ICOM

SERVICE MANUAL

VHF MARINE TRANSCEIVER

IC-M56

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-M56** VHF MARINE TRANSCEIVER at the time of going to press.

Two versions of the **IC-M56** have been designed. This service manual covers the following versions.

VERSION NUMBER	AREA
#01	U.S.A.
#02	Europe

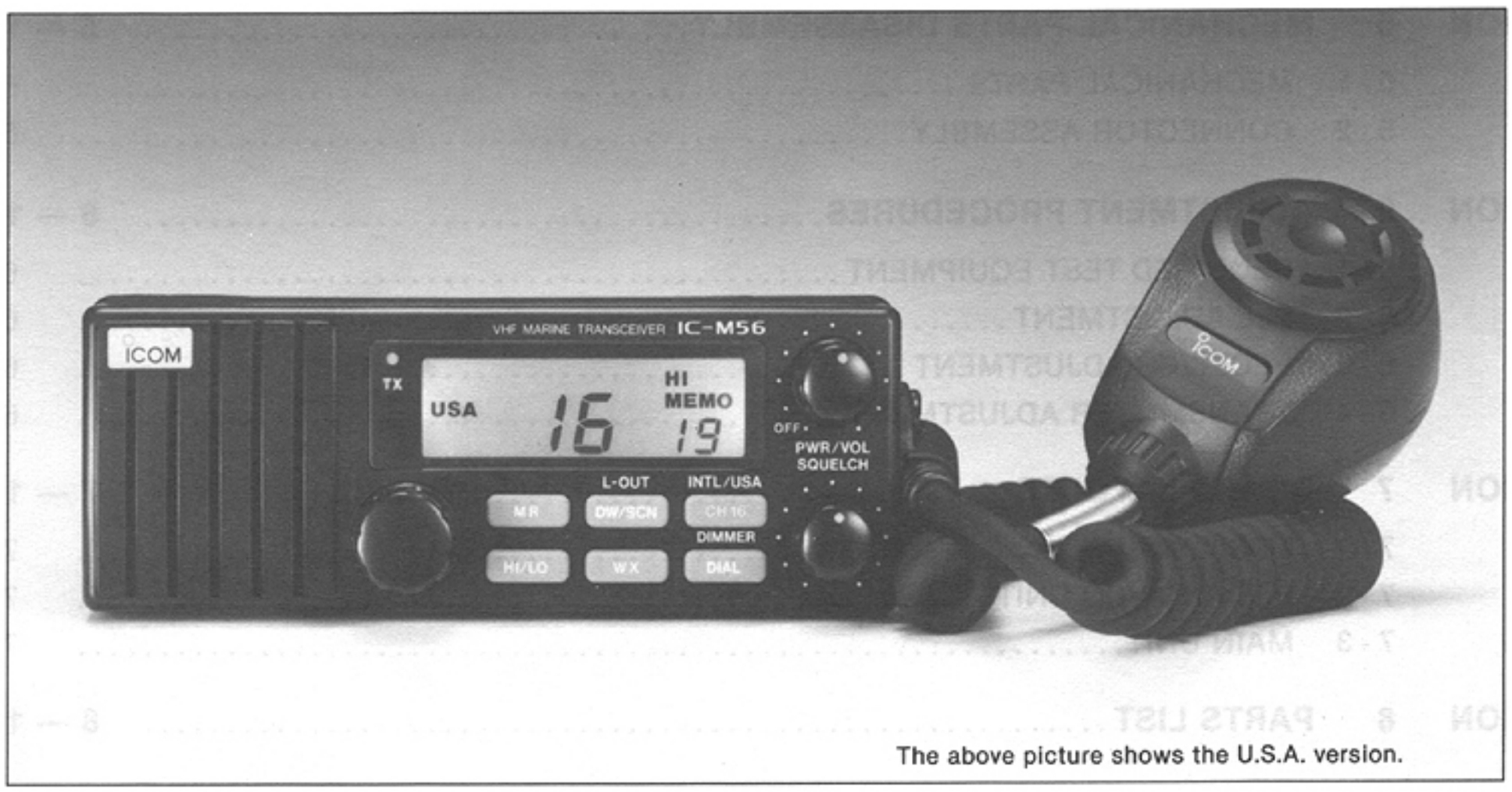
DANGER

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

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

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

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



The above picture shows the U.S.A. version.

ORDERING PARTS

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

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

<SAMPLE ORDER>

IC	MC3357P	IC-M56	MAIN UNIT		5 pieces
Screw	PH M3×6	IC-M56	Front panel	8810001350	10 pieces

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

REPAIR NOTE

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

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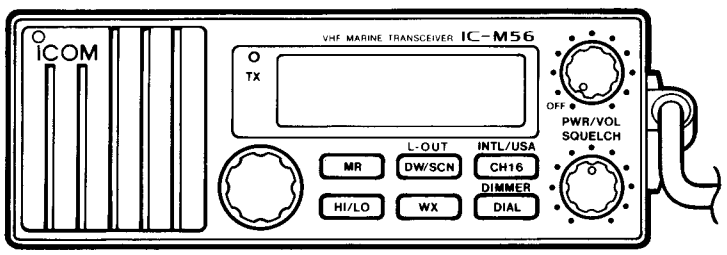
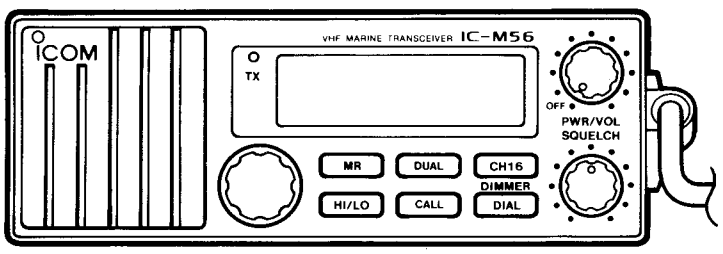
FRONT PANEL INFORMATION

• U.S.A. Version (#01)



• EUROPE Version (#02)



SECTION 1 SPECIFICATIONS

■ GENERAL

• Frequency range	:	156~157.5 MHz (transmit) 156~163.0 MHz (receive)
• Type of emission	:	16K0G3E
• Number of channels	:	All U.S.A. and International channels 20 memory channels 10 weather channels
• Frequency stability	:	±0.0005 %
• Antenna impedance	:	50 Ω (unbalanced)
• Power supply voltage	:	13.8 V DC (Negative ground)
• Usable temperature range	:	−20 °C~ +60 °C (−4 °F~140 °F)
• Dimensions	:	140 mm (W) × 55 mm (H) × 155 mm (D) 5.5″(W) × 2.2″(H) × 6.1″(D)
• Weight	:	1.1 kg (2.4 lbs)

■ TRANSMITTER

• RF output power (at 13.8 V DC)	:	High 25 W Low 1 W
• Modulation system	:	Variable reactance frequency modulation
• Current drain (at 13.8 V DC)	:	High power 5.5 A Low power 1.4 A
• Microphone impedance	:	600 Ω
• Maximum deviation	:	±5 kHz
• Spurious emissions	:	−70 dB
• Harmonic emissions	:	−60 dB (U.S.A. version) −70 dB (Europe version)

■ RECEIVER

• Receive system	:	Double-conversion superheterodyne
• Sensitivity	:	0.3 μV at 12 dB SINAD
• Squelch sensitivity (threshold)	:	Less than 0.3 μV
• Intermediate frequencies	:	1st 21.8 MHz 2nd 455 kHz
• Current drain (at 13.8 V DC)	:	Audio max. 1 A (Lamp ON) Squelched 190 mA (Lamp OFF)
• Audio output power	:	4 W at 10 % distortion with a 4 Ω load
• Audio output impedance	:	4 Ω

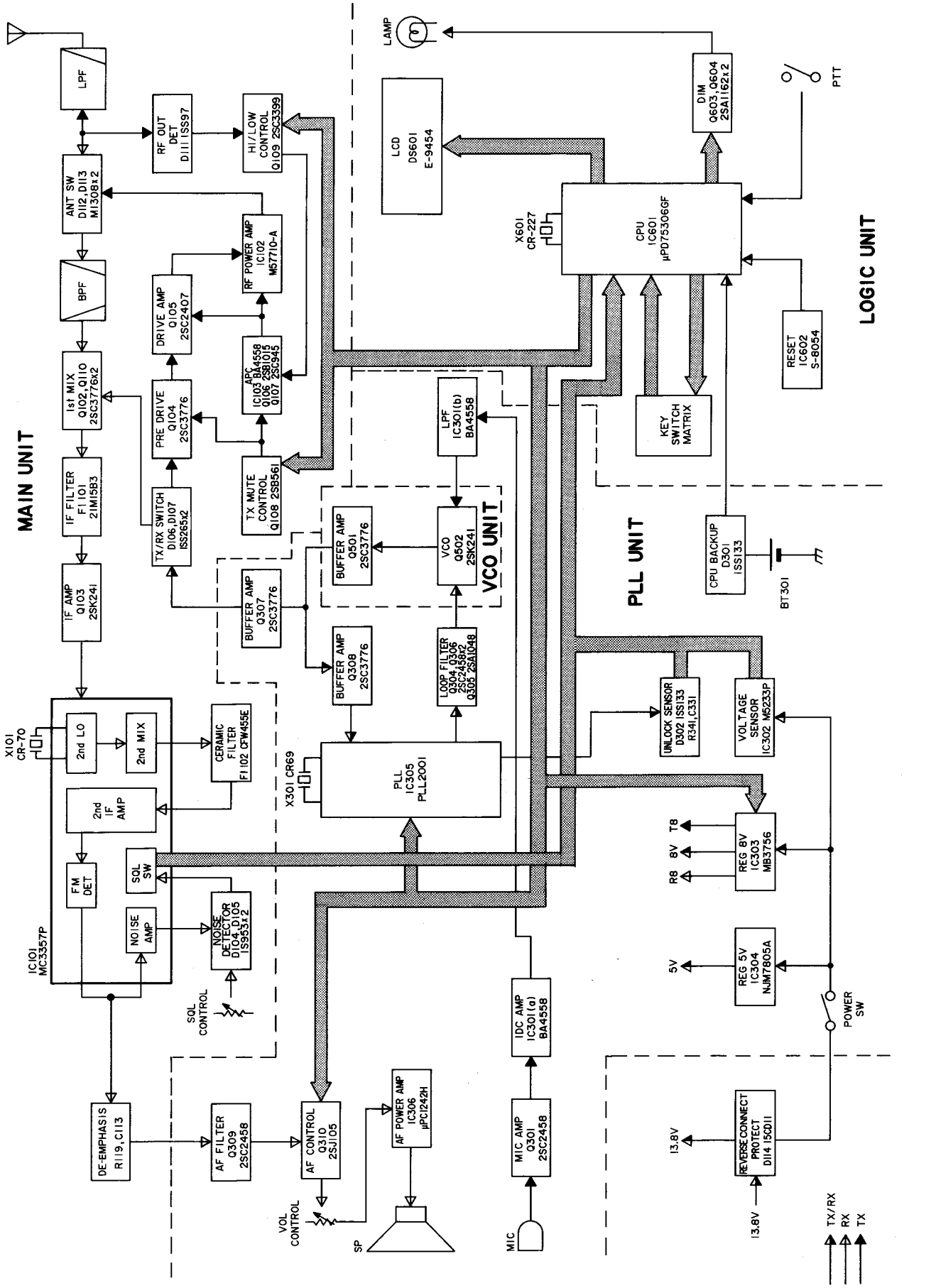
■ MARINE VHF TRANSCEIVER CHANNEL CHART

Channel No.	Frequency (MHz)		Transmitter output power
	Transmitter	Receiver	
01	156.050	160.650	25W & 1W
01A	156.050	156.050	25W & 1W
02	156.100	160.700	25W & 1W
02A	156.100	156.100	25W & 1W
03	156.150	160.750	25W & 1W
03A	156.150	156.150	25W & 1W
04	156.200	160.800	25W & 1W
04A	156.200	156.200	25W & 1W
05	156.250	160.850	25W & 1W
05A	156.250	156.250	25W & 1W
06	156.300	156.300	25W & 1W
07	156.350	160.950	25W & 1W
07A	156.350	156.350	25W & 1W
08	156.400	156.400	25W & 1W
09	156.450	156.450	25W & 1W
10	156.500	156.500	25W & 1W
11	156.550	156.550	25W & 1W
12	156.600	156.600	25W & 1W
13	156.650	156.650	25W & 1W
14	156.700	156.700	25W & 1W
*15	156.750	156.750	1W only
16	156.800	156.800	25W & 1W
17	156.850	156.850	1W only
18	156.900	161.500	25W & 1W
18A	156.900	156.900	25W & 1W
19	156.950	161.550	25W & 1W
19A	156.950	156.950	25W & 1W
20	157.000	161.600	25W & 1W
20A	157.000	157.000	25W & 1W
21	157.050	161.650	25W & 1W
21A	157.050	157.050	25W & 1W
22	157.100	161.700	25W & 1W
22A	157.100	157.100	25W & 1W
23	157.150	161.750	25W & 1W
23A	157.150	157.150	25W & 1W
24	157.200	161.800	25W & 1W
25	157.250	161.850	25W & 1W
26	157.300	161.900	25W & 1W
27	157.350	161.950	25W & 1W
28	157.400	162.000	25W & 1W
60	156.025	160.625	25W & 1W
60A	156.025	156.025	25W & 1W
61	156.075	160.675	25W & 1W
61A	156.075	156.075	25W & 1W
62	156.125	160.725	25W & 1W
62A	156.125	156.125	25W & 1W
63	156.175	160.775	25W & 1W
63A	156.175	156.175	25W & 1W
64	156.225	160.825	25W & 1W
64A	156.225	156.225	25W & 1W

Channel No.	Frequency (MHz)		Transmitter output power
	Transmitter	Receiver	
65	156.275	160.875	25W & 1W
65A	156.275	156.275	25W & 1W
66	156.325	160.925	25W & 1W
66A	156.325	156.325	25W & 1W
67	156.375	156.375	25W & 1W
68	156.425	156.425	25W & 1W
69	156.475	156.475	25W & 1W
70	156.525	156.525	1W only
71	156.575	156.575	25W & 1W
72	156.625	156.625	25W & 1W
73	156.675	156.675	25W & 1W
74	156.725	156.725	25W & 1W
75	——	——	Guard
76	——	——	Guard
77	156.875	156.875	25W & 1W
78	156.925	161.525	25W & 1W
78A	156.925	156.925	25W & 1W
79	156.975	161.575	25W & 1W
79A	156.975	156.975	25W & 1W
80	157.025	161.625	25W & 1W
80A	157.025	157.025	25W & 1W
81	157.075	161.675	25W & 1W
81A	157.075	157.075	25W & 1W
82	157.125	161.725	25W & 1W
82A	157.125	157.125	25W & 1W
83	157.175	161.775	25W & 1W
83A	157.175	157.175	25W & 1W
84	157.225	161.825	25W & 1W
84A	157.225	157.225	25W & 1W
85	157.275	161.875	25W & 1W
85A	157.275	157.275	25W & 1W
86	157.325	161.925	25W & 1W
86A	157.325	157.325	25W & 1W
87	157.375	161.975	25W & 1W
87A	157.375	157.375	25W & 1W
88	157.425	162.025	25W & 1W
88A	157.425	157.425	25W & 1W
WX01	——	162.550	RX only
WX02	——	162.400	RX only
WX03	——	162.475	RX only
WX04	——	162.425	RX only
WX05	——	162.450	RX only
WX06	——	162.500	RX only
WX07	——	162.525	RX only
WX08	——	161.650	RX only
WX09	——	161.775	RX only
WX10	——	163.275	RX only

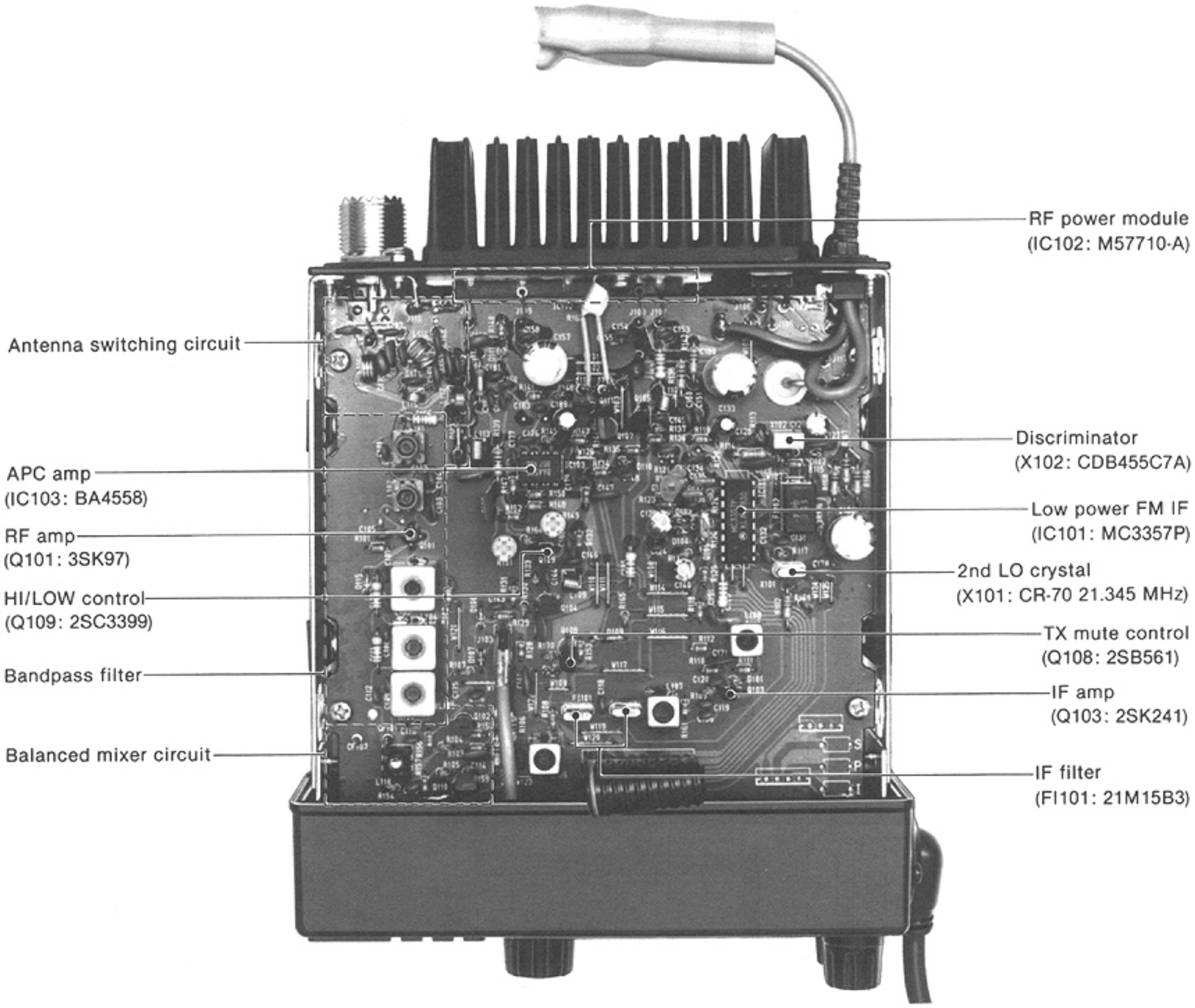
*: Only receives using a U.S.A. channel.

