ICOM

SERVICE MANUAL

UHF TRANSCEIVER

IC-U18

Icom Inc.

SCOPE OF THE SERVICE MANUAL

This service manual covers all service information related to the theoretical, physical, mechanical and electrical characteristics of the IC-U18 UHF TRANSCEIVER.

ASSISTANCE

If you require assistance or further information regarding the operation and capabilities of the IC-U18, contact your nearest authorized Icom Dealer or Icom Service Center.
Address are provided on the back cover for your convenience.

ORDERING REPLACEMENT PARTS

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.)

REPAIR NOTE

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.

TABLE OF CONTENTS

To program the operating frequency, tone frequency, etc., see the separately available EX-704 PROGRAMMING MANUAL (A-8011-1EX).

SECTION 1 SPECIFICATIONS

■ GENERAL

- Frequency range : 450~470MHz
- Type of emission : 16K0F3E
- Number of channels : Up to 16 channels
- Frequency stability : ±0.0005%
- Antenna impedance : 50Ω unbalanced
- Power supply voltage :

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

(Negative ground)

- Usable temperature range : −30°C~+60°C (−22°F~+140°F)
- Dimensions : 65mm(W)×109mm(H)×35mm(D)
  2.6"(W)×4.3"(H)×1.4"(D)
- Weight : 350g (0.77lbs.), (without battery pack)

■ TRANSMITTER

- RF Output power (At 13.2V DC) : 5W/1.5W
- Modulation system : Variable reactance frequency modulation
- Current drain (At 13.2V DC) : High power 2.0A
  Low power 1.5A
- Microphone impedance : 2.2kΩ
- Maximum deviation : ±5kHz
- Spurious emissions : −60dB
- FM hum and noise : 40dB
- Audio response : +1dB, −3dB of +6dB/octave from 300Hz~3000Hz

■ RECEIVER

- Receiver system : Double superheterodyne
- Sensitivity : 0.28μV at 12dB SINAD
- Squelch sensitivity (Threshold) : 0.22μV
- Modulation acceptance : ±7kHz
- Intermediate frequencies : 1st 23.15MHz
  2nd 455kHz
- Current drain (At 13.2V DC) : Audio max. 0.25A
  Standby 70mA
- Audio output power :

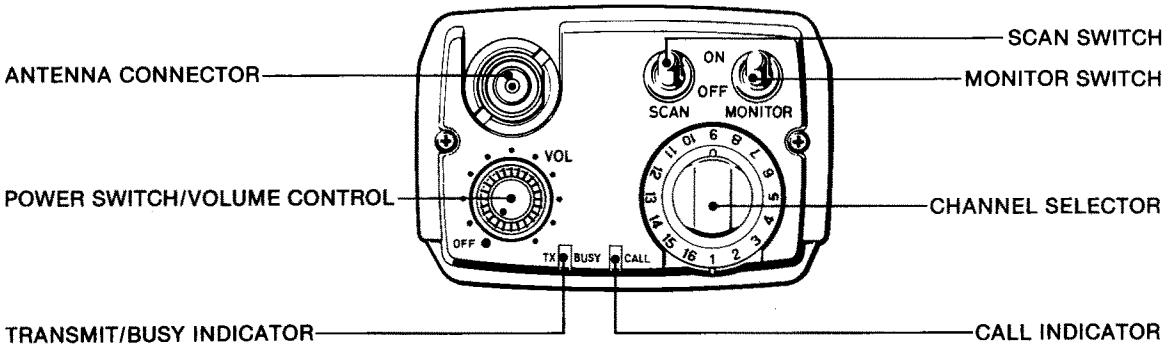
BATTERY PACK	OUTPUT (at 5% distortion with 8Ω load)
CM-71	200mW
CM-72	350mW
CM-73	500mW

- Audio output impedance : 8Ω
- Selectivity (±25kHz) : 70dB
- Spurious frequency rejection : 70dB
- Image rejection : 65dB
- Inter modulation : 68dB
- Hum and noise : 40dB
- Audio response : +1dB~−3dB of −6dB/octave from 300Hz~3000Hz

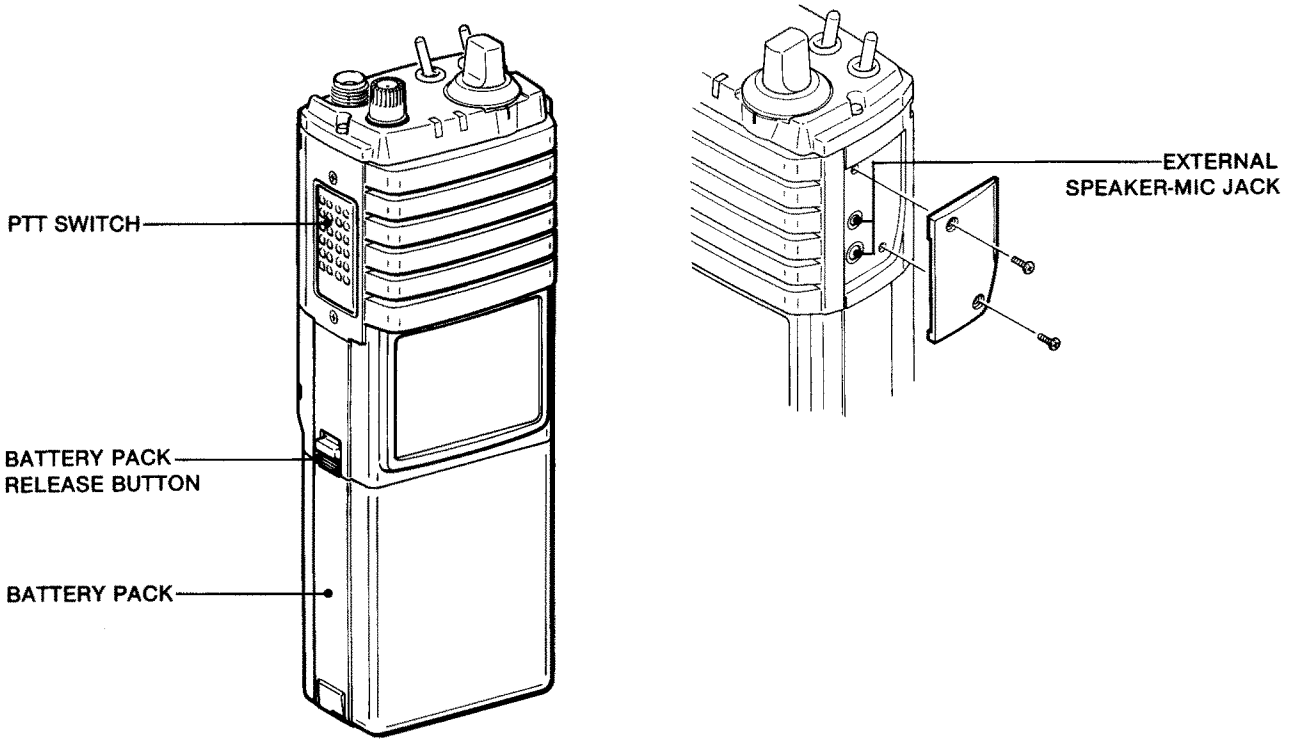
SECTION 2 OUTSIDE AND INSIDE VIEWS

2-1 OUTSIDE VIEWS

• TOP VIEW

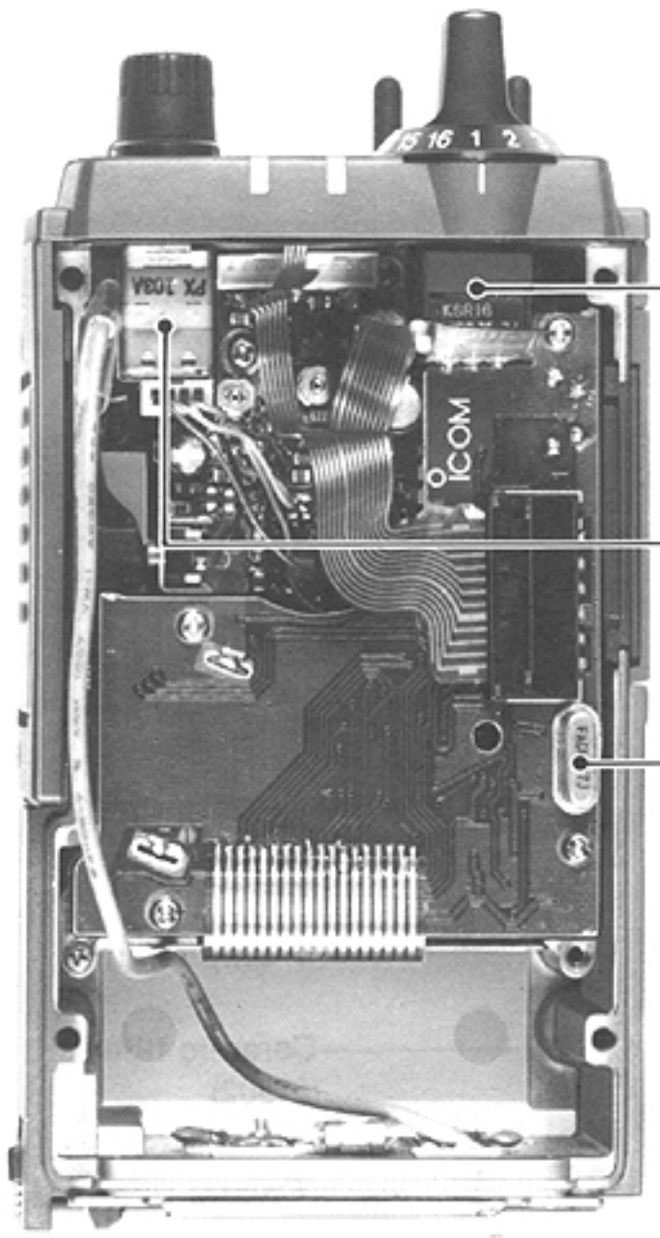


• FRONT AND SIDE VIEW

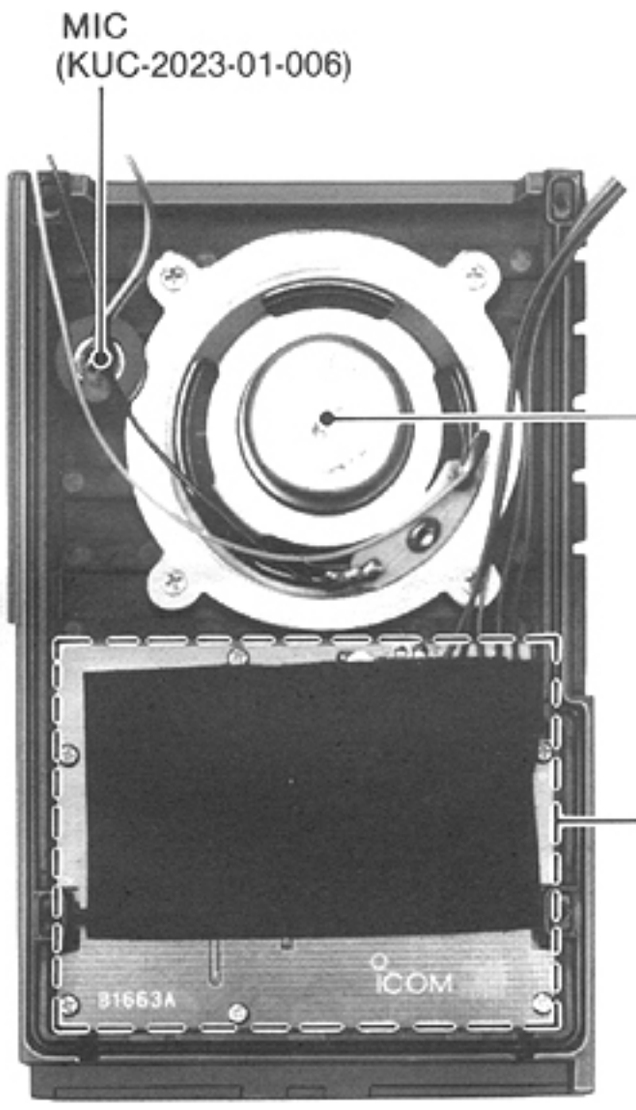


2-2 INSIDE VIEWS

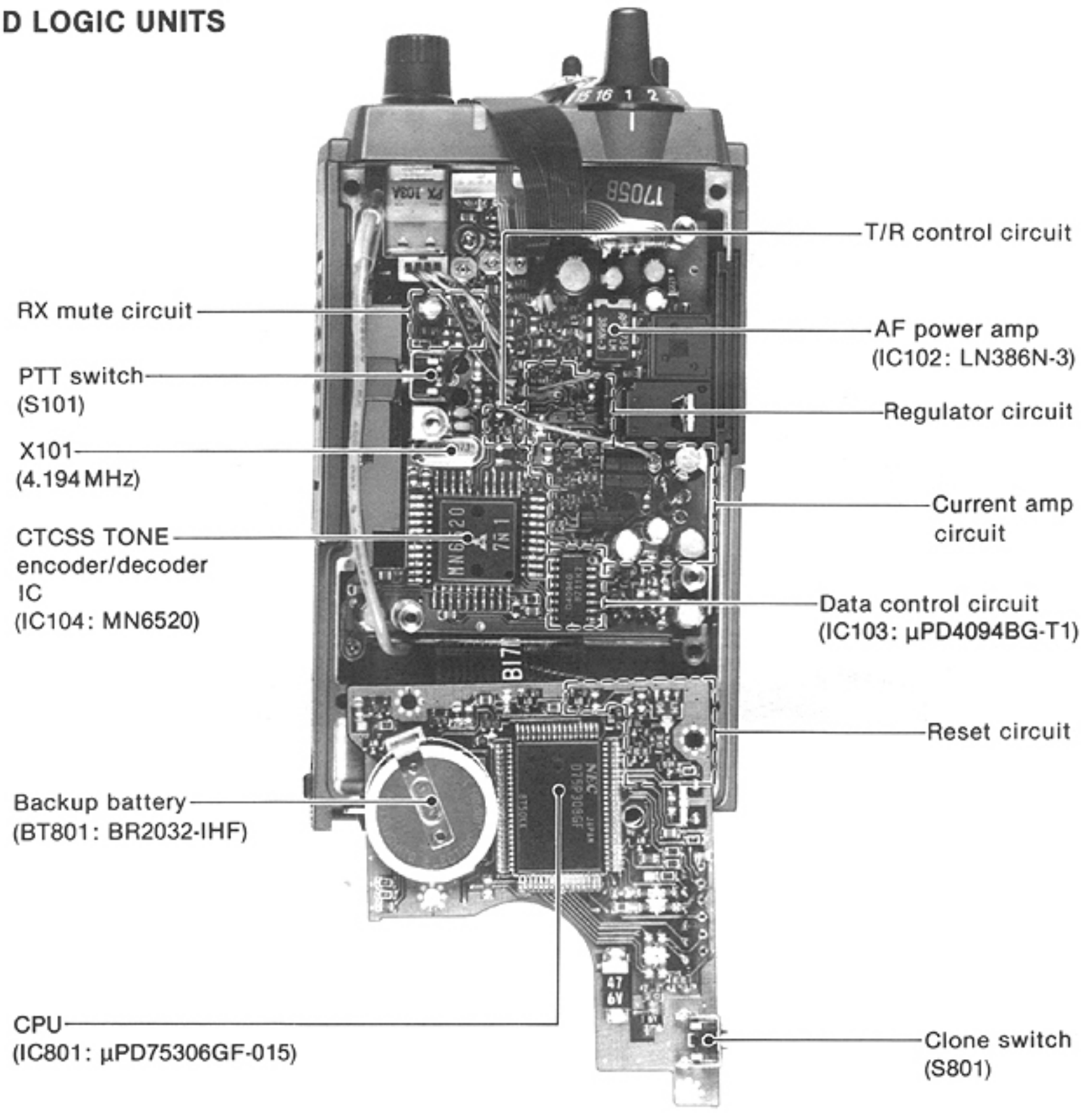
• LOGIC UNIT



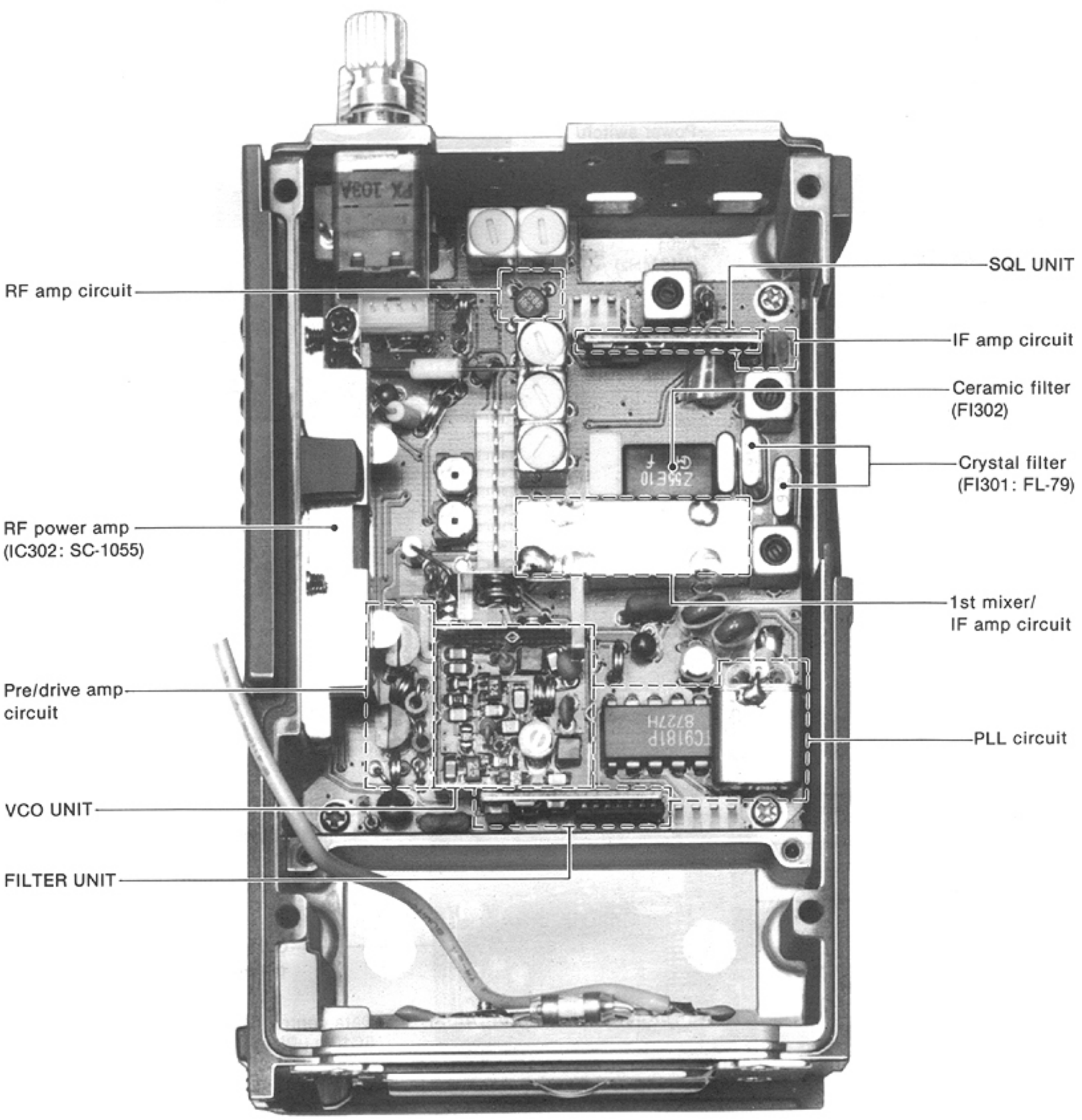
• FRONT PANEL (Rear side)



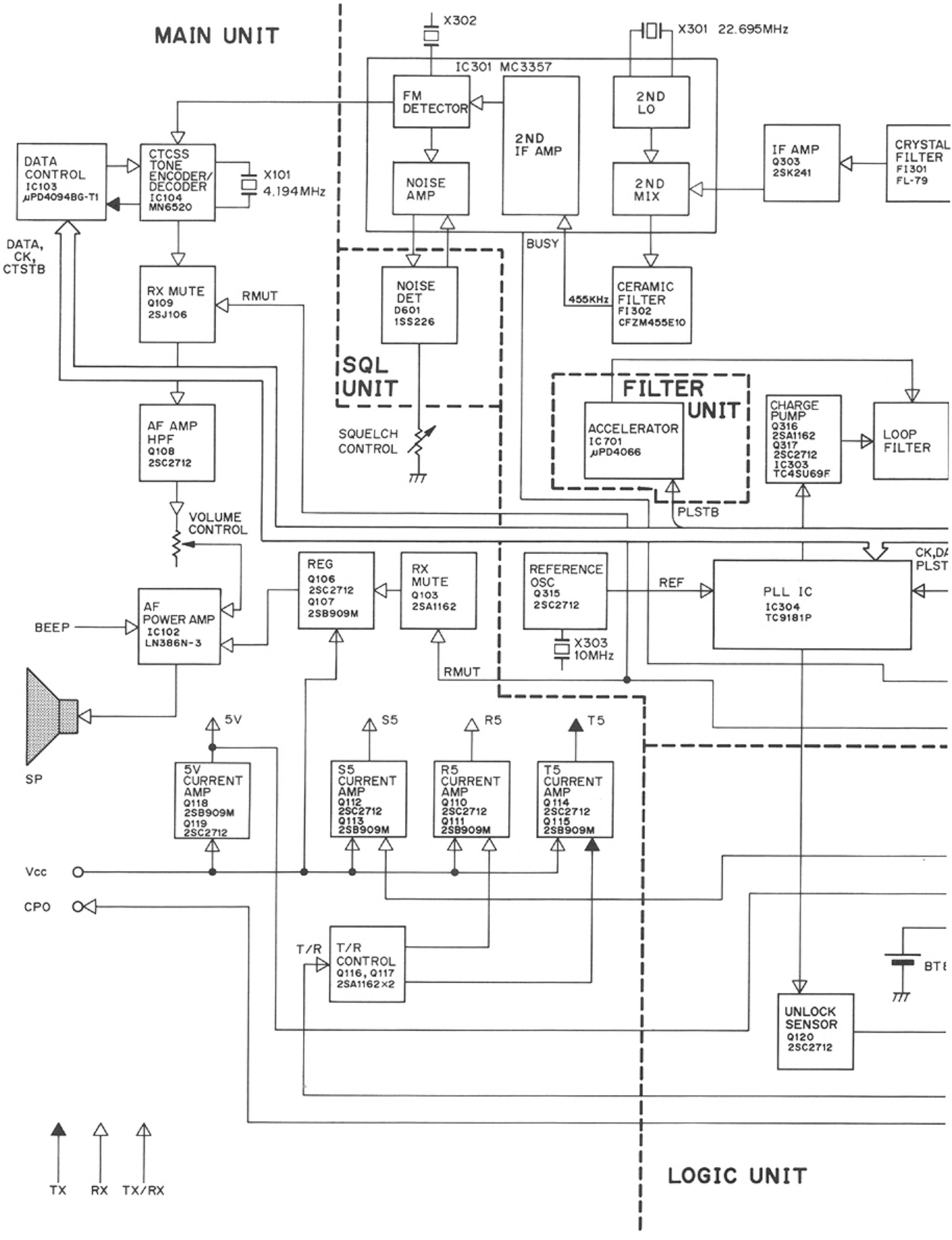
• MAIN AND LOGIC UNITS



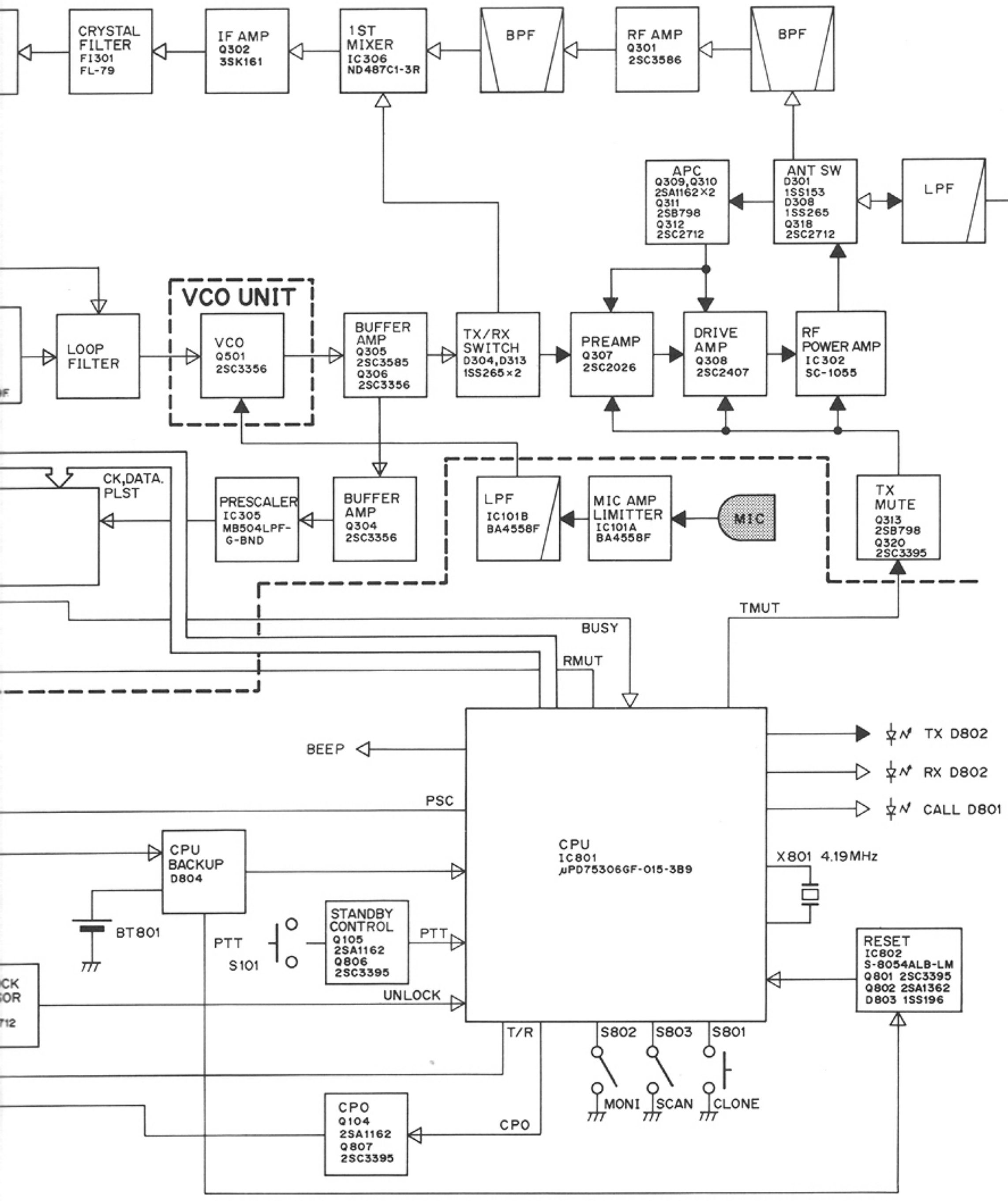
• RF UNIT


RF amp circuit
SQL UNIT
IF amp circuit
Ceramic filter
(FI302)
Crystal filter
(FI301: FL-79)
RF power amp
(IC302: SC-1055)
1st mixer/
IF amp circuit
Pre/drive amp
circuit
PLL circuit
VCO UNIT
FILTER UNIT

SECTION 3 BLOCK DIAGRAM



RF UNIT


CRYSTAL FILTER
F1301
FL-79
IF AMP
Q302
3SK161
1ST MIXER
IC306
ND487C1-3R
BPF
RF AMP
Q301
2SC3586
BPF
ANT
APC
Q309,Q310
2SA1162×2
Q311
2SB798
Q312
2SC2712
ANT SW
D301
1SS153
D308
1SS265
Q318
2SC2712
LPF
VCO UNIT
LOOP FILTER
VCO
Q501
2SC3356
BUFFER AMP
Q305
2SC3585
Q306
2SC3356
TX/RX SWITCH
D304,D313
1SS265×2
PREAMP
Q307
2SC2026
DRIVE AMP
Q308
2SC2407
RF POWER AMP
IC302
SC-1055
CK,DATA.
PLST
PRESCALER
IC305
MB504LPF-G-BND
BUFFER AMP
Q304
2SC3356
LPF
IC101B
BA4558F
MIC AMP
LIMITTER
IC101A
BA4558F
MIC
TX MUTE
Q313
2SB798
Q320
2SC3395
TMUT
BUSY
RMUT
BEEP
PSC
CPU BACKUP
D804
BT801
PTT
S101
STANDBY CONTROL
Q105
2SA1162
Q806
2SC3395
PTT
UNLOCK
CPU
IC801
μPD75306GF-015-3B9
X801 4.19MHz
RESET
IC802
S-8054ALB-LM
Q801 2SC3395
Q802 2SA1362
D803 1SS196
T/R
S802
S803
S801
MONI
SCAN
CLONE
CPO
Q104
2SA1162
Q807
2SC3395
CPO
TX D802
RX D802
CALL D801

SECTION 4 CIRCUIT DESCRIPTION

4-1 RECEIVER CIRCUITS

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

Received signals enter the antenna connector and pass through the π-type two-stage low-pass filter (C379, C381, C383, L319, L320) and the T-network high-pass filter (C375, C378, L318). The signals are applied to the antenna switching circuit (D301, D308, C376, L317) and then to the helical coil band-pass filter (L301). This antenna switching circuit employs a λ/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) 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 (IC306). From the matching transformer (L305), the RF signals are applied to IC306. The product of the 1st LO signal passes through L306 and is applied to IC306. L306 outputs a 23.15MHz 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 signals are applied to the crystal filter (FI301) to suppress out-of-band signals. The 1st IF signals are then fed to the 2nd IF circuit via L308.

