



SERVICE MANUAL

VHF MOBILE TRANSCEIVERS

IC-F5011

IC-F5012

IC-F5013

IC-F5013H

S-14712XZ-C1
Feb. 2011

Icom Inc.

INTRODUCTION

This service manual describes the latest technical information for the **IC-F5011, IC-F5012, IC-F5013 and IC-F5013H** VHF MOBILE TRANSCEIVER, at the time of publication.

MODEL	VERSION	CHANNEL SPACING (kHz)	TX OUTPUT POWER
IC-F5011	[USA-01]	12.5/25.0	50 W
IC-F5012	[EUR-01]	12.5/20.0/25.0	25 W
IC-F5013	[EXP-01]	12.5/25.0	
IC-F5013H	[EXP-02]		50 W

CAUTION

NEVER connect the transceiver to an AC outlet or to a DC power supply that uses more than the specified voltage. 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.

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



ORDERING PARTS

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

1. 10-digit Icom part number
2. Component name
3. Equipment model name and unit name
4. Quantity required

<ORDER EXAMPLE>

1110007320	S.IC	NJM2591V	IC-F5012	MAIN UNIT	5 pieces
8820001210	Screw	2438 screw	IC-F5013	Top cover	10 pieces

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

REPAIR NOTES

1. Make sure that the 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 Standard Signal Generator or a Sweep Generator.
7. **ALWAYS** connect a 50 dB to 60 dB attenuator between the transceiver and a Deviation Meter or Spectrum Analyzer, when using such test equipment.
8. **READ** the instructions of the test equipment thoroughly before connecting it to the transceiver.

TABLE OF CONTENTS

SECTION 1 SPECIFICATIONS

SECTION 2 INSIDE VIEWS

SECTION 3 DISASSEMBLY INSTRUCTION]

SECTION 4 OPTIONAL PRODUCTS INSTALLATION

SECTION 5 CIRCUIT DESCRIPITON

5-1	RECEIVER CIRCUITS.....	5-1
5-2	TRANSMITTER CIRCUITS.....	5-3
5-3	FREQUENCY SYNTHESIZER CIRCUITS.....	5-4
5-4	VOLTAGE DIAGRAM.....	5-4
5-5	PORT ALLOCATIONS.....	5-5

SECTION 6 ADJUSTMENT PROCEDURES

6-1	PREPARATION.....	6-1
6-2	FREQUENCY ADJUSTMENT.....	6-4
6-3	TRANSMIT ADJUSTMENT.....	6-5
6-4	RECEIVE ADJUSTMENT.....	6-6

SECTION 7 PARTS LIST

SECTION 8 MECHANICAL PARTS

SECTION 9 BOARD LAYOUTS

SECTION 10 BLOCK DIAGRAM

SECTION 11 VOLTAGE DIAGRAM

SECTION 1

SPECIFICATIONS

			[USA], [EXP]	[EUR]	
GENERAL	• Frequency coverage		136–174 MHz		
	• Type of emission	Wide	16K0F3E (25.0 kHz)		
		Middle	–	14K0F3E (20.0 kHz)	
		Narrow	11K0F3E (12.5 kHz)	8K50F3E (12.5 kHz)	
	• Number of conventional channels		8		
	• Antenna impedance		50 Ω (Nominal)		
	• Operating temperature range		–30°C to +60°C (–22°F to +140°F)	–25°C to +55°C	
	• Power supply requirement (Nominal)		13.6 V DC (Negative ground)	13.2 V DC (Negative ground)	
	• Current drain (Approximately)	RX	Stand-by	250 mA	
			Max.audio	700 mA	
		TX	at 25 W	5.0 A	
			at 50 W*	10.0 A	–
• Dimensions (Projections not included)	[25 W ver.]	150 (W) × 40 (H) × 117.5 (D) mm; 5.9 (W) × 1.6 (H) × 4.6 (D) in			
	[50 W ver.]	150 (W) × 40 (H) × 167.5 (D) mm; 5.9 (W) × 1.6 (H) × 6.6 (D) in	–		
• Weight	[25 W ver.]	0.8 kg (1.8 lb)			
	[50 W ver.]	1.1 kg (2.4 lb)	–		
TRANSMITTER	• Transmit output power	[25 W ver.]	25 W (High), 10 W (Low2), 2.5 W (Low1)		
		[50 W ver.]	50 W (High), 25 W (Low2), 5.0 W (Low1)	–	
	• Modulation		Variable reactance frequency modulation		
	• Max. permissible deviation	Wide	±5.0 kHz		
		Middle	–	±4.0 kHz	
		Narrow	±2.5 kHz		
	• Frequency error		±2.5 ppm	±1.5 kHz	
	• Spurious emission		70 dB min.	0.25 μW (≤1 GHz), 1.0 μW (>1 GHz)	
	• Adjacent channel power	Wide	70 dB min.		
		Middle	–	70 dB min.	
		Narrow	60 dB min.		
	• Audio frequency response		+1 dB to –3 dB of 6 dB/octave (500–2500 Hz)		
	• Audio harmonic distortion		3% typ. (With 1 kHz AF 40% deviation)		
	• FM hum and noise (without CCITT filter)	Wide	More than 40 dB (46 dB typ.)	–	
		Narrow	More than 34 dB (40 dB typ.)	–	
	• Residual modulation (with CCITT filter)	Wide	–	More than 45 dB (55 dB typ.)	
		Middle	–	More than 43 dB (53 dB typ.)	
		Narrow	–	More than 40 dB (50 dB typ.)	
• Limiting charact of modulation		70–100% of maximum deviation			
• Microphone impedance		600 Ω			

*: 50 W version only.

		[USA], [EXP]	[EUR]	
RECEIVER	• Receive system	Double-conversion superheterodyne		
	• Intermediate frequencies	1st IF; 46.35 MHz, 2nd IF; 450 kHz		
	• Sensitivity	0.25 μ V typ. at 12 dB SINAD	-4 dB μ V (EMF) typ. at 20 dB SINAD	
	• Squelch sensitivity (At threshold)	0.25 μ V typ.	-4 dB μ V (EMF) typ.	
	• Adjacent channel selectivity	Wide	More than 70 dB (75 dB typ.)	
		Middle	-	More than 70 dB (75 dB typ.)
		Narrow	More than 60 dB (65 dB typ.)	
	• Spurious response	70 dB min.		
	• Intermodulation	More than 70 dB (75 dB typ.)	More than 65 dB (67 dB typ.)	
	• FM hum and noise (Without CCITT filter)	Wide	More than 40 dB (45 dB typ.)	-
		Narrow	More than 34 dB (40 dB typ.)	-
	• Residual modulation (With CCITT filter)	Wide	-	More than 45 dB (55 dB typ.)
		Middle	-	More than 43 dB (53 dB typ.)
		Narrow	-	More than 40 dB (50 dB typ.)
	• Audio output power	4.0 W typ. at 5% distortion with a 4 Ω load		
• Audio output impedance	4 Ω			

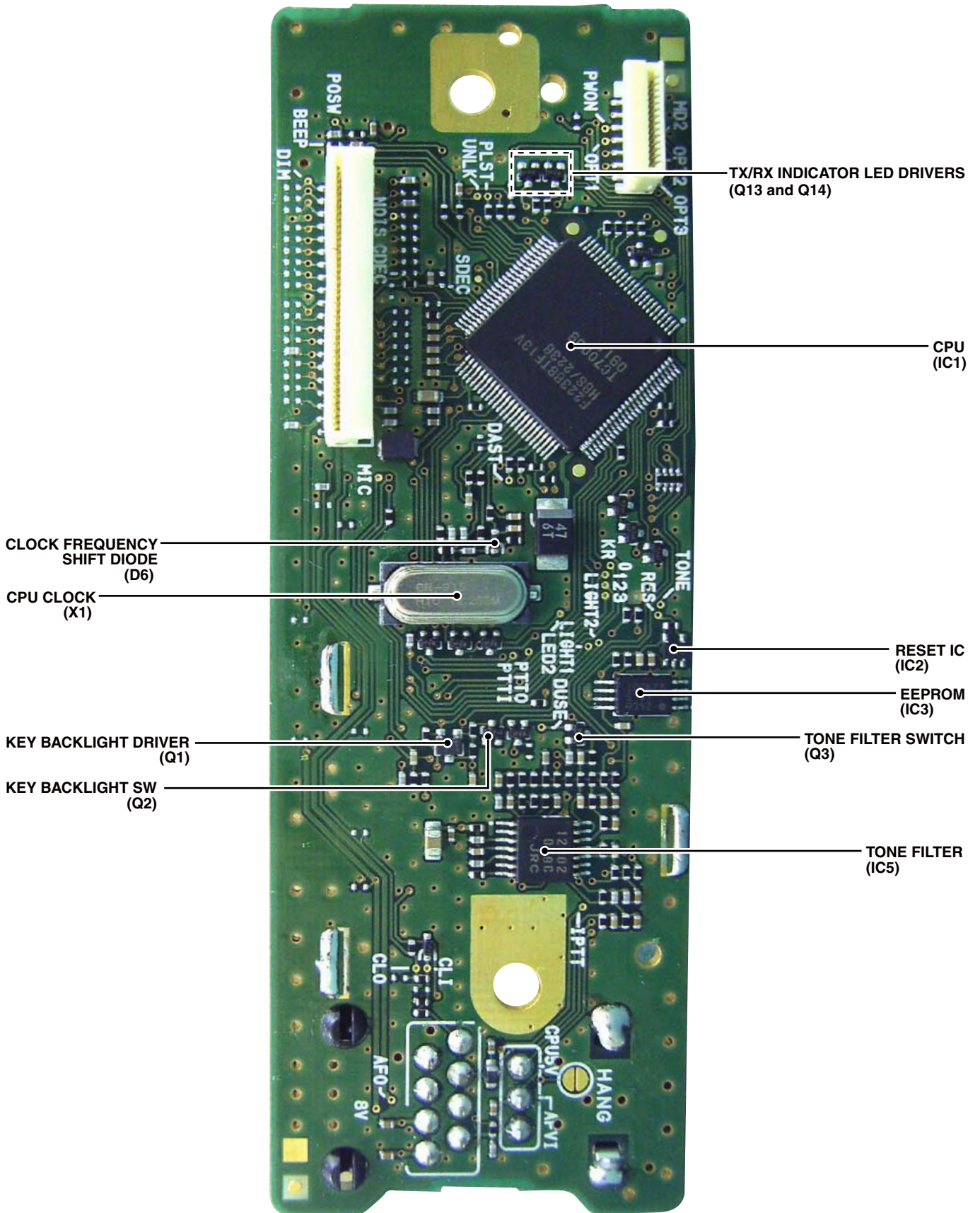
Measurements made in accordance with TIA-603 ([USA], [EXP]) or EN 300 086 ([EUR]).

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

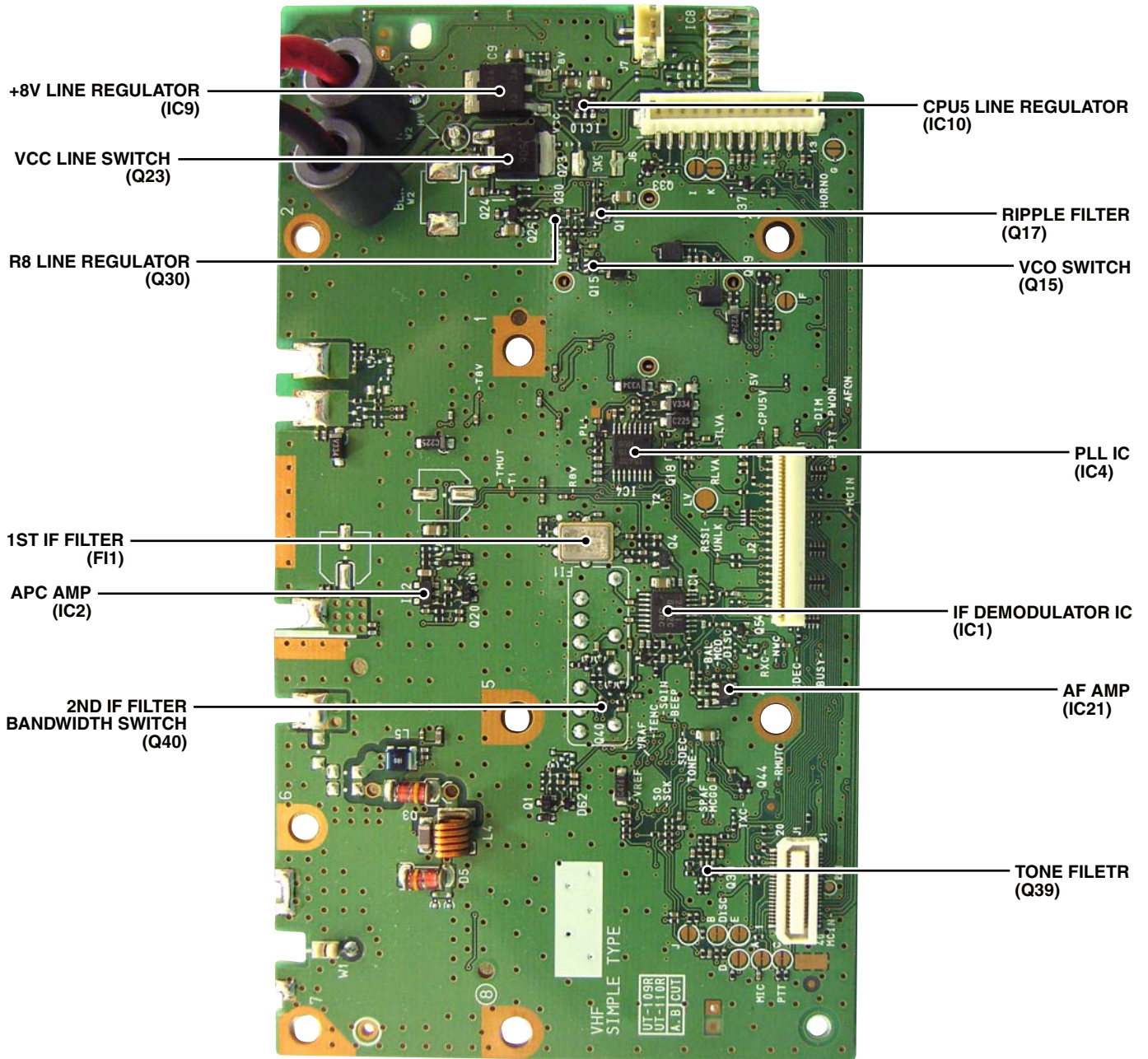
SECTION 2

INSIDE VIEWS

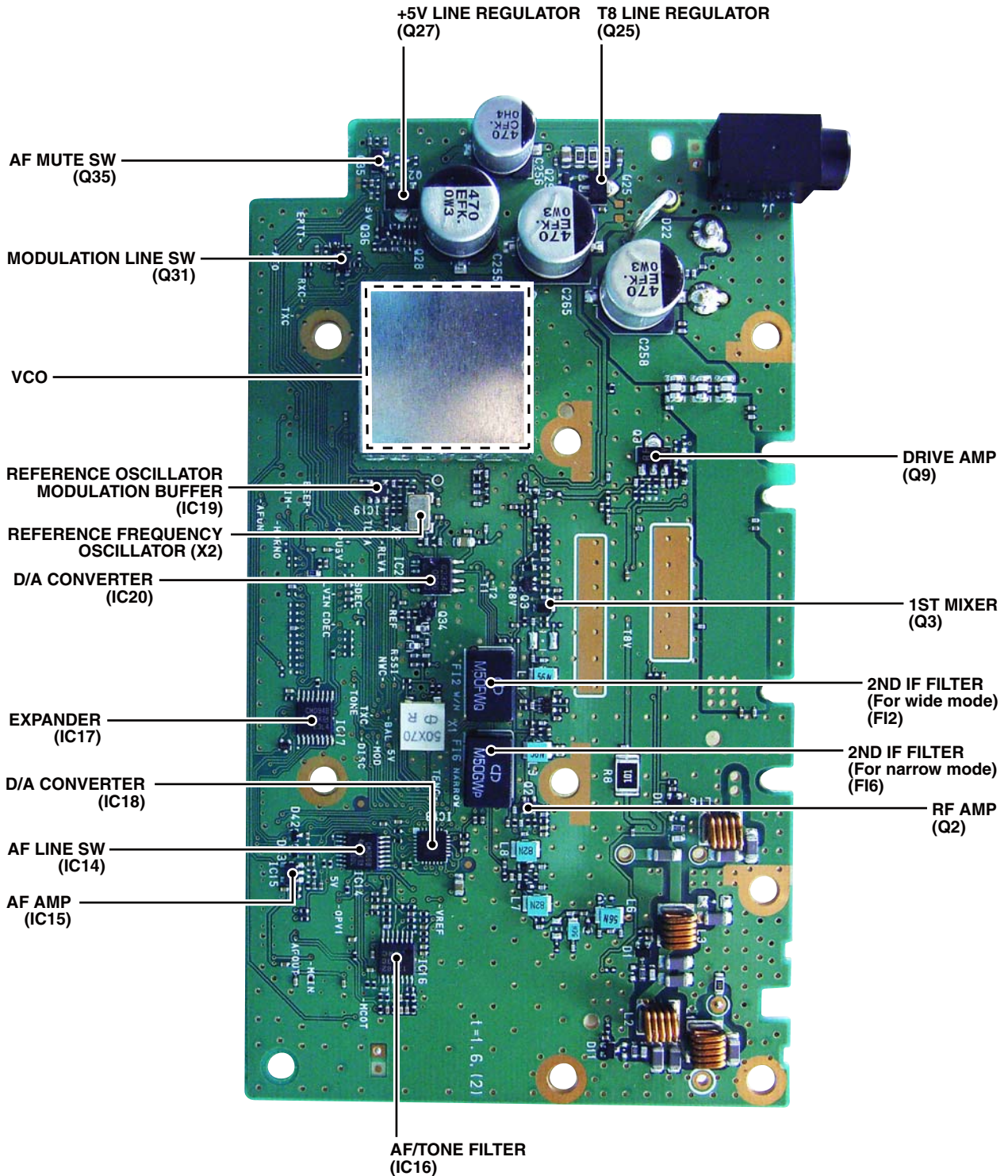
• FRONT UNIT



• MAIN-A UNIT
(TOP VIEW)

