



SERVICE MANUAL

VHF/UHF DIGITAL TRANSCEIVER

IC-92AD

S-14415XZ-C1
Jan. 2008

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-92AD** VHF/UHF DIGITAL TRANSCEIVER at the time of publication.

MODEL	VERSION	SUPPLIED CHARGER
IC-92AD	[USA]	BC-167A
	[SEA]	
	[CHN]	BC-167D
	[EXP]	
	[CAN]	BC-167A

UNIT ABBREVIATIONS:

F=FRONT UNIT
L=LOGIC UNIT
M=MAIN UNIT
R=RF UNIT
V=VCO UNIT

CAUTION

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

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 parts numbers
2. Component name
3. Equipment model name and unit name
4. Quantity required

<ORDER EXAMPLE>

1110003491 S.IC TA31136FNG IC-92AD MAIN UNIT 5 pieces
8820001210 SCREW 2438 SCREW IC-92AD Top cover 10 pieces

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



REPAIR NOTES

1. Make sure 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 S-Lowly 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 test equipment thoroughly before connecting a test equipment to the transceiver.

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SECTION 1

SPECIFICATIONS

GENERAL

- Frequency coverage : (unit: MHz)

Version	A band	B band
U.S.A.	Tx: 144-148, 420-450* ¹ Rx: 0.495-823.990* ^{1, *2} , 849-868.990, 894-999.990	Tx: 144-148, 420-450* ¹ Rx: 118-174* ² , 350-470* ¹
CAN	Tx: 144-148, 420-450* ¹ Rx: 0.495-999.990* ^{1, *2}	Tx: 144-148, 420-450* ¹ Rx: 118-174* ² , 350-470* ¹
S.E.A. CHN EXP	Tx: 137-174* ² , 400-470* ³ Rx: 0.495-999.990* ^{2, *3}	Tx: 137-174* ² , 400-470* ³ Rx: 118-174* ² , 350-470* ³

*¹Guaranteed 440-450 MHz only, *²Guaranteed 144-148 MHz only,
*³Guaranteed 430-440 MHz only

- Mode : FM, FN-N, AM (Rx only), WFM (Rx only), DV
- No. of memory channels : 1304
(incl. 100 scan edges and 4 call channels)
- Usable temp. range : -20°C to +60°C; -4°F to +140°F
- Tuning steps : 5[‡], 6.25[‡], 8.33[‡], 9[‡], 10, 12.5, 15, 20, 25, 30, 50, 100, 125 and 200 kHz
- Frequency stability : ±2.5 ppm
(-20°C to +60°C; -4°F to +140°F)
- Power supply : 10.0-16.0 V DC for external DC power,
or specified Icom's battery pack
- Digital transmission speed: 4.8 kbps
- Voice coding speed : 2.4 kbps
- Current drain (at 7.4 V DC) :

Tx High	144 MHz	1.8 A typical
	430/440 MHz	2.1 A typical
Tx Mid.	144 MHz	1.2 A typical
	430/440 MHz	1.5 A typical
Tx Low	144 MHz	0.6 A typical
	430/440 MHz	0.7 A typical
Tx S-Low		0.4 A typical
Rx	Rated output	150 mA typical (single watch; FM) 180 mA typical (dualwatch; FM/FM) 200 mA typical (single watch; DV) 220 mA typical (dualwatch; FM/DV)
	Power save	38 mA typical (single watch; FM)
	(Duty 1:4)	43 mA typical (dualwatch; FM/FM) 47 mA typical (single watch; DV) 50 mA typical (dualwatch; FM/DV)
	standby	65 mA typical (single watch; FM) 90 mA typical (dualwatch; FM/FM) 110 mA typical (single watch; DV) 130 mA typical (dualwatch; FM/DV)
- Antenna connector : SMA (50 Ω)
- Dimensions : 59(W)×112(H)×34.2(D) mm;
(projections not included) 2⁵/₁₆(W)×4¹³/₃₂(H)×1¹¹/₃₂(D) in
- Weight (approx.) : 325 g; 11.5 oz (with antenna and BP-256)

TRANSMITTER

- Modulation system :

FM	Variable reactance freq. modulation
DV (Digital)	GMSK reactance freq. modulation
- Output power (at 7.4 V DC)
(Typical) : High 5.0 W, Mid. 2.5 W, Low 0.5 W,
S-Low 0.1 W
- Max. frequency deviation : ±5.0 kHz (FM wide: approx.)
±2.5 kHz (FM narrow: approx.)
- Spurious emissions : Less than -60 dBc at High/Mid.
Less than -13 dBm at Low/Slow
- Ext. mic. impedance : 2 kΩ

RECEIVER

- Receive system :

Except WFM	Double-conversion superheterodyne
WFM	Triple-conversion superheterodyne
- Intermediate frequencies :

1st	A band	61.65 MHz/59.25 MHz (WFM only)
	B band	46.35 MHz
2nd		450 kHz/13.35 MHz (WFM only)
3rd		1.95 MHz (WFM only)
- Sensitivity (except spurious points):

AM (1 kHz/30% Mod.; 10 dB S/N)	
0.495-4.995 MHz	1.3 μV typ.
5.000-29.995 MHz	0.56 μV typ.
118.000-137.000 MHz	0.5 μV typ.
222.000-246.995 MHz	0.79 μV typ.
247.000-329.995 MHz	1 μV typ.
FM (1 kHz/3.5 kHz Dev.; 12 dB SINAD)	
VHF (Amateur band only)	0.14 μV typ.
UHF (Amateur band only)	0.16 μV typ.
1.625-29.995 MHz	0.4 μV typ.
30.000-117.995 MHz	0.25 μV typ.
118.000-173.995 MHz	0.14 μV typ.
174.000-259.995 MHz	0.32 μV typ.
260.000-349.995 MHz	0.32 μV typ.
350.000-469.995 MHz	0.16 μV typ.
470.000-599.995 MHz	0.32 μV typ.
600.000-999.990 MHz	0.56 μV typ.
WFM (1 kHz/52.5 kHz Dev.; 12 dB SINAD)	
76.000-108.000 MHz	1 μV typ.
175.000-221.995 MHz	1.8 μV typ.
470.000-770.000 MHz	2.5 μV typ.
DV (digital/PN9 4.8 kbps; BER 1%)	
VHF (Amateur band only)	0.22 μV typ.
UHF (Amateur band only)	0.22 μV typ.
- Audio output power : More than 200 mW at 10% distortion
(at 7.4 V DC) with an 8 Ω load
- Selectivity :

FM (Wide), AM	More than 50 dB
FM (Narrow), DV	More than 45 dB
WFM	More than 300 kHz/-3 dB Less than 700 kHz/-20 dB
- Ext. speaker connector : 3-conductor 3.5(d) mm: (1/8")/8 Ω
- Spurious and image rejection ratio :

VHF	More than 60 dB
UHF	More than 50 dB
(Intermediate freq.;)	More than 60 dB
- Squelch Sensitivity (except spurious points):

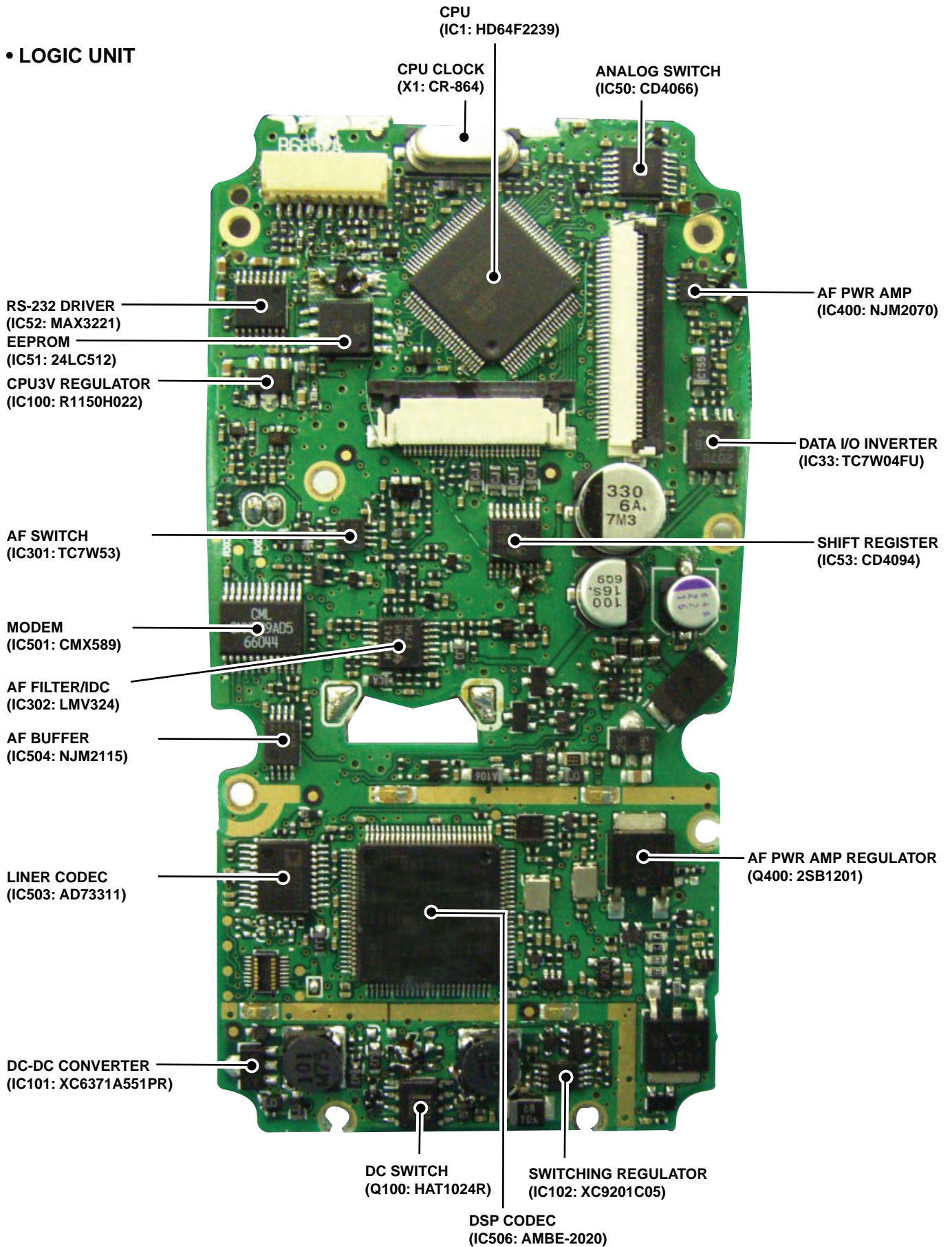
AM (1 kHz/30% Mod.)	
0.495-4.995 MHz	1.3 μV typ.
5.000-29.995 MHz	0.56 μV typ.
118.000-137.000 MHz	0.5 μV typ.
222.000-246.995 MHz	0.79 μV typ.
247.000-329.995 MHz	1 μV typ.
FM (1 kHz/3.5 kHz Dev.)	
1.625-29.995 MHz	0.4 μV typ.
30.000-75.995 MHz	0.25 μV typ.
76.000-117.995 MHz	0.25 μV typ.
118.000-173.995 MHz	0.14 μV typ.
174.000-259.995 MHz	0.32 μV typ.
260.000-349.995 MHz	0.32 μV typ.
350.000-469.995 MHz	0.16 μV typ.
470.000-599.995 MHz	0.32 μV typ.
600.000-999.990 MHz	0.56 μV typ.
WFM (1 kHz/52.5 kHz Dev.)	
76.000-108.000 MHz	1 μV typ.
175.000-221.995 MHz	1.8 μV typ.
470.000-770.000 MHz	2.5 μV typ.

[‡]Selectable depending on the operating frequency band.

SECTION 2

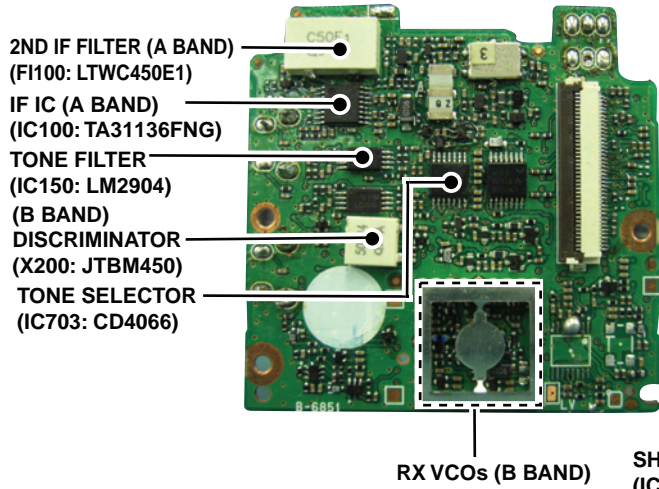
INSIDE VIEWS

• LOGIC UNIT

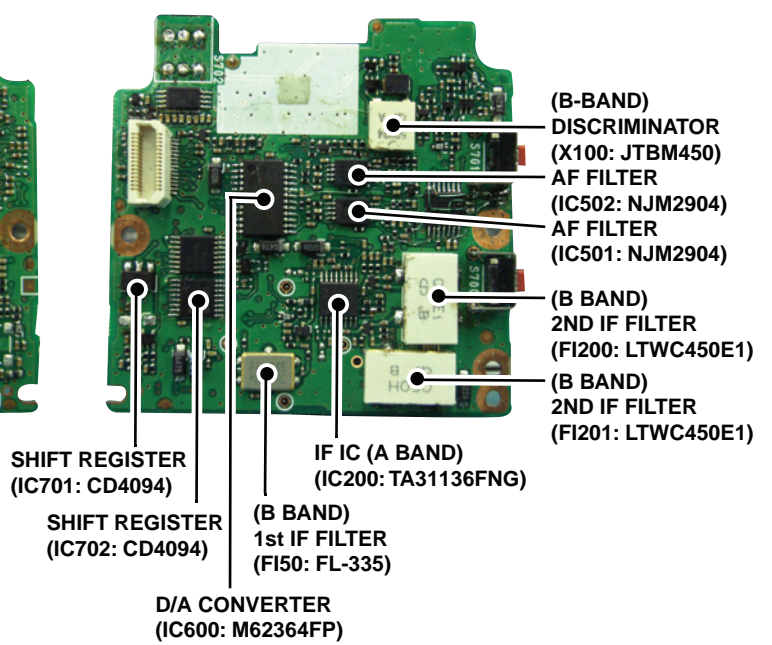


• MAIN UNIT

(TOP VIEW)

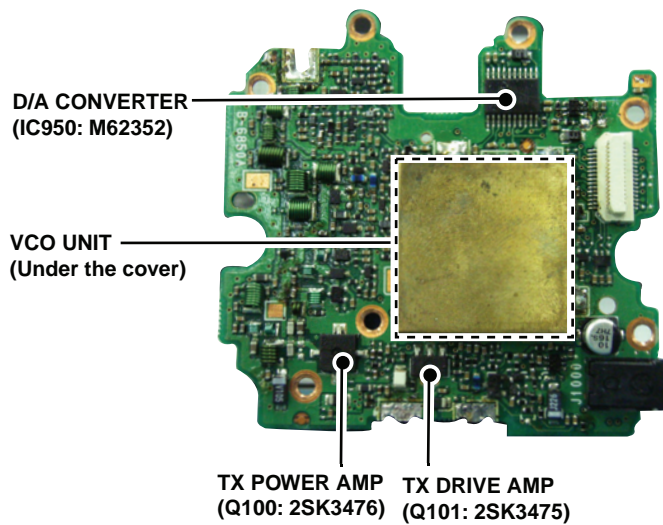


(BOTTOM VIEW)

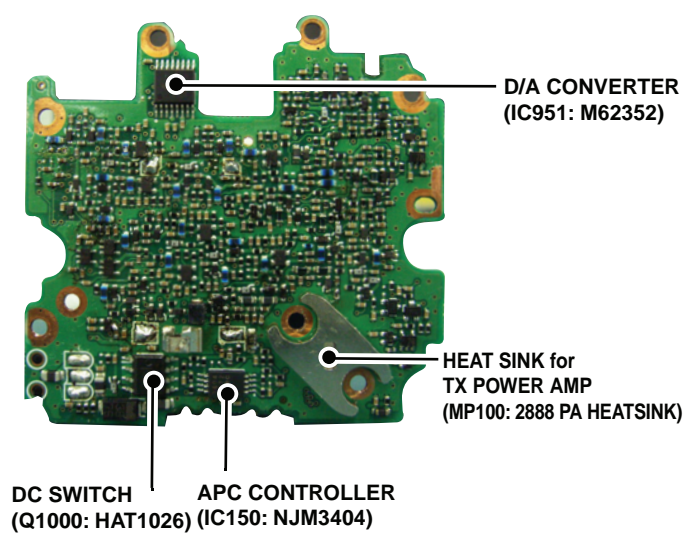


• RF UNIT

(TOP VIEW)



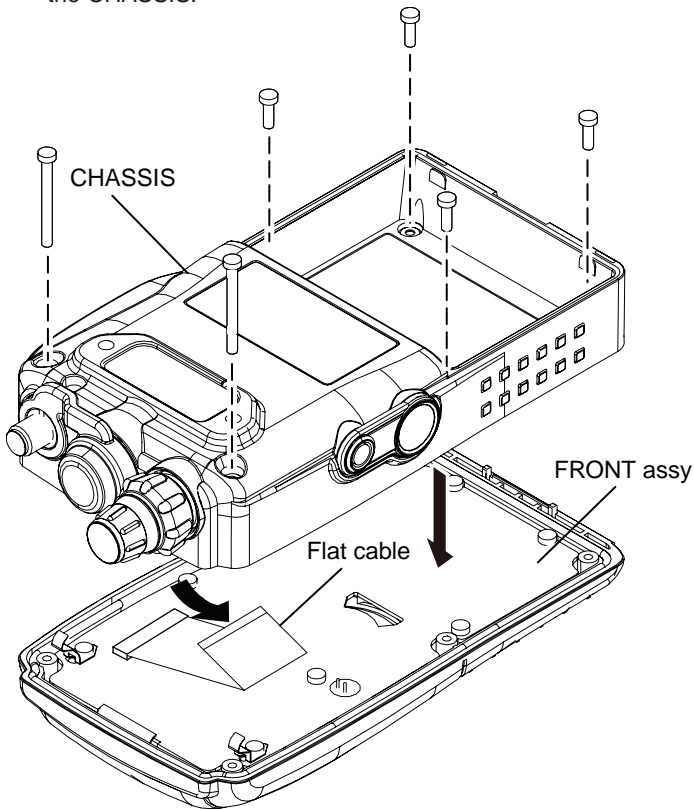
(BOTTOM VIEW)



SECTION 3 DISASSEMBLY INSTRUCTION

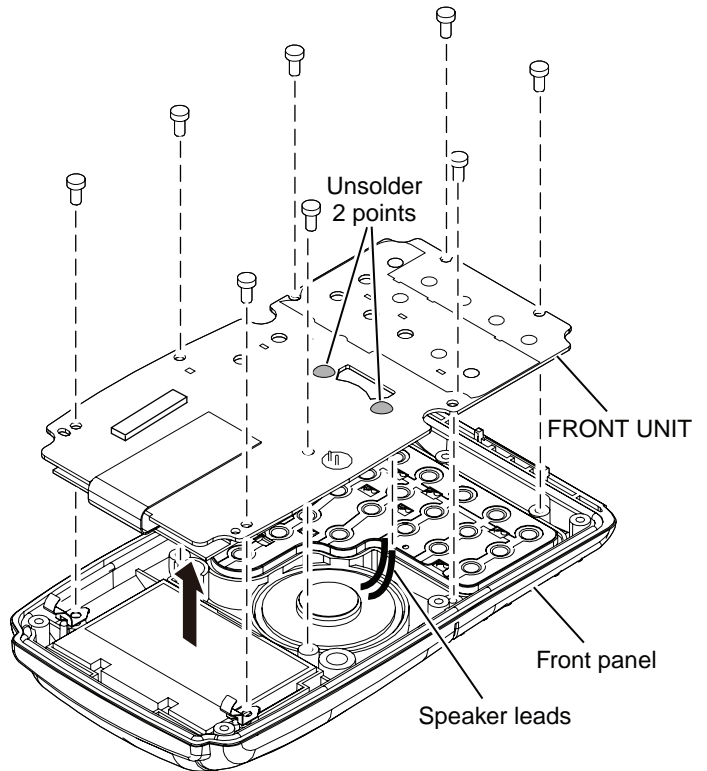
1. Removing the front panel

- ① Unscrew 6 screws from the CHASSIS.
- ② Disconnect the flat cable between MAIN UNIT and FRONT assembly, and remove the FRONT assembly from the CHASSIS.



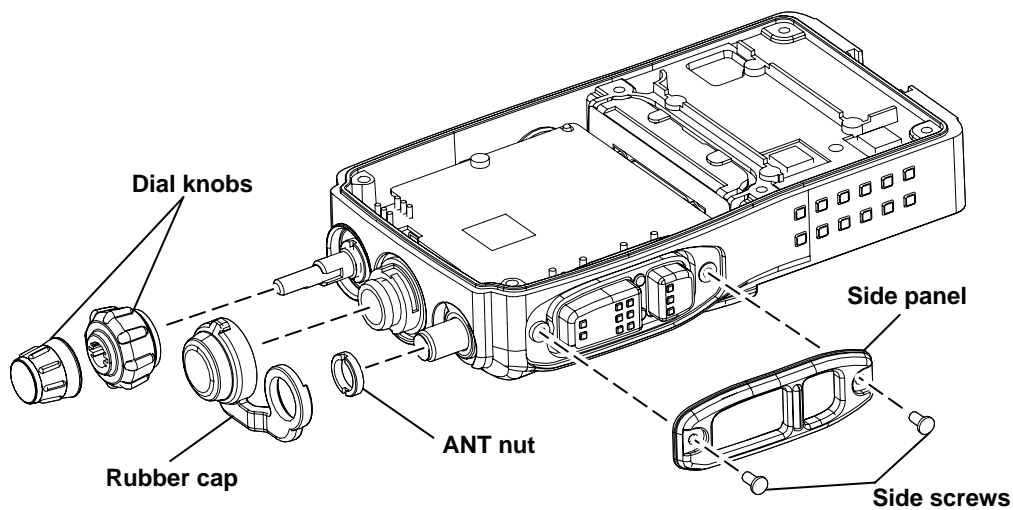
2. Removing the FRONT UNIT

- ① Unscrew 8 screws from the FRONT UNIT.
- ② Unsolder 2 points to remove the speaker leads, then remove the FRONT UNIT from the front panel.



3. Removing outer parts

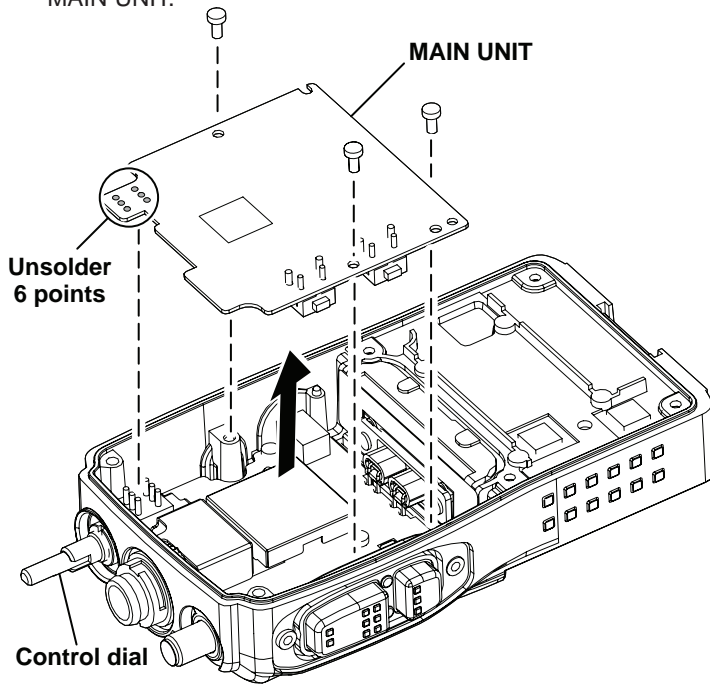
- ① Remove the dial knobs.
- ② Remove the rubber cap, and unscrew the ANT nut.
- ③ Unscrew the side screws, and remove the side panel.



(Continued to next page)

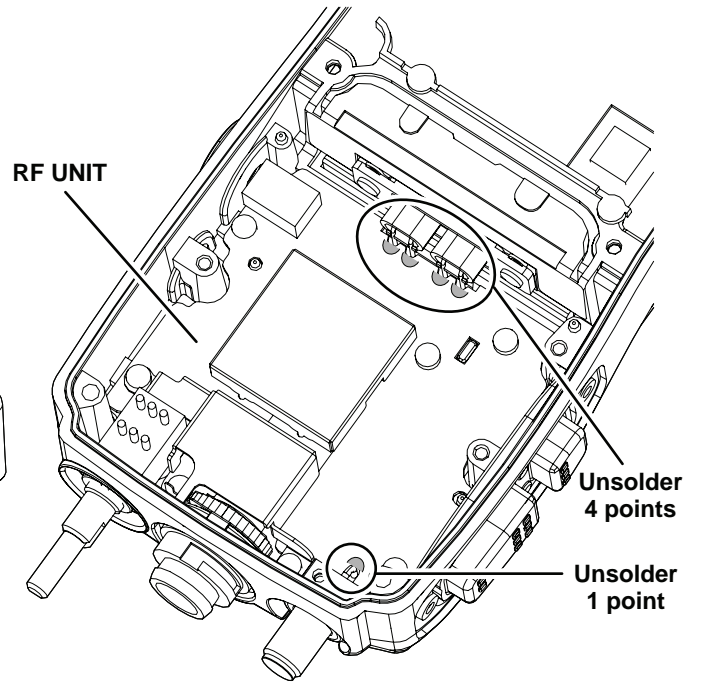
4. Removing MAIN UNIT

- ① Unscrew 3 screws from the MAIN UNIT.
- ② Unsolder 6 points at the control dial, and remove the MAIN UNIT.

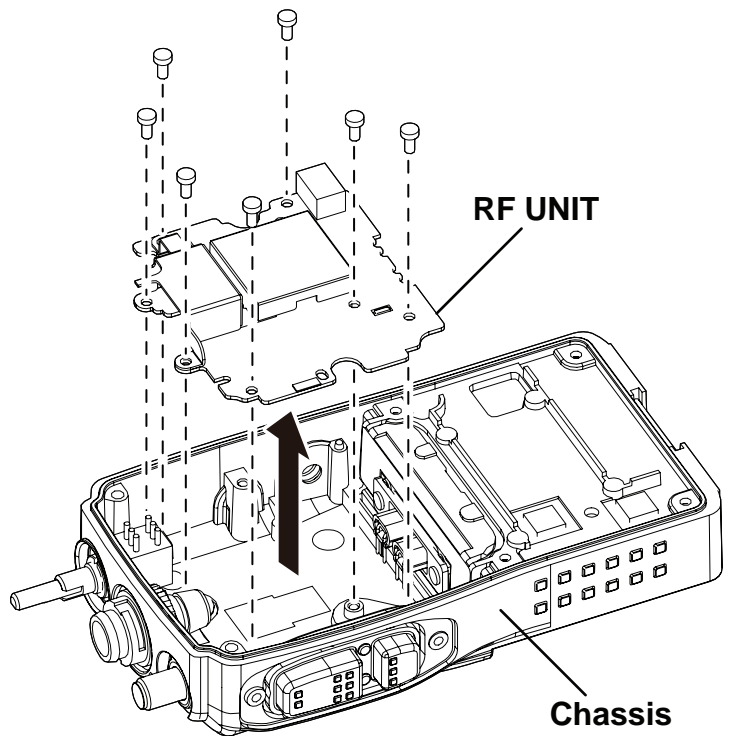


5. Removing RF UNIT

- ① Unsolder 4 points at the contact pins.
- ② Unsolder 1 point at the bottom of ANT connector.



- ③ Unscrew 7 screws from the RF UNIT, and remove the RF UNIT from the CHASSIS.



4-1 RECEIVER CIRCUITS

RF CIRCUITS (RF UNIT)

RX signals from the antenna are sorted by its frequency by the filters and gone through RF circuits for each bands. And this transceiver also has two RX lines for two independent operating bands; A BAND and B BAND.

<A BAND>

• 76 MHz and below

The RX signals are passed through two LPFs, ANT SW, ATT, band SW and LPF. The RX signals are sorted by its frequency by band SWs.

• 0.495–29.995 MHz

The RX signals are passed through the band SW (D201) and LPF, and applied to tuned RF AMP (Q200). The amplified RX signals are applied to the 1st mixer (IC900) via the band SW (D203).

• 30–75.995 MHz

The RX signals are passed through the band SW (D250) and tuned BPF, and applied to the RF AMP (Q250). The amplified RX signals are passed through tuned BPF, then applied to the 1st IF mixer (IC900) via the band SW (D256).

• 76–117.995 MHz

The RX signals are passed through two LPFs, ANT SW, ATT, band SW, LPF and another band SW in sequence, then applied to the RF AMP (Q300) via the tuned BPF. The amplified RX signals are passed through another tuned BPF, then applied to another RF AMP (Q301). The amplified RX signals are applied to the 1st mixer (IC900) via the band SW (D311).

• RF CIRCUITS

• 118–173.995 MHz

The RX signals are passed through two LPFs, ANT SW, ATT and band SW, then applied to the RF AMP (Q400). The amplified RX signals are passed through the tuned BPF, and applied to another RF AMP (Q401). The amplified RX signals are passed through tuned BPF, then applied to the 1st IF mixer (IC900) via the band SW.