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

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

The 1st IF signals from L309 are fed to the 2nd mixer section of IC301 and are mixed with 2nd LO signals to convert the 1st IF signals to 455kHz 2nd IF signals. IC301 contains the 2nd mixer circuit, the 2nd LO circuit and the quadrature circuit. The 2nd LO circuit and X301 generate 22.695MHz 2nd LO signals.

The 2nd IF signals from the 2nd mixer (pin 3 of IC301) pass through the ceramic filter FI302 to suppress unwanted signals. They are then amplified at the limiter amplifier section (pin 5 of IC301) and applied to the quadrature detector section (pin 8 of IC301 and ceramic discriminator X302) to demodulate 2nd IF signals to AF signals.

AF signals output from pin 9 of IC301 are applied to the AF circuit.

4-1-6 AF CIRCUIT (MAIN UNIT)

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

Passing through the AF amplifier section and the two-stage AF filter, the signal is output from pin 18. The −6dB/octave low-pass filter (R155, C153) deemphasizes the signal, which then passes through the muting circuit (Q109). The AF preamplifier (Q108) amplifies the signal to a level sufficient to drive IC102. When the squelch is closed, Q109 activates as the AF switch. Q108 serves 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 amplified signal output is 500mW at an 8Ω load. IC102 will not be damaged if the battery voltage range is 7.2~13.2V. The constant voltage circuit (D104, Q106, Q107) provides stable voltage to IC102 pin 6.

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

R604 and R605 are used for temperature compensation. IC301's built-in amplifier (between pins 10 and 11) amplifies noise components 20kHz or more. The output of this amplifier is applied to D601 for detection and rectification. This voltage drives IC301's built-in squelch trigger. After being output from pin 13, the BUSY signal is input to the CPU (IC801) at pin 61. The squelch circuit activates IC801 pin 52. R314 provides hysteresis for high speed squelch switching.

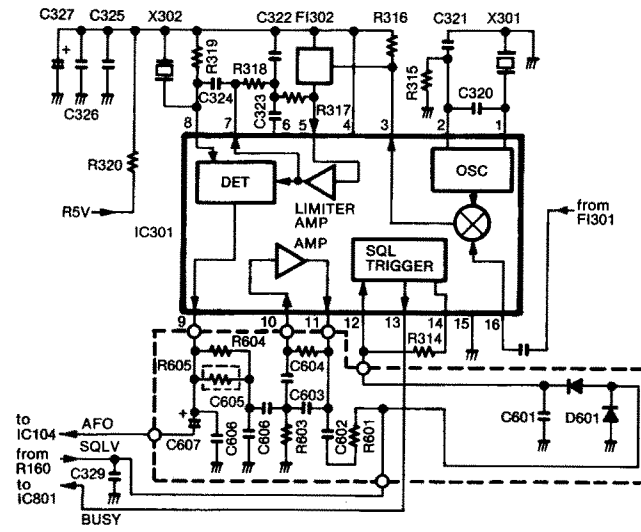


Fig. 1

4-2 TRANSMITTER CIRCUITS

4-2-1 MICROPHONE AMPLIFIER (MAIN UNIT)

AF signals from a built-in condenser microphone enter IC101A at pin 3 and are preemphasized 6dB/octave through pin 2 by C104 and R102. IC101A functions as the microphone amplifier and the limiter.

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

Modulated signals then change the capacitance of D501 to create FM modulation.

4-2-2 DRIVE AMPLIFIER (RF UNIT)

The VCO output is buffer amplified at the buffer amplifier (Q305, Q306).

After passing through the buffer amplifier (Q305, Q306), the diode switch (D313) and preamplifier (Q307), the VCO output is amplified at the drive amplifier (Q308) where 10mW is obtained without adjustment.

The APC circuit controls the voltage supplied to Q307 and Q308, so that stable RF output power is obtained.

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

IC302 is a miniature power module which provides stable 5W output within band limits.

The RF signals from the drive amplifier (Q308) are applied to pin 1 of IC302. Power amplified signals are output from pin 5.

4-2-4 APC CIRCUIT (RF UNIT)

The signal then passes through the low-pass filter (C372, C373, L315), producing matched and unmatched voltages which are detected by D306 and D307.

When antenna impedance is matched at 50Ω, voltage detected at D306 and D307 is at a minimum. However, when antenna impedance is mismatched, the detected voltage is higher than when matched.

The voltage detected at D306 and D307 is fed to the differential amplifier (Q309, Q310). The APC reference voltage is fed to base of Q310.

When the antenna impedance is mismatched, the base voltage of Q309 is higher than the reference voltage. The collector voltage of Q309 decreases, decreasing Q311 and Q312 collector current.

This decreases the output power of the drive amplifier (Q307,Q308) until the base voltage of Q309 equals the base voltage of Q310. Thus, stable RF output power is obtained.

4-2-5 POWER OUTPUT SELECTION CIRCUIT (RF UNIT)

The power selection circuit consists of R353, R354, R355, R358, and R359. This circuit shifts the RF output power by shifting APC reference voltage.

When HIGH output power is programmed, RF output power can be adjusted by R354.

When LOW output power is programmed, a LOW signal is applied from the CPU (IC801). A series combination of R358 and R359 is connected in parallel with R353. RF output power is adjusted by R358.

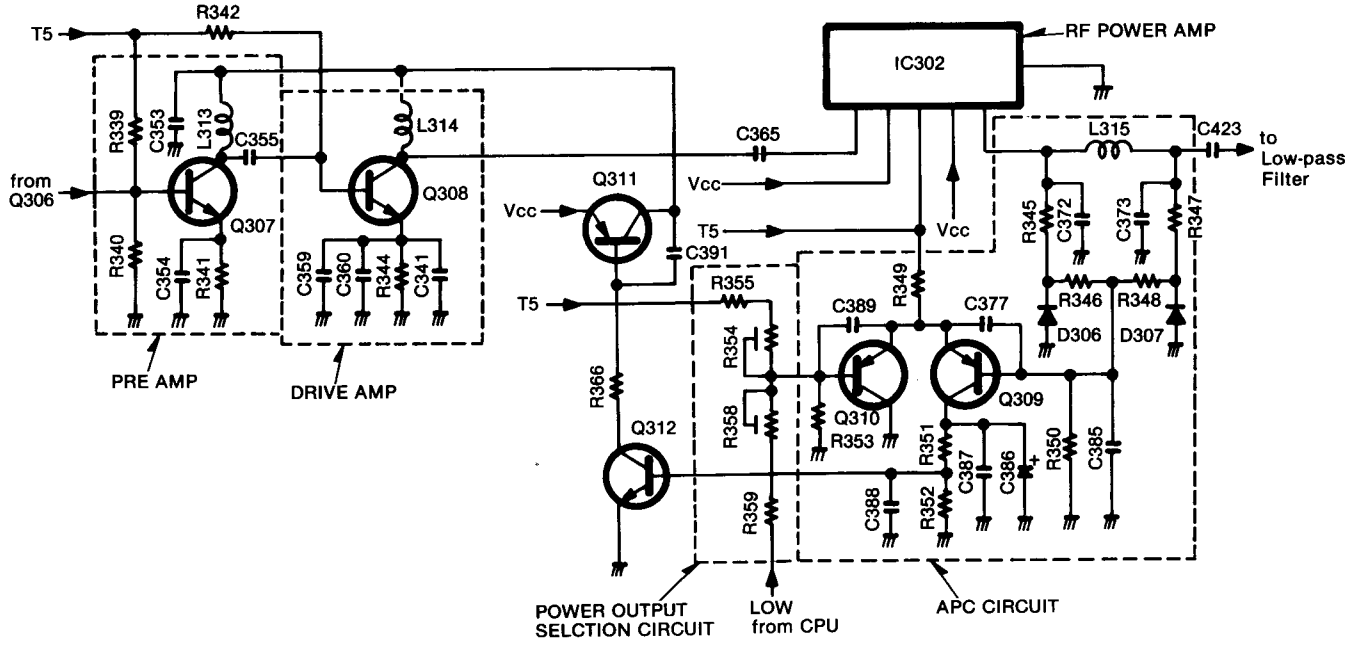


Fig. 2

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

"TMUT" signal from the CPU (IC801) turns Q314 OFF. The bias to Q307, Q308 and IC302 is cut off, preventing transmission.

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

When transmitting, Q318, D301 and D308 are switched ON. L317 and C302 form a parallel resonant circuit. IC302 output does not enter the receive circuit, but passes through L315, D308 and C375, the low-pass filter (L319, L320, C379, C381, C383) and then on to the antenna.

4-3 PLL CIRCUITS

4-3-1 GENERAL

The PLL circuit, using a dual modular prescaler (IC304, IC305), is designed such that the desired frequency to be generated directly at the VCO circuit. The dual modular prescaler (IC304, IC305) 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, X303 and the divider inside IC304. D310 provides frequency control. The output frequency of this circuit is stable over a large temperature range.

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

Phase-detected signals from IC304 pins 14 and 15 are converted to DC voltage by the charge pump Q316, Q317 and IC303; and a loop filter consisting of R703 ~R705 and C702.

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

D701 is an accelerator which ensures rapid PLL lock up time.

4-3-4 VCO CIRCUIT (VCO UNIT)

Q502 and D501 change the inductive reactance of the Colpitts oscillator (Q501), shifting the receive and transmit frequencies. A variable capacitor (D502) provides frequency control. The buffer amplifier (Q304, Q305, Q306) is unaffected by VCO oscillation.

PLL CIRCUIT

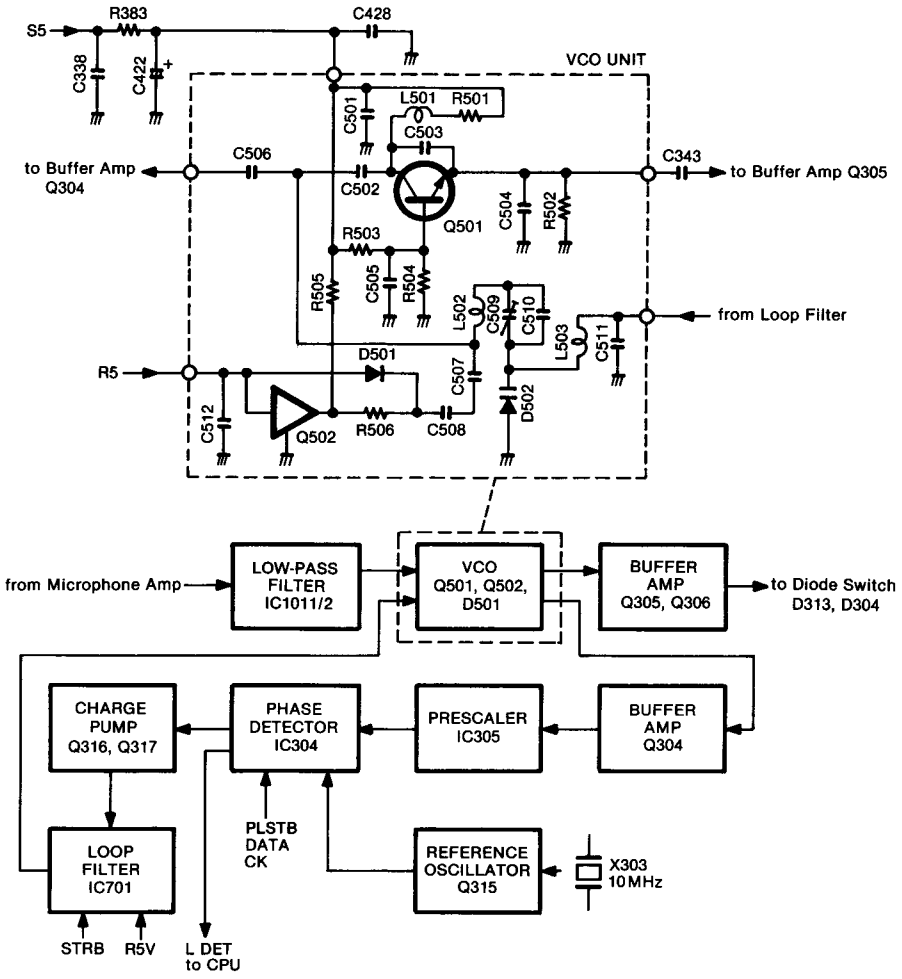


Fig. 3

4-4 VOLTAGE LINES

LINE	DESCRIPTION
Vcc	NiCd battery used: CM-71...7.2V, CM-72...8.4V, CM-73...13.2V. Passes through the fuse F1 and the POWER SWITCH and is applied to the power module (IC302), the charge pump (Q316, Q317), AF amplifier (IC102) and the following 5V lines.
+5V	Common 5V voltage with low noise characteristics amplified by the constant voltage circuit (Q118, Q119, D111, D112) which receives an input of 6~16V. This circuit employs a complementary amplifier system where it receives high current amplification. Because the heat factor of the combined voltages at Q119 (V_{BE}) and D111 are equal, the output voltage is stable even with regard to temperature changes.
S5	Common 5V controlled by the power save function. Made at Q112, Q113 and D109. When the power save function is turned ON, the CPU (IC801) pin 50 becomes "LOW," turning OFF the 5V from S5, and saving current.
T5	Transmit 5V current amplified at Q115.
R5	Receive 5V controlled by the power save function. Current amplified at Q111.

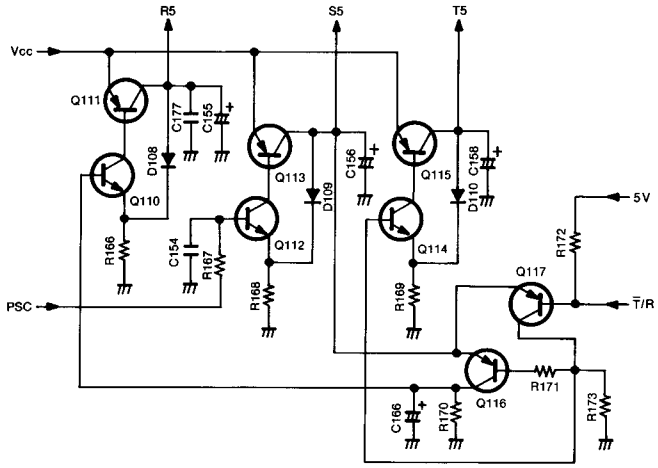


Fig. 4

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

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

When receiving:
The CPU (IC801) pin 51 becomes "HIGH," Q117 turned OFF, and Q116 is turned ON. Bias voltage is applied to Q110, and Q111 outputs R5V. Because Q116 supplies voltage through 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 encoder/decoder which produces 37 tone frequencies. IC104 pins 3~8 (S0~S5) are used to set the tone frequencies for IC103 using serial data from the CPU. When the IC104 transmit/receive switching pin 12 is "LOW," the transceiver transmits; when "HIGH," the transceiver receives.

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) PORTS

INPUT PORT

PIN	PORT	NAME	DESCRIPTION
38	P00	INT4	Interrupt input HIGH: Normal operation LOW: Puts the CPU on standby.
41	P03	HIGH/LOW	HIGH: Low RF output has been selected. LOW: High RF output has been selected. The RF output remains high when low output is written into the memory.
42	P10	PTT	LOW: PTT SWITCH has been pushed.
43	P11	CLONE	LOW: CLONING SWITCH has been pushed. Pressing the CLONING SWITCH when the power is ON activates the cloning function.
44	P12	MONI	LOW: MONITOR SWITCH is pushed. The CPU turns OFF the CTCSS tone decoder when the port is "LOW."
45	P13	SCAN CONTROL	Starts a scan when "LOW."
	P40~P43		Matrix input.
60	P60	DET	Equalizes tones when "HIGH."
61	P61	BUSY	Opens the squelch when "HIGH."
62	P62	UNLOCK	Unlocks the PLL when "LOW."

OUTPUT PORT

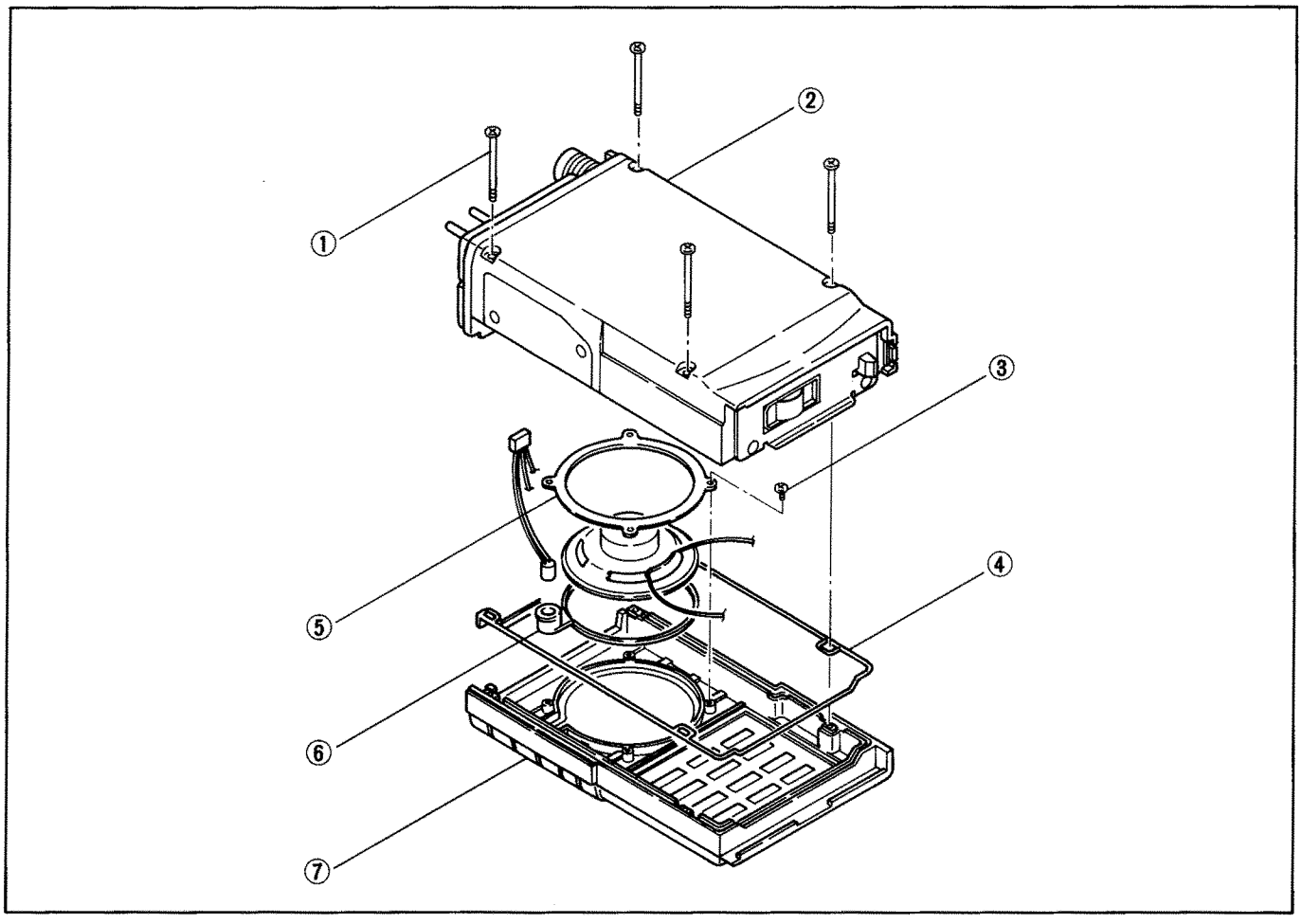
PIN	PORT	NAME	DESCRIPTION
34	P50	KS4	Matrix signal output. (Matrix is used for CH selection.)
35	P51	KS5	Matrix signal output.
36	P52	LOWO	Power control signal output. Outputs "LOW" when the HIGH/LOW power switch is set to low power output.
37	P53	TMUT	Transmit mute output.
39	P01	CK	Serial data output.
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	$\overline{T}$/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.

SECTION 5 MECHANICAL PARTS AND DISASSEMBLY

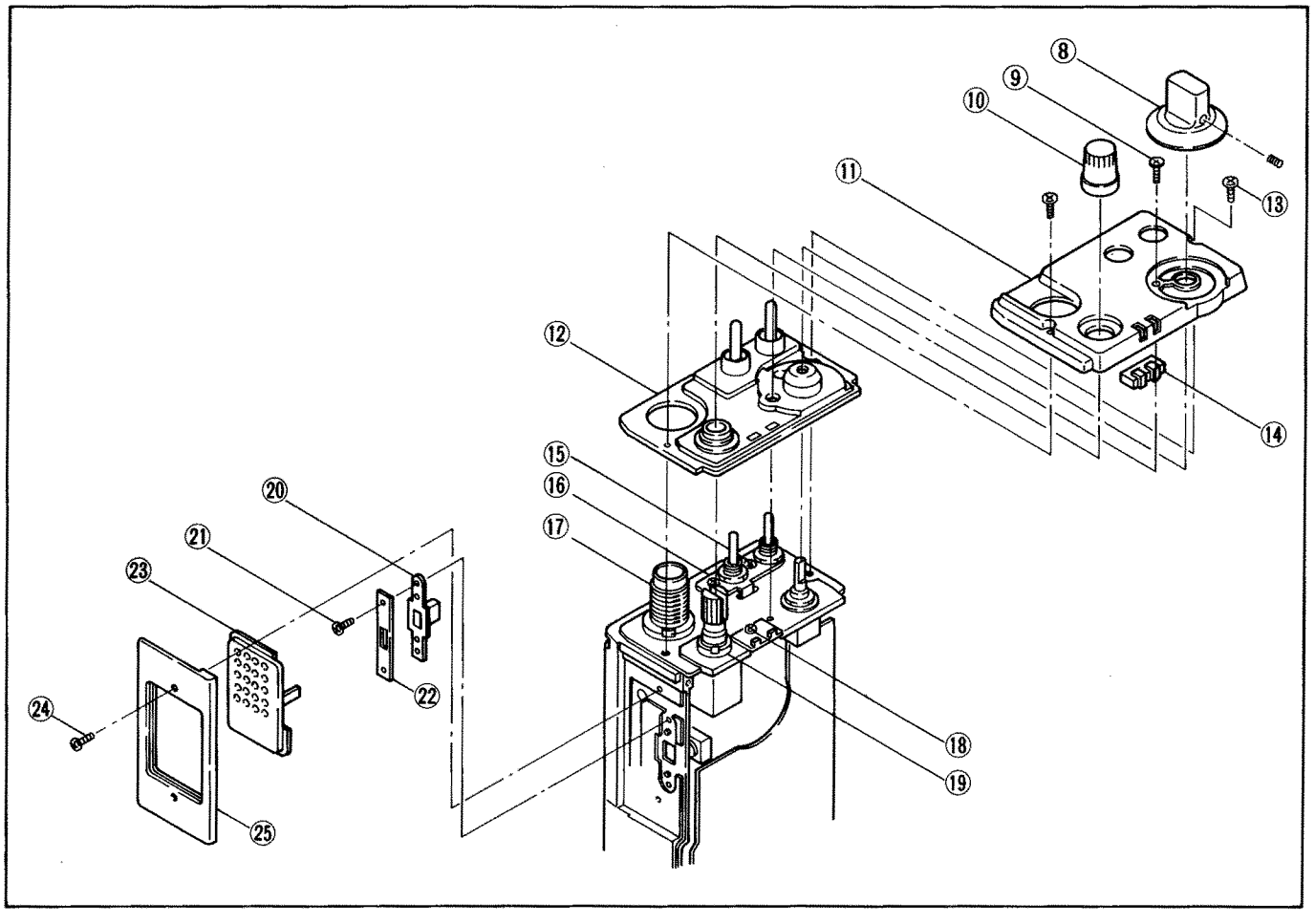
LABELLED NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	PH B0 2×31.5 ZK	8810004000	4
②	Rear panel	8010007230	1
③	PH B0 2×4	8810000980	4
④	Casing seal	8010007240	1
⑤	Speaker plate	8930012480	1
⑥	Speaker seal	8930012630	1
⑦	Front panel (A)	8210003220	1
⑧	Knob (channel) N-132 (includes HLH M3×3)	8610004300 (8810003520)	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's head style PH: Pan head BH: Button head FH: Flat head HLH: Headless hex head