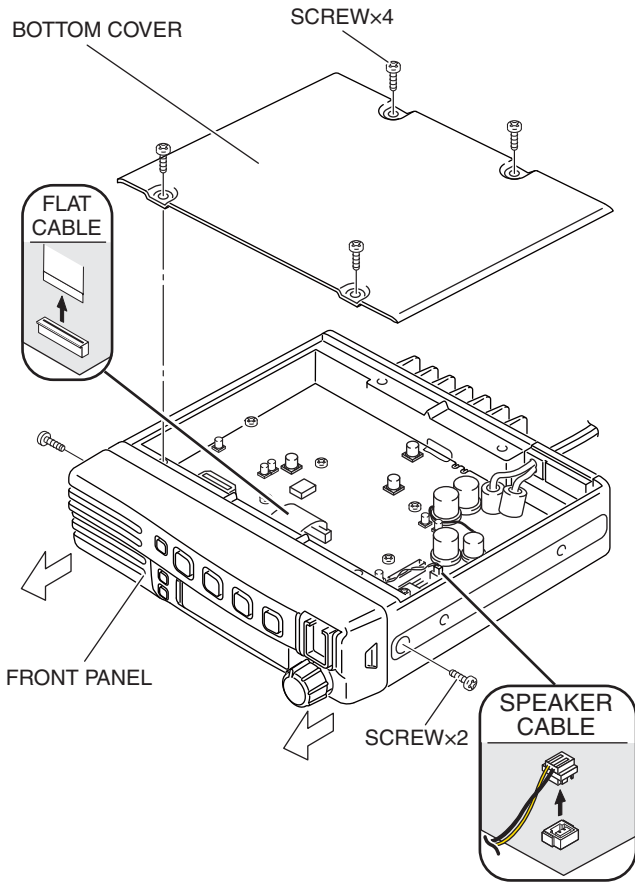


• MAIN-A UNIT
(BOTTOM VIEW)

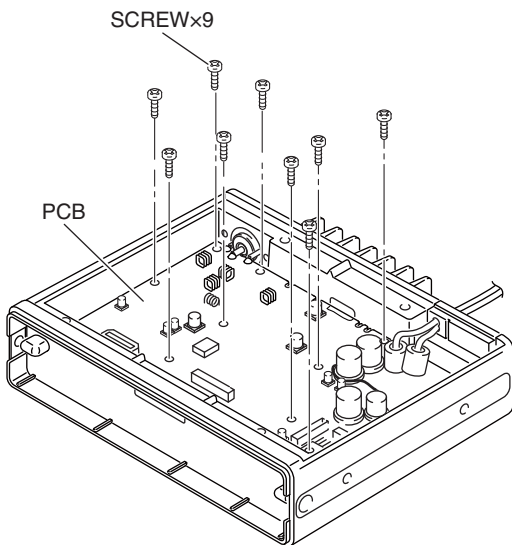


SECTION 3 DISASSEMBLY INSTRUCTION

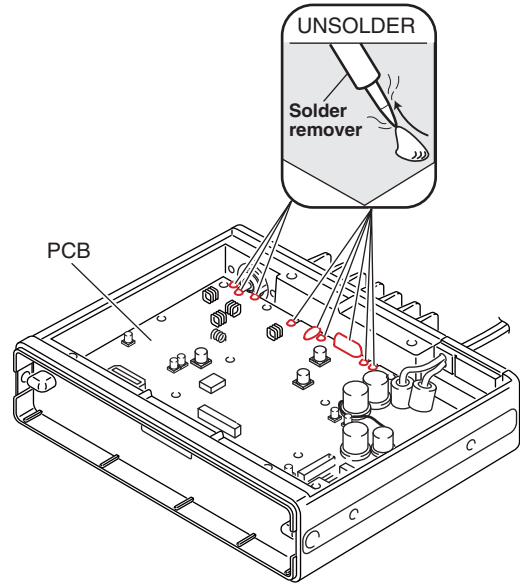
- 1) Remove 4 screws from the bottom cover, and then remove it.
- 2) Disconnect the flat cable and speaker cable.
- 3) Remove 2 screws from the both sides, and then remove the front panel in the direction of the arrow.



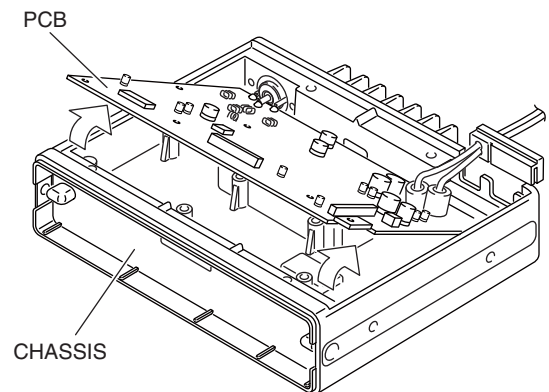
- 4) Remove 9 screws from the PCB.



- 5) Unsolder total of 9 points; 3 points at the antenna connector, 6 points at the PA module.



- 6) Remove the PCB from the CHASSIS.

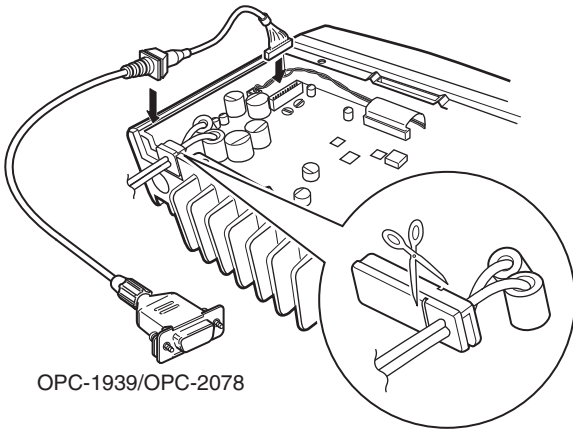


SECTION 4

OPTIONAL PRODUCTS INSTALLATION

Install optional OPC-1939/OPC-2078 as follows:

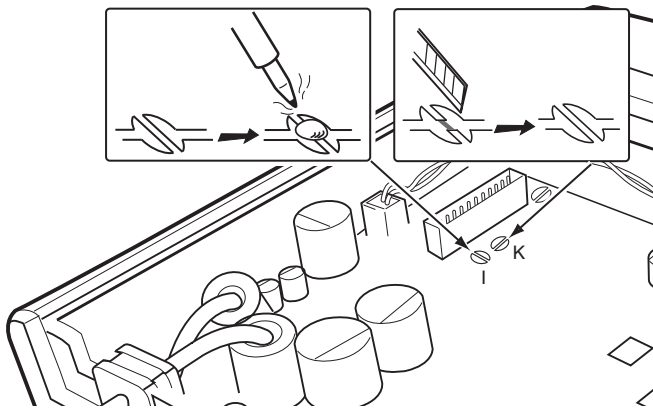
- 1) Turn OFF the power, and then disconnect the DC power cable.
- 2) Remove 4 screws, and then remove the bottom cover.
- 3) Install the cable as shown.



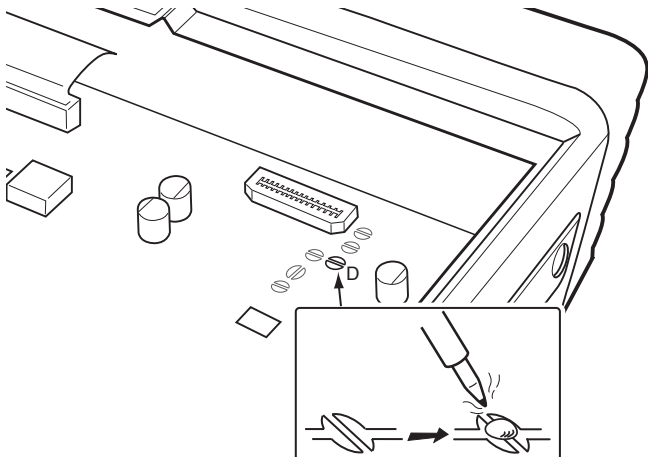
OPC-1939/OPC-2078

Cut off the bushing as in the illustration.

- 4) Cut or short the patterns as below. (For AF output)



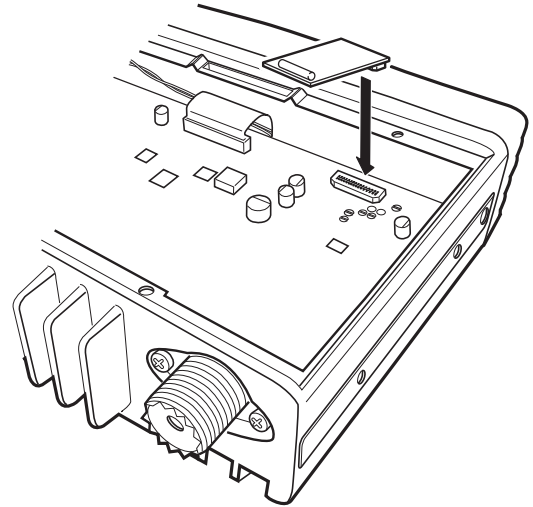
- 5) Short the pattern as below. (For modulation input)



- 6) Recover the bottom cover, screws and DC power cable.

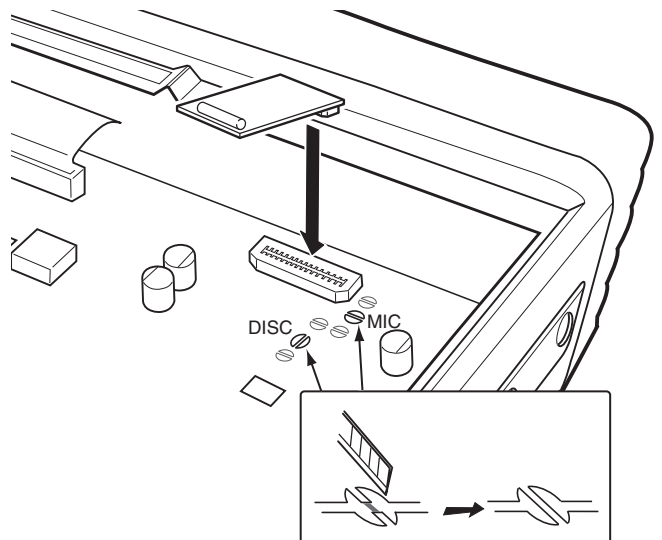
Install optional UT-108R as follows:

- 1) Turn OFF the power, and then disconnect the DC cable.
- 2) Remove 4 screws, and then remove the bottom cover.
- 3) Install the unit as shown.
- 4) Recover the bottom cover, screws and DC power cable.

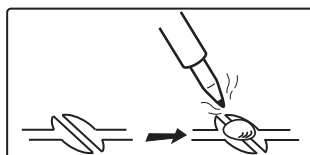
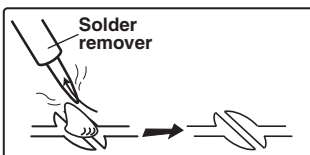


Install optional UT-109R or UT-110R as follows:

- 1) Turn OFF the power, and then disconnect the DC power cable.
- 2) Remove 4 screws, and then remove the bottom cover.
- 3) Cut the pattern on the PCB at "MIC" and "DISC" as shown.
- 4) Install the unit as shown.
- 5) Recover the bottom cover, screws and DC power cable.



NOTE: Be sure to recover the patterns when you remove the optional product. Otherwise no TX modulation or AF output is available.



5-1 RECEIVER CIRCUITS

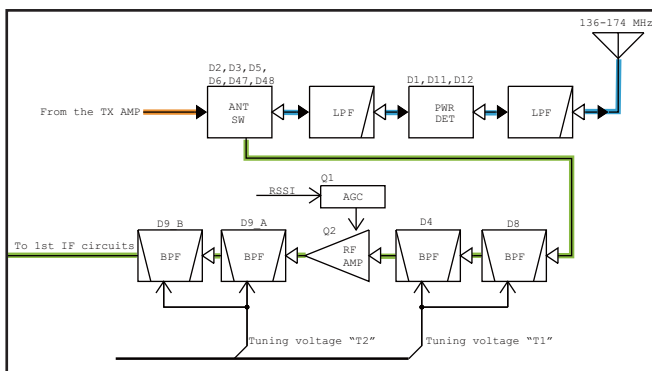
RF CIRCUITS (MAIN-A UNIT)

RF signal from the antenna is passed through the LPF (as the harmonic filter for transmitting) and antenna SW, and then applied to the RX BPF circuit.

The applied RX signal is passed through the 2-staged tuned BPF (D4, D8) to remove unwanted out-of-band signals, and amplified by the low-noise RF AMP (Q2), and then applied to the 1st mixer (Q3) through another 2-staged tuned BPF (D9, 10).

Total of 4 stage BPFs are tuned to the RX frequency by the tuning voltage "T1" and "T2" from the D/A converter (IC20), to obtain required IMD characteristic.

• RF CIRCUITS



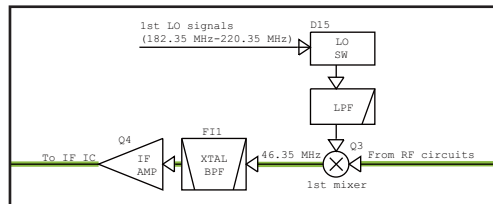
1ST IF CIRCUITS (MAIN-A UNIT)

The RX signal from the BPF is mixed with the 1st LO signal to be converted into the 46.35 MHz 1st IF signal.

The 1st LO signal is generated by the RX VCO (Q14, D33, D34, L26, L39, etc.), and passed through the LO SW (D15) and attenuator, and then applied to the 1st mixer (Q3)

The converted 1st IF signal is filtered by the crystal filter (F11) and amplified by the 1st IF AMP (Q4), then applied to the IF demodulator IC (IC1).

• 1ST IF CIRCUITS



2ND IF AND DEMODULATOR CIRCUITS (MAIN-A UNIT)

The amplified 1st IF signal is mixed with the 2nd LO signal at the internal 2nd IF mixer of the IF demodulator IC (IC1), to obtain the 450 kHz 2nd IF signal.

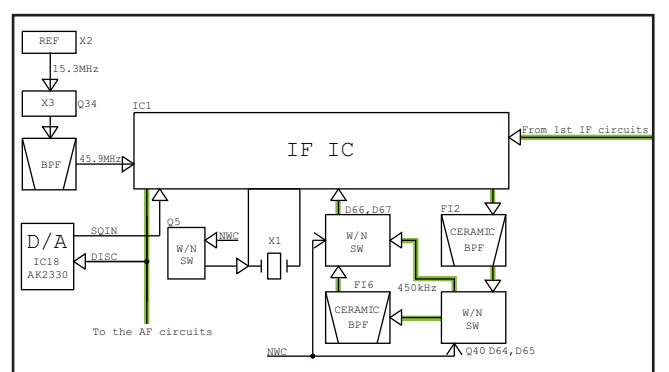
The 15.3 MHz signal generated by the reference oscillator (X2) is passed through the filter AMP (Q34, L33, 35, C305-308) to extract the 45.9 MHz 3rd harmonic component. The 45.9 MHz signal is then applied to the pin 2 of IF demodulator IC (IC1) as the 2nd LO signal.

The converted 2nd IF signal is output from the pin 3 of IF demodulator IC (IC1), and filtered by the ceramic filters (FI2 and FI6 for Narrow mode; FI2 only for Wide mode) to remove unwanted out-of-band signals, and then applied to the internal frequency-demodulator of IF demodulator IC (IC1) from pin 5.

The demodulator is a quadrature type which uses X1 as the phase shifter.

The frequency-demodulated AF signal is output from pin 9 to AF circuits.

• 2ND IF AND DEMODULATOR CIRCUITS



AF CIRCUITS (MAIN-A UNIT)

The demodulated AF signal from the IF demodulator IC (IC1) is amplified by the AMP (IC21), filtered by the HPF (IC16), and then passed through the AF line SW (IC14) and LPF (IC16). The filtered AF signal is adjusted in level (=loudness) by the D/A converter (IC18), and applied to the AF AMP (IC15) through the AF line SW (IC14).

The amplified AF signal is applied to the AF power AMP (IC8) and power-amplified to obtain AF output level.

The power-amplified AF signal is output from the external speaker jack (J4) on the rear panel, or applied to the internal speaker on the FRONT UNIT, through the external speaker jack (J4).

