



SERVICE MANUAL

UHF TRANSCEIVER

IC-4061T/S

IC-4062T/S

IC-4063T/S

IC-4161T/S

IC-4162T/S

IC-4163T/S

IC-4161DT/DS

S-14229HZ-C1-①
Jan. 2008

INTRODUCTION

This service manual describes the latest service information for the **IC-F4061/62/63T/S**, **IC-F4161/62/63T/S/** and **IC-F4161DT/DS** UHF TRANSCEIVER at the time of publication.

| MODEL | VERSION | FREQUENCY RANGE (MHz) | CHANNEL SPACING | KEY TYPE | MDC |
|----------------------------|---------|-----------------------|-----------------|----------|-----|
| F4061T | USA-01 | 400–470 | 12.5/25.0 | 10-key | – |
| | USA-02 | 450–512 | | | |
| F4062T | EUR-01 | 400–470 | 12.5/20.0/25.0 | | |
| F4063T | GEN-01 | 400–470 | 12.5/25.0 | | |
| | GEN-02 | 450–520 | | | |
| F4061S | USA-01 | 400–470 | 12.5/25.0 | | |
| | USA-02 | 450–512 | | | |
| F4062S | EUR-01 | 400–470 | 12.5/20.0/25.0 | | |
| F4063S | GEN-01 | 400–470 | 12.5/25.0 | | |
| | GEN-02 | 450–520 | | | |
| F4161T | USA-01 | 400–470 | 12.5/25.0 | 10-key | Yes |
| | USA-02 | 450–512 | | | |
| F4162T | EUR-01 | 400–470 | 12.5/20.0/25.0 | | |
| F4163T | GEN-01 | 400–470 | 12.5/25.0 | | |
| | GEN-02 | 450–520 | | | |
| F4161S | USA-01 | 400–470 | 12.5/25.0 | | |
| | USA-02 | 450–512 | | | |
| F4162S | EUR-01 | 400–470 | 12.5/20.0/25.0 | | |
| F4163S | GEN-01 | 400–470 | 12.5/25.0 | | |
| | GEN-02 | 450–520 | | | |
| F4161DT (Incl. UT-126H) | USA-01 | 400–470 | 6.25/12.5//25.0 | 10-key | |
| | USA-02 | 450–512 | | 4-key | |
| F4161DS (Incl. UT-126H) | USA-01 | 400–470 | 6.25/12.5//25.0 | 4-key | |
| | USA-02 | 450–512 | | 4-key | |

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

ORDERING PARTS

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

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

<ORDER EXAMPLE>

1110003491 S.IC TA31136FNG IC-F4061 MAIN UNIT 5 pieces
8820001210 Screw 2438 screw IC-F4061 Top cover 10 pieces

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

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CAUTION

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

DO NOT expose the transceiver to rain, snow or any liquids.

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

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

REPAIR NOTES

1. Make sure the problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a Standard Signal Generator or a Sweep Generator.
7. **ALWAYS** connect a 50 dB to 60 dB attenuator between the transceiver and a Deviation Meter or Spectrum Analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting a test equipment to the transceiver.

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SECTION 1

SPECIFICATIONS

| | | | [USA], [GEN], [EXP] | [EUR] |
|--------------------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------|
| GENERAL | • Frequency coverage | | 400–470 MHz [USA-01], [GEN-01], 450–512 MHz [USA-02] 450–520 MHz [GEN-02], [EXP-02] | 400–470 MHz |
| | • Type of emission | Wide | 16K0F3E (25.0 kHz) | |
| | | Middle | – | 14K0F3E (20.0 kHz) |
| | | Narrow | 11K0F3E, 11K0F7E/D (15.0 kHz) 8K50F3E, 8K10F1E/D (12.5 kHz) 4K00F1E/D (6.25 kHz)* | 8K50F3E (12.5 kHz) 4K00F1E/D (6.25 kHz)* |
| | • Number of programable channels | | 512 channels (128 zones) | |
| | • Antenna impedance | | 50 Ω (nominal) | |
| | • Operating temperature range | | –22°F to +140°F | –25°C to +55°C |
| | • Power supply requirement | | Specified Icom's battery packs only (Operatable voltage; 7.2 V DC negative ground) | |
| | • Current drain (approx.) | RX | Stand-by | 100 mA 140 mA (with UT-119H/UT-126H) |
| | | | Max. audio | 600 mA |
| TX | | at 5 W | 1.8 A | |
| | | at 1 W | 0.7 A | |
| • Dimensions (with BP-232N) (projections not included) | | 2 3/32 (W) × 5 11/32 (H) × 1 17/32 (D) in | 53.0 (W) × 136.0 (H) × 38.5 (D) mm | |
| • Weight (with BP-232N, approx.) | | 12 oz | 340 g | |
| TRANSMITTER | • Transmit output power | High | 5 W | |
| | | Low | 1 W | |
| | • Modulation | | Variable reactance frequency modulation | |
| | • Max. frequency deviation | Wide | ±5.0 kHz | |
| | | Middle | – | ±4.0 kHz |
| | | Narrow | ±2.5 kHz | |
| | • Frequency error | | ±1.0 ppm | ±1.5 kHz |
| | • Spurious emission | | 75 dB typ. | 0.25 μW (≤1 GHz), 1.00 μW (>1 GHz) |
| | • Adjacent channel power | Wide | More than 70 dB (80 dB typ.) | |
| | | Middle | – | More than 70 dB (80 dB typ.) |
| | | Narrow | More than 60 dB (70 dB typ.) | |
| | • Audio harmonic distortion | | 3% typ. (with 1 kHz AF 40% deviation) | |
| | • FM hum and noise (without CCITT filter) | Wide | More than 40 dB (46 dB typ.) | – |
| Narrow | | More than 34 dB (40 dB typ.) | – | |
| • Limiting charact of modulation | | 60–100% of max. deviation | | |
| • Microphone impedance | | 2.2 kΩ | | |

*; Available when an optional digital unit (UT-119H/UT-126H) is installed.

| | | [USA], [GEN], [EXP] | [EUR] | |
|--------------------------|-----------------------------------------------------|------------------------------------|-----------------------------------------|------------------------------|
| RECEIVER | • Receive system | Double conversion superheterodyne | | |
| | • Intermediate frequencies | 1st IF; 46.35 MHz, 2nd IF; 450 kHz | | |
| | • Sensitivity | 0.25 μ V typ. at 12 dB SINAD | -4 dB μ V (EMF) typ. at 20 dB SINAD | |
| | • Squelch sensitivity (at threshold) | 0.25 μ V typ. | | |
| | • Adjacent Frequency selectivity | Wide | More than 70 dB (75 dB typ.) | |
| | | Middle | - | More than 70 dB (75 dB typ.) |
| | | Narrow | More than 65 dB (68 dB typ.) | |
| | • Spurious response | More than 70 dB (80 dB typ.) | | |
| | • Intermodulation | More than 70 dB (74 dB typ.) | More than 65 dB (67 dB typ.) | |
| | • Hum and Noise (without CCITT filter) | Wide | More than 40 dB (46 dB typ.) | - |
| | | Narrow | More than 34 dB (40 dB typ.) | - |
| | • Residual modulation (with CCITT filter) | Wide | - | More than 45 dB (55 dB typ.) |
| | | Middle | - | More than 43 dB (53 dB typ.) |
| | | Narrow | - | More than 40 dB (50 dB typ.) |
| • Audio output power | 0.5 W typ. at 5% distortion with an 8 Ω load | | | |
| • Audio output impedance | 8 Ω | | | |

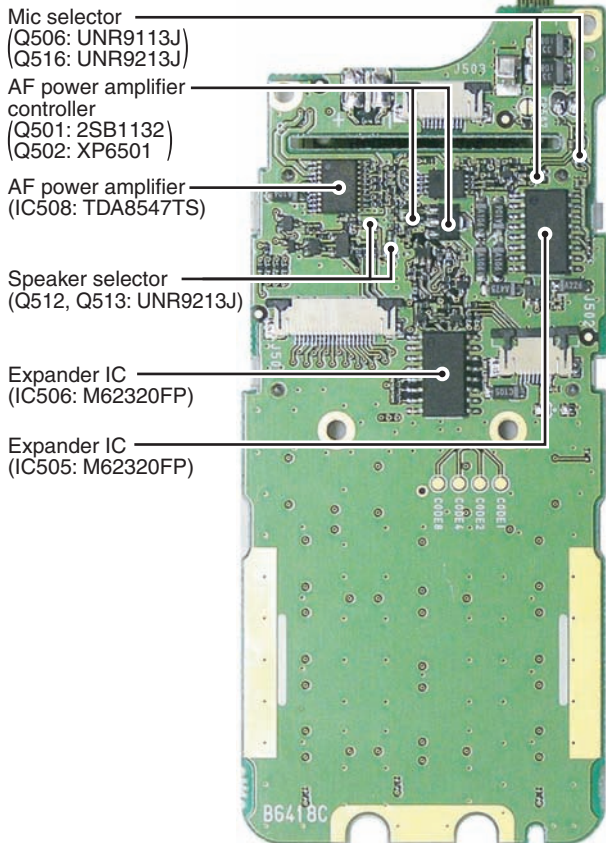
Measurements made in accordance with EIA-152-C/204D, TIA-603 ([USA], [GEN], [EXP]) or EN 300 086 ([EUR-01]).

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

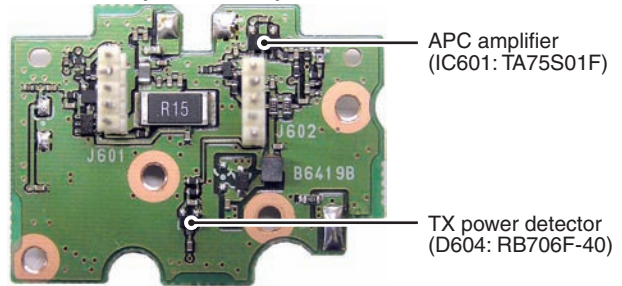
SECTION 2

INSIDE VIEWS

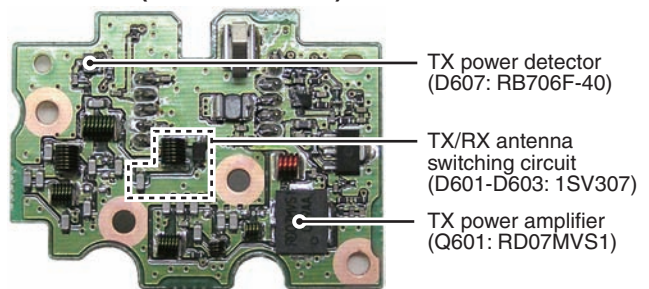
• FRONT UNIT



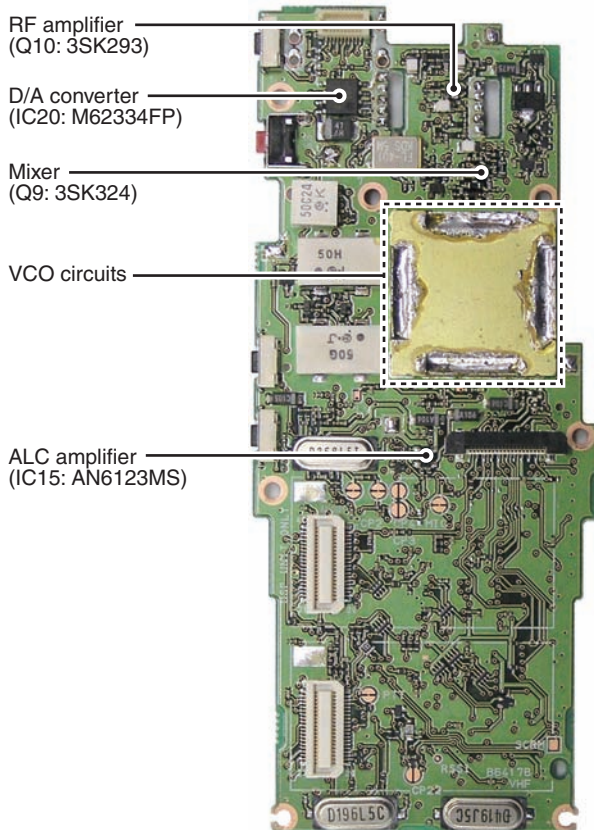
• RF UNIT (TOP VIEW)



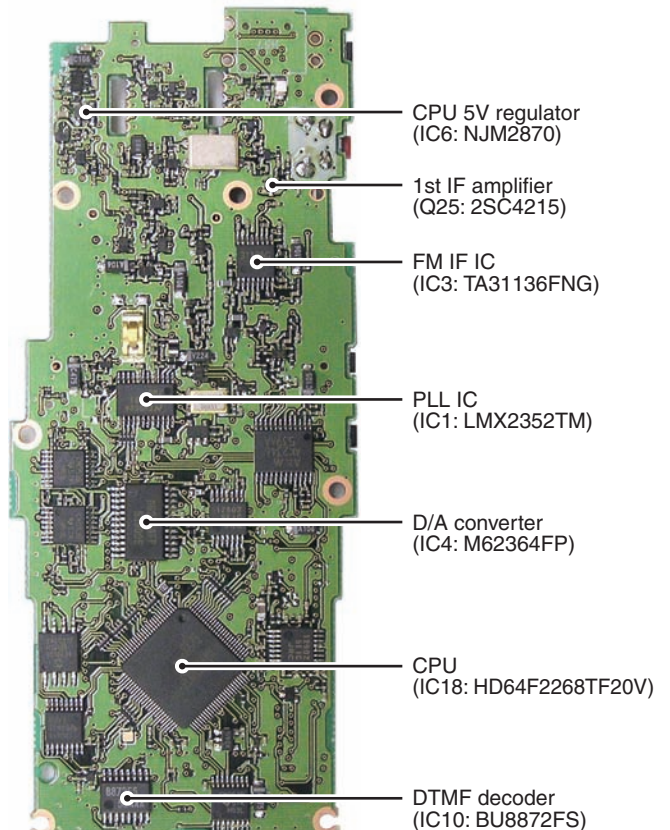
• RF UNIT (BOTTOM VIEW)



• MAIN UNIT (TOP VIEW)



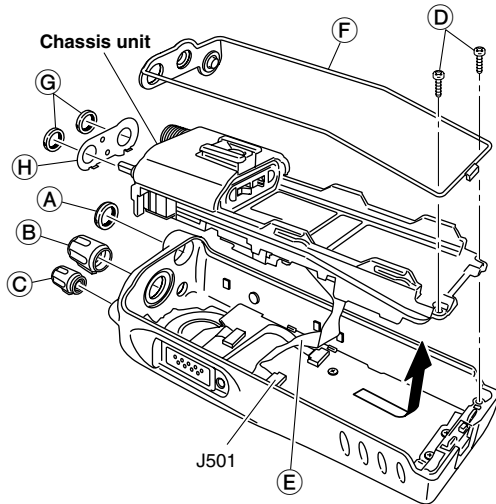
• MAIN UNIT (BOTTOM VIEW)



SECTION 3 DISASSEMBLY INSTRUCTION

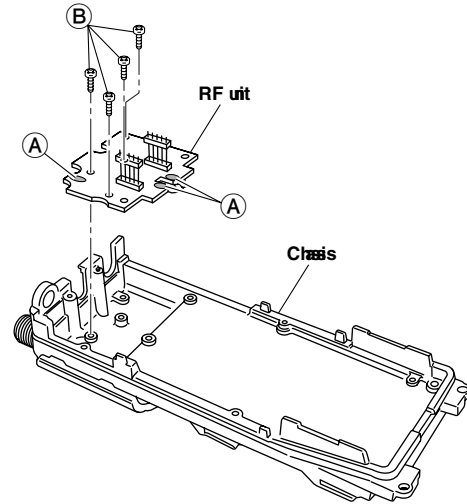
• REMOVING THE CHASSIS UNIT

- ① Unscrew 1 nut (A), and remove 2 knobs (B) and (C).
- ② Unscrew 2 screws (D).
- ③ Take off the chassis unit in the direction of the arrow.
- ④ Disconnect the flat cable (E) from J501.
- ⑤ Remove the seal (F).
- ⑥ Unscrew 2 nuts (G) and remove the plate (H).



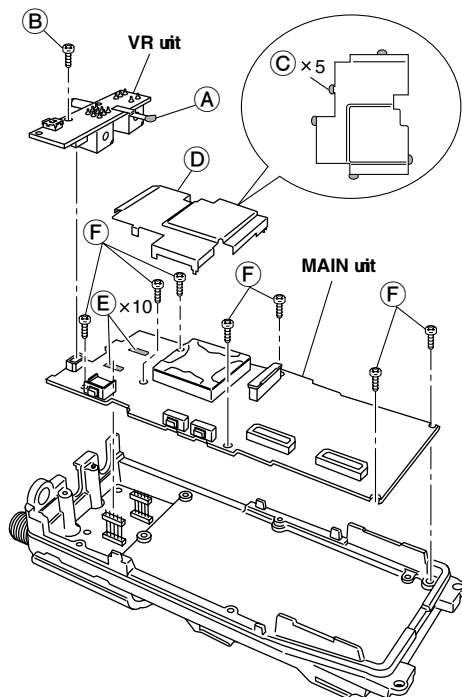
• REMOVING THE RF UNIT

- ① Unsolder 3 points (A).
- ② Unscrew 4 screws (B) and remove the RF unit from the chassis.



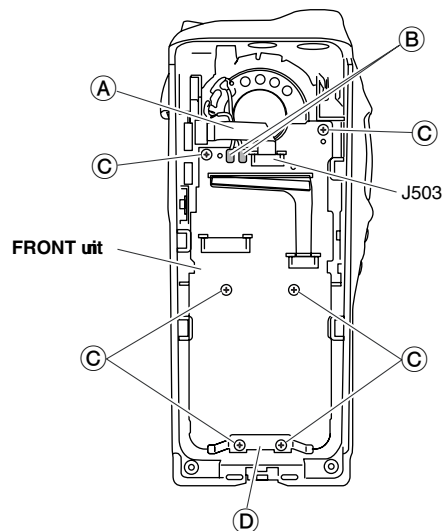
• REMOVING THE MAIN UNIT

- ① Unsolder 1 point (A).
- ② Unscrew 1 screw (B) and remove the VR unit.
- ③ Unsolder 5 points (C) and remove the shield plate (D).
- ④ Unsolder 10 points (E).
- ⑤ Unscrew 7 screws (F) and remove the MAIN unit from the chassis.



• REMOVING THE FRONT UNIT

- ① Disconnect the flat cable (A) from J503.
- ② Unsolder 2 points (B).
- ③ Unscrew 6 screws (C) and remove the plate (D) and FRONT unit.

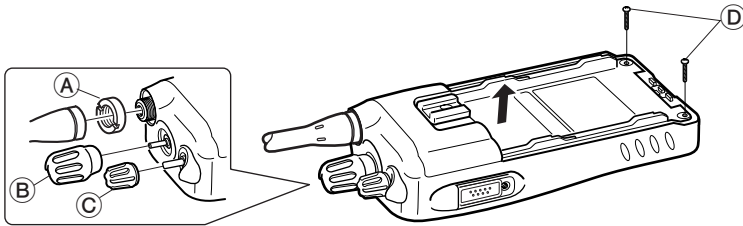


SECTION 4 OPTIONAL UNIT INSTALLATION

CAUTION! Optional unit should be installed at the authorized Icom service center only. The waterproof capability of the transceiver cannot be guaranteed if you install an unit yourself, or have it done at a non-authorized dealer/service center.

Install the optional unit as follows.

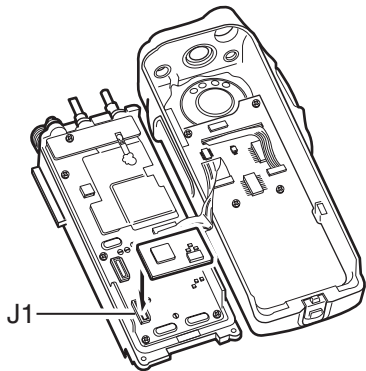
- ① Rotate [VOL] to turn the power OFF, and remove the battery pack.
- ② Remove the antenna and antenna nut (A).
- ③ Remove the rotary selector (B) and volume control (C).
- ④ Unscrew two screws (D), then take off the chassis from the front panel in the direction of the arrow.
BE CAREFUL! Flat cable is connected between the MAIN unit on the chassis and front panel.



- ⑤ Install the optional unit as below.

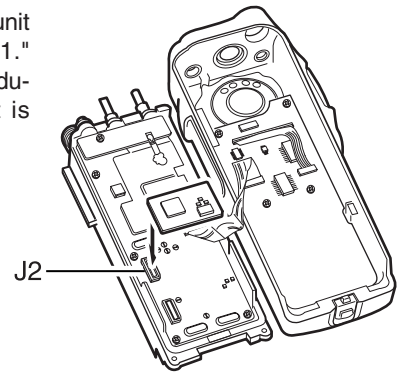
• UT-96R, UT-109R and UT-110R installation*

DO NOT attach the unit to the connector "J2." Otherwise no TX modulation or AF output is available.



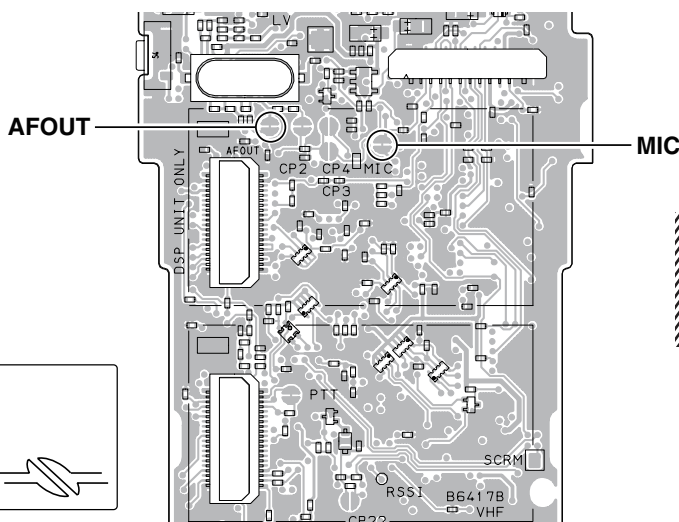
• UT-119H and UT-126H installation

DO NOT attach the unit to the connector "J1." Otherwise no TX modulation or AF output is available.