• 174–259.995 MHz

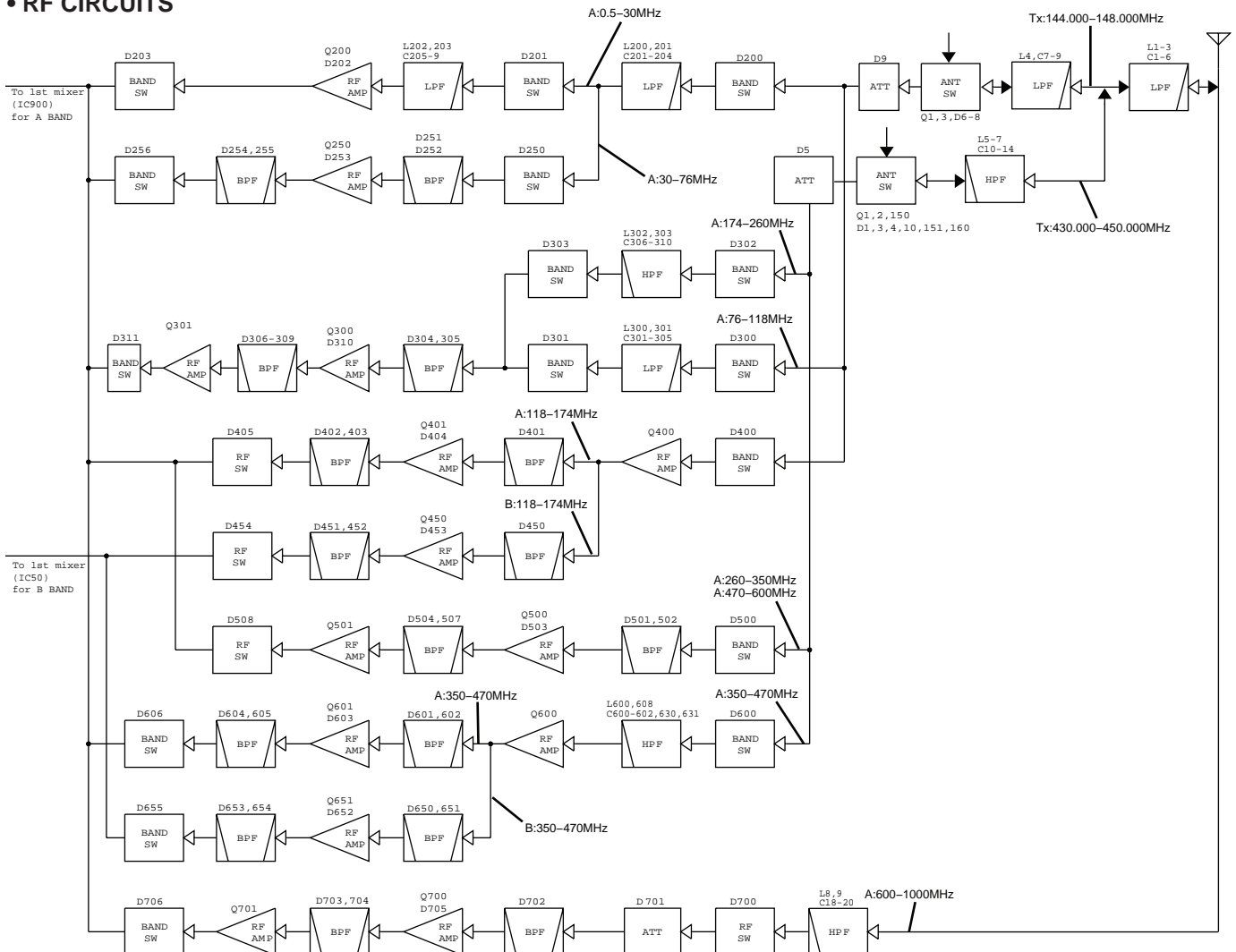
The RX signals are passed through the LPF, HPF, ANT SW, ATT, band SW, HPF and another band SW in sequence, then applied to the RF AMP (Q300) via the tuned BPF. The amplified RX signals are passed through another tuned BPF, then applied to another RF AMP (Q301). The amplified RX signals are applied to the 1st mixer (IC900) via the band SW.

• 260–349.995 MHz and 470–599.995 MHz

The RX signals are passed through the LPF, HPF, ANT SW, ATT, BAND SW and tuned BPF in sequence, then applied to the RF AMP (Q500). The amplified RX signals are passed through another 2pole tuned BPF, and applied to another RF AMP (Q501). The amplified RX signals are then applied to the 1st mixer (IC900) via the band SW.

• 350–469.995 MHz

The RX signals are passed through the LPF, HPF, ANT SW, ATT, band SW and HPF in sequence, then applied to the RF AMP (Q600). The amplified RX signals are passed through the tuned BPF, and applied to the RF AMP (Q601). The amplified RX signals are passed through the BPF, then applied to the 1st mixer (IC900) via the band SW.



• 600–999.990 MHz

The RX signals are passed through the HPF, band SW, ATT and tuned BPF in sequence, then applied to the RF AMP (Q700). The amplified RX signals are passed through the BPF, and applied to another RF AMP (Q701). The amplified RX signals are applied to the 1st mixer (IC900) via the band SW.

The RF attenuation which reduces RX signal level to -10 dB is carried out by D5, D9 and D701, by turning these PIN diodes ON using "ATT" signal.

<B BAND>

• 118–173.995 MHz

The RX signals for B BAND are passed through 2 LPFs, ANT SW, ATT and band SW, then applied to the RF AMP (Q400). The amplified RX signals are passed through the BPF, and applied to the tuned RF AMP (Q450). The amplified RX signals are passed through tuned 2-pole BPF, then applied to the 1st mixer (M: IC50) via the band SW.

• 350–469.995 MHz

The RX signals are passed through the LPF, HPF, ANT SW, ATT, band SW and another HPF in sequence, then applied to the RF AMP (Q600). The amplified RX signals are passed through 2-pole tuned BPF, and applied to tuned RF AMP (Q651). The amplified RX signals are passed through another tuned BPF, then applied to the 1st mixer (M: IC50) via the band SW.

• FREQUENCY CONFIGULATION

BAND	RX MODE	1st IF	1st LO	2nd IF	2nd LO	3rd IF	3rd LO
A BAND	NFM/AM	61.65 MHz	62.15–538.345 MHz (<600 MHz) 269.175–469.17 MHz (>600 MHz)	450 kHz	61.2 MHz	-	-
	WFM	59.25 MHz	16.75–355.375 MHz(76–770 MHz)	13.35 MHz	45.9 MHz	1.95 MHz	15.3 MHz
B BAND	NFM/AM	46.35 MHz	71.65–423.65 MHz (118–174, 350–470 MHz)	450 kHz	45.9 MHz	-	-

1ST IF CIRCUIT (MAIN UNIT)

<A BAND>

The RX signals from the RF circuits are applied to the 1st mixer (RF: IC900) to be converted into the 1st IF signal, by being mixed with the 1st Local Oscillator (LO) signals from the VCO UNIT. The 1st LO signals from the VCO UNIT are applied to the 1st mixer via the LO SW, or doubler (in receiving of 600 MHz and above).

The converted 1st IF signal is passed through the IF SW (D2) which toggles the path of the 1st IF signal: WFM mode or other than WFM mode.

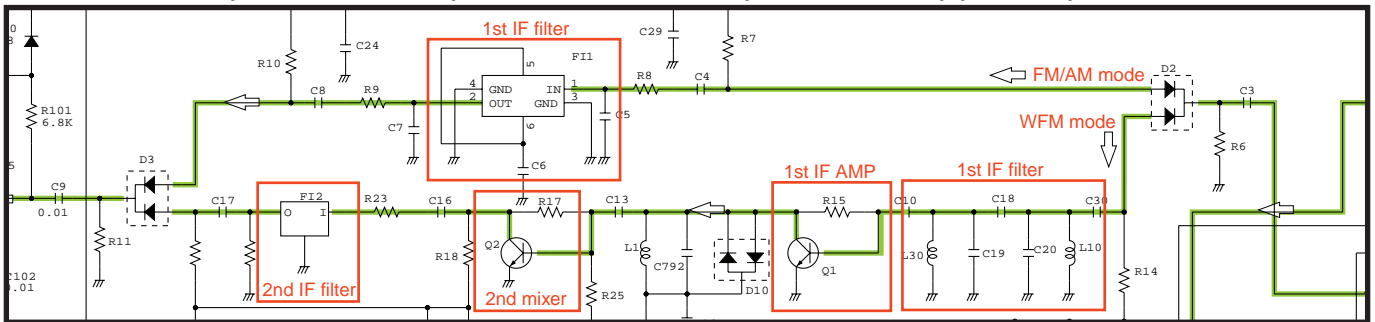
• FM/AM MODE

The 1st IF signal from the 1st mixer (RF: IC900) is entered to the MAIN UNIT, and passed through the 1st IF filter (F11) via IF SWs (D2, 3) to remove unwanted signals. The filtered 1st IF signals are applied to the 1st IF AMP (Q100), and the amplified 1st signal is applied to the 2nd IF circuit.

• WFM MODE (Incl. 2nd IF circuit)

When receiving in WFM mode, the 1st IF signal from the 1st mixer (RF: IC900) is entered to the MAIN UNIT and passed through the BPF, then applied to the 1st IF AMP (Q1). The amplified 1st IF signal is applied to the 2nd mixer (Q2) to be converted into the 13.35 MHz 2nd IF signal, by being mixed with the 45.9 MHz 2nd LO signal (generated by X450, tripled by Q451). The converted 2nd IF signal is passed through the 2nd IF filter (F12) to remove sideband noise, then applied to the 2nd IF AMP (Q100) via the IF SW (D3). The amplified 2nd IF signal is applied to the 3rd IF circuit.

• 1ST IF CIRCUIT (For FM/AM mode) AND 2ND IF CIRCUIT (For WFM mode) (A BAND)

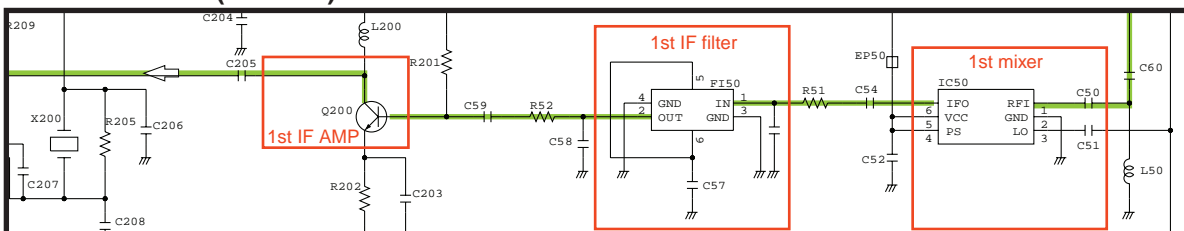


<B BAND>

The RX signals from the RF circuits are entered to the MAIN UNIT, and applied to the 1st mixer (IC50) to be converted into the 1st IF signal, by being mixed with the 1st Local Oscillator (LO) signals from the B BAND VCO (Q350, 351)

via the buffer (Q353). The converted 1st IF signal is passed through the 1st IF filter (F150) to remove unwanted signals, then applied to the 1st IF AMP (Q200). The amplified 1st IF signal is applied to the 2nd IF circuits.

• 1st IF CIRCUIT (B BAND)



2ND IF AND DEMODULATOR CIRCUITS (MAIN UNIT)

<A BAND>

The 1st IF signal from the 1st IF AMP (Q100) is applied to the IF IC (IC100). The applied 1st IF signal is mixed with the 61.2 MHz 2nd LO signal (generated by X450, buffered by Q450) at the internal 2nd mixer, to be converted into the 2nd IF signal. The converted 2nd IF signal is output from pin 3, then passed through the 2nd IF filter (FI100) via IF SWs (D102, 103).

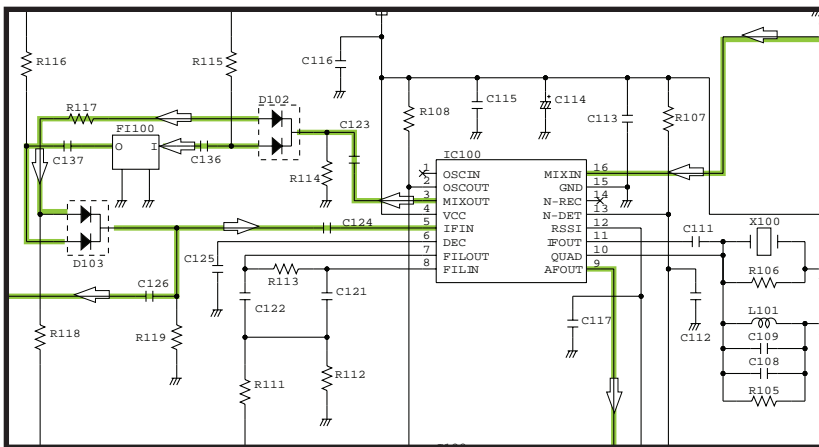
• FM MODE

The filtered 2nd IF signal is backed to the IF IC from pin 5, and saturation-amplified by the internal limit AMP. The amplified 2nd IF signal is FM-demodulated by the discriminator (X100), and the recovered AF signals (RX AF signals) are output from pin 9, then applied to the AF circuits via the AF mute SW (IC500, pins 8, 9).

• AM MODE

The filtered 2nd IF signal is amplified by 2nd IF AMP (Q103), then applied to the AM demodulator circuit (Q104, 105, D105) to be recovered to the AF signals. The demodulated AF signals are applied to the AF circuits.

• 2ND IF AND FM DEMODULATOR CIRCUITS (A BAND)

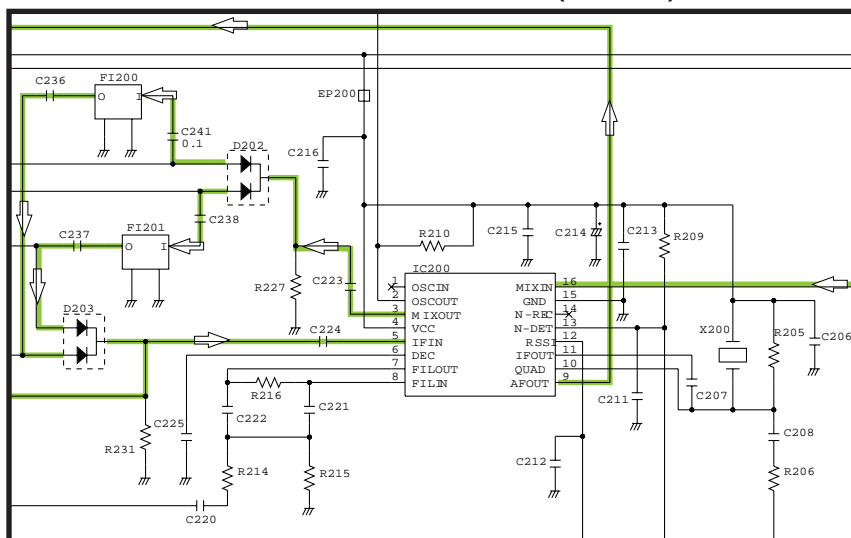


3RD IF CIRCUIT (MAIN UNIT) (FOR A BAND, WFM MODE ONLY)

The 2nd IF signal from the 2nd IF AMP (Q100) is applied to the IF IC.

The applied 2nd IF signal is mixed with the 15.3 MHz 3rd LO signal (generated by X450, buffered by Q450), to be converted into the 1.95 MHz 3rd IF signal by the internal 3rd mixer. The converted 3rd IF signal is output from pin 3, and passed through the IF SWs (D102, 103), then backed to the

• 2ND IF AND FM DEMODULATOR CIRCUIT (B BAND)



<B BAND>

The 1st IF signal from the 1st IF AMP (Q200) is applied to the IF IC (IC200). The applied 1st IF signal is mixed with 45.9 MHz 2nd LO signal (generated by X450, tripled by Q451) at the internal 2nd mixer, to be converted into the 450 kHz 2nd IF signal. The converted 2nd IF signal is output from pin 3, then passed through one of the 2nd IF filters.

The 2nd IF signal is passed through FI200 in FM/AM mode, and passed through FI201 in FM-N mode.

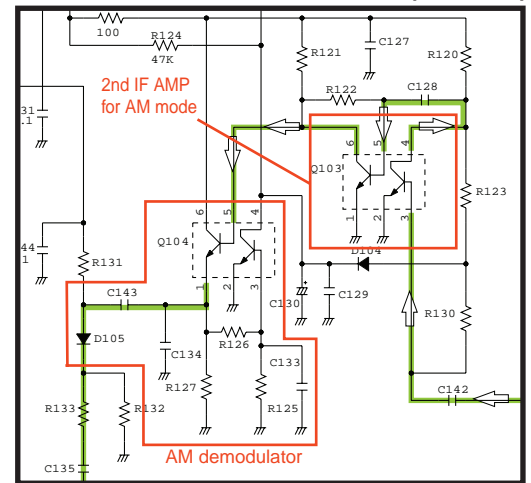
• FM/FM-N/DV MODE

The filtered 2nd IF signal is backed to the IF IC from pin 5, then saturation-amplified by the internal limit AMP. The amplified 2nd IF signal is FM-demodulated by the discriminator (X200), and the recovered AF signals (RX AF signals) are output from pin 9, then applied to the AF circuits via the AF mute SW (IC500, pins 4, 3).

• AM MODE

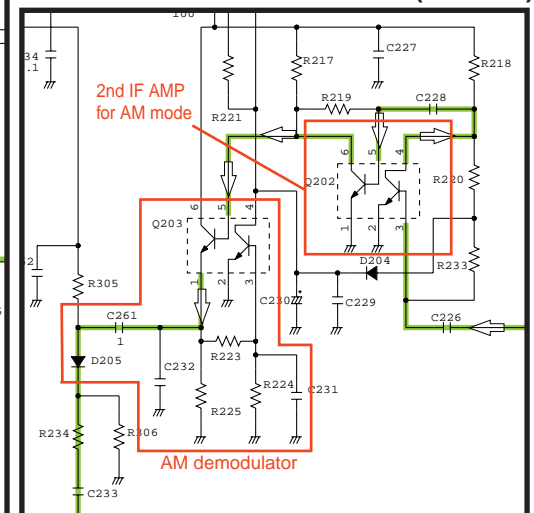
The filtered 2nd IF signal is amplified by another 2nd IF AMP (Q202), then applied to the AM demodulator circuit (Q203, 204, D205) to be AM-demodulated. The demodulated AF signals are applied to the AF circuits.

• AM DEMODULATOR CIRCUIT (A BAND)



IF IC (bypassing FI100). The 3rd IF signal is FM-demodulated by the discriminator (X100), and the recovered AF signals (RX AF signals) are output from pin 9, then applied to the AF circuits via the AF mute SW (IC500, pins 8, 9).

• AM DEMODULATOR CIRCUIT (B BAND)



RX AF CIRCUITS (LOGIC UNIT)

<A BAND>

The AF signals from the FM/AM demodulator circuits are passed through the mode SW (M: IC500D) and one of the AF filters (IC502 and Q501, or, Q502 only) whose audio frequency response is set as stable for each RX mode (FM/AM or WFM).

FM/AM-demodulated AF signals are filtered by IC502, and FM (WFM)-demodulated AF signals are filtered by Q502.

The filtered AF signals are passed through the D/A converter (DAC; IC600, pins 21, 22; 24, 23) for level adjustment. The level-adjusted AF signals are entered to the LOGIC UNIT via the RX AF mute SW (M: IC700, pins 8, 9), and applied to the AF power AMP (IC400) to obtain audio output power. The power-amplified AF signals are applied to the internal speaker or output from [DATA/SP/MIC] jack.

<B BAND>

• FM MODE

The FM-demodulated AF signals from the mute SW (M: IC500B) are passed through the mode SW (IC500A) and AF filter (M: IC501).

• AM MODE

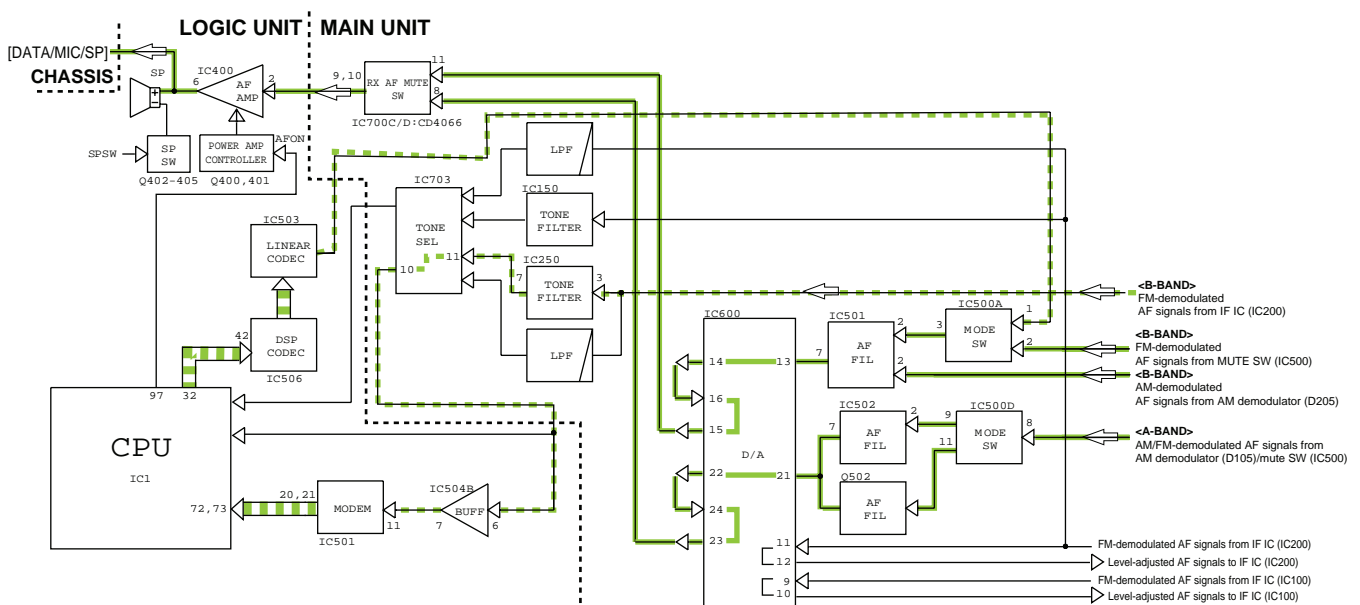
The AM-demodulated AF signals from the AM detector (M: Q203, 204, D205) are directly passed through the AF filter (M: IC501, pin 2).

• DV MODE

The FM-demodulated signals from the IF IC (M: IC200) are passed through the tone filter (M: IC250). The filtered signals are applied to the modem (IC501) via the tone selector (M: IC703) and buffer (IC504B), to be converted into the DV data. The DV data is applied to the CPU (IC1), and converted into the AMBE signals. The AMBE signal is then applied to the DSP CODEC IC (IC506) and decoded. The decoded AMBE signals are converted into the analog audio signal by linear CODEC IC (IC503). The converted AF signals are passed through the mode SW (M: IC500A) and AF filter (M: IC501).

The filtered AF signals are passed through the D/A converter (DAC; M: IC600, pins 13, 14; 16, 15) for level adjustment. The level-adjusted AF signals are entered to the LOGIC UNIT via RX AF mute SW (M: IC700C/D; CD4066), and applied to the AF power AMP (IC400) to obtain audio output power. The power-amplified AF signals are applied to the internal speaker or output from [DATA/SP/MIC] jack.

• RX AF CIRCUITS

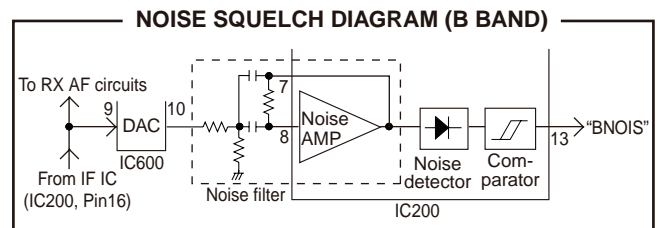
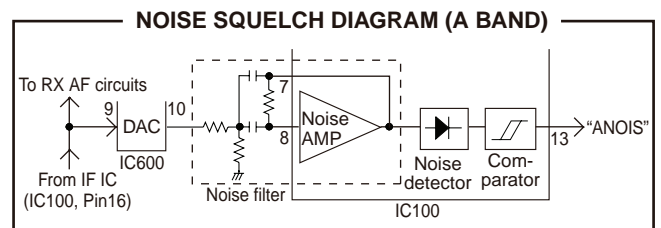


SQUELCH CIRCUIT

The squelch circuit cuts off the AF output signals when no RF signals are received. Detecting noise components (approx. 30 kHz signals) in the demodulated AF signals, the squelch circuit stops audio signals being emitted.

A portion of FM-demodulated AF signal from the IF IC (M: IC100/IC200) is passed through the DAC (M: IC600) for level (=threshold) adjustment. The level-adjusted AF signals are passed through the noise filter (IC100, pins 7, 8 and R111-113, C121, 122/IC200, pins 7, 8 and R214-216, C221, 222) to filter the noise components (approx. 30 kHz signals) only. The noise components are rectified to produce DC voltage corresponding to the noise level.

If the noise level is higher than the preset one, the internal comparator set the "ANOISE"/"BNOISE" signal to the CPU to "High", then the CPU turns the "AFON" signal which controls the AF power AMP (L: IC400) to "Low," to inactivate the AF power AMP (L: IC400). At the same time, the CPU turns the "ARMUTE"/"BRMUTE" signal which controls the RX AF mute SW (L: IC700) to "Low," to cut-off the RX AF line.



4-2 TRANSMIT CIRCUITS TX AF CIRCUITS (LOGIC UNIT)

• FM MODE

MIC signals from the internal/external microphone (MC300) are passed through the MIC gain SW (Q303), and applied to the MIC AMP (Q302, 304). The amplified MIC signals are passed through the mode SW (IC301) which toggles the MIC line according to the operating mode; FM or DV. The MIC signals are applied to the IDC (Instance Deviation Controller; IC302) circuit which limits the amplitude of MIC signals (=deviation) to prevent over deviation.

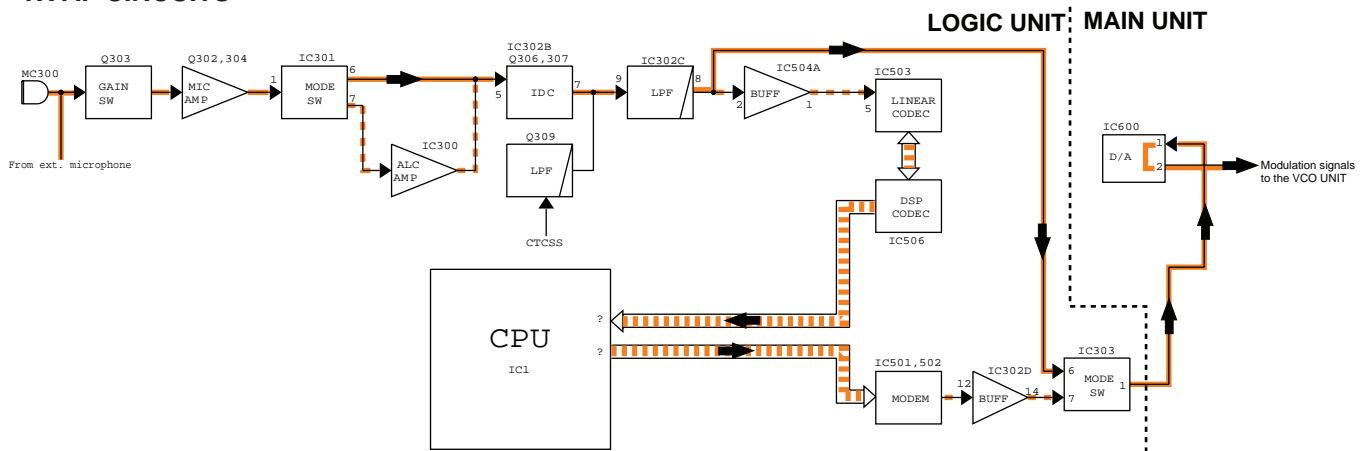
The amplitude-limited MIC signals are passed through the splatter filter (IC302) which cuts off the 3 kHz and higher audio signals. The frequency-limited MIC signals are entered to the MAIN UNIT via the mode SW (IC303), then applied to the DAC (M: IC600) for level (deviation) adjustment. The level-adjusted MIC signals are applied to the modulation circuits.

• DV MODE

The MIC signals from the microphone (MC300) are passed through the MIC gain SW (Q303) and applied to the MIC AMP (Q302, 304). The amplified MIC signals are applied to the ALC AMP (IC300) which automatically adjusts the level of MIC signals to stable for digital processing, via the mode SW (IC301). The level-adjusted MIC signals are applied to the IDC circuit (IC302) for amplitude-limiting. The amplitude-limited MIC signals are passed through the splatter filter (IC302) which cuts off the 3 kHz and higher audio signals.

The frequency-limited MIC signals are applied to the liner CODEC IC (IC503) via the buffer (IC504A), and encoded into the digital audio signal. The digital audio signal is then applied to the DSP CODEC IC (IC506) and converted into the AMBE signal. The AMBE signal is applied to the modem IC (IC501) via the CPU (IC1). The modem IC converts the AMBE signal into the analog signal, and output to the DAC (IC600, pin 1) via the buffer (IC302D) and the mode SW (IC303). The tone signal is level-adjusted by DAC (M: IC600), then applied to the modulation circuits as the modulation signals.

