ICOM

SERVICE MANUAL

VHF MARINE TRANSCEIVER

IC-M59

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-M59** VHF MARINE TRANSCEIVER at the time of publication.
5 versions of the **IC-M59** have been designed. This service manual covers each version.

VERSION NO.	VERSION	SYMBOL
#01	U.S.A.	USA
#02	U.S.A.	USA-1

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.

ORDERING PARTS

Be sure to include the following four points when ordering replacement parts:
1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

〈SAMPLE ORDER〉

1180001250	IC	TA7808F	IC-M59	MAIN UNIT	5 pieces
8810008530	Screw	BiH M3×8 SUS	IC-M59	Rear Panel	10 pieces

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

REPAIR NOTES

1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from its 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 40 dB to 50 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.

TABLE OF CONTENTS

SECTION 1 SPECIFICATIONS

■ GENERAL

• Frequency range	: Transmit	156.025 MHz to 157.425 MHz	
	: Receive	156.025 MHz to 163.275 MHz	
• Mode	: FM (16K0G3E)		
• Power supply requirement	: 13.8 V DC ±15 % (negative ground)		
• Current drain (at 13.8 V DC)	: Receive	Max. audio	1.2 A
		Standby	350 mA
	Transmit	at 25 W	6.0 A
		at 1 W	1.5 A
• Frequency stability	: ±10 ppm (±0.001 %)		
• Usable temperature range	: −20 °C to +60 °C; −4 °F to +140 °F		
• Antenna connector	: SO-239 (50 Ω)		
• Dimensions (projections not included)	: 140 (W) × 55 (H) × 155 (D) mm 5 1/2 (W) × 2 5/32 (H) × 6 3/32 (D) in		
• Weight	: 1.0 kg (2.2 lb)		

■ TRANSMITTER

• Output power (at 13.8 V)	: High	25 W
	Low	1 W
• Modulation system	: Variable reactance phase modulation	
• Maximum frequency deviation	: ±5 kHz	
• Spurious emissions	: Less than −70 dB	
• Microphone impedance	: 600 Ω	
• Audio frequency response	: −3 dB to +1 dB in a 6 dB/octave range with 300 Hz to 3000 Hz input	
• Noise and hum	: More than 40 dB	

■ RECEIVER

• Receive system	: Double conversion superheterodyne	
• Intermediate frequencies	: 1st	21.8 MHz
	2nd	455 kHz
• Sensitivity	: 0.22 μV for 12 dB SINAD (typical)	
• Squelch threshold sensitivity	: 0.18 μV	
• Adjacent channel selectivity	: Less than −70 dB	
• Spurious response	: Less than −70 dB	
• Intermodulation rejection	: Less than −70 dB	
• Audio frequency response	: −3 dB to +1 dB in a −6 dB/octave range with 300 Hz to 3000 Hz modulation	
• Audio output power (at 13.8 V DC)	: More than 3.5 W at 10 % distortion with a 4 Ω load	
• External speaker connector	: 3-conductor 3.5 mm (1/8") / 4 Ω	

All stated specifications are subject to change without notice or obligation.

■ VHF MARINE CHANNEL LIST

Channel number			Frequency (MHz)		Channel number			Frequency (MHz)	
USA	INT	CAN	Transmit	Receive	USA	INT	CAN	Transmit	Receive
	01	01	156.050	160.650	61A		61A	156.075	156.075
01A			156.050	156.050		62		156.125	160.725
	02	02	156.100	160.700	62A		62A	156.125	156.125
02A			156.100	156.100		63		156.175	160.775
	03	03	156.150	160.750	63A			156.175	156.175
03A			156.150	156.150		64	64	156.225	160.825
	04		156.200	160.800	64A		64A	156.225	156.225
04A		04A	156.200	156.200		65		156.275	160.875
	05		156.250	160.850	65A		65A	156.275	156.275
05A		05A	156.250	156.250		66		156.325	160.925
06	06	06	156.300	156.300	66A		66A*1	156.325	156.325
	07		156.350	160.950	67*2	67	67	156.375	156.375
07A		07A	156.350	156.350	68	68	68	156.425	156.425
08	08	08	156.400	156.400	69	69	69	156.475	156.475
09	09	09	156.450	156.450	70*3	70*3	70*3	156.525	156.525
10	10	10	156.500	156.500	71	71	71	156.575	156.575
11	11	11	156.550	156.550	72	72	72	156.625	156.625
12	12	12	156.600	156.600	73	73	73	156.675	156.675
13*2	13	13*1	156.650	156.650	74	74	74	156.725	156.725
14	14	14	156.700	156.700	77*1	77	77*1	156.875	156.875
15*2	15*1	15*1	156.750	156.750		78		156.925	161.525
16	16	16	156.800	156.800	78A		78A	156.925	156.925
17*1	17	17*1	156.850	156.850		79		156.975	161.575
	18		156.900	161.500	79A		79A	156.975	156.975
18A		18A	156.900	156.900		80		157.025	161.625
	19		156.950	161.550	80A		80A	157.025	157.025
19A		19A	156.950	156.950		81		157.075	161.675
20	20	20	157.000	161.600	81A		81A	157.075	157.075
20A			157.000	157.000		82		157.125	161.725
	21	21	157.050	161.650	82A		82A	157.125	157.125
21A		21A	157.050	157.050		83	83	157.175	161.775
	22		157.100	161.700	83A		83A	157.175	157.175
22A		22A	157.100	157.100	84	84	84	157.225	161.825
	23	23	157.150	161.750	84A			157.225	157.225
23A			157.150	157.150	85	85	85	157.275	161.875
24	24	24	157.200	161.800	85A			157.275	157.275
25	25	25	157.250	161.850	86	86	86	157.325	161.925
26	26	26	157.300	161.900	86A			157.325	157.325
27	27	27	157.350	161.950	87	87	87	157.375	161.975
28	28	28	157.400	162.000	87A			157.375	157.375
	60	60	156.025	160.625	88	88	88	157.425	162.025
60A			156.025	156.025	88A			157.425	157.425
	61		156.075	160.675					

Weather channel (U.S.A version only)	Frequency (MHz)		Weather channel (U.S.A version only)	Frequency (MHz)	
	Transmitter	Receiver		Transmitter	Receiver
WX 01	RX only	162.550	WX 06	RX only	162.500
WX 02	RX only	162.400	WX 07	RX only	162.525
WX 03	RX only	162.475	WX 08	RX only	161.650
WX 04	RX only	162.425	WX 09	RX only	161.775
WX 05	RX only	162.450	WX 10	RX only	163.275

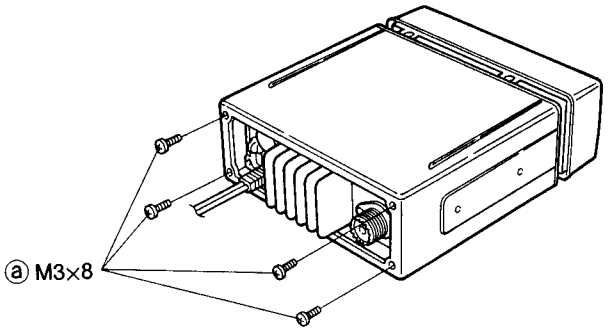
*1Low power only. *2Momentary high power. *3Receive only (except DSC transmission).

SECTION 2 DISASSEMBLY AND OPTION INSTALLATIONS

• REMOVING THE CASE

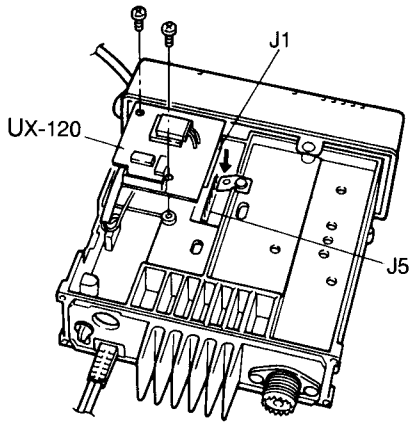
Remove the 4 screws ⓐ, as shown below, and slide the case free of the chassis.

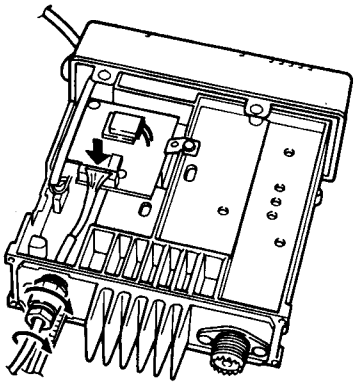
Note: When replacing the screws, 4–6 kg of torque MUST be applied to ensure water resistance.



• UX-120 DSC UNIT INSTALLATION

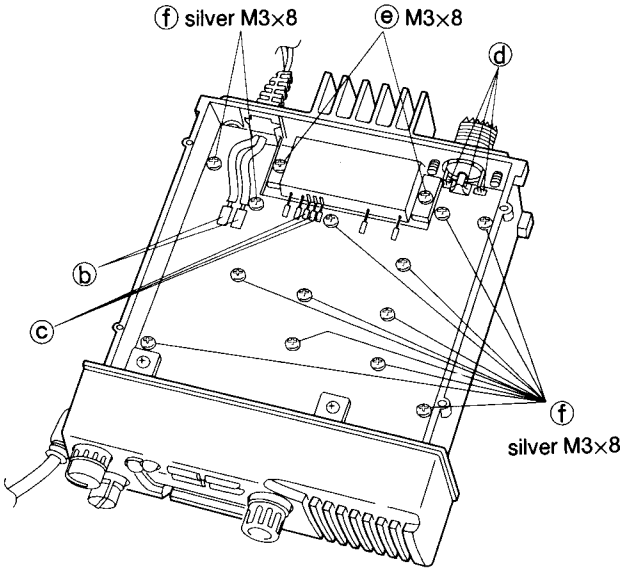
① Connect the UX-120 (J1) to the IC-M59 (J5), and secure the UX-120 with the 2 supplied screws as shown below.
② Slide the UX-120's cable through the opening in the rear of the IC-M59.
③ Secure the cable to the IC-M59 by rotating the cable nut clockwise, and attach the end to the 7-pin plug on the UX-120.





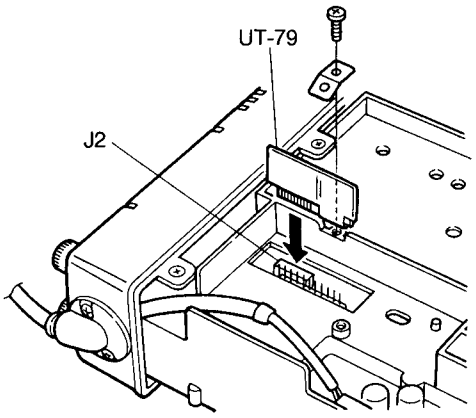
• REMOVING THE MAIN UNIT

① Unsolder DC cable ⓑ (2 points), transistor ⓒ (3 points) and antenna connector ⓓ (3 points) as shown below.
② Remove 2 screws ⓔ and 13 screws ⓕ to remove the MAIN unit.



• UT-79 VOICE SCRAMBLER UNIT INSTALLATION

① Connect the UT-79 to the 14-pin plug (J2) of the IC-M59 as shown below.
② Secure the UT-79 in place with the supplied screw and washer.



SECTION 3 CIRCUIT DESCRIPTION

3-1 RECEIVER CIRCUITS

3-1-1 ANTENNA SWITCHING CIRCUIT

The antenna switching circuit functions as a low-pass filter while receiving and as resonator circuit while transmitting. It switches the flow of the transmitting and receiving signals.

Received signals enter the MAIN unit from the antenna connector and pass through the low-pass filter (L14–L16, C62–C68). The signals are then applied to the antenna switching circuit (D9, D10).

3-1-2 ATTENUATOR CIRCUIT

The current flow of D10 is controlled by the [SQUELCH] control and DC amplifier (IC11a). When the [SQUELCH] control is set deeply, the current of D10 is increased. In this case, D10 acts as an attenuator.

3-1-3 RF CIRCUIT

The signal from the antenna switching circuit passes through a tunable bandpass filter (L19, D11) where the object signals are led to the RF amplifier (Q20).

The amplified signals at Q20 are then applied to the 3-stage tunable bandpass filter (L20–L22, D12–D14) to eliminate the out-of-band signals and improve the selectivity. The signals are then applied to the 1st mixer circuit (Q21).

The PLL lock voltage is used for control voltage of the varactor diodes (D11–D14). The PLL lock voltage is current-amplified at IC11b via Q30 and then applied to these diodes.

3-1-4 1ST MIXER AND IF CIRCUITS

The 1st mixer circuit converts the received signal to a fixed frequency of the 1st IF signal with a PLL output frequency. By changing the PLL frequency, only the desired frequency will be passed through a pair of crystal filters at the next stage of the mixer.

The signals from the RF circuit are mixed with the VCO signal at the 1st mixer (Q21) to produce a 21.8 MHz 1st IF signal.

The 1st IF signal is applied to a pair of crystal filters (FI2) to suppress out-of-band signals. The 1st IF signal is amplified at the IF amplifier (Q22) and is then applied to the 2nd mixer circuit (IC3).

3-1-5 2ND IF AND DEMODULATOR CIRCUITS

The 2nd mixer circuit converts the 1st IF signal to a 2nd IF signal. A double superheterodyne system (which converts receive signals twice) improves the image rejection ratio and obtains stable receiver gain.

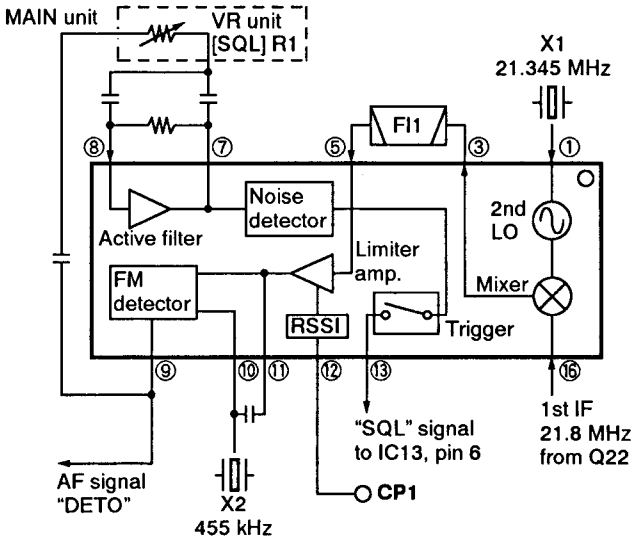
The FM IF IC (IC3) contains the 2nd local oscillator, 2nd mixer, limiter amplifier, quadrature detector, and noise detector circuits, etc.

The 1st IF signal from Q22 is applied to the 2nd mixer section of IC3 (pin 16), and is mixed with a 21.345 MHz 2nd LO signal generated by X3 to produce a 455 kHz 2nd IF signal.

The 2nd IF signal from IC3 (pin 3) is passed through the ceramic filter (FI1), where unwanted signals are suppressed, and is then applied to the 2nd IF and limiter amplifiers in IC3 (pin 5). The signal is applied to the FM detector section in IC3 for demodulation into AF signals.

The FM detector circuit employs a quadrature detection method (liner phase detection), which uses a ceramic discriminator (X2) for phase delay to obtain a non-adjusting circuit. The detected signal from IC3 (pin 9) is applied to the AF circuit.

• FM DEMODULATOR AND SQUELCH CIRCUIT



3-1-6 SQUELCH CIRCUIT

In an FM receiver, audio noise is produced in the IF and AF circuits when receiving no RF signal. However, the noise is suppressed when receiving a signal. The noise squelch circuit acts in accordance with this phenomenon.

Noise components in the detected signal (20 kHz or higher) from IC3 (pin 9) are passed through the [SQUELCH] control, and are detected at the noise detector section via the active filter in IC6 (pin 8). The noise detector converts this to DC voltage. The squelch trigger section in IC3 converts to a HIGH or LOW squelch switch signal. Q23 controls squelch attack and release time.

The squelch switch signal from the IC3 (pin 13) is applied to the CPU through the I/O expander (IC13, pin 6).

3-1-7 AF AMPLIFIER CIRCUIT

AF signals from IC3 (pin 9) enter an optional voice scrambler unit to demodulate scrambled audio, or bypass the unit via an analog switch (IC5, pins 8, 9). The signal is then applied to the de-emphasis circuit (R122, C144). The de-emphasis circuit is an integrated circuit with frequency characteristic of −6 dB/octave.

The integrated signal is applied to the active filters (Q32, Q25). Q32 functions as a high-pass filter to suppress unwanted lower noise signals and Q25 functions as a low-pass filter to suppress higher noise signals.

The filtered signal is passed through the [VOL] control and AF mute switch (Q26), and is then applied to the AF power amplifier (IC8, pin 1). The output signal from IC8 (pin 4) drives the internal speaker.

3-2 TRANSMITTER CIRCUITS

3-2-1 MICROPHONE AMPLIFIER CIRCUIT

The microphone amplifier circuit amplifies audio signals with +6 dB/octave pre-emphasis from the microphone to a level needed at the modulation circuit.

The signals from the microphone are amplified at the microphone amplifier (IC6). A capacitor (C135) and resistor (R96) are connected to the amplifier to obtain the pre-emphasis characteristics.

The amplified signals enter an optional voice scrambler unit to scramble the audio via the "MICAO" line, or bypass the unit via R99 and an analog switch (IC5, pins 11, 10).

The signals pass through the analog switch (IC5, pins 4, 3) and are applied to the limiter amplifier (IC7a) to be limited in frequency deviation, and are then fed to the splatter filter (IC7b) where signals of 3 kHz or higher are eliminated.

3-2-2 MODULATION CIRCUIT

The modulation circuit modulates the VCO oscillating signal (RF signal) using the microphone audio signals.

Audio signals from IC7b pass through the frequency deviation control (R117), are then applied to the modulation circuit (D4) to change the reactance of D4, and modulate the oscillated signal at the VCO (Q9).

3-2-3 DRIVE AMPLIFIER CIRCUIT

The drive amplifier circuit amplifies the VCO oscillating signal to a level needed at the power amplifier.

The VCO output is buffer-amplified by Q10 and Q11, and is then applied to the TX/RX switch (D5). The transmit signal from the TX/RX switch is amplified at the pre-drive (Q12) and drive (Q13) amplifiers to obtain an approximate +23 dB (200 mW) signal level. The amplified signal is then applied to the RF power amplifier (IC2).

3-2-4 POWER AMPLIFIER CIRCUIT

The power amplifier circuit amplifies the driver signal to an output power level.

IC2 is a power module which has amplification output capabilities of about 35 W. The output from IC2 (pin 4) is passed through the antenna switching circuit and is then applied to the antenna connector via a low-pass filter.

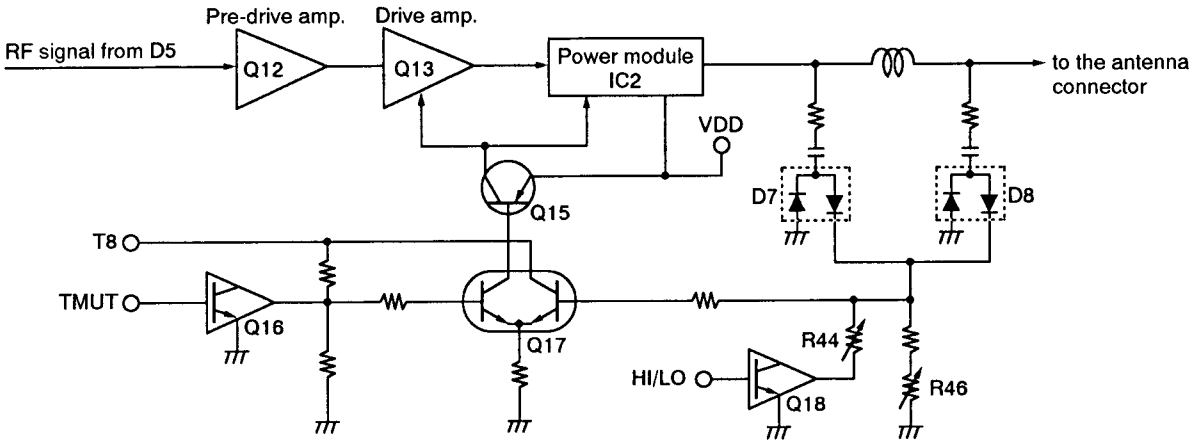
3-2-5 APC CIRCUIT

The APC circuit protects the power module (IC2) from a mismatched output load.

The APC detector circuit (D7, D8) detects forward signals and rectified signals at D7 and D8 respectively. The combined voltage is at a minimum level when the antenna is matched at 50 Ω and increases when it is mismatched.