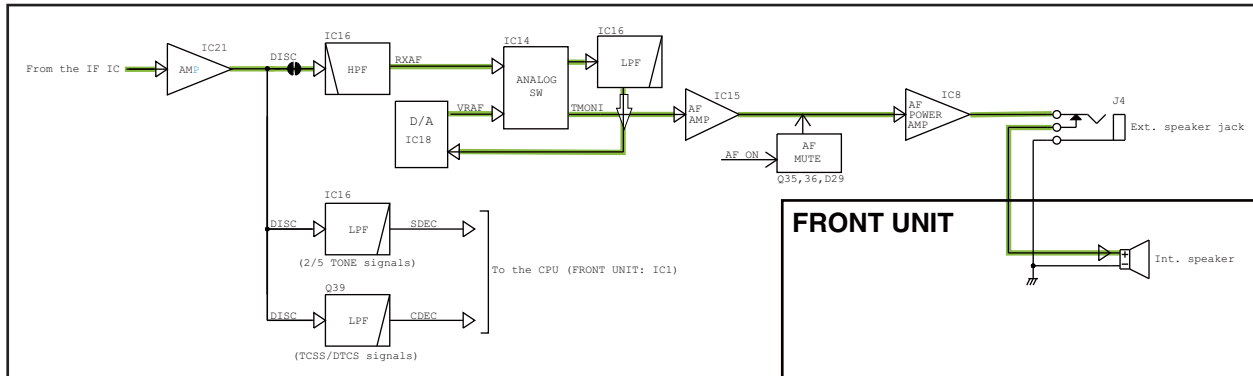
SIGNALING (DECODING) (MAIN-A UNIT)

Demodulated signal from the pin 9 of the IF demodulator IC (IC1) is passed through the LPF to extract tone signals contained in the demodulated signal.

2/5 tone signal is extracted by the LPF (IC16). CTCSS/DTCS signals are extracted by the LPF (Q39).

These extracted tone signal is applied to the CPU (FRONT UNIT: IC1) for decoding.

• RX AF CIRCUITS



5-2 TRANSMITTER CIRCUITS

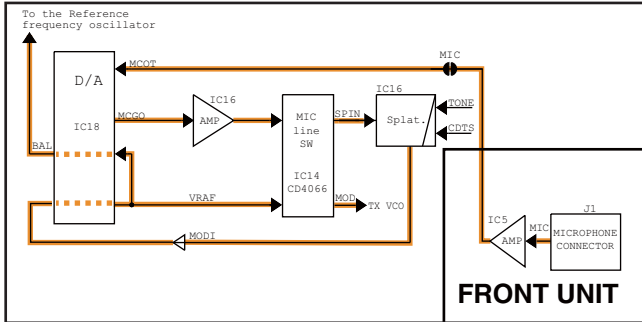
MIC AMPLIFIER (FRONT UNIT)

Audio signal from the connected microphone is applied to the MIC AMP (IC5), through the microphone connector (J1). The amplified MIC signal is applied to the MAIN UNIT.

TX AF CIRCUITS (MAIN-A UNIT)

The MIC signal from the FRONT UNIT is passed through the D/A converter (as a MIC gain controller; IC18) for level adjustment, and applied to the limiter AMP which is also rolled to the pre-emphasis circuit (IC16).

•TX AF CIRCUITS



MIC MUTE SWITCH (MAIN-A UNIT)

The pre-emphasized MIC signal is passed through the MIC mute SW (IC14).

While receiving, the MIC mute SW (IC14) cuts the MIC line off, and is controlled by "MMUT" signal from the expander (IC17).

SPLATTER FILTER (MAIN-A UNIT)

The MIC signal from the MIC mute SW (IC14) is applied to the splatter filter (IC16).

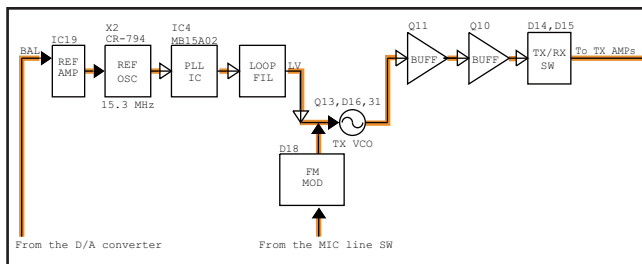
The splatter filter (IC16) is also used as the AF Summing AMP for tone signal modulation (CTCSS, 2/5 TONE).

MODULATION CIRCUIT (MAIN-A UNIT)

MIC signal from the splatter filter (IC16) is level-adjusted (=deviation adjustment) by the D/A converter (IC18), and applied to the TX VCO (Q13, D16, 31), through the modulation mute SW (IC14) as the modulation signal.

The MIC signal is also applied to the reference frequency oscillator (X2) as the modulation signal, through D/A converter (IC18) and REF AMP (IC19).

• MODULATION CIRCUITS



CTCSS/DTCS SIGNALS ENCODING (FRONT UNIT)

The CTCSS/DTCS encoding signal from the CPU (IC1) "CENC0-CENC2" is passed through the LPF (IC5) for waveform conversion, and applied to the MAIN UNIT as tone modulation signal.

2/5 TONE, DTMF ENCODING (FRONT UNIT)

Encoding signal from the CPU (IC1) named "SENC" is passed through the LPF (IC5), and applied to the MAIN UNIT as tone modulation signal.

TX AMPLIFIERS (MAIN-A UNIT)

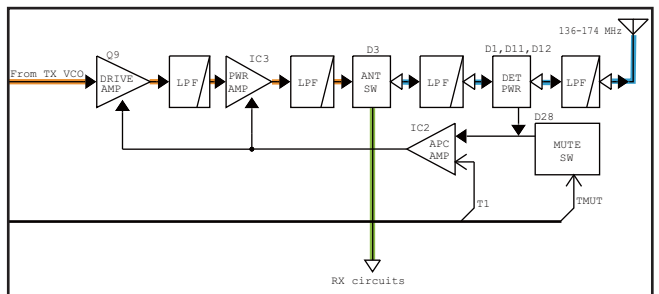
The frequency-modulated signal from the TX VCO is buffer-amplified by two buffers (Q11 and Q10), and applied to the drive AMP (Q9) as the TX signal through the LO SW (D14). The amplified TX signal is applied to the FET HPA module (IC3) through the LPF, and power-amplified to obtain TX output power level.

The power-amplified TX signal is passed through the antenna SW (D3) and LPF as a harmonic filter, and then fed to the antenna.

APC CIRCUIT (MAIN-A UNIT)

A portion of TX signal rectified by D1, D11 and D12 on the TX line to detect TX power level. The rectified voltage is applied to the APC AMP (IC2), and the APC AMP controls the gain of HPA module (IC3) automatically by comparing the rectified voltage and the power setting voltage "T1."

•TX AMPLIFIERS APC CIRCUIT



5-3 FREQUENCY SYNTHESIZER CIRCUITS VCOs (MAIN-A UNIT)

The TX VCO which generates the TX signal is composed by Q13, D16, D31, L25, L38, etc., and the frequency modulation is carried out by applying modulation signals to D18.

The RX VCO which generates the 1st LO signals is composed by Q14, D33, D34, L26, L39, etc.

These two VCOs are switched by the VCO SW (Q15, 16) using "RXC" signal.

The output signal from each VCO is amplified by the buffer AMP (Q11) and LO AMP (Q10), and then applied to the TX or RX circuits.

A portion of generated signals is applied to the PLL IC (IC4) via buffer AMP (Q12).

PLL (MAIN-A UNIT)

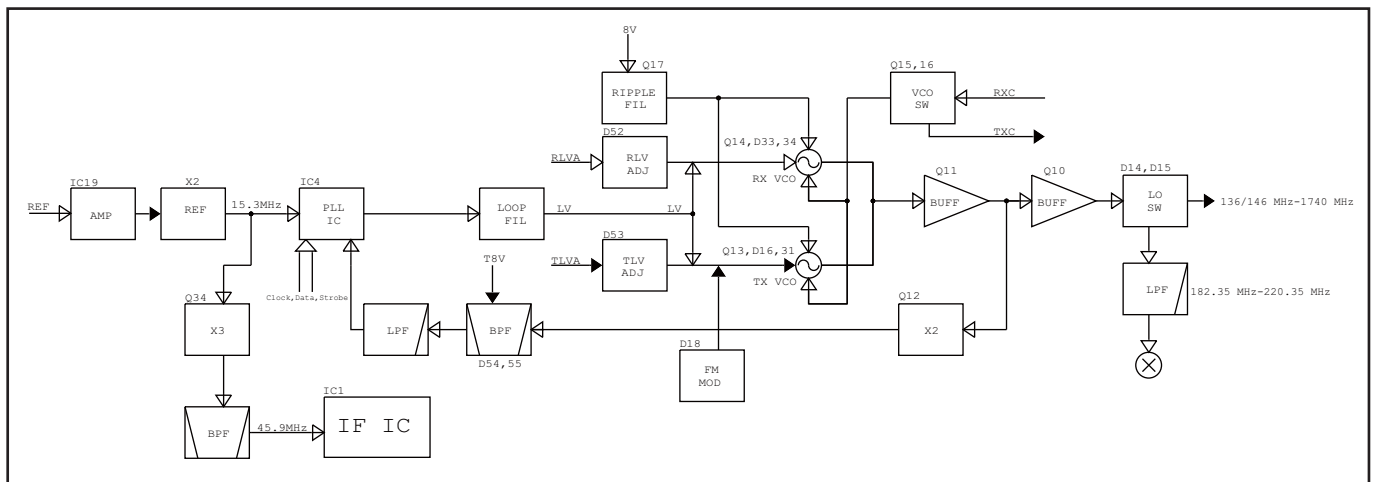
The applied VCO output is divided according to the serial data including divide ratio from the CPU, at the prescaler and programmable divider. In the same way, the reference frequency signal from the reference frequency signal oscillator is applied to the PLL IC and divide so that these are the same frequency.

The frequency-matched signal is applied to the phase comparator and phase-compared. The resulted phase difference is detected as a phase-type signal, and level-adjusted at the charge pump then output. The output pulse type signal is passed through the loop filter to be converted into the DC voltage (=Lock Voltage).

Applying the lock voltage to the variable capacitors (VD) which composes a part of the resonator of VCO, the capacitance of VDs changes corresponding to the applied lock voltage. This causes the change of resonation frequency that determines the VCO oscillating frequency to keep the VCO frequency constant.

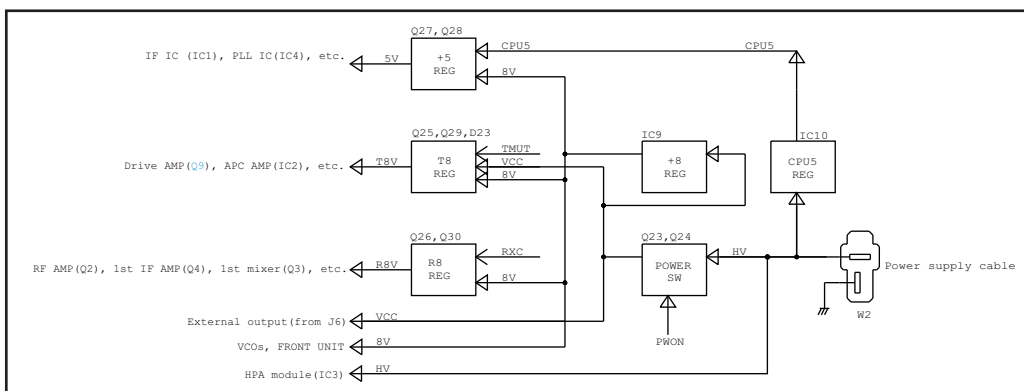
When the oscillation frequency drifts, its phase changes from that of the reference frequency, causing a lock voltage change to compensate for the drift in the VCO oscillating frequency.

• FREQUENCY SYNTHESIZER CIRCUITS



5-4 VOLTAGE DIAGRAM

Voltage from the power supply is routed to the whole of the transceiver via regulators and switches.



5-5 PORT ALLOCATIONS

• CPU (FRONT UNIT; IC1)

Pin No.	Port Name	Description	I/O
1-3	KR1-KR3	Dealer-programmable keys input.	I
10	CCS	Chip-select signal to the attached optional unit.	O
19-21	CENC0-CENC2	CTCSS/DTCS signal.	O
23	DUSE	Frequency response of tone filter (IC5) switching control. "Low"=While transmitting.	O
24	IPTT	PTT input. "Low"=PTT is pushed.	I
25	HANG	Microphone on/off hook detect. "Low"=The microphone is off hook.	I
30	PLST	PLL strobe to the PLL IC (MAIN UNIT; IC4, pin 11).	O
34	ULCK	PLL unlock detect signal from the PLL IC (MAIN UNIT; IC4, pin 7). "Low"=While the PLL circuit is unlocked.	I
35	LED1	Key indicator LED for [P1] (DS9) control. "High"= Lights.	O
36	LED2	Key indicator LED for [P2] (DS8) control. "High"= Lights.	O
37	LED3	Key indicator LED for [P3] (DS7) control. "High"= Lights.	O
28	POSW	[PWR] key input. "Low"=Pushed.	I
39	DSDA	Serial data to the D/A converter (MAIN UNIT; IC20, pin 6).	O
43	SENC	DTMF signals to the LPF (IC5, pin 3).	O
44	BEEP	Beep audio.	O
45	SDEC	DTMF signals.	I
46	CDEC	CTCSS/DTCS signals.	I
48	BATV	Power supply voltage.	I
49	LVIN	VCO lock voltage.	I
50	RSSI	Received signal strength level signal from the IF demodulator IC (MAIN UNIT; IC1, pin 12).	I
51	TEMP	Temperature sensing voltage.	I
52	AFVI	[VOL] dial (R14) input. (divided voltage of "5V" line)	I
59	RES	CPU reset signal from the reset IC (IC8, pin 1). "Low"=CPU is reset.	I
69	CSFT	CPU clock shift signal to the clock frequency shift switch (D6).	O
71	DAST	Strobe signal to the D/A converter (MAIN UNIT; IC18, pin 7).	O
72	IGSW	Ignition SW input.	I
75	NOIS	Noise signal from the IF demodulate IC (MAIN UNIT; IC1, pin 13).	I
82	ESDA	Serial data to the EEPROM (IC3, pin 5).	O
85	ESCL	Clock signal to the EEPROM (IC3, pin 6).	O
86	PWON	Transceiver's power control. "High"=Power ON.	I
87	CH4L	Channel indicator LED for [CH4] (DS3) control. "High"= Lights.	O
88	CH3L	Channel indicator LED for [CH3] (DS4) control. "High"= Lights.	O
89	CH2L	Channel indicator LED for [CH2] (DS5) control. "High"= Lights.	O
90	CH1L	Channel indicator LED for [CH1] (DS6) control. "High"= Lights.	O
95	LIGT2	Key backlight LED (DS1, DS2) control. "High"=Backlight is ON.	O
96	TLED	TX indicator LED (DS10) control. "High"= Lights red (While transmitting).	O
97	RLED	RX indicator LED (DS10) control. "High"= Lights green (While receiving).	O

Pin No.	Port Name	Description	I/O
98	SCK	Serial clock signal to the PLL IC (IC4, pin 9) and D/A converters (IC17, pin 3/IC18, pin 8/IC20, pin 7).	O
99	SO	Serial data to the PLL IC (IC4, pin 9) and D/A converters (IC17, pin 3/IC18, pin 8/IC20, pin 7).	O
100	KR0	Input ports for dealer-programmable keys.	I

• EXPANDER (MAIN UNIT; IC17)

Pin No.	Line Name	Description
4	RXC	T8V, R8V lines and RX VCO ON/OFF control.
5	AFON	AF mute SW (Q35) control. "Low"=Mute
6	NWC	<ul style="list-style-type: none"> RX band width switching signal to the 2nd IF filter SW (D56, D57). "Low"=Narrow mode RX band width switching signal to the phase shifter SW (Q5). "Low"=Wide mode
7	RMUT	AF mute signal to the analog switch (IC3, pins 12, 13). "Low"=While the squelch is close or transmitting.
12	HORNO	External device control. "Low"=Pin 6 of OPC-1939 or pin 10 of OPC-2078 (if connected) is "Low."
13	TMUT	Transmit mute signal to the transmit mute switch (Q46). "High"=Transmitting is muted.

• D/A CONVERTER (MAIN UNIT; IC18)

Pin No.	Description
2, 3	MIC signal level adjustment.
4, 5	RX AF/MIC signal level adjustment.
16, 17	Tone signal level adjustment.
18, 19	Oscillation frequency control voltage to the reference frequency oscillator (X2).
20, 21	Modulation signal level adjustment.
22, 23	Beep sound loudness adjustment.
24, 25	Squelch threshold level adjustment.

• D/A CONVERTER (MAIN UNIT; IC20)

Pin No.	Line Name	Description
1	T1	<ul style="list-style-type: none"> While receiving Tuning voltage to the tuned BPF (D4, D8). While transmitting TX power level setting signal to the APC AMP IC2).
2	T2	Tuning voltage to the tuned BPF (D9, D10).
3	TLVA	Oscillation frequency correcting voltage to the TX VCO (Q13, D16, D18, D31, D53).
4	RLVA	Oscillation frequency correcting voltage to the RX VCO (Q14, D33, D34, D52).

