



SERVICE MANUAL

VHF MARINE TRANSCEIVER

IC-M401E

INTRODUCTION

This service manual describes the latest service information for the **IC-M401E** VHF MARINE TRANSCEIVER at the time of publication.

4 versions of the **IC-M401E** have been designed. This service manual covers each version.

MODEL	VERSION	SYMBOL
IC-M401E	UK, EUR, HOL, FRG	BLACK
	EUR-1	WHITE

To upgrade quality, anyelectrical or mechanical parts and internal circuits are subject to change without notice or obligation.

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 (100mW) 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>

1110003200 S.IC TA31136FN IC-M401E MAIN UNIT 5 pieces
8820001210 Screw 2438 screw IC-M401E Chassis 12 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 turning 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.

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SECTION 1 SPECIFICATIONS

■ GENERAL

• Frequency coverage	: 156.000–161.450 MHz (Tx) 156.000–163.425 MHz (Rx)
• Mode	: 16K0G3E (FM) 16K0G2B (DSC)
• Power supply requirement	: 13.8 V DC (negative ground)
• Usable temperature range	: –20°C to +60°C
• Frequency stability	: ±10 ppm (–20°C to +60°C)
• Current drain (at 13.8 V DC)	: Transmit at 25 W 5.5 A (max.) Receive max. audio 1.5 A (max.)
• Antenna impedance	: 50 Ω (nominal)
• Input impedance (MIC)	: 2 kΩ
• Output impedance (Audio)	: 4 Ω
• Dimensions (projections not included)	: 153(W)×67(H)×141.6(D) mm
• Weight (approx.)	: 950 g

■ TRANSMITTER

• Output power (at 13.8 V DC)	: High 25 W Low 1 W
• Modulation	: Variable reactance frequency modulation
• Maximum frequency deviation	: ±5.0 kHz
• Spurious emissions	: Less than 0.25 μW
• Adjacent channel power	: More than 70 dB
• Residual modulation	: More than 40 dB
• Audio harmonic distortion	: Less than 10% at 60% deviation
• Audio frequency response	: +1 dB to –3 dB of 6 dB octave from 300 Hz to 3000 Hz

■ RECEIVER

• Receive system	: Double conversion superheterodyne system
• Intermediate frequencies	: 1st 21.7 MHz 2nd 450 kHz
• Sensitivity	: Less than –2 dBμ emf typical at 20 dB SINAD
• Squelch sensitivity	: Less than 0 dBμ emf typical
• Adjacent channel selectivity	: More than 70 dB
• Spurious response	: More than 70 dB
• Intermodulation rejection ratio	: More than 70 dB
• Hum and noise	: More than 40 dB
• Audio frequency response	: +1 dB to –3 dB of –6 dB octave from 300 Hz to 3000 Hz

Specifications are measured in accordance with EN301 025-2, -3

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

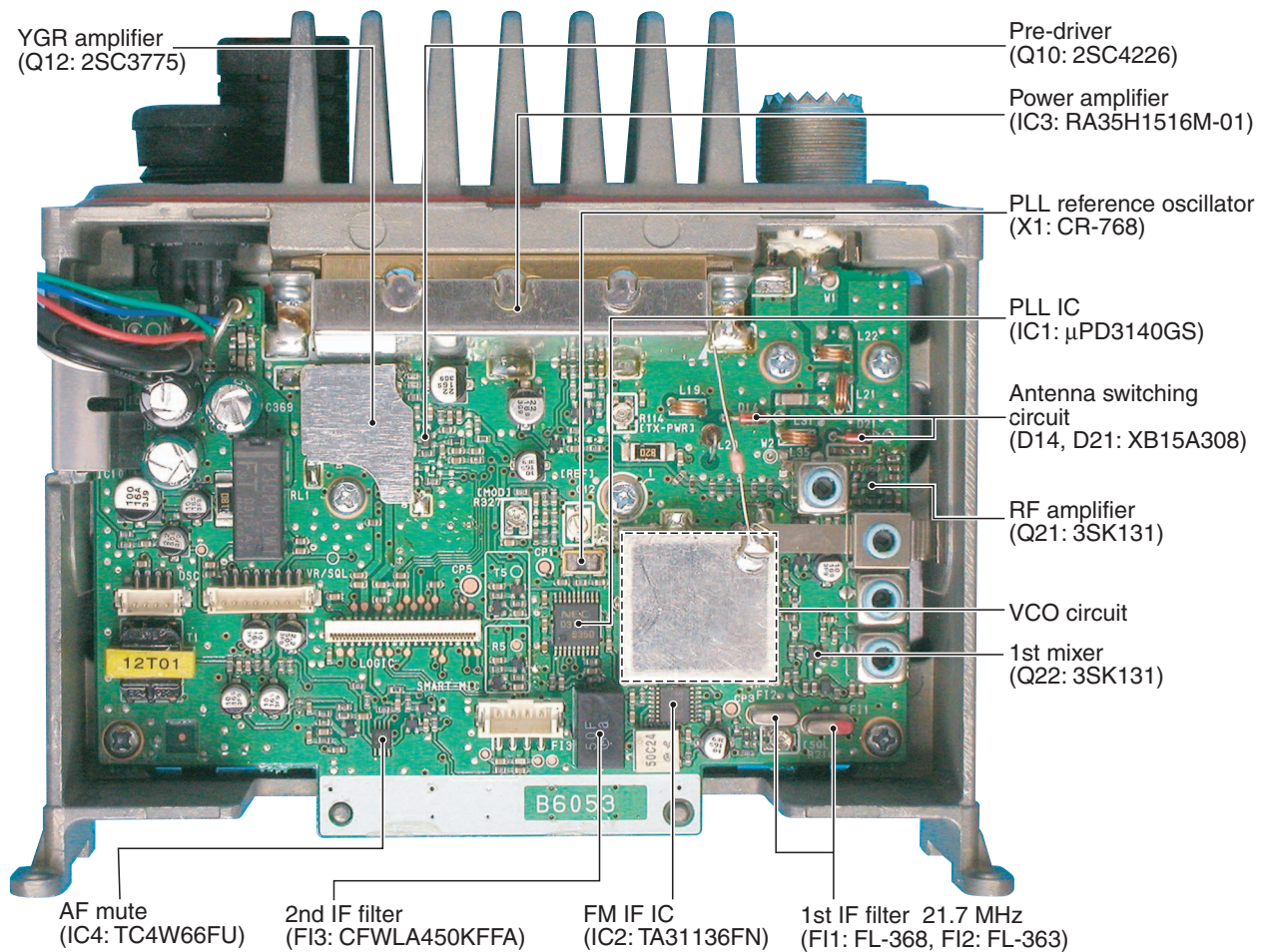
■ VHF MARINE CHANNEL LIST

Channel No.		Frequency (MHz)		Channel No.		Frequency (MHz)		Channel No.		Frequency (MHz)	
USA * ²	INT	Transmit	Receive	USA * ²	INT	Transmit	Receive	USA * ²	INT	Transmit	Receive
	01	156.050	160.650		22	157.100	161.700	74	74	156.725	156.725
01A		156.050	156.050	22A		157.100	157.100		75* ¹	156.775	156.775
	02	156.100	160.700		23	157.150	161.750		76* ¹	156.825	156.825
	03	156.150	160.750	23A		157.150	157.150	77* ¹	77	156.875	156.875
03A		156.150	156.150	24	24	157.200	161.800		78	156.925	161.525
	04	156.200	160.800	25	25	157.250	161.850	78A		156.925	156.925
	05	156.250	160.850	26	26	157.300	161.900		79	156.975	161.575
05A		156.250	156.250	27	27	157.350	161.950	79A		156.975	156.975
06	06	156.300	156.300	28	28	157.400	162.000		80	157.025	161.625
	07	156.350	160.950	37A	37A* ²	157.850	157.850	80A		157.025	157.025
07A		156.350	156.350		60	156.025	160.625		81	157.075	161.675
08	08	156.400	156.400		61	156.075	160.675	81A		157.075	157.075
09	09	156.450	156.450	61A		156.075	156.075		82	157.125	161.725
10	10	156.500	156.500		62	156.125	160.725	82A		157.125	157.125
11	11	156.550	156.550		63	156.175	160.775		83	157.175	161.775
12	12	156.600	156.600	63A		156.175	156.175	83A		157.175	157.175
13*	13	156.650	156.650		64	156.225	160.825	84	84	157.225	161.825
14	14	156.700	156.700	64A		156.225	156.225	84A		157.225	157.225
15* ¹	15* ¹	156.750	156.750		65	156.275	160.875	85	85	157.275	161.875
16	16	156.800	156.800	65A		156.275	156.275	85A		157.275	157.275
17* ¹	17* ¹	156.850	156.850		66	156.325	160.925	86	86	157.325	161.925
	18	156.900	161.500	66A		156.325	156.325	86A		157.325	157.325
18A		156.900	156.900	67*	67	156.375	156.375	87	87	157.375	161.975
	19	156.950	161.550	68	68	156.425	156.425	87A		157.375	157.375
19A		156.950	156.950	69	69	156.475	156.475	88	88	157.425	162.025
20	20	157.000	161.600	70	70	Rx only	156.525	88A		157.425	157.425
20A		157.000	157.000	71	71	156.575	156.575				
	21	157.050	161.650	72	72	156.625	156.625				
21A		157.050	157.050	73	73	156.675	156.675				

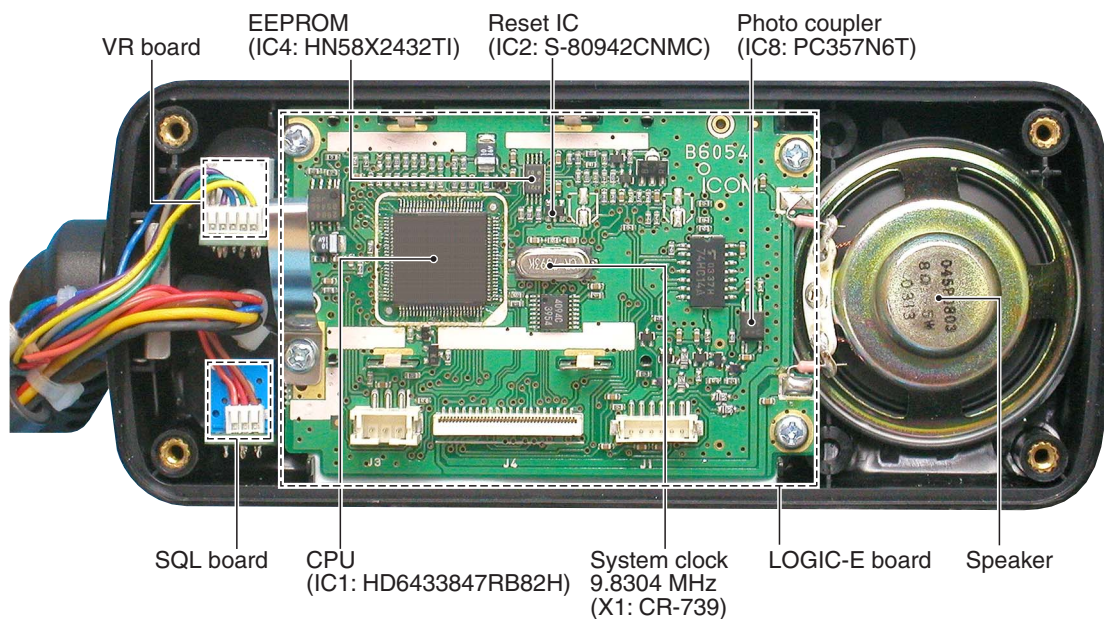
*¹ Low power only, *² For [UK] version only

SECTION 2 INSIDE VIEWS

• MAIN-E UNIT



• FRONT UNIT

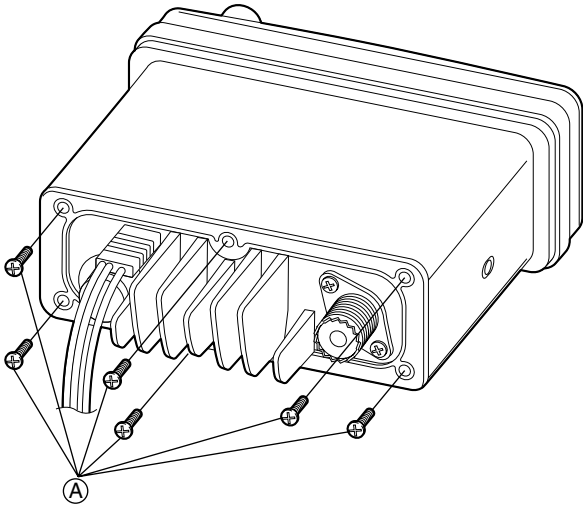


SECTION 3 DISASSEMBLY INSTRUCTIONS

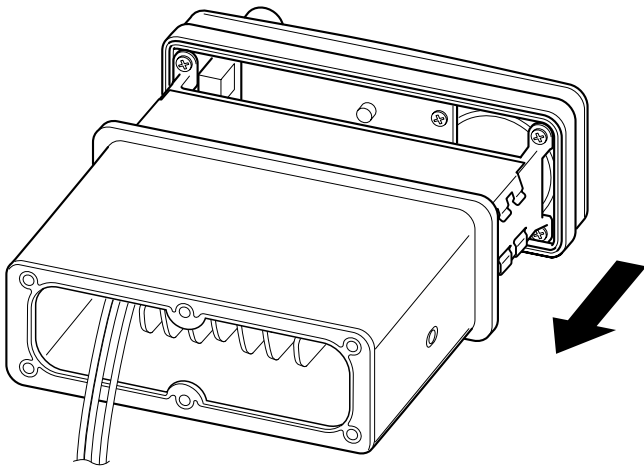
• REMOVING THE CASE

- 1 Unscrew 6 screws, **A**.

Note: When replacing the screw, 10–12 kg of torque **MUST** be applied to ensure water resistance.

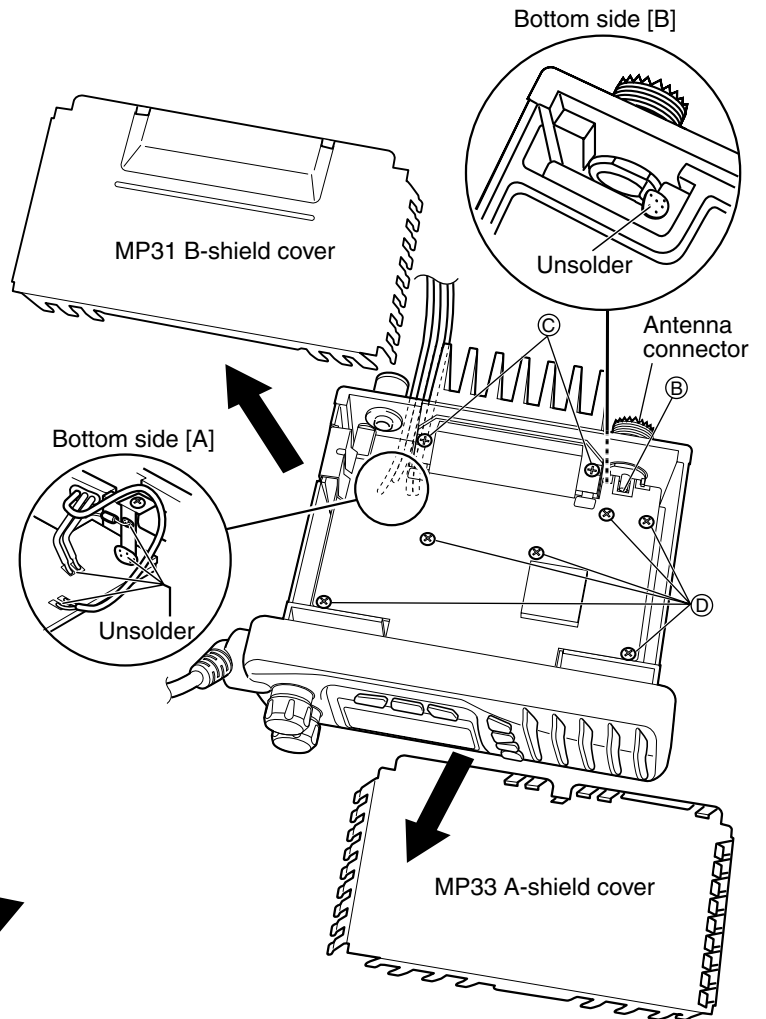


- 2 Slide the case free of the chassis in the direction of the arrow.