The combined voltage is applied to one of the differential amplifier inputs (Q17a) via the High/Low control circuit (R44, R46, Q18). The applied voltage controls the differential amplifier output (Q17b) and the bias voltage control (Q15). Thus the bias voltages of the drive amplifier and the power module are decreased.

• APC CIRCUIT



3-3 PLL CIRCUITS

The PLL circuit provides stable oscillation of the transmit frequency and receive LO frequency. It compares the phase of the divided VCO frequency to the reference frequency. The PLL output frequency is controlled by the reference oscillator and the divided ratio (N-data) of the programmable divider.

The oscillation output from Q9 is buffer-amplified at Q10 and Q31, and then applied to the PLL IC (IC10, pin 5). IC10 divides this input with the serial data from the CPU and phase-detects it with the divided reference frequency and then outputs the phase difference as a pulse.

The output signals from IC10 (pin 7) are amplified at the charge pump (Q28, Q29) to expand the lock voltage. The amplified signals are then converted to DC voltage (lock voltage) by the loop filter (R137, C155–C160, IC9) and controls the varactor diodes (D2, D3).

The DC voltage is also applied to the RX tunable bandpass filter as the tuning signal via Q30.

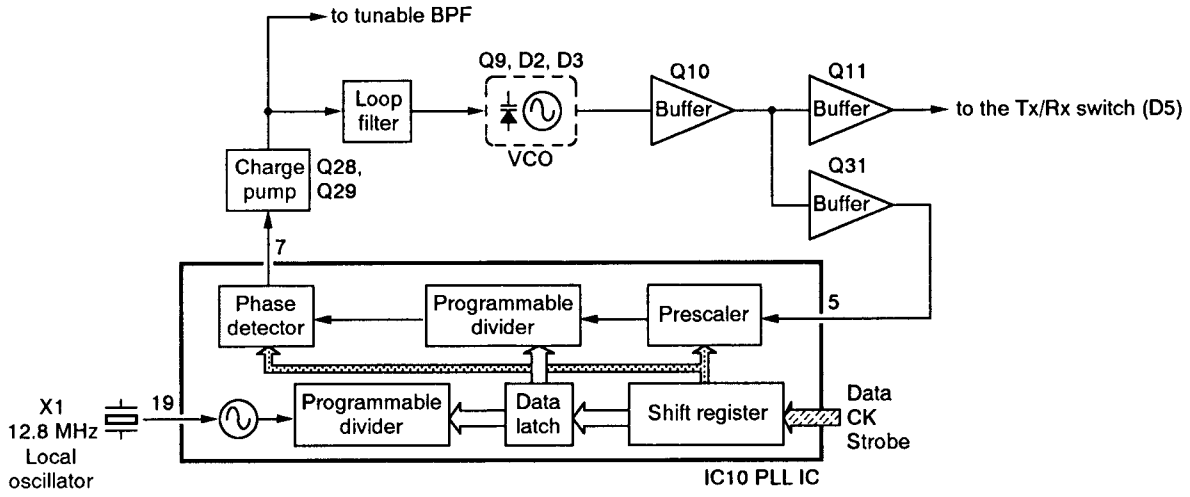
The VCO output from Q9 is buffer-amplified at Q10 and Q11, and is then sent to the TX/RX switch (D5). The receive LO signal is applied to the 1st mixer (Q21) through a low-pass filter, and the transmit signal is applied to the pre-drive amplifier. A portion of the VCO output is re-applied to the PLL IC (IC10, pin 5) via Q31.

3-4 POWER SUPPLY CIRCUITS

VOLTAGE LINES

Line	Description
VDD	The external DC power supply from the power connector.
HV	13.8 V DC passed through the resistors (R1–R3).
HVS	The same voltage as the HV line which is controlled by the power switch (SW unit, R1).
VCC	The VDD passed through the HVS control circuit (Q1, Q2) which is controlled by the HVS line.
8 V	Common 8 V converted from the VCC line at the 8 V regulator circuit (MAIN unit, IC1) which is applied to PLL, R8 regulator and T8 regulator circuits, etc.
5 V	Common 5 V converted from the HVS line at the 5 V regulator circuit (LOGIC unit, IC3) which is applied to PLL and expander ICs.
R8	Receive 8 V converted from the 8 V line at the R8 regulator circuit (MAIN unit, Q3, Q4) which is applied to receiver circuits.
T8	Transmit 8 V converted from the 8 V line at the T8 regulator circuit (MAIN unit, Q5, Q6) which is applied to transmitter circuits.

• **PLL CIRCUIT**



3-5 PORT ALLOCATIONS

3-5-1 CPU (LOGIC UNIT)

Pin No.	Port name	Description
1	ECK	Outputs clock signal to EEPROM IC (IC2).
2	EDATA	DATA bus line to EEPROM IC (IC2).
8	L. BATT	Input port for low battery indicator.
10	BEEP	Output port for beep audio.
12	S. STB	Outputs strobe signals to optional voice scrambler unit (UT-79).
13	P. STB	Outputs strobe signals to PLL IC (MAIN unit IC10).
14	DATA	Output port for serial data.
15	CK	Output port for serial clock.
16	IEX. P/S	Outputs mode select signal to the input expander IC (MAIN unit IC13). High : Parallel mode Low : Serial mode.
17	HI/LO	Outputs select signals for; Beep audio level while receiving. High : Low audio level beep. Low : High audio level beep. RF output power (High or Low) while transmitting. High : High power.
21, 22	DIAL. A DIAL. B	Input pulse signals from the [DIAL] (SENSOR unit S1).
23	PTT	Input port for the PTT switch. Low : PTT is pushed.
24	IEX. D	Input port for data signal from the input expander IC (MAIN unit IC13).
26	S. CON	Outputs control signal to optional voice scrambler unit (UT-79). Low : Scrambler is activated.
27	S. TRU	Outputs control signal to the analog switch (MAIN unit IC5). Low : When optional scrambler function is turned ON.
33	H/L	Input port for the [H/L] switch.
34	SCAN	Input port for the [SCAN] switch.
35	DL/WX	Input port for the [DL/WX] switch.
36	DUAL	Input port for the [DUAL] switch.
37	CALL	Input port for the [CH9] or [CALL] switch.
38	CH16	Input port for the [CH16] switch.

3-5-2 OUTPUT EXPANDER IC (MAIN UNIT IC12)

Pin No.	Port name	Description
4	RCV	Outputs a control signal for the R8 regulator circuit (Q3, Q4). High : While receiving.
5	SEND	Outputs a control signal for the T8 regulator circuit (Q5, Q6). High : While transmitting.
6	MIC/DSC	Outputs transmit audio select signal to the analog switch (IC5). High : DSC's are selected. Low : Microphone's are selected.
7	DETSQL	Outputs a squelch react time control signal. High : While squelch is opened. (The react time is longer.) Low : While squelch is closed or during dual/tri-watch or scanning. (The react time is shorter.)
11	RMUT	Outputs the AF mute switch (Q26) control signal. High : Mute switch is ON (muted).
12	TMUT	Outputs transmit mute signal. High : Transmit mute.
14	DETSCN	Outputs lock-up control signal High : Normal Low : During dual/tri-watch or scanning.

3-5-3 INPUT EXPANDER IC (MAIN UNIT IC13)

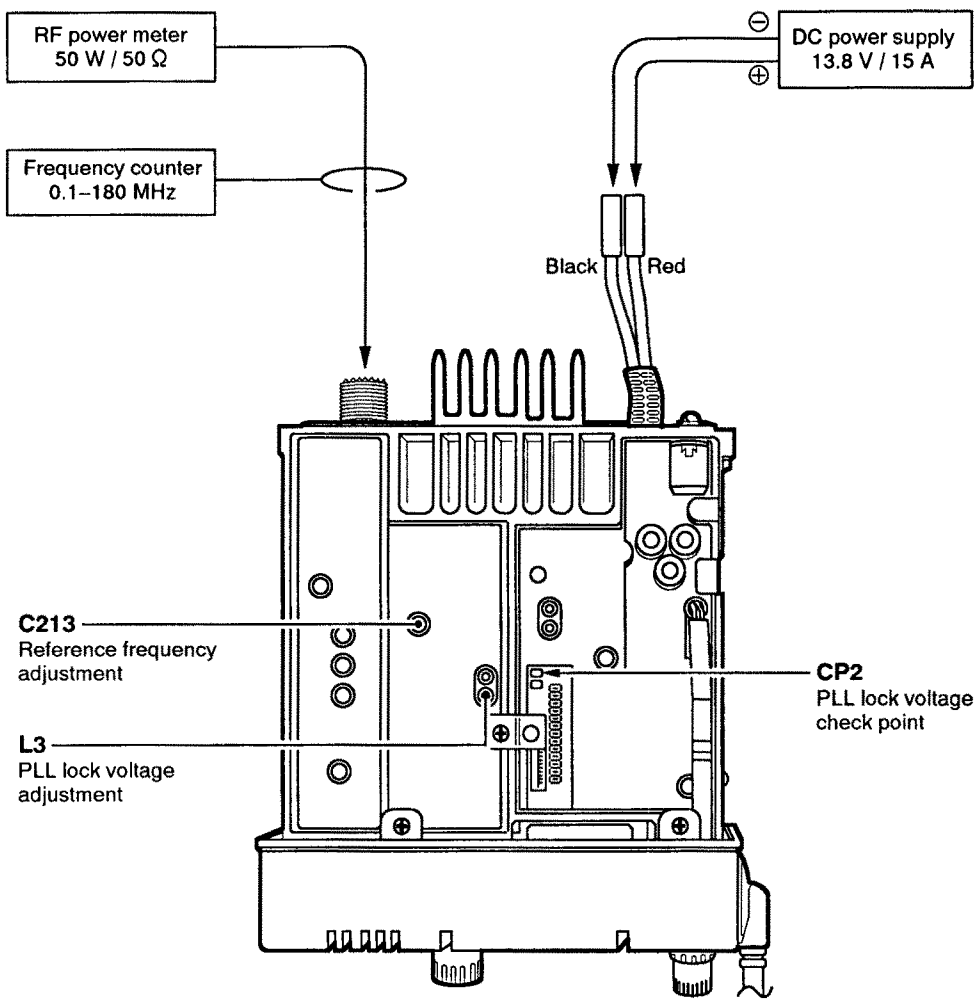
Pin No.	Port name	Description
4	OPTIN	Input port to detect optional voice scrambler unit (UT-79) installation. High : UT-79 is installed.
6	SQL	Input port for squelch ON/OFF signal. Low : Squelch open.
7	UNLK	Input port for unlock signal. Low : PLL is unlocked.
13	TONE	Input port for differentiated signal from the WX tone decoder circuit (IC4). Low : WX tone is received.
14	TXDET	Input port for TX indicator ("TX" in the LCD) control signal. Low : TX indicator is ON (RF signal is output). High : TX indicator is OFF (No RF signal is output).

SECTION 4 ADJUSTMENT PROCEDURES

4-1 PLL ADJUSTMENTS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1	• Operating channel: ch 16 • Receiving	MAIN	Connect a digital multi-meter or oscilloscope to CP2.	3.5 V	MAIN	L3
REFERENCE FREQUENCY	1	• Operating channel: ch 16 • Connect an RF power meter or a 50 Ω dummy load to the antenna connector. • Transmitting	MAIN	Loosely couple the frequency counter to the antenna connector.	156.8000 MHz	MAIN	C213

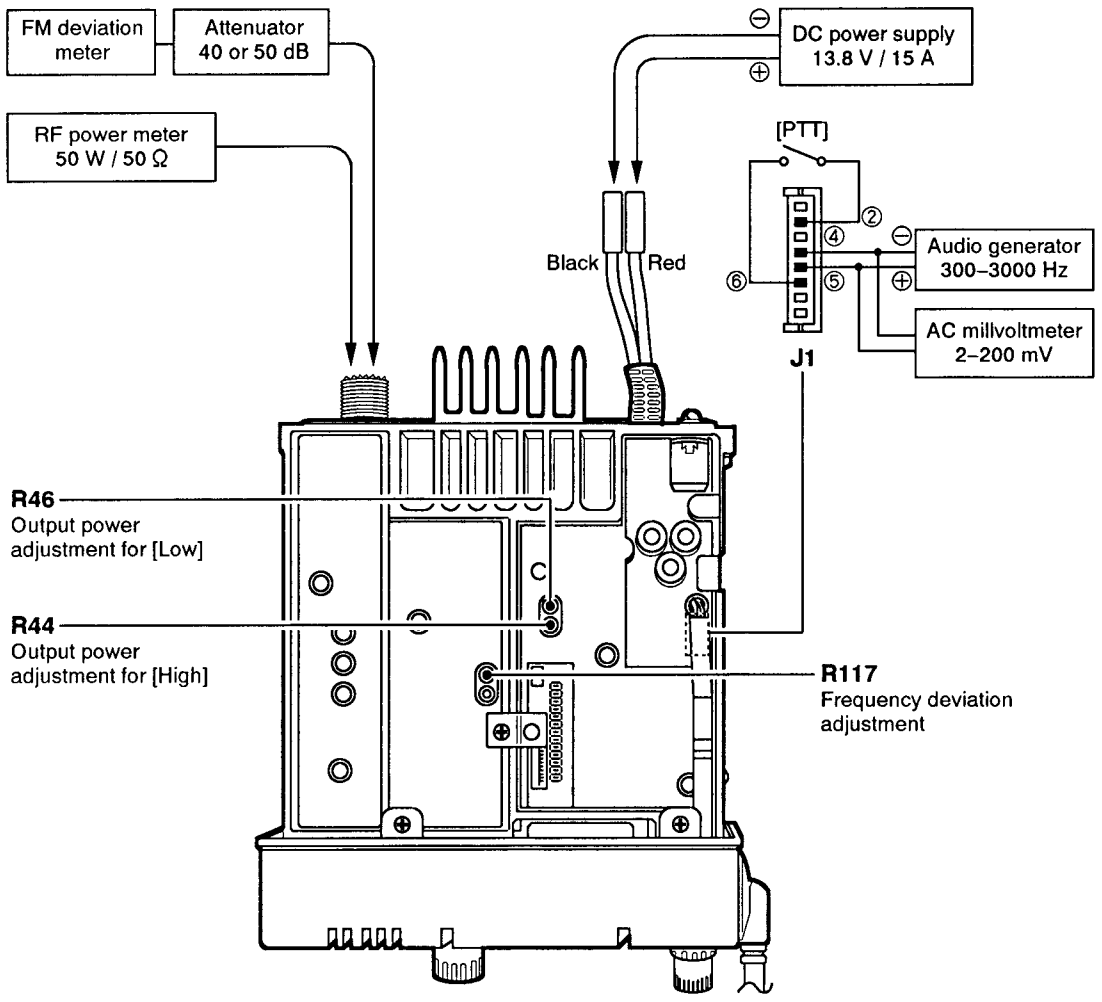
• **MAIN UNIT**



4-2 TRANSMITTER ADJUSTMENTS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	• Operating channel: ch 16 • Output power: High • Transmitting	Rear panel	Connect an RF power meter to the antenna connector.	25 W	MAIN	R44
	2	• Output power: Low			0.9 W		R46
FREQUENCY DEVIATION	1	• Operating channel: ch 16 • Connect an audio generator to J1 (pin 5) with an AC millivoltmeter and set as; Frequency : 1 kHz Level : 150 mV • Set an FM deviation meter as; HPF : OFF LPF : 20 kHz De-emphasis: OFF Detector : (P−P)/2 • Output power: Low • Transmitting	Rear panel	Connect an FM deviation meter to the antenna connector through an attenuator.	±4.3 kHz	MAIN	R117

• MAIN UNIT

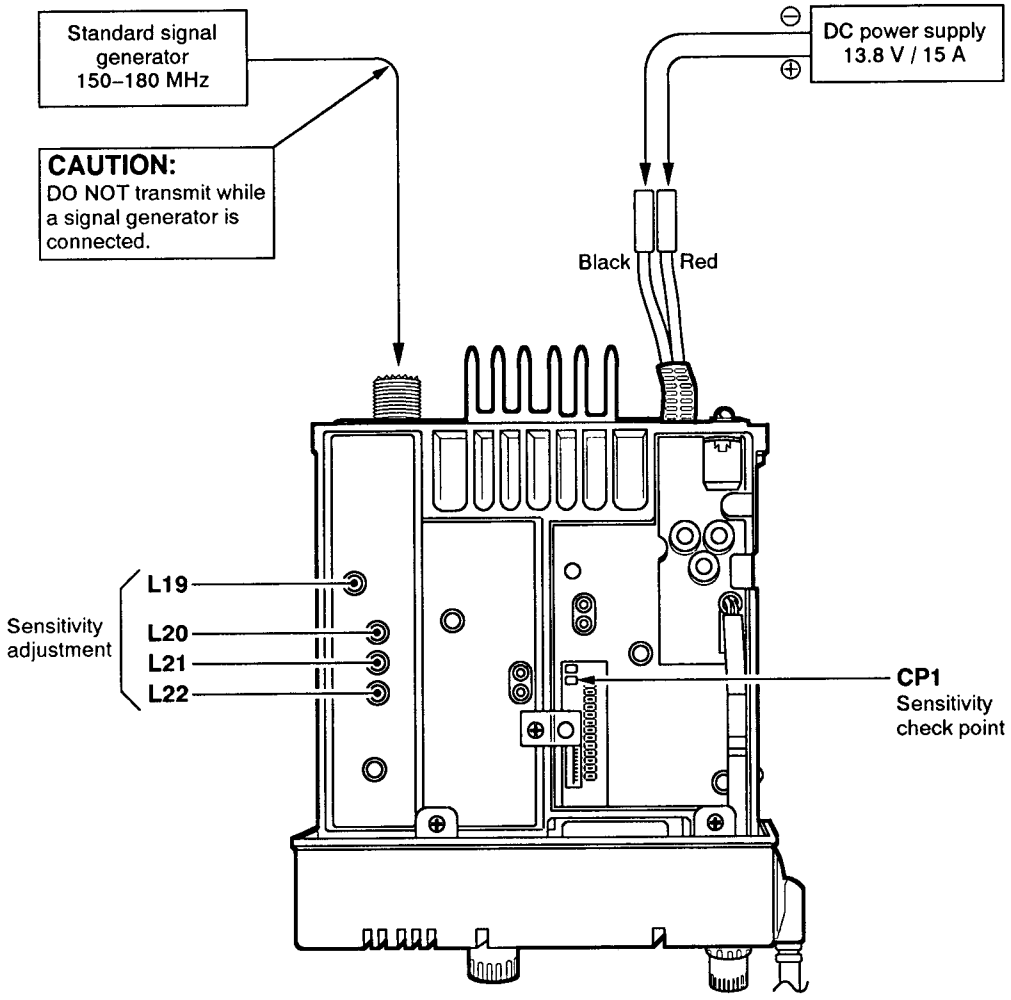


4-3 RECEIVER ADJUSTMENTS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1	• Operating channel: ch 16 • [SQUELCH] control: Max. counterclockwise • Connect an SSG to the antenna connector and set as; Frequency : 156.800 MHz Level : 1 μV*(− 107 dBm) Modulation: 1 kHz Deviation : ±3.5 kHz • Receiving	MAIN	Connect a DC voltmeter to CP1.	Maximum voltage	MAIN	Adjust in sequence L19, L20 L21, L22

*This output level of the standard signal generator (SSG) is indicated as SSG's open circuit.

