ICOM®

SERVICE MANUAL

VHF TRANSCEIVER

IC-F50
IC-F51

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-F50/IC-F51** VHF TRANSCEIVERS at the time of publication.

MODEL	VERSION	SYMBOL	I/S	TX Hi-POWER
IC-F50	U.S.A	USA	NO	5 W
		USA-88	FM	
IC-F51	Europe	EUR	NO	5 W
		EUR-88	ATEX	1 W

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

DANGER

NEVER connect the transceiver to an AC outlet or to a DC power supply that uses more than 8 V. Such a connection could cause a fire or electric hazard.

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

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

ORDERING PARTS

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

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

<**SAMPLE ORDER**>

5030002630 LCD	L3-0048TAY-2	IC-F50	Front unit	5 pieces
8810010120 Screw	BO 2x8 SUS ZK	IC-F50	Chassis	10 pieces

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

REPAIR NOTES

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

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SECTION 1 SPECIFICATIONS

■ GENERAL

- Frequency coverage : 136.000–174.000 MHz
- Type of emission :

VERSION	WIDE	MIDDLE	NARROW
[USA], [GEN]	16K0F3E (25.0 kHz)		11K0F3E (12.5 kHz)
[EUR]		14K0F3E (20.0 kHz)	8K50F3E (12.5 kHz)

- Number of conventional channels : 128 ch (Divided into 8 banks)
- Antenna connector : SMA type (50 Ω)
- Operating temperature range : –30˚C to +60˚C (–22˚F to +140˚F) [USA], [GEN]
  –25˚C to +55˚C [EUR]
- Power supply requirement : 7.2 V DC nominal (negative ground)
- Current drain (at 7.2 V DC) :

RECEIVING		TRANSMITTING	
Stand-by	Max. audio	at 5 W	at 1 W
85 mA	300 mA	1.8 A	0.7 A

- Dimensions (projections not included) : 56.0(W)×97.0(H)×36.4(D) mm
  $2\frac{7}{32}$(W) × $3\frac{13}{16}$(H) × $1\frac{7}{16}$(D) in
- Weight (Including BP-227) : Approximately 280 g (9.88 oz)

■ TRANSMITTER

- Output power (at 7.2 V DC) : High: 5 W, Low: 1 W (1 W only for [EUR-88])
- Modulation : Variable reactance frequency modulation
- Maximum permissible deviation : ±5.0 kHz (Wide), ±4.0 kHz (Middle), ±2.5 kHz (Narrow)
- Frequency error : ±2.5 ppm
- Spurious emissions : 70 dB (typical) [USA], [GEN]
  0.25 µW (≤ 1 GHz), 1.0 µW (> 1 GHz) [EUR]
- Adjacent channel power : 70 dB min. (Wide, Middle), 60 dB min. (Narrow)
- Audio harmonic distortion : 3% typical (AF 1 kHz, 40% deviation)
- Hum and Noise ([USA], [GEN] only) (without CCITT filter) : 40 dB min (46 dB typical) for Wide
  34 dB min (40 dB typical) for Narrow
- Residual modulation ([EUR] only) (with CCITT filter) : 45 dB min (55 dB typical) for Wide
  43 dB min (53 dB typical) for Middle
  40 dB min (50 dB typical) for Narrow
- Limiting charact of modulator : 60–100% of maximum deviation
- Microphone impedance : 2.2 kΩ

■ RECEIVER

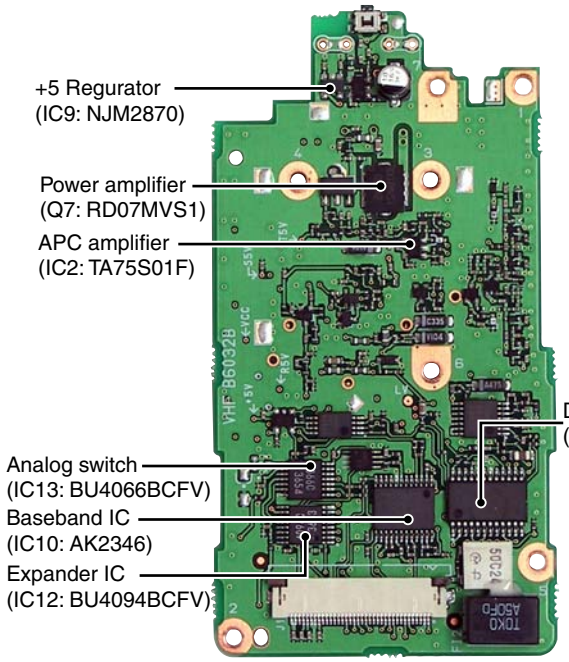
- Receive system : Double conversion superheterodyne system
- Intermediate frequencies : 1st IF: 46.35 MHz, 2nd IF: 450 kHz
- Sensitivity : 0.25 µV (–119 dBm) typical at 12 dB SINAD [USA], [GEN]
  0.63 µV (–111 dBm) emf typical at 20 dB SINAD [EUR]
- Squelch sensitivity (at threshold) : 0.25 µV typical [USA], [GEN]
  0.63 µV (–111 dBm) emf typical [EUR]
- Output impedance (Audio) : 8 Ω
- Adjacent channel selectivity : 70 dB min (75 dB typical) for Wide and Middle
  60 dB min (65 dB typical) for Narrow
- Spurious response : 70 dB
- Intermodulation rejection ratio : 70 dB min (74 dB typical) [USA], [GEN]
  65 dB min (67 dB typical) [EUR]
- Hum and Noise ([USA], [GEN] only) (without CCITT filter) : 40 dB min (45 dB typical) for Wide
  34 dB min (40 dB typical) for Narrow
- Residual modulation ([EUR] only) (with CCITT filter) : 45 dB min (55 dB typical) for Wide
  43 dB min (53 dB typical) for Middle
  40 dB min (50 dB typical) for Narrow
- Audio output power (at 7.2 V DC) : 0.5 W typical at 5% distortion with an 8 Ω load

Specifications are measured in accordance with EIA-152-C/204D, TIA-603 or EN 300 086.
All stated specifications are subject to change without notice or obligation.

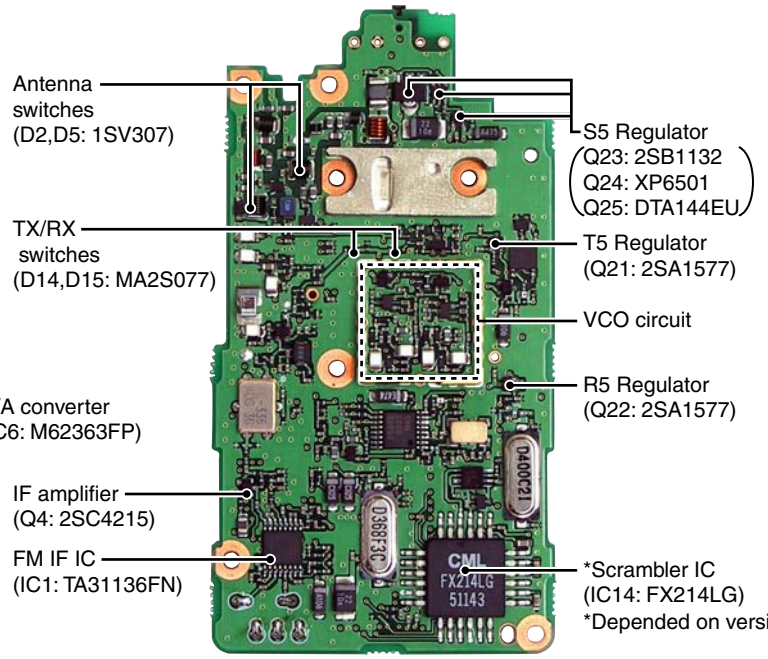
SECTION 2 INSIDE VIEWS

● MAIN UNIT

TOP VIEW

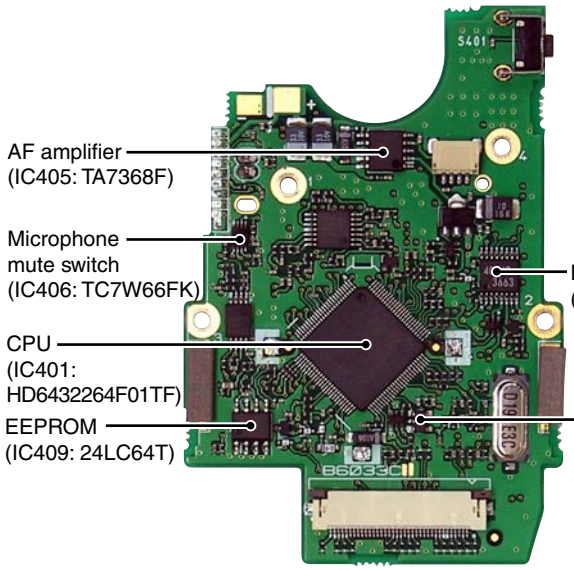


BOTTOM VIEW

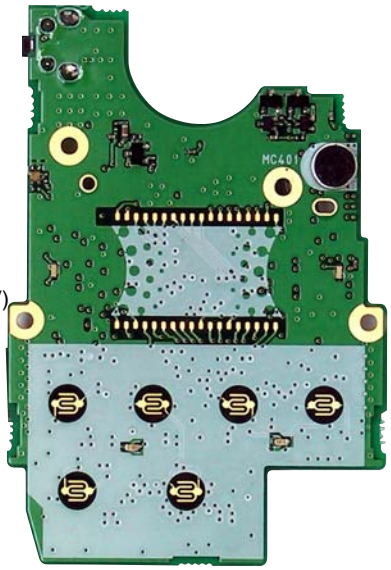


● FRONT UNIT

TOP VIEW



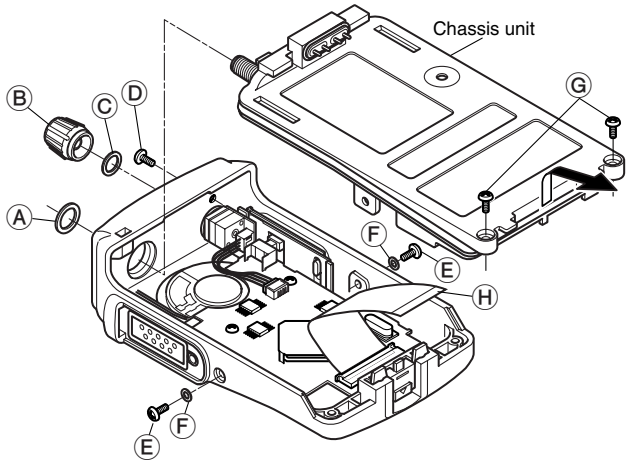
BOTTOM VIEW



SECTION 3 DISASSEMBLY INSTRUCTIONS

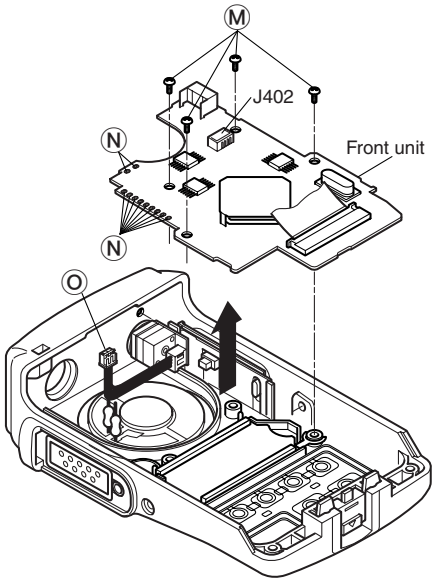
● REMOVING THE CHASSIS UNIT

① Unscrew 1 nut Ⓐ, and remove 1 knob Ⓑ.
② Remove 1 washer Ⓒ, and unscrew 1 screw Ⓓ.
③ Unscrew 2 screws Ⓔ, and remove 2 washers Ⓕ.
④ Unscrew 2 screws Ⓖ.
⑤ Take off the chassis unit in the direction of the arrow.
⑥ Remove the cable Ⓗ from the chassis unit.



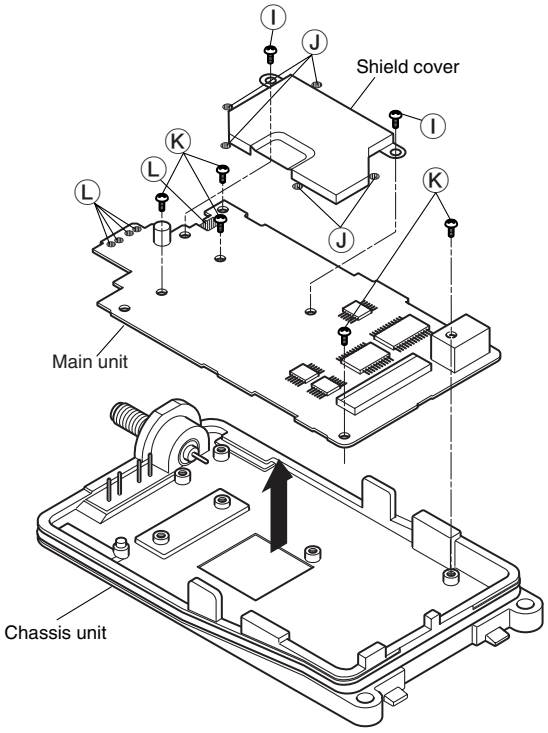
● REMOVING THE FRONT UNIT

① Unscrew 4 screws Ⓜ.
② Unsolder 11 points Ⓝ.
③ Unplug the connector Ⓞ from J402 on the Front unit.
④ Take off the front unit in the direction of the arrow.



● REMOVING THE MAIN UNIT

① Unscrew 2 screws Ⓘ.
② Unsolder 5 points Ⓙ, and remove the shield cover.
③ Unscrew 5 screws Ⓚ.
④ Unsolder 5 points Ⓛ, and take off the main unit in the direction of the arrow.



SECTION 4 CIRCUIT DESCRIPTION

4-1 RECEIVER CIRCUITS

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

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

Received signals enter the antenna connector (CHASSIS; J1) and pass through the low-pass filter (L1, L2, C1–C5). The filtered signals are passed through the λ/4 type antenna switching circuit (D5, D6, L5, L6) and then applied to the RF circuit.

4-1-2 RF CIRCUIT (MAIN UNIT)

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

The signals from the antenna switching circuit pass through the two-stage tunable bandpass filters (D4, D8, L7, L8). The filtered signals are amplified at the RF amplifier (Q2) and then passed through the another two-stage tunable bandpass filters (D9, D10, L9, L11) to suppress unwanted signals. The filtered signals are applied to the 1st mixer circuit.

D4, D8–D10 employ varactor diodes, that are controlled by the CPU via the D/A converter (IC6), to track the bandpass filter. These varactor diodes tune the center frequency of an RF pass band for wide bandwidth receiving and good image response rejection.

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

The 1st mixer circuit converts the received signal into fixed frequency of the 1st IF signal with the PLL output frequency. By changing the PLL frequency, only the desired frequency passes through a crystal filter at the next stage of the 1st mixer.

The RF signals from the bandpass filter are mixed with the 1st LO signals, where come from the RX VCO circuit via the attenuator (R26–R28), at the 1st mixer circuit (Q3) to produce a 46.35 MHz 1st IF signal. The 1st IF signal is passed through a monolithic filter (FI1) in order to obtain selection capability and to pass only the desired signals. The filtered signal is applied to the 2nd IF circuit after being amplified at the 1st IF amplifier (Q4).

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

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

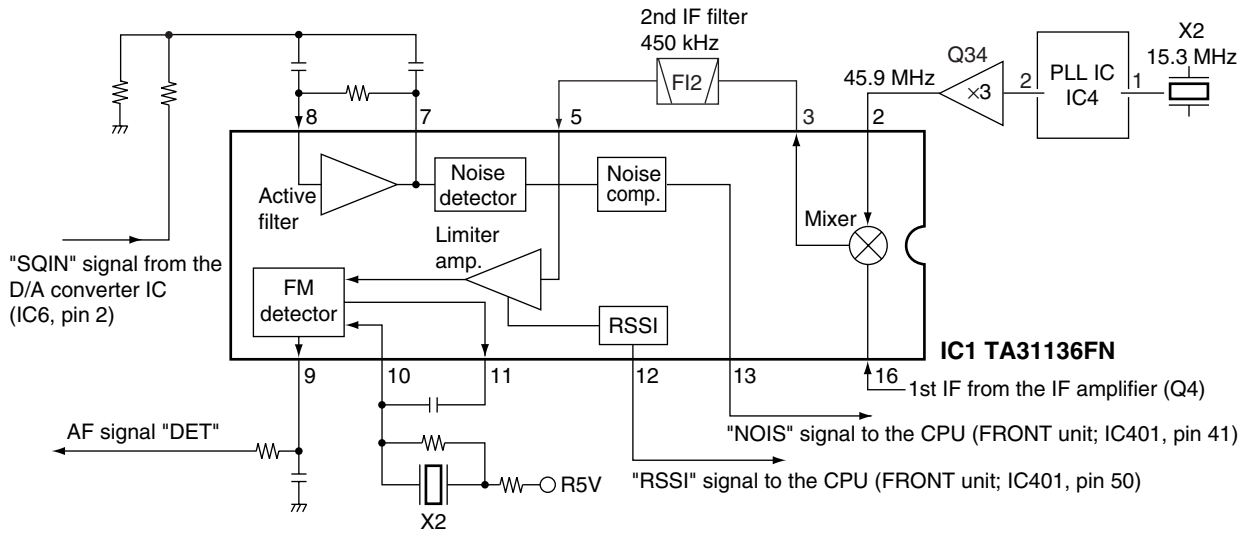
The 1st IF signal from the IF amplifier (Q4) is applied to the 2nd mixer section of the FM IF IC (IC1, pin 16), and is mixed with the 2nd LO signal to be converted into a 450 kHz 2nd IF signal.

The FM IF IC (IC1) contains the 2nd mixer, 2nd local oscillator, limiter amplifier, quadrature detector, active filter and noise amplifier circuits. A 2nd LO signal (45.9 MHz) is produced at the PLL circuit by tripling it's reference frequency (15.3 MHz).

The 2nd IF signal from the 2nd mixer (IC1, pin 3) passes through the ceramic filter (FI2) to remove unwanted heterodyned frequencies. It is then amplified at the limiter amplifier section (IC1, pin 5) and applied to the quadrature detector section (IC1, pins 10, 11) to demodulate the 2nd IF signal into AF signals.

The demodulated AF signals are output from pin 9 (IC1) and applied to the AF circuit via the receiver mute circuit.

• 2ND IF AND DEMODULATOR CIRCUITS



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

The AF amplifier circuit amplifies the demodulated AF signals to drive a speaker. This transceiver employs the base band IC which is composed of pre-amplifier, expander, scrambler, MSK de-modulator, etc. at the AF amplifier section.

The AF signals from the FM IF IC (IC1, pin 9) are amplified at the AF amplifier section of the base band IC (IC10, pin 5) and are then applied to the low-pass filter section of it.

The filtered signals passes through the high-pass filter to suppress unwanted harmonic components. The signals pass through (or bypass) scrambler and expander sections, and are then applied to (or bypass) the scrambler IC (IC14) via the analog switch (IC13). The signals are amplified at the amplifier section of the base band IC (IC10), and pass through the AF mute switch (IC406) and low-pass filter (IC403). The filtered signals pass through the AF volume, and are then applied to the AF power amplifier (IC405) to drive the speaker.

4-1-6 RECEIVE MUTE CIRCUITS (MAIN AND FRONT UNITS)

• NOISE SQUELCH

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

Some noise components in the AF signals from the FM IF IC (IC1, pin 9) are passed through the D/A converter (IC6, pin 1). The signals are applied to the active filter section in the FM IF IC (IC1, pin 8). Noise components about 10 kHz are amplified and output from pin 7.

The filtered signals are converted into the pulse-type signals at the noise detector section and output from pin 13 (NOIS).

The “NOIS” signal from the FM IF IC is applied to the CPU (FRONT unit; IC401, pin 41). Then the CPU analyzes the noise condition and controls the AF mute signal via “AFON” line from expander IC (FRONT unit; IC410, pin 7) to the AF power controller (FRONT unit; Q401, Q402).

• CTCSS AND DTCS

The tone squelch circuit detects AF signals and opens the squelch only when receiving a signal containing a matching subaudible tone (CTCSS or DTCS). When tone squelch is in use, and a signal with a mismatched or no subaudible tone is received, the tone squelch circuit mutes the AF signals even when noise squelch is open.

A portion of the “DET” AF signals from the FM IF IC (IC1, pin 9) passes through the low-pass filter (IC5, pin 5) to remove AF (voice) signals, and are then applied to the amplifier (MAIN unit; IC5, pin 10). The amplified signals are applied to the CTCSS or DTCS decoder inside of the CPU (FRONT; IC401, pin 44) via the “CDEC” line. The CPU outputs AF mute control signal, and is then applied to the I/O expander IC (IC410). The IC outputs AF mute circuit (IC406) and AF power supply circuits (Q401, Q402) control signals via the “AFON” line.