• REMOVING THE MAIN-E UNIT

- 1 Remove the shield covers, MP31 and MP33.
- 2 Unsolder the antenna connector, **B** (1 point).
- 3 Unsolder bottom side [A] (6 points), and side [B] (1 point), as shown below.
- 4 Unscrew 2 screws, **C**, and 6 screws, **D**, to remove the MAIN-E unit.



SECTION 4 CIRCUIT DESCRIPTION

4-1 RECEIVER CIRCUITS

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

The antenna switching circuit functions as a low-pass filter while receiving and as resonator circuit while transmitting. The circuit does not allow transmit signals to enter receiver circuits.

Received signals enter the MAIN-E unit from the antenna connector and pass through the low-pass filter (L21, L22, C127, C130, C133). The signals are then applied to the RF circuit via the antenna switching circuit (D14, D21, L31, C141, C142).

4-1-2 RF CIRCUIT (MAIN-E UNIT)

The RF circuit amplifies signals within the range of frequency coverage and filters out-of-band signals.

The signals from the antenna switching circuit pass through a tunable bandpass filter (D25, L35, C150, C152) where the object signals are applied to the RF amplifier circuit (Q21).

The amplified signals at Q21 are applied to the 3-stage tunable bandpass filter (D26-D28, L36, L38, L39, C161, C162, C164, C173-C178) to suppress unwanted signals and improve the selectivity. The signals are then applied to the 1st mixer circuit (Q22).

4-1-3 1ST MIXER AND 1ST IF CIRCUITS (MAIN-E UNIT)

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

The signals from the RF circuit are mixed with the VCO signals at the 1st mixer circuit (Q22) to produce a 21.7 MHz 1st IF signal.

The 1st IF signal is applied to two crystal filters (F11, F12) to suppress out-of-band signals and is then amplified at the IF amplifier (Q23). The amplified signal is applied to the 2nd mixer circuit (IC2).

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

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.

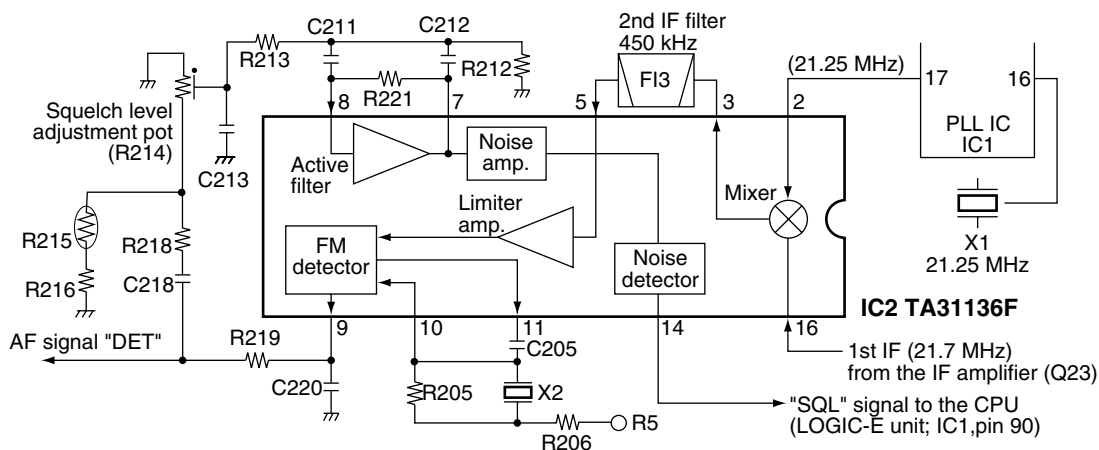
The FM IF IC (IC2) contains the 2nd local oscillator, 2nd mixer, limiter amplifier, quadrature detector, and noise detector circuits, etc.

The 1st IF signal from Q23 is applied to the 2nd mixer section of IC2 (pin 16), and is mixed with a 21.25 MHz 2nd LO signal generated at the PLL circuit using the reference frequency (21.25 MHz) to produce a 450 kHz 2nd IF signal.

The 2nd IF signal from IC2 (pin 3) is passed through the ceramic filter (F13), where unwanted signals are suppressed, and is then applied to the 2nd IF (limiter) amplifier in IC2 (pin 5). The signal is applied to the FM detector section in IC2 for demodulation into AF signals.

The FM detector circuit employs a quadrature detection method (linear phase detection), which uses a ceramic discriminator (X2) for phase delay to obtain a non-adjusting circuit. The detected signal from IC2 (pin 9) is applied to the AF circuit.

• 2ND IF AND DEMODULATOR CIRCUITS



4-1-5 AF AMPLIFIER CIRCUIT (MAIN-E AND FRONT UNITS)

The AF amplifier circuit amplifies the detected signals to drive a speaker. The AF circuit includes an AF mute circuit for the squelch.

AF signals from IC2 (pin 9) are applied to the de-emphasis circuit (R231, C232). The de-emphasis circuit is an integrated circuit with frequency characteristic of -6 dB/octave.

The integrated signals pass through the bandpass filter (Q31, R232, R234–R237, C233, C234) to suppress unwanted noise signals.

The filtered signals are applied to the AF mute circuit (IC4), and then passes through the [VOLUME] control (VR board; R1) via the "VOL1" signal. The signals are applied to the AF power amplifier (IC9, pin 1). The output signal from IC9 (pin 4) drives the internal (external) speaker.

4-1-6 SQUELCH CIRCUIT (MAIN-E UNIT)

A squelch circuit cuts out AF signals when no RF signals are received. By detecting noise components in the AF signals, the squelch circuit switches the AF mute switch.

A portion of the AF signals from the FM IF IC (IC2, pin 9) pass through the squelch adjustment pot (R214), and are then applied to the active filter section (IC2, pin 8). The active filter section filters and amplifies noise components. The amplified signals are converted into the pulse-type signals at the noise detector section. The detected signals outputs from pin 14 as the "SQL" signal.

The "SQL" signal from the FM IF IC is applied to the CPU (LOGIC-E board; IC1, pin 90). The CPU analyzes the noise condition and outputs as the "RMUTM" signal to the AF mute switch (IC4).

4-2 TRANSMITTER CIRCUITS

4-2-1 MICROPHONE AMPLIFIER CIRCUIT (MAIN-E UNIT)

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 AF signals from the microphone are amplified at the microphone amplifier (IC7, pins 6, 7) via the analog switch (IC4, pins 5, 6). A capacitor (C302) and resistor (R303) are connected to the amplifier to obtain the pre-emphasis characteristics.

The amplified signals are passed through the MIX circuit (IC7, pins 1, 2) to do amplitude limiting, and are then applied to the splatter filter (IC8, pins 1, 3) to suppress unwanted 3 kHz or higher signals. The filtered signals are then applied to the modulation circuit.

4-2-2 MODULATION CIRCUIT (MAIN-E UNIT)

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

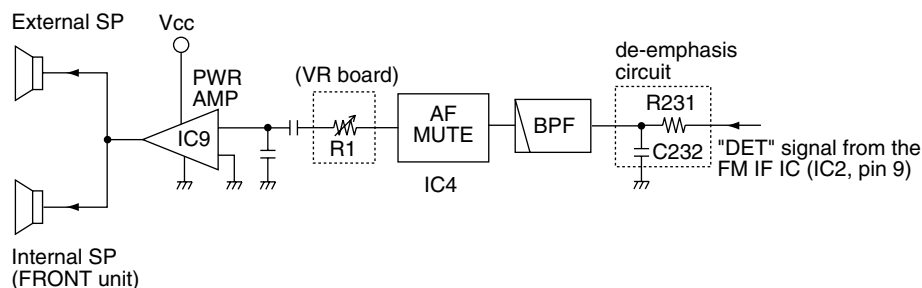
Audio signals from the splatter filter (IC8, pins 1, 3) pass through the frequency deviation adjustment pot (R327) and are then applied to the modulation circuit (D3, D4) to change the reactance of D3, D4 and modulate the oscillated signal at the VCO (Q4, Q5).

4-2-3 DRIVE AMPLIFIER CIRCUIT (MAIN-E UNIT)

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

The VCO output is buffer-amplified by Q6 and Q7, and is then applied to the Tx/Rx switch (D7). The transmit signal from the Tx/Rx switch is amplified to the pre-drive (Q10) and YGR (Q12) amplifiers to obtain an approximate 50 mW signal level. The amplified signal is then applied to the RF power amplifier (IC3).

• AF AMPLIFIER CIRCUIT



4-2-4 POWER AMPLIFIER CIRCUIT (MAIN-E UNIT)

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

IC3 is a power module which has amplification output capabilities of about 35 W with 50 mW input. The output from IC3 (pin 4) is passed through the antenna switching circuit (D14) and is then applied to the antenna connector via the low-pass filter.

4-2-5 APC CIRCUIT (MAIN-E UNIT)

The APC circuit stabilizes transmit output power.

The RF output signal from the power amplifier (IC3; pin 4) is detected at the power detector circuit (D12, D13, L19, C121, C124) and is then applied to one of the differential amplifier inputs (Q16, pin 5) via the High/Low control circuit (Q17, R114). The applied voltage controls the differential amplifier output (Q16, pin 2) and the bias voltage control (Q13). Thus the APC circuit maintains a constant output power.

4-3 PLL CIRCUITS

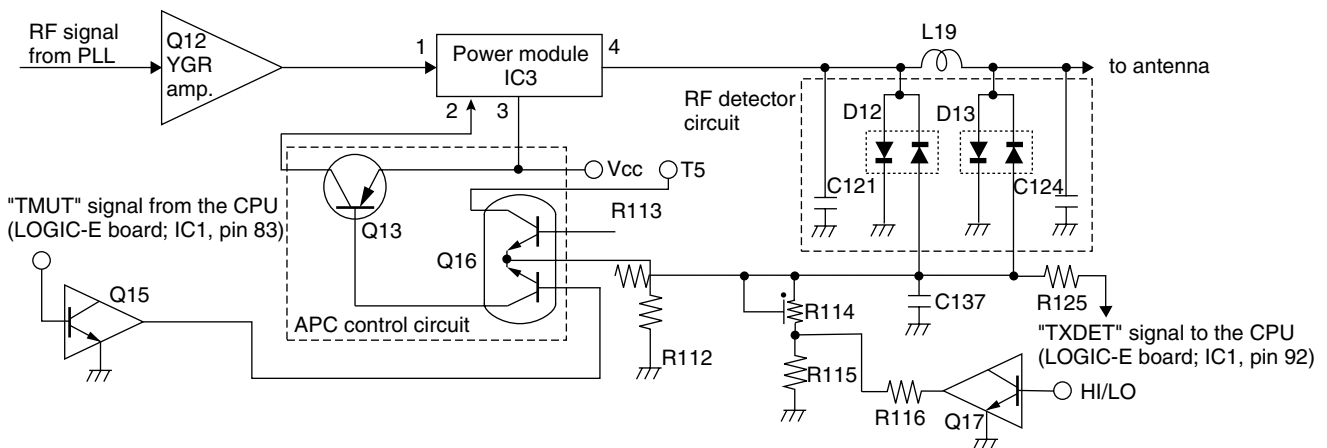
4-3-1 GENERAL

The PLL circuit provides stable oscillation of the transmit frequency and receive 1st LO frequency. The PLL circuit compares the phase of the divided VCO frequency to the reference frequency. The PLL output frequency is controlled by a crystal oscillator and the divided ratio of the programmable divider.

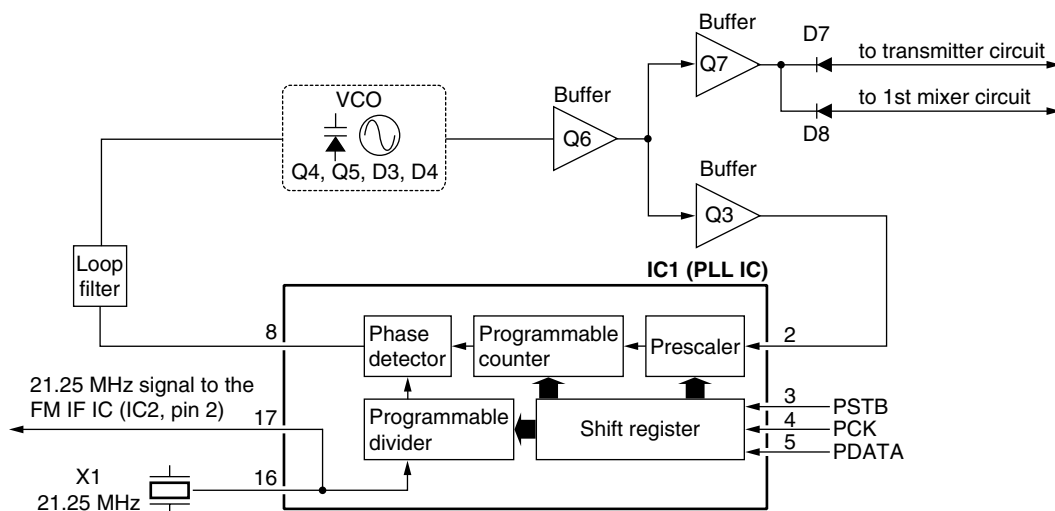
IC1 on the MAIN-E unit is a dual PLL IC which controls both VCO circuits for Tx and Rx, and contains a prescaler, programmable counter, programmable divider, phase detector, charge pump, etc.

The PLL circuit, using a one chip PLL IC (MAIN-E unit; IC1), directly generates the transmit frequency and receive 1st IF frequency with VCOs. The PLL sets the divided ratio based on serial data from the CPU on the LOGIC-E board and compares the phases of VCO signals with the reference oscillator frequency. The PLL IC detects the out-of-step phase and output from pins 8 for Tx and Rx. The reference frequency (21.25 MHz) is oscillated at X1 (MAIN-E unit).

• APC CIRCUIT



• PLL CIRCUIT



4-3-2 TX AND RX LOOP (MAIN-E UNIT)

The generated signal at the VCO (Q4, Q5, D3, D4) enters the PLL IC (IC1, pin 2) and is divided at the programmable divider section and is then applied to the phase detector section.

The phase detector compares the input signal with a reference frequency, and then outputs the out-of-phase signal (pulse-type signal) from pin 8.

The pulse-type signal is converted into DC voltage (lock voltage) at the loop filter (R7–R9, R41, C4, C5, C43, C44), and is then applied to varactor diodes (D3, D4) of the VCO to stabilize the oscillated frequency.

4-3-4 VCO CIRCUIT (MAIN-E UNIT)

The VCO outputs from Q4, Q5 are buffer-amplified at the buffer amplifiers (Q6 and Q7), and are then sent to the Tx/Rx switch (D7 and D8). The receive LO signal is applied to the 1st mixer circuit (Q22) through a low-pass filter, and the transmit signal is applied to the pre-drive amplifier (Q10). A portion of the VCO output is reapplied to the PLL IC (IC1, pin 2) via the buffer amplifier (Q3).

