

**SERVICE  
MANUAL**

VHF TRANSCEIVER

**IC-H18**

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## 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-H18 VHF TRANSCEIVER.

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## ASSISTANCE

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If you require assistance or further information regarding the operation and capabilities of the IC-H18, contact your nearest authorized Icom Dealer or Icom Service Center.

Address are provided on the back cover for your convenience.

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## ORDERING REPLACEMENT PARTS

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For the fastest service, supply all of the following information when ordering parts from your dealer or Icom Service Center:

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., MAIN UNIT/B-1665C)
4. Component part number and name  
(e.g., 2SC2712 Transistor)
5. Order number for mechanical parts
6. Quantity required (e.g., 3pcs.)

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## REPAIR NOTE

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1. **DO NOT** open transceiver covers until the transceiver is disconnected from a power source.
2. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
3. **DO NOT** short any circuits or electronic parts.
4. 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 sweep generator. Always connect a 30dB or 40dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
7. Read the instructions of test equipment thoroughly before connecting the 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-8011-1EX).

**GENERAL**

- Frequency range : 136~174MHz
- Type of emission : 16K0F3E
- Number of channels : Up to 16 channels
- Frequency stability :  $\pm 0.0005\%$
- Antenna impedance : 50 $\Omega$  unbalanced
- Power supply voltage :

BATTERY PACK	OUTPUT VOLTAGE
CM-71	7.2V
CM-72	8.4V
CM-73	13.2V

(Negative ground)

- Usable temperature range :  $-30^{\circ}\text{C} \sim +60^{\circ}\text{C}$  ( $-22^{\circ}\text{F} \sim +140^{\circ}\text{F}$ )
- Dimensions : 65mm(W)  $\times$  109mm(H)  $\times$  35mm(D)  
2.6"(W)  $\times$  4.3"(H)  $\times$  1.4"(D), (without battery pack)
- Weight : 350g (0.77 lbs), (without battery pack)

**TRANSMITTER**

- RF Output power (At 13.2V DC) : 5W
- Modulation system : Variable reactance frequency modulation
- Current drain (At 13.2V DC) : High power 1.8A  
Low power 1.2A
- Microphone impedance : 2.2k $\Omega$
- Maximum deviation :  $\pm 5\text{kHz}$
- Spurious emissions :  $-60\text{dB}$
- FM hum and noise : 40dB
- Audio response :  $+1\text{dB}$ ,  $-3\text{dB}$  of  $+6\text{dB/octave}$  from 300Hz~3000Hz

**RECEIVER**

- Receiver system : Double-conversion superheterodyne
- Sensitivity : 0.28 $\mu\text{V}$  at 12dB SINAD
- Squelch sensitivity : 0.22 $\mu\text{V}$
- Modulation acceptance :  $\pm 7\text{kHz}$
- Intermediate frequencies : 1st 21.8MHz  
2nd 455kHz
- Current drain (At 13.2V DC) : Audio max. 0.25A  
Standby 70mA
- Audio output power :

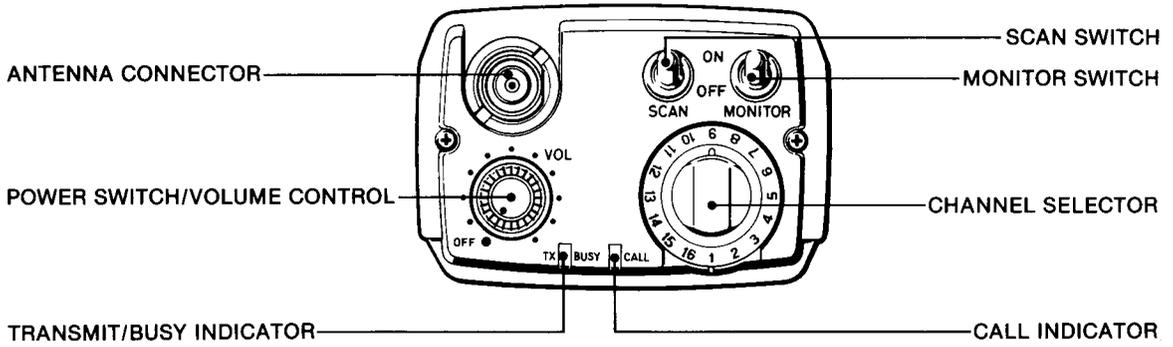
BATTERY PACK	OUTPUT POWER (at 5% distortion with an 8 $\Omega$ load)
CM-71	200mW
CM-72	350mW
CM-73	500mW

- Audio output impedance : 8 $\Omega$
- Selectivity ( $\pm 25\text{kHz}$ ) : 70dB
- Spurious frequency rejection : 70dB
- Image rejection : 68dB
- Inter modulation : 70dB
- Hum and noise : 40dB
- Audio response :  $+1\text{dB}$ ,  $-3\text{dB}$  of  $-6\text{dB/octave}$  from 300Hz~3000Hz

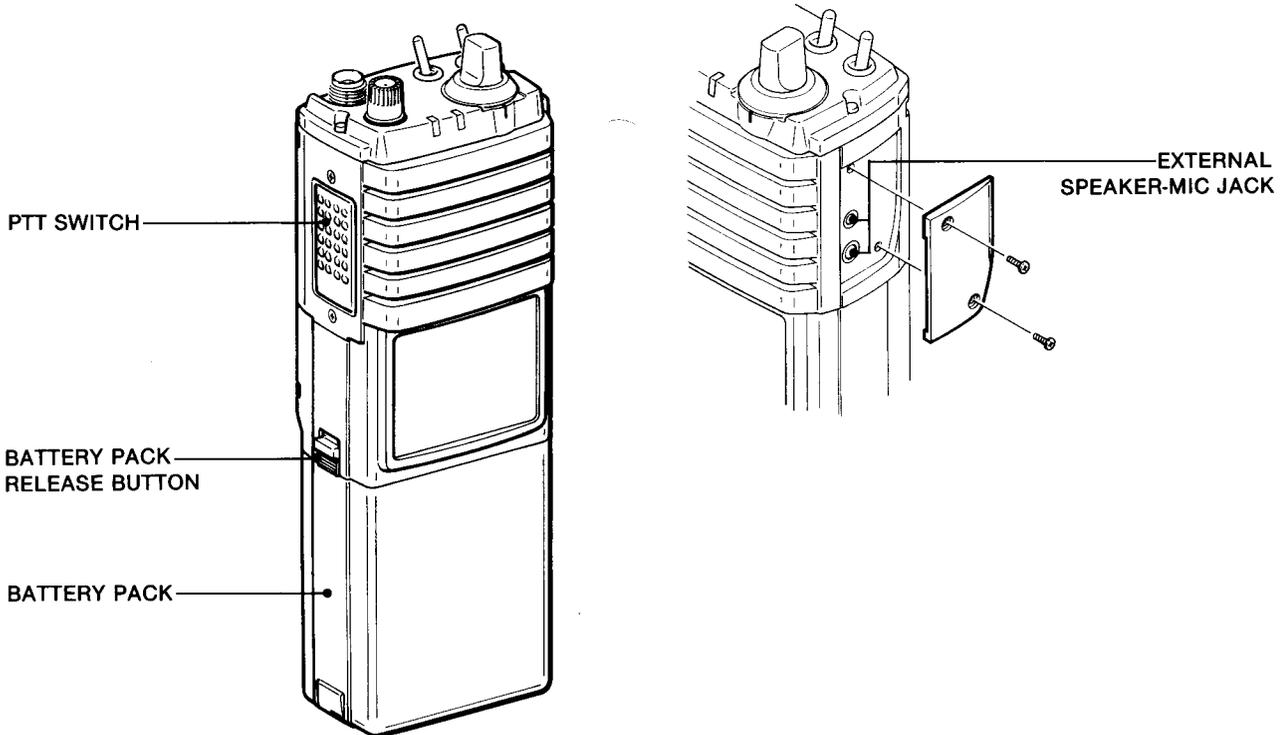
All specifications are per EIA RS316B procedures.

2-1 OUTSIDE VIEWS

• TOP VIEW



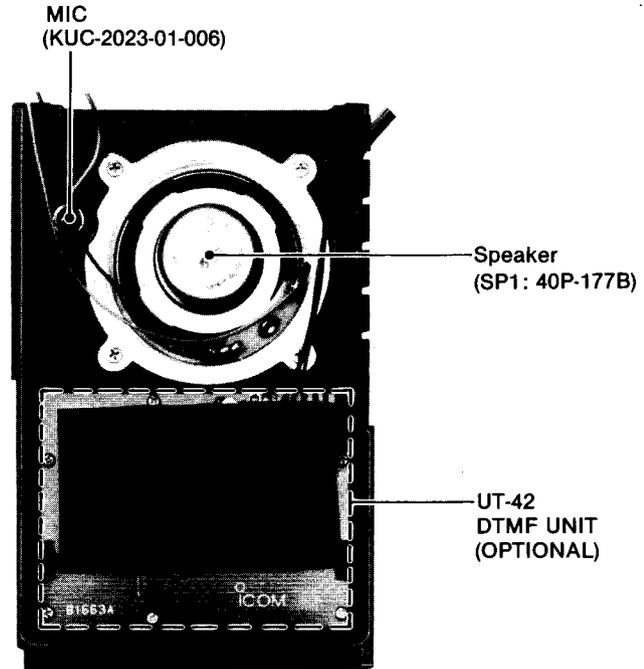
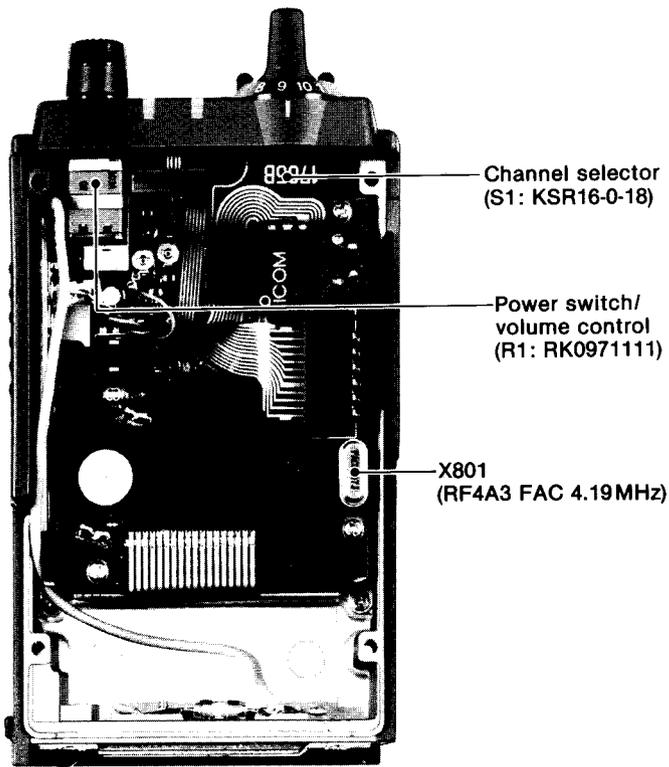
• FRONT AND SIDE VIEWS



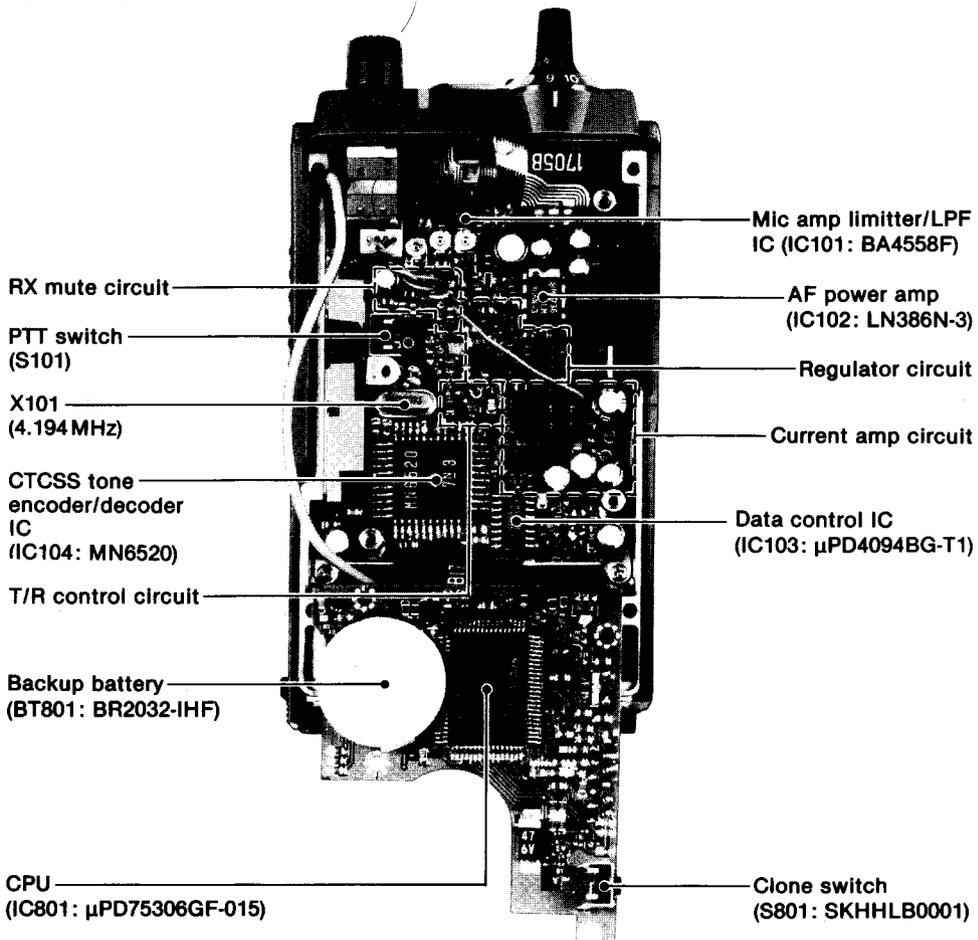
## 2-2 INSIDE VIEWS

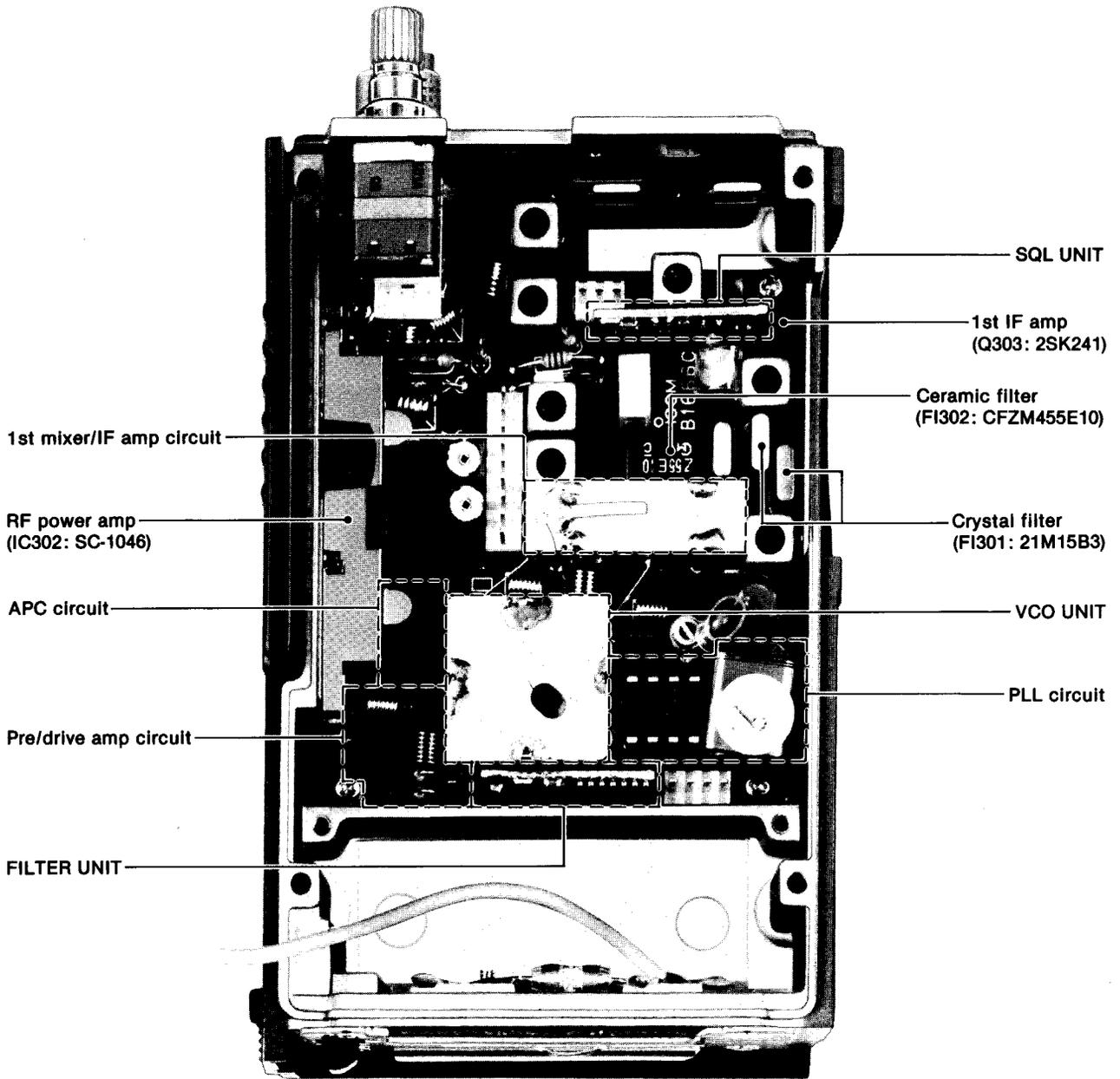
### • LOGIC UNIT

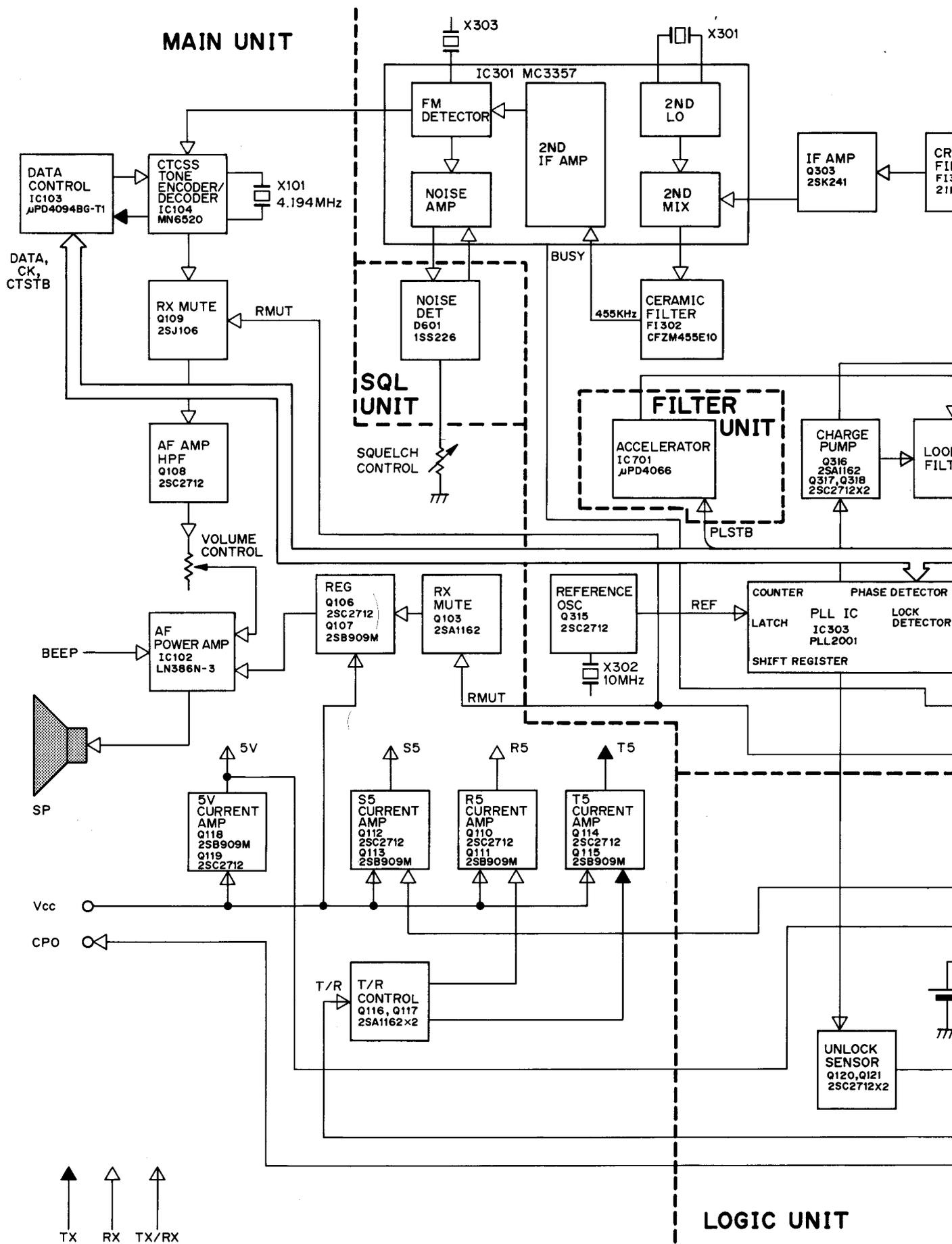
### • FRONT PANEL (Rear side)



### • MAIN AND LOGIC UNITS









## 4-1 RECEIVER CIRCUITS

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

Received signals enter the antenna connector and pass through a two-stage Chebyshev low-pass filter (L311, L312, C340~C344). The signals are applied to the antenna switching circuit (D307, D310, L310, C337, C338), and then to the RF circuit. This antenna switching circuit employs a  $\lambda/4$ -type diode switching system.

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

The filtered RF signals are applied to the RF amplifier (Q301), and reapplied to the bandpass filter (L304, D303, D304, C309~C312) to suppress out-of-band signals.

### 4-1-3 1st MIXER CIRCUIT (RF UNIT)

This circuit is a double balanced mixer composed of four Schottky barrier diodes (D305). From the matching transformer (L305), the RF signals are applied to D305. The product of the 1st LO signal passes through C314 and is applied to D305. L306 outputs a 21.8MHz 1st IF signal.

### 4-1-4 1st IF CIRCUIT (RF UNIT)

After passing through the IF amplifier (Q302) and the matching transformer (L307), the 1st IF signal is applied to the crystal filter (FI301) to suppress out-of-band signals. The 1st IF signal is then applied to the 2nd IF circuit via L308.

### 4-1-5 2nd IF AND DEMODULATOR CIRCUITS (RF UNIT)

The 1st IF signal amplified at amplifier (Q303) passes through the matching transformer (L309).

The 1st IF signal from L309 is applied to the 2nd mixer section of IC301, and is mixed with 2nd LO signal to convert the 1st IF signal to a 455kHz 2nd IF signal. IC301 contains the 2nd mixer circuit, the 2nd LO circuit and the quadrature detector circuit. The 2nd LO circuit and X301 generate 21.345MHz for the 2nd LO signal.

The 2nd IF signal from the 2nd mixer (IC103, pin 3) passes through the ceramic filter FI302 where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC301, pin 5) and applied to the quadrature detector section (IC301, pin 8 and ceramic discriminator X303) to demodulate the 2nd IF signal into an AF signal.

AF signal output from pin 9 of IC301 is applied to the AF circuit.

### 4-1-6 AF CIRCUIT (MAIN UNIT)

The AF signal from IC301 is applied to pin 29 of IC104. IC104 contains the CTCSS tone encoder/decoder, the AF amplifier, and the two-stage AF filter.

Passing through the AF amplifier section and the two-stage AF filter in IC104, the filtered signal is output from pin 18. The  $-6\text{dB/octave}$  low-pass filter (R155, C153, C167) deemphasizes the signal which then passes through the muting circuit (Q109).

The AF preamplifier (Q108) amplifies the signal to a sufficient level to drive IC102. When the squelch is closed, Q109 functions as an AF mute switch. Q108 functions as both an AF preamplifier and a high-pass filter. The signal passes through the VOLUME CONTROL (R1) and is applied to the AF amplifier (IC102, pin 2).

The regulated DC voltage is applied to pin 6 of IC102 through the voltage regulator circuit consisting of Q107, Q106 and D104. In this way, IC102 should not be damaged from overloading.

### 4-1-7 SQUELCH CIRCUIT (RF AND LOGIC UNITS)

R604 and R605, connected to pin 9 of IC301, improve the temperature characteristic of the AF output power.

The internal op-amp in IC301 amplifies noise components of frequencies at 20kHz and above, and outputs the resulting signals from pin 11. Output signals are rectified by D601.

The rectified voltage triggers the squelch circuit in IC301. Pin 13 of IC301 outputs the squelch signal. The signal is applied to the CPU (IC801, pin 61) through the BUSY signal line.

The squelch circuit is activated when Q109 is turned on by a signal (RMUT) from the CPU (IC801, pin 52).

