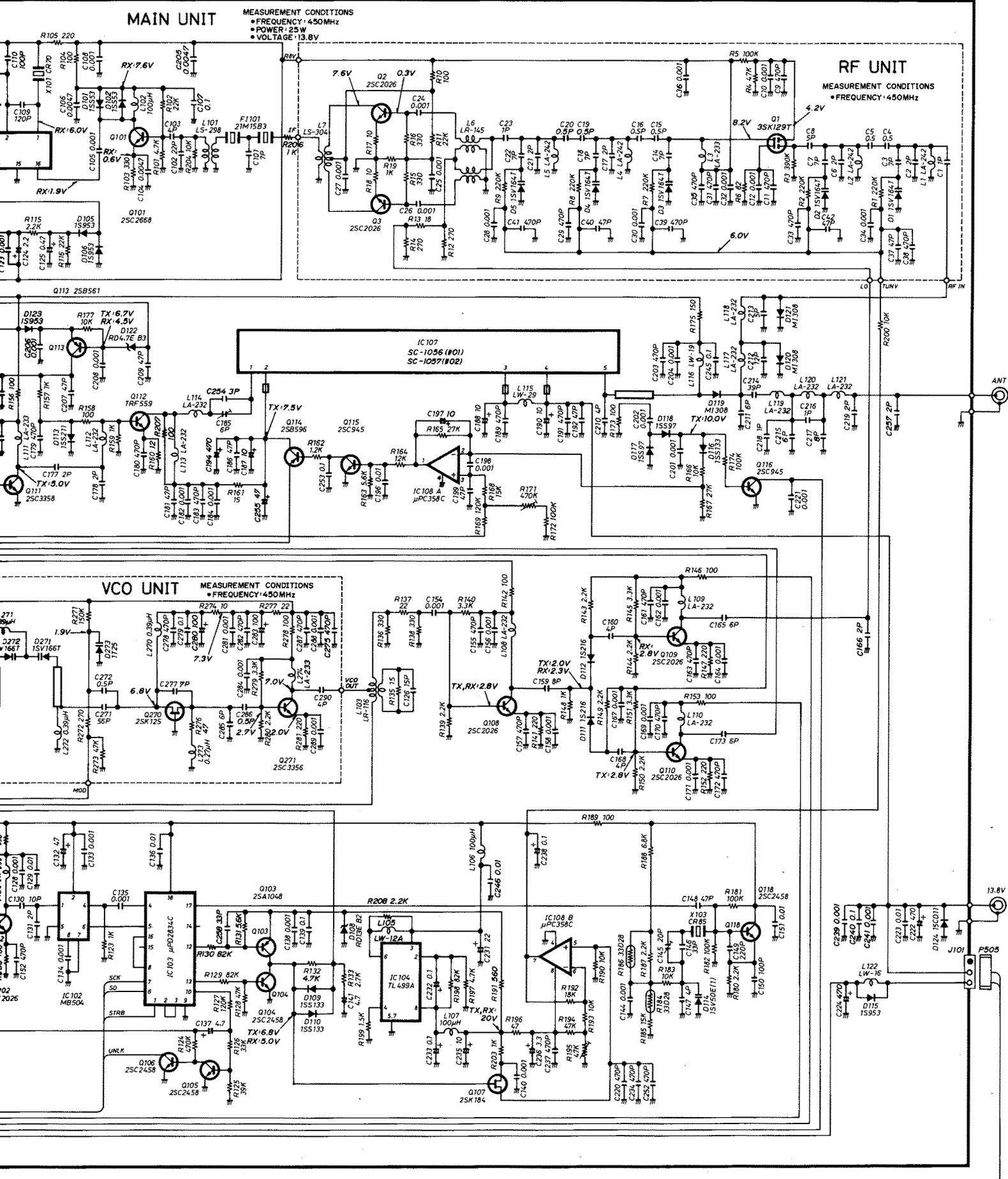
REF. NO.	DESCRIPTION	PART NO.
IC1	IC	$\mu$ PC324G
IC2	IC	BA1604
IC3	IC	$\mu$ PD4017BG
IC4	IC	$\mu$ PD4518BG
IC5	IC	$\mu$ PD4512BG
Q1	Transistor	2SC2712-Y
Q2	Transistor	2SC2712-Y
Q3	Transistor	2SA1162-Y
Q4	Transistor	2SC2712-Y
Q5	Transistor	2SC2712-Y
Q7	Transistor	2SC3395
Q8	Transistor	2SC3395
Q9	Transistor	2SA1341
Q10	Transistor	2SC3395
Q11	Transistor	2SD1286-L
D1	Diode	1SS53
D2	Diode	1SS53
D3	Diode	1SS53
D4	Diode	1SS53
D5	Diode	1SS272
D7	Diode	1SS272
D9	Diode	1SS53
D10	Diode	1SS53
D11	Zener	RD4.7E B2
D12	Diode	1SS53
D13	Diode	1SS53
D14	Diode	1SS53
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53