4-4 ATIS AND DSC CIRCUITS

4-4-1 ATIS ENCODE CIRCUIT

(LOGIC-E BOARD AND MAIN-E UNIT)

The FSK signal of ATIS created at CPU (LOGIC-E board; IC1) is passed through the ladder type D/A convertor (R41–R56) to convert into the analog signal. The analog signal is applied to the buffer amplifier (LOGIC-E board; IC9), and then applied to the mixer circuit (MAIN-E unit; IC7, pins 1, 2) to mix with signals from the microphone. The signal passes through the low-pass filter (MAIN-E unit; IC8, pins 1, 3) and is then applied to the VCO circuit as modulation signal.

4-4-2 DSC ENCODE CIRCUIT (MAIN-E UNIT)

The DSC signal created at the optional DSC controller (DS-100) is applied to the T1 via the J7, and then as floating system output. The signal is applied to the buffer amplifier (Q61), and then passes through the 6 dB/oct pre-emphasis circuit (R417, C416). The signal is applied to the mixer circuit (IC7, pins 1, 2) to mix with signals from the microphone. The signal passes through the low-pass filter (IC8, pins 1, 3) and is then applied to the VCO circuit as modulation signal.

4-5 LOGIC CIRCUITS (LOGIC-E BOARD)

• CPU

IC1 is an 8 bit signal chip micro-computer and contains LCD driver, serial I/O, timer, A/D converter, programmable I/O, ROM and RAM.

• SYSTEM CLOCK CIRCUIT

X1 is a ceramic oscillator and oscillate 9.8304 MHz system clock for the CPU (IC1).

• RESET CIRCUIT

IC2 is a reset IC. When turn power ON, IC2 outputs a reset signal (“LOW” pulse) to the CPU (IC1, pin 15) via the “RES” line.

• LOW BATTERY DETECTOR

VCC voltage is divided by R84, R85 and is applied to the low battery detector section in the CPU (IC1, pin 91) via the “LBAT” line.

• DIMMER CIRCUIT

The CPU (IC1), Q1, Q2 and Q3 are dimmer circuit and control the 4 steps the LCD backlight (DS2–DS7).

4-6 POWER SUPPLY CIRCUITS

VOLTAGE LINES

LINE	DESCRIPTION
HV	The voltage from the connected DC power supply.
HVS	Same voltage as the HV line which is passed through the [PWR] switch (VR unit; R1).
VCC	Same voltage as the HVS line. The voltage is applied to the optional DSC controller (DS-100).
5V	Common 5 V converted from the VCC line at the 5V regulator circuit (MAIN-E unit; IC10).
T5	Transmit 5 V controlled by the T5 control circuit (MAIN-E unit; Q52, Q57) using the “SEND” signal from the CPU (LOGIC-E board; IC1). The controlled voltage is applied to the transmitter circuit.
R5	Receive 5 V controlled by the R5 control circuit (MAIN-E unit; Q53, Q54) using the “RCV” signal from the CPU (LOGIC-E board; IC1). The controlled voltage is applied to the receiver circuit.
R8	Receive 8 V controlled by the R5 control circuit (MAIN-E unit; Q55, Q56) using the “R5” signal. The controlled voltage is applied to the receiver circuit.

4-7 PORT ALLOCATIONS

4-7-1 CPU (LOGIC-E BOARD; IC1)

Pin number	Port name	Description									
1 2	CONT1 CONT2	Outputs control signal for the LCD contrast. <table border="1"> <thead> <tr> <th>CONT1</th> <th>CONT2</th> <th>CONTRAST</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>LIGHT</td> </tr> <tr> <td>1</td> <td>1</td> <td>DEEP</td> </tr> </tbody> </table>	CONT1	CONT2	CONTRAST	0	0	LIGHT	1	1	DEEP
CONT1	CONT2	CONTRAST									
0	0	LIGHT									
1	1	DEEP									
3	BEEPMP	Outputs beep audio signal.									
5	CH16	Input port for the CH16 switch. Low: While CH16 switch is pushed.									
6	CH	Input port for the CH switch. Low: While CH switch is pushed.									
7	H/L	Input port for the H/L switch. Low: While H/L switch is pushed.									
8	HANG	Input port for the MIC hanging signal. Low: While MIC is pull-up.									
16	PCK	Outputs clock signal to the PLL IC (MAIN-E unit; IC1, pin 4).									
17	PSTB	Outputs strobe signals to the PLL IC (MAIN-E unit; IC1, pin 3).									
18	PDATA	Outputs data signals to the PLL IC (MAIN-E unit; IC1, pin 5).									
20	ICFC	Outputs control signal to switch NMEA or ICF3.									
21	BPLVL	Outputs beep volume control signal. Low: Beep audio is maximum.									
22	ECK	Outputs clock signal for the EEPROM (LOGIC-E board; IC2, pin 6).									
23	EDA	I/O port for the EEPROM data signals.									
27	HI/LO	Output port for RF output power (High or Low) select signal.									
28	RRXD	Input port for the cloning data.									
29	RTXD	Output port for the cloning data.									
31	BPFV	Outputs bandpass filter select signals. Low: Receiving more than 160 MHz. High: Receiving less than 160 MHz.									
83	TMUT	Outputs transmit mute signal. High: While transmitting.									
84	NMEAI	Input port for DS-100 data.									
89	SQLV	Input port for the squelch volume level.									
90	SQL	Input port from the FM IF IC (MAIN-E unit; IC2) for the squelch operation.									
91	LBAT	Input port for the connected power supply voltage detection (low battery indicator).									
92	TXDET	Input port for TX LED control signal.									

Pin number	Port name	Description
93	KEYM	Input port for the HM-132 functions. 2.02 V: [▲] is pushed. 3.00 V: [▼] is pushed. 3.84 V: [16/C] is pushed.
94	PTT	Input port for the PTT switch from HM-132. Low: While PTT is pushed.
95	TAG	Input port for the TAG switch. Low: While TAG switch is pushed.
96	SCN	Input port for the SCN switch. Low: While SCN switch is pushed.
97	UP	Input port for the UP switch. Low: While UP switch is pushed.
98	DN	Input port for the DOWN switch. Low: While DOWN switch is pushed.
99	UNLK	Input port for the PLL unlock signal. Low: While PLL is locked.

4-7-2 I/O EXPANDER IC (LOGIC-E BOARD; IC3)

Pin number	Port name	Description
4	RMUTM	Outputs the AF mute switch (MAIN-E unit; IC4) control signal. Low: While squelched
6	PTTM	Outputs main microphone (HM-132) select signal to the analog switch (MAIN-E unit; IC4).
13	SEND	Outputs the T5 regulator (MAIN-E unit; Q52, Q57) control signal. High: While transmitting
14	RCV	Outputs the R5 regulator (MAIN-E unit; Q53, Q54) control signal. High: While receiving.

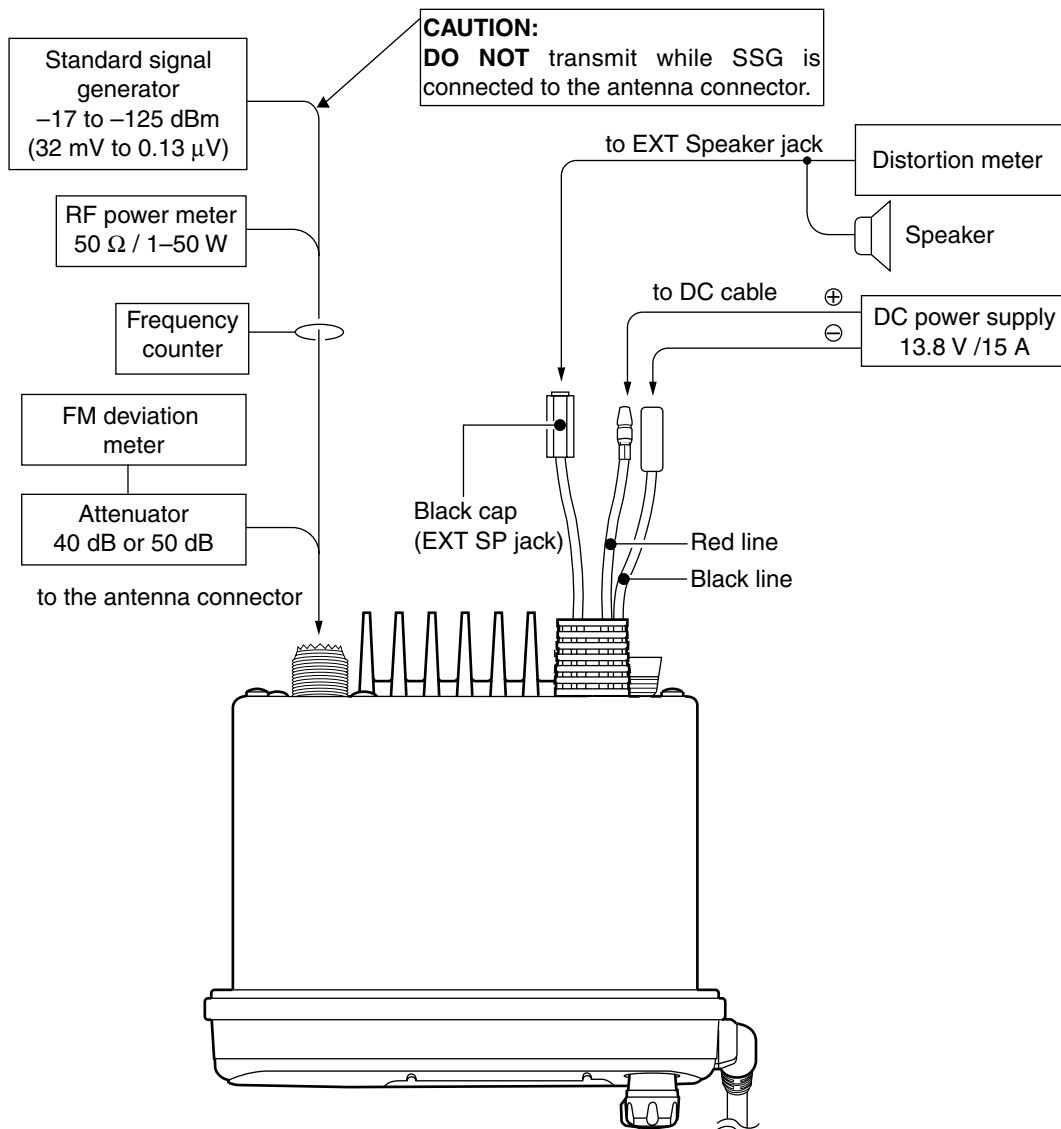
SECTION 5 ADJUSTMENT PROCEDURES

5-1 PREPARATION

■ REQUIRED TEST EQUIPMENT

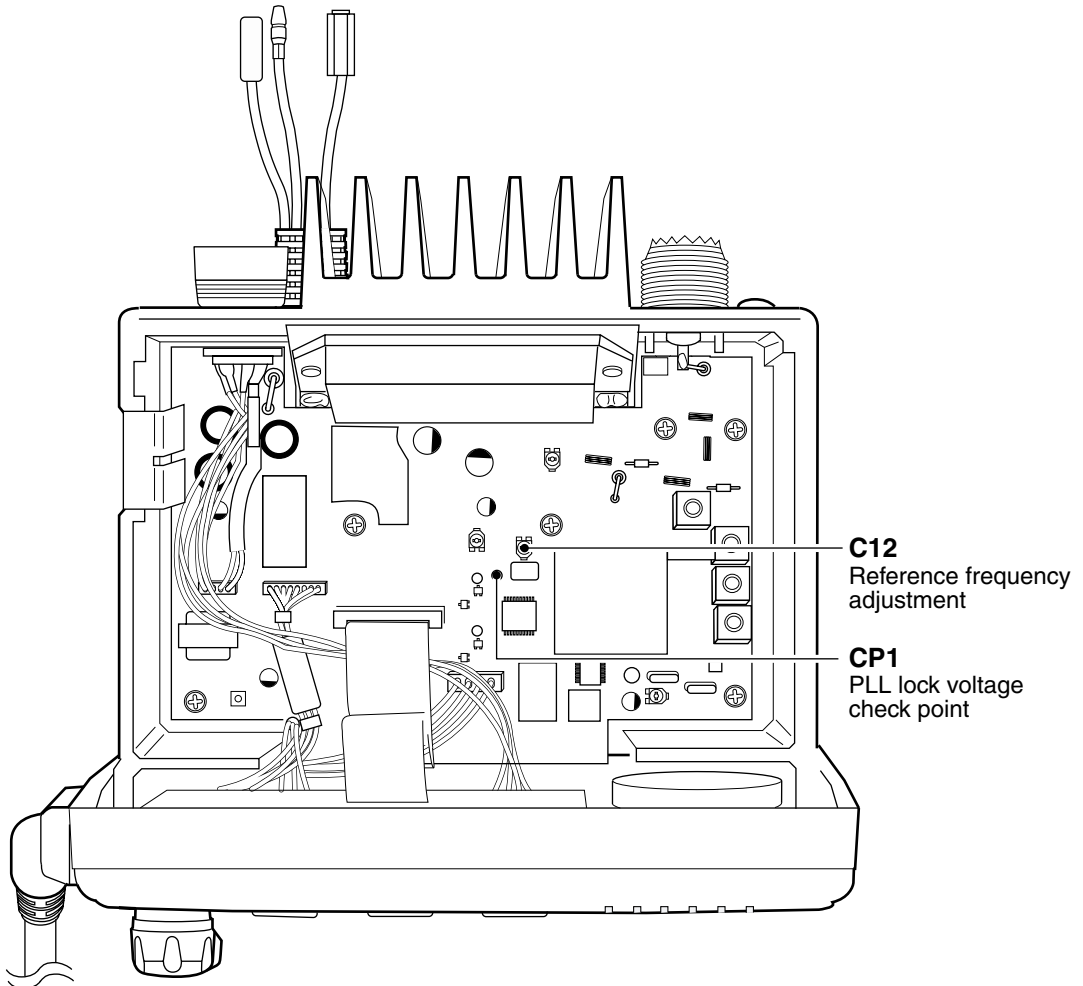
EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 13.8 V DC Current capacity : 10 A or more	Audio generator	Frequency range : 300–3000 Hz Measuring range : 1–500 mV
RF power meter (terminated type)	Measuring range : 1–50 W Frequency range : 100–300 MHz Impedance : 50 Ω SWR : Less than 1.2 : 1	Standard signal generator (SSG)	Frequency range : 0.1–300 MHz Output level : 0.1 μV–32 mV (–127 to –17 dBm)
Frequency counter	Frequency range : 0.1–300 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	Oscilloscope	Frequency range : DC–20 MHz Measuring range : 0.01–20 V
FM deviation meter	Frequency range : 30–300 MHz Measuring range : 0 to ±10 kHz	AC millivoltmeter	Measuring range : 10 mV–10 V
DC voltmeter	Input impedance : 50 kΩ/V DC or better	External speaker	Input impedance : 4 Ω Capacity : 5 W or more
Digital multi-meter	Input impedance : 10 MΩ/V DC or better	Attenuator	Power attenuation : 40 or 50 dB Capacity : 50 W or more
Distortion meter	Frequency range : 1 kHz ±10 % Measuring range : 1–100 %	Dummy load	Resistance : 50 Ω Capacity : 100 W or more

■ CONNECTIONS



5-2 PLL ADJUSTMENTS

ADJUSTMENT	ADJUSTMENT CONDITION	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1 <ul style="list-style-type: none"> • Operating channel : ch16 • Receiving 	MAIN-E	Connect a digital multi-meter or oscilloscope to the check point CP1.	1.8 V		Verify
	2 <ul style="list-style-type: none"> • Operating channel : ch16 • Output power : Low • Transmitting 			1.6 V		
REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> • Operating channel : ch16 • Output power : Low • Connect an RF power meter or a 50 Ω dummy load to the antenna connector. • Transmitting 	Rear Panel	Loosely couple the frequency counter to the antenna connector.	156.8000 MHz	MAIN	C12