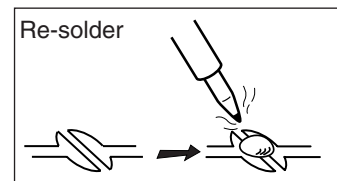
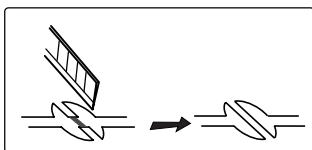


*; The following PC board modification is required when installing optional UT-109R and UT-110R.

Cut the pattern on the PC board at "MIC" and "AFOUT" as shown below.



NOTE: When uninstalling the unit
Be sure to re-solder the disconnected points as below when you remove the unit. Otherwise, no TX modulation or AF output is available.



5-1 RECEIVER CIRCUITS

5-1-1 ANTENNA SWITCH (MAIN and RF UNITS)

The received signals from the antenna connector are passed through the antenna switch which toggles the receive (RX) line and transmit (TX) line.

The received signals from the antenna connector are passed through the low-pass filter (LPF; L601–L603, C601–C607), and the antenna switch (D601, D602 and D603 are OFF).

While transmitting, the voltage on the T5V line is applied to D601, D602 and D603, and these are ON. Thus the TX line is connected to the antenna. Simultaneously, the RX line is connected to the GND to prevent transmit signal entering.

While receiving, no voltage is applied to the D601, D602 and D603, and these are OFF. Thus the TX line and the antenna is disconnected to prevent received signals entering. Simultaneously, the RX line is disconnected from the GND and the received signals are passed through the LPF (RF UNIT; L604, C610, C611).

The filtered signals from the LPF (RF UNIT; L604, C610, C611) are then applied to the RF circuit via the two staged tunable bandpass filter (BPF; D21–D24, L31, L32, C120–C122, C125–C127).

5-1-2 RF CIRCUIT (MAIN UNIT)

The received signals are filtered and amplified at the RF circuit.

The filtered signals are applied to the RF amplifier (Q10). The amplified signals are applied to the 1st mixer (Q9) via another two-staged BPF (D28, D29, L33, L34, C141–C144, C147, C148).

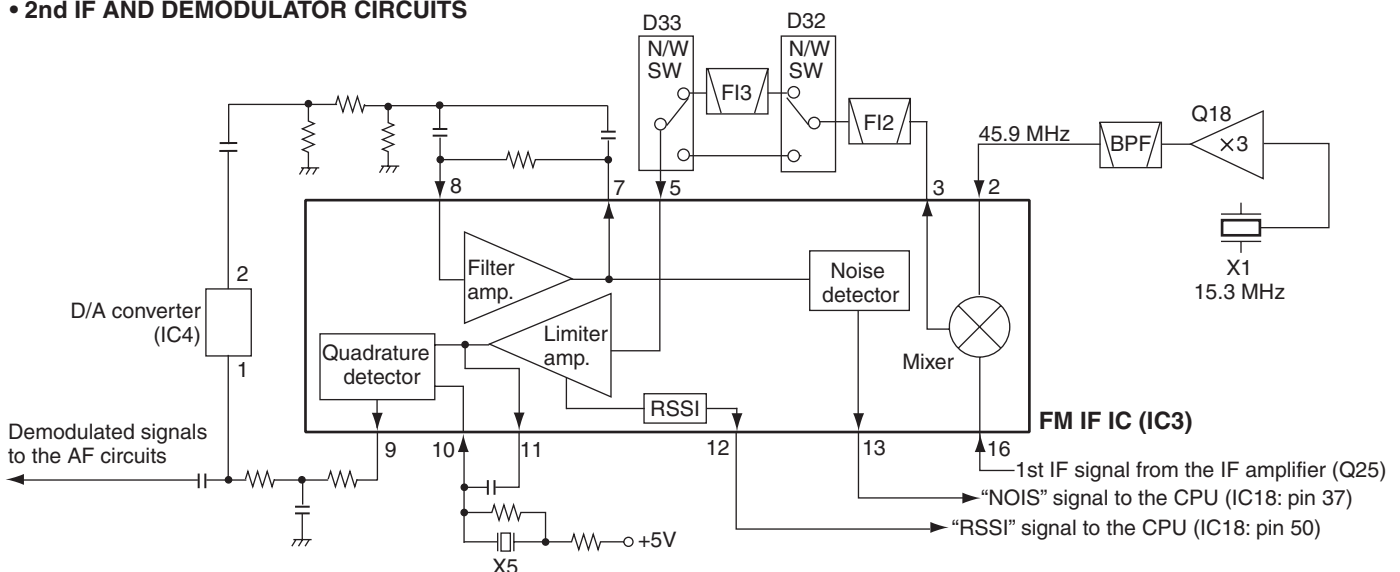
5-1-3 1st IF CIRCUITS

The received signals are converted into the 1st IF signal, and amplified at the 1st IF circuits.

The filtered signals from the RF circuit are converted into the 46.35 MHz 1st IF signal by being mixed with the 1st Local Oscillator (LO) signals from the VCO at the 1st mixer (Q9).

The LO signals for 435/485 MHz (Low band/High band) and lower frequencies are generated by the RX1 VCO (Q2, D5, D6, D8), and the LO signals for 435/485 MHz (Low band/High band) and higher frequencies are generated by the RX2 VCO (Q1, D1, D2).

• 2nd IF AND DEMODULATOR CIRCUITS



The converted 1st IF signal is passed through the 1st IF filter (in wide mode; FI1, in narrow mode; FI4) via the bandwidth switch (D34), to remove adjacent signals. The filtered signal is applied to the 1st IF amplifier (Q25) via another bandwidth switch (D35). The amplified 1st IF signal is then applied to the FM IF IC (IC3, pin 16).

5-1-4 2nd IF AND DEMODULATOR CIRCUITS (MAIN UNIT)

The 1st IF signal is converted into the 2nd IF signal, and demodulated.

The 1st IF signal from the 1st IF amplifier (Q25) is applied to the 2nd IF mixer in the FM IF IC (IC3, pin 16). And the 1st IF signal is converted into the 450 kHz 2nd IF signal by being mixed with the 2nd LO signal from the reference frequency oscillator (X1) via the tripler (Q18).

The converted 2nd IF signal is output from pin 3, and passed through the 2nd IF filter (FI2) to suppress sideband noise. In narrow mode, the 2nd IF signal is also passed through another 2nd IF filter (FI3) via bandwidth switches (D32, D33).

The filtered 2nd IF signal is applied to the limiter amplifier in the FM IF IC (IC3, pin 5). The amplified 2nd IF signal is FM-demodulated at the quadrature detector (X5, IC3, pins 10, 11) and output from pin 9. The demodulated AF signals are then applied to the AF circuits.

5-1-5 AF CIRCUITS (FRONT and MAIN UNITS)

The demodulated AF signals from the FM IF IC are amplified and filtered at AF circuits. This transceiver employs the base band IC for audio signal processing for both transmit and receive. The base band IC is an audio processor and composed of pre-amplifier, compressor, expander, scrambler, etc. in its package.

The demodulated AF signals from the FM IF IC (IC3, pin 9) are applied to the base band IC (IC5, pin 23) via the Digital/Analog switch (IC14, pins 2, 15).

The applied AF signals are amplified at the amplifier (RXA1) and level adjusted at the volume controller (VR3), then suppressed unwanted 3 kHz and higher audio signals at LPF. The filtered AF signals are applied or bypassed the TX/RX HPF, scrambler, de-emphasis sections in sequence.

The TX/RX HPF filters out 250 Hz and lower audio signals, and the de-emphasis circuit obtains -6 dB/oct of audio characteristics. The expander expands the compressed audio signals and also noise reduction function is provided.

The AF signals are then level adjusted at the volume controller (VR4) and amplified at the amplifier (RXA2). The amplified AF signals are output from pin 20 and passed through another de-emphasis circuit (IC13, pins 2, 15), and then applied to the D/A converter (IC4, pin 16) for level adjustment via the AF mute switch (IC14, pins 3, 4).

The level-adjusted AF signals are applied to the AF amplifier (FRONT UNIT; IC509, pin 2). The amplified AF signals are output from pin 1, and applied to the AF power amplifier (IC508, pin 17) to obtain 0.5 W (typical) of AF output power. The power-amplified AF signals are output from pin 18, and then applied to the internal speaker.

When an external speaker-microphone or headset is attached to the multi-connector (JACK UNIT; MP801), the AF signals from the AF amplifier (IC509, pin 1) are applied to the AF power amplifier (IC508, pin 14). The power-amplified AF signals are then output from pin 13, and applied to the multi-connector (JACK UNIT; MP801, pin 7).

5-1-5 SQUELCH CIRCUIT

• NOISE SQUELCH

The squelch mutes the AF output signals when no RF signals are received. By detecting noise components (30 kHz and higher signals) in the demodulated AF signals, the squelch circuit toggles the AF power amplifier ON and OFF.

A portion of the demodulated AF signals from the FM IF IC (IC3, pin 9) are applied to the D/A converter (IC4, pin 1) for level adjustment (squelch threshold adjustment). The level-adjusted AF signals are output from pin 2 and passed through the noise filter (IC3, pins 7, 8, R121-R124, C216-C218). The filtered noise signals are amplified the noise components only.

The amplified noise components are converted into the pulse-type signal at the noise detector section, and output from pin 13 as the "NOIS" signal. The signal is applied to the CPU (IC18, pin 37). Then the CPU outputs serial data to the expand IC (FRON UNIT; IC505, pin 3), and the expand IC outputs "AFON" signal from pin 4 according to the "NOIS" signal level, to the AF power amplifier controller (FRONT UNIT; Q501, Q502, D508). The AF power amplifier controller toggles AF power amplifier (FRONT UNIT; IC508, IC509) ON and OFF according to the "AFON" signal.

• TONE SQUELCH

The tone squelch circuit detects tone signals and opens the squelch only when receiving a signal containing a matched subaudible tone. When the 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 the noise squelch is open.

• CTCSS/DTCS

A portion of the demodulated AF signals are passed through the active LPF (Q28) to filters CTCSS/DTCS signal. The filtered signal is applied to the CPU (IC18, pin 46). The CPU compares the applied signal and the set CTCSS/DTCS, then output the serial data to the expand IC (FRON UNIT; IC505, pin 3), and the expand IC outputs "AFON" signal from pin 4 to the AF power amplifier controller (Q501, Q502, D508).

• 2/5 TONE

2/5 tone signals in the demodulated AF signals are passed through the LPF in the base band IC (IC5) and output from pin 21, then applied to the CPU (IC18, pin 45) and decoded.

• DTMF

DTMF signals in the demodulated AF signals are passed through the LPF in the base band IC (IC5) and output from pin 21, then applied to the DTMF decoder (IC10, pin 1) and decoded.

5-2 TRANSMITTER CIRCUITS

5-2-1 MICROPHONE AMPLIFIER CIRCUITS (MAIN UNIT)

The AF signals from the microphone (MIC signals) are filtered and level-adjusted at microphone amplifier circuits.

MIC signals from the microphone are passed through the microphone switch (FRON UNIT; Q515). The microphone switch selects the AF signals from the internal microphone (FRON UNIT; MC501) or from an external microphone.

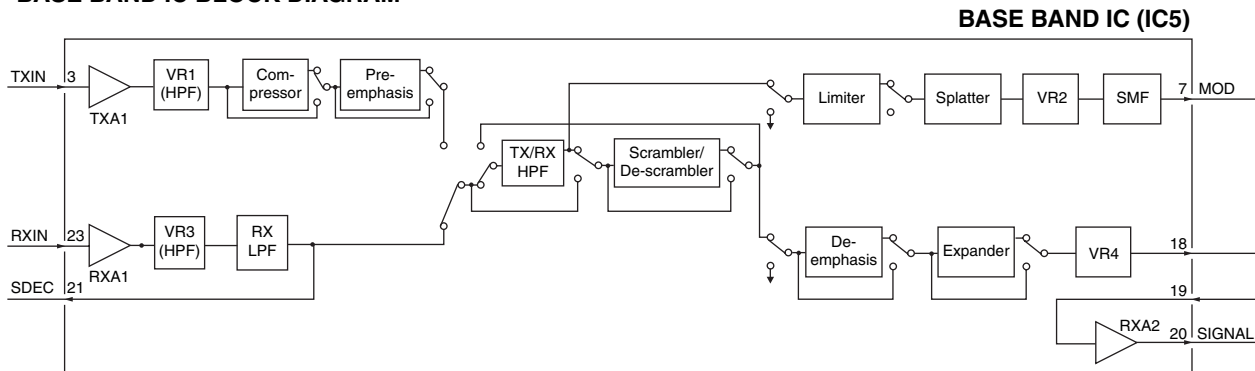
MIC signals from the microphone switch (FRON UNIT; Q515) are applied to the microphone amplifier (FRON UNIT; IC509, pin 6), and amplified AF signals are output from pin 7, and passed through the pre-emphasis circuit (IC13, pins 4, 5) to obtain +6 dB/oct of frequency characteristic. The pre-emphasized MIC signals are then applied to the microphone amplifier (IC9, pin 9). And the amplified MIC signals are output from pin 8, and applied to the D/A converter (IC4, pin 9) for level adjustment (=microphone sensitivity adjustment). The level-adjusted MIC signals are output from pin 10, and applied to the ALC (Automatic Level Control) circuit (IC15, pin 3) which limits the amplitude of the MIC signals to prevent over deviation. The amplitude-limited MIC signals are output from pin 5, then applied to the base band IC (IC5, pin 3).

The applied MIC signals are amplified at the amplifier (TXA1), and level adjusted at the volume controller (VR1). The level adjusted MIC signals are applied or bypassed the compressor section, pre-emphasis section, TX/RX HPF, de-scrambler, limiter, splatter, in sequence, then applied to another volume controller.

The compressor compresses the MIC signals to provide high S/N ratio for receive side, and the pre-emphasis obtains +6 dB/oct audio characteristics. The TX/RX HPF filters out 250 Hz and lower audio signals, the limiter limits its level and the splatter filters out 3 kHz and higher audio signals.

The filtered MIC signals are level adjusted at another volume controller (VR2), and then output from pin 7 via smoothing filter (SMF).

• BASE BAND IC BLOCK DIAGRAM



The output AF signals are then passed through the Digital/Analog switch (IC14, pins 12, 14) and applied to the AF mixer (IC9, pin 6) where the MIC signals and Tone signals are mixed with (while CTCSS/DTCS are in use) via the PM/FM switch (IC13, pins 12, 14).

The CTCSS and DTCS signals are generated by the CPU (IC18) and output from pins 89–91. The output signals are passed through the 3 registers (R263–R265) to change its wave form. The wave form changed CTCSS/DTCS signals are passed through the LPF (IC17, pins 1, 3) and the D/A converter (IC4, pins 21, 22) for level adjustment. The level adjusted CTCSS/DTCS signals are then applied to the AF mixer (IC9, pin 6).

2/5 tone and DTMF signals are generated by the CPU (IC18) and output from pin 43. The output signals are passed through two LPF's (IC17, pins 8, 10 and pins 5, 7), then applied to the AF mixer (IC9, pin 6).

The mixed AF signals are output from pin 7 of the AF mixer (IC9) and passed through the D/A converter (IC4, pins 3, 4) for level adjustment (=deviation adjustment), then applied to the modulation circuit (D11) as the modulation signals.

The modulation signals are also applied to the reference frequency oscillator (X1) via D/A converter (IC4, pins 11, 12) and AF amplifier (IC21, pins 1, 4).

5-2-2 MODULATION CIRCUIT (MAIN UNIT)

The modulation signals from the microphone amplifier circuits are applied to the D11, and modulate the VCO oscillating signal by changing the reactance of D11. The modulated VCO output signal is buffer-amplified by Q4 and Q6, then applied to transmit amplifiers as a transmit signal via the TX/RX switch (D14 is ON, D15 is OFF) and buffer amplifier (Q7).

5-2-3 TRANSMIT AMPLIFIERS (RF UNIT)

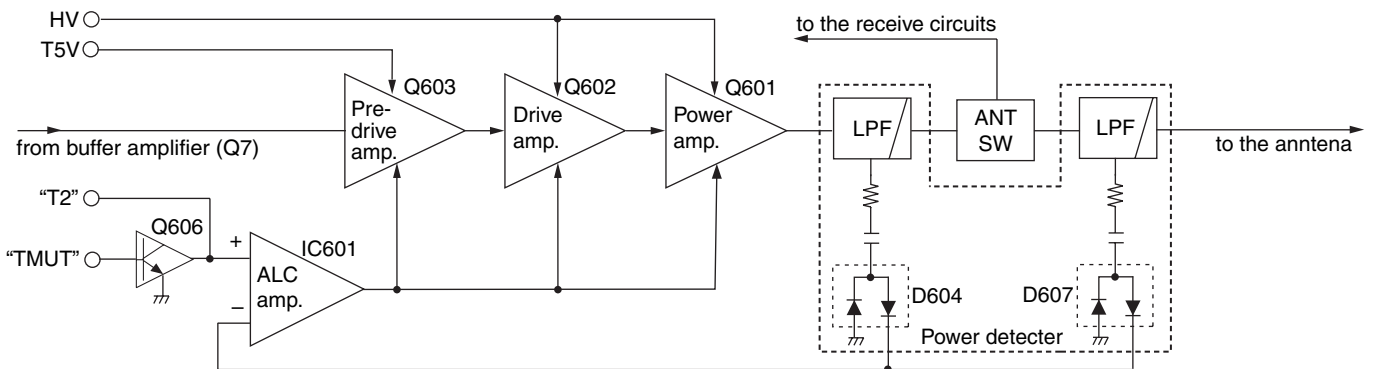
The transmit signal from the buffer amplifier (MAIN UNIT; Q7) is amplified to the transmit output level by pre-driver (Q603), driver (Q602) and power (Q601) amplifiers.

The power-amplified transmit signal is passed through the two staged LPF (L607, L608, C612, C616, C620, C623, C624) to filter off the harmonic components in the transmit signal. The filtered transmit signal is passed through the antenna switching circuit (D601, D602 and D603 are ON), then applied to the antenna connector (CHASSIS; J1) via another LPF (L601–L603, C601–C607).

5-2-4 APC CIRCUIT (RF UNIT)

The APC (Automatic Power Control) circuit stabilizes transmit output power to prevent the transition of the transmit output power level which is caused by load mismatching or heat effect, etc. The APC circuit also selects transmit output power from high, middle and low power.

• APC CIRCUIT



A portion of the transmit signal is detected by the transmit power detector (D604, D607) to produce a DC voltage corresponding to the transmit output power level. The detected voltage is applied to the APC amplifier (IC601, pin 3). The transmit power setting voltage "T2" from the D/A converter (MAIN UNIT; IC20, pin 2) is applied to another input terminal (pin 1) as the reference voltage.

The APC amplifier compares the detected voltage and reference voltage, and the difference of the voltage is output from pin 4. The output voltage controls the bias of the pre-drive (Q603), drive (Q602) and power (Q601) amplifiers to reduce/increase the gain of these amplifiers for stable transmit output power.

The change of transmit output power is carried out by the change of reference voltage "T2," and the transmit power muting is carried out by the TX mute switch (Q606), using the "TMUT" signal from the CPU (IC18, pin 13).

5-3 PLL CIRCUITS

5-5-1 VCO (Voltage Controlled Oscillator) CIRCUITS (MAIN UNIT)

A VCO is a oscillator which its oscillating frequency is controlled by adding voltage (lock voltage).

This transceiver has 3 VCO's; RX VCO1 (Q1, D1, D2), RX VCO2 (Q2, D5, D6) and TX VCO (Q3, D9, D10). The RX VCO1 oscillates the 1st LO signals for 435 MHz/485 MHz (Low band/High band) and higher, and the RX VCO2 oscillates the 1st LO signals for 435 MHz/485 MHz (Low band/High band) and lower frequencies. And the TX VCO oscillates the transmit output signal.

• RX VCO1 and RX VCO2

The RX VCO1/RX VCO2 (Q1, D1, D2/Q2, D5, D6) oscillates the 1st LO signals. The output signals are amplified by the buffer amplifiers (Q4, Q6), and applied to the 1st mixer (Q37) via TX/RX switch (D14 is OFF, D15 is ON) and LPF (L38, C160, C161), to be mixed with the received signals to produce the 46.35 MHz 1st IF signal.

• TX VCO

The TX VCO (Q3, D9, D10) oscillates the transmit signal. The output signal is applied to the transmit amplifiers via the buffer amplifiers (Q4, Q6) and TX/RX switch (D14 is ON, D15 is OFF).

A portion of the each VCO output is applied to the PLL IC (IC1, pin 6) via the buffer amplifiers (Q4, Q5) and the tunable BPF (D16, D17, L40, C151, C152, C154).