SECTION 2 BLOCK DIAGRAM

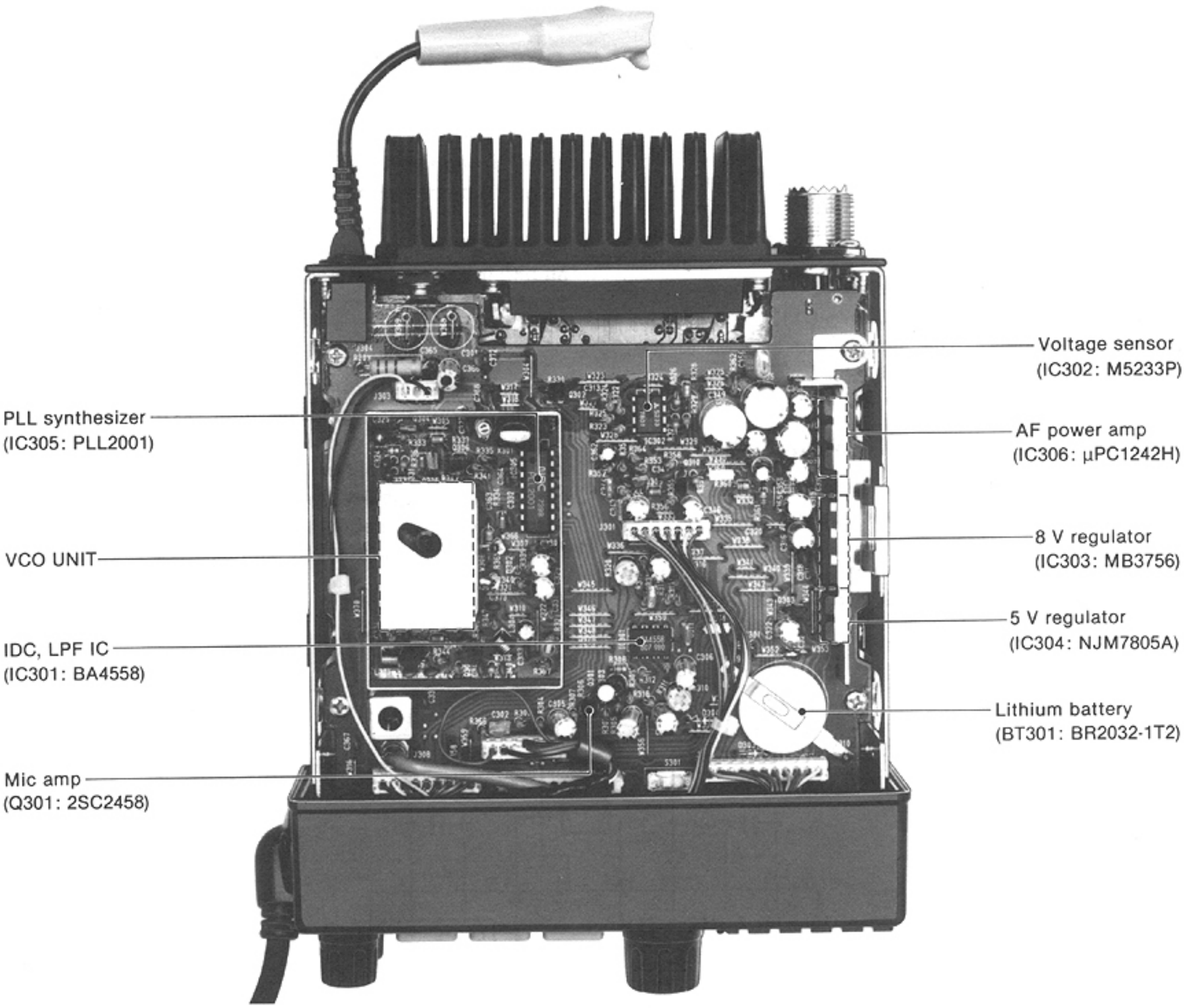


SECTION 3 INSIDE VIEWS

- **MAIN UNIT**



• PLL UNIT


PLL synthesizer
(IC305: PLL2001)
VCO UNIT
IDC, LPF IC
(IC301: BA4558)
Mic amp
(Q301: 2SC2458)
Voltage sensor
(IC302: M5233P)
AF power amp
(IC306: µPC1242H)
8 V regulator
(IC303: MB3756)
5 V regulator
(IC304: NJM7805A)
Lithium battery
(BT301: BR2032-1T2)

SECTION 4 CIRCUIT DESCRIPTION

4-1 RECEIVER CIRCUITS

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

Received signals enter the antenna connector and pass through a three-stage Chebyshev low-pass filter (C168~C174, L114~L116). The signals are applied to the antenna switching circuit (D112, D113), and then to the RF circuit.

4-1-2 RF CIRCUIT (MAIN UNIT)

The signals from the antenna switching circuit pass through a two-stage bandpass filter (L101, L102, C101~C104), and are applied to the RF amplifier (Q101). Q101 is an N-channel GaAs FET which provides high-gain and low-noise amplification.

Amplified signals are reapplied to the three-stage bandpass filter (L103~L105, C107~C112) to suppress out-of-band signals. The signals are applied to the 1st mixer circuit (Q102, Q110 L118).

4-1-3 1ST MIXER CIRCUIT (MAIN UNIT)

The 1st mixer circuit forms a balanced mixer circuit which improves the two-signal characteristics.

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

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

After passing through the matching transformer (L106), the 1st IF signal is applied to a pair of crystal filters (FI101) to suppress unwanted heterodyned signals. The 1st IF signal is amplified at the IF amplifier (Q103) and then applied to the 2nd mixer circuit via L108.

4-1-5 2ND IF AND DEMODULATOR CIRCUITS (MAIN UNIT)

The 1st IF signal from L108 is applied to the 2nd mixer section of IC101, and is mixed with the 2nd LO signal to be converted to a 455 kHz 2nd IF signal.

IC101 contains the 2nd mixer, local oscillator, limiter amplifier and quadrature detector circuits. The local oscillator section and X101 generate 21.345 MHz for the 2nd LO signal.

The 2nd IF signal from the 2nd mixer (IC101, pin 3) passes through the ceramic filter, FI102, where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC101, pin 5) and applied to the quadrature detector section (IC101, pin 8 and ceramic discriminator X102) to demodulate the 2nd IF signal into an AF signal.

AF signal output from pin 9 of IC101 is applied to the AF circuit and squelch circuit.

DEMODULATOR CIRCUIT

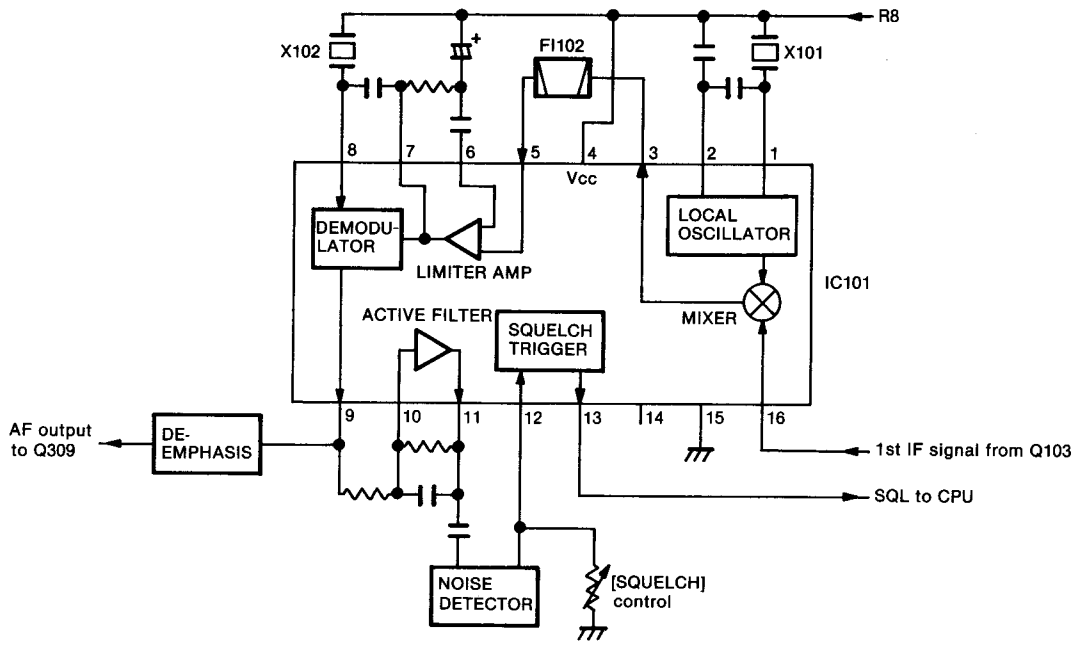


Fig. 1

4-1-6 AF CIRCUIT (MAIN AND PLL UNITS)

The AF signal from IC101 is applied to the de-emphasis circuit (R119, C133). This de-emphasis circuit is an integrated circuit with frequency characteristics of −6 dB/octave. The resulting signal is applied to Q309 on the PLL UNIT. Q309 functions as a high-pass filter to suppress unwanted low-frequency signals.

The filtered signal passes through the volume control (R625) and the AF mute circuit (Q310). When the squelch is closed, Q310 is activated as the AF mute switch. The AF signal is power-amplified at the AF amplifier (IC306) and then applied to the speaker.

4-1-7 SQUELCH CIRCUIT (MAIN UNIT)

Some of the noise components in the AF signal from IC101 are applied to pin 10 of IC101 via C135, R121, R122.

The active filter section in IC101 amplifies noise components of frequencies of 20 kHz and above, and outputs the resulting signals from pin 11. Output signals are rectified by D104 and D105, and are converted to DC voltage. This voltage is applied to the squelch trigger circuit (pin 12). The squelch control (R626) is also connected to pin 12 to adjust the DC voltage.

The DC voltage triggers the squelch circuit in IC101. Pin 13 of IC101 outputs the squelch signal. The signal is applied to the CPU (IC601, pin 36) through the SQL signal line. The CPU outputs the RMUT signal. The signal activates the AF mute circuit (Q310) to cut the AF signal from the volume control.

4-2 TRANSMITTER CIRCUITS

4-2-1 MICROPHONE AMPLIFIER (PLL UNIT)

AF signals from the microphone are pre-emphasized to +6 dB/octave through C302 and R302~R304, and amplified at Q301. Amplified signals are applied to the limiter amplifier IC301 pin 2.

The output signals from IC301 pin 1 pass through the splatter filter circuit (IC301 pins 5 and 6) where signals of 3 kHz and above are attenuated. IC301 pin 7 then outputs the signals. The signals are applied to the VCO circuit to produce an FM signal.

4-2-2 DRIVE AMPLIFIER (PLL AND MAIN UNITS)

The VCO output is amplified at Q307, and applied to the low-pass filter (L302, L303, C337~C339) to suppress high harmonic components. The resulting signal is applied to the transmit/receive switching circuit (D106, D107) on the MAIN UNIT.

After passing through the transmit/receive switching circuit (D106, D107), the VCO output is amplified at the predrive amplifier (Q104) and the drive amplifier (Q105) where 150 mW is obtained.

The bias voltage controlled by the TMUT signal from the CPU is applied to the predrive and drive amplifiers to prevent unwanted transmission when the operating mode (transmit or receive) is changed or PLL is unlocked.

The voltage controlled by the APC circuit is applied to the collector of Q105 to protect the RF power module from damage by an antenna mismatch.

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

IC102 is a power module which provides a stable 25 W output power.

An RF signal from the drive amplifier (Q105) is applied to pin 1 of IC102. The amplified signal is output from pin 4, and applied to the antenna connector through the diode switching and low-pass filter circuits.

4-2-4 APC CIRCUIT (MAIN UNIT)

The APC circuit protects the power module (IC102) from a mismatched output load and selects HIGH and LOW output power.

TRANSMITTER CIRCUIT

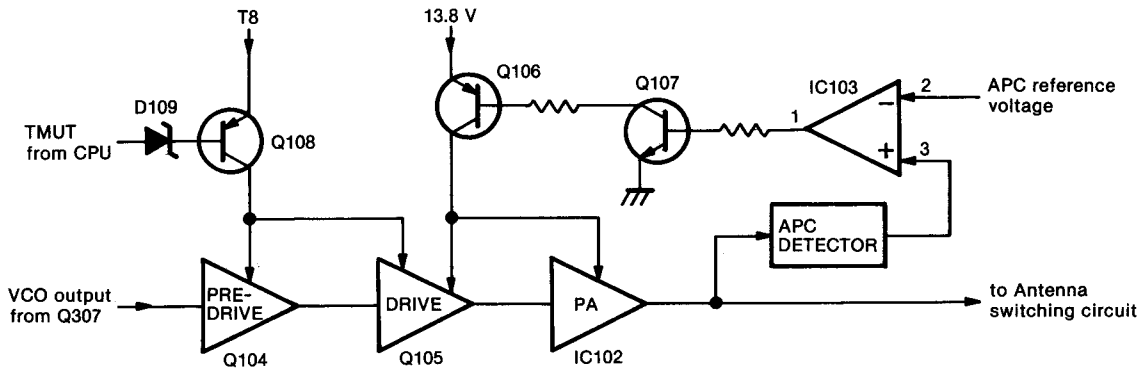


Fig. 2

The output power level from the power module (IC102) is detected at the APC detector (D111). When antenna impedance is matched at 50 Ω, the detected level is at a minimum. However, when antenna impedance is mismatched, the detected voltage is higher than when matched.

When the antenna impedance is mismatched, the voltage of IC103 pin 2 is higher than the voltage of pin 3 (reference voltage). IC103 decreases the collector current of Q106 using Q107. Q106 collector current is used at the power module (IC102) and the driver amplifier (Q105). Hence, when the antenna impedance is mismatched, the output power is decreased.

The output power selecting circuit uses the APC circuit. The LOWO signal from the CPU (IC601) selects the reference voltage, changing the output power to HIGH or LOW.

The overheat protector circuit uses the APC circuit. The thermistor (R163) installed in the heatsink detects temperatures and protects the power module (IC102) from overheating, reducing the output power.

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

When transmitting, D112 and D113 are turned ON. The RF output signal from IC102 is not applied to the receiver circuit, passing through D112 and C167, the low-pass filter (C168~C174, C187, L114~L116) and then on to the antenna. The low-pass filter suppresses high harmonic components.

4-3 PLL CIRCUITS

4-3-1 GENERAL

The PLL circuit, using a direct programmable divider (IC305), directly generates the desired frequency with the VCO circuit. IC305 sets the dividing ratio based on serial data from the CPU, and compares the phases of the VCO signal and the PLL reference frequency. It detects the out-of-step phase and outputs it.

4-3-2 REFERENCE OSCILLATOR CIRCUIT (PLL UNIT)

A reference frequency is produced by the local oscillator section of IC305 and X301. R338 is thermistor designed to compensate for the frequency drift of low temperature. The reference frequency is applied to the PLL circuit and divided to 12.5 kHz as the PLL reference frequency.

4-3-3 CHARGE PUMP AND LOOP FILTER CIRCUITS (PLL AND VCO UNITS)

Phase-detected signals from pins 5 and 12 are converted to DC voltage by the charge pump Q304~Q306; and the lag-lead loop filter consisting of R332, R333 and C325.

The frequency at which the VCO oscillates is controlled by varactor diodes (D504, D505). DC voltage (PLL lock voltage) is provided through the loop filter.

4-3-4 VCO CIRCUIT

D503 changes the inductive reactance of the Clapp oscillator (Q502), shifting the receive and transmit frequencies and making an FM modulation. Varactor diodes (D504, D505) provide frequency control. The buffer amplifier (Q501) is unaffected by VCO oscillation.

PLL CIRCUIT

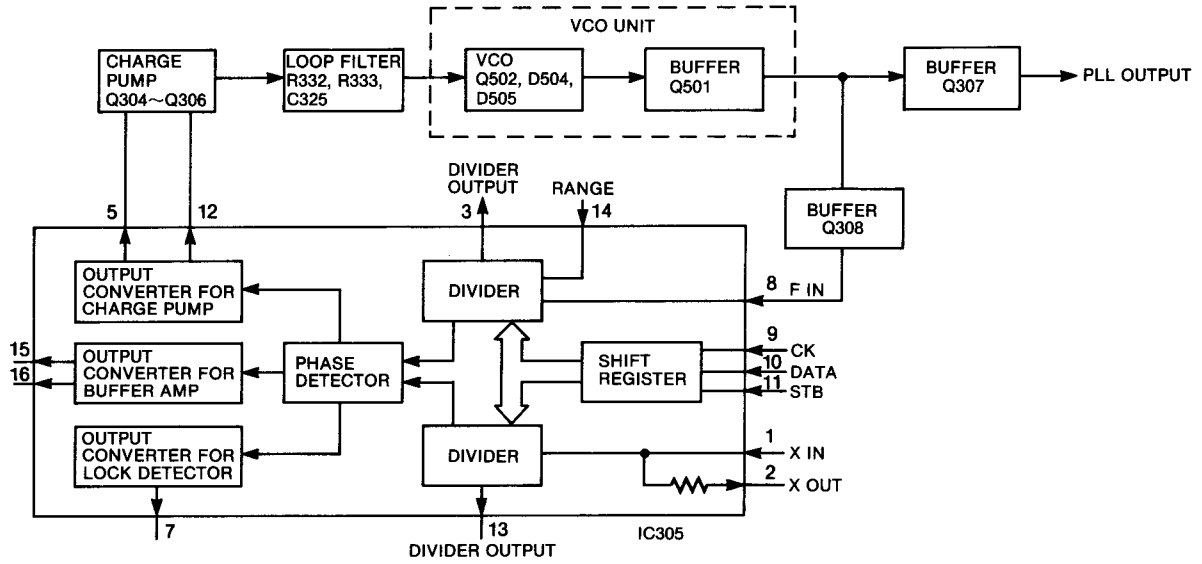


Fig. 3

4-4 OTHER CIRCUITS

4-4-1 RESET CIRCUIT (LOGIC UNIT)

The CPU (IC601) is reset when the RESET port changes from "HIGH" to "LOW" and then becomes "HIGH." The RESET port remains "HIGH" except when the CPU is reset.

4-4-2 DIMMER CIRCUIT (LOGIC UNIT)

The function display changes its brightness at 4 levels using combinations of output level at S28 and S29. By changing levels at S28 and S29, the base voltage and collector current of Q603 and Q604 changes. Therefore, the collector voltage is changed and the brightness of lamps DS602 and DS603 changes.

DIMMER CIRCUIT

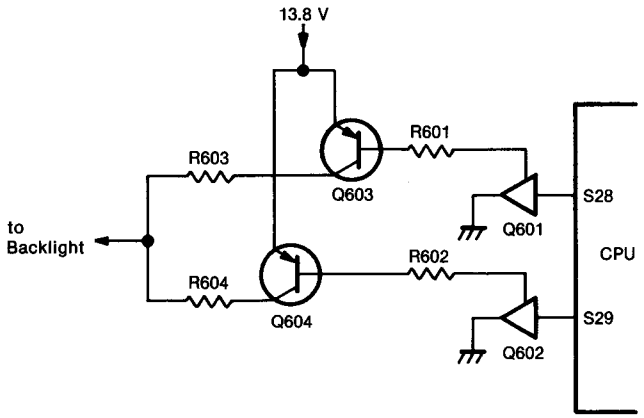


Fig. 4

BRIGHTNESS	S28	S29	INDICATION
↑ Bright	H	H	d-3
	L	H	d-2
Dark ↓	H	L	d-1
	L	L	OFF

Table 1

4-4-3 REGULATOR CIRCUITS (PLL UNIT)

IC303 is a voltage regulator IC chip with a control terminal. +13.8 V is applied to pin 2 and pin 1 outputs constant 8 V. IC303 also outputs a transmit 8 V (T8) from pin 8 and receive 8 V (R8) from pin 6. The SEND signal from the CPU is applied to Q303 and then to IC303 pin 5, controlling the T8 and R8.

IC304 is a 3-terminal voltage regulator IC chip. +13.8 V is applied to an input terminal and the output terminal outputs +5 V.

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

When the power switch is turned OFF, a voltage is applied to the CPU (IC601) pin 54 via D301 from the lithium backup battery installed in the transceiver to provide backup for the memory contents.