REF. NO.	DESCRIPTION	PART NO.	
R1	Chip	18k $\Omega$	MCR10
R2	Chip	18k $\Omega$	MCR10
R3	Chip	10k $\Omega$	MCR10
R4	Chip	10k $\Omega$	MCR10
R5	Chip	330k $\Omega$	MCR10
R6	Chip	10k $\Omega$	MCR10
R8	Trimmer	RH0651C13J1YA 1k $\Omega$	
R9	Chip	1k $\Omega$	MCR10
R10	Chip	10k $\Omega$	MCR10
R11	Chip	10k $\Omega$	MCR10
R12	Chip	68k $\Omega$	MCR10
R13	Chip	100k $\Omega$	MCR10
R14	Chip	47k $\Omega$	MCR10
R15	Chip	10k $\Omega$	MCR10
R16	Chip	1M $\Omega$	MCR10
R17	Chip	10k $\Omega$	MCR10
R18	Chip	18k $\Omega$	MCR10
R19	Chip	1.5M $\Omega$	MCR10
R20	Chip	10k $\Omega$	MCR10
R21	Chip	10k $\Omega$	MCR10
R22	Chip	47k $\Omega$	MCR10
R23	Chip	1k $\Omega$	MCR10
R24	Chip	1k $\Omega$	MCR10
R25	Chip	47k $\Omega$	MCR10
R26	Chip	10k $\Omega$	MCR10
R27	Chip	4.7k $\Omega$	MCR10
R28	Chip	47k $\Omega$	MCR10
R29	Chip	10k $\Omega$	MCR10
R30	Chip	47k $\Omega$	MCR10
R31	Chip	10k $\Omega$	MCR10
R32	Chip	330k $\Omega$	MCR10
R33	Chip	39k $\Omega$	MCR10
R34	Chip	22k $\Omega$	MCR10
R35	Chip	4.7k $\Omega$	MCR10
R36	Chip	39k $\Omega$	MCR10
R37	Chip	47k $\Omega$	MCR10
R38	Chip	47k $\Omega$	MCR10
R39	Chip	47k $\Omega$	MCR10
R40	Chip	10k $\Omega$	MCR10
R41	Chip	100k $\Omega$	MCR10
R42	Chip	100k $\Omega$	MCR10
R43	Chip	10k $\Omega$	MCR10
R44	Chip	47k $\Omega$	MCR10
R45	Chip	0 $\Omega$	MCR10
R46	Resistor	47 $\Omega$	R10
C1	Electrolytic	SVA1E474M	
C2	Mylar	0.001 $\mu$ F	
C3	Mylar	0.001 $\mu$ F	
C4	Electrolytic	1 $\mu$ F	50V MS5
C6	Tantalum	2.2 $\mu$ F	16V
C7	Tantalum	1 $\mu$ F	35V
C8	Monolithic	0.01 $\mu$ F	GRM40 B
C9	Electrolytic	0.22 $\mu$ F	SVA1V224M1
C10	Electrolytic	1 $\mu$ F	50V MS5
C11	Electrolytic	SVA1C105M1	
C12	Monolithic	0.1 $\mu$ F	GRM40
C13	Monolithic	0.1 $\mu$ F	GRM40
C14	Monolithic	0.1 $\mu$ F	GRM40
C15	Monolithic	0.1 $\mu$ F	GRM40
C16	Electrolytic	SVA1C105M1	
C17	Electrolytic	4.7 $\mu$ F	25V MS5
C24	Monolithic	0.1 $\mu$ F	GRM40
C25	Electrolytic	0.47 $\mu$ F	50V MS5
C29	Electrolytic	4.7 $\mu$ F	25V MS5
C30	Monolithic	0.1 $\mu$ F	GRM40
C32	Electrolytic	SVA1V	103M1
C34	Electrolytic	10 $\mu$ F	16V MS5
C35	Electrolytic	100 $\mu$ F	10V MS7
CP1	Check Point	IPS-1136	
CP2	Check Point	IPS-1136	

REF. NO.	DESCRIPTION	PART NO.
J1	Connector	TLB-P03-A1
J2	Connector	TLB-P05-A1
J3	Connector	10B-SQ
J4	Connector	08B-SQ
J5	Connector	RT-01T-1.0B
P1	Connector	EHR-8
EP1	P.C. Board	B-1347A









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