• **MAIN UNIT**



SECTION 5 PARTS LIST

5-1 IC-M59

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1180001250	S.IC	TA7808F(TE16L)
IC2	1150001540	IC	SC-1302
IC3	1110003330	S.IC	TA31136F(EL)
IC4	1110003640	S.IC	BA1604F-T
IC5	1130007690	S.IC	BU4066BCF-T1
IC6	1130007370	S.IC	TA75S558F(TE85L)
IC7	1110002490	S.IC	M5218FP-73A
IC8	1110003090	IC	LA4425A
IC9	1130007020	S.IC	TC7S66FU(TE85R)
IC10	1110003420	S.IC	M64073GP 600G
IC11	1110003340	S.IC	µPC358GR-T1
IC12	1130007700	S.IC	BU4094BCF-T1
IC13	1130004670	S.IC	BU4021BF-T1
Q1	1550000020	S.FET	2SJ377 (TE16R)
Q2	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q3	1520000460	S.TRANSISTOR	2SB1132 T100 R
Q4	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q5	1520000460	S.TRANSISTOR	2SB1132 T100 R
Q6	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q7	1530000160	S.TRANSISTOR	2SC2712-Y (TE85RTEM)
Q8	1530000160	S.TRANSISTOR	2SC2712-Y (TE85RTEM)
Q9	1560000270	S.FET	2SK302-Y (TE85R)
Q10	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q11	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q12	1530002240	S.TRANSISTOR	2SC3775-3-TB
Q13	1530002340	S.TRANSISTOR	2SC2954-T2B
Q14	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q15	1520000380	TRANSISTOR	2SB1143 S
Q16	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q17	1590000670	S.TRANSISTOR	FMW1 T148
Q18	1590000460	S.TRANSISTOR	RN1402 (TE85R)
Q19	1530000160	S.TRANSISTOR	2SC2712-Y (TE85RTEM)
Q20	1580000540	S.FET	3SK131-T2-LA
Q21	1580000540	S.FET	3SK131-T2-LA
Q22	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q23	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q24	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q25	1530000160	S.TRANSISTOR	2SC2712-Y (TE85RTEM)
Q26	1590000520	S.FET	2SJ106-GR (TE85R)
Q27	1590000420	S.TRANSISTOR	RN1404 (TE85R)
Q28	1530003010	S.TRANSISTOR	2SC4117-GR (TE85R)
Q29	1530003010	S.TRANSISTOR	2SC4117-GR (TE85R)
Q30	1560000540	S.FET	2SK880-Y (TE85R)
Q31	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q32	1530000160	S.TRANSISTOR	2SC2712-Y (TE85RTEM)
Q33	1530003010	S.TRANSISTOR	2SC4117-GR (TE85R)
D1	1790000700	DIODE	DSA3A1
D2	1790000540	S.VARICAP	MA338(TX)
D3	1790000540	S.VARICAP	MA338(TX)
D4	1750000080	S.DIODE	1SS153-T2
D5	1790000450	S.DIODE	MA862(TX)
D6	1750000060	S.DIODE	1SS196 (TE85R)
D7	1790000690	S.DIODE	HSM88ASR-TR
D8	1790000690	S.DIODE	HSM88ASR-TR
D9	1710000290	DIODE	MI308
D10	1710000290	DIODE	MI308
D11	1720000180	S.VARICAP	1SV164-T2B
D12	1720000180	S.VARICAP	1SV164-T2B
D13	1720000180	S.VARICAP	1SV164-T2B
D14	1720000180	S.VARICAP	1SV164-T2B
D15	1720000360	S.DIODE	HSU88TRF
D16	1730000410	S.ZENER	RD5.1M-T2B2
D17	1750000070	S.DIODE	1SS226 (TE85R)
D18	1750000060	S.DIODE	1SS196 (TE85R)
D19	1730000730	S.ZENER	RD6.2M-T2B2

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
D20	1750000110	S.DIODE	1SS272 (TE85R)
D22	1730000730	S.ZENER	RD6.2M-T2B2
D23	1790000540	S.VARICAP	MA338(TX)
FI1	2020000120	CERAMIC	CFW455E
FI2	2010001710	XTAL	FL-210 (21.800 MHz)
X1	6050009720	XTAL	CR-543 (12.8 MHz)
X2	6070000130	DISCRIMINATOR	CDBM455C24
X3	6050009060	XTAL	CR-488 (21.345 MHz)
L1	6200001980	S.COIL	NL 252018T-1R0J
L2	6200001980	S.COIL	NL 252018T-1R0J
L3	6130002360	S.COIL	LB-257
L4	6200001980	S.COIL	NL 252018T-1R0J
L5	6200001980	S.COIL	NL 252018T-1R0J
L6	6200002630	S.COIL	NL 252018T-R10J
L7	6200002630	S.COIL	NL 252018T-R10J
L8	6200002430	S.COIL	NL 252018T-082J
L9	6200002430	S.COIL	NL 252018T-082J
L10	6200002600	S.COIL	NL 252018T-047J
L11	6200002600	S.COIL	NL 252018T-047J
L12	6110001600	COIL	LA-243
L13	6170000180	COIL	LW-19
L14	6110001130	COIL	LA-149
L15	6110001600	COIL	LA-243
L16	6110001670	COIL	LA-253
L17	6110001600	COIL	LA-243
L18	6110001580	COIL	LA-238
L19	6150003820	COIL	LS-440
L20	6150003820	COIL	LS-440
L21	6150003820	COIL	LS-440
L22	6150003820	COIL	LS-440
L23	6200002430	S.COIL	NL 252018T-082J
L24	6200002600	S.COIL	NL 252018T-047J
L25	6200003050	S.COIL	NL 322522T-R82J-3
L26	6200003280	S.COIL	NL 252018T-2R2J
L27	6200002630	S.COIL	NL 252018T-R10J
L28	6200002600	S.COIL	NL 252018T-047J
L29	6200001980	S.COIL	NL 252018T-1R0J
R1	7030004050	S.RESISTOR	ERJ3GEYJ 1R0 V (1 Ω)
R2	7030004050	S.RESISTOR	ERJ3GEYJ 1R0 V (1 Ω)
R3	7030004050	S.RESISTOR	ERJ3GEYJ 1R0 V (1 Ω)
R4	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R5	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R6	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R7	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R8	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R9	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R10	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R11	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R12	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R13	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R14	7030003730	S.RESISTOR	ERJ3GEYJ 274 V (270 kΩ)
R15	7030003550	S.RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R16	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R17	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R18	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R19	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R20	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R21	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R22	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R23	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R24	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)

S.=Surface mount

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R25	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R26	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R27	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R28	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R29	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R30	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R31	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R32	7030003200	S.RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R33	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R34	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R35	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R36	7030003200	S.RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R37	7030003200	S.RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R38	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R39	7030003530	S.RESISTOR	ERJ3GEYJ 562 V (5.6 kΩ)
R40	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R41	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R42	7030003340	S.RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R43	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R44	7310002670	S.TRIMMER	RV-143 (RH03A3AS2)471
R45	7030003490	S.RESISTOR	ERJ3GEYJ 272 V (2.7 kΩ)
R46	7310002760	S.TRIMMER	RV-152 (RH03A3AJ4X0HA)223
R47	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R48	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R49	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R50	7030001150	S.RESISTOR	MCR50JZHJ 150 Ω (151)
R51	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R52	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R53	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R54	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R55	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R56	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R57	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R58	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R59	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R60	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R61	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R62	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R63	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R64	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R65	7030003260	S.RESISTOR	ERJ3GEYJ 330 V (33 Ω)
R66	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R67	7030003200	S.RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R68	7030003820	S.RESISTOR	ERJ3GEYJ 155 V (1.5 MΩ)
R69	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R70	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R71	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R72	7030003200	S.RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R73	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R74	7030003450	S.RESISTOR	ERJ3GEYJ 122 V (1.2 kΩ)
R75	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
R76	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R77	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R78	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R79	7030003430	S.RESISTOR	ERJ3GEYJ 821 V (820 Ω)
R80	7030003740	S.RESISTOR	ERJ3GEYJ 334 V (330 kΩ)
R81	7030003610	S.RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R82	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R83	7030003450	S.RESISTOR	ERJ3GEYJ 122 V (1.2 kΩ)
R84	7030003660	S.RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R85	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R86	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R87	7030003840	S.RESISTOR	ERJ3GEYJ 225 V (2.2 MΩ)
R88	7030007590	S.RESISTOR	RR0816R-433-D (43 kΩ)
R89	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R90	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R91	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R92	7030003490	S.RESISTOR	ERJ3GEYJ 272 V (2.7 kΩ)
R93	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R95	7030003730	S.RESISTOR	ERJ3GEYJ 274 V (270 kΩ)
R96	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R97	7030003710	S.RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R98	7030003540	S.RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R99	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R100	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R101	7510000750	S.THERMISTOR	NTCCS2012 3NH 103KC-T
R102	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R103	7030003670	S.RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R104	7030003700	S.RESISTOR	ERJ3GEYJ 154 V (150 kΩ)
R105	7030003670	S.RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R106	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R107	7030003670	S.RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R108	7030003670	S.RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R109	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R110	7030003550	S.RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R111	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R112	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R113	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R114	7510000750	S.THERMISTOR	NTCCS2012 3NH 103KC-T
R115	7030003570	S.RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R116	7030003570	S.RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R117	7310002600	S.TRIMMER	RV-110 (RH03A3AS4X0AA)473
R118	7030003660	S.RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R119	7030003610	S.RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R120	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R121	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R122	7030003550	S.RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R123	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R124	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R125	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R127	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R128	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R129	7030003760	S.RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R130	7030003450	S.RESISTOR	ERJ3GEYJ 122 V (1.2 kΩ)
R131	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R132	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R133	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R134	7030003410	S.RESISTOR	ERJ3GEYJ 561 V (560 Ω)
R135	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R136	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R137	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R138	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R139	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R140	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R141	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R142	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R143	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R144	7030003280	S.RESISTOR	ERJ3GEYJ 470 V (47 Ω)
R145	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R146	7030003610	S.RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R147	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R148	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R149	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R150	7030003710	S.RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R151	7030003690	S.RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R152	7030003610	S.RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R153	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R154	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R155	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R156	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R157	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R158	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R159	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R160	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R161	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R162	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R163	7410000720	S.ARRAY	EXB-V8V 473JV (47 kΩ)
R164	7410000990	S.ARRAY	EXB-V8V 470JV
R165	7410000990	S.ARRAY	EXB-V8V 470JV
R166	7410000990	S.ARRAY	EXB-V8V 470JV
R167	7410000990	S.ARRAY	EXB-V8V 470JV
R168	7030003550	S.RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R169	7030003770	S.RESISTOR	ERJ3GEYJ 564 V (560 kΩ)
R170	7030003710	S.RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R171	7030003490	S.RESISTOR	ERJ3GEYJ 272 V (2.7 kΩ)
R172	7030003380	S.RESISTOR	ERJ3GEYJ 331 V (330 Ω)
R174	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R175	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R176	7030003530	S.RESISTOR	ERJ3GEYJ 562 V (5.6 kΩ)
R177	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)

S.=Surface mount

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R178	7030003790	S.RESISTOR	ERJ3GEYJ 824 V (820 kΩ)
R179	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R180	7030003690	S.RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R181	7510000710	S.THERMISTOR	NTCCS2012 3FH 222KC-T
R182	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
C1	4510004590	ELECTROLITIC	16 MV 470 HC
C2	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C3	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C4	4510004630	S.ELECTROLITIC	ECEV1CA100SR
C5	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C6	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C7	4510006010	ELECTROLITIC	16 MV 47 SWB
C8	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C9	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C10	4550006300	S.TANTALUM	ECST1AY475R
C11	4030008680	S.CERAMIC	C2012 JF 1C 105Z-T-A
C12	4030008680	S.CERAMIC	C2012 JF 1C 105Z-T-A
C13	4030008680	S.CERAMIC	C2012 JF 1C 105Z-T-A
C14	4030006850	S.CERAMIC	C1608 JB 1H 471K-T-A
C15	4030007050	S.CERAMIC	C1608 CH 1H 220J-T-A
C16	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C17	4550006360	S.TANTALUM	ECST1VY104R
C18	4030008180	S.CERAMIC	C1608 UJ 1H 030C-T-A
C19	4030007040	S.CERAMIC	C1608 CH 1H 180J-T-A
C20	4030008300	S.CERAMIC	C1608 UJ 1H 330J-T-A
C21	4030009530	S.CERAMIC	C1608 CH 1H 030B-T-A
C22	4030009530	S.CERAMIC	C1608 CH 1H 030B-T-A
C23	4030009530	S.CERAMIC	C1608 CH 1H 030B-T-A
C24	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C25	4030009500	S.CERAMIC	C1608 CH 1H 0R5B-T-A
C26	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C27	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A
C28	4030007020	S.CERAMIC	C1608 CH 1H 120J-T-A
C29	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C30	4030007020	S.CERAMIC	C1608 CH 1H 120J-T-A
C31	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C33	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C34	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C35	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C36	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C37	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C38	4030007030	S.CERAMIC	C1608 CH 1H 150J-T-A
C39	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C40	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C41	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C42	4030007050	S.CERAMIC	C1608 CH 1H 220J-T-A
C43	4030007080	S.CERAMIC	C1608 CH 1H 390J-T-A
C44	4030007080	S.CERAMIC	C1608 CH 1H 390J-T-A
C45	4030007040	S.CERAMIC	C1608 CH 1H 180J-T-A
C46	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C47	4510005310	S.ELECTROLITIC	ECEV1CA220SR
C48	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C49	4510004590	ELECTROLITIC	16 MV 470 HC
C50	4550006150	S.TANTALUM	ECST1CY105R
C51	4030006850	S.CERAMIC	C1608 JB 1H 471K-T-A
C52	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C53	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C54	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C55	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C56	4010005640	CERAMIC	HM60SJ SL 180J 500V
C57	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C58	4010005640	CERAMIC	HM60SJ SL 180J 500V
C59	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C60	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C61	4010005790	CERAMIC	HM60SJ YB 102K 500V
C62	4010005560	CERAMIC	HM60SJ SL 050C 500V
C63	4010005610	CERAMIC	HM60SJ SL 100D 500V
C64	4010005650	CERAMIC	HM60SJ SL 200J 500V
C65	4010005580	CERAMIC	HM60SJ SL 070D 500V
C66	4010005640	CERAMIC	HM60SJ SL 180J 500V
C67	4010005560	CERAMIC	HM60SJ SL 050C 500V
C68	4010005560	CERAMIC	HM60SJ SL 050C 500V
C69	4010005660	CERAMIC	HM60SJ SL 220J 500V
C70	4010005650	CERAMIC	HM60SJ SL 200J 500V

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C71	4010005780	CERAMIC	HM60SJ SL 101J 500V
C72	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C73	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C74	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C75	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C76	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C77	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C78	4030006990	S.CERAMIC	C1608 CH 1H 080D-T-A
C79	4030007010	S.CERAMIC	C1608 CH 1H 100D-T-A
C80	4030007010	S.CERAMIC	C1608 CH 1H 100D-T-A
C81	4030006960	S.CERAMIC	C1608 CH 1H 050C-T-A
C82	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C83	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C84	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C85	4030007010	S.CERAMIC	C1608 CH 1H 100D-T-A
C86	4030009530	S.CERAMIC	C1608 CH 1H 030B-T-A
C87	4030009530	S.CERAMIC	C1608 CH 1H 030B-T-A
C88	4030006930	S.CERAMIC	C1608 CH 1H 020C-T-A
C89	4030007010	S.CERAMIC	C1608 CH 1H 100D-T-A
C90	4030009500	S.CERAMIC	C1608 CH 1H 0R5B-T-A
C91	4030006930	S.CERAMIC	C1608 CH 1H 020C-T-A
C92	4030007010	S.CERAMIC	C1608 CH 1H 100D-T-A
C93	4030009530	S.CERAMIC	C1608 CH 1H 030B-T-A
C94	4030006970	S.CERAMIC	C1608 CH 1H 060D-T-A
C95	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C96	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C97	4510004630	S.ELECTROLITIC	ECEV1CA100SR
C98	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C99	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C100	4030007010	S.CERAMIC	C1608 CH 1H 100D-T-A
C101	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C102	4030007110	S.CERAMIC	C1608 CH 1H 680J-T-A
C103	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C104	4030008880	S.CERAMIC	C1608 JB 1C 223K-T-A
C105	4030006990	S.CERAMIC	C1608 CH 1H 080D-T-A
C106	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C107	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A
C108	4030007140	S.CERAMIC	C1608 CH 1H 121J-T-A
C109	4030007120	S.CERAMIC	C1608 CH 1H 820J-T-A
C110	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C111	4030008680	S.CERAMIC	C2012 JF 1C 105Z-T-A
C112	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C113	4030007170	S.CERAMIC	C1608 CH 1H 221J-T-A
C114	4030007170	S.CERAMIC	C1608 CH 1H 221J-T-A
C115	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C116	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C117	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C118	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C119	4510004630	S.ELECTROLITIC	ECEV1CA100SR
C120	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C121	4030007130	S.CERAMIC	C1608 CH 1H 101J-T-A
C122	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C123	4030008920	S.CERAMIC	C1608 JB 1C 473K-T-A
C124	4030009000	S.CERAMIC	C2012 JB 1C 224K-T-A
C125	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C126	4510005310	S.ELECTROLITIC	ECEV1CA220SR
C127	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C128	4550006170	S.TANTALUM	ECST1AY225R
C129	4550006150	S.TANTALUM	ECST1CY105R
C130	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C131	4340000010	S.MYLAR	ECWU 1C 223JB5
C132	4030008680	S.CERAMIC	C2012 JF 1C 105Z-T-A
C133	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C134	4030008770	S.CERAMIC	C1608 JB 1H 562K-T-A
C135	4550000510	S.TANTALUM	TESVA 1V 473M1-8L
C136	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C137	4030008650	S.CERAMIC	C1608 JB 1H 332K-T-A
C138	4030007110	S.CERAMIC	C1608 CH 1H 680J-T-A
C139	4550006530	S.TANTALUM	ECST0JY685R
C140	4550006250	S.TANTALUM	TEMSVA 1A 106M-8L
C141	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C142	4030008470	S.CERAMIC	C1608 JB 1H 272K-T-A
C143	4030008680	S.CERAMIC	C2012 JF 1C 105Z-T-A
C144	4550006130	S.TANTALUM	ECST1VY224R
C145	4030006870	S.CERAMIC	C1608 JB 1H 222K-T-A
C146	4030009490	S.CERAMIC	C1608 JB 1H 821K-T-A

S.=Surface mount

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C147	4550006170	S.TANTALUM	ECST1AY225R
C148	4550006250	S.TANTALUM	TEMSVA 1A 106M-8L
C149	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A
C150	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C151	4550006170	S.TANTALUM	ECST1AY225R
C152	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C153	4510004590	ELECTROLITIC	16 MV 470 HC
C154	4510004590	ELECTROLITIC	16 MV 470 HC
C155	4550004040	S.TANTALUM	TEMSVA 0J 685M-8L
C156	4550004040	S.TANTALUM	TEMSVA 0J 685M-8L
C157	4550003080	S.TANTALUM	TEMSVA 1A 335M-8L
C158	4550003080	S.TANTALUM	TEMSVA 1A 335M-8L
C159	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C160	4030010070	S.CERAMIC	C1608 X7S 1C 104K-T-A
C161	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C162	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C163	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C164	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C165	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C166	4030007020	S.CERAMIC	C1608 CH 1H 120J-T-A
C167	4030007040	S.CERAMIC	C1608 CH 1H 180J-T-A
C168	4030007040	S.CERAMIC	C1608 CH 1H 180J-T-A
C169	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C174	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C175	4550006170	S.TANTALUM	ECST1AY225R
C176	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C177	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C178	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C179	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C180	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C181	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C182	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C183	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C184	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C185	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C187	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C188	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C189	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C190	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C191	4030006850	S.CERAMIC	C1608 JB 1H 471K-T-A
C192	4030006850	S.CERAMIC	C1608 JB 1H 471K-T-A
C193	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C194	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C195	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C196	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C198	4030008890	S.CERAMIC	C1608 JB 1C 273K-T-A
C199	4030008890	S.CERAMIC	C1608 JB 1C 273K-T-A
C200	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C201	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C202	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C203	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C204	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C205	4550006170	S.TANTALUM	ECST1AY225R
C206	4550006170	S.TANTALUM	ECST1AY225R
C207	4030008630	S.CERAMIC	C1608 JF 1C 104Z-T-A
C208	4030007070	S.CERAMIC	C1608 CH 1H 330J-T-A
C209	4030006890	S.CERAMIC	C1608 JF 1H 103Z-T-A
C210	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A
C211	4030007010	S.CERAMIC	C1608 CH 1H 100D-T-A
C212	4030007080	S.CERAMIC	C1608 CH 1H 390J-T-A
C213	4610001910	S.TRIMMER	CTZ3E-10A-W1
C214	4030007020	S.CERAMIC	C1608 CH 1H 120J-T-A
C215	4030007040	S.CERAMIC	C1608 CH 1H 180J-T-A
C216	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A
C217	4030006900	S.CERAMIC	C1608 JB 1E 103K-T-A
J1	6510003430	CONNECTOR	B07B-EH-S
J2	6510012880	S.CONNECTOR	CEW9114-0202
J3	6450001060	CONNECTOR	HSJ1493-01-010
J4	6510017810	S.CONNECTOR	IMSA-9611S-30C
J5	6510004890	CONNECTOR	3022-09A
W1	6910001020	JUMPER	IPS-1041-2
W2	6910001020	JUMPER	IPS-1041-2

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
W3	6910001020	JUMPER	IPS-1041-2
W4	6910001020	JUMPER	IPS-1041-2
EP1	0910046833	PCB	B 4711C