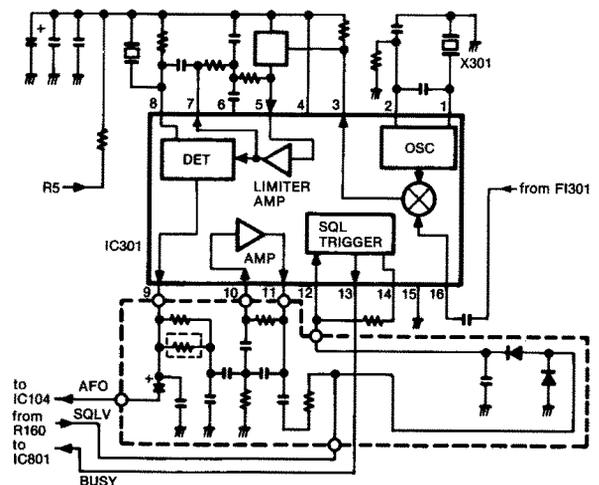


Fig. 1

## 4-2 TRANSMITTER CIRCUITS

### 4-2-1 MICROPHONE AMPLIFIER (MAIN UNIT)

AF signals from the built-in condenser microphone are applied to IC101A at pin 3, and are pre-emphasized to 6dB/octave through C104 and R102 connected to pin 2. IC101A functions as the microphone amplifier and the limiter.

The signals pass through the splatter filter circuit (IC101B, R107, C108, R110, C109, R111, C111) where signals of 3kHz and above are attenuated. IC101 pin 7 then outputs the signals. The signals are applied to D501 in the VCO circuit as signals to be modulated.

The signals to be modulated then change the capacitance of D501 to make an FM signal.

### 4-2-2 DRIVE AMPLIFIER (RF UNIT)

The VCO output is buffer-amplified at Q305, and applied to the transmit/receive switching circuit (D311).

After passing through the transmit/receive switching circuit (D311), and the preamplifier (Q307), the VCO output is amplified at the drive amplifier (Q306) where 20mW is obtained.

The voltage controlled by the APC circuit is applied to the collector of Q306 for a stable RF output power from IC302.

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

IC302 is a power module which provides stable 5W output power.

RF signals from the drive amplifier (Q306) are applied to pin 1 of IC302. The amplified signals are output from pin 5, and applied to the ANTENNA CONNECTOR through the APC detector circuit, the antenna switching circuit and the low-pass filter circuit.

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

The APC detector circuit consists of L315, C352, C353, R324, R325, D308 and D309.

When the antenna impedance is matched at 50Ω, the voltage detected at D308 and D309 is at a minimum.

The voltage detected at D308 and D309 is applied to the differential amplifier (Q308, Q309). The APC reference voltage is applied to the base of Q309.

When the antenna impedance is mismatched, the base voltage of Q308 is higher than the reference voltage. The collector voltage of Q308 decreases. Q311 amplifies the current from the differential amplifier which controls Q312 and Q320—changing the supply voltage to Q306 and IC302.

This decreases the output power of the drive amplifier (Q306) and power amplifier (IC302) until the base voltage of Q308 becomes equal to the base voltage of Q309.

### 4-2-5 POWER OUTPUT CONTROL CIRCUIT (RF UNIT)

The power output control circuit consists of R349~R353. This circuit controls the RF output power with the APC reference voltage.

When HIGH output power is selected, RF output power can be adjusted with R353.

When LOW output power is selected, the signal for low power selection from the CPU (IC801) is applied to R352 through the LOW signal line. RF output power is adjusted with R352.

### 4-2-6 TX MUTE CIRCUIT (RF UNIT)

“TMUT” signal from the CPU (IC801) turns Q313 OFF. Bias voltages to Q307, Q306 and IC302 are cut off, stopping transmission.

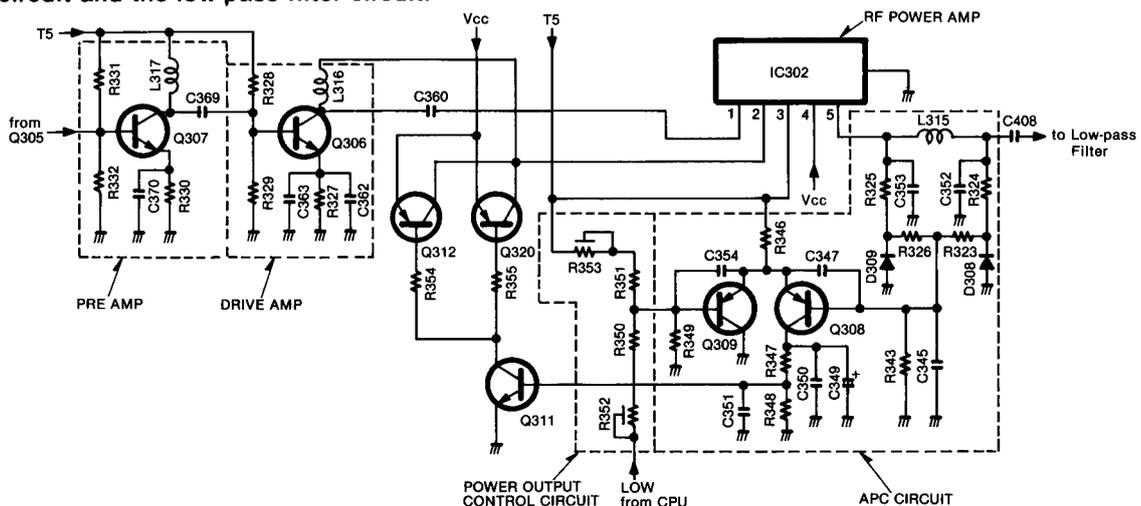


Fig. 2

## 4-2-7 ANTENNA SWITCHING CIRCUIT (RF UNIT)

When transmitting, Q310, D307 and D310 are turned on. L310 and C338 form a parallel resonant circuit. The RF output signal from IC302 is not applied to receiver circuit, but passes through L315, D307 and C339, the low-pass filter (L311, L312, C340~C344) and then on to the antenna. The impedance of the parallel resonant circuit increases. Signals which leak through the resonant circuit are bypassed through D310 and Q310.

## 4-3 PLL CIRCUITS

### 4-3-1 GENERAL

The PLL circuit, using a direct programmable divider (IC303), is designed in a way that allows the desired frequency to be generated directly at the VCO circuit. IC303 sets the dividing ratio based on serial data from the CPU (IC801), and compares the phases of the VCO signal and the reference oscillator frequency. It detects the out of step phase and outputs it.

### 4-3-2 REFERENCE OSCILLATOR CIRCUIT (RF UNIT)

A reference frequency is acquired by Q315 and X302. D313, R361 and R364 provide frequency control. Thus, the output frequency of this circuit is stable over a wide temperature range.

## 4-3-3 CHARGE PUMP AND LOOP FILTER CIRCUITS (RF UNIT)

Phase-detected signals from pins 5 and 12 are converted to DC voltage by the charge pump Q316~Q318; and a lag-lead loop filter consisting of R701, R702, R705 and C702.

VCO oscillating signals are controlled by a varactor diodes (D502, D503). DC voltage (PLL lock voltage) is provided through the loop filter.

D701 is used as an accelerator to ensure rapid PLL lock-up time.

On the other hand, the output of the loop filter passes through Q314, and is used as the voltage for controlling the bandpass filter (D301~D304) of the receiver RF circuit.

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

When the PLL circuit is unlocked, pin 7 of IC303 is "LOW." A "LOW" signal is applied to the unlock circuit consisting of Q120 and Q121. The unlock circuit outputs the resulting signal to the CPU (IC801) pin 62.

### 4-3-5 VCO CIRCUIT (RF UNIT)

D501 changes the inductive reactance of the Clapp oscillator (Q501), shifting the receive and transmit frequencies. Varactor diodes (D502, D503) provide frequency control. The buffer amplifier (Q305, Q319) is unaffected by VCO oscillation.

## PLL CIRCUIT

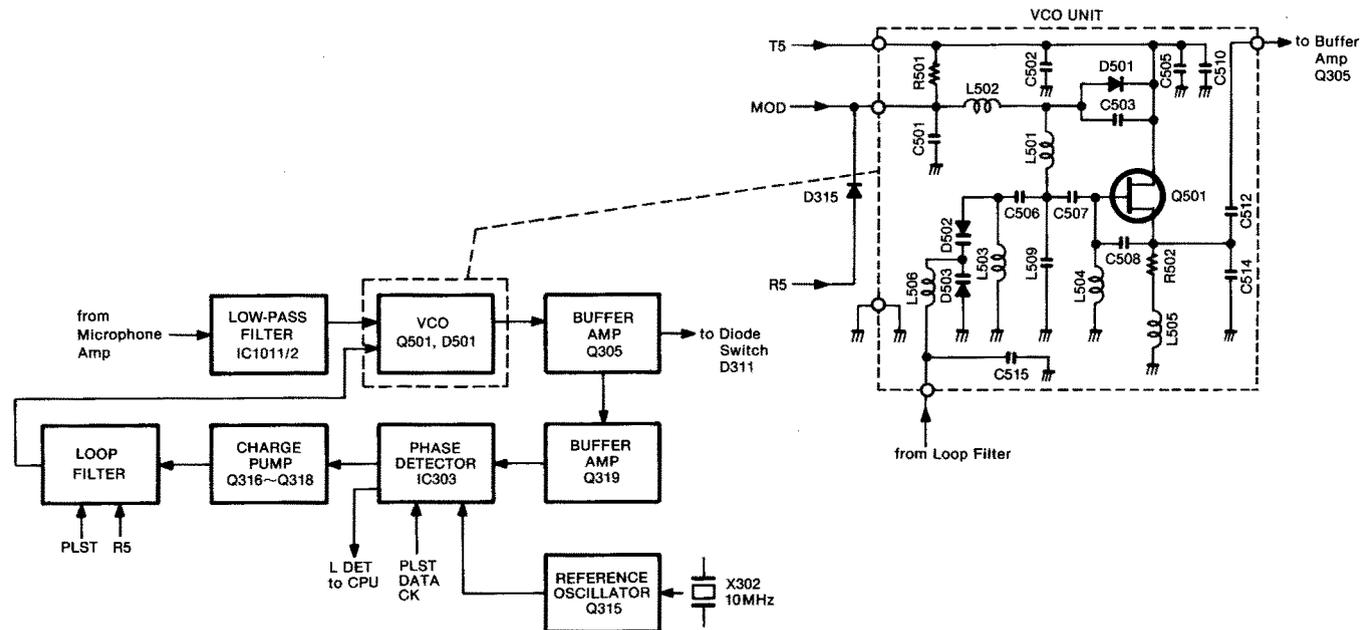


Fig. 3

## 4-4 VOLTAGE LINES

LINE	DESCRIPTION
Vcc	This voltage is applied to Q316, Q317, the 5V regulator circuits and IC102 through the fuse F1 and POWER SWITCH.  The line voltage changes depending on type of the battery pack. 7.2V (CM-71), 8.4V (CM-72), 13.2V (CM-73).
+5V	The regulator circuit consisting of Q118, Q119, D111 and D112 supplies 5V with low noise.  This circuit applies a continuously stable output voltage in any mode because the circuit is constructed using a complementary connection ensuring high current amplification and good temperature characteristics.
S5	The circuit is constructed by Q112, Q113 and D109 as a complementary circuit. When the power saver is turned on, CPU (IC801, pin 50) cuts off the S5 line intermittently to save power.
T5	Transmit 5V. Q115 supplies T5V when pin 51 of IC801 (CPU) outputs "LOW."
R5	Receive 5V. Q111 supplies R5V when pin 51 of IC801 (CPU) outputs "HIGH."

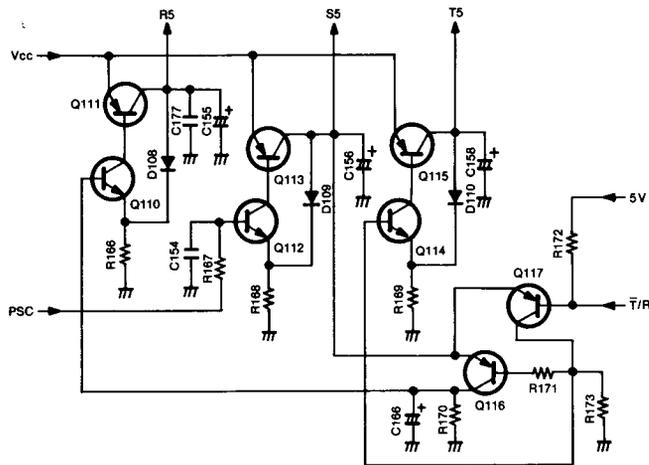


Fig. 4

## 4-5 T5/R5 SWITCHING CIRCUIT (MAIN UNIT)

When transmitting, pin 51 of IC801 (CPU) becomes "LOW." Q117 is turned ON, and Q116 is turned OFF. Bias voltage is applied to Q114, and Q115 outputs 5V as T5V.

When receiving, pin 51 of IC801 (CPU) becomes "HIGH," Q117 is turned OFF, and Q116 is turned ON. Bias voltage is applied to Q110, and Q111 outputs 5V as R5V. Because Q116 applies the voltage from the S5 line, R5 line voltage becomes zero, reducing current consumption when the power save function is ON.

## 4-6 CTCSS CIRCUIT (MAIN UNIT)

IC104 is a programmable CTCSS tone encoder/decoder which generates 37 tone frequencies. IC801 (CPU) outputs the serial data through IC103 to set the CTCSS tone frequency at IC104 through IC103. IC104 pins 3~8 (S0~S5) receive data for the tone frequency.

When transmitting, pin 12 of IC104 becomes "LOW." When receiving, pin 12 becomes "HIGH."

### CTCSS TONE FREQUENCIES:

OUTPUT FREQUENCY [Hz]	IC104 INPUT PIN NUMBER					
	3	4	5	6	7	8
67.0	H	L	H	H	H	L
71.9	L	L	H	H	H	L
74.4	H	H	L	H	H	L
77.0	L	H	L	H	H	L
79.7	H	L	L	H	H	L
82.5	L	L	L	H	H	L
85.4	H	H	H	L	H	L
88.5	L	H	H	L	H	L
91.5	H	L	H	L	H	L
94.8	H	L	L	H	H	H
100.0	L	L	L	H	H	H
103.5	H	H	H	L	H	H
107.2	L	H	H	L	H	H
110.9	H	L	H	L	H	H
114.8	L	L	H	L	H	H
118.8	H	H	L	L	H	H
123.0	L	H	L	L	H	H
127.3	H	L	L	L	H	H
131.8	L	L	L	L	H	H
136.5	H	H	H	H	L	H
141.3	L	H	H	H	L	H
146.2	H	L	H	H	L	H
151.4	L	L	H	H	L	H
156.7	H	H	L	H	L	H
162.2	L	H	L	H	L	H
167.9	H	L	L	H	L	H
173.8	L	L	L	H	L	H
179.9	H	H	H	L	L	H
186.2	L	H	H	L	L	H
192.8	H	L	H	L	L	H
203.5	L	L	H	L	L	H
210.7	H	H	L	L	L	H
218.1	L	H	L	L	L	H
225.7	H	L	L	L	L	H
233.6	L	L	L	L	L	H
241.8	H	H	H	H	H	L
250.3	L	H	H	H	H	L

## 4-7 CPU (IC801) PORT ALLOCATIONS

### INPUT PORT

PIN	PORT	NAME	DESCRIPTION
38	P00	INT4	Interrupt input. HIGH: Normal operation. LOW: Standby mode.
41	P03	HIGH/LOW	HIGH: Low RF output is selected. LOW: High RF output is selected.
42	P10	PTT	LOW: PTT switch is pushed.
43	P11	CLONE	The CPU enters the cloning mode when the port is "LOW."
44	P12	MONI	The CPU turns the CTCSS OFF when the port is "LOW."
45	P13	SCAN CONTROL	Scan starts when the port is "LOW."
	P40~P43		Matrix input.
60	P60	DET	The CPU reads that the same tone frequency is received when the port is "HIGH."
61	P61	BUSY	The CPU reads that the squelch opens when the port is "HIGH."
62	P62	UNLOCK	The CPU reads that the PLL is unlocked when the port is "LOW."

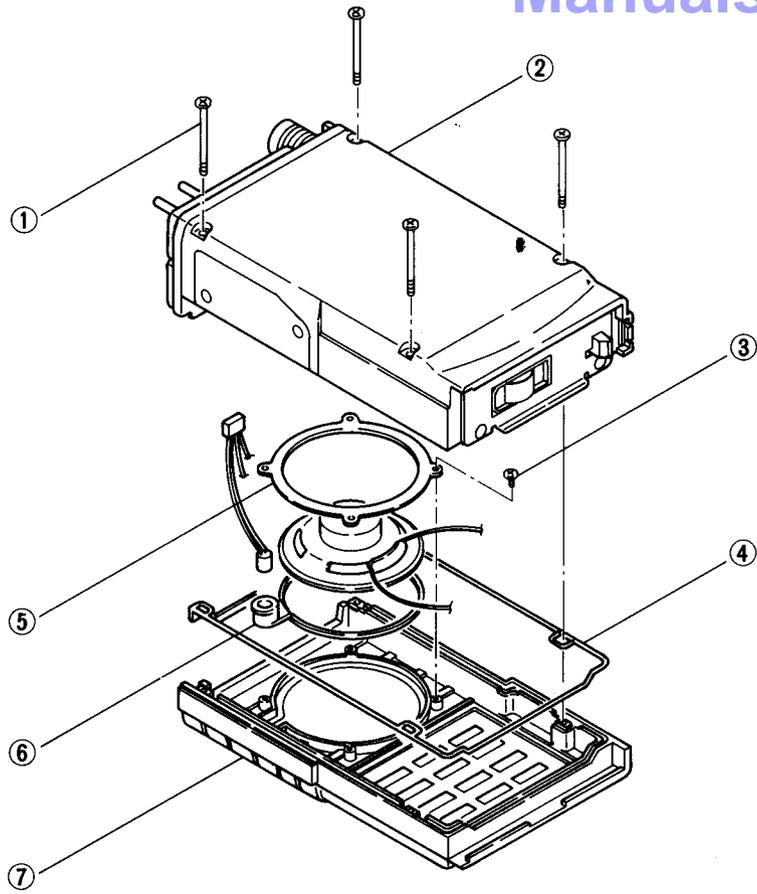
### OUTPUT PORT

PIN	PORT	NAME	DESCRIPTION
34	P50	KS4	Matrix signal output. (Matrix is used for CH selection.)
35	P51	KS5	Matrix signal output.
36	P52	LOWO	Power control signal output. Outputs "LOW" when the transceiver is programmed for low power output.
37	P53	TMUT	Transmit mute output.
39	P01	CK	Clock output for serial data.
40	P02	DATA	Serial data output.
46	P20	BEEP	Outputs a 1kHz pulse when a beep is emitted over the speaker.
47	P21	PLSTB	Strobe signal output for the PLL.
48	P22	CTSTB	Strobe signal output for the CTCSS tone encoder/decoder.
49	P23	TONEC	2-tone control signal output. Becomes "LOW" when DPL or SINGLE tone is selected.
50	P30	PSC	Power save control output. Becomes "LOW" when the power save function is activated.
51	P31	$\bar{T}/R$	Transmit/Receive switching output. Becomes "LOW" with input when transmitting.
52	P32	RMUT	Receiver mute output. Becomes "HIGH" when receiver audio output is muted.
53	P33	CALLO	Busy signal output. Outputs a signal synchronized with the BUSY input. Directly drives the TRANSMIT/BUSY INDICATOR.
63	P63	CPO	CLONE DATA output.
	P70~P73		Matrix signal output pins.

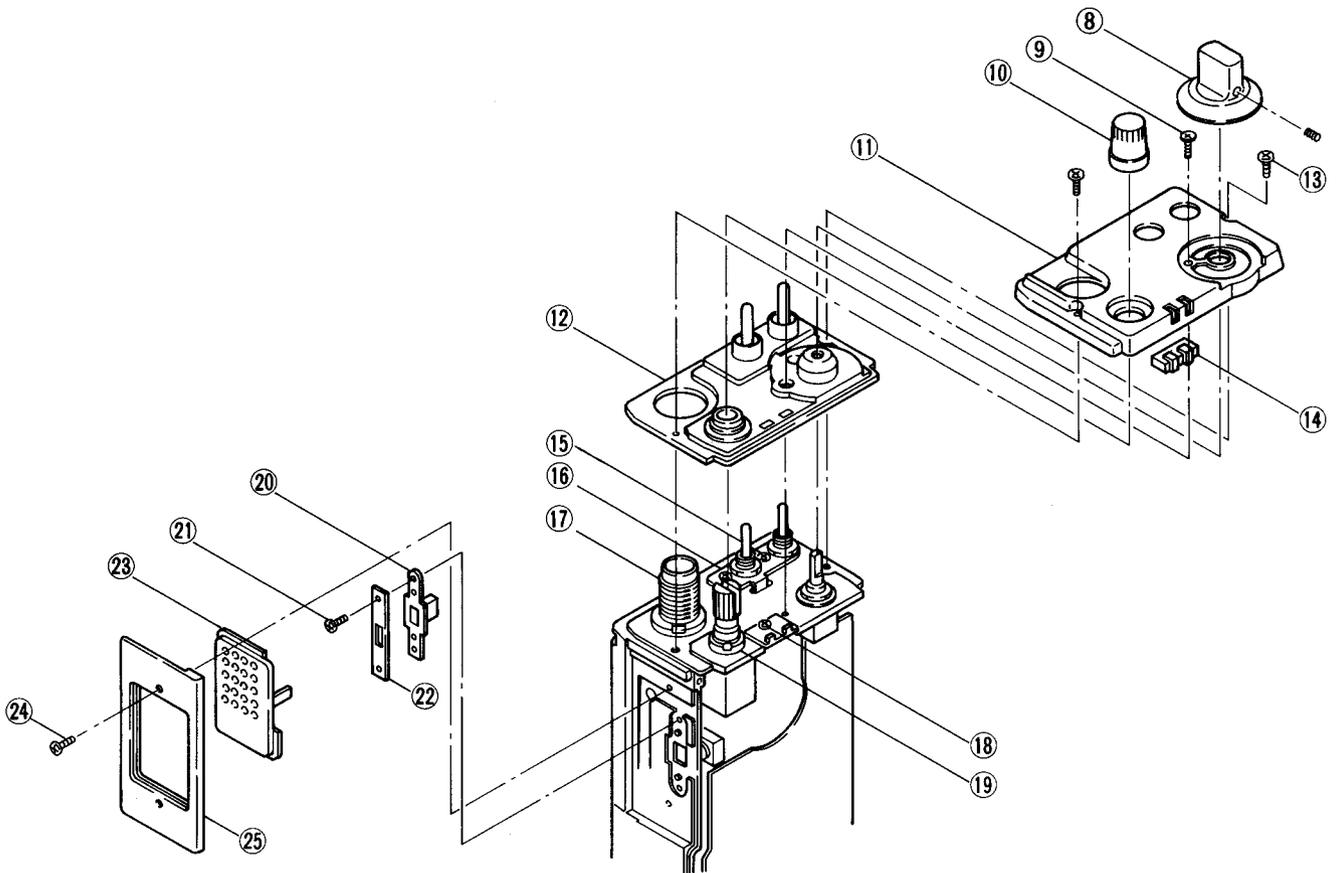
LABELLED NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	PH B0 2×31.5 ZK	8810004000	4
②	Rear panel	8010007230	1
③	PH B0 2×4	8810000980	4
④	Casing seal	8010007240	1
⑤	Speaker plate	8930012480	1
⑥	Speaker seal	8930012630	1
⑦	Front panel (A)	8210003170	1
⑧	Knob (channel) N-132 (includes HLH M3×3)	8610004300 (8810003520)	1 1
⑨	No. 0-1 PH M2×7 ZK	8810005100	1
⑩	Knob (Power/Volume) N-133	8610004310	1
⑪	Top panel	8210003180	1
⑫	Top panel seal	8930012560	1
⑬	PH M2×6 ZK	8810004860	2
⑭	Lens	8930012600	1
⑮	No. 0-1 PH M2×2.5	8810004870	2
⑯	Top plate	8310012090	1
⑰	Antenna connector TNC-R107 (includes nut)	6510007250	1
⑱	No. 0-1 PH M2×2.5	8810004870	1
⑲	VR nut (E)	8830000550	1
⑳	Switch seal	8310012280	1
㉑	PH M2×6	8810000030	2
㉒	Switch plate	8930012500	1
㉓	PTT button	8930012570	1
㉔	No. 0-1 PH M2×5 ZK	8810000530	2
㉕	PTT holder	8930012590	1
㉖	PH M2×3	8810004210	4
㉗	PH M2×3 ZK	8810005090	2
㉘	Side plate	8930012580	1
㉙	Jack cover seal	8930012620	1
㉚	Standoff (AR)	8930012510	3
㉛	No. 0-1 PH M2×2.5	8810004870	3
㉜	PH M2×3	8810004210	4
㉝	PH M2×6	8810000030	1
㉞	Module mounting plate	8930012490	1
㉟	Screw lug M2	8860000010	2
㊱	Spring (K)	8930012640	1
㊲	Release button	8930012610	1
㊳	BH M2×6 Ni	8810002580	2
㊴	Sliding guide (A)	8010007180	1
㊵	FH M2×4 Ni	8810002310	4
㊶	Connection spring	8930005980	1
㊷	Contact holder	8930011880	1