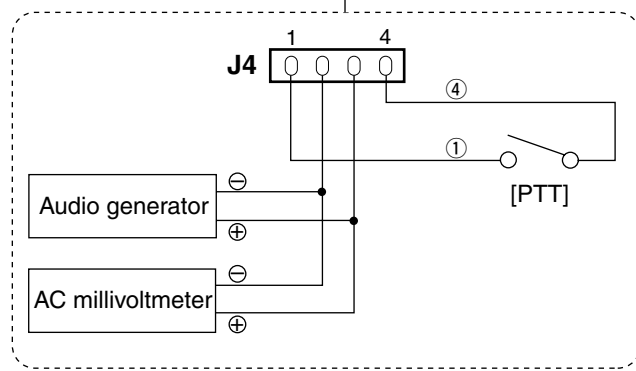
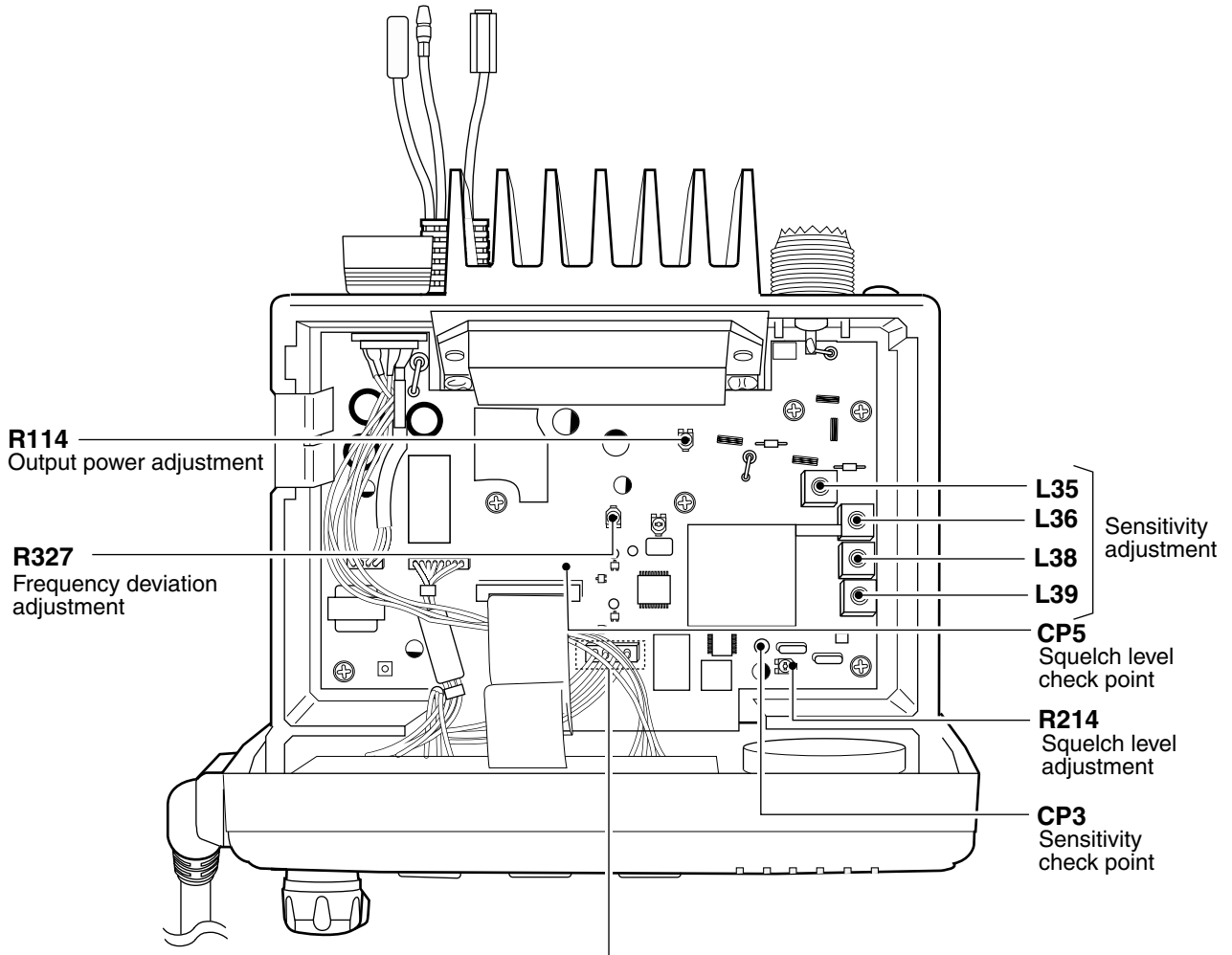
5-3 TRANSMITTER ADJUSTMENTS

ADJUSTMENT	ADJUSTMENT CONDITION	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1 <ul style="list-style-type: none"> • Operating channel : ch16 • Output power : High • Transmitting 	Rear Panel	Connect an RF power meter to the antenna connector.	23 W	MAIN	R114
FREQUENCY DEVIATION	1 <ul style="list-style-type: none"> • Operating channel : ch16 • Output power : Low • Connect an audio generator to J4 (pin 3) on the MAIN-E unit with an AC millivoltmeter and set as: <ul style="list-style-type: none"> Frequency : 1 kHz Level : 30 mV • Set an FM deviation meter as: <ul style="list-style-type: none"> HPF : OFF LPF : 20 kHz De-emphasis : OFF Detector : (P-P)/2 • Transmitting 	Rear Panel	Connect an FM deviation meter to the antenna connector through an attenuator.	±4.3 kHz	MAIN	R327

5-4 RECEIVER ADJUSTMENTS

ADJUSTMENT	ADJUSTMENT CONDITION	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1 <ul style="list-style-type: none"> • Operating channel : ch16 • [SQUELCH] control: <ul style="list-style-type: none"> Max. counterclockwise • Connect an SSG to the antenna connector and set as: <ul style="list-style-type: none"> Frequency : 156.800 MHz Level : 3.2 μV* (-97 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving 	MAIN-E	Connect a DC voltmeter to the check point CP3.	Maximum voltage	MAIN-E	L35, L36 L38, L39
SQUELCH	1 <ul style="list-style-type: none"> • Operating channel : ch16 • [SQUELCH] control: <ul style="list-style-type: none"> Max. counterclockwise • Connect an SSG to the antenna connector and set as: <ul style="list-style-type: none"> Frequency : 156.800 MHz Level : 0.4 μV* (-115 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving 	MAIN-E	Connect a DC voltmeter to the check point CP5.	0.8 V	MAIN-E	R214

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



[MAIN-E UNIT]

Table with columns: REF NO., ORDER NO., DESCRIPTION, M. Rows 1-223.

M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)

[MAIN-E UNIT]

Table with columns: REF NO., ORDER NO., DESCRIPTION, M. Rows 1-223.

S.=Surface mount

[MAIN-E UNIT]

REF NO.	ORDER NO.	DESCRIPTION		M.
C415	4030008470	S.CERAMIC	C1608 JB 1H 272K-T	B
C416	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	B
RL1	6330001670	RELAY	FTR-P3CP012W1	T
J4	6510018970	S.CONNECTOR	B4B-PH-SM3-TB	T
J5	6510019420	S.CONNECTOR	B8B-ZR-SM3-TF	T
J6	6510022470	S.CONNECTOR	40FLT-SM1-TB	T
J7	6510015540	S.CONNECTOR	B4B-ZR-SM3-TF	T
T1	5920000570	TRANSFORMER	12T01	T
W1	7120000470	JUMPER	ERDS2T0	T
W2	7120000470	JUMPER	ERDS2T0	T
EP1	0910056801	PCB	B 6053A	

[LOGIC-E BOARD]

REF NO.	ORDER NO.	DESCRIPTION		M.
IC1	1140011930	S.IC	HD6433847RB82H (FX-2706B)	T
IC2	1110005770	S.IC	S-80942CNMC-G9C-T2	T
IC3	1130007570	S.IC	BU4094BCFV-E2	T
IC4	1130009680	S.IC	HN58X2432T1	T
IC7	1130005290	S.IC	TC74HC14AF	T
IC8	1170000350	S.IC	PC357N6T	T
IC9	1110002700	S.IC	NJM2904M-TE1	T
Q1	1530002850	S.TRANSISTOR	2SC4116-BL (TE85R)	T
Q2	1520000460	S.TRANSISTOR	2SB1132 T100 R	T
Q3	1530002850	S.TRANSISTOR	2SC4116-BL (TE85R)	T
Q4	1560000810	S.FET	2SK1069-4-TL	T
Q6	1590000680	S.TRANSISTOR	DTC114EUA T106	T
Q7	1590000720	S.TRANSISTOR	DTA144EUA T106	T
Q8	1530002060	S.TRANSISTOR	2SC4081 T106 R	T
Q9	1510000510	S.TRANSISTOR	2SA1576A T106R	T
Q11	1590001330	S.TRANSISTOR	DTA114EUA T106	T
D1	1750000550	S.DIODE	1SS355 TE-17	T
D2	1750000550	S.DIODE	1SS355 TE-17	T
D3	1730002360	S.ZENER	MA8062-M (TX)	T
D4	1730002360	S.ZENER	MA8062-M (TX)	T
D5	1730002360	S.ZENER	MA8062-M (TX)	T
D6	1730002360	S.ZENER	MA8062-M (TX)	T
D7	1750000150	S.DIODE	DA204K T146	T
X1	6050011500	S.XTAL	CR-739 (9.8304 MHz)	T
R1	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R2	7030003550	S.RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)	T
R3	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R4	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)	T
R5	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R6	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)	T
R7	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)	T
R8	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R9	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R10	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R11	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)	T
R12	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R13	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R14	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)	T
R15	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R16	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)	T
R17	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)	T
R18	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)	T
R19	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)	T
R20	7030003570	S.RESISTOR	ERJ3GEYJ 123 V (12 kΩ)	T
R21	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)	T
R22	7030003250	S.RESISTOR	ERJ3GEYJ 270 V (27 Ω)	T
R23	7030003250	S.RESISTOR	ERJ3GEYJ 270 V (27 Ω)	T
R24	7030003250	S.RESISTOR	ERJ3GEYJ 270 V (27 Ω)	T
R25	7030003430	S.RESISTOR	ERJ3GEYJ 821 V (820 Ω)	T
R26	7030003430	S.RESISTOR	ERJ3GEYJ 821 V (820 Ω)	T
R27	7030003380	S.RESISTOR	ERJ3GEYJ 331 V (330 Ω)	T
R28	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R29	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R30	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R31	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R32	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R33	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R34	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R35	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R36	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)	T
R37	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)	T
R38	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)	T
R41	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R42	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R43	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R44	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R45	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R46	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R47	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R48	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R49	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R50	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R51	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R52	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R53	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R54	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R55	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R56	7030004120	S.RESISTOR	ERJ3GEYJ 203 V (20 kΩ)	T
R60	7030006041	S.RESISTOR	ERA3YED 622V	T
R61	7030003860	S.RESISTOR	ERJ3GE JPW V	T

M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)

S.=Surface mount

[LOGIC-E BOARD]

REF NO.	ORDER NO.	DESCRIPTION		M.
R62	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R63	7030003490	S.RESISTOR	ERJ3GEYJ 272 V (2.7 kΩ)	T
R64	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)	T
R65	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R71	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)	T
R72	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)	T
R73	7030003280	S.RESISTOR	ERJ3GEYJ 470 V (47 Ω)	T
R75	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R77	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)	T
R78	7030003540	S.RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)	T
R81	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)	T
R82	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R83	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)	T
R84	7030003700	S.RESISTOR	ERJ3GEYJ 154 V (150 kΩ)	T
R85	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)	T
R86	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R87	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R88	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)	T
R90	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)	T
C1	4030007060	S.CERAMIC	C1608 CH 1H 270J-T	T
C2	4030009650	S.CERAMIC	C1608 CH 1H 240J-T	T
C3	4030008890	S.CERAMIC	C1608 JB 1H 273K-T	T
C5	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C6	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C7	4550006210	S.TANTALUM	ECST1CX106R	T
C8	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C9	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C11	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	T
C12	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C41	4550006210	S.TANTALUM	ECST1CX106R	T
C42	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C43	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C44	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	T
C72	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C73	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C74	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C75	4030006880	S.CERAMIC	C1608 JB 1H 472K-T	T
C76	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C81	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	T
C82	4030006900	S.CERAMIC	C1608 JB 1H 103K-T	T
C91	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	T
C92	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	T
C93	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	T
C94	4030006850	S.CERAMIC	C1608 JB 1H 471K-T	T
C95	4030006860	S.CERAMIC	C1608 JB 1H 102K-T	T
C96	4030006850	S.CERAMIC	C1608 JB 1H 471K-T	T
J1	6510021440	S.CONNECTOR	B6B-ZR-SM3-TF	T
J3	6510022190	S.CONNECTOR	B3B-PH-SM3-TB	T
J4	6510022470	S.CONNECTOR	40FLT-SM1-TB	T
DS1	5030001950	LCD	TTR5341	B
DS2	5040002310	S.LED	SML-311YTT86	B
DS3	5040002310	S.LED	SML-311YTT86	B
DS4	5040002310	S.LED	SML-311YTT86	B
DS5	5040002310	S.LED	SML-311YTT86	B
DS6	5040002660	S.LED	FY1101F-TR (LED)	B
DS7	5040002660	S.LED	FY1101F-TR (LED)	B
EP1	0910056810	PCB	B 6054	
EP2	8930054970	LCD CONTACT	SRCN-2438-SP-N-W	B

M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)

[VR BOARD]

REF NO.	ORDER NO.	DESCRIPTION		M.
R1	7210002350	VARIABLE	TP96N97N15F-10KA-1301	T
W1	8900010820	CABLE	OPC-1099 <CMI>	T
EP1	0910056781	PCB	B 6051A	

[SQL BOARD]

REF NO.	ORDER NO.	DESCRIPTION		M.
R1	7210002360	VARIABLE	TP96N97-15F-10KB-1301	
EP1	0910056791	PCB	B 6052A	

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION		M.
MC1	0800006232	MICROPHONE	HM-132B-2 ACC <KN> [BLACK]	
MC1	0800006242	MICROPHONE	HM-132W-2 ACC <KN> [WHITE]	
SP1	2510001240	SPEAKER	045P0803 <FG>	
W1	7120000470	JUMPER	ERDS2T0	
W2	7120000470	JUMPER	ERDS2T0	
W3	8900010500	CABLE	OPC-1046	

[CHASSIS UNIT]

REF NO.	ORDER NO.	DESCRIPTION		M.
C1	4020000430	CYLINDER	UP050 B 471K-NA-CZ	
J1	6510004880	CONNECTOR	MR-DS-E 01	
W1	8900010710	CABLE	OPC-1087 <LIA>	
W2	8900010491	CABLE	OPC-1041A	
W3	7120000470	JUMPER	ERDS2T0	