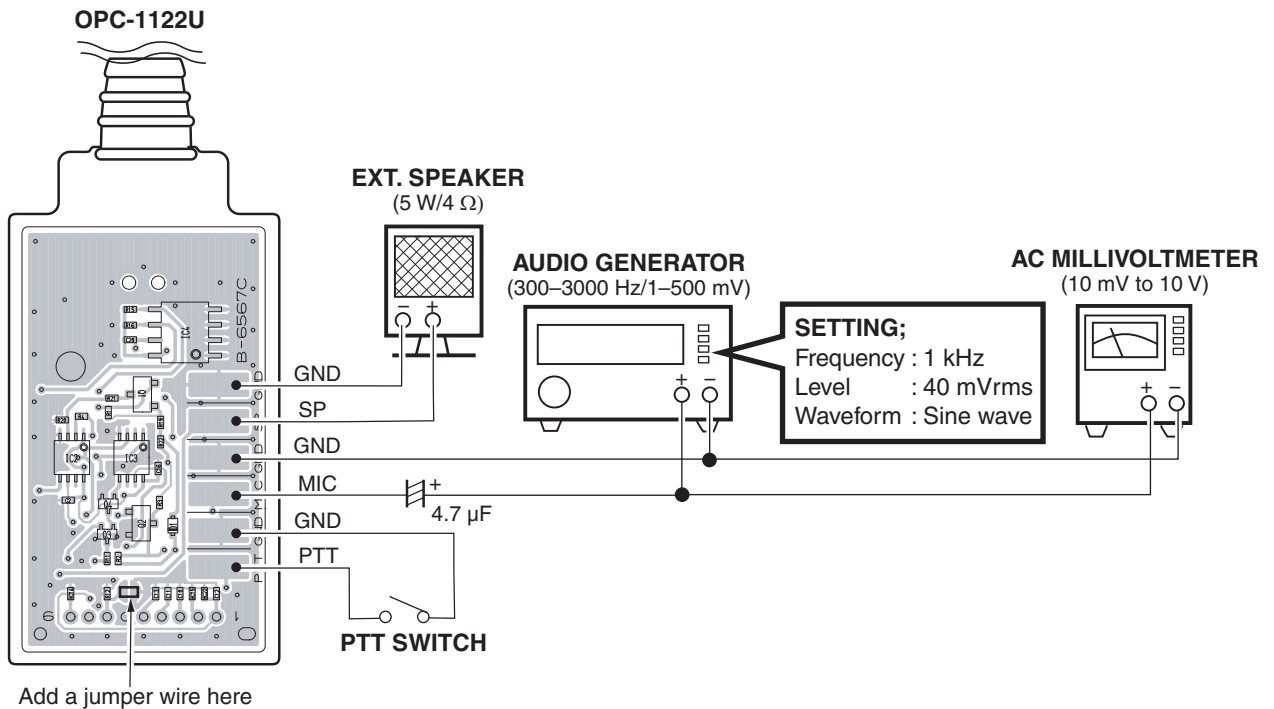
SECTION 6 ADJUSTMENT PROCEDURE

6-1 PREPARATION

REQUIRED EQUIPMENTS

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
Cloning Software	CS-F5010 : Revision 1.0 or later	JIG Cable	Modified OPC-1122U (see the illust below)
DC Power Supply	Output voltage : 13.6 V DC except [EUR] 13.2 V DC [EUR] Current capacity : More than 20 A	Attenuator	Power attenuation : 50 or 60 dB Capacity : 30 W [25 W ver.] 60 W [50 W ver.]
Modulation Analyzer	Frequency range : DC–300 MHz Measuring range : 0 to ±10 kHz	External Speaker	Input impedance : 4 Ω Capacity : 20 W or more
Frequency Counter	Frequency range : 0.1–300 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	Standard Signal Generator (SSG)	Frequency range : 0.1–300 MHz Output level : 0.1 μV to 32 mV (–127 to –17 dBm)
RF Power Meter	Measuring range : 0.1–30 W [25 W ver.] 0.1–60 W [50 W ver.] Frequency range : 100–300 MHz Impedance : 50 Ω SWR : Better than 1.2 : 1	Oscilloscope	Frequency rang : DC–20 MHz Measuring range : 0.01–20 V

JIG CABLE



ADJUSTMENT FREQUENCIES

Before starting adjustment, clone adjustment frequencies and settings into the transceiver as below.

CH	Atr	Inh	Frequency (MHz)				C.Tone		Text	TOT	RF PWR
			RX	TX	TX Inh	W/N	SQL Tight	RX			
1- 1	AB		136.000000	<-		W				RXLV ADJ	L1
1- 2			136.000000	<-		W				TXLV ADJ	L1
1- 3			174.000000	<-		W				LV VERIFY	L1
1- 4			174.000000	<-		W				REF FREQ	L1
1- 5			155.000000	<-		W				TXPWR H.	H
1- 6			155.000000	<-		W				TXPWR L2	L2
1- 7			155.000000	<-		W				TXPWR L1	L1
1- 8			155.000000	<-		W			007N	BAL	L1
1- 9			155.000000	<-		N				MOD N	L1
1- 10			155.000000	<-		W				MOD W	L1
1- 11			155.000000	<-		W				MOD M	L1
1- 12			155.000000	<-		W			225.7	CTC/DTC	L1
1- 13			136.100000	<-	i	W				BPF	L1
1- 14			136.100000	<-	i	W				RSSI	L1
1- 15			136.100000	<-	i	W				SQL	L1
1- 16											

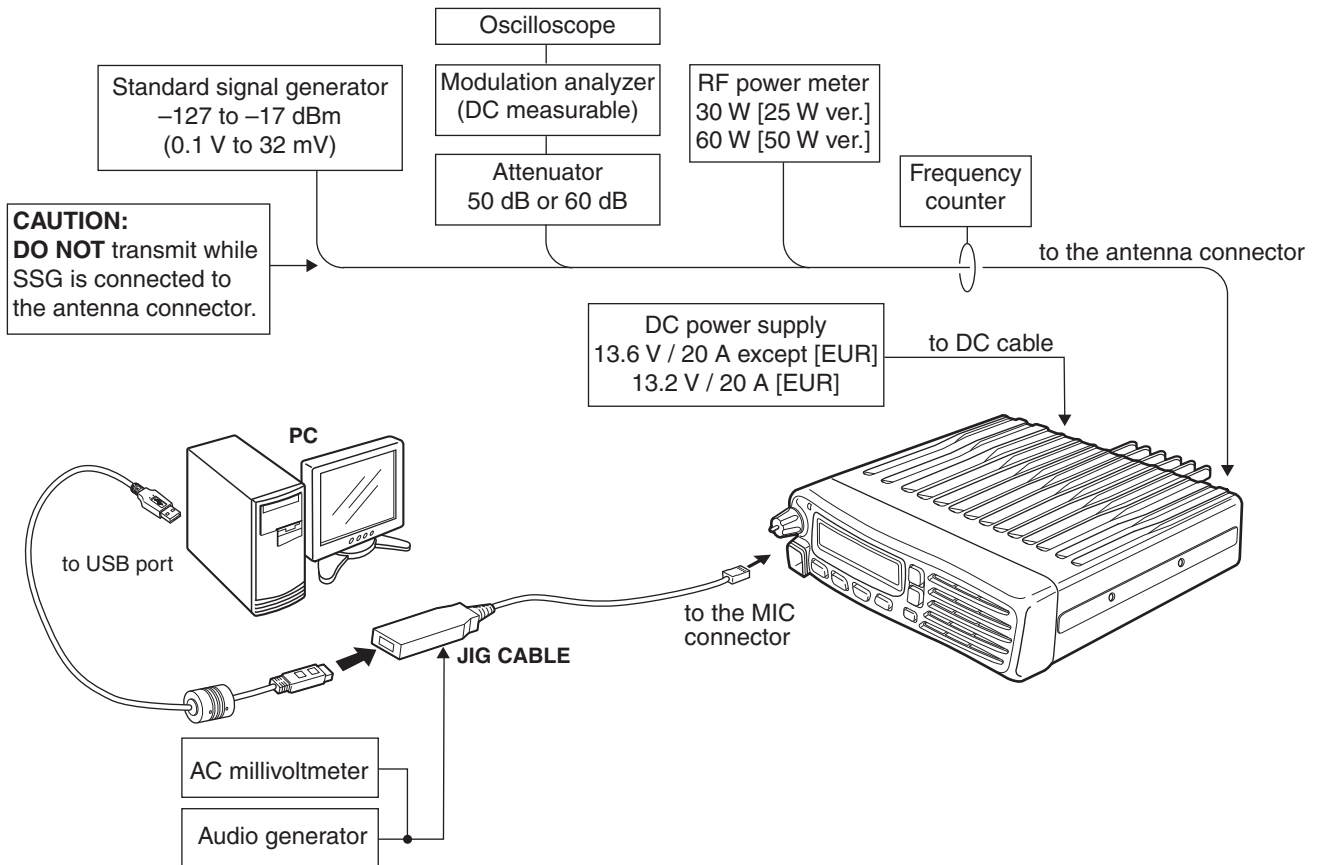
CONVENIENT: The cloning data file for the adjustment, as described in this service manual, is attached. Right click the clip icon, and select "Save Embedded File to Disk."



NOTE: FOR [EUR] versions, when adjust "Deviation," "Modulation Balance," and "S-meter" in the middle band, change the bandwidth to "Middle" as below.

The screenshot shows the PMR software interface with the 'Common' settings tab selected. The 'Wide Band Width' dropdown menu is open, and 'Middle' is selected. A red box highlights the 'Middle' option, with a red arrow pointing to it and the text 'Select "Middle"'. The 'Others' section shows 'Beat Cancel' set to 'Auto', 'Wide Band Width' set to 'Middle', 'Battery Type' set to 'Wide', 'SQL Tight Offset' set to 'Middle', and 'SQL Tight Offset 2' set to '9'. The 'DQS Time' is set to '0.00'.

CONNECTION



ADJUSTMENT UTILITY SCREEN (example)

Click to open the
"I/O Check screen"

Adjust Utility

Setting

CH No. 1 RX=136.10000, TX=136.10000
RF Power=High, Mode=Narrow

Adjust

Power (Hi) 179 [#####-----]

Power (L2) 102 [#####-----]

Power (L1) 47 [###-----]

BAL 195 [#####-----]

MOD N 74 [#####-----]

MOD Ratio M 94 [#####-----]

MOD Ratio W 118 [#####-----]

CTCSS/DTCS 108 [#####-----]

SQL 41 [###-----]

REF 121 [#####-----]

BPF ALL [Enter] to Sweep

BPF T1 40 [###-----] [Enter] to Sweep

BPF T2 68 [#####-----] [Enter] to Sweep

RX LVA 111 [#####-----] [Enter] to Sweep

TX LVA 127 [#####-----] [Enter] to Sweep

LV(RX LVA) 56 1.10V

LV(TX LVA) 54 1.06V

RSSI 86 [Enter] to Capture

Password

ADJ. CHANNEL

TX POWER

MOD. BALANCE

DEVIATION

CTCSS/DTCS

SQUELCH

REF. FREQUENCY

RX SENSITIVITY

LOCK VOLTAGE

RSSI
(S3 and S1 level)

6-2 FREQUENCY ADJUSTMENT

- 1) Select an adjustment item using cursor or [↑]/[↓] of the PC's keyboard.
- 2) Set or modify the adjustment value as specified using [←]/[→] of the PC's keyboard, then push [ENTER].

ADJUSTMENT	TRANSCIVER'S CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
PLL LOCK VOLTAGE (RX)	1 • Channel : 1-1 • Receiving	1) Connect an RF power meter to the antenna connector. 2) Set the adjustment value on the "Adjust Utility" screen.	[RX LVA]	1.1 V
(TX)	2 • Channel : 1-2 • Transmitting		[TX LVA]	1.06 V
(RX)	3 • Channel : 1-3 • Receiving	• Click [Update (F5)] button, and then check the "LVIN" item on the "I/O Check screen" as below.	[LVIN] (On the "I/O Check screen")	3.0-4.0 V (Verify)
(TX)	4 • Channel : 1-3 • Transmitting			2.5-3.5 V (Verify)
REFERENCE FREQUENCY	1 • Channel : 1-4 • Transmitting	• Loosely couple a frequency counter to the antenna connector.	[REF]	174.000000 MHz

• I/O Check screen

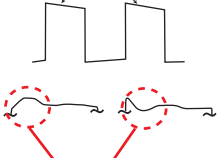
I/O Check			
Input	Dec	Hex	Data
VIN	187	BB	14.67V
TEMPS	179	B3	27.28°C
LVIN	54	36	1.06V
SD	27	1B	0.53V
Output	Dec	Hex	Data
BPF T1	40	28	0.78V
T2/POW	68	44	1.33V
REF	134	86	2.63V
MOD BAL	0	0	0.00%
Dev	0	0	0.00V
CTCSS	98	62	1.92V
SQL Lev	20	14	0.39V
TXLVA	128	80	2.51V
RXLVA	144	90	2.82V

Lock voltage

(The values shown in the above screen are example only.
Each transceiver has their own values.)

6-3 TRANSMIT ADJUSTMENT

- 1) Select an adjustment item using cursor or [↑]/[↓] of the PC's keyboard.
- 2) Set or modify the adjustment value as specified using [←]/[→] of the PC's keyboard, then push [ENTER].

ADJUSTMENT		TRANSCIEVER'S CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE	
OUTPUT POWER (Hi power)	1	• Channel : 1-5 • Transmitting	• Connect an RF power meter to the antenna connector.	[Power (Hi)]	25 W [25 W ver.] 50 W [50 W ver.]	
	(L2 power)	2		• Channel : 1-6 • Transmitting	[Power (L2)]	10 W [25 W ver.] 25 W [50 W ver.]
	(L1 power)	3		• Channel : 1-7 • Transmitting	[Power (L1)]	2.5 W [25 W ver.] 5.0 W [50 W ver.]
MODULATION BALANCE	1	• Channel : 1-8 • No audio signal applied to the JIG cable. • Transmitting.	• Connect a modulation analyzer with an oscilloscope to the antenna connector through an attenuator, and set it as; HPF : OFF LPF : 20 kHz De-emphasis : OFF Detector : (P-P)/2	[BAL]	As flat as possible.  No over or under shoot.	
DEVIATION (NARROW)	1	• Channel : 1-9 • Transmitting	• Connect a modulation analyzer to the antenna connector through an attenuator, and set it as described in the "MODULATION BALANCE" above. • Connect an audio generator to the JIG cable and set it as; Frequency : 1.0 kHz Level : 40 mVrms	[MOD N]	±2.05 to ±2.15 kHz	
(WIDE)	2	• Channel : 1-10 • Transmitting		[MOD Ratio]	±4.05 to ±4.15 kHz	
(MIDDLE)*	3	• Channel : 1-11 • Transmitting		[MOD Ratio]	±3.25 to ±3.35 kHz	
CTCSS/DTCS DEVIATION	1	• Channel : 1-12 • No audio signal applied to the JIG cable. • Transmitting	• Connect a modulation analyzer to the antenna connector through an attenuator, and set it as described in the "MODULATION BALANCE" above.	[CTCSS/DTCS]	±0.65 to ±0.75 kHz	

*: [EUR] only

6-4 RECEIVE ADJUSTMENT

1) Select an adjustment item using cursor or [↑]/[↓] of the PC's keyboard.

2) Set or modify the adjustment value as specified using [←]/[→] of the PC's keyboard, then push [ENTER].

ADJUSTMENT	TRANSCIVER'S CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
RECEIVE SENSITIVITY	NOTE: When "RECEIVE SENSITIVITY" is re-adjusted, "S-METER" and "SQUELCH" must be re-adjusted too.			
1	<ul style="list-style-type: none"> • Channel : 1-13 • Receiving 	1) Connect an SSG to the antenna connector and set it as; Frequency : 136.000 MHz Level [†] : +20 dBμ (-87 dBm) Modulation : 1 kHz Deviation : ±3.0 kHz 2) Put the cursor on the adjustment item, then push [ENTER].	[BPF ALL]	Push [ENTER].
S-METER (S3 level)	NOTE: "RECEIVE SENSITIVITY" MUST be adjusted before "S-METER." When "RECEIVE SENSITIVITY" is re-adjusted, "S-METER" MUST be re-adjusted too.			
1	<ul style="list-style-type: none"> • Channel : 1-14 • Receiving 	<ul style="list-style-type: none"> • Connect an SSG to the antenna connector and set it as; Frequency : 136.000 MHz Level[†] : +23 dBμ (-84 dBm) Modulation : 1 kHz Deviation : ±3.0 kHz 	[RSSI]	Push [ENTER].
(S1 level)	2	<ul style="list-style-type: none"> • Set the SSG as; Level[†] : -7 dBμ (-114 dBm) 		
SQUELCH	NOTE: "RECEIVE SENSITIVITY" MUST be adjusted before "SQUELCH." When "RECEIVE SENSITIVITY" is re-adjusted, "SQUELCH" MUST be re-adjusted too.			
1	<ul style="list-style-type: none"> • Channel : 1-15 • Receiving 	1) Connect a SSG to the antenna connector and set it as; Frequency : 136.000 MHz Level [†] : -13 dBμ (-120 dBm) Modulation : 1 kHz Deviation : ±3.0 kHz 2) Once close the squelch by increasing [SQL] value, and then decrease the value to open the squelch.	[SQL]	Push [ENTER].

[†]; The output level of the standard signal generator (SSG) is indicated as the SSG's open circuit.