**Screw type** Screw: M2×6, etc. Self-tapping screw: B0 2×4, etc. Precision type screw: No. 0-1  
**Screw head style** PH: Pan head BH: Button head FH: Flat head HLH: Headless hex head

• CASE AND FRONT PANELS

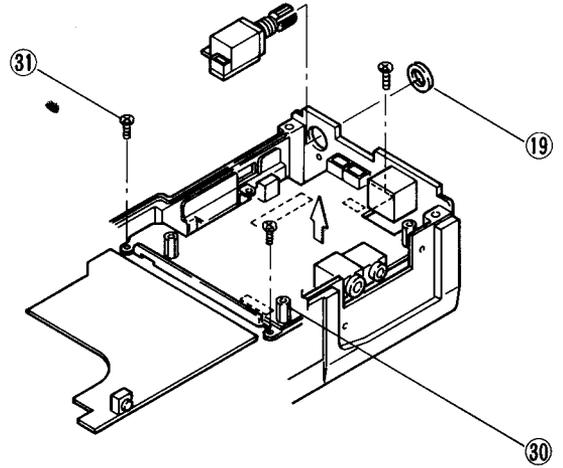
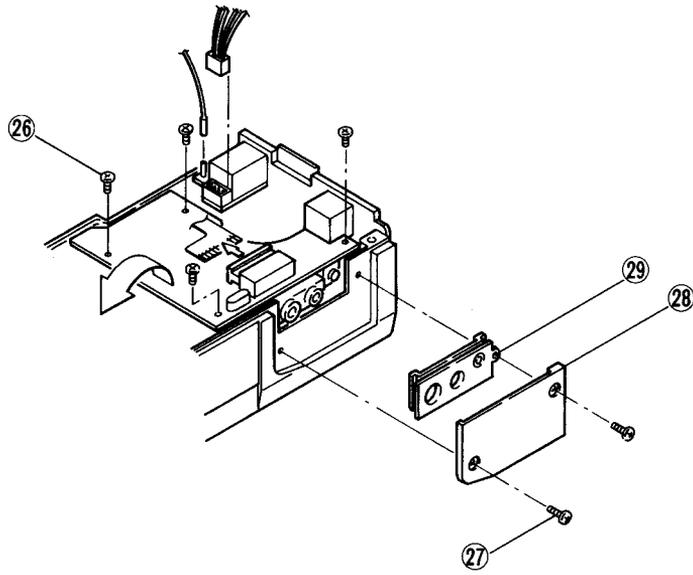


• TOP PANEL



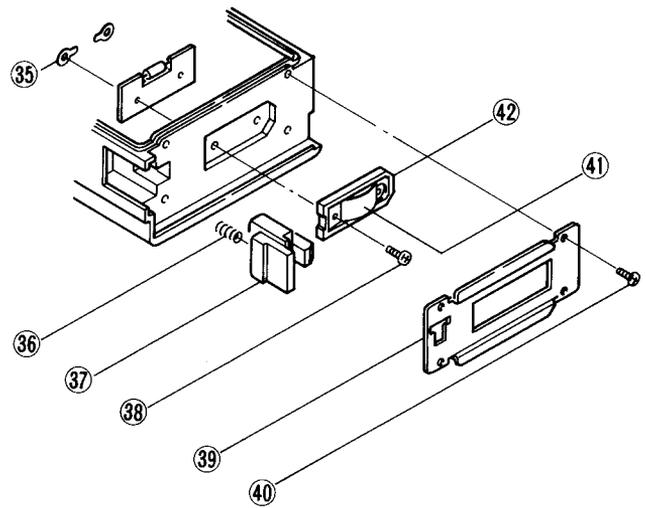
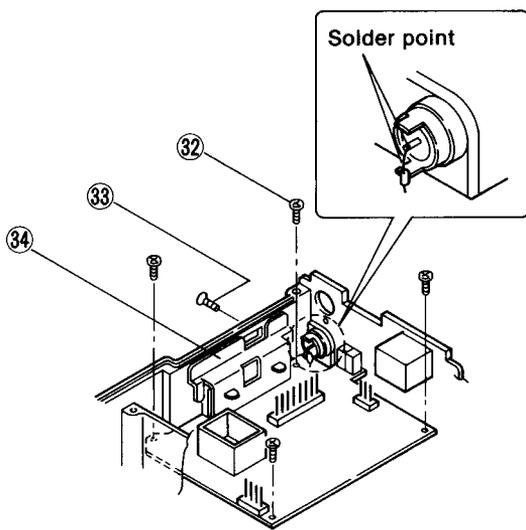
• LOGIC UNIT

• MAIN UNIT



• RF UNIT

• CONTACT HOLDER



**NOTE:**

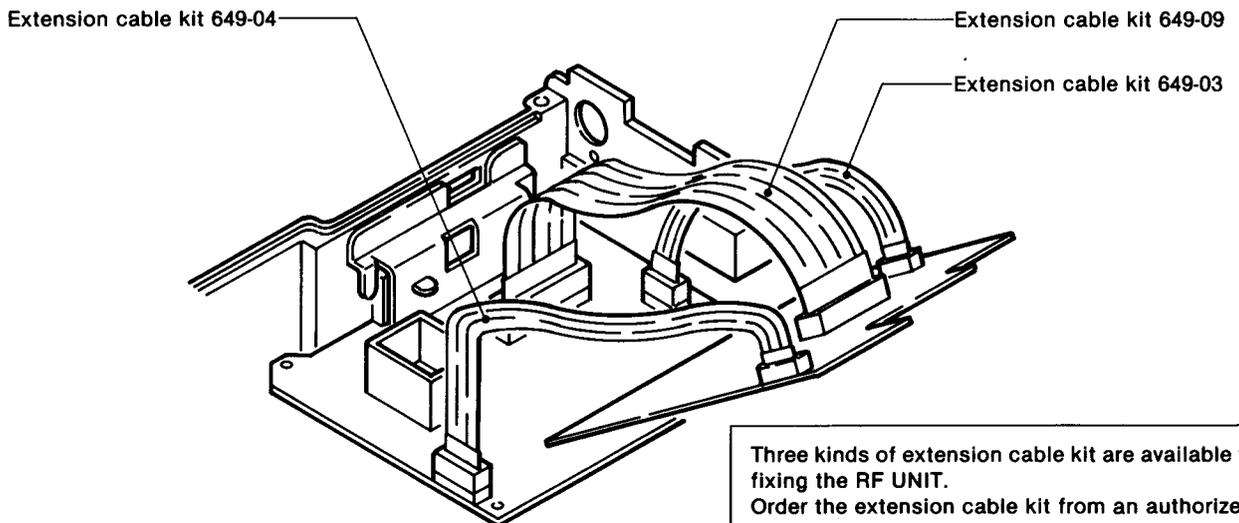
The battery pack can not be disassembled.

6-1 PLL ADJUSTMENT

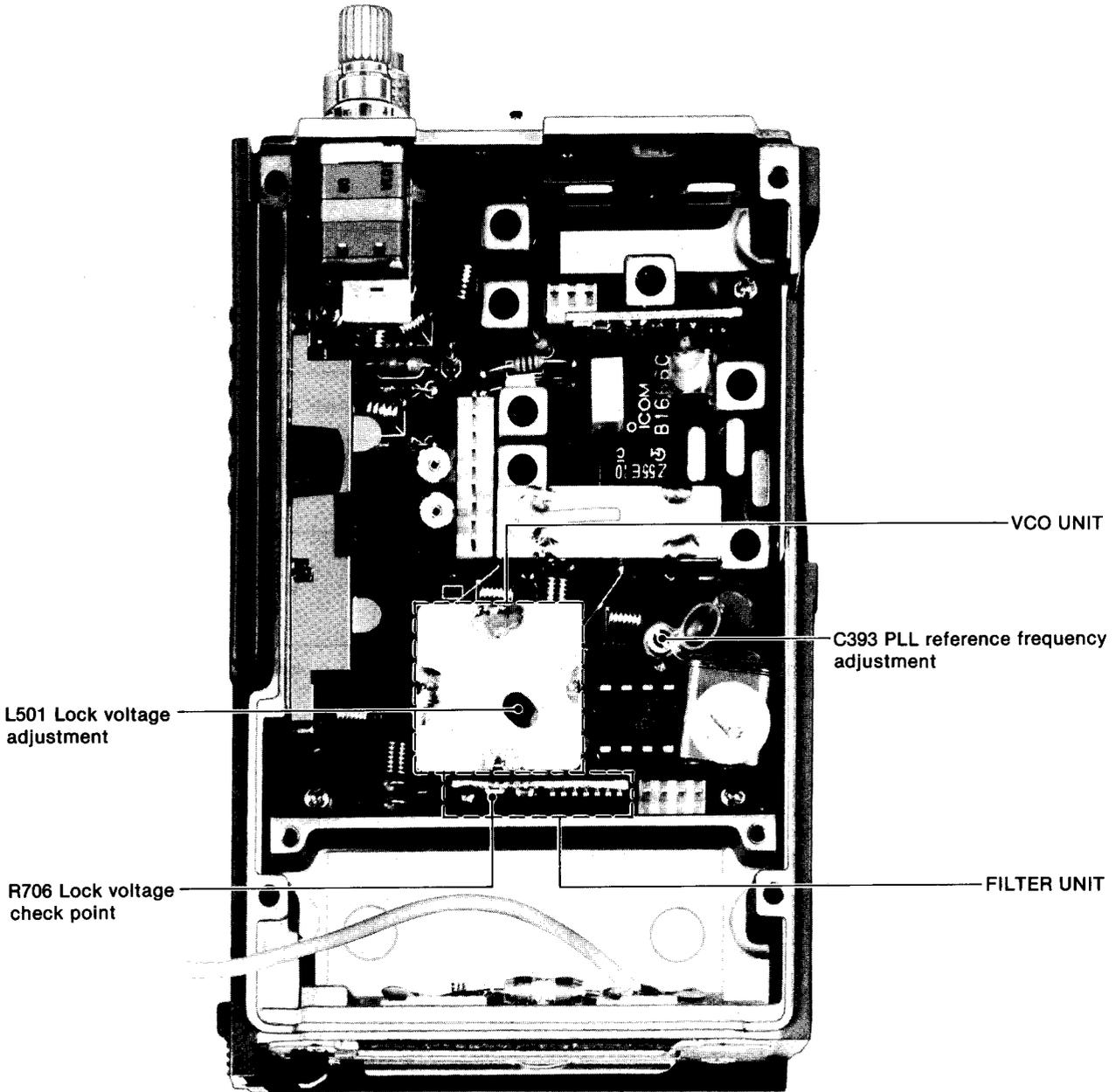
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
<p>(1) AC POWER SUPPLY</p> <ul style="list-style-type: none"> <li>• Output voltage : 13.2V DC</li> <li>• Current capacity : 3A or more</li> </ul> <p>(2) FREQUENCY COUNTER</p> <ul style="list-style-type: none"> <li>• Frequency range : 0.1~180MHz</li> <li>• Frequency accuracy : ±1ppm or better</li> <li>• Sensitivity : 100mV or better</li> </ul> <p>(3) DC VOLTMETER</p> <ul style="list-style-type: none"> <li>• Input impedance : 50kΩ/DC or better</li> </ul>	

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>• Transmitting</li> <li>• Connect an antenna.</li> </ul>	Top panel	Loose couple the frequency counter to the antenna.	Same frequency as the programmed one. To check the programmed frequency, use the EX-704.	RF	C393
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: 148.0000MHz</li> <li>• Receiving</li> </ul>	FILTER	Connect the DC voltmeter to R706.	1.3V	VCO	L501
	2 <ul style="list-style-type: none"> <li>• Transmitting</li> </ul>			Approx. 1.3V		Verify

RF AND MAIN UNITS SEPARATION



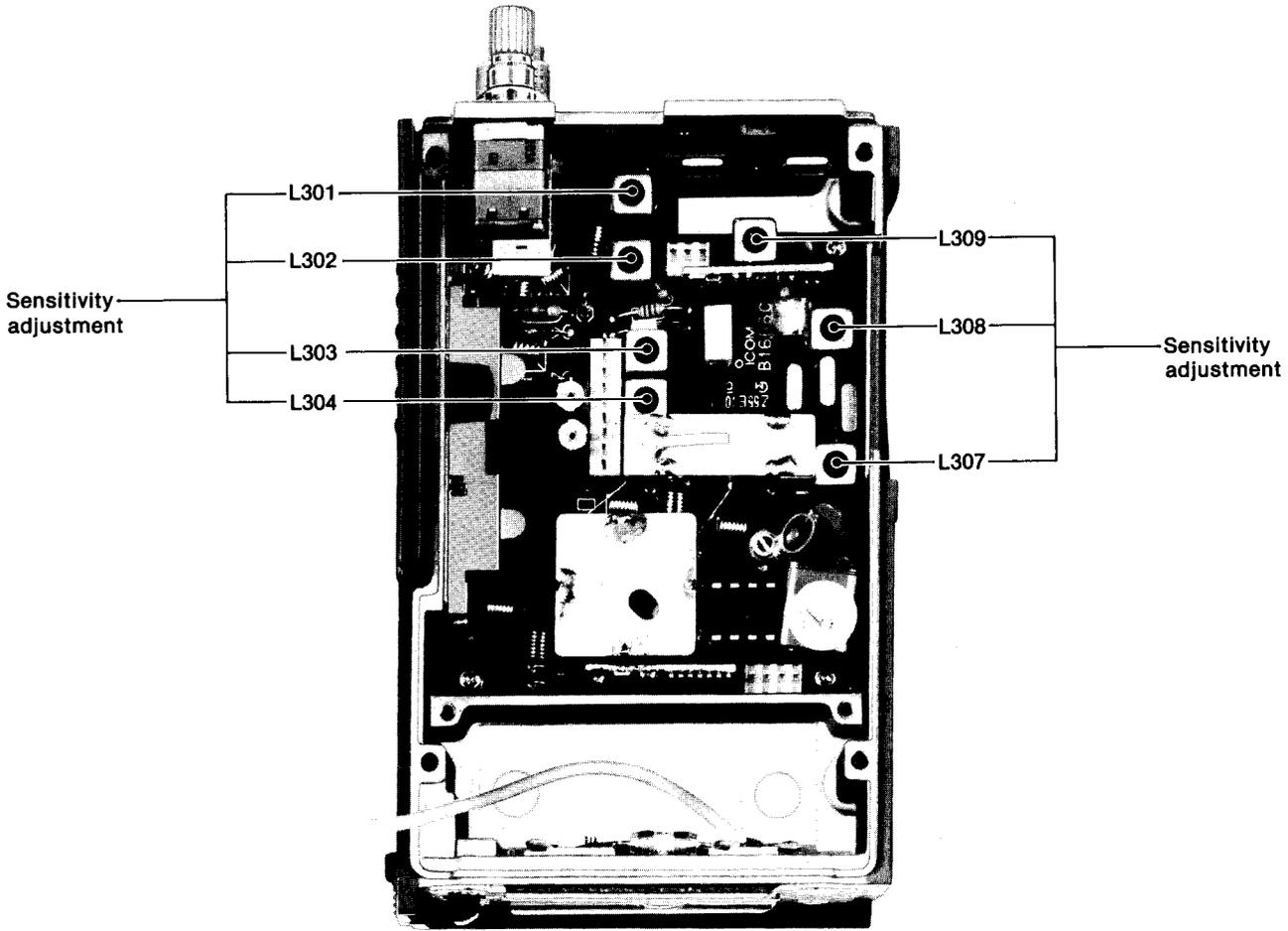
Three kinds of extension cable kit are available for fixing the RF UNIT. Order the extension cable kit from an authorized Icom Dealer.



## 6-2 RECEIVER ADJUSTMENT

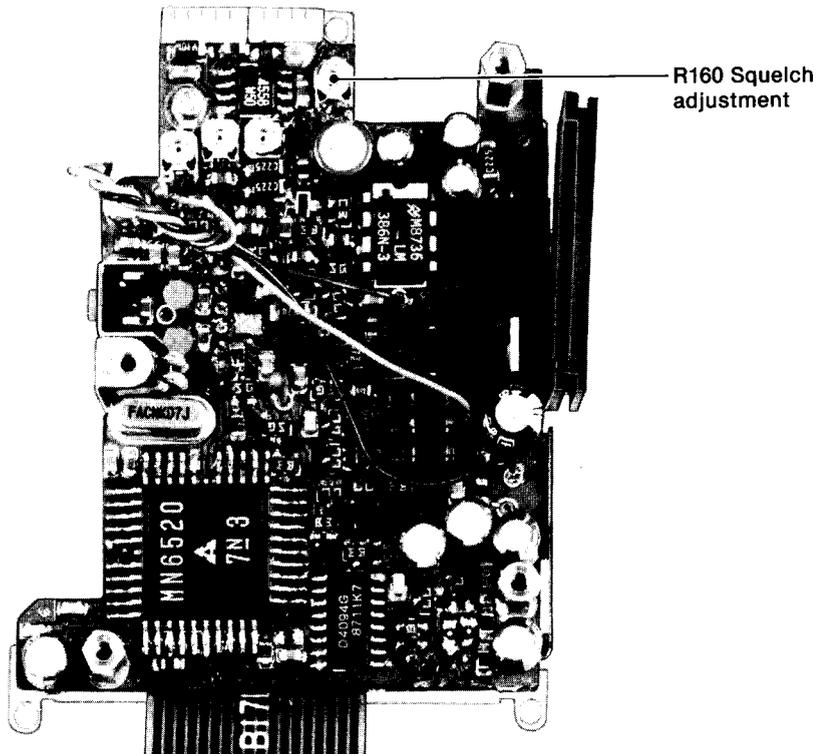
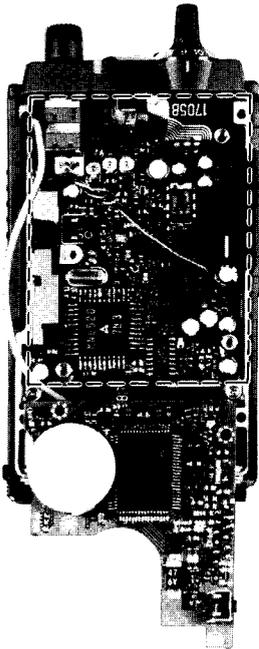
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
<p>(1) AC POWER SUPPLY</p> <ul style="list-style-type: none"> <li>• Output voltage : 13.2V DC</li> <li>• Current capacity : 3A or more</li> </ul> <p>(2) STANDARD SIGNAL GENERATOR (SSG)</p> <ul style="list-style-type: none"> <li>• Frequency range : 0.1~180MHz</li> <li>• Output level : -127~-17dBm (0.1<math>\mu</math>V~32mV)</li> </ul> <p>(3) DISTORTION METER</p> <ul style="list-style-type: none"> <li>• Frequency range : 1kHz<math>\pm</math>10Hz</li> <li>• Measuring range : 1~100%</li> </ul> <p>(4) NON-INDUCTIVE RESISTOR</p> <ul style="list-style-type: none"> <li>• Impedance : 8<math>\Omega</math></li> </ul>	<pre> graph TD     AC[AC POWER SUPPLY] -- "to BATTERY TERMINAL" --&gt; TR[TRANSCIVER]     SSG[STANDARD SIGNAL GENERATOR] -- "to ANTENNA CONNECTOR" --&gt; TR     NI[NON-INDUCTIVE RESISTOR] --&gt; DM[DISTORTION METER]     DM --&gt; SPJ[EXT. SP JACK]     TR --&gt; SPJ     </pre>

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT		
		UNIT	LOCATION		UNIT	ADJUST	
SENSITIVITY	NOTE: When the sensitivity is less than 0.28 $\mu$ V (12dB SINAD) on every channel, the following sensitivity adjustment is not necessary. Skip to squelch adjustment below. To adjust the RF bandpass filters, see the diagram on p. 6-1.						
1	<ul style="list-style-type: none"> <li>• Operating frequency: Center of the frequency edge.</li> <li>• Receiving</li> <li>• Apply an RF signal to the ANTENNA CONNECTOR. Level: -118dBm (0.28<math>\mu</math>V) Mod.: 1kHz Dev.: <math>\pm</math>3.5kHz</li> <li>• MONITOR SWITCH: ON</li> </ul>	Side panel	Connect the distortion meter with an 8 $\Omega$ load to the EXT. SP JACK.	Minimum distortion level.	RF	L301 L302 L303 L304 L307 L308 L309	
SQUELCH	NOTE: Before squelch adjustment, be sure that the sensitivity on every channel is less than 0.28 $\mu$ V (12dB SINAD).						
1	<ul style="list-style-type: none"> <li>• Apply an RF signal to ANTENNA CONNECTOR: Level: -120dBm (0.22<math>\mu</math>V) Mod.: 1kHz Dev.: <math>\pm</math>3.5kHz</li> <li>• Turn R160 max. counterclockwise.</li> </ul>	Front panel	Speaker	Squelch threshold point	MAIN	R160	



MAIN UNIT

UNIT LOCATION

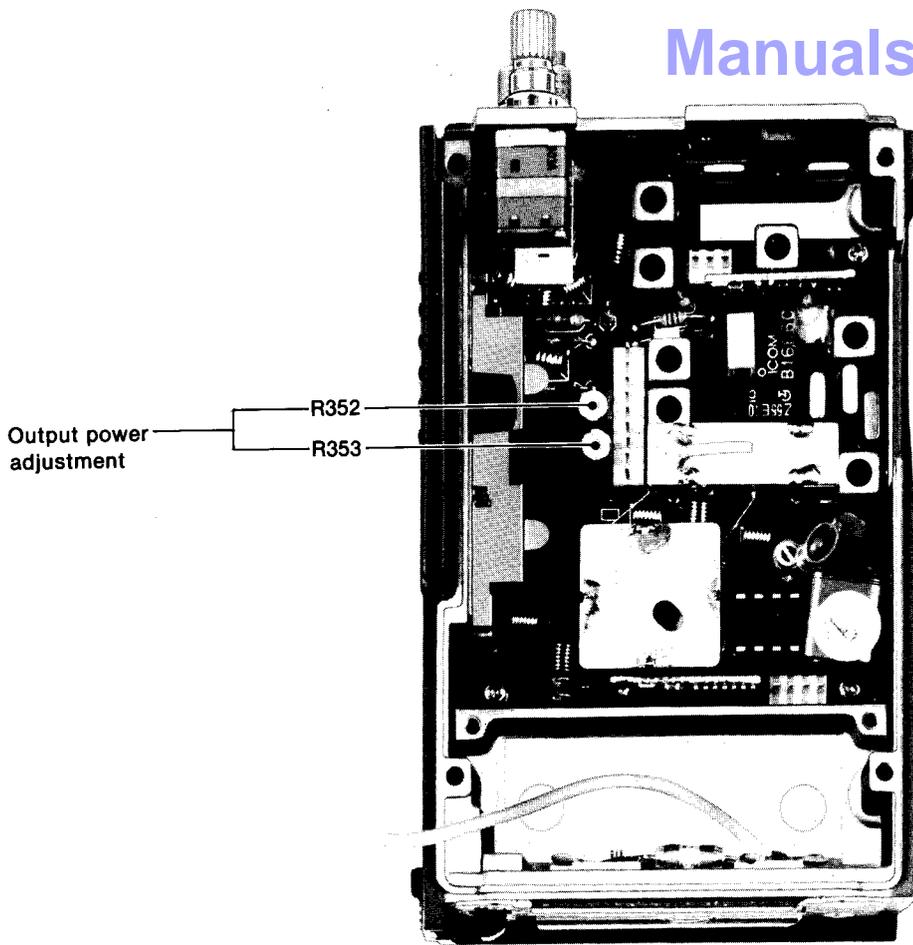


# 6-3 TRANSMITTER ADJUSTMENT

TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
<p>(1) AC POWER SUPPLY</p> <ul style="list-style-type: none"> <li>• Output voltage : 13.2V DC</li> <li>• Current capacity : 3A or more</li> </ul> <p>(2) RF POWER METER (TERMINATED TYPE)</p> <ul style="list-style-type: none"> <li>• Measuring range : 1~10W</li> <li>• Frequency range : 120~180MHz</li> <li>• Impedance : 50Ω</li> <li>• SWR : Less than 1.2:1</li> </ul> <p>(3) AF GENERATOR (AG)</p> <ul style="list-style-type: none"> <li>• Frequency range : 200~2000 Hz</li> <li>• Output level : 0~200mV</li> </ul> <p>(4) AC MILLI-VOLTMETER</p> <ul style="list-style-type: none"> <li>• Measuring range : 2~200mV</li> </ul> <p>(5) FM DEVIATION METER</p> <ul style="list-style-type: none"> <li>• Frequency minimum : 480MHz</li> <li>• Measuring range : 0~±5kHz</li> </ul>	<p>The diagram illustrates the setup for transmitter adjustment. An AF GENERATOR and an AC MILLI-VOLTMETER are connected to the EXT. MIC JACK. An AC POWER SUPPLY is connected to the BATTERY TERMINAL. The FM DEVIATION METER and ATTENUATOR are connected to the ANTENNA CONNECTOR. The RF POWER METER is also connected to the ANTENNA CONNECTOR. The TRANSCEIVER is connected to the BATTERY TERMINAL and the ANTENNA CONNECTOR.</p>