CPU POWER SUPPLY CIRCUIT

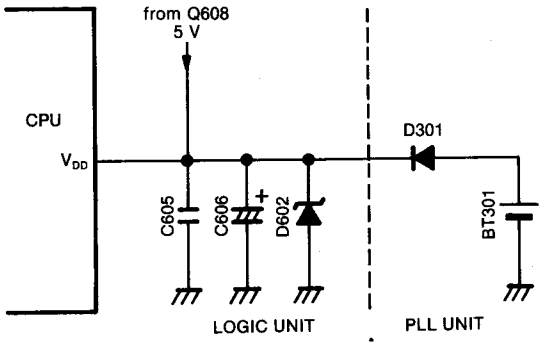


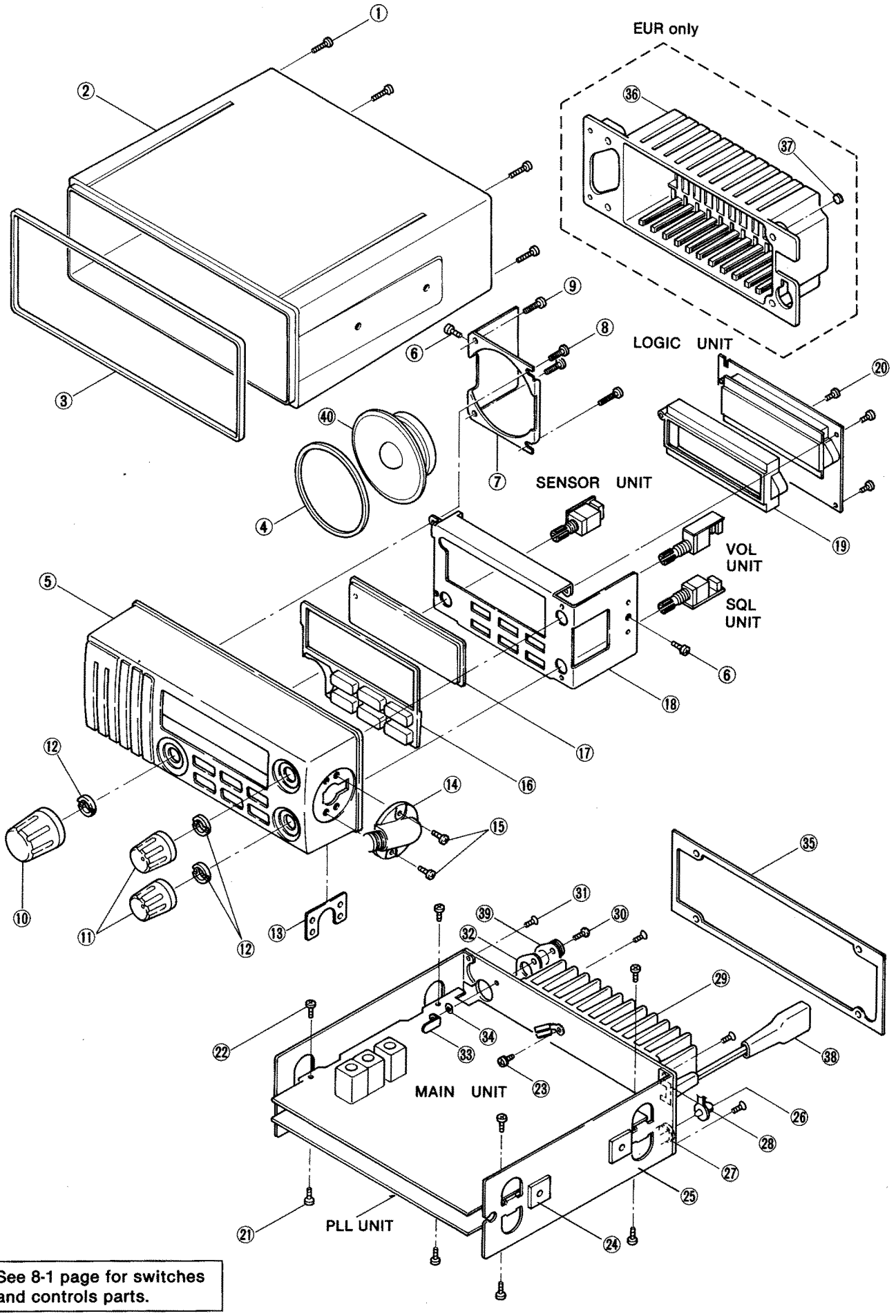
Fig. 5

5-1 MECHANICAL PARTS

LABEL NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.	LABEL NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	BiH M3×10 SUS	8810005550	4	⑳	PH M2.6×6	8810000150	3
②	Case	8110003190	1	㉑	PH B1 3×6	8810001350	4
③	Front seal	8930014320	1	㉒	PH B1 3×5	8810001340	4
④	Speaker ring	8930014350	1	㉓	Set screw (C) M3×6	8810003360	1
⑤	Front panel (U.S.A.)	8210004430	1	㉔	Sealing nut	8930014340	4
	Front panel (EUR)	8210004710	1	㉕	Side plate	8010008030	2
⑥	FH M3×8	8810002180	2	㉖	Jack cap seal	8930014310	1
⑦	Speaker plate	8930014220	1	㉗	Jack seal	8930014300	1
⑧	PH B0 3×8	8810001120	1	㉘	Cable plate	8930010690	1
⑨	PH B0 3×6	8810001110	3	㉙	706 heatsink	8410001250	1
⑩	Knob N-140	8610004890	1	㉚	ICOM screw (A) 8	8810003680	2
⑪	Knob N-141	8610004900	2	㉛	FH B1 3×8	8810002270	4
⑫	VR nut (E)	8830000550	3	㉜	ANT connector seal	8930002850	1
⑬	Cable plate	8930014230	1	㉝	Ground lug (U.S.A.)	8860000580	1
⑭	Cable stopper (assembled in the microphone, EM-51)	(EM-51: 7700000890)	1		Ground lug (EUR)	8860000580	3
⑮	PH M3×8 SUS ZK	8810005560	2	㉞	Insulation washer (EUR only)	6910000280	2
⑯	Front switch seal (U.S.A.)	8310016370	1	㉟	Heatsink seal	8930014330	1
	Front switch seal (EUR)	8010008580	1	㊱	Heatsink cover (EUR only)	8410001250	1
⑰	Front display plate	8310016380	1	㊲	Seal (EUR only)	8930011490	4
⑱	Sub chassis	8010008040	1	㊳	DC cable (OPC-116)	8900001120	1
⑲	LCD cover	8930014660	1	㊴	ANT connector (MR-DS-01)	6510004880	1
				㊵	Speaker (T045S01A0000)	2510000480	1

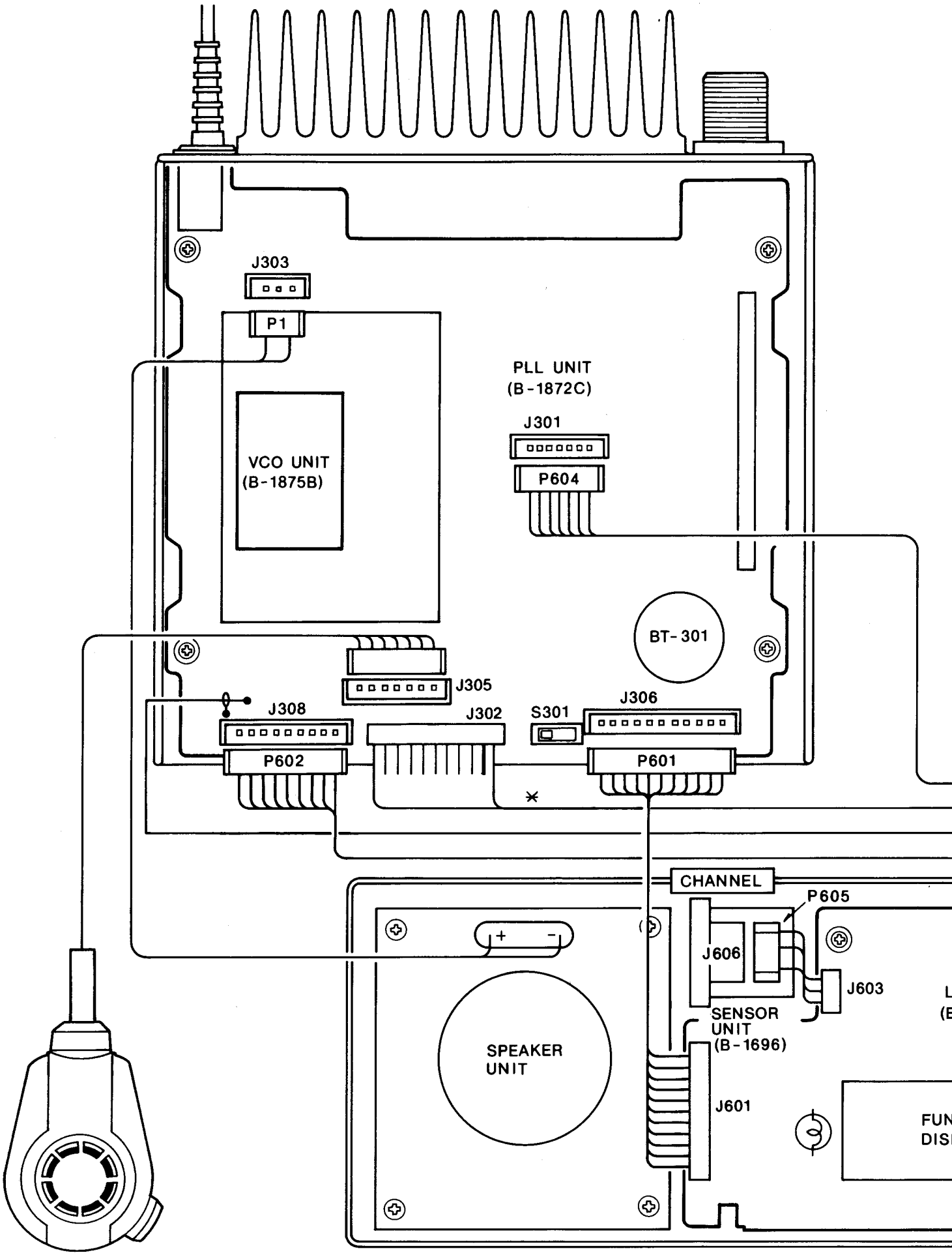
Screw type Screw: M3×10, etc. Self-tapping screw: B0 3×8, etc.
Screw head style PH: Pan head FH: Flat head BiH: Binding head

SECTION 5 MECHANICAL PARTS DISASSEMBLY

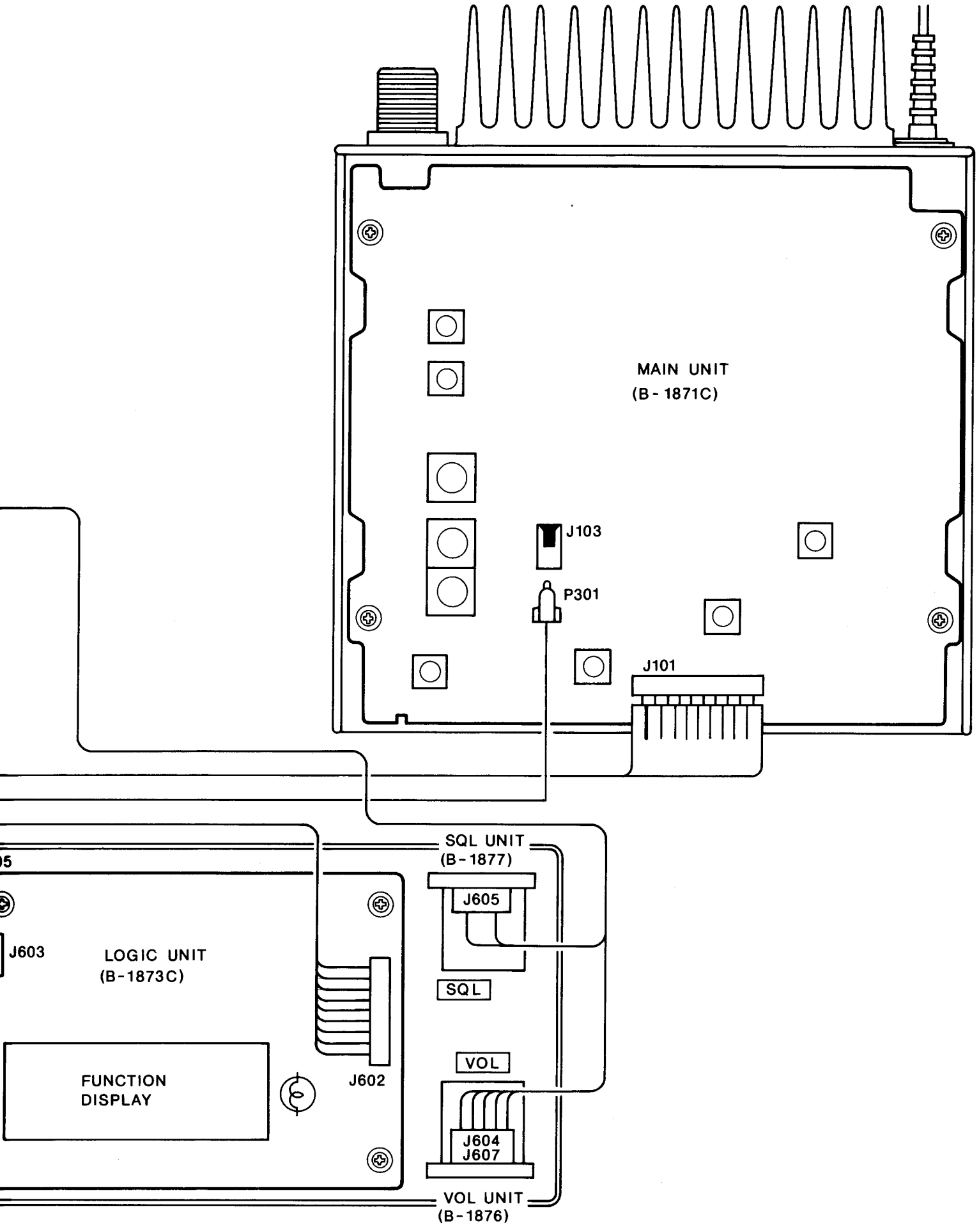


See 8-1 page for switches and controls parts.

5-2 CONNECTOR ASSEMBLY

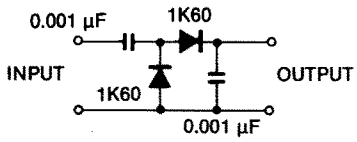


* FLAT CABLE (MAIN-PLL)
STYLE2468 AWG26 VW1 E43172


MAIN UNIT
(B-1871C)
J103
P301
J101
SQL UNIT
(B-1877)
J605
SQL
VOL
J604
J607
VOL UNIT
(B-1876)
J603
LOGIC UNIT
(B-1873C)
J602
FUNCTION
DISPLAY

SECTION 6 ADJUSTMENT PROCEDURES

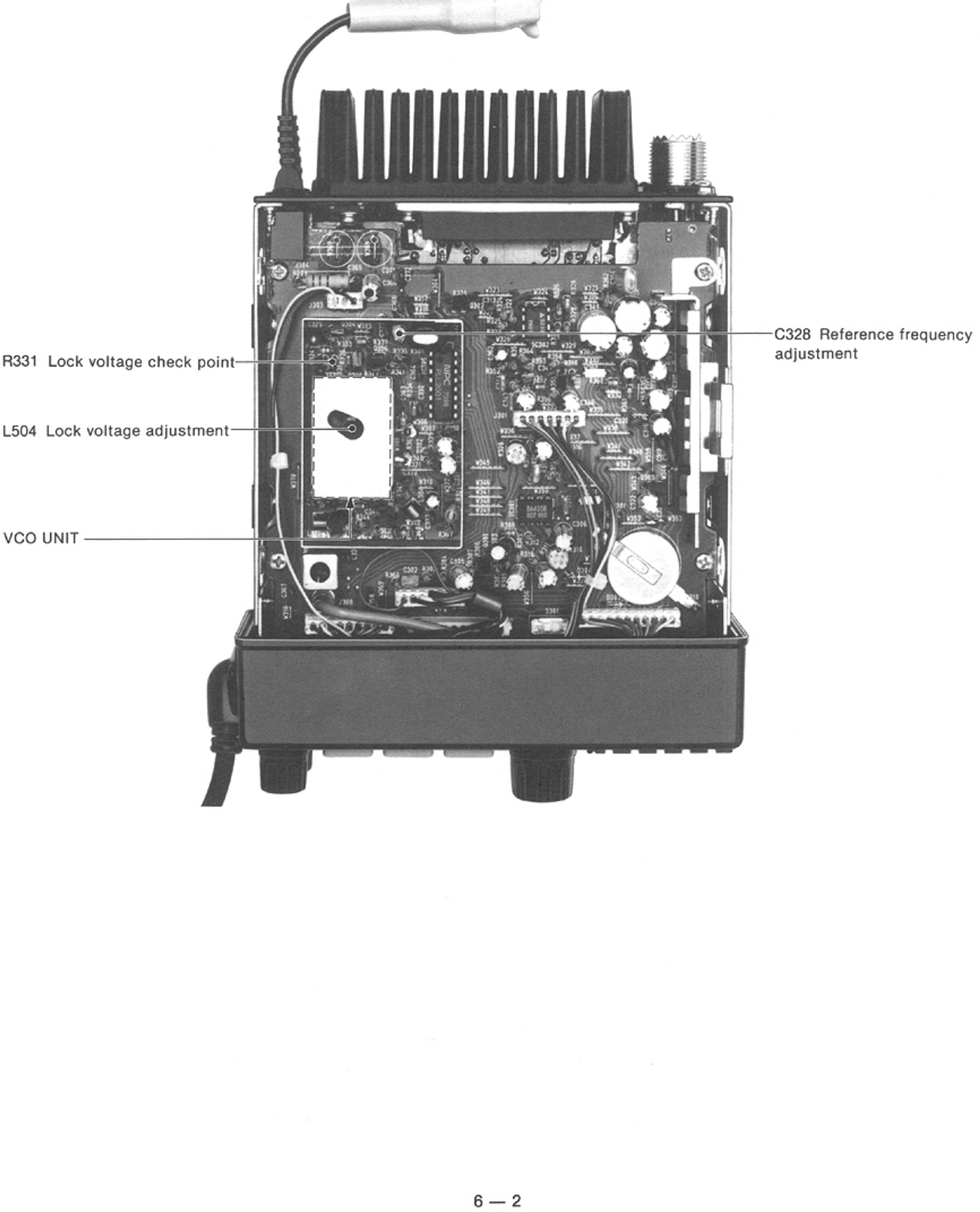
6-1 REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
AC power supply	Output voltage : 13.8 V DC Current capacity : 10 A or more	External speaker	Impedance : 4 Ω
RF power meter (terminated type)	Measuring range : 10~40 W Frequency range : 0.1~200 MHz Impedance : 50 Ω SWR : Less than 1.2 : 1	Audio generator	Frequency range : 200~2000 Hz Output level : 0~200 mV
		FM deviation meter	Frequency minimum: 200 MHz Measuring range : 0~±5 kHz
Frequency counter	Frequency range : 0.1~200 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	Attenuator	Power attenuation : 30 or 40 dB Capacity : 40 W or more
Oscilloscope	Frequency range : DC~20 MHz Measuring range : 0.01~10 V	Detector	
Standard signal generator (SSG)	Frequency range : 0.1~200 MHz Output level : −127~−17 dBm (0.1 µV~32 mV)		
DC voltmeter	Input impedance : 50 kΩ/DC or better		

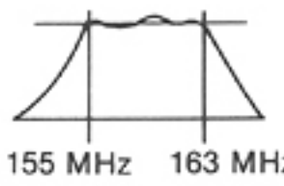
6-2 PLL ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1	• Operating channel: 16 • Receiving	PLL	Connect the DC voltmeter to R331.	3.5 V	VCO	L504
	2	• Transmitting			3.0~4.5 V		Verify
REFERENCE FREQUENCY	1	• Operating channel: 16 • Connect a dummy load. • Transmitting	Rear panel	Loose couple the frequency counter to the dummy load.	156.800 MHz	PLL	C328

•PLL AND VCO UNITS

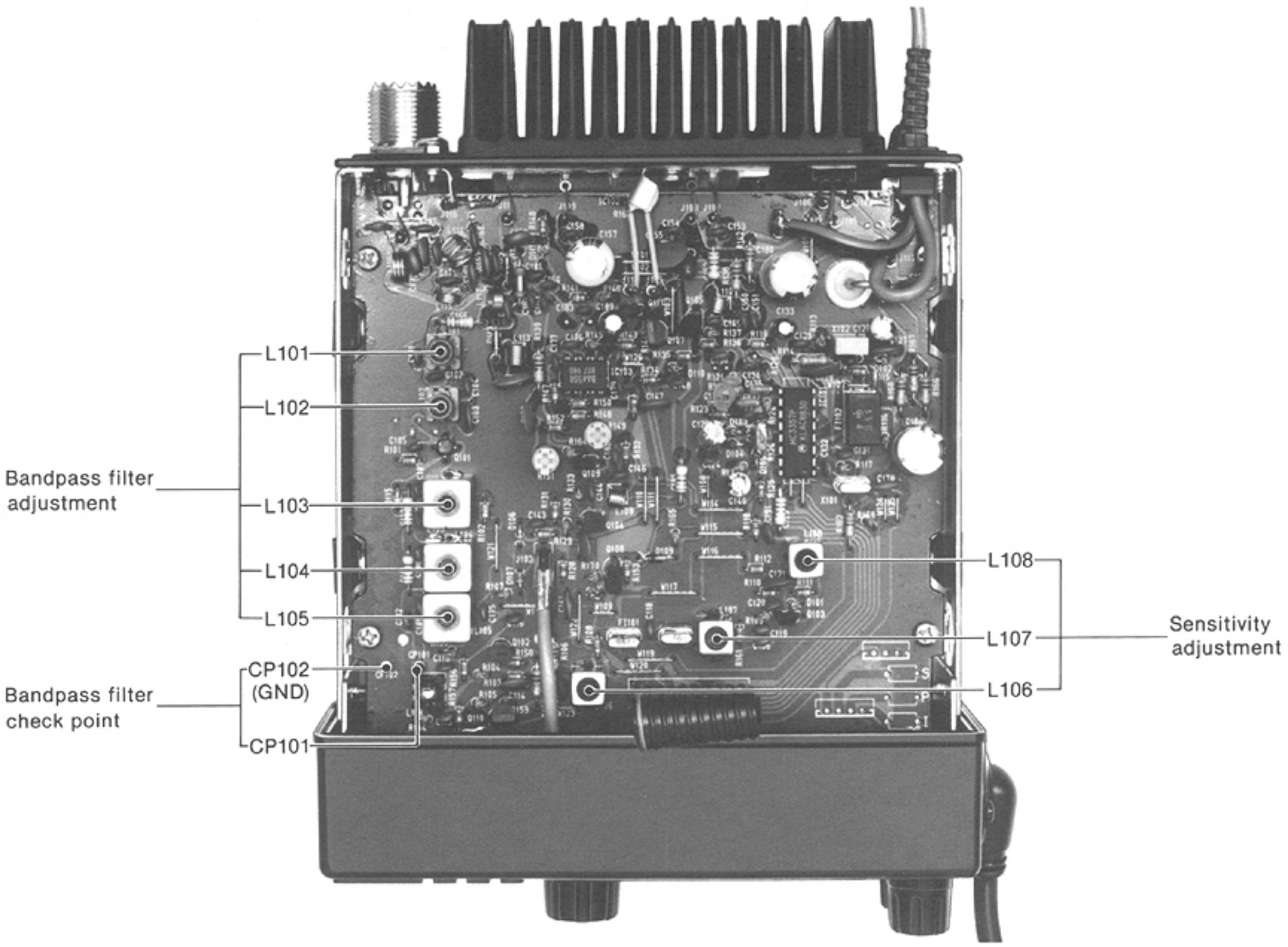


6-3 RECEIVER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
RF BANDPASS FILTER	1	• Receiving • Apply an RF sweep signal to the antenna connector. Center frequency : 160 MHz Sweep bandwidth: ±20 MHz Level : −20 dBm	MAIN	Connect the oscilloscope to CP101 via the detector. (CP102 is ground.)	The signal level for each frequency (155 MHz, 163 MHz) is equal.  155 MHz 163 MHz	MAIN	L101 L102 L103 L104 L105
SENSITIVITY	1	• Operating Channel: 16 • Receiving • Apply an RF signal to the antenna connector. Frequency: 156.800 MHz Level : −117 dBm (0.32 µV) Mod. : 1 kHz Dev. : ±3.5 kHz • [SQUELCH] control: Max. CCW	Rear panel	Connect the distortion meter with a 4 Ω load to the [EXT SP] jack.	Minimum distortion level	MAIN	L106 L107 L108
	2	• Adjust SSG output level so that SINAD level becomes 12 dB.			Applied RF signal level is less than −117 dBm (0.32 µV).		Verify