[MAIN-A UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
C180	4550006970	S.TAN TEESVA0G476M8R	T	35.9/30.3
C181	4030016930	S.CER C1005 JB 1A 104K-T	B	29.8/19.3
C182	4030016790	S.CER C1005 JB 1E 103K-T	B	28.5/19.6
C183	4030016930	S.CER C1005 JB 1A 104K-T	B	27.6/18.0
C184	4030017700	S.CER C1005 CH 1H 151J-T	B	24.9/19.6
C185	4030016930	S.CER C1005 JB 1A 104K-T	B	36.4/30.0
C186	4030016930	S.CER C1005 JB 1A 104K-T	B	16.9/13.8
C187	4030016930	S.CER C1005 JB 1A 104K-T	B	17.0/7.2
C188	4030016930	S.CER C1005 JB 1A 104K-T	B	33.3/21.9
C189	4030017460	S.CER C1005 JB 1H 102K-T	T	42.3/22.3
C190	4030016790	S.CER C1005 JB 1E 103K-T	B	35.5/30.0
C195	4550000550	S.TAN TEESVA 1V 224M8R	T	93.9/16.6
C196	4030017460	S.CER C1005 JB 1H 102K-T	T	97.3/17.1
C197	4030017460	S.CER C1005 JB 1H 102K-T	T	101.9/21.3
C198	4030016930	S.CER C1005 JB 1A 104K-T	T	101.9/20.3
C200	4030016930	S.CER C1005 JB 1A 104K-T	T	76.4/15.3
C201	4030016930	S.CER C1005 JB 1A 104K-T	T	77.8/7.5
C202	4030016930	S.CER C1005 JB 1A 104K-T	T	80.3/11.3
C203	4030016930	S.CER C1005 JB 1A 104K-T	B	75.8/11.4
C204	4030017420	S.CER C1005 CH 1H 470J-T	B	70.8/6.6
C207	4030017460	S.CER C1005 JB 1H 102K-T	B	73.9/11.3
C208	4030017460	S.CER C1005 JB 1H 102K-T	B	71.0/14.3
C209	4030017460	S.CER C1005 JB 1H 102K-T	B	70.0/14.3
C210	4030017460	S.CER C1005 JB 1H 102K-T	B	69.1/14.3
C226	4030017420	S.CER C1005 CH 1H 470J-T	B	65.2/6.9
C242	4030016930	S.CER C1005 JB 1A 104K-T	T	36.9/19.0
C244	4030018900	S.CER C1005 JB 0J 474K-T	B	126.9/19.5
C245	4030016790	S.CER C1005 JB 1E 103K-T	B	30.3/9.8
C246	4030016930	S.CER C1005 JB 1A 104K-T	B	116.6/18.6
C247	4030016930	S.CER C1005 JB 1A 104K-T	B	39.2/21.1
C249	4030017760	S.CER C1005 JB 1H 222K-T	B	33.3/9.3
C250	4030016930	S.CER C1005 JB 1A 104K-T	B	29.8/5.7
C251	4030016970	S.CER C1005 JB 1E 223K-T	B	125.8/16.9
C252	4030016930	S.CER C1005 JB 1A 104K-T	B	124.0/16.9
C253	4030018860	S.CER C1005 JB 0J 105K-T	B	131.6/16.6
C254	4030017460	S.CER C1005 JB 1H 102K-T	T	133.3/45.0
C255	4510009680	S.ELE EEEFK1E471P	B	120.1/29.1
C256	4510009250	S.ELE EEEFK1C471P	B	130.5/34.8
C258	4510009680	S.ELE EEEFK1E471P	B	110.2/52.7
C259	4030017460	S.CER C1005 JB 1H 102K-T	B	113.4/58.8
C260	4030017420	S.CER C1005 CH 1H 470J-T	B	105.5/59.0
C261	4030018980	S.CER C1608 JB 1H 104K-T	B	129.4/50.6
C262	4030016930	S.CER C1005 JB 1A 104K-T	T	127.8/40.1
C263	4030018980	S.CER C1608 JB 1H 104K-T	T	124.3/37.1
C264	4030016930	S.CER C1005 JB 1A 104K-T	T	125.7/34.3
C265	4510009680	S.ELE EEEFK1E471P	B	117.0/41.7
C266	4030019560	S.CER GRM21BB31C106KE15L	T	127.8/44.0
C267	4030017460	S.CER C1005 JB 1H 102K-T	T	125.7/38.1
C268	4030019560	S.CER GRM21BB31C106KE15L	T	124.3/33.7
C269	4030017460	S.CER C1005 JB 1H 102K-T	B	122.1/48.2
C270	4030017460	S.CER C1005 JB 1H 102K-T	T	107.7/46.3
C271	4030019560	S.CER GRM21BB31C106KE15L	T	105.5/44.4
C272	4030019560	S.CER GRM21BB31C106KE15L	B	129.4/43.4
C273	4030017460	S.CER C1005 JB 1H 102K-T	B	120.7/22.8
C274	4030019560	S.CER GRM21BB31C106KE15L	T	42.5/19.6
C275	4030017460	S.CER C1005 JB 1H 102K-T	T	107.7/37.4
C276	4030017460	S.CER C1005 JB 1H 102K-T	B	128.6/42.0
C280	4030016790	S.CER C1005 JB 1E 103K-T	B	37.1/8.9
C282	4030019560	S.CER GRM21BB31C106KE15L	B	78.7/29.8
C283	4030019560	S.CER GRM21BB31C106KE15L	B	76.9/29.8
C284	4030017420	S.CER C1005 CH 1H 470J-T	B	77.4/33.5
C285	4030017460	S.CER C1005 JB 1H 102K-T	B	94.5/30.4
C286	4030017570	S.CER C1005 CH 1H 040B-T	B	94.5/29.5
C287	4030017770	S.CER C1005 JB 1H 332K-T	B	93.8/13.8
C288	4030016930	S.CER C1005 JB 1A 104K-T	T	114.9/16.0
C289	4030018860	S.CER C1005 JB 0J 105K-T	T	114.9/15.1
C290	4030017460	S.CER C1005 JB 1H 102K-T	T	114.9/16.9
C291	4030017460	S.CER C1005 JB 1H 102K-T	T	114.9/14.2
C292	4030017420	S.CER C1005 CH 1H 470J-T	B	116.6/20.2
C293	4030017460	S.CER C1005 JB 1H 102K-T	T	116.6/27.5
C294	4030017460	S.CER C1005 JB 1H 102K-T	T	114.9/11.7
C295	4030018860	S.CER C1005 JB 0J 105K-T	T	110.7/11.7
C297	4030017600	S.CER C1005 CH 1H 080C-T	B	86.1/32.8
C298	4030017640	S.CER C1005 CH 1H 150J-T	B	83.6/31.5
C299	4030017600	S.CER C1005 CH 1H 080C-T	B	82.0/31.5
C300	4030017600	S.CER C1005 CH 1H 080C-T	B	84.5/31.5
C301	4030017460	S.CER C1005 JB 1H 102K-T	B	94.0/32.3
C302	4030017620	S.CER C1005 CH 1H 100C-T	B	80.7/39.3
C303	4030017460	S.CER C1005 JB 1H 102K-T	B	81.6/36.4
C305	4030017500	S.CER C1005 CH 1H 560J-T	B	64.2/23.3
C306	4030017580	S.CER C1005 CH 1H 060C-T	B	63.4/25.0
C307	4030017500	S.CER C1005 CH 1H 560J-T	B	61.6/23.2
C308	4030017360	S.CER C1005 CH 1H 030B-T	B	61.6/24.8
C309	4030016790	S.CER C1005 JB 1E 103K-T	B	67.1/22.4
C310	4030017460	S.CER C1005 JB 1H 102K-T	B	19.4/5.7
C311	4030017460	S.CER C1005 JB 1H 102K-T	T	11.8/12.8
C312	4030016930	S.CER C1005 JB 1A 104K-T	B	68.7/21.6
C314	4030016790	S.CER C1005 JB 1E 103K-T	T	110.5/33.8
C315	4030016970	S.CER C1005 JB 1E 223K-T	B	26.7/22.9
C316	4030017740	S.CER C1005 JB 1H 821K-T	B	24.9/24.6
C317	4030017740	S.CER C1005 JB 1H 821K-T	B	21.3/24.6
C318	4030016930	S.CER C1005 JB 1A 104K-T	B	22.2/24.6
C320	4030016940	S.CER C1005 JB 1A 393K-T	B	29.1/18.6
C321	4030016930	S.CER C1005 JB 1A 104K-T	T	27.5/18.6
C322	4030017790	S.CER C1005 JB 1H 682K-T	T	27.5/17.7
C323	4030017430	S.CER C1005 CH 1H 101J-T	B	76.9/26.6
C325	4030016970	S.CER C1005 JB 1E 223K-T	T	27.5/21.3
C330	4550002980	S.TAN TEESVA 1C 225M8R	T	78.8/53.9
C333	4030017420	S.CER C1005 CH 1H 470J-T	B	40.4/40.7
C335	4030017460	S.CER C1005 JB 1H 102K-T	B	95.4/33.2
C337	4030017460	S.CER C1005 JB 1H 102K-T	T	82.6/31.4
C339	4030017590	S.CER C1005 CH 1H 070C-T	B	52.7/40.4
C342	4550000560	S.TAN TEESVA 1V 334M8R	T	78.4/66.1
C343	4030017460	S.CER C1005 JB 1H 102K-T	B	51.5/39.1
C347	4030017460	S.CER C1005 JB 1H 102K-T	T	52.1/24.3

[MAIN-A UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
C348	4030017460	S.CER C1005 JB 1H 102K-T	T	59.3/20.4
C349	4030016930	S.CER C1005 JB 1A 104K-T	B	21.0/17.7
C350	4030017920	S.CER C1005 JB 1A 683K-T	T	95.4/13.8
C351	4030016780	S.CER C1005 JB 1E 153K-T	B	131.6/18.7
C353	4030017570	S.CER C1005 CH 1H 040B-T	B	98.8/20.3
C354	4030017610	S.CER C1005 CH 1H 090C-T	B	92.2/23.3
C355	4030017560	S.CER C1005 CH 1H 2R5B-T	B	105.1/22.1
C356	4030017590	S.CER C1005 CH 1H 070C-T	B	107.7/23.2
C357	4030016930	S.CER C1005 JB 1A 104K-T	T	103.6/34.2
C359	4030018860	S.CER C1005 JB 0J 105K-T	B	29.4/18.0
C360	4030017380	S.CER C1005 CH 1H 050B-T	B	107.3/26.7
C361	4030016930	S.CER C1005 JB 1A 104K-T	B	56.7/6.3
C362	4030017460	S.CER C1005 JB 1H 102K-T	T	133.3/62.5
C363	4030016780	S.CER C1005 JB 1E 153K-T	T	36.4/37.9
C364	4030017420	S.CER C1005 CH 1H 470J-T	T	79.8/67.8
C366	4030017460	S.CER C1005 JB 1H 102K-T	B	69.1/61.6
C367	4030017510	S.CER C1005 CH 1H 680J-T	B	95.1/57.2
C368	4030017460	S.CER C1005 JB 1H 102K-T	B	95.1/68.3
C369	4030017510	S.CER C1005 CH 1H 680J-T	B	93.9/68.3
C371	4030017460	S.CER C1005 JB 1H 102K-T	B	106.5/59.0
C372	4030017460	S.CER C1005 JB 1H 102K-T	T	60.2/67.2
C375	4030017460	S.CER C1005 JB 1H 102K-T	B	122.5/64.9
C376	4030017380	S.CER C1005 CH 1H 050B-T	B	107.3/25.8
C377	4030017510	S.CER C1005 CH 1H 680J-T	B	65.7/61.6
C378	4030017910	S.CER C1005 JB 1H 152K-T	B	23.0/14.9
C379	4030016780	S.CER C1005 JB 1E 153K-T	B	30.3/10.7
C380	4030017640	S.CER C1005 CH 1H 150J-T	B	90.7/59.3
	4030017640	S.CER C1005 CH 1H 150J-T	[EXP-01]	
C381	4030017640	S.CER C1005 CH 1H 150J-T	B	90.0/58.2
	4030017640	S.CER C1005 CH 1H 150J-T	[EXP-01]	
C382	4030017460	S.CER C1005 JB 1H 102K-T	B	75.8/9.1
C383	4030016930	S.CER C1005 JB 1A 104K-T	T	36.4/36.2
C384	4030016930	S.CER C1005 JB 1A 104K-T	T	59.1/29.4
C385	4030016930	S.CER C1005 JB 1A 104K-T	T	53.5/33.5
C388	4030018980	S.CER C1608 JB 1H 104K-T	T	110.5/48.7
C390	4030017420	S.CER C1005 CH 1H 470J-T	B	74.6/40.6
C391	4030017460	S.CER C1005 JB 1H 102K-T	B	75.7/40.6
C392	4030017390	S.CER C1005 CH 1H 180J-T	B	61.3/39.1
C394	4030016930	S.CER C1005 JB 1A 104K-T	T	52.8/31.7
C395	4030016930	S.CER C1005 JB 1A 104K-T	T	46.0/29.8
C396	4030016930	S.CER C1005 JB 1A 104K-T	T	53.9/29.3
C397	4030016790	S.CER C1005 JB 1E 103K-T	B	39.6/31.5
C398	4030016790	S.CER C1005 JB 1E 103K-T	T	48.0/28.6
C399	4030016790	S.CER C1005 JB 1E 103K-T	B	39.6/32.5
C401	4030017390	S.CER C1005 CH 1H 180J-T	T	88.1/64.1
	4030017390	S.CER C1005 CH 1H 180J-T	[EXP-01]	
	4030017460	S.CER C1005 JB 1H 102K-T	[USA-01]	
	4030017460	S.CER C1005 JB 1H 102K-T	[EXP-02]	
C402	4030011160	S.CER GRM31M2C2H150JV01L (GRM42-6 CH)	B	36.2/68.7
	4030011160	S.CER GRM31M2C2H150JV01L (GRM42-6 CH)	[EXP-02]	
C403	4030011170	S.CER GRM31M2C2H180JV01L (GRM42-6 CH)	B	35.0/65.3
	4030011170	S.CER GRM31M2C2H180JV01L (GRM42-6 CH)	[USA-01]	
	4030011170	S.CER GRM31M2C2H220JV01L (GRM42-6 CH)	[EXP-02]	
C404	4030011180	S.CER GRM31M2C2H220JV01L (GRM42-6 CH)	B	20.4/58.7
C408	4030017460	S.CER C1005 JB 1H 102K-T	B	43.9/57.9
C409	4030017460	S.CER C1005 JB 1H 102K-T	B	38.0/52.6
C411	4030017460	S.CER C1005 JB 1H 102K-T	T	42.2/55.4
	4030017460	S.CER C1005 JB 1H 102K-T	[USA-01]	
	4030017460	S.CER C1005 JB 1H 102K-T	[EXP-02]	
C431	4030017440	S.CER C1005 CH 1H 221J-T	B	113.4/59.7
C436	4030017460	S.CER C1005 JB 1H 102K-T	T	114.9/8.0
C437	4030017460	S.CER C1005 JB 1H 102K-T	T	116.7/9.6
C440	4030017630	S.CER C1005 CH 1H 120J-T	B	27.0/44.3
C442	4030017570	S.CER C1005 CH 1H 040B-T	B	24.6/49.8
C443	4030017420	S.CER C1005 CH 1H 470J-T	T	40.3/55.0
C451	4030019560	S.CER GRM21BB31C106KE15L	T	67.9/53.9
C456	4030017380	S.CER C1005 CH 1H 050B-T	B	88.6/60.4
	4030017380	S.CER C1005 CH 1H 050B-T	[EXP-01]	
	4030017460	S.CER C1005 JB 1H 102K-T	[USA-01]	
	4030017460	S.CER C1005 JB 1H 102K-T	[EXP-02]	
C457	4030017460	S.CER C1005 JB 1H 102K-T	B	72.5/51.7
C458	4030017460	S.CER C1005 JB 1H 102K-T</		

[MAIN-A UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
J1	6510026770	S.CON AXK540147YG	T	23.0/8.3
J2	6510027960	S.CON 04-6294-040-000-800	T	67.5/10.6
J4	6450000140	CON HSJ0807-01-010		
J6	6510022891	S.CON B13B-ZR-SM4-TF(LF)(SN)	T	120.0/17.2
J7	6510014961	S.CON B2B-ZR-SM4-TF(LF)(SN)	T	130.5/27.3
S1	2260003180	S.SWI MINISMDC050F-2 CN	T	114.1/33.8
W1	7030012290	JUM RDS2T0R0		
W2	8900011863	CAB OPC-1195C <TJM>		
EP1	6910018460	S.BEA MMZ1005Y102C-T	B	106.3/34.8
EP4	6910010280	BEA HF70BB9.5X10.4X4.9		
EP5	6910010280	BEA HF70BB9.5X10.4X4.9		
EP7	6910018460	S.BEA MMZ1005Y102C-T	B	84.7/24.8
EP8	6910018460	S.BEA MMZ1005Y102C-T	T	84.1/28.7
EP9	6910018460	S.BEA MMZ1005Y102C-T	T	103.1/21.8