4-2 TRANSMITTER CIRCUITS

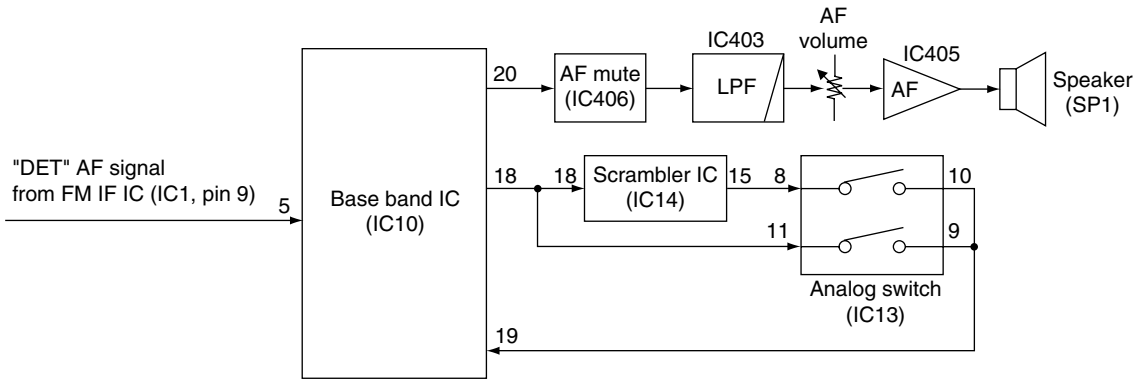
4-2-1 MICROPHONE AMPLIFIER CIRCUIT (FRONT AND MAIN UNITS)

The microphone amplifier circuit amplifies audio signals within +6 dB/octave pre-emphasis characteristics from the microphone to a level needed for the modulation circuit.
This transceiver employs the base band IC which is composed of microphone amplifier, compressor, scrambler, limiter, splatter filter, MSK modulator, etc. at the microphone amplifier section.

The AF signals (MIC) from the microphone (MC401) are passed through the microphone mute switch (IC406, pins 2, 1), and are then applied to the amplifier (IC407, pins 2, 6). The amplified signals pass through (or bypass) the scrambler IC (IC14) via the analog switch (IC13), and are then applied to the microphone amplifier section of the base band IC (MAIN unit; IC10, pins 3, 4). The amplified signals are passed through or bypass the compressor, scrambler sections of IC10 (MAIN unit), and are then passed through the high-pass, limiter amplifier, splatter filter sections of IC10 (MAIN unit).

The filtered AF signals are applied to the FM/PM switch (MAIN unit; IC11, pin 6), and pass through the low-pass filter (MAIN unit; IC5, pin 1). The amplified signals are applied to the D/A converter (MAIN unit; IC6, pin 4)
The output signals from the D/A converter (MAIN unit; IC6, pin 3) are applied to the modulation circuit (MAIN unit; D18).

• AF AMPLIFIER AND MICROPHONE AMPLIFIER CIRCUITS



4-2-2 MODULATION CIRCUIT (MAIN UNIT)

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

The AF signals from the D/A converter (IC6, pin 3) change the reactance of varactor diode (D18) to modulate the oscillated signal at the TX VCO circuit (Q13, D16, D17). The modulated VCO signal is amplified at the buffer amplifiers (Q10, Q12) and is then applied to the drive amplifier circuit via the T/R switch (D14).

The CTCSS/DTCS signals ("CENC0", "CENC1", "CENC2" from the CPU (FRONT unit; IC401, pins 79–81) pass through the low-pass filter (IC403, pins 1, 3), and are then applied to the D/A converter via the "CDCS" line (IC6, pin 9). The output signal from the D/A converter (IC6, pin 10) passes through the low-pass filter (IC5, pins 1, 2). The CTCSS/DTCS signals are mixed with "MOD" signal at the low-pass filter (IC5), and are then applied to the D/A converter again (IC6, pin 4).

4-2-3 DRIVE/POWER AMPLIFIER CIRCUITS

The drive/power amplifier circuits amplify the VCO oscillating signal to an output power level.

The signal from the VCO circuit passes through the T/R switch (D14), and is amplified at the pre-drive (Q9), drive (Q8), power (Q7) amplifiers to obtain 5 W of RF power (at 7.2 V DC).

The amplified signal is passed through the power detector (D1), antenna switching circuit (D2) and low-pass filter (L1, L2, C1–C5), and is then applied to the antenna connector (CHASSIS unit; J1).

The bias current of the pre-drive (Q9), drive (Q8) and power (Q7) amplifiers are controlled by the APC circuit.

4-2-4 APC CIRCUIT (MAIN UNIT)

The APC circuit (IC2, D1) protects the drive and power amplifiers from excessive current drive, and selects output power of HIGH, LOW2 or LOW1.

The power detector circuit (D1) detects the transmit power output level and converts it into DC voltage. The output voltage is at a minimum level when the antenna impedance is matched at 50 Ω and is increased when it is mismatched.

The detected voltage is applied to the differential amplifier (IC2, pin 3), and the "T2" signal from the D/A converter (IC6, pin 14), controlled by the CPU (FRONT unit; IC401), is applied to the other input for reference. When antenna impedance is mismatched, the detected voltage exceeds the power setting voltage. Then the output voltage of the differential amplifier (IC2, pin 4) controls the input current of the pre-drive (Q9), drive (Q8) and power (Q7) amplifiers to reduce the output power.

4-3 PLL CIRCUITS

4-3-1 PLL CIRCUIT (MAIN UNIT)

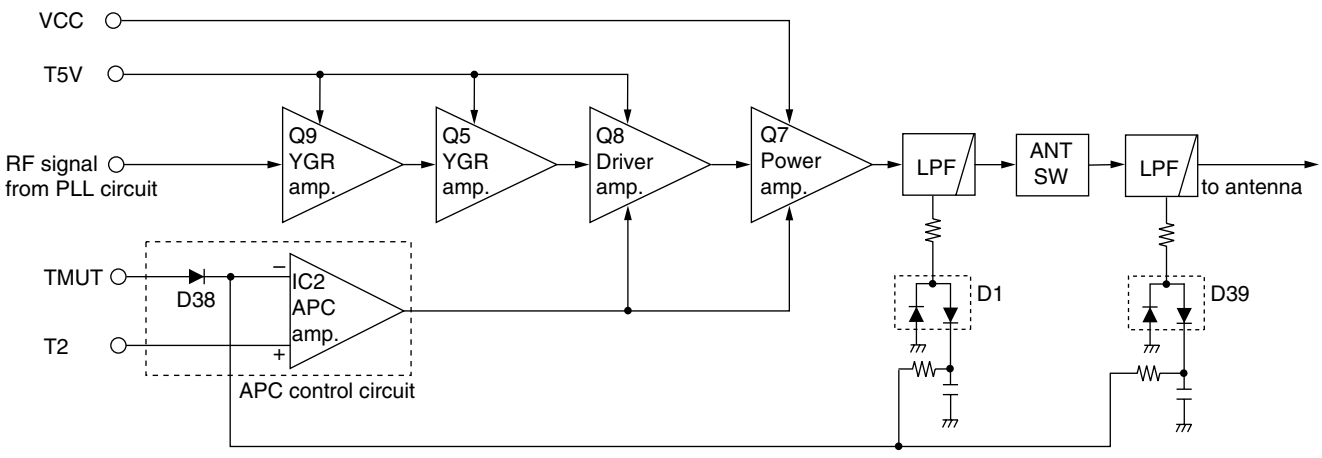
A PLL circuit provides stable oscillation of the transmit frequency and receive 1st LO frequency. The PLL output compares the phase of the divided VCO frequency to the reference frequency. The PLL output frequency is controlled by the divided ratio (N-data) of a programmable divider.

The PLL circuit contains the TX/RX VCO circuits (Q13, Q14, D16, D17, D19, D20). The oscillated signal is amplified at the buffer amplifiers (Q11, Q12) and then applied to the PLL IC (IC4, pin 8) after being passed through the low-pass filter (L32, C206–C208).

The PLL IC contains a prescaler, programmable counter, programmable divider and phase detector, etc. The entered signal is divided at the prescaler and programmable counter section by the N-data ratio from the CPU. The divided signal is detected on phase at the phase detector using the reference frequency.

If the oscillated signal drifts, its phase changes from that of the reference frequency, causing a lock voltage change to compensate for the drift in the oscillated frequency.

• APC CIRCUIT



4-3-2 VCO CIRCUIT (MAIN UNIT)

The VCO circuit contains a separate RX VCO (Q14, D19, D20) and TX VCO (Q13, D16, D17). The oscillated signal is amplified at the buffer amplifiers (Q10, Q12) and is then applied to the T/R switch (D14, D15). Then the receive 1st LO (Rx) signal is applied to the 1st mixer (Q3) and the transmit (Tx) signal to the pre-drive amplifier circuit (Q9).

A portion of the signal from the buffer amplifier (Q12) is fed back to the PLL IC (IC4, pin 8) via the buffer amplifier (Q11) as the comparison signal.

4-4 POWER SUPPLY CIRCUIT

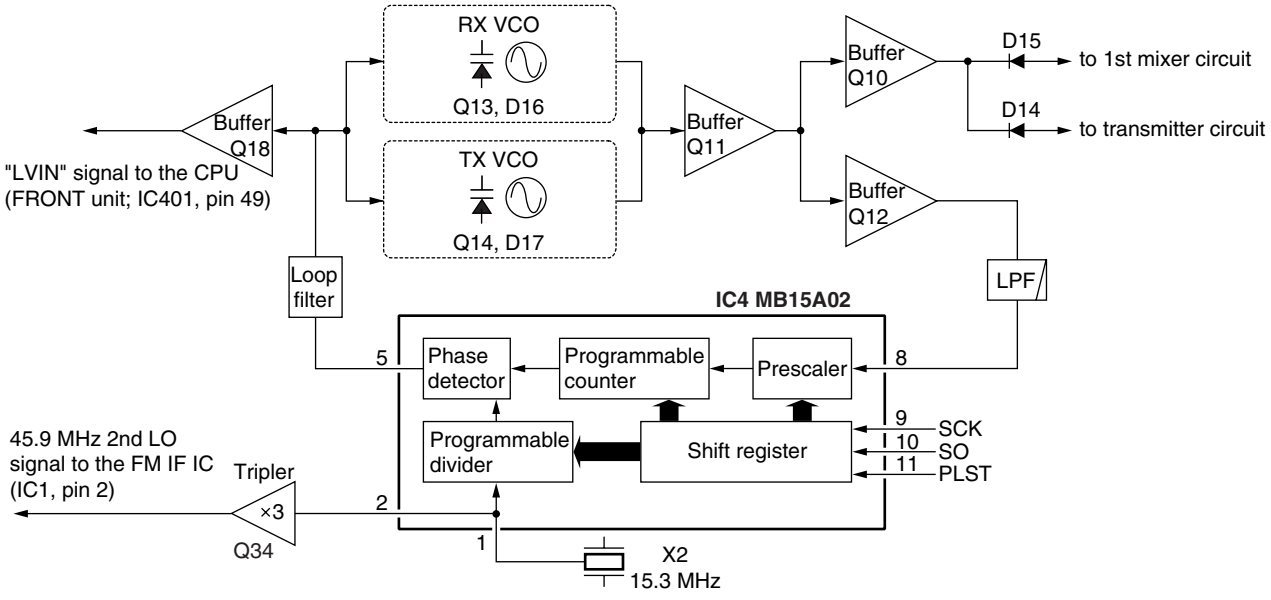
4-4-1 MAIN UNIT VOLTAGE LINE

LINE	DESCRIPTION
VCC	The voltage from the connected battery pack.
+5V	Common 5 V converted from the VCC line at the +5 regulator circuit (IC9). The output voltage is supplied to the fast switch (IC17), buffer amplifiers (IC16, IC18) and so on.
S5V	Common 5 V converted from the VCC line at the S5 regulator circuit (Q23–Q25). The output voltage is supplied to the ripple filter (Q17), PLL IC (IC4), FRONT unit, etc.
R5V	Receive 5 V converted from the S5V line at the R5 regulator circuit (Q22). The output voltage is supplied to the tripler (Q19), FM IF IC (IC1), IF amplifier (Q4), VCO switch (Q15, Q16), 1st mixer (Q3), etc.
T5V	Transmit 5 V converted from the S5V line at the T5 regulator circuit (Q21). The output voltage is supplied to the pre-drive (Q9), APC amplifier (IC2).

4-4-2 FRONT UNIT VOLTAGE LINE

LINE	DESCRIPTION
VCC	Same voltage as VCC line on the MAIN unit is applied to the FRONT unit via the J401, pins 1, 2 (FRONT unit). The voltage is supplied to the [PWR] switch controller (Q401, Q402).
CPU5	Same voltage as +5V line on the MAIN unit is applied to the FRONT unit via the J401, pin 4 (FRONT unit). The voltage is supplied to the CPU (IC401), reset IC (IC408), etc.
S5V	Same voltage as S5V line on the MAIN unit is applied to the FRONT unit via the J401, pin 5 (FRONT unit). The voltage is supplied to the mic mute circuit (IC406), etc.

• PLL CIRCUIT



4-5 OTHER CIRCUITS

4-5-1 COMPOUNDER CIRCUIT (MAIN UNIT)

IC-F50/F51 have compounder circuit which can improve S/N ratio and become wide dynamic range to suppress the transmitting signal and to extend receiving signal. The circuit is composed of the base band IC (MAIN unit; IC10).

(1) IN CASE OF TRANSMITTING

The audio signals from the microphone are applied to the base band IC (IC10, pin 3) via microphone mute circuit (FRONT unit; IC406), microphone amplifier (IC407), etc. The signals are amplified at the amplifier section, and are then applied to the compressor circuit to compress the audio signals. The signals pass through (or bypass) scrambler section, and are then amplified at limiter amplifier section after being passed through the high-pass filter. The amplified signals pass through the low-pass filter section, and are then applied to the modulation circuit (Q13, D16–D18) via the FM/PM switch (IC11), low-pass filter (IC5) and D/A converter (IC6).

(2) IN CASE OF RECEIVING

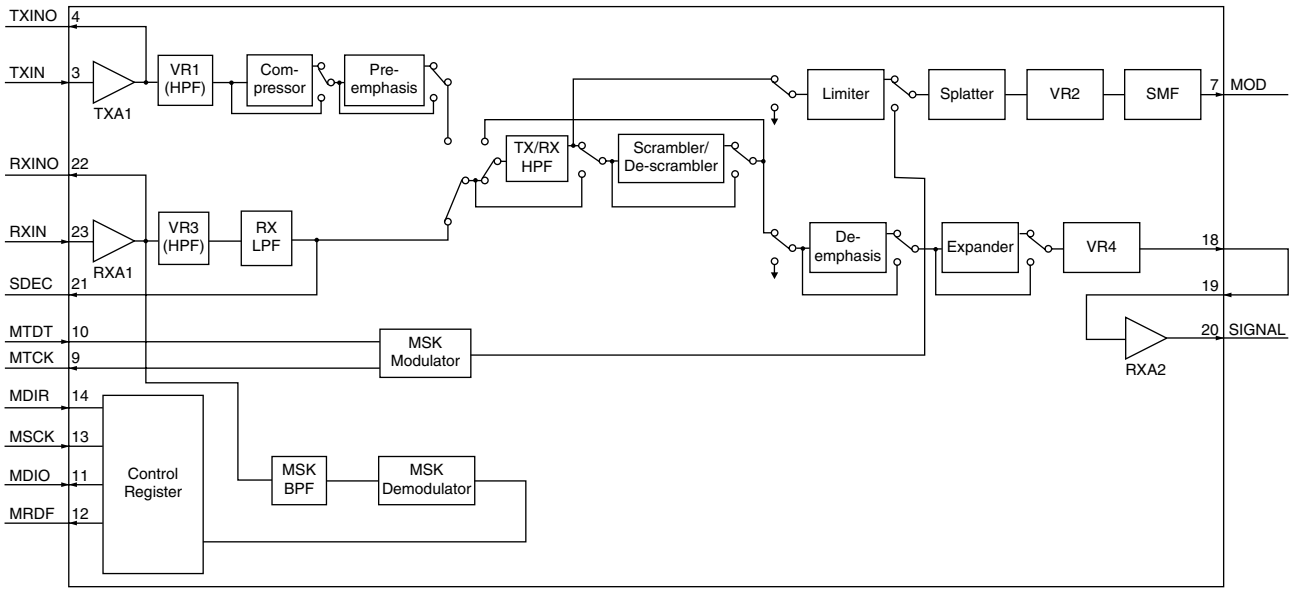
The demodulated AF signals from the IF IC are applied to the amplifier section of base band IC (IC10, pin 23), and then pass through the low-pass and high-pass filter section to suppress unwanted signals. The filtered signals pass through (or bypass) scrambler section, and are then applied to the expander circuit to expand AF signals. The signals pass through (or bypass) scrambler IC (IC14), and are then applied to the analog switch (IC13, pins 8, 11). The signals are applied to the base band IC's amplifier section (IC10, pins 19, 20), and are then applied to the AF amplifier circuit.

4-6 PORT ALLOCATIONS

4-6-1 EXPANDER IC (FRONT UNIT; IC410)

Pin number	Port name	Description
4	LEDR	Outputs RX LED control signal. Low: Lights ON.
5	LEDT	Outputs TX LED control signal. Low: Lights ON.
6	LIGT	Outputs back light LED control signal. Low: Back light is ON.
7	AFON	Outputs audio control signal. Low: Outputs audio signals from speaker.
11	DUSE	• Outputs CTCSS/DTCS switching signal when transmitting. High: Selected DTCS. • Outputs Min. VR switching signal when receiving. Low: Select Min VR. **NOTE:** Audio signals are prior to transmitting.
12	MCON	Outputs microphone select signal. High: While the internal microphone is used.
13	CSFT	Outputs shift signal for reference oscillator's frequency.
14	SPON	Outputs the internal speaker control signal. High: The internal speaker is selected.

• BASE BAND IC BLOCK DIAGRAM



4-6-2 MAIN CPU (FRONT unit; IC401)

Pin number	Port name	Description
1–11, 13, 15–25,	SEG23–SEG13, SEG12, SEG11–SEG1	Output segment data to the LCD display.
26	SO	Outputs serial data to the PLL IC (MAIN unit; IC6, pin 8) and D/A convertor (MAIN unit; IC6, pin 8).
27	SCK	Outputs serial clock signal to the PLL IC (MAIN unit; IC4, pin 9), D/A convertor (MAIN unit; IC6, pin 7), etc.
28	MDIO	I/O port for the serial data signals from/to the base band IC (MAIN unit; IC10, pin 11).
29	MSCK	Outputs clock signal to the base band IC (MAIN unit; IC10, pin 13).
30	SCST	Outputs strobe signals to the scrambler IC (MAIN unit; IC14, pin 11).
31	PLST	Outputs strobe signals to the PLL IC (MAIN unit; IC4, pin 11).
32	ESDA	I/O port for data signals from/to the EEPROM (IC409, pin 5).
33	ESCL	Outputs clock signal to the EEPROM (IC409, pin 6).
34	SCAT	• Outputs power down control signal to the scrambler IC (MAIN unit; IC14, pin 12). • Input port for the detection signal whether the scrambler unit is installed or not.
35	EXSF	Outputs strobe signals to the expander IC (IC410, pin 2).
36	EXSM	Outputs strobe signals to the expander IC (MAIN unit; IC12, pin 1).
37	EXOE	Outputs the enable signal to the expander ICs (IC410, pin 15 and MAIN unit; IC12, pin 15).
38	BEEP	Outputs beep audio signals.
39	MTDT	Outputs MSK data for transmitting to the base band IC (MAIN unit; IC10, pin 10).
40	MTCK	Input port for the transmitting MSK clock signal from the base band IC (MAIN unit; IC10, pin 9).
41	NOIS	Input port for the noise signal from the FM IF IC (MAIN unit; IC1, pin 13).
43	SDEC	Input port for single tone decode signal from the base band IC (MAIN unit; IC10, pin 21).
44	CDEC	Input port for CTCSS/DTCS signal from the amplifier (MAIN unit; IC5, pin 8).
45	PTT	Input port for the PTT switch detection signal. Low: While the PTT switch is pushed.
46 47	KR1 KR0	Input ports for the key return A/D signals.
48	BATV	Input port for the detect signal for connecting battery pack's voltage.
49	LVIN	Input port for the PLL lock voltage.
50	RSSI	Input port for the S-meter signal from the FM IF IC (MAIN unit; IC1, pin 12).
51	TEMP	Input port for the transceiver's internal temperature detecting signal.
52	OPTV	Input port for the optional microphone determine signal.
55	ULCK	Input port for the PLL unlock signal. Low: The PLL circuit is unlocked.
71	MDIR	Outputs serial data control signal to the base band IC (MAIN unit; IC10, pin 14)
72–75	SENC3–SENC0	Output single tone encoder signal.
76	CLO	Outputs the cloning data signal.
77	CLI	Input port for the cloning data signal.
78	MRDF	Input port for the receiving MSK detection signal from the base band IC (MAIN unit; IC10, pin 12)
79–81	CENC2–CENC0	Output the CTCSS/DTCS signals.
82	DAST	• Outputs strobe signals to the D/A convertor (IC6, pin 6). • Input port for the connecting battery type detect signal.
88–91	COM4–COM1	Output common signal to the LCD display.

4-6-3 EXPANDER IC (FRONT UNIT; IC410)

Pin number	Port name	Description
4	LEDR	Outputs RX LED control signal. Low: Lights ON.
5	LEDT	Outputs TX LED control signal. Low: Lights ON.
6	LIGT	Outputs back light LED control signal. Low: Back light is ON.
7	AFON	Outputs audio control signal. Low: Outputs audio signals from speaker.
11	DUSE	• Outputs CTCSS/DTCS switching signal when transmitting. High: Selected DTCS. • Outputs Min. VR switching signal when receiving. Low: Select Min VR. **NOTE:** Audio signals are prior to transmitting.
12	MCON	Outputs microphone select signal. High: While the internal microphone is used.
13	CSFT	Outputs shift signal for reference oscillator's frequency.
14	SPON	Outputs the internal speaker control signal. High: The internal speaker is selected.

4-6-4 D/A CONVERTER IC (MAIN UNIT; IC6)

Pin number	Port name	Description
11	BAL	Outputs the modulation balance level control signal. The signal is applied to the buffer amplifier (IC16, pin 2).
14	T2	• Outputs the bandpass filter tuning signal. The output signal is applied to the bandpass filters (D9, D10). • Outputs the TX power control signal. The output signal is applied to the APC amplifier (IC2, pin 1).
15	T1	Outputs the bandpass filter tuning signal. The output signal is applied to the bandpass filters (D4, D8).
22	LVA	Outputs the PLL lock voltage control signal. The output signal is applied to the buffer amplifier (IC16, pin 5).
23	REF	Outputs the reference oscillator correcting voltage. The voltage is applied to the buffer amplifier (IC16, pin 3).