• TX AF CIRCUITS



MODULATION CIRCUITS (VCO UNIT)

The modulation signals from the DAC (M: IC600, pin 2) are entered to the VCO UNIT, and applied to the variable capacitors of VCOs.

• OPERATING ON VHF BAND

The modulation signals are applied to the D55 of the VHF VCO (Q51, D51, 54) to obtain FM modulation. The FM-modulated VCO output is buffer-amplified by Q200, amplified by Q201 then entered to the RF UNIT as TX signal.

• OPERATING ON UHF BAND

The modulation signals are applied to the D100 of the UHF VCO (Q101, D101, 104) to obtain FM modulation. The FM-modulated VCO output is buffer-amplified by Q200, amplified by Q201 then entered to the RF UNIT as TX signal.

TX AMPLIFIERS (RF UNIT)

TX signal from VCO UNIT is applied to the LO AMP (IC100) via the LO SW (D100). The amplified TX signal is passed through the ATT (D158, 159) which is a part of the APC circuit. The level-adjusted TX signal is amplified by YGR (Q102), drive (Q101) and power (Q100) amplifiers in sequence, to obtain TX output power. The power-amplified TX signal is passed through the TX filters, power detector and ANT SWs.

• OPERATION ON VHF BAND

The power-amplified TX signal from the power AMP (Q100) is passed through the LPF, power detector, ANT SW and two LPFs (as a harmonic filter), then applied to the antenna via ANT connector (CHASSIS; J1).

• OPERATION ON UHF BAND

The power-amplified TX signal from the power AMP (Q100) is passed through the BPF, power detector, ANT SW, HPF and LPF (as a harmonic filter), then applied to the antenna via ANT connector (CHASSIS; J1).

APC CIRCUIT (RF UNIT)

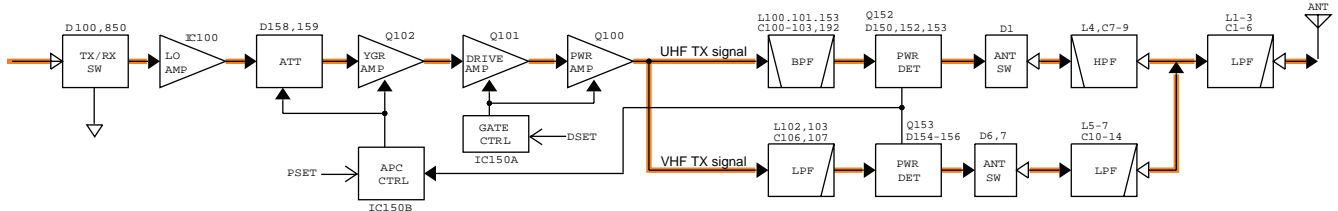
The APC (Automatic Power Control) circuit stabilizes transmit output power to prevent transmit output power level change which is caused by load mismatching or heat effect, etc.

TX signal is passed through the power detector (VHF; D154 –156/UHF; D150, 152,153). The power detector rectifies a portion of the TX signal and converts it into DC voltage which is in proportion to the transmit output power. The detected voltage is applied to the APC controller (IC150B). The TX power setting voltage “PSET” is applied to another input terminal as the reference voltage.

The output voltage is applied to the ATT (D158, 159) to control the attenuation level, to adjust the input level of the YGR AMP (Q102) so that the TX output power is stable.

The setting of TX power is carried out by applying voltage “DSET” to the APC controller (IC150A). The output voltage of the controller controls the bias of the drive and power AMPs to reduce/increase the gain of these amplifiers to set the TX output power to High, Mid., Low and S-Low.

• TX AMPLIFIERS AND APC CIRCUIT



4-3 FREQUENCY SYNTHESIZER CIRCUITS VCOs

This transceiver has total of five VCOs; one RX VCO and RX/TX VCOs on the VCO UNIT, and two RX VCOs on the MAIN UNIT.

<A BAND>

• BC BAND VCO (VCO UNIT; Q1, D1, 3, 5, 6)

The BC BAND VCO generates the 1st LO for BC band (0.495 –75.995 MHz) RX.

• VHF BAND VCO (VCO UNIT; Q51, D51, 54)

The VHF BAND VCO generates the 1st LO for VHF band (76 –173.995 MHz) RX, and also TX signal for the operation on the VHF band.

• UHF BAND VCO (VCO UNIT; Q101, D101, 104)

The UHF BAND VCO generates the LO for UHF band (174 –599.995 MHz) RX, and also TX signal for the operation on the UHF band.

When receiving 600 MHz and higher signals, the UHF BAND VCO oscillates 269.175–469.17 MHz 1st LO signals, and the output signal is doubled by the doubler (MAIN UNIT; Q850, D851) before being applied to the mixer (MAIN UNIT; IC900).

<B BAND>

• VHF BAND VCO (MAIN UNIT; Q301, D300, 301)

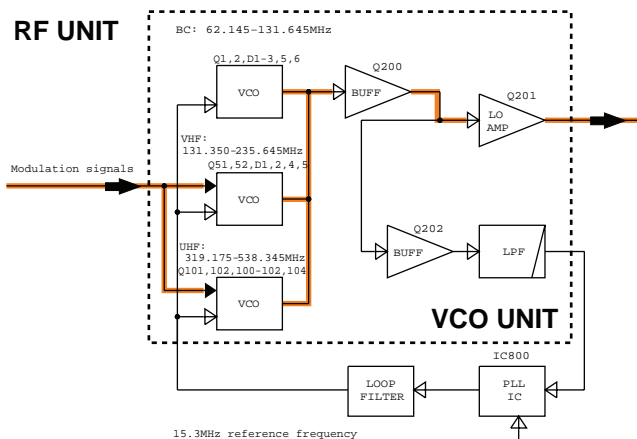
The VHF BAND VCO generates the 1st LO for VHF band (118–174 MHz) RX for B BAND.

• UHF BAND VCO (MAIN UNIT; Q351, D350, 352)

The UHF BAND VCO generates the 1st LO for UHF band (350–470 MHz) RX for B BAND.

• FREQUENCY SYNTHESIZER CIRCUITS (A BAND)

RF UNIT



PLLs

The PLL circuit provides stable oscillation for both of the transmit and 1st LO frequencies. By comparing the feedback VCO output and the reference frequency signal, the oscillating frequency is stabilized. The PLL output frequency is controlled by the serial data including divide ratio from the CPU.

<A BAND> (VCO AND MAIN UNITS)

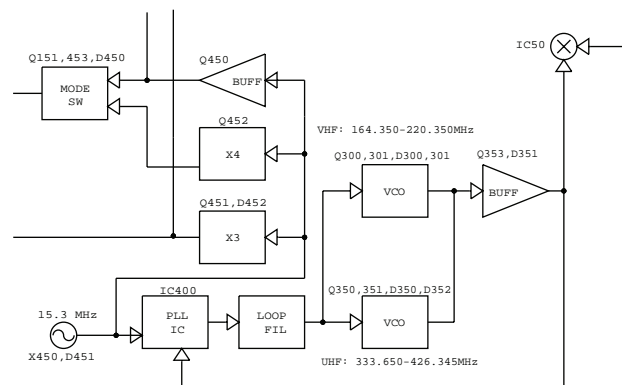
A portion of output signals from each VCO are feedback to the PLL IC (M: IC800) via buffers (V: Q200, 202) and LPF. The applied VCO outputs are divided by the prescaler and programmable divider, then phase-compared with divided reference frequency from X450 (MAIN). The phase difference is output via the charge pump, and applied to the VCOs as lock voltage via the loop filter.

<B BAND> (MAIN UNIT)

A portion of output signals from each VCO are feedback to the PLL IC (IC400) via buffer (Q353). The applied VCO outputs are divided by the prescaler and programmable divider, then phase-compared with divided reference frequency from X450. The phase difference is output via the charge pump, and applied to the VCOs as lock voltage via the loop filter.

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 (B BAND)



4-4 CPU PORT ALLOCATION

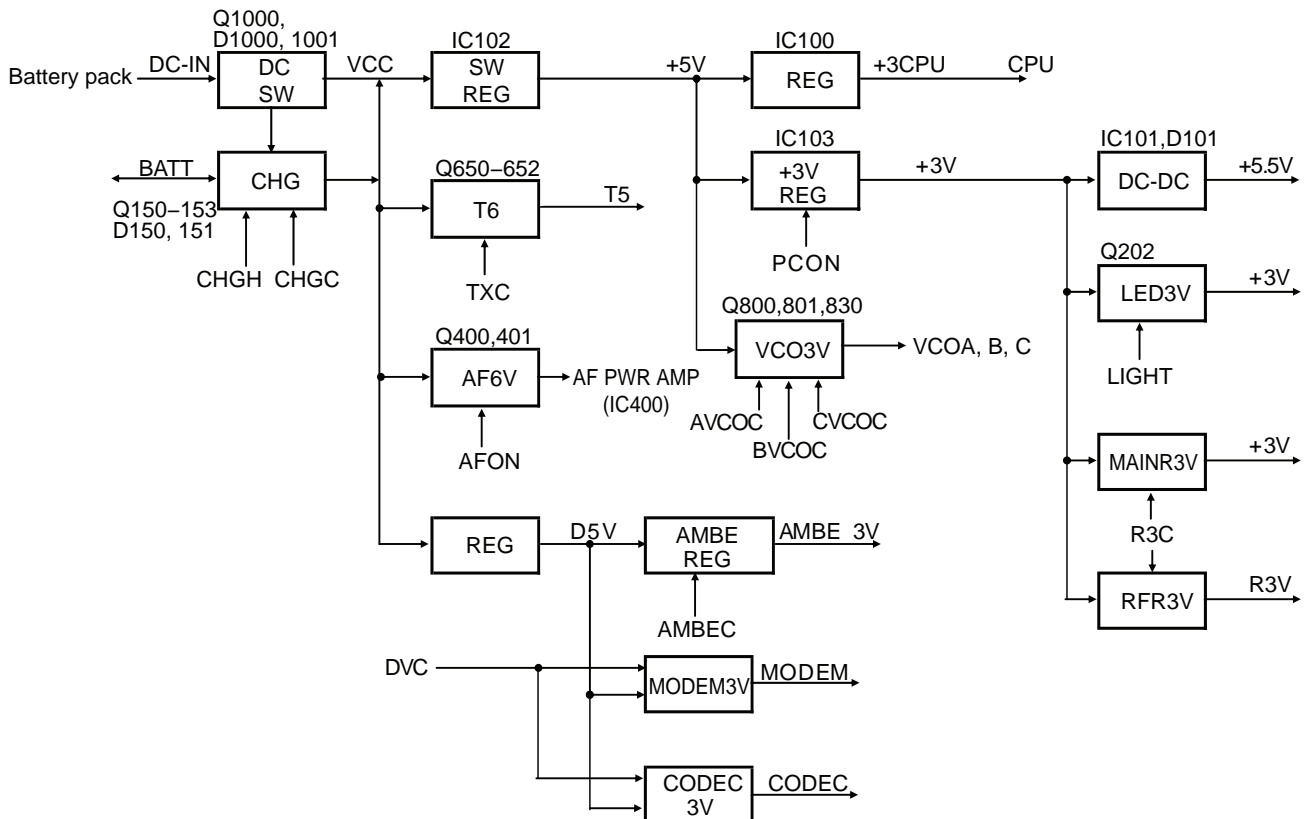
LINE NAME	DESCRIPTION	IN/OUT	STATUS	CONDITION
POWER	[POWER] key input. (Pull-up).	IN	L	–
PKEY	[PWR] key input (Pull-up).	IN	L	The key is pushed
DICK	[DIAL] input(Phase A).	IN	–	–
DIUD	[DIAL] input(Phase B).	IN	–	–
PTT	[PTT] key input (Pull-down).	IN	H	The key is pushed
SQL	[SQL] key input (Pull-up).	IN	L	The key is pushed
I0–I3	Initial matrix ports.	IN	–	–
KR0–KR4	Key detect signal. (Pushed bottom is detected according to the input voltage.)	IN	–	–
KS0–KS3	Key matrix ports.	OUT	–	–
ESIO	Serial data to the EEPROM.	IN/OUT	–	–
ECK	Clock to the EEPROM.	OUT	–	–
TXC	T6 line regulator (M: Q650–652) control signal.	OUT	H	While transmitting.
BLED	[BUSY] LED driver (L: Q201) control signal.	OUT	H	RX(Squelch open)
LIGHT	LCD/Key backlight driver (L: Q202) control signal.	OUT	L	Lights ON.
LCDDT	Serial data to the LCD driver (L: DS1).	OUT	–	–
LCDCS	Chip select signal to the LCD driver (L: DS1).	OUT	–	–
LCDCK	Clock to the LCD driver (L: DS1).	OUT	–	–
LCDRS	Strobe signal to the LCD driver (L: DS1).	OUT	–	–
LCDRES	Reset signal to the LCD driver (L: DS1).	OUT	–	–
AMBEC	DSP IC power line regulator (L:IC508) control signal.	OUT	H	In DV mode operation.
DVC	Liner CODEC IC power line regulator (L: Q503,504) control signal.	OUT	H	In DV mode operation.
TX232	RS-232 data (TXD).	OUT	–	–
RX232	RS-232 data (RXD).	IN	–	–
TXCK	TX clock to the modem (L: IC501).	IN	–	–
TXDT	TX data to the modem (L: IC501).	OUT	–	–
RXCK	RX clock to the modem (L: IC501).	IN	–	–
RXDT	RX data to the modem (L: IC501).	IN	–	–
ACQ	ACQ signal to the modem (L: IC501).	OUT	H	Synchronized
DCEL	DCEL signal to the modem (L: IC501).	OUT	H	Synchronized
AMBERES	Reset signal to the liner CODEC IC and DSP CODEC IC (L: IC503 and IC506).	OUT	–	–
AMBECLK	AMBE clock signal to the DSP CODEC IC (L: IC506).	OUT	–	–
AMBESTB	AMBE strobe signal to the DSP CODEC IC (L: IC506).	OUT	–	–
AMBETXD	AMBE TX data to the DSP CODEC IC (L: IC506).	OUT	–	–
AMBERXD	AMBE RX data to the DSP CODEC IC (L: IC506).	IN	–	–
AMBEEPR	AMBE EPR signal to the DSP CODEC IC (L: IC506).	IN	–	–
CLSFT	Clock frequency shift signal to the clock oscillator (L:X1, D13).	OUT	H	
DICK2	[DIAL] (VR) input (Phase A).	IN	–	–
DIUD2	[DIAL] (VR) input (Phase B).	IN	–	–
CHGC	Charging control signal to the charge circuit (L:Q150–153, D150, 151)	OUT	H	While charging.
CHGH	Charging current control signal to the charging controller (L: Q150, 152).	OUT	H	Charging current increase.
CPUHV	External power supply detection.	IN	L	External power supply is connected.
AFON	Control signal to the AF power AMP controller (L: Q400, 401).	OUT	H	AF power AMP (L: IC400) is activated (Squelch open).
BATT	Power supply select signal to the power supply selector (L: IC50, Q53).	OUT	H/L	H=Operated by the battery pack. L=Operated by an external power source.
SPSW	Speaker select signal to the Internal speaker SW (L: Q402–405).	OUT	–	–
ANOIS	Noise detect signal from the A BAND IF IC (M: IC100).	IN	–	–
BNOIS	Noise detect signal from the B-AND IF IC (M: IC200).	IN	–	–
CK	Common clock signal to the the PLL ICs and DAC (LMX2313/ME15E03SL/M62352AGP).	OUT	–	–
DATA	Common serial data to the PLL ICs and DAC (LMX2313/ME15E03SL/M62352AGP).	OUT	–	–

4-4 CPU PORT ALLOCATION (continued)

LINE NAME	DESCRIPTION	IN/OUT	STATUS	CONDITION
DASTB1	Strobe signal to the DAC (R: IC950).	OUT	-	-
DASTB2	Strobe signal to the DAC (M: IC600).	OUT	-	-
IOSTB1	Strobe signal to the expander (R: IC951).	OUT	-	-
IOSTB3	Strobe signal to the expanders (M: IC701, 702).	OUT	-	-
IOSTB4	Strobe signal to the expander (L: IC53).	OUT	-	-
APLLSTB	Strobe signal to the A BAND PLL IC (M: IC800).	OUT	-	-
BPLLSTB	Strobe to the B BAND PLL IC (M: IC400).	OUT	-	-
BPS	Power save mode control signal to the A/B BAND PLL ICs (M: IC800/IC400).	OUT	L	In power save mode.
UNLK	Unlock signal from the A BAND PLL IC (M: IC800).	IN	H	PLL is locked.
CLIN	Key detect signal. (Pushed bottom is detected by referring input voltage.)	IN	A/D	-
ATONE	Tone signals; tone and WX A BAND.	IN	A/D	-
BTONE	Tone signals; tone and WX B BAND.	IN	A/D	-
VIN	DC voltage divided by the voltage detect resistors (L: R159 and R160). (Remaining battery capacity detection.)	IN	A/D	-
OPTV	External device detect.	IN	A/D	-
TEMP	The voltage in proportion to the internal temperature. The voltage divided by R66 (thermistor; LOGIC) and R67 (LOGIC).	IN	A/D	-
S-TXV	<ul style="list-style-type: none"> While operated by battery RSSI voltage from the IF IC (M: IC100). While perated by external power supply Current in TX from the I-V converter (M: IC704). 	IN	A/D	-
BRSSI	RSSI voltage from the B BAND IF IC (M: IC200).	IN	A/D	-
CTCOUT	CTCSS/DTCS signals.	OUT	D/A	-
DTMF	Tone signals; DTMF, EUR tone,	OUT	D/A	-
RESET	Reset signal from the reset IC (L:IC100).	IN	H	-

4-5 VOLTAGE BLOCK DIAGRAMS

Voltage from the attached battery pack is routed to the whole of the transceiver via regulators and switches.



SECTION 5 ADJUSTMENT PROCEDURE

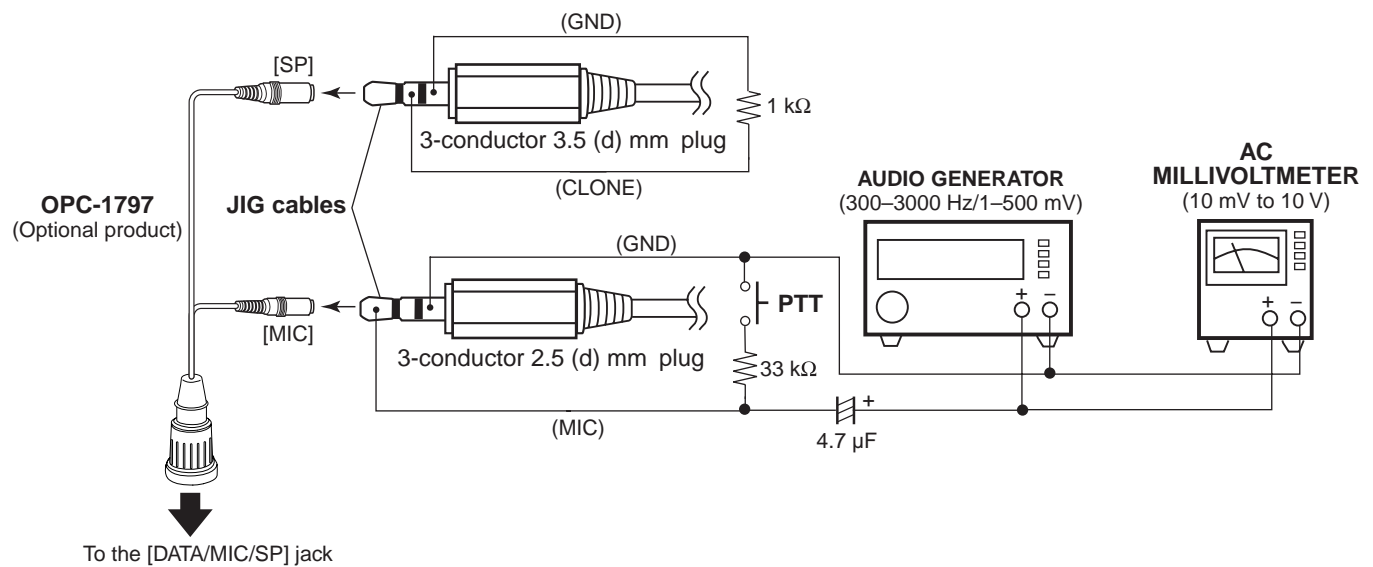
5-1 PREPARATION

■ REQUIRED INSTRUMENTS

INSTRUMENTS	SPECIFICATION	INSTRUMENTS	SPECIFICATION
DC Cable	OPC-254L (Optional product)	JIG cable	(See the illust below)
Power Supply	Output voltages : 5.0–13.5 V DC Current capacity : More than 3 A	Multimeter	Input impedance : 50 k Ω Measuring range : 0.1–10V/0.01–5 A
RF Power Meter (terminated type)	Measuring range : 0.1–10 W Frequency range : 100–500 MHz Impedance : 50 Ω SWR : Less than 1.2 : 1	Standard Signal Generator (SSG)	Frequency range : 0.1–1000 MHz Output level : 0.04 μ V to 32 mV (–28 dBu to 90 dBu)
Frequency Counter	Frequency range : 0.1–600 MHz Frequency accuracy : \pm 1 ppm or better Input level : Less than 1 mW	AC Millivoltmeter	Measuring range : 10 mV to 10 V
		Attenuator	Power attenuation : 30 dB Capacity : More than 10 W
Modulation Analyzer	Frequency range : 30–600 MHz Measuring range : 0 to \pm 10 kHz	Audio Generator	Frequency range : 300–3000 Hz Output level : 1–500 mV

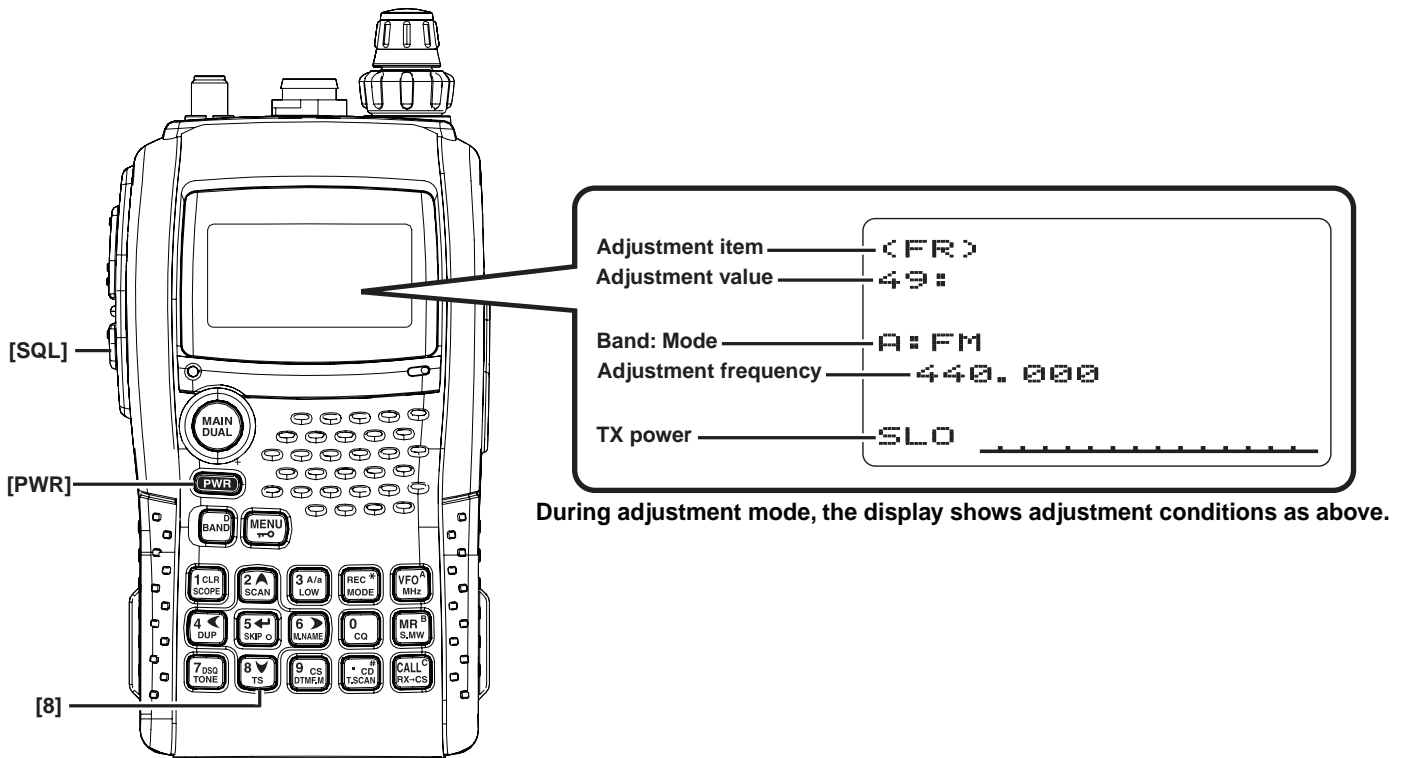
CAUTION! BACK UP originally programmed contents (Memory channels, Common settings, etc.) in the transceiver using optional RS-92 REMOTE CONTROL SOFTWARE before starting adjustment.
When all adjustments are completed, these contents in the transceiver will be cleared.

■ JIG CABLE CONNECTION

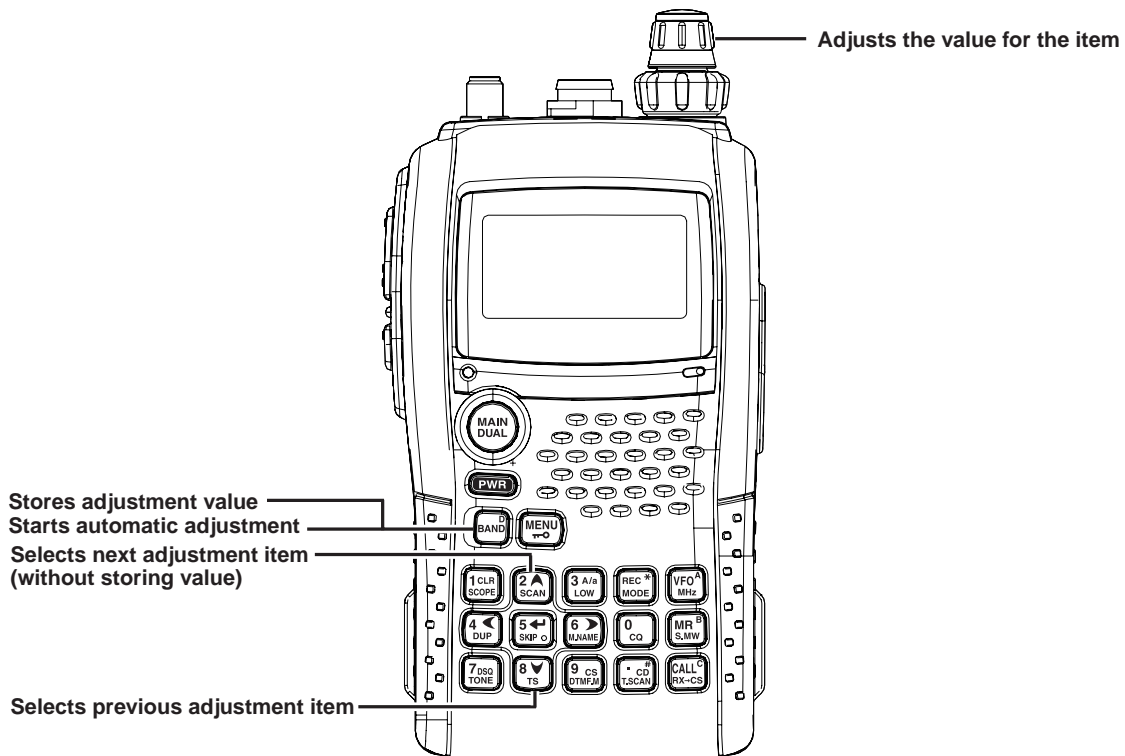


ENTERING ADJUSTMENT MODE

- ① Turn the power OFF.
- ② Connect the JIG cable to the [DATA/SP/MIC] jack.
- ③ While pushing [SQL] and [8] keys, turn the power ON.