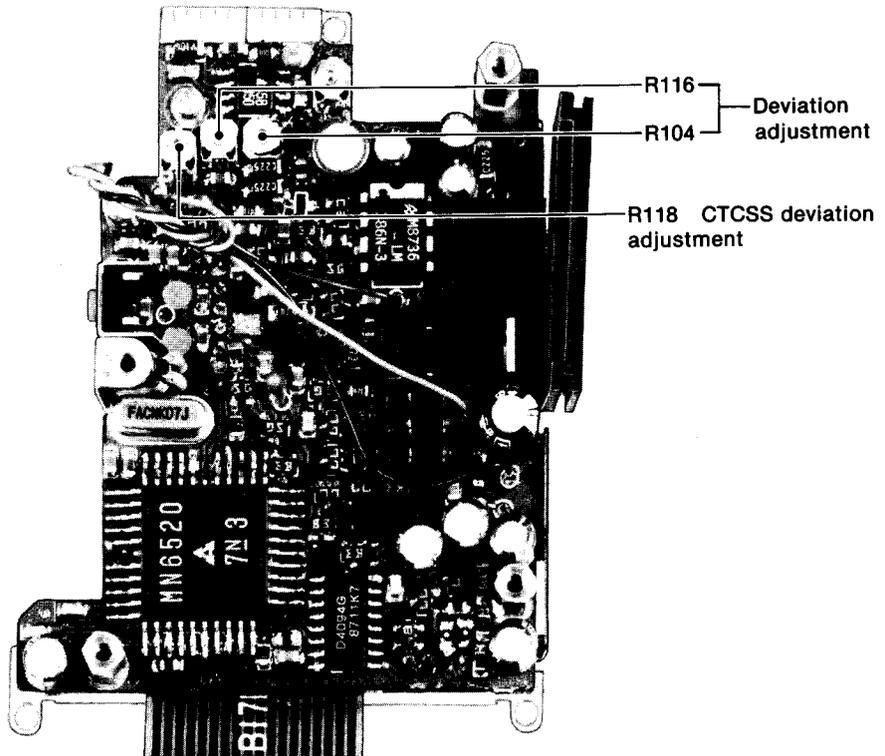
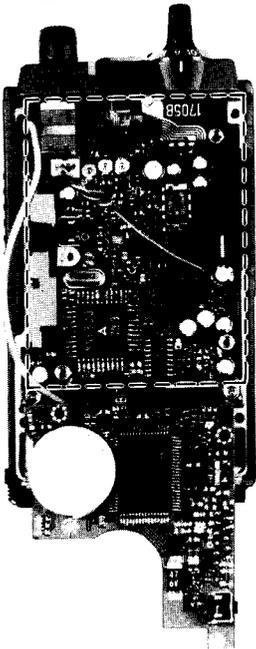
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	Top panel	Connect the RF power meter to the ANTENNA CONNECTOR.	5.0W	RF	R353
	2			1.5W		R352
DEVIATION	1	Top panel	Connect the FM deviation meter to the ANTENNA CONNECTOR via the attenuator.	±4.3kHz	MAIN	R116
	2			Symmetrical deviation		R104
CTCSS DEVIATION	1	Top panel	Connect the FM deviation meter to the ANTENNA CONNECTOR via the attenuator.	±0.75kHz	MAIN	R118

**RF UNIT**

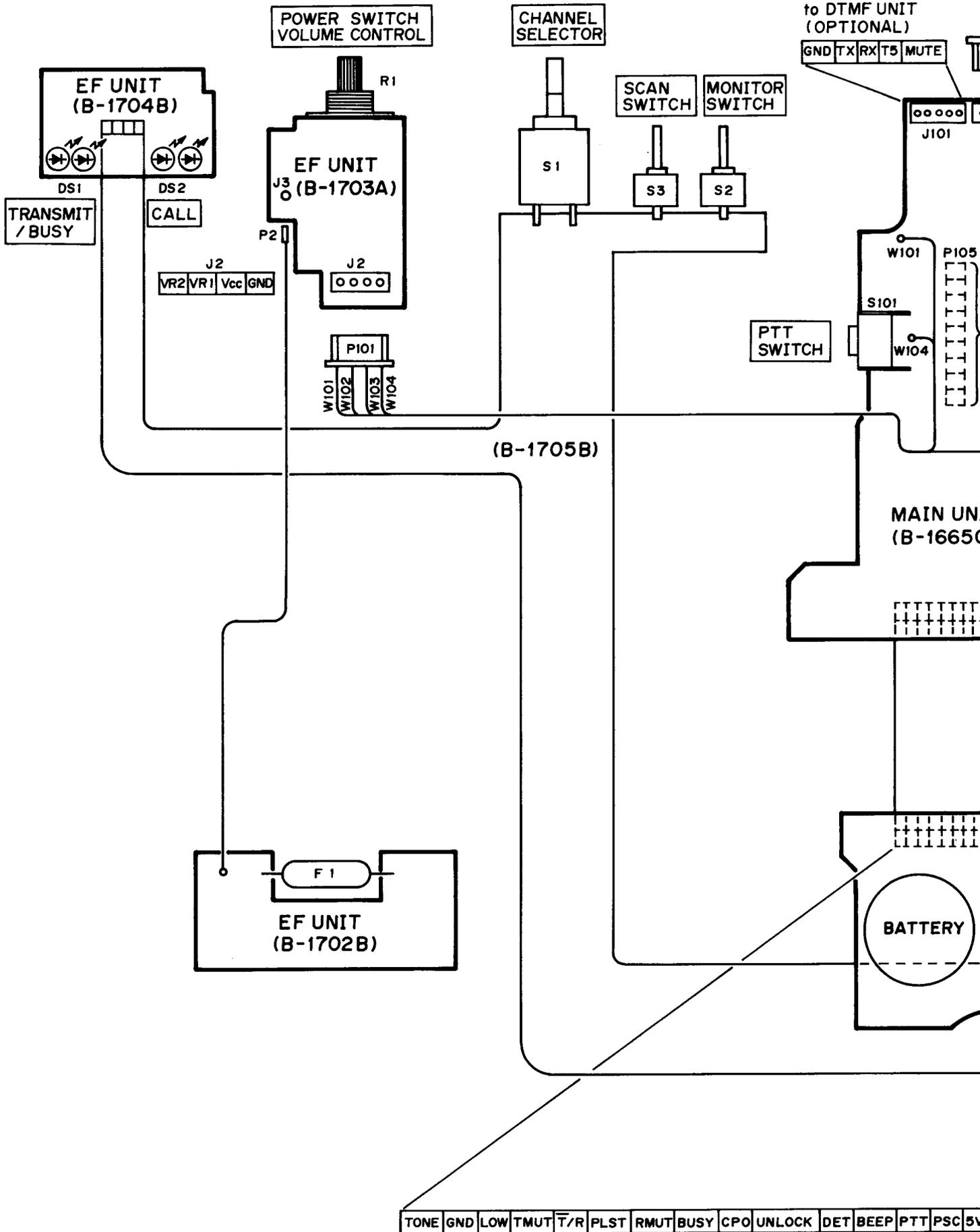


**MAIN UNIT**

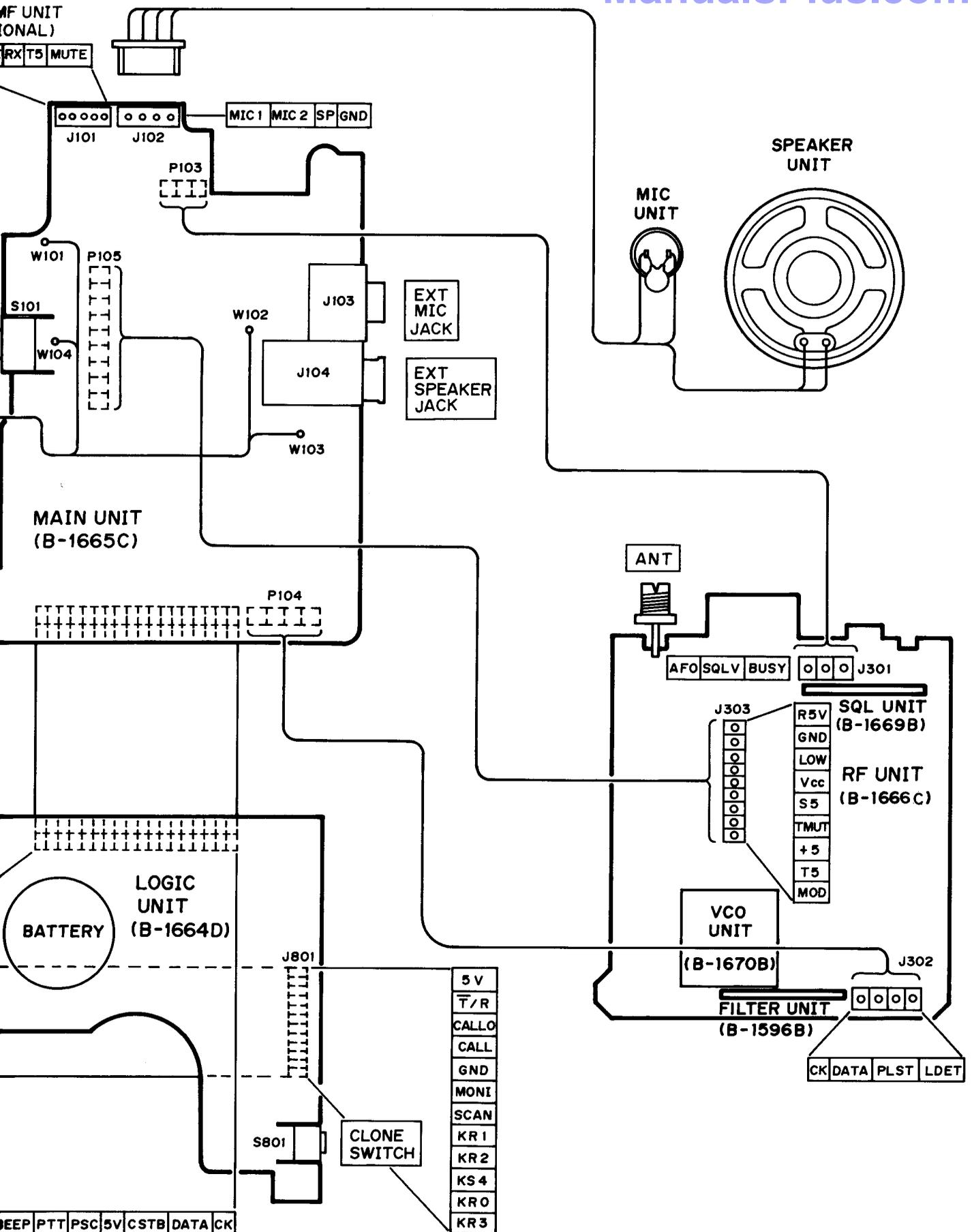
**UNIT LOCATION**



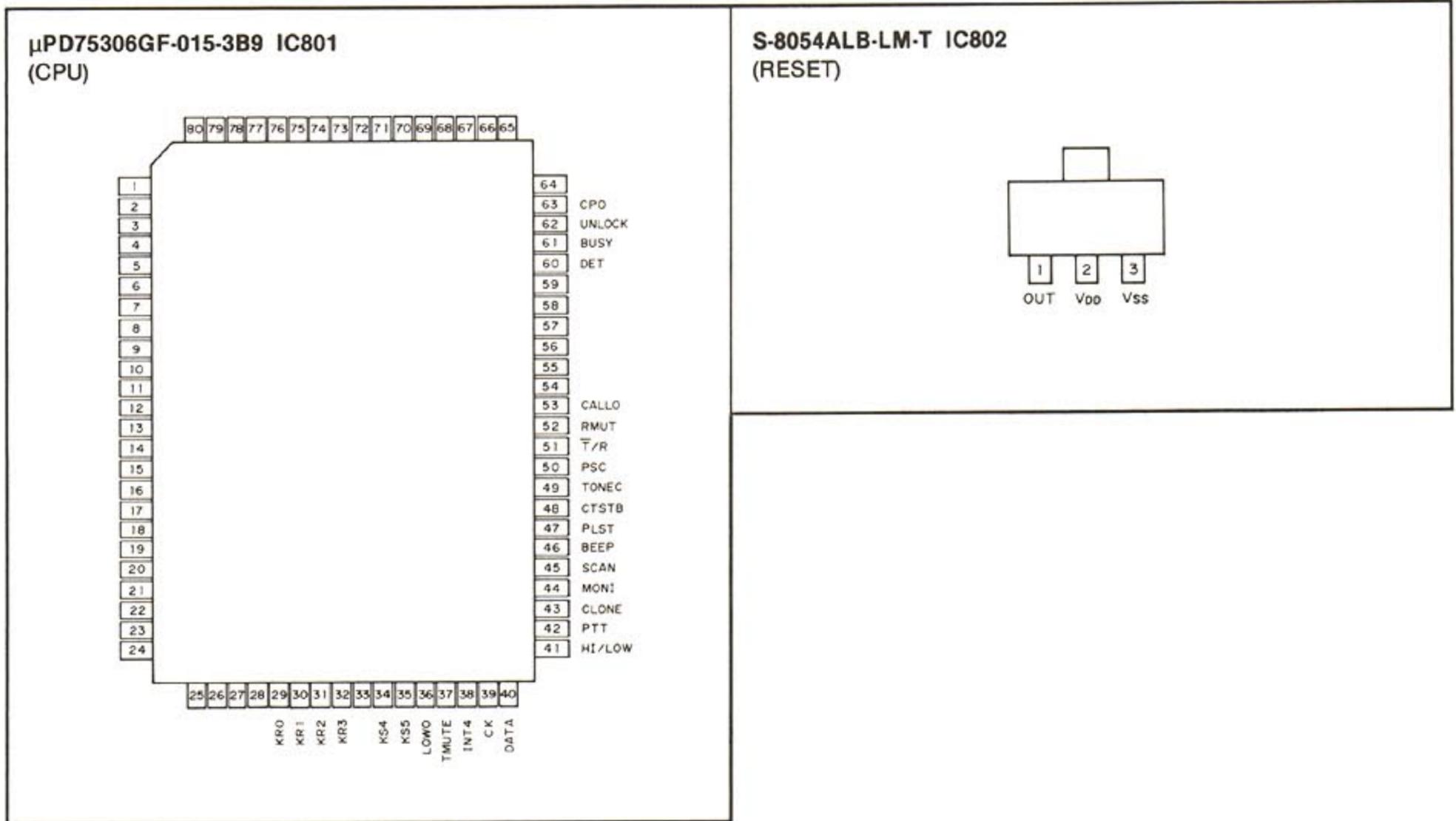
7-1 INTERCONNECTION



TONE	GND	LOW	TMUT	T/R	PLST	RMUT	BUSY	CPO	UNLOCK	DET	BEEP	PTT	PSC	5V
------	-----	-----	------	-----	------	------	------	-----	--------	-----	------	-----	-----	----

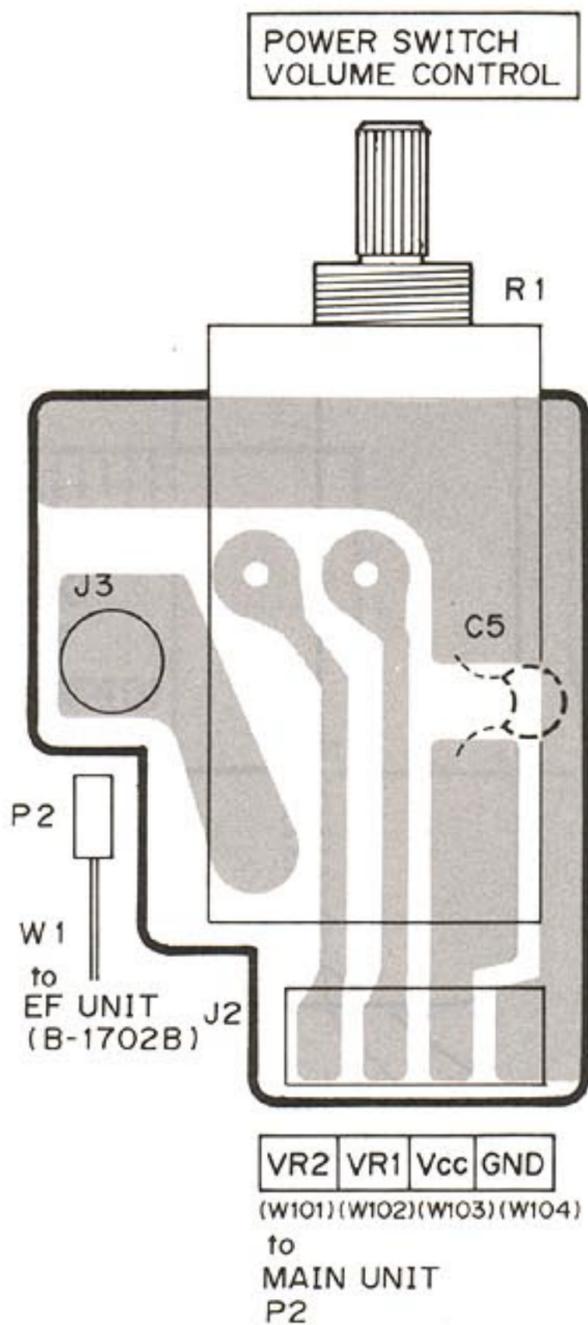


## • LOGIC UNIT

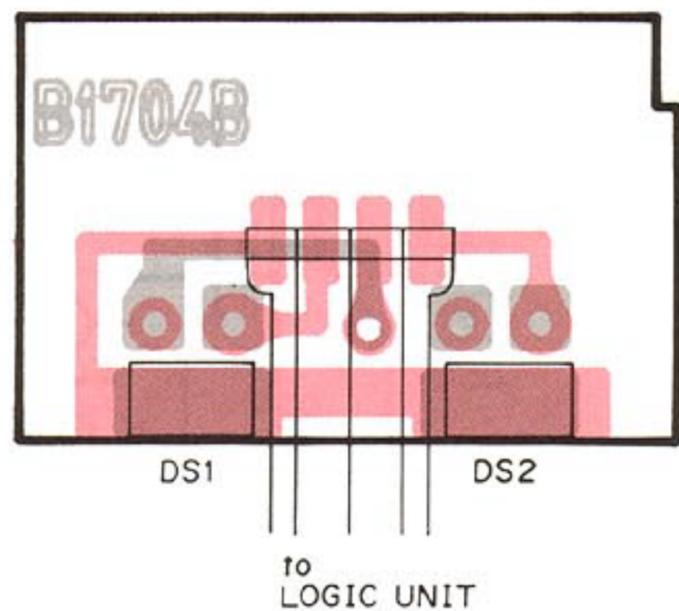


## • EF UNIT

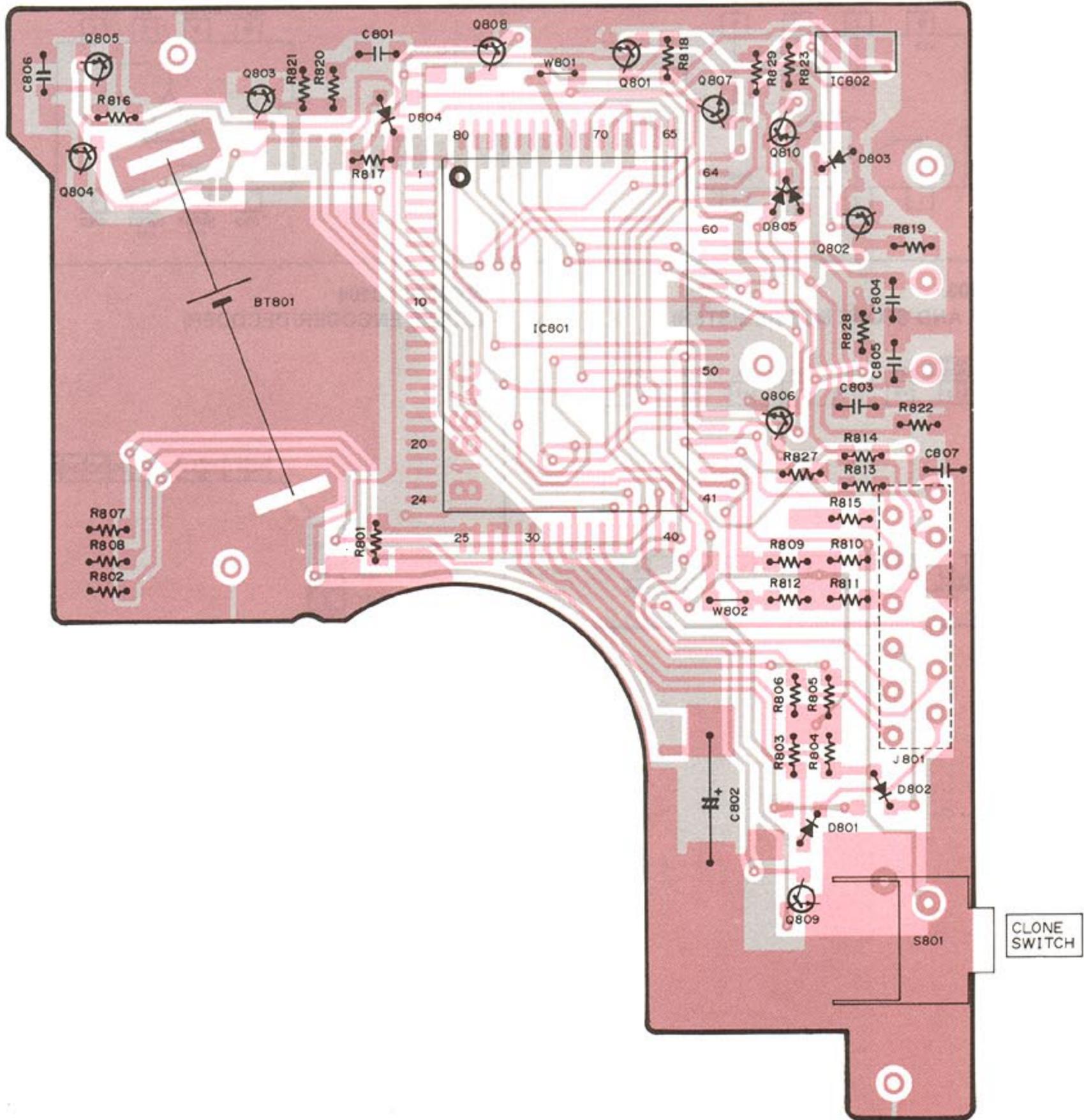
### VOL



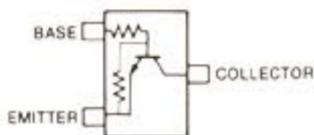
### LED



COMPONENT SIDE

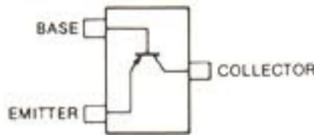


**2SC3395**  
Q801, Q804  
Q806, Q807  
Q808, Q809



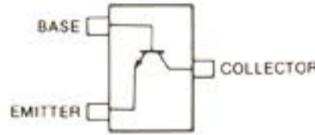
Symbol: BY

**2SA1362 GR**  
Q802



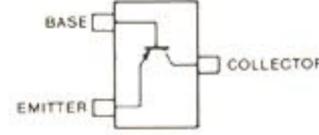
Symbol: AEG

**2SC2712 BL**  
Q803



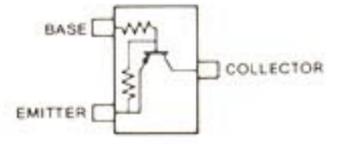
Symbol: LL

**2SA1162 GR**  
Q805



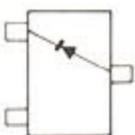
Symbol: SG

**2SA1341**  
Q810



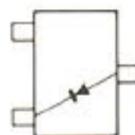
Symbol: BL

**1SS187**  
D801



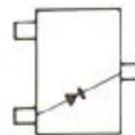
Symbol: D3

**1SS190**  
D802



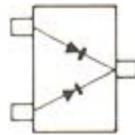
Symbol: E3

**1SS196**  
D803, D804

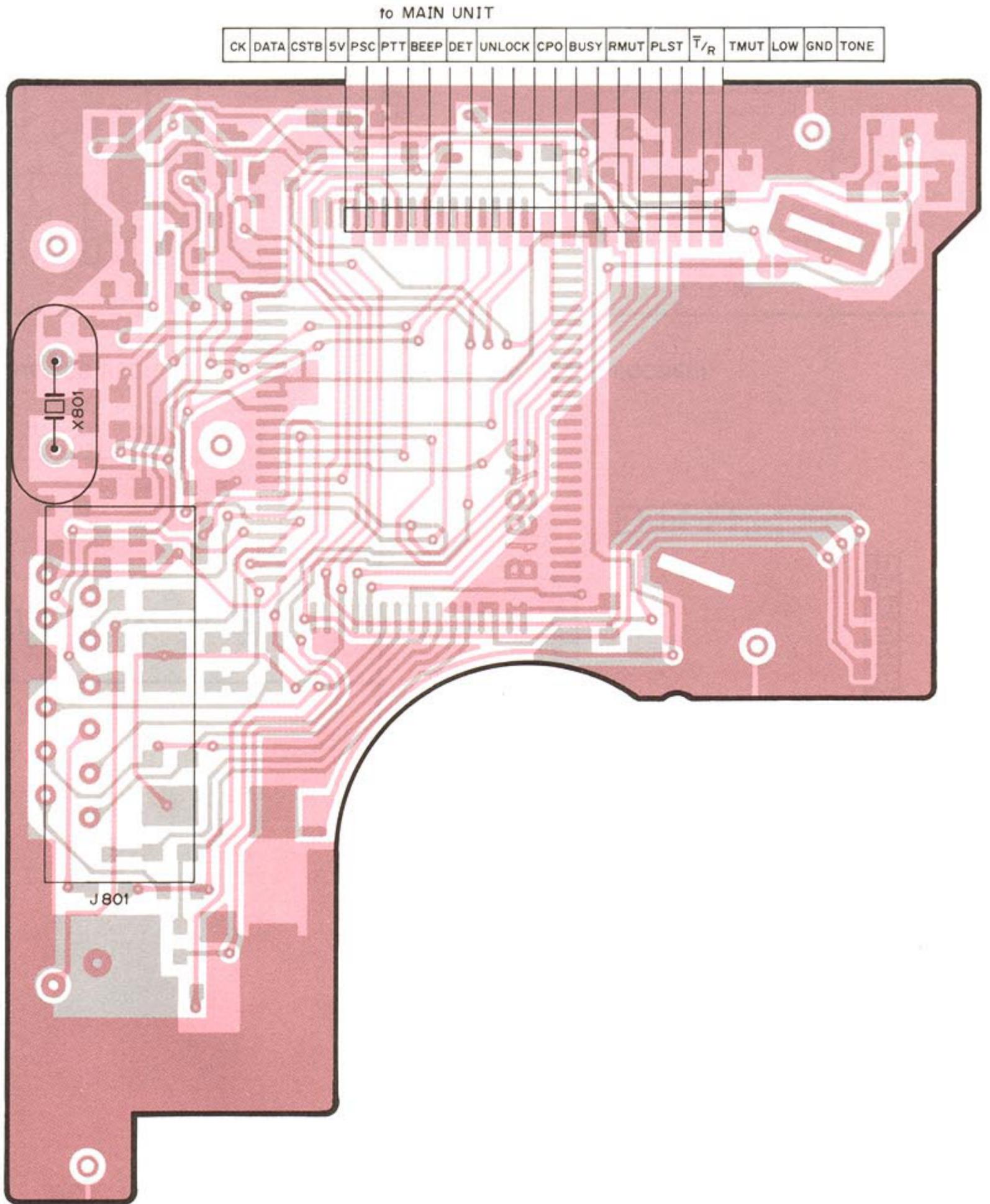


Symbol: G3

**1SS184**  
D805



Symbol: B3



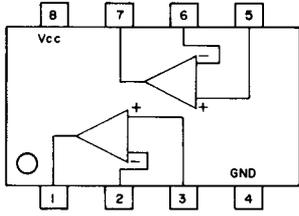
- to TRANSMIT / BUSY, CALL INDICATOR
- to MONITOR SWITCH(S2)
- to SCAN SWITCH(S3)
- to CHANNEL SELECTOR (S1)