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140005810	S.IC	M38223M4-118-GP
IC2	1190000480	S.IC	24LC08BTI/SN
IC3	1180001560	S.IC	TA7805F
IC4	1110004230	S.IC	S-80742SL-A6
IC5	1130008190	S.IC	TC7W02F(TE12L)
Q1	1530003480	S.TRANSISTOR	2SC2712 GR(TE85R)
Q2	1530003480	S.TRANSISTOR	2SC2712 GR(TE85R)
Q3	1510000990	S.TRANSISTOR	2SA1162-GR(TE85R)
Q4	1520000690	S.TRANSISTOR	2SB1132 T100 Q
Q5	1590002170	S.TRANSISTOR	FMW1 T148
D1	1750000490	S.DIODE	1SS196 (TE85R)
D2	1750000490	S.DIODE	1SS196 (TE85R)
D3	1750000490	S.DIODE	1SS196 (TE85R)
D4	1730002390	S.ZENER	RD6.2M-T2B2
X1	6060000640	S.CERAMIC	PBRC 4.91 BR
R1	7030006380	S.RESISTOR	ERJ3GEYJ 103 V
R2	7030006380	S.RESISTOR	ERJ3GEYJ 103 V
R3	7030006370	S.RESISTOR	ERJ3GEYJ 154 V
R4	7030006400	S.RESISTOR	ERJ3GEYJ 473 V
R5	7030007750	S.RESISTOR	ERJ3GEYJ 223 V
R6	7030007750	S.RESISTOR	ERJ3GEYJ 223 V
R7	7030007780	S.RESISTOR	ERJ3GEYJ 104 V
R8	7030006420	S.RESISTOR	ERJ3GEYJ 102 V
R9	7030006390	S.RESISTOR	ERJ3GEYJ 474 V
R10	7030007790	S.RESISTOR	ERJ3GEYJ 224 V
R11	7030007790	S.RESISTOR	ERJ3GEYJ 224 V
R12	7030007780	S.RESISTOR	ERJ3GEYJ 104 V
R13	7030006400	S.RESISTOR	ERJ3GEYJ 473 V
R14	7030007780	S.RESISTOR	ERJ3GEYJ 104 V
R15	7030006400	S.RESISTOR	ERJ3GEYJ 473 V
R16	7030007740	S.RESISTOR	ERJ3GEYJ 682 V
R17	7030007760	S.RESISTOR	ERJ3GEYJ 333 V
R18	7030006380	S.RESISTOR	ERJ3GEYJ 103 V
R19	7030006340	S.RESISTOR	MCR10EZHJ 27 Ω
R20	7030006340	S.RESISTOR	MCR10EZHJ 27 Ω
R21	7030007830	S.RESISTOR	ERJ3GEYJ 683 V
R22	7030006400	S.RESISTOR	ERJ3GEYJ 473 V
R23	7030007820	S.RESISTOR	ERJ3GEYJ 393 V
R24	7030007770	S.RESISTOR	ERJ3GE 563 V
R25	7030006420	S.RESISTOR	ERJ3GEYJ 102 V
R26	7030007810	S.RESISTOR	ERJ3GEYJ 392 V
R27	7030007800	S.RESISTOR	ERJ3GEYJ 272 V
R28	7030006380	S.RESISTOR	ERJ3GEYJ 103 V
R29	7030006420	S.RESISTOR	ERJ3GEYJ 102 V
R30	7030007780	S.RESISTOR	ERJ3GEYJ 104 V
C1	4030010790	S.CERAMIC	C1608 JB 1E 103K

S.=Surface mount

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C2	4030010790	S.CERAMIC	C1608 JB 1E 103K
C3	4030010790	S.CERAMIC	C1608 JB 1E 103K
C4	4030010790	S.CERAMIC	C1608 JB 1E 103K
C5	4510006200	S.ELECTROLITIC	ECEV1CA100SR
C6	4510006180	S.ELECTROLITIC	ECEV0JA101SP
C7	4030010790	S.CERAMIC	C1608 JB 1E 103K
C8	4030010790	S.CERAMIC	C1608 JB 1E 103K
C9	4030011750	S.CERAMIC	C1608 JF 1C 224Z
C10	4030010790	S.CERAMIC	C1608 JB 1E 103K
C11	4510006170	S.ELECTROLITIC	ECEV1HA2R2SR
C12	4030010790	S.CERAMIC	C1608 JB 1E 103K
C13	4030010790	S.CERAMIC	C1608 JB 1E 103K
C14	4030010840	S.CERAMIC	C1608 SL 1H 470J
C15	4030010840	S.CERAMIC	C1608 SL 1H 470J
C16	4030010790	S.CERAMIC	C1608 JB 1E 103K
C17	4030010790	S.CERAMIC	C1608 JB 1E 103K
C18	4030010830	S.CERAMIC	C1608 JB 1H 102K
DS1	5030001372	LCD	E4548-2
DS2	5080000350	LAMP	HRS-7219A-Y2 30
DS3	5080000350	LAMP	HRS-7219A-Y2 30
S1	2260002180	S.SWITCH	EVQ-PJU 05K
S2	2260002180	S.SWITCH	EVQ-PJU 05K
S3	2260002180	S.SWITCH	EVQ-PJU 05K
S4	2260002180	S.SWITCH	EVQ-PJU 05K
S5	2260002180	S.SWITCH	EVQ-PJU 05K
S6	2260002180	S.SWITCH	EVQ-PJU 05K
J1	6510018210	S.CONNECTOR	IMSA-9611S-30C
J2	6510018220	CONNECTOR	B8B-ZR
J3	6510018230	CONNECTOR	B2B-ZR
J4	6510018240	CONNECTOR	B3B-ZR
J5	6510019790	S.CONNECTOR	B2B-ZR-SM3-TF
W1	8900005530	CABLE	OPC-501
EP1	0910046842	PCB	B 4712B
EP2	9018490130	TUBE	IRRAX D=0.7 L=1.5 mm

[SENSOR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
S1	2260002190	ENCODER	SW-122(RK097103)
WS1	8600034970		P01*J01SE
EP1	0910043741	PCB	B 4358A

[VR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7210002680	VARIABLE	RK097111000AA
EP1	0910043720	PCB	B 4356

[SW UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7210002690	VARIABLE	RK097111102AA
WS1	8600034960		P01*J01*02SW
EP1	0910043730	PCB	B 4357

S.=Surface mount

5-2 HM-107

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7010006890	RESISTOR	R20J 12 kΩ
R2	7010006880	RESISTOR	R20J 6.8 kΩ
R3	7010006900	RESISTOR	R20J 15 kΩ
R4	7010006910	RESISTOR	R20J 33 kΩ
C1	4010008030	CERAMIC	DD104 B 471K 50 V
S1	2260002330	SWITCH	SKHHLP014A
S2	2260002340	SWITCH	SKHHAM024A
S3	2260002340	SWITCH	SKHHAM024A
S4	2260002340	SWITCH	SKHHAM024A
W1	9018490010	WIRE	71/98/010/X98/X98
W2	9018490010	WIRE	71/98/010/X98/X98
MC1	7700002120	MICROPHONE	KUC2123-030245
EP1	0910046892	PCB	B 4764B
EP2	9018230010	TUBE	IRRAX D=0.7 L=4 mm

S.=Surface mount

SECTION 6 MECHANICAL PARTS

6-1 IC-M59

[CHASSIS PARTS]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6510018200	Antenna connector MR-DSE-01	1
W1	8900003500	DC power connector OPC-356	1
EP1	8930040400	LCD contact ZPP-505	1
MP1	8410001961	1542 heat sink -1	1
MP2	8210011340	1542 reflector	1
MP3	8010009200	1542 case (black)	1
	8510015850	1542 case (A) (white)	1
MP4	8210013560	1542 front panel (D) (black)	1
	8210013570	1542 front panel (E) (white)	1
MP5	8930039650	1542 front key (C)	1
MP6	8930033240	1542 R-sealing	1
MP7	8930034290	1542 F-sealing	1
MP8	8310034090	1542 window plate	1
MP9	8610009310	Knob N-221 (black)	2
	8610009640	Knob N-221 (A) (white)	2
MP10	8930040370	1542 cable plate	1
MP11	8930020860	IC-holder	1
MP12	8610009300	Knob N-220 (black)	1
	8610009630	Knob N-220 (A) (white)	1
MP13	8930033462	1542 jack seal -2	1
MP14	8930033470	1542 jack bush	1
MP15	8930034300	1542 antenna seal	1
MP16	8810008530	Screw BiH M3 x 8 SUS	4
MP17	8930034340	1542 speaker net	1
MP18	8810008540	Screw FH M2.6 x 5	4
MP19	8930034320	1542 bush plate	1
MP20	8810008720	Screw PH BT M3 x 6 NI	13
MP21	8810009400	Screw BiH M3 x 8 SUS ZK (for black)	2
	8810008530	Screw BiH M3 x 8 SUS (for white)	2
MP22	8810008570	Screw PH B0 M2.6 x 10	5
MP23	8810008530	Screw BiH M3 x 8 SUS	2
MP24	8810008530	Screw BiH M3 x 8 SUS	2
MP25	8930033220	1542 LCD holder	1
MP26	8930033230	1542 LCD rubber	1
MP27	8930033490	1542 jack cap	1
MP28	8930034950	O-ring	3
MP29	8930032370	Shaft tape (A)	3
MP30	8810008530	Screw BiH M3 x 8 SUS	1
MP39	8810008720	Screw PH BT M3 x 6 NI	1
MP40	8930034610	1542 P.C.B plate	1
MP41	8930040360	1849 front plate	1
SP1	2510000740	Speaker F45G05-04	1

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
W1	8900005530	Flat cable OPC-501	1
DS1	5030001372	LCD E4548-2	1

[VR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
R1	7210002680	Variable resistor RK097111000AA [SQUELCH] (incl. nut)	1

[SW UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
R1	7210002690	Switch/Variable resistor RK097111102AA [PWR/VOL] (incl. nut)	1

[SENSOR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
S1	2260002190	Encoder SW-122 [CHANNEL] (incl. nut)	1

[UNPACKING]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
W1	8900006540	DC power cable OPC-632	1
W2	8900005640	Microphone hanger OPC-562 (black)	1
	8900005630	Microphone hanger OPC-562 (white)	1
MP1	8010015380	Mounting bracket (B) (black)	1
	8010016860	Mounting bracket (A) (white)	1
MP2	8610009610	Mounting bracket knob	4
MP3	8850001400	Flat washer M4 SUS	2
MP4	8810008510	Screw PH A M3.5 x 30 SUS	2
MP5	8810008520	Screw PH A M5 x 20 SUS	4
MP8	8310038580	Sticker (for scrambler function)	1

6-2 HM-107

[CHASSIS PARTS]

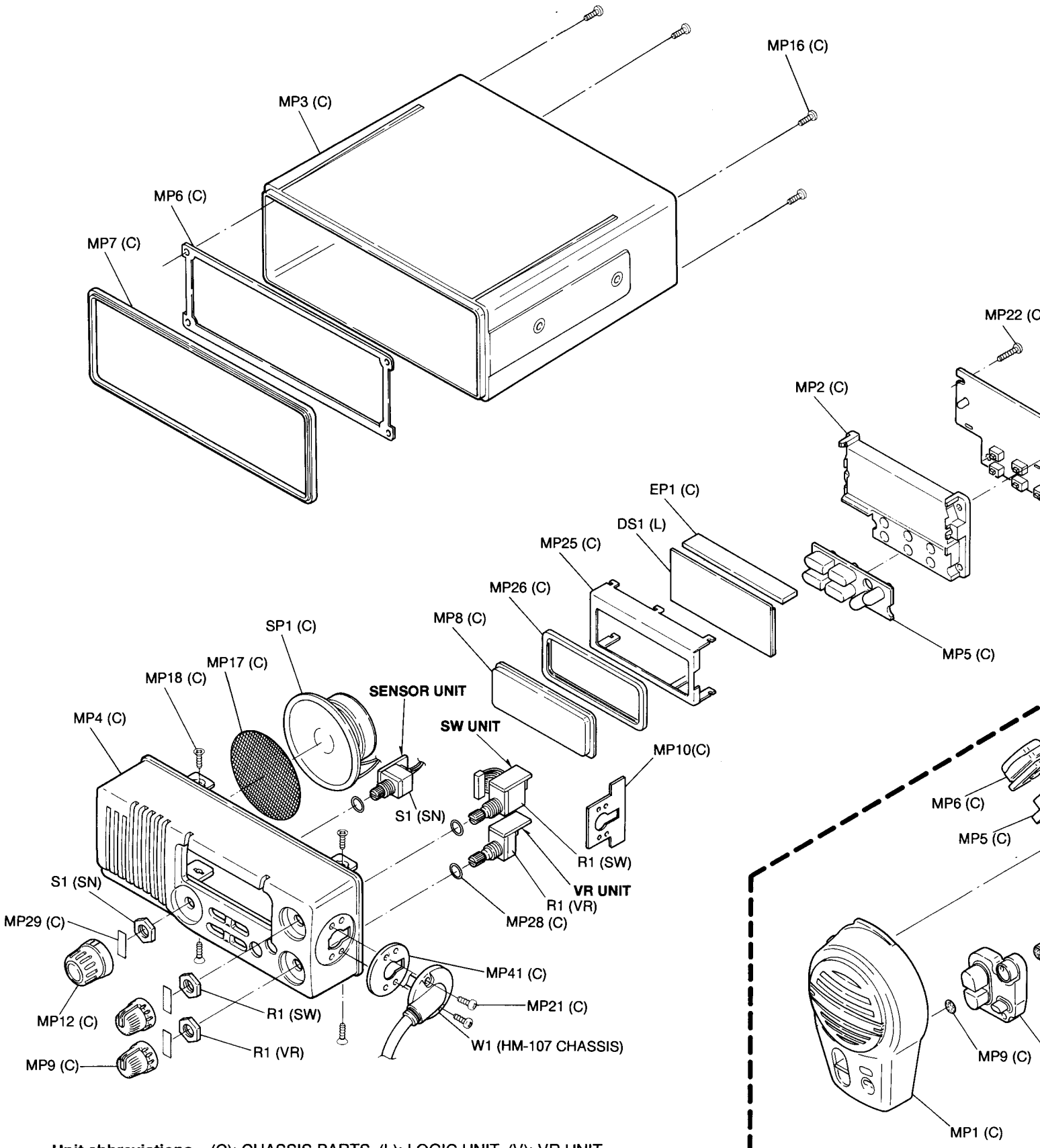
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
W1	8900006730	Microphone cable OPC-633 (black)	1
	8900006740	Microphone cable OPC-634 (white)	1
MP1	8210013600	1823 front panel (black)	1
	8210013590	1823 front panel (A) (white)	1
MP2	8210013620	1823 rear panel (black)	1
	8210013610	1823 rear panel (A) (white)	1
MP3	8930039770	1823 R-plate	1
MP4	8930039780	1823 panel seal	1
MP5	8930039750	1823 PTT holder	1
MP6	8930039760	1823 PTT rubber	1
MP7	8930039730	1823 keyboard	1
MP8	8930039720	1823 hanger knob	1
MP9	8930039740	1823 M-sheet	2
MP11	8810009250	Screw PH B0 M2.6 x 16 SUS	5
MP12	8810009260	Screw PH BT M2 x 6 NI	5
MP13	8810009240	Screw BiH M4 x 10 ZK	1
MP14	8850001610	Flat washer M4 SUS	1
MP15	8810008900	Screw PH M3 x 6 NI	1

[MAIN UNIT]

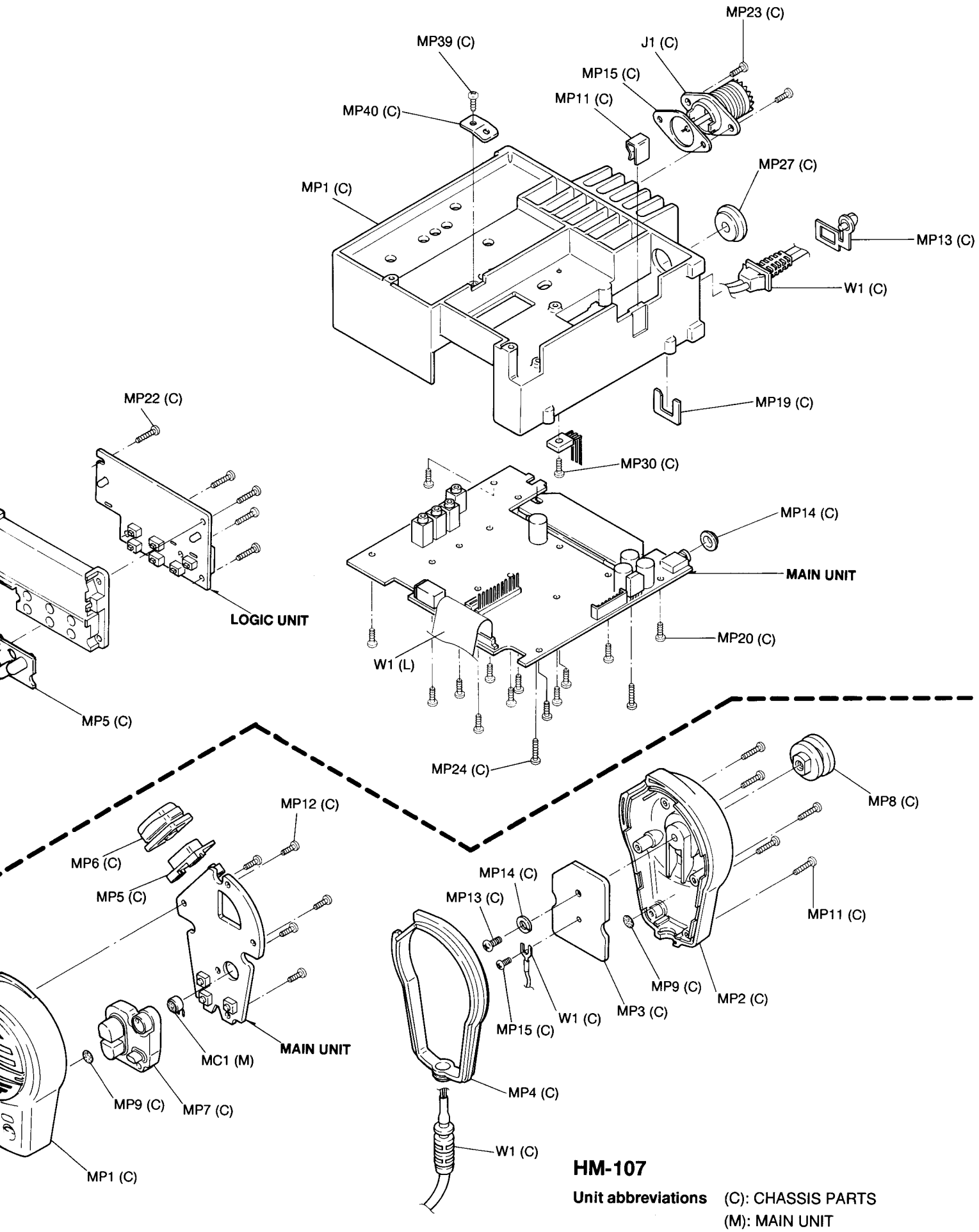
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MC1	7700002120	Microphone KUC2123-030245	1

Screw abbreviations

A, B0, BT: Self-tapping
PH: Pan head
FH: Flat head
BiH: Bind head
NI: Nickel
SUS: Stainless
ZK: Black



Unit abbreviations (C): CHASSIS PARTS (L): LOGIC UNIT (V): VR UNIT
(SW): SW UNIT (S): SENSOR UNIT

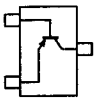
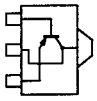
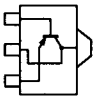
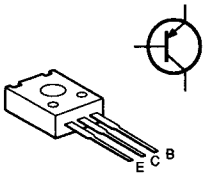
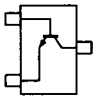
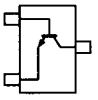
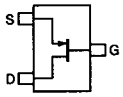
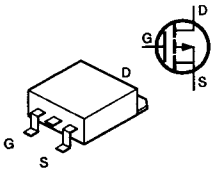
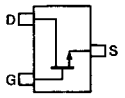
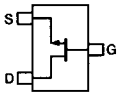
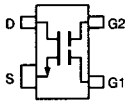
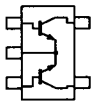


HM-107

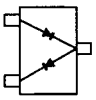
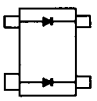
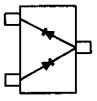
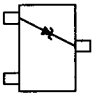
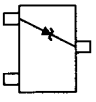
Unit abbreviations (C): CHASSIS PARTS
(M): MAIN UNIT