CCW: Counterclockwise

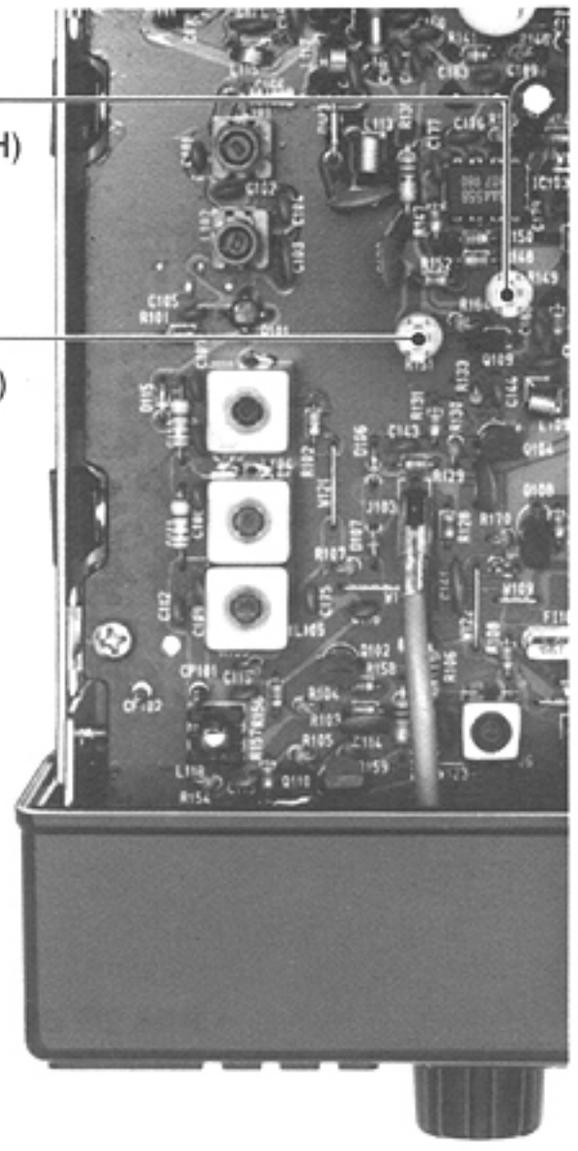
• MAIN UNIT



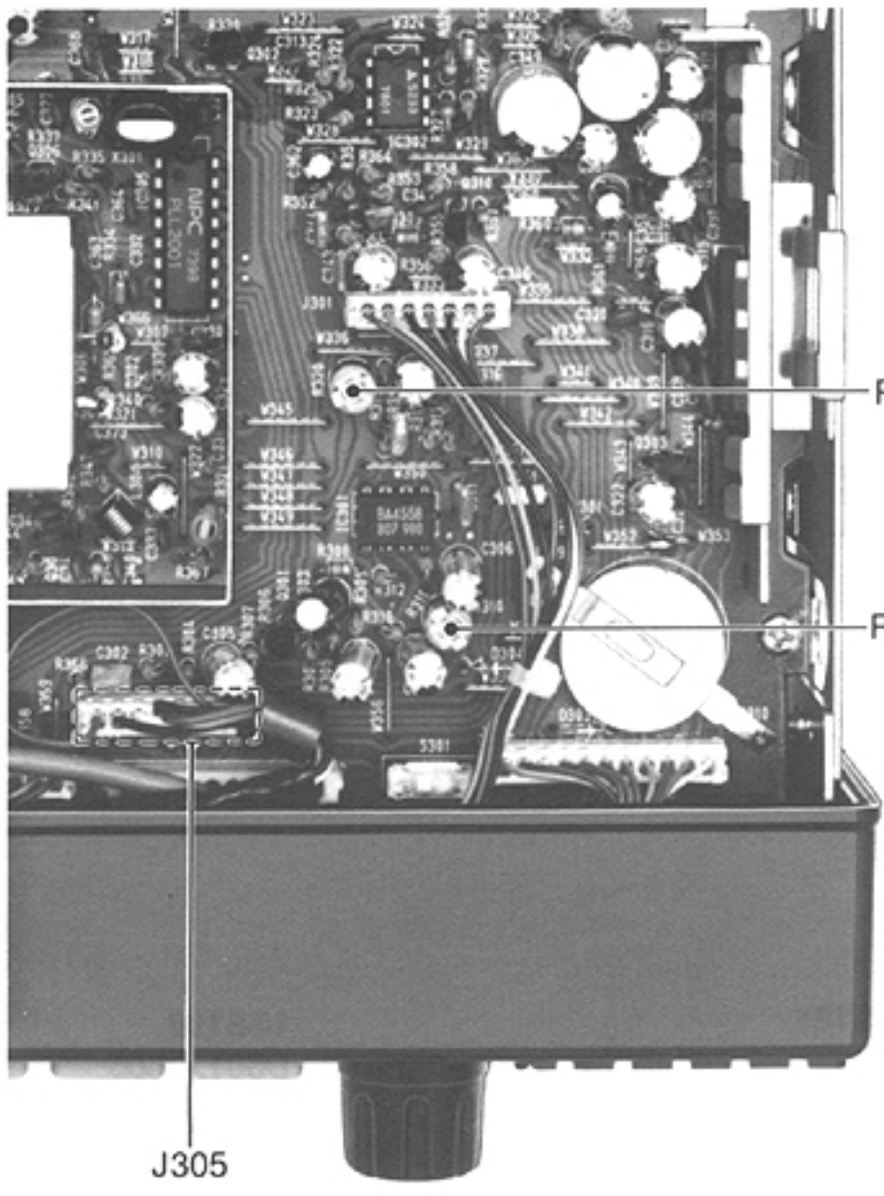
6-4 TRANSMITTER ADJUSTMENT

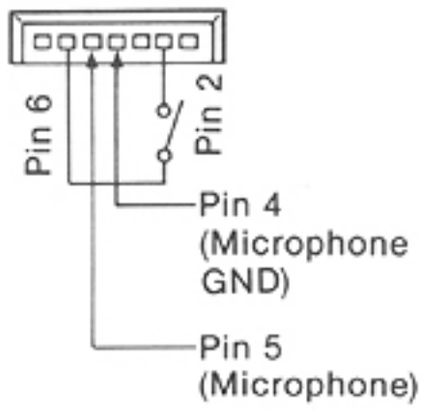
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	• Operating channel: 16 • [HI/LO] switch: HIGH • Transmitting	Rear panel	Connect the RF power meter to the antenna connector.	25 W	MAIN	R149
	2	• [HI/LO] switch: LOW			1.0 W		R151
FM DEVIATION	1	• Operating channel: 16 • Unplug a connector from J305. • Apply an AF signal to J305 pin 5. (Pin 4 is ground.) Level: 40 mV/1 kHz • Set the FM deviation meter. HPF : OFF LPF : 20 kHz De-emphasis: OFF Detector : (P-P)/2 • Transmitting	Rear panel	Connect the FM deviation meter to the antenna connector through the attenuator.	±4.5 kHz	PLL	R320
	2	• Set the FM deviation meter. Detector: −P and +P			Same level at −P and +P		R310
		NOTE: After above adjustment, plug the connector to J305.					

• MAIN UNIT



• PLL UNIT

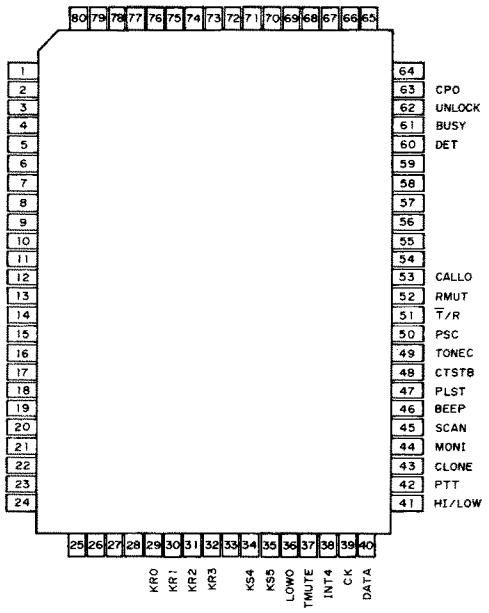




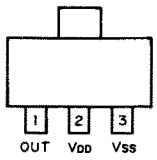
SECTION 7 BOARD LAYOUTS

7-1 LOGIC UNIT

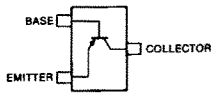
µPD75306GF-042-3B9 IC601
(CPU)



S-8054ALB-LN IC602
(RESET)

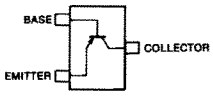


2SA1162 Y
Q603, Q604, Q609



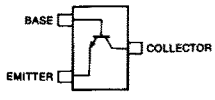
Symbol: SY

2SA1362 GR
Q608



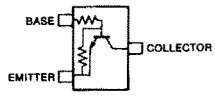
Symbol: AEG

2SC2712 Y
Q606



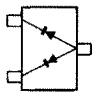
Symbol: LY

2SC3395
Q601, Q602, Q605,
Q607, Q610



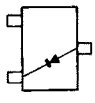
Symbol: BY

1SS181
D604



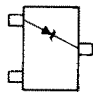
Symbol: A3

1SS190
D601, D605
D606 (EUR only)