CK	DATA	CSTB	5V	PSC	PTT	BEEP	DET	UNLOCK	CPO	BUSY	RMUT	PLST	T/R	TMUT	LOW	GND	TONE
----	------	------	----	-----	-----	------	-----	--------	-----	------	------	------	-----	------	-----	-----	------

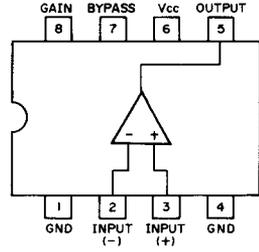
J801	5V
	T/R
	CALLO
	CALL
	GND
	MONI
	SCAN
	KR 1
	KR 2
	KS 4
	KR 0
	KR 3

# 7-3 MAIN UNIT

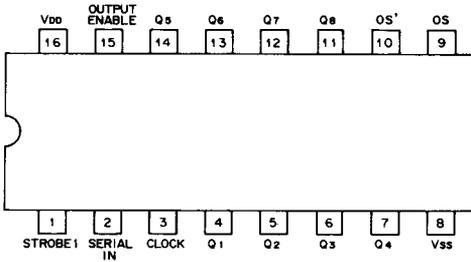
**BA4558F IC101**  
(LOW NOISE DUAL AMPLIFIER)



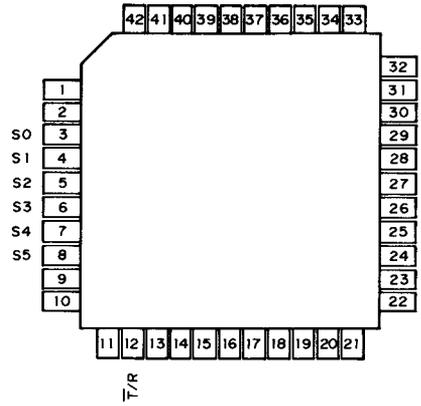
**LM386N-3 IC102**  
(AUDIO POWER AMPLIFIER)

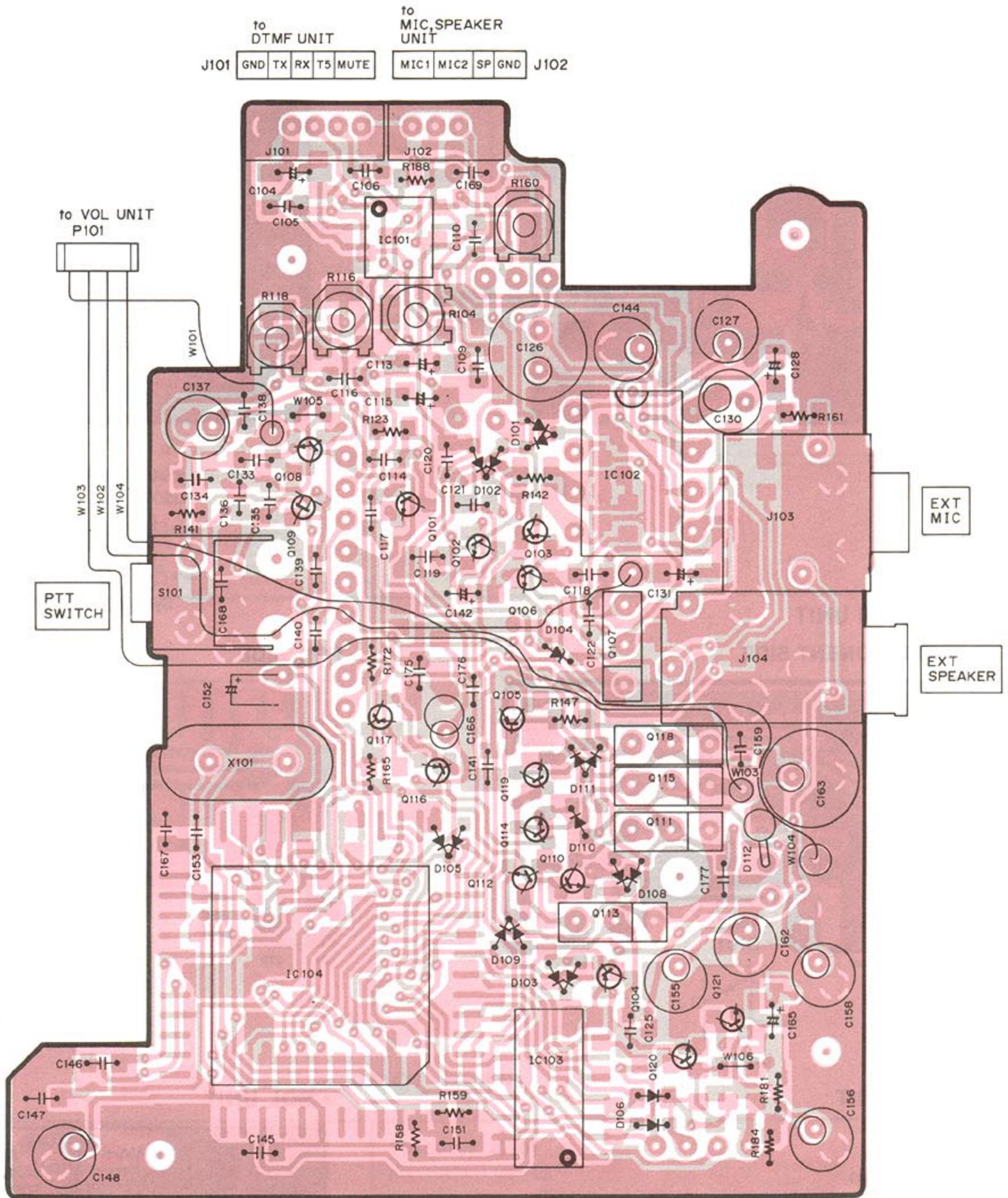


**μPD4094BG IC103**  
(8-STAGE SHIFT AND STORE BUS REGISTER)

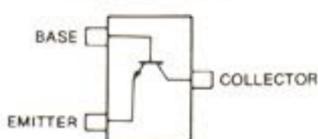


**MN6520 IC104**  
(CTCSS ENCODER/DECODER)



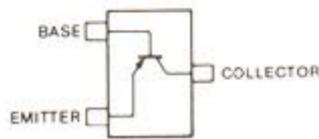


**2SC2712 BL**  
 Q101, Q102  
 Q106, Q108  
 Q110, Q112  
 Q114, Q119  
 Q120, Q121



Symbol: LL

**2SA1162 GR**  
 Q103, Q104  
 Q105, Q116  
 Q117

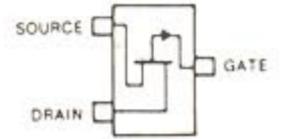


Symbol: SG

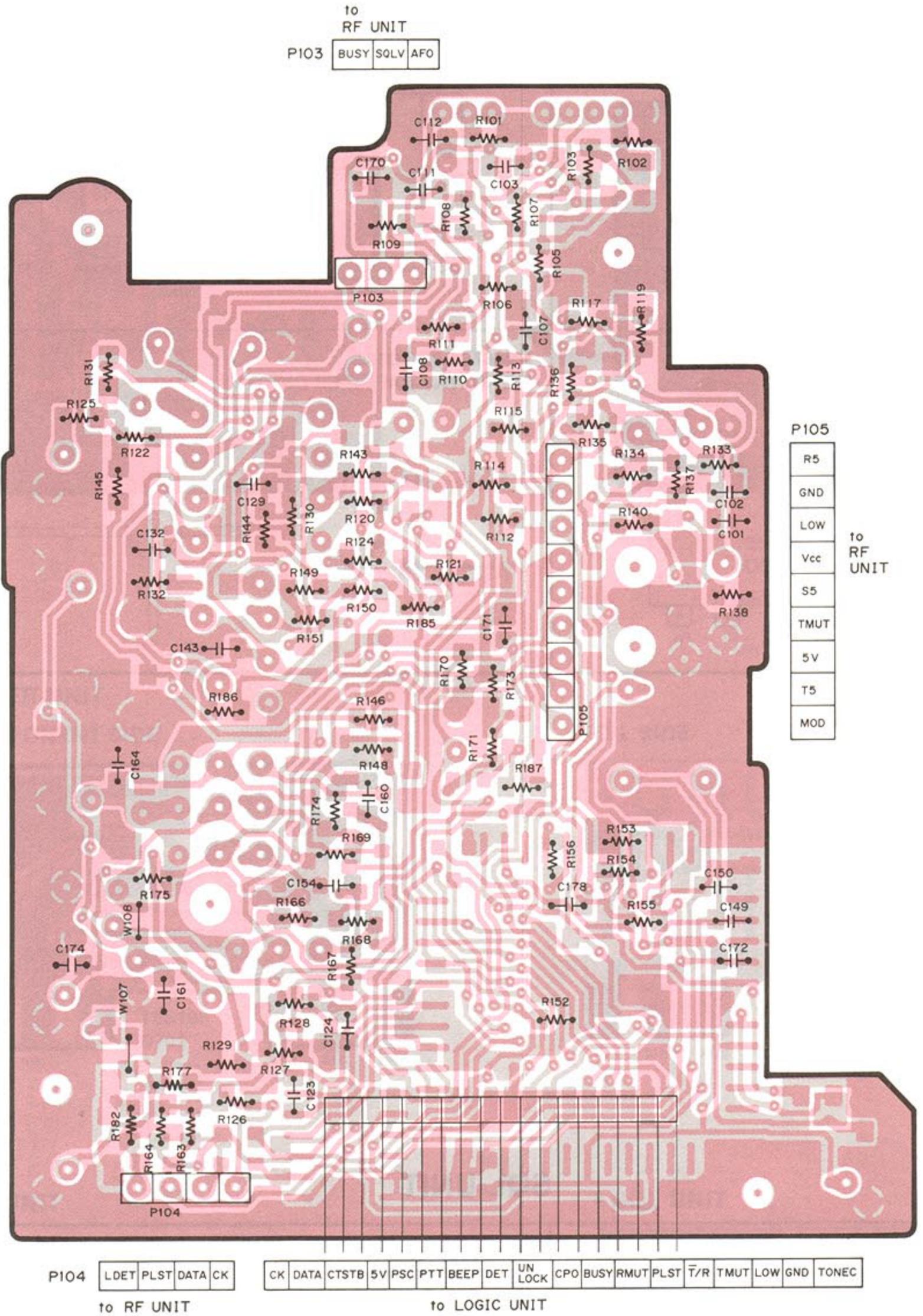
**2SB909M R**  
 Q107, Q111  
 Q113, Q115  
 Q118



**2SJ106 Y**  
 Q109



Symbol: VY



1SS226  
D101

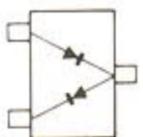
1SS184  
D102, D103  
D105, D108  
D109

RD4.7M B3  
D104

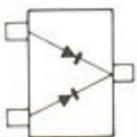
DWA010  
D106

1SS190  
D110

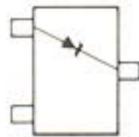
1SS181  
D111



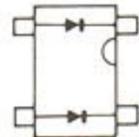
Symbol: C3



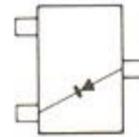
Symbol: B3



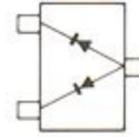
Symbol: 473



Symbol: W8



Symbol: E3

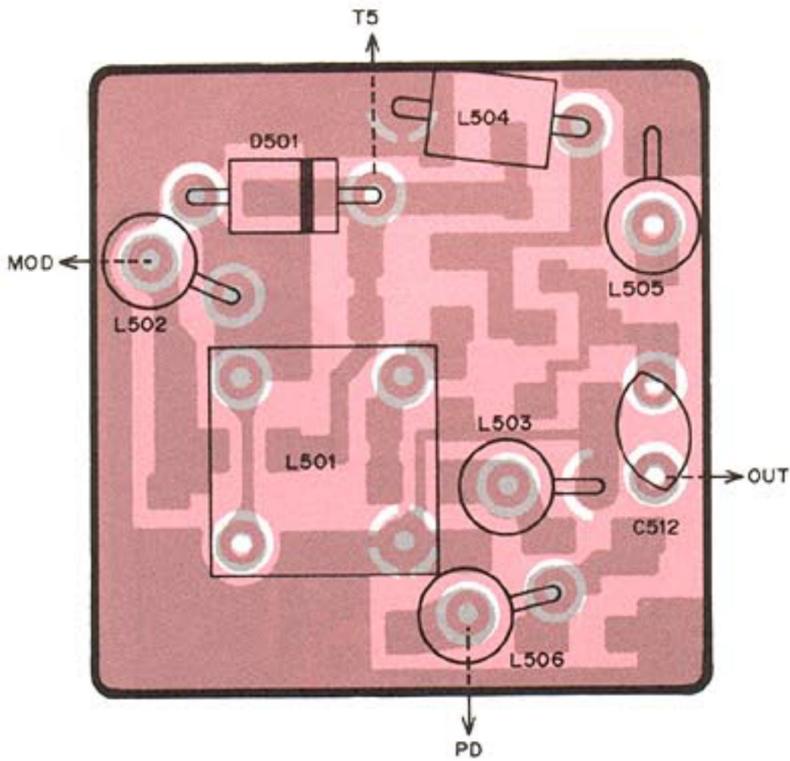


Symbol: A3

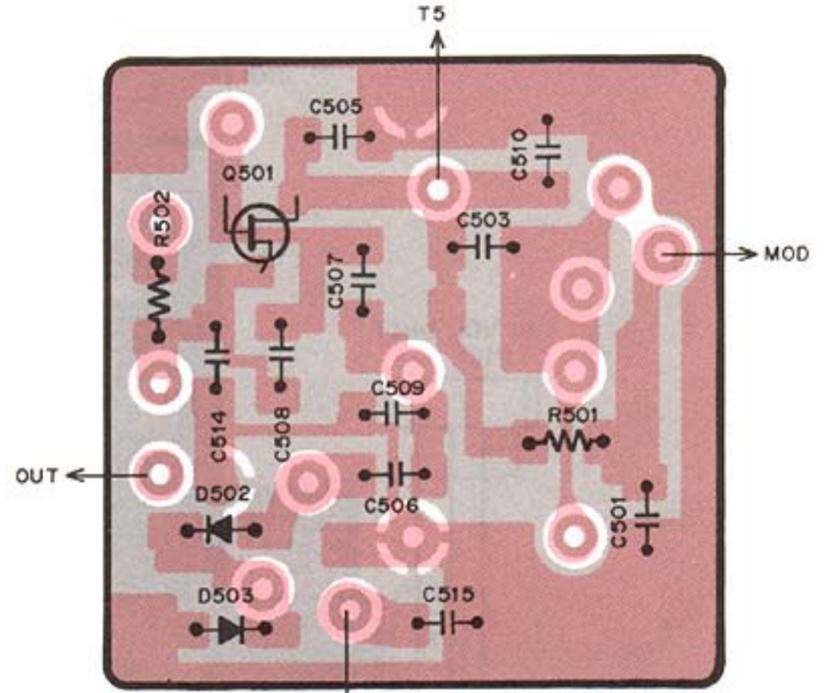
# 7-4 RF UNIT

## • VCO UNIT

COMPONENT SIDE

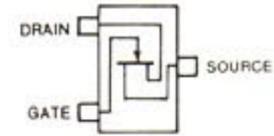


FOIL SIDE



**2SK302 GR**

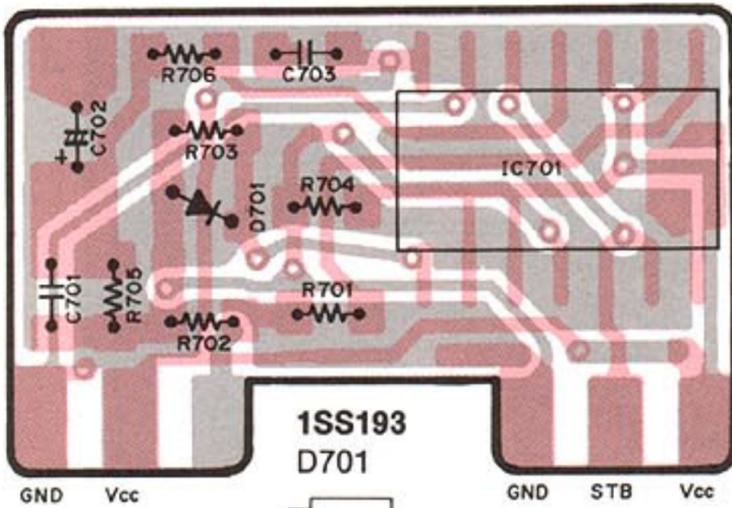
**Q501**



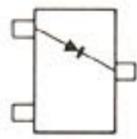
Symbol: TG

## • FILTER UNIT

COMPONENT SIDE

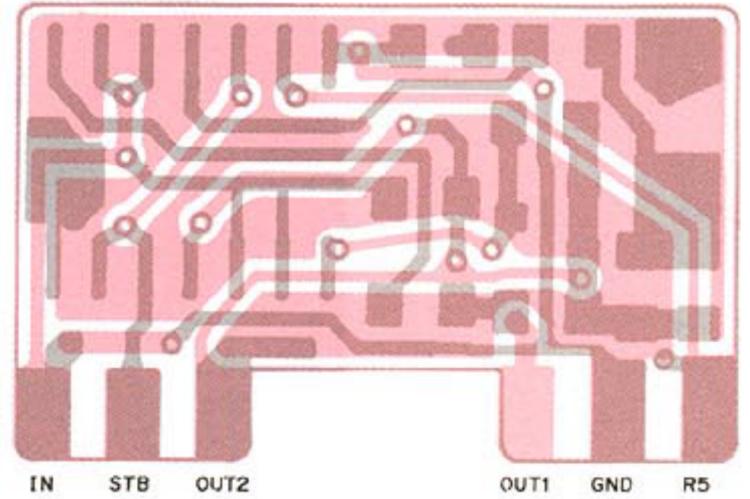


**1SS193**  
**D701**

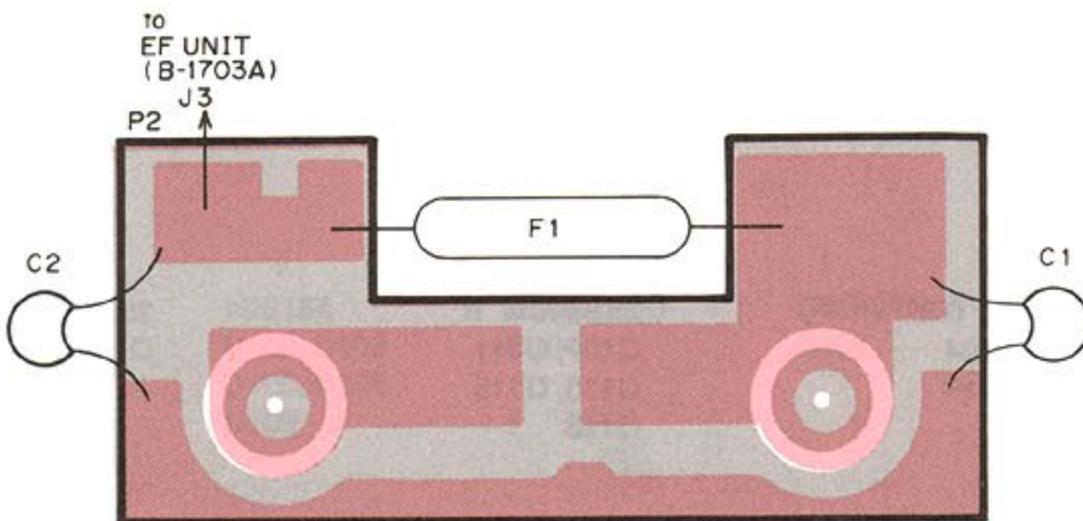


Symbol: F3

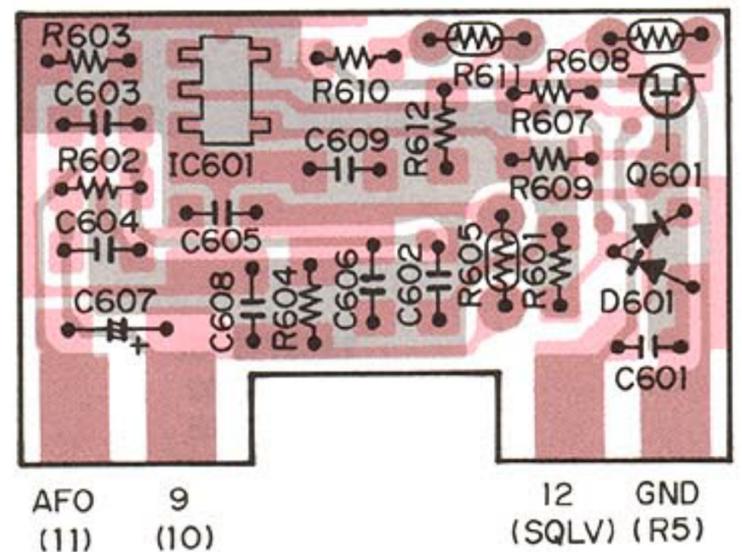
FOIL SIDE



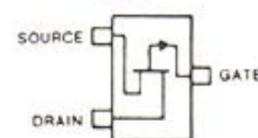
## • POWER UNIT



## • SQL UNIT

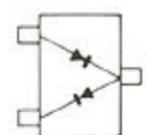


**2SJ106Y**  
**Q601**



Symbol: VY

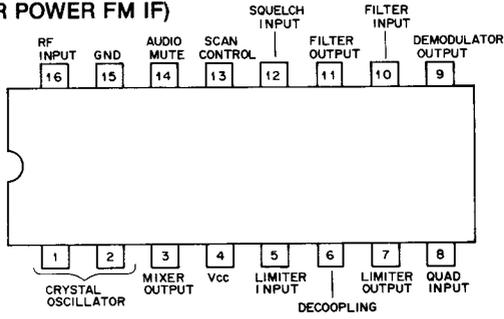
**HSM88AS**  
**D601**



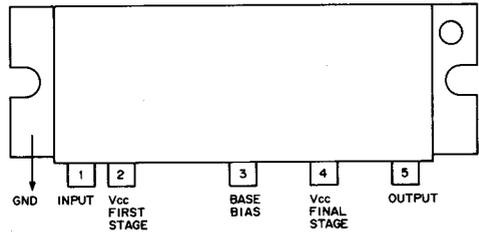
Symbol: C1

# 7-4 RF UNIT

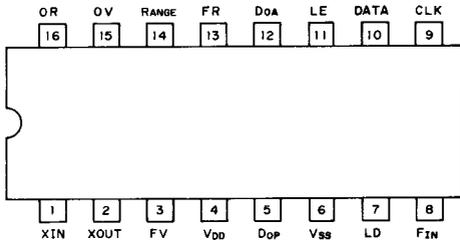
## MC3357DR IC301 (LOWER POWER FM IF)