5-5-2 PLL CIRCUIT (MAIN UNIT)

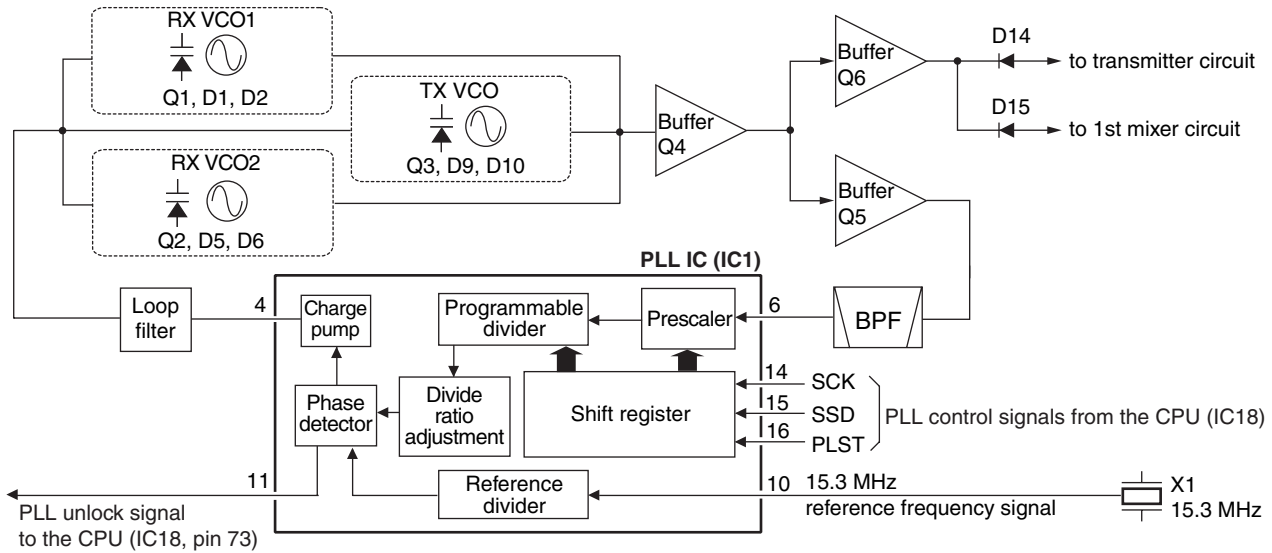
The PLL circuit provides stable oscillation of the transmit frequency and receive 1st LO frequency. The PLL output frequency is controlled by the divided ratio (N-data) from the CPU.

The buffer-amplified VCO output signals from the tunable BPF (L601–L603, C601–C607) are applied to the PLL IC (IC1, pin 6). The applied signals are divided at the prescaler and programmable counter according to the “SSD” signal from the CPU (IC18, pin 10). The divided signal is phase-compared with the reference frequency signal from the reference frequency oscillator (X1), at the phase detector.

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 VCO oscillating frequency.

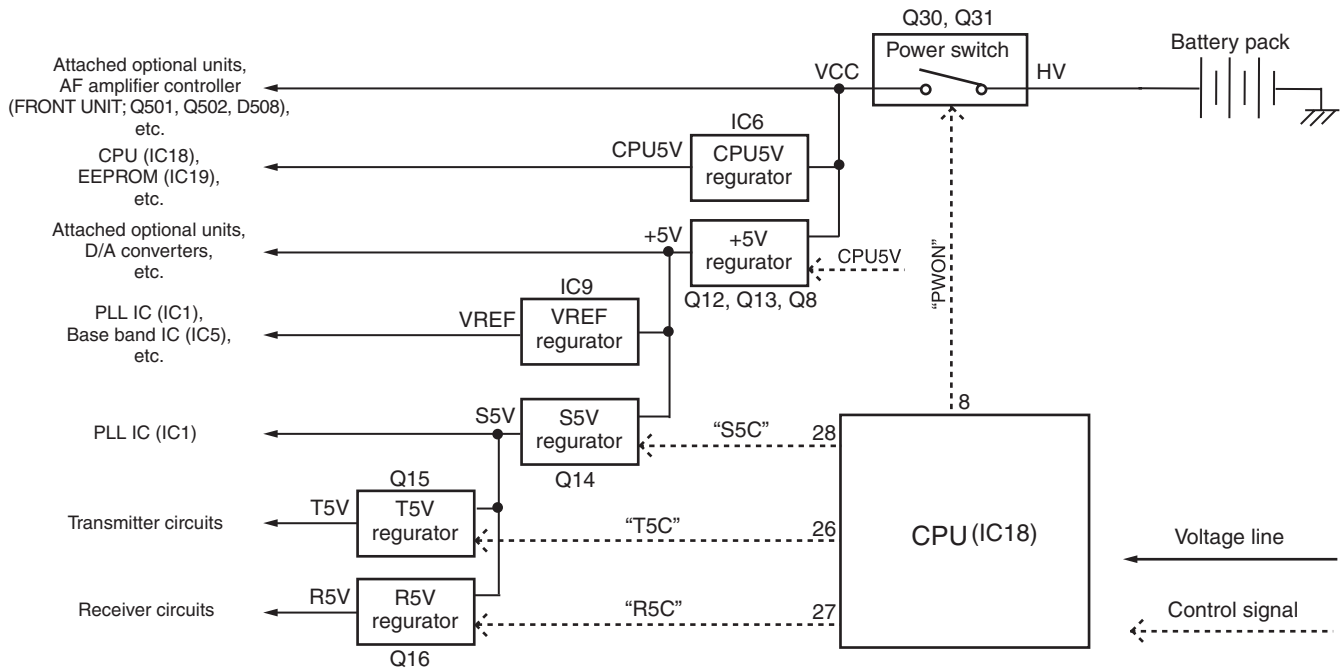
The phase difference is output from pin 4 as a pulse type signal after being passed through the internal charge pump. The output signal is converted into the DC voltage (lock voltage) by passing through the loop filter (R7, R8, R12, C14, C16, C19). The lock voltage is applied to the varactor diodes (D1 and D2 of RX VCO1, D5 and D6 of RX VCO2, D9 and D10 of TX VCO) and locked to keep the VCO frequency constant.

• PLL CIRCUIT



5-4 POWER SUPPLY CIRCUITS

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



5-5 PORT ALLOCATIONS

5-5-1 CPU (MAIN UNIT; IC18)

| Pin No. | Port Name | Description |
|---------|-----------|-------------------------------------------------------------------------------------------------|
| 1 | DSDA | Outputs serial data to the D/A converter (IC20, pin 6). |
| 2 | DAST | Outputs strobe signal to the D/A converter (IC4, pin 6). |
| 3 | SIDE3 | Input port for [Side3] key (S4). "Low"=When the key is pushed. |
| 4-7 | CBIO-3 | Input ports for [ROTARY SELECTOR] (VR UNIT; S701). |
| 10 | SSO | Outputs serial data to the PLL IC (IC1, pin 15), D/A converter (IC4, pin 8). |
| 11 | SCK | Outputs serial clock signal to the PLL IC (IC1, pin 14), D/A converter (IC4, pin 8). |
| 13 | PLST | Outputs PLL strobe signal to the PLL IC (RF UNIT; IC1, pin 16). |
| 15 | DASW | Outputs mode (Digital/Analog) switching signal to the D/A converter (IC14, pins 10, 11). |
| 17 | TMUT | Outputs transmit mute signal to the transmit mute switch (RF UNIT; Q606). |
| 18 | NWC2 | Outputs Narrow/Wide mode switching signal to the bandwidth switches (Q26, D32, D33). |
| 19 | NWC1 | Outputs Narrow/Wide mode switching signal to the bandwidth switches (Q27, Q41, Q42, D34, D35). |
| 20 | DDSD | Outputs serial data to the DTMF decode IC (IC10, pin 9). |
| 21 | DDAC | Outputs serial clock signal to the DTMF decode IC (IC10, pin 11). |
| 26 | T5C | Outputs T5V line control signal to the T5V regulator (Q15). "Low"= While transmitting. |
| 27 | R5C | Output R5V line control signal to the R5V regulator (Q16). "Low"= While receiving. |
| 28 | S5C | Output S5V line control signal to the S5V regulator (Q14). "Low"=While power save mode. |
| 29 | PTTSW | Input port for [PTT] switch (S3). "Low"=When the switch is pushed. |
| 30 | SIDE2 | Input port for [Side2] key (S5). "Low"=When the key is pushed. |
| 32 | RMUT | Outputs mute signal to the AF mute switch (D42). |
| 37 | NOIS | Input port for the noise level from the FM IF IC (IC3, pin 13). |
| 38 | POSW | Input port for power switch (VR UNIT; R702) from power controller (D36). |
| 39 | DDST | Outputs strobe signal to the DTMF decode IC (MAIN UNIT; IC10, pin 14). |
| 40 | MTCK | Outputs serial clock signal to the base band IC (MAIN UNIT; IC5, pin 9). |
| 41 | PWON | Outputs VCC line control signal to the power switch (Q30, Q31). "Low"=While the power is ON. |
| 43 | SENC | Outputs single tone encode signal to the LPF (IC17, pin 10). |
| 44 | BEEP | Outputs beep sound to the AF circuits (IC4, pin 13). |
| 45 | SDEC | Input port for decoded 2/5 tone and DTMF signals. |
| 46 | CDEC | Input port for decoded CTCSS/DTCS signal. |
| 48 | BATV | Input port for remaining battery power. |
| 49 | LVIN | Input port for VCO lock voltage. |
| 50 | RSSI | Input port for RSSI signal from the FM IF IC (IC3, pin 12). |
| 55 | EMER | Input port for [Emer] switch (VR UNIT; S702). |

| Pin No. | Port Name | Description |
|---------|-----------|-----------------------------------------------------------------------------------------|
| 70 | CSFT | Outputs CPU clock frequency shift signal to the CPU clock oscillator (X2, D38). |
| 71 | DUSE | Outputs CTCSS/DTCS select signal to the CTCSS/DTCS switch (Q34). |
| 73 | UNLK | Input port for PLL unlock detect signal from the PLL IC (IC1, pin 11). |
| 74 | RLED | Outputs RX indicator (VR UNIT; DS701) control signal to the LED driver (VR UNIT; Q701). |
| 75 | TLED | Outputs TX indicator (VR UNIT; DS701) control signal to the LED driver (VR UNIT; Q701). |
| 78 | FSDA | Outputs serial data to the expand IC (FRONT UNIT; IC505, pin 3). |
| 79 | FSCL | Outputs serial clock signal to the expand IC (FRONT UNIT; IC505, pin 3). |
| 81 | CIRQ | Input port for external connection detect signal from J1 and J2. |
| 88 | SIDE1 | Input port for [Side1] key (S6). "Low"=When the key is pushed. |
| 89-91 | CENC0-2 | Output CTCSS/DTCS signals to the LPF (IC17, pin 3). |
| 92 | EMPH | Outputs emphasis characteristic change signal to the D/A converter (IC13, pins 9, 10). |
| 93 | MTDT | Outputs serial data to the base band IC (IC5, pin 10). |
| 96 | MSCK | Outputs serial clock signal to the base band IC (MAIN UNIT; IC5, pin 13). |
| 97 | PMFM | Outputs modulation mode switching signal to the PM/FM switch (IC13, pin 11). |
| 98 | ESDA | Outputs serial data to the EEPROM (IC19, pin 5). |
| 99 | ESCL | Outputs serial clock signal to the EEPROM (IC19, pin 6). |
| 100 | RESL | Input port for reset signal from the reset IC (IC8, pin 1). |

5-5-2 D/A CONVERTER (MAIN UNIT; IC20)

| Pin No. | Port Name | Description |
|---------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | T1 | Outputs BPF tuning voltage to the tunable BPF (D21-D24, L31, L32, C120-C122, C125-C127). |
| 2 | T2 | <ul style="list-style-type: none"> • While receiving Outputs BPF tuning voltage to the tunable BPF (D28, D29, L33, L34, C141-C144, C147). • While transmitting Outputs TX power setting voltage to the APC amplifier (RF UNIT; IC601). |
| 3 | TXLVA | Outputs oscillating frequency adjust voltage to the TX VCO (Q3, D9, D10). |
| 4 | RXLVA | Outputs oscillating frequency adjust voltage to the RX VCO1/2 (Q1, D1, D2/Q2, D5, D6). |

5-5-3 EXPAND IC (FRONT UNIT; IC505)

| Pin No. | Port Name | Description |
|---------|-----------|-------------------------------------------------------------------------------------------------------------------|
| 4 | AFON | Outputs AF power amplifier (IC508, IC509) control signal to the AF power amplifier controller (Q501, Q502, D508). |
| 5 | LIGH | Outputs backlight control signal to the backlight driver (Q507-Q509). |
| 6 | SPCON | Outputs internal/external speaker select signal to the SP/ESP switch (Q512, Q513). |
| 7 | MCON | Outputs internal/external microphone select signal to the microphone controller (Q505, D504). |

SECTION 6 ADJUSTMENT PROCEDURE

6-1 PREPARATION

When adjusting IC-F4060 series, the optional CS-F3060 ADJ ADJUSTMENT SOFTWARE (Rev. 1.1 or later), OPC-966 JIG CABLE (modified OPC-966 CLONING CABLE; see illustration page 5-2) and below test equipments are required.

■ REQUIRED TEST EQUIPMENT

| EQUIPMENT | GRADE AND RANGE | EQUIPMENT | GRADE AND RANGE |
|--------------------|------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------|
| FM deviation meter | Frequency range : DC–600 MHz Measuring range : 0 to ±10 kHz | Attenuator | Power attenuation : 20 or 30 dB Capacity : 10 W |
| Frequency counter | Frequency range : 0.1–600 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better | Standard signal generator (SSG) | Frequency range : 0.1–600 MHz Output level : 0.1 μV to 32 mV (–127 to –17 dBm) |
| RF power meter | Measuring range : 1–10 W Frequency range : 100–300 MHz Impedance : 50 Ω SWR : Better than 1.2 : 1 | Oscilloscope | Frequency rang : DC–20 MHz Measuring range : 0.01–20 V |
| | | External speaker | Input impedance : 8 Ω Capacity : 1 W or more |

■ SYSTEM REQUIREMENTS

- Microsoft® Windows® 98/98SE/Me/2000/XP
- RS-232C serial port (D-sub 9 pin)

■ ADJUSTMENT SOFTWARE INSTALLATION

- ① Quit all applications when Windows is running.
- ② Insert the CD into the appropriate CD drive.
- ③ Double-click the “Setup.exe” contained in the ‘CS-F3060 ADJ’ folder in the CD drive.
- ④ The “Welcome to the InstallShield Wizard for CS-F3060 ADJ” will appear. Click [Next>].
- ⑤ The “Choose Destination Location” will appear. Then click [Next>] to install the software to the destination folder. (e.g. C:\Program Files\icom\CS-F3060 ADJ)
- ⑥ After the installation is completed, the “InstallShield Wizard Complete” will appear. Then click [Finish].
- ⑦ Eject the CD.
- ⑧ Program group ‘CS-F3060 ADJ’ appears in the ‘Programs’ folder of the start menu, and ‘CS-F3060 ADJ’ icon appears on the desk top screen.

■ BEFORE STARTING SOFTWARE ADJUSTMENT

Clone the adjustment frequencies into the transceiver, and set the configuration using with the CS-F3060 CLONING SOFTWARE before starting the software adjustment. Otherwise, the software adjustment can not be started.

CAUTION!: **BACK UP** the originally programmed memory data in the transceiver before programming 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.

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■ STARTING SOFTWARE ADJUSTMENT

- ① Connect the transceiver and PC with OPC-966 JIG CABLE.
- ② Turn the transceiver power ON.
- ③ Boot up Windows, and click the program group ‘CS-F3060 ADJ’ in the ‘Programs’ folder of the [Start] menu, then CS-F3060 series ADJ’s window appears.
- ④ Click ‘Connect’ on the CS-F3060 ADJ’s window, then appears transceiver’s up-to-date condition.
- ⑤ Set or modify adjustment data as specified.

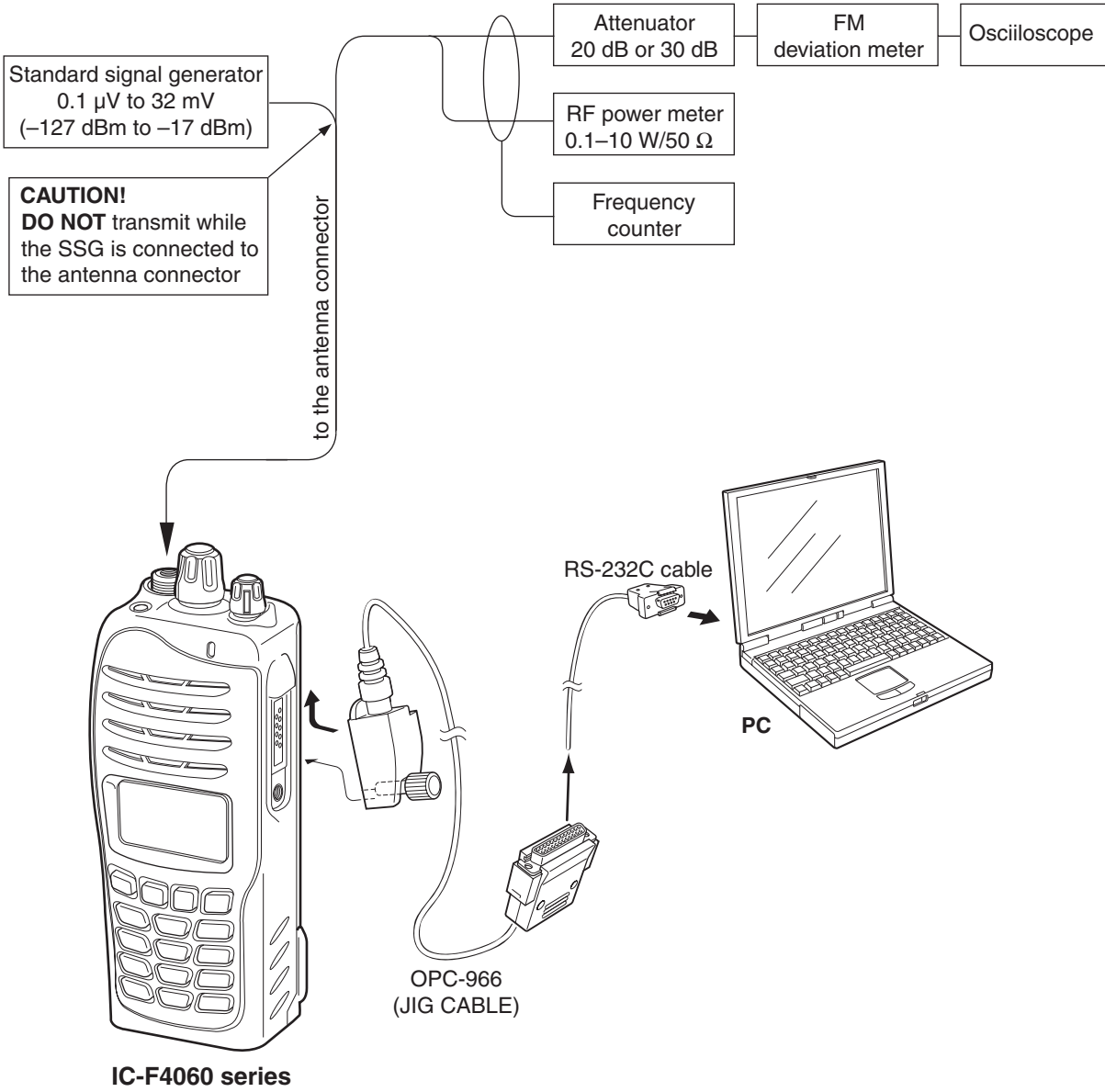
• ADJUSTMENT FREQUENCY LIST

| CH | FREQUENCY (MHz) | | ADJUSTMENT ITEM |
|-----|-----------------|-----------|-----------------------------------------------------|
| | Low band | High band | |
| 1 | 400.000 | 450.000 | TX power : Low1 Mode : Wide |
| 2 | 435.000 | 485.000 | TX power : Low1 Mode : Wide |
| 3 | 470.000 | 520.000 | TX power : Low1 Mode : Wide |
| 4 | 434.950 | 484.950 | TX power : Low1 Mode : Wide |
| 5 | 435.000 | 485.000 | TX power : High Mode : Wide |
| 6 | 435.000 | 485.000 | TX power : Low2 Mode : Wide |
| 7 | 435.000 | 485.000 | TX power : Low1 Mode : Wide |
| 8 | 400.000 | 450.000 | TX power : Low1 Mode : Narrow |
| 9 | 470.000 | 520.000 | TX power : Low1 Mode : Narrow |
| 10* | 435.000 | – | TX power : Low1 Mode : Middle |
| 11* | 400.000 | – | TX power : Low1 Mode : Middle |
| 12* | 470.000 | – | TX power : Low1 Mode : Middle |
| 13† | 435.000 | 485.000 | TX power : Low1 Mode : Digital |
| 14† | 400.000 | 450.000 | TX power : Low1 Mode : Digital |
| 15† | 470.000 | 520.000 | TX power : Low1 Mode : Digital |
| 16 | 435.000 | 485.000 | TX power : Low1 Mode : Wide CTCSS : 151.4 Hz: |

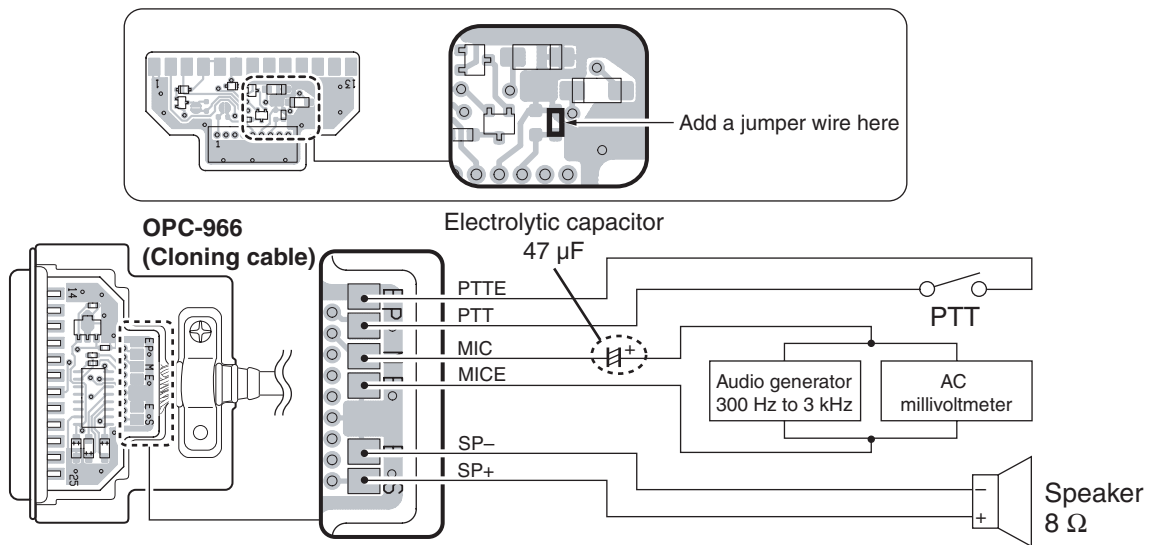
†: Necessary only when the optional UT-119 is installed.