KEY ASSIGNMENTS FOR THE ADJUSTMENT MODE



QUITTING ADJUSTMENT MODE

- ① Turn the power OFF.
- ② While pushing [VFO], [MR] and [BAND] keys, turn the power ON. (All reset)

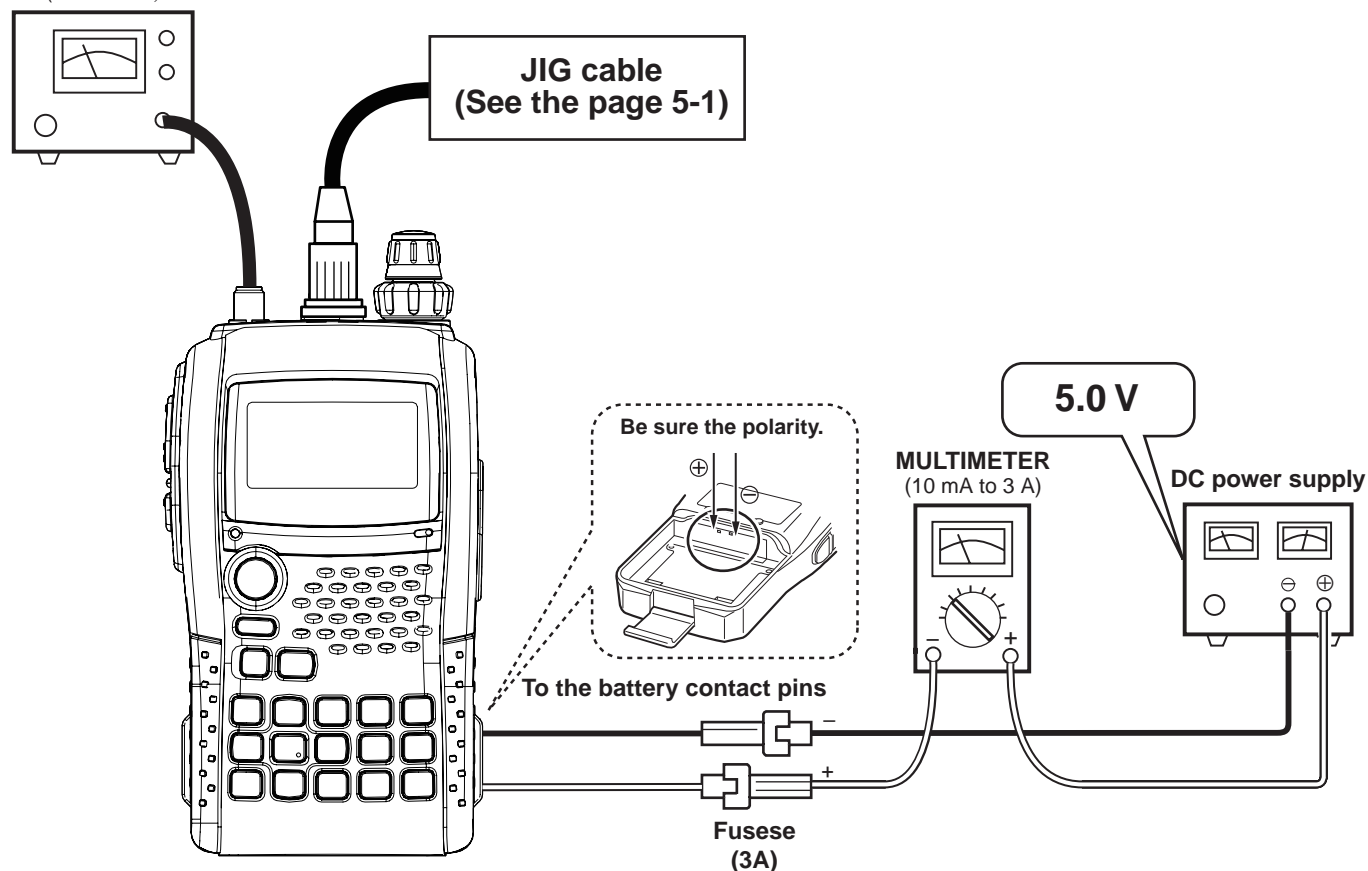
5-2 TRANSMIT AMPLIFIER ADJUSTMENT

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT		ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
IDLING CURRENT (@5.0 V) [PREPARATION]	0	• Supply voltage : 5.0 V	1) Connect an RF power meter to the antenna connector. 2) Connect a multimeter between the external power supply and transceiver.	-	-
[VHF BAND]	1	• Displayed freq. : "(1)" • Transmitting	• Adjust the current using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[id]	200-300 mA
[UHF BAND]	2	• Displayed freq. : "(4)" • Transmitting			
TRANSMIT POWER (@5.0 V) [VHF (BAND LOW)]	1	• Displayed freq. : "144.000" • TX power : "SLO" • Transmitting	• Adjust the TX power using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[Po]	50-150 mW
[VHF (BAND HIGH)]	2	• Displayed freq. : "(2)" • TX power : "SLO" • Transmitting			
[UHF (BAND LOW)]	3	• Displayed freq. : "(3)" • TX power : "SLO" • Transmitting			
[UHF (BAND HIGH)]	4	• Displayed freq. : "(5)" • TX power : "SLO" • Transmitting			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

RF POWER METER
(10 W/50 Ω)

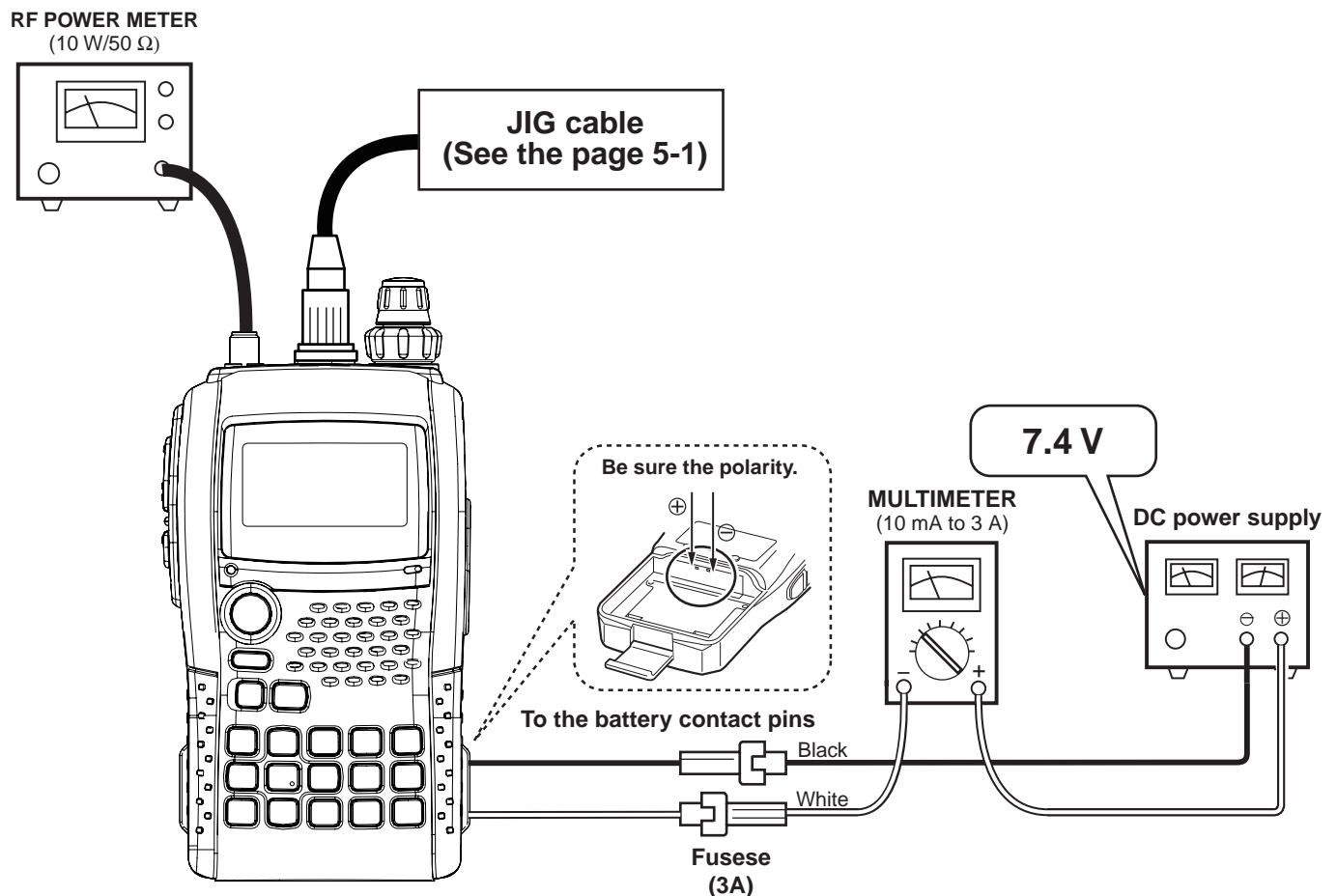


5-2 TRANSMIT AMPLIFIER ADJUSTMENT (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
IDLING CURRENT (@7.4 V) [PREPARATION]	0 • Supply voltage : 7.4 V	1) Connect an RF power meter to the antenna connector. 2) Connect a multimeter between the external power supply and transceiver.	-	-
[VHF BAND] (Hi power)	1 • Displayed freq. : "(1)" • TX power : "Hi" • Transmitting	• Adjust the current using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[id]	1.1– 1.2 A
(Mid power)	2 • Displayed freq. : "(1)" • TX power : "Mid" • Transmitting			600–700 mA
(Low power)	3 • Displayed freq. : "(1)" • TX power : "Low" • Transmitting			200–300 mA
(S-Low power)	4 • Displayed freq. : "(1)" • TX power : "SLO" • Transmitting			200–300 mA
[UHF BAND] (Hi power)	5 • Displayed freq. : "(4)" • TX power : "Hi" • Transmitting			1.1– 1.2 A
(Mid power)	6 • Displayed freq. : "(4)" • TX power : "Mid" • Transmitting			600–700 mA
(Low power)	7 • Displayed freq. : "(4)" • TX power : "Low" • Transmitting			200–300 mA
(S-Low power)	8 • Displayed freq. : "(4)" • TX power : "SLO" • Transmitting			200–300 mA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100



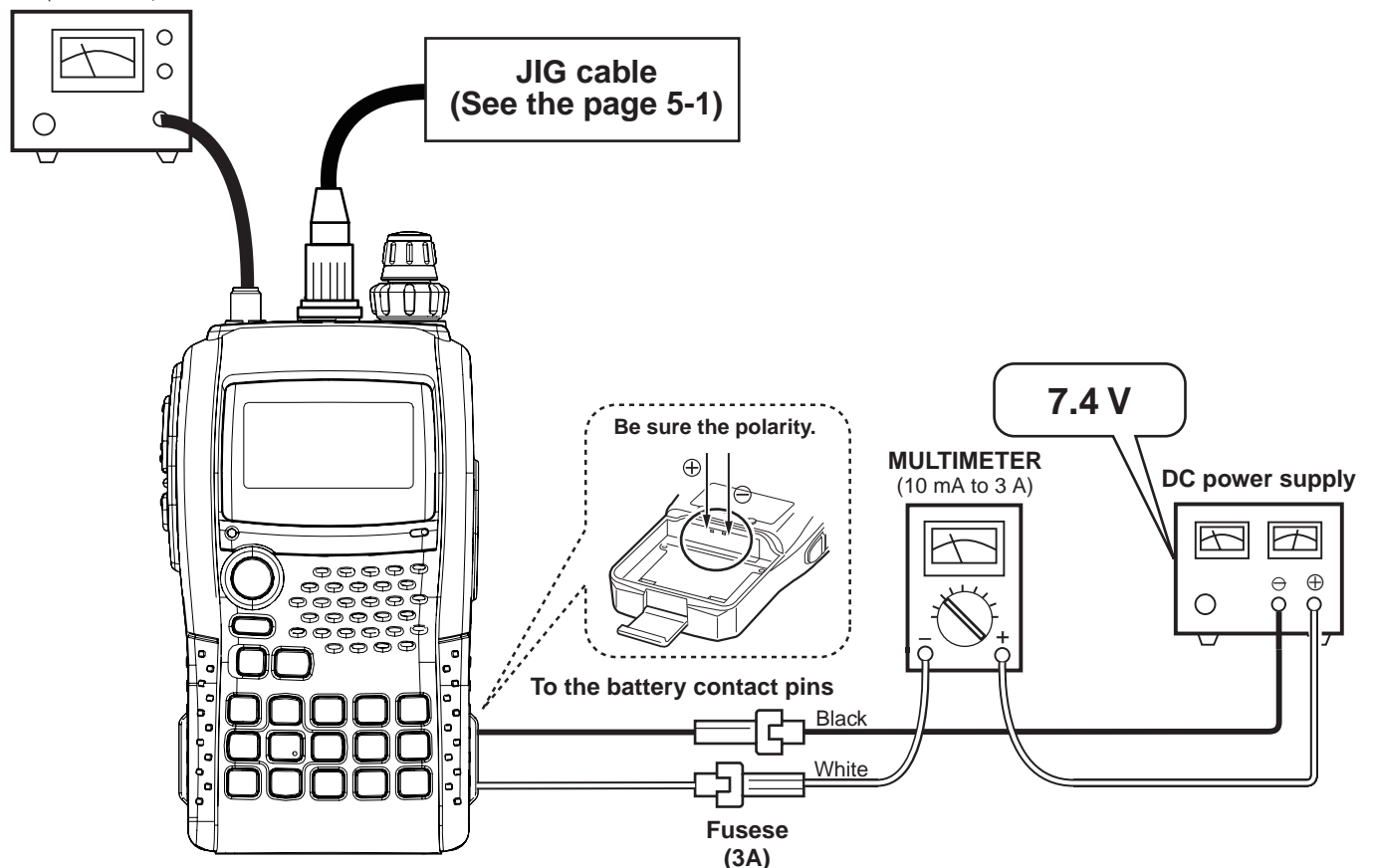
5-2 TRANSMIT AMPLIFIER ADJUSTMENT (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
TRANSMIT POWER (@7.4 V) [PREPARATION]	0 • Supply voltage : 7.4 V	1) Connect an RF power meter to the antenna connector. 2) Connect a multimeter between the external power supply and transceiver.	-	-
(Hi power) [VHF (BAND LOW)] ----- [VHF (BAND HIGH)]	1 • Displayed freq. : "144.000" • TX power : "Hi" • Transmitting ----- • Displayed freq. : "(2)" • TX power : "Hi" • Transmitting	• Adjust the TX power using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[Po]	4.8-5.2 W
(Mid power) [VHF (BAND LOW)] ----- [VHF (BAND HIGH)]	2 • Displayed freq. : "144.000" • TX power : "Mid" • Transmitting ----- • Displayed freq. : "(2)" • TX power : "Mid" • Transmitting			
(Low power) [VHF (BAND LOW)] ----- [VHF (BAND HIGH)]	3 • Displayed freq. : "144.000" • TX power : "Low" • Transmitting ----- • Displayed freq. : "(2)" • TX power : "Low" • Transmitting			
(S-Low power) [VHF (BAND LOW)] ----- [VHF (BAND HIGH)]	4 • Displayed freq. : "144.000" • TX power : "SLO" • Transmitting ----- • Displayed freq. : "(2)" • TX power : "SLO" • Transmitting			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

RF POWER METER
(10 W/50 Ω)



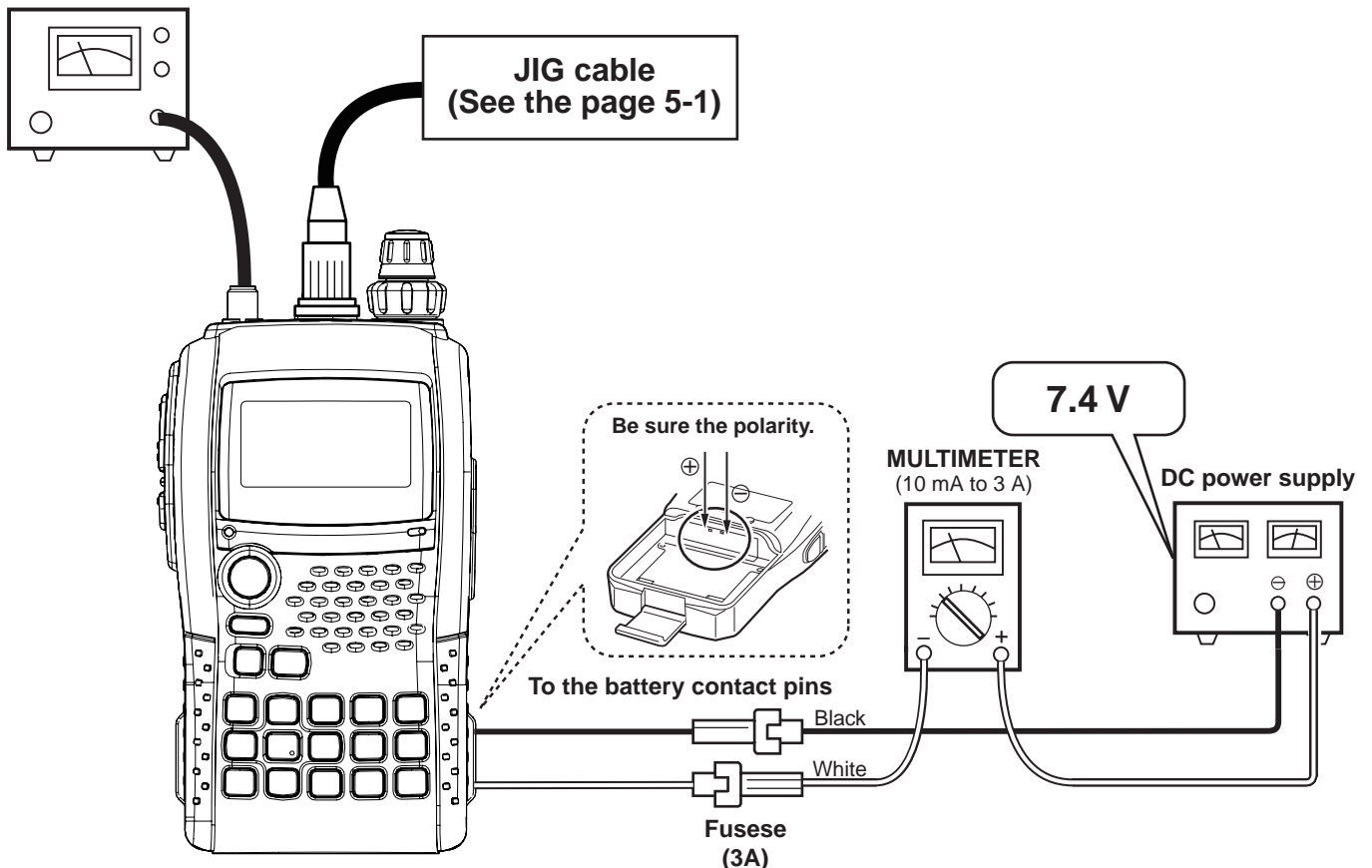
5-2 TRANSMIT AMPLIFIER ADJUSTMENT (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
TRANSMIT POWER (@7.4 V) [PREOARATION]	0 • Supply voltage : 7.4 V	1) Connect an RF Power Meter to the antenna connector. 2) Connect a multimeter between the external power supply and transceiver.	-	-
(Hi power) [UHF (BAND LOW)]	1 • Displayed freq. : "(3)" • TX power : "Hi" • Transmitting	• Adjust the TX power using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[Po]	4.8-5.2 W
[UHF (BAND HIGH)]	2 • Displayed freq. : "(5)" • TX power : "Hi" • Transmitting			
(Mid power) [UHF (BAND LOW)]	3 • Displayed freq. : "(3)" • TX power : "Mid" • Transmitting			2.3-2.7 W
[UHF (BAND HIGH)]	4 • Displayed freq. : "(5)" • TX power : "Mid" • Transmitting			
(Low power) [UHF (BAND LOW)]	5 • Displayed freq. : "(3)" • TX power : "Low" • Transmitting			0.4-0.6 W
[UHF (BAND HIGH)]	6 • Displayed freq. : "(5)" • TX power : "Low" • Transmitting			
(S-Low power) [UHF (BAND LOW)]	7 • Displayed freq. : "(3)" • TX power : "SLO" • Transmitting			50-150 mW
[UHF (BAND HIGH)]	8 • Displayed freq. : "(5)" • TX power : "SLO" • Transmitting			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

RF POWER METER
(10 W/50 Ω)



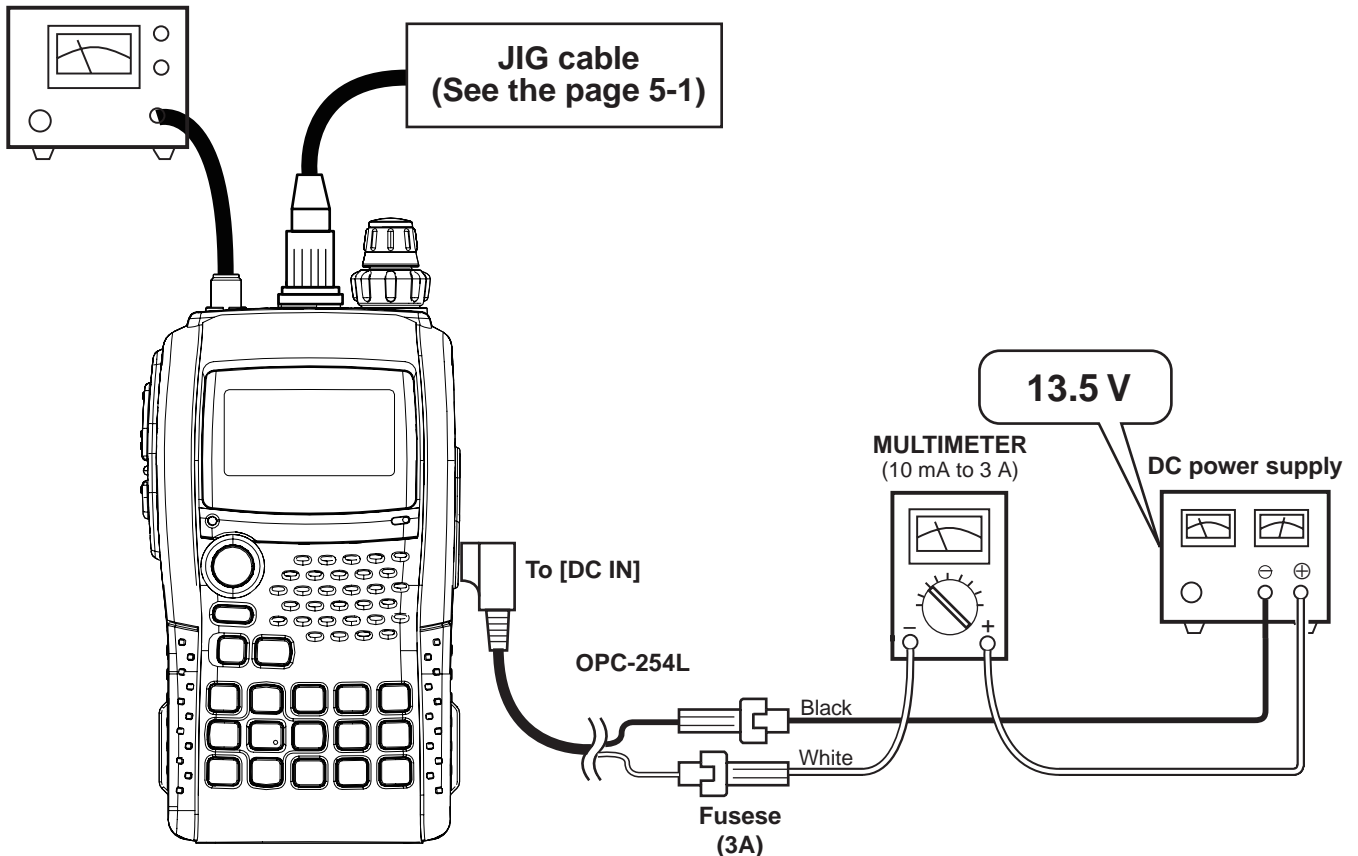
5-2 TRANSMIT AMPLIFIER ADJUSTMENT (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
IDLING CURRENT (@13.5 V) [PREOARATION]	0 • Supply voltage : 13.5 V (supplying from [DC IN])	1) Connect an RF Power Meter to the antenna connector. 2) Connect a Multimeter between the external power supply and transceiver. 3) Set the item [Po] to "00."	[Po]	"00"
[VHF BAND] (Hi power)	1 • Displayed freq. : "(1)" • TX power : "Hi" • Transmitting	• Adjust the current using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[id]	650–750 mA
(Mid power)	2 • Displayed freq. : "(1)" • TX power : "Mid" • Transmitting			350–450 mA
(Low power)	3 • Displayed freq. : "(1)" • TX power : "Low" • Transmitting			200–300 mA
(S-Low power)	4 • Displayed freq. : "(1)" • TX power : "SLO" • Transmitting			200–300 mA
[UHF BAND] (Hi power)	5 • Displayed freq. : "(4)" • TX power : "Hi" • Transmitting			850–950 mA
(Mid power)	6 • Displayed freq. : "(4)" • TX power : "Mid" • Transmitting			350–450 mA
(Low power)	7 • Displayed freq. : "(4)" • TX power : "Low" • Transmitting			200–300 mA
(S-Low power)	8 • Displayed freq. : "(4)" • TX power : "SLO" • Transmitting			200–300 mA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

RF POWER METER
(10 W/50 Ω)



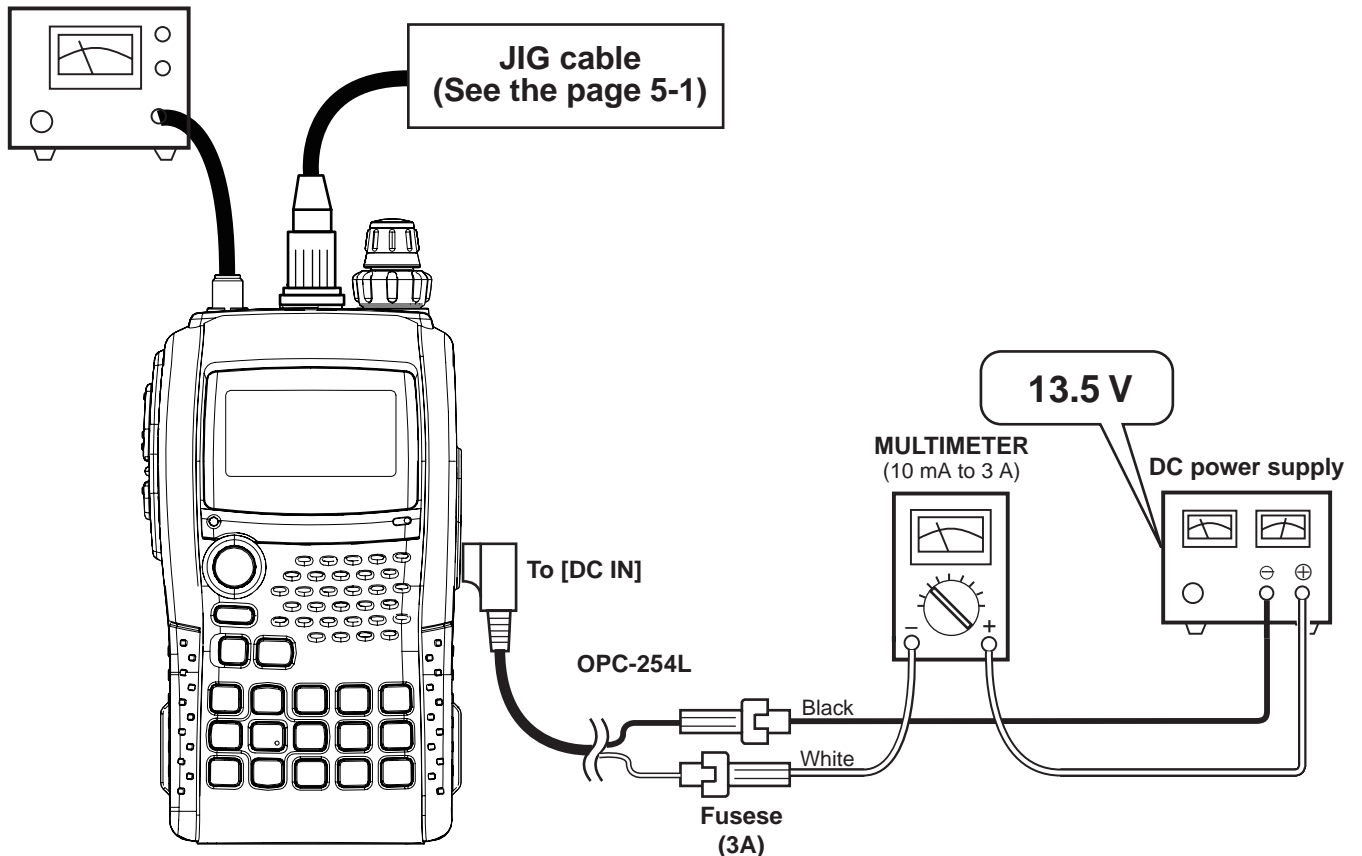
5-2 TRANSMIT AMPLIFIER ADJUSTMENT (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
TRANSMIT POWER (@13.5 V) [PREARATION]	0 • Supply voltage : 13.5 V (supplying from [DC IN])	• Connect an RF Power Meter to the antenna connector.		
(Hi power) [VHF (BAND LOW)]	1 • Displayed freq. : "144.000" • TX power : "Hi" • Transmitting	• Adjust the TX power using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[Po]	4.8–5.2 W
[VHF (BAND HIGH)]	2 • Displayed freq. : "146.000" • TX power : "Hi" • Transmitting			
(Mid power) [VHF (BAND LOW)]	3 • Displayed freq. : "144.000" • TX power : "Mid" • Transmitting			2.3–2.7 W
[VHF (BAND HIGH)]	4 • Displayed freq. : "146.000" • TX power : "Mid" • Transmitting			
(Low power) [VHF (BAND LOW)]	5 • Displayed freq. : "144.000" • TX power : "Low" • Transmitting			0.4–0.6 W
[VHF (BAND HIGH)]	6 • Displayed freq. : "146.000" • TX power : "Low" • Transmitting			
(S-Low power) [VHF (BAND LOW)]	7 • Displayed freq. : "144.000" • TX power : "SLO" • Transmitting			50–150 mW
[VHF (BAND HIGH)]	8 • Displayed freq. : "146.000" • TX power : "SLO" • Transmitting			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

RF POWER METER
(10 W/50 Ω)