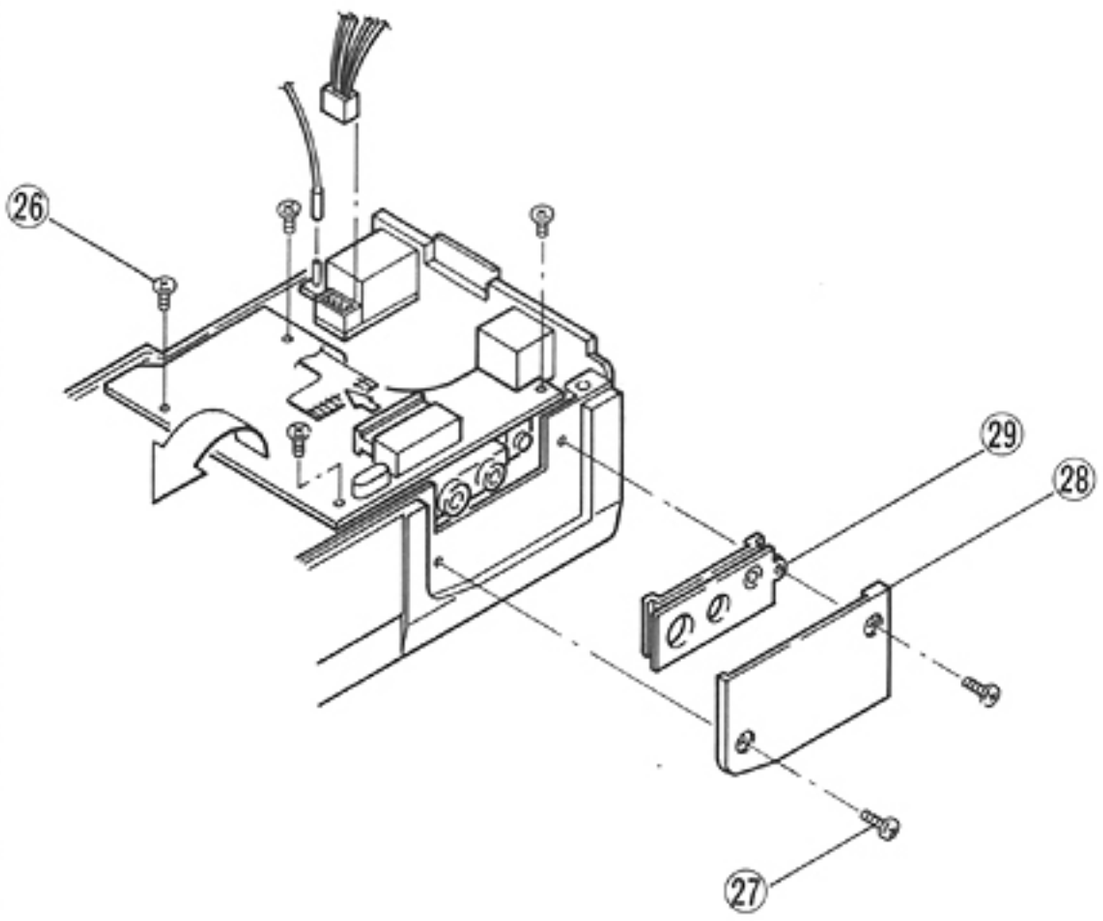
• **CASE AND FRONT PANELS**



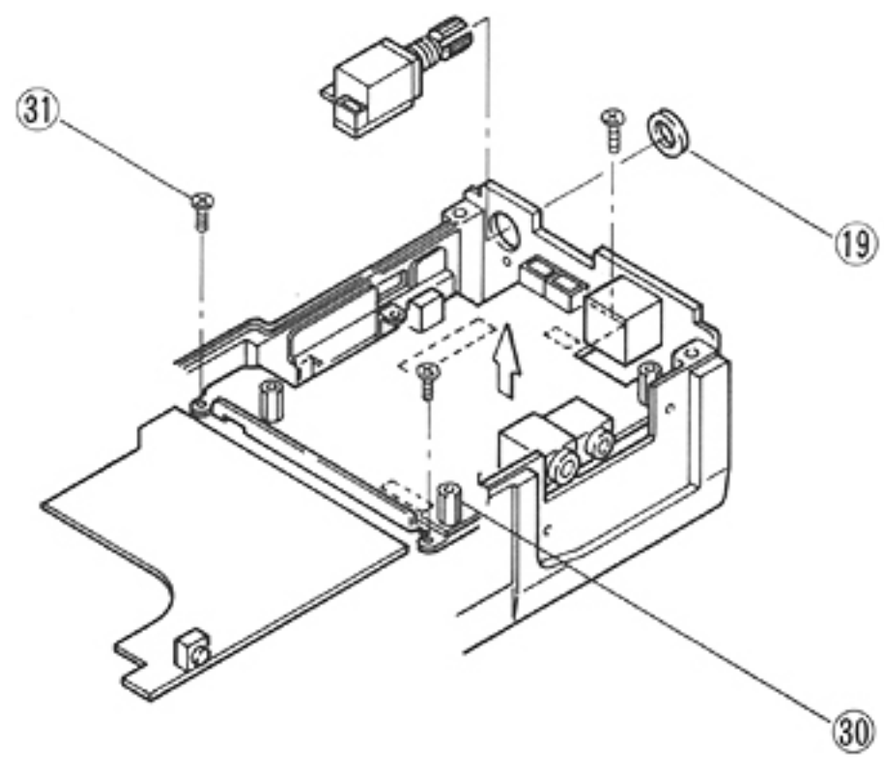
• **TOP PANEL**



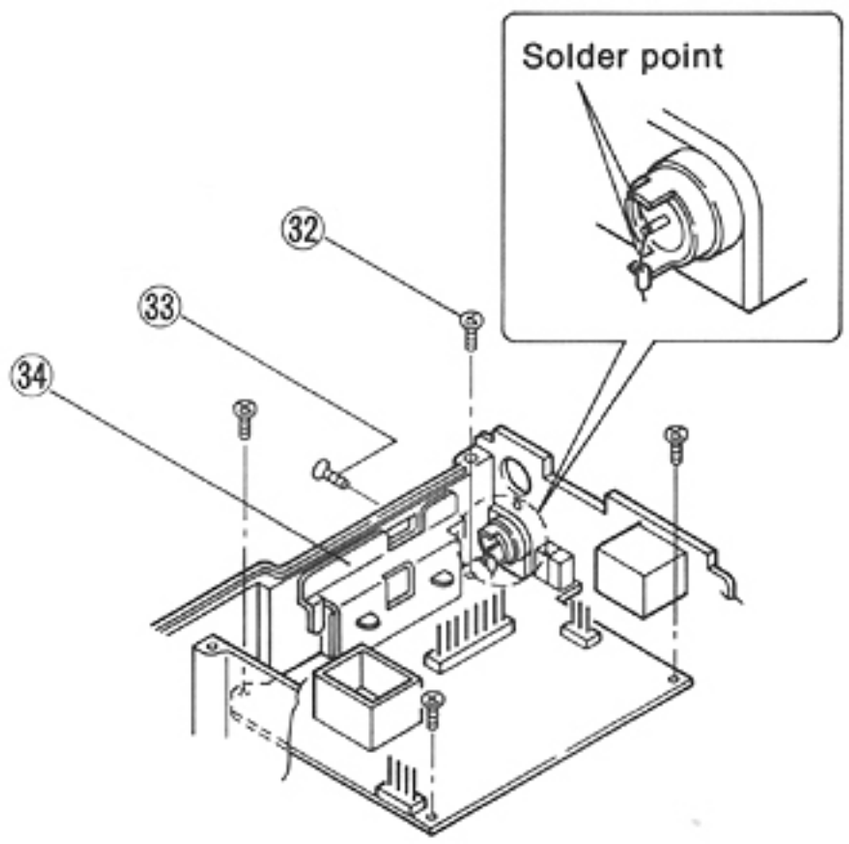
• LOGIC UNIT



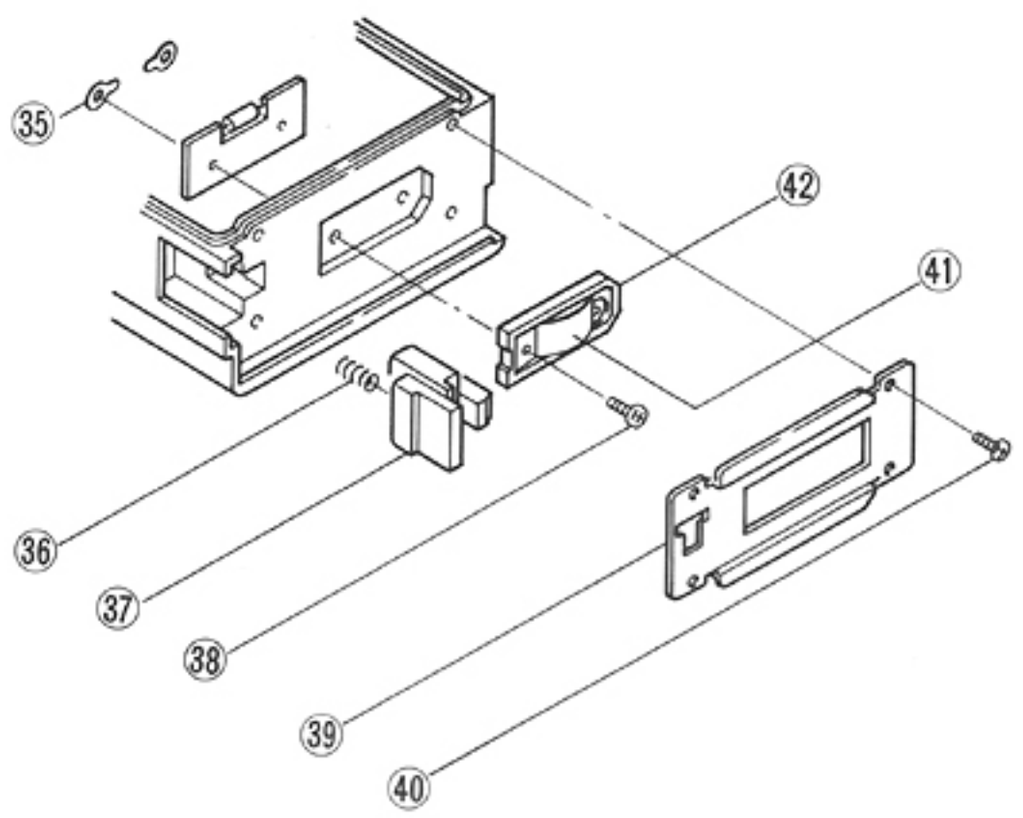
• MAIN UNIT



• RF UNIT



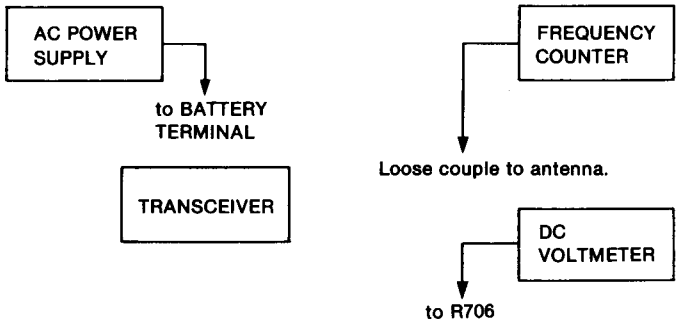
• CONTACT HOLDER



NOTE:
The battery pack can not be disassembled.

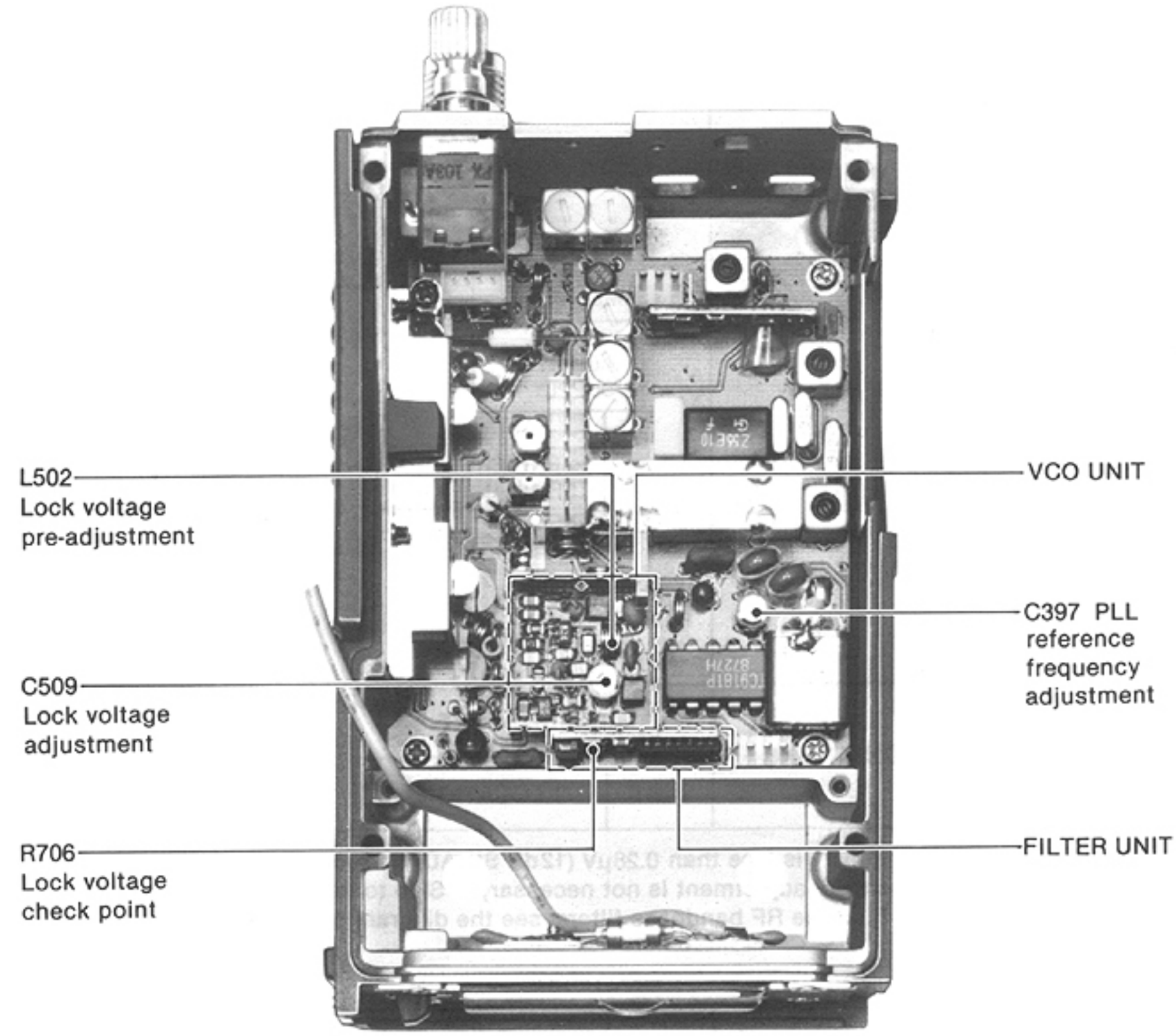
SECTION 6 ADJUSTMENT PROCEDURES

6-1 PLL ADJUSTMENT

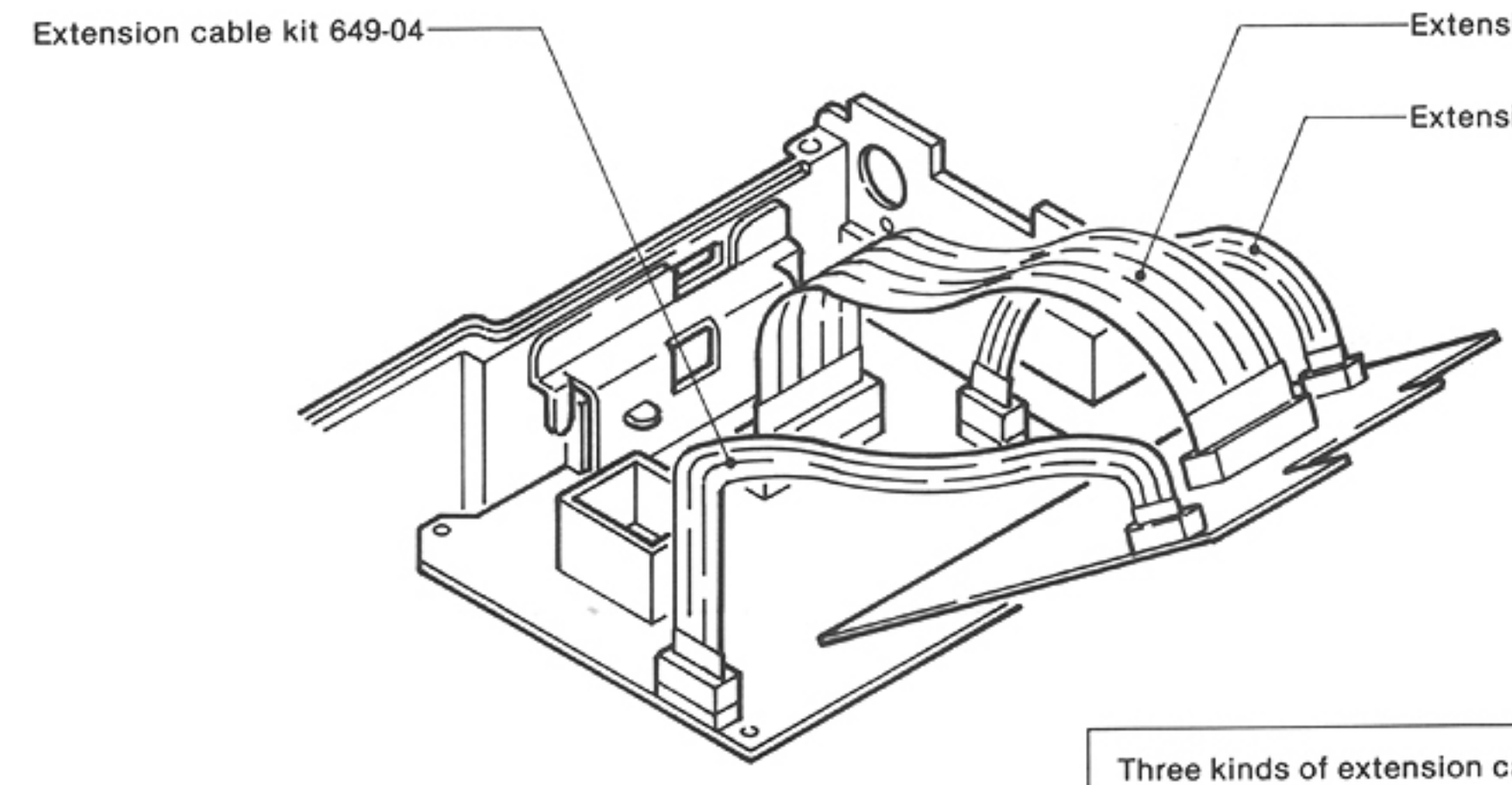
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 3A or more (2) FREQUENCY COUNTER • Frequency range : 0.1~480MHz • Frequency accuracy : ±1ppm or better • Sensitivity : 100mV or better (3) DC VOLTMETER • Input impedance : 50kΩ/DC or better	

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
PLL REFERENCE FREQUENCY	1	• Select any channel. • Transmitting • Connect an antenna.	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	C397
LOCK VOLTAGE		NOTE: Lock voltage affects the C/N ratio. If you adjust the lock voltage, set the frequency with the EX-704.					
	1	• Operating frequency: 450.0000MHz • Receiving	FILTER	Connect the DC voltmeter to R706.	1.2V	VCO	C509
	2	• Transmitting			1.2~2.8V		Verify
LOCK VOLTAGE PRE-ADJUST-MENT		NOTE: When replacing L502, the following pre-adjustment is necessary.					
	1	• Operating frequency: 450.0000MHz • Receiving	FILTER	Connect the DC voltmeter to R706.	Maximum	VCO	C509
	2	• Same as above.			1.8~2.2V 		L502
	3	• Readjust LOCK VOLTAGE as above from step 1.					

RF UNIT

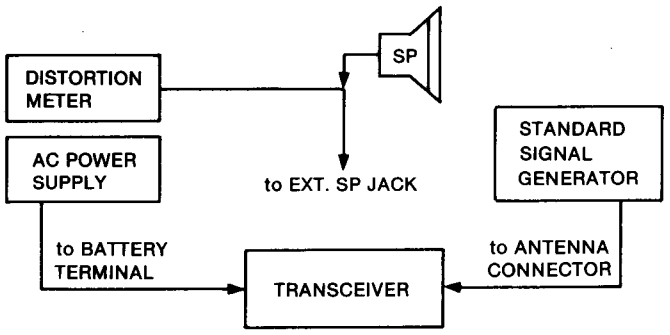


RF AND MAIN UNITS SEPARATION



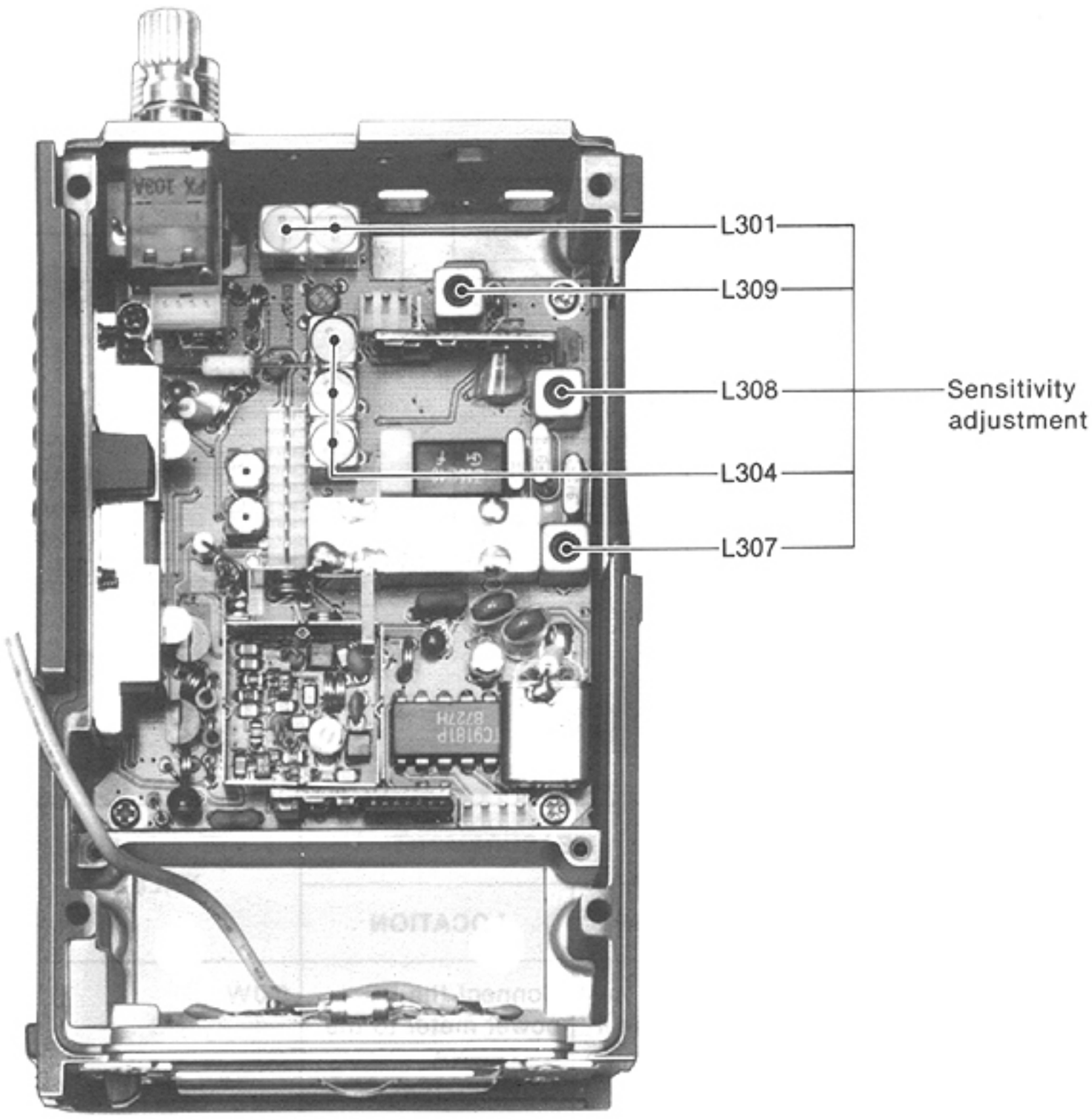
Three kinds of extension cable kit are available for fixing the RF UNIT.
Order the extension cable kit from an authorized Icom Dealer.