4-6-5 EXPANDER IC (MAIN UNIT; IC12)

Pin number	Port name	Description
4	R5C	Outputs the R5 regulator (Q22) control signal. Low: While receiving.
5	T5C	Outputs the T5 regulator (Q21) control signal. Low: While transmitting.
6	LIGT	Outputs the S5 regulator (Q23–Q25) control signal. Low: While the S5 regulator outputs 5 V voltage.
7	AFON	Outputs audio control signal. Low: Outputs audio signals from speaker.
11	MUT2	Outputs the analog switch (IC13, pins 5, 6) control signal to control the scrambler unit. High: While the scrambler function is ON. Low: While the microphone mute or AF mute is ON.
12	MUT1	Outputs the analog switch (IC13, pins 12, 13) control signal to control the scrambler unit. High: While the scrambler function is ON. Low: While the microphone mute or AF mute is ON.
13	PMFM	Outputs the FM/PM modulation switching signal to the FM/PM switch (IC11, pin 5). High: PM is selected.
14	TMUT	Outputs the transmitting mute switch control signal to the mute switch (D25). High: While muting.

SECTION 5 ADJUSTMENT PROCEDURES

5-1 PREPARATION

When adjusting IC-F50/F51, the optional CS-F50 ADJ ADJUSTMENT SOFTWARE (Rev. 1.0 or later), *OPC-966 JIG CABLE (modified OPC-966 CLONING CABLE) are required.

■ REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 7.2 V DC Current capacity : 3 A or more	Audio generator	Frequency range : 300–3000 Hz Output level : 1–500 mV
FM deviation meter	Frequency range : DC–300 MHz Measuring range : 0 to ±10 kHz	Attenuator	Power attenuation : 40 or 50 dB Capacity : 10 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 : 100–300 MHz Output level : 0.1 µV to 32 mV (–127 to –17 dBm)
Digital multimeter	Input impedance : 10 MΩ/V DC or more	DC voltmeter	Input impedance : 50 kΩ/V DC or more
RF power meter (terminated type)	Measuring range : 1–10 W Frequency range : 100–300 MHz Impedance : 50 Ω SWR : Less than 1.2 : 1	Oscilloscope	Frequency range : DC–20 MHz Measuring range : 0.01–20 V
		AC millivoltmeter	Measuring range : 10 mV to 10 V

■ SYSTEM REQUIREMENTS

- Microsoft® Windows® 95/98/ME
- RS-232C Serial port (DB9)

■ ADJUSTMENT SOFTWARE INSTALLATION

① Boot up Windows.
 - Quit all applications when Windows is running.
② Insert the cloning software CD-ROM into the appropriate CD-ROM drive.
③ Select 'Run' from the [Start] menu.
④ Type the setup program name using the full path name, then push [Enter] key.
 (For example; D:\Setup.exe)
⑤ Follow the prompts.
⑥ Program group 'CS-F50 ADJ' appears in the 'Programs' folder of the [Start] menu.

■ BEFORE STARTING SOFTWARE ADJUSTMENT

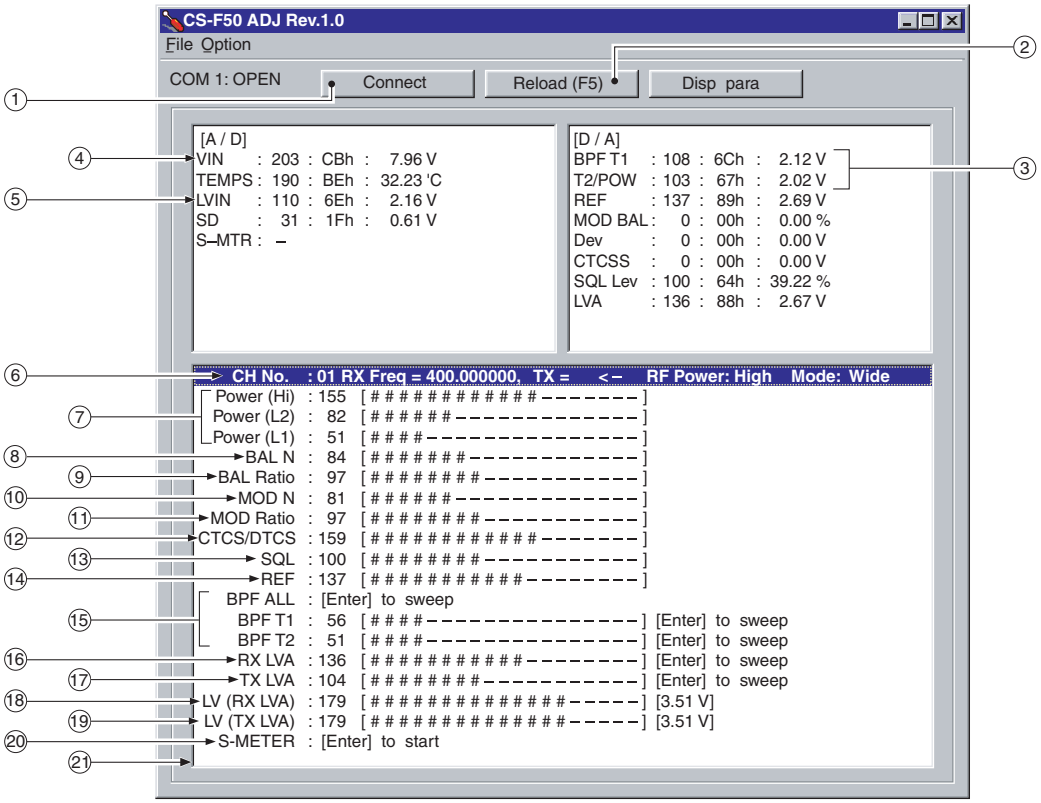
Clone the adjustment frequencies, listed in page 5-2, into the transceiver using with the CS-F50 before starting the software adjustment. Otherwise, the transceiver can not start software adjustment.

CAUTION!: BACK UP the originally programed memory data in the transceiver before progaming the adjustment frequencies.
When program the adjustment frequencies into the transceiver, the transceiver's memory data will be overwritten and lose original memory data at the same time.

■ STARTING SOFTWARE ADJUSTMENT

① Connect IC-F50/F51 and PC with *OPC-966 JIG CABLE.
② Turn the transceiver power ON.
③ Boot up Windows, and click the program group 'CS-F50 ADJ' in the 'Programs' folder of the [Start] menu, then CS-F50 ADJ's window appears.
④ Click 'Connect' on the CS-F50's window, then appears IC-F50/F51's up-to-date condition.
⑤ Set or modify adjustment data as desired.

• PC SCREEN EXAMPLE



NOTE: The above values for settings are example only.
Each transceiver has its own specific values for each setting.

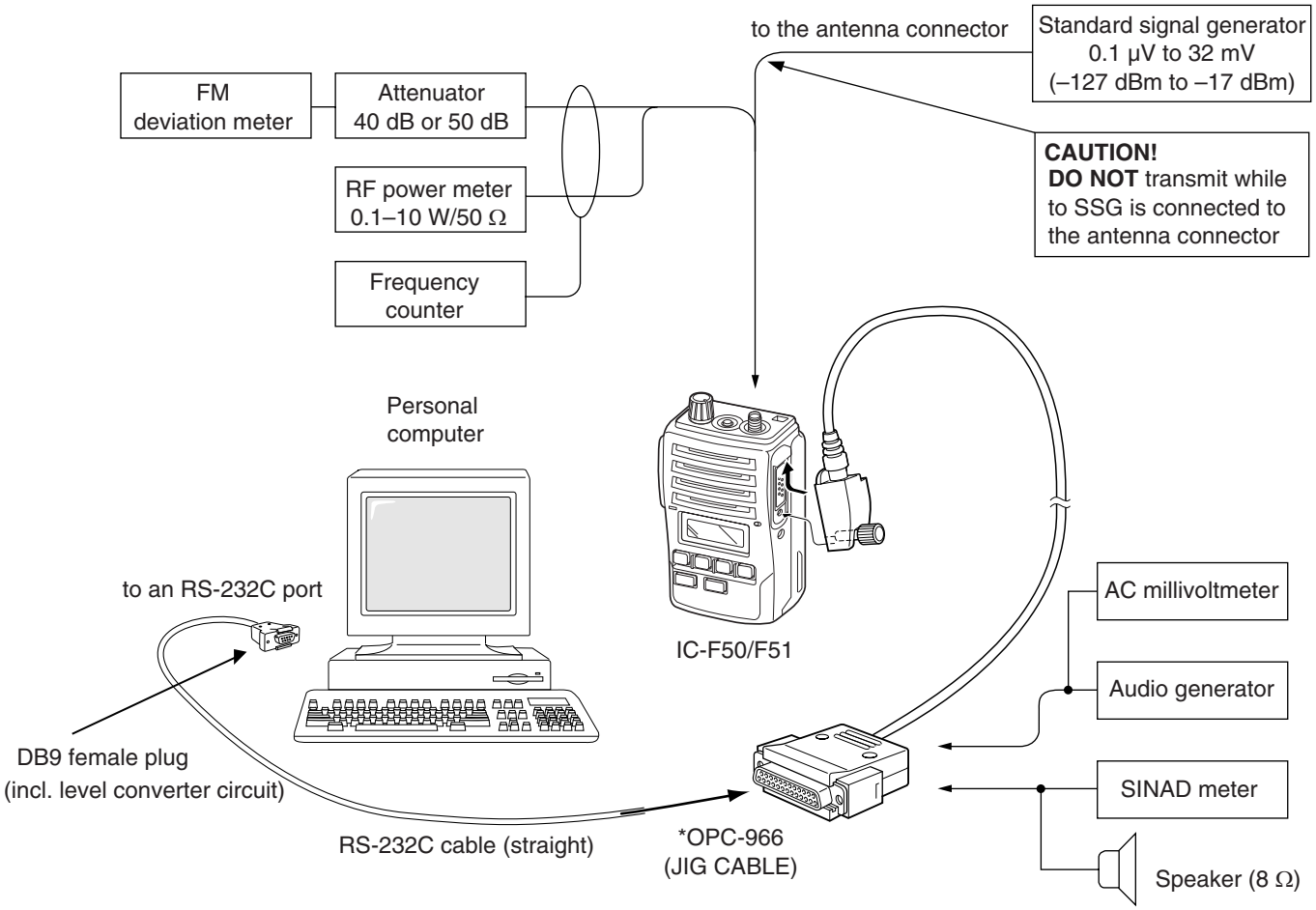
① : Transceiver's connection state
② : Reload adjustment data
③ : Receive sensitivity measurement
④ : Connected DC voltage measurement
⑤ : PLL lock voltage measurement
⑥ : Operating channel select
⑦ : RF output power
⑧ : FM deviation balance (Narrow)
⑨ : FM deviation balance (Wide)
⑩ : FM deviation (Narrow)
⑪ : FM deviation (Wide/Middle)
⑫ : CTCSS/DTCS deviation
⑬ : Squelch level
⑭ : Reference frequency
⑮ : Receive sensitivity (automatically)
⑯ : PLL lock voltage for RX (automatically)
⑰ : PLL lock voltage for TX (automatically)
⑱ : PLL lock voltage for RX (manually)
⑲ : PLL lock voltage for TX (manually)
⑳ : S-meter
㉑ : Adjustment items

• ADJUSTMENT CONFIGULATION

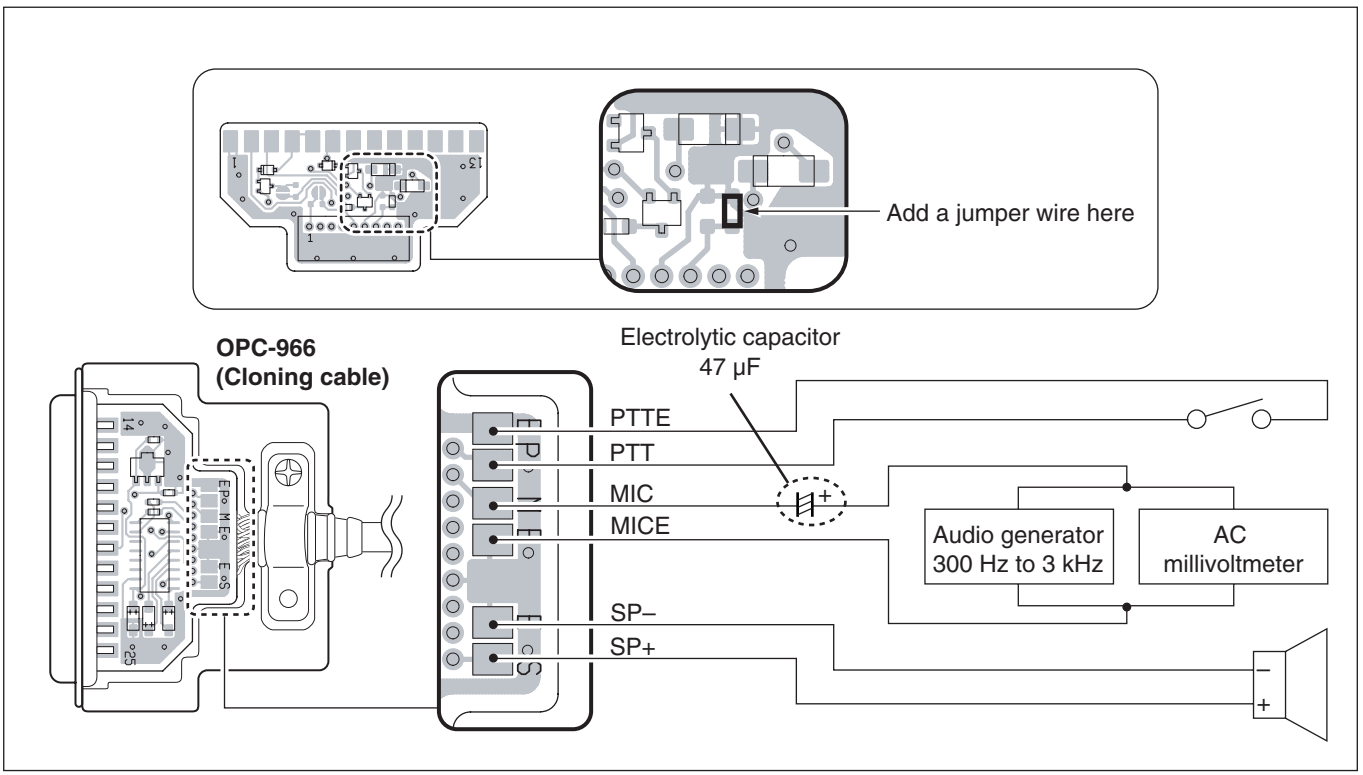
CH	FREQUENCY	ADJUSTMENT ITEM		CH	FREQUENCY	ADJUSTMENT ITEM	
1	174.000 MHz	TX power Band width DTCS code	: L1 : Narrow : 007	7*	174.000 MHz	TX power Band width DTCS code	: L1 : Middle : 007
2	155.000 MHz	TX power	: Hi	8	174.000 MHz	TX power Band width DTCS code	: L1 : Wide : 007
3	155.000 MHz	TX power	: L2				
4	155.000 MHz	TX power Band width	: L1 : Narrow	9	155.000 MHz	TX power Band width DTCS code CTCSS	: L1 : Wide : 007 : 151.4 Hz
5*	155.000 MHz	TX power Band width	: L1 : Middle				
6	155.000 MHz	TX power Band width	: L1 : Wide	10	136.000 MHz	TX power Band width	: L1 : Wide

* ; [IC-F51] only

• CONNECTION

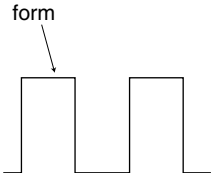


• *OPC-966 (JIG CABLE)



5-2 SOFTWARE ADJUSTMENTS (TRANSMITTING)

Select an operation using [↑] / [↓] keys, then set specified value using [←] / [→] keys on the connected computer keyboard.

ADJUSTMENT		ADJUSTMENT CONDITION	MEASUREMENT		VALUE
			UNIT	LOCATION	
PLL LOCK VOLTAGE [LV (RX LVA)] [LV (TX LVA)]	1	• Operating CH : CH1 • Receiving	Soft ware	Check the "RX LV" item on the CS-F50 ADJ's screen.	3.5 V
	2	• Operating CH : CH1 • Transmitting		Check the "TX LV" item on the CS-F50 ADJ's screen.	3.5 V
	3	• Operating CH : CH10 • Receiving	Soft ware	Check the "RX LV" item on the CS-F50 ADJ's screen.	0.9–1.5 V (Verify)
	4	• Operating CH : CH10 • Transmitting		Check the "TX LV" item on the CS-F50 ADJ's screen.	0.9–1.5 V (Verify)
REFERENCE FREQUENCY [REF]	1	• Operating CH : CH1 • Connect an RF power meter or 50 Ω dummy load to the antenna connector. • Transmitting	op panel	Loosely couple a frequency counter to the antenna connector.	174.0000 MHz ±300 Hz
OUTPUT POWER [Power (Hi)]	1	• Operating CH : CH2 • Transmitting	Top panel	Connect an RF power meter to the antenna connector.	5.0 W 1.0 W [EUR-88]
[Power (L2)]	2	• Operating CH : CH3 • Transmitting			2.0 W 1.0 W [EUR-88]
[Power (L1)]	3	• Operating CH : CH1 • Transmitting			1.0 W
FM DEVIATION [MOD N] (Narrow)	1	• Operating CH : CH4 • Set the FM deviation meter as: HPF : OFF LPF : 20 kHz De-emphasis : OFF Detector : (P–P)/2 • Connect the audio generator to the multi connector through the JIG cable (*OPC-966) and set as: : 1.0 kHz/150 mVrms • Transmitting	Top panel	Connect an FM deviation meter to the antenna connector through the attenuator.	±2.05 to ±2.15 kHz
[MOD Ratio] (Middle; [IC-F51] only)	2	• Operating CH : CH5 • Transmitting			±3.15 to ±3.25 kHz
[MOD Ratio] (Wide)	3	• Operating CH : CH6 • Transmitting			±4.05 to ±4.15 kHz
MODULATION BALANCE [BAL N] (Narrow)	1	• Operating CH : CH1 • No audio applied to the multi connector. • Set an FM deviation meter as: HPF : OFF LPF : 20 kHz De-emphasis : OFF Detector : (P–P)/2 • IF bandwidth : Narrow • Transmitting		Connect an FM deviation meter with an oscilloscope to the antenna connector through an attenuator.	Set to square wave form 
[BAL Ratio] (Middle; [IC-F51] only)	2	• Operating CH : CH7 • Transmitting			
[BAL Ratio] (Wide)	3	• Operating CH : CH8 • Transmitting			
CTCSS/DTCS DEVIATION [CTCS/DTCS]		• Operating CH : CH9 • No audio applied to the multi connector. • Transmitting	Top panel	Connect an FM deviation meter to the antenna connector through the attenuator.	±0.66 to ±0.70 kHz

SOFTWARE ADJUSTMENTS (RECEIVING)

- Select an operation using [↑] / [↓] keys, then set specified value using [←] / [→] keys on the connected computer keyboard.
- Need to adjust "S-METER ADJUSTMENT" after "RX SENSITIVITY ADJUSTMENT" is adjusted. Otherwise, "S-METER ADJUSTMENT" will not be adjusted properly.

ADJUSTMENT		ADJUSTMENT CONDITION	MEASUREMENT		VALUE
			UNIT	LOCATION	
RX SENSITIVITY [BPF T1], [BPF T2]	1	• Operating CH : CH10 • Connect a standard signal generator to the antenna connector and set as: Frequency : 136.000 MHz Level : 10 µV* (–87 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving	MAIN	Connect a SINAD meter with an 8 Ω load to the multi connector through the JIG cable (see page 5-3).	Minimum distortion level
		CONVENIENT: The BPF T1, BPF T2 can be adjusted automatically. ①-1: Set the cursor to "BPF ALL" on the adjustment program and then push [ENTER] key. ①-2: The connected PC tunes BPF T1, BPF T2 to peak levels. or ②-1: Set the cursor to one of BPF T1, T2 as desired. ②-2: Push [ENTER] key to start tuning. ②-3: Repeat ②-1 and ②-2 to perform additional BPF tuning.			
S-METER [S-METER]	1	• Operating CH : CH10 • Connect an SSG to the antenna connector and set as: Frequency : 136.000 MHz Level : 4.5 µV* (–94 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving	Push [ENTER] key on the connected computer keyboard to set "S6 level".		
	2	• Set an SSG as: Level : 0.25 µV* (–119 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving	Push [ENTER] key on the connected computer keyboard to set "S1 level".		
SQUELCH LEVEL [SQL]	1	• Operating CH : CH6 • Connect an SSG to the antenna connector and set as: Frequency : 155.000 MHz Level : 0.18 µV* (–122 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving	Front panel	Internal speaker	Set "SQL level" to close squelch. Then set "SQL level" at the point where the audio signals just appears.