Symbol: E3

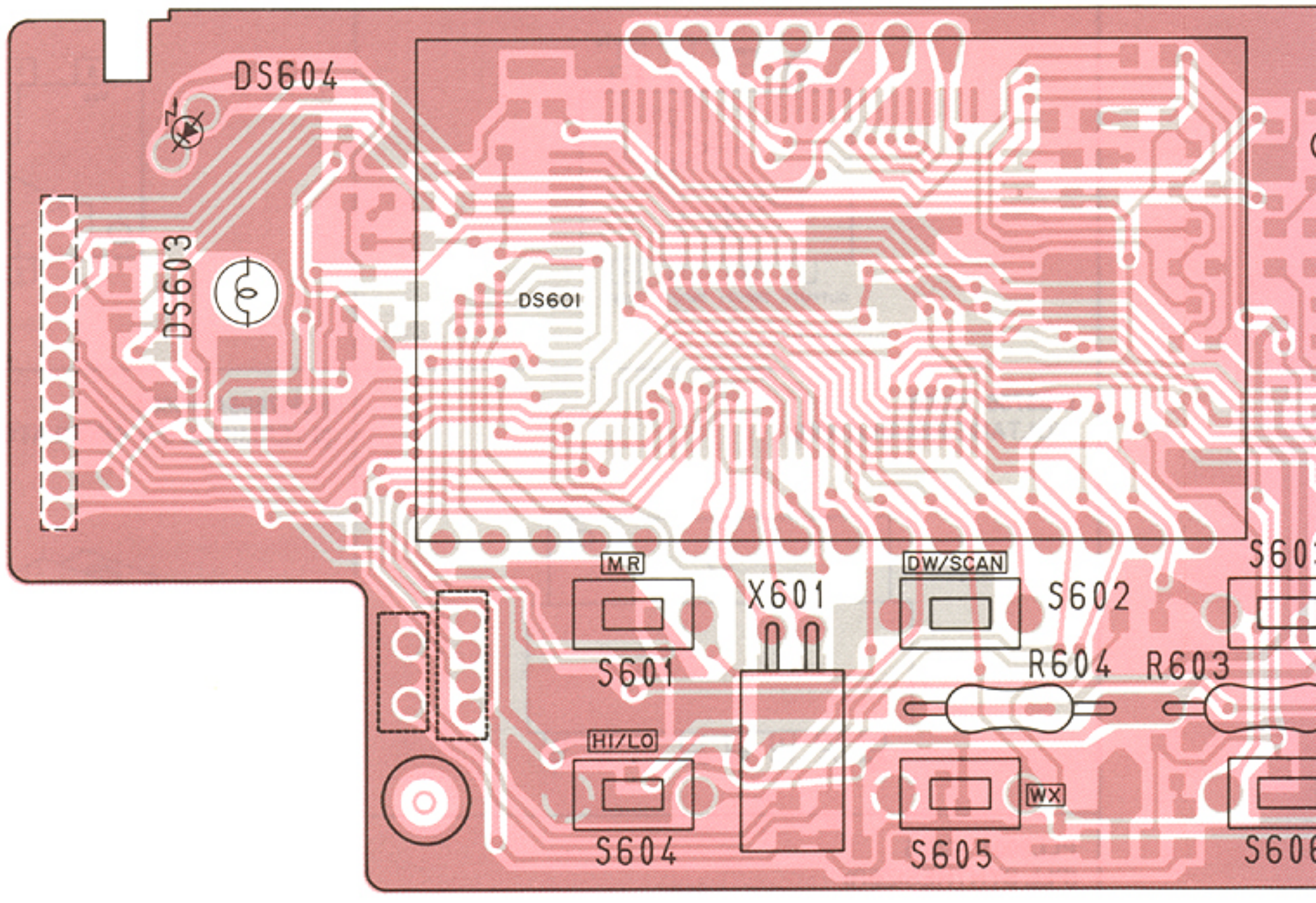
RD6.2M B2
D602, D603



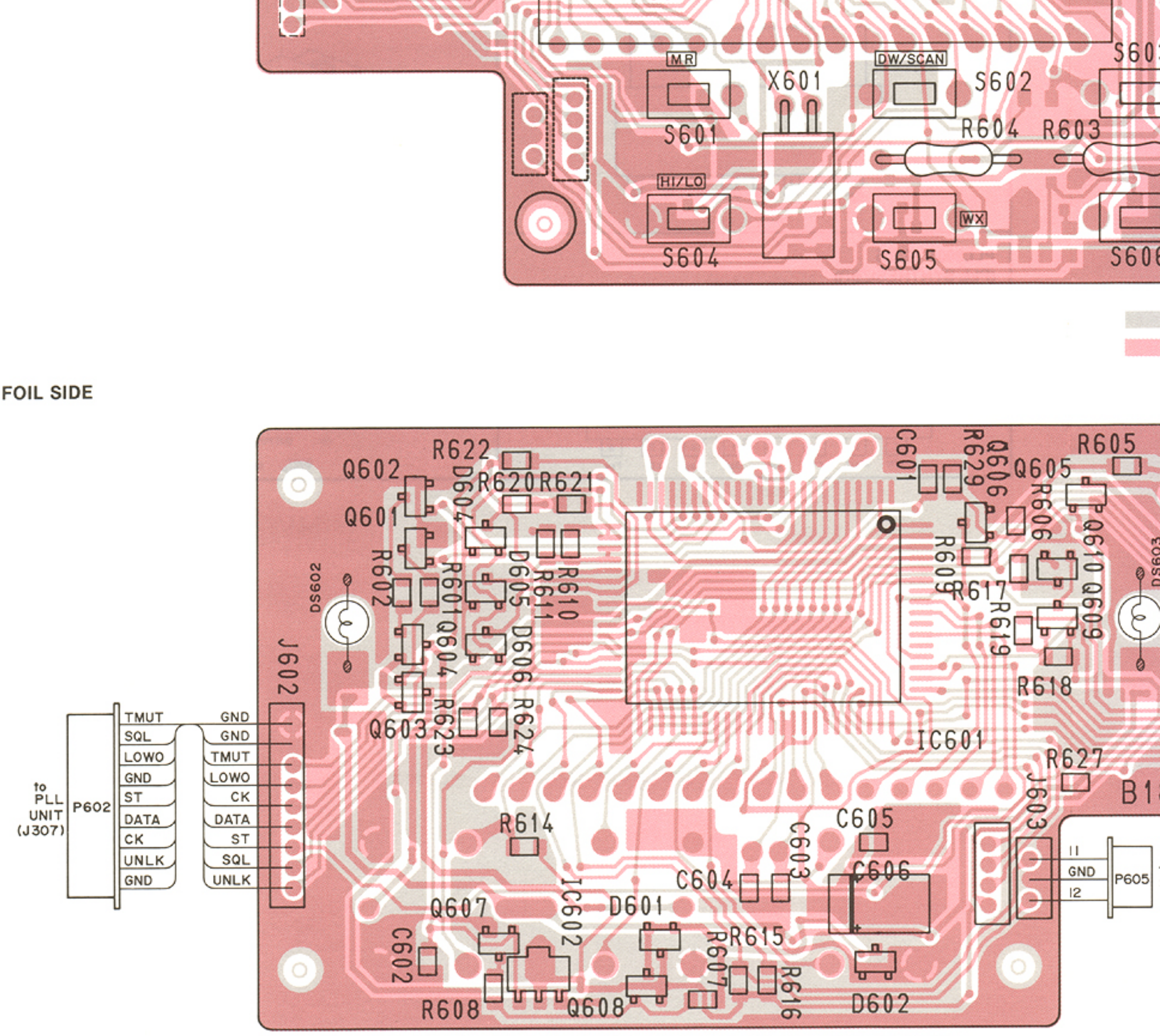
Symbol: 622

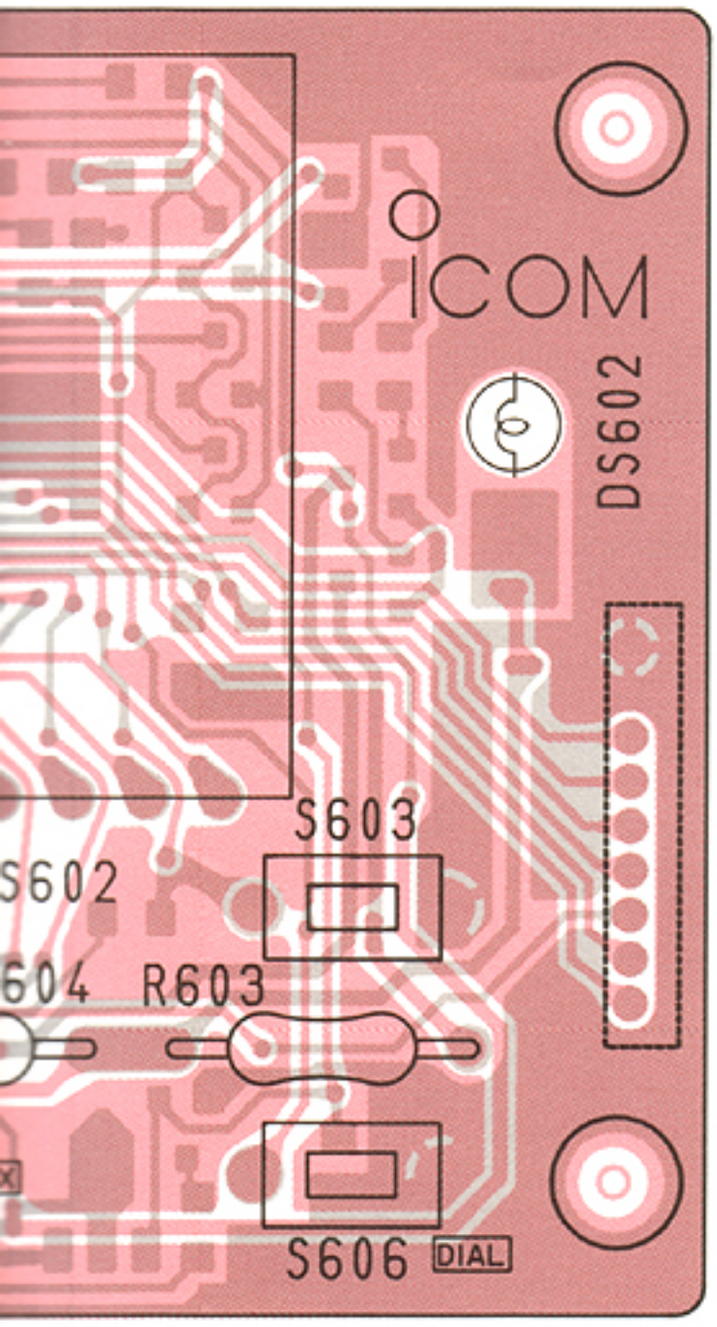
• LOGIC UNIT

COMPONENT SIDE

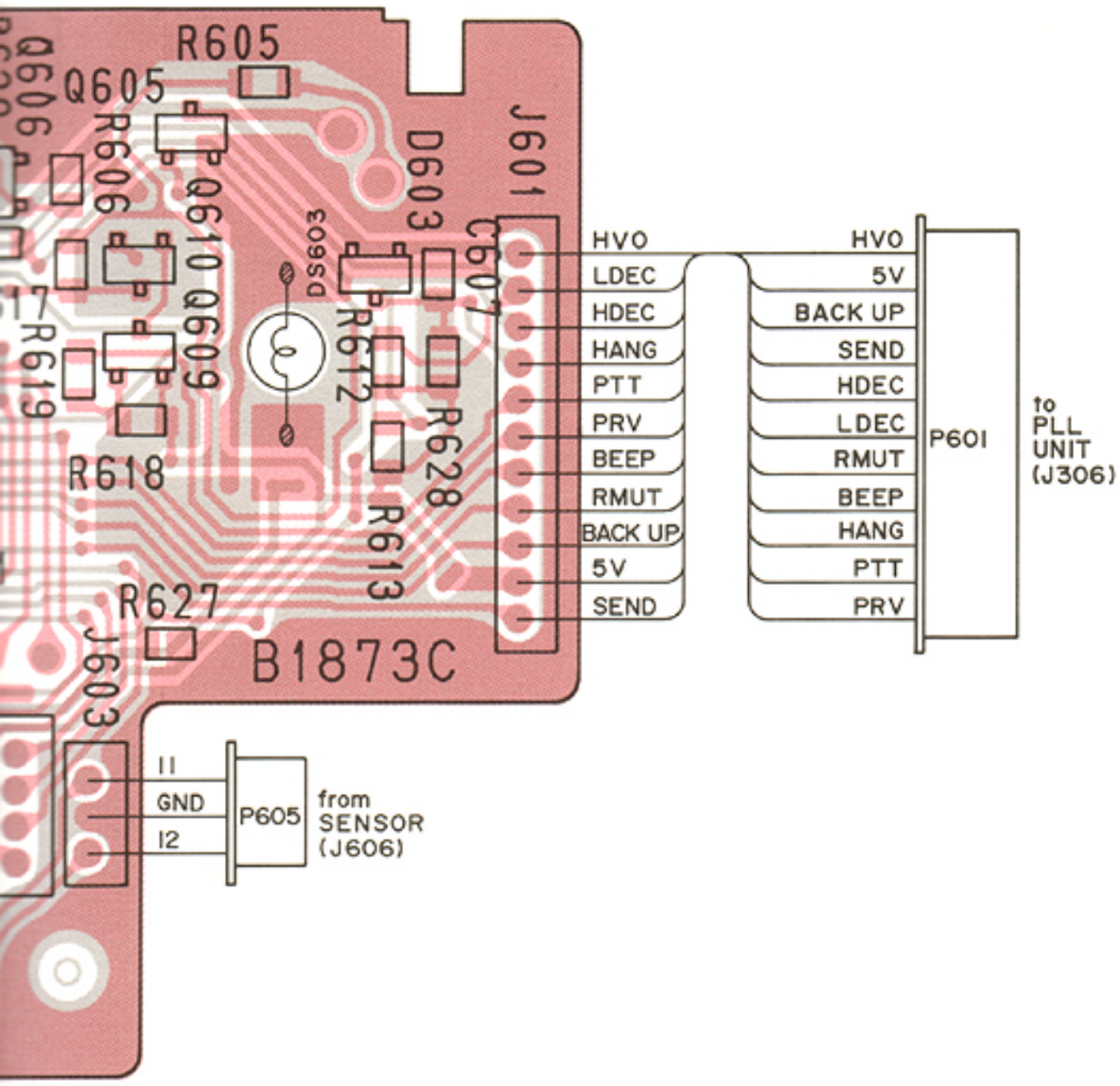


FOIL SIDE



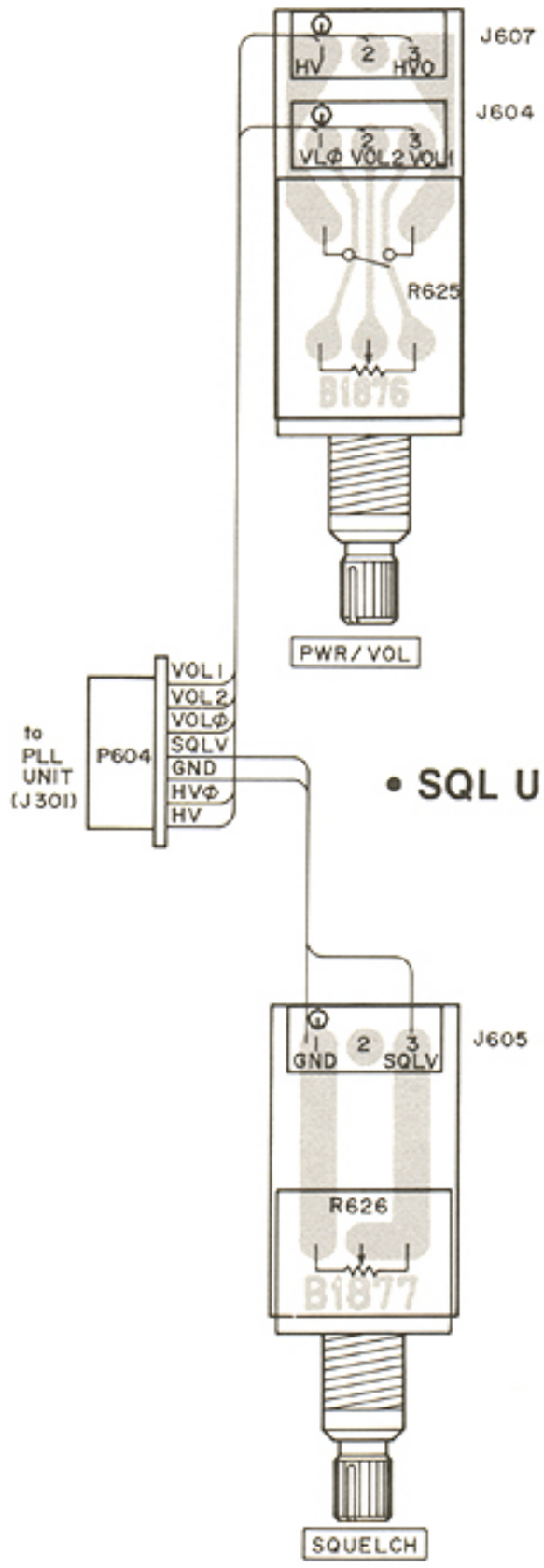


FOIL SIDE
COMPONENT SIDE



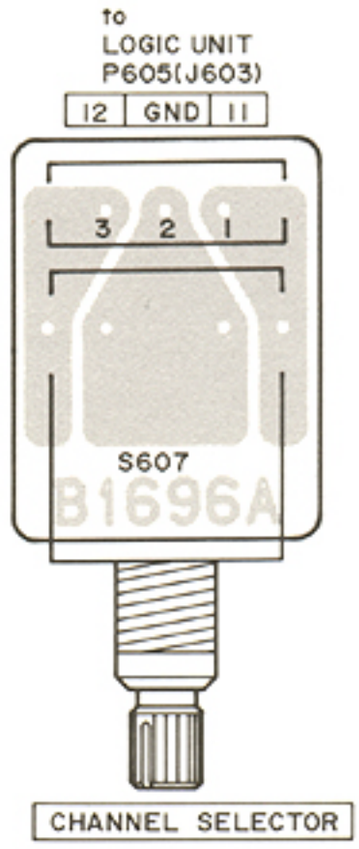
FOIL SIDE
COMPONENT SIDE

• VOL UNIT



• SQL UNIT

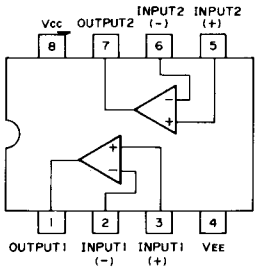
• SENSOR UNIT



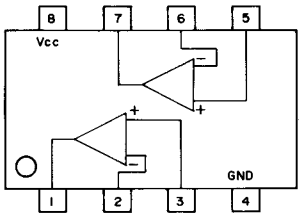
FOIL SIDE
COMPONENT SIDE

7-2 PLL AND VCO UNITS

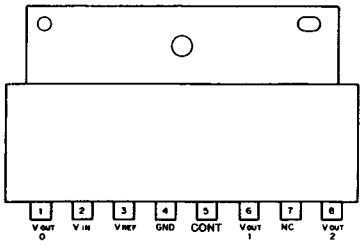
BA4558 IC301
(DUAL OPERATION AMPLIFIER)



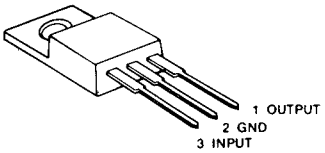
M5233P IC302
(VOLTAGE SENSOR)



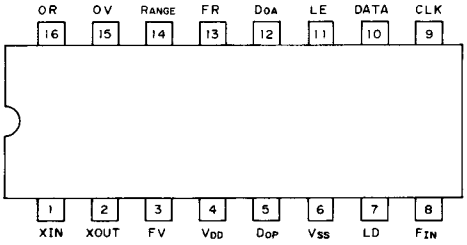
MB3756 IC303
(VOLTAGE REGULATOR)



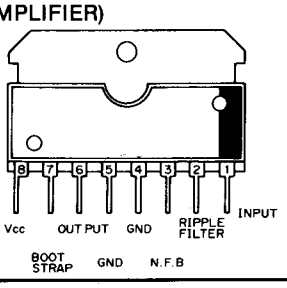
NJM7805A IC304
(3-TERMINAL 5 V REGULATOR)



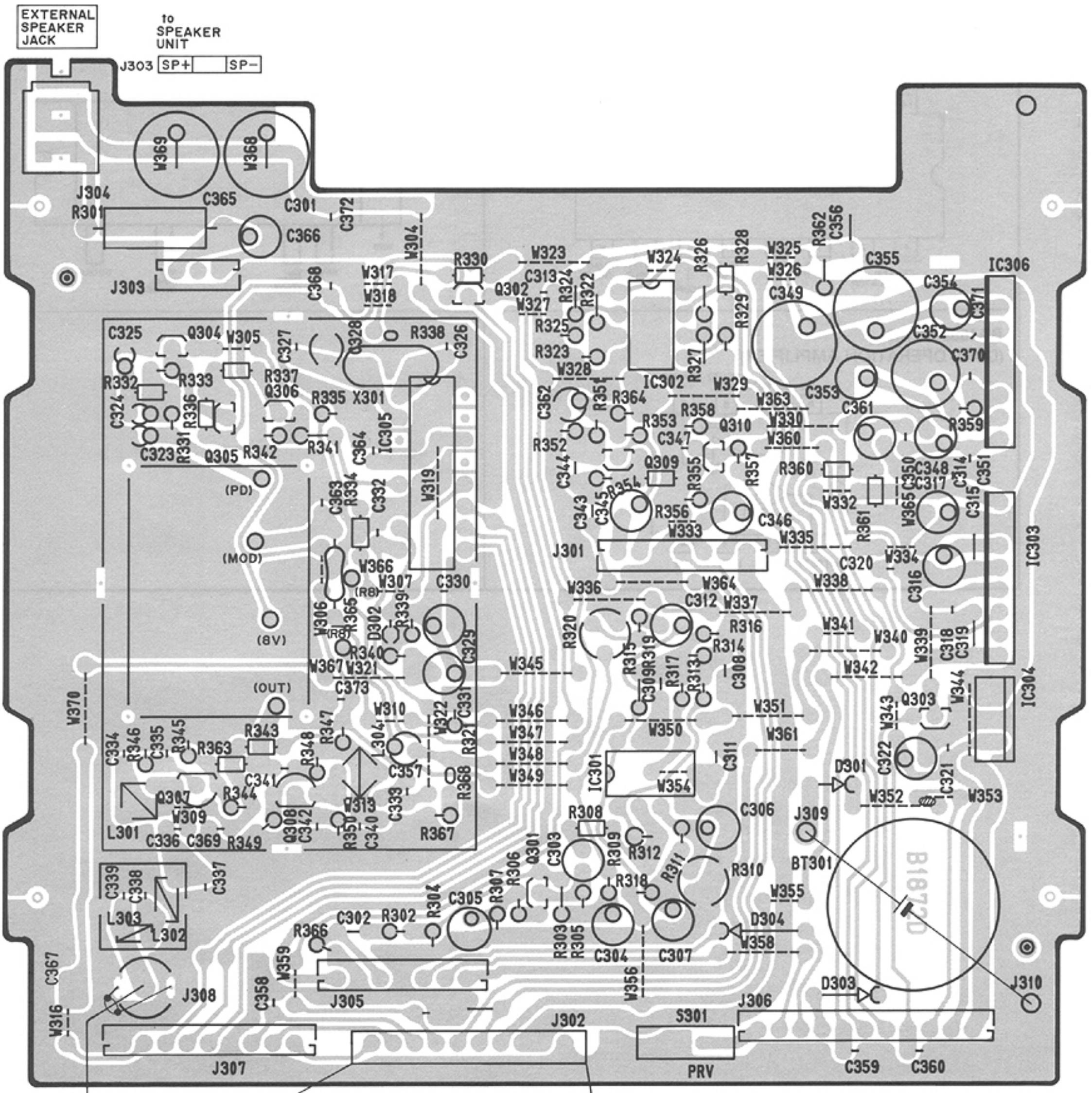
PLL2001 IC305
(PLL SYNTHESIZER)



μPC1242H IC306
(AUDIO POWER AMPLIFIER)



• PLL UNIT



to MAIN UNIT P301(J103)

J302

TMUT	SQL	LOWO	R8	AFO	SQLV	T8	HV	HV	GND

to MAIN UNIT (J101)

J306

PRV	PTT	HANG	BEEP	RMUT	LDEC	HDEC	SEND	BACI

from LOGIC UNIT P601 (J601)

J307

GND	UNLK	CK	DATA	ST	GND	LOWO	SQL	TMUT

from LOGIC UNIT P602 (J602)

J305

AFZ	GND	MIC	MIC-E	HANG	PTT	AFI

from MIC UNIT

J301

VOL1	VOL2	VOLΦ	SQLV	GND	HVO	HV

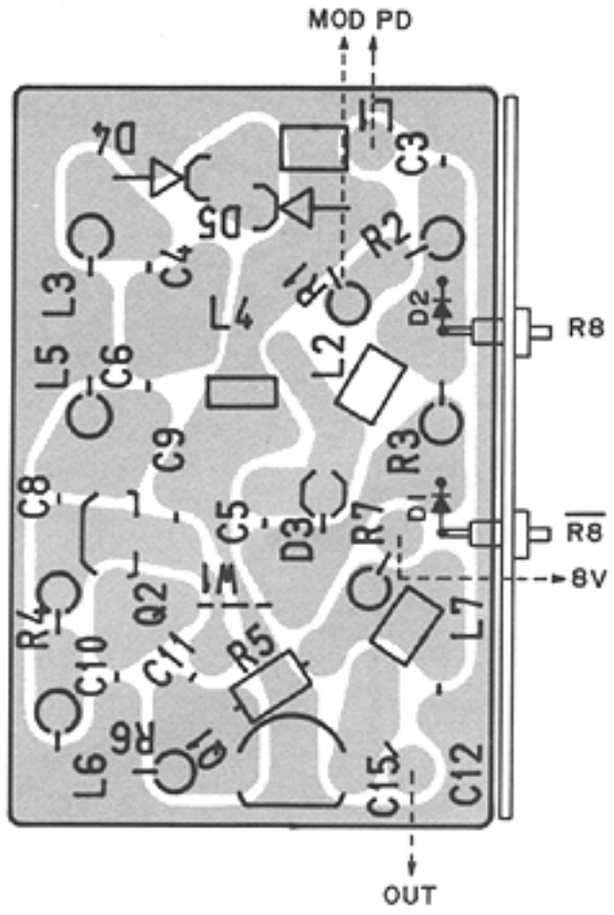
from VOL P604 (J604,J607)

from SQL P604 (J605)

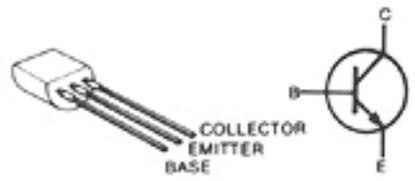
C	HDEC	SEND	BACKUP	5 V	HVO

601

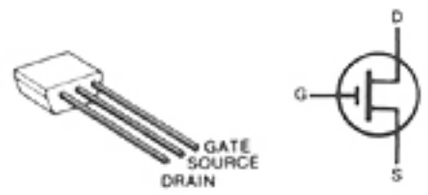
• VCO UNIT



2SC3776 D
Q501



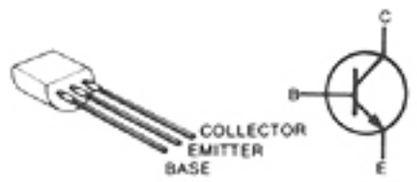
2SK241 GR
Q502



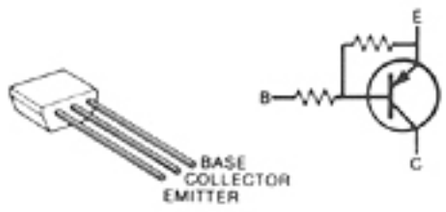
NOTE: Add "500" to the indicated number on the unit for actual parts number respectively.

2SA1048 GR
Q305

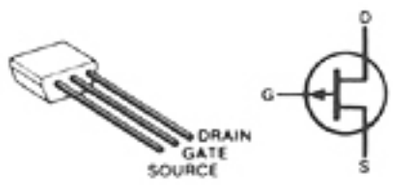
2SC3776 D
Q307, Q308



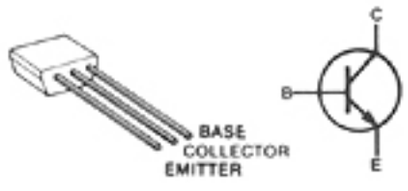
2SA1345
Q302



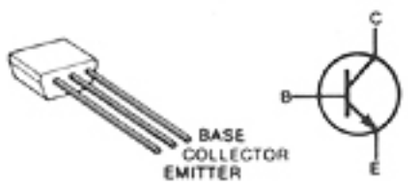
2SJ105 Y
Q310



2SC2458 GR
Q301, Q304, Q306,
Q309

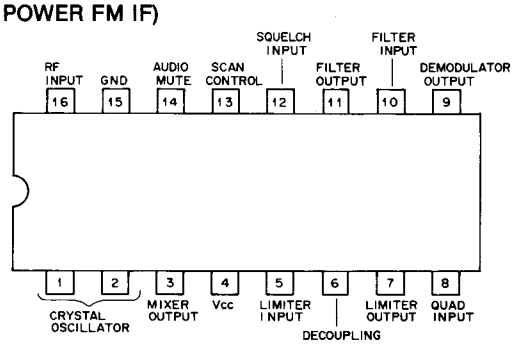


2SC3399
Q303

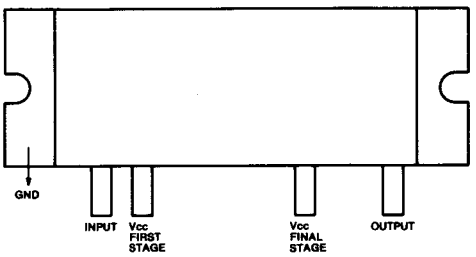


7-3 MAIN UNIT

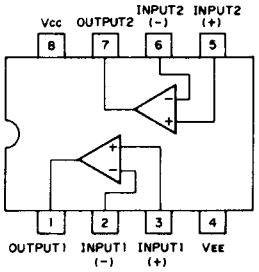
MC3357P IC101
(LOW POWER FM IF)