S.=Surface mount

6-2 HM-132

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION		M.
R1	7010007640	RESISTOR	FRD25 T2-123J (12 kΩ)	T
R2	7010007630	RESISTOR	FRD25 T2-682J (6.8 kΩ)	T
R3	7010007650	RESISTOR	FRD25 T2-153J (15 kΩ)	T
R4	7010007660	RESISTOR	FRD25 T2-333J (33 kΩ)	T
C1	4030018550	S.CERAMIC	C1608 JB 1H 223K-T	T
C2	4030011340	S.CERAMIC	C1608 CH 1H 471J-T	B
MC1	7700002500	MICROPHONE	KUC3523-040245	
S1	2260002330	SWITCH	SKHHL014A	B
S2	2260002340	SWITCH	SKHHAM024A	T
S3	2260002340	SWITCH	SKHHAM024A	T
S4	2260002340	SWITCH	SKHHAM024A	T
W1	9018490010	WIRE	71/98/010/X98/X98 <KN>	T
W2	9018490010	WIRE	71/98/010/X98/X98 <KN>	T
W3	9024495010	WIRE	24/00/020/W01/W01 <KN>	B
W4	9024495020	WIRE	24/04/020/W01/W01 <KN>	B
EP1	0910053701	PCB	B-5587A	

M.=Mounted side (T: Mounted on the Top side, B: Mounted on the Bottom side)

S.=Surface mount

SECTION 7 MECHANICAL PARTS AND DISASSEMBLY

7-1 IC-M401E

[CHASSIS PARTS]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
J 1	6510004880	Connector MR-DS-E 01	1
W 1	8900010710	Cable OPC-1087 (nut, w/gasket) <LIA>	1
W 2	8900010491	Cable OPC-1041A	1
MP1	8510013960	2438 case Ass'y <KN> [black]	1
	8510013970	2438 case (A) Ass'y <KN> [white]	1
MP4	8930055070	2438 sheet	1
MP5	8930054660	2438 R-packing	1
MP11	8010018473	2438 chassis-3	1
MP12	8930034300	1542 antennna seal	1
MP13	8810002950	Screw bind M3 × 6 SUS	2
MP14	8930054620	2438 B-bush plate<KN>	1
MP16	8510016000	2706 module plate Y701	1
MP17	8510011870	2040 module cover Y413	1
MP19	8810008660	Screw PH BT M3 × 8 NI-ZU	2
MP20	8950000180	Cable tie 80	2
MP22	8930052440	2345 B-IC CLIP	1
MP23	8810008660	Screw PH BT M3 × 8 NI-ZU	6
MP24	8950000180	Cable tie-80	1
MP25	8930055850	2490 grounding plate	1
MP26	8810008630	Screw PH BT M3 × 6 NI-ZU	1
MP27	6910008240	Clip 59TN4772	1
MP31	8510014070	2490 B-shield cover	1
MP32	8930056401	Shiled sponge (H)-1	1
MP33	8510014080	2490 A-shield cover	1
MP40	8810008680	Screw PH M3 × 8 NI	4
MP41	8930045280	Seal 2040 F-packing	1
MP42	8820001210	2438 screw	6
MP43	8930052290	Swal O-ring (AD)	6
MP45	8930055040	2438 cap <KN>	1
MP47	8930049040	Isolating sheet FQ	1
MP48	8930061410	2685 grounding spring Y699	1

[FRONT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MC1	800006232	Microphone HM-132B-2 <KN> [black]	1
	800006242	Microphone HM-132W-2 <KN> [white]	1
SP 1	2510001240	Speaker 045P0803 <FG>	1
W 3	8900010500	Cable OPC-1046	1
MP1	8210020680	2438 front panel (K) ASS'Y <KN> [black]	1
	8210020690	2438 front panel (L) ASS'Y <KN> [white]	1
MP2	8310050810	2438 window plate <KN>	1
MP4	8930014280	Speaker net FX706	1
MP5	8110007580	2490 E-cover <KN>	1
MP10	8930055601	2438 key bord (A)-1 <KN>	1
MP21	8930052280	O-ring (AC)	2
MP22	8310051220	2438 C-bush plate <KN>	1
MP23	8930055840	2490 grounding spring	1
MP25	8810008660	Screw PH BT M3 × 8 NI-ZU	4
MP31	8610011060	TSUMAMI N286 Ass'y <KN> [black]	2
	8610011070	TSUMAMI N286(A) Ass'y <KN> [white]	2
MP33	8610009240	Knob spring NO.7800P	2

[LOGIC-E BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
DS 1	5030001950	LCD TTR5341	1
EP 2	8930054970	LCD contact SRCN-2438-SP-N-W	2
MP1	8210017700	2438 reflector	1
MP2	8930054650	2438 LCD holder <KN>	1
MP3	8930055060	2438 white sheet	1

[VR BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
R 1	7210002350	TP96N97N15F-10KA-1301 (incl. nut)	1
W 1	8900010820	Cable OPC-1099 <CM1>	1

[SQL BOARD]

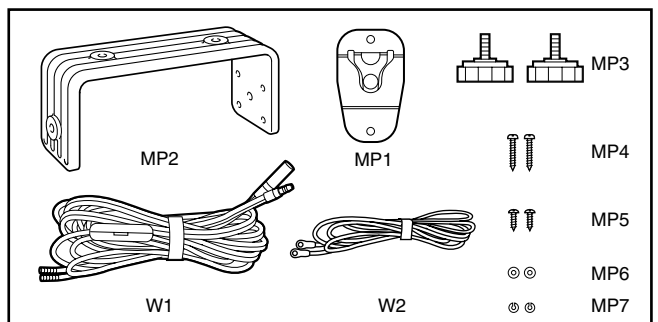
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
R1	7210002360	TP96N97N15F-10KB-1301 (incl. nut)	1

[MAIN-E UNIT]

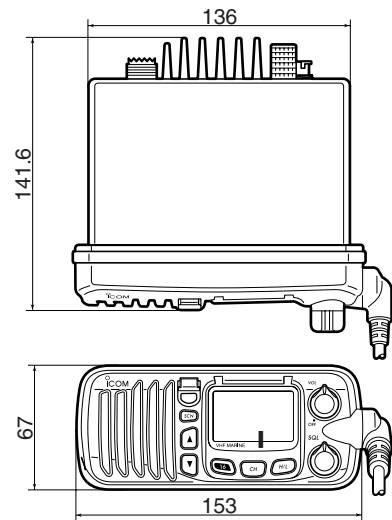
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP1	6910015690	2685 shield case	1
MP2	8510002280	VCO shield plate (A) FX 15	1
MP3	8930052271	Shield sponge (D)-1	1
MP4	8930005320	filter spacer	2
MP5	8510014180	2490 shield plate Y596	1

[ACCESSORIES]

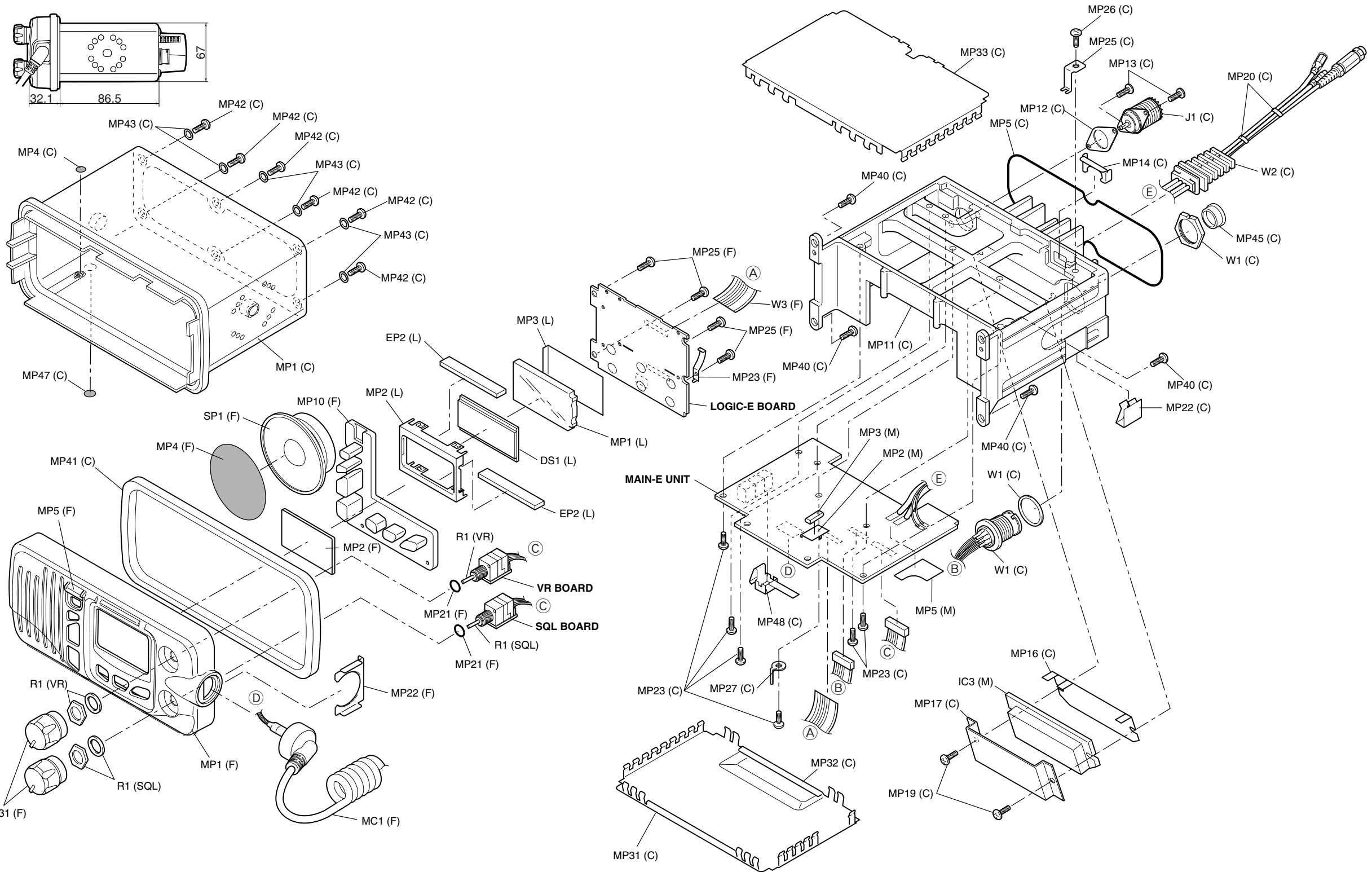
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
W 1	8900009040	Cable OPC-891 [black]	1
W 2	8900010770	Cable OPC-1097 [white]	1
MP1	8950005110	2289 MIC hanger	1
MP2	8010017250	2040 Mobile bracket [black]	1
	8010017270	2040 Mobile bracket (A) [white]	1
MP3	8610010561	2040 Knob bolt-1 [black]	2
	8610010591	2040 Knob bolt (A)-1 [white]	2
MP4	8810004700	Screw PH A0 M3 × 16 SUS	2
MP5	8810001490	Screw PH A0 M5 × 20 SUS	2
MP6	8850000180	Flat washer M5 SUS	2
MP7	8850000500	Spring washer M5 SUS	2



Screw abbreviations A0, B0, BT: Self-tapping
 PH: Pan head
 BiH: Bind head
 NI: Nickel
 SUS: Stainless
 NI-ZU: Nickel-Zinc



Unit: mm

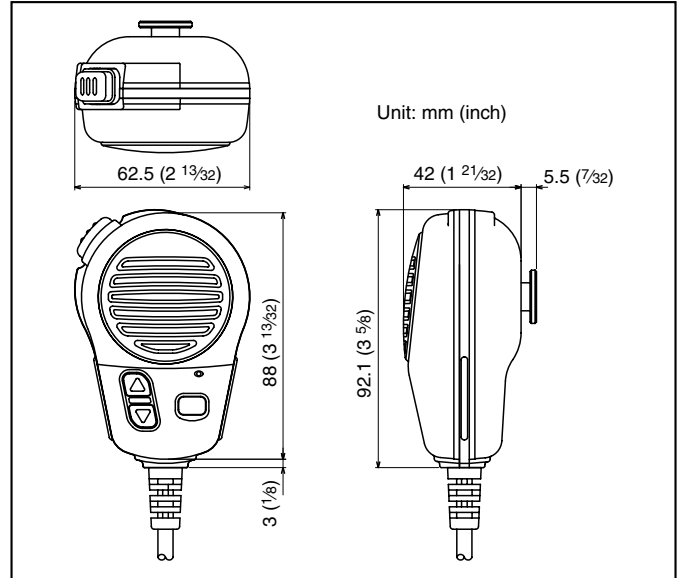


UNIT abbreviations (C): CHASSIS PARTS, (L): LOGIC-E BOARD, (M): MAIN-E UNIT
(VR): VR BOARD, (SQL): SQL BOARD, (F): FRONT UNIT

7-2 HM-132

[CHASSIS PARTS]

REF. NO.	ORDER NO.	DESCRIPTION		QTY.
W1	8900010610	Cable OPC-1081	[black]	1
	8900010620	Cable OPC-1082	[white]	1
MP1	8210017950	2352 front panel (D)-1	[black]	1
	8210017960	2352 front panel (E)-1	[white]	1
MP2	8210016850	2352 rear panel	[black]	1
	8210017110	2352 rear panel (A)	[white]	1
MP3	8930052160	2352 key		1
MP4	8930052150	2352 PTT rubber		1
MP5	8930052140	2352 PTT holder		1
MP6	8930052690	2352 MIC rubber		1
MP7	8930052120	2352 rubber		1
MP8	8930052110	2352 main seal		1
MP9	8610010870	2352 hanger knob		1
MP10	8310048760	2352 R-plate		1
MP11	8310048780	2352 MIC plate		1
MP12	8820001150	2352 screw		5
MP13	8850001850	ICOM washer (Y)		5
MP14	8930052340	O-ring (AE)		5
MP15	8930052350	O-ring (AF)		1
MP16	8930056460	2449 MIC sheet		1
MP17	8930054910	2449 SP Rubber		1
MP18	8850001610	Spring washer M4 SUS		1
MP19	8810009260	Screw PH B0 2 × 6 NI (BT)		3
MP21	8810009240	Screw BiH M4 × 10 ZK		1
MP23	8810008900	Screw PH M3 × 6 NI		1