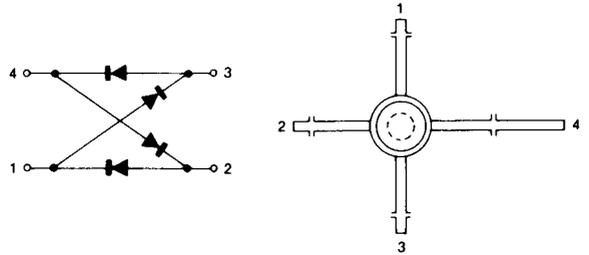
## SC-1046 IC302 (POWER MODULE)



## PLL2001 IC303 (PLL SYNTHESIZER IC)

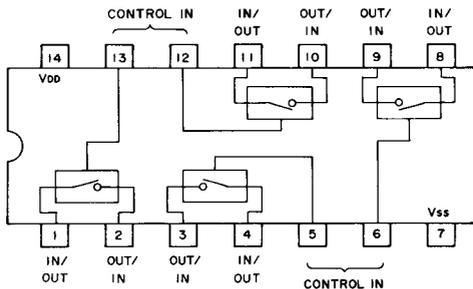


## ND487C1-3R IC304 (SCHOTTKY BARRIDER DIODE QUAD)



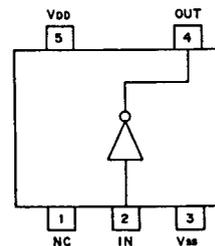
# FILTER UNIT

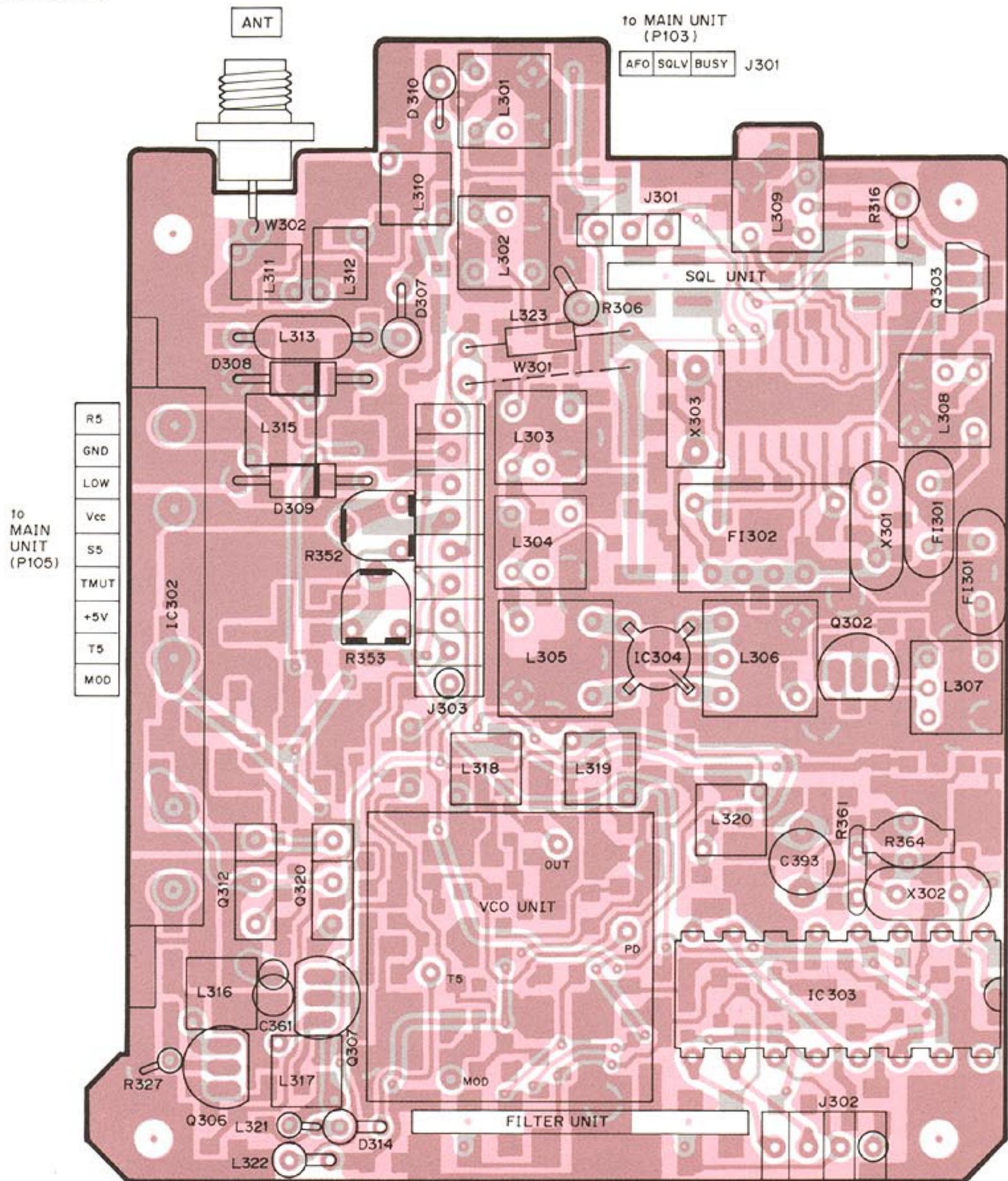
## μPD4066BG IC701 (QUAD BILATERAL SWITCHING)



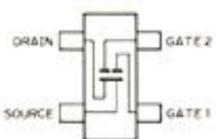
# SQL UNIT

## TC4SU69F IC601 (INVERTER GATE)



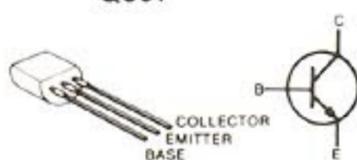


**3SK131 K**  
Q301



Symbol: V13

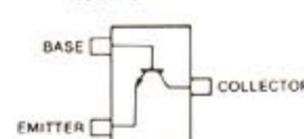
**2SC2026**  
Q302, Q306  
Q307



**2SK241 K**  
Q303

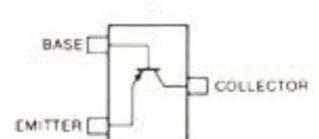


**2SC3356**  
Q304, Q305  
Q319



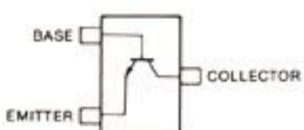
Symbol: R22

**2SA1162 GR**  
Q308, Q309  
Q313, Q316



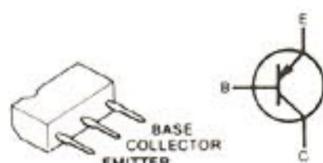
Symbol: SG

**2SC2712 BL**  
Q310, Q311  
Q315, Q317  
Q318



Symbol: LL

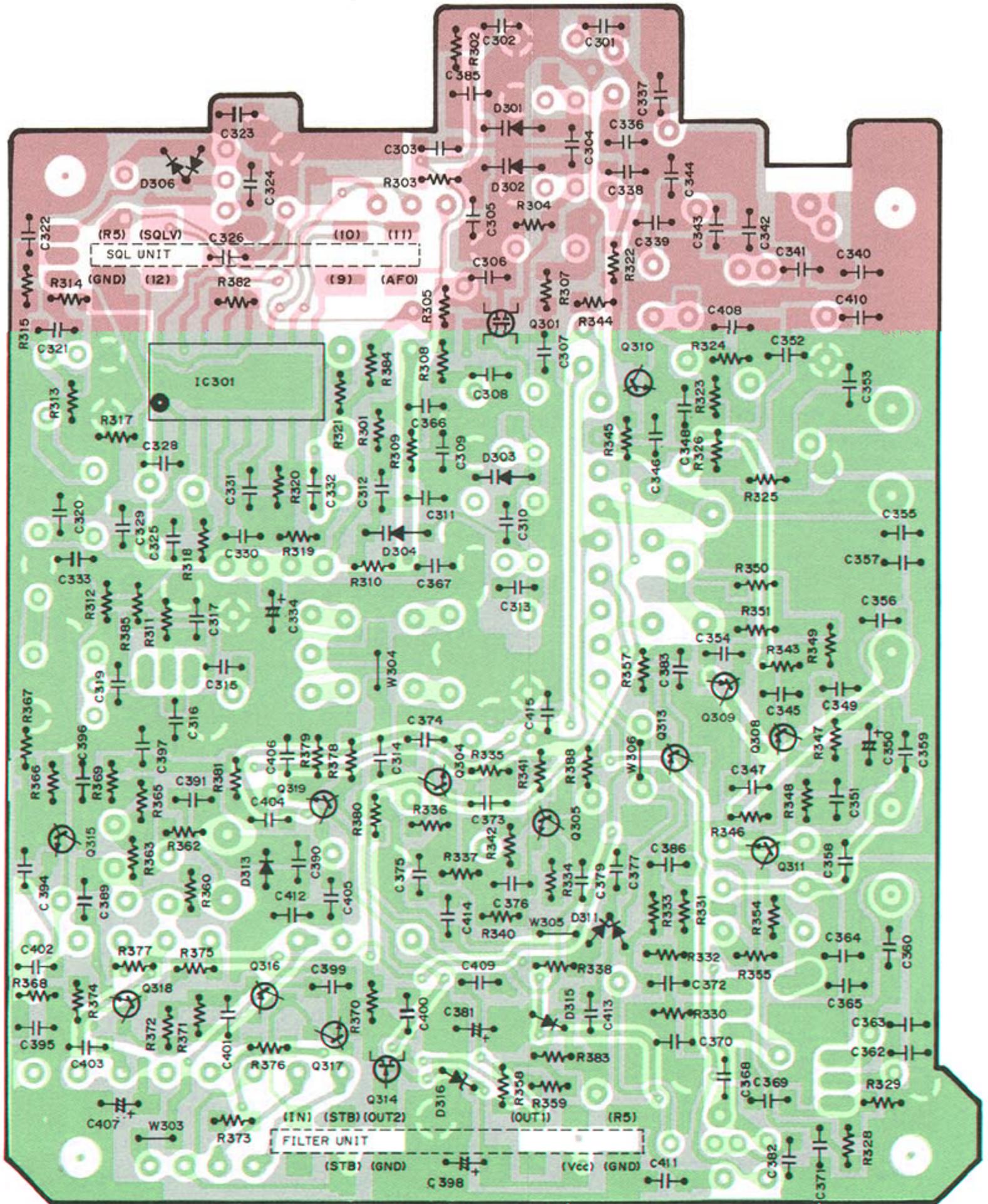
**2SB1237 TV2R**  
Q312, Q320



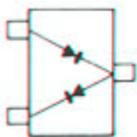
**2SK209 O**  
Q314



Symbol: XO

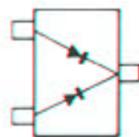


1SS226  
D306



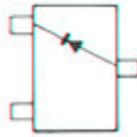
Symbol: C3

1SS268  
D311



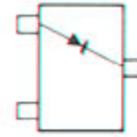
Symbol: BF

1SS187  
D315



Symbol: D3

RD6.8M B2  
D316



Symbol: 682

## [EF PARTS]

REF. NO.	DESCRIPTION	PART NO.
R1	Variable Resistor	RK0971111
C1	Ceramic	0.001 $\mu$ F 50V
C2	Ceramic	0.001 $\mu$ F 50V
C4	Ceramic	470pF 50V
J1	Connector	TNC-R107
J2	Connector	PI28A04M
J3	Connector	RT-01T-1.0B
P1	Connector	PI28A04F
P2	Connector	SMF-01T-1.0
F1	Fuse	MC2 1/2
DS1	LED	TLSG222
DS2	LED	TLSG222
MC1	Microphone	KUC-2023-01-006
S1	Switch	KSR16-0-18
S2	Switch	MS-243 2P
S3	Switch	MS-243 2P
SP1	Speaker	40P-177B
EP1	P.C. Board	B-1702B (POWER UNIT)
EP2	P.C. Board	B-1703A (VOL UNIT)
EP3	P.C. Board	B-1704B (LED UNIT)
EP4	P.C. Board	B-1705B (LOGIC-EF)
W1	Wire	13/02/140/W01/B30
W2	Wire	24/04/050/D02/W01
W3	Wire	24/01/050/D02/W01
W4	Wire	24/03/100/D02/W01
W5	Wire	24/00/080/D02/W01

## [LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC801	IC	$\mu$ PD75306GF-015-3B9
IC802	IC	S-8054ALB-LM-T
Q801	Transistor	2SC3395
Q802	Transistor	2SA1362 GR
Q803	Transistor	2SC2712 BL
Q804	Transistor	2SC3395
Q805	Transistor	2SA1162 GR
Q806	Transistor	2SC3395
Q807	Transistor	2SC3395
Q808	Transistor	2SC3395
Q809	Transistor	2SC3395

## [LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.
Q810	Transistor	2SA1341
D801	Diode	1SS181
D802	Diode	1SS190
D803	Diode	1SS196
D804	Diode	1SS196
D805	Diode	1SS184
X801	Crystal	RF4A3 FAC (4.19MHz)
R801	Resistor	47k $\Omega$ MCR10
R802	Resistor	47k $\Omega$ MCR10
R803	Resistor	47k $\Omega$ MCR10
R804	Resistor	47k $\Omega$ MCR10
R805	Resistor	47k $\Omega$ MCR10
R806	Resistor	47k $\Omega$ MCR10
R807	Resistor	1M $\Omega$ MCR10
R808	Resistor	1M $\Omega$ MCR10
R809	Resistor	47k $\Omega$ MCR10
R810	Resistor	47k $\Omega$ MCR10
R811	Resistor	47k $\Omega$ MCR10
R812	Resistor	47k $\Omega$ MCR10
R813	Resistor	470 $\Omega$ MCR10
R814	Resistor	470 $\Omega$ MCR10
R815	Resistor	470 $\Omega$ MCR10
R816	Resistor	22k $\Omega$ MCR10
R817	Resistor	100k $\Omega$ MCR10
R818	Resistor	47k $\Omega$ MCR10
R819	Resistor	1M $\Omega$ MCR10
R820	Resistor	1k $\Omega$ MCR10
R821	Resistor	100k $\Omega$ MCR10
R822	Resistor	1M $\Omega$ MCR10
R823	Resistor	100k $\Omega$ MCR10
R827	Resistor	47k $\Omega$ MCR10
R828	Resistor	1M $\Omega$ MCR10
R829	Resistor	220k $\Omega$ MCR10
C801	Ceramic	0.01 $\mu$ F GRM40 B
C802	Tantalum	TESVD0J476M-12L
C803	Ceramic	0.01 $\mu$ F GRM40 B
C804	Ceramic	15pF GRM40 CH
C805	Ceramic	15pF GRM40 CH
C806	Ceramic	0.001 $\mu$ F GRM40
C807	Ceramic	0.001 $\mu$ F GRM40
C808	Ceramic	0.001 $\mu$ F GRM40 B
C809	Ceramic	0.001 $\mu$ F GRM40 B
C810	Ceramic	0.001 $\mu$ F GRM40 B
J801	Connector	SLEM12R-2
S801	Switch	SKH HLB0001 (CLONE)
BT801	Lithium Battery	BR2032-IHF
EP801	P.C. Board	B-1664C (LOGIC UNIT)
W801	Jumper	MCR10-JPW
W802	Jumper	MCR10-JPW

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC101	IC	BA4558F
IC102	IC	LM386N-3
IC103	IC	μPD4094BG
IC104	IC	MN6520
Q101	Transistor	2SC2712 BL
Q102	Transistor	2SC2712 BL
Q103	Transistor	2SA1162 GR
Q104	Transistor	2SA1162 GR
Q105	Transistor	2SA1162 GR
Q106	Transistor	2SC2712 BL
Q107	Transistor	2SB909M R
Q108	Transistor	2SC2712 BL
Q109	FET	2SJ106 Y
Q110	Transistor	2SC2712 BL
Q111	Transistor	2SB909M R
Q112	Transistor	2SC2712 BL
Q113	Transistor	2SB909M R
Q114	Transistor	2SC2712 BL
Q115	Transistor	2SB909M R
Q116	Transistor	2SA1162 GR
Q117	Transistor	2SA1162 GR
Q118	Transistor	2SB909M R
Q119	Transistor	2SC2712 BL
Q120	Transistor	2SC2712 BL
Q121	Transistor	2SC2712 BL
D101	Diode	1SS226
D102	Diode	1SS184
D103	Diode	1SS184
D104	Zener	RD4.7MB3
D105	Diode	1SS184
D106	Diode	DWA010
D108	Diode	1SS184
D109	Diode	1SS184
D110	Diode	1SS190
D111	Diode	1SS181
D112	Zener	RD5.1JS B2
X101	Crystal	RF4A3 FAC (4.194MHz)
R101	Resistor	33kΩ MCR10
R102	Resistor	560Ω MCR10
R103	Resistor	180kΩ MCR10
R104	Trimmer	330kΩ RH04A3AN5J
R105	Resistor	180kΩ MCR10
R106	Resistor	1kΩ MCR10
R107	Resistor	180kΩ MCR10
R108	Resistor	120kΩ MCR10
R109	Resistor	220kΩ MCR10
R110	Resistor	82kΩ MCR10
R111	Resistor	82kΩ MCR10
R112	Resistor	1.2kΩ MCR10
R113	Resistor	3.9kΩ MCR10
R114	Resistor	390kΩ MCR10
R115	Resistor	1MΩ MCR10
R116	Trimmer	47kΩ RH04A3AS4J
R117	Resistor	15kΩ MCR10
R118	Trimmer	330kΩ RH04A3AN5J
R119	Resistor	100kΩ MCR10
R120	Resistor	27kΩ MCR10
R121	Resistor	47kΩ MCR10
R122	Resistor	1kΩ MCR10
R123	Resistor	47kΩ MCR10
R124	Resistor	56kΩ MCR10
R125	Resistor	1kΩ MCR10
R126	Resistor	27Ω MCR10
R127	Resistor	5.6kΩ MCR10
R128	Resistor	47kΩ MCR10
R129	Resistor	47kΩ MCR10
R130	Resistor	1kΩ MCR10

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
R131	Resistor	1.8kΩ MCR10
R132	Resistor	150kΩ MCR10
R133	Resistor	820Ω MCR10
R134	Resistor	6.8kΩ MCR10
R135	Resistor	1.5MΩ MCR10
R136	Resistor	470kΩ MCR10
R137	Resistor	33kΩ MCR10
R138	Resistor	1MΩ MCR10
R140	Resistor	1MΩ MCR10
R141	Resistor	1MΩ MCR10
R142	Resistor	12kΩ MCR10
R143	Resistor	330Ω MCR10
R144	Resistor	12kΩ MCR10
R145	Resistor	1.2kΩ MCR10
R146	Resistor	10kΩ MCR10
R147	Resistor	470Ω MCR10
R148	Resistor	47kΩ MCR10
R149	Resistor	56kΩ MCR10
R150	Resistor	47kΩ MCR10
R151	Resistor	1.2kΩ MCR10
R152	Resistor	47kΩ MCR10
R153	Resistor	10kΩ MCR10
R154	Resistor	12kΩ MCR10
R155	Resistor	10kΩ MCR10
R156	Resistor	820kΩ MCR10
R158	Resistor	10kΩ MCR10
R159	Resistor	10kΩ MCR10
R160	Trimmer	47kΩ RH04A3AS4J
R161	Resistor	1kΩ MCR10
R163	Resistor	47kΩ MCR10
R164	Resistor	47kΩ MCR10
R165	Resistor	15kΩ MCR10
R166	Resistor	10kΩ MCR10
R167	Resistor	1kΩ MCR10
R168	Resistor	10kΩ MCR10
R169	Resistor	6.8kΩ MCR10
R170	Resistor	10kΩ MCR10
R171	Resistor	180kΩ MCR10
R172	Resistor	33kΩ MCR10
R173	Resistor	10kΩ MCR10
R174	Resistor	10kΩ MCR10
R175	Resistor	6.8kΩ MCR10
R177	Resistor	470kΩ MCR10
R181	Resistor	33kΩ MCR10
R182	Resistor	120kΩ MCR10
R184	Resistor	560kΩ MCR10
R185	Resistor	56kΩ MCR10
R186	Resistor	4.7kΩ MCR10
R187	Resistor	100kΩ MCR10
R188	Resistor	10Ω MCR10
C101	Ceramic	470pF GRM40
C102	Ceramic	0.001μF GRM40
C103	Ceramic	0.01μF GRM40 F
C104	Tantalum	0.1μF 35V SV
C105	Ceramic	0.001μF GRM40
C106	Ceramic	0.001μF GRM40
C107	Ceramic	0.001μF GRM40
C108	Ceramic	0.001μF GRM40
C109	Ceramic	0.0022μF GRM40
C110	Ceramic	470pF GRM40
C111	Ceramic	100pF GRM40 CH
C112	Ceramic	0.001μF GRM40
C113	Tantalum	2.2μF TEMSVA1C225M-8L
C114	Ceramic	0.1μF GRM40 F
C115	Tantalum	2.2μF TEMSVA1C225M-8L
C116	Ceramic	0.1μF GRM40 F
C117	Ceramic	0.1μF GRM40 F
C118	Ceramic	0.1μF GRM40 F
C119	Ceramic	0.001μF GRM40
C120	Ceramic	0.1μF GRM40 F
C121	Ceramic	0.0068μF GRM40
C122	Ceramic	0.0068μF GRM40
C123	Ceramic	47pF GRM40

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
C124	Ceramic	47pF GRM40
C125	Ceramic	47pF GRM40
C126	Electrolytic	100μF 6.3V RC3
C127	Electrolytic	10μF 16V RC3
C128	Tantalum	2.2μF TEMSVA1C225M-8L
C129	Ceramic	0.001μF GRM40
C130	Electrolytic	1μF 50V RC3
C131	Tantalum	1μF 16V SV
C132	Ceramic	0.001μF GRM40
C133	Ceramic	0.1μF GRM40 F
C134	Ceramic	0.0068μF GRM40
C135	Ceramic	0.0047μF GRM40
C136	Ceramic	0.01μF GRM40 F
C137	Electrolytic	47μF 6.3V RC3
C138	Ceramic	0.1μF GRM40 F
C139	Ceramic	0.001μF GRM40
C140	Ceramic	0.1μF GRM40 F
C141	Ceramic	0.001μF GRM40
C142	Tantalum	0.47μF TEMSVA1V474M-8L
C143	Ceramic	0.001μF GRM40
C144	Electrolytic	10μF 16V RC3
C145	Ceramic	0.001μF GRM40
C146	Ceramic	0.1μF GRM40 F
C147	Ceramic	0.01μF GRM40 F
C148	Electrolytic	22μF 16V RC3
C149	Ceramic	18pF GRM40 CH
C150	Ceramic	18pF GRM40 CH
C151	Ceramic	0.001μF GRM40
C152	Electrolytic	47μF 6.3V RC3
C153	Ceramic	0.1μF GRM40 F
C154	Ceramic	0.001μF GRM40
C155	Electrolytic	22μF 16V RC3
C156	Electrolytic	47μF 6.3V RC3
C158	Electrolytic	47μF 6.3V RC3
C159	Ceramic	0.001μF GRM40
C160	Ceramic	470pF GRM40
C161	Ceramic	0.001μF GRM40
C162	Electrolytic	22μF 16V RC3
C163	Electrolytic	47μF 16V MS5
C164	Ceramic	0.001μF GRM40
C165	Tantalum	3.3μF 6.3V SV
C166	Tantalum	0.47μF 35V DN
C167	Ceramic	0.1μF GRM40 F
C168	Ceramic	0.0047μF GRM40
C169	Tantalum	4.7μF 16V DN
C170	Ceramic	470pF GRM40
C171	Ceramic	0.001μF GRM40
C172	Ceramic	0.01μF GRM40 F
C174	Ceramic	0.01μF GRM40 F
C175	Ceramic	0.001μF GRM40
C176	Ceramic	0.001μF GRM40
C177	Ceramic	0.001μF GRM40
C178	Ceramic	0.1μF GRM40 F
J101	Connector	PI28A05M
J102	Connector	PI28A04M
J103	Connector	HSJ-1102-01-540
J104	Connector	HSJ-0836-01-010
P101	Connector	PI28A04F
P103	Connector	BB04A03F
P104	Connector	BB04A04F
P105	Connector	BB04A09F
S101	Switch	SKHHL P000 (PTT)
EP101	P.C. Board	B-1665C (MAIN UNIT)
EP104	F.P.C.	B-1710 (LOGIC-MAIN)