*: [EUR] only

• CONNECTION



• JIG cable



• PC SCREEN EXAMPLE

Adjust Utility

| | |
|----------------|--------------------------|
| Setting | |
| CH No. | 1 RX=0.00000, TX=0.00000 |
| | RF Power=High, Mode=Wide |
| | CH Type=Analog |

Adjust

| | | |
|---------------|---|--------------------------|
| Power (Hi) | 0 | [-----] |
| Power (L2) | 0 | [-----] |
| Power (L1) | 0 | [-----] |
| BAL (Wide) | 0 | [-----] |
| BAL (Mid) | 0 | [-----] |
| BAL (Narrow) | 0 | [-----] |
| BAL (Digital) | 0 | [-----] |
| MOD (Wide) | 0 | [-----] |
| MOD (Mid) | 0 | [-----] |
| MOD (Narrow) | 0 | [-----] |
| MOD (Digital) | 0 | [-----] |
| CTCSS/DTCS | 0 | [-----] |
| SQL | 0 | [-----] |
| REF | 0 | [-----] |
| BPF C ALL | | [Enter] to Sweep |
| BPF T1 C | 0 | [-----] [Enter] to Sweep |
| BPF T2 C | 0 | [-----] [Enter] to Sweep |
| BPF L ALL | | [Enter] to Sweep |
| BPF T1 L | 0 | [-----] [Enter] to Sweep |
| BPF T2 L | 0 | [-----] [Enter] to Sweep |
| BPF H ALL | | [Enter] to Sweep |
| BPF T1 H | 0 | [-----] [Enter] to Sweep |
| BPF T2 H | 0 | [-----] [Enter] to Sweep |
| RX LVA1 | 0 | [-----] [Enter] to Sweep |
| RX LVA2 | 0 | [-----] [Enter] to Sweep |
| TX LVA | 0 | [-----] [Enter] to Sweep |
| LV (RX1) | 0 | 0.00V |
| LV (RX2) | 0 | 0.00V |
| LV (TX) | 0 | 0.00V |
| RSSI | 0 | [Enter] to Capture |
| MOD N C | 0 | [Enter] to Capture |
| MOD N L | 0 | [Enter] to Capture |
| MOD N H | 0 | [Enter] to Capture |
| MOD M C | 0 | [Enter] to Capture |
| MOD M L | 0 | [Enter] to Capture |
| MOD M H | 0 | [Enter] to Capture |
| MOD W C | 0 | [Enter] to Capture |
| MOD W L | 0 | [Enter] to Capture |
| MOD W H | 0 | [Enter] to Capture |
| MOD D C | 0 | [Enter] to Capture |
| MOD D L | 0 | [Enter] to Capture |
| MOD D H | 0 | [Enter] to Capture |
| Digital Mode | 1 | |

*; [EUR-01] only

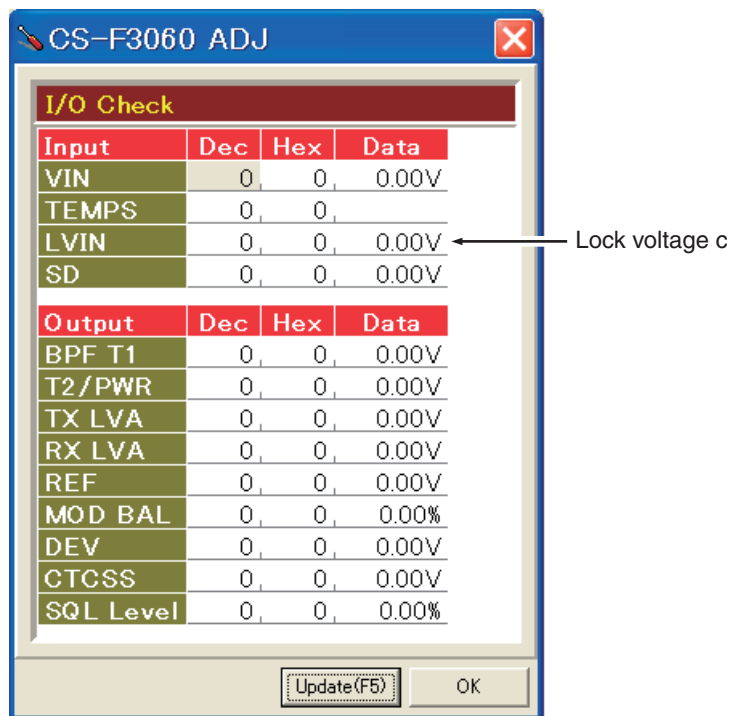
NOTE: The above values for settings are example only.
Each transceiver has its own specific values for each setting.

6-2 FREQUENCY ADJUSTMENT

Select an adjustment item using [↑]/[↓] keys, then set to the specified value using [←-]/[→] keys on the connected PC's keyboard.

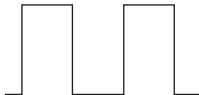
| ADJUSTMENT | ADJUSTMENT CONDITION | MEASUREMENT | | VALUE | |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| | | UNIT | OPERATION | | |
| PLL LOCK VOLTAGE [RX LVA1] | 1 <ul style="list-style-type: none"> • Channel : 1 • Lock voltage preset [LV (RX1)] : 51 [1.0 V] • Receiving | PC screen | Click [I/O Check] in the Clone menu to open the "I/O Check window." Click [Update (F5)] button, then check the "LVIN" item on the CS-F3060 ADJ's screen as below. | 1.00 V | |
| | [RX LVA2] | | | | 2 <ul style="list-style-type: none"> • Channel : 2 • Lock voltage preset [LV (RX2)] : 51 [1.0 V] • Receiving |
| | [TX LVA] | | | | 3 <ul style="list-style-type: none"> • Channel : 1 • Lock voltage preset [LV (TX)] : 51 [1.0 V] • Transmitting |
| PLL LOCK VOLTAGE | 1 <ul style="list-style-type: none"> • Channel : 4 • Receiving | PC screen | Click [Update (F5)] button, then check the "LVIN" item on the CS-F3060 ADJ's screen. | 3.4–4.4 V (Verify) | |
| | 2 <ul style="list-style-type: none"> • Channel : 3 • Receiving | | | 3.2–4.4 V (Verify) | |
| | 3 <ul style="list-style-type: none"> • Channel : 3 • Transmitting | | | | |
| REFERENCE FREQUENCY [REF] | <ul style="list-style-type: none"> • Channel : 3 • Connect an RF power meter to the antenna connector. • Transmitting | Top panel | Loosely couple a frequency counter to the antenna connector. | 470.000000/ 512.000000 MHz | |

• I/O Check window



6-3 TRANSMIT ADJUSTMENT

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

| ADJUSTMENT | ADJUSTMENT CONDITION | MEASUREMENT | | VALUE |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| | | UNIT | OPERATION | |
| OUTPUT POWER [Power (Hi)] | 1 • Channel : 5 • Transmitting | Top panel | Connect an RF power meter to the antenna connector. | 5.0 W |
| [Power (L2)] | 2 • Channel : 6 • Transmitting | | | 2.0 W |
| [Power (L1)] | 3 • Channel : 2 • Transmitting | | | 1.0 W |
| MODULATION BALANCE [BAL (Narrow)] | 1 • Channel : 2 • Preset [MOD Narrow] : 80 • No audio applied to the JIG cable. • Set an FM deviation meter same as; HPF : OFF LPF : 20 kHz De-emphasis : OFF Detector : (P-P)/2 • Push [P0] key while transmitting. | Top panel | Connect the FM deviation meter to the antenna connector through an attenuator. | Set to square wave form  |
| FM DEVIATION (NARROW) [MOD N C] | 1 • Frequency : 7 • Connect an audio generator to the JIG cable and set as; Frequency : 1.0 kHz Level : 150 mV rms • Set the FM deviation meter to same condition as "MODULATION BALANCE." • Transmitting | Top panel | Connect the FM deviation meter to the antenna connector through an attenuator. | ±2.05 to ±2.15 kHz |
| (NARROW) [MOD N L] | 2 • Channel : 8 • Transmitting | | | |
| (NARROW) [MOD N H] | 3 • Channel : 9 • Transmitting | | | |
| (WIDE) [MOD W C] | 4 • Channel : 2 • Transmitting | | | ±4.05 to ±4.15 kHz |
| (WIDE) [MOD W L] | 5 • Channel : 1 • Transmitting | | | |
| (WIDE) [MOD W H] | 6 • Channel : 3 • Transmitting | | | |
| (MIDDLE) [†] [MOD M C] | 7 • Frequency : 10 • Transmitting | | | ±3.2 to ±3.3 kHz |
| (MIDDLE) [†] [MOD M L] | 8 • Frequency : 11 • Transmitting | | | |
| (MIDDLE) [†] [MOD M H] | 9 • Frequency : 12 • Transmitting | | | |
| DIGITAL DEVIATION* [MOD D C] | 1 • Frequency : 13 • Preset [Digital Mode] : 7 • Set the FM deviation meter to same condition as "MODULATION BALANCE." • Transmitting | Top panel | Connect an FM deviation meter to the antenna connector through an attenuator. | ±1.35 to ±1.39 kHz |
| [MOD D L] | 2 • Channel : 14 • Transmitting | | | |
| [MOD D H] | 3 • Channel : 15 • Transmitting | | | |
| CTCSS/DTCS DEVIATION [CTCSS/DTCS] | 1 • Channel : 16 • CTCSS : 151.4 Hz • No audio applied to the JIG cable. • Set the FM deviation meter to same condition as "MODULATION BALANCE." • Transmitting | Top panel | Connect an FM deviation meter to the antenna connector through an attenuator. | ±0.68 to ±0.72 kHz |

[†]; [EUR-01] only.

*; Necessary only when the optional UT-119H or UT-126H is installed.

6-4 RECEIVE ADJUSTMENT

Select an adjustment item using [↑] / [↓] keys, then set to the specified value using [←] / [→] keys on the connected PC's keyboard.

| ADJUSTMENT | ADJUSTMENT CONDITION | MEASUREMENT | | VALUE |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------|
| | | UNIT | LOCATION | |
| RECEIVE SENSITIVITY [BPF C ALL] | NOTE: "RECEIVE SENSITIVITY" must be adjusted before "S-METER." Otherwise, "S-METER" will not be adjusted properly. | | | |
| | 1 <ul style="list-style-type: none"> • Frequency : 1 • Connect the SSG to the antenna connector and set as; <ul style="list-style-type: none"> Frequency : 400 MHz (low band) 450 MHz (High band) Level : +20 dBμ[†] (-87 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving | Multi connector | Connect the SINAD meter with an 8 Ω load to the JIG cable. | Minimum distortion level |
| S-METER [RSSI] | 1 <ul style="list-style-type: none"> • Frequency : 1 • Connect the SSG to the antenna connector and set as; <ul style="list-style-type: none"> Frequency : 400 MHz (low band) 450 MHz (High band) Level : +23 dBμ[†] (-84 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving | Push the [ENTER] key on the connected PC's keyboard to set "S3" level. | | |
| | 2 <ul style="list-style-type: none"> • Set the SSG as; <ul style="list-style-type: none"> Level : -7dBμ[†] (-114 dBm) • Receiving | Push the [ENTER] key on the connected PC's keyboard to set "S1" level. | | |
| SQUELCH [SQL] | 1 <ul style="list-style-type: none"> • Frequency : 1 • Close the squelch by adjusting the value of [SQL] item on the CS-F3060 ADJ's screen. • Connect the SSG to the antenna connector and set as; <ul style="list-style-type: none"> Frequency : 400 MHz (low band) 450 MHz (High band) Level : -14 dBμ[†] (-121 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving | External speaker | Connect an 8 Ω speaker to the JIG cable. | Set the [SQL] to the value that the audio signals just appears. |

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

SECTION 7

PARTS LIST

[FRONT UNIT] (For F4060 series)

| REF NO. | ORDER NO. | DESCRIPTION | M. | H/V LOCATION |
|---------|------------|------------------------------------------|----|--------------|
| IC501 | 1180002401 | S.REG S-812C30AMC-C2K-G | B | 66.7/35.7 |
| IC505 | 1110007330 | S.IC M62320FP-DF5G | B | 74/36.8 |
| IC506 | 1110007330 | S.IC M62320FP-DF5G | B | 56.8/24.5 |
| IC508 | 1110006770 | S.IC TDA8547TS/N | B | 79.6/11.9 |
| IC509 | 1110005330 | S.IC NJM12904V-TE1 | B | 79.8/24.9 |
| Q501 | 1520000460 | S.TR 2SB1132 T100 R | B | 75.2/25 |
| Q502 | 1590001190 | S.TR XP6501-(TX) .AB | B | 75.8/20.8 |
| Q506 | 1590003230 | S.TR UNR9113J-(TX) | B | 83.6/41 |
| Q507 | 1590003290 | S.TR UNR9213J-(TX) | B | 72.3/6.1 |
| Q508 | 1590001330 | S.TR DTA114EUA T106 | B | 72.2/9 |
| Q509 | 1590000980 | S.TR DTB123EK T146 | B | 72.4/12.3 |
| Q512 | 1590003290 | S.TR UNR9213J-(TX) | B | 72/18 |
| Q513 | 1590003290 | S.TR UNR9213J-(TX) | B | 74.9/15.6 |
| Q515 | 1560001360 | S.FET 2SK3019 TL | B | 81/32.2 |
| Q516 | 1590003290 | S.TR UNR9213J-(TX) | B | 80.9/36 |
| D504 | 1790001250 | S.DIO MA2S111-(TX) | B | 71/25.1 |
| D505 | 1160000140 | S.DIO DAP222 TL | B | 63.6/21.9 |
| D506 | 1160000140 | S.DIO DAP222 TL | B | 63.6/26 |
| D508 | 1160000060 | S.DIO DAN202U T106 | B | 75.1/5.7 |
| R503 | 7030009140 | S.RES ERJ2GEJ 272 X (2.7 k) | B | 74/20 |
| R504 | 7030008290 | S.RES ERJ2GEJ 183 X (18 k) | B | 74.8/18.4 |
| R505 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 76.6/18.4 |
| R506 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 75.2/13.7 |
| R508 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 81.8/18.2 |
| R509 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 79.1/18.2 |
| R510 | 7030005720 | S.RES ERJ2GEJ 563 X (56 k) | B | 81.7/16.6 |
| R511 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 78.3/16.6 |
| R513 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 85.2/41.1 |
| R514 | 7030005060 | S.RES ERJ2GEJ 333 X (33 k) | B | 87.5/38.8 |
| R515 | 7030005080 | S.RES ERJ2GEJ 823 X (82 k) | B | 81.8/34 |
| R516 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 79.4/32.4 |
| R518 | 7030010040 | S.RES ERJ2GEJ-JPW | B | 66/23 |
| R521 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 68.3/24.8 |
| R522 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 53.6/18.8 |
| R523 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 54.6/18.8 |
| R524 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 55.6/18.8 |
| R525 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 56.6/18.8 |
| R526 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 65.1/23 |
| R527 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 63.6/23.5 |
| R528 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 63.6/24.4 |
| R529 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 65/24.7 |
| R530 | 7030009280 | S.RES ERJ2GEJ 391 X | B | 71.6/14.4 |
| R531 | 7030005000 | S.RES ERJ2GEJ 471 X (470) | B | 82.7/33 |
| R532 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 65.2/31.6 |
| R533 | 7030007250 | S.RES ERJ2GEJ 220 X (22) | B | 63.2/27.8 |
| R534 | 7030007250 | S.RES ERJ2GEJ 220 X (22) | B | 64/29.1 |
| R535 | 7030004970 | S.RES ERJ2GEJ 470 X (47) | B | 69.7/3.4 |
| R536 | 7030004970 | S.RES ERJ2GEJ 470 X (47) | B | 69.7/5.4 |
| R537 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 69.7/4.4 |
| R538 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 72/3.1 |
| R539 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 69.7/2.4 |
| R540 | 7030007340 | S.RES ERJ2GEJ 153 X (15 k) | B | 80.3/20.2 |
| R541 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 79.4/20.2 |
| R542 | 7030005220 | S.RES ERJ2GEJ 223 X (22 k) | B | 81.7/28.3 |
| R543 | 7030007340 | S.RES ERJ2GEJ 153 X (15 k) | B | 82.6/27.1 |
| R544 | 7030004980 | S.RES ERJ2GEJ 101 X (100) | B | 82.6/29.9 |
| R546 | 7030009280 | S.RES ERJ2GEJ 391 X [TENKEY] only | B | 71.6/15.3 |
| R547 | 7030009280 | S.RES ERJ2GEJ 391 X [TENKEY] only | B | 71.6/16.2 |
| R548 | 7030005230 | S.RES ERJ2GEJ 334 X (330 k) | B | 74.4/8.5 |
| R552 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 79.8/30.4 |
| R553 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 72.9/41.7 |
| R554 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) [4-key] only | B | 79.4/41.3 |
| R555 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 74.4/9.4 |
| R557 | 7030004970 | S.RES ERJ2GEJ 470 X (47) | B | 87/34.7 |
| R558 | 7030005040 | S.RES ERJ2GEJ 472 X (4.7 k) | B | 73.9/18.4 |
| R559 | 7030005040 | S.RES ERJ2GEJ 472 X (4.7 k) | B | 77.4/16.6 |
| R560 | 7030005040 | S.RES ERJ2GEJ 472 X (4.7 k) | B | 77.5/18.4 |
| R561 | 7030005000 | S.RES ERJ2GEJ 471 X (470) | B | 82.7/22.7 |
| R562 | 7030005000 | S.RES ERJ2GEJ 471 X (470) | B | 83.4/20.3 |
| R563 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 80.4/16.6 |
| R564 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 79.5/16.6 |
| R566 | 7030010040 | S.RES ERJ2GEJ-JPW | B | 77.6/20.2 |
| R567 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 81/30.4 |
| C501 | 4550006760 | S.TAN TEESVB21A336M8R | B | 93.4/37.3 |
| C502 | 4550006760 | S.TAN TEESVB21A336M8R | B | 96.7/37.3 |
| C506 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 75.8/31.1 |
| C507 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 70.5/29 |
| C508 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 70.5/31.1 |
| C509 | 4030017460 | S.CER ECJ0EB1E102K | B | 75.6/12.5 |
| C510 | 4030016930 | S.CER ECJ0EB1A104K | B | 73.1/20 |
| C511 | 4030017460 | S.CER ECJ0EB1E102K | B | 75.7/18.4 |
| C514 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 78.5/5.4 |
| C515 | 4030016930 | S.CER ECJ0EB1A104K | B | 80.9/18.2 |
| C517 | 4030016930 | S.CER ECJ0EB1A104K | B | 80/18.2 |
| C518 | 4030017460 | S.CER ECJ0EB1E102K | B | 71.9/26.7 |
| C520 | 4030017460 | S.CER ECJ0EB1E102K | B | 87/41.1 |
| C522 | 4030016930 | S.CER ECJ0EB1A104K | B | 85.2/39.9 |
| C523 | 4030016930 | S.CER ECJ0EB1A104K | B | 80/34 |

[FRONT UNIT] (For F4060 series)

| REF NO. | ORDER NO. | DESCRIPTION | M. | H/V LOCATION |
|---------|------------|-----------------------------------|----|--------------|
| C525 | 4030016930 | S.CER ECJ0EB1A104K | B | 80.9/34 |
| C526 | 4030017460 | S.CER ECJ0EB1E102K | B | 70.9/26.7 |
| C527 | 4030017460 | S.CER ECJ0EB1E102K | B | 86.1/41.1 |
| C528 | 4030016930 | S.CER ECJ0EB1A104K | B | 80.3/41.3 |
| C529 | 4030016930 | S.CER ECJ0EB1A104K | B | 58/29.5 |
| C530 | 4030017460 | S.CER ECJ0EB1E102K | B | 81.2/41.3 |
| C531 | 4030017460 | S.CER ECJ0EB1E102K | B | 56.4/29.5 |
| C532 | 4550007090 | S.TAN TEESVA 1A 226M8R | B | 67.4/39.9 |
| C534 | 4030016930 | S.CER ECJ0EB1A104K | B | 65.8/38.2 |
| C535 | 4030016790 | S.CER ECJ0EB1C103K | B | 64.9/38.2 |
| C536 | 4550005980 | S.TAN TEESVA 1A 475M8R | B | 67/31.5 |
| C537 | 4030016930 | S.CER ECJ0EB1A104K | B | 55/37.7 |
| C538 | 4550000460 | S.TAN TEESVA 1C 105M8R | B | 54.6/31.9 |
| C539 | 4030016930 | S.CER ECJ0EB1A104K | B | 82.6/28.3 |
| C540 | 4030018140 | S.CER ECJ0EB1H391K | B | 81.2/20.2 |
| C541 | 4030016930 | S.CER ECJ0EB1A104K | B | 74.4/7.6 |
| C542 | 4030017440 | S.CER ECJ0EC1H221J | B | 79.8/29.4 |
| C543 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 75.8/29 |
| C544 | 4030017460 | S.CER ECJ0EB1E102K | B | 82.6/26.2 |
| C559 | 4030016790 | S.CER ECJ0EB1C103K | T | 87.8/27.1 |
| C560 | 4030017770 | S.CER ECJ0EB1E332K | B | 78.5/20.2 |
| C561 | 4030016930 | S.CER ECJ0EB1A104K | B | 82.4/31.1 |
| J501 | 6510025240 | S.CNR IMSA-9631S-20Y912 | B | 63.5/11.4 |
| J502 | 6510025250 | S.CNR IMSA-9631S-08Y912 | B | 58.8/35.5 |
| J503 | 6510025260 | S.CNR IMSA-9631S-10Y912 | B | 89.8/24.4 |
| DS501 | 5040002961 | S.LED SML-A12MT T86J | T | 82.9/33.6 |
| DS502 | 5040002961 | S.LED SML-A12MT T86J | T | 82.9/23.1 |
| DS503 | 5040002961 | S.LED SML-A12MT T86J | T | 82.9/12.6 |
| DS504 | 5040002420 | S.LED SML-310MT T86 | T | 38.1/12.9 |
| DS505 | 5040002420 | S.LED SML-310MT T86 | T | 38.1/30.9 |
| DS506 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 29.2/14.9 |
| DS507 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 29.2/28.9 |
| DS508 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 11.7/14.9 |
| DS509 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 11.7/28.9 |
| DS510 | 5030002830 | LCD M4-0078TAY-2 | | |
| MC501 | 7700002760 | MIC EM6027P-46C33-G-01 | | |
| W501 | 9028930010 | WIR 23/04/020/W02/W02 <TJM> | | |
| W502 | 9014506004 | WIR 23/00/025/W02/W02 <TJM> | | |