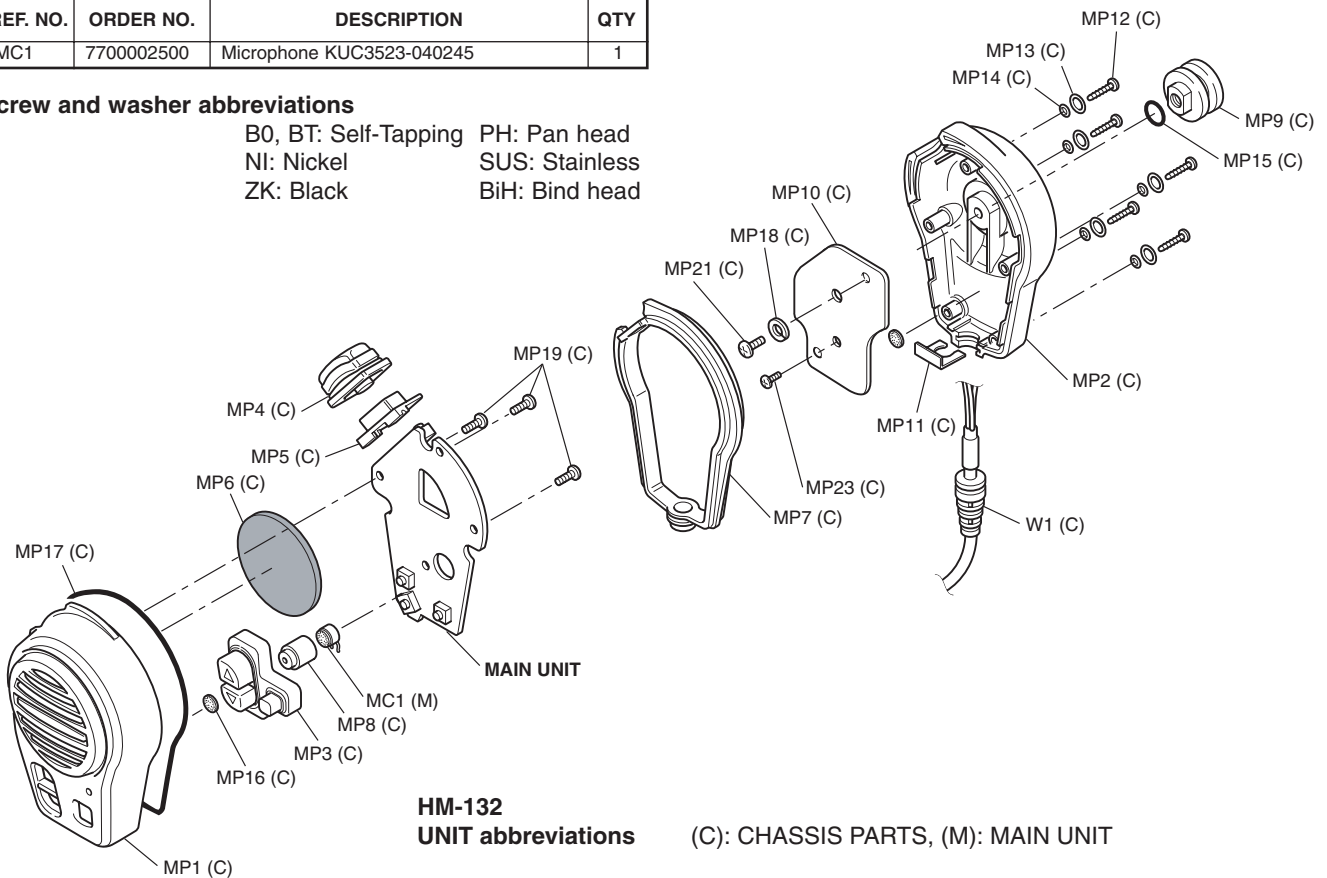


[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY
MC1	7700002500	Microphone KUC3523-040245	1

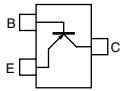
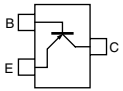
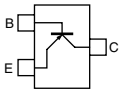
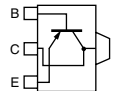
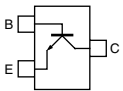
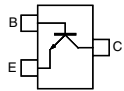
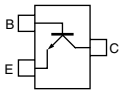
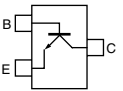
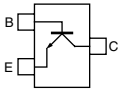
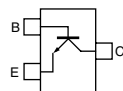
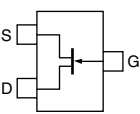
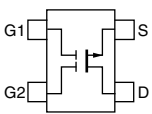
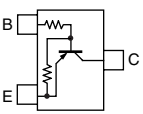
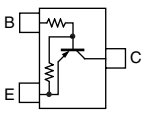
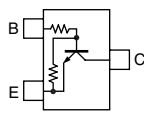
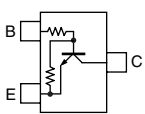
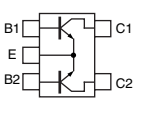
Screw and washer abbreviations

B0, BT: Self-Tapping PH: Pan head
 NI: Nickel SUS: Stainless
 ZK: Black BiH: Bind head

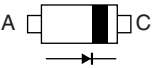
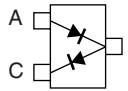
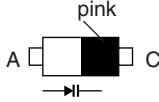
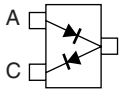
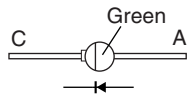
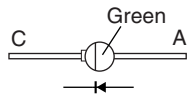
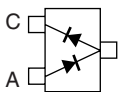

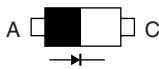
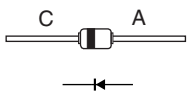
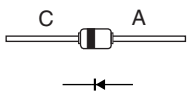


SECTION 8 SEMI-CONDUCTOR INFORMATION

• TRANSISTOR AND FET'S

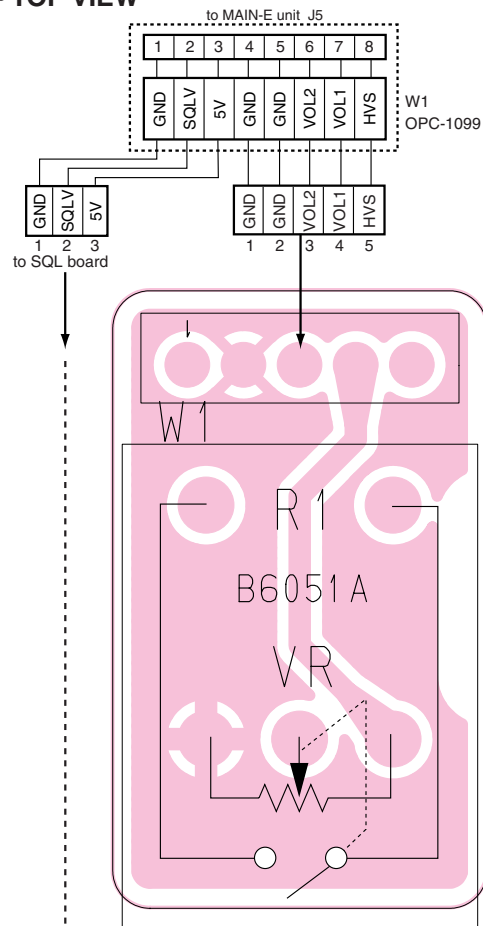
2SA1576A R (Symbol: FR) 	2SA1577 Q (Symbol: HQ) 	2SA1588 GR (Symbol: ZG) 	2SB1132 R (Symbol: BAR) 	2SC2714 Y (Symbol: QY) 
2SC3775 3 (Symbol: OY3) 	2SC4081 R (Symbol: BR) 	2SC4116 BL (Symbol: LL) 	2SC4215 O (Symbol: QO) 	2SC4226 R25 (Symbol: R25) 
2SK1069-4 (Symbol: FJ) 	3SK131-T2-LA (Symbol: V12) 	DTA114 EUA (Symbol: 14) 	DTA144 EUA (Symbol: 16) 	DTC114 EUA (Symbol: 24) 
DTC144 EUA (Symbol: 26) 	FMW1 (Symbol: W1) 			

• DIODES

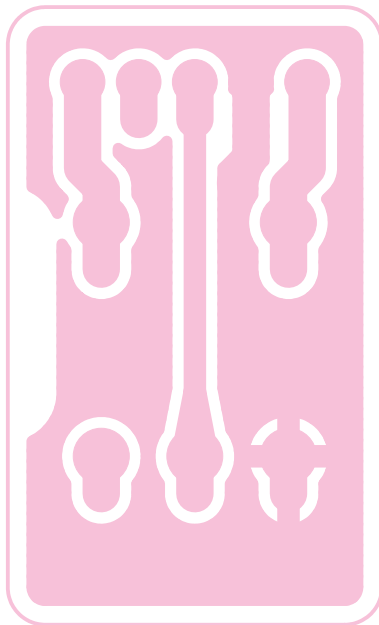
1SS355 (Symbol: A) 	1SS375 (Symbol: FH) 	1SV214 (Symbol: T1) 	DA204 U (Symbol: K) 	DA204 K (Symbol: K) 	DSA3A1 (Symbol: Green) 
HSM88ASR (Symbol: C3) 	HVC350BTRF (Symbol: B0) 	MA77 (Symbol: 4B) 	MA8062-M (Symbol: 6-2) 	XB15A308 (Symbol: T8) 	

SECTION 9 BOARD LAYOUTS

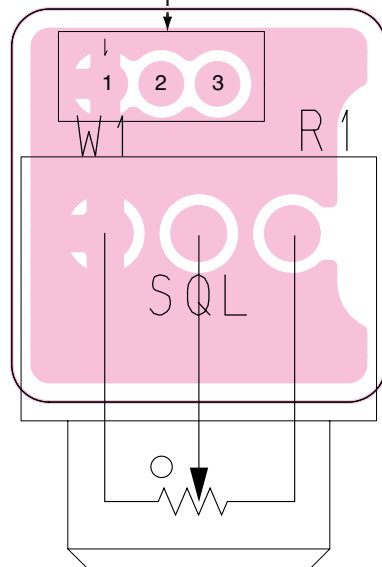
9-1 VR BOARD
• TOP VIEW



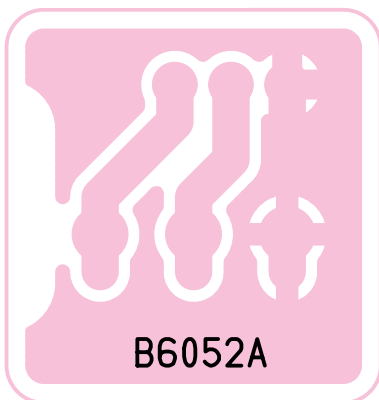
• BOTTOM VIEW



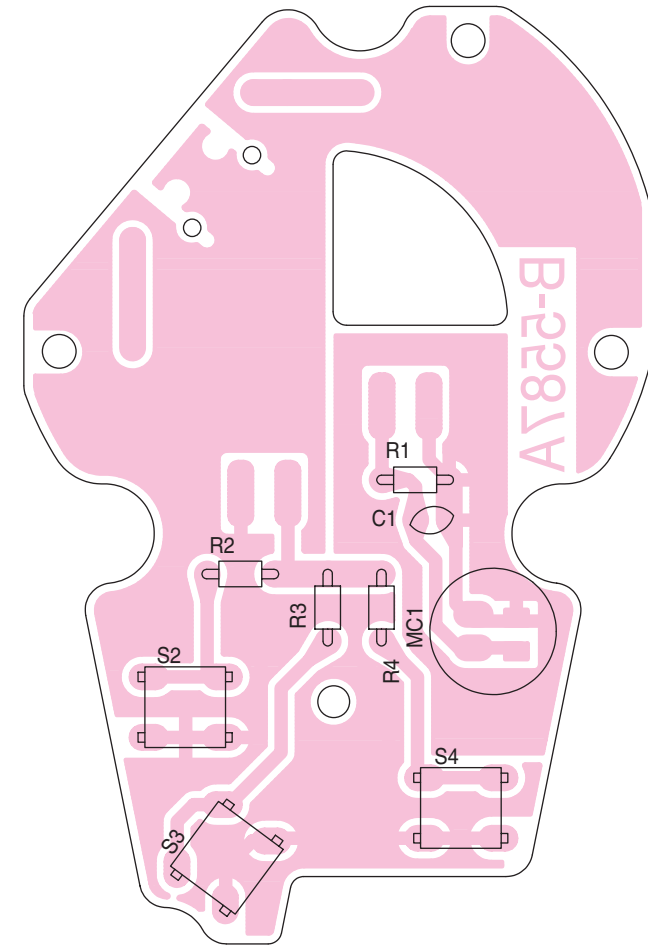
9-2 SQL BOARD
• TOP VIEW



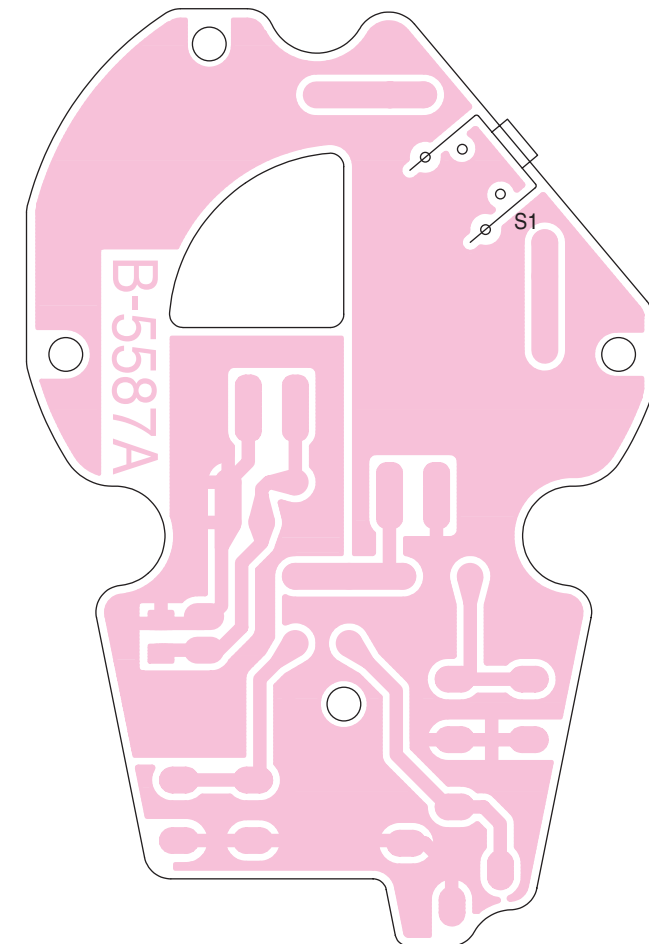
• BOTTOM VIEW



9-3 HM-132
• TOP VIEW

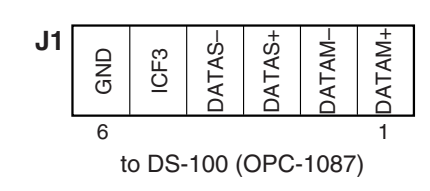
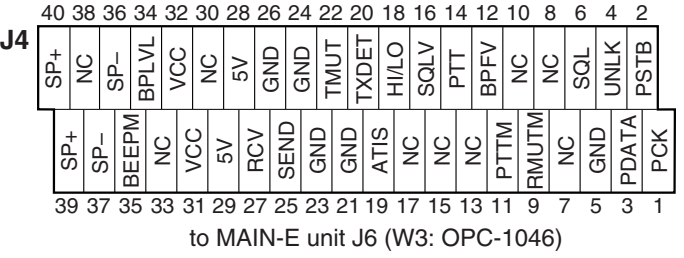
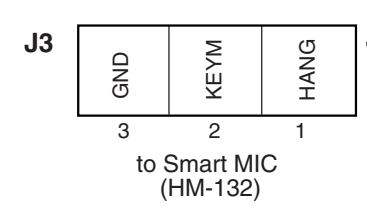
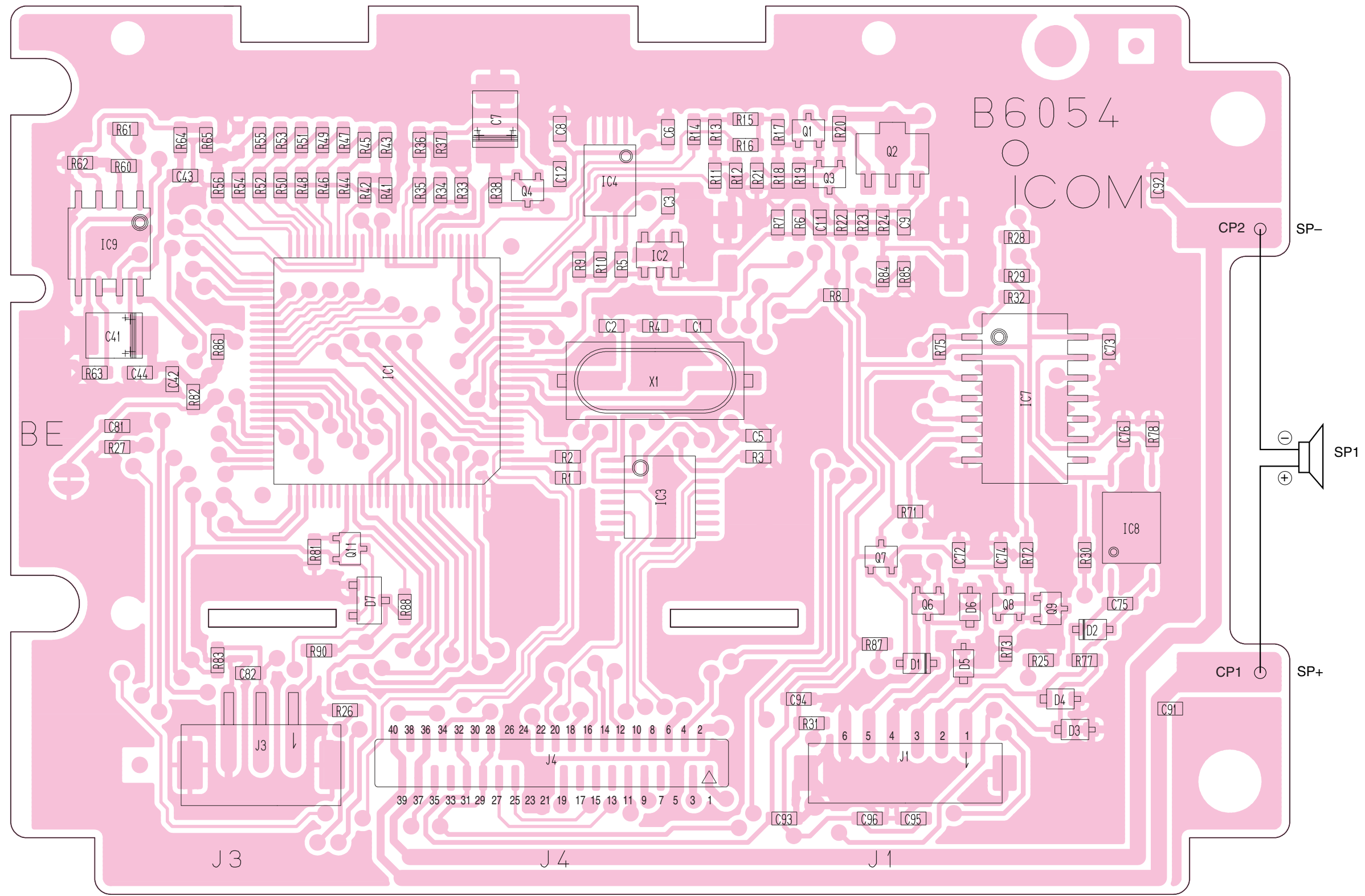