[FRONT UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
IC1	1140015761	S.IC HD64F2238BTF13V(FX-3334A-1)	T	57.8/24.7
IC2	1110007620	S.IC NUJ7704F3-42A-TE1-#ZZZB	T	60.0/54.9
IC3	1130015560	S.IC S-24C64CI-T8T1U3	B	41.1/28.6
IC5	1110005340	S.IC NJM12902V-TE1-#ZZZB	B	29.3/21.1
Q1	1530002851	S.TRA 2SC4116-BL(TE85RF)	B	37.2/13.8
Q2	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	38.2/17.1
Q3	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	38.1/23.7
Q5	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	38.2/19.1
Q6	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	75.1/28.7
Q7	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	55.6/27.0
Q8	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	53.5/27.8
Q9	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	52.0/29.7
Q10	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	45.1/14.6
Q11	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	45.1/16.9
Q12	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	45.1/12.3
Q13	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	81.3/22.1
Q14	1590004060	S.TRA LDTC114EET1G <SLVJ>	B	81.3/20.1
D1	1790001990	S.VAR EZJP0V080DA	T	10.9/17.1
D2	1790001990	S.VAR EZJP0V080DA	T	6.4/17.1
D3	1790001990	S.VAR EZJP0V080DA	B	17.4/11.8
D5	1750001810	S.DIO L1SS400T1G <SLVJ>	B	21.6/12.2
D6	1750001890	S.DIO HVD142AKRF-E	B	52.8/17.3
X1	6050013190	S.XTA CR-915 (HC-49US/12.288 MHz) <JJE>	B	48.9/14.2
L1	6200003640	S.COI MLF1608E 100K-T	B	11.6/17.2
L2	6200001981	S.COI NLV25T-1R0J	B	60.0/9.9
R11	7030009280	S.RES ERJ2GEJ 391 X	B	36.8/15.6
R12	7030005000	S.RES ERJ2GEJ 471 X (470)	B	38.4/15.6
R14	7210003330	VAR RK09D1130A1N		
R15	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	7.2/17.4
R16	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	16.5/11.8
R18	7030005090	S.RES ERJ2GEJ 104 X (100K)	T	8.2/17.1
R19	7030005090	S.RES ERJ2GEJ 104 X (100K)	B	19.2/11.8
R20	7030005110	S.RES ERJ2GEJ 224 X (220K)	B	77.1/27.9
R21	7030005720	S.RES ERJ2GEJ 563 X (56K)	B	77.1/27.0
R22	7030005220	S.RES ERJ2GEJ 223 X (22K)	B	77.1/26.1
R23	7030005240	S.RES ERJ2GEJ 473 X (47K)	B	34.6/25.7
R24	7030005240	S.RES ERJ2GEJ 473 X (47K)	B	34.6/24.8
R25	7030005220	S.RES ERJ2GEJ 223 X (22K)	B	34.6/26.6
R26	7030005240	S.RES ERJ2GEJ 473 X (47K)	B	32.9/24.8
R27	7030005240	S.RES ERJ2GEJ 473 X (47K)	B	31.2/25.7
R28	7030005040	S.RES ERJ2GEJ 472 X (4.7K)	B	34.6/23.9
R29	7030008290	S.RES ERJ2GEJ 183 X (18K)	B	36.3/24.8
R32	7030007340	S.RES ERJ2GEJ 153 X (15K)	B	34.6/21.2
R33	7030005220	S.RES ERJ2GEJ 223 X (22K)	B	34.6/22.1
R34	7030005060	S.RES ERJ2GEJ 333 X (33K)	B	34.6/20.3
R35	7030005070	S.RES ERJ2GEJ 683 X (68K)	B	34.6/19.4
R36	7030005070	S.RES ERJ2GEJ 683 X (68K)	B	34.6/18.5
R37	7030005070	S.RES ERJ2GEJ 683 X (68K)	B	32.9/19.4
R38	7030005070	S.RES ERJ2GEJ 683 X (68K)	B	32.9/20.3
R39	7030005070	S.RES ERJ2GEJ 683 X (68K)	B	32.9/21.2
R40	7030005040	S.RES ERJ2GEJ 472 X (4.7K)	B	23.6/25.7
R41	7030005600	S.RES ERJ2GEJ 273 X (27K)	B	23.6/27.5
R42	7030005240	S.RES ERJ2GEJ 473 X (47K)	B	27.4/26.6
R43	7030007350	S.RES ERJ2GEJ 393 X (39K)	B	29.1/25.7
R44	7030005100	S.RES ERJ2GEJ 154 X (150K)	B	25.5/25.7
R45	7030005160	S.RES ERJ2GEJ 105 X (1M)	B	27.4/27.5
R46	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	34.6/12.0
R47	7030009140	S.RES ERJ2GEJ 272 X (2.7K)	B	34.6/11.1
R48	7030010040	S.RES ERJ2GEJ-JPW	B	30.9/16.0
R51	7030005090	S.RES ERJ2GEJ 104 X (100K)	B	21.6/11.0
R58	7030005050	S.RES ERJ2GEJ 103 X (10K)	B	43.8/26.6
R60	7030005090	S.RES ERJ2GEJ 104 X (100K)	B	84.4/6.8
R65	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	77.1/28.8
R68	7030005090	S.RES ERJ2GEJ 104 X (100K)	B	43.8/27.5
R76	7030005120	S.RES ERJ2GEJ 102 X (1K)	T	9.1/17.1
R77	7030005030	S.RES ERJ2GEJ 152 X (1.5K)	B	72.6/10.8
R90	7030006610	S.RES ERJ2GEJ 394 X (390K)	B	83.5/5.1
R101	7030008010	S.RES ERJ2GEJ 123 X (12K)	B	53.4/16.2
R102	7030008010	S.RES ERJ2GEJ 123 X (12K)	B	55.0/16.9
R103	7030008010	S.RES ERJ2GEJ 123 X (12K)	B	52.9/18.8
R104	7030005090	S.RES ERJ2GEJ 104 X (100K)	B	57.7/16.2
R105	7030005530	S.RES ERJ2GEJ 100 X (10)	B	53.4/13.1
R106	7030005160	S.RES ERJ2GEJ 105 X (1M)	B	52.1/13.6
R107	7030005050	S.RES ERJ2GEJ 103 X (10K)	B	46.4/30.9
R108	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	78.3/14.7
R109	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	78.3/16.9
R111	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	63.3/30.5
R112	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	61.9/30.5
R113	7030005090	S.RES ERJ2GEJ 104 X (100K)	B	57.7/15.3
R114	7030005090	S.RES ERJ2GEJ 104 X (100K)	B	70.2/12.6
R115	7410001130	S.ARR EXB28V102JX	B	57.6/30.7
R116	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	59.7/27.0
R117	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	58.5/20.5
R118	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	58.7/19.3
R119	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	58.7/18.4
R120	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	78.3/13.5
R121	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	78.3/17.8
R122	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	78.3/18.7
R127	7030005160	S.RES ERJ2GEJ 105 X (1M)	B	82.6/5.1
R128	7030005050	S.RES ERJ2GEJ 103 X (10K)	B	34.6/23.0
R129	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	27.3/16.0
R130	7030009280	S.RES ERJ2GEJ 391 X	B	78.8/20.6
R131	7030008400	S.RES ERJ2GEJ 182 X (1.8K)	B	78.8/21.5
R132	7030008400	S.RES ERJ2GEJ 182 X (1.8K)	B	38.0/12.0

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

[FRONT UNIT]

REF NO.	PARTS NO.	DESCRIPTION	M.	H/V LOCATION
R133	7030008400	S.RES ERJ2GEJ 182 X (1.8K)	B	40.5/20.7
R134	7030008400	S.RES ERJ2GEJ 182 X (1.8K)	B	57.6/21.4
R135	7030005030	S.RES ERJ2GEJ 152 X (1.5K)	B	27.4/28.4
R136	7030005030	S.RES ERJ2GEJ 152 X (1.5K)	B	47.2/28.3
R137	7030005030	S.RES ERJ2GEJ 152 X (1.5K)	B	47.2/27.4
R138	7030005030	S.RES ERJ2GEJ 152 X (1.5K)	B	78.5/24.2
R139	7030005120	S.RES ERJ2GEJ 102 X (1K)	B	54.7/9.2
R140	7030005050	S.RES ERJ2GEJ 103 X (10K)	B	63.1/15.8
C2	4030017420	S.CER C1005 CH 1H 470J-T	B	84.4/5.1
C3	4030017420	S.CER C1005 CH 1H 470J-T	B	34.6/10.2
C4	4030017420	S.CER C1005 CH 1H 470J-T	B	45.3/10.8
C5	4030017420	S.CER C1005 CH 1H 470J-T	B	57.0/4.2
C8	4030017460	S.CER C1005 JB 1H 102K-T	B	13.8/17.2
C10	4030017460	S.CER C1005 JB 1H 102K-T	B	7.7/9.2
C12	4030017460	S.CER C1005 JB 1H 102K-T	B	5.2/9.2
C14	4030017460	S.CER C1005 JB 1H 102K-T	B	32.9/26.6
C15	4030016960	S.CER C1005 JB 1E 183K-T	B	32.9/25.7
C16	4030016930	S.CER C1005 JB 1A 104K-T	B	32.9/23.9
C17	4030017750	S.CER C1005 JB 1H 122K-T	B	31.2/26.6
C19	4030016930	S.CER C1005 JB 1A 104K-T	B	36.3/23.9
C20	4030017460	S.CER C1005 JB 1H 102K-T	B	34.6/17.6
C21	4030017460	S.CER C1005 JB 1H 102K-T	B	32.9/18.5
C22	4030020020	S.CER C1005 CH 1H 391J-T	B	30.0/16.0
C23	4030016790	S.CER C1005 JB 1E 103K-T	B	32.9/22.1
C24	4030017420	S.CER C1005 CH 1H 470J-T	B	28.2/16.0
C25	4030016790	S.CER C1005 JB 1E 103K-T	B	25.5/28.4
C26	4030016930	S.CER C1005 JB 1A 104K-T	B	23.6/26.6
C27	4030020010	S.CER C1005 CH 1H 271J-T	B	25.5/26.6
C28	4030016930	S.CER C1005 JB 1A 104K-T	B	29.1/16.0
C30	4030019560	S.CER GRM21BB31C106KE15L	B	29.9/12.6
C31	4030016930	S.CER C1005 JB 1A 104K-T	B	36.3/11.1
C34	4030017420	S.CER C1005 CH 1H 470J-T	B	80.7/10.8
C36	4030016930	S.CER C1005 JB 1A 104K-T	B	38.7/27.2
C38	4030017420	S.CER C1005 CH 1H 470J-T	B	78.9/10.8
C41	4030017460	S.CER C1005 JB 1H 102K-T	B	23.6/28.4
C50	4030017420	S.CER C1005 CH 1H 470J-T	B	61.9/9.3
C54	4030017420	S.CER C1005 CH 1H 470J-T	B	62.8/9.3
C69	4030017420	S.CER C1005 CH 1H 470J-T	B	67.4/1.8
C74	4030017420	S.CER C1005 CH 1H 470J-T	B	61.7/1.8
C76	4030016930	S.CER C1005 JB 1A 104K-T	B	29.1/26.6
C77	4030016950	S.CER C1005 JB 1A 473K-T	B	73.0/12.4
C78	4030017460	S.CER C1005 JB 1H 102K-T	B	8.9/17.4
C82	4030017420	S.CER C1005 CH 1H 470J-T	B	36.3/23.0
C84	4030017420	S.CER C1005 CH 1H 470J-T	B	25.5/27.5
C85	4030017420	S.CER C1005 CH 1H 470J-T	B	32.9/17.6
C87	4030016930	S.CER C1005 JB 1A 104K-T	B	34.6/15.6
C93	4030017460	S.CER C1005 JB 1H 102K-T	B	61.9/12.6
C101	4030016930	S.CER C1005 JB 1A 104K-T	B	56.0/15.3
C102	4030016930	S.CER C1005 JB 1A 104K-T	B	53.8/18.8
C103	4030016930	S.CER C1005 JB 1A 104K-T	B	54.7/18.8
C104	4030017400	S.CER C1005 CH 1H 220J-T	B	52.1/15.3
C105	4030017600	S.CER C1005 CH 1H 080C-T	B	53.4/14.9
C106	4030017640	S.CER C1005 CH 1H 150J-T	B	53.4/14.0
C107	4030017030	S.CER C1005 JB 1A 273K-T	B	43.8/29.3
C111	4030016930	S.CER C1005 JB 1A 104K-T	B	43.8/28.4
C112	4550006780	S.TAN TEESVB2 0J 476M8R	B	53.4/21.7
C113	4030018910	S.CER C1608 JB 0J 475K-T	B	63.9/12.2
C114	4030017420	S.CER C1005 CH 1H 470J-T	B	62.8/12.6
C116	4030016930	S.CER C1005 JB 1A 104K-T	B	65.7/12.6
C117	4030016930	S.CER C1005 JB 1A 104K-T	B	66.6/12.6
C118	4030016930	S.CER C1005 JB 1A 104K-T	B	69.3/12.6
C119	4030016930	S.CER C1005 JB 1A 104K-T	B	67.5/12.6
C120	4030016930	S.CER C1005 JB 1A 104K-T	B	68.4/12.6
C123	4030017460	S.CER C1005 JB 1H 102K-T	B	80.0/14.7
C124	4030016930	S.CER C1005 JB 1A 104K-T	B	73.9/30.1
C125	4030016930	S.CER C1005 JB 1A 104K-T	B	83.5/6.8
C126	4030017460	S.CER C1005 JB 1H 102K-T	B	30.4/14.0
C128	4030016930	S.CER C1005 JB 1A 104K-T	T	14.3/19.2
C129	4030017460	S.CER C1005 JB 1H 102K-T	T	14.3/17.5
C130	4030017460	S.CER C1005 JB 1H 102K-T	B	84.8/8.1
C131	4030018860	S.CER C1005 JB 0J 105K-T	B	36.3/21.2
C139	4030017420	S.CER C1005 CH 1H 470J-T	B	5.6/17.4
J1	6450002210	CON 3017-8821 <KIN>		
J2	6510027960	S.CON 04-6294-040-000-800	B	71.0/5.7
J3	6510022022	S.CON 14FLT-SM2-TB(LF)(SN)(M)	B	84.4/28.6
DS1	5040003510	S.LED LNJ426W83RA	T	37.5/6.8
DS2	5040003510	S.LED LNJ426W83RA	T	67.9/6.8
DS3	5040003510	S.LED LNJ426W83RA	T	75.5/27.2
DS4	5040003510	S.LED LNJ426W83RA	T	60.3/27.2
DS5	5040003510	S.LED LNJ426W83RA	T	45.1/27.2
DS6	5040003510	S.LED LNJ426W83RA	T	29.9/27.2
DS7	5040003510	S.LED LNJ426W83RA	T	60.3/21.2
DS8	5040003510	S.LED LNJ426W83RA	T	45.1/21.2
DS9	5040003510	S.LED LNJ426W83RA	T	29.9/21.2
DS10	5040002670	S.LED CL-165HR/YG	T	79.8/21.2
SP1	2510001221	SPE C052SB500-14 <OSC>		
W1	8900010503	CAB OPC-1046B-1(P0.5N40L55) <TJM>		

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

SECTION 8

MECHANICAL PARTS

[CHASSIS PARTS]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6510004880	MR-DS-E 01 <SSC>	1
W1	8900011800	OPC-1199	1
MP1	8010019065	2601 CHASSIS-5	[EUR-01] 1
	8010019065	2601 CHASSIS-5	[EXP-01] 1
	8010019135	2601 LONG CHASSIS-5	[USA-01] 1
	8010019135	2601 LONG CHASSIS-5	[EXP-02] 1
	8110007821	2601 COVER-1 RO	1
MP2	8110007821	2601 COVER-1 RO	1
MP3	8810008661	PHBT M3 X 8 NI-ZC3	8
MP4	8810008661	PHBT M3 X 8 NI-ZC3	2
MP5	8810008661	PHBT M3 X 8 NI-ZC3	2
MP6	8810008661	PHBT M3 X 8 NI-ZC3	1
MP7	8810009991	PHBT M3 X 8 NI-ZK3	4
MP8	8810009991	PHBT M3 X 8 NI-ZK3	2
MP11	8930049131	SHIELD TAPE (D)-1	[EUR-01] only 1

[ACCESSORIES]

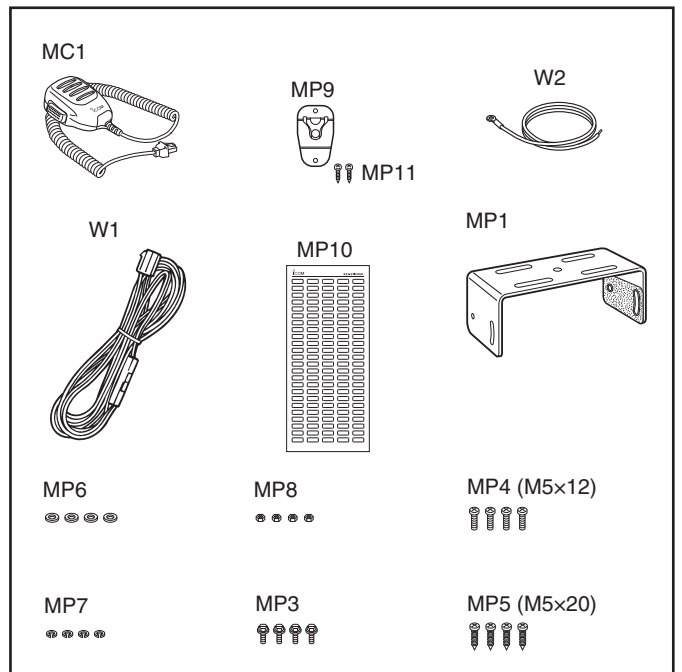
REF NO.	ORDER NO.	DESCRIPTION	QTY.
MC1	(Optional)	HM-152	1
W1	8900011781	OPC-1194A	[EUR-01] 1
	8900011781	OPC-1194A	[EXP-01] 1
	(Optional)	OPC-1132A	[USA-01] 1
	(Optional)	OPC-1132A	[EXP-02] 1
W2	8900000731	OPC-049A	1
MP1	8010019151	2601 MOBIL BRACKET-1	1
MP3	8820000530	FLANGE BOLT M4 X 8 NI	4
MP4	8810000471	PH M5 X12 (+-) ZC3	4
MP5	8810005841	PHA M5 X20 ZC3	4
MP6	8850000150	FLAT WASHER M 5 NI BS	4
MP7	8850000391	S-WASHER M5 ZC3	4
MP8	8830000121	NUT M5 ZC3	4
MP9	8950005110	2289 MIC HANGER Y468	1
MP10	8310073440	3179 LCD LABEL M6K	1
MP11	8810004700	PHA M3 X16 SUS	2