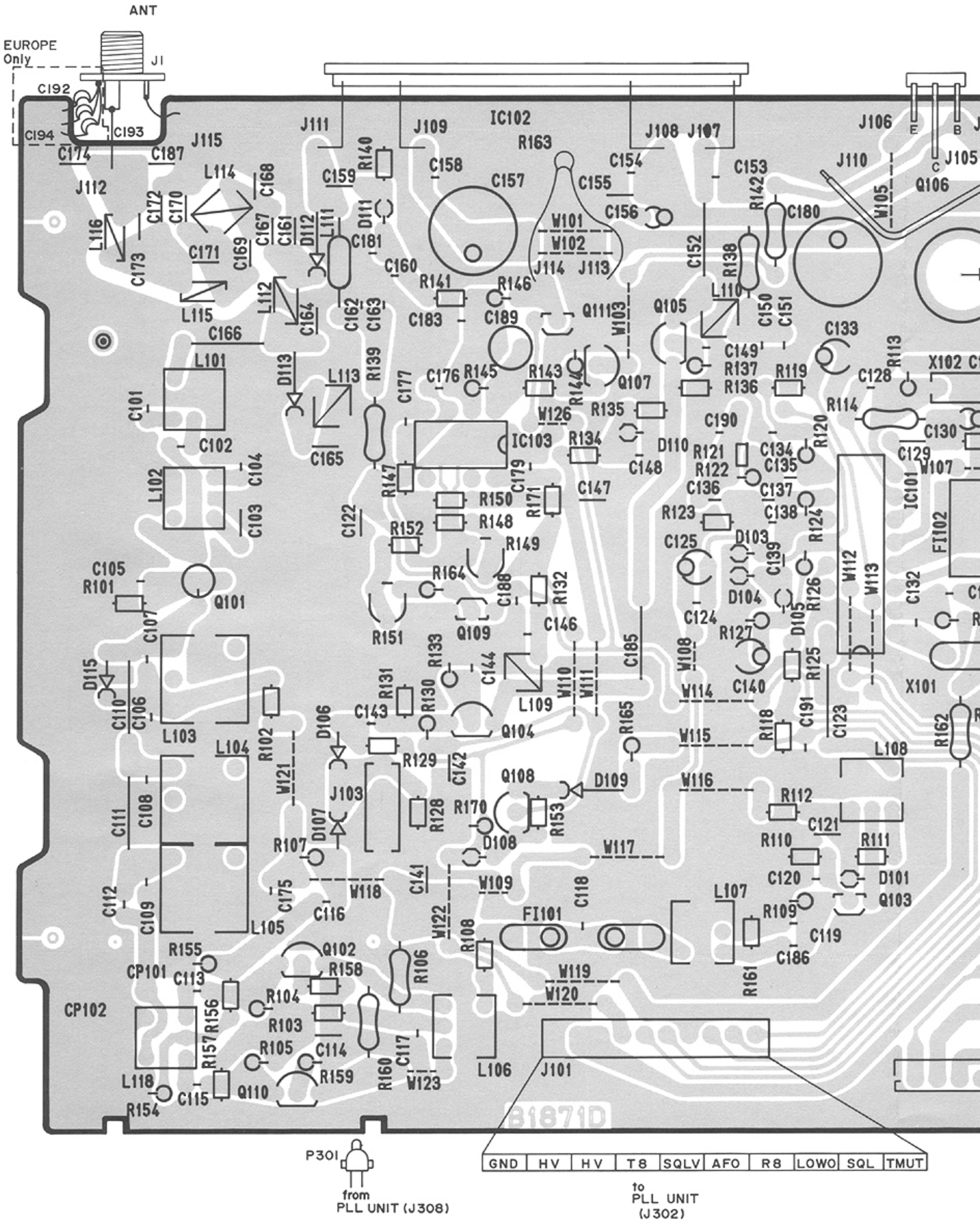


M57710-A IC102
(FM POWER MODULE)



BA4558 IC103
(DUAL OPERATION AMPLIFIER)




ANT
EUROPE Only
J1
C192
C193
C194
C174
C187
J115
J112
L114
C168
C172
C170
L116
C173
C171
C169
C167
C161
D112
L111
D111
C181
L115
L112
C164
C162
C163
C166
L101
C101
C102
L102
C104
C103
C165
D113
L113
R139
C177
R147
C122
C179
R150
R148
R152
R149
R171
C147
IC103
C176
R145
R143
R144
Q107
W126
R135
R134
D110
C148
C157
C158
R140
C159
C160
R141
R146
C183
C189
Q1113
W103
J111
J109
IC102
R163
J108
J107
C154
C155
C156
W101
W102
J114
J113
C152
R138
L110
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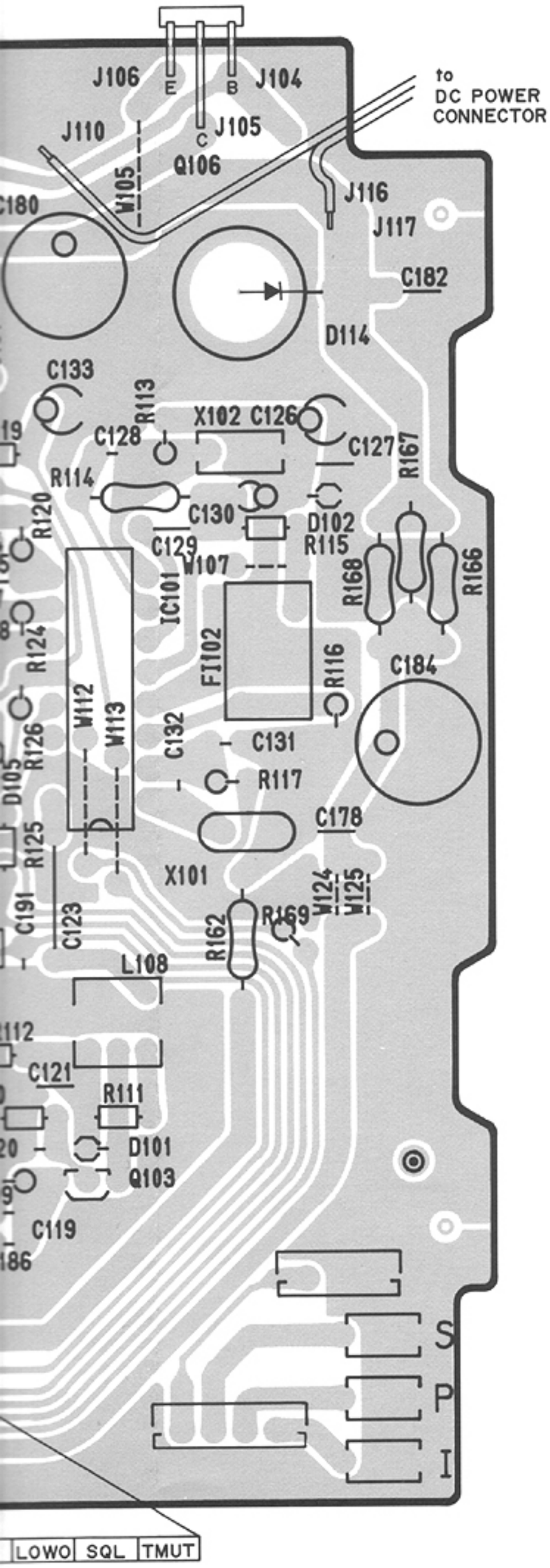
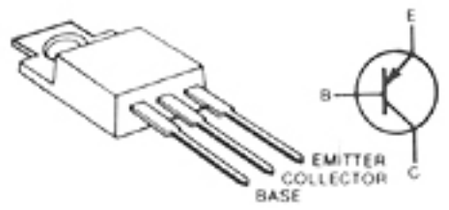
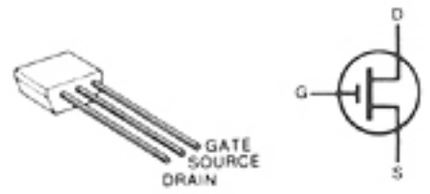
J105
Q106
W105
R113
X102
C128
R114
C130
C129
W107
IC101
FI102
R120
C134
C135
C136
C137
C138
R121
R122
R123
R124
C125
D103
C139
D104
D105
R126
C124
R127
W112
W113
C132
C140
R125
C191
C123
X101
R162
W108
W114
W115
R118
L108
W116
R112
C121
R110
R111
C120
D101
Q103
C190
C118
L107
R109
C119
C186
R161
W117
W109
W122
C141
C116
C175
R107
D107
J103
R128
C142
R129
C143
R131
R130
R133
C144
L109
W110
W111
C185
C146
R132
R188
R164
R151
Q109
Q104
D106
R102
W121
L103
L104
L105
C105
R101
Q101
C107
D115
C110
C106
C111
C108
C112
C109
R155
CP101
C113
CP102
R156
R157
L118
C115
R154
Q110
R159
R160
C117
W123
R165
Q108
D109
R170
R153
D108
Q102
R158
R104
R103
R105
C114
R106
W119
W120
L106
J101
B1871D
P301
from PLL UNIT (J308)
GND
HV
HV
T8
SQLV
AFO
R8
LOWO
SQL
TMUT
to PLL UNIT (J302)



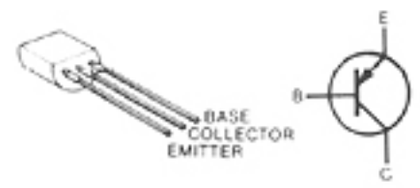
2SB1015 Y
Q106



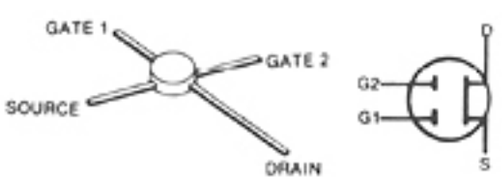
2SK241 GR
Q103



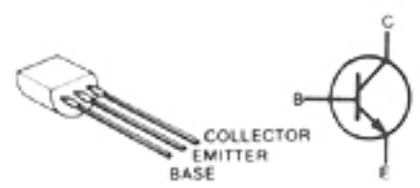
2SB561 C
Q108



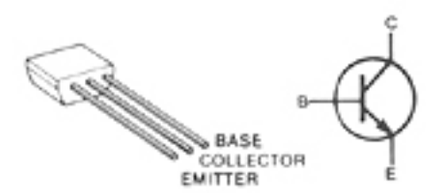
3SK97 Q2
Q101



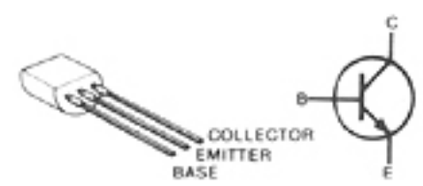
2SC2407 A
Q105



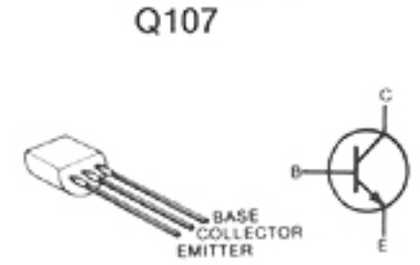
2SC3399
Q109, Q111



2SC3776 D
Q102, Q104, Q110



2SC945 P
Q107



SECTION 8 PARTS LIST

[LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC601	IC	µPD75306GF-042-3B9
IC602	IC	S-8054ALB-LN
Q601	Transistor	2SC3395
Q602	Transistor	2SC3395
Q603	Transistor	2SA1162 Y
Q604	Transistor	2SA1162 Y
Q605	Transistor	2SC3395
Q606	Transistor	2SC2712 Y
Q607	Transistor	2SC3395
Q608	Transistor	2SA1362 GR
Q609	Transistor	2SA1162 Y
Q610	Transistor	2SC3395
D601	Diode	1SS190
D602	Zener	RD6.2M B2
D603	Zener	RD6.2M B2
D604	Diode	1SS181 (EUR only)
D605	Diode	1SS190
D606	Diode	1SS190 (EUR only)
X601	Crystal	CR-227
R601	Resistor	10 kΩ MCR10
R602	Resistor	10 kΩ MCR10
R603	Resistor	100 Ω R50X
R604	Resistor	47 Ω R50X
R605	Resistor	470 Ω MCR10
R606	Resistor	100 kΩ MCR10
R607	Resistor	1 MΩ MCR10
R608	Resistor	47 kΩ MCR10
R609	Resistor	100 kΩ MCR10
R610	Resistor	47 kΩ MCR10
R611	Resistor	47 kΩ MCR10
R612	Resistor	47 kΩ MCR10
R613	Resistor	47 kΩ MCR10
R614	Resistor	47 kΩ MCR10
R615	Resistor	47 kΩ MCR10
R616	Resistor	47 kΩ MCR10
R617	Resistor	47 kΩ MCR10
R618	Resistor	47 kΩ MCR10
R619	Resistor	47 kΩ MCR10
R620	Resistor	47 kΩ MCR10
R621	Resistor	47 kΩ MCR10
R622	Resistor	47 kΩ MCR10
R623	Resistor	1 MΩ MCR10
R624	Resistor	1 MΩ MCR10
R625	Variable	10 kΩ A RK097111102AA [PWR/VOL]
R626	Variable	10 kΩ B RK097111000AA [SQUELCH]
R627	Resistor	47 kΩ MCR10
R628	Resistor	47 kΩ MCR10
R629	Resistor	1 kΩ MCR10
C601	Ceramic	0.01 µF GRM40 F
C602	Ceramic	100 pF GRM40
C603	Ceramic	47 pF GRM40
C604	Ceramic	47 pF GRM40
C605	Ceramic	0.1 µF GRM40 F
C606	Tantalum	47 µF SVD0J476M
C607	Ceramic	0.1 µF GRM40 F
J601	Connector	TZB-P11H-A1

[LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.
J602	Connector	TZB-P09H-A1
J603	Connector	TZB-P03H-A1
J604	Connector	TLB-P03H-B1
J605	Connector	TLB-P03H-B1
J606	Connector	B03B-EH-S
J607	Connector	TLB-P03H-B1
P601	Connector	EHR-11
P602	Connector	EHR-09
P604	Connector	EHR-07
P605	Connector	EHR-03
DS601	LCD	E-9454
DS602	Lamp	HRS7219A
DS603	Lamp	HRS7219A
DS604	LED	BR3889S
S601	Switch	SKHLAD [MR]
S602	Switch	SKHLAD [DW/SCN]
S603	Switch	SKHLAD [CH16]
S604	Switch	SKHLAD [HI/LO]
S605	Switch	SKHLAD [WX]
S606	Switch	SKHLAD [DIAL]
S607	Encoder	SRBMIL038A [CHANNEL SELECTOR]
W601	Wire	23/04/075/B06/C23
W602	Wire	23/02/065/B06/C23
W603	Wire	23/01/065/B06/C23
W604	Wire	23/03/065/B06/C23
W605	Wire	23/05/075/B06/C23
W606	Wire	23/06/065/B06/C23
W607	Wire	23/07/065/B06/C23
W608	Wire	23/08/065/B06/C23
W609	Wire	23/09/070/B06/C23
W610	Wire	23/01/070/B06/C23
W611	Wire	23/03/070/B06/C23
W612	Wire	23/01/075/B06/C23
W613	Wire	23/03/070/B06/C23
W614	Wire	23/05/070/B06/C23
W615	Wire	23/00/070/B06/C23
W616	Wire	23/06/065/B06/C23
W617	Wire	23/07/065/B06/C23
W618	Wire	23/08/065/B06/C23
W619	Wire	23/09/065/B06/C23
W620	Wire	23/00/065/B06/C23
W625	Wire	23/01/175/B06/C22
W626	Wire	23/03/175/B06/C22
W627	Wire	23/00/175/B06/C22
W628	Wire	23/05/175/B06/C22
W629	Wire	23/00/175/B06/C22
W630	Wire	23/04/175/B06/C22
W631	Wire	23/06/175/B06/C22
W632	Wire	23/01/050/B06/C23
W633	Wire	23/03/050/B06/C23
W634	Wire	23/05/050/B06/C23
EP601	P.C. Board	B-1873C (LOGIC)
EP602	P.C. Board	B-1696A (SENSOR)
EP603	P.C. Board	B-1876 (VOL)
EP604	P.C. Board	B-1877 (SQL)

[PLL UNIT]

REF. NO.	DESCRIPTION	PART NO.	
IC301	IC	BA4558	
IC302	IC	M5233P	
IC303	IC	MB3756	
IC304	IC	NJM7805A	
IC305	IC	PLL2001	
IC306	IC	μPC1242H	
Q301	Transistor	2SC2458 GR	
Q302	Transistor	2SA1345	
Q303	Transistor	2SC3399	
Q304	Transistor	2SC2458 GR	
Q305	Transistor	2SA1048 GR	
Q306	Transistor	2SC2458 GR	
Q307	Transistor	2SC3776 D	
Q308	Transistor	2SC3776 D	
Q309	Transistor	2SC2458 GR	
Q310	FET	2SJ105 Y	
D301	Diode	1SS133	
D302	Diode	1SS133	
D303	Diode	1SS133	
D304	Diode	1SS53	
X301	Crystal	CR-69	
L301	Coil	LA237	
L302	Coil	LA244	
L303	Coil	LA233	
L304	Coil	LA237	
R301	Resistor	100 Ω	CRH200R-02J
R302	Resistor	4.7 kΩ	ELR20
R303	Resistor	330 kΩ	ELR20
R304	Resistor	82 kΩ	ELR20
R305	Resistor	3.9 kΩ	ELR20
R306	Resistor	100 Ω	ELR20
R307	Resistor	560 Ω	ELR20
R308	Resistor	1.5 kΩ	R20
R309	Resistor	47 Ω	ELR20
R310	Trimmer	470 kΩ	RH0651CS5J10A
R311	Resistor	100 kΩ	ELR20
R312	Resistor	560 kΩ	ELR20
R313	Resistor	6.8 kΩ	ELR20
R314	Resistor	12 kΩ	ELR20
R315	Resistor	27 kΩ	ELR20
R316	Resistor	56 kΩ	ELR20
R317	Resistor	12 kΩ	ELR20
R318	Resistor	47 Ω	ELR20
R319	Resistor	12 kΩ	ELR20
R320	Trimmer	10 kΩ	RH0651C14J2WA
R321	Resistor	10 kΩ	ELR20
R322	Resistor	150 kΩ	ELR20
R323	Resistor	39 kΩ	ELR20
R324	Resistor	330 kΩ	ELR20
R325	Resistor	22 kΩ	ELR20
R326	Resistor	56 kΩ	ELR20
R327	Resistor	82 kΩ	ELR20
R328	Resistor	68 kΩ	R20
R329	Resistor	27 kΩ	ELR20
R330	Resistor	10 Ω	R20
R331	Resistor	8.2 kΩ	R20
R332	Resistor	390 Ω	R20
R333	Resistor	1 kΩ	ELR20
R334	Resistor	56 kΩ	R20
R335	Resistor	22 kΩ	ELR20
R336	Resistor	47 kΩ	R20
R337	Resistor	47 kΩ	R20
R338	Posistor	PTH60T222M	
R339	Resistor	22 kΩ	ELR20
R340	Resistor	390 kΩ	ELR20

[PLL UNIT]

REF. NO.	DESCRIPTION	PART NO.		
R341	Resistor	47 kΩ	ELR20	
R342	Resistor	12 kΩ	ELR20	
R343	Resistor	100 Ω	R20	
R344	Resistor	3.3 kΩ	ELR20	
R345	Resistor	2.2 kΩ	ELR20	
R346	Resistor	220 Ω	ELR20	
R347	Resistor	100 Ω	ELR20	
R348	Resistor	3.3 kΩ	ELR20	
R349	Resistor	2.2 kΩ	ELR20	
R350	Resistor	220 Ω	ELR20	
R351	Resistor	2.2 MΩ	ELR20	
R352	Resistor	470 kΩ	ELR20	
R353	Resistor	6.8 kΩ	ELR20	
R354	Resistor	33 kΩ	ELR20	
R355	Resistor	1.2 kΩ	R20	
R356	Resistor	1 MΩ	ELR20	
R357	Resistor	100 kΩ	ELR20	
R358	Resistor	33 kΩ	ELR20	
R359	Resistor	100 Ω	ELR20	
R360	Resistor	100 kΩ	R20	
R361	Resistor	100 kΩ	R20	
R362	Resistor	1 Ω	ELR20	
R363	Resistor	100 Ω	R20	
R364	Resistor	100 Ω	ELR20	
R365	Resistor	2.2 kΩ	R25	
R366	Resistor	1 kΩ	ELR20	
R367	Resistor	10 kΩ	ELR20	
R368	Thermistor	ERT-D2FGL202S		
C301	Electrolytic	470 μF	16 V	(EUR only)
C302	Mylar	0.0015 μF	50 V	
C303	Electrolytic	0.47 μF	50 V	BP
C304	Electrolytic	22 μF	16 V	SS
C305	Electrolytic	4.7 μF	25 V	SS
C306	Electrolytic	0.47μF	50 V	SS
C307	Electrolytic	22 μF	16 V	SS
C308	Mylar	0.01 μF	50 V	
C309	Mylar	0.022 μF	50 V	
C311	Mylar	0.001 μF	50 V	
C312	Electrolytic	4.7 μF	25 V	SS
C313	Ceramic	0.001 μF	50 V	
C314	Barrier Layer	0.0047 μF	25 V	
C315	Barrier Layer	0.1 μF	16 V	
C316	Electrolytic	4.7 μF	25 V	SS
C317	Electrolytic	100 μF	16 V	SS
C318	Barrier Layer	0.0047 μF	25 V	
C319	Barrier Layer	0.1 μF	16 V	
C320	Barrier Layer	0.0047 μF	25 V	
C321	Barrier Layer	0.0047 μF	25 V	
C322	Electrolytic	10 μF	16 V	SS
C323	Tantalum	0.1 μF	35 V	DN
C324	Tantalum	0.47 μF	35 V	DN
C325	Tantalum	22 μF	16 V	DN
C326	Ceramic	30 pF	50 V	
C327	Ceramic	20 pF	50 V	
C328	Trimmer	20 pF	CV38D2001	
C329	Electrolytic	47 μF	16 V	SS
C330	Ceramic	0.001 μF	50 V	
C331	Electrolytic	3.3 μF	50 V	SS
C332	Ceramic	18 pF	50 V	
C333	Ceramic	18 pF	50 V	
C334	Ceramic	0.001 μF	50 V	
C335	Ceramic	0.001 μF	50 V	
C336	Ceramic	10 pF	50 V	
C337	Ceramic	33 pF	50 V	
C338	Ceramic	22 pF	50 V	
C339	Ceramic	22 pF	50 V	
C340	Ceramic	0.001 μF	50 V	
C341	Ceramic	10 pF	50 V	
C342	Ceramic	0.001 μF	50 V	
C343	Mylar	0.01 μF	50 V	
C344	Mylar	0.0068 μF	50 V	
C345	Electrolytic	0.47 μF	50 V	SS
C346	Electrolytic	0.47 μF	50 V	SS

[PLL UNIT]