SECTION 7 SEMI-CONDUCTOR INFORMATION

• TRANSISTORS AND FET'S

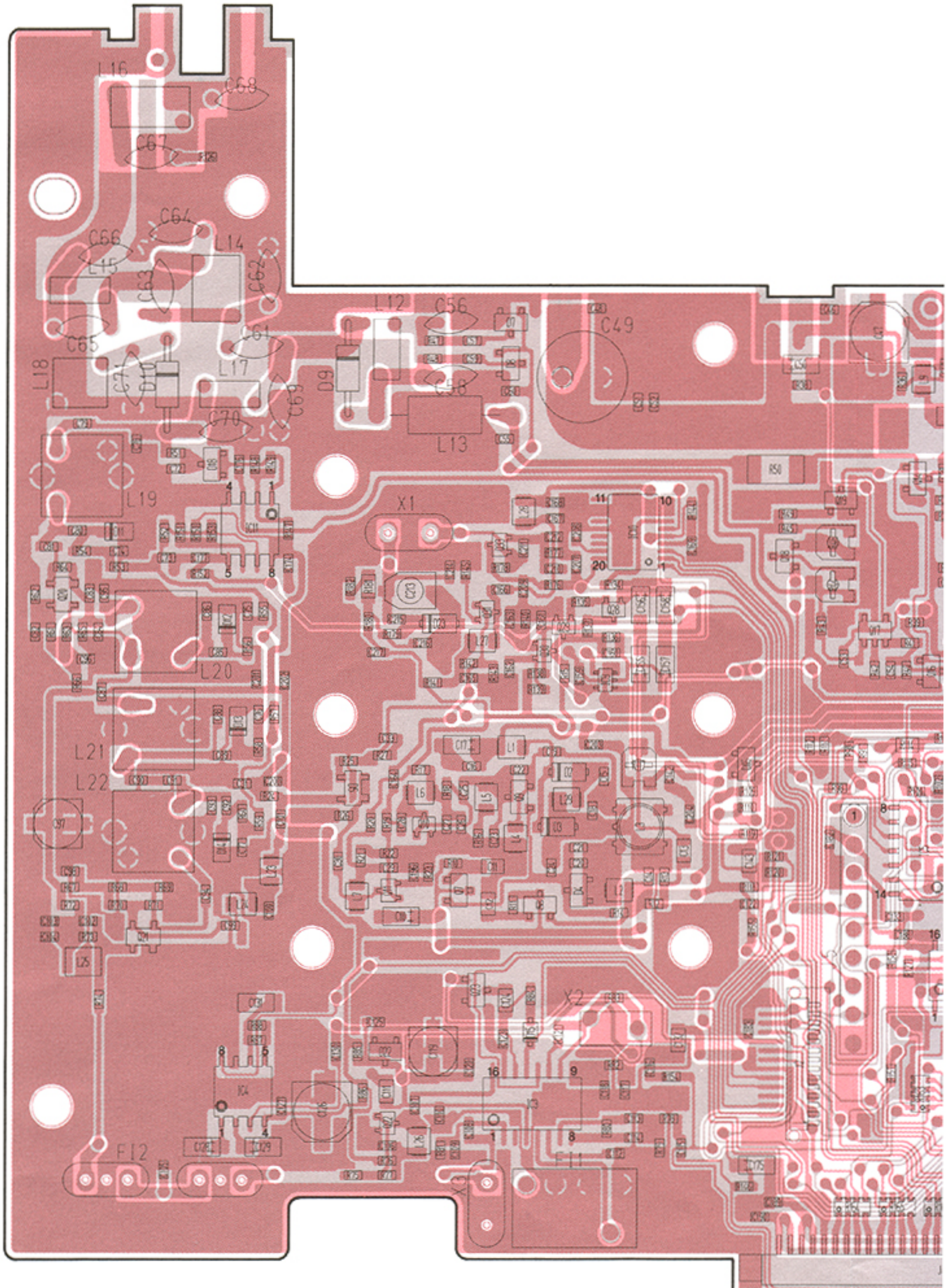
2SA1162 GR (Symbol: SR) 	**2SB1132** (Symbol: BA) 	**2SB1132 R** (Symbol: BARB) 	**2SB1143 S** 	**2SC2712 GR** (Symbol: LG) 
2SC2712 Y (Symbol: LY) 	**2SC2954** (Symbol: QK) 	**2SC3775 3** (Symbol: OY3) 	**2SC4117 GR** (Symbol: DG) 	**2SC4215 O** (Symbol: QO) 
2SJ106 GR (Symbol: VG) 	**2SJ377** (Symbol: 4L) 	**2SK302 Y** (Symbol: TY) 	**2SK880 Y** (Symbol: XY) 	**3SK131 LA** (Symbol: V12) 
FMW1 (Symbol: W1) 	**RN1402** (Symbol: XB) 	**RN1404** (Symbol: XD) 		

• DIODES

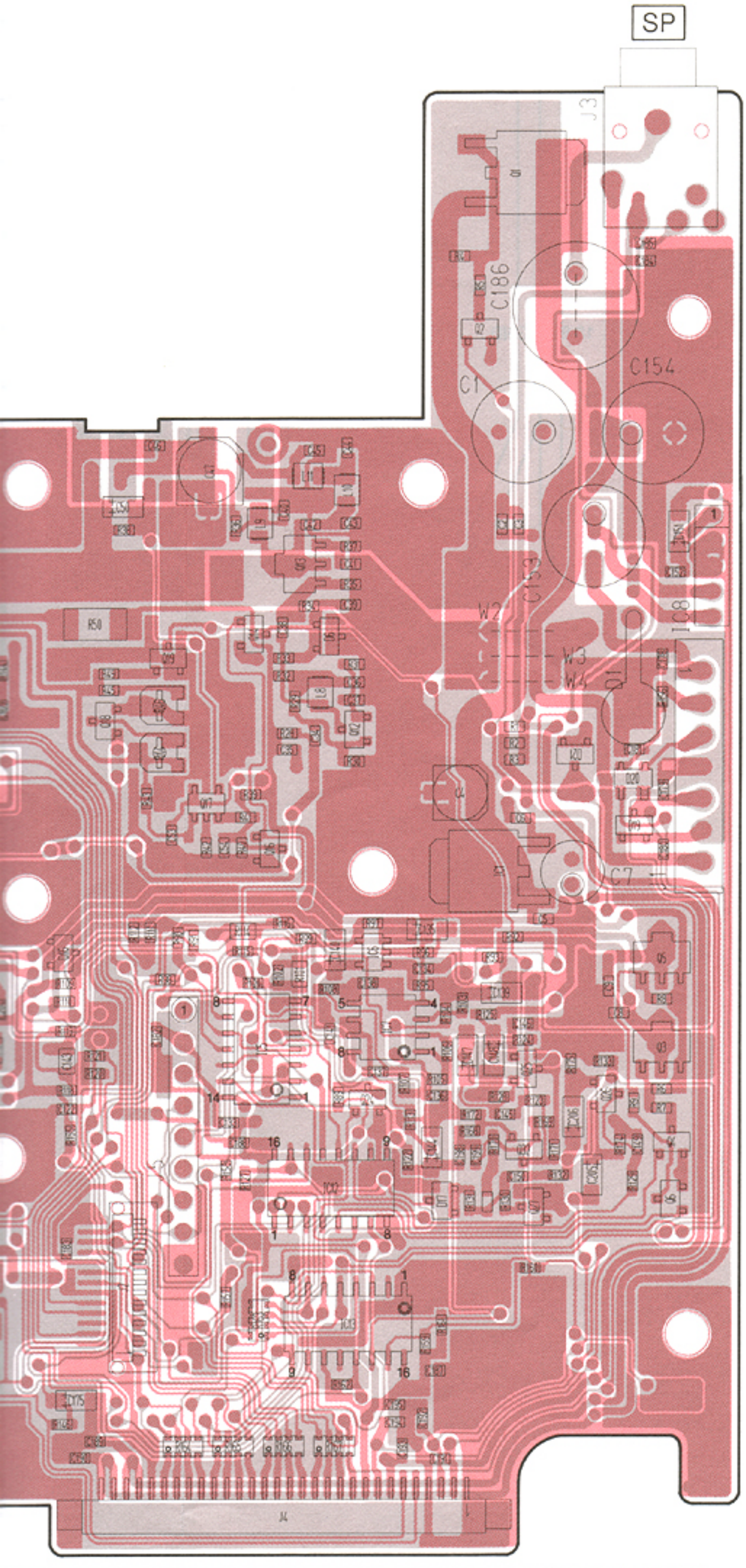
1SS153 (Symbol: A9) 	**1SS196** (Symbol: G3) 	**1SS226** (Symbol: C3) 	**1SS272** (SymboL: A1) 	**HSM88ASR** (Symbol: C3) 
MA862 (Symbol: M1I) 	**RD5.1M B2** (Symbol: 512) 	**RD6.2M B2** (Symbol: 622) 		

SECTION 8 BOARD LAYOUTS

8-1 MAIN UNIT



The combination of this page and the next page show the unit layout in the same configuration as the actual P.C. Board.



J1

1	AF1
	PTT
	HANG
	GND
	MIC
	GND
7	AF2

FROM HM-107

J5

1	NC
	5V
	DATAM
	DATAS
	OP.RST
	NC
	DSC
	DET
9	GND

FROM OPTIONAL UX-120
DSC UNIT J1

J2

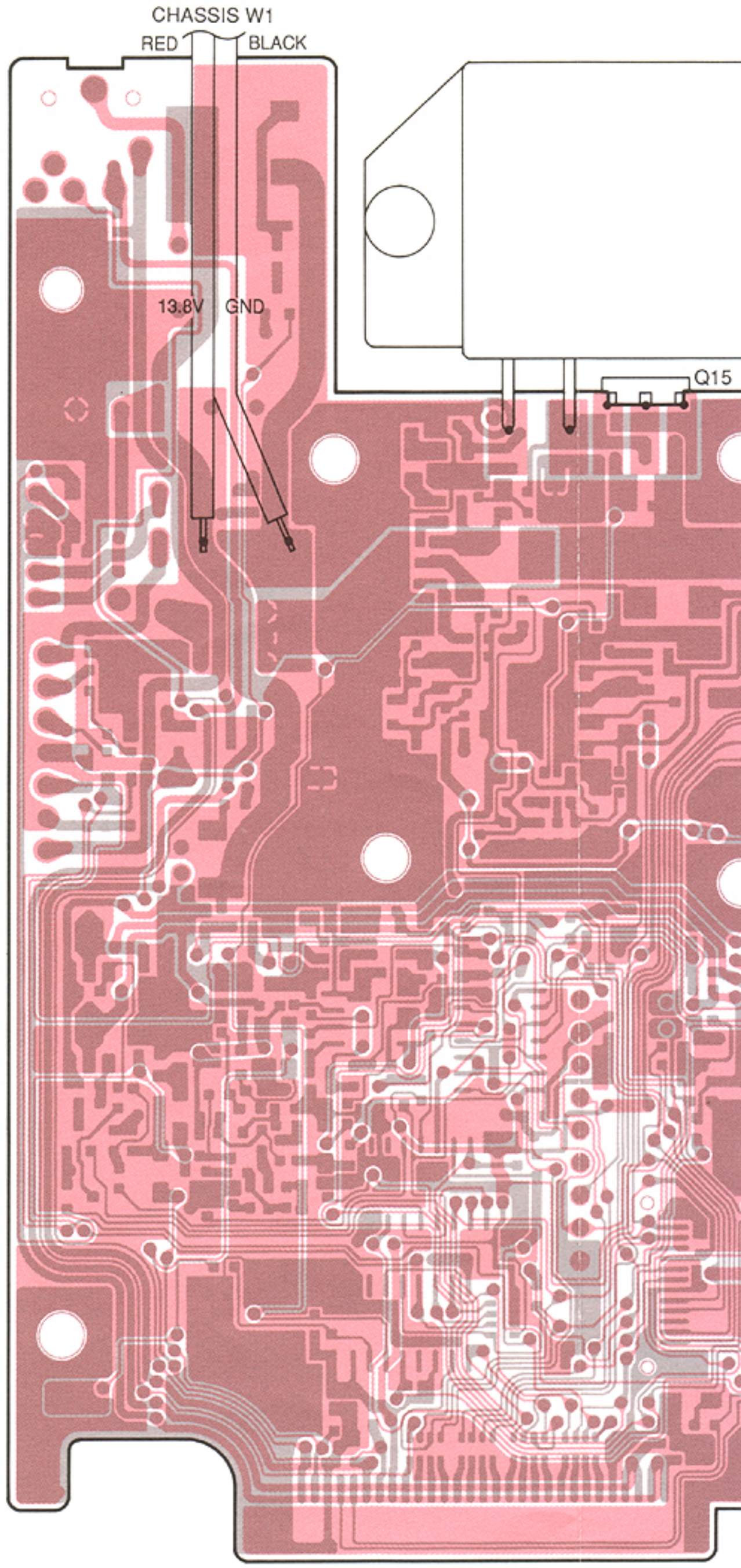
14	GND
	DATA
	CK
	S.STB
	5V
	OPTIN
	S.CON
	GND
	DETO
	MICAO
	NC
	MICFI
	DET
1	GND

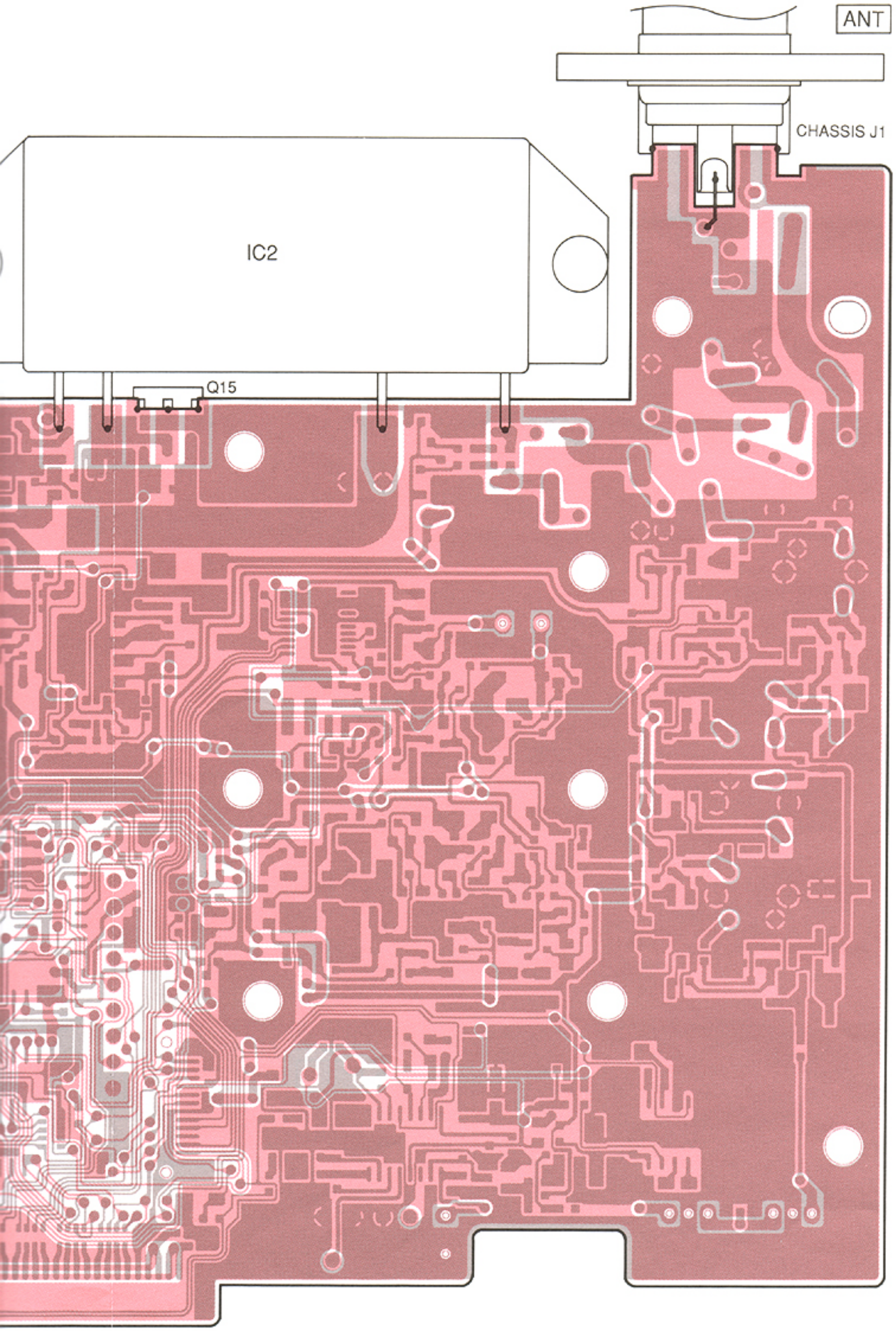
FROM OPTIONAL UT-79
VOICE SCRAMBLER

SP+	SP+	GND	BEEP	PTT	HI/LO	IEX.D	IEX.P/S	OEX.OE	P.STB	OEX.STB	DATAS	DATAM	S.STB	S.CON	S.TRU	CK	DATA	ICF3	5V	HVS	HV	SQLV	SQLI	A.GND	VOL2	VOL1	GND
																											1

TO LOGIC UNIT J1

● MAIN UNIT

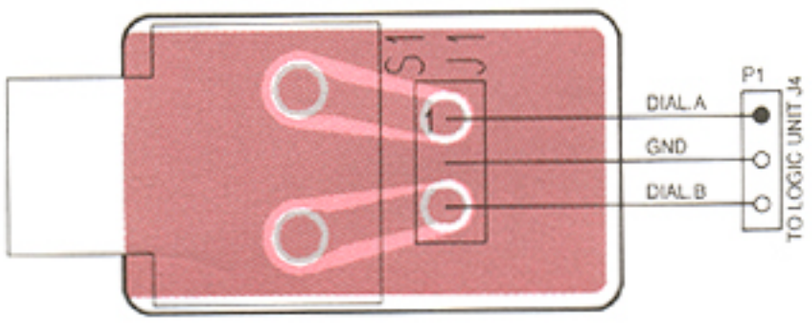



ANT
CHASSIS J1
IC2
Q15

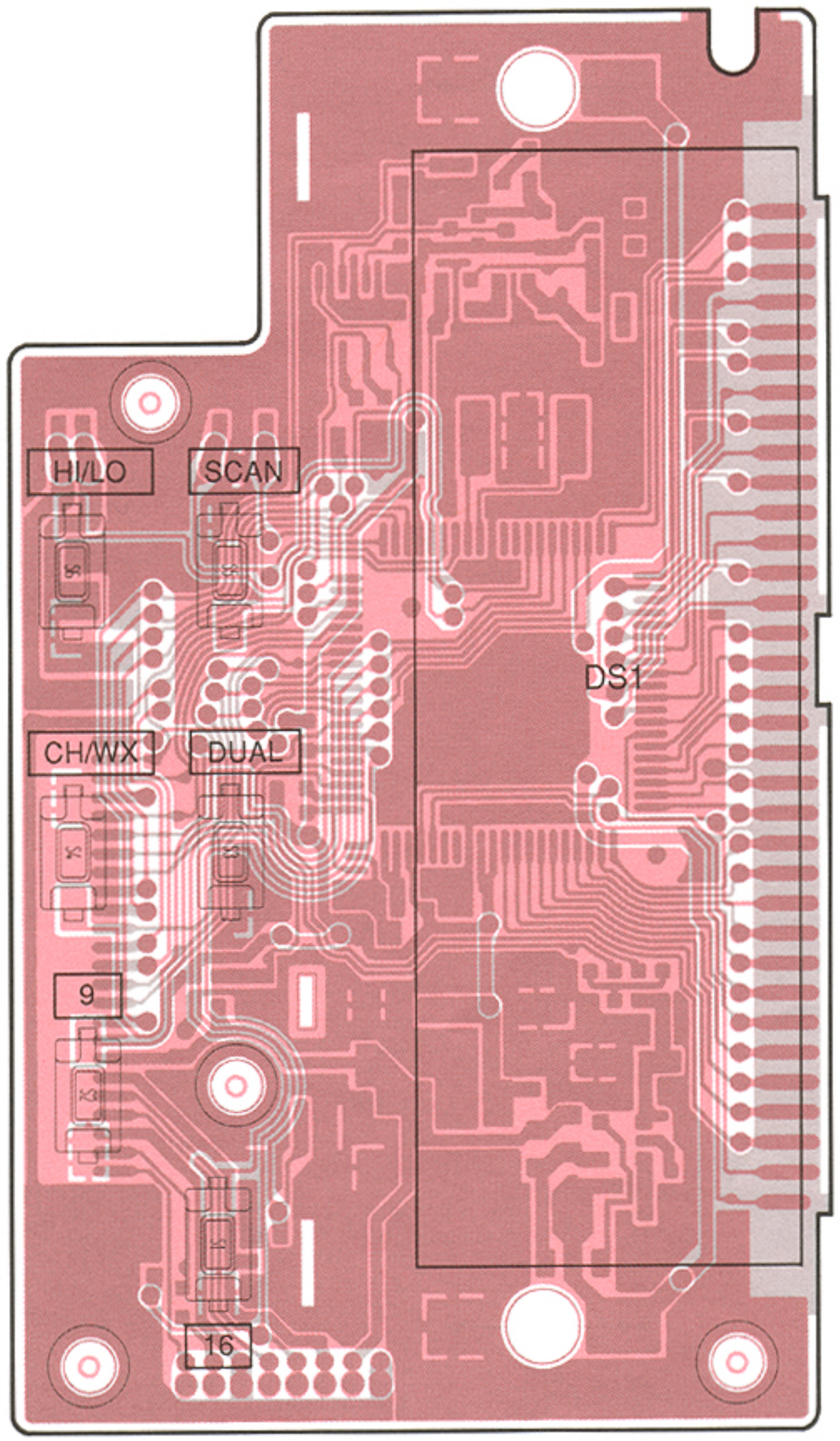
8-2 LOGIC UNIT

The combination of this page and the next page show the unit layout in the same configuration as the actual P.C. Board.