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
W101	Wire	24/03/040/D02/C21
W102	Wire	24/01/055/D02/C21
W103	Wire	23/02/065/D02/C21
W104	Wire	24/00/080/D02/C21
W105	Jumper	MCR10-JPW
W106	Jumper	MCR10-JPW
W107	Jumper	MCR10-JPW
W108	Jumper	MCR10-JPW

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC301	IC	MC3357 DR
IC302	IC	SC-1046
IC303	IC	PLL2001
IC304	IC	ND487C1-3R
Q301	FET	3SK131 K
Q302	Transistor	2SC2026
Q303	FET	2SK241 GR
Q304	Transistor	2SC3356
Q305	Transistor	2SC3356
Q306	Transistor	2SC2026
Q307	Transistor	2SC2026
Q308	Transistor	2SA1162 GR
Q309	Transistor	2SA1162 GR
Q310	Transistor	2SC2712 BL
Q311	Transistor	2SC2712 BL
Q312	Transistor	2SB1237 TV2 R
Q313	Transistor	2SA1162 GR
Q314	FET	2SK209 O
Q315	Transistor	2SC2712 BL
Q316	Transistor	2SA1162 GR
Q317	Transistor	2SC2712 BL
Q318	Transistor	2SC2712 BL
Q319	Transistor	2SC3356
Q320	Transistor	2SB1237 TV2 R
D301	Varicap	MA334 B
D302	Varicap	MA334 B
D303	Varicap	MA334 B
D304	Varicap	MA334 B
D306	Diode	1SS226
D307	Diode	1SS265
D308	Diode	1SS97
D309	Diode	1SS97
D310	Diode	1SS265
D311	Diode	1SS268
D313	Varicap	1SV166
D314	Diode	1SS99
D315	Diode	1SS187
D316	Zener	RD6.8M B2
FI301	Crystal	FL-42
FI302	Ceramic	CFZM455E10
X301	Crystal	CR-70
X302	Crystal	CR-212 (10MHz)
X303	Discriminator	CDB455C7A
L301	Coil	LS-334
L302	Coil	LS-335
L303	Coil	LS-336

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
L304	Coil	LS-335
L305	Coil	LR-145
L306	Coil	LR-116
L307	Coil	LS-330
L308	Coil	LS-332
L309	Coil	LS-331
L310	Coil	LA-237
L311	Coil	LA-234
L312	Coil	LA-227
L313	Coil	LAL03NA 4R7K 4.7 $\mu$
L315	Coil	LA-235
L316	Coil	LA-237
L317	Coil	LA-237
L318	Coil	LA-237
L319	Coil	LA-237
L320	Coil	LA-237
L321	Coil	LAL02NA 4R7K 4.7 $\mu$
L322	Coil	LAL02NA 4R7K 4.7 $\mu$
L323	Coil	LAL02NA 101K 100 $\mu$
R301	Resistor	47k $\Omega$ MCR10
R302	Resistor	220k $\Omega$ MCR10
R303	Resistor	220k $\Omega$ MCR10
R304	Resistor	47k $\Omega$ MCR10
R305	Resistor	82k $\Omega$ MCR10
R306	Resistor	150k $\Omega$ ELR20
R307	Resistor	56 $\Omega$ MCR10
R308	Resistor	10 $\Omega$ MCR10
R309	Resistor	220k $\Omega$ MCR10
R310	Resistor	220k $\Omega$ MCR10
R311	Resistor	33 $\Omega$ MCR10
R312	Resistor	22 $\Omega$ MCR10
R313	Resistor	4.7k $\Omega$ MCR10
R314	Resistor	100k $\Omega$ MCR10
R315	Resistor	100 $\Omega$ MCR10
R316	Resistor	22 $\Omega$ ELR20
R317	Resistor	22k $\Omega$ MCR10
R318	Resistor	1.5k $\Omega$ MCR10
R319	Resistor	1.5k $\Omega$ MCR10
R320	Resistor	47k $\Omega$ MCR10
R321	Resistor	1.5k $\Omega$ MCR10
R322	Resistor	180 $\Omega$ MCR10
R323	Resistor	4.7k $\Omega$ MCR10
R324	Resistor	100k $\Omega$ MCR10
R325	Resistor	100k $\Omega$ MCR10
R326	Resistor	4.7k $\Omega$ MCR10
R327	Resistor	47 $\Omega$ ELR20
R328	Resistor	1.2k $\Omega$ MCR10
R329	Resistor	1k $\Omega$ MCR10
R330	Resistor	470 $\Omega$ MCR10
R331	Resistor	5.6k $\Omega$ MCR10
R332	Resistor	4.7k $\Omega$ MCR10
R333	Resistor	10k $\Omega$ MCR10
R334	Resistor	22k $\Omega$ MCR10
R335	Resistor	150 $\Omega$ MCR10
R336	Resistor	22k $\Omega$ MCR10
R337	Resistor	5.6k $\Omega$ MCR10
R338	Resistor	10k $\Omega$ MCR10
R340	Resistor	150 $\Omega$ MCR10
R341	Resistor	5.6k $\Omega$ MCR10
R342	Resistor	4.7k $\Omega$ MCR10
R343	Resistor	22k $\Omega$ MCR10
R344	Resistor	1M $\Omega$ MCR10
R345	Resistor	47k $\Omega$ MCR10
R346	Resistor	82k $\Omega$ MCR10
R347	Resistor	100k $\Omega$ MCR10
R348	Resistor	270k $\Omega$ MCR10
R349	Resistor	22k $\Omega$ MCR10
R350	Resistor	3.9k $\Omega$ MCR10
R351	Resistor	8.2k $\Omega$ MCR10
R352	Trimmer	22k $\Omega$ RH0421CJ4J09A
R353	Trimmer	22k $\Omega$ RH0421CJ4J09A
R354	Resistor	1.5k $\Omega$ MCR10
R355	Resistor	1.5k $\Omega$ MCR10

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
R357	Resistor	6.8k $\Omega$ MCR10
R358	Resistor	820k $\Omega$ MCR10
R359	Resistor	120k $\Omega$ MCR10
R360	Resistor	15k $\Omega$ MCR10
R361	Thermistor	33D28
R362	Resistor	10k $\Omega$ MCR10
R363	Resistor	10k $\Omega$ MCR10
R364	Thermistor	33D28
R365	Resistor	6.8k $\Omega$ MCR10
R366	Resistor	120k $\Omega$ MCR10
R367	Resistor	68k $\Omega$ MCR10
R368	Resistor	2.2k $\Omega$ MCR10
R369	Resistor	100 $\Omega$ MCR10
R370	Resistor	1.5k $\Omega$ MCR10
R371	Resistor	4.7k $\Omega$ MCR10
R372	Resistor	10k $\Omega$ MCR10
R373	Resistor	3.3k $\Omega$ MCR10
R374	Resistor	47k $\Omega$ MCR10
R375	Resistor	100k $\Omega$ MCR10
R376	Resistor	10k $\Omega$ MCR10
R377	Resistor	10 $\Omega$ MCR10
R378	Resistor	3.3k $\Omega$ MCR10
R379	Resistor	120 $\Omega$ MCR10
R380	Resistor	1.8k $\Omega$ MCR10
R381	Resistor	220 $\Omega$ MCR10
R382	Resistor	27k $\Omega$ MCR10
R383	Resistor	47k $\Omega$ MCR10
R384	Resistor	100 $\Omega$ MCR10
R385	Resistor	100k $\Omega$ MCR10
R388	Resistor	2.2k $\Omega$ MCR10
C301	Ceramic	100pF GRM40
C302	Ceramic	0.001 $\mu$ F GRM40
C303	Ceramic	0.001 $\mu$ F GRM40
C304	Ceramic	1pF GRM40
C305	Ceramic	27pF GRM40
C306	Ceramic	0.001 $\mu$ F GRM40
C307	Ceramic	0.001 $\mu$ F GRM40
C308	Ceramic	0.001 $\mu$ F GRM40
C309	Ceramic	27pF GRM40
C310	Ceramic	0.5pF GRM40
C311	Ceramic	1pF GRM40
C312	Ceramic	22pF GRM40
C313	Ceramic	3pF GRM40
C314	Ceramic	22pF GRM40
C315	Ceramic	0.01 $\mu$ F GRM40 B
C316	Ceramic	220pF GRM40
C317	Ceramic	0.01 $\mu$ F GRM40 B
C319	Ceramic	0.001 $\mu$ F GRM40
C320	Ceramic	5pF GRM40
C321	Ceramic	180pF GRM40
C322	Ceramic	0.001 $\mu$ F GRM40
C323	Ceramic	0.001 $\mu$ F GRM40
C324	Ceramic	47pF GRM40
C325	Ceramic	0.1 $\mu$ F GRM40 F
C326	Ceramic	220pF GRM40
C328	Ceramic	120pF GRM40
C329	Ceramic	68pF GRM40
C330	Ceramic	0.022 $\mu$ F GRM40
C331	Ceramic	0.1 $\mu$ F GRM40 F
C332	Ceramic	82pF GRM40
C333	Ceramic	0.01 $\mu$ F GRM40 B
C334	Tantalum	4.7 $\mu$ F TEMSVA0J475M-8L
C336	Ceramic	180pF GRM40
C337	Ceramic	15pF GRM40
C338	Ceramic	15pF GRM40
C339	Ceramic	0.001 $\mu$ F GRM40
C340	Ceramic	12pF GRM40
C341	Ceramic	8pF GRM40
C342	Ceramic	27pF GRM40
C343	Ceramic	2pF GRM40
C344	Ceramic	15pF GRM40
C345	Ceramic	0.001 $\mu$ F GRM40
C346	Ceramic	0.001 $\mu$ F GRM40

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
C347	Ceramic	0.001 $\mu$ F GRM40
C348	Ceramic	0.001 $\mu$ F GRM40
C349	Ceramic	0.001 $\mu$ F GRM40
C350	Tantalum	4.7 $\mu$ F TEMSVA0J475M-8L
C351	Ceramic	0.001 $\mu$ F GRM40
C352	Ceramic	12pF GRM40
C353	Ceramic	12pF GRM40
C354	Ceramic	0.001 $\mu$ F GRM40
C355	Ceramic	0.001 $\mu$ F GRM40
C356	Ceramic	0.001 $\mu$ F GRM40
C357	Ceramic	0.1 $\mu$ F GRM40 F
C358	Ceramic	0.001 $\mu$ F GRM40
C359	Ceramic	0.001 $\mu$ F GRM40
C360	Ceramic	15pF GRM40
C361	Tantalum	2.2 $\mu$ F 16V DN
C362	Ceramic	0.001 $\mu$ F GRM40
C363	Ceramic	0.01 $\mu$ F GRM40 B
C364	Ceramic	0.001 $\mu$ F GRM40
C365	Ceramic	0.01 $\mu$ F GRM40 B
C366	Ceramic	0.001 $\mu$ F GRM40
C367	Ceramic	0.001 $\mu$ F GRM40
C368	Ceramic	0.001 $\mu$ F GRM40
C369	Ceramic	27pF GRM40
C370	Ceramic	0.001 $\mu$ F GRM40
C371	Ceramic	0.001 $\mu$ F GRM40
C372	Ceramic	2pF GRM40
C373	Ceramic	0.001 $\mu$ F GRM40
C374	Ceramic	0.001 $\mu$ F GRM40
C375	Ceramic	10pF GRM40
C376	Ceramic	0.001 $\mu$ F GRM40
C377	Ceramic	22pF GRM40
C379	Ceramic	4pF GRM40
C381	Tantalum	6.8 $\mu$ F 6.3V SV
C382	Ceramic	0.022 $\mu$ F GRM40
C383	Ceramic	0.001 $\mu$ F GRM40
C385	Ceramic	22pF GRM40
C386	Ceramic	0.001 $\mu$ F GRM40
C389	Ceramic	0.001 $\mu$ F GRM40
C390	Ceramic	5pF GRM40 CH
C391	Ceramic	33pF GRM40 CH
C393	Trimmer	20pF ECRGA020E30
C394	Ceramic	220pF GRM40
C395	Ceramic	100pF GRM40
C396	Ceramic	0.022 $\mu$ F GRM40
C397	Ceramic	0.1 $\mu$ F GRM40 F
C398	Tantalum	4.7 $\mu$ F 10V SV
C399	Ceramic	0.1 $\mu$ F GRM40 F
C400	Ceramic	0.001 $\mu$ F GRM40
C401	Ceramic	100pF GRM40
C402	Ceramic	0.001 $\mu$ F GRM40
C403	Ceramic	0.1 $\mu$ F GRM40 F
C404	Ceramic	0.001 $\mu$ F GRM40
C405	Ceramic	33pF GRM40
C406	Ceramic	0.001 $\mu$ F GRM40
C407	Tantalum	4.7 $\mu$ F TEMSVA0J475M-8L
C408	Ceramic	0.001 $\mu$ F GRM40
C409	Ceramic	0.01 $\mu$ F GRM40 B
C410	Ceramic	0.001 $\mu$ F GRM40
C411	Ceramic	0.001 $\mu$ F GRM40
C412	Ceramic	15pF GRM40
C413	Ceramic	470pF GRM40
C414	Ceramic	12pF GRM40
C415	Ceramic	0.001 $\mu$ F GRM40
J301	Connector	BB04J03M
J302	Connector	BB04J04M
J303	Connector	BB04J09M
EP301	P.C. Board	B-1666A (RF UNIT)
EP307	Ferrite Bead	DL2-OP2.6-3-1.2H

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
W301	Jumper	JPW-01 R-01
W302	Jumper	JPW-01 R-01
W303	Jumper	MCR10-JPW
W304	Jumper	MCR10-JPW
W305	Jumper	MCR10-JPW
W306	Jumper	MCR10-JPW

## [VCO UNIT]

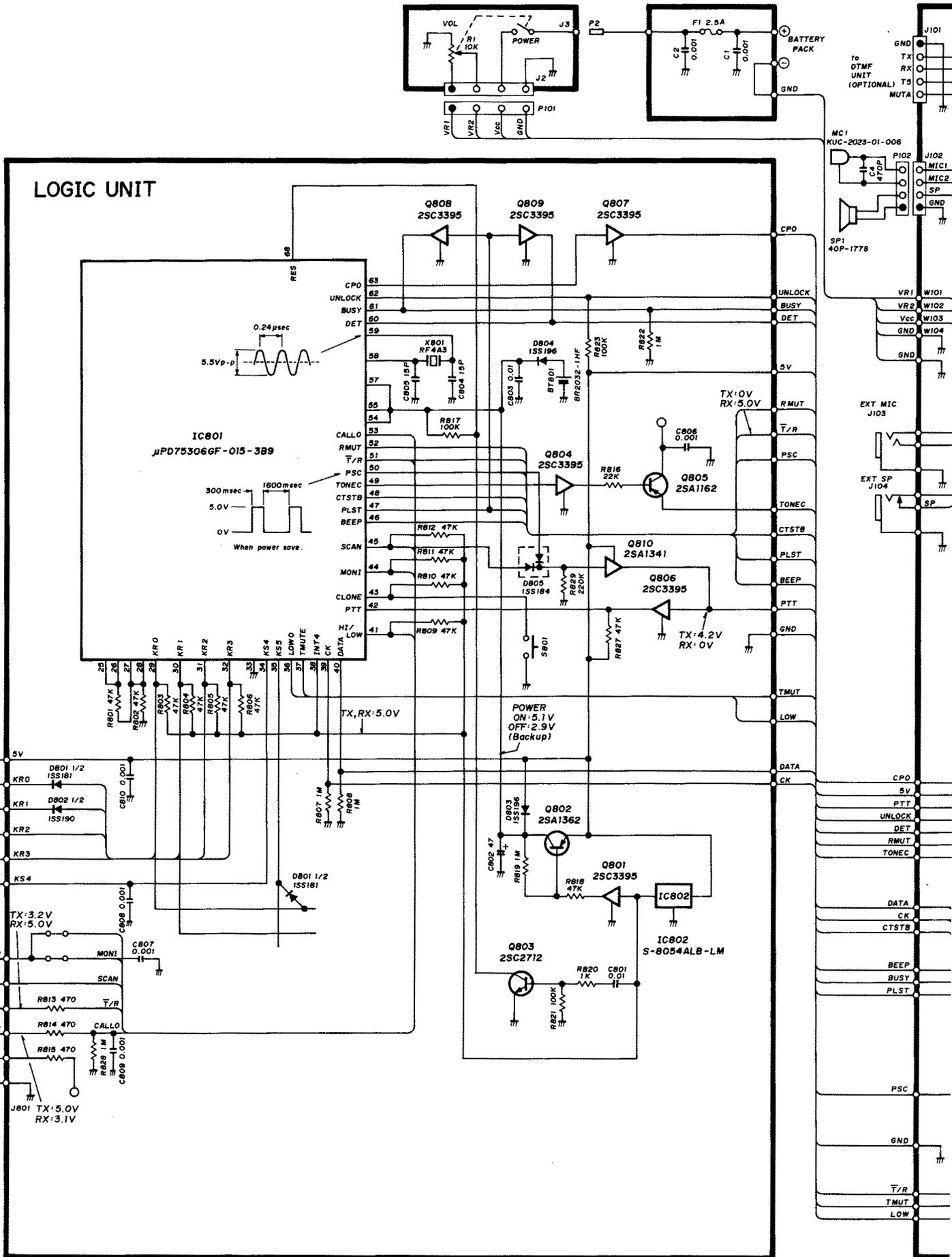
REF. NO.	DESCRIPTION	PART NO.
Q501	FET	2SK302 GR
D501	Diode	1SS265
D502	Varicap	1SV166 2B
D503	Varicap	1SV166 2B
L501	Coil	S7T-BN
L502	Coil	LAL02NA 4R7K 4.7 $\mu$
L503	Coil	LAL02NA 2R2M 2.2 $\mu$
L504	Coil	LAL02NA 4R7K 4.7 $\mu$
L505	Coil	LAL02NA 4R7K 4.7 $\mu$
L506	Coil	LAL02NA 4R7K 4.7 $\mu$
R501	Resistor	100k $\Omega$ MCR10
R502	Resistor	120 $\Omega$ MCR10
C501	Ceramic	470pF GRM40
C503	Ceramic	68pF GRM40 CH
C505	Ceramic	0.001 $\mu$ F GRM40
C506	Ceramic	68pF GRM40
C507	Ceramic	39pF GRM40
C508	Ceramic	3pF GRM40 UJ
C509	Ceramic	1pF GRM40
C510	Ceramic	0.01 $\mu$ F GRM40 F
C512	Ceramic	0.5pF 50V
C514	Ceramic	3pF GRM40 UJ
C515	Ceramic	0.001 $\mu$ F GRM40
EP501	P.C. Board	B-1670B (VCO UNIT)

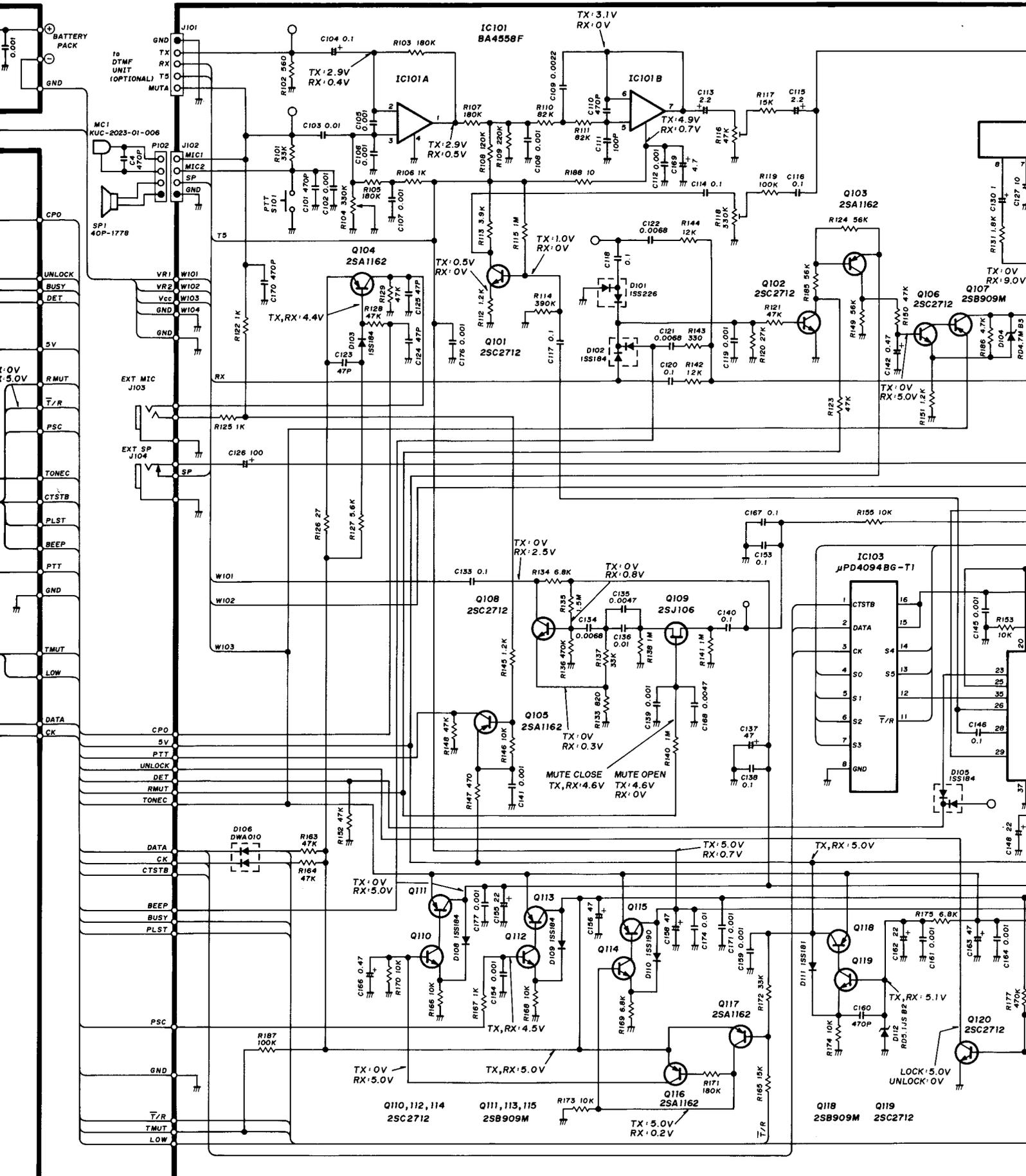
**[SQL UNIT]**

REF. NO.	DESCRIPTION	PART NO.	
IC601	IC	TC4SU69F	
Q601	Transistor	2SJ106Y	
D601	Diode	HSM88AS	
R601	Resistor	1.8k $\Omega$	MCR10
R602	Resistor	330k $\Omega$	MCR10
R603	Resistor	2.2k $\Omega$	MCR10
R604	Resistor	1.0k $\Omega$	MCR10
R605	Thermistor	33D28	
R607	Resistor	47k $\Omega$	MCR10
R608	Thermistor	33D28	
R609	Resistor	1M $\Omega$	MCR10
R610	Resistor	4.7k $\Omega$	MCR10
R611	Thermistor	33D28	
R612	Resistor	12k $\Omega$	MCR10
C601	Ceramic	0.01 $\mu$ F	GRM40
C602	Ceramic	0.01 $\mu$ F	GRM40
C603	Ceramic	33pF	GRM40 CH
C604	Ceramic	0.001 $\mu$ F	GRM40
C605	Ceramic	0.001 $\mu$ F	GRM40
C606	Ceramic	0.001 $\mu$ F	GRM40
C607	Tantalum	0.1 $\mu$ F	35V SV
C608	Ceramic	470pF	GRM40
C609	Ceramic	0.001 $\mu$ F	GRM40
EP601	P.C. Board	B-1669B (SQL UNIT)	