6-2 RECEIVER ADJUSTMENT

TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 3A or more (2) STANDARD SIGNAL GENERATOR (SSG) • Frequency range : 0.1~480MHz • Output level : −127~−17dBm (0.1μV~32mV) (3) DISTORTION METER • Frequency range : 1kHz±10Hz • Measuring range : 1~100% (4) EXTERNAL SPEAKER • Impedance : 8Ω	

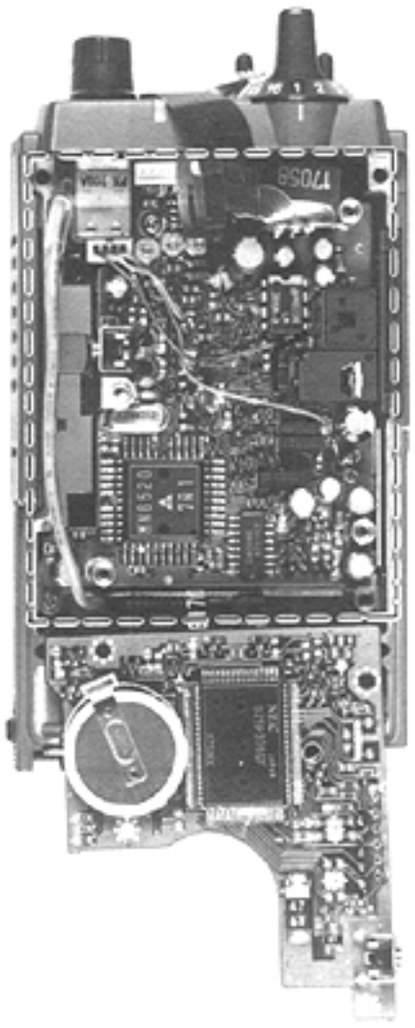
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY		NOTE: When the sensitivity is less than 0.28μV (12dB SINAD) on every channel, the following sensitivity adjustment is not necessary. Skip to squelch adjustment below. To adjust the RF bandpass filters, see the diagram on p. 6-2.					
	1	• Operating frequency: Center of the frequency edge. • Receiving • Apply an RF signal to the ANTENNA CONNECTOR. Level: −116dBm (0.35μV) Mod.: 1kHz Dev. : ±3.5kHz • MONITOR SWITCH: ON	Side panel	Connect the distortion meter with an 8Ω load to the EXT. SP JACK.	Minimum distortion level	RF	L301 L304 L307 L308 L309
SQUELCH		NOTE: Before squelch adjustment, be sure that the sensitivity on every channel are less than 0.28μV (12dB SINAD).					
	1	• Apply an RF signal to ANTENNA CONNECTOR: Level: −120dBm (0.22μV) Mod.: 1kHz Dev. : ±3.5kHz • Turn R160 max. counterclockwise.	Front panel	Speaker	Squelch threshold point	MAIN	R160

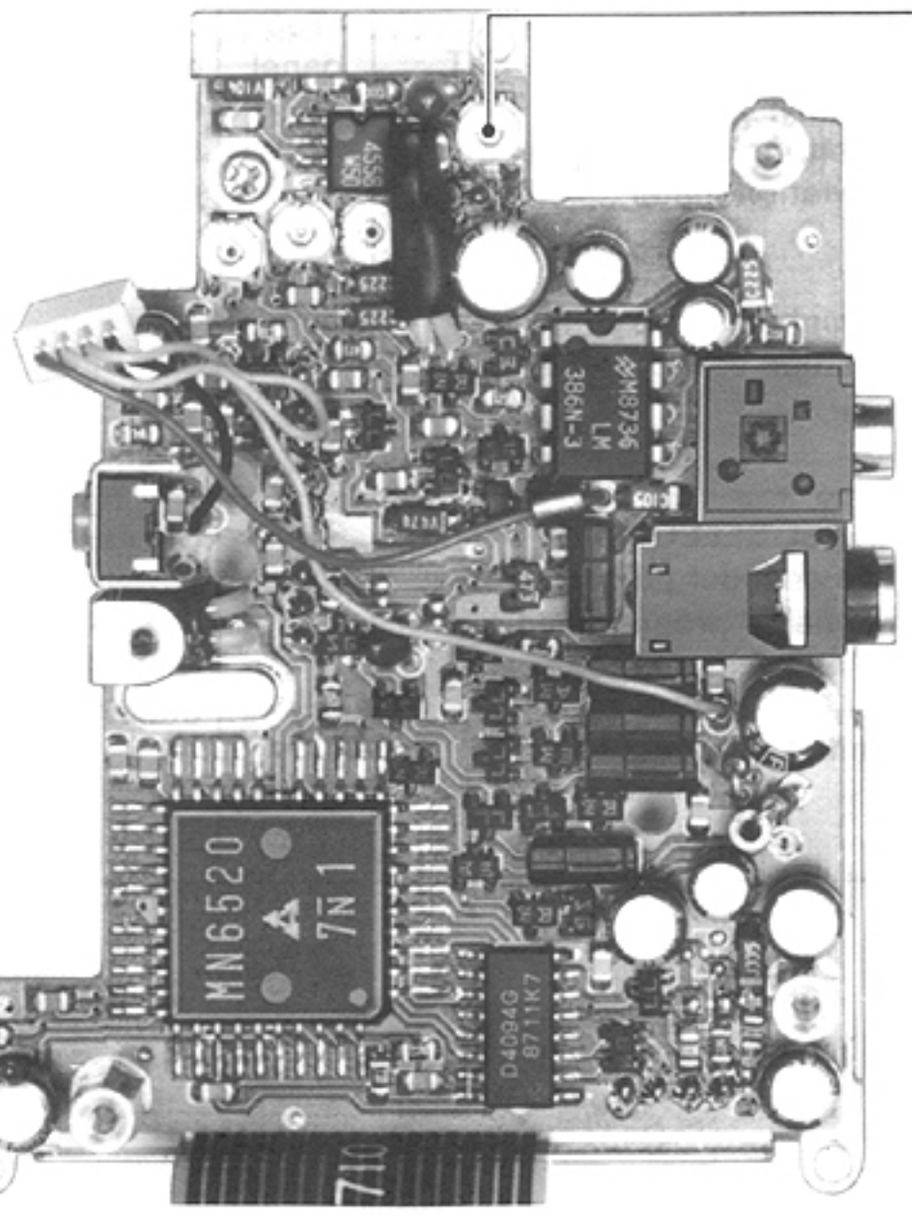
RF UNIT



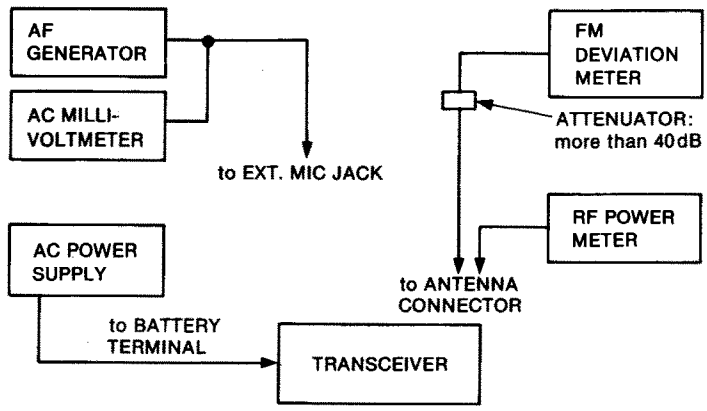
MAIN UNIT

UNIT LOCATION



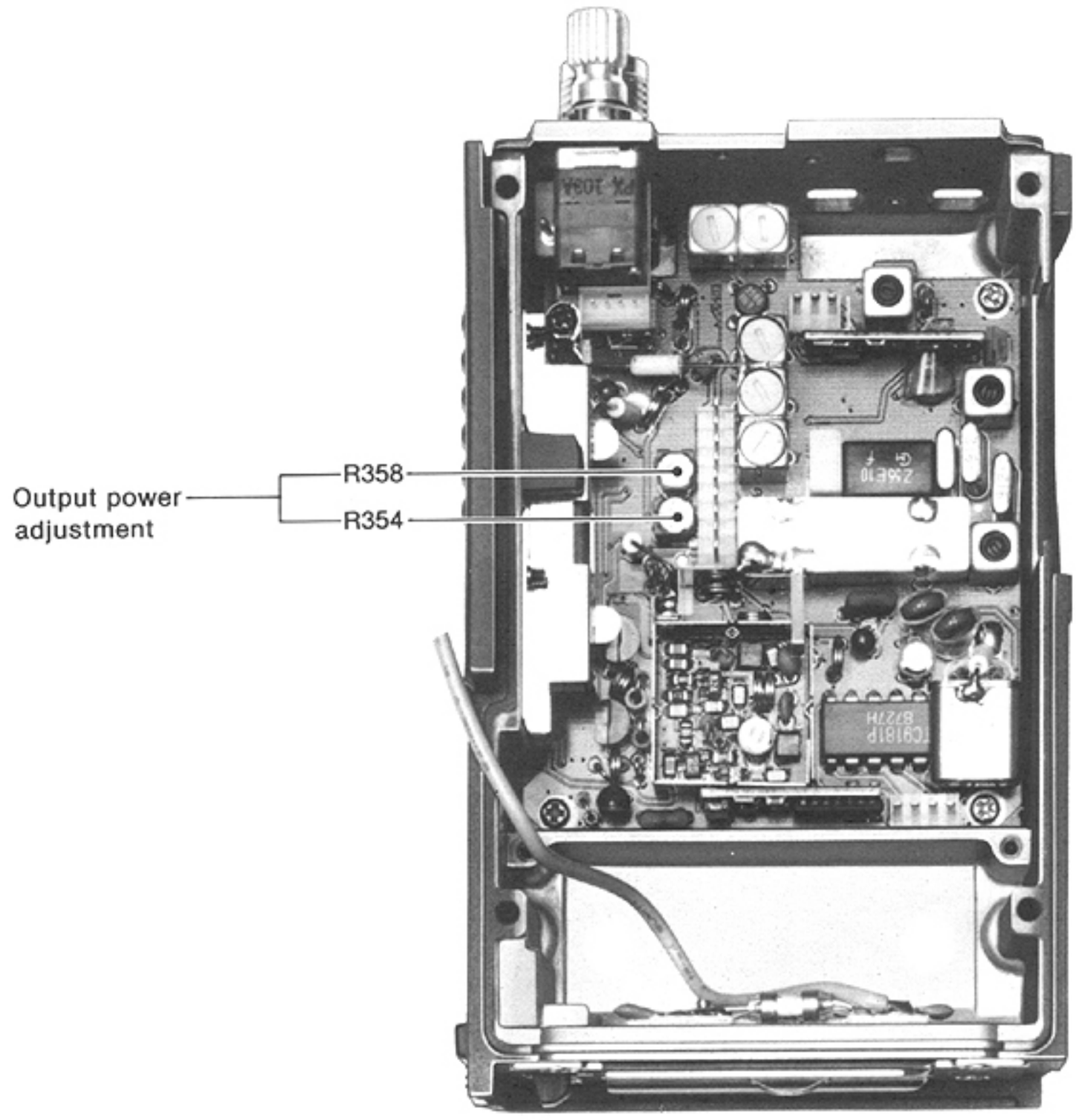


6-3 TRANSMITTER ADJUSTMENT

TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 3A or more (2) RF POWER METER (TERMINATED TYPE) • Measuring range : 1~10W • Frequency range : 440~480MHz • Impedance : 50Ω • SWR : Less than 1.2:1 (3) AF GENERATOR (AG) • Frequency range : 200~2000Hz • Output level : 0~200mV (4) AC MILLI-VOLTMETER • Measuring range : 2~200mV (5) FM DEVIATION METER • Frequency minimum : 480MHz • Measuring range : 0~±5kHz	

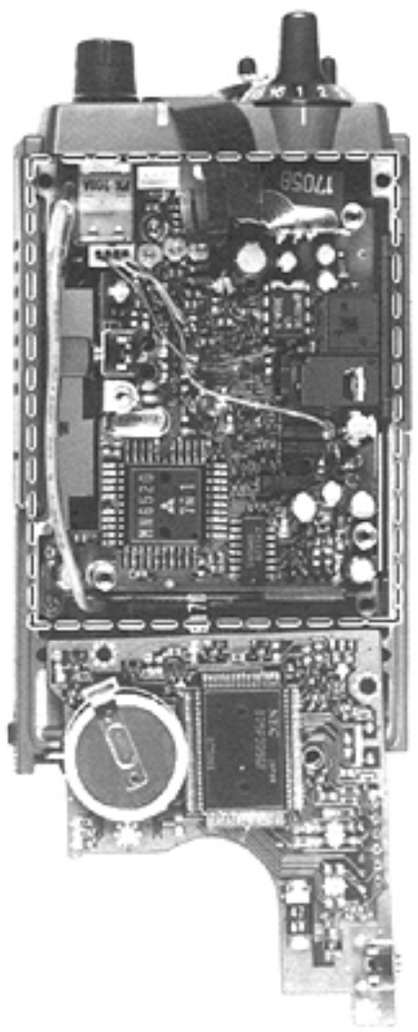
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	• Select any channel. • Transmitting	Top panel	Connect the RF power meter to the ANTENNA CONNECTOR.	5.0W	RF	R354
	2	• CHANNEL SELECTOR: Low power channel, if programmed.			1.5W		R358
DEVIATION	1	• Select any channel • Apply an AF signal to the EXT. MIC JACK: 1kHz/170mV • Transmitting • FM deviation meter HPF : OFF LPF : 20kHz Deemphasis : OFF Deviation sense: P-P/2	Top panel	Connect the FM deviation meter to the ANTENNA CONNECTOR via the attenuator.	±4.2kHz	MAIN	R116
CTCSS DEVIATION	1	• CHANNEL SELECTOR: Tone encoder programmed channel, if programmed. • Apply no AF signal to the EXT. MIC JACK. • Tranmitting	Top panel	Connect the FM deviation meter to the ANTENNA CONNECTOR via the attenuator.	±0.75kHz	MAIN	R118

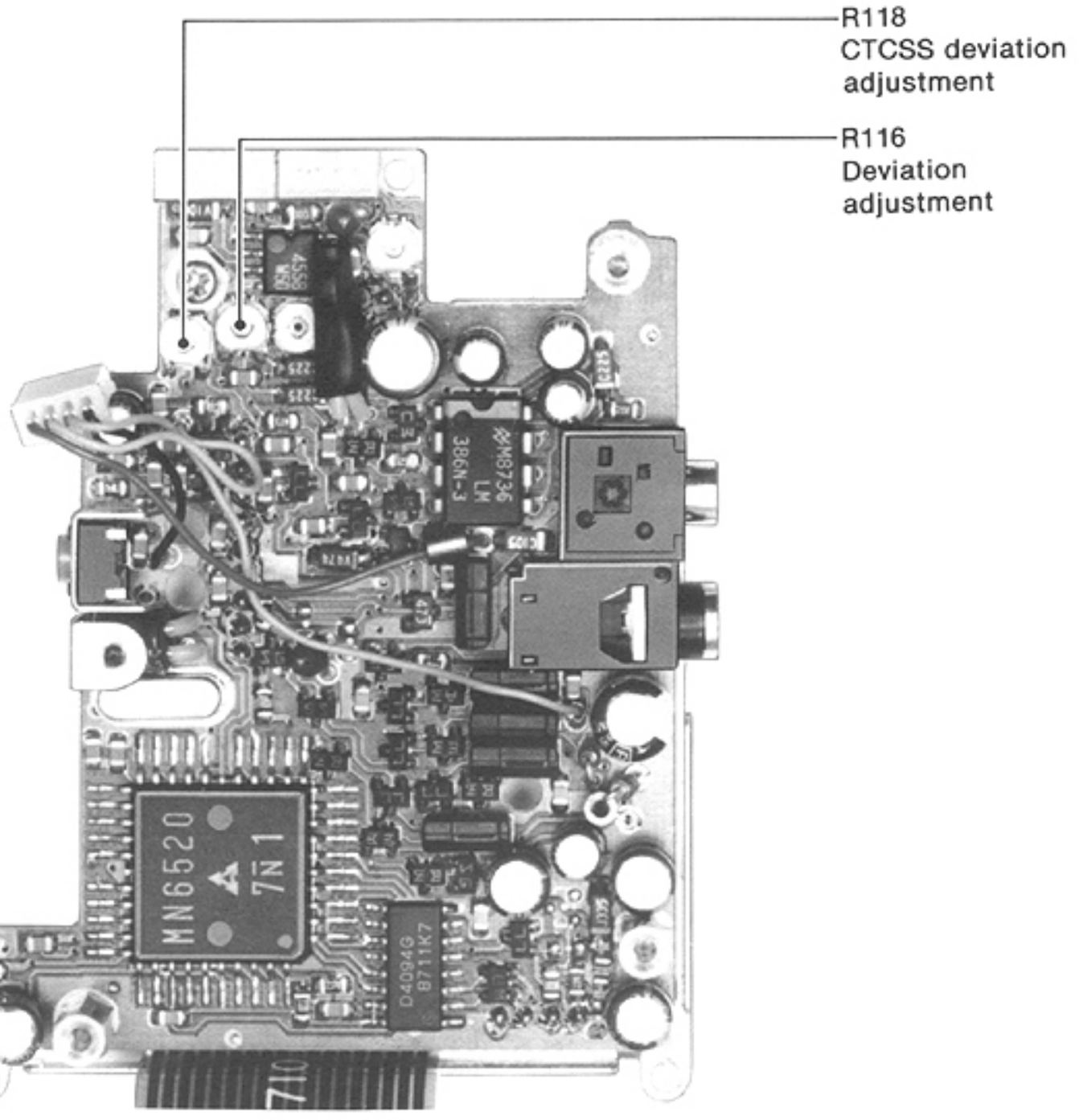
RF UNIT



MAIN UNIT

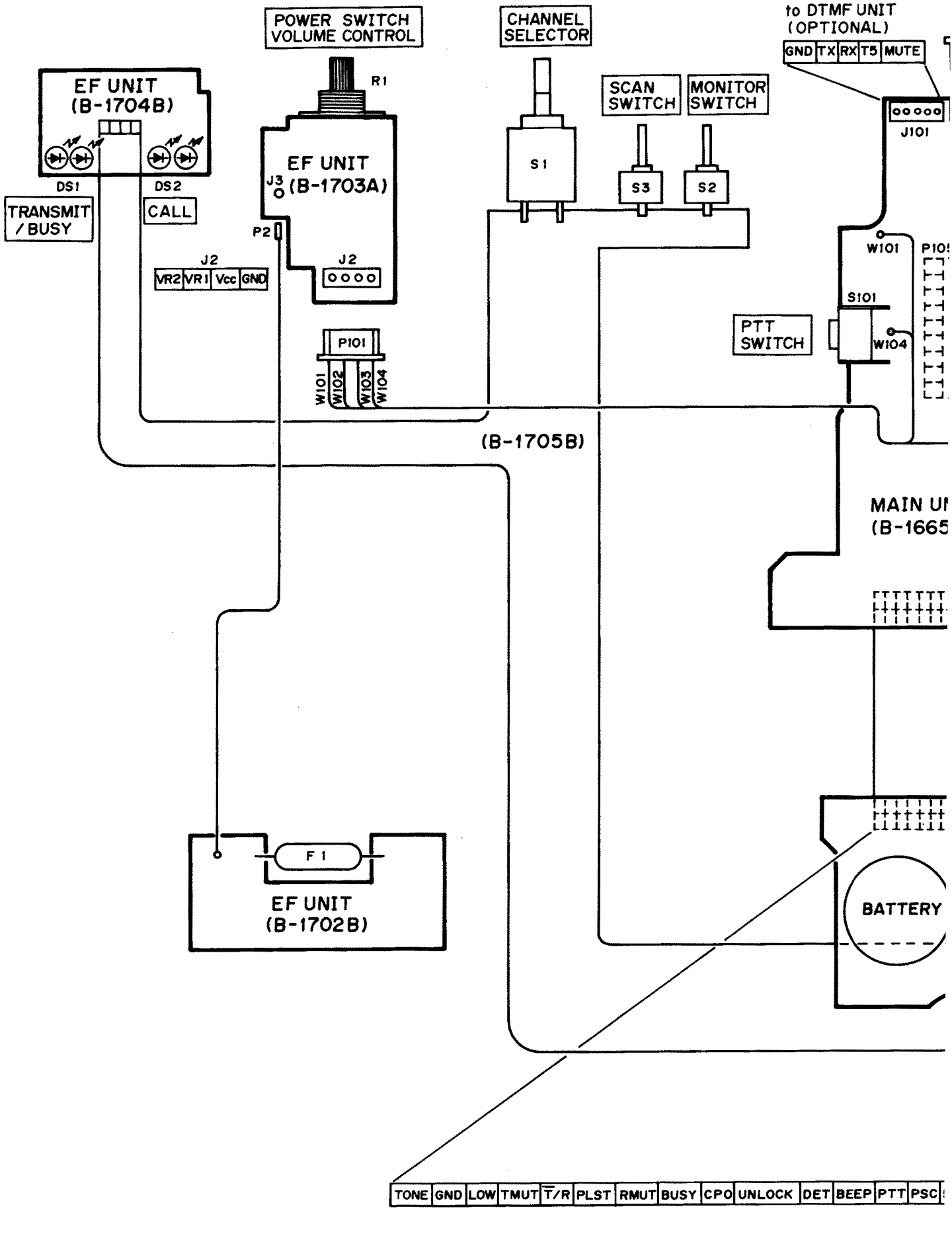
UNIT LOCATION

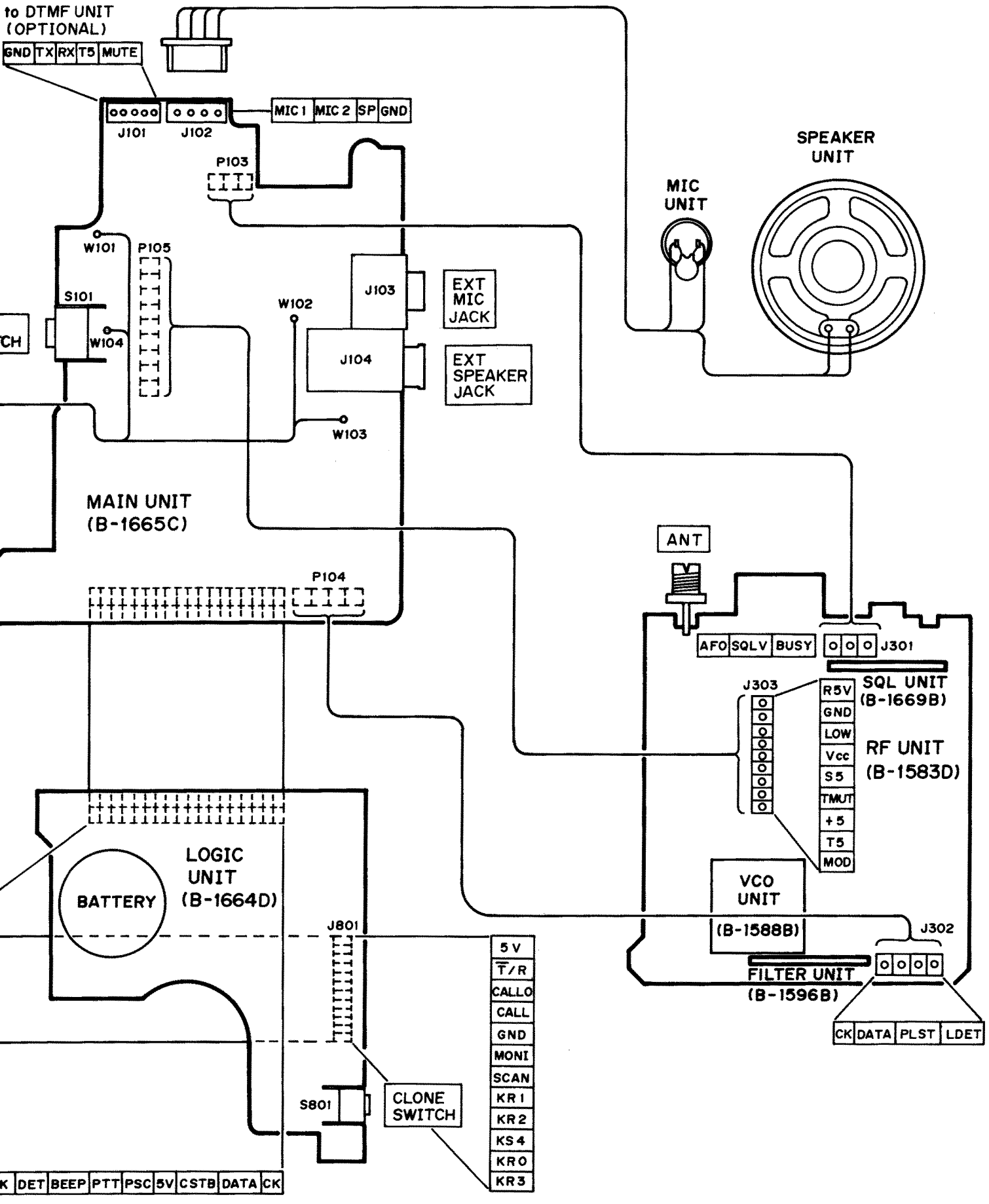




SECTION 7 BOARD LAYOUTS

7-1 INTERCONNECTION

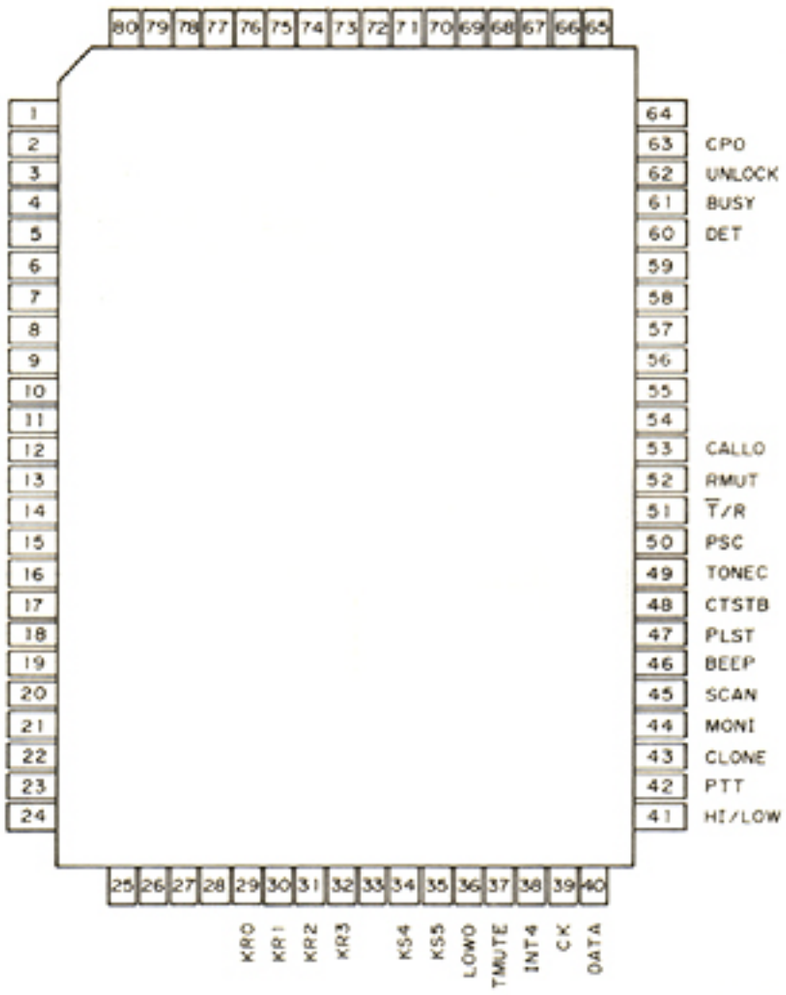



to DTMF UNIT
(OPTIONAL)
GND TX RX T5 MUTE
J101
J102
MIC 1 MIC 2 SP GND
P103
W101
P105
S101
W104
W102
J103
J104
EXT
MIC
JACK
EXT
SPEAKER
JACK
W103
MIC
UNIT
SPEAKER
UNIT
MAIN UNIT
(B-1665C)
P104
ANT
AFO SQLV BUSY
J301
J303
R5V
GND
LOW
Vcc
S5
TMUT
+5
T5
MOD
SQL UNIT
(B-1669B)
RF UNIT
(B-1583D)
LOGIC
UNIT
(B-1664D)
BATTERY
VCO
UNIT
(B-1588B)
J801
J302
FILTER UNIT
(B-1596B)
5V
T/R
CALLO
CALL
GND
MONI
SCAN
KR1
KR2
KS4
KR0
KR3
S801
CLONE
SWITCH
CK DATA PLST LDET
K DET BEEP PTT PSC 5V CSTB DATA CK

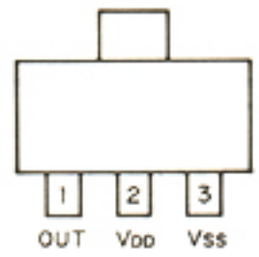
7-2 LOGIC AND EF UNITS

• LOGIC UNIT

µPD75306GF-015-3B9 IC801
(CPU)