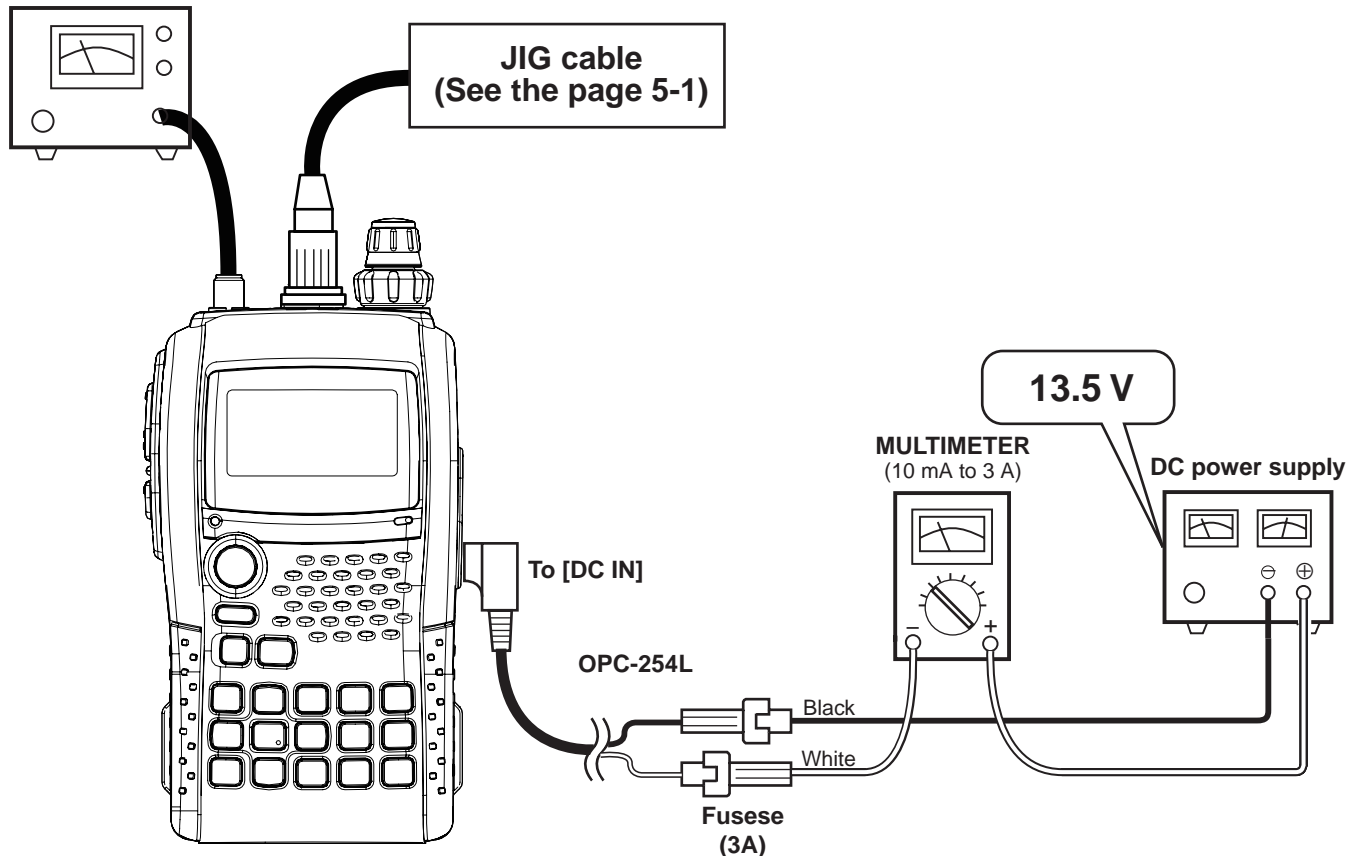
5-2 TRANSMIT AMPLIFIER ADJUSTMENT (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
TRANSMIT POWER (@13.5 V) [PREPARATION]	0 • Supply voltage : 13.5 V (supplying from [DC IN])	1) Connect an RF Power Meter to the antenna connector. 2) Set the power supply voltage to 13.5 V.	-	-
(Hi power) [UHF (BAND LOW)]	1 • Displayed freq. : "(3)" • TX power : "Hi" • Transmitting	• Adjust the TX power using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[Po]	4.8–5.2 W
[UHF (BAND HIGH)]	2 • Displayed freq. : "(5)" • TX power : "Hi" • Transmitting			
(Mid power) [UHF (BAND LOW)]	3 • Displayed freq. : "(3)" • TX power : "Mid" • Transmitting			2.3–2.7 W
[UHF (BAND HIGH)]	4 • Displayed freq. : "(5)" • TX power : "Mid" • Transmitting			
(Low power) [UHF (BAND LOW)]	5 • Displayed freq. : "(3)" • TX power : "Low" • Transmitting			0.4–0.6 W
[UHF (BAND HIGH)]	6 • Displayed freq. : "(5)" • TX power : "Low" • Transmitting			
(S-Low power) [UHF (BAND LOW)]	7 • Displayed freq. : "(3)" • TX power : "SLO" • Transmitting			50–150 mW
[UHF (BAND HIGH)]	8 • Displayed freq. : "(5)" • TX power : "SLO" • Transmitting			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

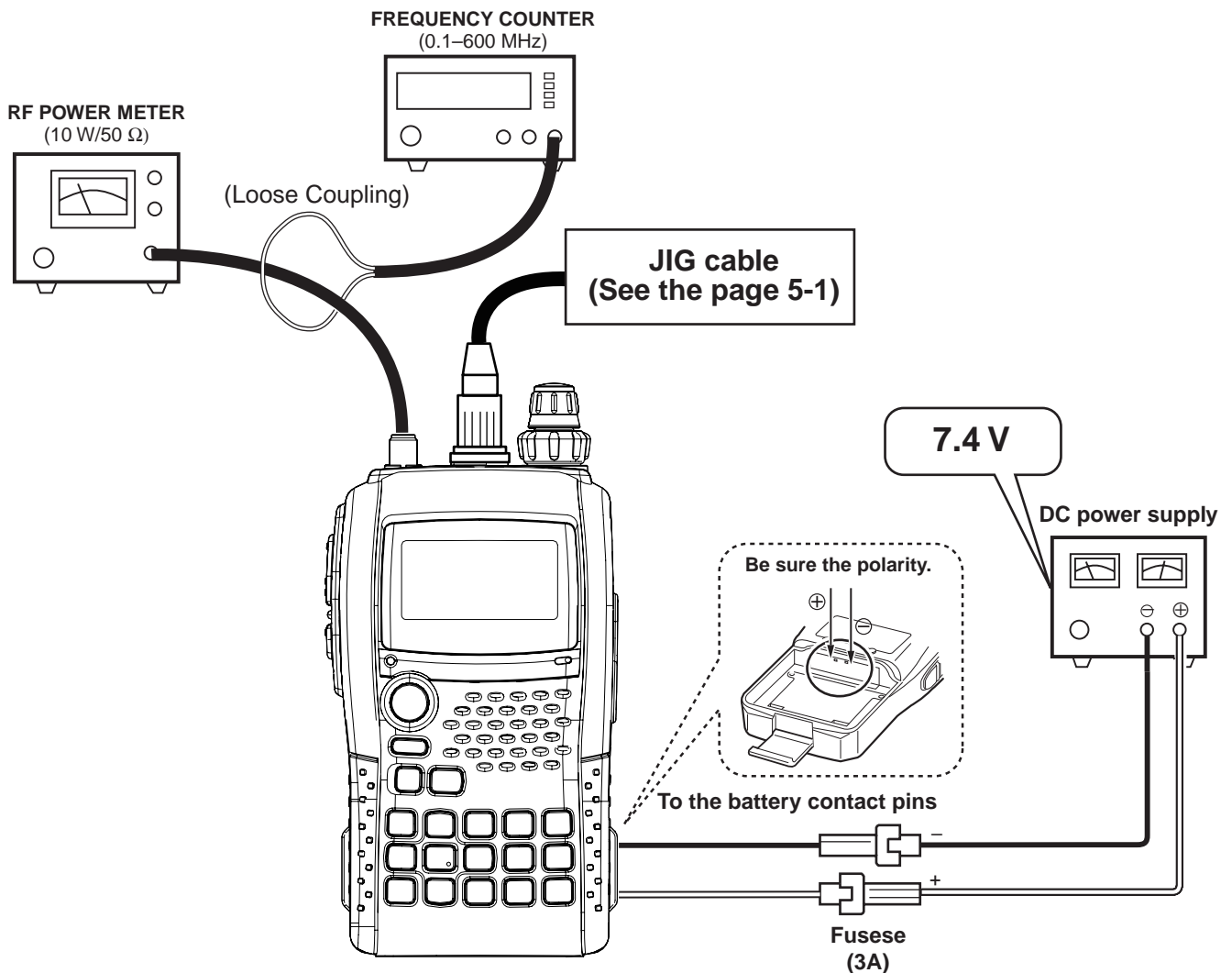
RF POWER METER
(10 W/50 Ω)



5-3 FREQUENCY ADJUSTMENT

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> • Displayed freq. : "440.000" • Transmitting 	1) Connect an RF to the antenna connector. 2) Loose couple a Frequency Counter to the antenna connector. 3) Adjust the frequency using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[Fr]	(Displayed frequency)



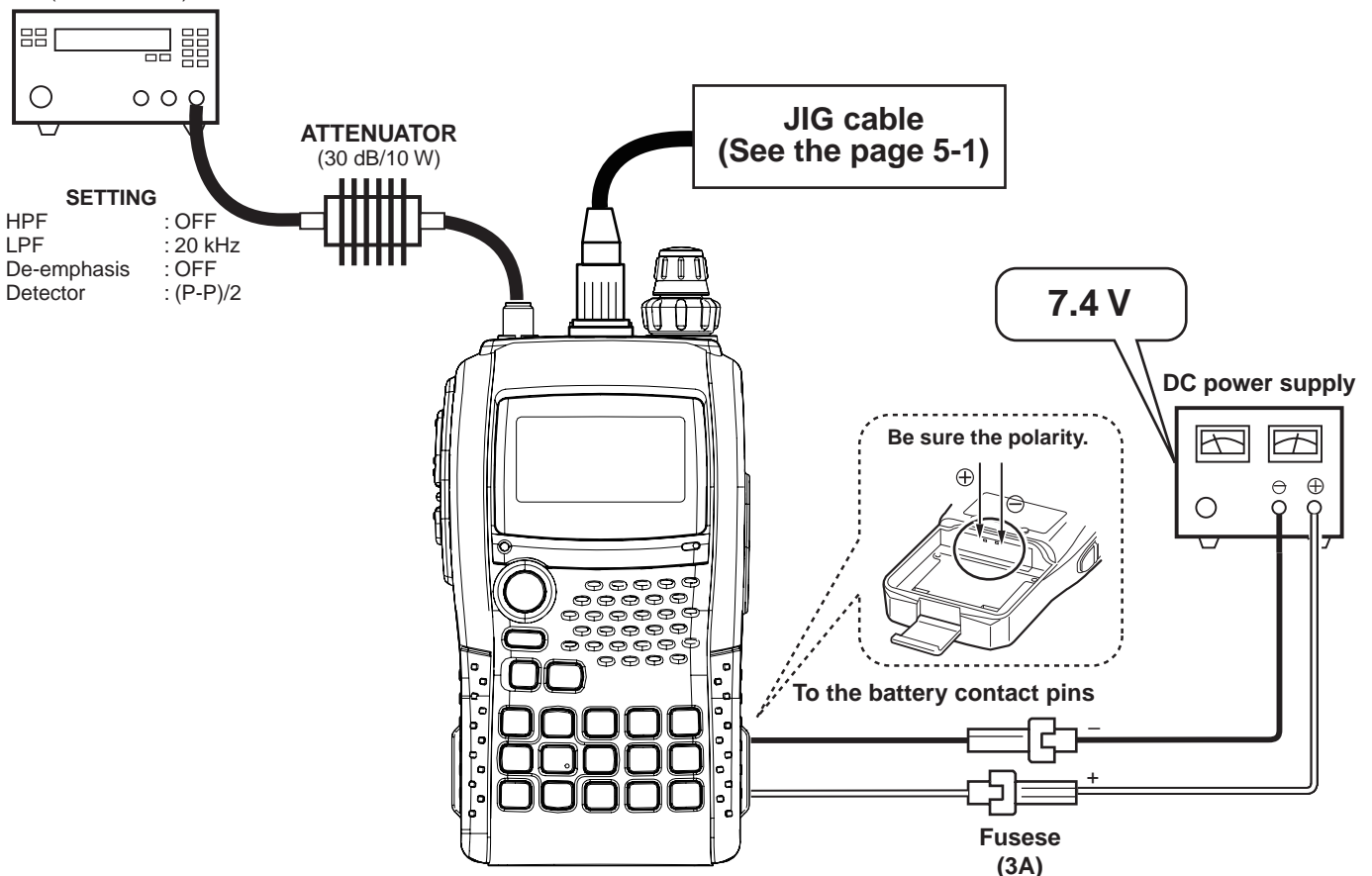
5-4 DEVIATION ADJUSTMENTS

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
FM DEVIATION [PREPARATION]	0 • Supply voltage : 7.4 V	1) Connect a Modulation Analyzer to the antenna connector through an Attenuator. 2) Connect an Audio Generator to the JIG cable (see the page 5-1).	-	-
(@1 kHz) [VHF (BAND LOW)]	1 • Displayed freq. : "144.000" • Transmitting	1) Set the Audio Generator as; Frequency : 1 kHz Level : 90 mVrms 2) Adjust the deviation using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[FMU]	4.2–4.3 kHz
[VHF (BAND HIGH)]	2 • Displayed freq. : "(2)" • Transmitting			
[UHF (BAND LOW)]	3 • Displayed freq. : "(3)" • Transmitting			
[UHF (BAND HIGH)]	4 • Displayed freq. : "(5)" • Transmitting			
(@300 Hz) [VHF (BAND LOW)]	5 • Channel : "144.000" • Transmitting	1) Set the Audio Generator as; Frequency : 300 Hz Level : 90 mVrms 2) Adjust the deviation using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[FMR]	4.0–4.1 kHz
[VHF (BAND HIGH)]	6 • Displayed freq. : "(2)" • Transmitting			
[UHF (BAND LOW)]	7 • Displayed freq. : "(3)" • Transmitting			
[UHF (BAND HIGH)]	8 • Displayed freq. : "(5)" • Transmitting			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

MODULATION ANALYZER (0.1–500 MHz)



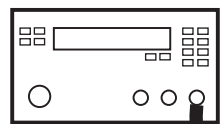
5-4 DEVIATION ADJUSTMENTS (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
DIGITAL VOICE DEVIATION [PREPARATION]	0 • Supply voltage : 7.4 V	• Connect a Modulation Analyzer to the antenna connector through an Attenuator. • No audio signals are applied.	-	-
(VCO MODULATION) [VHF (BAND LOW)]	1 • Displayed freq. : "144.000" • Transmitting	• Adjust the deviation using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[DUU]	1.1–1.3 kHz
[VHF (BAND HIGH)]	2 • Displayed freq. : "(2)" • Transmitting			
[UHF (BAND LOW)]	3 • Displayed freq. : "(3)" • Transmitting			
[UHF (BAND HIGH)]	4 • Displayed freq. : "(5)" • Transmitting			
(REF. MODULATION) [VHF (BAND LOW)]	5 • Displayed freq. : "144.000" • Transmitting		[DUR]	Minimum deviation
[VHF (BAND HIGH)]	6 • Displayed freq. : "(2)" • Transmitting			
[UHF (BAND LOW)]	7 • Displayed freq. : "(3)" • Transmitting			
[UHF (BAND HIGH)]	8 • Displayed freq. : "(5)" • Transmitting			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

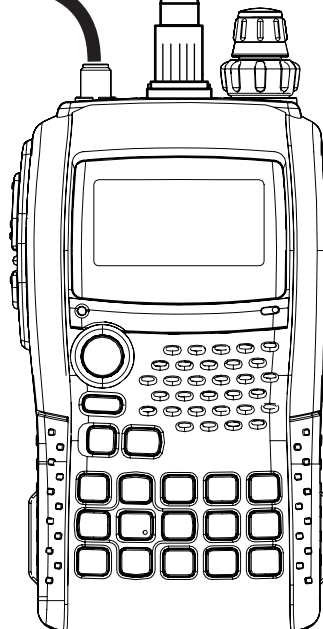
MODULATION ANALYZER (0.1–500 MHz)



SETTING
 HPF : OFF
 LPF : 20 kHz
 De-emphasis : OFF
 Detector : (P-P)/2

ATTENUATOR
(30 dB/10 W)

JIG cable
(See the page 5-1)



7.4 V

DC power supply

Be sure the polarity.

To the battery contact pins

Fusese
(3A)

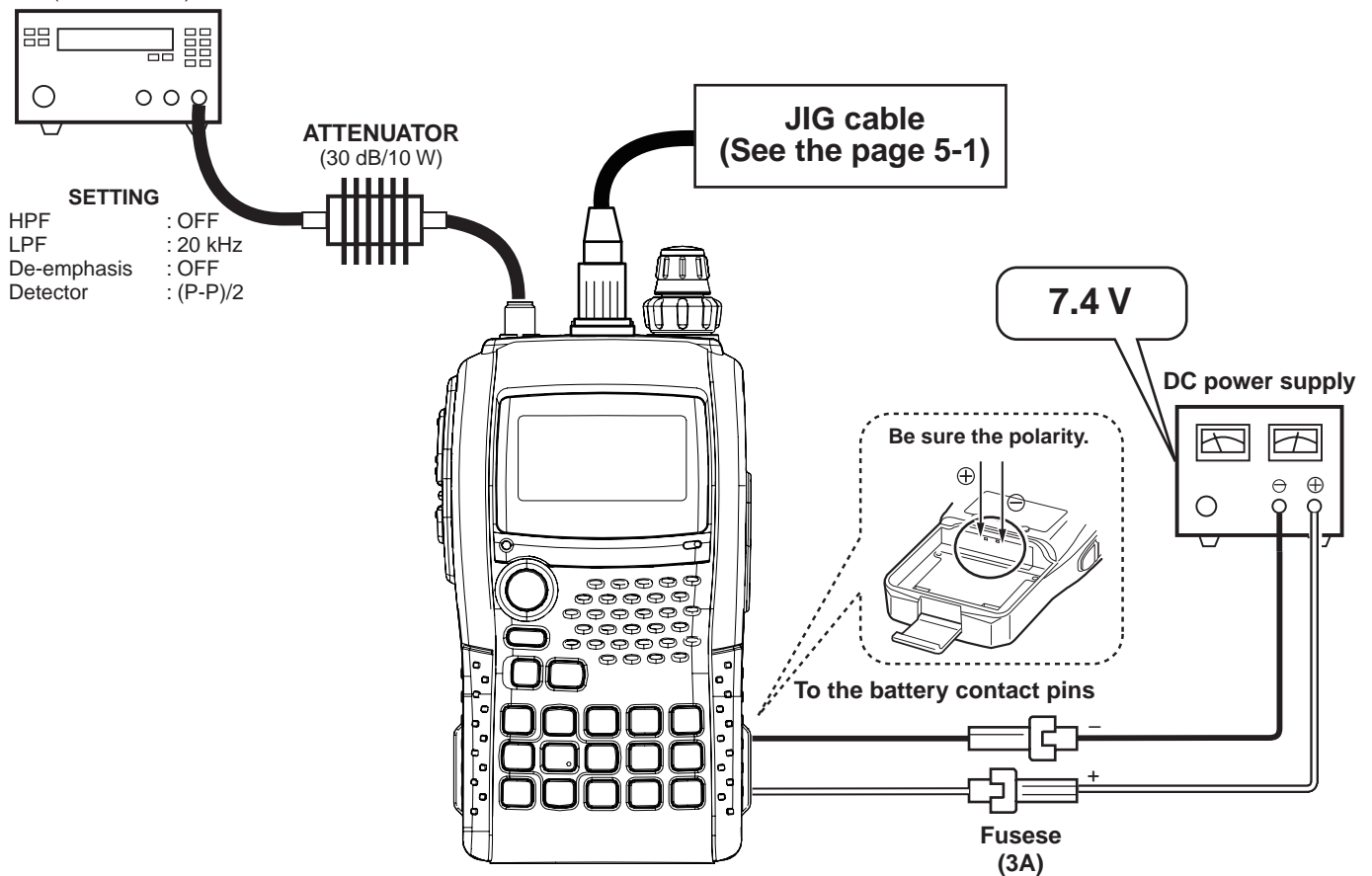
5-4 DEVIATION ADJUSTMENTS (continued)

Select an adjustment item using [2] / [8] keys, then set the adjustment value as specified using [DIAL].

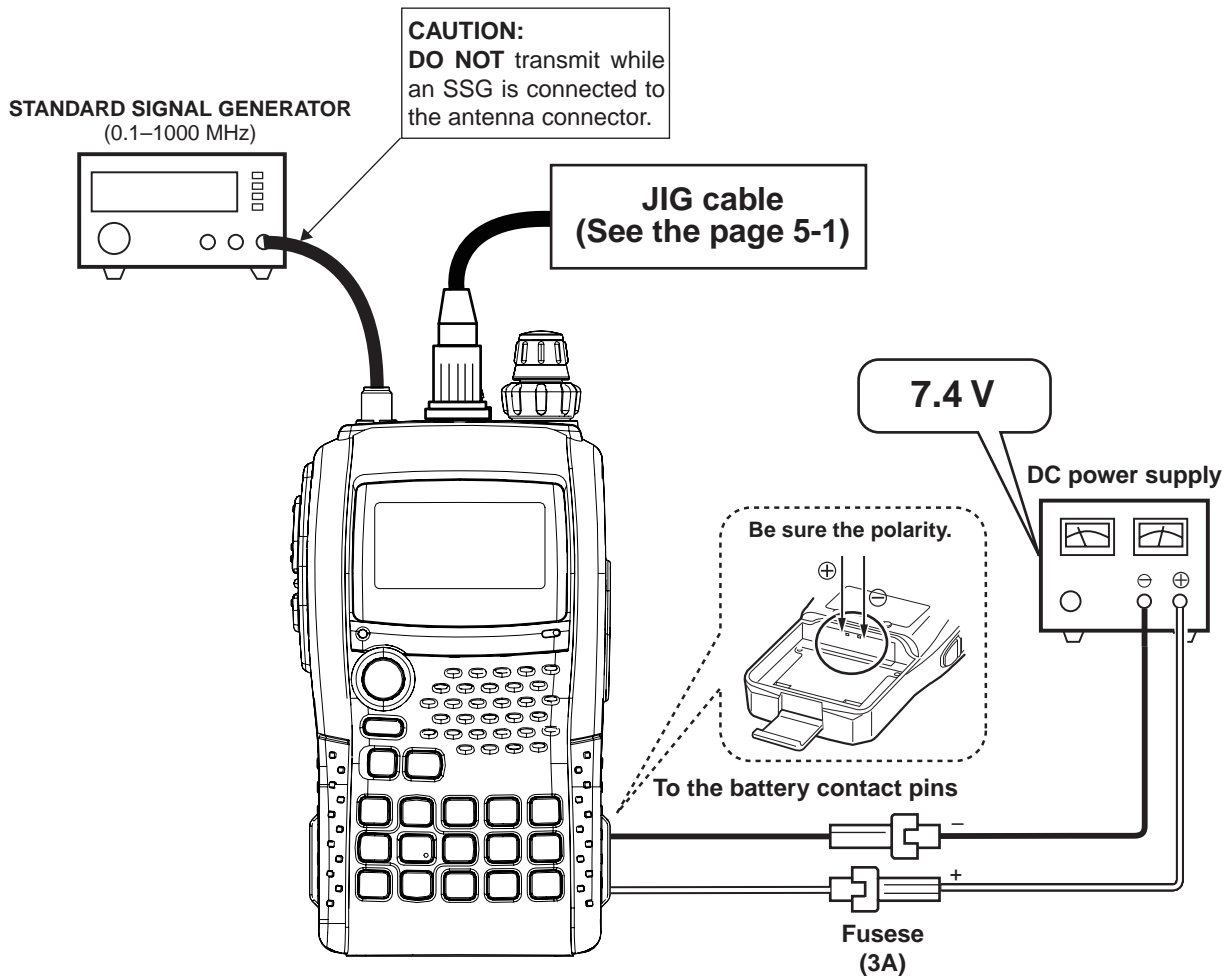
ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
DTMF, European tone, CTCSS, DTCS DEVIATION [PREPARATION]	0 • Supply voltage : 7.4 V	• Connect a Modulation Analyzer to the antenna through an Attenuator. • No audio signals are applied.	-	-
[DTMF] (VHF) ----- (UHF)	1 • Displayed freq. : "(1)" • Transmitting • Displayed freq. : "(4)" • Transmitting	• Adjust the deviation using [DIAL], then release the PTT and push [BAND] to store the adjustment value.	[DTMF]	3.4–3.6 kHz
[European tone] (VHF) ----- (UHF)	2 • Displayed freq. : "(1)" • Transmitting • Displayed freq. : "(4)" • Transmitting		[EUR]	
[CTCSS] (VHF) ----- (UHF)	3 • Displayed freq. : "(1)" • Transmitting • Displayed freq. : "(4)" • Transmitting		[CT]	0.74–0.76 kHz
[DTCS] (VHF) ----- (UHF)	4 • Displayed freq. : "(1)" • Transmitting • Displayed freq. : "(4)" • Transmitting		[DTCS]	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

MODULATION ANALYZER (0.1–500 MHz)



5-5 RECEIVE ADJUSTMENTS



WHOLE PROCEDURE OF RECEIVE ADJUSTMENTS

- 1) Select an adjustment item using [2] / [8] keys.
- 2) Set the SSG as specified (frequency, deviation and output level).
- 3) Push the [BAND] key to adjust (automatic) and store the adjustment value.

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
A BAND RECEIVE SENSITIVITY [PREPARATION]	0 • Supply voltage : 7.4 V	• Connect an SSG to the antenna connector and set as; Modulation : 1 kHz Deviation : 3.5 kHz	[TrA]	Push the [BAND] key. (Automatic adjustment)
[30.1 MHz]	1 • Displayed freq. : "30.100" • Receiving	• Set the SSG as; Frequency : 30.1 MHz Level : 0 dBμ		
[49.9 MHz]	2 • Displayed freq. : "49.900" • Receiving	• Set the SSG as; Frequency : 49.9 MHz Level : 0 dBμ		
[50.1 MHz]	3 • Displayed freq. : "50.100" • Receiving	• Set the SSG as; Frequency : 50.1 MHz Level : 0 dBμ		
[75.9 MHz]	4 • Displayed freq. : "75.900" • Receiving	• Set the SSG as; Frequency : 75.9 MHz Level : 0 dBμ		
[76.1 MHz]	5 • Displayed freq. : "76.100" • Receiving	• Set the SSG as; Frequency : 76.1 MHz Level : 0 dBμ		
[90.2 MHz]	6 • Displayed freq. : "90.200" • Receiving	• Set the SSG as; Frequency : 90.2 MHz Level : 0 dBμ		
[117.9 MHz]	7 • Displayed freq. : "117.900" • Receiving	• Set the SSG as; Frequency : 117.9 MHz Level : 0 dBμ		

RECEIVE ADJUSTMENT (continued)

- 1) Select an adjustment item using [2] / [8] keys.
- 2) Set the SSG as specified (frequency, deviation and output level).
- 3) Push the [BAND] key to adjust (automatic) and store the adjustment value.

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
[118.1 MHz]	8 • Displayed freq. : "118.100" • Receiving	• Set the SSG as; Frequency : 118.1 MHz Level : -3 dBμ	[TrA]	Push the [BAND] key. (Automatic adjustment)
[146.1 MHz]	9 • Displayed freq. : "146.100" • Receiving	• Set the SSG as; Frequency : 146.1 MHz Level : -3 dBμ		
[173.9 MHz]	10 • Displayed freq. : "173.900" • Receiving	• Set the SSG as; Frequency : 173.9 MHz Level : -3 dBμ		
[174.1 MHz]	11 • Displayed freq. : "174.100" • Receiving	• Set the SSG as; Frequency : 174.1 MHz Level : 0 dBμ		
[222.1 MHz]	12 • Displayed freq. : "222.100" • Receiving	• Set the SSG as; Frequency : 222.1 MHz Level : 0 dBμ		
[259.9 MHz]	13 • Displayed freq. : "259.900" • Receiving	• Set the SSG as; Frequency : 259.9 MHz Level : 0 dBμ		
[260.2 MHz]	14 • Displayed freq. : "260.200" • Receiving	• Set the SSG as; Frequency : 260.2 MHz Level : 0 dBμ		
[305.2 MHz]	15 • Displayed freq. : "305.200" • Receiving	• Set the SSG as; Frequency : 305.2 MHz Level : 0 dBμ		
[349.9 MHz]	16 • Displayed freq. : "349.900" • Receiving	• Set the SSG as; Frequency : 349.9 MHz Level : 0 dBμ		
[350.1 MHz]	17 • Displayed freq. : "350.100" • Receiving	• Set the SSG as; Frequency : 350.1 MHz Level : -3 dBμ		
[440.1 MHz]	18 • Displayed freq. : "440.100" • Receiving	• Set the SSG as; Frequency : 440.1 MHz Level : -3 dBμ		
[469.9 MHz]	19 • Displayed freq. : "469.900" • Receiving	• Set the SSG as; Frequency : 469.9 MHz Level : -3 dBμ		
[470.1 MHz]	20 • Displayed freq. : "470.100" • Receiving	• Set the SSG as; Frequency : 470.1 MHz Level : 0 dBμ		
[535.1 MHz]	21 • Displayed freq. : "535.100" • Receiving	• Set the SSG as; Frequency : 535.1 MHz Level : 0 dBμ		
[599.9 MHz]	22 • Displayed freq. : "599.900" • Receiving	• Set the SSG as; Frequency : 599.9 MHz Level : 0 dBμ		
[600.1 MHz]	23 • Displayed freq. : "600.100" • Receiving	• Set the SSG as; Frequency : 600.1 MHz Level : 0 dBμ		
[800.1 MHz]	24 • Displayed freq. : "800.100" • Receiving	• Set the SSG as; Frequency : 800.1 MHz Level : 0 dBμ		
[999.9 MHz]	25 • Displayed freq. : "999.900" • Receiving	• Set the SSG as; Frequency : 999.9 MHz Level : 0 dBμ		

RECEIVE ADJUSTMENT (continued)

- 1) Select an adjustment item using [2] / [8] keys.
- 2) Set the SSG as specified (frequency, deviation and output level).
- 3) Push the [BAND] key to adjust (automatic) and store the adjustment value.