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

[FRONT-A UNIT] (For F4160 series)

| REF NO. | ORDER NO. | DESCRIPTION | M. | H/V LOCATION |
|---------|------------|-----------------------------------|----|--------------|
| IC501 | 1180002401 | S.REG S-812C30AMC-C2K-G | B | 66.7/35.7 |
| IC505 | 1110007330 | S.IC M62320FP-DF5G | B | 74/36.8 |
| IC506 | 1110007330 | S.IC M62320FP-DF5G | B | 56.8/24.5 |
| IC508 | 1110006770 | S.IC TDA8547TS/N | B | 79.6/11.9 |
| IC509 | 1110005330 | S.IC NJM12904V-TE1 | B | 79.8/24.9 |
| Q501 | 1520000460 | S.TR 2SB1132 T100 R | B | 75.2/25 |
| Q502 | 1590001190 | S.TR XP6501-(TX) .AB | B | 75.8/20.8 |
| Q506 | 1590003230 | S.TR UNR9113J-(TX) | B | 83.6/41 |
| Q507 | 1590003290 | S.TR UNR9213J-(TX) | B | 72.3/6.1 |
| Q508 | 1590001330 | S.TR DTA114EUA T106 | B | 72.2/9 |
| Q509 | 1590000980 | S.TR DTB123EK T146 | B | 72.4/12.3 |
| Q512 | 1590003290 | S.TR UNR9213J-(TX) | B | 72/18 |
| Q513 | 1590003290 | S.TR UNR9213J-(TX) | B | 74.9/15.6 |
| Q515 | 1560001360 | S.FET 2SK3019 TL | B | 81/32.2 |
| Q516 | 1590003290 | S.TR UNR9213J-(TX) | B | 80.9/36 |
| Q517 | 1590003290 | S.TR UNR9213J-(TX) | B | 56.7/9 |
| D504 | 1790001250 | S.DIO MA2S111-(TX) | B | 71/25.1 |
| D505 | 1160000140 | S.DIO DAP222 TL | B | 63.6/22.9 |
| D506 | 1160000140 | S.DIO DAP222 TL | B | 63.6/26 |
| D508 | 1160000060 | S.DIO DAN202U T106 | B | 75.1/5.7 |
| D509 | 1730002350 | S.ZEN MA8110-M (TX) | B | 56.1/11.1 |
| R503 | 7030009140 | S.RES ERJ2GEJ 272 X (2.7 k) | B | 74/20 |
| R504 | 7030008290 | S.RES ERJ2GEJ 183 X (18 k) | B | 74.8/18.4 |
| R505 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 76.6/18.4 |
| R506 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 75.2/13.7 |
| R508 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 81.8/18.2 |
| R509 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 79.1/18.2 |
| R510 | 7030005720 | S.RES ERJ2GEJ 563 X (56 k) | B | 81.7/16.6 |
| R511 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 78.3/16.6 |
| R512 | 7030005530 | S.RES ERJ2GEJ 100 X (10) | B | 87.6/16.2 |
| R513 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 85.2/41.1 |
| R514 | 7030005060 | S.RES ERJ2GEJ 333 X (33 k) | B | 87.5/38.8 |
| R515 | 7030005080 | S.RES ERJ2GEJ 823 X (82 k) | B | 81.8/34 |
| R516 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 79.4/32.4 |
| R521 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 68.3/24.8 |
| R522 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 53.6/18.8 |
| R523 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 54.6/18.8 |
| R524 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 55.6/18.8 |
| R525 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 56.6/18.8 |
| R526 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 65.1/23 |
| R527 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 63.6/23.5 |
| R528 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 63.6/24.4 |
| R529 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 65/24.7 |
| R530 | 7030009280 | S.RES ERJ2GEJ 391 X | B | 71.6/14.4 |
| R531 | 7030005000 | S.RES ERJ2GEJ 471 X (470) | B | 82.7/33 |
| R532 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 65.2/31.6 |
| R533 | 7030007250 | S.RES ERJ2GEJ 220 X (22) | B | 63.2/27.8 |
| R534 | 7030007250 | S.RES ERJ2GEJ 220 X (22) | B | 64/29.1 |
| R535 | 7030004970 | S.RES ERJ2GEJ 470 X (47) | B | 69.7/3.4 |
| R536 | 7030004970 | S.RES ERJ2GEJ 470 X (47) | B | 69.7/5.4 |
| R537 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 69.7/4.4 |
| R538 | 7030005120 | S.RES ERJ2GEJ 102 X (1 k) | B | 72/3.1 |
| R539 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 69.7/2.4 |
| R540 | 7030007340 | S.RES ERJ2GEJ 153 X (15 k) | B | 80.3/20.2 |
| R541 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 79.4/20.2 |
| R542 | 7030005220 | S.RES ERJ2GEJ 223 X (22 k) | B | 81.7/28.3 |
| R543 | 7030007340 | S.RES ERJ2GEJ 153 X (15 k) | B | 82.6/27.1 |
| R544 | 7030004980 | S.RES ERJ2GEJ 101 X (100) | B | 82.6/29.9 |
| R546 | 7030009280 | S.RES ERJ2GEJ 391 X | B | 71.6/15.3 |
| R547 | 7030009280 | S.RES ERJ2GEJ 391 X [TENKEY] only | B | 71.6/16.2 |
| R548 | 7030005230 | S.RES ERJ2GEJ 334 X (330 k) | B | 74.4/8.5 |
| R552 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 79.8/30.4 |
| R553 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 72.9/41.7 |
| R554 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 79.4/41.3 |
| R555 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 74.4/9.4 |
| R557 | 7030005530 | S.RES ERJ2GEJ 100 X (10) | B | 87/34.7 |
| R558 | 7030005040 | S.RES ERJ2GEJ 472 X (4.7 k) | B | 73.9/18.4 |
| R559 | 7030005040 | S.RES ERJ2GEJ 472 X (4.7 k) | B | 77.4/16.6 |
| R560 | 7030005040 | S.RES ERJ2GEJ 472 X (4.7 k) | B | 77.5/18.4 |
| R561 | 7030005000 | S.RES ERJ2GEJ 471 X (470) | B | 82.7/22.7 |
| R562 | 7030005000 | S.RES ERJ2GEJ 471 X (470) | B | 83.4/20.3 |
| R563 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 80.4/16.6 |
| R564 | 7030005050 | S.RES ERJ2GEJ 103 X (10 k) | B | 79.5/16.6 |
| R566 | 7030010040 | S.RES ERJ2GEJ-JPW | B | 77.6/20.2 |
| R567 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 81/30.4 |
| R568 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 69.8/42.1 |
| R569 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 70.7/42.1 |
| R570 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 71.6/42.1 |
| R571 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 57.1/7.4 |
| R572 | 7030005090 | S.RES ERJ2GEJ 104 X (100 k) | B | 69.1/20.4 |
| C501 | 4550006760 | S.TAN TEESVB21A336M8R | B | 93.4/37.3 |
| C502 | 4550006760 | S.TAN TEESVB21A336M8R | B | 96.7/37.3 |
| C506 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 75.8/31.1 |
| C507 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 70.5/29 |
| C508 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 70.5/31.1 |
| C509 | 4030017460 | S.CER ECJ0EB1E102K | B | 75.6/12.5 |
| C510 | 4030016930 | S.CER ECJ0EB1A104K | B | 73.1/20 |
| C511 | 4030017460 | S.CER ECJ0EB1E102K | B | 75.7/18.4 |
| C514 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 78.5/5.4 |
| C515 | 4030016930 | S.CER ECJ0EB1A104K | B | 80.9/18.2 |
| C517 | 4030016930 | S.CER ECJ0EB1A104K | B | 80/18.2 |
| C518 | 4030017460 | S.CER ECJ0EB1E102K | B | 71.9/26.7 |
| C519 | 4030016950 | S.CER ECJ0EB1A473K | B | 87.6/14.6 |
| C520 | 4030017460 | S.CER ECJ0EB1E102K | B | 87/41.1 |
| C522 | 4030016930 | S.CER ECJ0EB1A104K | B | 85.2/39.9 |

[FRONT-A UNIT] (For F4160 series)

| REF NO. | ORDER NO. | DESCRIPTION | M. | H/V LOCATION |
|---------|------------|-----------------------------------|----|--------------|
| C523 | 4030016930 | S.CER ECJ0EB1A104K | B | 80/34 |
| C525 | 4030016930 | S.CER ECJ0EB1A104K | B | 80.9/34 |
| C526 | 4030017460 | S.CER ECJ0EB1E102K | B | 70.9/26.7 |
| C527 | 4030017460 | S.CER ECJ0EB1E102K | B | 86.1/41.1 |
| C528 | 4030016930 | S.CER ECJ0EB1A104K | B | 80.3/41.3 |
| C529 | 4030016930 | S.CER ECJ0EB1A104K | B | 58/29.5 |
| C530 | 4030017460 | S.CER ECJ0EB1E102K | B | 81.2/41.3 |
| C531 | 4030017460 | S.CER ECJ0EB1E102K | B | 56.4/29.5 |
| C532 | 4550007090 | S.TAN TEESVA 1A 226M8R | B | 67.4/39.9 |
| C534 | 4030016930 | S.CER ECJ0EB1A104K | B | 65.8/38.2 |
| C535 | 4030016970 | S.CER ECJ0EB1C103K | B | 64.9/38.2 |
| C536 | 4550005980 | S.TAN TEESVA 1A 475M8R | B | 67/31.5 |
| C537 | 4030016930 | S.CER ECJ0EB1A104K | B | 55/37.7 |
| C538 | 4550000460 | S.TAN TEESVA 1C 105M8R | B | 54.6/31.9 |
| C539 | 4030016930 | S.CER ECJ0EB1A104K | B | 82.6/28.3 |
| C540 | 4030018140 | S.CER ECJ0EB1H391K | B | 81.2/20.2 |
| C541 | 4030016930 | S.CER ECJ0EB1A104K | B | 74.4/7.6 |
| C542 | 4030017440 | S.CER ECJ0EC1H221J | B | 79.8/29.4 |
| C543 | 4550006250 | S.TAN TEESVA 1A 106M8R | B | 75.8/29 |
| C544 | 4030017460 | S.CER ECJ0EB1E102K | B | 82.6/26.2 |
| C551 | 4030017420 | S.CER ECJ0EC1H470J | T | 87.9/24.4 |
| C552 | 4030017420 | S.CER ECJ0EC1H470J | T | 87.9/23.5 |
| C554 | 4030017420 | S.CER ECJ0EC1H470J | T | 87.9/21.7 |
| C556 | 4030017420 | S.CER ECJ0EC1H470J | T | 87.9/25.3 |
| C558 | 4030017420 | S.CER ECJ0EC1H470J | T | 87.8/28 |
| C559 | 4030016790 | S.CER ECJ0EB1C103K | T | 87.8/27.1 |
| C560 | 4030017770 | S.CER ECJ0EB1E332K | B | 78.5/20.2 |
| C561 | 4030016930 | S.CER ECJ0EB1A104K | B | 82.4/31.1 |
| C562 | 4030017460 | S.CER ECJ0EB1E102K | B | 69.1/19.5 |
| J501 | 6510025240 | S.CNR IMSA-9631S-20Y912 | B | 63.5/11.4 |
| J502 | 6510025250 | S.CNR IMSA-9631S-08Y912 | B | 58.8/35.5 |
| J503 | 6510025260 | S.CNR IMSA-9631S-10Y912 | B | 89.8/24.4 |
| DS501 | 5040002961 | S.LED SML-A12MT T86J | T | 82.9/33.6 |
| DS502 | 5040002961 | S.LED SML-A12MT T86J | T | 82.9/23.1 |
| DS503 | 5040002961 | S.LED SML-A12MT T86J | T | 82.9/12.6 |
| DS504 | 5040002420 | S.LED SML-310MT T86 | T | 38.1/12.9 |
| DS505 | 5040002420 | S.LED SML-310MT T86 | T | 38.1/30.9 |
| DS506 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 29.2/14.9 |
| DS507 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 29.2/28.9 |
| DS508 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 11.7/14.9 |
| DS509 | 5040002420 | S.LED SML-310MT T86 [TENKEY] only | T | 11.7/28.9 |
| DS510 | 5030002830 | LCD M4-0078TAY-2 | | |
| MC501 | 7700002760 | MIC EM6027P-46C33-G-01 | | |
| W501 | 9028930010 | WIR 23/04/020/W02/W02 <TJM> | | |
| W502 | 9014506004 | WIR 23/00/025/W02/W02 <TJM> | | |

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

[MAIN-A UNIT] (For F4160 series)

Table with columns: REF NO., ORDER NO., DESCRIPTION, M., H/V LOCATION. Contains component lists for F4160 series including ICs, Qs, Ds, and Xs.

[MAIN-A UNIT] (For F4160 series)

Table with columns: REF NO., ORDER NO., DESCRIPTION, M., H/V LOCATION. Contains component lists for F4160 series including X5, Ls, R1-R99, and X1-X4.

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

• BC-160 (Optional)

[MAIN UNIT]

| REF NO. | ORDER NO. | DESCRIPTION | M. | H/V LOCATION |
|---------|------------|------------------------------|----|--------------|
| IC1 | 1110006480 | S.IC NJM2801U1-0543-TE1 | B | 10.2/62.3 |
| IC2 | 1110003071 | S.IC uPC494GS-E1-A | B | 13/36.7 |
| IC3 | 1140012301 | S.IC uPD789112AMC-534-5A4-A | B | 19.1/19.6 |
| IC4 | 1110002700 | S.IC NJM2904M-TE1 | B | 35.1/13.8 |
| Q1 | 1530002060 | S.TR 2SC4081 T106 R | B | 37.3/63.9 |
| Q2 | 1550000090 | S.FET RSQ035P03TR | B | 37.3/60.9 |
| Q3 | 1530002060 | S.TR 2SC4081 T106 R | B | 35.8/19.3 |
| Q4 | 1530002060 | S.TR 2SC4081 T106 R | B | 41.6/18.3 |
| Q5 | 1590000430 | S.TR DTC144EUA T106 | B | 23.7/26.6 |
| Q6 | 1530002060 | S.TR 2SC4081 T106 R | B | 22.5/58.2 |
| D1 | 1730002350 | S.ZEN MA8110-M (TX) | B | 17.6/60.5 |
| D2 | 1750000550 | S.DIO 1SS355 TE-17 | B | 34.8/64.4 |
| D3 | 1750001110 | S.DIO SM240A-T | B | 44.4/56 |
| D4 | 1160000070 | S.DIO DAN202K T146 | B | 26.9/20.6 |
| D5 | 1750000550 | S.DIO 1SS355 TE-17 | B | 27.2/15 |
| X1 | 6060000790 | S.CER CSTCR4M91G | B | 10.3/17.7 |
| L1 | 6190001640 | S.COL SLF12555T-101M1R1 | B | 35.3/52.7 |
| L2 | 6200002611 | S.COL NLV25T-R47J | B | 20.8/28.2 |
| R2 | 7030000460 | S.RES MCR10EZHZJ 4.7 k | B | 20.3/58.6 |
| R3 | 7030003410 | S.RES ERJ3GEYJ 561 V (560) | B | 37.3/65.8 |
| R4 | 7030003200 | S.RES ERJ3GEYJ 100 V (10) | B | 34.6/61.1 |
| R5 | 7030009580 | S.RES ERJ8RSJ R12V | B | 31.8/73 |
| R6 | 7030000540 | S.RES MCR10EZHZJ 22 k | B | 30.1/26.8 |
| R7 | 7030000380 | S.RES MCR10EZHZJ 1 k | B | 30.1/29.6 |
| R8 | 7030003520 | S.RES ERJ3GEYJ 472 V (4.7 k) | B | 39.5/18.4 |
| R9 | 7030003600 | S.RES ERJ3GEYJ 223 V (22 k) | B | 13.8/30.5 |
| R10 | 7030000740 | S.RES MCR10EZHZJ 1 M | B | 25.8/34.9 |
| R11 | 7030000540 | S.RES MCR10EZHZJ 22 k | B | 24.8/37.8 |
| R12 | 7030003560 | S.RES ERJ3GEYJ 103 V (10 k) | B | 10.8/30.5 |
| R13 | 7030003600 | S.RES ERJ3GEYJ 223 V (22 k) | B | 19.3/34.5 |
| R14 | 7030003770 | S.RES ERJ3GEYJ 564 V (560 k) | B | 21/34.5 |
| R15 | 7030003650 | S.RES ERJ3GEYJ 563 V (56 k) | B | 21/40.3 |
| R16 | 7030003770 | S.RES ERJ3GEYJ 564 V (560 k) | B | 19.3/40.3 |
| R17 | 7030003560 | S.RES ERJ3GEYJ 103 V (10 k) | B | 22.7/40.3 |
| R18 | 7030003410 | S.RES ERJ3GEYJ 561 V (560) | B | 8.6/43.5 |
| R19 | 7030003620 | S.RES ERJ3GEYJ 333 V (33 k) | B | 16.7/42.1 |
| R20 | 7030000560 | S.RES MCR10EZHZJ 33 k | B | 28.1/40.4 |
| R21 | 7030000380 | S.RES MCR10EZHZJ 1 k | B | 26.3/28.6 |
| R22 | 7030000440 | S.RES MCR10EZHZJ 3.3 k | B | 24/11.4 |
| R23 | 7030000460 | S.RES MCR10EZHZJ 4.7 k | B | 24/8.8 |
| R24 | 7030000260 | S.RES MCR10EZHZJ 100 (101) | B | 20.3/11.4 |
| R25 | 7030000260 | S.RES MCR10EZHZJ 100 (101) | B | 20.3/8.8 |
| R26 | 7030000500 | S.RES MCR10EZHZJ 10 k | B | 30.5/22 |
| R27 | 7030007220 | S.RES ERA3YED 202V (2 k) | B | 30.2/19.6 |
| R28 | 7030011200 | S.RES ERA3YEB 303V (30 k) | B | 30/18.1 |
| R29 | 7030011190 | S.RES ERA3YEB 103V (10 k) | B | 26.9/16.6 |
| R30 | 7030005871 | S.RES ERA3YKD 104V (100 k) | B | 40.4/15.1 |
| R31 | 7030003560 | S.RES ERJ3GEYJ 103 V (10 k) | B | 29.8/15.9 |
| R32 | 7030005341 | S.RES ERA3YED 332V (3.3 k) | B | 43.4/11.1 |
| R33 | 7030000500 | S.RES MCR10EZHZJ 10 k | B | 31.7/9.8 |
| R34 | 7030000740 | S.RES MCR10EZHZJ 1 M | B | 42.1/14.4 |
| R35 | 7030003440 | S.RES ERJ3GEYJ 102 V (1 k) | B | 40.4/12.2 |
| R36 | 7030000460 | S.RES MCR10EZHZJ 4.7 k | B | 34.7/23.8 |
| R37 | 7030005501 | S.RES ERA3YKD 124V (120 k) | B | 33.6/21.3 |
| R38 | 7030005671 | S.RES ERA3YKD 393V (39 k) | B | 30.1/25.1 |
| R39 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 28.1/42.2 |
| R40 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 27.7/8.4 |
| R41 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 34.6/9.2 |
| R42 | 7030008240 | S.RES ERJ12YJ0R00U | B | 38.9/7.4 |
| R43 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 30.1/33.3 |
| R44 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 28.1/33.3 |
| R45 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 29.1/38 |
| R46 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 29.1/36.1 |
| R47 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 43.9/18.3 |
| R48 | 7030008240 | S.RES ERJ12YJ0R00U | B | 43/28.9 |
| R49 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 23.5/5.7 |
| R50 | 7030008240 | S.RES ERJ12YJ0R00U | B | 34.1/38.2 |
| R51 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 23.9/34.9 |
| R52 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 24.7/32 |
| R53 | 7030008240 | S.RES ERJ12YJ0R00U | B | 38.6/33.1 |
| R54 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 34.4/33 |
| R55 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 32/60.1 |
| R56 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 42.1/41.5 |
| R57 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 37.2/41.5 |
| R58 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 24.9/57 |
| R59 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 27.6/49.3 |
| R60 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 16.3/58.3 |
| R61 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 4.9/31.7 |
| R62 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 39.1/41.5 |
| R63 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 31.4/43.6 |
| R64 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 40.1/38.7 |
| R65 | 7030000010 | S.RES MCR10EZHZJ JPW | B | 4.9/49.5 |
| R66 | 7030003560 | S.RES ERJ3GEYJ 103 V (10 k) | B | 8.2/13.6 |
| R67 | 7030000100 | S.RES MCR10EZHZJ 4R7 (4.7) | B | 10.2/45.1 |
| C1 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 44.5/70.7 |
| C2 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 48.2/73.5 |
| C3 | 4030006860 | S.CER C1608 JB 1H 102K-T | B | 44.5/67.8 |