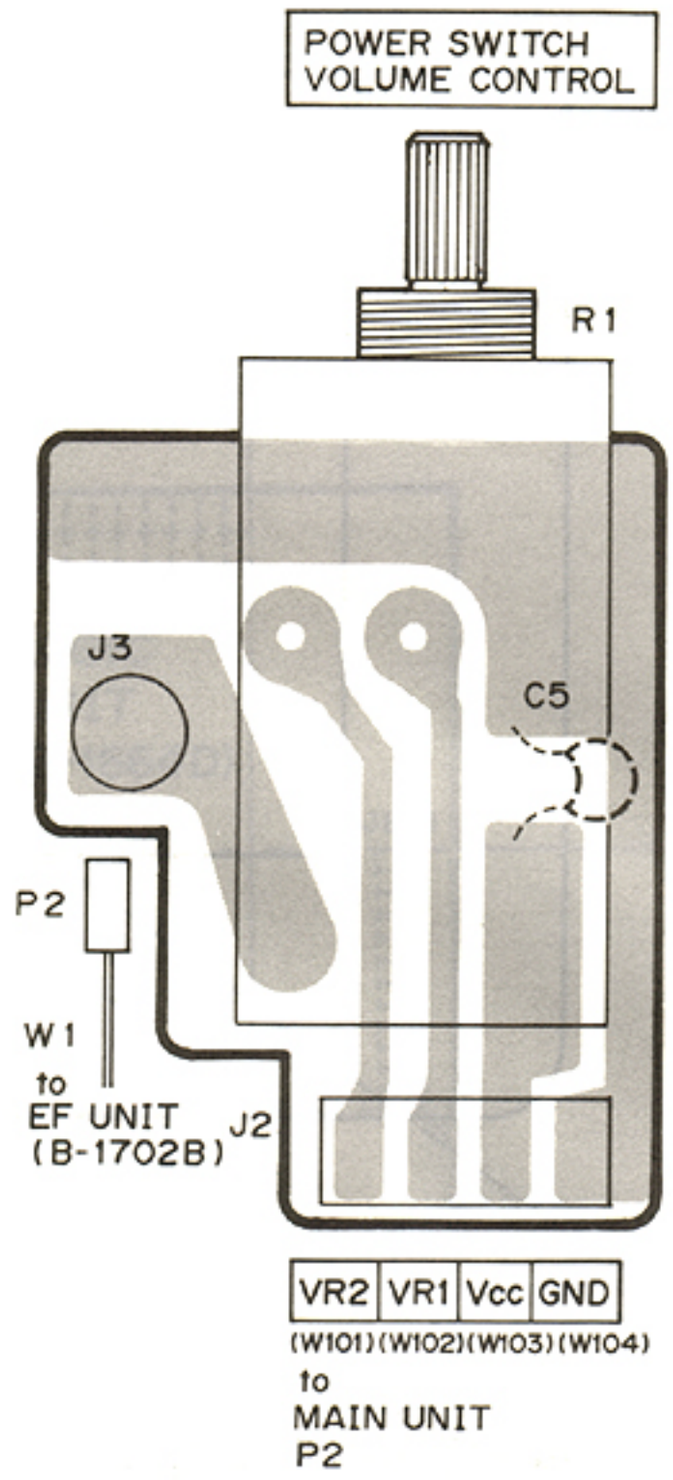


S-8054ALB-LM-T IC802
(RESET)

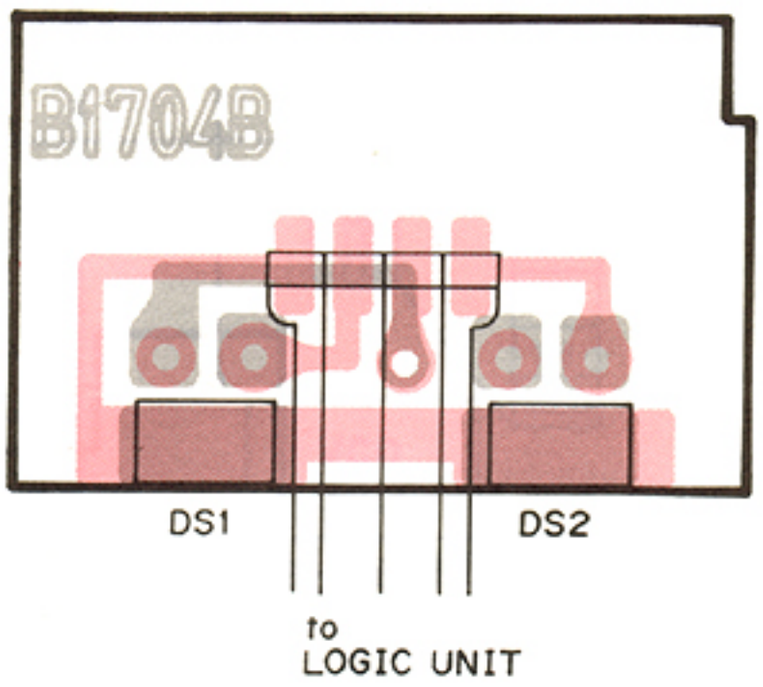


• EF UNIT

VOL

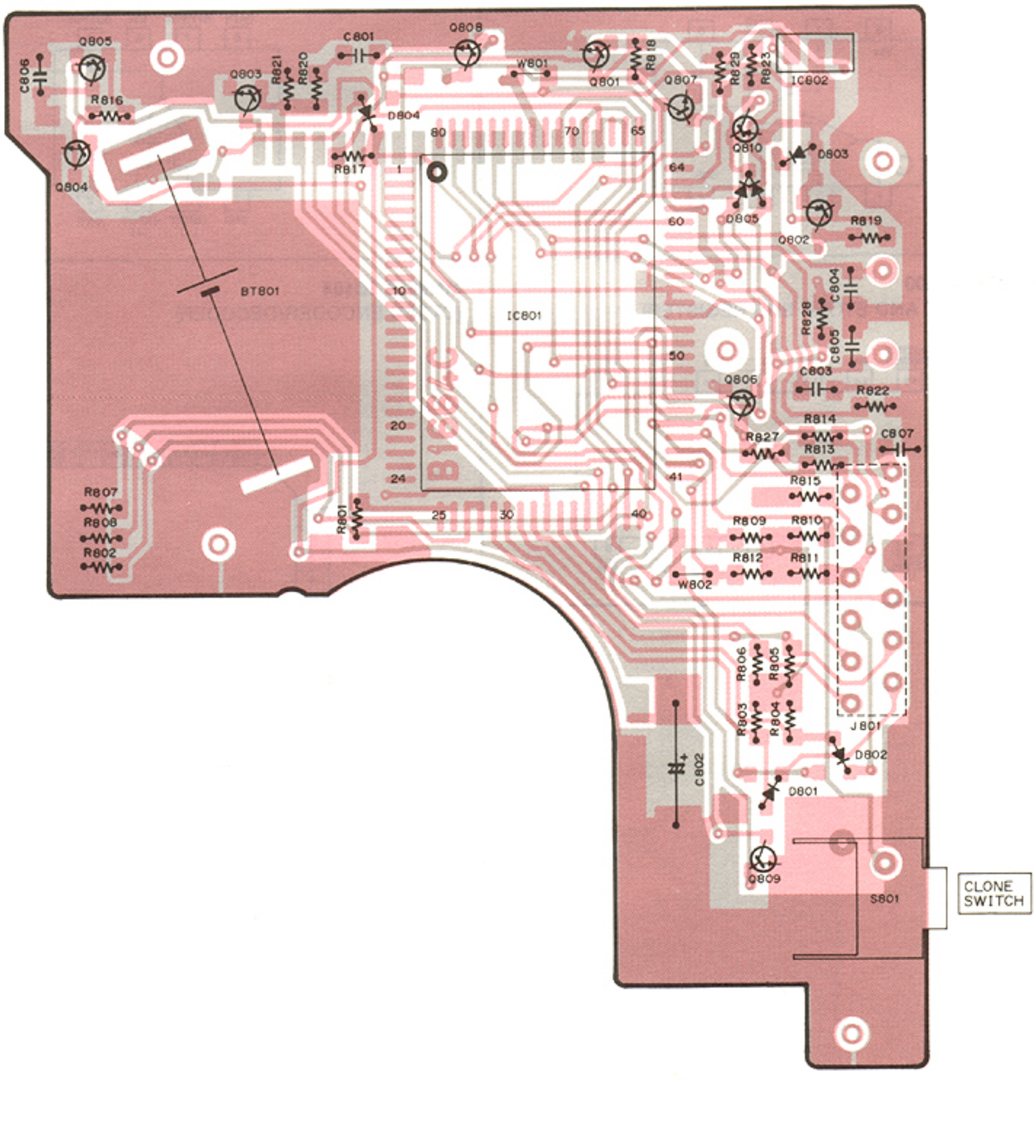


LED

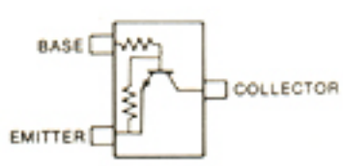


• LOGIC UNIT

COMPONENTS SIDE

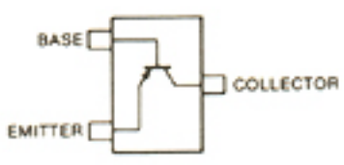


2SC3395
Q801, Q804
Q806, Q807
Q808, Q809



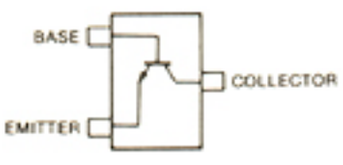
Symbol: BY

2SA1362 GR
Q802



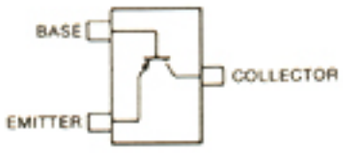
Symbol: AEG

2SC2712 BL
Q803



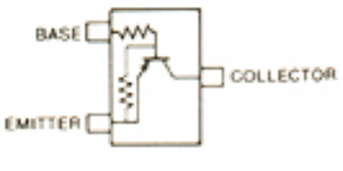
Symbol: LL

2SA1162 GR
Q805



Symbol: SY

2SA1341 GR
Q810

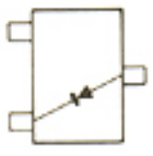


Symbol: BL

1SS187
D801

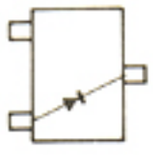
Symbol: D3

1SS190
D802



Symbol: E3

1SS196
D803, D804

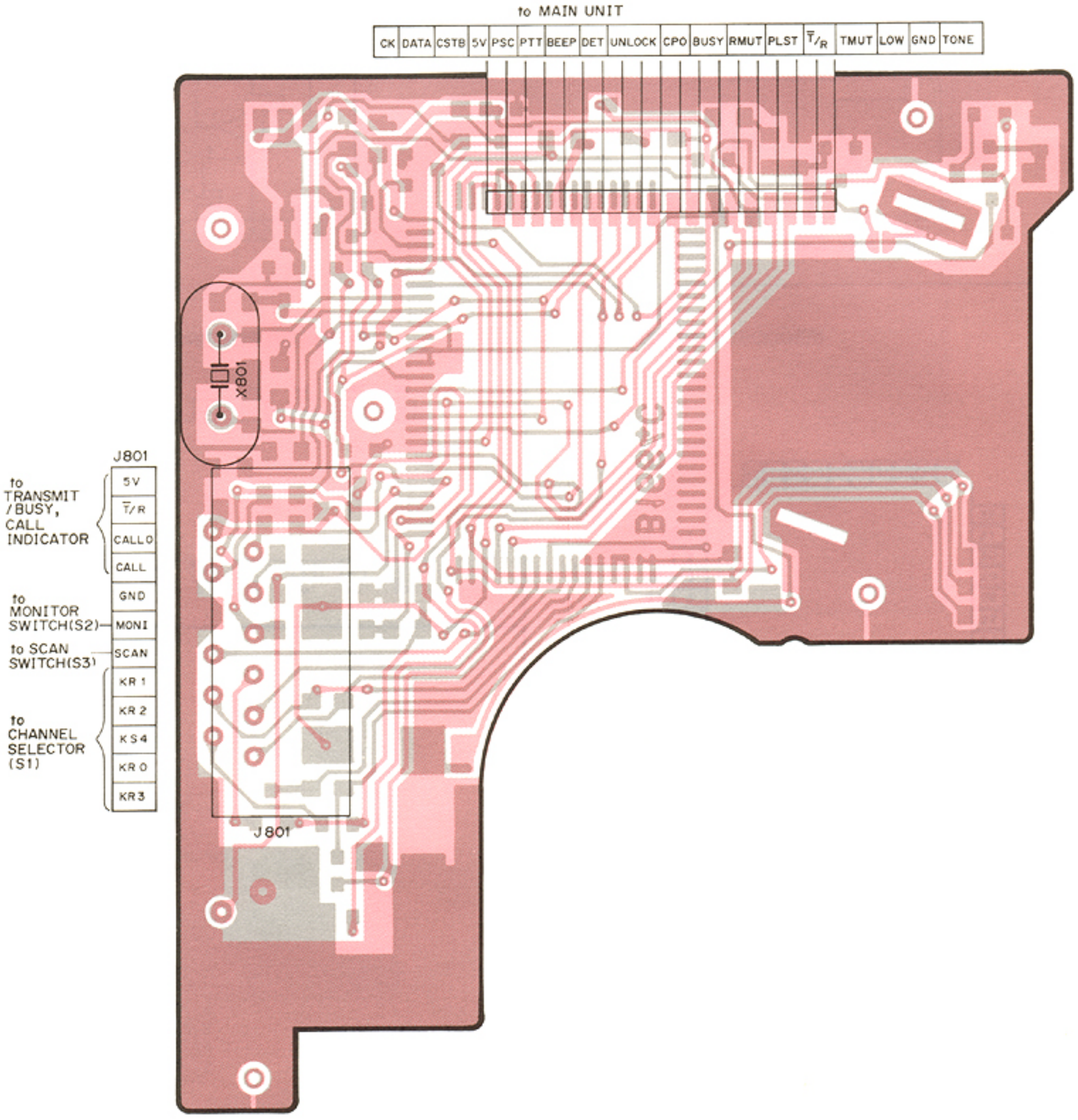


Symbol: G3

1SS184
D805

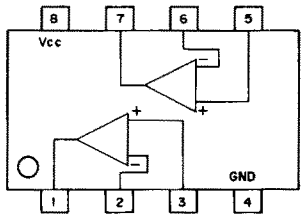
Symbol: B3

FOIL SIDE

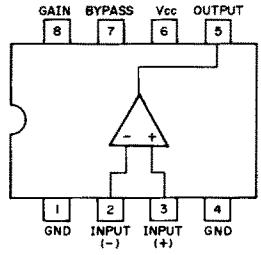

to MAIN UNIT
CK
DATA
CSTB
5V
PSC
PTT
BEEP
DET
UNLOCK
CPO
BUSY
RMUT
PLST
T/R
TMUT
LOW
GND
TONE
X801
J801
to TRANSMIT /BUSY, CALL INDICATOR
5V
T/R
CALL0
CALL
to MONITOR SWITCH(S2)
GND
MONI
to SCAN SWITCH(S3)
SCAN
to CHANNEL SELECTOR (S1)
KR1
KR2
KS4
KR0
KR3
J801

7-3 MAIN UNIT

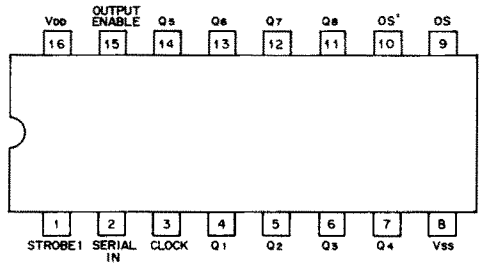
BA4558F IC101
(LOW NOISE DUAL AMPLIFIER)



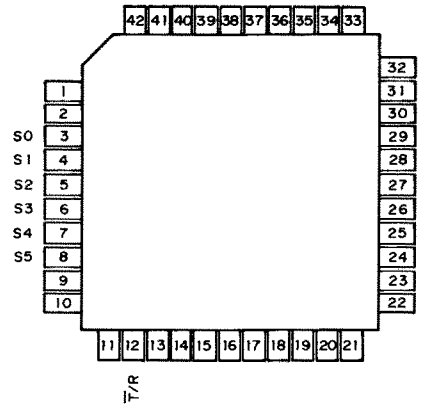
LM386N-3 IC102
(AUDIO POWER AMPLIFIER)



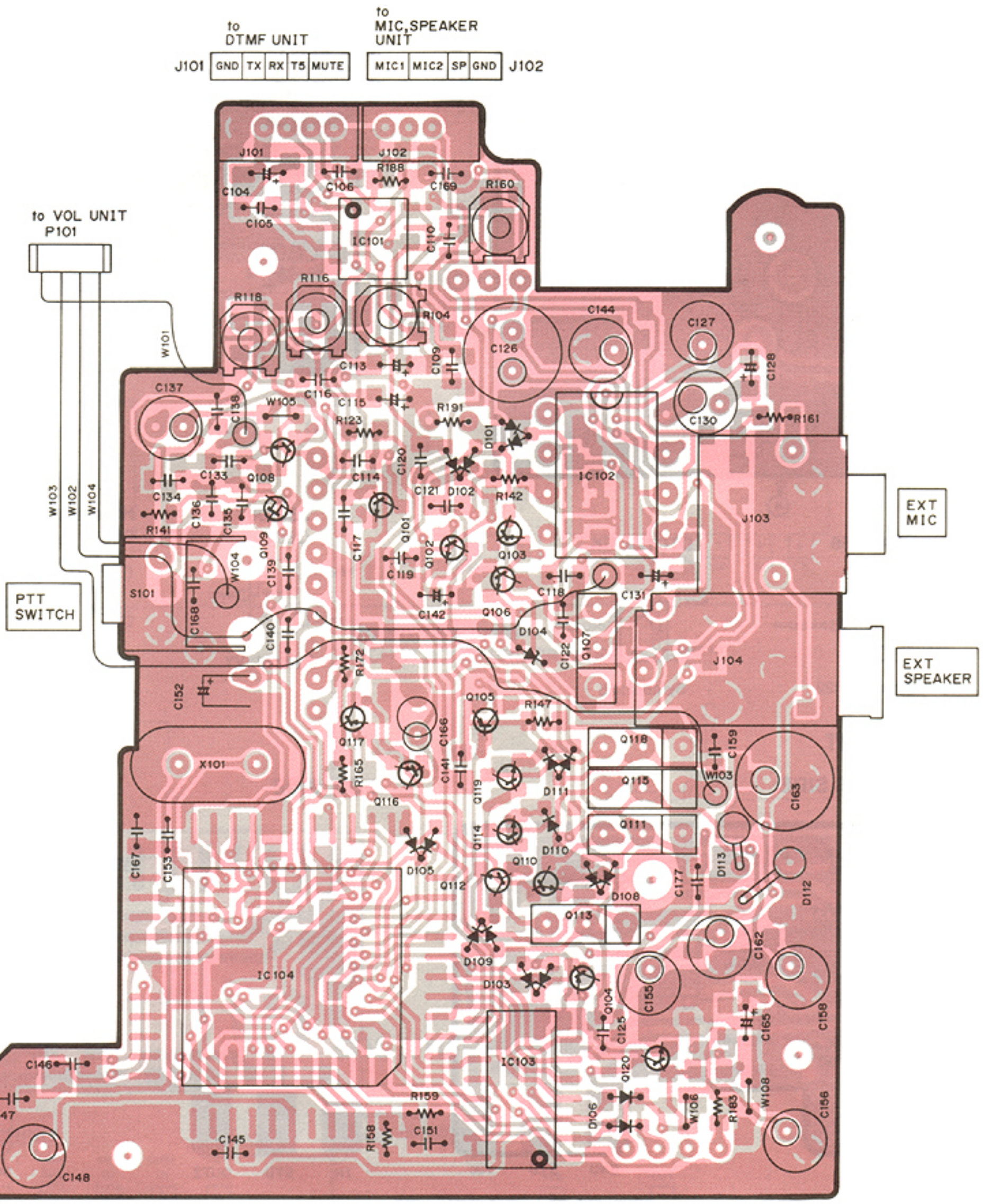
μPD4094BG IC103
(8-STAGE SHIFT AND STORE BUS REGISTER)



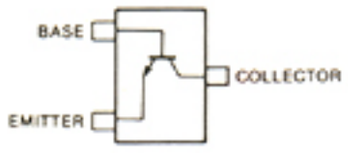
MN6520 IC104
(CTCSS ENCODER/DECODER)



COMPONENTS SIDE

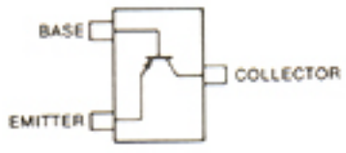


2SC2712 BL
Q101, Q102
Q106, Q108
Q110, Q112
Q114, Q119
Q120



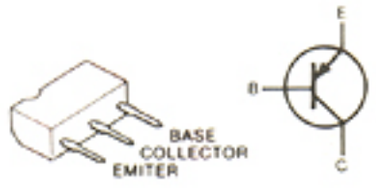
Symbol: LL

2SA1162 GR
Q103, Q104
Q105, Q116
Q117



Symbol: SG

2SB909M R
Q107, Q111
Q113, Q115
Q118



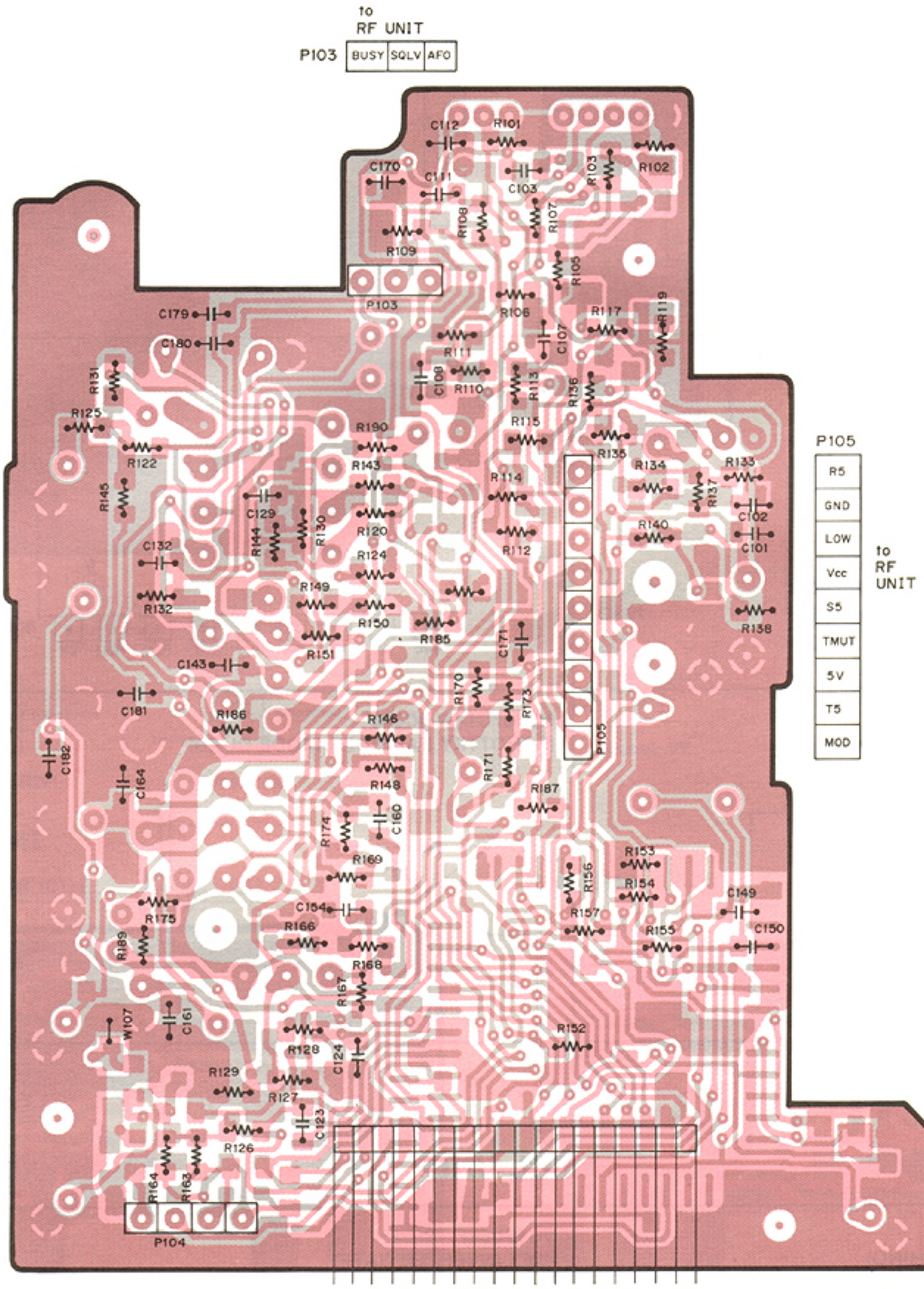
2SJ106 Y
Q109

Symbol: VY

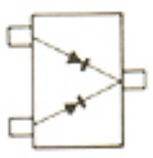
1SS226
D101

Symbol: C3

FOIL SIDE



1SS184
D102, D103
D105, D108
D109

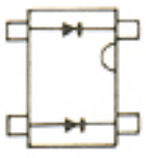


Symbol: B3

RD4.7M B3
D104

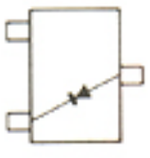
Symbol: 473

DWA010
D106



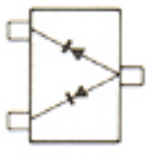
Symbol: W8

1SS190
D110



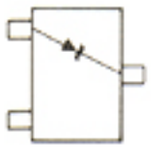
Symbol: E3

1SS181
D111



Symbol: A3

RD5.1JS B2
D112



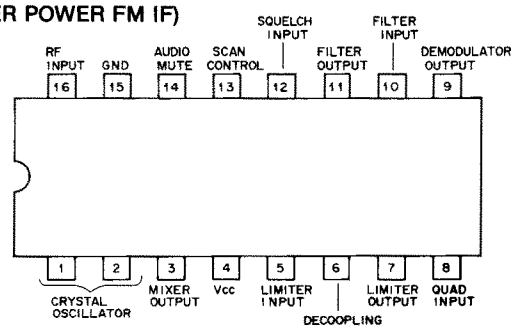
Symbol: 512

RD6.8E B2
D113

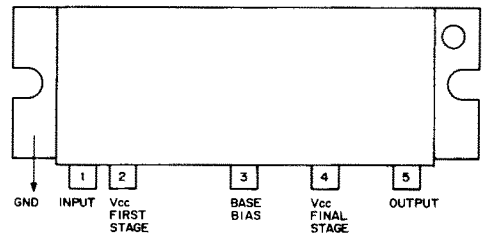
Symbol: 682

7-4 RF UNIT

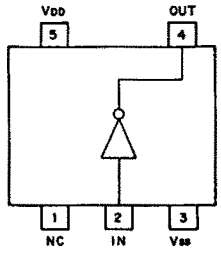
MC3357DR IC301
(LOWER POWER FM IF)



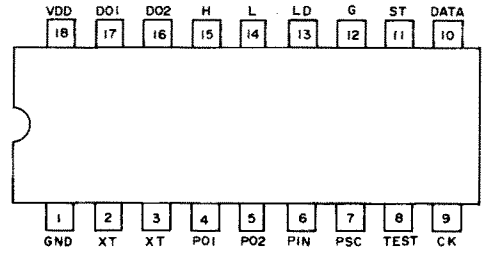
SC-1046 IC302
(POWER MODULE)



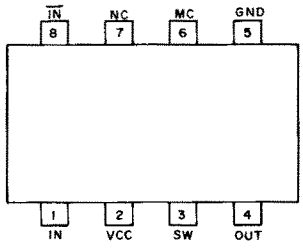
TC4SU69F IC303
(HEX INVERTER GATE)



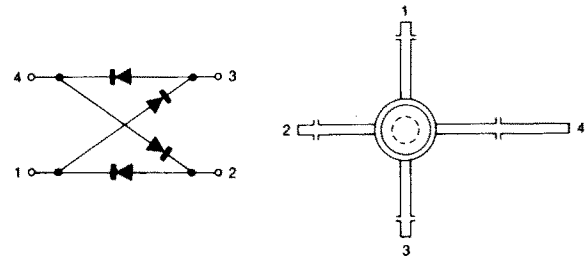
TC9181P IC304
(PROGRAM DIVIDER)



MB504LPF-G-BND IC305
(PRESCALER)