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

SECTION 6 PARTS LIST

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
IC1	1110003200	S.IC TA31136FN (EL)	B	13.6/9.1
IC2	1110002750	S.IC TA75S01F (TE85R)	T	52.3/18.1
IC4	1140005990	S.IC MB15A02PFV1-G-BND-ER	B	28.7/24.1
IC5	1110005340	S.IC NJM12902V-TE1	T	30.4/9.7
IC6	1190000350	S.IC M62363FP-650C	T	19.7/8.9
IC7	1190001860	S.IC EW-460-FT	B	50.7/39.9
IC9	1110005350	S.IC NJM2870F05-TE1	T	73.8/28.6
IC10	1110006220	S.IC AK2346-E2	T	18.9/19.6
IC11	1130006220	S.IC TC4W53FU (TE12L)	T	25.2/25
IC12	1130007570	S.IC BU4094BCFV-E2	T	16.9/32.2
IC13	1130008090	S.IC BU4066BCFV-E1	T	22.7/32.2
IC14	1110004990	S.IC FX214LG/TR		
		Except [USA-02], [EUR-02], [GEN-02]	B	9.8/32.5
IC15	1130007990	S.IC TC3W03FU (TE12L)		
		Except [USA-02], [EUR-02], [GEN-02]	B	22.5/33.4
IC16	1110005330	S.IC NJM12904V-TE1	T	29.6/28.4
IC17	1130004200	S.IC TC4S66F (TE85R)	T	30.2/34.9
Q1	1560000840	S.FET 2SK1829 (TE85R)	T	46.4/10.8
Q2	1580000730	S.FET 3SK293 (TE85L)	T	47.3/8.2
Q3	1580000760	S.FET 3SK299-T1 U73	B	41.2/9.1
Q4	1530002600	S.TR 2SC4215-O (TE85R)	B	21.3/4.5
Q7	1560001230	S.FET RD07MVS1	T	59.8/21.9
Q8	1560001240	S.FET RD01MUS1	T	60.2/28
Q9	1530003420	S.TR 2SC5110-O (TE85R)	B	52.4/29
Q10	1530003310	S.TR 2SC5107-O (TE85R)	B	47.9/21.9
Q11	1530003310	S.TR 2SC5107-O (TE85R)	T	43.7/32.1
Q12	1530003310	S.TR 2SC5107-O (TE85R)	B	47.6/29.5
Q13	1530002920	S.TR 2SC4226-T1 R25	B	45/22.4
Q14	1530002920	S.TR 2SC4226-T1 R25	B	43.9/29.9
Q15	1590001400	S.TR XP1214 (TX)	T	45.8/26.2
Q16	1590000430	S.TR DTC144EUA T106	T	43.2/26.8
Q17	1530002850	S.TR 2SC4116-BL (TE85R)	B	46.9/37.8
Q18	1560000540	S.FET 2SK880-Y (TE85R)	T	46.4/17.3
Q19	1530002850	S.TR 2SC4116-BL (TE85R)	B	25.6/17.8
Q21	1510000920	S.TR 2SA1577 T106 Q	B	52.8/36.5
Q22	1510000920	S.TR 2SA1577 T106 Q	B	34.5/37.9
Q23	1520000450	S.TR 2SB1132 T100 Q	B	72.1/25.4
Q24	1590001190	S.TR XP6501-(TX) AB	B	72.1/29.2
Q25	1590000720	S.TR DTA144EUA T106	B	68.8/31.6
Q26	1590003320	S.FET TPC6103 (TE85L)	T	72.9/25.1
Q27	1590000720	S.TR DTA144EUA T106		
		Except [USA-02], [EUR-02], [GEN-02]	B	19.5/34.5
Q29	1590000430	S.TR DTC144EUA T106	B	54.9/39.7
D1	1790001670	S.DIO RB706F-40T106	B	55.5/12.3
D2	1750000580	S.DIO 1SV307 (TPH3)	B	59.8/8.3
D4	1750000720	S.VCP HVC375BTRF	T	50.2/5.6
D5	1750000580	S.DIO 1SV307 (TPH3)	B	57/3.5
D6	1790001260	S.DIO MA2S077-(TX)	T	59.9/7.9
D7	1790001240	S.DIO MA2S728-(TX)	T	56.6/7.9
D8	1750000720	S.VCP HVC375BTRF	T	54.6/5.6
D9	1750000710	S.VCP HVC350BTRF	T	43.2/5.6
D10	1750000710	S.VCP HVC350BTRF	T	38.8/5.6
D12	1790001250	S.DIO MA2S111-(TX)	B	45.9/40
D14	1790001260	S.DIO MA2S077-(TX)	B	51.8/23.7
D15	1790001260	S.DIO MA2S077-(TX)	B	51.8/18
D16	1750000770	S.VCP HVC376BTRF	B	40.6/20.5
D17	1750000770	S.VCP HVC376BTRF	B	42.8/21.8
D18	1720000470	S.VCP 1SV239 (TPH3)	T	37.9/21.5
D19	1750000770	S.VCP HVC376BTRF	B	40.8/27.4
D20	1750000770	S.VCP HVC376BTRF	B	40.8/28.8
D21	1750000720	S.VCP HVC375BTRF	B	37.2/22.7
D22	1750000720	S.VCP HVC375BTRF	B	37.2/29.4
D23	1790001250	S.DIO MA2S111-(TX)	T	42.8/8.1
D24	1790001250	S.DIO MA2S111-(TX)	B	32.5/29.2
D25	1790001250	S.DIO MA2S111-(TX)	T	53.3/15
FI1	2030000150	S.MLH FL-335 (46.350 MHz)	B	31.7/5.8
FI2	2020001840	CER ALFYM450F=K		
X1	6070000190	S.DCR CDBCB450KCAY24-R0	T	11.6/8.8
X2	6050011710	S.XTL CR-763 (15.3 MHz)	B	28.4/32.9
X3	6050011560	S.XTL CR-746 (4.000 MHz)		
		Except [USA-02], [EUR-02], [GEN-02]	B	22.8/39.7
X4	6050011730	S.XTL CR-765 (3.6864 MHz)	B	15.3/21.4
L1	6200008580	S.COL 0.30-1.4-6TL 32N	B	67.8/7
L2	6200009800	S.COL 0.26-1.1-7TR 30N	B	63.4/5.5
L3	6200008280	S.COL 0.30-1.7-7TL 50N	B	62/11.4

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
L4	6200008490	S.COL 0.30-0.9-3TR 7.5N	B	67.4/13.4
L5	6200008280	S.COL 0.30-1.7-7TL 50N	B	57.3/5.8
L6	6200010400	S.COL ELJRE 39NJ-F	B	56.5/7.9
L7	6200008090	S.COL LQW2BHN68NJ01L	B	53.6/4.5
L8	6200008090	S.COL LQW2BHN68NJ01L	B	50.9/4.5
L9	6200007750	S.COL LQW2BHN56NJ01L	B	47.3/7.7
L11	6200007750	S.COL LQW2BHN56NJ01L	B	41.3/5.2
L12	6200009350	S.COL ELJRE R22G-F3	B	43.5/12.8
L13	6200007850	S.COL ELJNC R82K-F	B	38.5/11.5
L15	6200002860	S.COL NL 252018T-4R7J	B	57.2/9.8
L16	6200009710	S.COL 0.30-0.9-4TL 10.5N	B	68.6/18.3
L17	6200008210	S.COL 0.45-1.5-5TL 23.2N	B	67.3/21.4
L18	6200005700	S.COL ELJRE 22NG-F		
		[USA-88], [EUR-88] only	T	65.5/26.5
L19	6200005740	S.COL ELJRE 47NG-F	B	54.4/29
L20	6200003590	S.COL EXCCL3225U1	B	71.9/21.4
L21	6200009180	S.COL ELJRE R10J-F3	T	47.8/21.4
L22	6200009180	S.COL ELJRE R10J-F3	B	47.7/27.6
L24	6200003640	S.COL MLF1608E 100K-T	B	41.4/24.4
L25	6200007760	S.COL LQW2BHN82NJ01L	B	38.8/24.9
L26	6200008090	S.COL LQW2BHN68NJ01L	B	37.8/31.6
L27	6200007170	S.COL MLF1608A 3R3K-T	T	41/21.9
L28	6200007170	S.COL MLF1608A 3R3K-T	T	40.4/25.1
L31	6200007000	S.COL ELJRE 82NG-F	T	58.8/4.8
L32	6200005720	S.COL ELJRE 33NG-F	T	37.1/32.1
L33	6200004480	S.COL MLF1608D R82K-T	B	25.8/15.7
L35	6200003540	S.COL MLF1608D R22K-T	B	27.5/18
L37	6200003640	S.COL MLF1608E 100K-T	B	40.8/30.1
L38	6200008090	S.COL LQW2BHN68NJ01L	B	37.7/21
L39	6200007720	S.COL LQW2BHN33NJ01L	B	37.9/27.7
L41	6200009180	S.COL ELJRE R10J-F3	T	41.3/30.9
L42	6200007170	S.COL MLF1608A 3R3K-T	T	36.6/28.5
L43	6200007170	S.COL MLF1608A 3R3K-T	T	36.6/25.1
R1	7030003490	S.RES ERJ3GEYJ 272 V (2.7 kΩ)	B	59.1/11.7
R2	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	T	55.5/15.2
R3	7030005530	S.RES ERJ2GEJ 100 X (10 Ω)	T	52.6/20.3
R4	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	56.5/17
R5	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	54.5/15.2
R6	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	52.1/15.2
R7	7030005310	S.RES ERJ2GEJ 124 X (120 kΩ)	T	50.8/15.7
R8	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	T	54.5/17
R9	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	T	55/18.3
R10	7030005030	S.RES ERJ2GEJ 152 X (1.5 kΩ)	T	54.2/20.5
R11	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	53.4/5.1
R12	7030005530	S.RES ERJ2GEJ 100 X (10 Ω)	T	49.1/8.7
R13	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	51.4/5.1
R14	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	52.4/7.7
R15	7030005310	S.RES ERJ2GEJ 124 X (120 kΩ)	T	47.7/4.4
R16	7030008280	S.RES ERJ2GEJ 271 X (270 Ω)	T	45.4/5.1
R17	7030004970	S.RES ERJ2GEJ 470 X (47 Ω)	B	49/9.7
R18	7030009320	S.RES ERJ2GEJ 4R7 X (4.7 Ω)	B	50.3/9.2
R19	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	49.6/7.4
R20	7030009270	S.RES ERJ2GEJ 821 X (820 Ω)	T	44.4/6.9
R21	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	T	42/5.1
R22	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	37.5/5.1
R23	7030005100	S.RES ERJ2GEJ 154 X (150 kΩ)	T	40/5.1
R24	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	B	49.5/11.5
R25	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	B	40.1/7.3
R26	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	B	46.1/11.6
R27	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	B	44.7/12.1
R28	7030010430	S.RES ERJ2GEJ 120 X (12 Ω)	B	46.1/10.6
R29	7030009160	S.RES ERJ2GEJ 181 X (180 Ω)	B	41.5/13.1
R31	7030004970	S.RES ERJ2GEJ 470 X (47 Ω)	B	36/12.2
R32	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	B	37.6/6.7
R33	7030007280	S.RES ERJ2GEJ 331 X (330 Ω)	B	25.4/4.4
R34	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	23.1/5.9
R35	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	B	22.6/7.6
R36	7030005030	S.RES ERJ2GEJ 152 X (1.5 kΩ)	T	13.1/13.3
R38	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	20.2/7.6
R39	7030004970	S.RES ERJ2GEJ 470 X (47 Ω)	B	11.9/5.8
R40	7030005030	S.RES ERJ2GEJ 152 X (1.5 kΩ)	B	9.9/6.1
R42	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	B	12.6/12.9
R43	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	B	16.6/12.3
R44	7030006610	S.RES ERJ2GEJ 394 X (390 kΩ)	B	10.6/12.9
R45	7030005100	S.RES ERJ2GEJ 154 X (150 kΩ)	B	12.6/14.7
R46	7030007290	S.RES ERJ2GEJ 222 X (2.2 kΩ)	B	11.6/14.7
R48	7030005010	S.RES ERJ2GEJ 681 X (680 Ω)	B	21.8/6.4
R50	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	48.5/13.5
R51	7030003670	S.RES ERJ3GEYJ 823 V (82 kΩ)	B	69.9/7.2
R52	7030007270	S.RES ERJ2GEJ 151 X (150 Ω)	B	53.9/9.8
R53	7030007250	S.RES ERJ2GEJ 220 X (22 Ω)	T	55.8/23.8
R54	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	54.2/23.8
R55	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	T	54.2/22.8

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

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
R57	7030005590	S.RES ERJ2GEJ 680 X (68 Ω)	T	56.5/28.5
R58	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	54.6/27.5
R59	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	T	54.6/26.5
R61	7030005530	S.RES ERJ2GEJ 100 X (10 Ω)	T	54.1/30.8
R62	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	B	52.6/31.3
R63	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	B	53.6/26.7
R65	7030005030	S.RES ERJ2GEJ 152 X (1.5 kΩ)	B	51.6/26.7
R67	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	B	53.1/25.2
R68	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	53.6/23.8
R69	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	B	52.2/19.9
R70	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	T	49.3/24.7
R71	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	49.3/23.7
R72	7030009320	S.RES ERJ2GEJ 4R7 X (4.7 Ω)	B	48.6/24.3
R75	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	T	44.2/30.1
R76	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	T	44.5/34.9
R77	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	T	49.3/26.7
R78	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	47.3/26.4
R79	7030008340	S.RES RR0510P-182-D (1.8 kΩ)	B	43.9/32.3
R80	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	44.7/24
R81	7030010040	S.RES ERJ2GE-JPW	B	42.9/32.3
R82	7030009320	S.RES ERJ2GEJ 4R7 X (4.7 Ω)	B	44/24.8
R83	7030008340	S.RES RR0510P-182-D (1.8 kΩ)	B	45/24.8
R84	7030011000	S.RES RR0510P-392-D (3.9 kΩ)	B	43/25.6
R85	7030011000	S.RES RR0510P-392-D (3.9 kΩ)	B	45.9/32.3
R86	7030005310	S.RES ERJ2GEJ 124 X (120 kΩ)	T	36.4/22.2
R87	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	T	45.5/28.3
R88	7030008370	S.RES ERJ2GEJ 561 X (560 Ω)	T	46.2/24.3
R89	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	44.5/17.3
R90	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	B	32.2/14
R91	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	B	31.2/14
R92	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	29.2/14
R93	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	B	31/28.4
R94	7030005100	S.RES ERJ2GEJ 154 X (150 kΩ)	B	30.9/29.7
R95	7030009290	S.RES ERJ2GEJ 562 X (5.6 kΩ)	T	40.7/20.7
R96	7030008400	S.RES ERJ2GEJ 182 X (1.8 kΩ)	T	40.7/19.7
R97	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	B	32.6/25.6
R98	7030007290	S.RES ERJ2GEJ 222 X (2.2 kΩ)	B	45/37.6
R100	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	47.1/15.2
R101	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	T	45.5/15.2
R102	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	B	19.1/3.7
R103	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	T	29.1/23.8
R104	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	T	26.1/14.6
R105	7030005230	S.RES ERJ2GEJ 334 X (330 kΩ)	T	30.7/22.2
R108	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	24.6/27.4
R109	7030005580	S.RES ERJ2GEJ 560 X (56 Ω)	T	34.3/31.6
R110	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	30.3/15
R111	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	30.4/32.7
R113	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	T	37.2/26.8
R115	7030007570	S.RES ERJ2GEJ 122 X (1.2 kΩ)	B	27.1/19.8
R116	7030007060	S.RES ERJ2GEJ 684X (680 kΩ)	B	25.3/19.8
R117	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	B	31.7/19.3
R118	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	B	30.7/19.3
R119	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	18.4/12.7
R120	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	T	25.2/12.7
R121	7030008010	S.RES ERJ2GEJ 123 X (12 kΩ)	T	27.1/17.2
R122	7030006610	S.RES ERJ2GEJ 394 X (390 kΩ)	T	27.1/18.2
R123	7030005080	S.RES ERJ2GEJ 823 X (82 kΩ)	T	13/16.9
R124	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	13.5/15.6
R125	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	B	16.6/14.3
R126	7030005160	S.RES ERJ2GEJ 105 X (1 MΩ)	T	14/18.7
R127	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	20.7/24.8
R128	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	21.7/24.8
R129	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	B	21.8/13.3
R130	7030007290	S.RES ERJ2GEJ 222 X (2.2 kΩ)	B	22.4/19.2
R131	7030007290	S.RES ERJ2GEJ 222 X (2.2 kΩ)	B	22.9/21.5
R132	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	B	24.2/22
R133	7030008290	S.RES ERJ2GEJ 183 X (18 kΩ)	T	24.3/21.9
R134	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	25.9/20.6
R135	7030005160	S.RES ERJ2GEJ 105 X (1 MΩ)	T	14/21.5
R139	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	4.8/21
R141	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	26.5/32.2
R144	7030005160	S.RES ERJ2GEJ 105 X (1 MΩ) Except [USA-02], [EUR-02], [GEN-02]	B	22.5/36.5
R145	7030005530	S.RES ERJ2GEJ 100 X (10 Ω) Except [USA-02], [EUR-02], [GEN-02]	B	24.3/36.5
R147	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	29.8/5.3
R148	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	30.3/4
R150	7030010040	S.RES ERJ2GE-JPW [EUR-88] only	T	16.7/3
R151	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	26.6/10.7
R152	7030008310	S.RES ERJ2GEJ 564 X (560 kΩ)	T	28.1/3
R153	7030005100	S.RES ERJ2GEJ 154 X (150 kΩ)	T	26.1/7.1
R154	7030005100	S.RES ERJ2GEJ 154 X (150 kΩ) [EUR-88] only	T	27.1/7.1
R155	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	27.1/3
R157	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	25.4/3.4
R161	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	50.9/36.6
R162	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	B	49.6/36.1
R163	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	34.5/39.8
R164	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	B	32.7/37.4
R165	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	B	74.6/28.5
R166	7030007290	S.RES ERJ2GEJ 222 X (2.2 kΩ)	B	69.8/28.8
R167	7030005700	S.RES ERJ2GEJ 274 X (270 kΩ)	T	75.1/24.4

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
R168	7030010080	S.RES ERJ2RHD 104 X (100 kΩ)	T	76.1/23.5
R169	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	47.7/40.7
R170	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	B	46.3/41.2
R171	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	T	50.1/10.5
R172	7030005220	S.RES ERJ2GEJ 223 X (22 kΩ)	T	50.1/8.7
R173	7030009290	S.RES ERJ2GEJ 562 X (5.6 kΩ)	T	44.5/9.6
R174	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	T	43.5/9.6
R175	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	T	44/10.9
R180	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	B	5.8/22.9
R181	7030005220	S.RES ERJ2GEJ 223 X (22 kΩ)	T	31.9/2.6
R182	7030005220	S.RES ERJ2GEJ 223 X (22 kΩ)	T	32.4/4
R183	7030005220	S.RES ERJ2GEJ 223 X (22 kΩ)	T	31.9/5.3
R184	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	34.2/11.4
R185	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	T	34.2/12.4
R186	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	B	4.8/22.9
R187	7030007350	S.RES ERJ2GEJ 393 X (39 kΩ) [EUR-88] only	T	31.2/16
R188	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ) [EUR-88] only	T	28.2/14.6
R189	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ) [EUR-88] only	T	29.4/14
R190	7510001730	S.TMR ERTJOEP 473J	B	25.9/31.9
R191	7030010080	S.RES ERJ2RHD 104 X (100 kΩ)	B	24.7/29.8
R192	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	13.6/31.8
R193	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	13.6/30
R194	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	20.4/38.2
R195	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ) Except [USA-02], [EUR-02], [GEN-02]	T	14.3/36.7
R196	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	T	25.2/11.7
C1	4030007000	S.CER C1608 CH 1H 090D-T	B	69.9/9.8
C2	4030006990	S.CER C1608 CH 1H 080D-T	B	65.8/6.9
C3	4030009650	S.CER C1608 CH 1H 240J-T	B	67.9/4.7
C4	4030011530	S.CER C1608 CH 1H 110J-T	B	63.1/7.3
C5	4030007050	S.CER C1608 CH 1H 220J-T	B	61.1/4.5
C6	4030017460	S.CER ECJ0EB1E102K	B	60.4/6.2
C7	4030017460	S.CER ECJ0EB1E102K	B	61.6/9
C8	4030007040	S.CER C1608 CH 1H 180J-T	B	64.1/9.8
C9	4030007030	S.CER C1608 CH 1H 150J-T	B	59.1/13
C10	4030017460	S.CER ECJ0EB1E102K	B	64.4/13
C11	4030007050	S.CER C1608 CH 1H 220J-T	B	66.3/15.9
C13	4030007100	S.CER C1608 CH 1H 560J-T	B	68.2/16.4
C14	4030011530	S.CER C1608 CH 1H 110J-T	B	59.7/4.5
C15	4030017460	S.CER ECJ0EB1E102K	B	54.6/14.4
C16	4030017400	S.CER ECJ0EC1H220J	B	54.2/7.3
C17	4030017630	S.CER ECJ0EC1H120J	T	59.7/6.4
C18	4030017380	S.CER ECJ0EC1H050B	T	57/5.1
C19	4030017460	S.CER ECJ0EB1E102K	T	57.9/6.4
C20	4030017430	S.CER ECJ0EC1H101J	T	53.5/3.8
C22	4030017340	S.CER ECJ0EC1H010B	T	52.4/6.4
C23	4030016930	S.CER ECJ0EB1A104K	T	42.5/9.6
C24	4030017460	S.CER ECJ0EB1E102K	B	52.9/9.8
C25	4030017580	S.CER ECJ0EC1H060C	T	56.1/6.4
C26	4030017430	S.CER ECJ0EC1H101J	T	50.2/3.8
C27	4030017460	S.CER ECJ0EB1E102K	T	52.4/5.1
C28	4030017370	S.CER ECJ0EC1H3R5B	T	49/5.1
C29	4030017560	S.CER ECJ0EC1H2R5B	T	48.7/6.4
C30	4030016930	S.CER ECJ0EB1A104K	T	49.1/10.5
C31	4030016930	S.CER ECJ0EB1A104K	B	51/8.2
C32	4030017460	S.CER ECJ0EB1E102K	T	46.4/5.1
C33	4030017420	S.CER ECJ0EC1H470J	T	46.8/6.4
C35	4030017490	S.CER C1608 JB 1A 105K-T	B	49.6/7.2
C36	4030017460	S.CER ECJ0EB1E102K	B	47.1/9.2
C37	4030016790	S.CER ECJ0EB1C103K	T	45.4/6.9
C38	4030017360	S.CER ECJ0EC1H030B	T	44.4/5.1
C39	4030017460	S.CER ECJ0EB1E102K	T	43/3.8
C40	4030017550	S.CER ECJ0EC1H1R5B	T	41/6.4
C41	4030017620	S.CER ECJ0EC1H100C	B	41.9/7.3
C42	4030017460	S.CER ECJ0EB1E102K	T	38/3.8
C43	4030017460	S.CER ECJ0EB1E102K	T	41/5.1
C44	4030017570	S.CER ECJ0EC1H040B	B	39.8/5.2
C45	4030017460	S.CER ECJ0EB1E102K	T	39.8/3.8
C48	4030016790	S.CER ECJ0EB1C103K	B	41.5/11.1
C49	4030017350	S.CER ECJ0EC1H020B	B	44.1/10.6
C50	4030017460	S.CER ECJ0EB1E102K	B	41.5/12.1
C51	4030017460	S.CER ECJ0EB1E102K	B	37.6/7.7
C52	4030017630	S.CER ECJ0EC1H120J	B	38.5/9.7
C53	4030016790	S.CER ECJ0EB1C103K	B	36.6/8.7
C54	4030017460	S.CER ECJ0EB1E102K	B	36.6/9.7
C55	4030017570	S.CER ECJ0EC1H040B	B	37.6/5.7
C56	4030017400	S.CER ECJ0EC1H220J	B	33.3/9.1
C57	4030017460	S.CER ECJ0EB1E102K	B	35/12.2
C58	4030017460	S.CER ECJ0EB1E102K	B	23.6/4.4
C59	4030017460	S.CER ECJ0EB1E102K	B	22.3/8.9
C60	4030016790	S.CER ECJ0EB1C103K	B	23.3/8.9
C61	4030017430	S.CER ECJ0EC1H101J	B	19.1/5.8
C62	4030017680	S.CER ECJ0EC1H820J	B	17.9/10.4
C63	4030017420	S.CER ECJ0EC1H470J	B	18.9/7.4
C65	4030017460	S.CER ECJ0EB1E102K	B	18.4/9.1
C66	4030017460	S.CER ECJ0EB1E102K	B	18.4/11.7
C67	4030017460	S.CER ECJ0EB1E102K	B	9.9/5.1
C68	4030017430	S.CER ECJ0EC1H101J	B	13.6/14.7