[MAIN UNIT]

| REF NO. | ORDER NO. | DESCRIPTION | M. | H/V LOCATION |
|---------|------------|--------------------------|----|--------------|
| C4 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 32.9/69.7 |
| C5 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 32.9/71.1 |
| C6 | 4510008540 | S.ELE EEE1CA100SR | B | 17.5/63.8 |
| C7 | 4030011600 | S.CER C1608 JB 1E 104K-T | B | 13.4/60.8 |
| C8 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 9.2/58.7 |
| C9 | 4030011600 | S.CER C1608 JB 1E 104K-T | B | 13.4/63.8 |
| C10 | 4510009150 | S.ELE EEE1EA470WP | B | 43.6/62.8 |
| C11 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 35.8/67.9 |
| C12 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 32.4/67.9 |
| C13 | 4510009150 | S.ELE EEE1EA470WP | B | 26.5/62.8 |
| C14 | 4510008660 | S.ELE EEE0JA220SR | B | 34.3/28 |
| C15 | 4510008660 | S.ELE EEE0JA220SR | B | 40.8/23.8 |
| C16 | 4030006860 | S.CER C1608 JB 1H 102K-T | B | 12.3/30.5 |
| C17 | 4030011600 | S.CER C1608 JB 1E 104K-T | B | 19.3/37.4 |
| C18 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 21/37.4 |
| C19 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 13.1/42.2 |
| C20 | 4030009980 | S.CER C1608 JB 1H 152K-T | B | 8.6/42.1 |
| C21 | 4030011600 | S.CER C1608 JB 1E 104K-T | B | 9.5/21.9 |
| C22 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 19/25.5 |
| C23 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 26.9/23.2 |
| C24 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 26.9/18 |
| C25 | 4030004760 | S.CER C2012 JF 1H 104Z-T | B | 33.2/17.5 |
| C26 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 41.9/11.1 |
| C27 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 29.5/12.6 |
| C28 | 4030006900 | S.CER C1608 JB 1H 103K-T | B | 30.1/23.7 |
| J1 | 6510024940 | CNR HEC2305-016250 | | |
| DS1 | 5040002740 | LED RT3-03HRYG | | |

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

SECTION 8

MECHANICAL PARTS

[CHASSIS PARTS]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|-----------------------------------------|------|
| J1 | 6910015910 | ANT CONNECTOR 104 | 1 |
| J2 | 6910015860 | IMSA-6277S-O2A-G | 1 |
| SP1 | 2510001360 | K036NAX040A00-55 | 1 |
| W1 | 8900014981 | OPC-1589-1 | 1 |
| W2 | 8900014971 | OPC-1590-1 | 1 |
| MP1 | 8010020290 | 2893 CHASSIS | 1 |
| MP2 | 8210022600 | 2893 T-FRONT PANEL | 1 |
| | | (Incl. MP5. 6, 13, 25, 27, 28) [TENKEY] | 1 |
| | 8210022940 | 2893 S-FRONT PANEL | 1 |
| | | (Incl. MP5. 6, 13, 25, 27, 28) [4-KEY] | 1 |
| MP3 | 8210022540 | 2893 REAR PANEL | 1 |
| MP4 | 8310065610 | 2893 WINDOW PLATE | 1 |
| MP5 | 8210022560 | 2893 PTT PANEL | 1 |
| MP6 | 8930068630 | 2893 PTT BUTTON | 1 |
| MP7 | 8930068640 | 2893 LENS | 1 |
| MP8 | 8610012920 | KNOB N-345 (Incl. MP9) | 1 |
| MP9 | 8610007920 | KNOB SPRING NO.1500 | 1 |
| MP10 | 8610012930 | KNOB N-346 (Incl. MP11) | 1 |
| MP11 | 8610007510 | KNOB SPRING NO.7800 | 1 |
| MP12 | 8930068610 | 2893 KEYBOARD | 1 |
| | 8930068960 | 2893 4-KEY [TENKEY] | 1 |
| | | [4-KEY] | 1 |
| MP13 | 8930068620 | 2893 PTT RUBBER | 1 |
| MP14 | 8930068650 | 2893 MAIN SEAL | 1 |
| MP15 | 8930068660 | 2893 WASHER PLATE | 1 |
| MP16 | 8510017650 | 2893 SHIELD PLATE | 1 |
| MP17 | 8930063060 | 2721 T-RUBBER | 1 |
| MP18 | 8930070362 | 2775 RELEASE PLATE (A)-2 | 1 |
| MP19 | 8930059360 | 2600 RELEASE BUTTON | 1 |
| MP20 | 8930056540 | PUSH SPRING (AH) | 2 |
| MP22 | 8930058720 | 2600 9-PIN SHEET | 1 |
| MP23 | 8930055890 | 2403 CONNECTOR SHEET | 1 |
| MP24 | 8930055730 | 2403 CONNECTOR SEAL | 1 |
| MP25 | 8830001591 | 1362 INSERT NUT (A)-1 | 1 |
| MP26 | 8930046020 | 1123 SHEET (A)-1 | 1 |
| MP27 | 8930040390 | SPEAKER NET (B) | 1 |
| MP28 | 8930046050 | SPEAKER NET (C) | 1 |
| MP29 | 8930063411 | 2775 B-TOP PLATE-1 | 1 |
| MP30 | 8830001701 | VR NUT (Q)-1 | 2 |
| MP31 | 8830001720 | 2721 ANT NUT | 1 |
| MP32 | 8930048840 | 2135 MIC SPONGE | 1 |
| MP33 | 8810008641 | 0TAP 1FLAT WASHER B0 2X4 NI-ZC3 (BT) | 6 |
| MP34 | 8810008971 | 0TAP 1FLAT WASHERB0 2X3.5NI-ZC3 (BT) | 8 |
| MP35 | 8810009511 | SCREW BT B0 2X4 NI-ZC3 (BT) | 4 |
| MP36 | 8810010430 | SCREW TRUSS M3X5 SUS SSBC | 1 |
| MP38 | 8810009561 | SCREW BT B0 2X6 NI-ZK3 (BT) | 2 |
| MP39 | 8810009221 | SCREW BT B0 2X8 NI-ZK3 (BT) | 2 |
| MP40 | 8930069710 | THERMALLY SHEET (BC) | 1 |
| MP41 | 8930069860 | 2893 WINDOW SHEET | 1 |
| MP42 | 8510017710 | 2893 EARTH PLATE | 1 |
| MP44 | 8930070010 | 2893 VOL RUBBER | 1 |

[FRONT/FRONT-A UNIT]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|----------------------|------|
| J501* | 6510025240 | IMSA-9631S-20A-TB | 1 |
| J502* | 6510025250 | IMSA-9631S-08A-TB | 1 |
| J503* | 6510025260 | IMSA-9631S-10A-TB | 1 |
| DS510 | 5030002830 | M4-0078TAY-2 | 1 |
| MC501 | 7700002760 | EM6027P-46C33-G-01 | 1 |
| W501 | 9028930010 | 23/04/020/W02/W02 | 1 |
| W502 | 9014506004 | 23/00/025/W02/W02 | 1 |
| MP501 | 8210021460 | 2803 REFLECTOR | 1 |
| MP502 | 8950004430 | DOUBLESIDED TAPE (O) | 2 |
| MP503 | 8930062540 | SPONGE (HO) | 2 |
| MP505* | 6910014760 | OG-503040 | 1 |
| MP506 | 8930069990 | SPONGE (IZ) | 1 |
| MP507 | 8930074230 | 2893 LCD SHEET | 1 |

[MAIN/MAIN-A UNIT]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|------------------------------------|------|
| J1* | 6510025220 | AXK540145J | 1 |
| J2* | 6510025220 | AXK540145J | 1 |
| J3* | 6510025190 | IMSA-9639S-20Y905 | 1 |
| J4* | 6510023970 | 20P3.5-JMCS-G-B | 1 |
| S3 | 2260002840 | SKHLLFA010 | 1 |
| S4* | 2260002800 | SW-167 (SKQT) | 1 |
| S5* | 2260002800 | SW-167 (SKQT) | 1 |
| S6* | 2260002800 | SW-167 (SKQT) | 1 |
| MP1* | 8510017410 | 2893 VCO CASE | 1 |
| MP2 | 8510017420 | 2893 VCO COVER | 1 |
| MP4 | 8930070311 | SPONGE (JE)-1 [IC-F4061DT/DS] only | 1 |
| EP7 | (Optional) | UT-126H [IC-F4061DT/DS] only | 1 |

[RF UNIT]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|-------------------------|------|
| J601 | 6910017940 | IMSA-9230B-1-05Z118-PT1 | 1 |
| J602 | 6910017940 | IMSA-9230B-1-05Z118-PT1 | 1 |
| F601* | 5210000970 | ERBSE3R00U | 1 |
| MP601* | 8510017600 | OG-363050 | 1 |
| MP602 | 8930070500 | 2894 RF SPRING | 1 |

[VR UNIT]

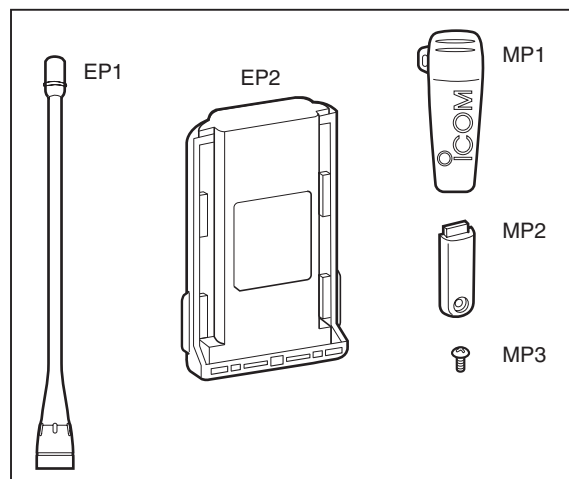
| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|-----------------------|------|
| J701* | 6510024930 | 20RF-JMCS-G-1B-TF (N) | 1 |
| S701 | 2250000490 | TP70TF5163 15.9F-2775 | 1 |
| S702* | 2230001060 | EVQ-PUL 02K | 1 |

[JACK UNIT]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|------------------------|------|
| J801* | 6510025141 | 10FLT-SM2-TB (LF) (SN) | 1 |
| MP801* | 8950005520 | 2403 9-PIN CONNECTOR | 1 |
| MP802 | 8930069960 | 2893 EARTH SPRING | 1 |

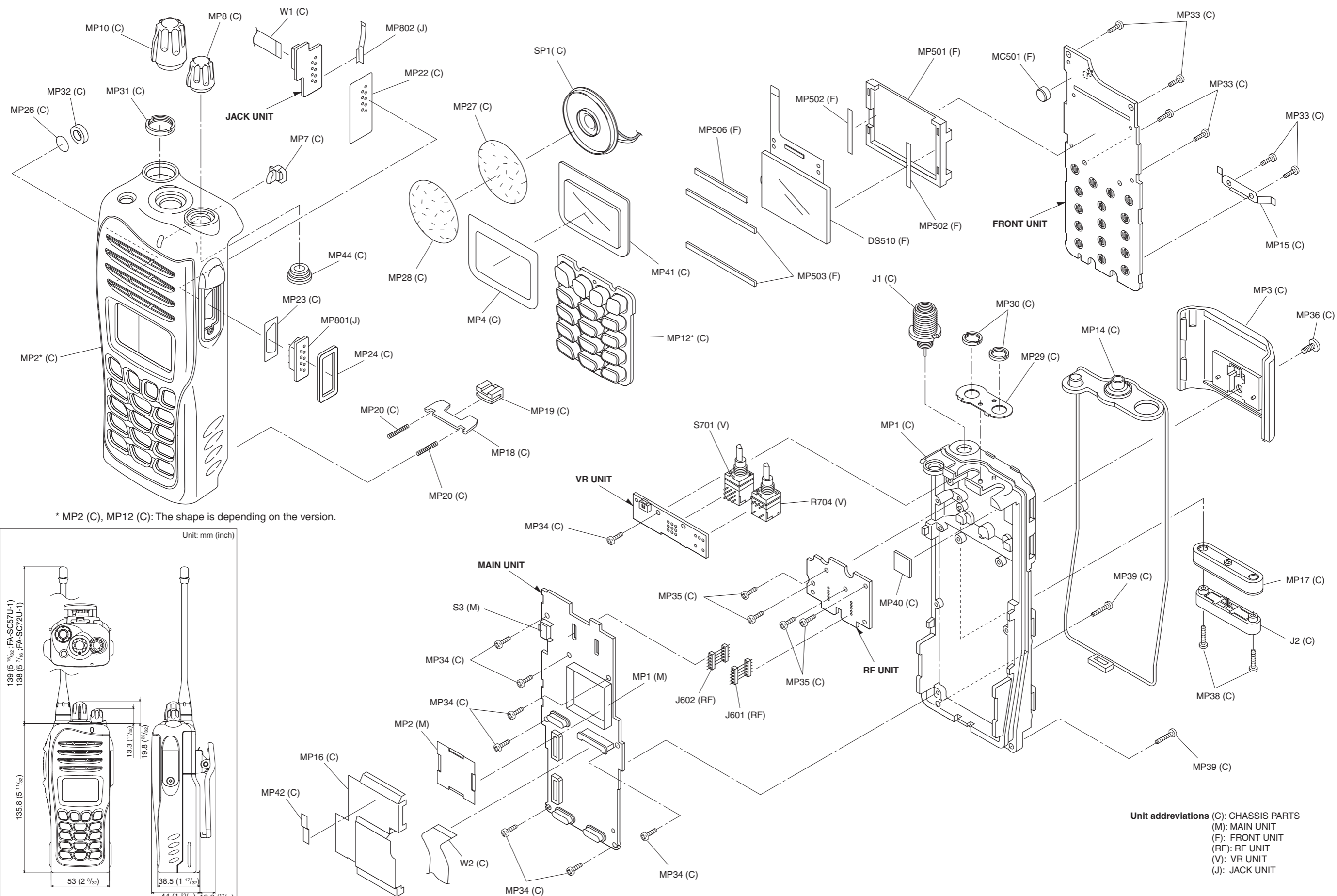
[ACCESSORIES]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|---------------------------|------|
| EP1 | (Optional) | FA-SC57U-1 [Low band] | 1 |
| | (Optional) | FA-SC72U-1 [High band] | 1 |
| EP2 | (Optional) | BP-232N | 1 |
| MP1 | (Optional) | MB-94 | 1 |
| MP2 | 8210021471 | 2803 SIDE PANEL-1 | 1 |
| MP3 | 8810010430 | SCREW TRUSS M3X5 SUS SSBC | 1 |

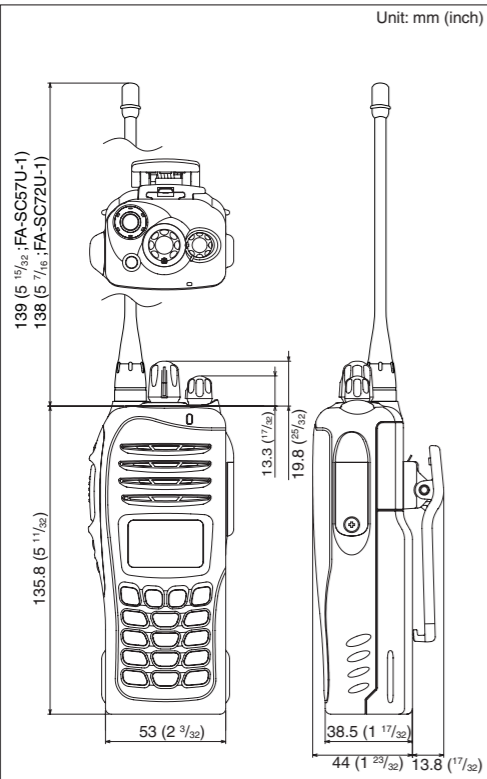


*: Refer to "BOARD LAYOUTS."

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



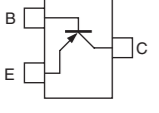
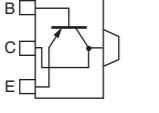
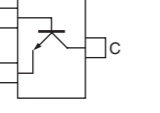
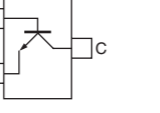
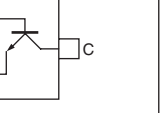
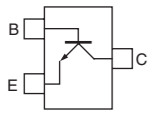
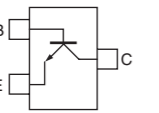
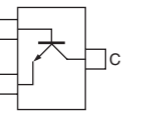
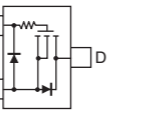
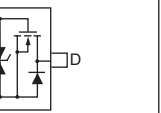
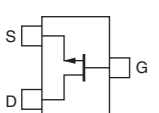
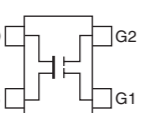
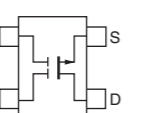
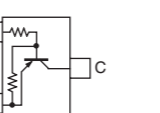
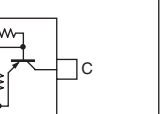
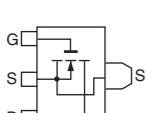
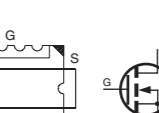
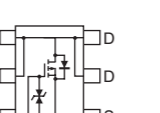
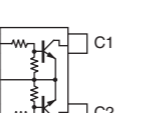
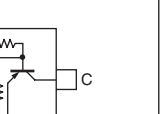
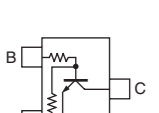
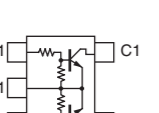
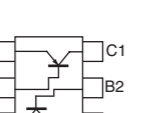
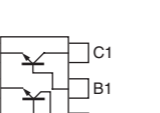
* MP2 (C), MP12 (C): The shape is depending on the version.



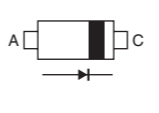
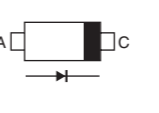
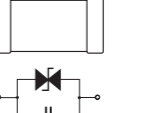
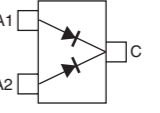
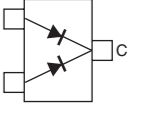
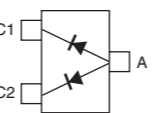
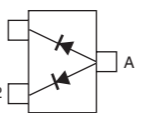
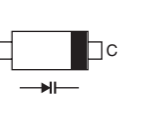
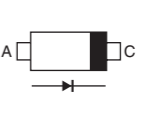
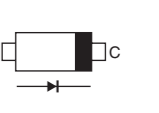
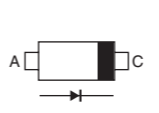
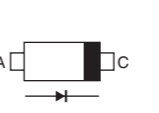
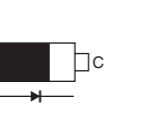
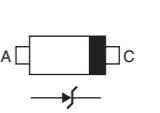
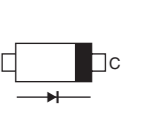
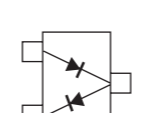
Unit abbreviations (C): CHASSIS PARTS
 (M): MAIN UNIT
 (F): FRONT UNIT
 (RF): RF UNIT
 (V): VR UNIT
 (J): JACK UNIT

SECTION 9 SEMICONDUCTOR INFORMATION

• TRANSISTERS AND FETs

| | | | | |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 2SA1577 T106 Q (Symbol: HQ)  | 2SB1132 T100 R (Symbol: BAR)  | 2SC3356 (Symbol: R25)  | 2SC4116 BL (Symbol: LL)  | 2SC4215 O (Symbol: QO)  |
| 2SC4226 T1 R25 (Symbol: R25)  | 2SC5107 O (Symbol: MFO)  | 2SC5700 (Symbol: WB-)  | 2SK1829 (Symbol: K1)  | 2SK3019 (Symbol: KN)  |
| 2SK880 Y (Symbol: XY)  | 3SK293 (Symbol: UF)  | 3SK324UG-TL-E (Symbol: UG-)  | DTA114EUA T106 (Symbol: 16)  | DTB123 EK T146 (Symbol: F12)  |
| RD01MUS1 (Symbol: K2)  | RD07MVS1 (Symbol: RD07MVS1)  | TPC6103 (Symbol: S3C)  | UMG2N (Symbol: G2)  | UNR9113J (Symbol: 6C)  |
| UNR9213J (Symbol: 8C)  | XP1214 (Symbol: 9H)  | XP4601 (Symbol: 5C)  | XP6501 AB (Symbol: 5N)  | |

• DIODES

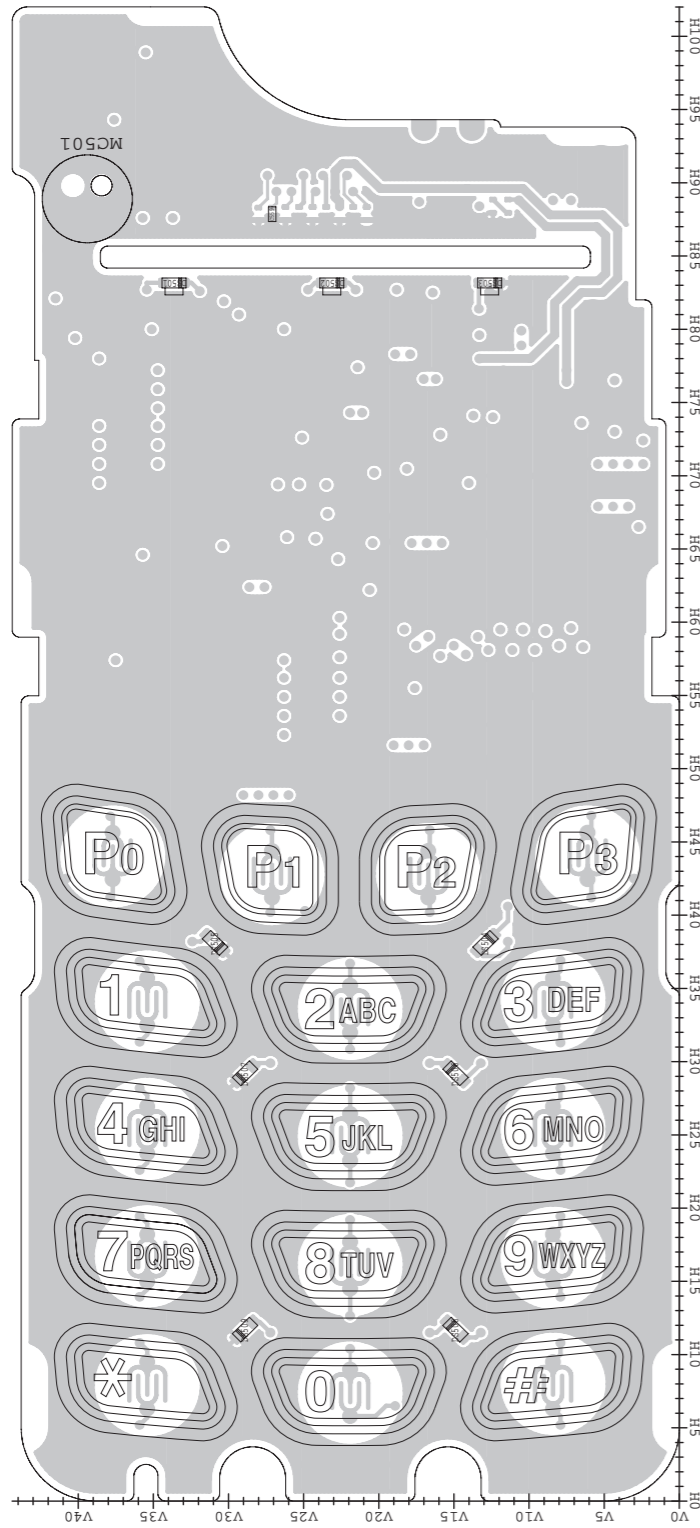
| | | | | |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 1SV307 (Symbol: TX)  | 1SV308 (Symbol: TX)  | AVR-M1005C080MTABB  | DAN202 U T106 (Symbol: N)  | DAN235E TL (Symbol: M)  |
| DAP202 U T106 (Symbol: P)  | DAP222 TL (Symbol: P)  | HVC350B (Symbol: B0)  | HVC383B (Symbol: F4)  | MA2S077 (Symbol: S)  |
| MA2S111 (Symbol: A)  | MA2S728 (Symbol: B)  | MA368 (Symbol: 6L)  | MA8051 M (Symbol: 5-1)  | MA8150 M (Symbol: 15-)  |
| RB706F-40 T106 (Symbol: 3J)  | | | | |