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
BAND-B RECEIVE SENSITIVITY [PREPARATION]	0 • Supply voltage : 7.4 V	• Connect an SSG to the antenna connector and set as; Modulation : 1 kHz Deviation : 3.5 kHz	-	-
[118.1 MHz]	1 • Displayed freq. : "118.100" • Receiving	• Set the SSG as; Frequency : 118.1 MHz Level : -3 dBμ	[TrB]	Push the [BAND] key. (Automatic adjustment)
[146.1 MHz]	2 • Displayed freq. : "146.100" • Receiving	• Set the SSG as; Frequency : 146.1 MHz Level : -3 dBμ		
[173.9 MHz]	3 • Displayed freq. : "173.900" • Receiving	• Set the SSG as; Frequency : 173.9 MHz Level : -3 dBμ		
[350.1 MHz]	4 • Displayed freq. : "350.100" • Receiving	• Set the SSG as; Frequency : 350.1 MHz Level : -3 dBμ		
[440.1 MHz]	5 • Displayed freq. : "440.100" • Receiving	• Set the SSG as; Frequency : 440.1 MHz Level : -3 dBμ		
[469.9 MHz]	6 • Displayed freq. : "469.900" • Receiving	• Set the SSG as; Frequency : 469.9 MHz Level : -3 dBμ		
A BAND S-METER [PREPARATION]	0 • Supply voltage : 7.4 V	• Connect an SSG to the antenna connector and set as; Modulation : 1 kHz Deviation : 3.5 kHz		
[1.01 MHz (S0 level)]	1 • Displayed freq. : "1.010" • Receiving	• Set the SSG as; Frequency : 1.01 MHz Level : -8 dBμ	[S3A]	Automatic adjustment (Push the [BAND] key)
[1.01 MHz (S3 level)]		• Set the SSG as; Level : -6 dBμ		
[1.01 MHz (Full scale)]		• Set the SSG as; Level : 0 dBμ		
[15.1 MHz (S0 level)]	2 • Displayed freq. : "15.100" • Receiving	• Set the SSG as; Frequency : 15.1 MHz Level : -10 dBμ		
[15.1 MHz (S3 level)]		• Set the SSG as; Level : -8 dBμ		
[15.1 MHz (Full scale)]		• Set the SSG as; Level : 0 dBμ		
[40.1 MHz (S0 level)]	3 • Displayed freq. : "40.100" • Receiving	• Set the SSG as; Frequency : 40.1 MHz Level : -8 dBμ		
[40.1 MHz (S3 level)]		• Set the SSG as; Level : -6 dBμ		
[40.1 MHz (Full scale)]		• Set the SSG as; Level : 0 dBμ		
[60.1 MHz (S0 level)]	4 • Displayed freq. : "60.100" • Receiving	• Set the SSG as; Frequency : 60.1 MHz Level : -8 dBμ		
[60.1 MHz (S3 level)]		• Set the SSG as; Level : -6 dBμ		
[60.1 MHz (Full scale)]		• Set the SSG as; Level : 0 dBμ		
[87.5 MHz (S0 level)]	5 • Displayed freq. : "87.500" • Receiving	• Set the SSG as; Frequency : 87.5 MHz Level : -8 dBμ		
[87.5 MHz (S3 level)]		• Set the SSG as; Level : -6 dBμ		
[87.5 MHz (Full scale)]		• Set the SSG as; Level : 0 dBμ		

RECEIVE ADJUSTMENT (continued)

- 1) Select an adjustment item using [2] / [8] keys.
- 2) Set the SSG as specified (frequency, deviation and output level).
- 3) Push the [BAND] key to adjust (automatic) and store the adjustment value.

ADJUSTMENT		ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
[145.1 MHz (S0 level)]	6	<ul style="list-style-type: none"> • Displayed freq. : "(6)" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; Frequency : "(6)" Level : -8 dBμ 	[53A]	Automatic adjustment (Push the [BAND] key)
[145.1 MHz (S3 level)]			<ul style="list-style-type: none"> • Set the SSG as; Level : -6 dBμ 		
[145.1 MHz (Full scale)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 0 dBμ 		
[220.1 MHz (S0 level)]	7	<ul style="list-style-type: none"> • Displayed freq. : "220.100" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; Frequency : 220.1 MHz Level : -8 dBμ 		
[220.1 MHz (S3 level)]			<ul style="list-style-type: none"> • Set the SSG as; Level : -6 dBμ 		
[220.1 MHz (Full scale)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 0 dBμ 		
[305.2 MHz (S0 level)]	8	<ul style="list-style-type: none"> • Displayed freq. : "305.200" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; Frequency : 305.2 MHz Level : -8 dBμ 		
[305.2 MHz (S3 level)]			<ul style="list-style-type: none"> • Set the SSG as; Level : -6 dBμ 		
[305.2 MHz (Full scale)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 0 dBμ 		
[435.1 MHz (S0 level)]	9	<ul style="list-style-type: none"> • Displayed freq. : "(7)" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; Frequency : "(7)" Level : -8 dBμ 		
[435.1 MHz (S3 level)]			<ul style="list-style-type: none"> • Set the SSG as; Level : -6 dBμ 		
[435.1 MHz (Full scale)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 0 dBμ 		
[535.1 MHz (S0 level)]	10	<ul style="list-style-type: none"> • Displayed freq. : "535.100" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; Frequency : 535.1 MHz Level : -8 dBμ 		
[535.1 MHz (S3 level)]			<ul style="list-style-type: none"> • Set the SSG as; Level : -6 dBμ 		
[535.1 MHz (Full scale)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 0 dBμ 		
[800.1 MHz (S0 level)]	11	<ul style="list-style-type: none"> • Displayed freq. : "800.100" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; Frequency : 800.1 MHz Level : -2 dBμ 		
[800.1 MHz (S3 level)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 0 dBμ 		
[800.1 MHz (Full scale)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 8 dBμ 		
[87.5 MHz (S0 level)]	12	<ul style="list-style-type: none"> • Displayed freq. : "87.5" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; Frequency : 87.5MHz Level : 2 dBμ Modulation : 1 kHz Deviation : 52.5 kHz 	[5WF]	Push the [BAND] key. (Automatic adjustment)
[87.5 MHz (S3 level)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 5 dBμ 		
[87.5 MHz (Full scale)]			<ul style="list-style-type: none"> • Set the SSG as; Level : 12 dBμ 		

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

RECEIVE ADJUSTMENT (continued)

- 1) Select an adjustment item using [2] / [8] keys.
- 2) Set the SSG as specified (frequency, deviation and output level).
- 3) Push the [BAND] key to adjust (automatic) and store the adjustment value.

ADJUSTMENT	ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE		
B BAND S-METER [PREPARATION]	0 • Supply voltage : 7.4 V	• Connect an SSG to the antenna connector and set as; Frequency : "(6)" Modulation : 1 kHz Deviation : 3.5 kHz.	[S3B]	Push the [BAND] key. (Automatic adjustment)		
(VHF) [145.1 MHz (S0 level)]	1 • Displayed freq. : "(6)" • Receiving	• Set the SSG as; Level : -8 dBμ				
[145.1 MHz (S3 level)]		• Set the SSG as; Level : -6 dBμ				
[145.1 MHz (Full scale)]		• Set the SSG as; Level : 0 dBμ				
(UHF) [435.1 MHz (S0 level)]	2 • Displayed freq. : "(7)" • Receiving	• Set the SSG as; Level : -8 dBμ				
[435.1 MHz (S3 level)]		• Set the SSG as; Level : -6 dBμ				
[435.1 MHz (Full scale)]		• Set the SSG as; Level : 0 dBμ				
A BAND SQUELCH [PREPARATION]	0 • Supply voltage : 7.4 V	• Connect an SSG to the antenna connector and set as; Level : "OFF"			[SQLA]	Push the [BAND] key. (Automatic adjustment)
[1.01 MHz]	1 • Displayed freq. : "1.010" • Receiving	-				
[15.1 MHz]	2 • Displayed freq. : "15.100" • Receiving	-				
[40.1 MHz]	3 • Displayed freq. : "40.100" • Receiving	-				
[60.1 MHz]	4 • Displayed freq. : "60.100" • Receiving	-				
[87.5 MHz]	5 • Displayed freq. : "87.500" • Receiving	-				
[145.1 MHz]	6 • Displayed freq. : "(6)" • Receiving	-				
[220.1 MHz]	7 • Displayed freq. : "220.100" • Receiving	-				
[305.2 MHz]	8 • Displayed freq. : "305.200" • Receiving	-				
[435.1 MHz]	9 • Displayed freq. : "(7)" • Receiving	-				
[535.1 MHz]	10 • Displayed freq. : "535.100" • Receiving	-				
[800.1 MHz]	11 • Displayed freq. : "800.100" • Receiving	-				

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

RECEIVE ADJUSTMENT (continued)

- 1) Select an adjustment item using [2] / [8] keys.
- 2) Set the SSG as specified (frequency, deviation and output level).
- 3) Push the [BAND] key to adjust (automatic) and store the adjustment value.

ADJUSTMENT		ADJUSTMENT CONDITION	OPERATION	ADJUSTMENT ITEM	VALUE
(FM) [145.1 MHz]	1	<ul style="list-style-type: none"> • Displayed freq. : "(6)" • Mode : "FM" • Receiving 	-	[SOLB]	Push the [BAND] key. (Automatic adjustment)
[435.1 MHz]	2	<ul style="list-style-type: none"> • Displayed freq. : "(7)" • Mode : "FM" • Receiving 			
(NFM) [145.1 MHz]	3	<ul style="list-style-type: none"> • Displayed freq. : "(6)" • Mode : "NFM" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; <li style="padding-left: 20px;">Frequency : "(6)" <li style="padding-left: 20px;">Modulation : 1 kHz <li style="padding-left: 20px;">Deviation : 1.75 kHz <li style="padding-left: 20px;">Level : -28 dBμ 		
[435.1 MHz]	4	<ul style="list-style-type: none"> • Displayed freq. : "(7)" • Mode : "NFM" • Receiving 	<ul style="list-style-type: none"> • Set the SSG as; <li style="padding-left: 20px;">Frequency : "(7)" 		

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
[USA]	145.000	146.000	430.000	435.000	440.000	145.100	435.100
[SEA], [CHN], [EXP], [CAN]	146.000	148.000	440.000	445.000	450.000	146.100	445.100

[LOGIC UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C327	4030017920	S.CER ECJ0EB1A683K	B	50.9/26.2
C328	4030018860	S.CER ECJ0EB0J105K	B	50/26.2
C329	4030017710	S.CER ECJ0EC1H181J	B	50.4/29
C330	4030017460	S.CER ECJ0EB1E102K	B	55/31.1
C331	4550007690	S.TAN TEESVP 1C 105M8R	B	55.6/36.4
C332	4030016790	S.CER ECJ0EB1C103K	B	52.4/29.9
C333	4550007680	S.TAN TEESVP 0J 226M8R	B	52.9/28.5
C334	4030018110	S.CER ECJ0EB1H272K	B	46.9/35.3
C335	4030018140	S.CER ECJ0EB1H391K	B	50.2/38.4
C336	4550007730	S.TAN TEESVJ 0J 106M8R	B	45.2/34.1
C337	4030017920	S.CER ECJ0EB1A683K	B	47.3/33
C338	4030017040	S.CER ECJ0EB1A333K	B	46.1/31
C339	4030017460	S.CER ECJ0EB1E102K	B	47.8/29.9
C340	4030017040	S.CER ECJ0EB1A333K	B	17.2/2.4
C341	4030016960	S.CER ECJ0EB1C183K	B	50.2/41.1
C342	4030017460	S.CER ECJ0EB1E102K	B	19.3/5.8
C343	4030018860	S.CER ECJ0EB0J105K	B	54.9/38.9
C344	4030017460	S.CER ECJ0EB1E102K	B	14.7/6.4
C347	4030017460	S.CER ECJ0EB1E102K	B	39.9/33.2
C400	4030017460	S.CER ECJ0EB1E102K	B	52.2/6.8
C401	4030017460	S.CER ECJ0EB1E102K	B	51.4/14.7
C403	4030017460	S.CER ECJ0EB1E102K	B	53.5/15.8
C404	4030017460	S.CER ECJ0EB1E102K	B	54.5/11.3
C405	4030018860	S.CER ECJ0EB0J105K	B	55.4/11.3
C408	4030017460	S.CER ECJ0EB1E102K	B	58/14
C409	4030016930	S.CER ECJ0EB1A104K	B	23.3/2.1
C410	4030016780	S.CER ECJ0EB1C153K	B	26.7/2.1
C411	4030016930	S.CER ECJ0EB1A104K	B	26.3/3.3
C412	4550002960	S.TAN TEESVA 1C 155M8R	B	25.1/5.2
C413	4030016930	S.CER ECJ0EB1A104K	B	36.9/2.1
C414	4510008500	S.ELE EEE1CA101WP	B	47.2/12.7
C415	4030016950	S.CER ECJ0EB1A473K	B	37/8.2
C416	4510009020	S.ELE EEE0JA331P	B	39.2/13.4
C417	4030017460	S.CER ECJ0EB1E102K	B	38.7/18.9
C418	4030017460	S.CER ECJ0EB1E102K	B	56.6/33.4
C419	4030017460	S.CER ECJ0EB1E102K	B	57/16
C420	4510008040	S.ELE EEFCD 0K 330R	B	56/6.2
C421	4030018520	S.CER C1608 JB 0J 225M-T	B	54.7/16.2
C500	4030016930	S.CER ECJ0EB1A104K	B	77.6/16.3
C501	4030017460	S.CER ECJ0EB1E102K	B	72.3/16.2
C503	4030017460	S.CER ECJ0EB1E102K	B	70.6/16.5
C504	4030016930	S.CER ECJ0EB1A104K	B	69.1/16.2
C505	4030016930	S.CER ECJ0EB1A104K	B	72.4/18.1
C506	4030017460	S.CER ECJ0EB1E102K	B	70.1/24.6
C507	4030017400	S.CER ECJ0EC1H220J	B	56.3/44.7
C508	4030018860	S.CER ECJ0EB0J105K	B	56.4/46.8
C509	4030017460	S.CER ECJ0EB1E102K	T	49.3/50.4
C510	4030016930	S.CER ECJ0EB1A104K	T	47.7/50.6
C511	4030016930	S.CER ECJ0EB1A104K	B	45.1/51.1
C512	4030017030	S.CER ECJ0EB1A273K	B	45.5/44.5
C513	4030017030	S.CER ECJ0EB1A273K	B	44.6/46.1
C514	4030017460	S.CER ECJ0EB1E102K	B	45.8/37.3
C515	4030016930	S.CER ECJ0EB1A104K	B	43.6/41.8
C516	4030017760	S.CER ECJ0EB1H222K	B	50.9/42.3
C517	4030016930	S.CER ECJ0EB1A104K	B	70/41
C518	4030016930	S.CER ECJ0EB1A104K	B	81/43.4
C519	4550006930	S.TAN TEESVP 0J 225M8R	B	81.1/42
C520	4030017420	S.CER ECJ0EC1H470J	B	72.8/40.6
C521	4550007730	S.TAN TEESVJ 0J 106M8R	B	68.6/43
C522	4030016930	S.CER ECJ0EB1A104K	B	76.6/50.9
C523	4030016930	S.CER ECJ0EB1A104K	B	77.5/50.9
C524	4030016970	S.CER ECJ0EB1C223K	B	71.5/50.9
C525	4030016950	S.CER ECJ0EB1A473K	B	74.3/50.9
C526	4030016930	S.CER ECJ0EB1A104K	B	69.6/43.4
C527	4030016930	S.CER ECJ0EB1A104K	B	58.3/47.4
C528	4030018860	S.CER ECJ0EB0J105K	B	57.2/43.5
C529	4030016930	S.CER ECJ0EB1A104K	T	62.8/47
C530	4030016930	S.CER ECJ0EB1A104K	B	75.3/18.8
C531	4030016930	S.CER ECJ0EB1A104K	B	81.2/18.7
C532	4030017460	S.CER ECJ0EB1E102K	B	79.2/19.7
C534	4030017460	S.CER ECJ0EB1E102K	B	80.9/19.7
C535	4030016930	S.CER ECJ0EB1A104K	B	80.9/20.6
C536	4030016930	S.CER ECJ0EB1A104K	B	85.7/17.4
C537	4030016930	S.CER ECJ0EB1A104K	B	83.7/22.4
C538	4030016930	S.CER ECJ0EB1A104K	B	80.6/22.4
C539	4030016930	S.CER ECJ0EB1A104K	B	79/22.4
C540	4030016930	S.CER ECJ0EB1A104K	B	69.1/30.7
C541	4030016930	S.CER ECJ0EB1A104K	B	69.1/38.1
C542	4030016930	S.CER ECJ0EB1A104K	B	81.4/40.6
C543	4030016930	S.CER ECJ0EB1A104K	B	79.3/40.5
C544	4030016930	S.CER ECJ0EB1A104K	B	77.2/40.5
C545	4030016930	S.CER ECJ0EB1A104K	B	86.4/39.5
C546	4030017420	S.CER ECJ0EC1H470J	B	85.5/39.5
C547	4030017460	S.CER ECJ0EB1E102K	B	64.7/28.8
C548	4550006930	S.TAN TEESVP 0J 225M8R	T	66.9/29.4
C549	4030017460	S.CER ECJ0EB1E102K	T	66.9/31.5
C550	4030017460	S.CER ECJ0EB1E102K	T	66.4/35.2
C551	4030012610	S.CER C2012 JB 1C 474K-T	B	64.8/11.1
C552	4030018860	S.CER ECJ0EB0J105K	B	62.7/14.9
C553	4030018860	S.CER ECJ0EB0J105K	B	63.6/14.9
C554	4550007680	S.TAN TEESVP 0J 226M8R	B	64.8/17.3
C555	4550006250	S.TAN TEESVA 1A 106M8R	B	64.7/25.8
C556	4030016930	S.CER ECJ0EB1A104K	B	63.1/24.9
C557	4030017460	S.CER ECJ0EB1E102K	B	21.7/15.9
C600	4030017420	S.CER ECJ0EC1H470J	B	14.1/42.6
C602	4030017460	S.CER ECJ0EB1E102K	B	36.5/52.2
C603	4030017460	S.CER ECJ0EB1E102K	B	39.8/52.5
C604	4030017460	S.CER ECJ0EB1E102K	B	40.7/29.7
C605	4030017460	S.CER ECJ0EB1E102K	B	40.9/26.9
J1	6510025370	S.CNR AXK816145YG	B	84.2/47.3
J200	6510025170	S.CNR IMSA-9631S-27Y-921	B	30.6/27.4
J600	6510024131	S.CNR IMSA-9637S-40Y905	B	22/11.4

[LOGIC UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
J601	6510026410	S.CNR SM10B-SRSS-TB (LF) (SN)	B	6.8/41.6
DS1	5030002880	LCD HLM7972-010100		
DS201	5040002670	S.LED CL-165HR/YG	T	39.1/7.1
DS202	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	87.8/13.9
DS203	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	87.8/22.9
DS204	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	87.8/40.9
DS205	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	80.1/13.9
DS206	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	80.1/22.9
DS207	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	72.4/40.9
DS208	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	54.6/11.4
DS209	5040003280	S.LED RY-SP192UYG24-5M <VKH>	T	62.4/15.4
DS210	5040002961	S.LED SML-A12MT T86J	T	4.4/18.4
DS211	5040002961	S.LED SML-A12MT T86J	T	4.4/36.4
MC300	7700002850	MIC EM6022P-65B-G <HOR>		
SP1	2510001420	SP PSC-2849PA <PRI>		
W1	7120000470	JMP ERDS2T0		
W2	8900007682	CBL OPC-741A-1 (P0.5,N40,L55)		
EP50	6910018460	S.BEA MMZ1005Y102C-T	B	23.5/45.2
EP51	6910018460	S.BEA MMZ1005Y102C-T	B	12.7/45.5
EP52	6910018460	S.BEA MMZ1005Y102C-T	B	11.3/45.8
EP53	6910018460	S.BEA MMZ1005Y102C-T	B	13.1/44.3
EP100	6910018460	S.BEA MMZ1005Y102C-T	B	98.5/46.9
EP101	6910018460	S.BEA MMZ1005Y102C-T	B	92.6/38.5
EP102	6910018460	S.BEA MMZ1005Y102C-T	B	96.7/26.2
EP500	6910018460	S.BEA MMZ1005Y102C-T	B	78.5/16.3
EP501	6910018460	S.BEA MMZ1005Y102C-T	B	72.9/21.2
EP502	6910018460	S.BEA MMZ1005Y102C-T	T	57.4/51
EP503	6910018460	S.BEA MMZ1005Y102C-T	B	43.6/40.2
EP504	6910018460	S.BEA MMZ1005Y102C-T	B	70.4/39.8
EP505	6910018460	S.BEA MMZ1005Y102C-T	B	74.4/40.6
EP506	6910018460	S.BEA MMZ1005Y102C-T	B	70/44.6
EP507	6910018460	S.BEA MMZ1005Y102C-T	T	60.6/47.5
EP508	6910018460	S.BEA MMZ1005Y102C-T	B	73.4/19.5
EP509	6910018460	S.BEA MMZ1005Y102C-T	B	64.6/22.9
EP511	6910018460	S.BEA MMZ1005Y102C-T	B	10.9/38.1
EP512	6910018460	S.BEA MMZ1005Y102C-T	B	11.8/38.2
EP514	6910018460	S.BEA MMZ1005Y102C-T	B	11.6/41.5
EP515	6910018460	S.BEA MMZ1005Y102C-T	B	12.9/42.3
EP516	6910018460	S.BEA MMZ1005Y102C-T	B	11.4/43.1
EP517	6910018460	S.BEA MMZ1005Y102C-T	B	16.3/43.2

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

SECTION 7

MECHANICAL PARTS

[CHASSIS PARTS]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6910017840	2905 ANT CONNECTOR	1
S702	2250000630	TP70D974E20-21F-3066	1
W1	8900016810	OPC-1792 (Incl. W2)	1
W2	8900016791	OPC-1763A	1
MP1	8210024420	3066 REAR PANEL	1
MP2	8210024300	3066 PTT PANEL	1
MP3	8310070540	3066 LOCK PLATE	1
MP4	8310070550	3066 T-HOLDER	1
MP5	8930073710	3066 MIC CAP	1
MP6	8930073700	3066 DC CAP	1
MP7	8930073730	3066 MAIN SEAL	1
MP8	8930073720	3066 PTT RUBBER	1
MP9	8930073740	3066 T-RUBBER	1
MP10	8930073880	3066 BP SHEET	1
MP11	8930073870	3066 SHEET	1
MP12	8930073750	3066 SHAFT	1
MP13	8610012870	KNOB N-342 (Incl. MP21)	1
MP14	8610012890	KNOB N-342 COVER	1
MP15	8610013520	KNOB N-364	1
MP16	8930073850	O-RING (BP)	1
MP17	8850002830	PLAIN WASHER (AO)	1
MP18	8930053590	O-RING (AG)	1
MP19	8830001160	VR NUT (K)	1
MP20	8830001470	VR NUT (N)	1
MP21	8610007510	KNOB SPRING NO.7800	1
MP22	8930059830	2600 SHEET	1
MP23	8850002770	PLAIN WASHER (AM)	7
MP24	8810009511	SCREW BT B0 2X4 NI-ZC3 (BT)	10
MP25	8810009181	0-TAP FLAT WASHER B0 2X5 NI-ZC3 (BT)	2
MP26	8810010450	0-TAP SCREW PH M2X3 SUS SSBC	2
MP27	8810009161	SCREW BT B0 2X20 SUS SSBC	2
MP28	8810010750	SCREW BTB0 2X6SUS SSBC (BT)	4
MP29	8810010191	SCREW BiH M2X4 SUS SSBC	1
MP30	8810010630	0-TAP SCREW 3 PH M2X3 SUS SSBC	1
MP31	8950007300	3066 CONTACT SPRING	1
MP32	8930057022	THERMALLY SHEET (AE)-2	2
MP34	8930074690	3066 T-SHEET	1
MP35	8510018710	3066 MIC SHIELD	1
MP36	8930070590	SHIELD TAPE (S)	1
MP37	8930074980	SHIELD SPONGE (CF)	1

[LOGIC UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
DS1	5030002880	HLM7972-010100	1
MC300	7700002850	EM6022P-65B-G	1
SP1	2510001420	PSC-2849PA	1
W1	7120000470	ERDS2T0	1
W2	8900007682	OPC-741A-1	1
MP1	8210024350	3066 FRONT PANEL ASSY (Incl. MP8)	1
MP2	8310070850	3066 WINDOW PLATE (A)	1
MP3	8930073580	3066 LED LENS	1
MP4	8930073640	3066 KEY	1
MP5	8930073860	3066 WINDOW SHEET	1
MP6	8210022450	2888 REFLECTOR	1
MP7	8930074790	3066 LCD SPONGE	1
MP8	8930018220	870 SARAN NET	1
MP9	8930048840	2135 MIC SPONGE	1
MP10	8930061110	2681 MIC TAPE	1
MP11	8810009511	SCREW BT B0 2X4 NI-ZC3 (BT)	8
MP12	8930062970	DOUBLE SIDE TAPE (AN)	1
MP13	8930074970	3066 WHITE SHEET	1
MP24	8510017840	OG-321610G	1
MP500	8510017840	OG-321610G	1
MP501	8510017840	OG-321610G	1
MP510	8510017840	OG-321610G	1
MP511	8930074500	3066 A-SPRING	1
MP512	8930074510	3066 B-SPRING	1

*: Refer to SECTION 8 "BOARD LAYOUTS."