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

S.=Surface mount

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C69	4030017430	S.CER ECJ0EC1H101J	B	11.6/12.9
C70	4030017430	S.CER ECJ0EC1H101J	B	10.6/14.7
C71	4030016930	S.CER ECJ0EB1A104K	B	9.3/11
C72	4030017460	S.CER ECJ0EB1E102K	B	52.6/15.1
C73	4030017460	S.CER ECJ0EB1E102K	T	55/19.3
C74	4030017460	S.CER ECJ0EB1E102K	B	51.6/15.1
C75	4550006250	S.TAN TEESVA 1A 106M8L	B	7/13.8
C76	4030016930	S.CER ECJ0EB1A104K	T	50.1/18.7
C77	4030017460	S.CER ECJ0EB1E102K	T	52.6/21.3
C78	4030017460	S.CER ECJ0EB1E102K	T	56.5/15.2
C79	4030016930	S.CER ECJ0EB1A104K	T	55.5/17
C80	4030016930	S.CER ECJ0EB1A104K	T	50.8/14.7
C81	4030017490	S.CER C1608 JB 1A 105K-T	T	65.5/22.7
C82	4030017460	S.CER ECJ0EB1E102K	B	66.1/23.4
C83	4030017460	S.CER ECJ0EB1E102K	T	55.6/22.4
C84	4030017730	S.CER ECJ0EB1E471K	T	55.8/24.8
C85	4030017460	S.CER ECJ0EB1E102K	T	65.5/27.7
C86	4030017430	S.CER ECJ0EC1H101J	T	63.8/24.8
C87	4030017650	S.CER ECJ0EC1H270J	T	63.8/26.6
C88	4030017460	S.CER ECJ0EB1E102K	T	56.5/27.5
C89	4030016790	S.CER ECJ0EB1C103K	T	56.5/26.5
C90	4030017460	S.CER ECJ0EB1E102K	B	51.6/31.3
C91	4030017460	S.CER ECJ0EB1E102K	T	54.2/21.8
C92	4030017430	S.CER ECJ0EC1H101J	T	56.5/29.5
C93	4030017640	S.CER ECJ0EC1H150J	B	52.6/26.7
C94	4030017420	S.CER ECJ0EC1H470J	T	54.2/24.8
C95	4030017460	S.CER ECJ0EB1E102K	B	54.6/26.7
C96	4030017460	S.CER ECJ0EB1E102K	B	53.6/31.3
C97	4030017420	S.CER ECJ0EC1H470J	B	54.6/31.3
C98	4550006250	S.TAN TEESVA 1A 106M8L	T	52.4/24.9
C99	4030017460	S.CER ECJ0EB1E102K	B	54.6/23.8
C100	4030017620	S.CER ECJ0EC1H100C	T	49.8/21.2
C101	4030017460	S.CER ECJ0EB1E102K	B	54.9/9.8
C102	4030017590	S.CER ECJ0EC1H070C	B	48.6/26.1
C103	4030017360	S.CER ECJ0EC1H030B	T	46.1/31.4
C104	4030017460	S.CER ECJ0EB1E102K	T	48/27.2
C105	4030017460	S.CER ECJ0EB1E102K	T	44.5/33.9
C106	4030017420	S.CER ECJ0EC1H470J	T	55.1/30.8
C107	4030017460	S.CER ECJ0EB1E102K	T	49.3/22.7
C108	4030016790	S.CER ECJ0EB1C103K	B	54.2/34.4
C109	4030017460	S.CER ECJ0EB1E102K	T	49/34.8
C110	4030017730	S.CER ECJ0EB1E471K	T	49.3/25.7
C111	4030017460	S.CER ECJ0EB1E102K	T	46.5/28.3
C113	4030017540	S.CER ECJ0EC1HR75B	B	45.7/29.6
C114	4030017660	S.CER ECJ0EC1H330J	B	44.9/32.3
C115	4030017660	S.CER ECJ0EC1H330J	B	45/27.6
C116	4030016790	S.CER ECJ0EB1C103K	B	43/27.5
C117	4030017730	S.CER ECJ0EB1E471K	B	44/27.5
C118	4030017530	S.CER ECJ0EC1H0R5B	B	46/26.6
C119	4030017460	S.CER ECJ0EB1E102K	B	44.2/20.5
C120	4030017730	S.CER ECJ0EB1E471K	B	46/20.5
C121	4030017390	S.CER ECJ0EC1H180J	B	44.5/26.1
C122	4030017660	S.CER ECJ0EC1H330J	B	46.6/24.3
C123	4030017510	S.CER ECJ0EC1H680J	B	41.6/26.1
C124	4030017440	S.CER ECJ0EC1H221J	B	40.3/22.7
C126	4030017660	S.CER ECJ0EC1H330J	B	40.6/32.9
C127	4030017420	S.CER ECJ0EC1H470J	B	39.1/29.6
C129	4030017340	S.CER ECJ0EC1H010B	B	37.3/24.7
C132	4030016930	S.CER ECJ0EB1A104K	B	30.2/14
C133	4030017400	S.CER ECJ0EC1H220J	B	36.3/24.7
C134	4030017660	S.CER ECJ0EC1H330J	B	36.3/31.3
C135	4030017460	S.CER ECJ0EB1E102K	B	45.4/15.2
C137	4030016790	S.CER ECJ0EB1C103K	B	44.1/39
C138	4030017420	S.CER ECJ0EC1H470J	T	40.7/23.1
C139	4030016930	S.CER ECJ0EB1A104K	T	46.7/23
C140	4030016930	S.CER ECJ0EB1A104K	B	28/28.4
C141	4030017460	S.CER ECJ0EB1E102K	T	48.1/15.2
C143	4030017460	S.CER ECJ0EB1E102K	T	44.5/15.2
C145	4030017730	S.CER ECJ0EB1E471K	T	36.4/20.3
C146	4550000530	S.TAN TEESVA 1V 104M8L	T	40.8/15.7
C147	4550006390	S.TAN TEESVA 1C 335M8L	T	42.9/15.7
C148	4550006250	S.TAN TEESVA 1A 106M8L	B	41.9/37.4
C149	4550000270	S.TAN TEESVA 1E 474M8L	B	33/22.6
C150	4030017490	S.CER C1608 JB 1A 105K-T	T	31.7/17.2
C151	4030016930	S.CER ECJ0EB1A104K	B	32.6/31.5
C152	4030017420	S.CER ECJ0EC1H470J	B	31.7/16.9
C153	4030017420	S.CER ECJ0EC1H470J	B	30.7/16.9
C154	4030017420	S.CER ECJ0EC1H470J	B	29.7/18.5
C155	4030017450	S.CER ECJ0EB1E271K	B	30.9/31.5
C156	4030017460	S.CER ECJ0EB1E102K	B	25.6/27.4
C157	4030017620	S.CER ECJ0EC1H100C	B	26.1/28.9
C158	4030016930	S.CER ECJ0EB1A104K	B	25.4/35.4
C159	4030017460	S.CER ECJ0EB1E102K	B	25.4/33.4
C161	4030017620	S.CER ECJ0EC1H100C	B	25.3/25.3
C162	4030017500	S.CER ECJ0EC1H560J	B	29.2/17.2
C163	4030017570	S.CER ECJ0EC1H040B	B	27.5/15.8
C164	4030017590	S.CER ECJ0EC1H070C	B	26.2/14.5
C165	4030016790	S.CER ECJ0EB1C103K	B	28.7/18.5
C166	4030017360	S.CER ECJ0EC1H030B	B	26.2/13.5
C167	4030016930	S.CER ECJ0EB1A104K	B	21.3/8.9
C168	4030016930	S.CER ECJ0EB1A104K	B	8.6/6.6
C169	4030016930	S.CER ECJ0EB1A104K	B	8.8/9.4
C170	4030016930	S.CER ECJ0EB1A104K	T	26.6/8.9

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C171	4030018560	S.CER C2012 JB 1A 475K-T	T	25.7/4.5
C172	4030017460	S.CER ECJ0EB1E102K	T	27.6/4.3
C180	4030016930	S.CER ECJ0EB1A104K	T	29.3/4
C182	4030017460	S.CER ECJ0EB1E102K	B	49.5/13.5
C183	4030017620	S.CER ECJ0EC1H100C	B	47.5/13.5
C184	4030017460	S.CER ECJ0EB1E102K	B	50.3/10.2
C185	4030016930	S.CER ECJ0EB1A104K	T	29.3/20.6
C186	4030016930	S.CER ECJ0EB1A104K	T	51.1/8.7
C188	4030017460	S.CER ECJ0EB1E102K	B	17.9/7.4
C190	4030017380	S.CER ECJ0EC1H050B	B	41.3/31.6
C191	4030017570	S.CER ECJ0EC1H040B	B	40.3/31.6
C192	4030017360	S.CER ECJ0EC1H030B	B	41.6/22.2
C193	4030017360	S.CER ECJ0EC1H030B	B	40.3/21.7
C194	4030017380	S.CER ECJ0EC1H050B	B	40.3/24
C195	4030017570	S.CER ECJ0EC1H040B	B	42.9/23.5
C199	4030017460	S.CER ECJ0EB1E102K	B	12.5/18
C200	4030017420	S.CER ECJ0EC1H470J	T	27.6/35.9
C201	4030017490	S.CER C1608 JB 1A 105K-T	T	37.9/28.5
C202	4030016930	S.CER ECJ0EB1A104K	T	37.8/24.8
C203	4030017460	S.CER ECJ0EB1E102K	T	38.8/24.8
C205	4030017400	S.CER ECJ0EC1H220J	T	40.7/32.1
C206	4030017630	S.CER ECJ0EC1H120J	T	38.8/31.6
C207	4030017620	S.CER ECJ0EC1H100C	T	37.6/33.3
C208	4030017630	S.CER ECJ0EC1H120J	T	35.3/31.6
C209	4030017460	S.CER ECJ0EB1E102K	B	32.2/27.4
C211	4030018560	S.CER C2012 JB 1A 475K-T	B	16.5/4
C213	4030016930	S.CER ECJ0EB1A104K	T	30.7/23.8
C218	4030018560	S.CER C2012 JB 1A 475K-T [EUR-88] only	T	19.2/2.7
C219	4030018860	S.CER ECJ0EB0J105K [EUR-88] only	T	27.1/15.6
C220	4030016970	S.CER ECJ0EB1C223K	B	5.3/24.2
C221	4030016940	S.CER ECJ0EB1A393K	T	33.4/4
C222	4030016790	S.CER ECJ0EB1C103K	T	31.4/4
C223	4030016930	S.CER ECJ0EB1A104K	T	33.4/5.8
C224	4550000460	S.TAN TEESVA 1C 105M8L [EUR-88] only	T	34.6/8.4
C225	4030017730	S.CER ECJ0EB1E471K	T	34.2/13.4
C226	4030017460	S.CER ECJ0EB1E102K	B	4.5/25.2
C227	4030016790	S.CER ECJ0EB1C103K	B	28.2/14
C228	4030017460	S.CER ECJ0EB1E102K	B	18.4/13.7
C229	4030016930	S.CER ECJ0EB1A104K	T	25.2/9.1
C230	4030017460	S.CER ECJ0EB1E102K	T	67.6/25.6
C231	4030016790	S.CER ECJ0EB1C103K	B	51.9/34.4
C232	4030016790	S.CER ECJ0EB1C103K	B	32.7/39.2
C233	4550006350	S.TAN TEESVB2 1A 226M8L	B	67.3/27.2
C234	4030017330	S.CER ECJ0EF1C104Z	B	69.8/29.8
C235	4030016790	S.CER ECJ0EB1C103K	B	66.4/31.4
C236	4510004630	S.ELE ECEV1CA100SR	T	73.3/20.5
C237	4030016790	S.CER ECJ0EB1C103K	T	76/29.9
C238	4550005980	S.TAN TEESVA 1A 475M8L	B	66.7/35.3
C239	4030017330	S.CER ECJ0EF1C104Z	B	68.6/33.4
C240	4030017460	S.CER ECJ0EB1E102K	B	31.2/10.9
C241	4030017460	S.CER ECJ0EB1E102K	T	50.1/37.7
C242	4030017460	S.CER ECJ0EB1E102K	B	35.9/36.2
C243	4030016930	S.CER ECJ0EB1A104K	T	24.7/10.4
C245	4030017420	S.CER ECJ0EC1H470J	T	15.3/24.3
C246	4030017420	S.CER ECJ0EC1H470J	T	13.5/24.3
C247	4030017420	S.CER ECJ0EC1H470J	T	22.7/24.8
C248	4030017420	S.CER ECJ0EC1H470J	B	22.1/24.1
C249	4030017420	S.CER ECJ0EC1H470J	B	20.6/24.9
C250	4030017420	S.CER ECJ0EC1H470J	B	19.2/24.9
C251	4030017420	S.CER ECJ0EC1H470J	T	25.8/17.7
C252	4030017910	S.CER ECJ0EB1H152K	T	26.5/31.2
C253	4030017710	S.CER ECJ0EC1H181J	T	14/16.9
C254	4030017750	S.CER ECJ0EB1E122K	T	14.8/14.9
C255	4030016930	S.CER ECJ0EB1A104K	B	16.6/13.3
C256	4030017760	S.CER ECJ0EB1H222K	T	13/18.7
C257	4030016930	S.CER ECJ0EB1A104K	T	20.7/26.6
C258	4030016930	S.CER ECJ0EB1A104K	T	21.7/26.6
C259	4030017400	S.CER ECJ0EC1H220J	B	9/23.1
C260	4030017400	S.CER ECJ0EC1H220J	B	22.1/22.8
C261	4550000460	S.TAN TEESVA 1C 105M8L	B	20.8/17.6
C262	4550000460	S.TAN TEESVA 1C 105M8L	B	20.8/15.5
C263	4030017460	S.CER ECJ0EB1E102K	T	13/21.3
C264	4550006350	S.TAN TEESVB2 1A 226M8L	B	7.2/17.1
C265	4030017460	S.CER ECJ0EB1E102K	T	26.1/21.9
C266	4030017760	S.CER ECJ0EB1H222K	T	24.8/20.6
C267	4030016790	S.CER ECJ0EB1C103K	B	23.1/12.8
C269	4030017460	S.CER ECJ0EB1E102K	B	22.4/20.2
C271	4030016930	S.CER ECJ0EB1A104K	T	26/33.5
C273	4030016930	S.CER ECJ0EB1A104K Except [USA-02], [EUR-02], [GEN-02]	B	16.2/37.1
C274	4030016930	S.CER ECJ0EB1A104K Except [USA-02], [EUR-02], [GEN-02]	B	17.6/26.7
C275	4030017490	S.CER C1608 JB 1A 105K-T Except [USA-02], [EUR-02], [GEN-02]	B	6.9/41.6
C276	4030017490	S.CER C1608 JB 1A 105K-T Except [USA-02], [EUR-02], [GEN-02]	B	11.1/41.6
C277	4030017490	S.CER C1608 JB 1A 105K-T Except [USA-02], [EUR-02], [GEN-02]	B	14.2/39.9
C279	4030017650	S.CER ECJ0EC1H270J Except [USA-02], [EUR-02], [GEN-02]	B	29.1/41.4
C280	4030017650	S.CER ECJ0EC1H270J Except [USA-02], [EUR-02], [GEN-02]	B	16.5/41.4
C281	4030016930	S.CER ECJ0EB1A104K	T	13.6/34.5

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

S.=Surface mount

[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C287	4030016930	S.CER ECJ0EB1A104K	B	24.7/30.8
C288	4030016930	S.CER ECJ0EB1A104K Except [USA-02], [EUR-02], [GEN-02]	B	20.3/31.3
C289	4030016930	S.CER ECJ0EB1A104K Except [USA-02], [EUR-02], [GEN-02]	B	19.3/32.6
C290	4030016930	S.CER ECJ0EB1A104K	T	25.9/28.6
C291	4030017460	S.CER ECJ0EB1E102K	B	54.4/15.7
C292	4030017460	S.CER ECJ0EB1E102K	B	74.6/20.1
C293	4030017460	S.CER ECJ0EB1E102K	T	78.6/24.9
C294	4030017460	S.CER ECJ0EB1E102K	B	4.7/26.2
C295	4030017460	S.CER ECJ0EB1E102K	T	70.7/25.9
C296	4030017460	S.CER ECJ0EB1E102K	T	76.5/24.9
C297	4030017460	S.CER ECJ0EB1E102K	T	77.4/23.9
C298	4030017460	S.CER ECJ0EB1E102K	T	2.8/31.8
C299	4030017460	S.CER ECJ0EB1E102K	T	2.8/32.8
C300	4030017460	S.CER ECJ0EB1E102K	T	2.8/33.8
C301	4030017460	S.CER ECJ0EB1E102K	T	2.8/30.5
C302	4030007090	S.CER C1608 CH 1H 470J-T	B	68.2/15.1
C303	4030016930	S.CER ECJ0EB1A104K	T	21.9/37.9
C304	4030016930	S.CER ECJ0EB1A104K Except [USA-02], [EUR-02], [GEN-02]	T	16.7/37.2
C305	4030017420	S.CER ECJ0EC1H470J	B	53.5/41.5
C306	4030017460	S.CER ECJ0EB1E102K	T	31/37.6
C307	4030016930	S.CER ECJ0EB1A104K	T	76/27.7
C308	4030017530	S.CER ECJ0EC1H0R5B	B	57.4/12
J1	6510023520	S.CNR 54104-3692	T	7.4/25.2
F1	5210000830	S.FUS ERBFE3R00U Except [USA-88], [EUR-88]	T	76/26.2
F1	5210000900	S.FUS 0434003.NRP [USA-88], [EUR-88]	T	76/26.2
S1	2260002750	S.SW EVQP7M01K	T	81.2/24
EP1	6910015370	S.BEA ACZ1005Y-102-T	T	45.7/23
EP2	6910012350	S.BEA MMZ1608Y 102BT	T	66.4/24.6
EP3	6910015370	S.BEA ACZ1005Y-102-T	B	25.4/34.4
EP4	6910015600	S.BEA ACZ1005Y-241 (240 Ω)	T	24.2/16.7
EP5	6910015600	S.BEA ACZ1005Y-241 (240 Ω)	T	13.5/20
EP6	6910015370	S.BEA ACZ1005Y-102-T	B	28/29.4