SECTION 10

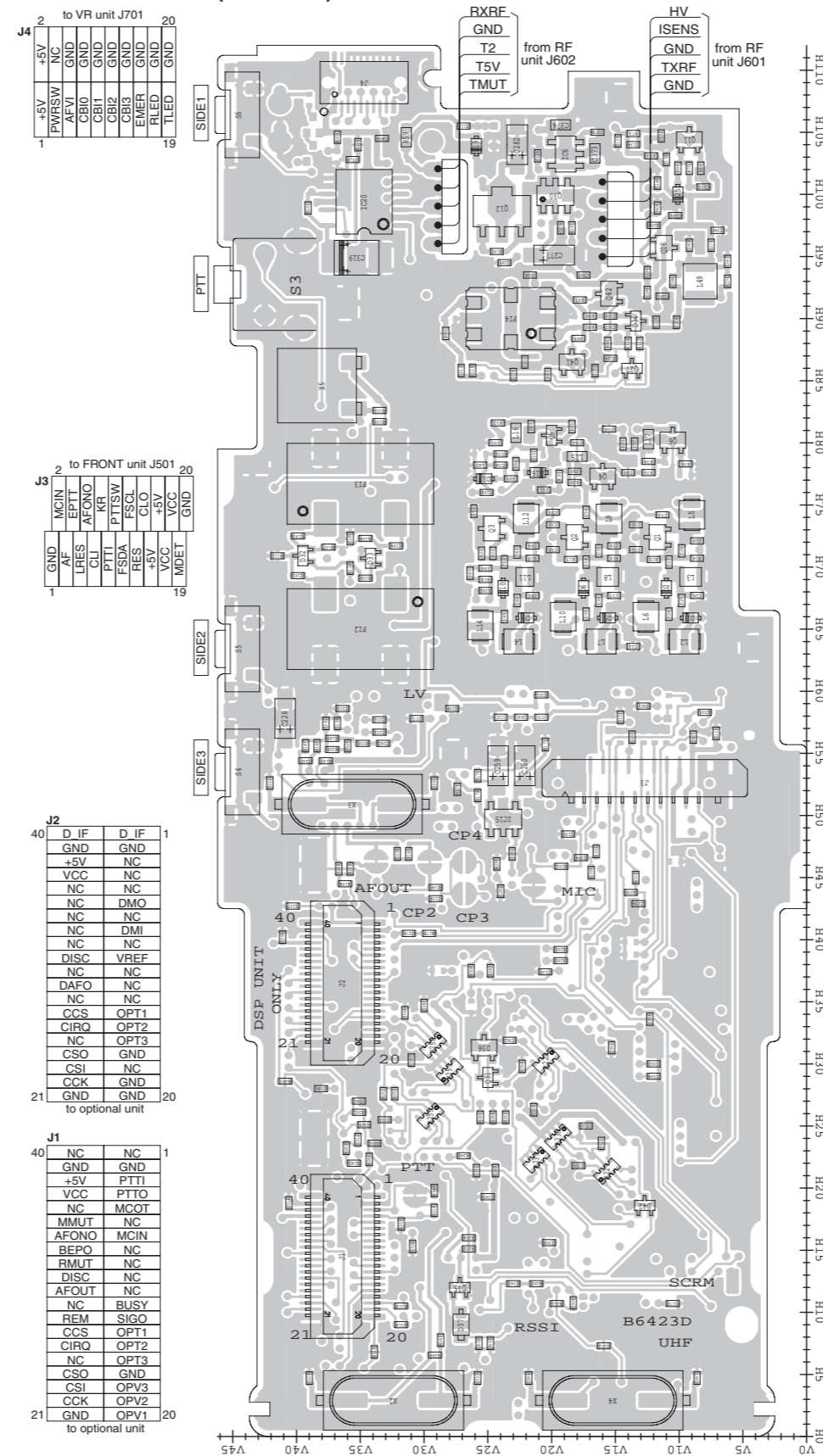
BOARD LAYOUTS

• For IC-F4060 series

• FRONT UNIT (TOP VIEW)

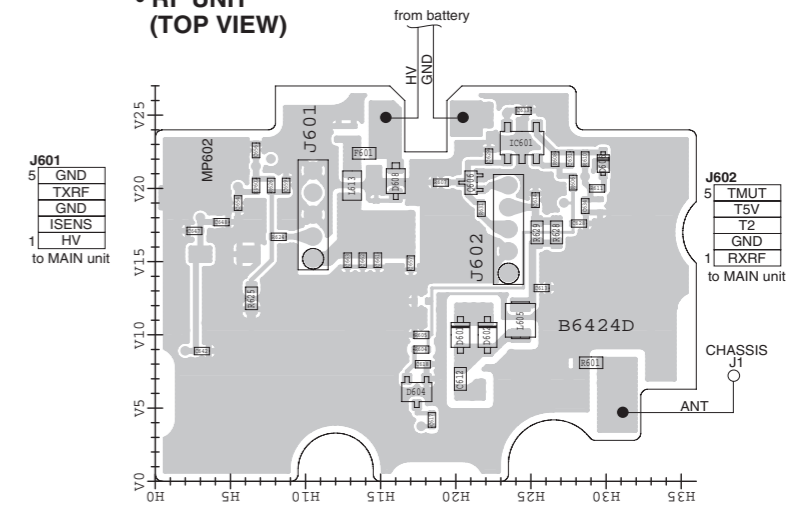


• MAIN UNIT (TOP VIEW)

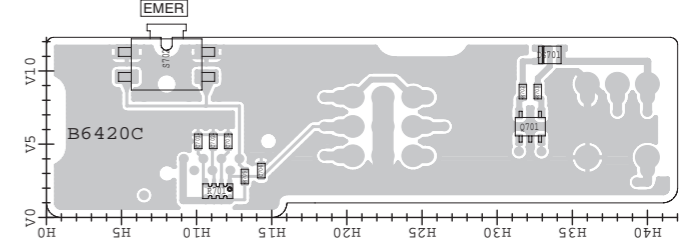


The combination of this side and the bottom side shows the board layout in the same configuration as the actual P.C.Board.

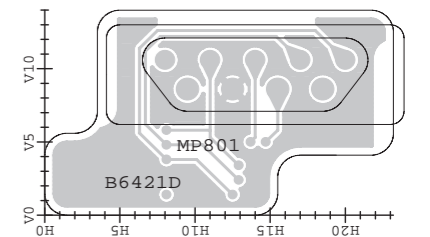
• RF UNIT (TOP VIEW)



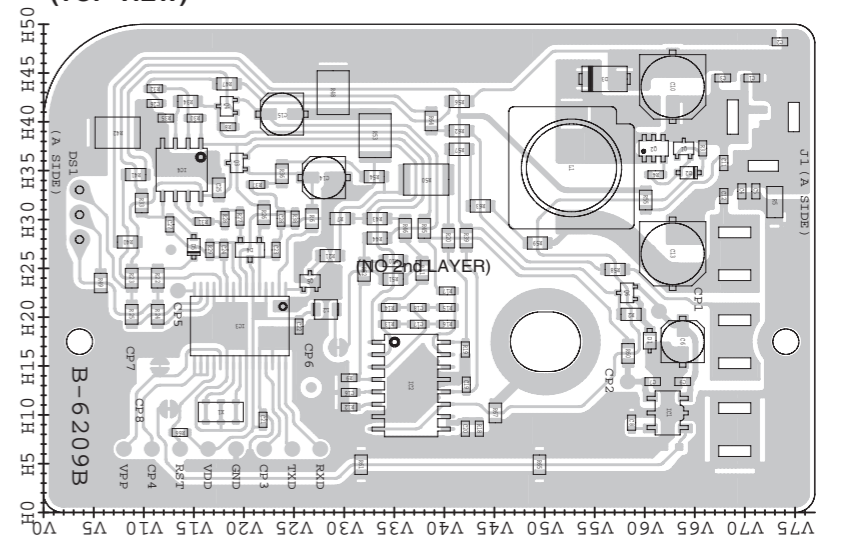
• VR UNIT (TOP VIEW)



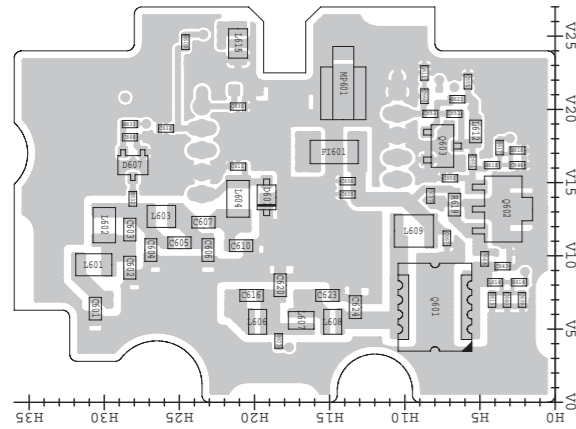
• JACK UNIT (TOP VIEW)



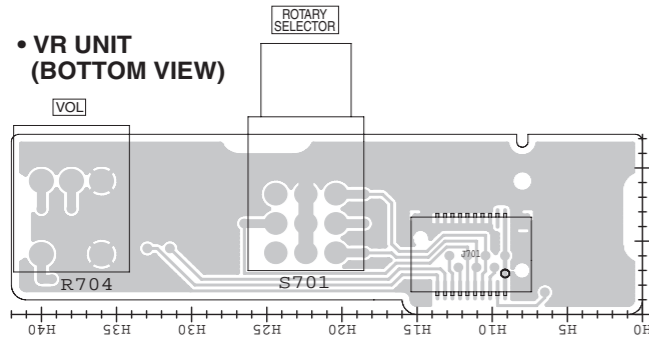
• BC-160 (TOP VIEW)



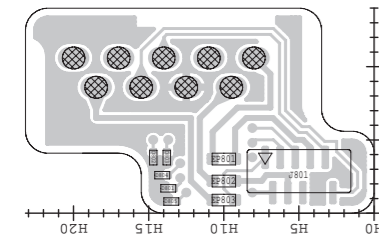
• RF UNIT
(BOTTOM VIEW)



• VR UNIT
(BOTTOM VIEW)



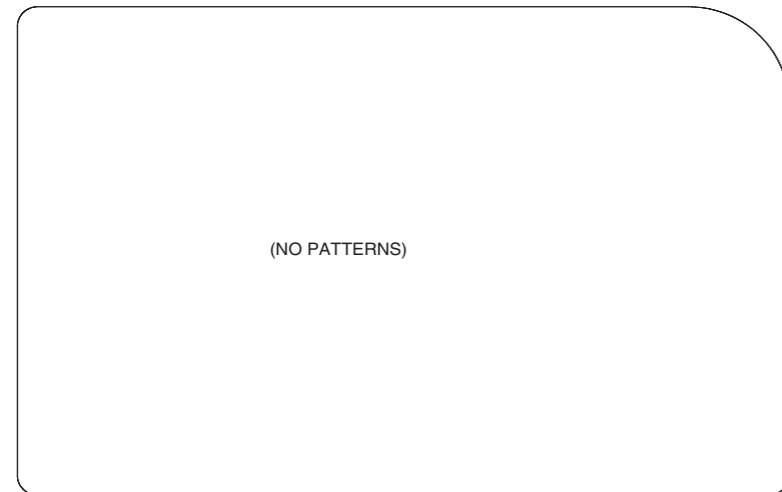
• JACK UNIT
(BOTTOM VIEW)



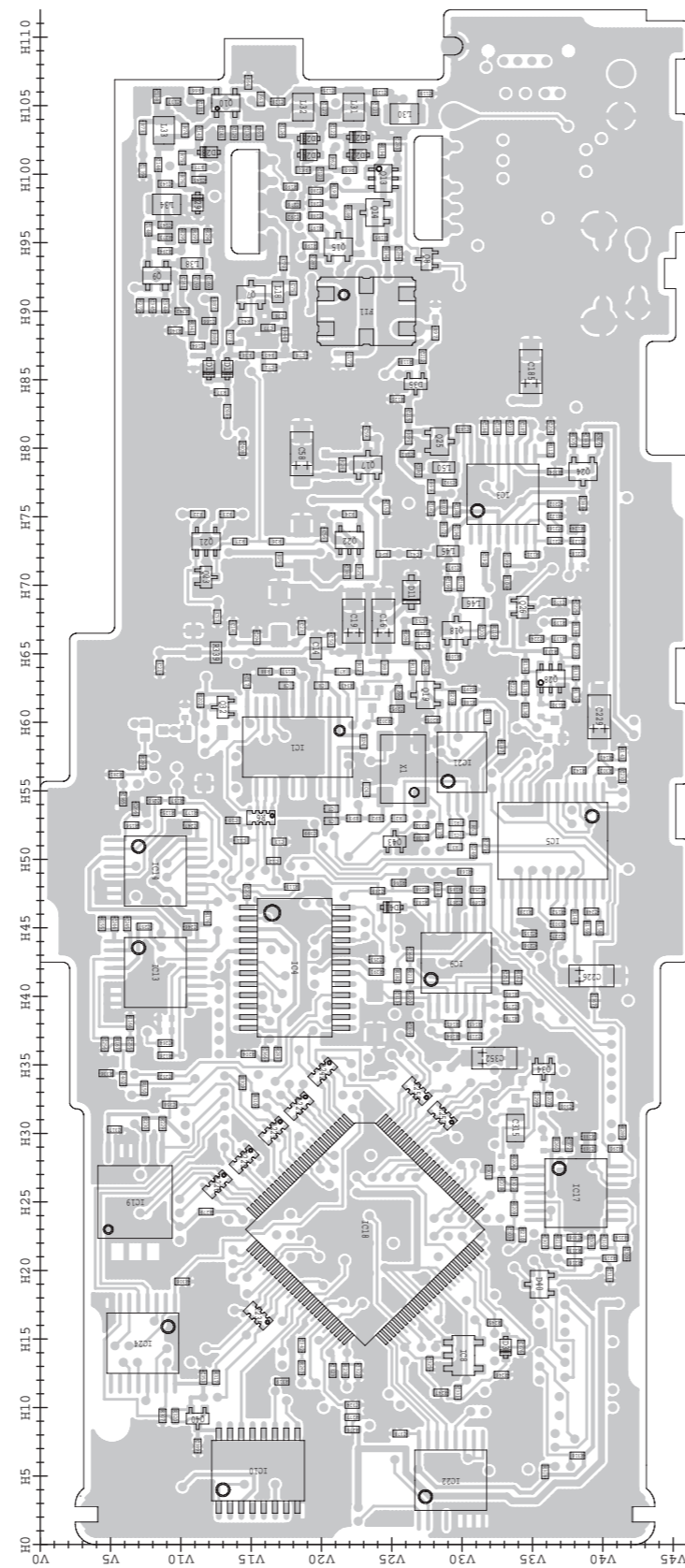
J801 to FRONT unit J503

| | |
|----|------|
| 1 | EPTT |
| 2 | CLO |
| 3 | MDET |
| 4 | EAFO |
| 5 | RES |
| 6 | GND |
| 7 | CLI |
| 8 | EMIC |
| 9 | VCC |
| 10 | NC |

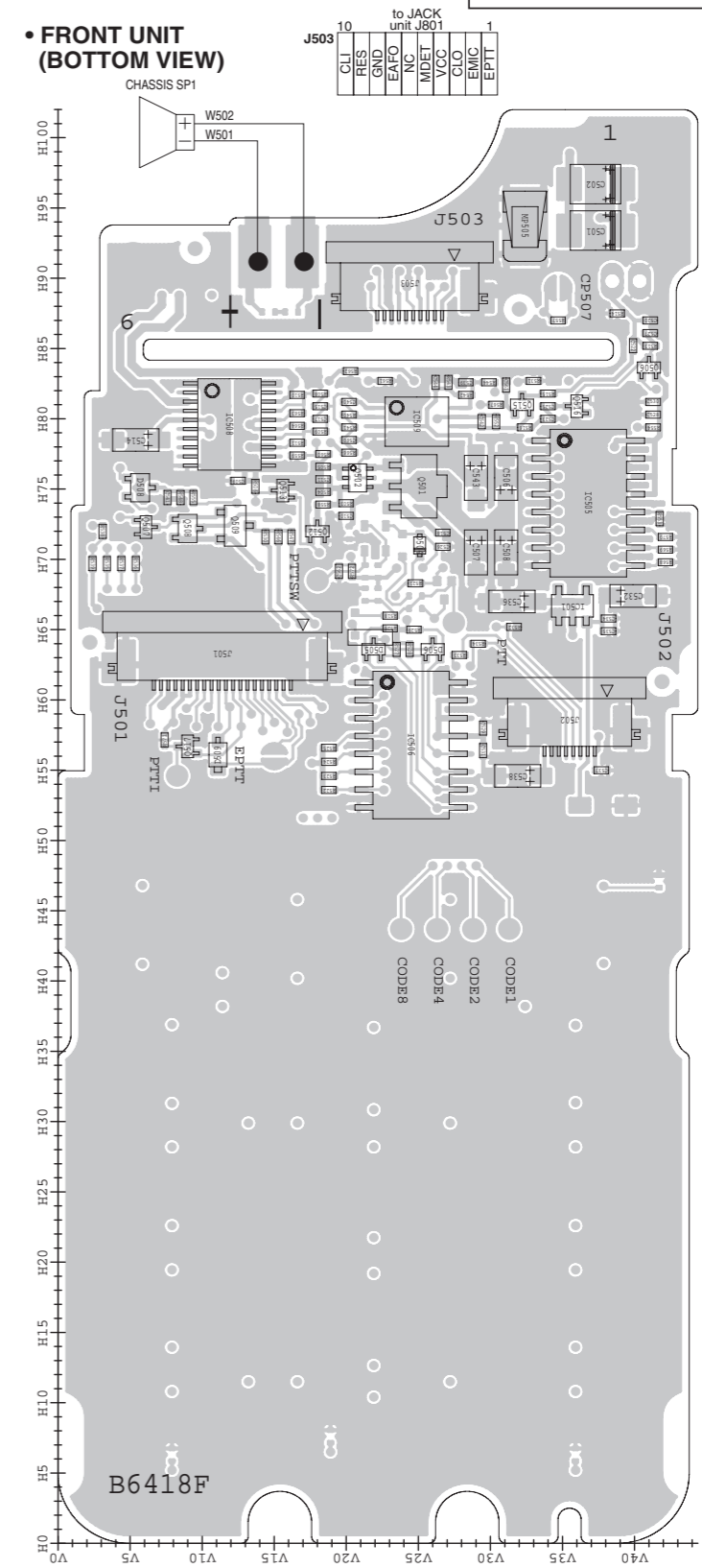
• BC-160
(BOTTOM VIEW)



• MAIN UNIT
(BOTTOM VIEW)



• FRONT UNIT
(BOTTOM VIEW)



J503 to JACK unit J801

| | |
|----|------|
| 10 | CLI |
| 9 | RES |
| 8 | GND |
| 7 | EAFO |
| 6 | NC |
| 5 | MDET |
| 4 | VCC |
| 3 | CLO |
| 2 | EMIC |
| 1 | EPTT |