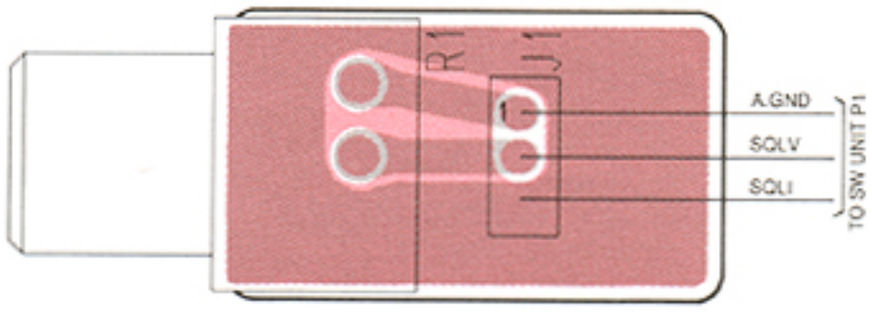
● SENSOR UNIT



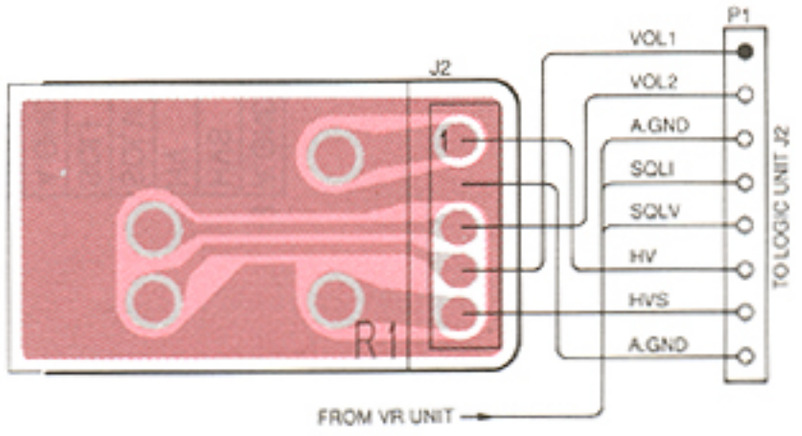
● LOGIC UNIT



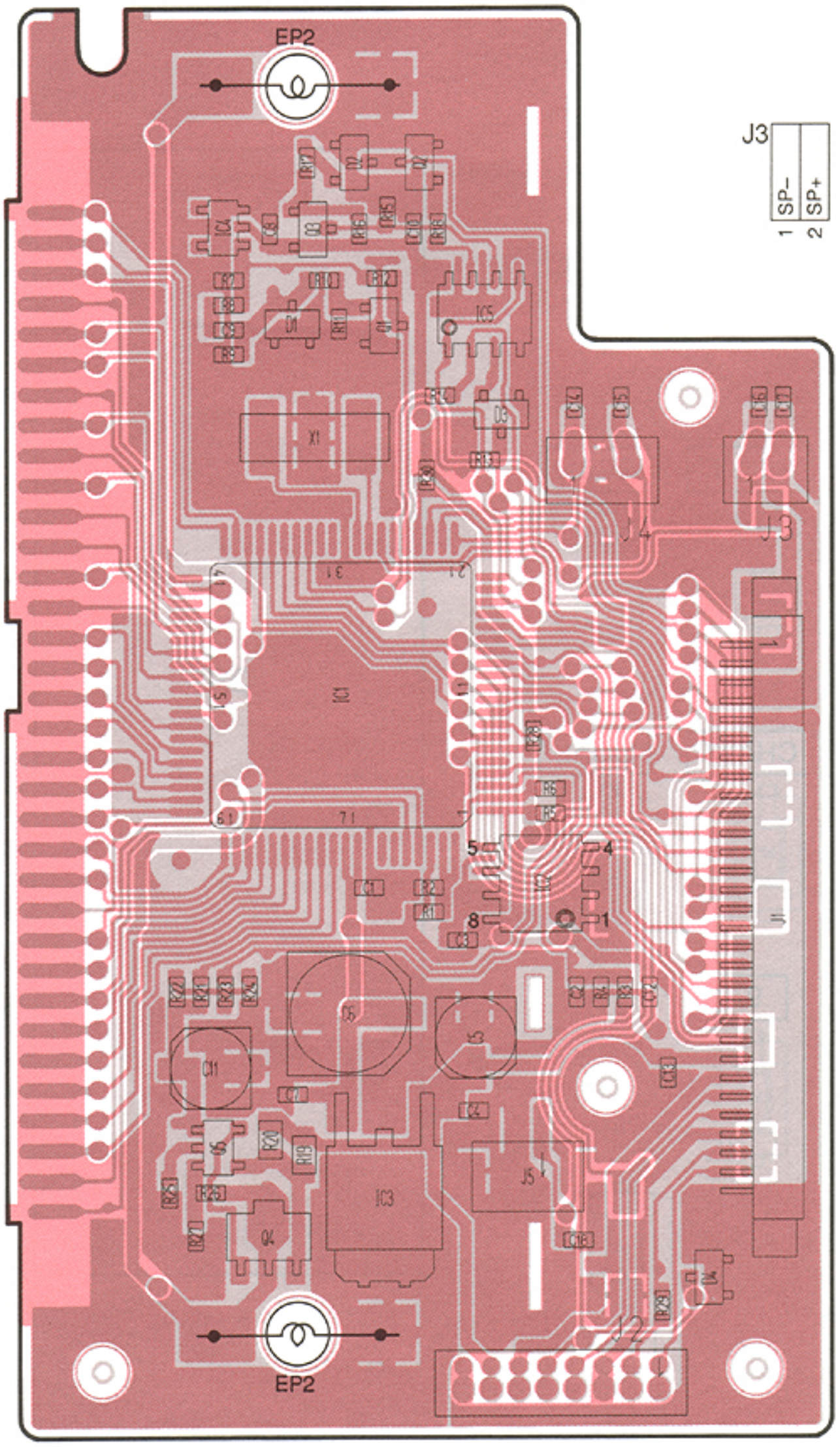
● VR UNIT



● SW UNIT



● LOGIC UNIT



J4

1	DIAL.A
	GND
3	DIAL.B

FROM SENSOR UNIT P1

J3

1	SP–
2	SP+

FROM CHASSIS SPEAKER

J1

1	SP–
	SP–
	SP+
	SP+
	GND
	BEEP
	PTT
	HI/LO
	IEX.D
	IEX.P/S
	OEX.OE
	P.STB
	OEX.STB
	DATAS
	DATAM
	S.STB
	S.CON
	S.TRU
	CK
	DATA
	ICF3
	5V
	HVS
	HV
	SQLV
	SQLI
	A.GND
	VOL2
	VOL1
30	GND

TO MAIN UNIT J4

J5

2	GND
1	KEY.M

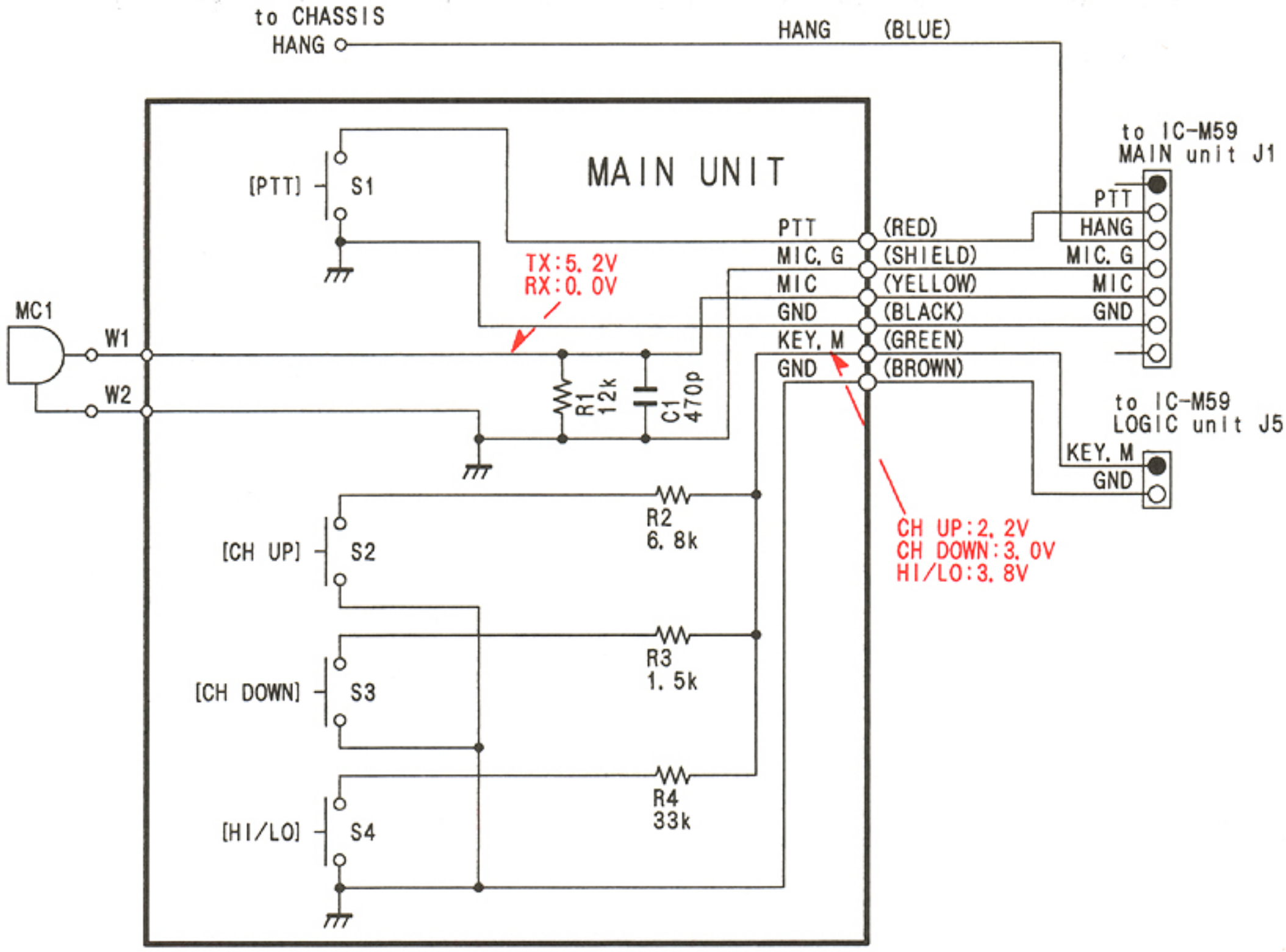
FROM HM–107

J2

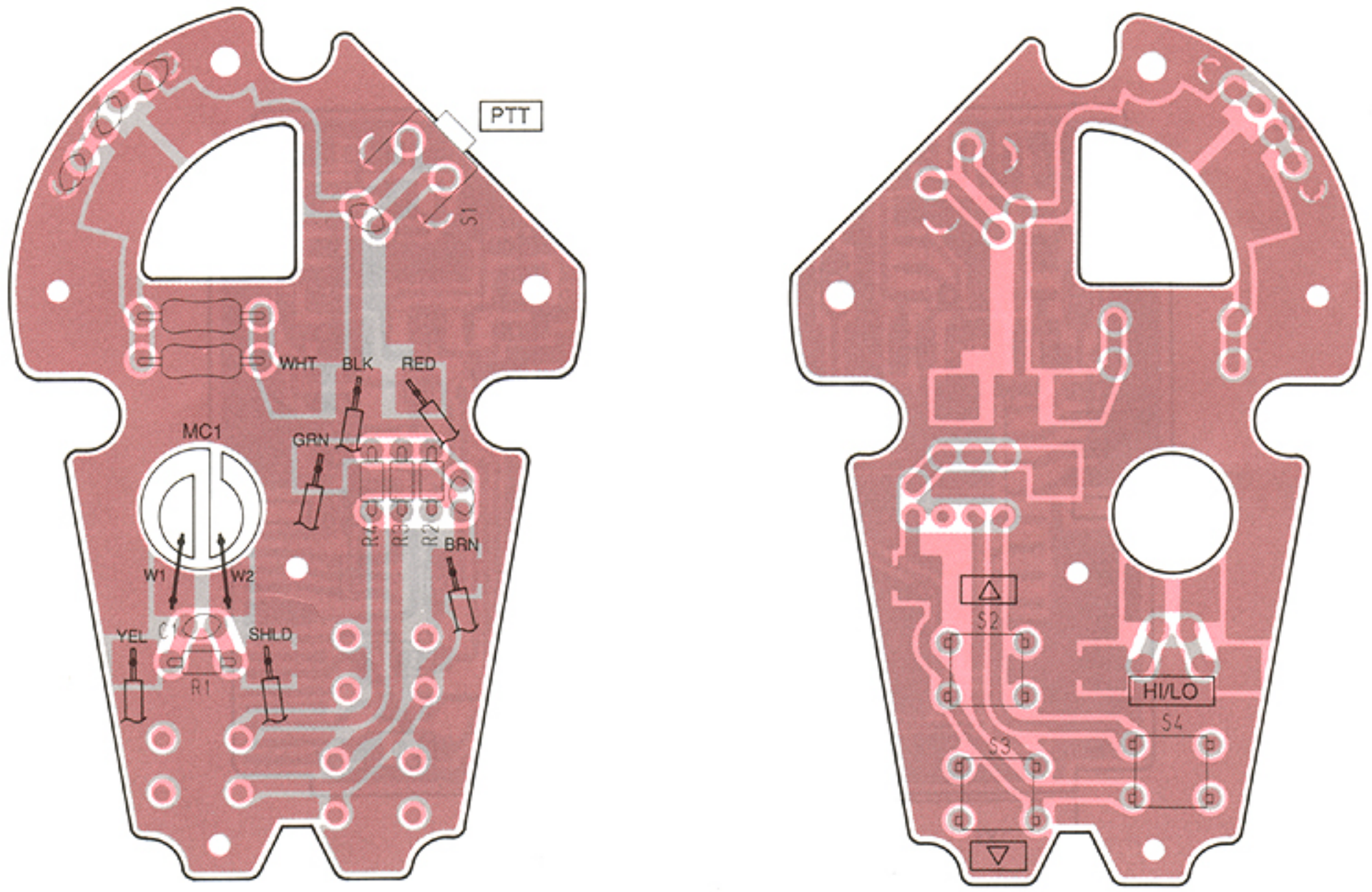
8	A.GND	HVS	HV	SQLV	SQLI	A.GND	VOL2	VOL1