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
IC401	1140011780	S.IC HD6432264F01TF Except [USA-02], [USA-02], [EUR-02], [GEN-02]	T	22.9/28
IC403	1110005340	S.IC NJM12902V-TE1	T	19.2/43.2
IC405	1110001810	S.IC TA7368F (ER)	T	25.9/53.3
IC406	1130011740	S.IC TC7W66FK (TE85L)	T	7.2/42.3
IC407	1110005330	S.IC NJM12904V-TE1	T	7.1/31.3
IC408	1110006260	S.IC BD5242G-TR	T	30.4/18.5
IC409	1130011580	S.IC 24LC64T-I/SN	T	8.8/17.8
IC410	1130007570	S.IC BU4094BCFV-E2	T	40.6/37.3
Q401	1520000450	S.TR 2SB1132 T100 Q	T	35.1/44.8
Q402	1590001190	S.TR XP6501-(TX) AB	T	34.2/40.7
Q403	1530002840	S.TR 2SC4116-Y (TE85R)	B	10.8/57
Q404	1560001330	S.FET RSR025N03	B	11.6/59.9
Q405	1560001330	S.FET RSR025N03	B	15.1/59.9
Q406	1590000430	S.TR DTC144EUA T106	B	15.6/57
Q407	1590000720	S.TR DTA144EUA T106	T	42.6/30.6
Q408	1590000430	S.TR DTC144EUA T106	T	26.5/39.1
Q409	1590002370	S.TR XP4111 (TX)	T	39.8/30.8
Q411	1590001660	S.TR XP4312 (TX)	T	27.4/18.6
Q412	1590000720	S.TR DTA144EUA T106	T	13/17.6
Q413	1560001330	S.FET RSR025N03	B	32.3/53
D401	1790001250	S.DIO MA2S111-(TX)	T	15.9/17.2
D402	1790001250	S.DIO MA2S111-(TX)	T	17.8/17.4
D403	1790001250	S.DIO MA2S111-(TX)	T	13.1/15.7
D404	1790001260	S.DIO MA2S077-(TX)	T	34.7/18.6
D406	1790001250	S.DIO MA2S111-(TX)	T	36.5/36.9
X401	6050011720	S.XTL CR-764 (19.6608 MHz)	T	42.1/18.8
R401	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ) [EUR-88] only	T	9/43.2
R402	7030005060	S.RES ERJ2GEJ 333 X (33 kΩ)	T	11.6/51.8

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
R403	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	T	16/18.4
R404	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	T	19/19.6
R405	7030007340	S.RES ERJ2GEJ 153 X (15 kΩ)	T	6/36.6
R406	7030005210	S.RES ERJ2GEJ 822 X (8.2 kΩ)	T	6/37.6
R407	7030005230	S.RES ERJ2GEJ 334 X (330 kΩ)	T	6.5/26.3
R408	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	6/35.6
R409	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	16/19.4
R410	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	9.4/38.8
R411	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	11.3/24.3
R412	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	28/14.2
R413	7030005600	S.RES ERJ2GEJ 273 X (27 kΩ)	T	26/14.2
R414	7030005600	S.RES ERJ2GEJ 273 X (27 kΩ)	T	33.9/14.3
R415	7030005100	S.RES ERJ2GEJ 154 X (150 kΩ)	T	37.9/23
R416	7030005100	S.RES ERJ2GEJ 154 X (150 kΩ)	T	31.2/21
R417	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	T	16/14.9
R418	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	T	5/15
R420	7030005600	S.RES ERJ2GEJ 273 X (27 kΩ)	T	28.8/37.7
R421	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	30.1/38
R422	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	30/37
R423	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	31.7/37
R426	7030005230	S.RES ERJ2GEJ 334 X (330 kΩ)	T	14.7/37.7
R427	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	T	16/39.9
R428	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	T	16/38.9
R429	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	T	13.7/38.1
R430	7030007350	S.RES ERJ2GEJ 393 X (39 kΩ)	T	12.7/40.6
R432	7030005720	S.RES ERJ2GEJ 563 X (56 kΩ)	T	13.7/40.6
R433	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	11.7/40.6
R434	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	B	35/56.5
R435	7030007260	S.RES ERJ2GEJ 330 X (33 Ω)	T	22.6/56.2
R436	7030005530	S.RES ERJ2GEJ 100 X (10 Ω)	T	24.4/49.8
R437	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	T	31.7/41.4
R438	7030007300	S.RES ERJ2GEJ 332 X (3.3 kΩ)	T	31.7/39.4
R439	7030009140	S.RES ERJ2GEJ 272 X (2.7 kΩ)	T	34.6/38.9
R440	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	42.8/32.7
R441	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	37.3/35.5
R442	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	B	12.7/57.3
R443	7030005170	S.RES ERJ2GEJ 474 X (470 kΩ)	B	11.4/55.2
R444	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	13.7/57.3
R445	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	B	32.3/55.2
R446	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	B	30.1/52.1
R455	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	T	43.2/27.8
R456	7030004980	S.RES ERJ2GEJ 101 X (100 Ω)	T	43.2/28.8
R457	7030005000	S.RES ERJ2GEJ 471 X (470 Ω)	B	45.2/48.4
R458	7030005120	S.RES ERJ2GEJ 102 X (1 kΩ)	B	43.9/49.9
R461	7030008300	S.RES ERJ2GEJ 184 X (180 kΩ)	T	33.1/33.6
R462	7030005720	S.RES ERJ2GEJ 563 X (56 kΩ)	T	32.1/33.6
R463	7030005220	S.RES ERJ2GEJ 223 X (22 kΩ)	T	31.1/33.6
R464	7030005220	S.RES ERJ2GEJ 223 X (22 kΩ)	T	32.1/35.2
R465	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	31.1/35.2
R466	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	T	26.6/41.4
R467	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	T	25.6/41.4
R468	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	T	23.6/41.4
R469	7030005040	S.RES ERJ2GEJ 472 X (4.7 kΩ)	T	18.9/39
R470	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	T	20.1/38.7
R471	7030005110	S.RES ERJ2GEJ 224 X (220 kΩ)	T	34.6/24.3
R472	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	33.6/24.3
R473	7030005240	S.RES ERJ2GEJ 473 X (47 kΩ)	T	32.6/24.3
R474	7030005220	S.RES ERJ2GEJ 223 X (22 kΩ)	T	31.6/24.3
R475	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	35.6/24.3
R476	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	27.2/45.2
R477	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	25.2/45.2
R478	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	23.9/44.8
R479	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	18.6/47.9
R480	7030005070	S.RES ERJ2GEJ 683 X (68 kΩ)	T	17/46.9
R482	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	37.2/34.1
R483	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	16/21.4
R484	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	16/20.4
R485	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	11.1/22.7
R486	7410001130	S.ARY EXB28V102JX	T	13.6/24.7
R487	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	33.5/23
R488	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	31.9/31.3
R489	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	32.9/31.3
R490	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	33.9/31.3
R491	7030005530	S.RES ERJ2GEJ 100 X (10 Ω)	T	37.3/17.5
R492	7030005160	S.RES ERJ2GEJ 105 X (1 MΩ)	T	37.3/18.5
R493	7030008010	S.RES ERJ2GEJ 123 X (12 kΩ)	T	35.9/18.8
R494	7030008010	S.RES ERJ2GEJ 123 X (12 kΩ)	T	33.6/18.3
R495	7030008010	S.RES ERJ2GEJ 123 X (12 kΩ)	T	36.9/20.8
R496	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	8/23
R497	7030005050	S.RES ERJ2GEJ 103 X (10 kΩ)	T	11.3/25.3
R500	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	28.7/20.6
R501	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	29.3/16
R502	7030010080	S.RES ERJ2RHD 104 X (100 kΩ)	T	36.9/14.3
R503	7030010080	S.RES ERJ2RHD 104 X (100 kΩ)	T	38.9/14.3
R506	7030007300	S.RES ERJ2GEJ 332 X (3.3 kΩ)	T	8.8/25.5
R507	7030005600	S.RES ERJ2GEJ 273 X (27 kΩ)	T	7.8/25.5
R508	7030007290	S.RES ERJ2GEJ 222 X (2.2 kΩ)	T	5.3/22
R509	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	25.1/18
R511	7030005700	S.RES ERJ2GEJ 274 X (270 kΩ)	T	7.8/35.6
R512	7030005090	S.RES ERJ2GEJ 104 X (100 kΩ)	T	5.2/25.8
R513	7030009290	S.RES ERJ2GEJ 562 X (5.6 kΩ)	T	5.4/39.8
R514	7030010040	S.RES ERJ2GE-JPW	T	7.4/48.6
C401	4030017460	S.CER ECJ0EB1E102K	T	10.6/51.8

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

S.=Surface mount

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
C402	4030017460	S.CER ECJ0EB1E102K	T	13.6/19.4
C403	4030017460	S.CER ECJ0EB1E102K	T	18/19.6
C404	4030017460	S.CER ECJ0EB1E102K	T	9.3/41.3
C405	4030017760	S.CER ECJ0EB1H222K	T	7.8/36.6
C406	4030018110	S.CER ECJ0EB1H272K	T	6/38.6
C407	4030017430	S.CER ECJ0EC1H101J	T	6.5/25.3
C408	4030016930	S.CER ECJ0EB1A104K	T	28.7/39.9
C409	4030016930	S.CER ECJ0EB1A104K	T	27.5/37.3
C410	4030016930	S.CER ECJ0EB1A104K	T	29.8/39.9
C411	4030016930	S.CER ECJ0EB1A104K	T	31.7/38
C412	4030016930	S.CER ECJ0EB1A104K	T	35.9/20.8
C413	4030016930	S.CER ECJ0EB1A104K Except [USA-02], [USA-02], [EUR-02], [GEN-02]	T	34.9/20.8
C414	4030017640	S.CER ECJ0EC1H150J	T	37.3/19.5
C415	4030016790	S.CER ECJ0EB1C103K	T	30.2/21
C416	4030017630	S.CER ECJ0EC1H120J	T	38.9/18.8
C417	4030017580	S.CER ECJ0EC1H060C	T	38.9/20.8
C418	4030016930	S.CER ECJ0EB1A104K	T	33/16
C419	4550006250	S.TAN TEESVA 1A 106M8L	T	23.7/16.4
C420	4030016930	S.CER ECJ0EB1A104K	T	23.4/18
C421	4030016930	S.CER ECJ0EB1A104K	T	16/37.9
C423	4030016930	S.CER ECJ0EB1A104K	T	12.7/39
C424	4030017460	S.CER ECJ0EB1E102K	T	30.3/54.8
C425	4030017730	S.CER ECJ0EB1E471K	T	14.7/40.6
C426	4030017460	S.CER ECJ0EB1E102K	B	35.5/55.2
C427	4550006080	S.TAN TEESVB2 1C 106M8L	T	40.4/45.9
C428	4030016930	S.CER ECJ0EB1A104K	T	36.9/47.5
C429	4030017460	S.CER ECJ0EB1E102K	T	33.7/48.3
C430	4030017460	S.CER ECJ0EB1E102K	T	31.7/40.4
C431	4030016930	S.CER ECJ0EB1A104K	T	34.3/37.9
C432	4030017460	S.CER ECJ0EB1E102K	T	39.1/43.2
C433	4030017420	S.CER ECJ0EC1H470J	B	25.2/53.3
C434	4550006250	S.TAN TEESVA 1A 106M8L	T	20.7/54.1
C435	4550007060	S.TAN ECSTIAX336R	T	17.8/54.8
C436	4030016950	S.CER ECJ0EB1A473K	T	26.2/49.8
C437	4030017490	S.CER C1608 JB 1A 105K-T	B	33.8/56
C441	4030016780	S.CER ECJ0EB1C153K	T	25.7/42.7
C442	4030016930	S.CER ECJ0EB1A104K	T	24.6/41.4
C443	4030017740	S.CER ECJ0EB1E821K	T	23.9/42.7
C444	4030016930	S.CER ECJ0EB1A104K	T	20.1/39.7
C445	4030017460	S.CER ECJ0EB1E102K	T	33.1/35.2
C446	4030017460	S.CER ECJ0EB1E102K	T	26.2/45.2
C447	4030017760	S.CER ECJ0EB1H222K	T	23.9/45.8
C448	4030017690	S.CER ECJ0EC1H121J	T	25.7/43.8
C449	4030017770	S.CER ECJ0EB1E332K	T	18.6/46.9
C450	4030017420	S.CER ECJ0EC1H470J	T	17/47.9
C461	4030017420	S.CER ECJ0EC1H470J	T	38.9/23
C462	4030017420	S.CER ECJ0EC1H470J	T	32.2/21
C463	4030017420	S.CER ECJ0EC1H470J	T	16/16
C464	4030017420	S.CER ECJ0EC1H470J	T	4/15
C465	4030017420	S.CER ECJ0EC1H470J	T	27/14.2
C466	4030017420	S.CER ECJ0EC1H470J	T	34.9/14.3
C467	4030017420	S.CER ECJ0EC1H470J	T	29.3/14.7
C468	4030017420	S.CER ECJ0EC1H470J	T	35.9/14.3
C473	4030016790	S.CER ECJ0EB1C103K	T	37.9/14.3
C474	4030017490	S.CER C1608 JB 1A 105K-T	T	5.7/23.1
C475	4030017460	S.CER ECJ0EB1E102K	T	8.9/55.3
C476	4030017460	S.CER ECJ0EB1E102K	T	10.1/47.6
C477	4030017460	S.CER ECJ0EB1E102K	T	12.7/36.4
C478	4030017460	S.CER ECJ0EB1E102K	T	13.7/36.4
C479	4030017460	S.CER ECJ0EB1E102K	T	19.2/16.5
C481	4030017460	S.CER ECJ0EB1E102K	T	4.4/35.6
C482	4030017460	S.CER ECJ0EB1E102K	T	11.5/37.7
C483	4030017460	S.CER ECJ0EB1E102K	T	38.1/43.4
C484	4030017460	S.CER ECJ0EB1E102K	B	14.7/55.2
C485	4030017460	S.CER ECJ0EB1E102K	B	7.3/58
C486	4030017460	S.CER ECJ0EB1E102K	T	10.1/56.5
C487	4030017460	S.CER ECJ0EB1E102K	T	34.3/36.9
C488	4030017460	S.CER ECJ0EB1E102K	T	23.9/43.7
C489	4030017460	S.CER ECJ0EB1E102K	T	8.5/27.1
C490	4030017460	S.CER ECJ0EB1E102K	T	41.2/28.6
C491	4030017460	S.CER ECJ0EB1E102K	T	37.3/38.8
C492	4030017460	S.CER ECJ0EB1E102K	T	8/22
C493	4030016930	S.CER ECJ0EB1A104K	T	16.9/34.7
C494	4030017460	S.CER ECJ0EB1E102K	T	39.6/67.3
C495	4030017460	S.CER ECJ0EB1E102K	T	9.4/39.8
C496	4550007060	S.TAN ECSTIAX336R	T	14.5/54.8
C497	4030016790	S.CER ECJ0EB1C103K	T	5.4/41.5
C498	4030017430	S.CER ECJ0EC1H101J	T	7.8/37.6
C499	4030017420	S.CER ECJ0EC1H470J	T	17.6/39.7
C500	4030016930	S.CER ECJ0EB1A104K	B	4.1/39
J401	6510023520	S.CNR 54104-3692	T	27.8/6.8
J402	6510023830	S.CNR SM04B-SRSS-TB	T	34.9/52.5
DS401	5030002730	LCD L3-0048TAY-5 [USA-88], [EUR-88] only		
DS402	5040002420	S.LED SML-310MT T86	B	13.5/16.1
DS403	5040002420	S.LED SML-310MT T86	B	32.7/15.3
DS404	5040002960	S.LED SML-A12MT T86	B	6.4/38
DS405	5040002960	S.LED SML-A12MT T86	B	42.6/38

[FRONT UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
DS406	5040002670	S.LED CL-165HR/YG	B	45.3/50.2
MC401	7700002480	MIC SKB-2746 LPC		
S401	2260002840	SW SKHLLFA010		
SP401	2510001092	SP 036D0801B <FG>		
W401	8900011880	CBL OPC-1210 (P=0.5 N=36 L=70)		
W402	7120000470	JMP ERDS2T0		
W403	7120000470	JMP ERDS2T0		
EP402	8930061530	LCT SRCN-2681-SP-N-W		

[CONNECTOR UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
D701	1790001810	S.VSR AVR-M1005C080MTABB	B	8/2.4
D702	1790001810	S.VSR AVR-M1005C080MTABB	B	8/3.4
D703	1790001810	S.VSR AVR-M1005C080MTABB	B	8/4.4
D704	1790001810	S.VSR AVR-M1005C080MTABB	T	9.6/6.1
D705	1790001810	S.VSR AVR-M1005C080MTABB	B	9.7/18.9
R701	7410001130	S.ARY EXB28V102JX	T	8/4.8
C701	4030017460	S.CER ECJ0EB1E102K	B	9.7/9.4
C702	4030017460	S.CER ECJ0EB1E102K	B	9.7/12.2
C703	4030017460	S.CER ECJ0EB1E102K	B	9.7/15.3
C704	4030017460	S.CER ECJ0EB1E102K	B	7.9/19.7
EP701	6910012350	S.BEA MMZ1608Y 102BT	B	8.2/8.6
EP702	6910012350	S.BEA MMZ1608Y 102BT	B	8.2/11.6
EP703	6910012350	S.BEA MMZ1608Y 102BT	B	8.2/14.6
EP704	6910012350	S.BEA MMZ1608Y 102BT	B	8.5/17.2
EP705	6910012350	S.BEA MMZ1608Y 102BT	B	9.8/17.2

[VR UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
R601	7210003130	VAR TP76N97N-13F-10KA-2497		
W601	8900012340	CBL OPC-1260		

[CHASSIS UNIT]

REF NO.	ORDER NO.	DESCRIPTION	M.	H/V LOCATION
J1	6910014700	CNR 2600 ANT CONNECTOR		

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

SECTION 7 MECHANICAL PARTS AND DISASSEMBLY

7-1 CABINET PARTS

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP4	8510015670	2681 shield plate	1

[CHASSIS PARTS]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
J1	6910014700	2600 ant connector	1
MP1	8010019290	2681 chassis	1
MP2	8950005511	2403 contact spring -1	1
MP3	8930058561	2403 A-main seal-1	1
MP4	8930059800	2600 pet sheet	1
MP5	8930059830	2600 sheet	1
MP6	8930051500	O ring (AB)	1
MP7	8930055870	O ring (AO)	1
MP8	8930058550	O ring (AS)	1
MP9	8830001600	Screw nut (L)	1
MP10	8830001470	VR nut (N)	1
MP11	8850001880	Sealing washer (W)	2
MP12	8810009510	Screw B0 2 x 4 NI-ZU (BT)	7
MP13	8810007890	Screw B0 2 x 4 SUS	1
MP14	8810010120	Screw B0 2 x 8 SUS ZK	2
MP15	8810010190	Screw M2 x 4 SUS ZK	3

[FRONT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
DS401	5030002630	L3-0048TAY-2	1
EP402	8930061530	SRCN-2681-SP-N-W	2
SP401	2510001092	036D0801B	1
W401	8900011880	OPC-1210	1
MP401	8210019860	2681 front panel	1
MP404	8930060540	2681 4-2 Key board	1
MP405	8210019880	2681 PTT button	1
MP406	8930060550	2681 PTT Plate	1
MP407	8930060710	2681 PTT rubber	1
MP408	8310059540	2681 LCD plate	1
MP410	8210019890	2681 Reflector	1
MP411	8310059530	2681 window plate	1
MP412	8930060860	2681 window sheet	1
MP413	8930059360	2600 release button	1
MP414	8930055761	2403 release plate	1
MP415	8930056540	Spring (AH)	2
MP417	8930055730	2403 connector seal	1
MP418	8930055890	2403 connector sheet	1
MP419	8930056430	2403 9-pin sheet	1
MP421	8610011380	Knob N-313	1
MP423	8930061110	2681 mic tape	1
MP424	8810009510	Screw B0 2 x 4 NI-ZU (BT)	4
MP426	8930061200	2681 mic rubber	1
MP429	8930062240	Sponge (HM)	1

[VR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
R601	7210003130	TP76N97N-13F-10KA-2497	1

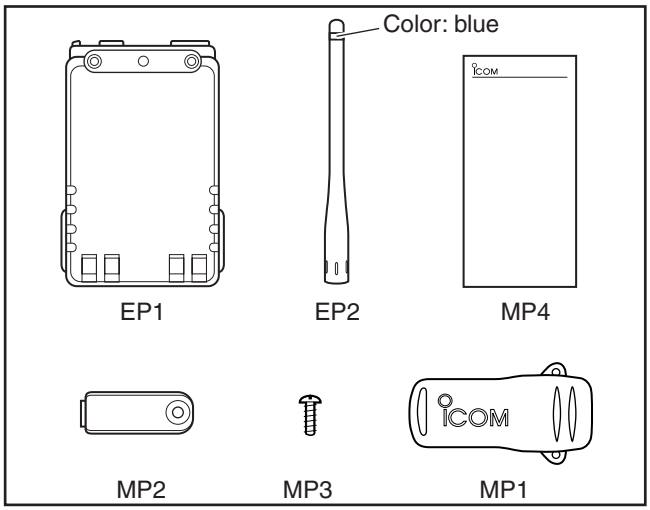
[CONNECTOR UNIT]

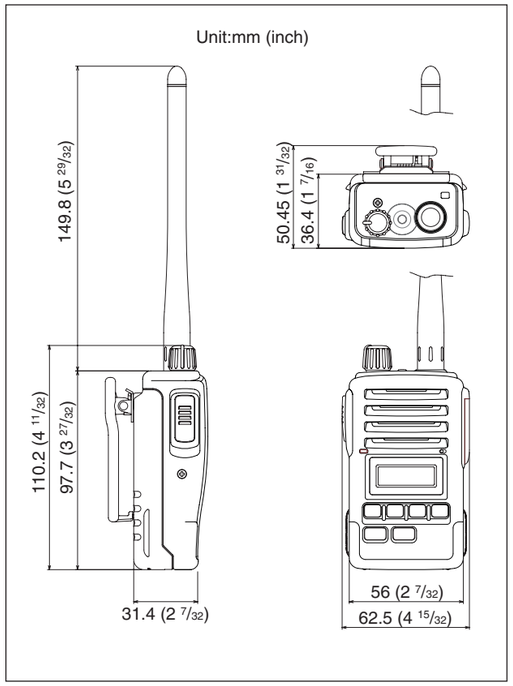
REF. NO.	ORDER NO.	DESCRIPTION	QTY.
MP701	8950005520	2403 9-pin connector	1