• BOTTOM VIEW



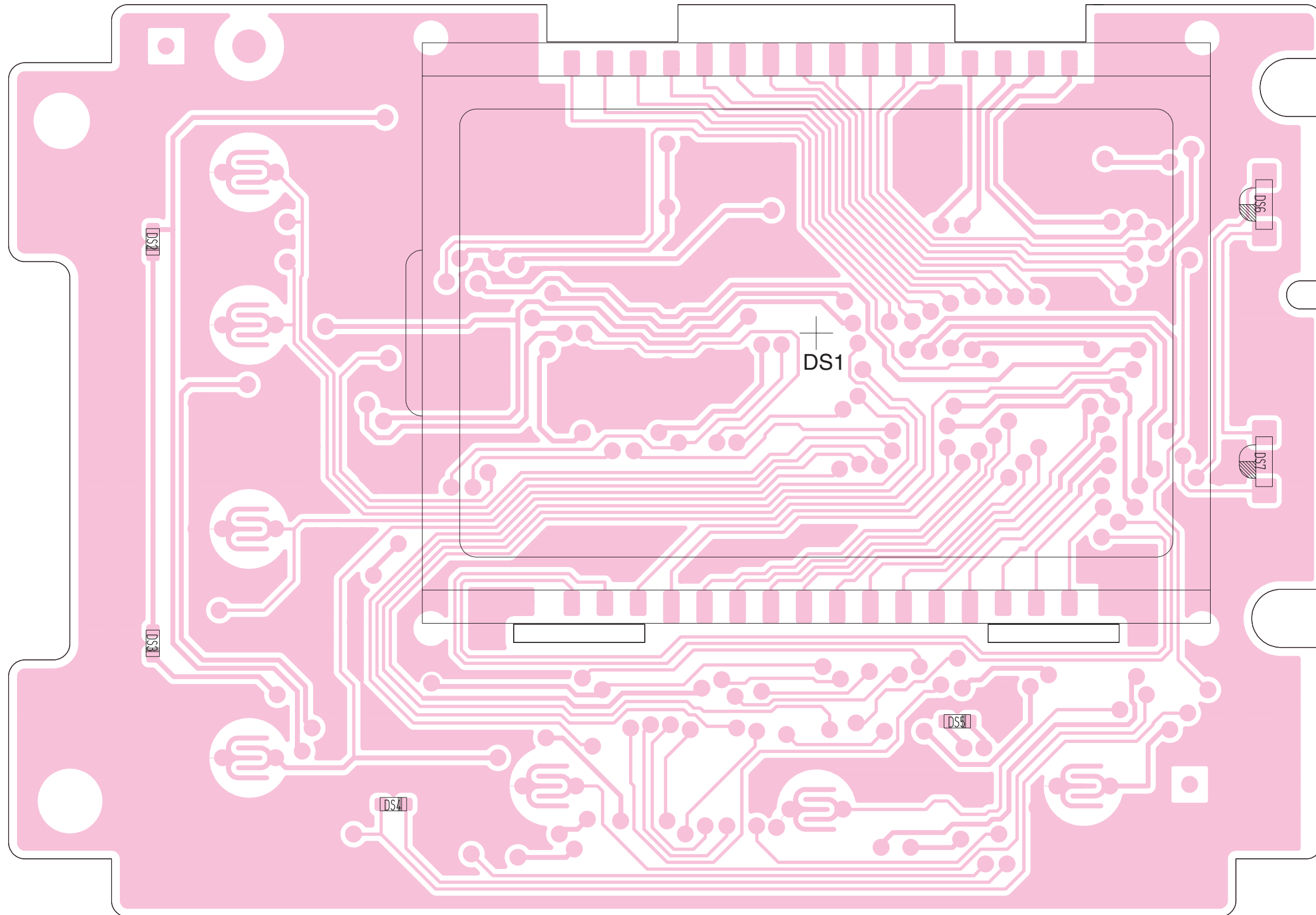
9-4 LOGIC-E BOARD
• TOP VIEW

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

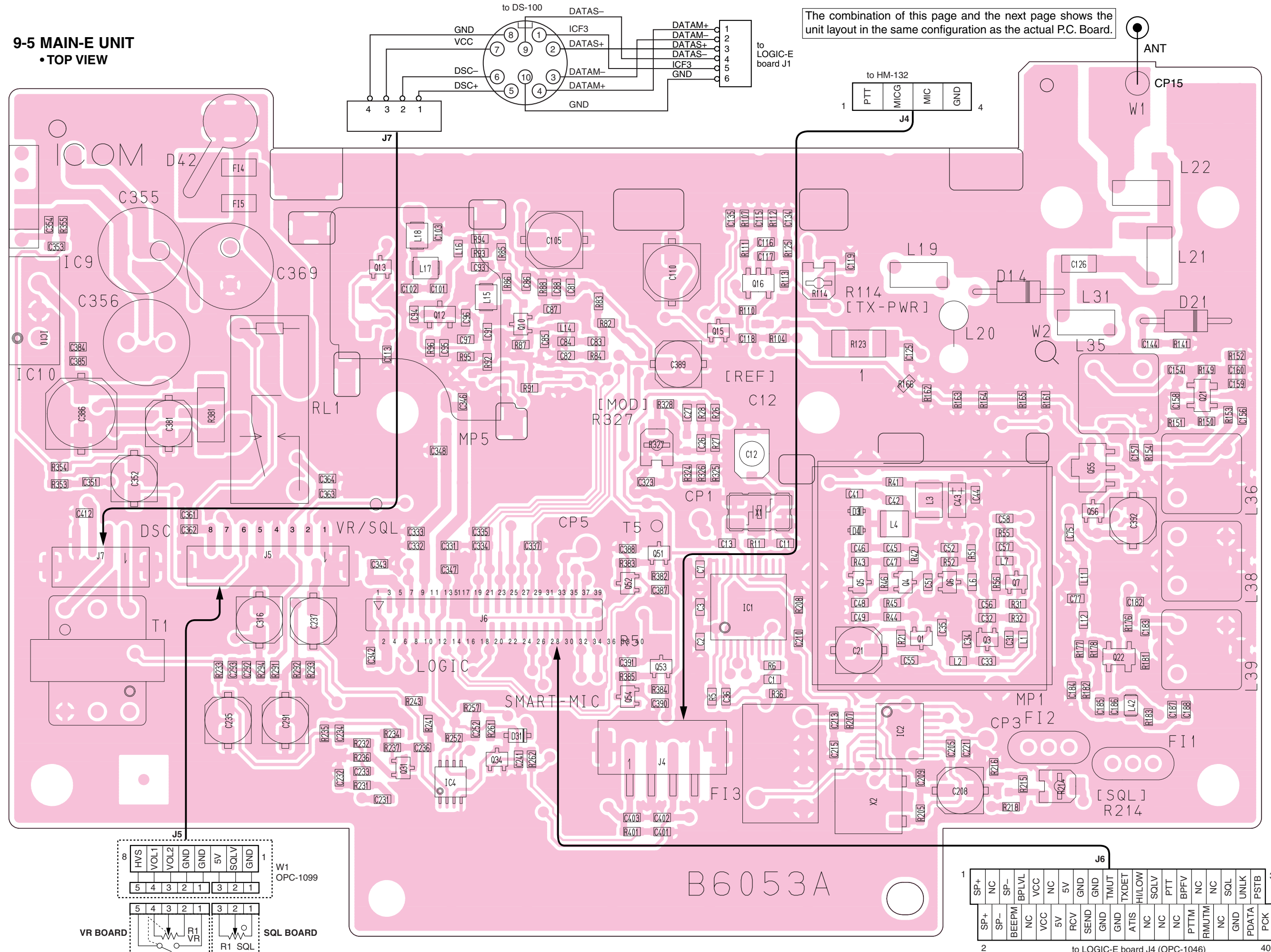


• BOTTOM VIEW

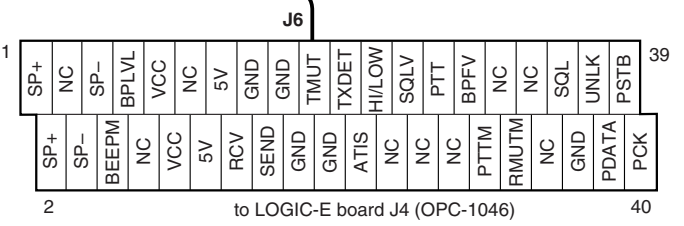
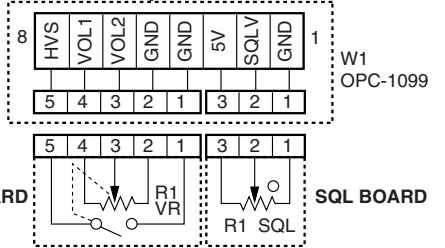
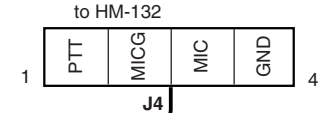
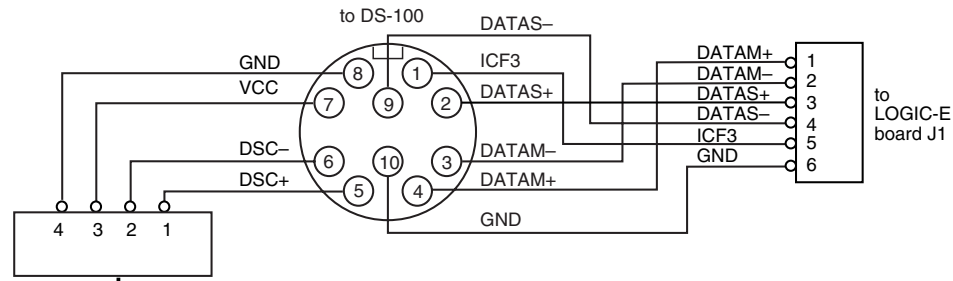
The combination of this page and the previous page shows the unit layout in the same configuration as the actual P.C. Board.