FROM SW UNIT P1

8-3 HM-107

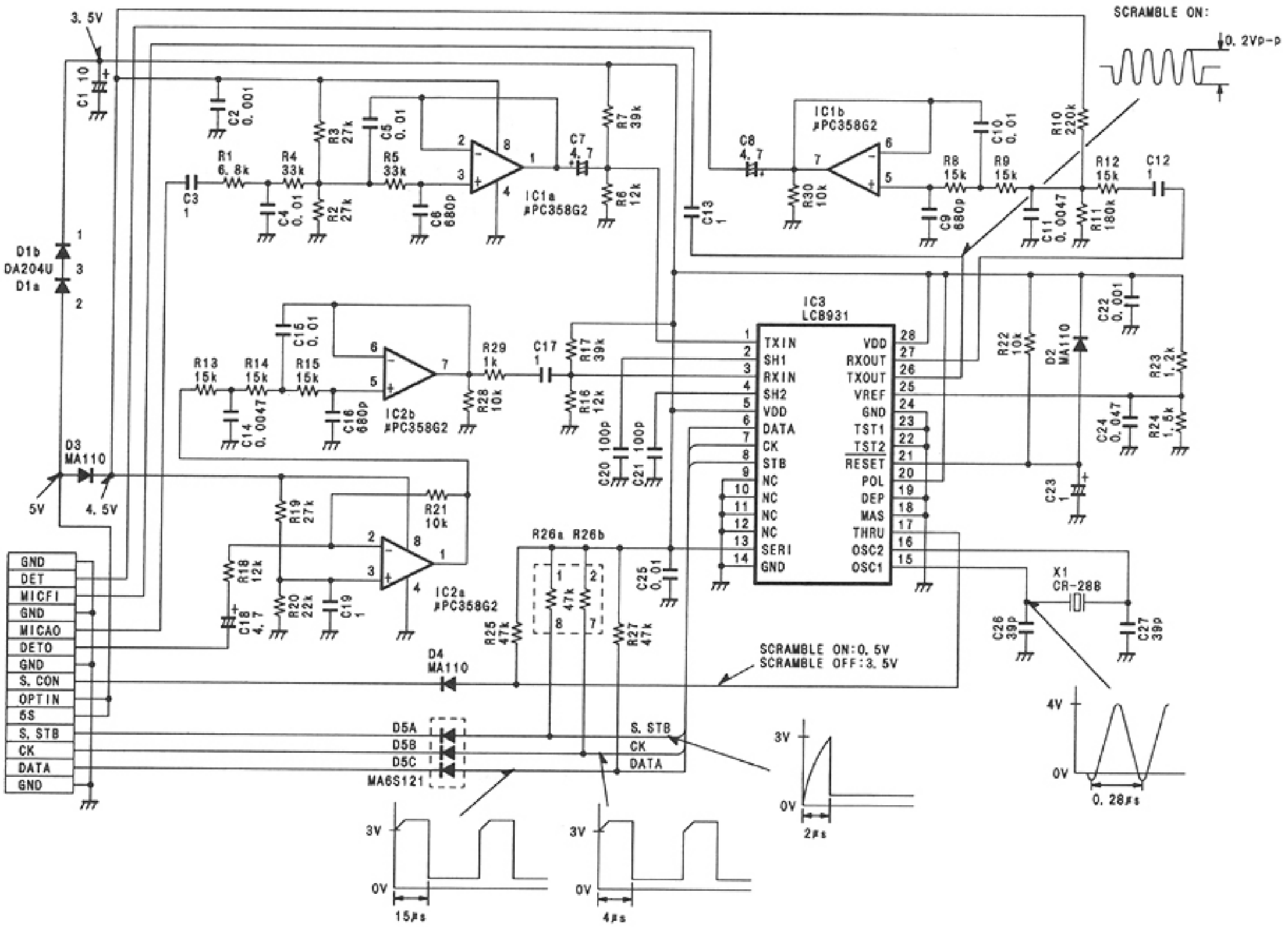


● **Board layout**

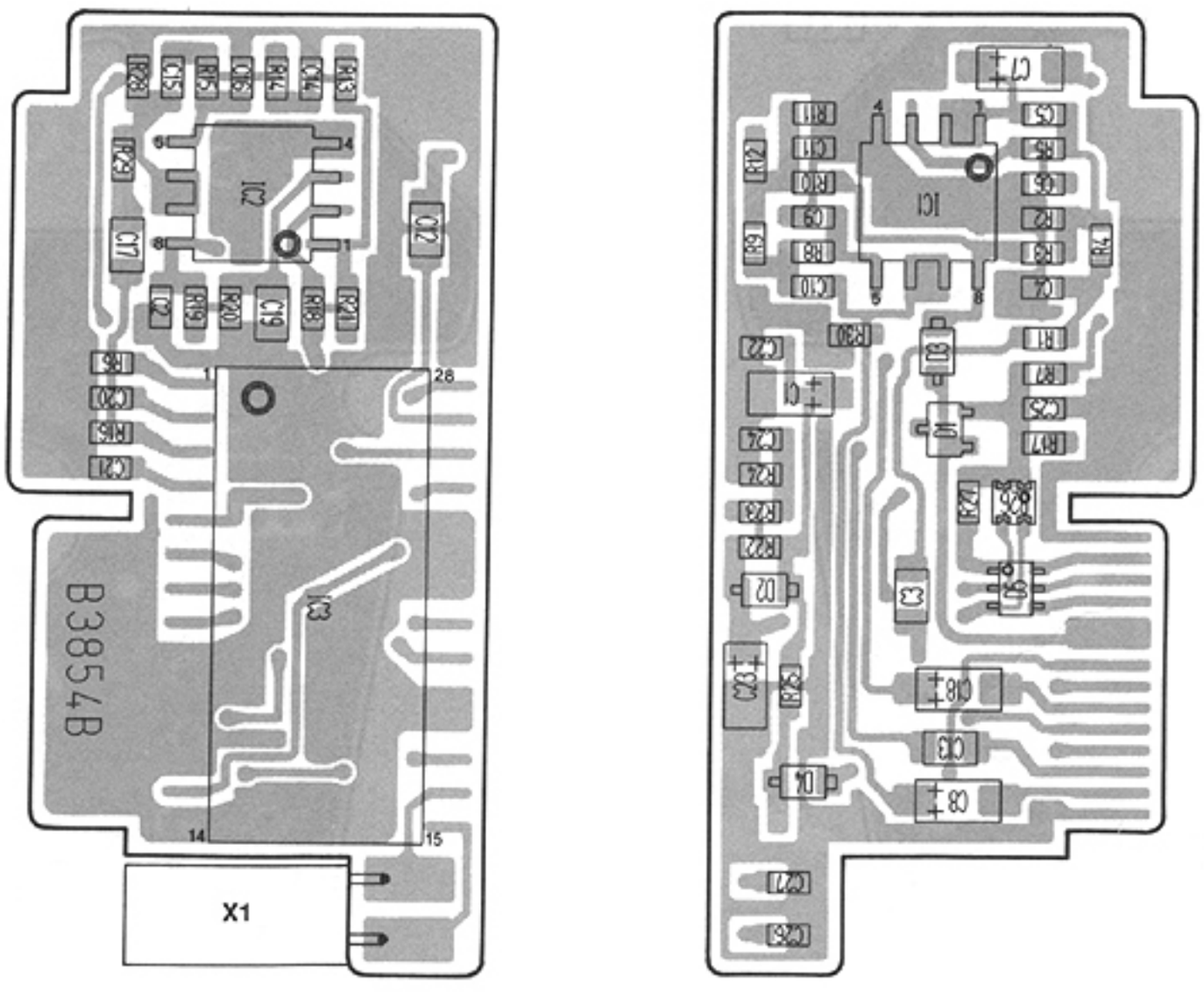


SECTION 9 OPTIONAL UNITS

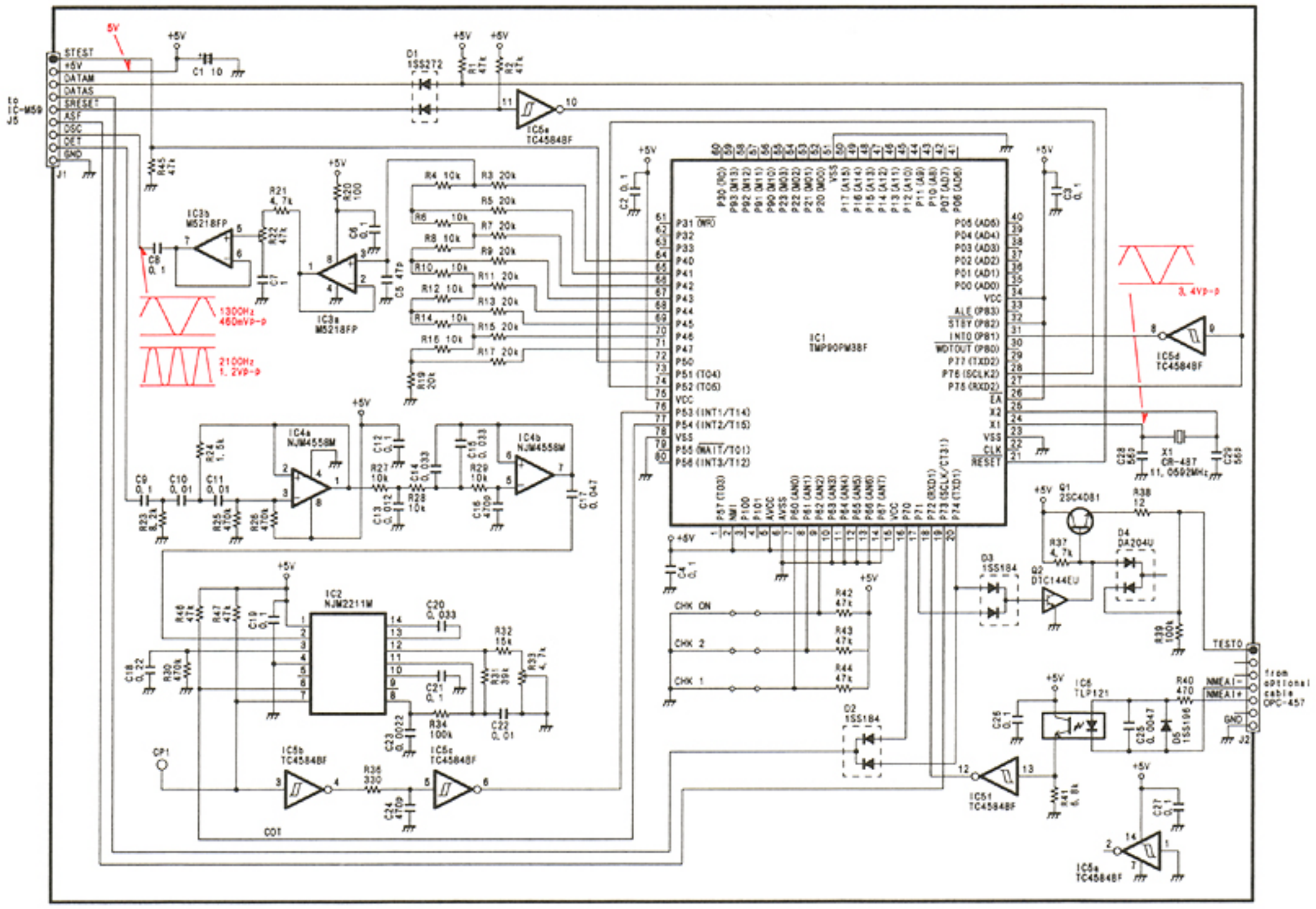
● UT-79 VOICE SCRAMBLER UNIT



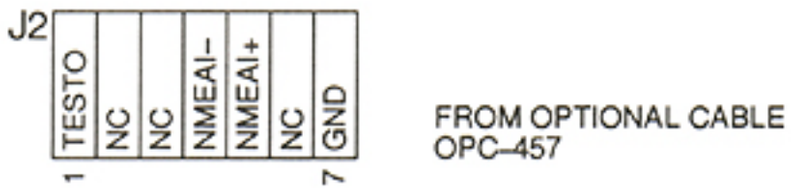
● Board layout



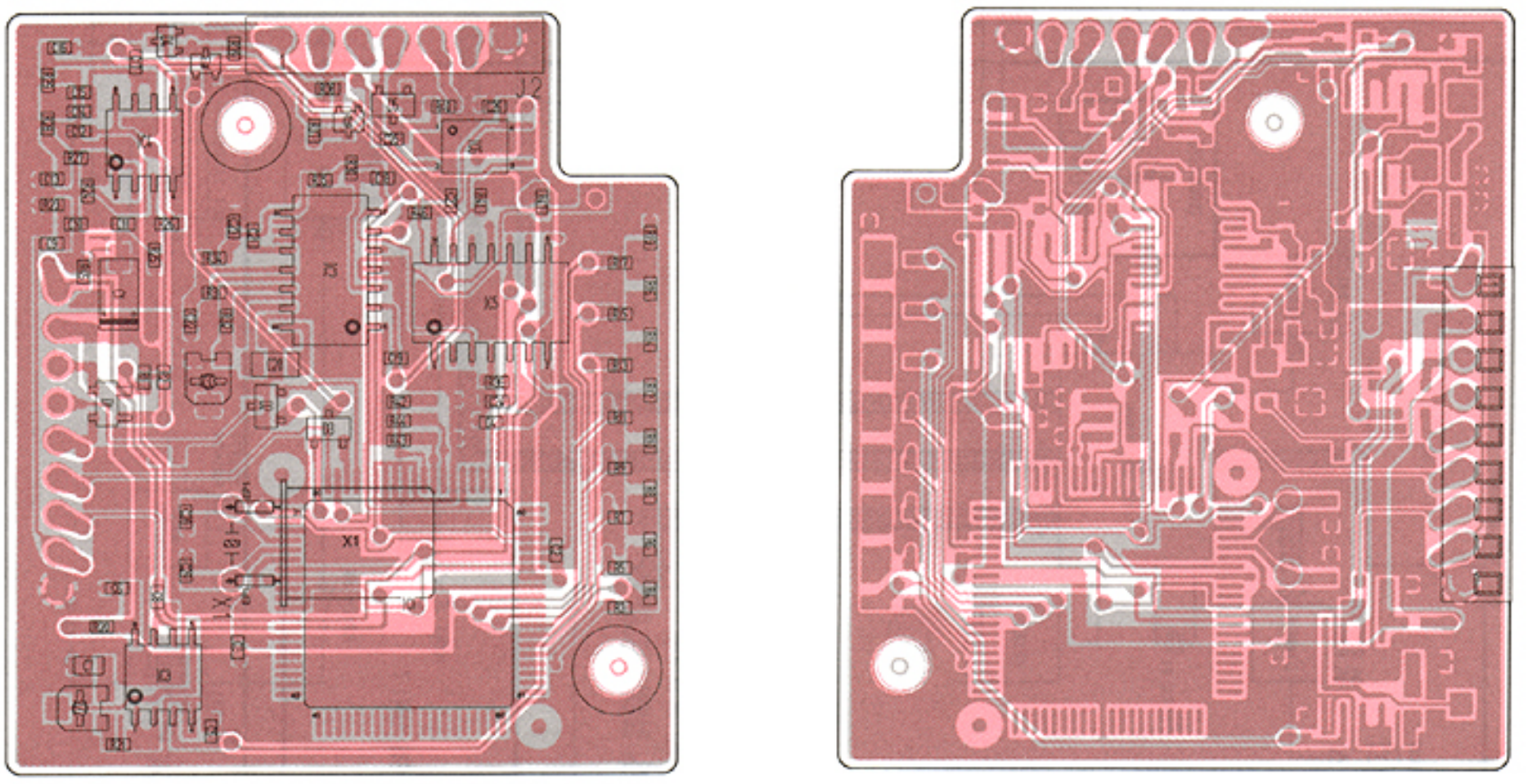
● UX-120 DSC UNIT



● Board layout

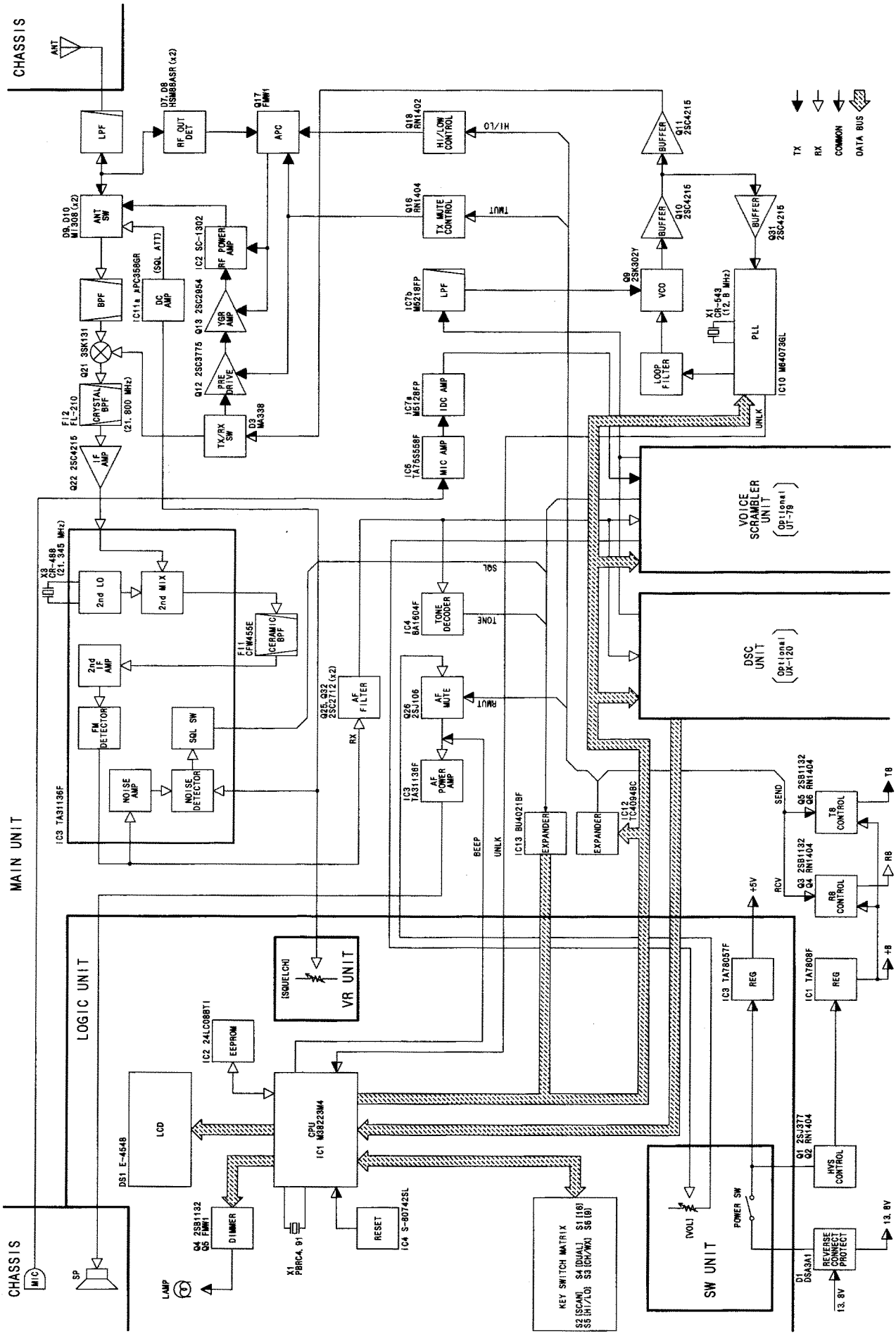


FROM OPTIONAL CABLE
OPC–457

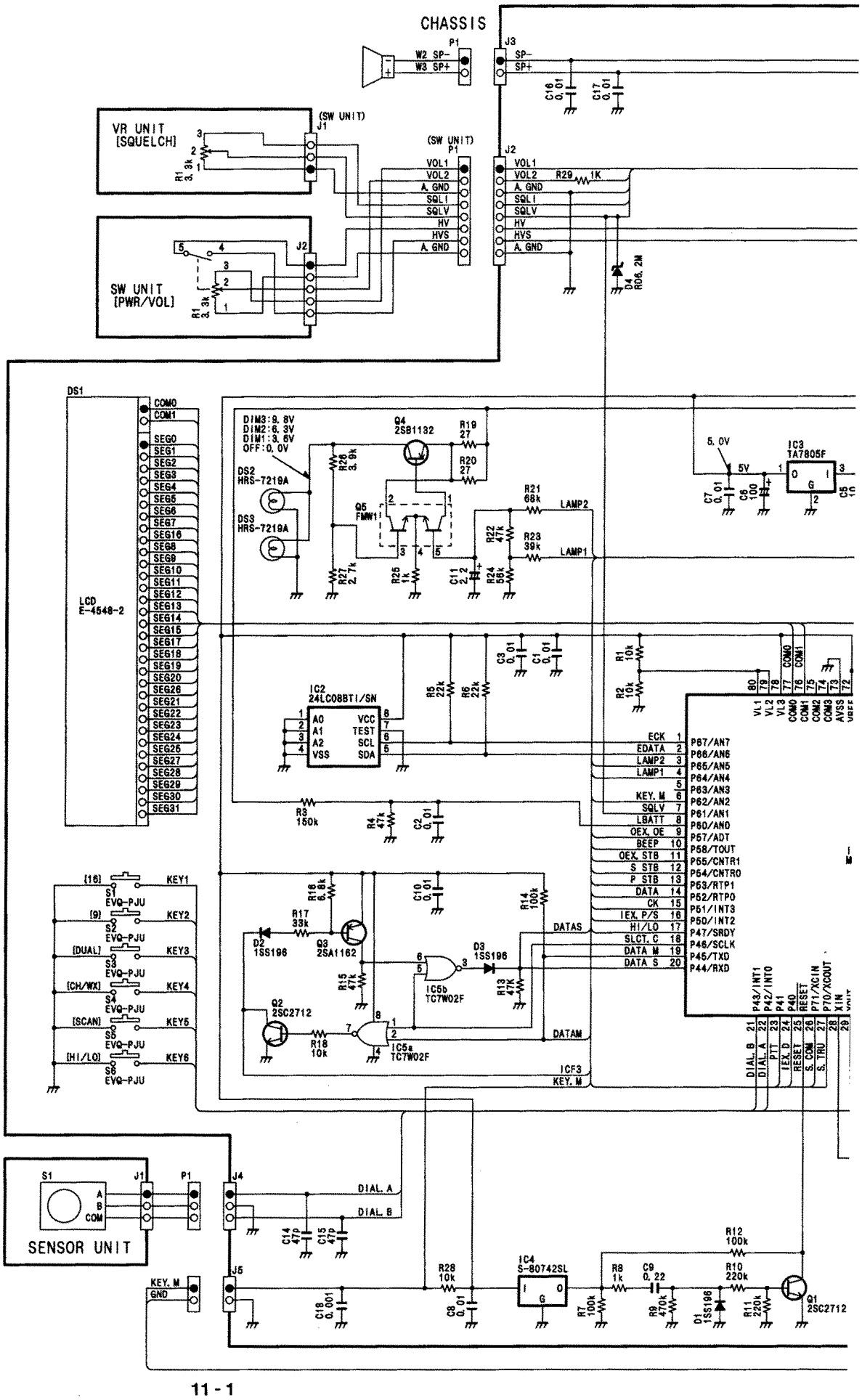


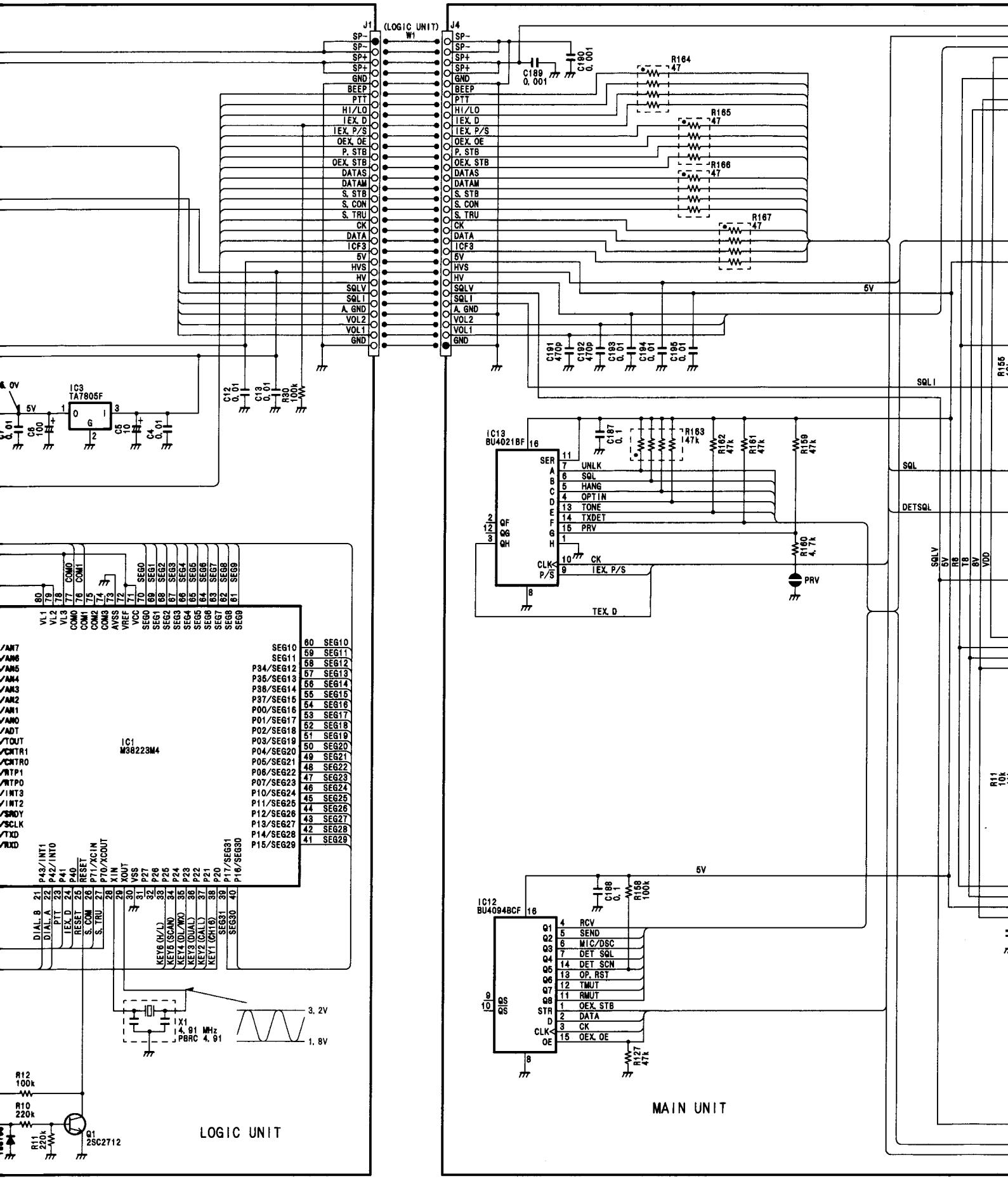
TO MAIN UNIT J5

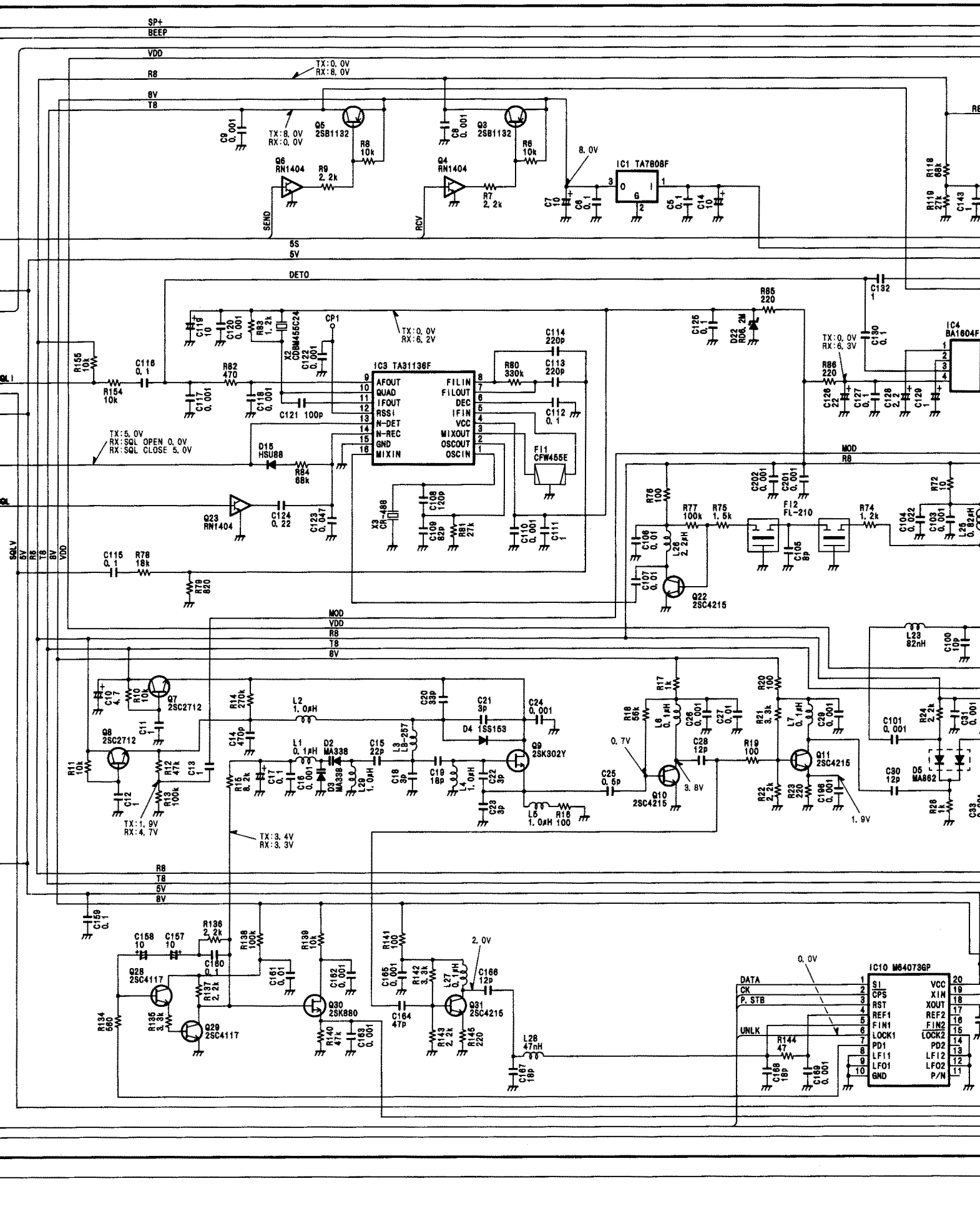
SECTION 10 BLOCK DIAGRAM

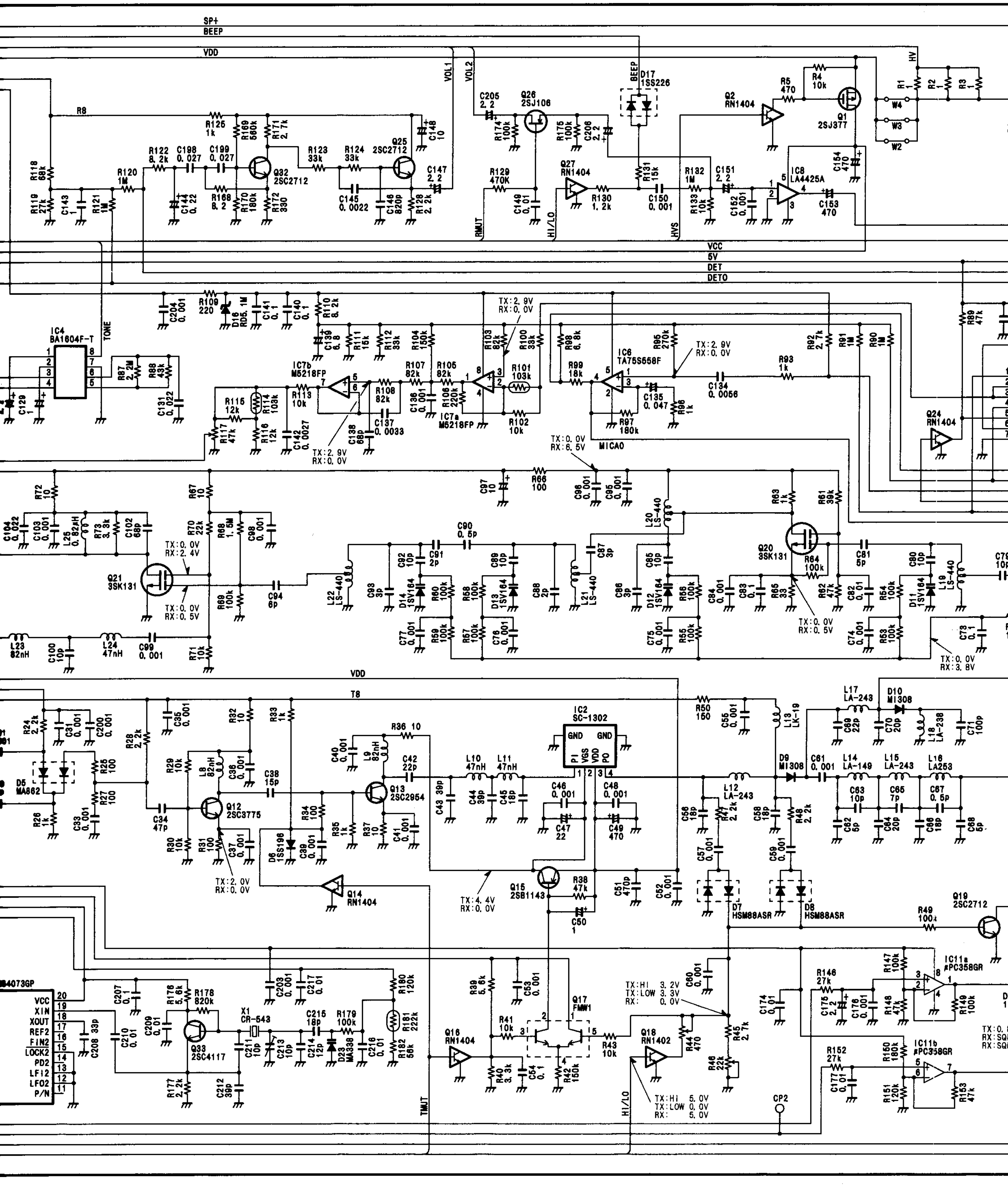


SECTION 11 VOLTAGE DIAGRAM

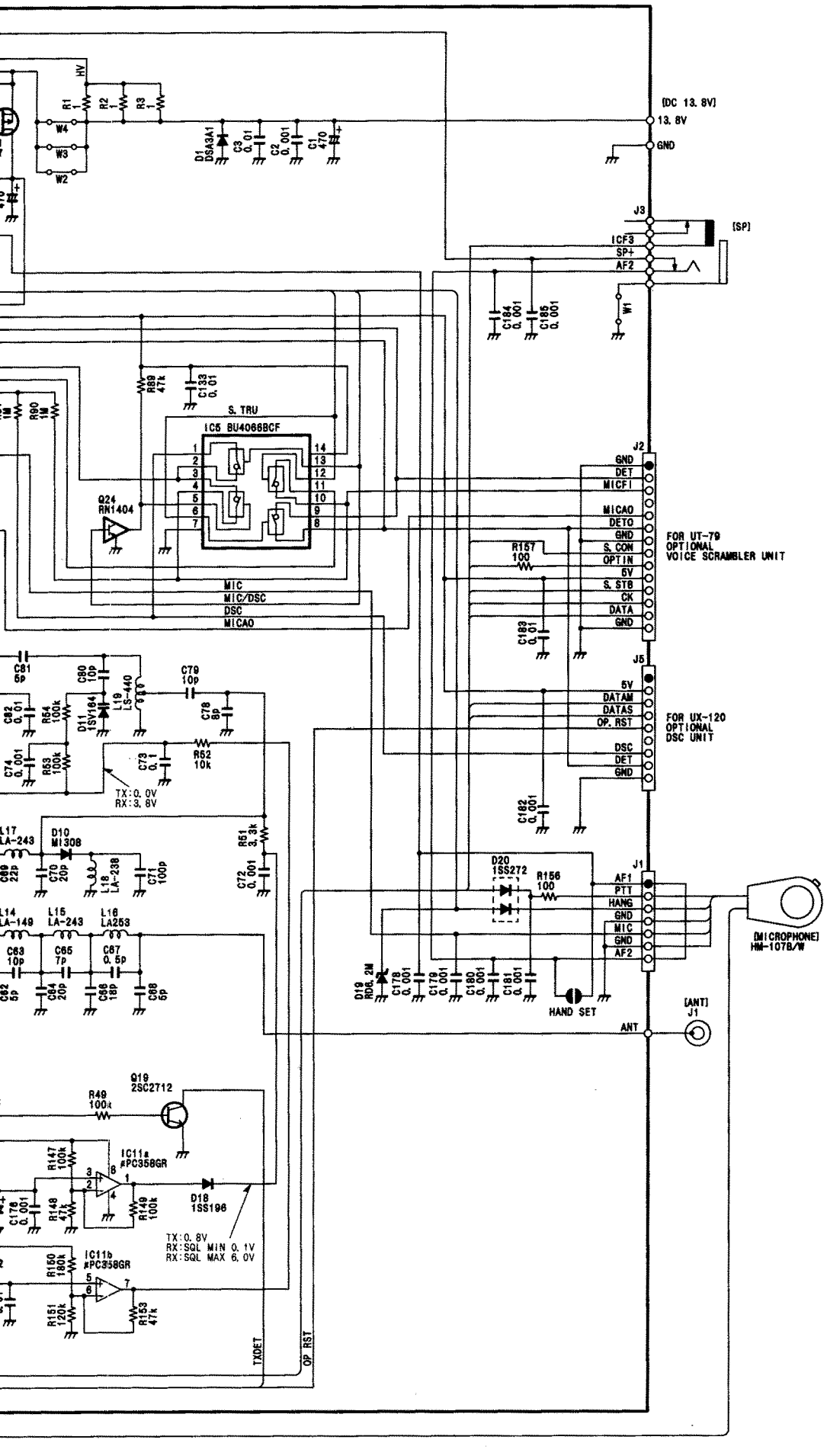



J1
(LOGIC UNIT)
W1
J4
SP-
SP-
SP+
SP+
GND
BEEP
PTT
HI/LO
IEX. D
IEX. P/S
OEX. OE
P. STB
OEX. STB
DATAS
DATAM
S. STB
S. CON
S. TRU
CK
DATA
ICF3
5V
HVS
HV
SQLV
SQLI
A. GND
VOL2
VOL1
GND
C189 0.001
C190 0.001
R164 47
R165 47
R166 47
R167 47
5V
C191 470p
C192 470p
C193 0.01
C194 0.01
C195 0.01
SQLI
IC3 TA7805F
C12 0.01
C13 0.01
R30 100k
C1 0.01
C6 100
C5 10
C4 0.01
IC13 BU4021BF
C187 0.1
R163 47k
R162 47k
R161 47k
R159 47k
SER
UNLK
SQL
HANG
OPTIN
TONE
TXDET
PRV
CK
IEX. P/S
TEX. D
R160 4.7k
SQL
DETSQL
SQLV
PRV
IC1 M38223M4
COM0
COM1
SEG0
SEG1
SEG2
SEG3
SEG4
SEG5
SEG6
SEG7
SEG8
SEG9
SEG10
SEG11
P34/SEG12
P35/SEG13
P36/SEG14
P37/SEG15
P00/SEG16
P01/SEG17
P02/SEG18
P03/SEG19
P04/SEG20
P05/SEG21
P06/SEG22
P07/SEG23
P10/SEG24
P11/SEG25
P12/SEG26
P13/SEG27
P14/SEG28
P15/SEG29
P43/INT1
P42/INT0
P41
P40
RESET
P71/XCIN
P70/XCOUT
XIN
XOUT
VSS
P27
P26
P25
P24
P23
P22
P21
P20
P17/SEG31
P16/SEG30
DIAL. B
DIAL. A
PTT
IEX. D
RESET
S. CON
S. TRU
KEY6 (H/L)
KEY6 (SCAN)
KEY4 (DL/WX)
KEY3 (DUAL)
KEY2 (CALL)
KEY1 (CH1/6)
SEG31
SEG30
X1
4.91 MHz
PBRC 4.91
3.2V
1.8V
IC12 BU4094BCF
C188 0.1
R158 100k
RCV
SEND
MIC/DSC
DET SQL
DET SCN
OP. RST
TMUT
RMUT
OEX. STB
DATA
CK
OEX. OE
R127 47k
R12 100k
R10 220k
R11 220k
Q1 2SC2712
LOGIC UNIT
MAIN UNIT


SP+
BEEP
VDD
R8
8V
T8
TX:0.0V
RX:8.0V
TX:8.0V
RX:0.0V
Q5 2SB1132
Q3 2SB1132
Q6 RN1404
Q4 RN1404
R9 2.2k
R7 2.2k
R8 10k
R6 10k
SEND
RCV
8.0V
IC1 TA7808F
5S
5V
DETO
CP1
TX:0.0V
RX:6.2V
IC3 TA31136F
AFOUT
QUAD
IFOUT
RSSI
N-DET
N-REC
GND
MIXIN
FILIN
FILOUT
DEC
IFIN
VCC