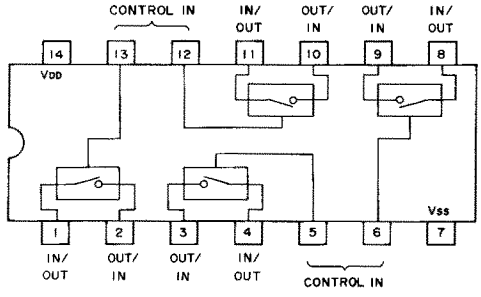


ND487C1-3R IC306
(SCHOTTKY BARRIDER DIODE QUAD)



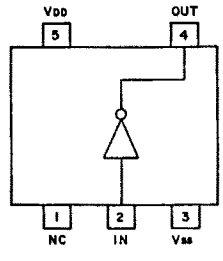
FILTER UNIT

µPD4066BG IC701
(QUAD BILATERAL SWITCHING)



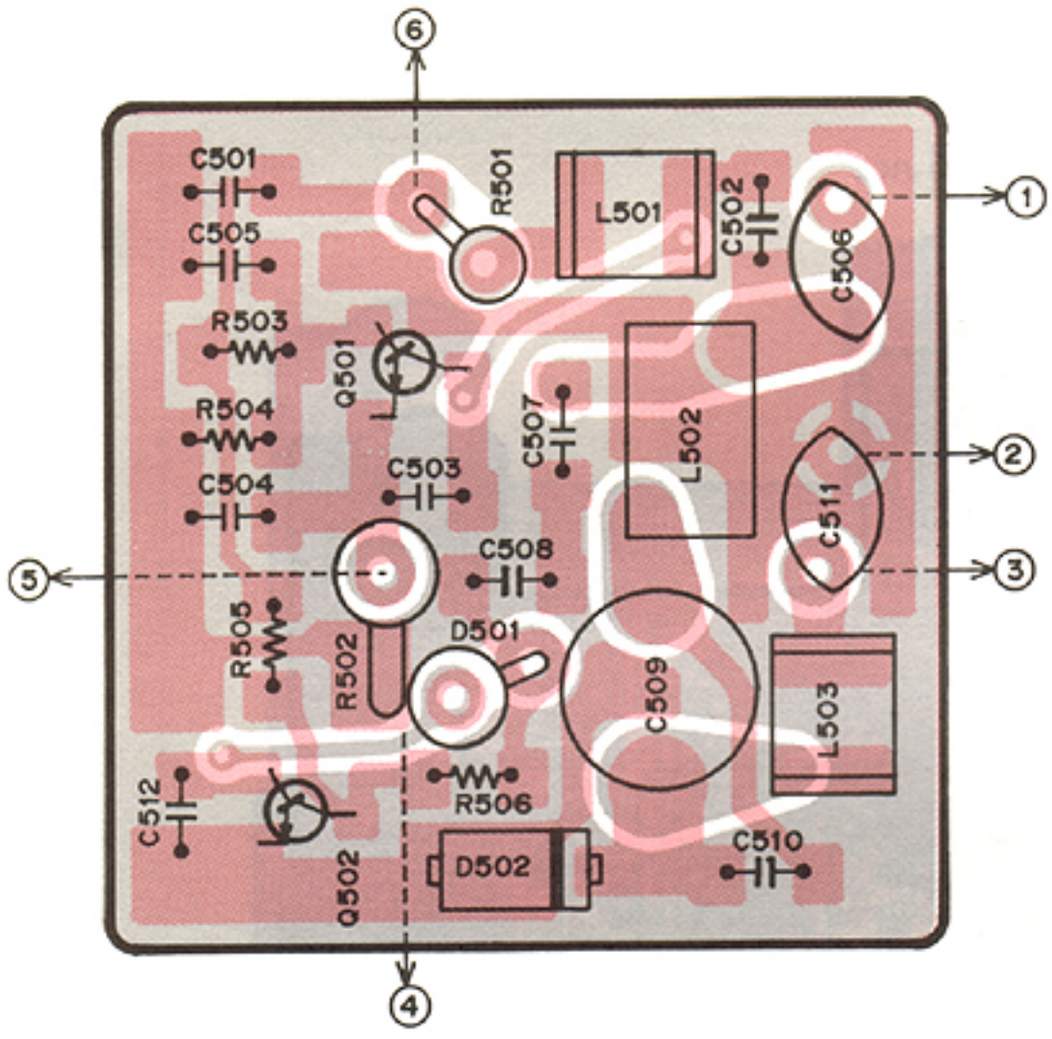
SQL UNIT

TC4SU69F IC601
(HEX INVERTER GATE)

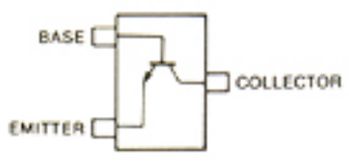


7-4 RF UNIT

• VCO UNIT

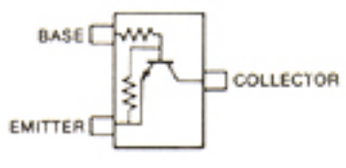


2SC3356
Q501



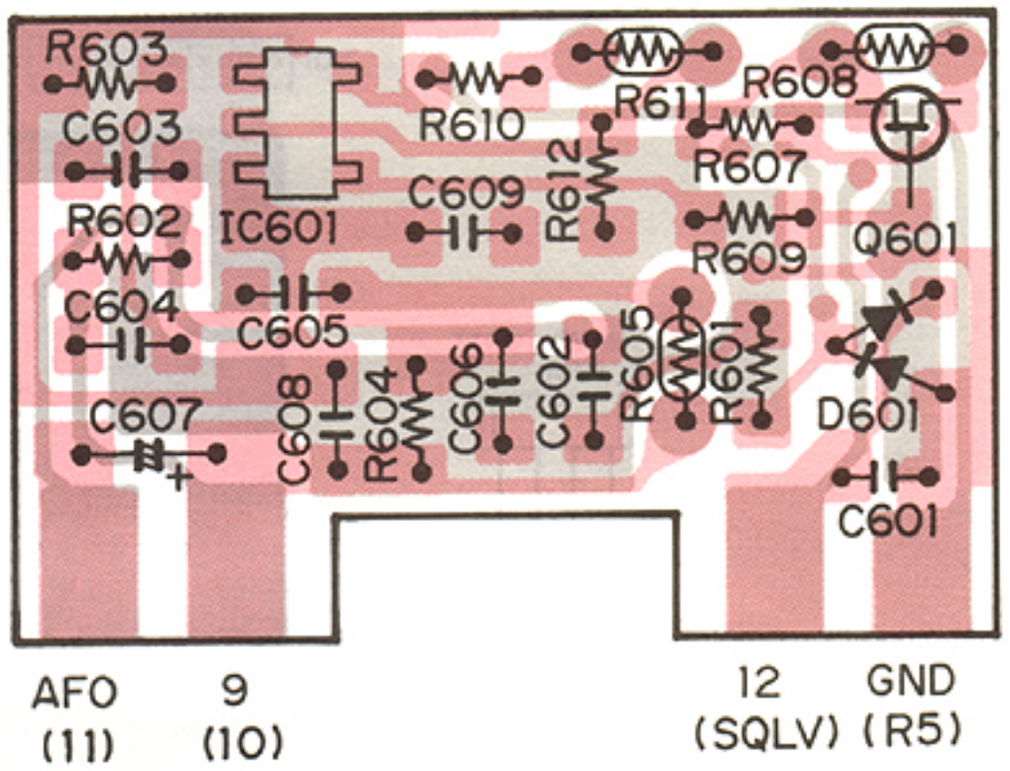
Symbol: R22

DTC124 EK
Q502

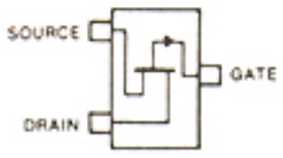


Symbol: 25

• SQL UNIT

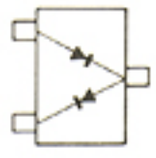


2SJ106Y
Q601



Symbol: VY

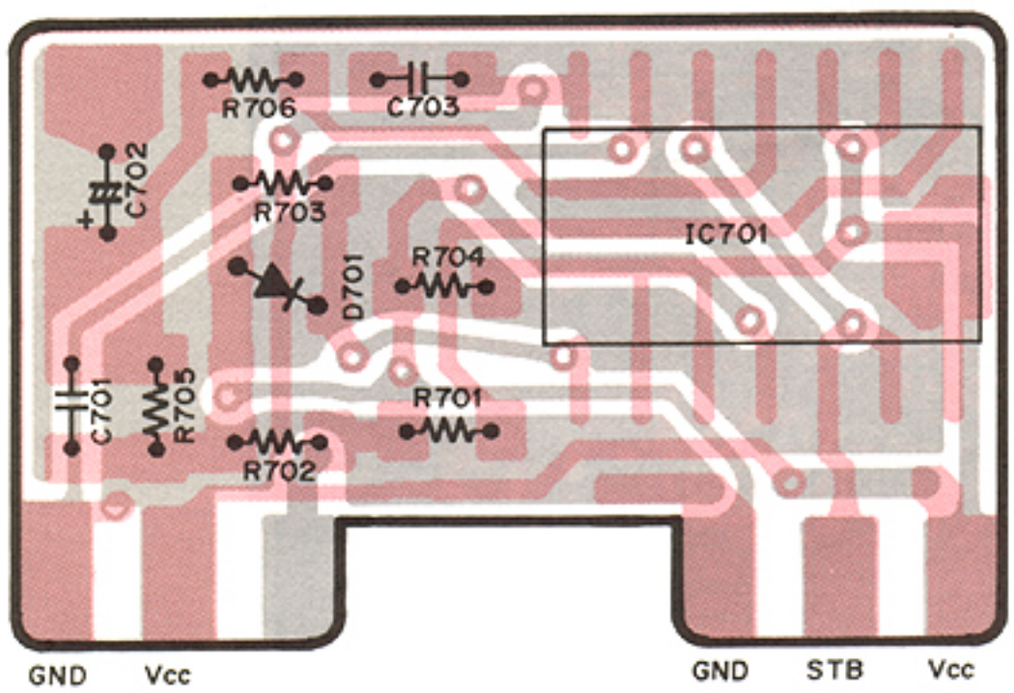
HSM88AS
D601



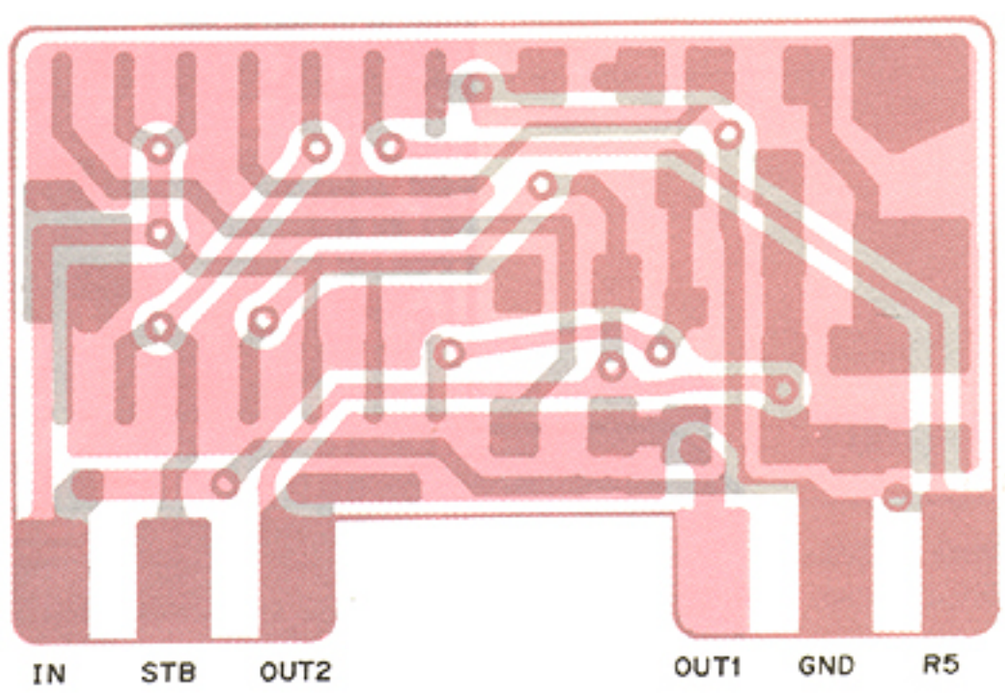
Symbol: C1

• FILTER UNIT

COMPONENTS SIDE



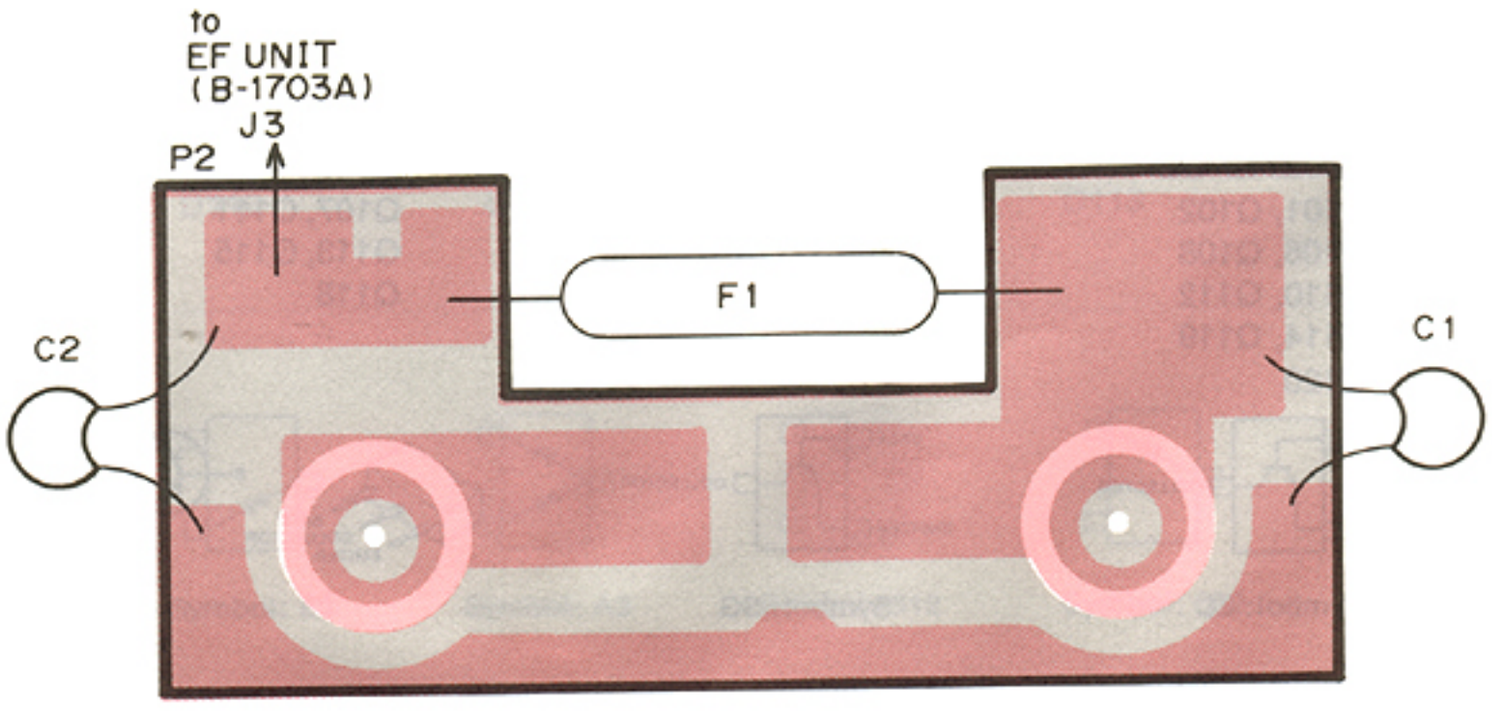
FOIL SIDE



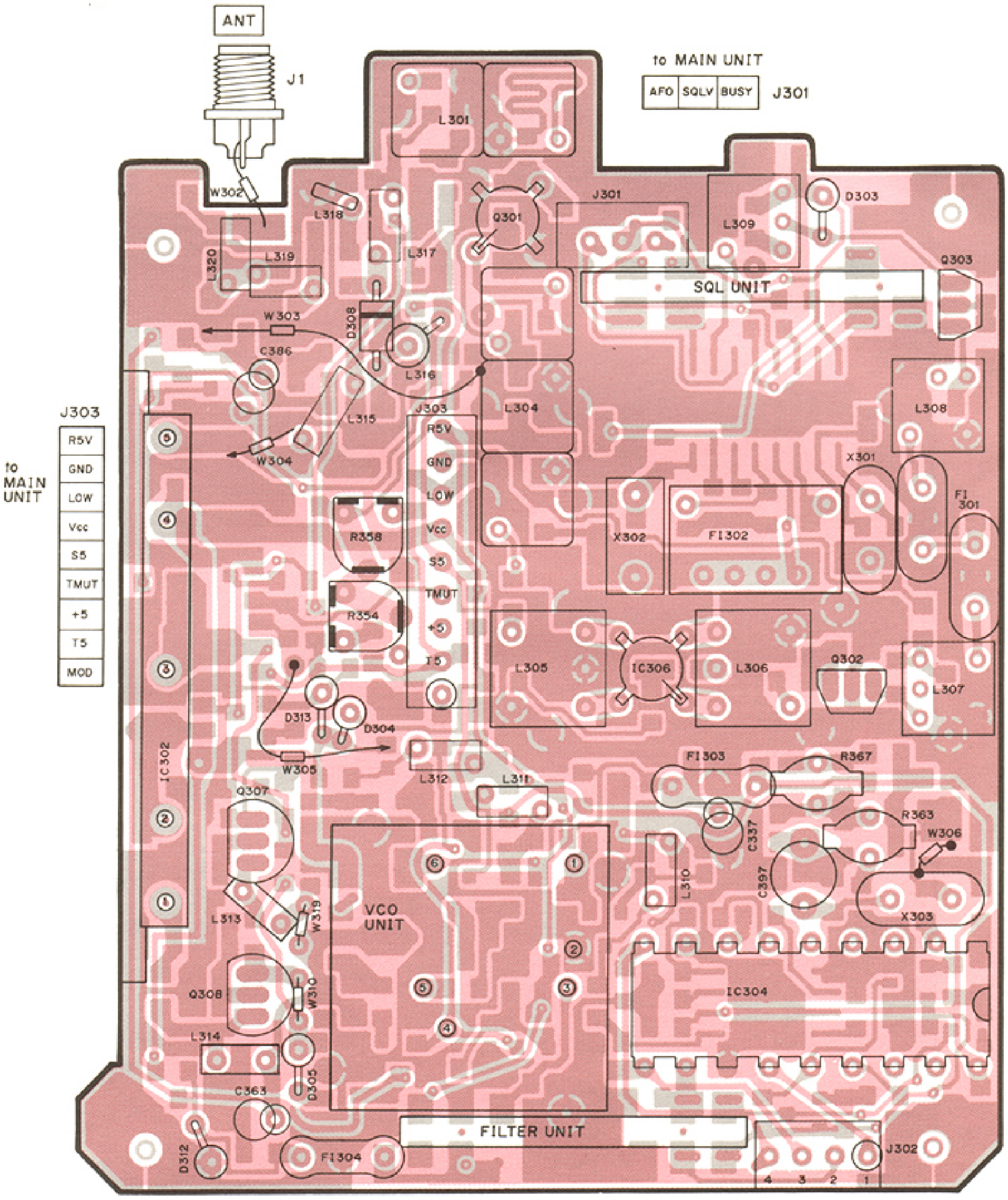
1SS193
D701

Symbol: F3

• POWER UNIT



COMPONENTS SIDE



2SC3586
Q301

2SK161 GR
Q302

2SK241 GR
Q303

2SC3356
Q304, Q306

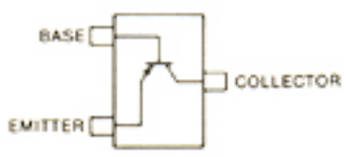
Symbol: R22

2SC3585
Q305

Symbol: R42

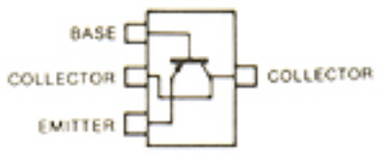
2SC2407
Q308

2SA1162 GR
Q309, Q310
Q316



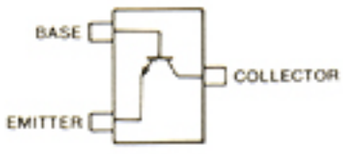
Symbol: SG

2SB798 DK
Q311, Q313
Q314



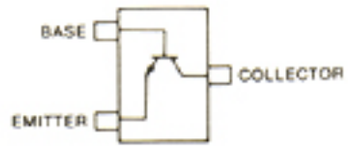
Symbol: DL

2SC2712 GR
Q312, Q319



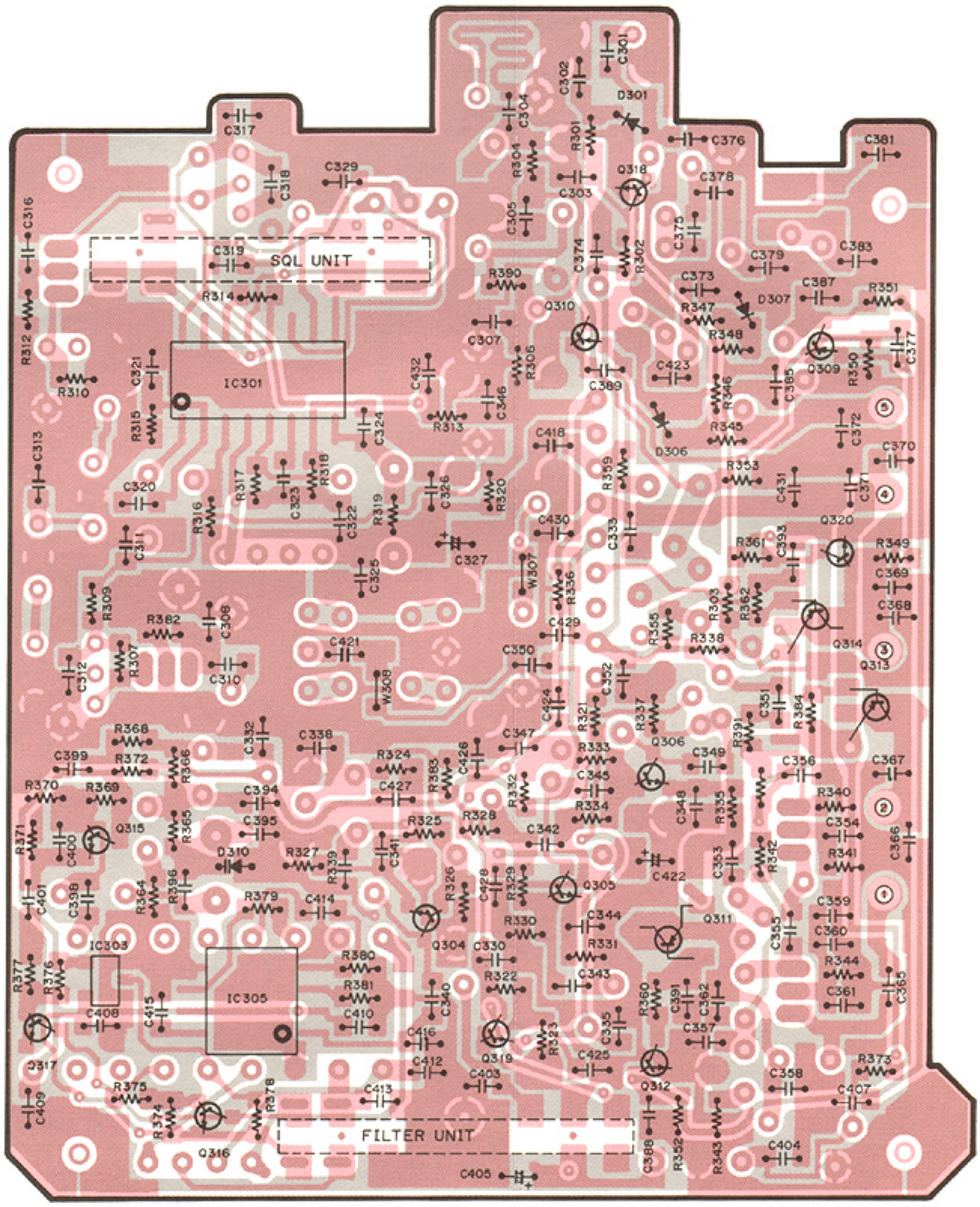
Symbol: LG

2SC2712 Y
Q315

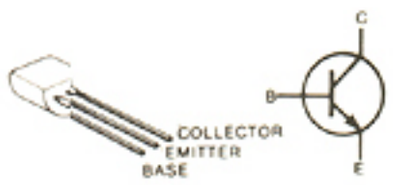


Symbol: LY

FOIL SIDE

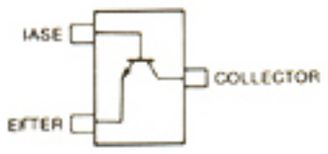


2SC2026
Q307

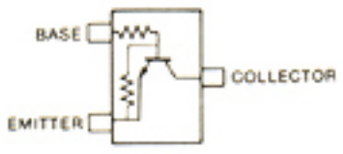


2SC2712 BL
Q317, Q318

2SC3395
Q320



Symbol: LL

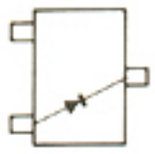


Symbol: BY

1SS153
D301

Symbol: A9

1SS154
D306, D307



Symbol: BA

SECTION 8 PARTS LIST

[EF UNIT]

REF. NO.	DESCRIPTION	PART NO.
R1	Variable Resistor	RK0971111
C1	Ceramic	47pF 50V
C2	Ceramic	47pF 50V
C4	Ceramic	47pF 50V
C5	Ceramic	470pF 50V
J1	Connector	TNC-R107
J2	Connector	PI28A04M
J3	Connector	RT-01-1.0B
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 (CHANNEL)
S2	Switch	MS-243 2P (SCAN)
S3	Switch	MS-243 2P (MONITOR)
SP1	Speaker	40P-177B
EP1	P.C. Board	B-1702 B (POWER UNIT)
EP2	P.C. Board	B-1703 A (VOL UNIT)
EP3	P.C. Board	B-1704 B (LED UNIT)
EP4	F.P.C.	B-1705 B (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	24/03/080/D02/W01
W5	Wire	24/00/100/D02/W01

[LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC801	IC	μPD75306GF-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

[LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.
Q809	Transistor	2SC3395
Q810	Transistor	2SA1341 GR
D801	Diode	1SS187
D802	Diode	1SS190
D803	Diode	1SS196
D804	Diode	1SS196
D805	Diode	1SS184
X801	Crystal	RF4A3 FAC (4.19MHz)
R801	Resistor	47kΩ MCR10
R802	Resistor	47kΩ MCR10
R803	Resistor	47kΩ MCR10
R804	Resistor	47kΩ MCR10
R805	Resistor	47kΩ MCR10
R806	Resistor	47kΩ MCR10
R807	Resistor	1MΩ MCR10
R808	Resistor	1MΩ MCR10
R809	Resistor	47kΩ MCR10
R810	Resistor	47kΩ MCR10
R811	Resistor	47kΩ MCR10
R812	Resistor	47kΩ MCR10
R813	Resistor	470Ω MCR10
R814	Resistor	470Ω MCR10
R815	Resistor	470Ω MCR10
R816	Resistor	22kΩ MCR10
R817	Resistor	100kΩ MCR10
R818	Resistor	47kΩ MCR10
R819	Resistor	1MΩ MCR10
R820	Resistor	1kΩ MCR10
R821	Resistor	100kΩ MCR10
R822	Resistor	1MΩ MCR10
R823	Resistor	100kΩ MCR10
R827	Resistor	47kΩ MCR10
R828	Resistor	1MΩ MCR10
R829	Resistor	220kΩ MCR10
C801	Ceramic	0.01μF GRM40 B
C802	Tantalum	TESVD0J476M-8L
C803	Ceramic	0.01μF GRM40 B
C804	Ceramic	15pF GRM40 CH
C805	Ceramic	15pF GRM40 CH
C806	Ceramic	0.001μF GRM40
C807	Ceramic	470pF GRM40
J801	Connector	SLEM12R-2
S801	Switch	SKHHLB0001 (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-T1
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
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
D113	Zener	RD6.8JE 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	100kΩ MCR10
R118	Trimmer	330kΩ RH04A3AN5J
R119	Resistor	390kΩ 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	330kΩ 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	8.2kΩ MCR10
R155	Resistor	10kΩ MCR10
R156	Resistor	150kΩ MCR10
R157	Resistor	2.2kΩ 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	4.7kΩ MCR10
R169	Resistor	4.7kΩ MCR10
R170	Resistor	10kΩ MCR10
R171	Resistor	180kΩ MCR10
R172	Resistor	33kΩ MCR10
R173	Resistor	10kΩ MCR10
R174	Resistor	4.7kΩ MCR10
R175	Resistor	2.7kΩ MCR10
R183	Resistor	220kΩ MCR10
R185	Resistor	56kΩ MCR10
R186	Resistor	4.7kΩ MCR10
R187	Resistor	100kΩ MCR10
R188	Resistor	10Ω MCR10
R189	Resistor	1.5kΩ MCR10
R190	Resistor	47kΩ MCR10
R191	Thermistor	33D28
C101	Ceramic	47pF GRM40
C102	Ceramic	0.001μF GRM40
C103	Ceramic	0.01μF GRM40 F
C104	Tantalum	0.1μF 35V SV
C105	Ceramic	470pF GRM40
C106	Ceramic	470pF GRM40
C107	Ceramic	470pF GRM40
C108	Ceramic	0.001μF GRM40
C109	Ceramic	0.0022μF GRM40
C110	Ceramic	470pF GRM40
C111	Ceramic	120pF 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

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
C123	Ceramic	47pF GRM40
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	470pF GRM40
C130	Electrolytic	1µF 50V RC3
C131	Tantalum	1µF 16V SV
C132	Ceramic	470pF 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	10µF 16V RC3
C138	Ceramic	0.1µF GRM40 F
C139	Ceramic	470pF GRM40
C140	Ceramic	0.1µF GRM40 F
C141	Ceramic	470pF GRM40
C142	Tantalum	0.47µF TEMSVA1V474M-8L
C143	Ceramic	470pF 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	470pF GRM40
C152	Electrolytic	47pF 6.3V RC3
C153	Ceramic	0.1µF GRM40 F
C154	Ceramic	470pF GRM40
C155	Electrolytic	22µF 16V RC3
C156	Electrolytic	22µF 16V RC3
C158	Electrolytic	22µF 16V RC3
C159	Ceramic	0.001µF GRM40
C160	Ceramic	470pF GRM40
C161	Ceramic	470pF GRM40
C162	Electrolytic	22µF 6.3V RC3
C163	Electrolytic	47µF 16V MS5
C164	Ceramic	470pF 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
C177	Ceramic	0.001µF GRM40
C179	Ceramic	47pF GRM40
C180	Ceramic	47pF GRM40
C181	Ceramic	47pF GRM40
C182	Ceramic	47pF GRM40
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	SKHHLP000 (PTT)
EP101	P.C. Board	B-1665C (MAIN UNIT)
EP104	F.P.C.	B-1710 (LOGIC-MAIN)
EP106	Ferrite Bead	DL-20P2.6-3-1.2H
EP108	Ferrite Bead	DL-20P2.6-3-1.2H

[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	23/00/030/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-1055
IC303	IC	TC4SU69F
IC304	IC	TC9181P
IC305	IC	MB504LPF-G-BND
IC306	Array	ND487C1-3R
Q301	Transistor	2SC3586
Q302	FET	2SK161 GR
Q303	FET	2SK241 GR
Q304	Transistor	2SC3356
Q305	Transistor	2SC3585
Q306	Transistor	2SC3356
Q307	Transistor	2SC2026
Q308	Transistor	2SC2407
Q309	Transistor	2SA1162 GR
Q310	Transistor	2SA1162 GR
Q311	Transistor	2SB798 DK
Q312	Transistor	2SC2712 GR
Q313	Transistor	2SB798 DK
Q314	Transistor	2SB798 DK
Q315	Transistor	2SC2712 Y
Q316	Transistor	2SA1162 GR
Q317	Transistor	2SC2712 BL
Q318	Transistor	2SC2712 BL
Q319	Transistor	2SC2712 GR
Q320	Transistor	2SC3395
D301	Diode	1SS153
D303	Diode	1SS97
D304	Diode	1SS265
D305	Diode	1SS254
D306	Diode	1SS154
D307	Diode	1SS154
D308	Diode	1SS265
D310	Varicap	1SV166
D312	Zener	RD6.2JS B2
D313	Diode	1SS265
FI301	Crystal	FL-79
FI302	Ceramic	CFZM455E10
FI303	LC	EXC-EMT-103DC
FI304	LC	EXC-EMT-103DC
X301	Crystal	CR188 (22.695MHz)
X302	Ceralock	CDB455 C7A
X303	Crystal	CR212 (10MHz)
L301	Herical	5HW-44545A
L304	Herical	05M-3075
L305	Coil	LR-145

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
L306	Coil	LR-145	
L307	Coil	LS-330	
L308	Coil	LS-332	
L309	Coil	LS-331	
L310	Coil	LA-232	
L311	Coil	LA-232	
L312	Coil	LA-232	
L313	Coil	LA-126	
L314	Coil	LA-126	
L315	Coil	LA-232	
L316	Choke	LAL02TAR56M	
L317	Coil	LA-232	
L318	Coil	LA-222	
L319	Coil	LA-232	
L320	Coil	LA-232	
R301	Resistor	330Ω	MCR10
R302	Resistor	1MΩ	MCR10
R303	Resistor	47kΩ	MCR10
R304	Resistor	22kΩ	MCR10
R306	Resistor	22Ω	MCR10
R307	Resistor	6.8kΩ	MCR10
R309	Resistor	22Ω	MCR10
R310	Resistor	10kΩ	MCR10
R312	Resistor	100Ω	MCR10
R313	Resistor	47Ω	MCR10
R314	Resistor	10kΩ	MCR10
R315	Resistor	47kΩ	MCR10
R316	Resistor	1.5kΩ	MCR10
R317	Resistor	1.5kΩ	MCR10
R318	Resistor	47kΩ	MCR10
R319	Resistor	1.5kΩ	MCR10
R320	Resistor	100Ω	MCR10
R321	Resistor	22kΩ	MCR10
R322	Resistor	10kΩ	MCR10
R323	Resistor	100kΩ	MCR10
R324	Resistor	100Ω	MCR10
R325	Resistor	47kΩ	MCR10
R326	Resistor	10kΩ	MCR10
R327	Resistor	10Ω	MCR10
R328	Resistor	100Ω	MCR10
R329	Resistor	22kΩ	MCR10
R330	Resistor	5.6kΩ	MCR10
R331	Resistor	10Ω	MCR10
R332	Resistor	47Ω	MCR10
R333	Resistor	15kΩ	MCR10
R334	Resistor	4.7kΩ	MCR10
R335	Resistor	10Ω	MCR10
R336	Resistor	10kΩ	MCR10
R337	Resistor	22kΩ	MCR10
R338	Resistor	10kΩ	MCR10
R339	Resistor	1.2kΩ	MCR10
R340	Resistor	560Ω	MCR10
R341	Resistor	22Ω	MCR10
R342	Resistor	1kΩ	MCR10
R343	Resistor	220Ω	MCR10
R344	Resistor	10Ω	MCR10
R345	Resistor	6.8kΩ	MCR10
R346	Resistor	470Ω	MCR10
R347	Resistor	6.8kΩ	MCR10
R348	Resistor	470Ω	MCR10
R349	Resistor	82kΩ	MCR10
R350	Resistor	22kΩ	MCR10
R351	Resistor	150kΩ	MCR10
R352	Resistor	560kΩ	MCR10
R353	Resistor	22kΩ	MCR10
R354	Trimmer	100kΩ	RH0421CJ15J06A
R355	Resistor	6.8kΩ	MCR10
R358	Trimmer	33kΩ	RH0421CN4J02A
R359	Resistor	1kΩ	MCR10
R360	Resistor	4.7kΩ	MCR10
R361	Resistor	6.8kΩ	MCR10
R362	Resistor	6.8kΩ	MCR10
R363	Thermistor		33D28

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R364	Resistor	15kΩ	MCR10
R365	Resistor	10kΩ	MCR10
R366	Resistor	10kΩ	MCR10
R367	Thermistor		33D28
R368	Resistor	6.8kΩ	MCR10
R369	Resistor	100kΩ	MCR10
R370	Resistor	100kΩ	MCR10
R371	Resistor	2.2kΩ	MCR10
R372	Resistor	100Ω	MCR10
R373	Resistor	1.8kΩ	MCR10
R374	Resistor	12kΩ	MCR10
R375	Resistor	39kΩ	MCR10
R376	Resistor	12kΩ	MCR10
R377	Resistor	12kΩ	MCR10
R378	Resistor	4.7kΩ	MCR10
R379	Resistor	10kΩ	MCR10
R380	Resistor	1kΩ	MCR10
R381	Resistor	33kΩ	MCR10
R382	Resistor	47kΩ	MCR10
R383	Resistor	100Ω	MCR10
R384	Resistor	10kΩ	MCR10
R390	Resistor	1kΩ	MCR10
R391	Resistor	220Ω	MCR10
C301	Ceramic	47pF	GRM40
C302	Ceramic	43pF	GRM40 CH
C303	Ceramic	47p	GRM40
C304	Ceramic	47pF	GRM40
C305	Ceramic	470pF	GRM40
C307	Ceramic	0.001μF	GRM40
C308	Ceramic	120pF	GRM40
C310	Ceramic	0.001μF	GRM40
C311	Ceramic	0.001μF	GRM40
C312	Ceramic	0.1μF	GRM40 F
C313	Ceramic	5pF	GRM40
C316	Ceramic	0.1μF	GRM40 F
C317	Ceramic	0.1μF	GRM40 F
C318	Ceramic	33pF	GRM40
C319	Ceramic	0.001μF	GRM40
C320	Ceramic	27pF	GRM40
C321	Ceramic	27pF	GRM40
C322	Ceramic	0.022μF	GRM40
C323	Ceramic	0.1μF	GRM40 F
C324	Ceramic	82pF	GRM40
C325	Ceramic	0.1μF	GRM40 F
C326	Ceramic	470pF	GRM40
C327	Tantalum	4.7μF	TESVB0J475M-12L
C329	Ceramic	47pF	GRM40
C330	Ceramic	0.001μF	GRM40
C332	Ceramic	0.001μF	GRM40
C333	Ceramic	0.001μF	GRM40
C335	Ceramic	470pF	GRM40
C337	Tantalum	4.7μF	10V DN
C338	Ceramic	470pF	GRM40
C339	Ceramic	470pF	GRM40
C340	Ceramic	6pF	GRM40
C341	Ceramic	470pF	GRM40
C342	Ceramic	47pF	GRM40
C343	Ceramic	0.5pF	GRM40
C344	Ceramic	47pF	GRM40
C345	Ceramic	4pF	GRM40
C346	Ceramic	470pF	GRM40
C347	Ceramic	470pF	GRM40
C348	Ceramic	470pF	GRM40
C349	Ceramic	12pF	GRM40
C350	Ceramic	27pF	GRM40
C351	Ceramic	0.001μF	GRM40
C352	Ceramic	470pF	GRM40
C353	Ceramic	470pF	GRM40
C354	Ceramic	470pF	GRM40
C355	Ceramic	6pF	GRM40
C356	Ceramic	470pF	GRM40
C357	Ceramic	470pF	GRM40
C358	Ceramic	470pF	GRM40

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
C359	Ceramic	470pF	GRM40
C360	Ceramic	470pF	GRM40
C361	Ceramic	470pF	GRM40
C362	Ceramic	0.001µF	GRM40
C363	Tantalum	10µF	16V DN
C365	Ceramic	6pF	GRM40
C366	Ceramic	470pF	GRM40
C367	Ceramic	47pF	GRM40
C368	Ceramic	470pF	GRM40
C369	Ceramic	0.001µF	GRM40
C370	Ceramic	470pF	GRM40
C371	Ceramic	0.001µF	GRM40
C372	Ceramic	6pF	GRM40
C373	Ceramic	6pF	GRM40
C374	Ceramic	470pF	GRM40
C375	Ceramic	7pF	GRM40
C376	Ceramic	6pF	GRM40
C377	Ceramic	470pF	GRM40
C378	Ceramic	10pF	GRM40
C379	Ceramic	3pF	GRM40
C381	Ceramic	10pF	GRM40
C383	Ceramic	5pF	GRM40
C385	Ceramic	47pF	GRM40
C386	Tantalum	1.5µF	25V DN
C387	Ceramic	470pF	GRM40
C388	Ceramic	470pF	GRM40
C389	Ceramic	47pF	GRM40
C391	Ceramic	0.001µF	GRM40
C393	Ceramic	47pF	GRM40
C394	Ceramic	0.001µF	GRM40
C395	Ceramic	4pF	GRM40 CH
C396	Ceramic	39pF	GRM40 CH
C397	Trimmer	10pF	ECRGA010D30
C398	Ceramic	0.001µF	GRM40
C399	Ceramic	0.1µF	GRM40 F
C400	Ceramic	220pF	GRM40
C401	Ceramic	100pF	GRM40
C403	Ceramic	0.022µF	GRM40
C404	Ceramic	0.1µF	GRM40 F
C405	Tantalum	1µF	16V SV
C407	Ceramic	470pF	GRM40
C408	Ceramic	0.1µF	GRM40 F
C409	Ceramic	0.1µF	GRM40 F
C410	Ceramic	0.1µF	GRM40 F
C411	Ceramic	47pF	GRM40
C412	Ceramic	47pF	GRM40
C413	Ceramic	47pF	GRM40
C414	Ceramic	0.001µF	GRM40
C415	Ceramic	0.001µF	GRM40
C416	Ceramic	5pF	GRM40
C418	Ceramic	470pF	GRM40
C421	Ceramic	27pF	GRM40
C422	Tantalum	6.8µF	6.3V SV
C423	Ceramic	470pF	GRM40
C424	Ceramic	470pF	GRM40
C425	Ceramic	470pF	GRM40
C426	Ceramic	0.001µF	GRM40
C427	Ceramic	47pF	GRM40
C428	Ceramic	47pF	GRM40
C429	Ceramic	0.001µF	GRM40
C430	Ceramic	0.001µF	GRM40
C431	Ceramic	0.1µF	GRM40 F
C432	Ceramic	470pF	GRM40
J301	Connector	BB04J03M	
J302	Connector	BB04J04M	
J303	Connector	BB04J09M	
EP301	P.C. Board	B-1583D (RF UNIT)	
EP302	Ferrite Beads	DL-20P2.6-3-1.2H	
EP303	Ferrite Beads	DL-20P2.6-3-1.2H	

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
W302	Jumper	JPW-01A
W303	Jumper	JPW02A
W304	Jumper	JPW02A
W305	Jumper	JPW-02A
W306	Jumper	JPW-02A
W307	Jumper	MCR10-JPW
W308	Jumper	MCR10-JPW
W309	Jumper	72/98/020/X98/X98
W310	Jumper	72/98/020/X98/X98

[VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.	
Q501	Transistor	2SC3356	
Q502	Transistor	DTC124 EK	
D501	Diode	1SS265	
D502	Varicap	MA333	
L501	Coil	LQH3N1R0M	
L502	Coil	LA-234	
L503	Coil	LQH3N4R7M	
R501	Resistor	150Ω	ELR20
R502	Resistor	220Ω	ELR20
R503	Resistor	6.8kΩ	MCR10
R504	Resistor	4.7kΩ	MCR10
R505	Resistor	47kΩ	MCR10
R506	Resistor	4.7kΩ	MCR10
C501	Ceramic	470pF	GRM40
C502	Ceramic	5pF	GRM40 CH
C503	Ceramic	8pF	GRM40 CH
C504	Ceramic	6pF	GRM40 CH
C505	Ceramic	470pF	GRM40
C506	Ceramic	0.5pF	50V
C507	Ceramic	5pF	GRM40 CH
C508	Ceramic	6pF	GRM40 CH
C509	Trimmer	3pF	ECRGA003A30
C510	Ceramic	4pF	GRM40 CH
C511	Ceramic	470pF	50V
C512	Ceramic	470pF	GRM40
EP501	P.C. Board	B-1588B (VCO UNIT)	

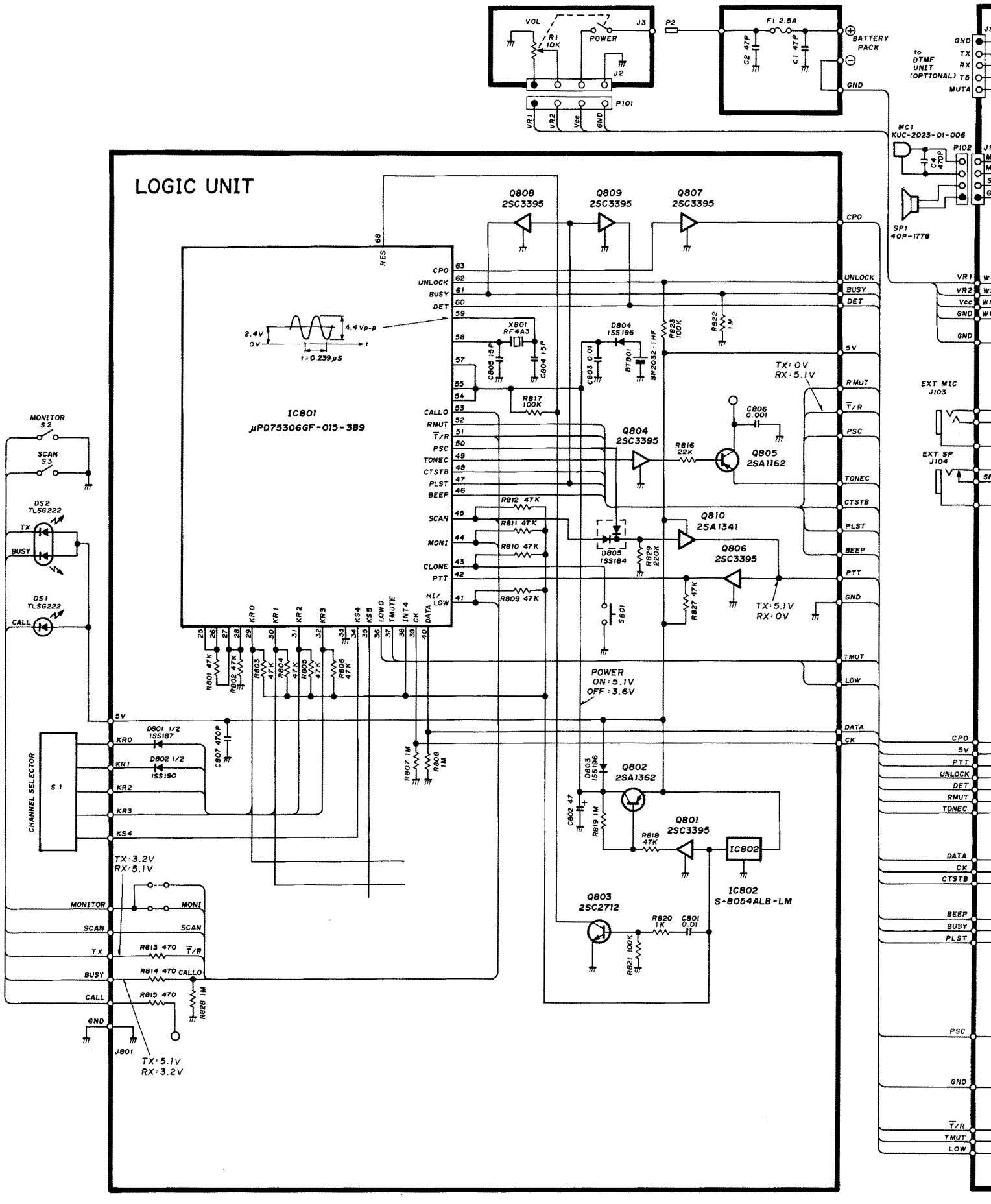
[SQL UNIT]

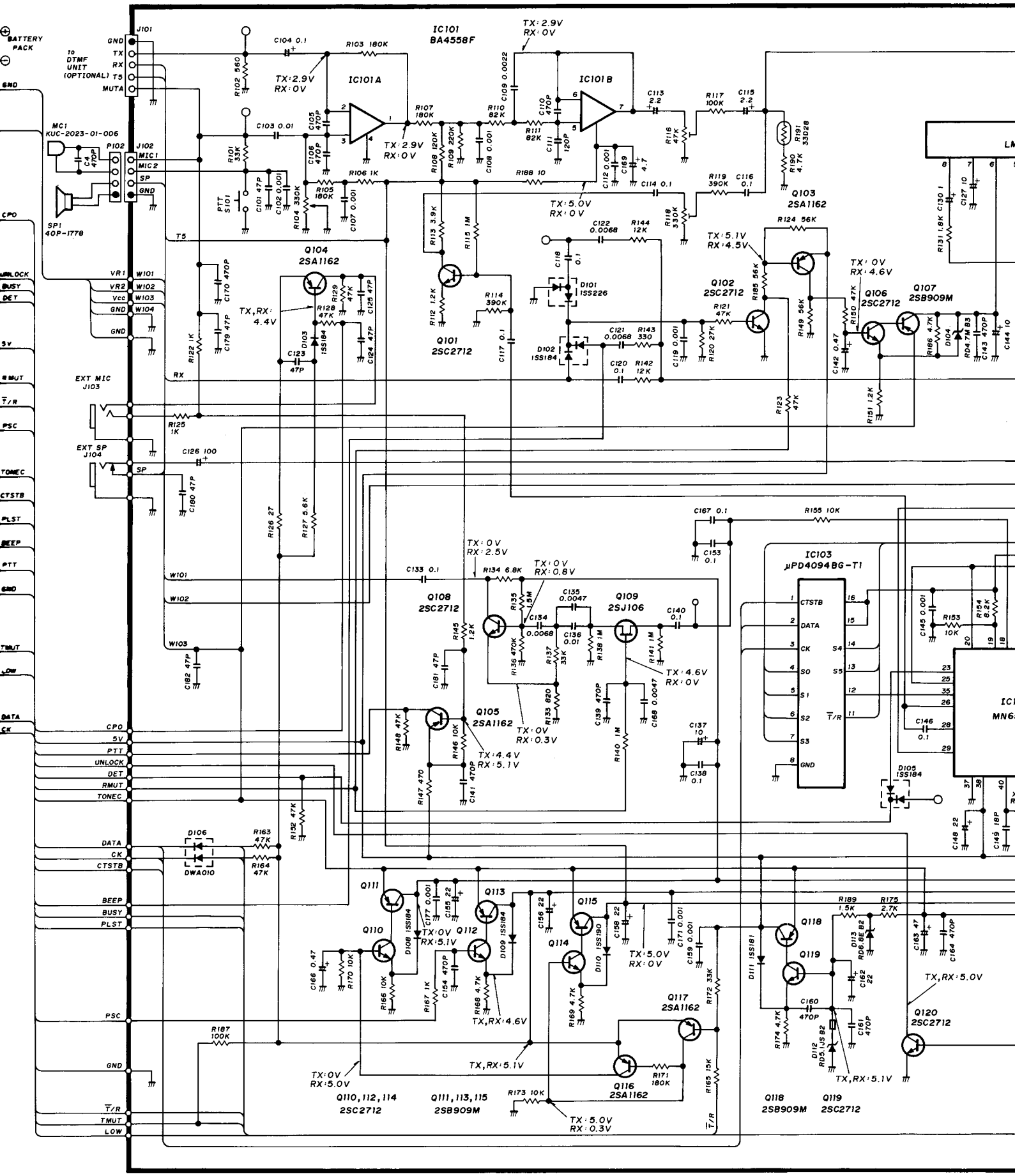
REF. NO.	DESCRIPTION	PART NO.	
IC601	IC	TC4SU69F	
Q601	Transistor	2SJ106Y	
D601	Diode	HSM88AS	
R601	Resistor	1kΩ	MCR10
R602	Resistor	330kΩ	MCR10
R603	Resistor	2.2kΩ	MCR10
R604	Resistor	2.2kΩ	MCR10
R605	Thermistor	33D28	
R607	Resistor	47kΩ	MCR10
R608	Thermistor	33D28	
R609	Resistor	1MΩ	MCR10
R610	Resistor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

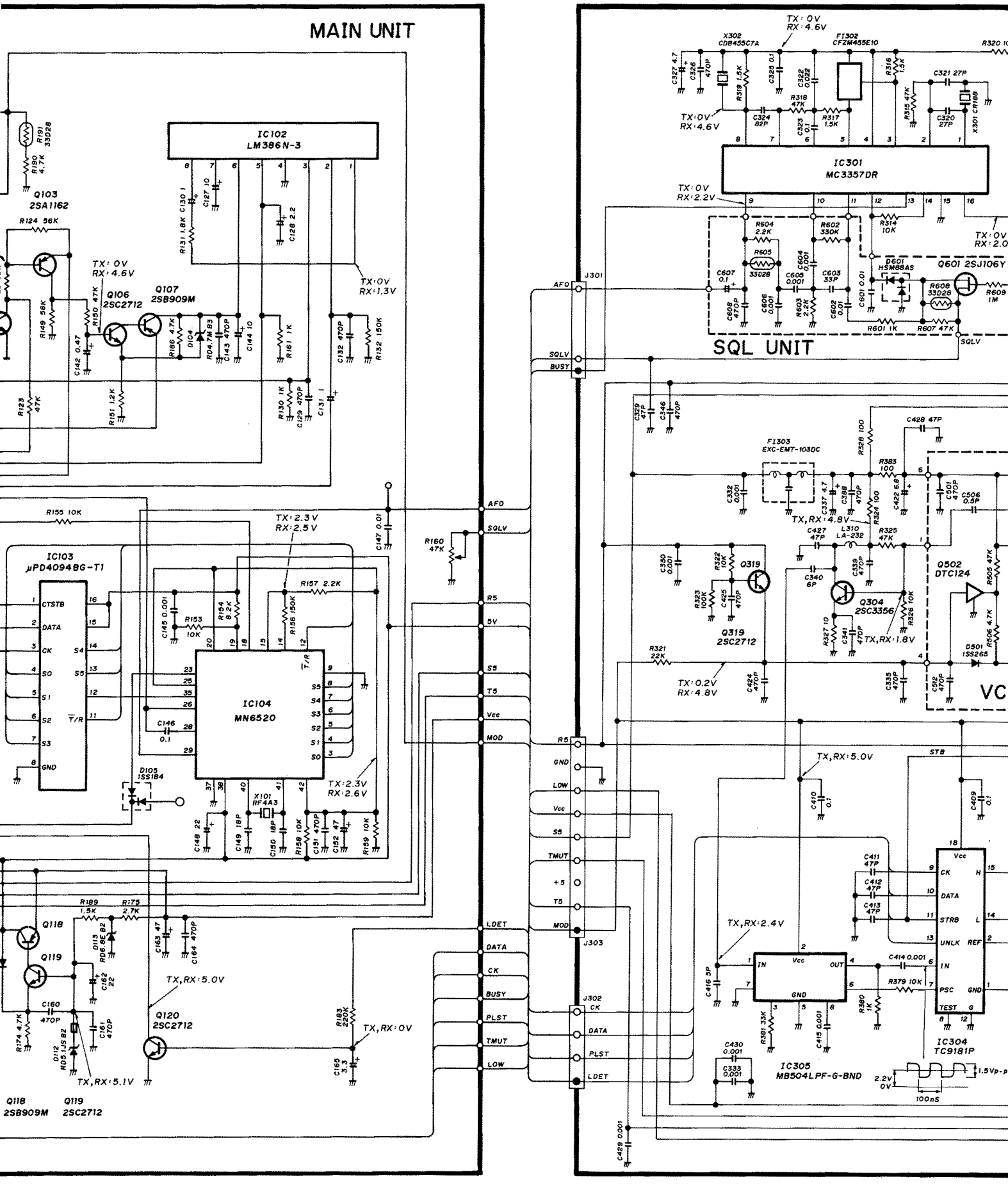
[FILTER UNIT]