REF. NO.	DESCRIPTION	PART NO.		
C347	Barrier Layer	0.01 µF	25 V	
C348	Electrolytic	4.7 µF	25 V	SS
C349	Electrolytic	470 µF	16 V	SS
C350	Ceramic	0.001 µF	50 V	
C351	Ceramic	0.001 µF	50 V	
C352	Electrolytic	220 µF	16 V	SS
C353	Electrolytic	47 µF	16 V	SS
C354	Electrolytic	47 µF	16 V	SS
C355	Electrolytic	470 µF	16 V	SS
C356	Mylar	0.1 µF	50 V	
C357	Electrolytic	0.1 µF	50 V	MS7
C358	Ceramic	47 pF	50 V	
C359	Ceramic	47 pF	50 V	
C360	Ceramic	47 pF	50 V	
C361	Electrolytic	0.1 µF	50 V	MS7
C362	Electrolytic	10 µF	16 V	MS7
C363	Ceramic	470 pF	50 V	
C364	Ceramic	0.001 µF	50 V	
C365	Electrolytic	470 µF	16 V	SS (EUR only)
C366	Electrolytic	22 µF	16 V	SS
C367	Ceramic	0.001 µF	50 V	
C368	Ceramic	0.001 µF	50 V	
C369	Ceramic	47 pF	50 V	
C370	Ceramic	0.001 µF	50 V	
C371	Ceramic	0.001 µF	50 V	
C372	Ceramic	0.001 µF	50 V	
C373	Ceramic	0.001 µF	50 V	
J301	Connector	B07B-EH-S		
J302	Connector	WH10D-1		
J303	Connector	B03B-EH-S		
J304	Connector	HSJ0807-01-010		
J305	Connector	B07B-EH-S		
J306	Connector	B11B-EH-S		
J307	Connector	B09B-EH-S		
J308	Connector	TBP-P01X-A1		
J309	Connector	RT-01T-1.0B		
J310	Connector	RT-01T-1.0B		
P301	Plug	TMP-P01X-A1		
S301	Switch	SSSS91		
BT301	Lithium Battery	BR2032-1T2		
W301	Shield Cable	[62/99/150/C24/C31		
W302	(with P301 assembly)	08]		
W304	Jumper	IPS-1041-4		
W305	Jumper	IPS-1041-2		
W306	Jumper	IPS-1041-2		
W307	Jumper	IPS-1041-2		
W309	Jumper	IPS-1041-2		
W310	Jumper	IPS-1041-2		
W313	Jumper	IPS-1041-2		
W316	Jumper	IPS-1041-2		
W317	Jumper	IPS-1041-2		
W318	Jumper	IPS-1041-2		
W319	Jumper	IPS-1041-4		
W321	Jumper	IPS-1041-4		
W322	Jumper	IPS-1041-4		
W323	Jumper	IPS-1041-4		
W324	Jumper	IPS-1041-2		
W325	Jumper	IPS-1041-2		
W326	Jumper	IPS-1041-2		
W327	Jumper	IPS-1041-2		
W328	Jumper	IPS-1041-4		
W329	Jumper	IPS-1041-4		
W330	Jumper	IPS-1041-4		
W332	Jumper	IPS-1041-2		
W333	Jumper	IPS-1041-2		

[PLL UNIT]

REF. NO.	DESCRIPTION	PART NO.
W334	Jumper	IPS-1041-2
W335	Jumper	IPS-1041-4
W336	Jumper	IPS-1041-4
W337	Jumper	IPS-1041-4
W338	Jumper	IPS-1041-4
W339	Jumper	IPS-1041-4
W340	Jumper	IPS-1041-4
W341	Jumper	IPS-1041-2
W342	Jumper	IPS-1041-4
W343	Jumper	IPS-1041-2
W344	Jumper	IPS-1041-4
W345	Jumper	IPS-1041-4
W346	Jumper	IPS-1041-4
W347	Jumper	IPS-1041-4
W348	Jumper	IPS-1041-4
W349	Jumper	IPS-1041-4
W350	Jumper	IPS-1041-4
W351	Jumper	IPS-1041-4
W352	Jumper	IPS-1041-4
W353	Jumper	IPS-1041-2
W354	Jumper	IPS-1041-2
W355	Jumper	IPS-1041-2
W356	Jumper	IPS-1041-4
W358	Jumper	IPS-1041-4
W359	Jumper	IPS-1041-2
W360	Jumper	JPW-02A
W361	Jumper	JPW-02A
W362	Flatcable	STYLE2468
	(10 wires)	AWG26 VW1 E43172
W363	Jumper	IPS-1041-4
W364	Jumper	IPS-1041-4
W365	Jumper	IPS-1041-2
W366	Jumper	JPW-02A
W367	Jumper	JPW-02A
W368	Jumper	IPS-1041-2 (U.S.A. only)
W369	Jumper	IPS-1041-2 (U.S.A. only)
W370	Jumper	IPS-1041-4
EP301	P.C. Board	B-1872C

[VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.	
Q501	Transistor	2SC3776 D	
Q502	FET	2SK241 GR	
D501	Diode	1SS53	
D502	Diode	1SS133	
D503	Diode	1SS265	
D504	Diode	1SV50E (1)	
D505	Diode	1SV50E (1)	
L501	Coil	LAL02NA 4R7	
L502	Coil	LAL02NA 2R2	
L503	Coil	LAL03NA 4R7	
L504	Coil	LB-164	
L505	Coil	LAL03NA 4R7	
L506	Coil	LAL03NA 4R7	
L507	Coil	LAL02NA R22	
R501	Resistor	560 kΩ	ELR20
R502	Resistor	47 kΩ	ELR20
R503	Resistor	220 kΩ	ELR20
R504	Resistor	150 Ω	ELR20

[VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.		
R505	Resistor	4.7 kΩ	R20	
R506	Resistor	560 Ω	ELR20	
R507	Resistor	47 Ω	ELR20	
C503	Ceramic	470 pF	50 V	
C504	Ceramic	22 pF	50 V	
C505	Ceramic	56 pF	50 V	
C506	Ceramic	18 pF	50 V	
C508	Ceramic	3 pF	50 V	UJ
C509	Ceramic	3 pF	50 V	UJ
C510	Ceramic	0.001 pF	50 V	
C511	Ceramic	0.5 pF	50 V	
C512	Ceramic	0.001 pF	50 V	
C515	Ceramic	22 pF	50 V	
W501	Jumper	IPS-1041-2		
EP501	P.C. Board	B-1875B		

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC101	IC	MC3357P
IC102	IC	M57710-A
IC103	IC	BA4558
Q101	FET	3SK97 Q2
Q102	Transistor	2SC3776 D
Q103	FET	2SK241 GR
Q104	Transistor	2SC3776 D
Q105	Transistor	2SC2407 A
Q106	Transistor	2SB1015 Y
Q107	Transistor	2SC945 P
Q108	Transistor	2SB561 C
Q109	Transistor	2SC3399
Q110	Transistor	2SC3776 D
Q111	Transistor	2SC3399
D101	Diode	1SS133
D102	Zener	RD6.2E B2
D103	Diode	1SS133
D104	Diode	1S953
D105	Diode	1S953
D106	Diode	1SS265
D107	Diode	1SS265
D108	Diode	1S953
D109	Zener	RD4.7E B3
D110	Diode	1SS133
D111	Diode	1SS97
D112	Diode	MI308
D113	Diode	MI308
D114	Diode	15CD11
D115	Diode	1SS133
FI101	Crystal	21M15B3
FI102	Ceramic	CFW455E
X101	Crystal	CR-70
X102	Discriminator	CDB455C7A

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
L101	Coil	LB173	
L102	Coil	LB173	
L103	Coil	LS-281	
L104	Coil	LS-281	
L105	Coil	LS-281	
L106	Coil	LS-304	
L107	Coil	LS-298	
L108	Coil	LS-297	
L109	Coil	LA236	
L110	Coil	LA236	
L111	Coil	LW-19	
L112	Coil	LA244	
L113	Coil	LA238	
L114	Coil	LA149	
L115	Coil	LA243	
L116	Coil	LA-253	
L118	Coil	LR-220	
R101	Resistor	100 Ω	R20
R102	Resistor	56 Ω	R20
R103	Resistor	22 kΩ	R20
R104	Resistor	330 Ω	ELR20
R105	Resistor	330 Ω	ELR20
R106	Resistor	100 Ω	R25
R107	Resistor	2.2 kΩ	ELR20
R108	Resistor	560 Ω	R20
R109	Resistor	10 kΩ	ELR20
R110	Resistor	100 Ω	R20
R111	Resistor	10 kΩ	R20
R112	Resistor	100 Ω	R20
R113	Resistor	1.5 kΩ	ELR20
R114	Resistor	47 kΩ	R25
R115	Resistor	1.5 kΩ	R20
R116	Resistor	1.5 kΩ	ELR20
R117	Resistor	47 kΩ	ELR20
R118	Resistor	10 kΩ	R20
R119	Resistor	3.3 kΩ	R20
R120	Resistor	470 Ω	ELR20
R121	Thermistor	ERT-D2FGL202S	
R122	Resistor	2.2 kΩ	ELR20
R123	Resistor	2.2 kΩ	R20
R124	Resistor	470 kΩ	ELR20
R125	Resistor	1 kΩ	R20
R126	Resistor	2.2 kΩ	ELR20
R127	Resistor	22 kΩ	ELR20
R128	Resistor	1 kΩ	R20
R129	Resistor	2.2 kΩ	R20
R130	Resistor	4.7 kΩ	ELR20
R131	Resistor	10 kΩ	R20
R132	Resistor	100 Ω	R20
R133	Resistor	100 Ω	ELR20
R134	Resistor	1 kΩ	R20
R135	Resistor	100 Ω	R20
R136	Resistor	1 kΩ	R20
R137	Resistor	10 Ω	ELR20
R138	Resistor	10 Ω	R25
R139	Resistor	100 Ω	R25
R140	Resistor	270 Ω	R20
R141	Resistor	39 kΩ	R20
R142	Resistor	1.2 kΩ	R25
R143	Resistor	12 kΩ	R20
R144	Resistor	5.6 kΩ	ELR20
R145	Resistor	47 kΩ	ELR20
R146	Resistor	10 kΩ	ELR20
R147	Resistor	10 kΩ	R20
R148	Resistor	10 kΩ	R20
R149	Trimmer	100 kΩ	RH0651C15J10A
R150	Resistor	10 kΩ	R20
R151	Trimmer	1 kΩ	RH0651CBJYA
R152	Resistor	1 kΩ	R20
R153	Resistor	10 kΩ	R20
R154	Resistor	330 Ω	ELR20
R155	Resistor	330 Ω	ELR20
R156	Resistor	22 Ω	R20

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R157	Resistor	1 kΩ	R20
R158	Resistor	22 Ω	R20
R159	Resistor	22 Ω	ELR20
R160	Resistor	10 kΩ	R25
R161	Resistor	10 kΩ	R20
R162	Resistor	220 Ω	R25
R163	Posistor	PTH487A01BF222TS	
R164	Resistor	330 Ω	ELR20
R165	Resistor	4.7 kΩ	ELR20
R166	Resistor	1 Ω	R25
R167	Resistor	1 Ω	R25
R168	Resistor	1 Ω	R25
R169	Resistor	1.2 kΩ	ELR20
R170	Resistor	4.7 kΩ	ELR20
R171	Resistor	100 Ω	R20
C101	Ceramic	10 pF	50 V
C102	Ceramic	2 pF	50 V
C103	Ceramic	220 pF	50 V
C104	Ceramic	10 pF	50 V
C105	Ceramic	0.001 µF	50 V
C106	Barrier Layer	0.01 µF	25 V
C107	Ceramic	10 pF	50 V
C108	Ceramic	10 pF	50 V
C109	Ceramic	6 pF	50 V
C110	Cylinder	1 pF	UP125SL 010M-NA
C111	Cylinder	1 pF	UP125SL 010M-NA
C112	Ceramic	5 pF	50 V
C113	Ceramic	0.001 µF	50 V
C114	Ceramic	0.0047 µF	50 V
C115	Ceramic	0.001 µF	50 V
C116	Ceramic	47 pF	50 V
C117	Barrier Layer	0.01 pF	25 V
C118	Ceramic	5 pF	50 V
C119	Ceramic	68 pF	50 V
C120	Barrier Layer	0.01 µF	25 V
C121	Barrier Layer	0.047 µF	25 V
C122	Ceramic	0.0047 µF	50 V
C123	Cylinder	0.001 µF	UP125B 102K-NA
C124	Ceramic	0.001 µF	50 V
C125	Electrolytic	2.2 µF	50 V SS
C126	Electrolytic	10 µF	16 V SS
C127	Ceramic	0.0047 µF	50 V
C128	Ceramic	82 pF	50 V
C129	Barrier Layer	0.1 µF	16 V
C130	Tantalum	0.1 µF	35 V DN
C131	Ceramic	68 pF	50 V
C132	Ceramic	120 pF	50 V
C133	Electrolytic	0.1 µF	50 V MS7
C134	Ceramic	0.001 µF	50 V
C135	Mylar	0.001 µF	50 V
C136	Mylar	0.001 µF	50 V
C137	Mylar	0.001 µF	50 V
C138	Ceramic	33 pF	50 V
C139	Mylar	0.033 µF	50 V
C140	Electrolytic	0.47 µF	50 V SS
C141	Ceramic	0.0047 µF	50 V
C142	Ceramic	0.0047 µF	50 V
C143	Ceramic	47 pF	50 V
C144	Ceramic	0.001 µF	50 V
C146	Ceramic	0.001 µF	50 V
C147	Ceramic	0.0047 µF	50 V
C148	Ceramic	0.001 µF	50 V
C149	Ceramic	0.001 µF	50 V
C150	Ceramic	470 pF	50 V
C151	Ceramic	0.001 µF	50 V
C152	Cylinder	22 pF	UP125SL 220J-NA
C153	Ceramic	18 pF	50 V
C154	Ceramic	0.001 µF	50 V
C155	Barrier Layer	0.1 µF	16 V
C156	Tantalum	22 µF	16 V DN
C157	Electrolytic	470 µF	16 V SS
C158	Ceramic	0.001 µF	50 V
C159	Ceramic	0.5 µF	500 V

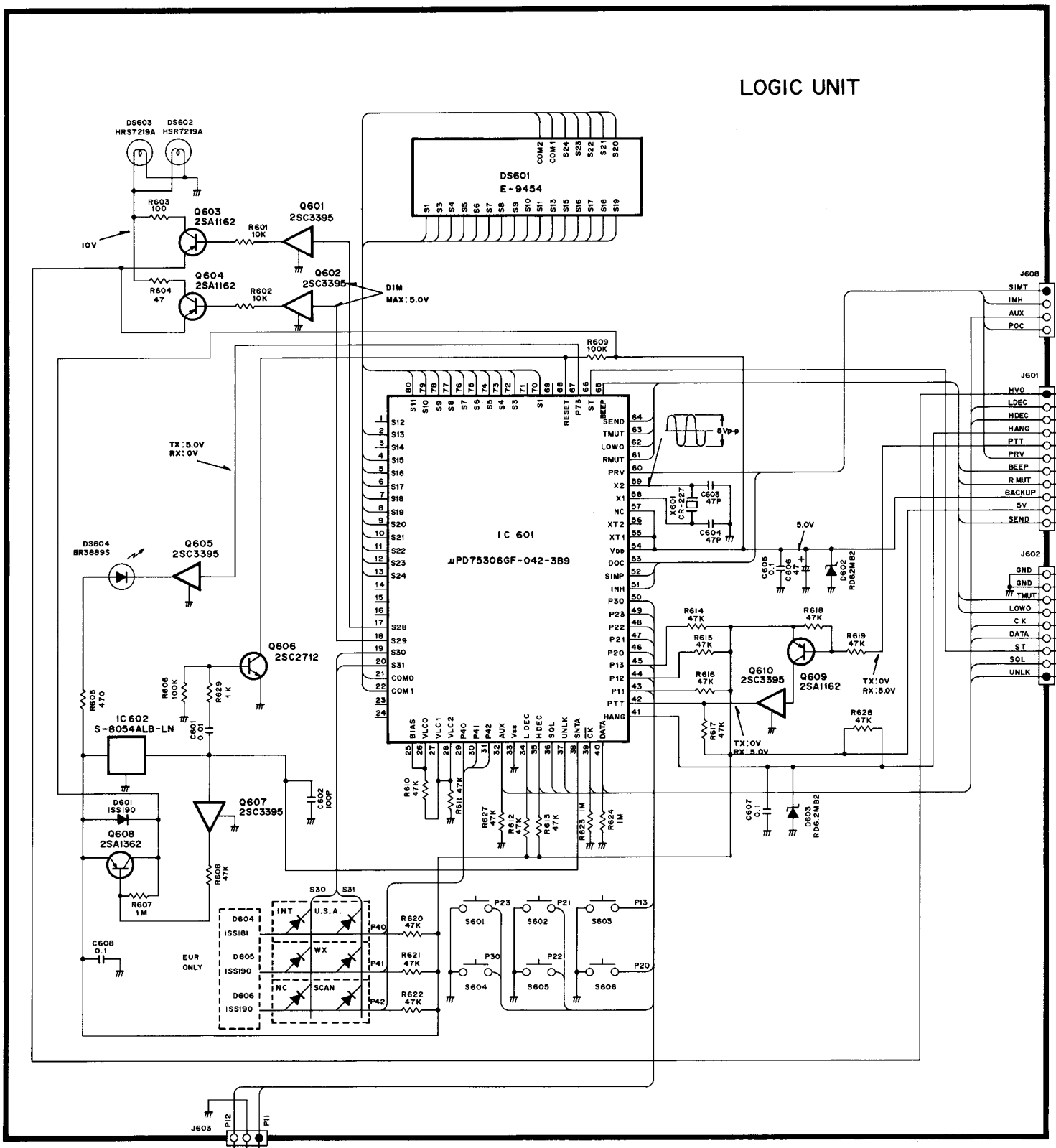
[MAIN UNIT]