MIXOUT
OSCOUT
OSCIN
X2 CDBM455C24
X3 CR-488
FI1 CFW455E
TX:5.0V
RX:SQL OPEN 0.0V
RX:SQL CLOSE 5.0V
D15 HSU88
Q23 RN1404
TX:0.0V
RX:6.3V
IC4 BA1604F
MOD
R8
Q22 2SC4215
F12 FL-210
SQLV
5V
R6
T8
8V
VDD
Q7 2SC2712
Q8 2SC2712
D4 1SS153
Q9 2SK302Y
Q10 2SC4215
Q11 2SC4215
D5 MA862
TX:1.9V
RX:4.7V
TX:3.4V
RX:3.3V
0.7V
3.8V
1.9V
Q28 2SC4117
Q29 2SC4117
Q30 2SK880
Q31 2SC4215
2.0V
0.0V
IC10 M64073GP
DATA
CK
P.STB
UNLK
SI
CPS
RST
REF1
FIN1
LOCK1
PD1
LF11
LF01
GND
VCC
XIN
XOUT
REF2
FIN2
LOCK2
PD2
LF12
LF02
P/N



SP+
BEEP
VDD
VCC
5V
DET
DETO
IC4 BA1604F-T
TONE
IC7b M5218FP
IC7a M5218FP
IC6 TA75S558F
MICAO
IC8 LA4425A
Q26 2SJ106
Q27 RN1404
Q2 RN1404
Q1 2SJ377
D17 1SS226
Q32 2SC2712
Q25 2SC2712
Q24 RN1404
Q21 3SK131
Q20 3SK131
IC2 SC-1302
Q12 2SC3775
Q13 2SC2954
Q14 RN1404
Q15 2SB1143
Q16 RN1404
Q17 FMW1
Q18 RN1402
Q19 2SC2712
Q33 2SC4117
X1 CR-543
D5 MA862
D6 1SS196
D7 HSM88ASR
D8 HSM88ASR
D9 M1308
D10 M1308
D23 MA338
IC11a µPC358GR
IC11b µPC358GR
HV
W2
W3
W4
VOL1
VOL2
RMUT
HI/LO
HVS
TMUT
CP2
T8
TX:2.9V RX:0.0V
TX:0.0V RX:6.5V
TX:0.0V RX:2.4V
TX:0.0V RX:0.5V
TX:0.0V RX:3.8V
TX:2.0V RX:0.0V
TX:4.4V RX:0.0V
TX:HI 3.2V TX:LOW 3.3V RX: 0.0V
TX:HI 5.0V TX:LOW 0.0V RX: 5.0V
VCC
XIN
XOUT
REF2
FIN2
LOCK2
PD2
LFI2
LFO2
P/N


[DC 13.8V]
13.8V
GND
J3
[SP]
ICF3
SP+
AF2
W1
C184 0.001
C185 0.001
R89 47k
C133 0.01
S.TRU
IC5 BU4066BCF
Q24 RN1404
J2
GND
DET
MICFI
MICAO
DETO
GND
S.CON
OPTIN
5V
S.STB
CK
DATA
GND
FOR UT-79
OPTIONAL
VOICE SCRAMBLER UNIT
R157 100
C183 0.01
MIC
MIC/DSC
DSC
MICAO
J5
5V
DATAM
DATAS
OP.RST
DSC
DET
GND
FOR UX-120
OPTIONAL
DSC UNIT
C182 0.001
C81 5p
C80 10p
C79 10p
C78 5p
C82 0.01
R54 100k
D11 1SV164
L19 LS-440
C74 0.001
R53 100k
C73 0.1
R52 10k
TX:0.0V
RX:3.8V
L17 LA-243
D10 MI308
C69 22p
C70 20p
L18 LA-238
C71 100p
R51 3.3k
C72 0.001
D20 1SS272
R156 100
J1
AF1
PTT
HANG
GND
MIC
GND
AF2
[MICROPHONE]
HM-107B/W
L14 LA-149
L15 LA-243
L16 LA253
C63 10p
C65 7p
C67 0.5p
C62 5p
C64 20p
C66 18p
C68 6p
D19 RD6.2M
C178 0.001
C179 0.001
C180 0.001
C181 0.001
HAND SET
[ANT]
J1
ANT
Q19 2SC2712
R49 100k
R147 100k
IC11a μPC358GR
C176 0.001
R148 47k
R149 100k
D18 1SS196
TX:0.8V
RX:SQL MIN 0.1V
RX:SQL MAX 6.0V
R150 180k
IC11b μPC358GR
R151 120k
R153 47k
TXDET
OP RST

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