[MAIN-A UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1*	6510026770	AXK540147YG	1
J2*	6510027960	04-6294-040-000-800	1
J4	6450000140	HSJ0807-01-010	1
J6*	6510022891	B13B-ZR-SM4-TF (LF) (SN)	1
J7*	6510014961	B2B-ZR-SM4-TF (LF) (SN)	1
S1*	2260003180	MINISMDC050F-2 CN	1
W1*	7030012290	RDS2T0R0	1
W2	8900011863	OPC-1195C	1
EP4*	6910010280	HF70BB9.5X10.4X4.9	1
EP5*	6910010280	HF70BB9.5X10.4X4.9	1
MP1*	8510019340	3179 VCO CASE Y1142	1
MP2	8510019350	3179 VCO COVER Y1143	1
MP3	8510015110	2602 M-PLATE Y660	1
MP4*	8930055841	2490 EARTH SPRING-1	1

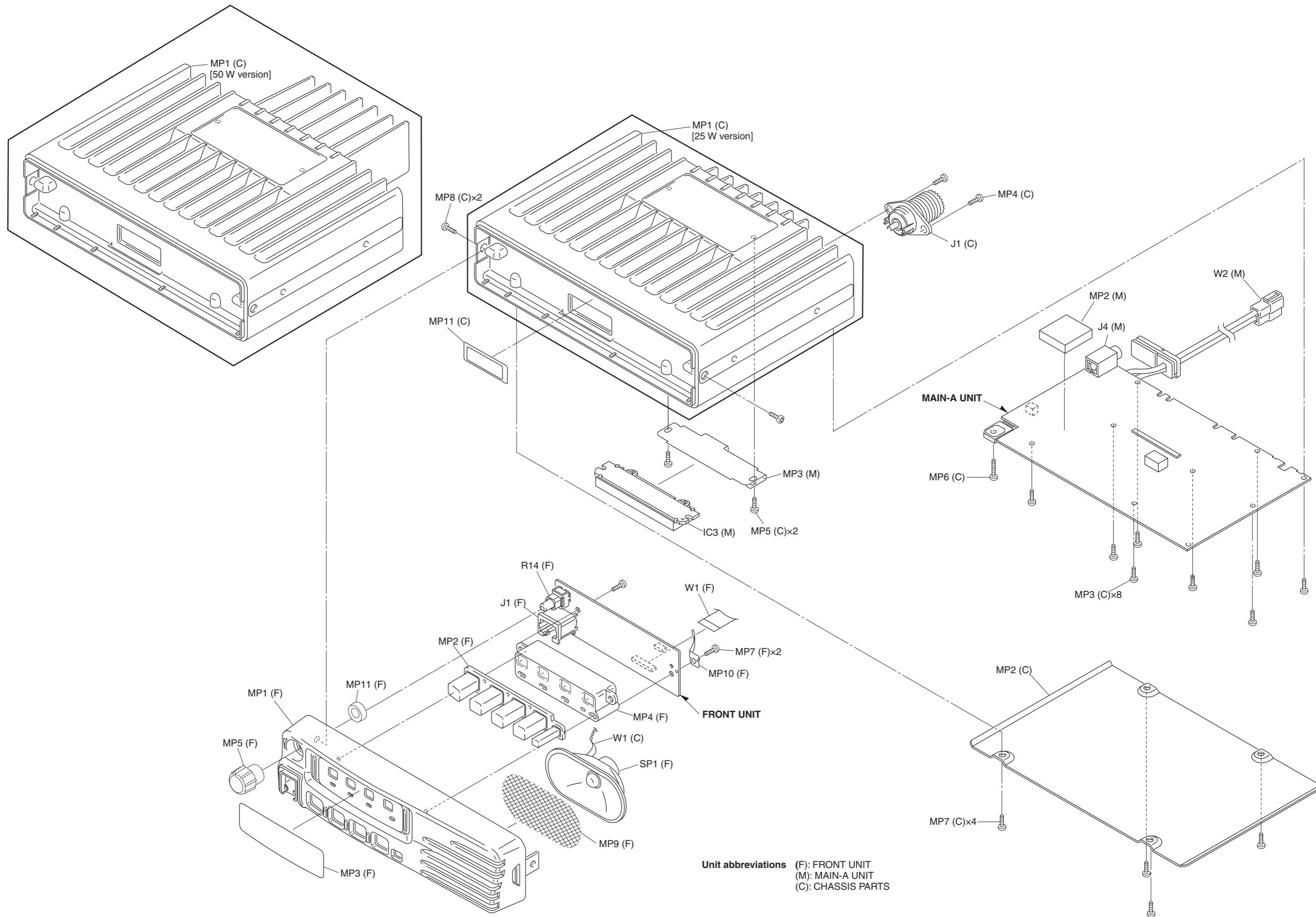
[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6450002210	3017-8821 <KIN>	1
J2*	6510027960	04-6294-040-000-800	1
J3*	6510022022	14FLT-SM2-TB (LF) (SN) (M)	1
SP1	2510001221	C052SB500-14 <OSC>	1
W1	8900010503	OPC-1046B-1 (P0.5N40L55)	1
MP1	8210026500	3334 FRONT PANEL	1
MP2	8930081280	3334 FRONT KEY <SEP>	1
MP3	8310076970	3334 FRONT PLATE	1
MP4	8210026510	3334 REFLECTOR	1
MP5	8610014010	KNOB N-386	1
MP7	8810009131	PHBT M3 X12 NI-ZC3	2
MP9	8930059000	2601 SP NET	1
MP10	8510014930	2601 EARTH PLATE Y648	1
MP11	8930070850	2979 VOL RUBBER (TOT)	1



*: Refer to "BOARD LAYOUTS" for the location.

Screw abbreviations A, B0, BT: Self-tapping PH: Pan head ZK: Black NI-ZU: Nickel-Zinc SUS: Stainless

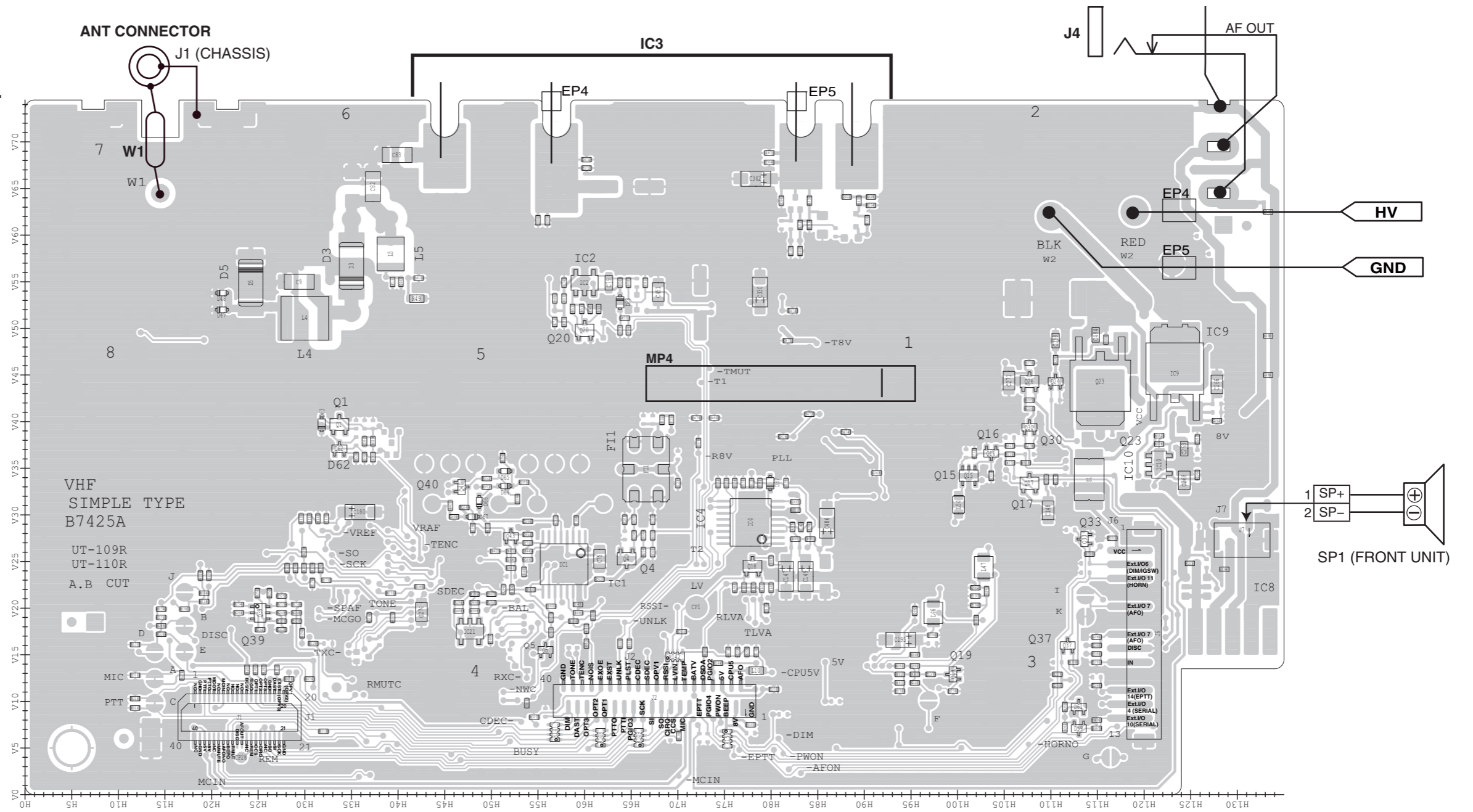


SECTION 9

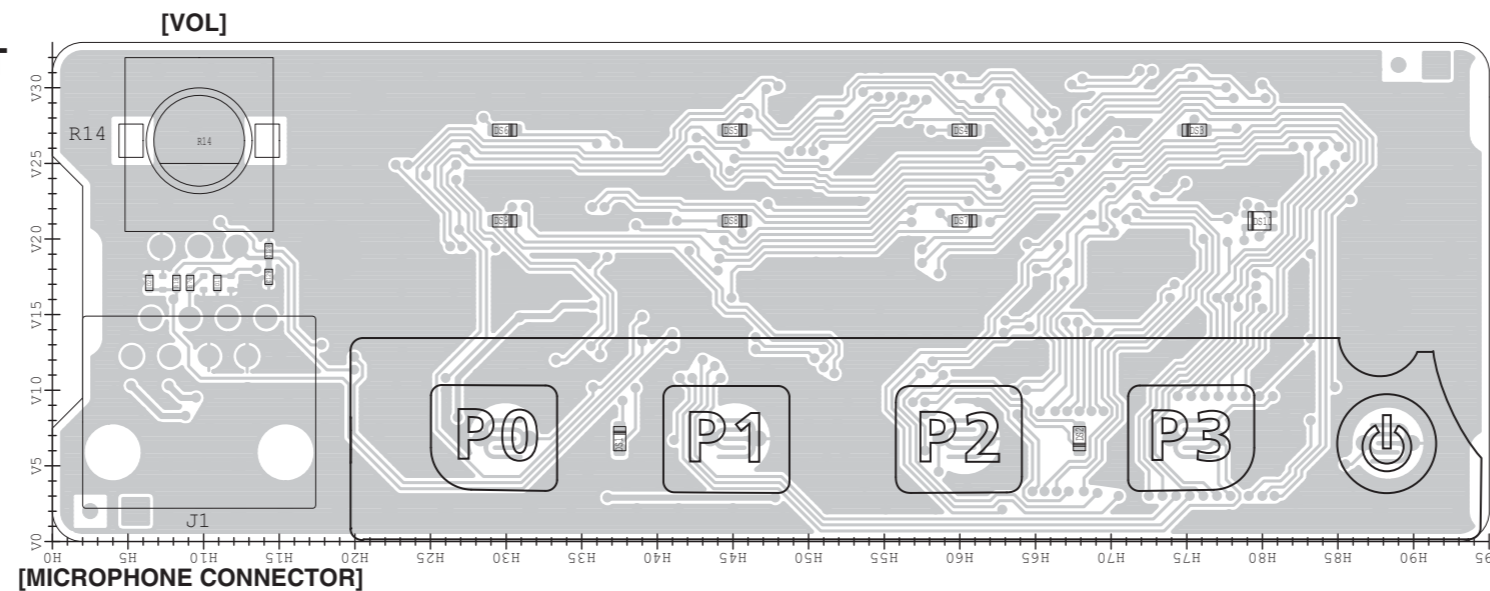
BOARD LAYOUTS

The combination of top side and bottom side of this page shows the actual configuration of P.C. board.

**• MAIN-A UNIT
(TOP VIEW)**

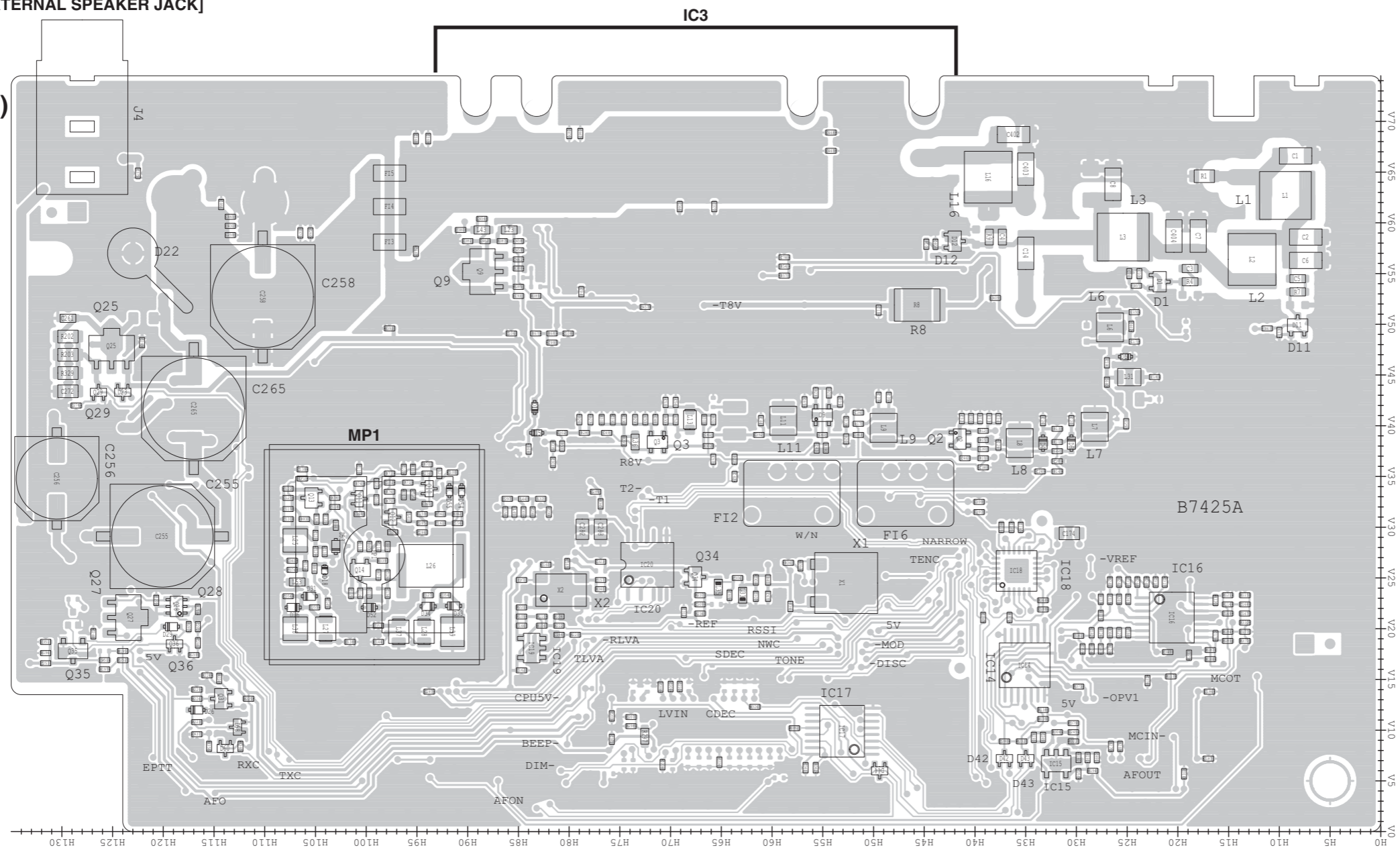


**• FRONT UNIT
(TOP VIEW)**

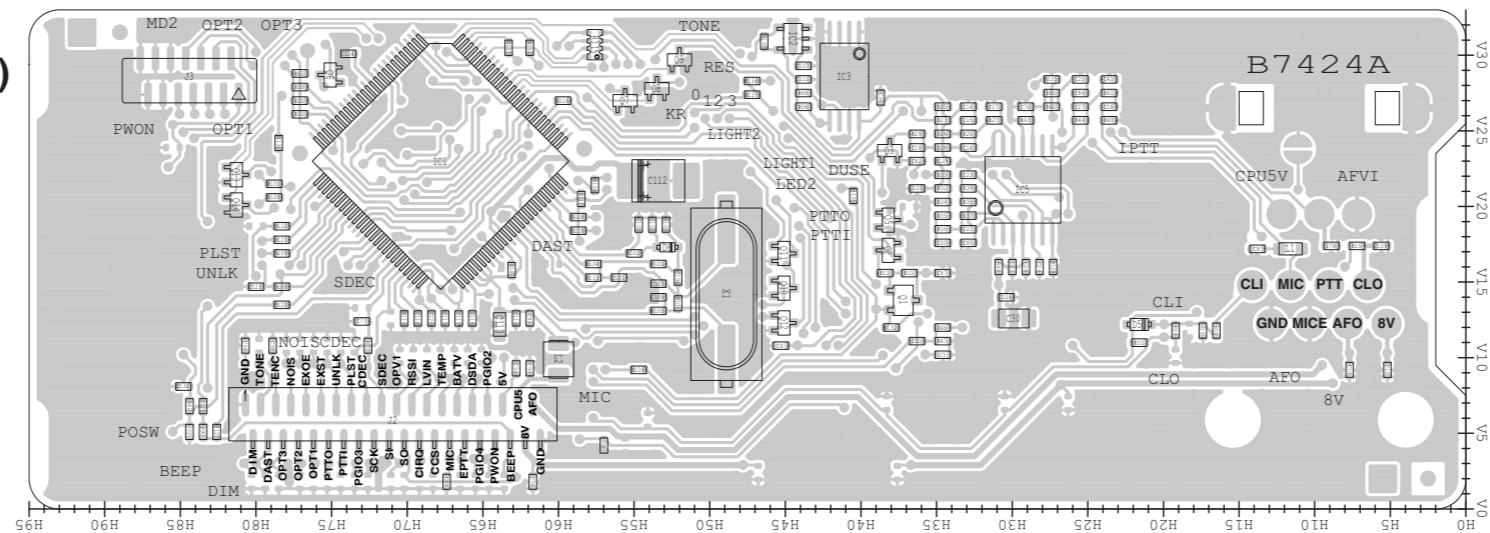


• MAIN-A UNIT
(BOTTOM VIEW)