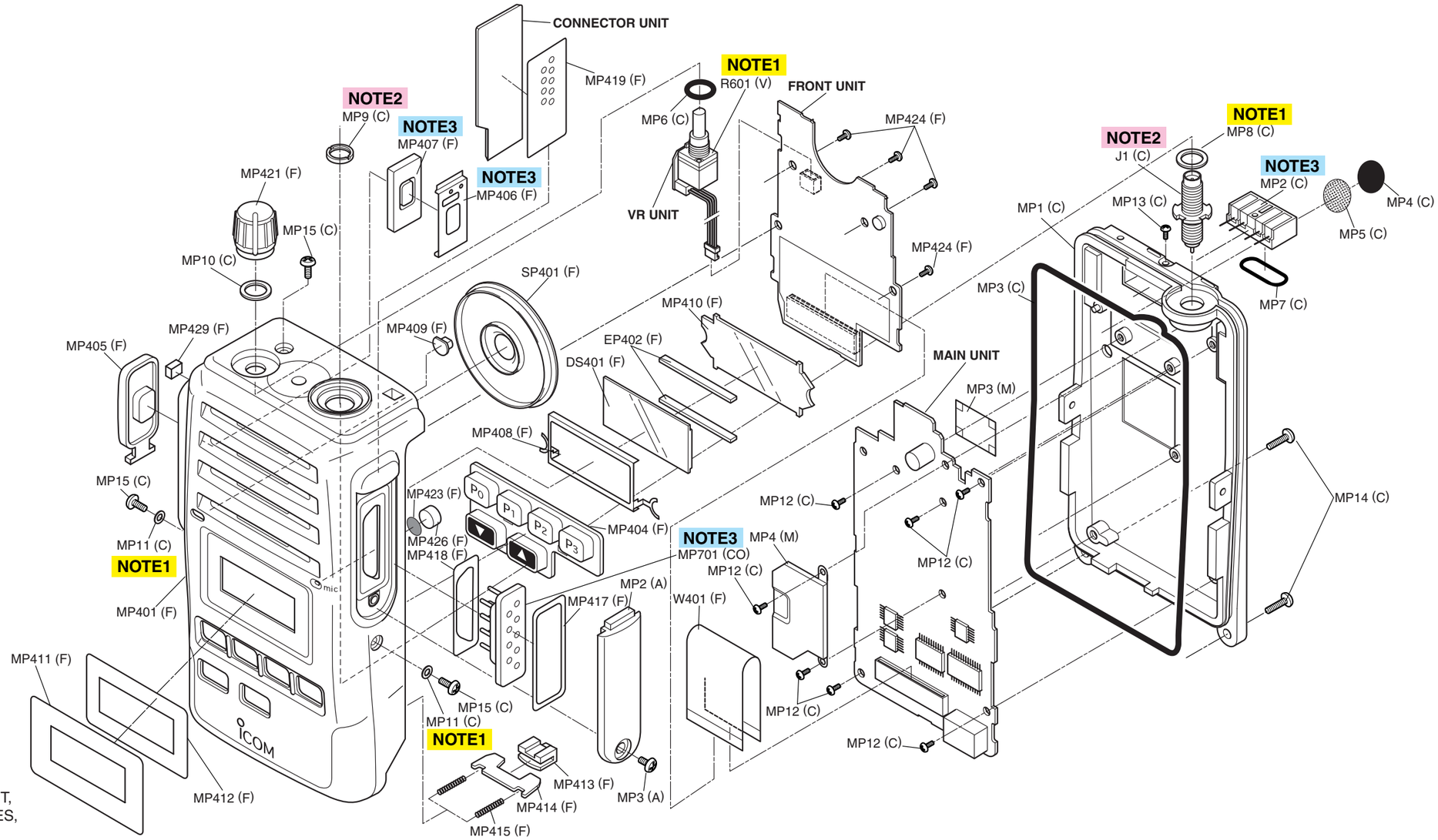
Screw abbreviations B0, BT: Self-tapping
ZK: Black
SUS: Stainless
NI-ZU: Nickel-zinc

[ACCESSORIES]

REF. NO.	ORDER NO.	DESCRIPTION	QTY.
EP1	0800006730	Battery BP-227	1
EP2	3310003020	Antenna FA-S59V ACC	1
MP1	8930061480	Clip MB-98 ACC	1
MP2	8210017071	2337 C-PANEL-1	1
MP3	8810009270	Screw M3 x 4 SUS ZK	1
MP4	8310060530	2681 key-sticker	1







UNIT abbreviations (C): CHASSIS PARTS, (M): MAIN UNIT, (CO): CONNECTOR UNIT, (V): VR UNIT, (A): ACCESSORIES, (F): FRONT UNIT

NOTE1 : Once the following parts are removed, an O ring or sealing washer must be replaced with new one before reattachement.

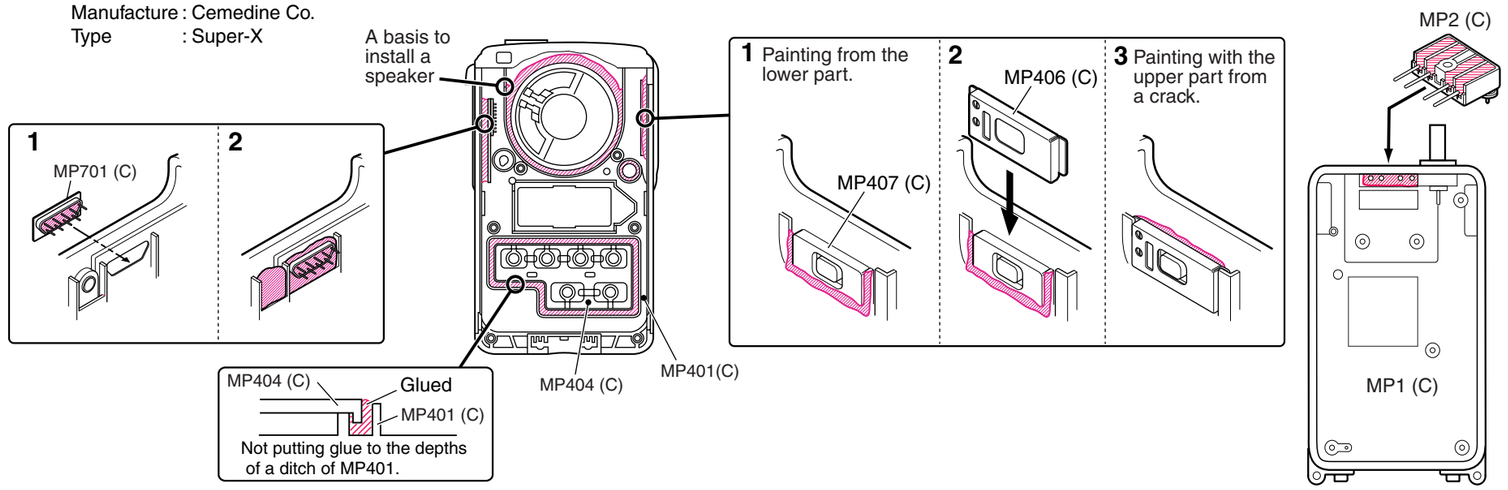
REF. NO.	Mother parts	Daughter parts for relayted replacement
MP8 (C)	2600 ant connector (J1)	O ring
MP11 (C)	MP15 (C) Screw	Sealing washer (W)
MP6 (C)	S1 (C) Encoder	O ring (AB)

NOTE2

Apply a screw lock in the conclusion with J1 (C) and MP9 (C).
Reference No. : 89500001350
Reference Name : Screw lock 1401B

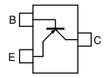
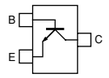
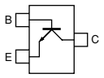
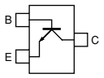
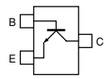
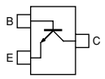
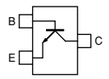
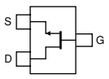
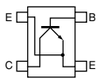
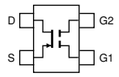
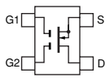
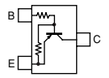
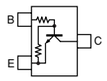
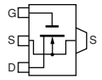
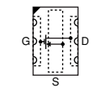
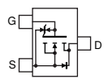
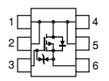
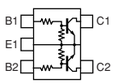
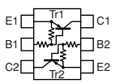
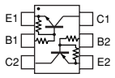
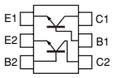
NOTE3 The glue must be applied to the ▨ areas when the front panel is replaced with new one, to ensure water tightness.

Manufacture : Cemedine Co.
Type : Super-X



SECTION 8 SEMICONDUCTOR INFORMATION

• TRANSISTOR AND FET'S

2SA1577 Q (Symbol: HP) 	**2SB1132 Q** (Symbol: BAQ) 	**2SC4116 BL** (Symbol: LL) 	**2SC4116 Y** (Symbol: LY) 	**2SC4215 O** (Symbol: QO) 
2SC4226 R25 (Symbol: R25) 	**2SC5107 O** (Symbol: MFO) 	**2SC5110 O** (Symbol: MGO) 	**2SK880 Y** (Symbol: XY) 	**2SK1829** (Symbol: K1) 
3SK293 (Symbol: UF) 	**3SK299** (Symbol: U73) 	**DTA144 EU** (Symbol: 16) 	**DTC144EU** (Symbol: 26) 	**RD01MUS1** (Symbol: K2) 
RD07MVS1 (Symbol: RD07MVS1) 	**RSR025N03** (Symbol: QY) 	**TPC6103** (Symbol: S3C) 	**XP1214** (Symbol: 9H) 	**XP4111** (Symbol: 9U) 
XP4312 (Symbol: 7T) 	**XP6501 AB** (Symbol: 5N) 			

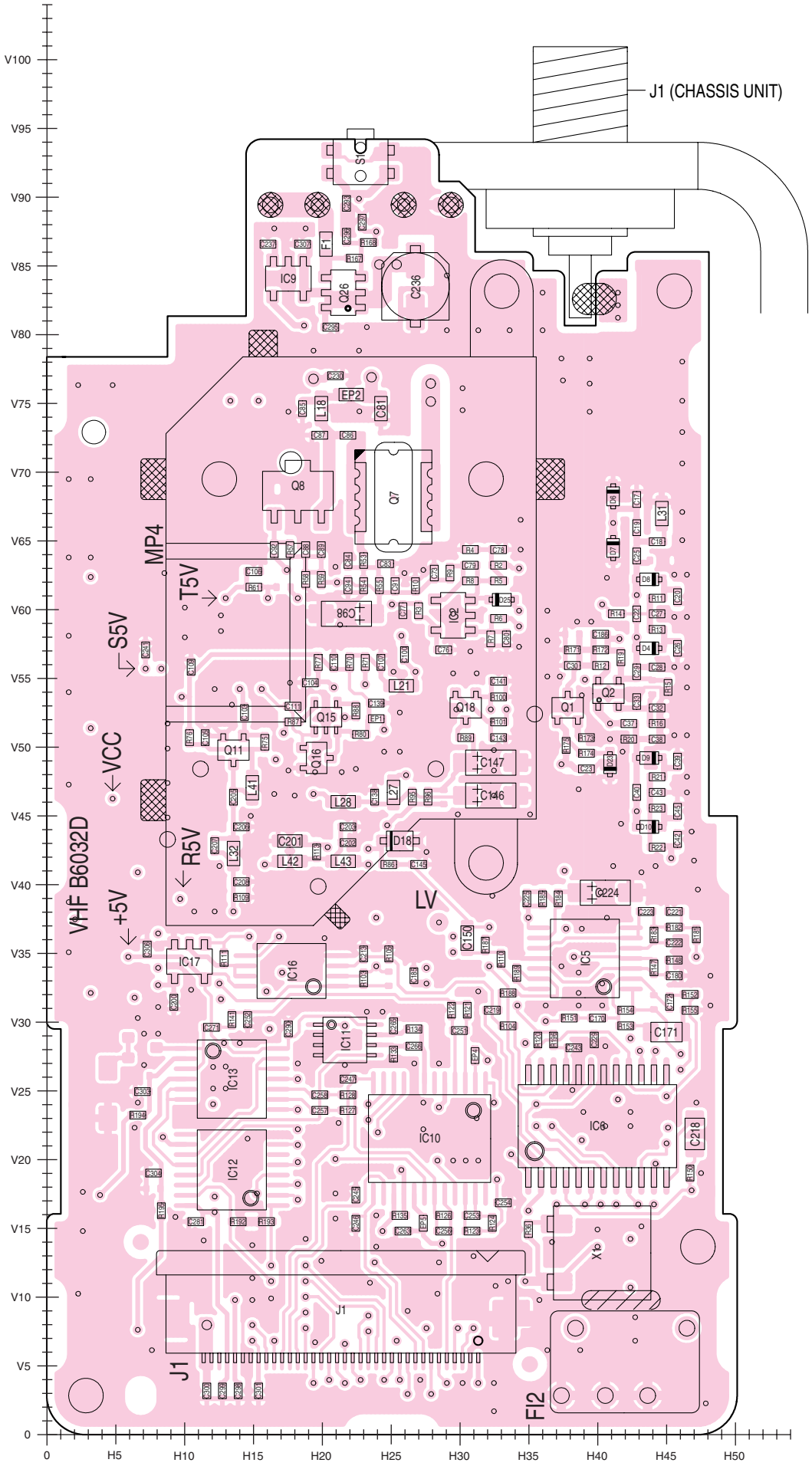
• DIODES

1SV239 (Symbol: TC) 	**1SV307** (Symbol: TX) 	**HVC350B** (Symbol: B0) 	**HVC375B** (Symbol: B8) 	**HVC376B** (Symbol: B9) 
MA2S077 (Symbol: S) 	**MA2S111** (Symbol: A) 	**MA2S728** (Symbol: B) 	**RB706F- 40** (Symbol: 3J) 	

SECTION 9 BOARD LAYOUTS

9-1 MAIN UNIT

- **TOP VIEW**



J1
to the FRONT unit J401

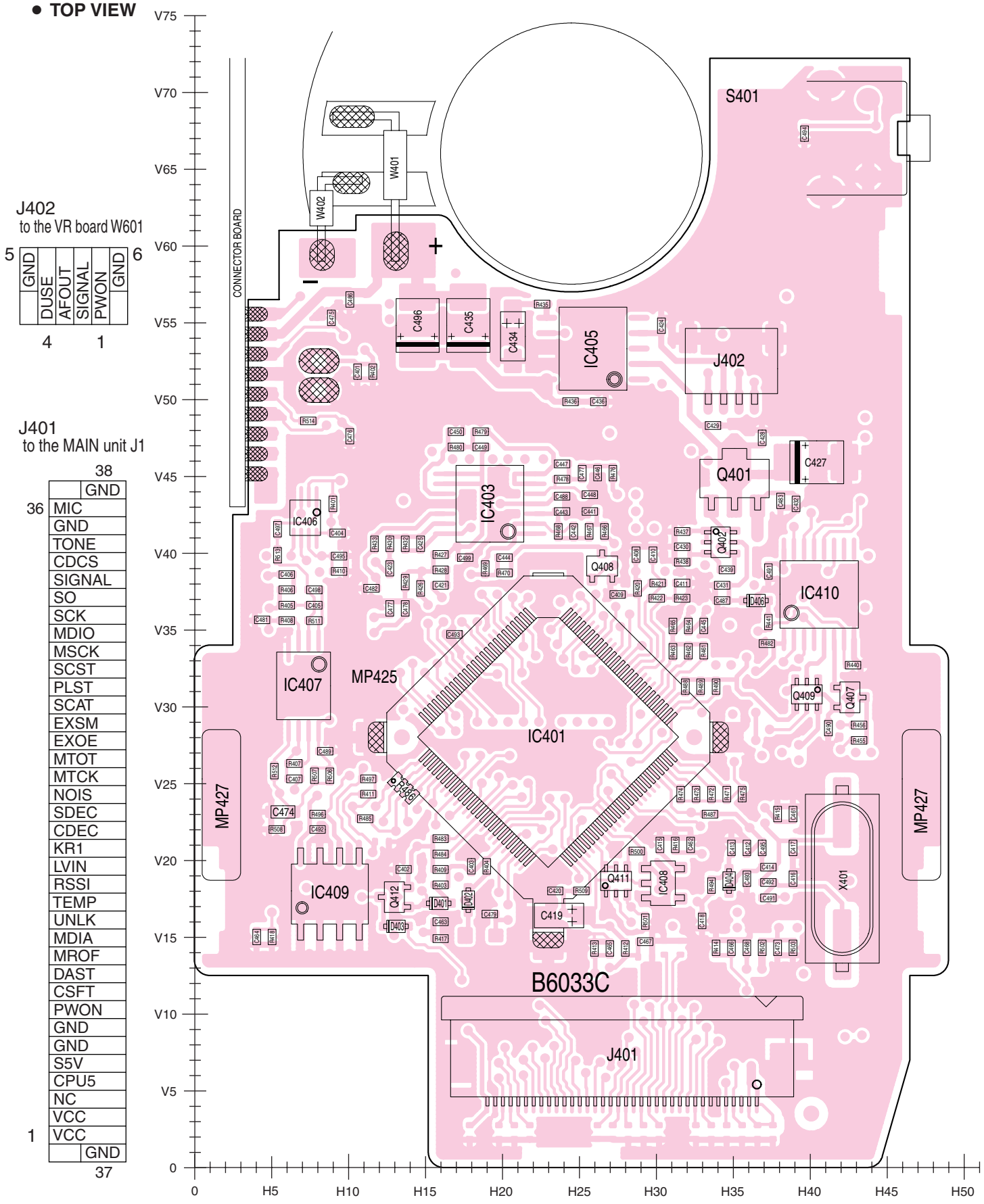
	38	
	GND	
36	VCC	
	VCC	
	NC	
	+5V	
	S5V	
	GND	
	GND	
	PWON	
	CSFT	
	DAST	
	MROF	
	MDIA	
	UNLK	
	TEMP	
	RSSI	
	LVIN	
	KR1	
	CDEC	
	SDEC	
	NOIS	
	MTCK	
	MTOT	
	EXOE	
	EXSM	
	SCAT	
	PLST	
	SCST	
	MSCK	
	MDIO	
	SCK	
	SO	
	SIGNAL	
	CDCS	
	TONE	
	GND	
1	MIC	
	GND	
	37	

● **BOTTOM VIEW**

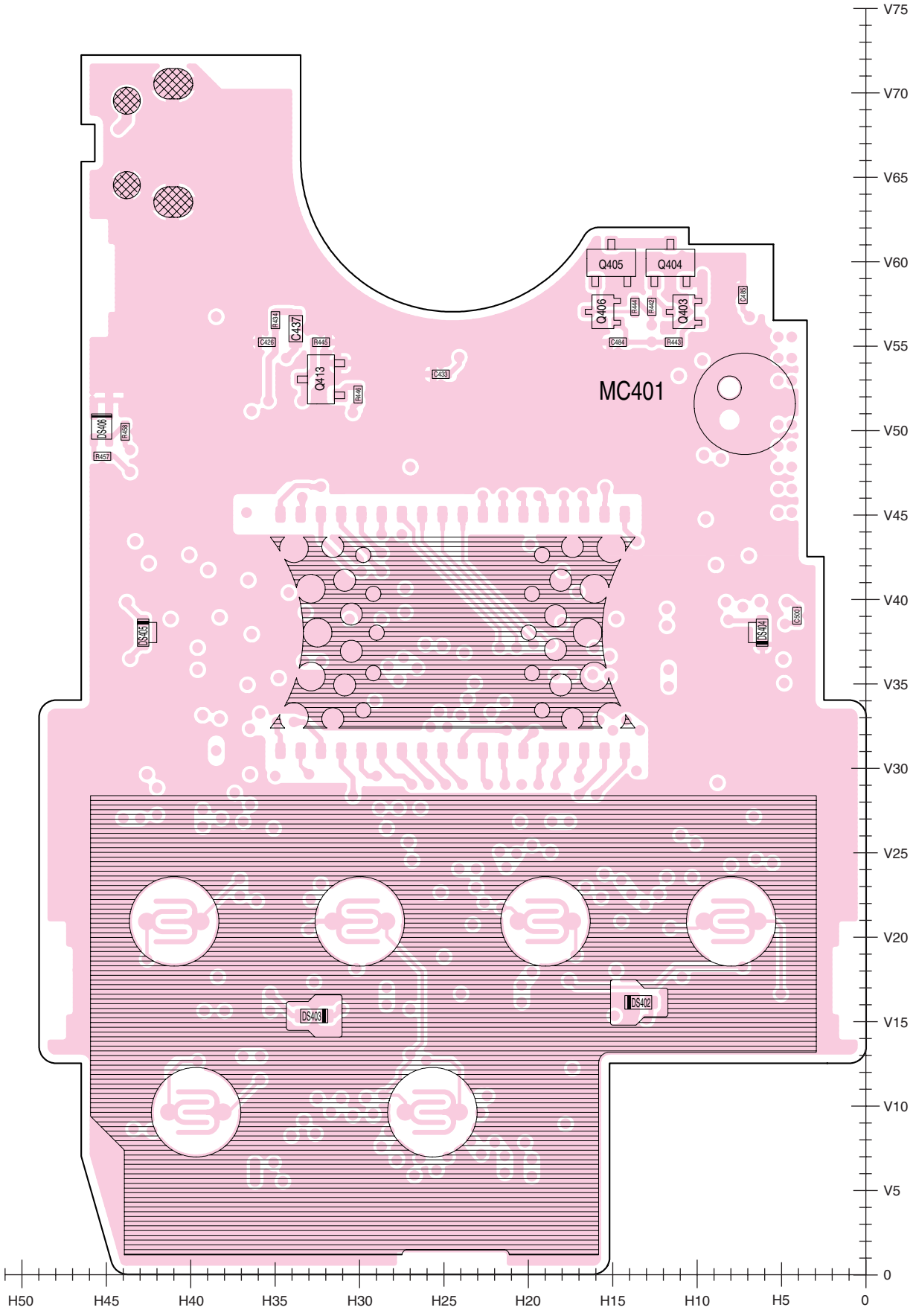

V100
V95
V90
V85
V80
V75
V70
V65
V60
V55
V50
V45
V40
V35
V30
V25
V20
V15
V10
V5
0
H50
H45
H40
H35
H30
H25
H20
H15
H10
H5
0
MP1
MP2
MP5
IC1
IC4
IC7
IC14
IC15
X2
X3
X4
Q23
Q24
Q25
Q29
Q9
Q21
Q10
Q12
Q43
Q14
Q17
Q3
Q4
Q19
Q22
Q27
L20
L17
L16
L4
L1
L2
L3
L5
L6
L15
L7
L8
L9
L11
L12
L13
L19
L22
L24
L25
L26
L37
L38
L39
L35
L33
C233
C238
C148
C149
C211
C262
C261
C264
C75
C277
C276
C275
D1
D2
D5
D6
D14
D15
D17
D24
FI1