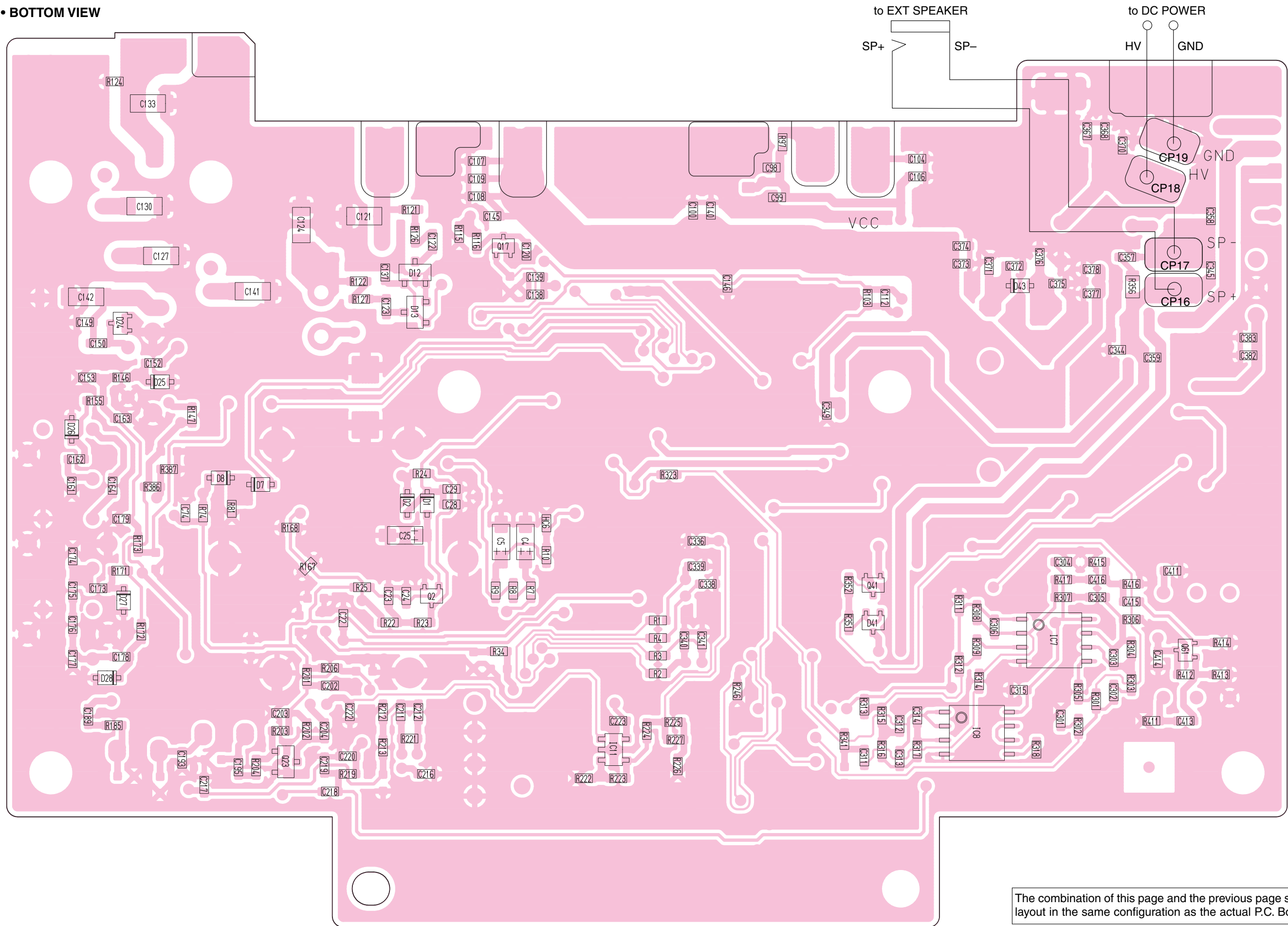
**9-5 MAIN-E UNIT
• TOP VIEW**



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

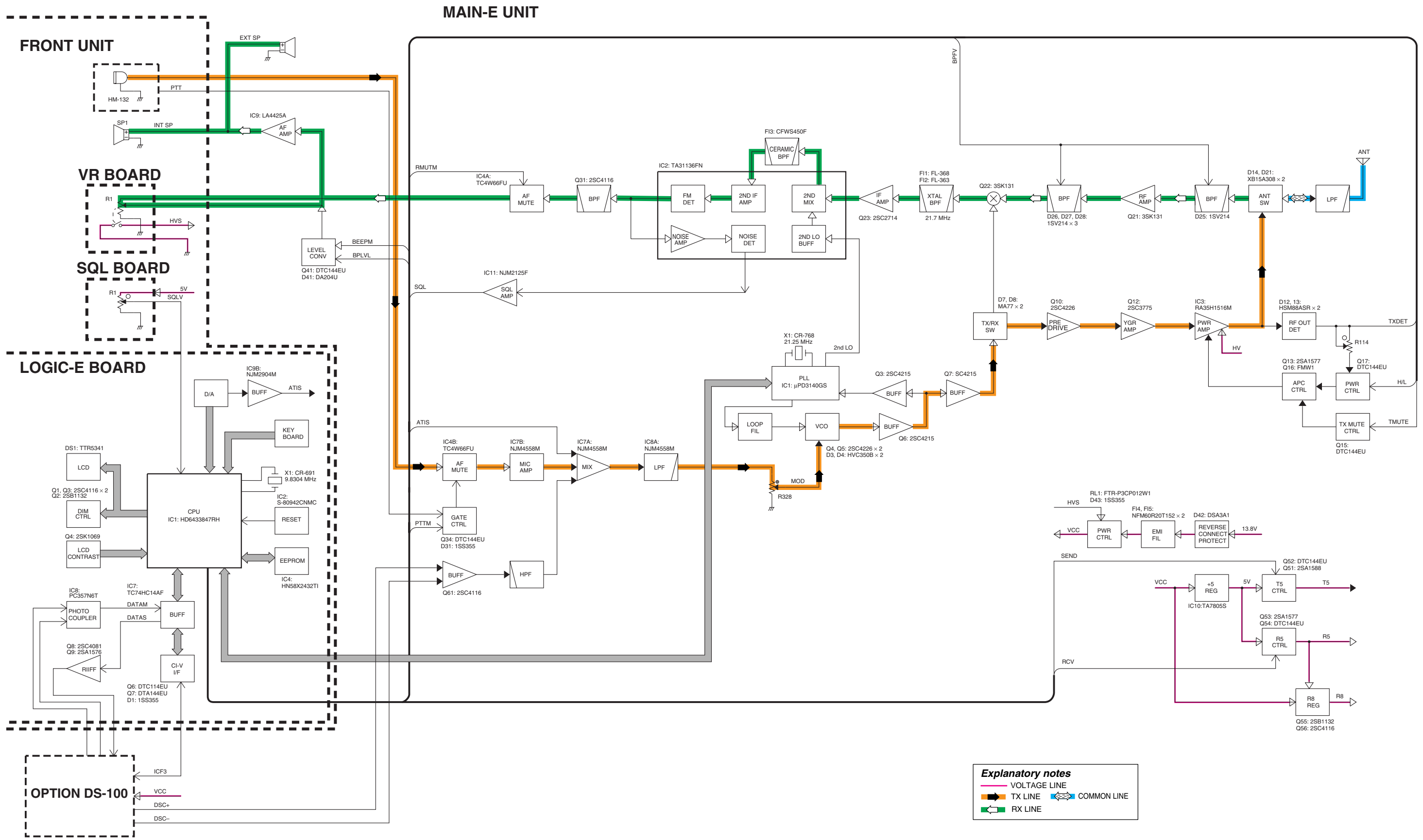


• BOTTOM VIEW



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

SECTION 10 BLOCK DIAGRAM

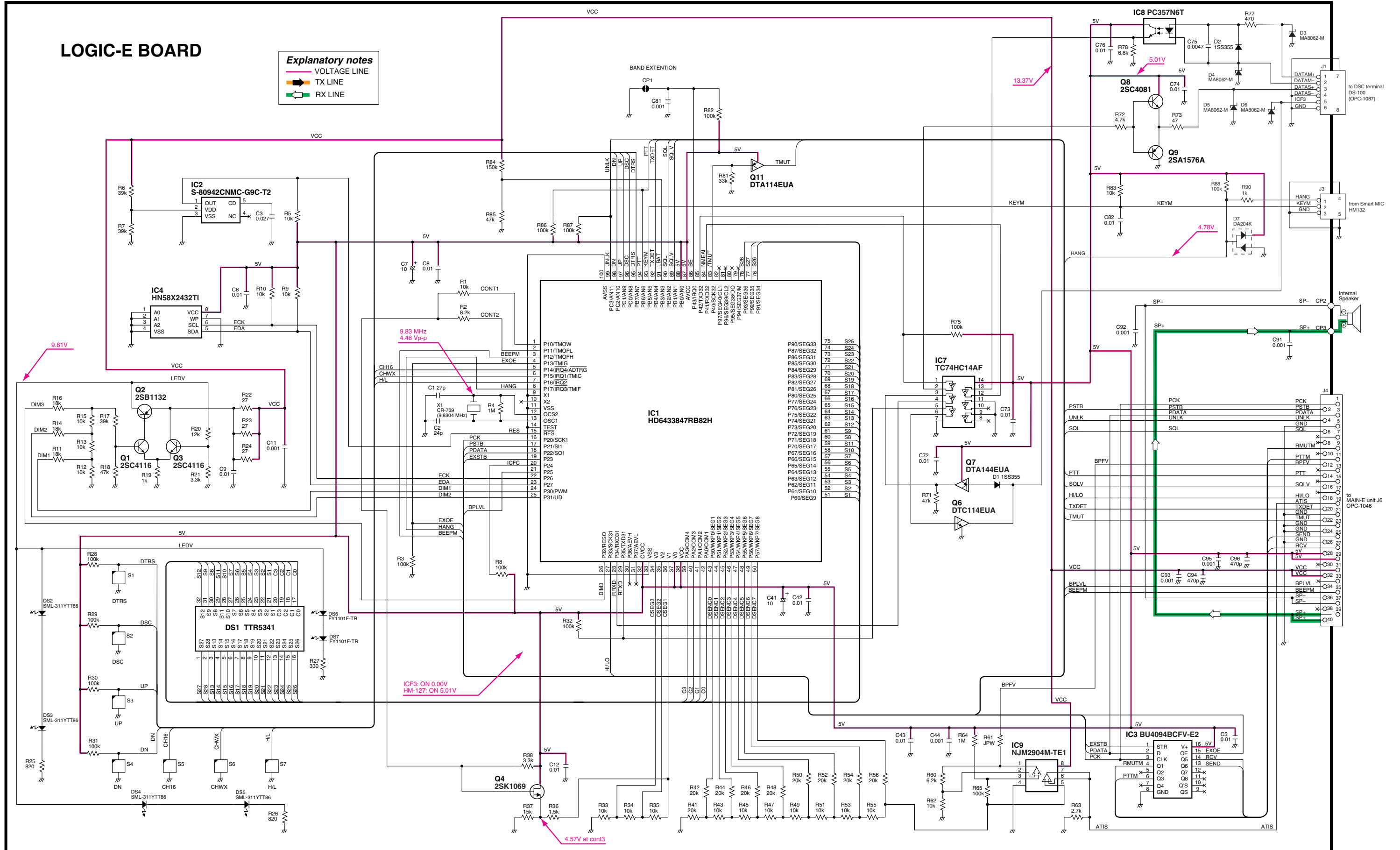


Explanatory notes

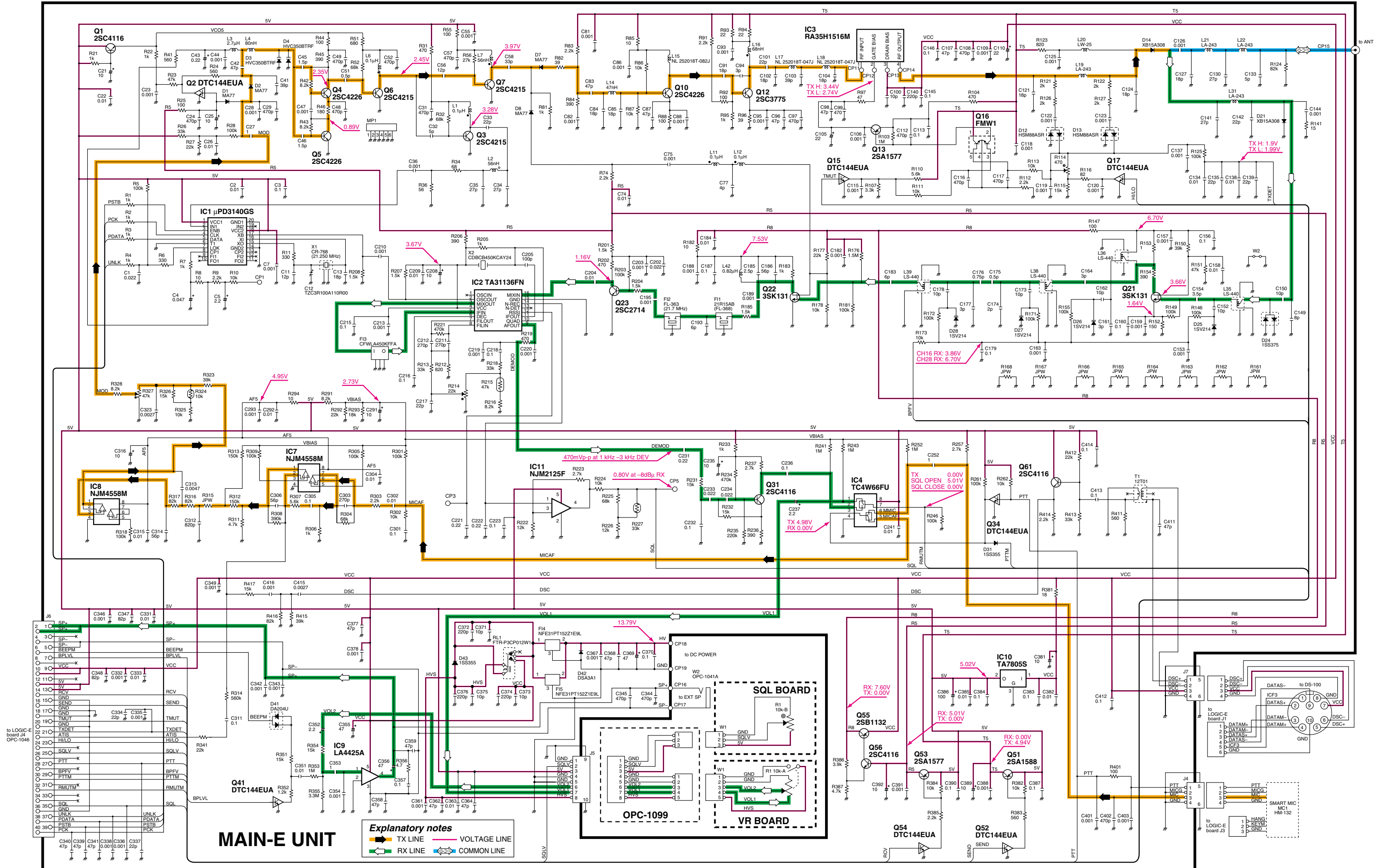
- VOLTAGE LINE
- TX LINE
- COMMON LINE
- RX LINE

SECTION 11 VOLTAGE DIAGRAM

11-1 LOGIC-E BOARD



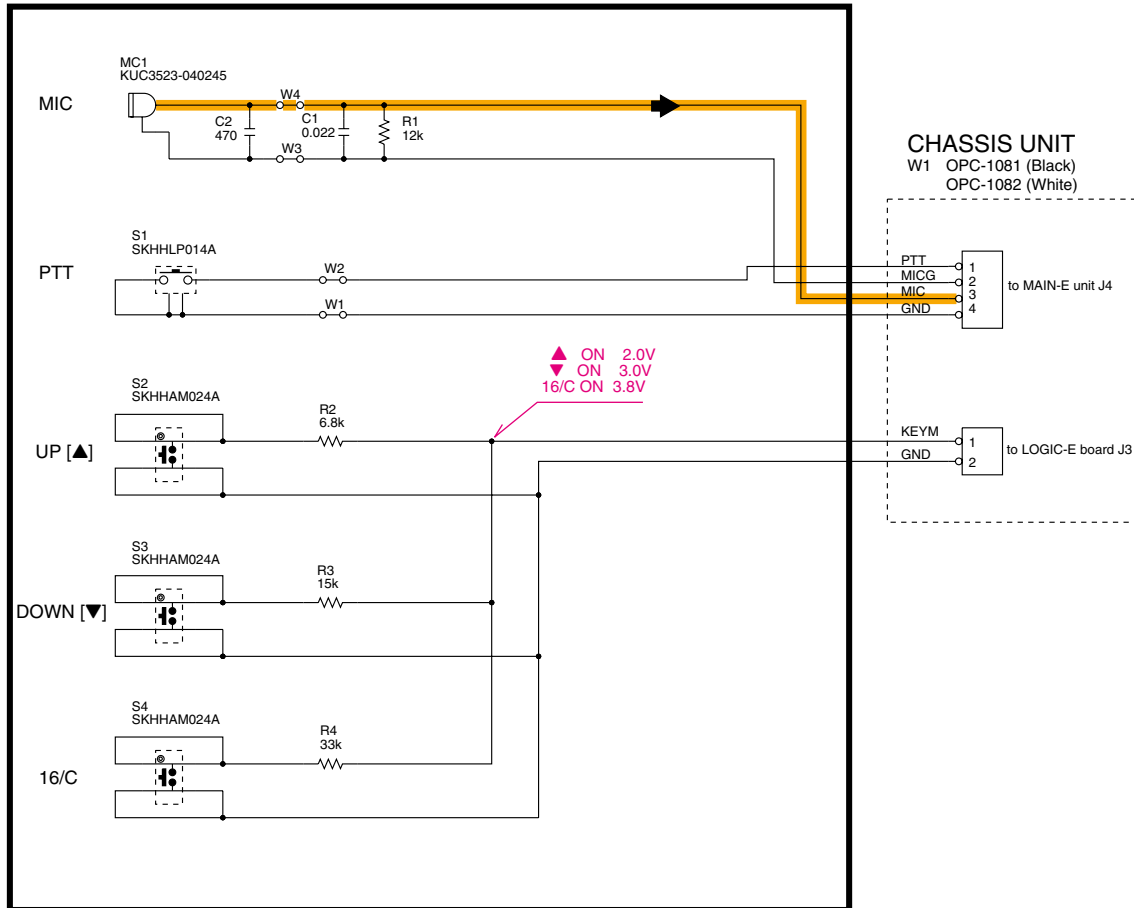
11-2 MAIN-E UNIT



MAIN-E UNIT

Explanatory notes
 — TX LINE
 — RX LINE
 — VOLTAGE LINE
 — COMMON LINE

11-3 HM-132



Icom Inc.

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URL : <http://www.icomuk.co.uk>

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URL : <http://www.icom-france.com>

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Phone : +886 (02) 2559 1899 Fax : +886 (02) 2559 1874

URL : <http://www.asia-icom.com>

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