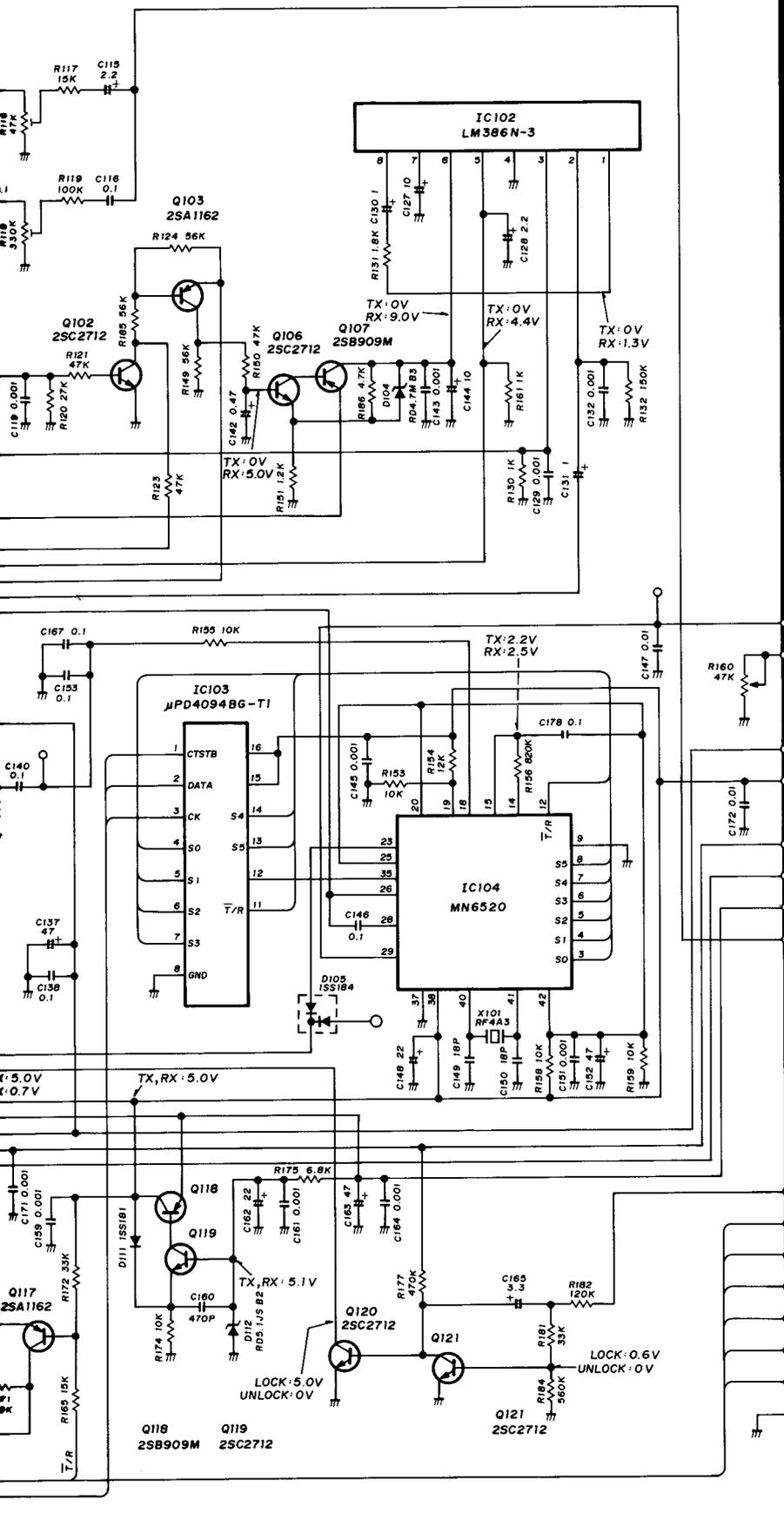
**[FILTER UNIT]**

REF. NO.	DESCRIPTION	PART NO.	
IC701	IC	$\mu$ PD4066 BG	
D701	Diode	1SS193	
R701	Resistor	4.7k $\Omega$	MCR10
R702	Resistor	4.7k $\Omega$	MCR10
R703	Resistor	10k $\Omega$	MCR10
R704	Resistor	10k $\Omega$	MCR10
R705	Resistor	3.3k $\Omega$	MCR10
R706	Resistor	1k $\Omega$	MCR10
C701	Ceramic	0.1 $\mu$ F	GRM40 F
C702	Tantalum	2.2	16V SV
C703	Ceramic	0.1 $\mu$ F	GRM40 F
EP701	P.C. Board	B-1596B (FILTER UNIT)	

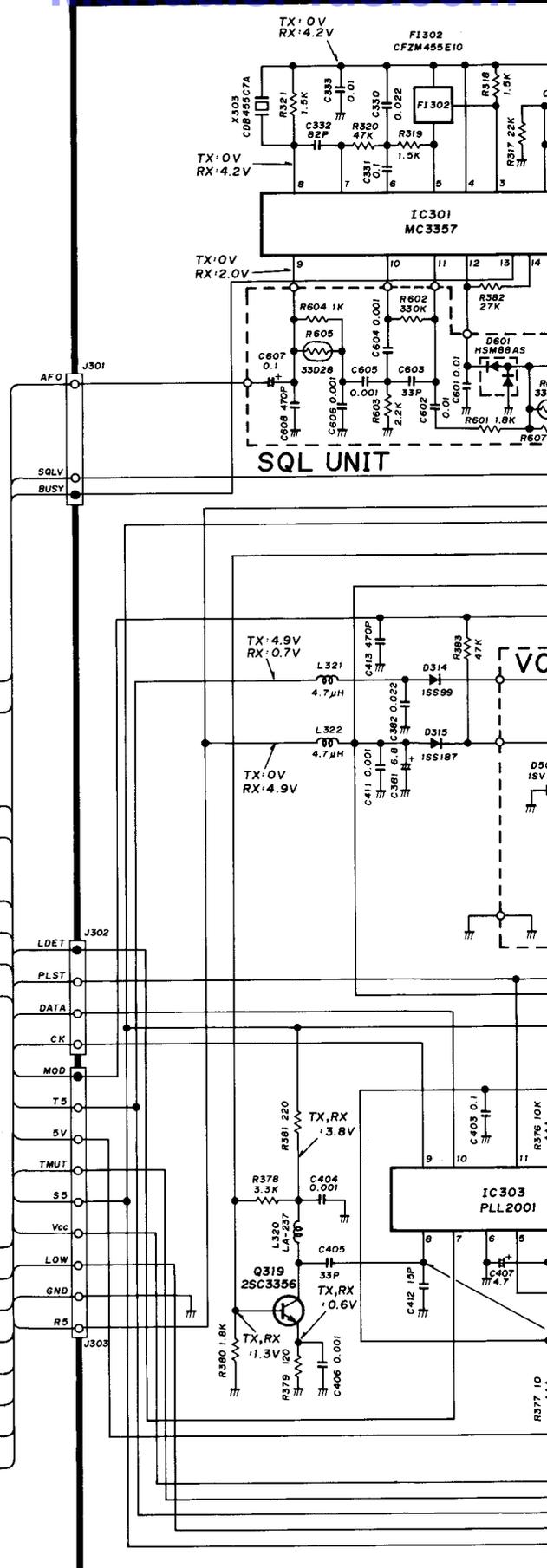


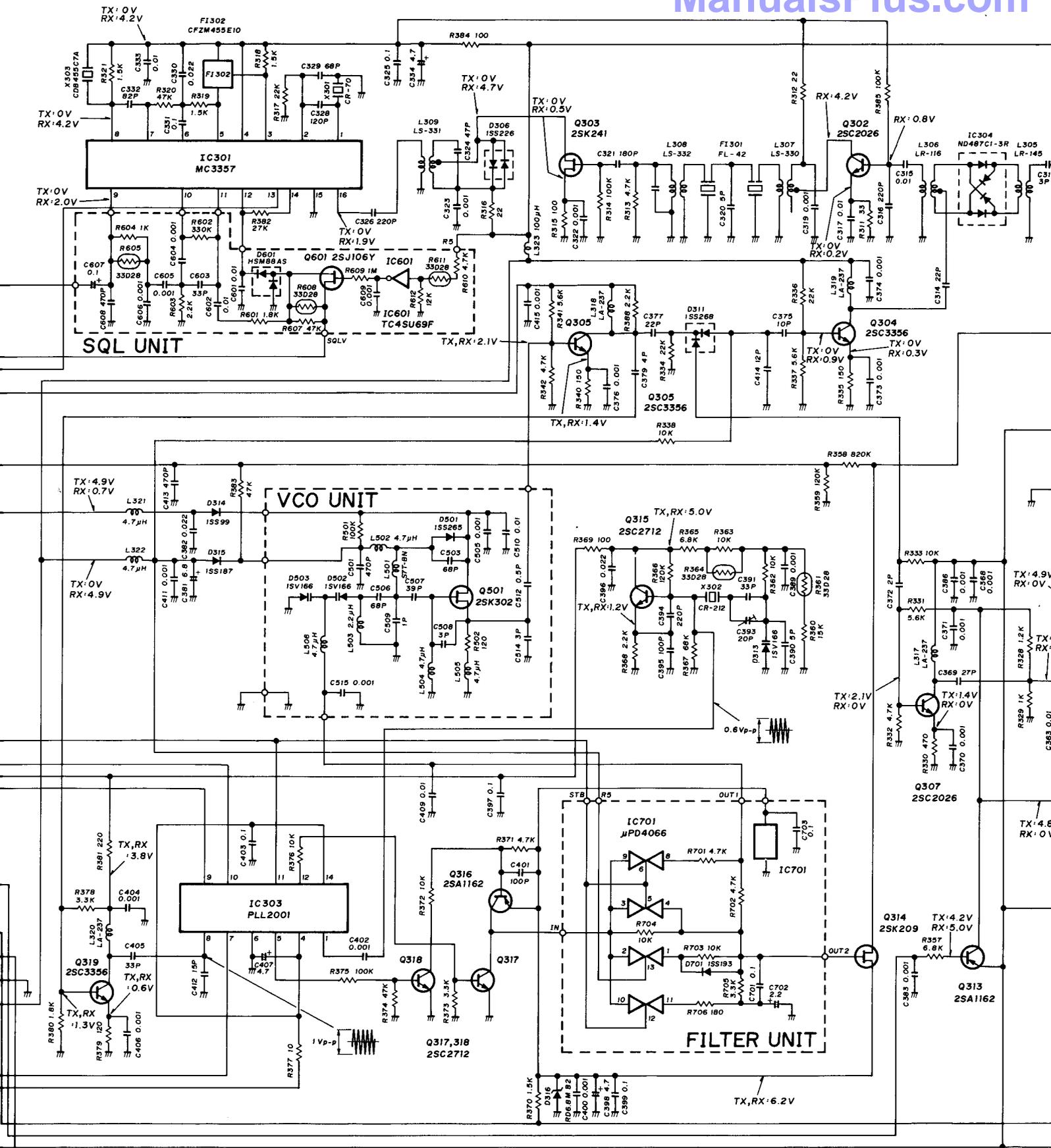


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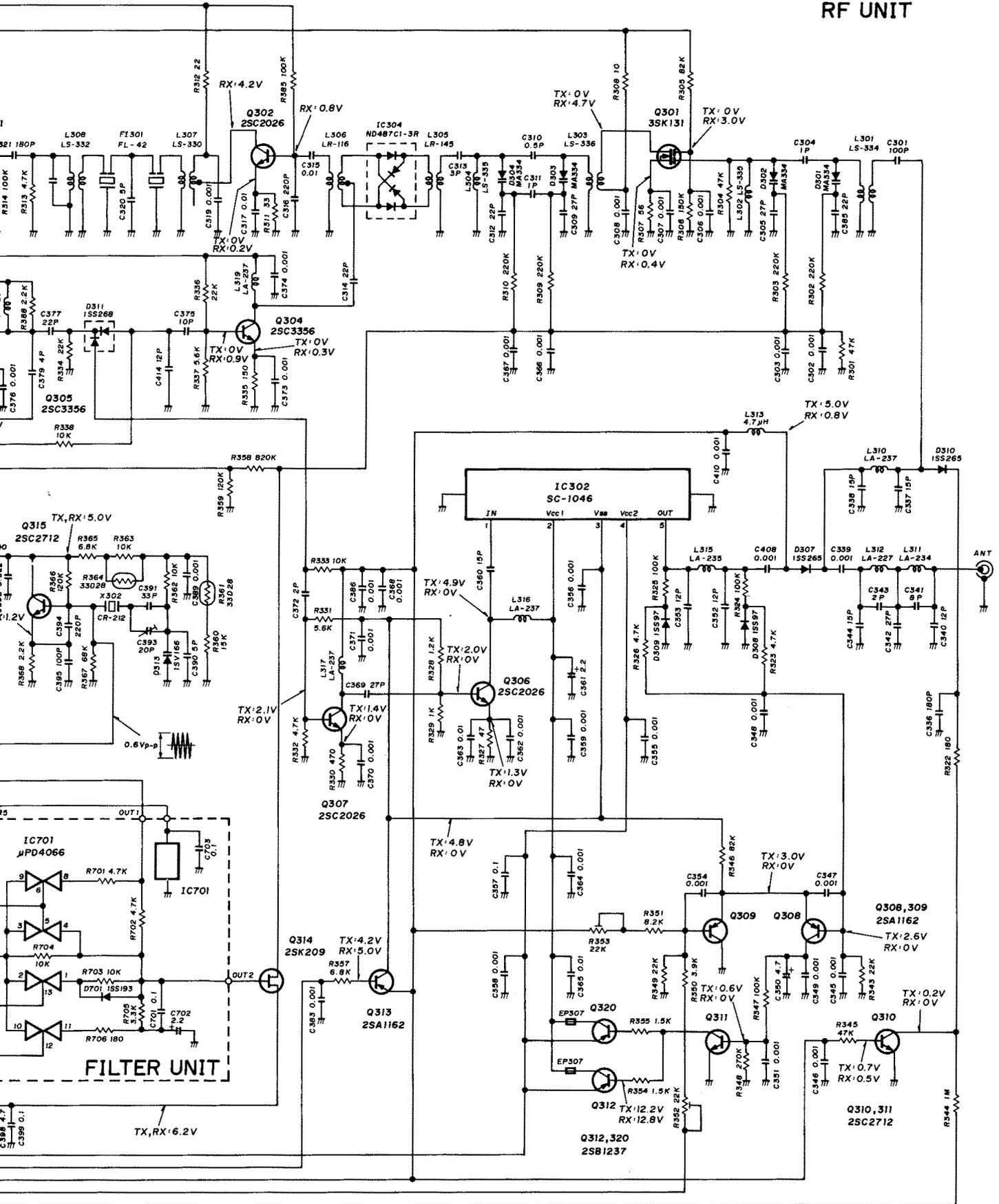


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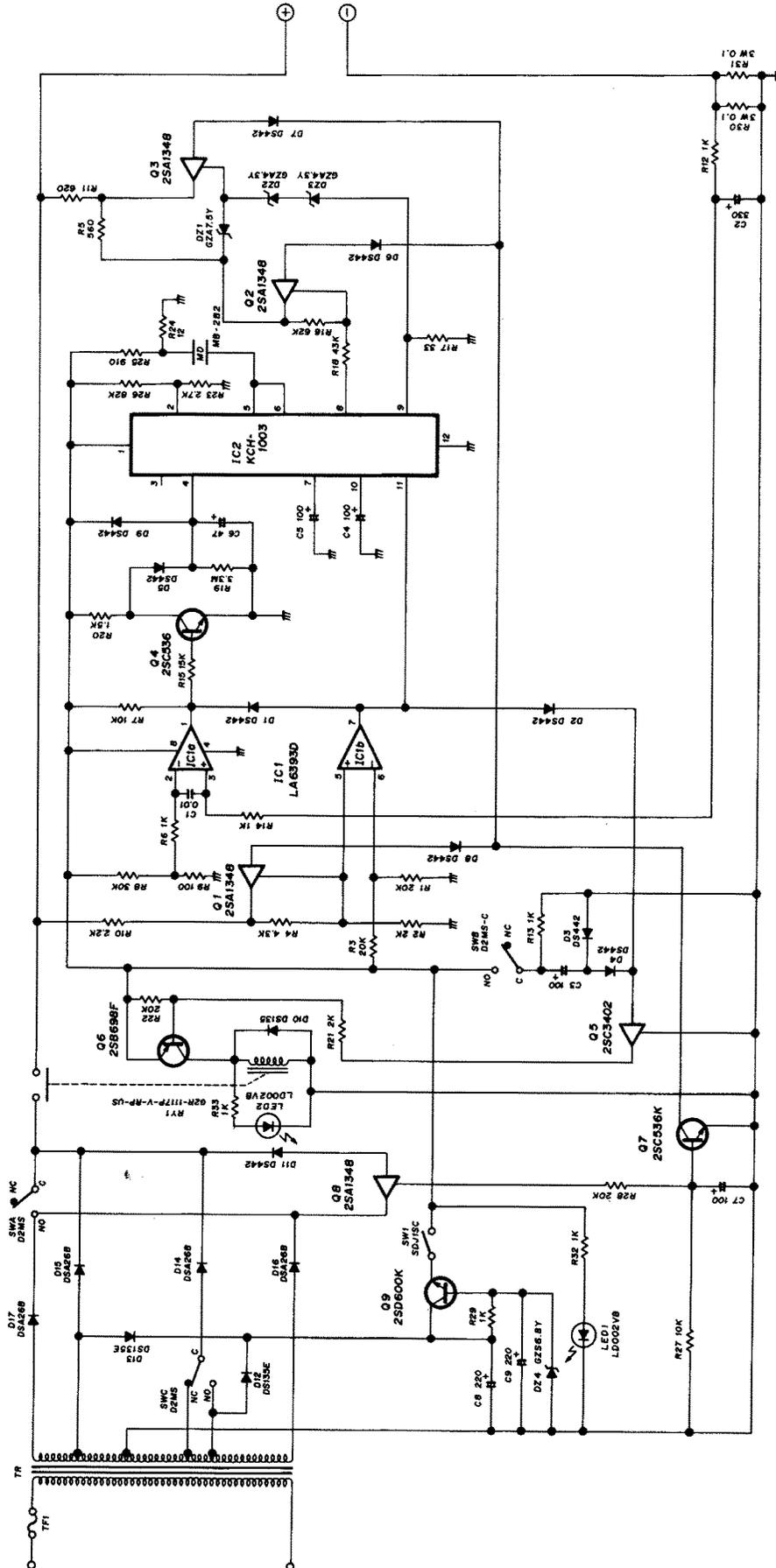




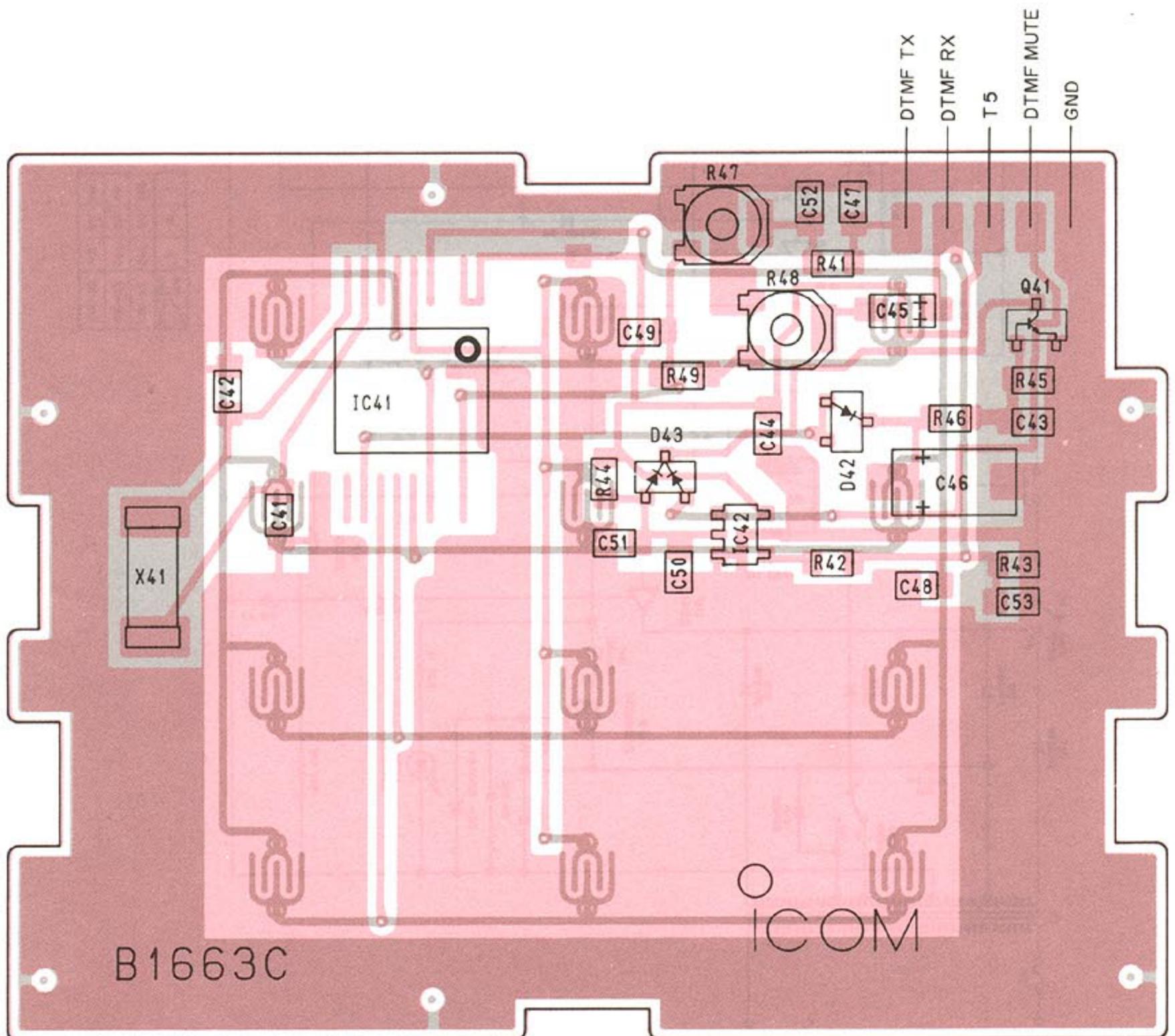
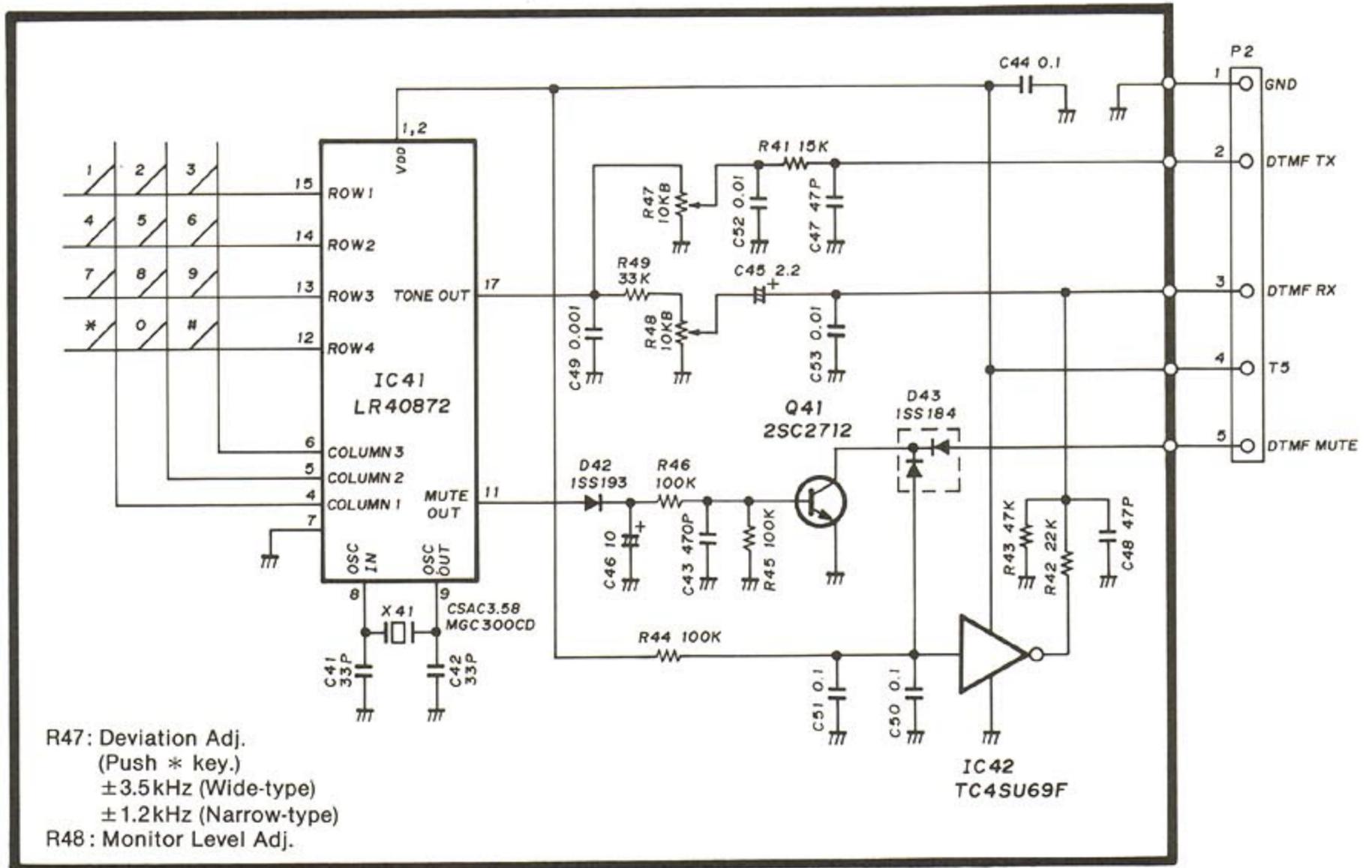
RF UNIT



10-1 BM-70 AC BATTERY CHARGER



SW	A	B	C
BATTERY	OFF	ON	OFF
CM-71	OFF	ON	ON
CM-72	OFF	ON	ON
CM-73	ON	ON	OFF



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