[EXTERNAL SPEAKER JACK]

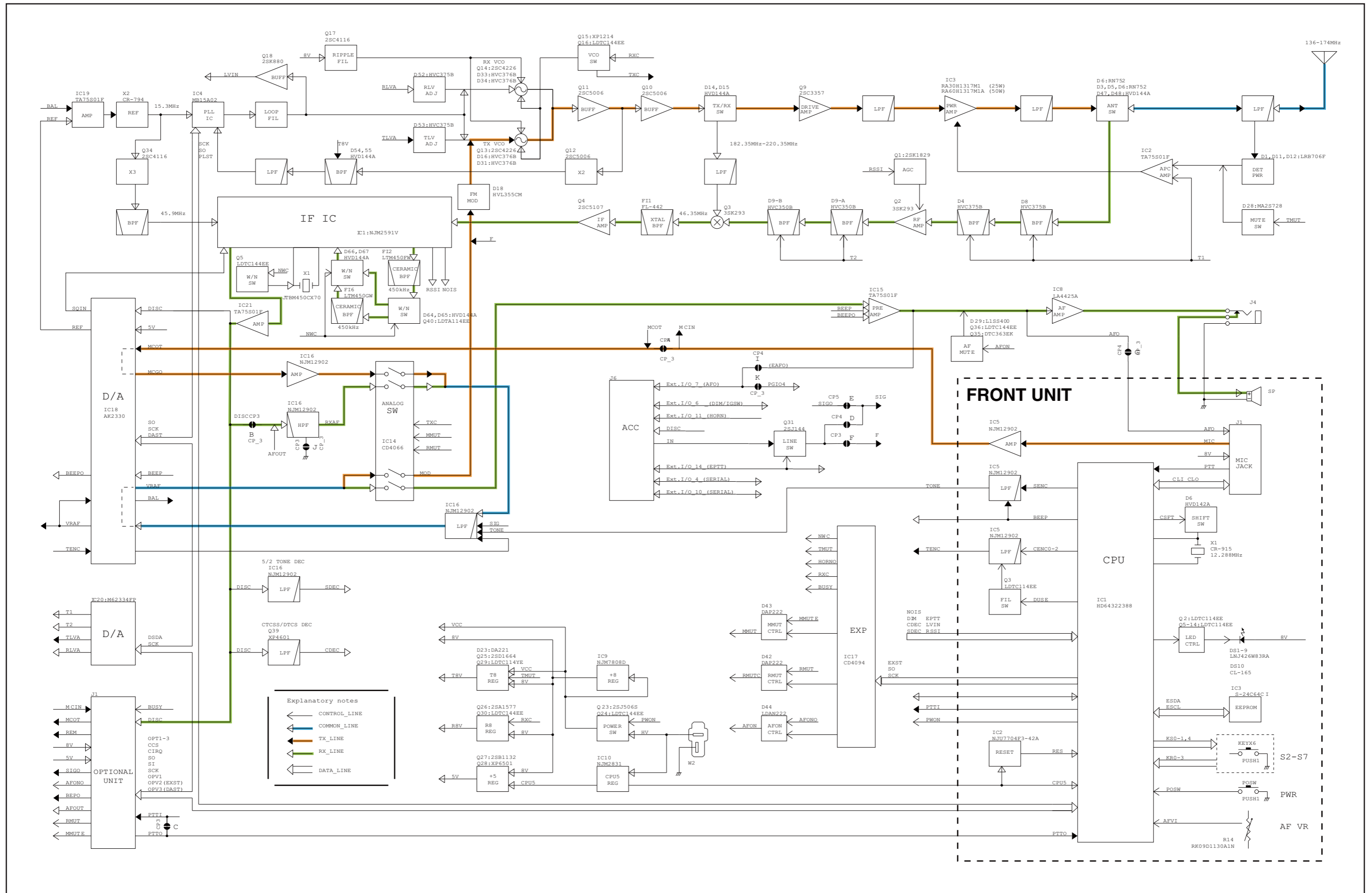


• FRONT UNIT
(BOTTOM VIEW)



SECTION 10

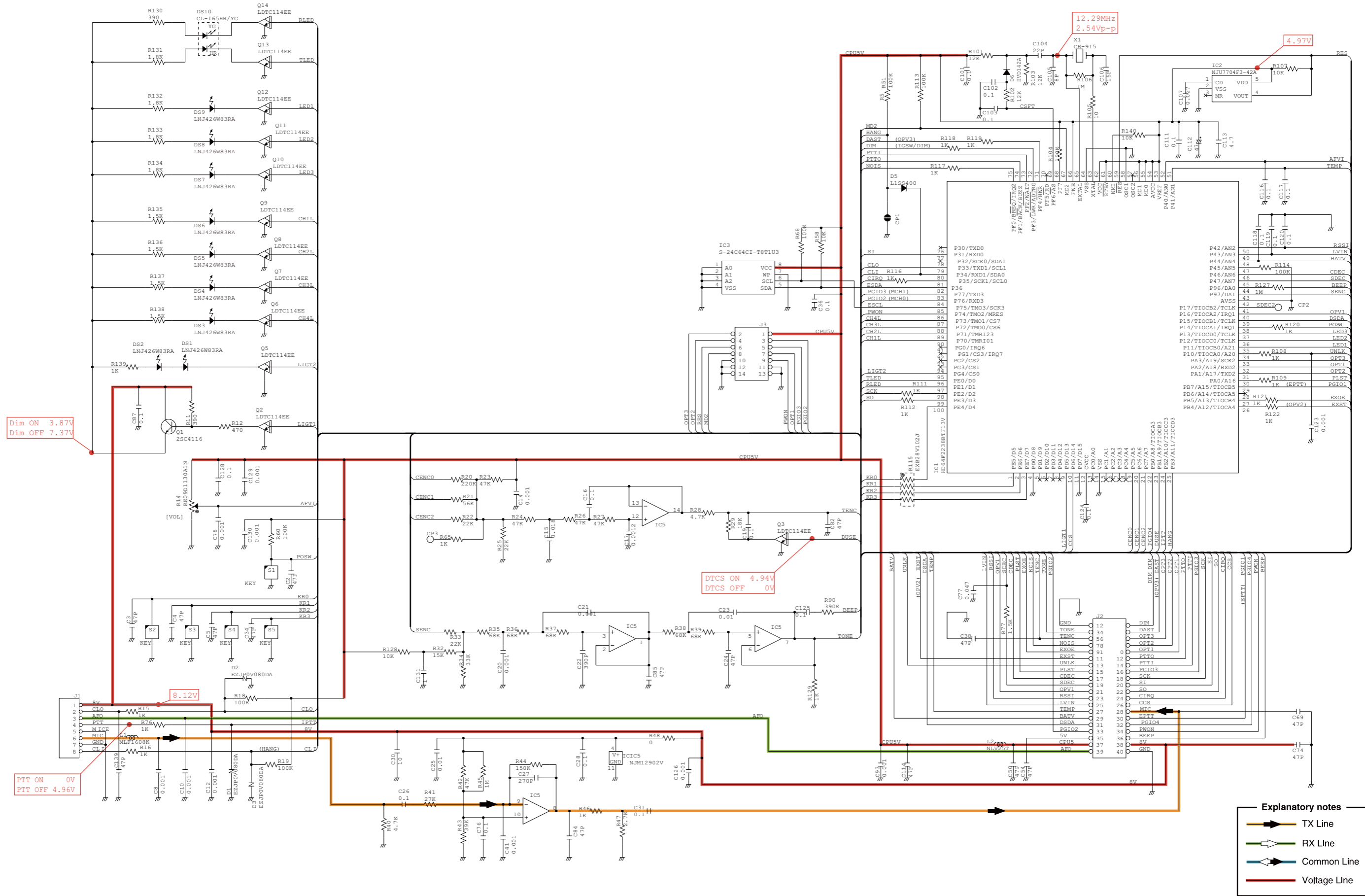
BLOCK DIAGRAM



SECTION 11

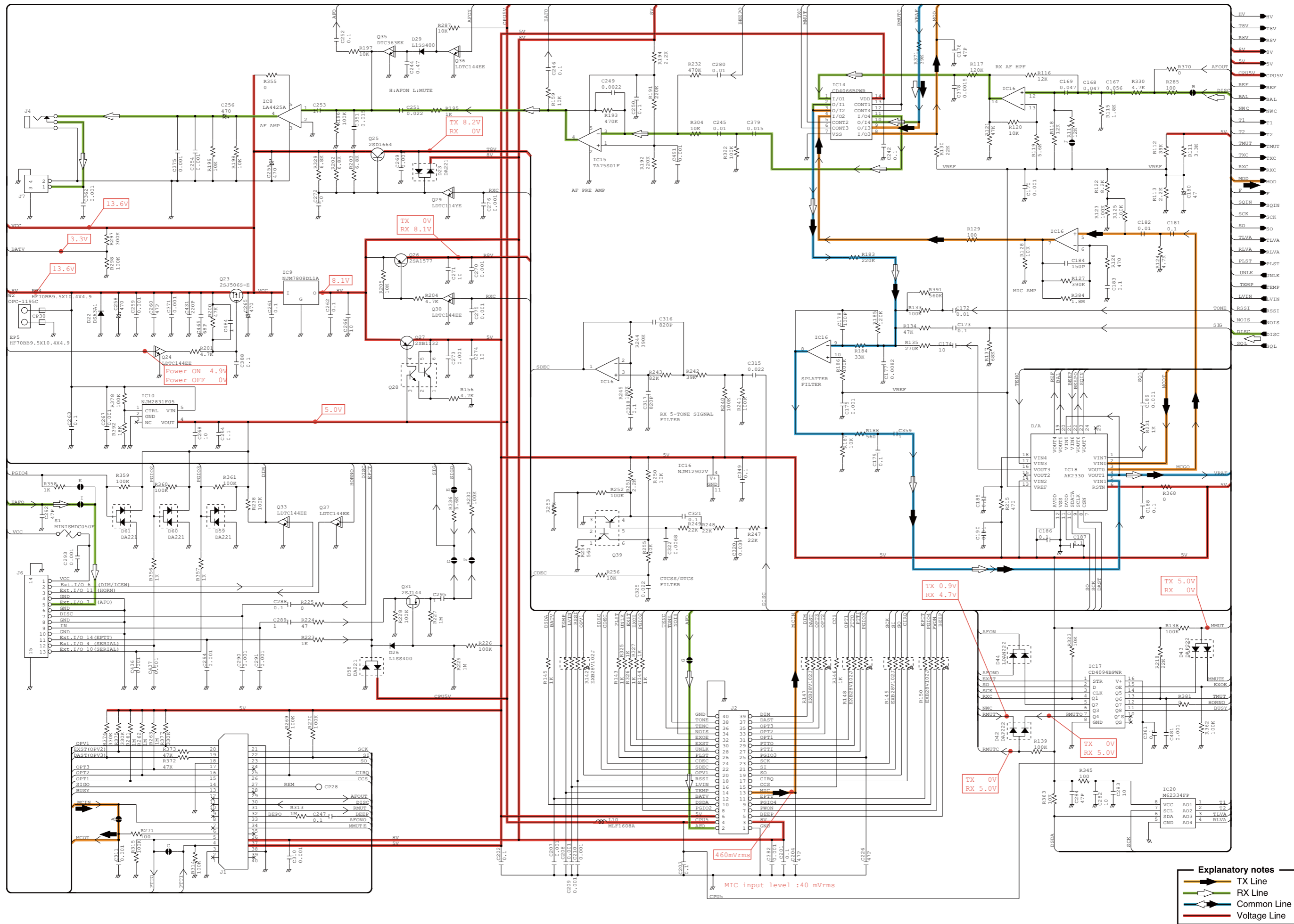
VOLTAGE DIAGRAM

• FRONT UNIT



*: Refer to the PARTS LIST for the value and name of component.

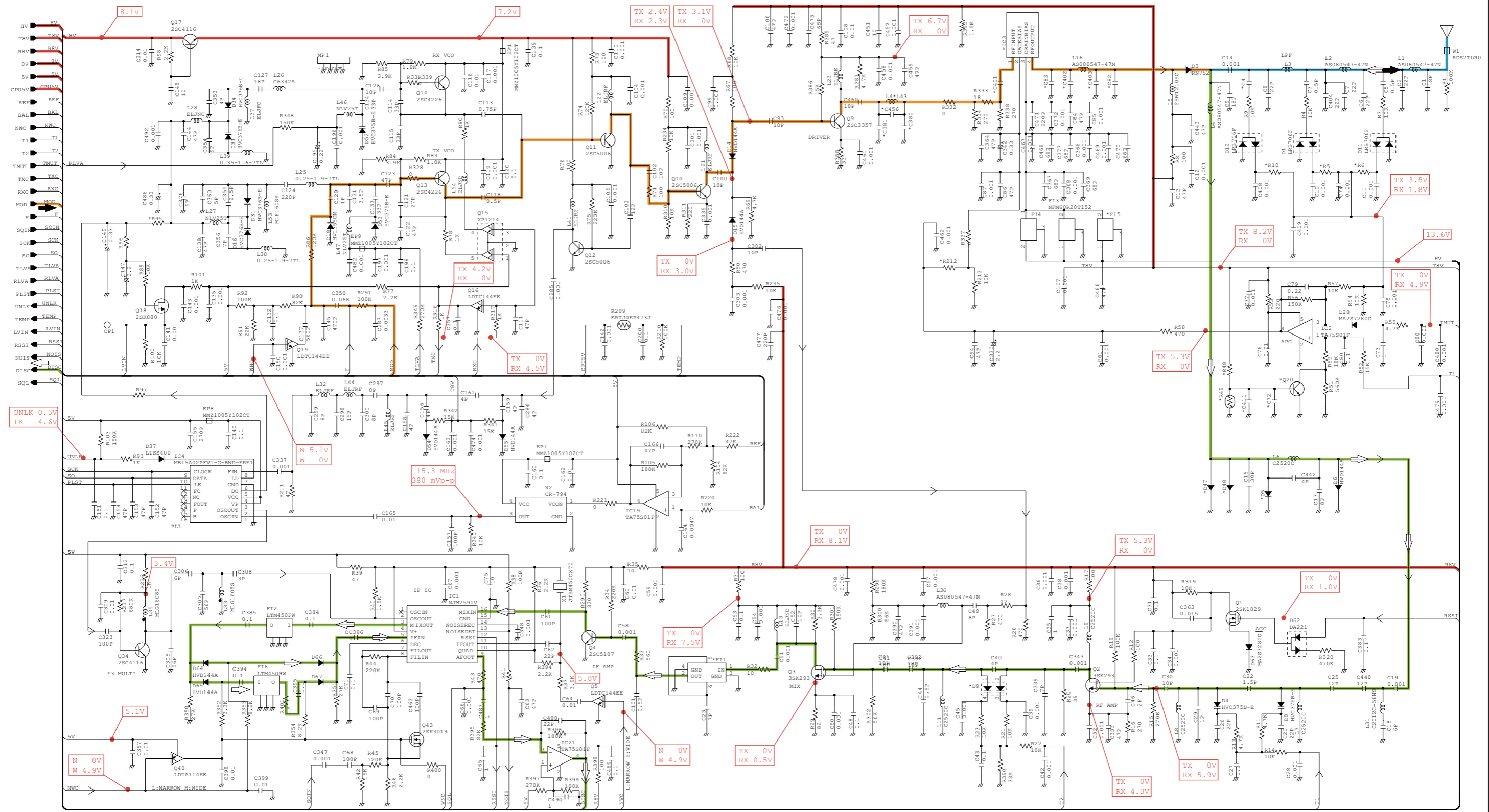
• MAIN-A UNIT (1/2)



*: Refer to the PARTS LIST for the value and name of component.

- Explanatory notes**
- TX Line
 - RX Line
 - Common Line
 - Voltage Line

• MAIN-A UNIT (1/2)



Explanatory notes

- TX Line
- RX Line
- Common Line
- Voltage Line

*: Refer to the PARTS LIST for the value and name of component.

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