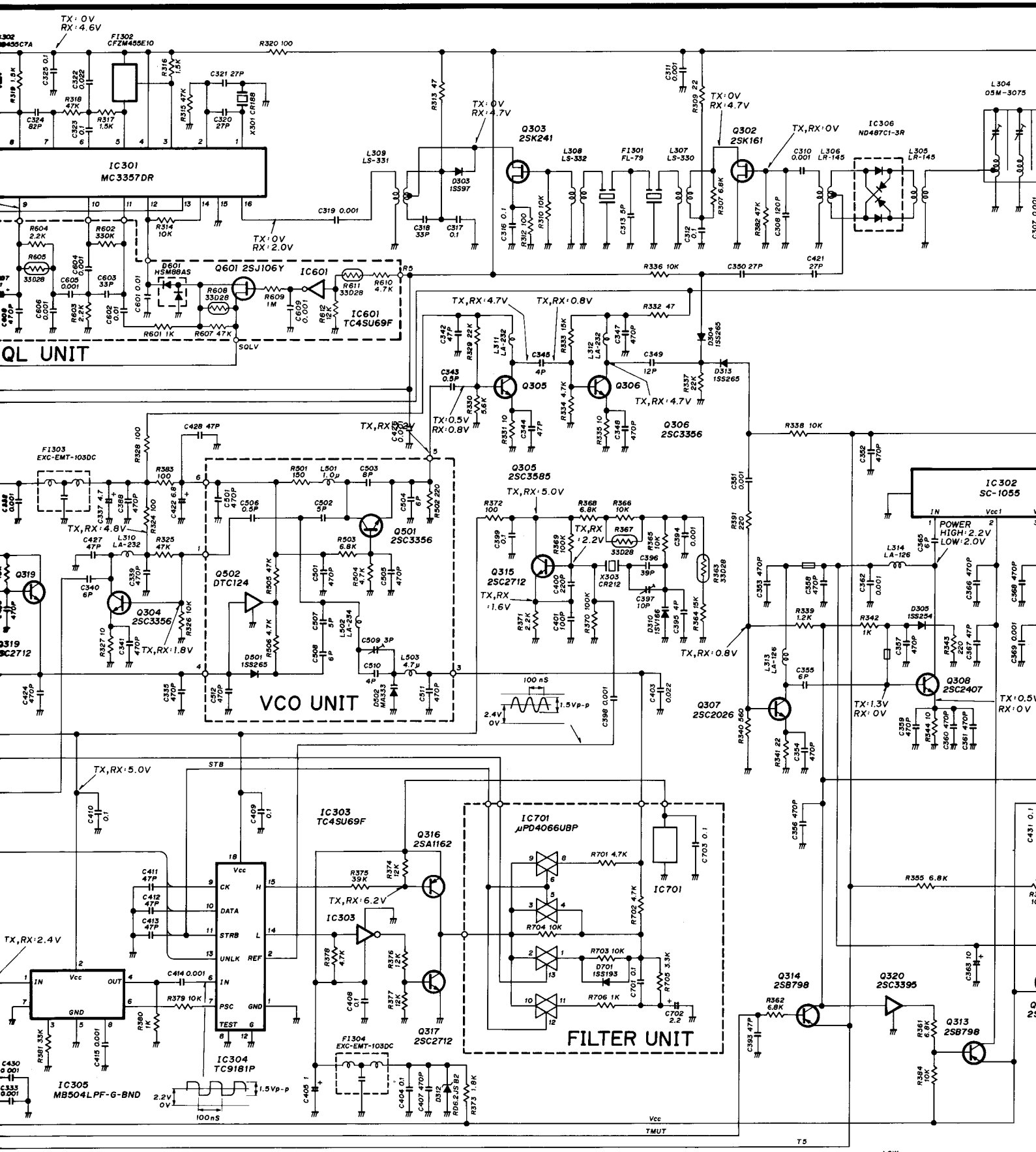
REF. NO.	DESCRIPTION	PART NO.	
IC701	IC	μPD4066 BG	
D701	Diode	1SS193	
R701	Resistor	4.7kΩ	MCR10
R702	Resistor	4.7kΩ	MCR10
R703	Resistor	10kΩ	MCR10
R704	Resistor	10kΩ	MCR10
R705	Resistor	3.3kΩ	MCR10
R706	Resistor	1kΩ	MCR10
C701	Ceramic	0.1μF	GRM40 F
C702	Tantalum	2.2	16V SV
C703	Ceramic	0.1μF	GRM40 F
EP701	P.C. Board	B-1596B (FILTER UNIT)	

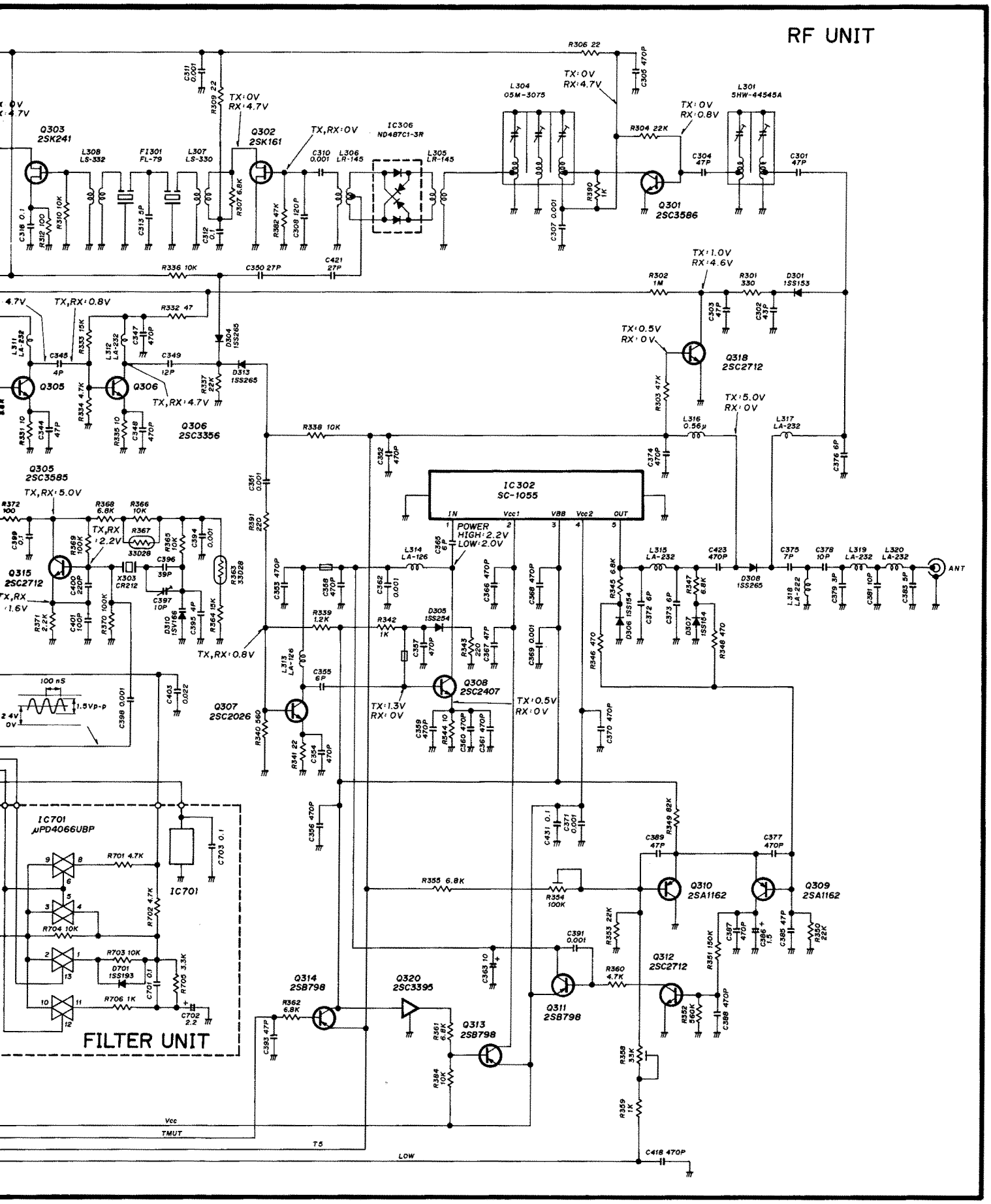
SECTION 9 VOLTAGE DIAGRAM



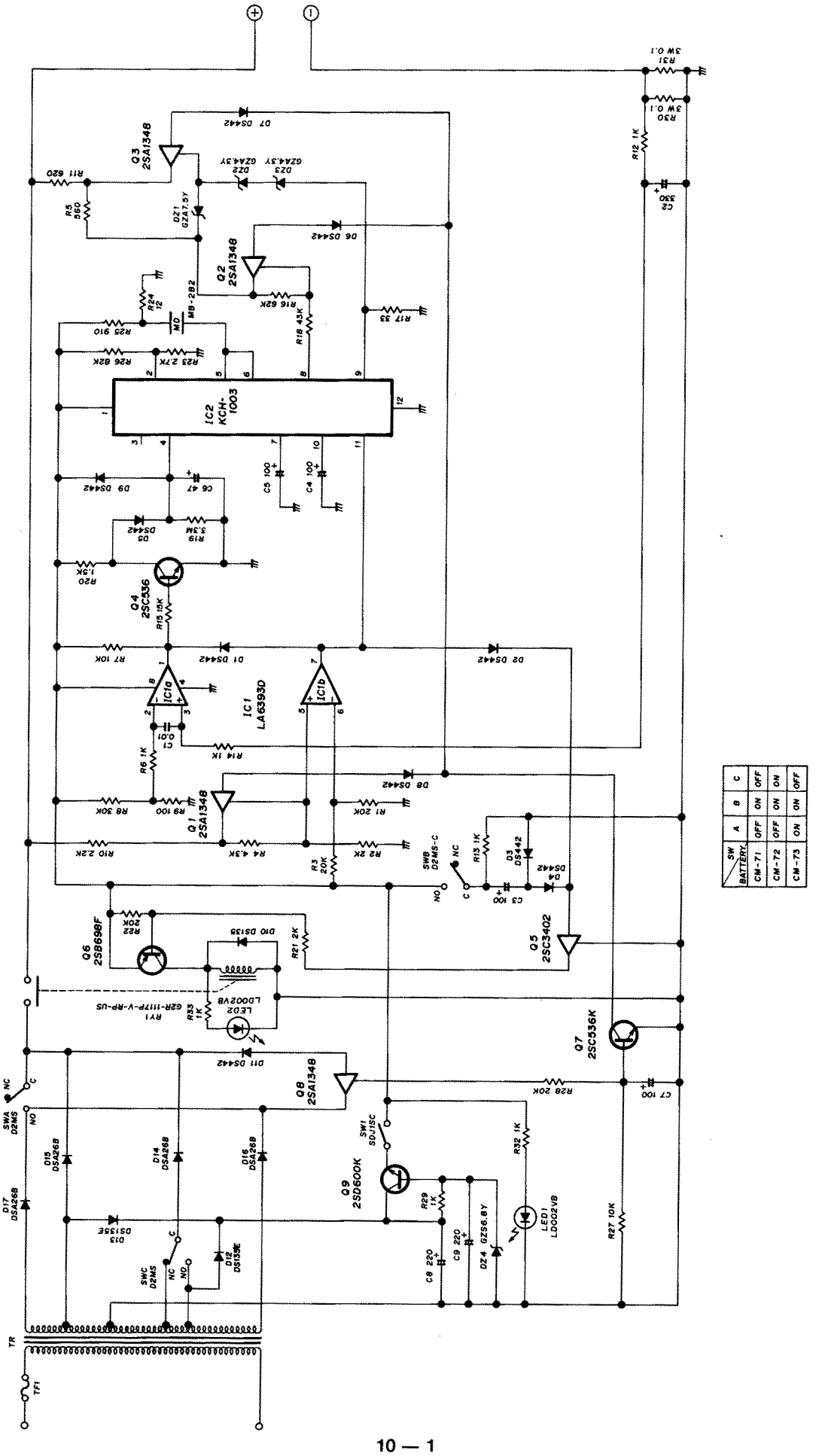

BATTERY PACK
J101
GND
TX
RX
T5
MUTA
10 DTMF UNIT (OPTIONAL)
MC1 KUC-2023-01-006
P102
J102
MIC1
MIC2
SP
GND
SP1 40P-1778
PTT S101
IC101 BA4558F
IC101A
IC101B
TX:2.9V RX:0V
TX:5.0V RX:0V
TX:5.1V RX:4.5V
TX:0V RX:4.6V
TX:0V RX:2.5V
TX:0V RX:0.8V
TX:4.6V RX:0V
TX:0V RX:0.3V
TX:4.4V RX:5.1V
TX,RX: 4.4V
TX,RX:4.6V
TX,RX:5.1V
TX,RX:5.0V
TX:0V RX:5.0V
TX:5.0V RX:0.3V
Q101 2SC2712
Q102 2SC2712
Q103 2SA1162
Q104 2SA1162
Q105 2SA1162
Q106 2SC2712
Q107 2SB909M
Q108 2SC2712
Q109 2SJ106
Q110,112,114 2SC2712
Q111,113,115 2SB909M
Q116 2SA1162
Q117 2SA1162
Q118 2SB909M
Q119 2SC2712
Q120 2SC2712
IC103 μPD4094BG-T1
CTSTB
DATA
CK
S0
S1
S2
S3
S4
S5
T/R
GND
D101 1SS226
D102 1SS184
D103 1SS184
D104 RD4.7M B3
D105 1SS184
D106 DWA010
D108 1SS184
D109 1SS184
D110 1SS190
D111 1SS181
D112 RD5.1S B2
D113 RD6.8E B2
EXT MIC J103
EXT SP J104
VR1
VR2
Vcc
W101
W102
W103
W104
CPO
5V
PTT
UNLOCK
DET
RMUT
TONEC
CTSTB
PLST
BEEP
BUSY
TMUT
LOW
DATA
CK
PSC
T/R
RX
SP


MAIN UNIT
SQL UNIT
IC102 LM386N-3
IC103 μPD4094BG-T1
IC104 MN6520
IC301 MC3357DR
IC304 TC9181P
IC305 MB504LPF-G-BND
Q103 2SA1162
Q106 2SC2712
Q107 2SB909M
Q118 2SB909M
Q119 2SC2712
Q120 2SC2712
Q319 2SC2712
Q304 2SC3356
Q502 DTC124
Q601 2SJ106Y
D601 HSM88AS
D105 1SS184
D501 1SS265
X101 RF4A3
X302 CDB455C7A
F1302 CFZM455E10
F1303 EXC-EMT-103DC
L310 LA-232
J301
J302
J303
AFO
SQLV
BUSY
R5
5V
S5
T5
Vcc
MOD
GND
LOW
TMUT
+5
PLST
DATA
CK
LDET
STB
TX:0V RX:4.6V
TX:0V RX:2.2V
TX:0V RX:1.3V
TX:2.3V RX:2.5V
TX:2.3V RX:2.6V
TX,RX:4.8V
TX,RX:1.8V
TX:0.2V RX:4.8V
TX,RX:5.0V
TX,RX:2.4V
TX,RX:0V
TX,RX:5.1V
2.2V 0V
100nS
1.5Vp-p

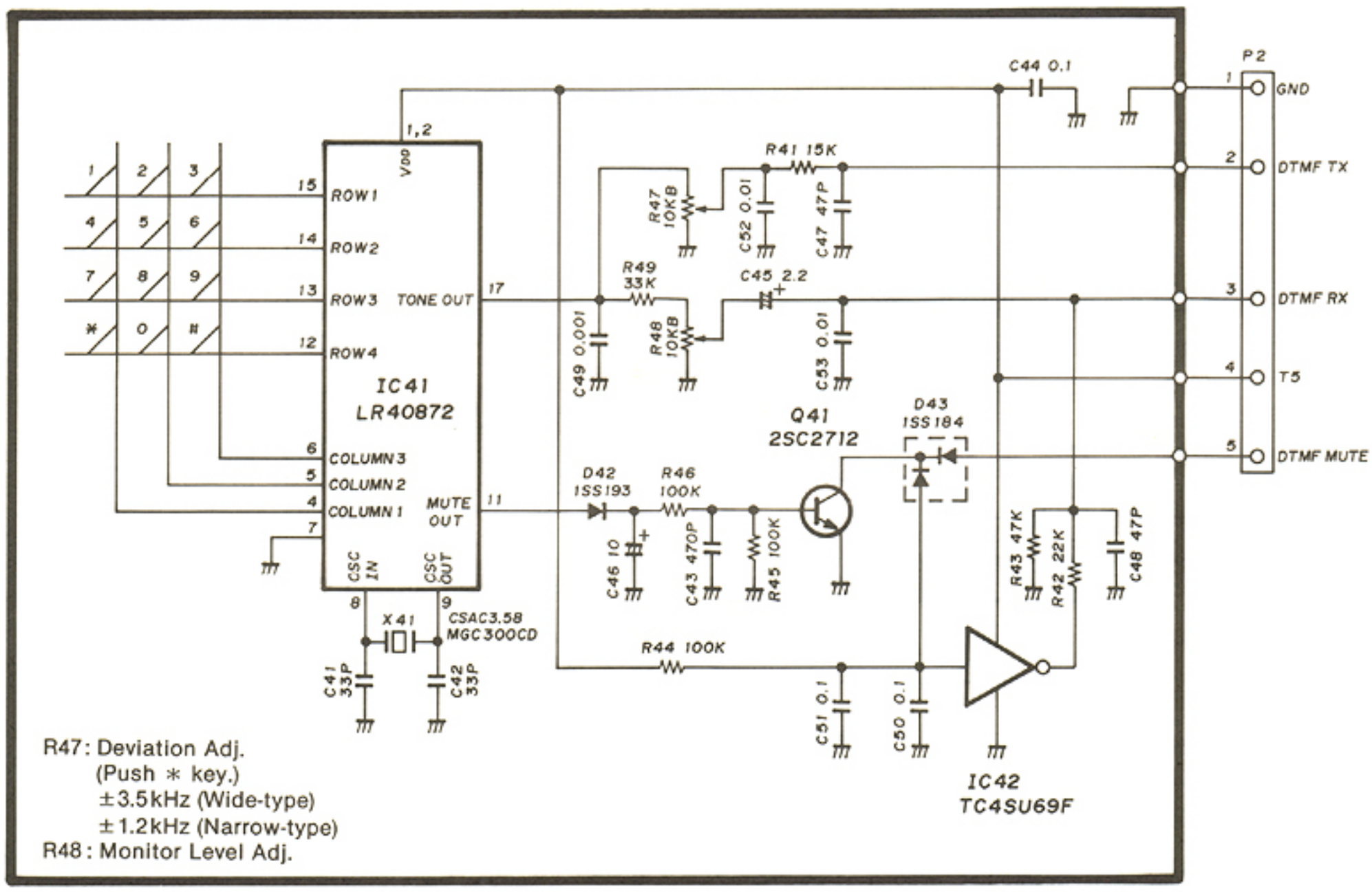

IC301
MC3357DR
IC302
SC-1055
IC303
TC4SU69F
IC304
TC9181P
IC305
MB504LPF-G-BND
IC306
ND487C1-3R
IC601
TC4SU69F
IC701
μPD4066UBP
Q303
2SK241
Q302
2SK161
Q305
2SC3585
Q306
2SC3356
Q307
2SC2026
Q308
2SC2407
Q313
2SB798
Q314
2SB798
Q315
2SC2712
Q316
2SA1162
Q317
2SC2712
Q320
2SC3395
Q501
2SC3356
Q502
DTC124
Q304
2SC3356
Q319
2SC2712
Q601 2SJ106Y
VCO UNIT
FILTER UNIT
QL UNIT
POWER
HIGH: 2.2V
LOW: 0.2V
TX: 0V
RX: 4.6V
TX: 0V
RX: 4.7V
TX: 0V
RX: 2.0V
TX,RX: 0V
TX,RX: 4.7V
TX,RX: 0.8V
TX,RX: 5.0V
TX,RX: 2.2V
TX,RX: 1.6V
TX,RX: 4.8V
TX,RX: 1.8V
TX,RX: 2.4V
TX,RX: 6.2V
TX: 0.5V
RX: 0.8V
TX: 1.3V
RX: 0V
TX: 0.5V
RX: 0V
STB
SOLV
TMUT
T5
LOW
100 nS
100nS
1.5Vp-p
2.4V
0V
2.2V
0V


RF UNIT
FILTER UNIT
IC302
SC-1055
IN
Vcc1
VBB
Vcc2
OUT
POWER
HIGH:2.2V
LOW:2.0V
IC701
μPD4066UBP
Q303
2SK241
Q302
2SK161
IC306
ND487C1-3R
Q301
2SC3586
Q318
2SC2712
Q305
2SC3585
Q306
2SC3356
Q315
2SC2712
Q307
2SC2026
Q308
2SC2407
Q310
2SA1162
Q309
2SA1162
Q312
2SC2712
Q311
2SB798
Q314
2SB798
Q320
2SC3395
Q313
2SB798
D701
1SS193
X303
CR212
ANT
TX:0V
RX:4.7V
TX:0V
RX:0.8V
TX:1.0V
RX:4.6V
TX:0.5V
RX:0V
TX:5.0V
RX:0V
TX,RX:0V
TX,RX:0.8V
TX,RX:4.7V
TX,RX:5.0V
TX,RX
:2.2V
:1.6V
TX:1.3V
RX:0V
TX:0.5V
RX:0V
100 nS
1.5Vp-p
2.4V
0V
Vcc
TMUT
T5
LOW

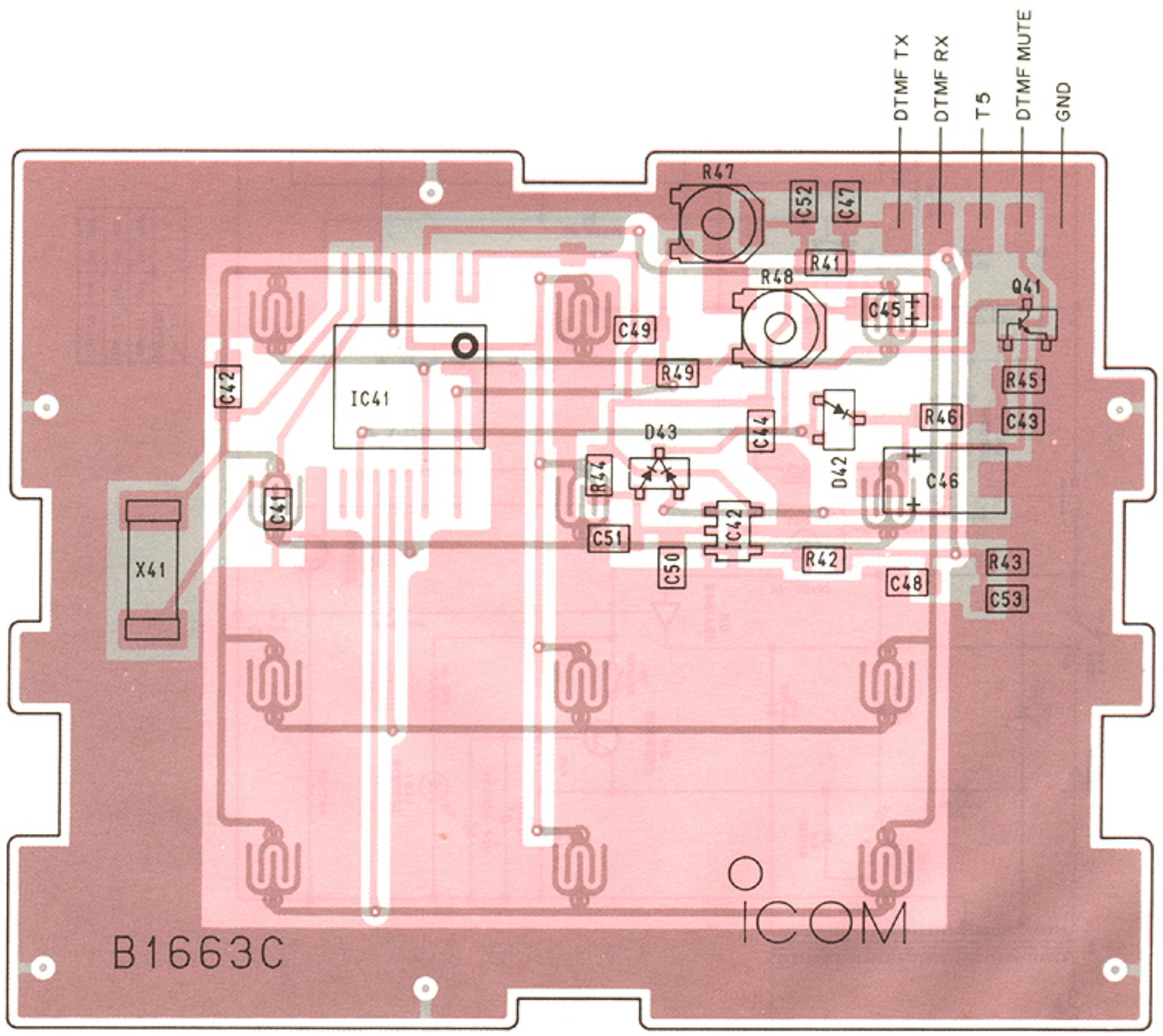
SECTION 10 BM-70 SCHEMATIC DIAGRAM



UT-42 DTMF ENCODER UNIT



R47: Deviation Adj.
(Push * key.)
±3.5kHz (Wide-type)
±1.2kHz (Narrow-type)
R48: Monitor Level Adj.



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