9-2 FRONT UNIT

- **TOP VIEW**

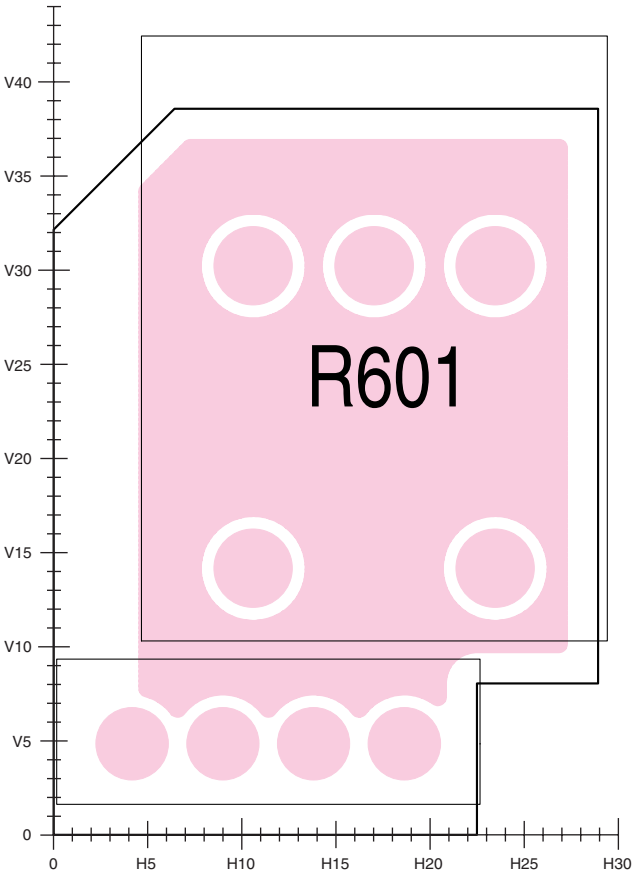


● **BOTTOM VIEW**

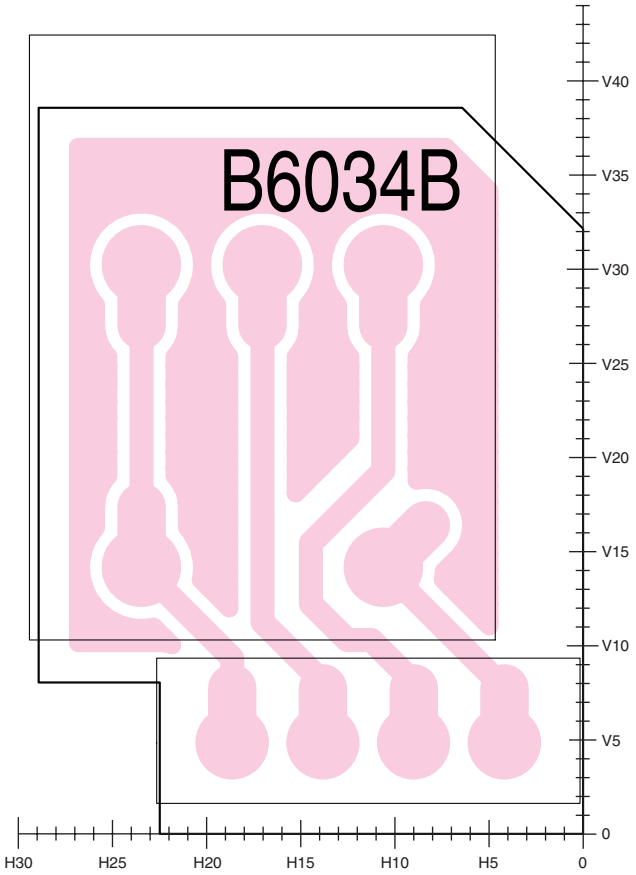

MC401
Q405
Q404
Q406
Q403
Q413
C437
C426
R445
R434
C433
R446
C484
R443
C485
R444
R449
DS406
R458
R457
DS405
DS404
C500
DS403
DS402
V75
V70
V65
V60
V55
V50
V45
V40
V35
V30
V25
V20
V15
V10
V5
0
H50
H45
H40
H35
H30
H25
H20
H15
H10
H5
0

9-3 VR UNIT

- **TOP VIEW**



- **BOTTOM VIEW**



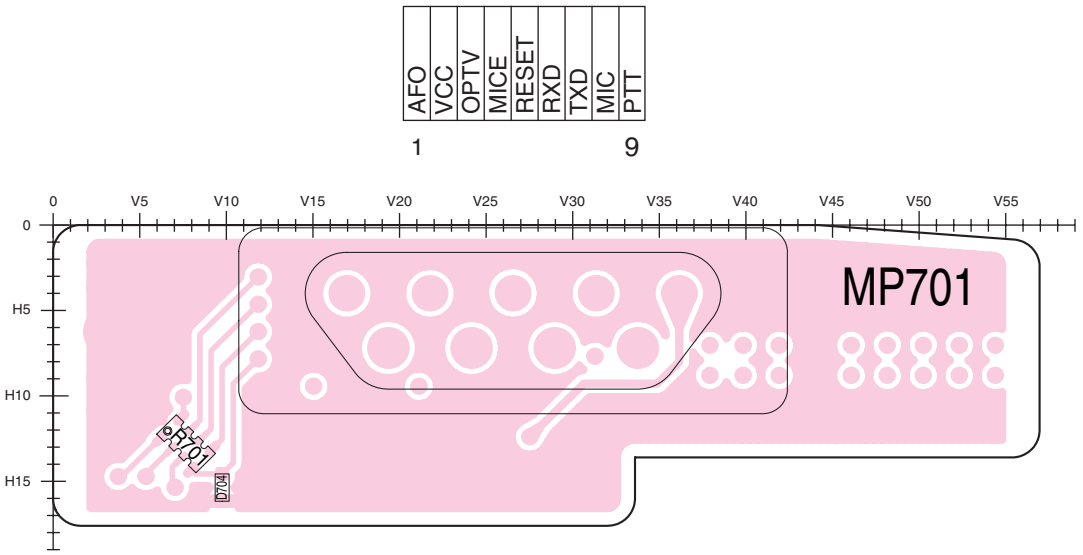
W601
to the FRONT UNIT J402

DUSE	AFOUT	AFON	PWON

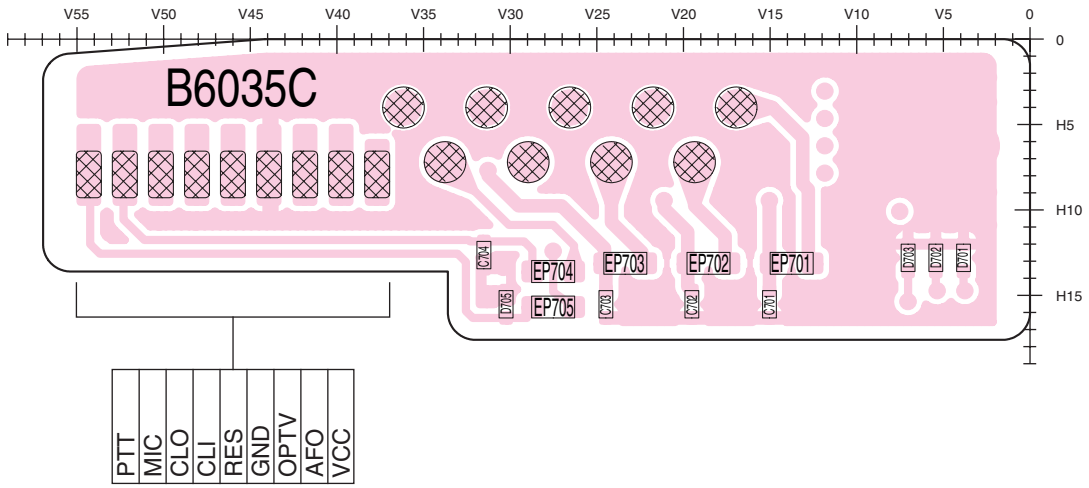
4 1

9-4 CONNECTOR UNIT

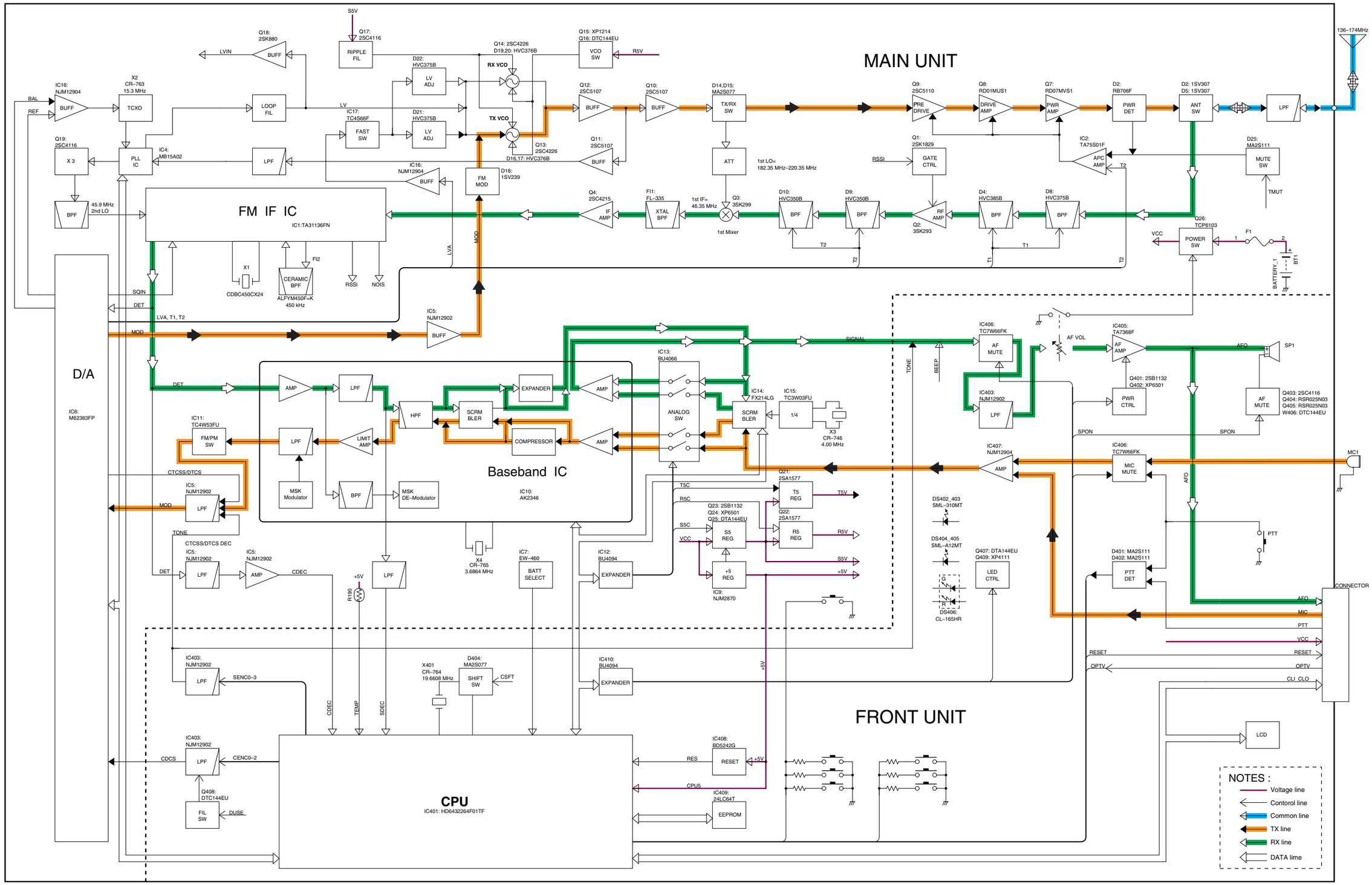
- **TOP VIEW**



- **BOTTOM VIEW**

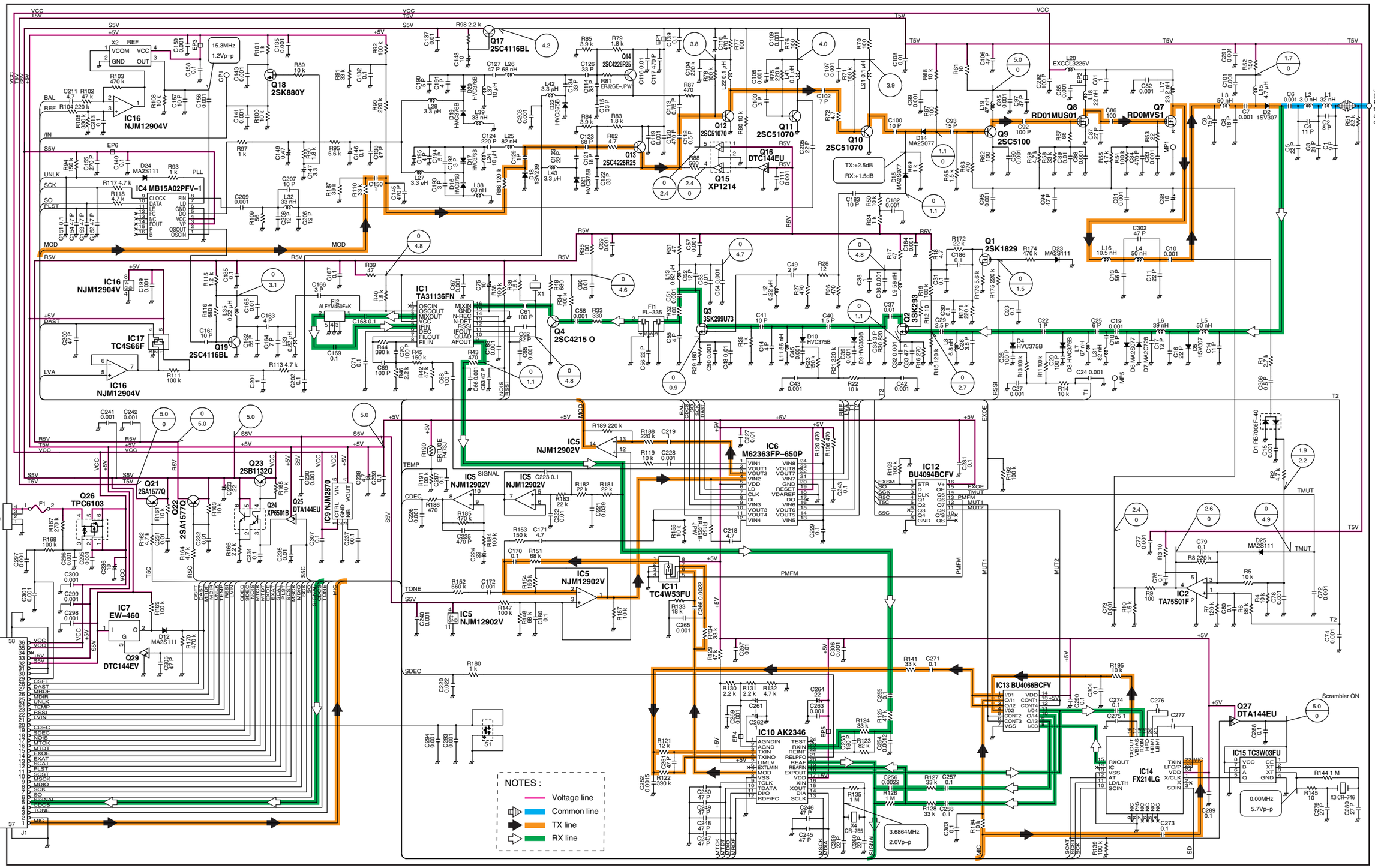


SECTION 10 BLOCK DIAGRAM

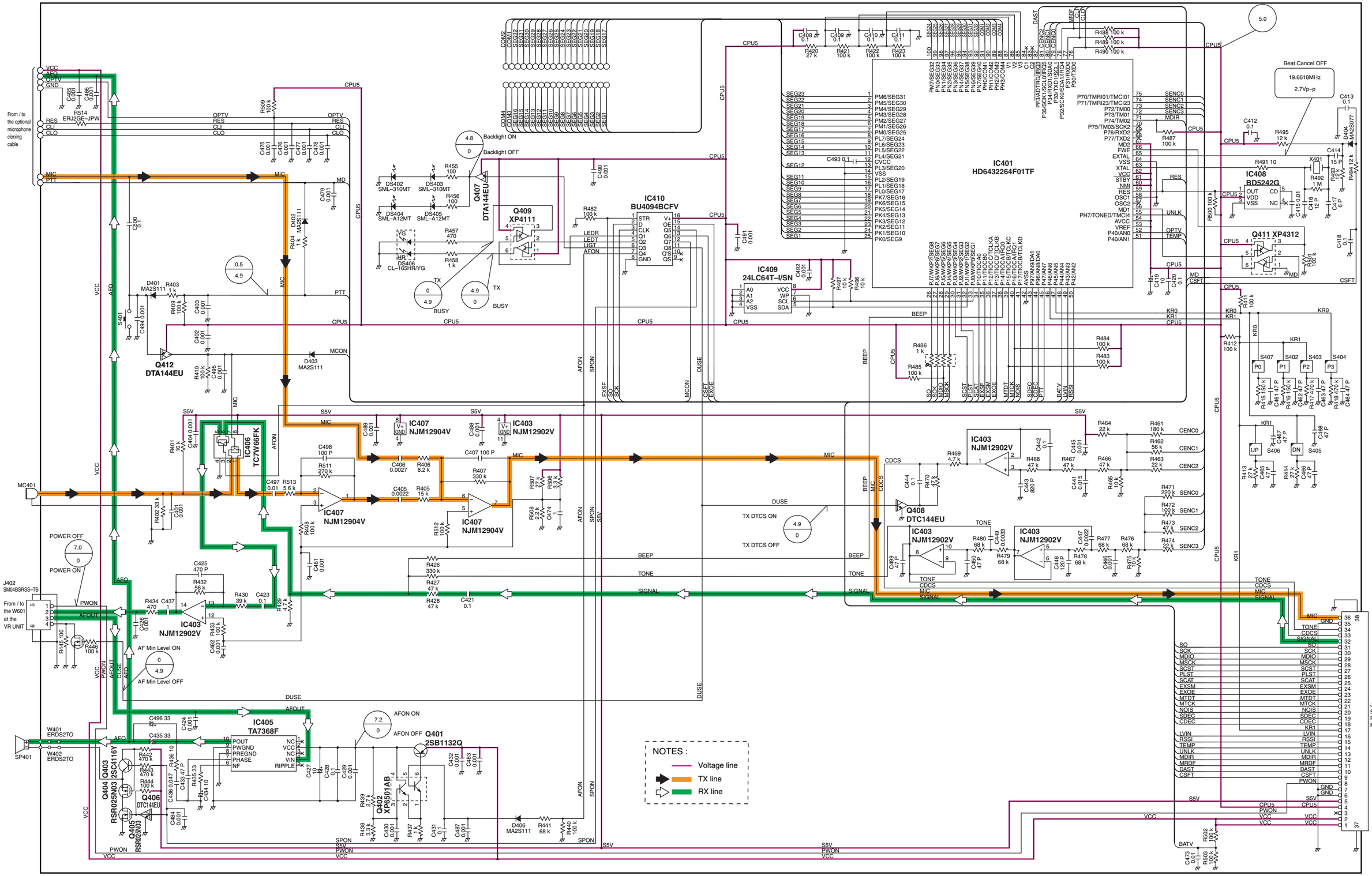


SECTION 11 VOLTAGE DIAGRAM

11-1 MAIN UNIT

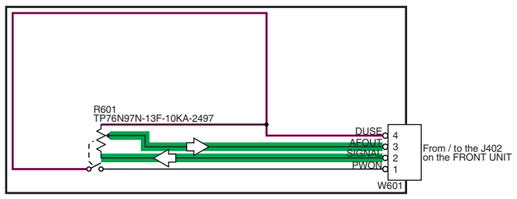


11-2 FRONT UNIT

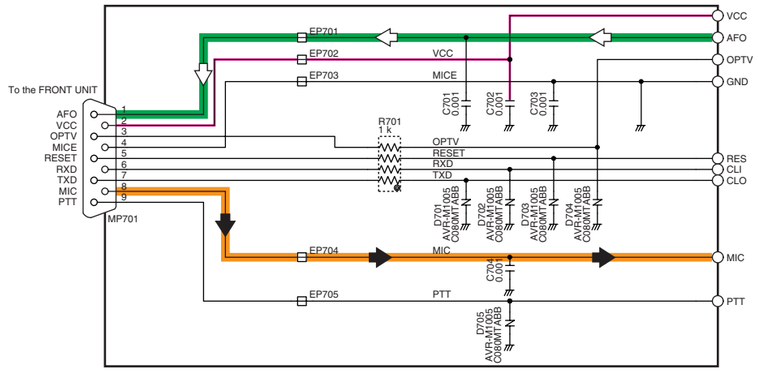


11-3 VR UNIT / CONNECTOR UNITS

VR UNIT



CONNECTOR UNIT



NOTES :

- Voltage line
- TX line
- RX line

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