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J702	6510024131	IMSA-9637S-40Y905	1
J703	6510022880	AXK5S30340P	1
S700	2260002840	SKHLLFA010	1
S701	2260002840	SKHLLFA010	1
MP300	8510016470	2775 VCO CASE	1
MP301	8510016460	2775 VCO COVER	1
MP302	8510017840	OG-321610G	1

[RF UNIT]

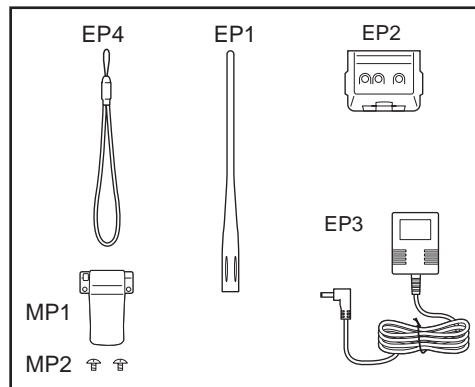
REF NO.	ORDER NO.	DESCRIPTION	QTY.
J800	6510025370	AXK816145YG	1
J1000	6450000870	HEC2711-01-020	1
J1001	6510024410	AXK6S30545	1
MP100	8410002610	2888 PA HEATSINK	1
MP101	6910014760	OG-503040	1

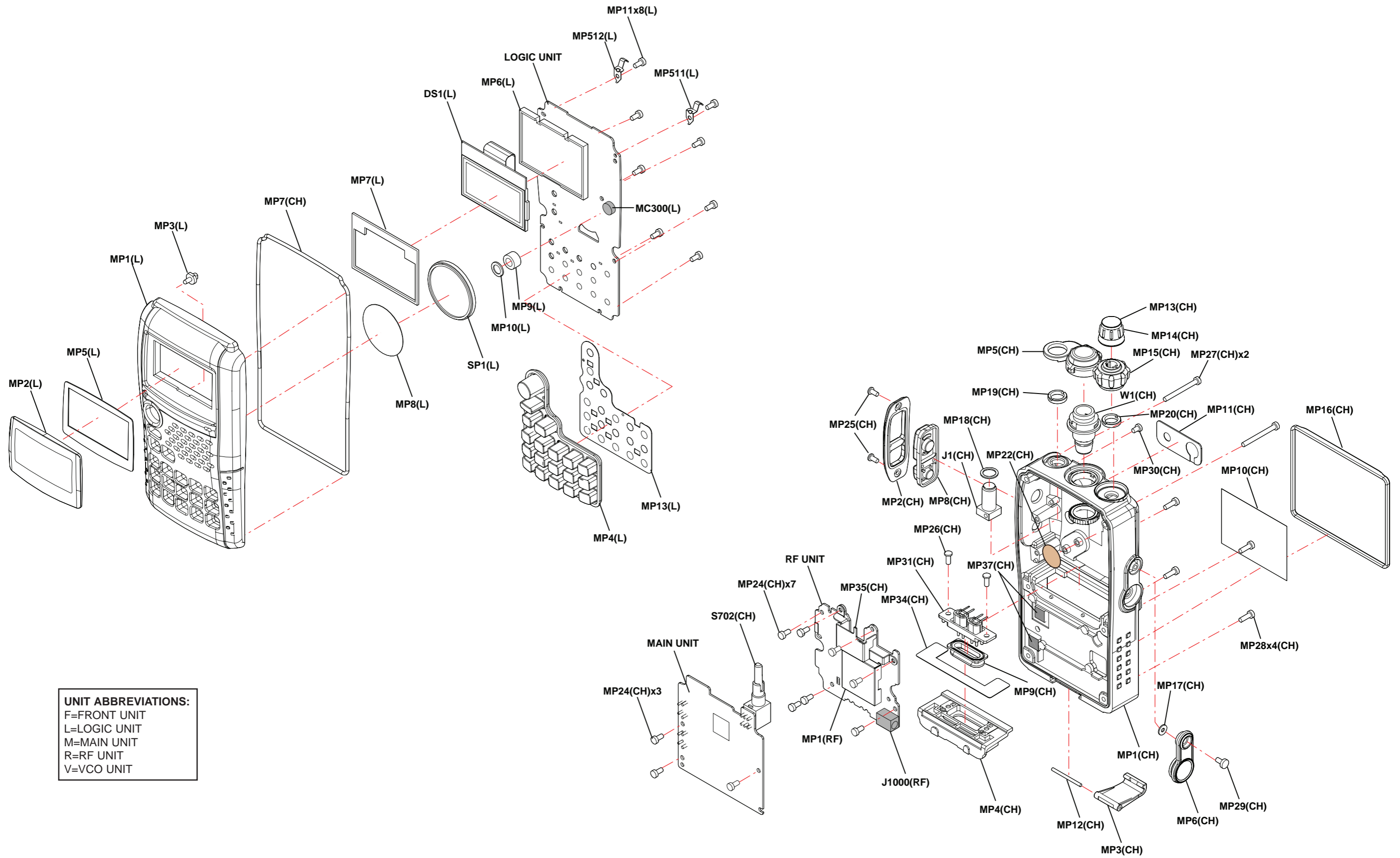
[VCO UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6510025380	AXK716147G	1
MP1	8510017470	2888 VCO CASE	1

[ACCESSORIES]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
EP1	3310002150	FA-S270C	1
EP2	(Optional)	BP-256	1
EP3	(Optional)	BC-167A [USA], [SEA], [CAN]	1
	(Optional)	BC-167D [CHN], [EXP]	1
EP4	6910018620	BLACK HANDY STRAP	1
MP1	(Optional)	MB-111 (Incl. MP2)	1
MP2	8810010470	SCREW TRUSS M3X4 SUS SSBC	2



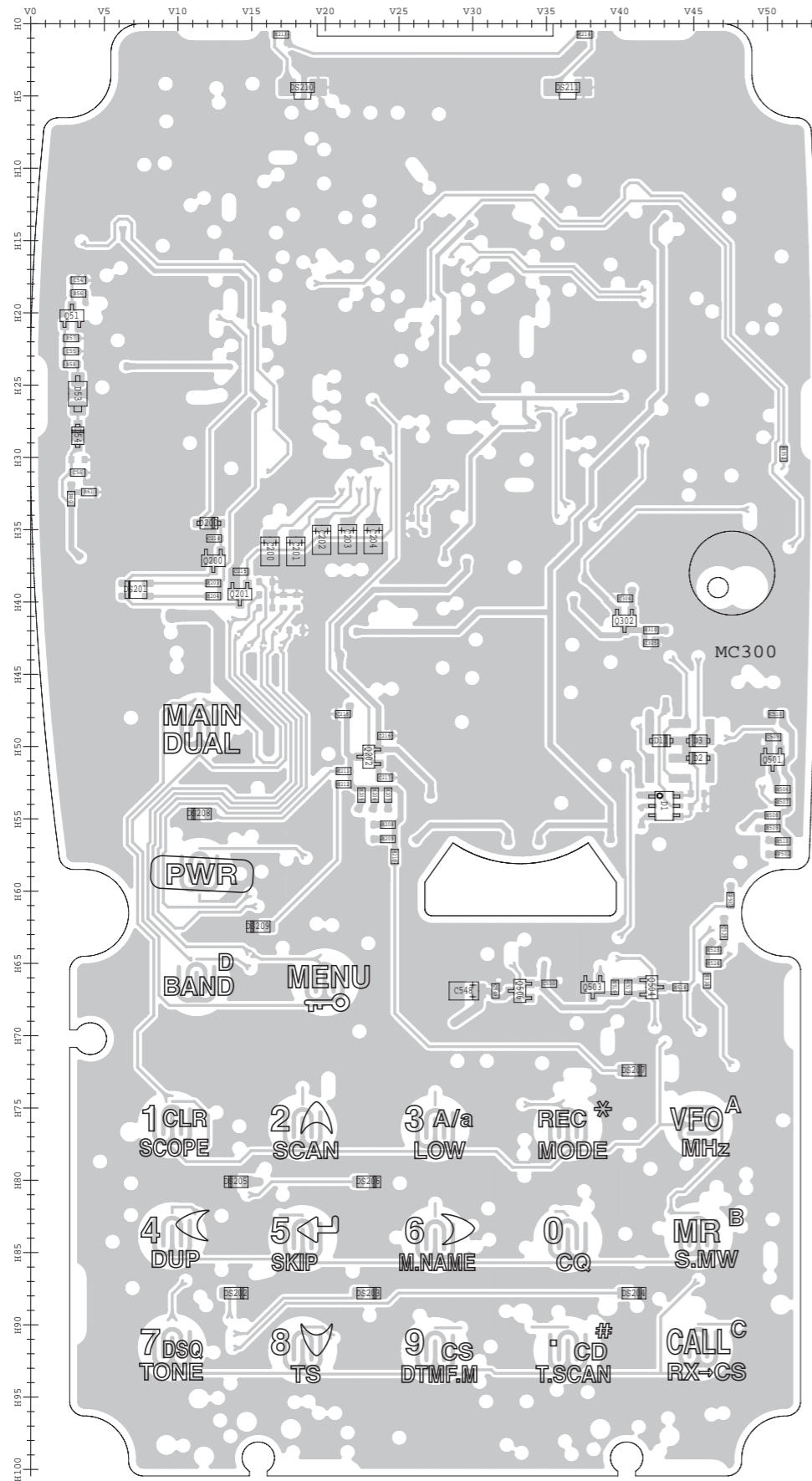


UNIT ABBREVIATIONS:
 F=FRONT UNIT
 L=LOGIC UNIT
 M=MAIN UNIT
 R=RF UNIT
 V=VCO UNIT

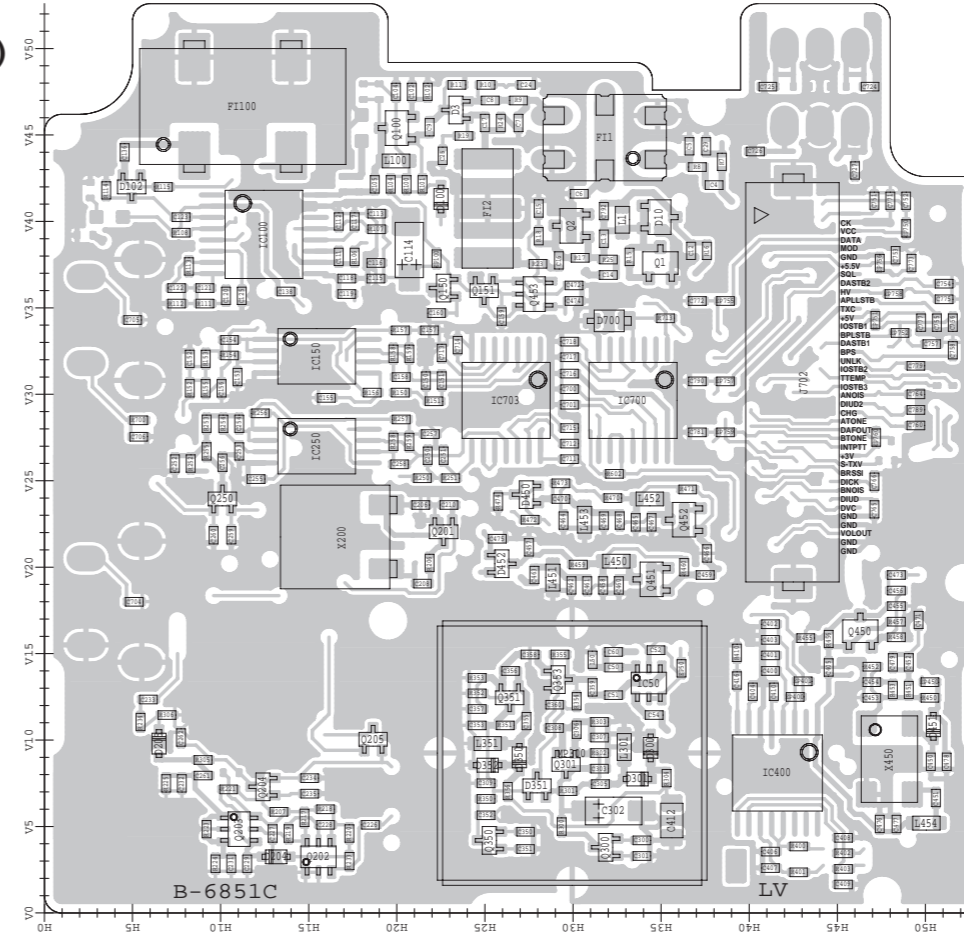
SECTION 8

BOARD LAYOUTS

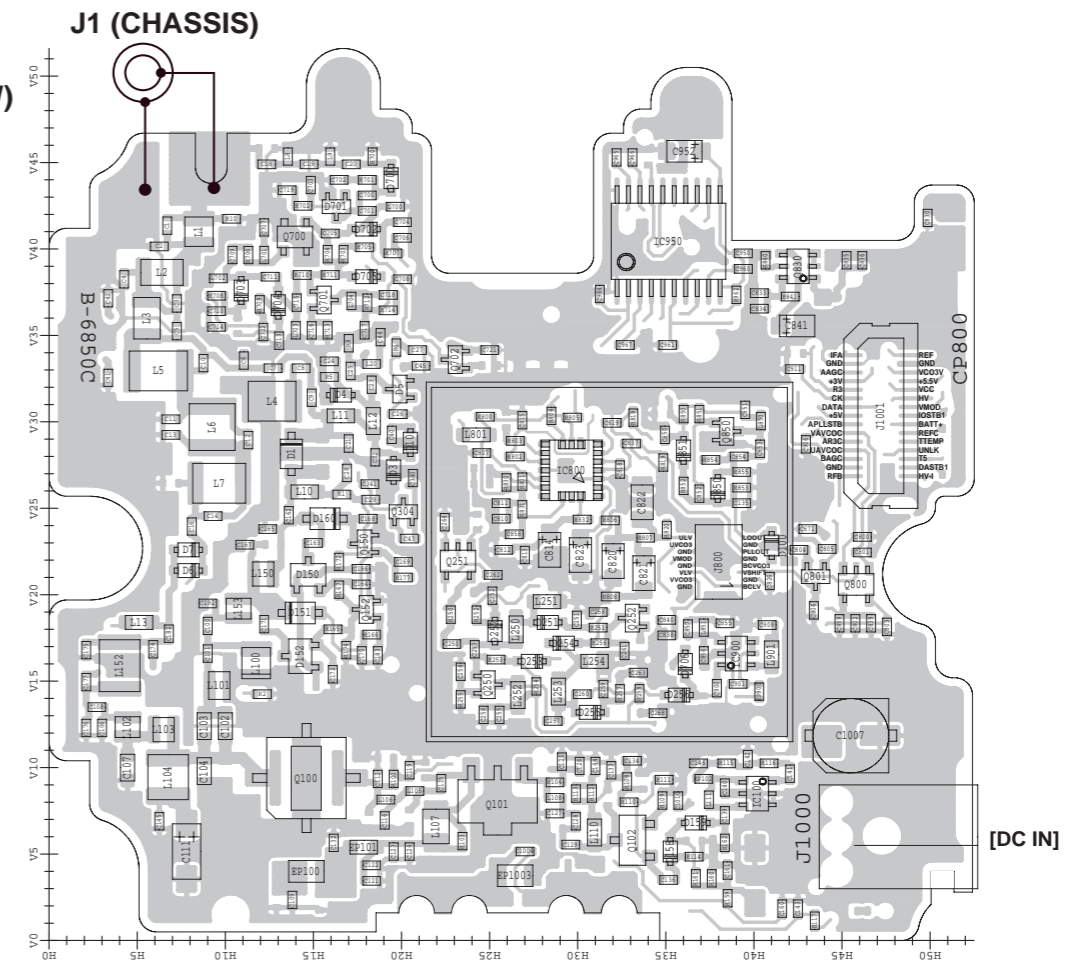
• LOGIC UNIT
(TOP VIEW)



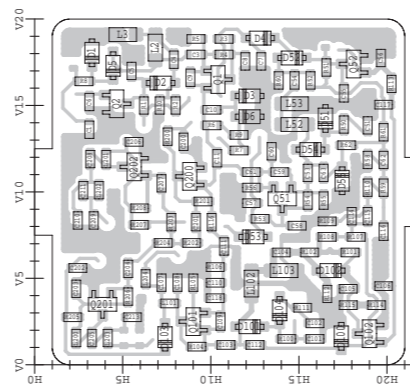
• MAIN UNIT
(TOP VIEW)



• RF UNIT
(TOP VIEW)

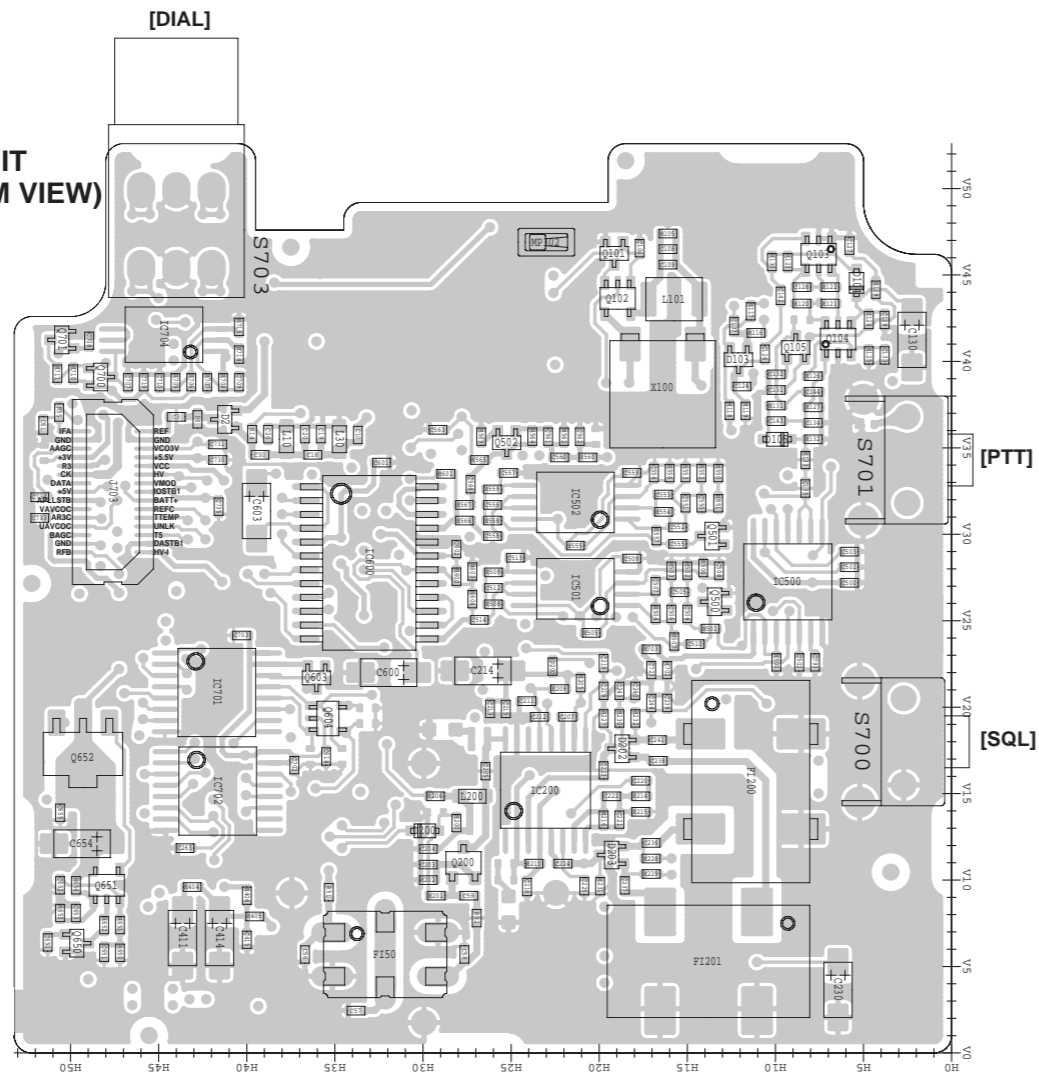


• VCO UNIT
(TOP VIEW)

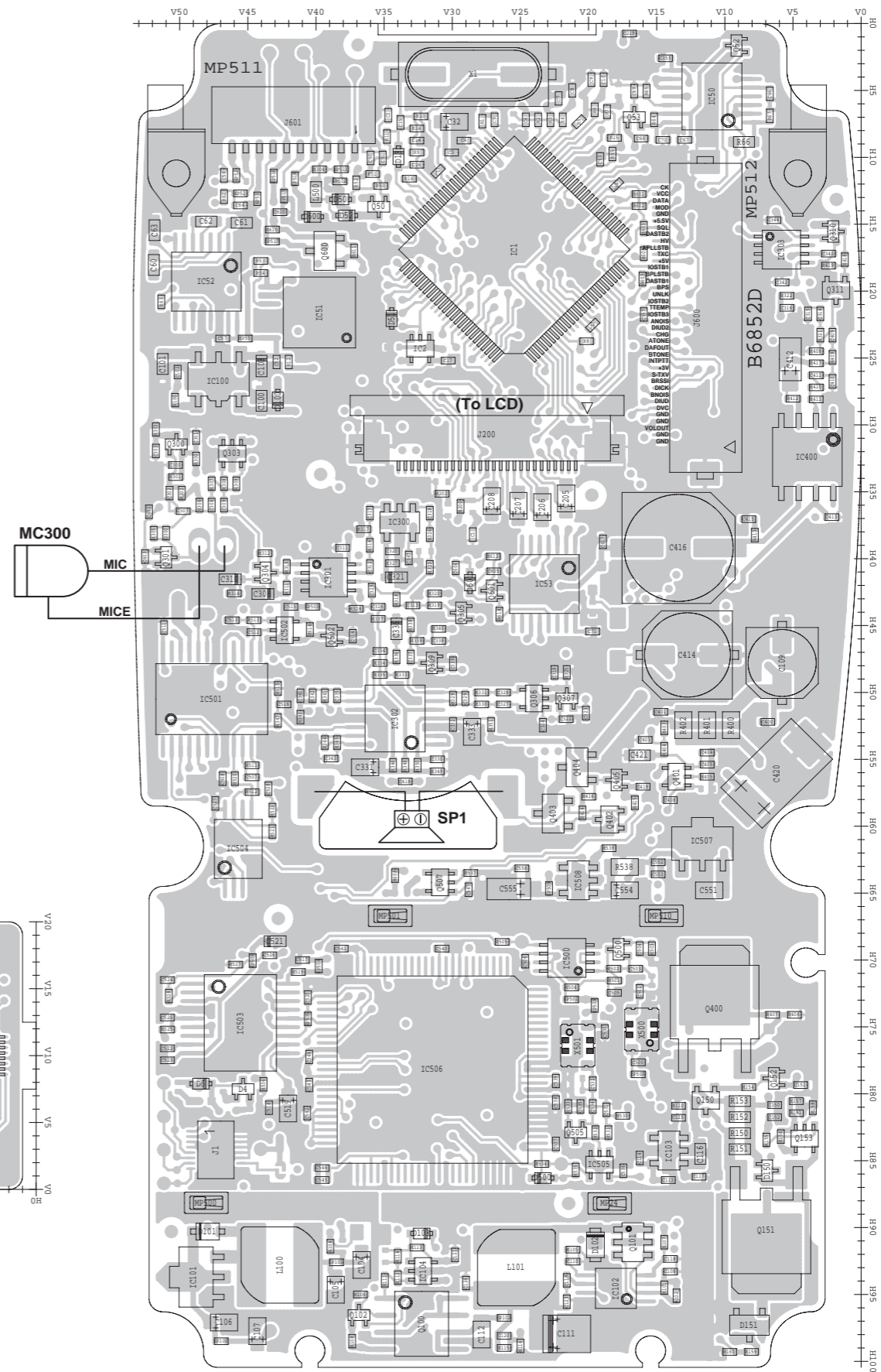


The combination of this side and the bottom side shows the board layout in the same configuration as the actual P.C.Board.

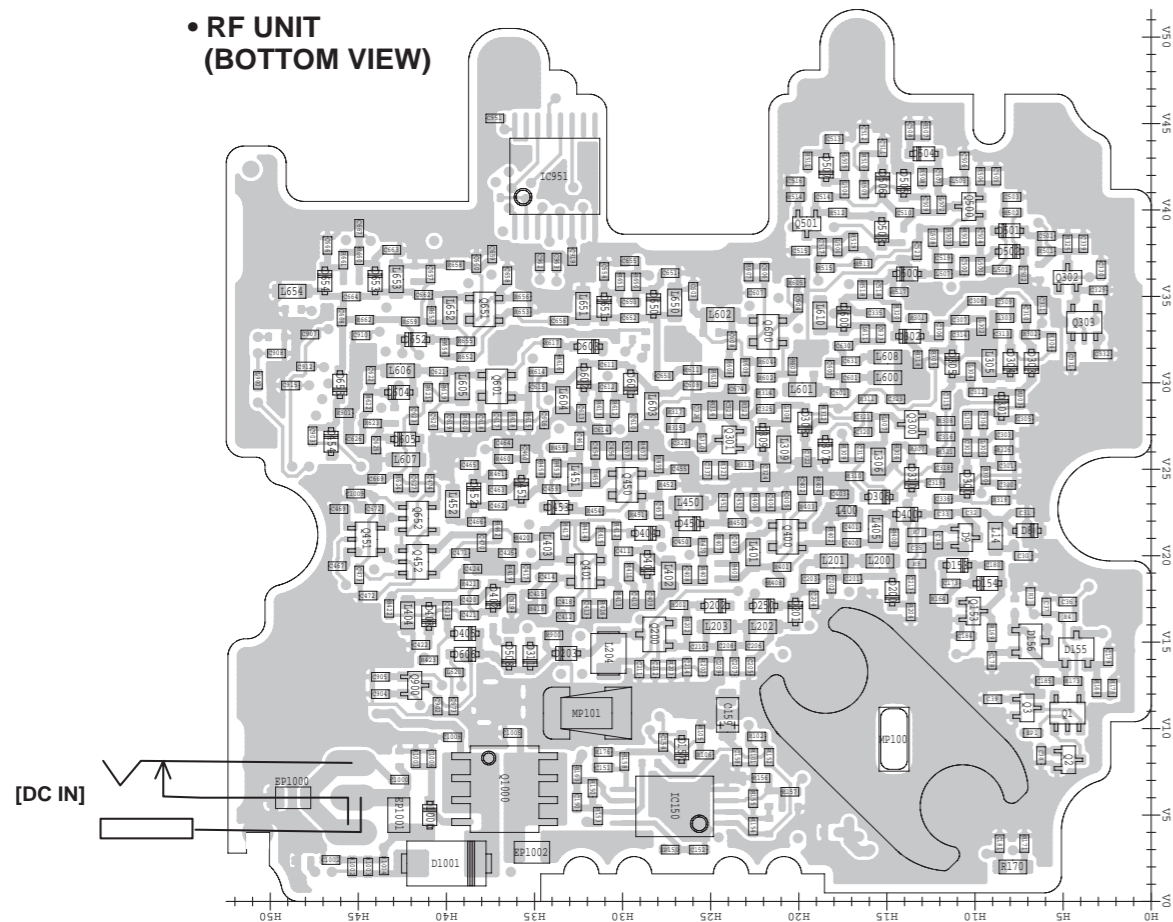
• MAIN UNIT (BOTTOM VIEW)



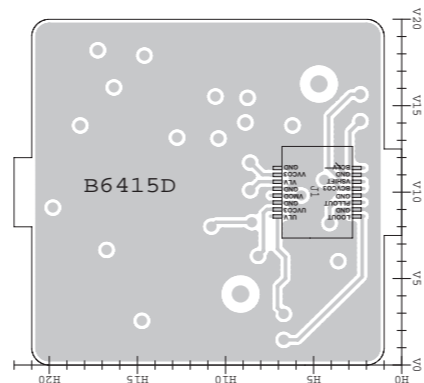
• LOGIC UNIT (BOTTOM VIEW)



• RF UNIT (BOTTOM VIEW)

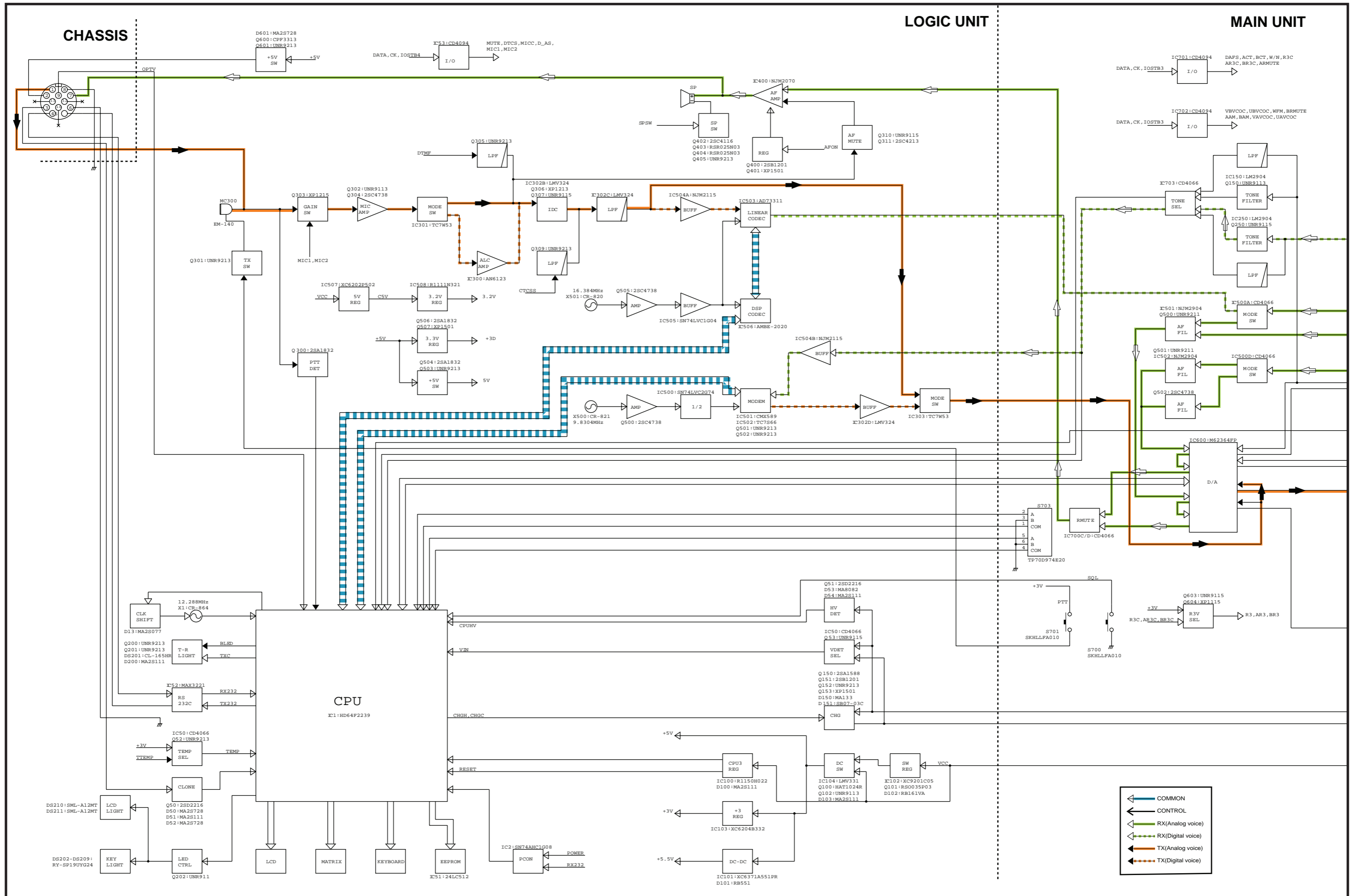


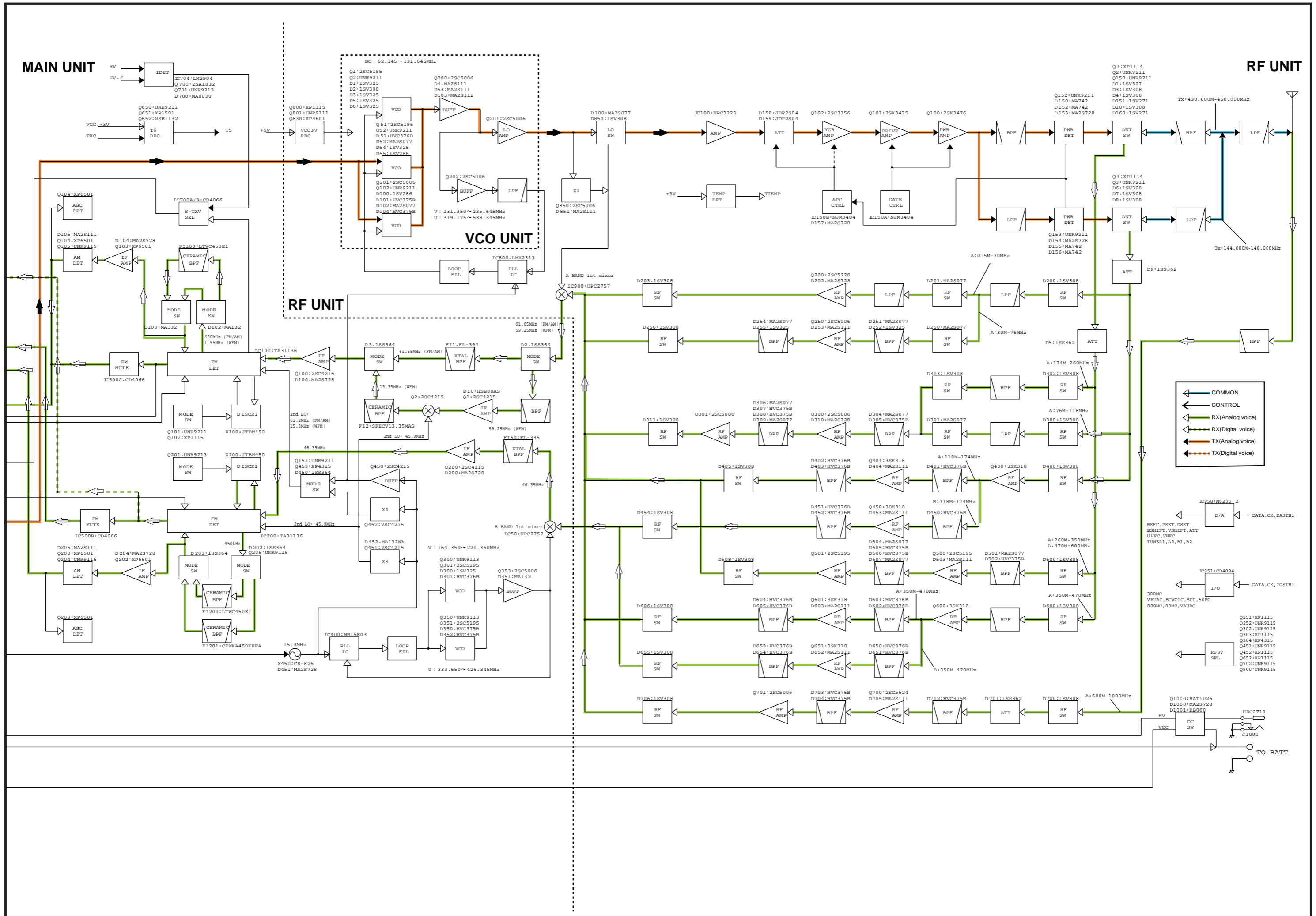
• VCO UNIT (BOTTOM VIEW)