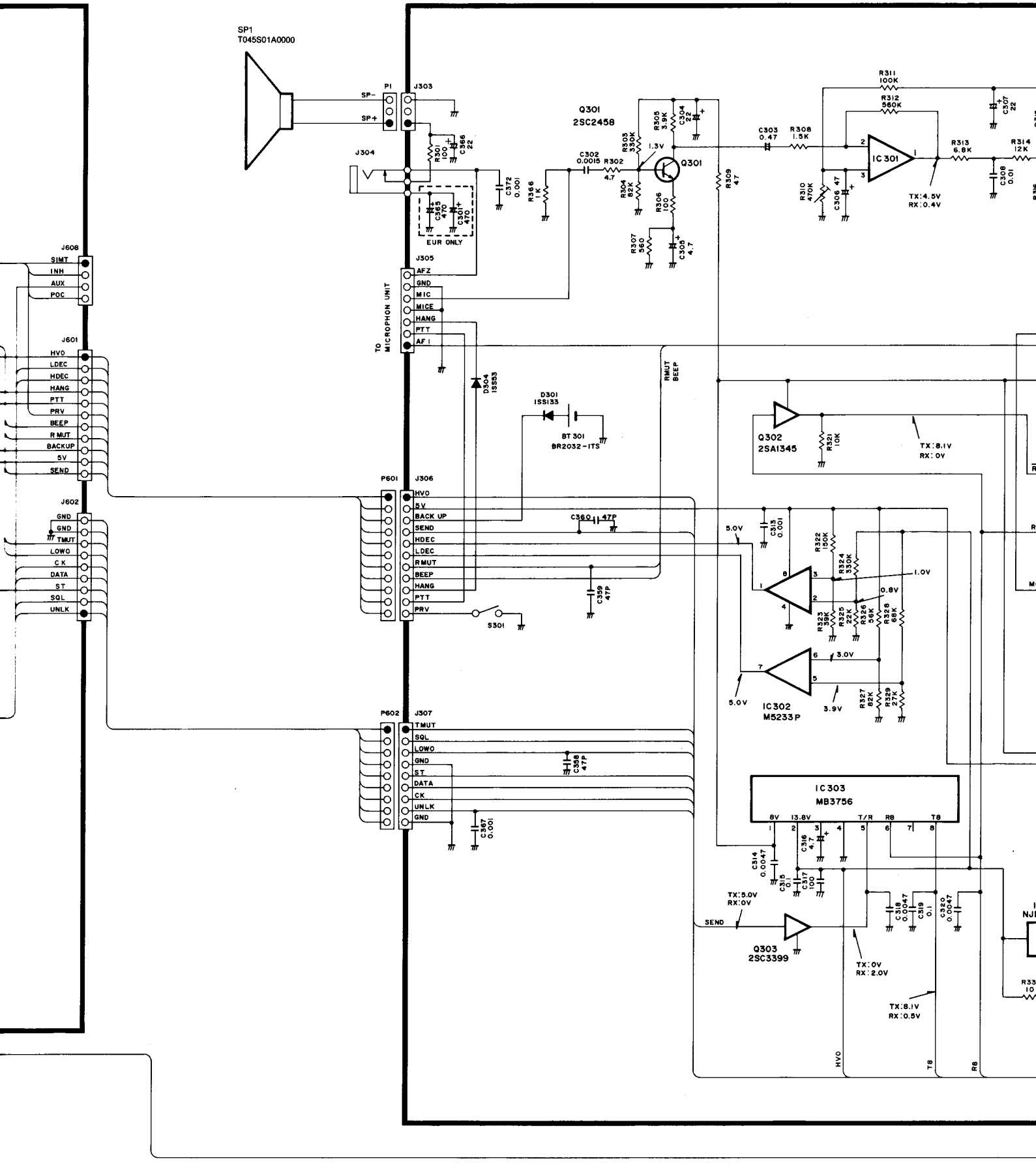
REF. NO.	DESCRIPTION	PART NO.	
C160	Ceramic	0.001 µF	50 V
C161	Ceramic	22 pF	500 V
C162	Ceramic	470 pF	50 V
C163	Ceramic	0.001 µF	50 V
C164	Ceramic	20 pF	500 V
C165	Ceramic	100 pF	500 V
C166	Cylinder	0.001 µF	UP125B 102K-NA
C167	Ceramic	0.001 µF	500 V
C168	Ceramic	5 pF	500 V
C169	Ceramic	10 pF	500 V
C170	Ceramic	20 pF	500 V
C171	Ceramic	7 pF	500 V
C172	Ceramic	24 pF	500 V
C173	Ceramic	0.5 pF	500 V (U.S.A.)
	Ceramic	1 pF	500 V (EUR)
C174	Ceramic	5 pF	500 V (U.S.A.)
	Ceramic	10 pF	500 V (EUR)
C175	Ceramic	0.001 µF	50 V
C176	Ceramic	0.001 µF	50 V
C177	Ceramic	0.001 µF	50 V
C178	Ceramic	0.0047 µF	50 V
C179	Ceramic	0.001 µF	50 V
C180	Electrolytic	470 µF	16 V SS
C181	Ceramic	470 pF	50 V
C182	Barrier Layer	0.1 µF	16 V
C183	Ceramic	0.001 µF	50 V
C184	Electrolytic	470 µF	16 V SS
C185	Cylinder	15 pF	UP125SL 150J-NA
C186	Ceramic	82 pF	50 V
C187	Ceramic	6 pF	500 V (U.S.A. only)
C188	Ceramic	0.001 µF	50 V
C189	Electrolytic	2.2 µF	50 V BP
C190	Ceramic	120 pF	50 V
C191	Barrier Layer	0.01 µF	25 V
C192	Ceramic	0.001 µF	500 V (EUR only)
C193	Ceramic	0.001 µF	500 V (EUR only)
C194	Barrier Layer	0.1 µF	16 V (EUR only)
CP101	Check Point	RT-01T-1.3B	
CP102	Check Point	RT-01T-1.3B	
J101	Connector	HBRB10S-1J	
J103	Connector	TMP-J01X-A2	
J104	Connector	RT-01T-1.3B	
J105	Connector	RT-01T-1.3B	
J106	Connector	RT-01T-1.3B	
J107	Connector	RT-01T-1.3B	
J108	Connector	RT-01T-1.3B	
J109	Connector	RT-01T-1.3B	
J110	Connector	RT-01T-1.3B	
J111	Connector	RT-01T-1.3B	
J112	Connector	RT-01T-1.3B	
J113	Connector	RT-01T-1.3B	
J114	Connector	RT-01T-1.3B	
J115	Connector	RT-01T-1.3B	(U.S.A. only)
J116	Connector	RT-01T-1.3B	
J117	Connector	RT-01T-1.3B	
W101	Jumper	IPS-1401-4	
W102	Jumper	IPS-1401-4	
W103	Jumper	IPS-1401-4	
W105	Jumper	IPS-1401-4	
W107	Jumper	IPS-1401-2	
W108	Jumper	IPS-1401-2	
W109	Jumper	IPS-1401-2	
W110	Jumper	IPS-1401-4	
W111	Jumper	IPS-1401-4	
W112	Jumper	IPS-1401-4	
W113	Jumper	IPS-1401-4	
W114	Jumper	IPS-1401-4	
W115	Jumper	IPS-1401-4	
W116	Jumper	IPS-1401-4	

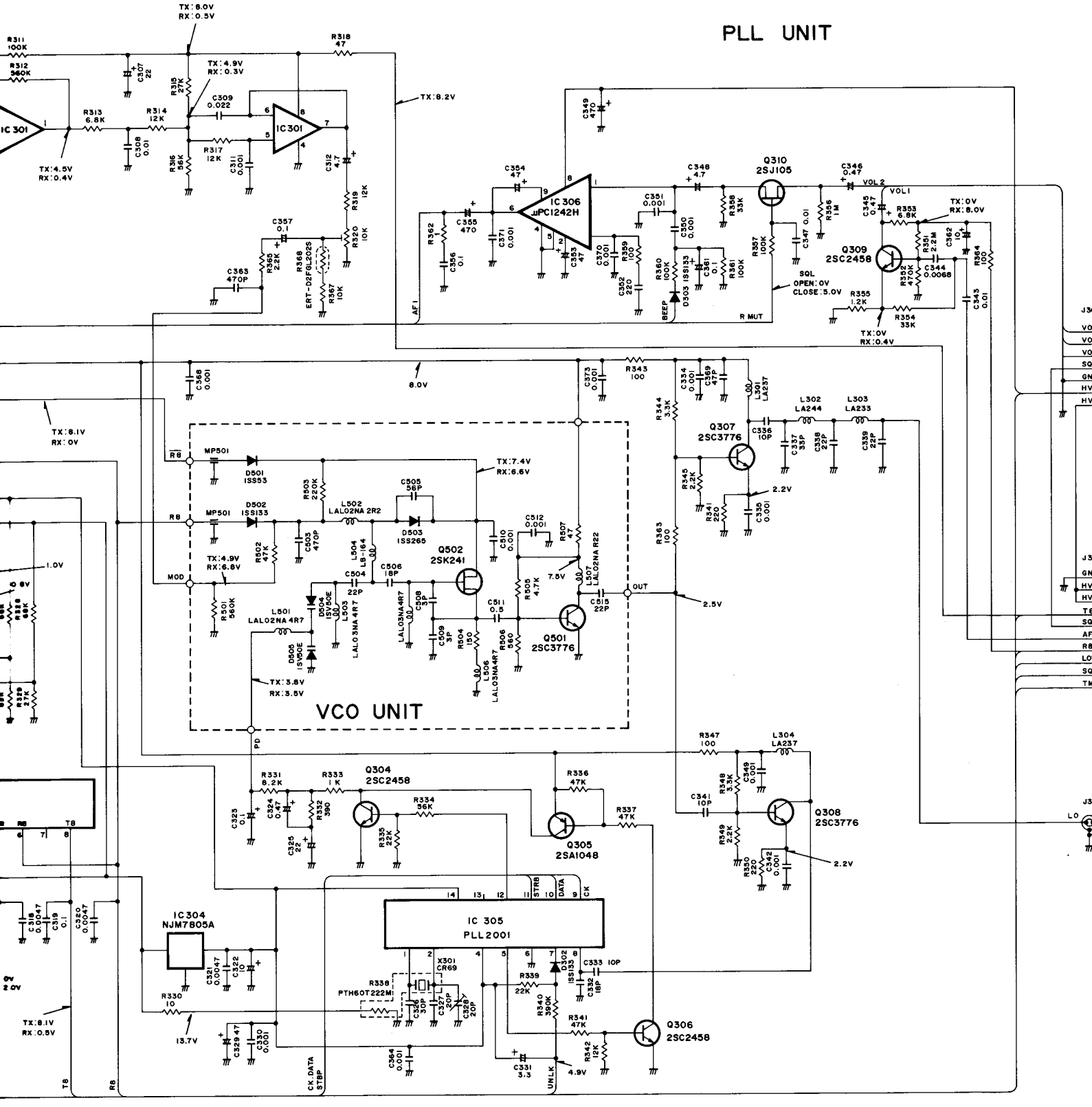
[MAIN UNIT]

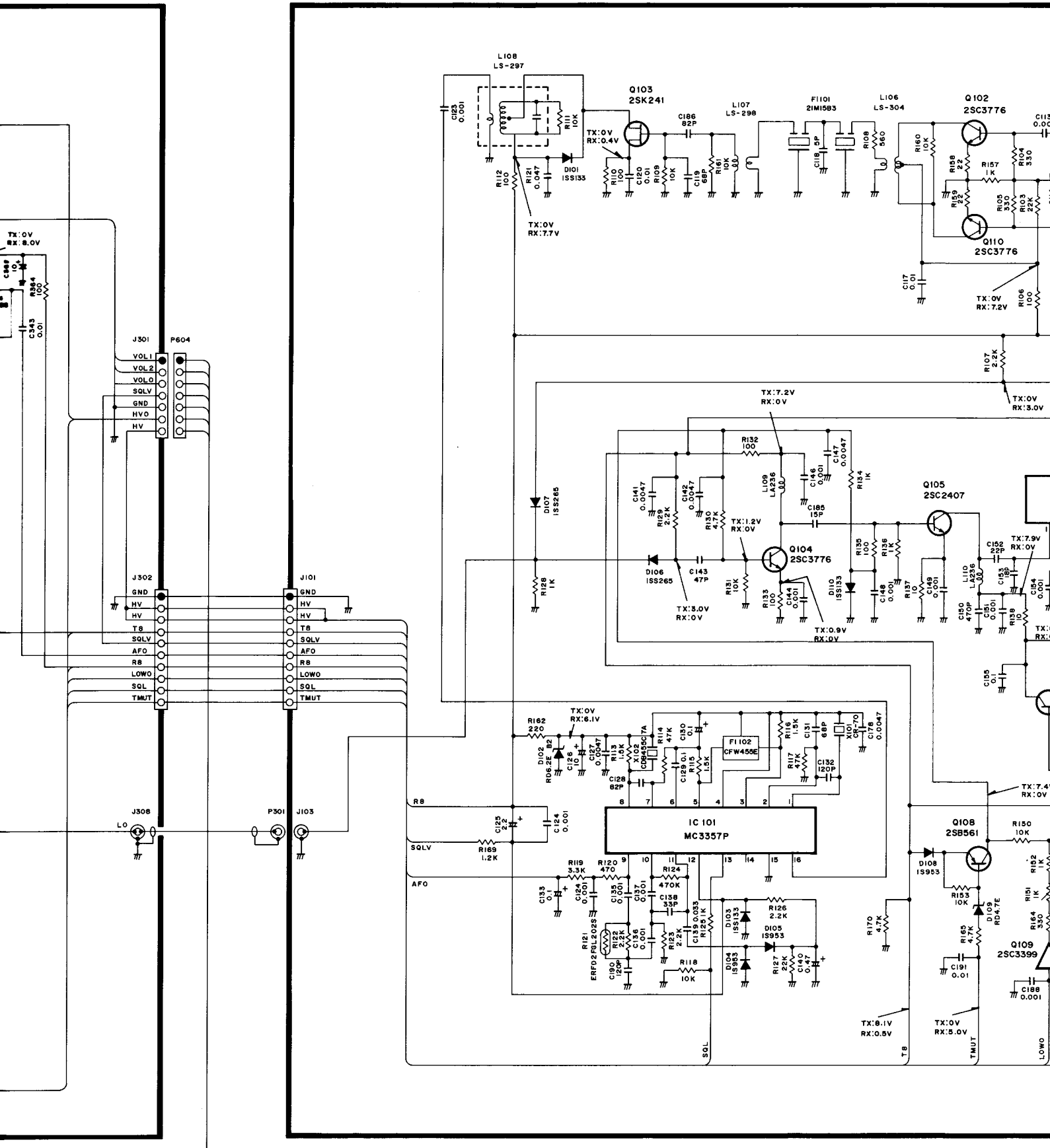
REF. NO.	DESCRIPTION	PART NO.
W117	Jumper	IPS-1401-4
W118	Jumper	IPS-1401-4
W119	Jumper	IPS-1401-4
W120	Jumper	IPS-1401-4
W121	Jumper	IPS-1401-4
W122	Jumper	IPS-1401-4
W123	Jumper	IPS-1401-2
W124	Jumper	IPS-1401-2
W125	Jumper	IPS-1401-2
W126	Jumper	IPS-1401-2
W127	Jumper	JPW-02A
EP101	P.C. Board	B-1871C

SECTION 9 VOLTAGE DIAGRAM

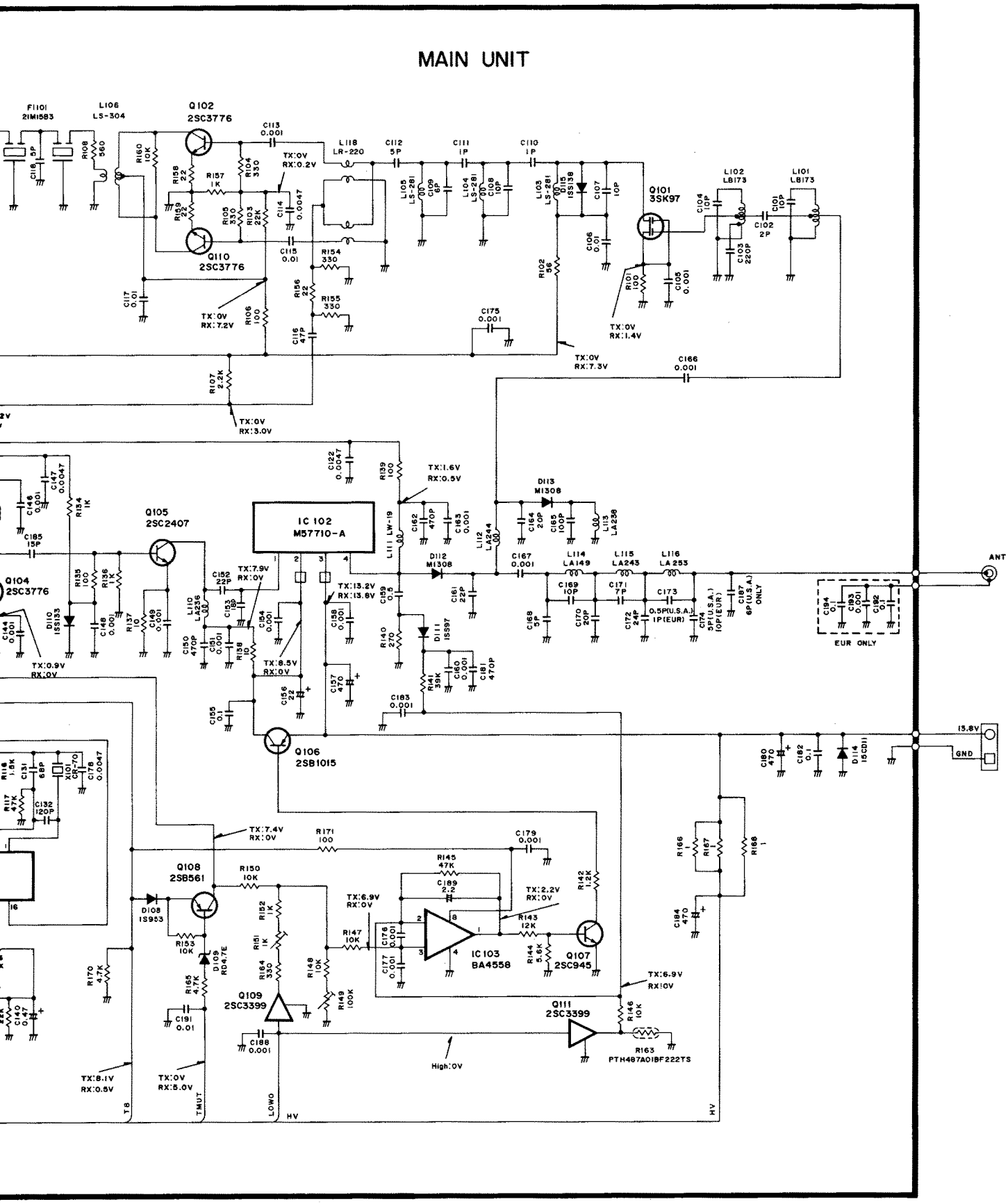



SP1
T045S01A0000
SP-
SP+
P1
J303
J304
C366 22
R350 100
C372 0.001
R366 1K
C302 0.0015
R302 4.7
Q301
2SC2458
R303 330K
R305 3.9K
C304 22
1.3V
Q301
R304 82K
R306 100
R307 560
C305 4.7
R309 47
C303 0.47
R308 1.5K
R311 100K
R312 560K
C307 22
IC 301
R310 470K
C306 47
R313 6.8K
R314 12K
C308 0.01
TX:4.5V
RX:0.4V
C365 470
C301 470
EUR ONLY
J305
TO MICROPHON UNIT
AFZ
GND
MIC
MICE
HANG
PTT
AF I
D304 1SS53
D301 1SS133
BT 301
BR2032-1TS
RMUT
BEEP
Q302
2SA1345
R321 10K
TX:8.1V
RX:0V
J608
SIMT
INH
AUX
POC
J601
HVO
LDEC
HDEC
HANG
PTT
PRV
BEEP
RMUT
BACKUP
5V
SEND
J602
GND
GND
TMUT
LOWO
CK
DATA
ST
SQL
UNLK
P601
J306
HVO
5V
BACK UP
SEND
HDEC
LDEC
RMUT
BEEP
HANG
PTT
PRV
S301
C360 47P
C359 47P
C313 0.001
5.0V
R322 150K
R324 330K
1.0V
0.8V
R323 39K
R325 22K
R326 56K
R328 82K
6
7
3.0V
5
5.0V
3.9V
IC302
M5233P
R327 82K
R329 27K
P602
J307
TMUT
SQL
LOWO
GND
ST
DATA
CK
UNLK
GND
C358 47P
C357 0.001
IC303
MB3756
8V
13.8V
T/R
RB
T8
C316 4.7
C314 0.0047
C315 0.1
C317 0.01
C318 0.0047
C319 0.1
C320 0.0047
TX:5.0V
RX:0V
SEND
Q303
2SC3399
TX:0V
RX:2.0V
TX:8.1V
RX:0.5V
HVO
T8
RB


PLL UNIT
VCO UNIT
IC 306 μPC1242H
IC 305 PLL2001
IC 304 NJM7805A
IC 301
IC 302
Q310 2SJ105
Q309 2SC2458
Q307 2SC3776
Q308 2SC3776
Q304 2SC2458
Q305 2SA1048
Q306 2SC2458
Q502 2SK241
Q501 2SC3776
MP501
D501 1SS53
D502 1SS133
D503 1SS265
D504 1SV50E
D505 1SV50E
D302 1SS133
D303 1SS133
X301 CR69
R338 PTH60T222M
ERT-D2F9L202S
TX:8.0V RX:0.5V
TX:4.9V RX:0.3V
TX:4.5V RX:0.4V
TX:8.2V
TX:8.1V RX:0V
TX:7.4V RX:6.6V
TX:4.9V RX:6.8V
TX:3.8V RX:3.5V
TX:8.1V RX:0.5V
TX:0V RX:8.0V
TX:0V RX:0.4V
8.0V
2.2V
7.5V
2.5V
13.7V
4.9V
SQL OPEN:0V CLOSE:5.0V
R MUT
BEEP
VOL1
VOL2
OUT
AF1
PD
MOD
CK.DATA
STBP
UNLK
STRB
DATA
CK


J301
P604
VOL1
VOL2
VOL0
SQLV
GND
HV0
HV
J302
J101
GND
HV
HV
T8
SQLV
AF0
R8
LOW0
SQL
TMUT
J308
L0
P301
J103
L108
LS-297
Q103
2SK241
L107
LS-298
F1101
21M15B3
L106
LS-304
Q102
2SC3776
Q110
2SC3776
Q105
2SC2407
Q104
2SC3776
IC 101
MC3357P
F1102
CFW455E
Q108
2SB561
Q109
2SC3399
D101
1SS133
D102
RD6.2E B2
D103
1SS133
D104
1S953
D105
1S953
D106
1SS265
D107
1SS265
D108
1S953
D109
RD4.7E
D110
1SS133
TX:0V
RX:8.0V
TX:0V
RX:0.4V
TX:0V
RX:7.7V
TX:0V
RX:7.2V
TX:0V
RX:3.0V
TX:7.2V
RX:0V
TX:1.2V
RX:0V
TX:3.0V
RX:0V
TX:0.9V
RX:0V
TX:7.9V
RX:0V
TX:0V
RX:6.1V
TX:8.1V
RX:0.5V
TX:0V
RX:5.0V

MAIN UNIT


IC 102
M57710-A
IC 103
BA4558
Q101
3SK97
Q102
2SC3776
Q104
2SC3776
Q105
2SC2407
Q106
2SB1015
Q107
2SC945
Q108
2SB561
Q109
2SC3399
Q110
2SC3776
Q111
2SC3399
ANT
13.8V
GND
EUR ONLY
TX:0V
RX:0.2V
TX:0V
RX:7.2V
TX:0V
RX:1.4V
TX:0V
RX:7.3V
TX:0V
RX:3.0V
TX:1.6V
RX:0.5V
TX:7.9V
RX:0V
TX:13.2V
RX:13.6V
TX:8.5V
RX:0V
TX:0.9V
RX:0V
TX:7.4V
RX:0V
TX:6.9V
RX:0V
TX:2.2V
RX:0V
TX:6.9V
RX:0V
TX:8.1V
RX:0.5V
TX:0V
RX:5.0V
High:0V
R163
PTH487A01BF222TS

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