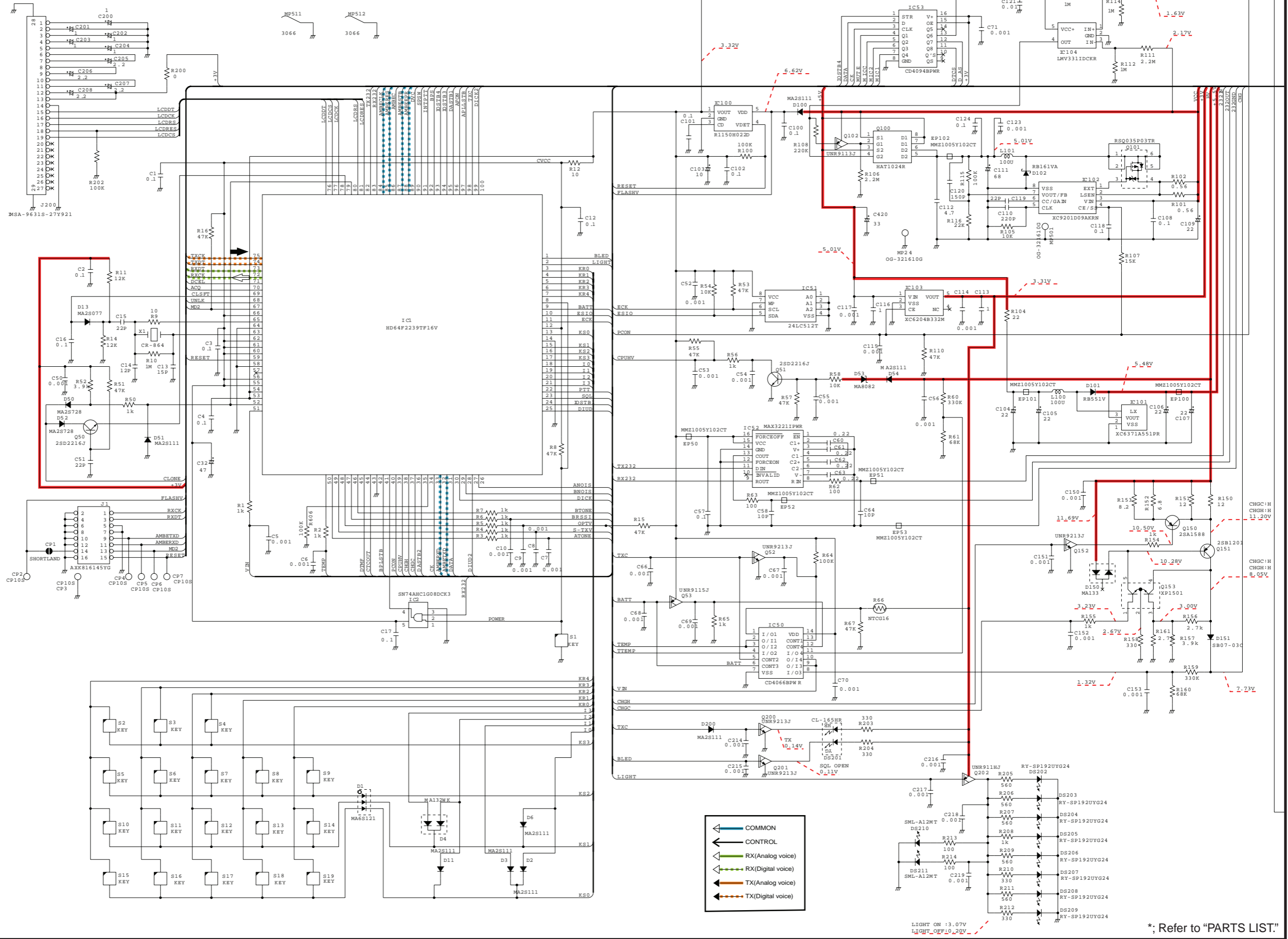
SECTION 9

BLOCK DIAGRAM

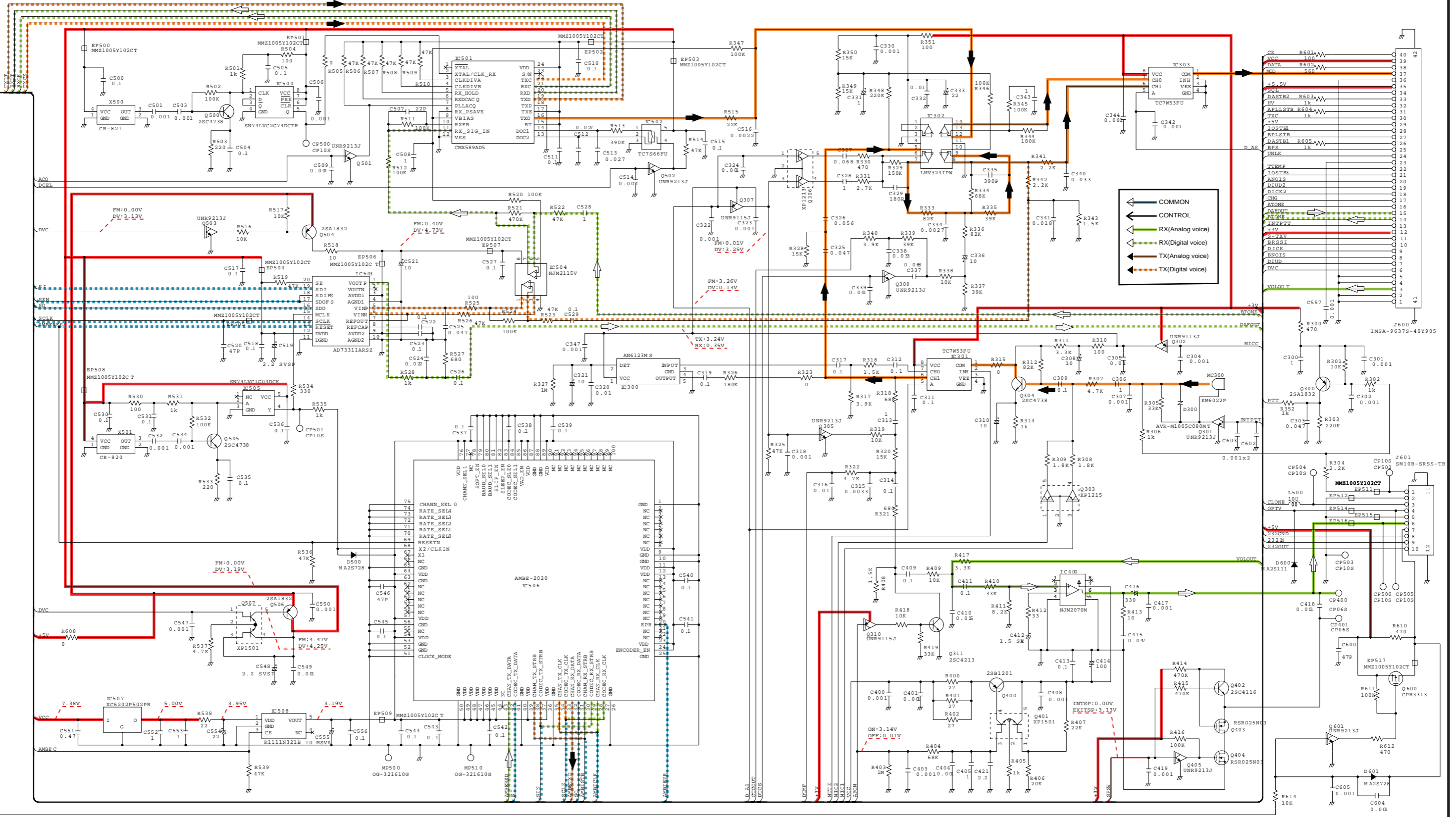




LOGIC UNIT

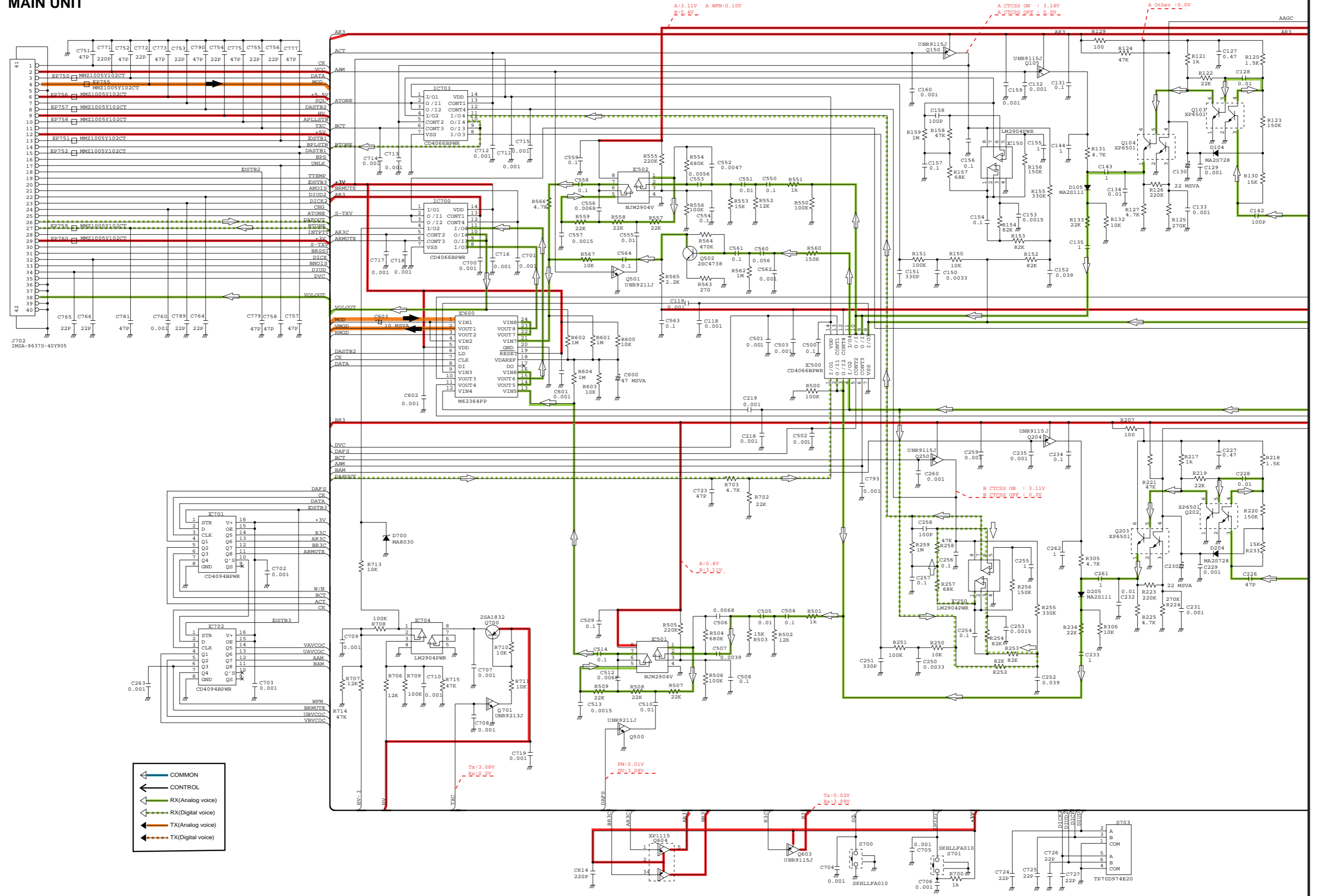


LOGIC UNIT



*; Refer to "PARTS LIST"

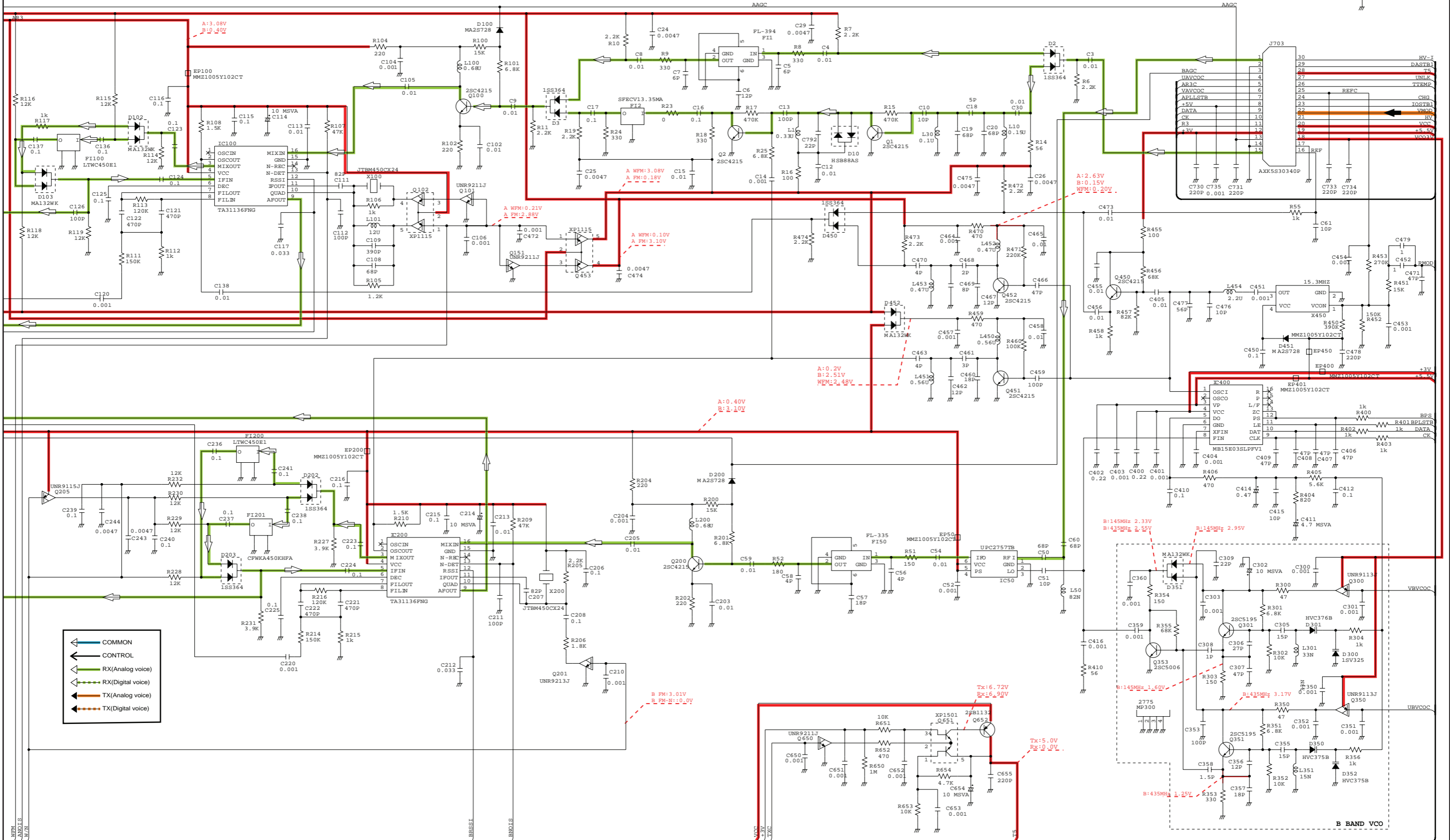
MAIN UNIT



*; Refer to "PARTS LIST."

MAIN UNIT

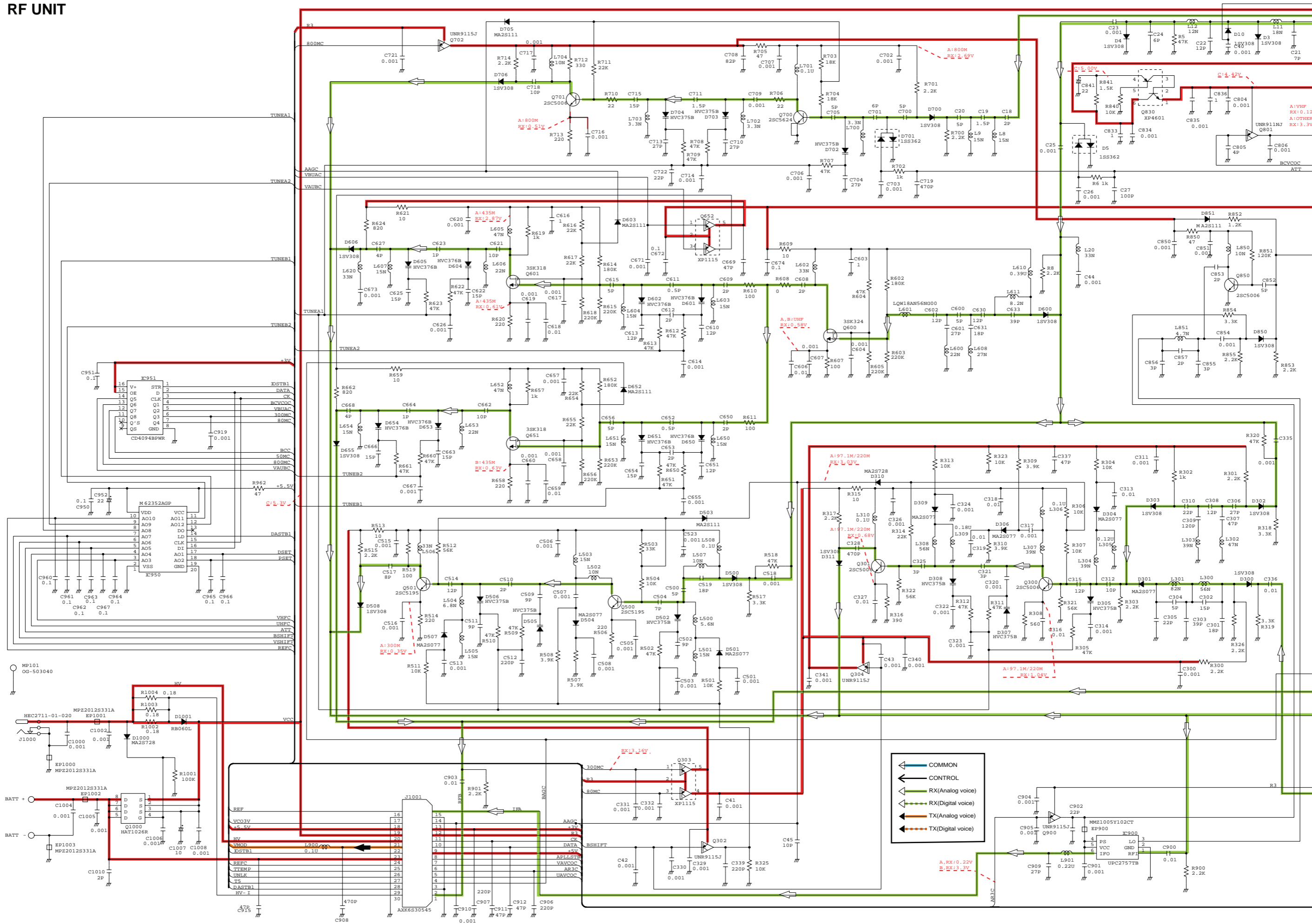
MP302
OG-321610G



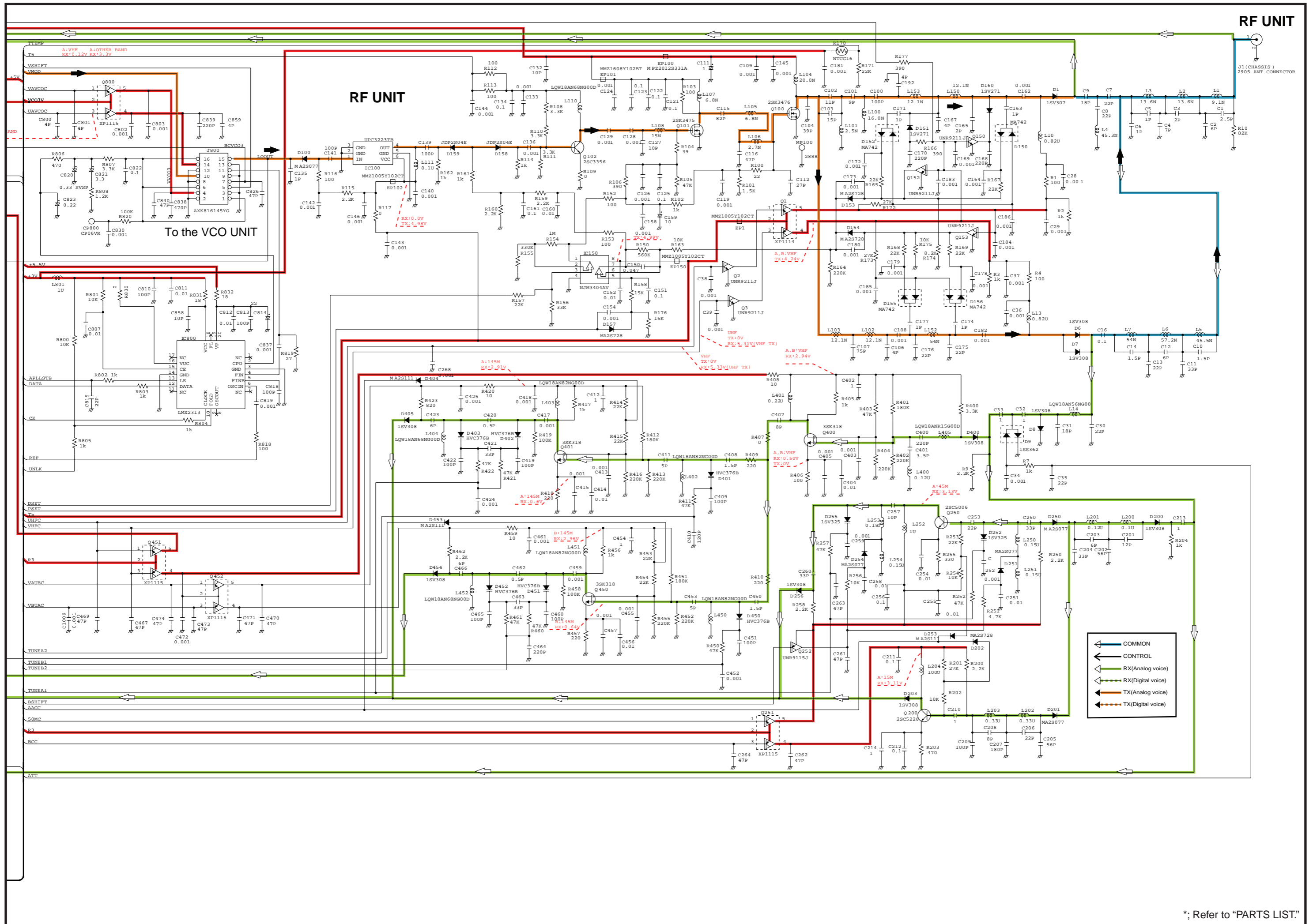
- ← COMMON
- ← CONTROL
- ← RX(Analog voice)
- ← RX(Digital voice)
- ← TX(Analog voice)
- ← TX(Digital voice)

*; Refer to "PARTS LIST"

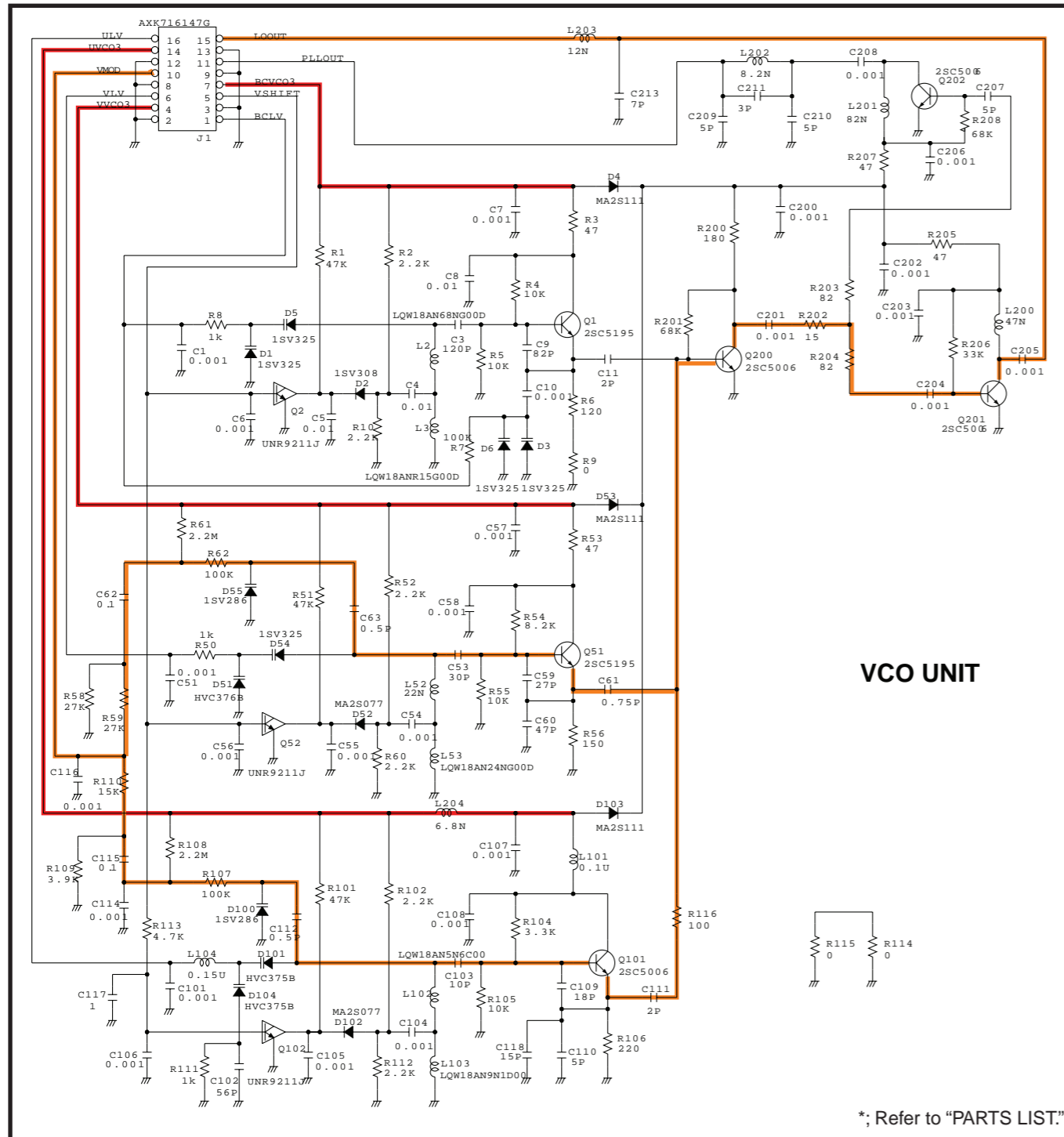
RF UNIT



*; Refer to "PARTS LIST"



*; Refer to "PARTS LIST"



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