J501 to MAIN unit J3

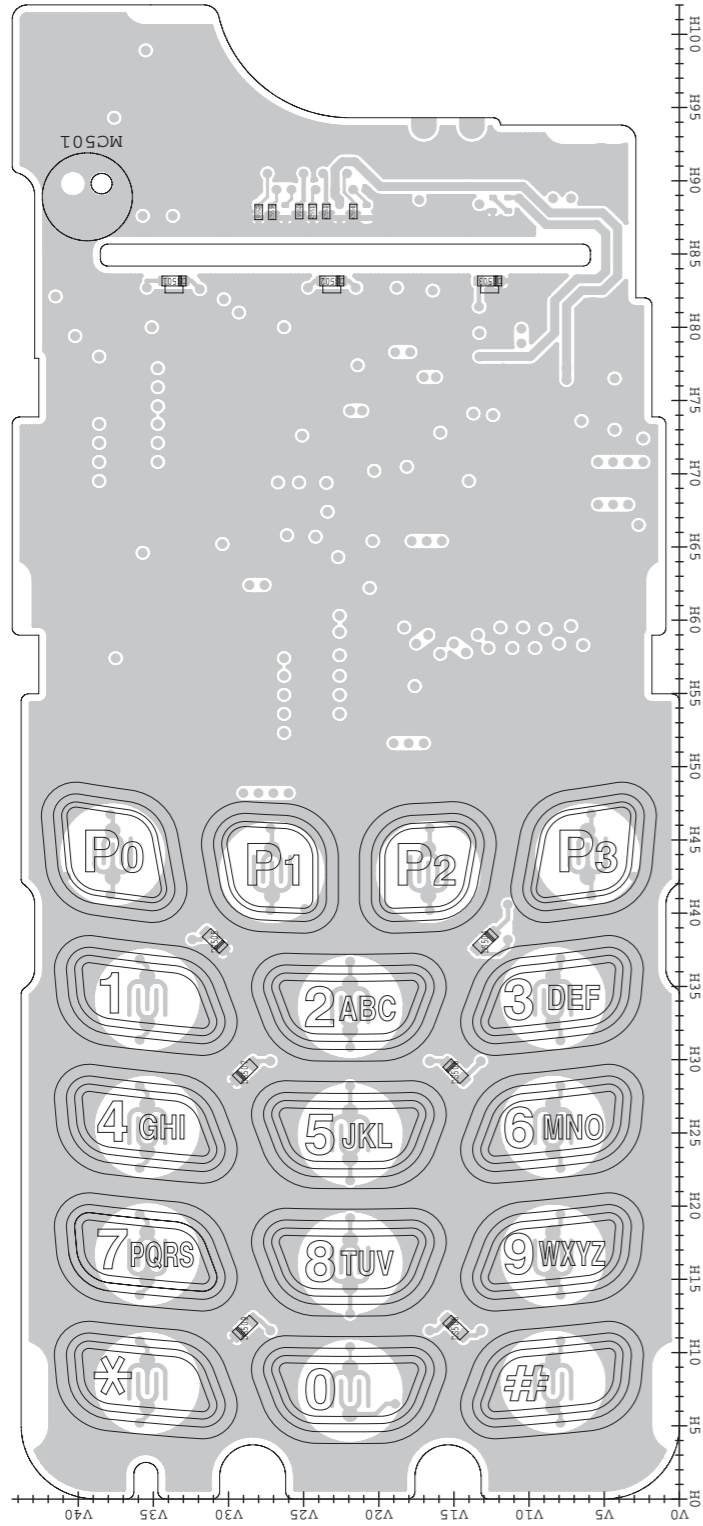
| | |
|----|--------|
| 20 | GND |
| 19 | MDET |
| 18 | VCC |
| 17 | VCC |
| 16 | +5V |
| 15 | +5V |
| 14 | CLO |
| 13 | RES |
| 12 | FSCA |
| 11 | FSDA |
| 10 | PITTSW |
| 9 | PITTT |
| 8 | KR |
| 7 | CLI |
| 6 | AFONO |
| 5 | LRES |
| 4 | EPTT |
| 3 | AF |
| 2 | MCIN |
| 1 | GND |

J502 to LCD

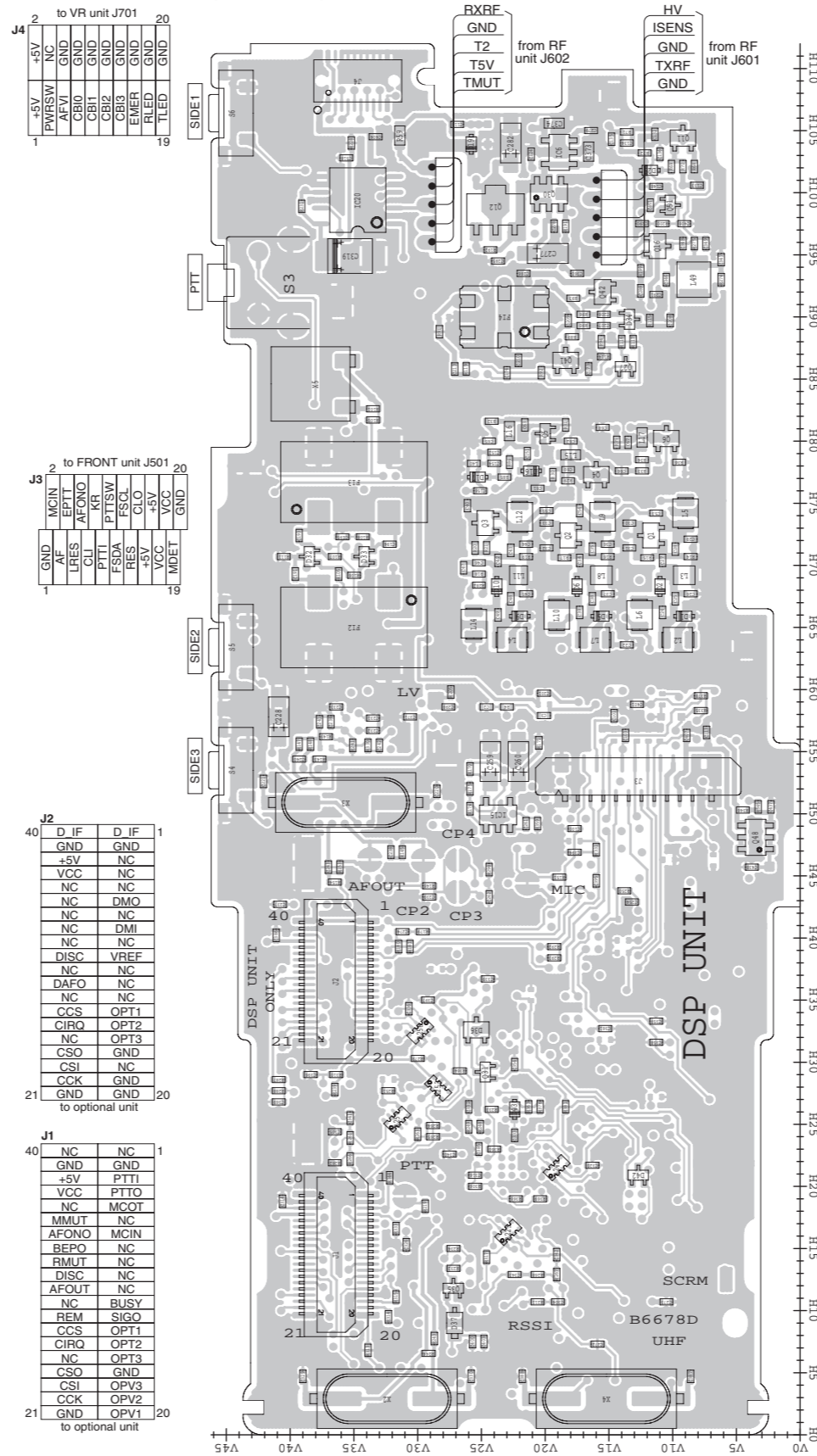
| | |
|---|-------|
| 8 | V LCD |
| 7 | GND |
| 6 | FSCL |
| 5 | FSDA |
| 4 | LRES |
| 3 | +3V |
| 2 | +5V |
| 1 | GND |

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

• FRONT-A UNIT
(TOP VIEW)

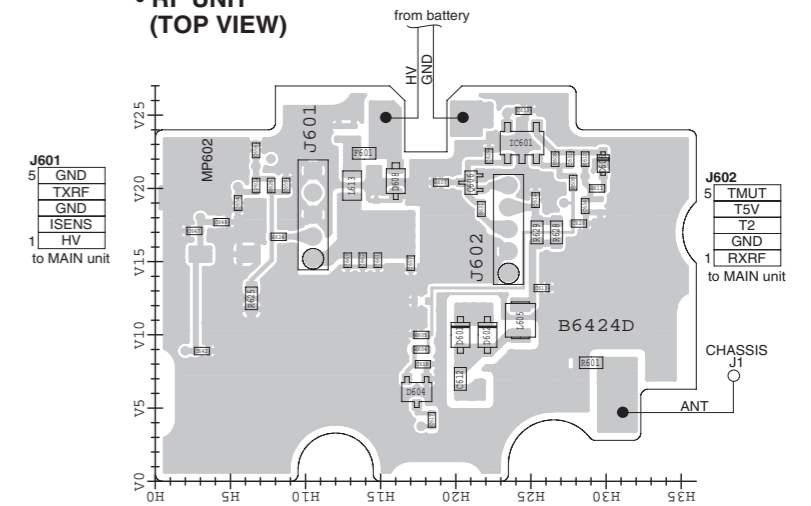


• MAIN-A UNIT
(TOP VIEW)

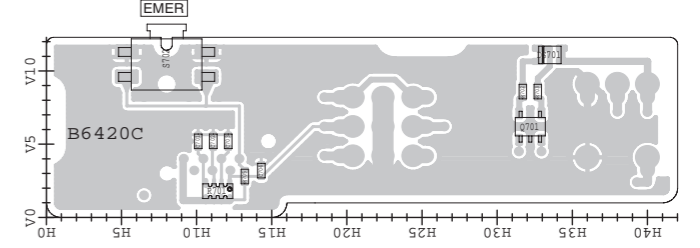


The combination of this side and the bottom side shows the board layout in the same configuration as the actual P.C.Board.

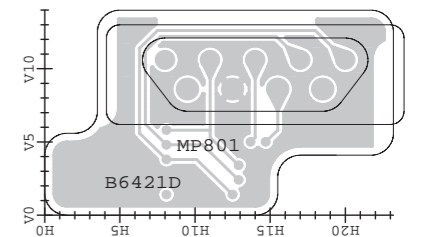
• RF UNIT
(TOP VIEW)



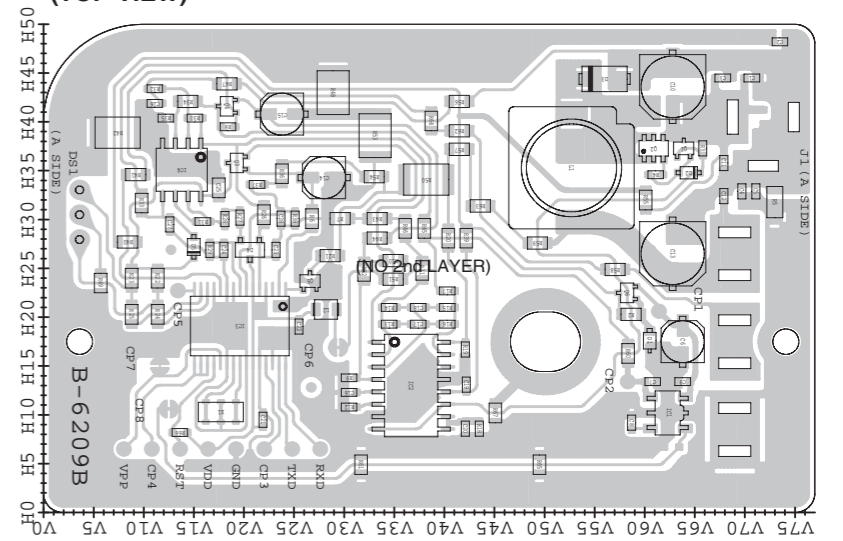
• VR UNIT
(TOP VIEW)



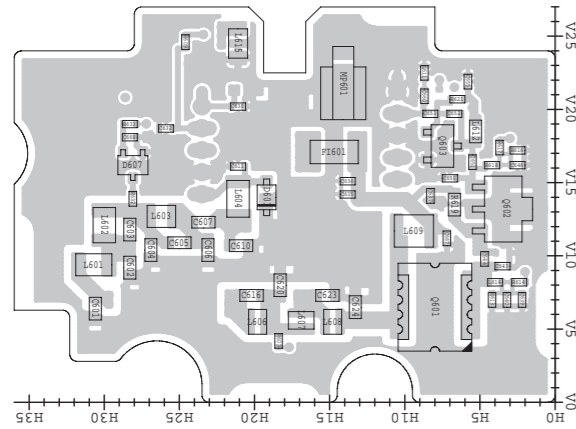
• JACK UNIT
(TOP VIEW)



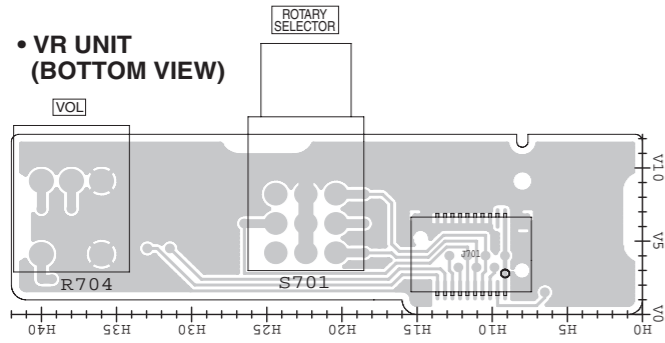
• BC-160
(TOP VIEW)



• RF UNIT
(BOTTOM VIEW)

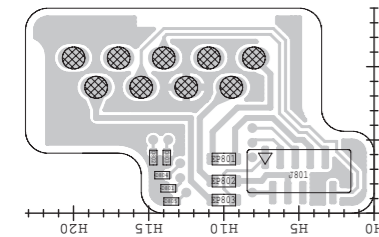


• VR UNIT
(BOTTOM VIEW)



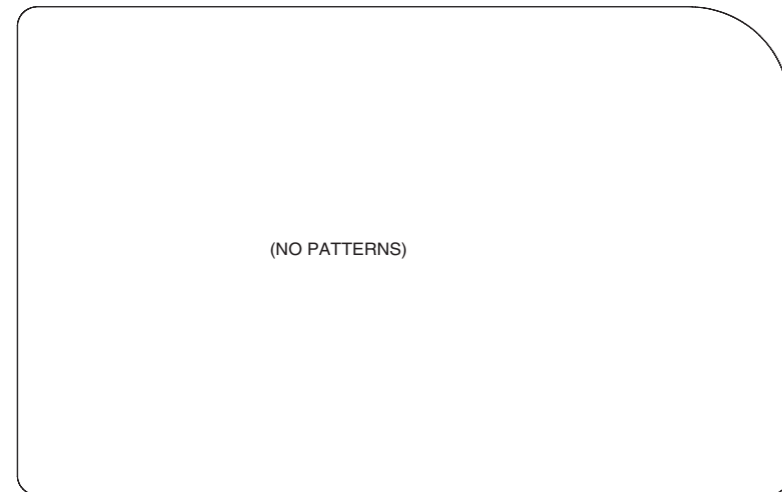
| | | | |
|------|-------|-----------------|-----|
| J701 | | to MAIN unit J4 | |
| 19 | GND | 20 | +5V |
| 18 | GND | 19 | +5V |
| 17 | TLED | 18 | GND |
| 16 | RLED | 17 | GND |
| 15 | EMER | 16 | GND |
| 14 | CB13 | 15 | GND |
| 13 | CB12 | 14 | GND |
| 12 | CB11 | 13 | GND |
| 11 | CB10 | 12 | GND |
| 10 | AFVI | 11 | GND |
| 9 | PWRSW | 10 | NC |
| 8 | NC | 9 | NC |

• JACK UNIT
(BOTTOM VIEW)

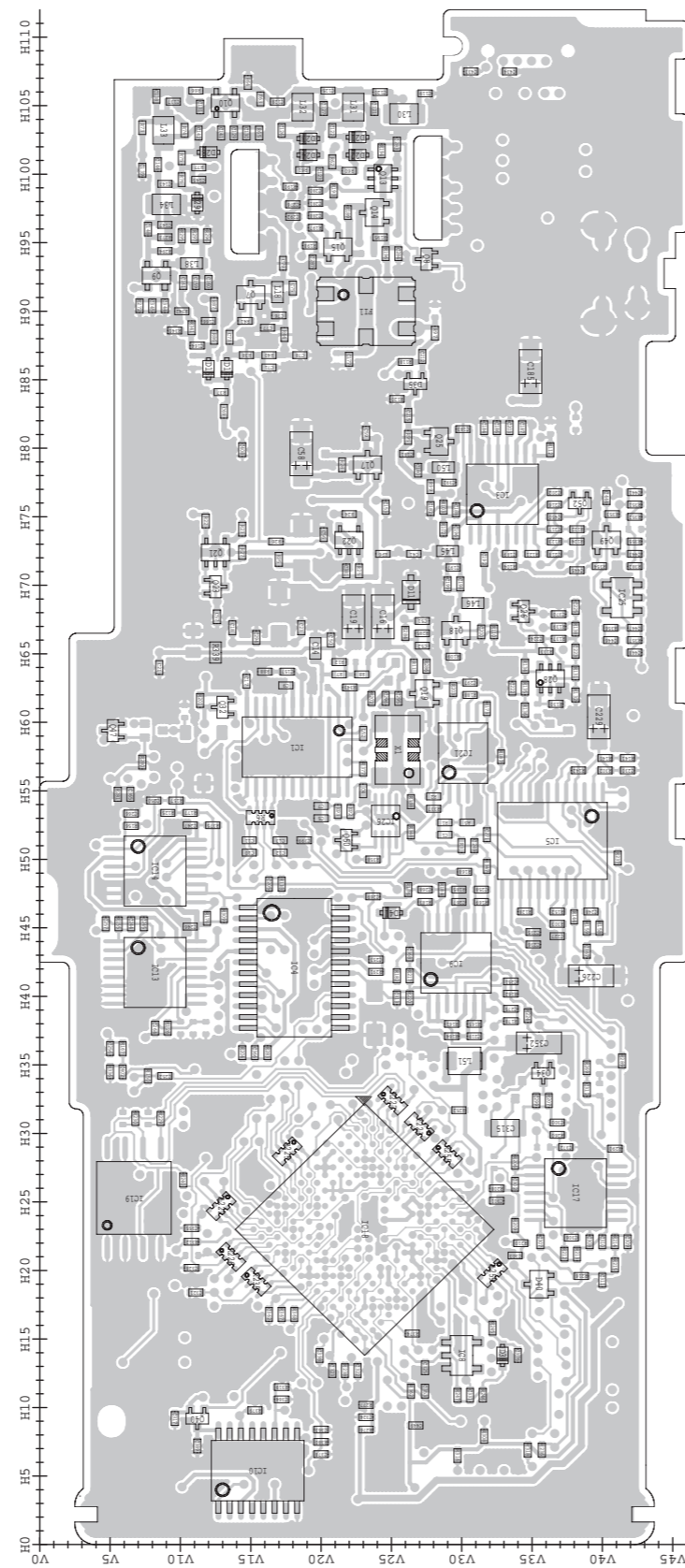


| | | | |
|------|------|--------------------|------|
| J801 | | to FRONT unit J503 | |
| 2 | EMIC | 10 | CLI |
| 1 | VCC | 9 | GND |
| | NC | 8 | EAFO |
| | MDET | 7 | EAFO |
| | CLO | 6 | RES |
| | EPTT | 5 | RES |

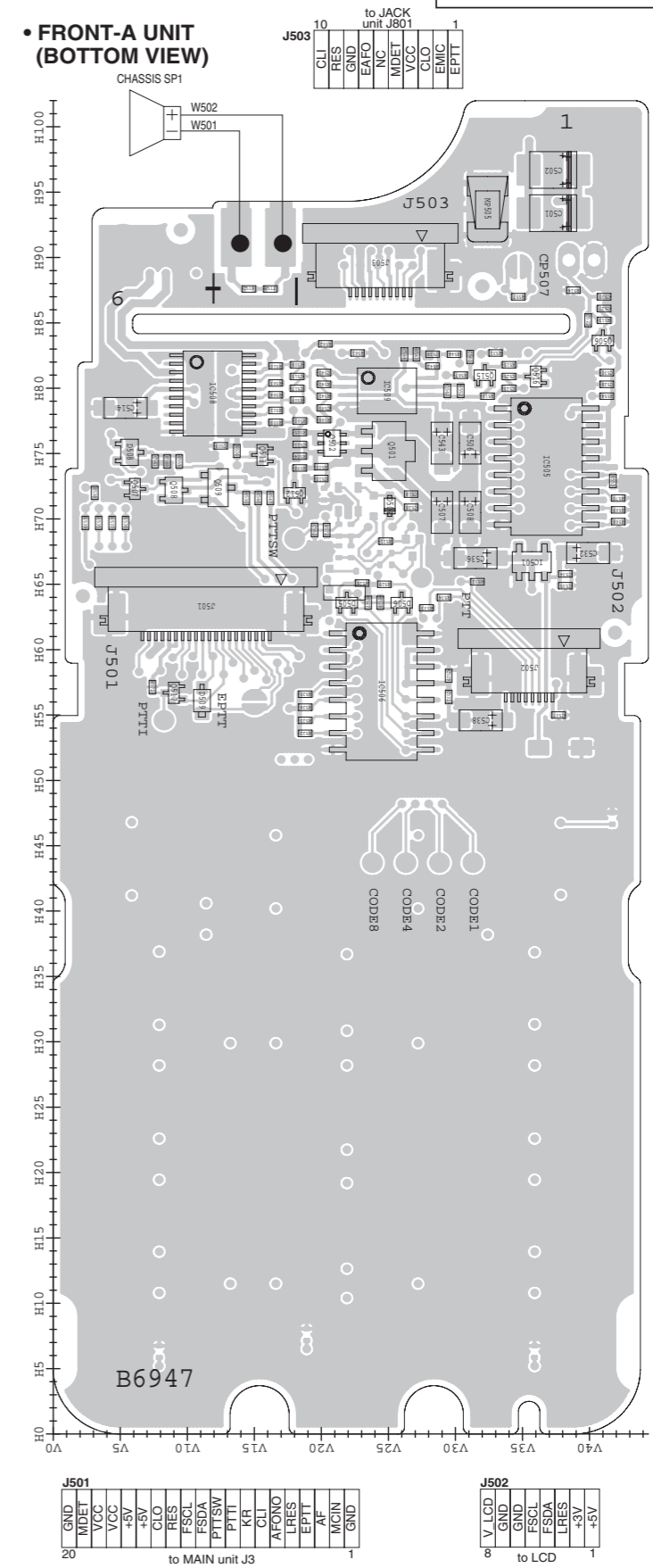
• BC-160
(BOTTOM VIEW)



• MAIN-A UNIT
(BOTTOM VIEW)



• FRONT-A UNIT
(BOTTOM VIEW)



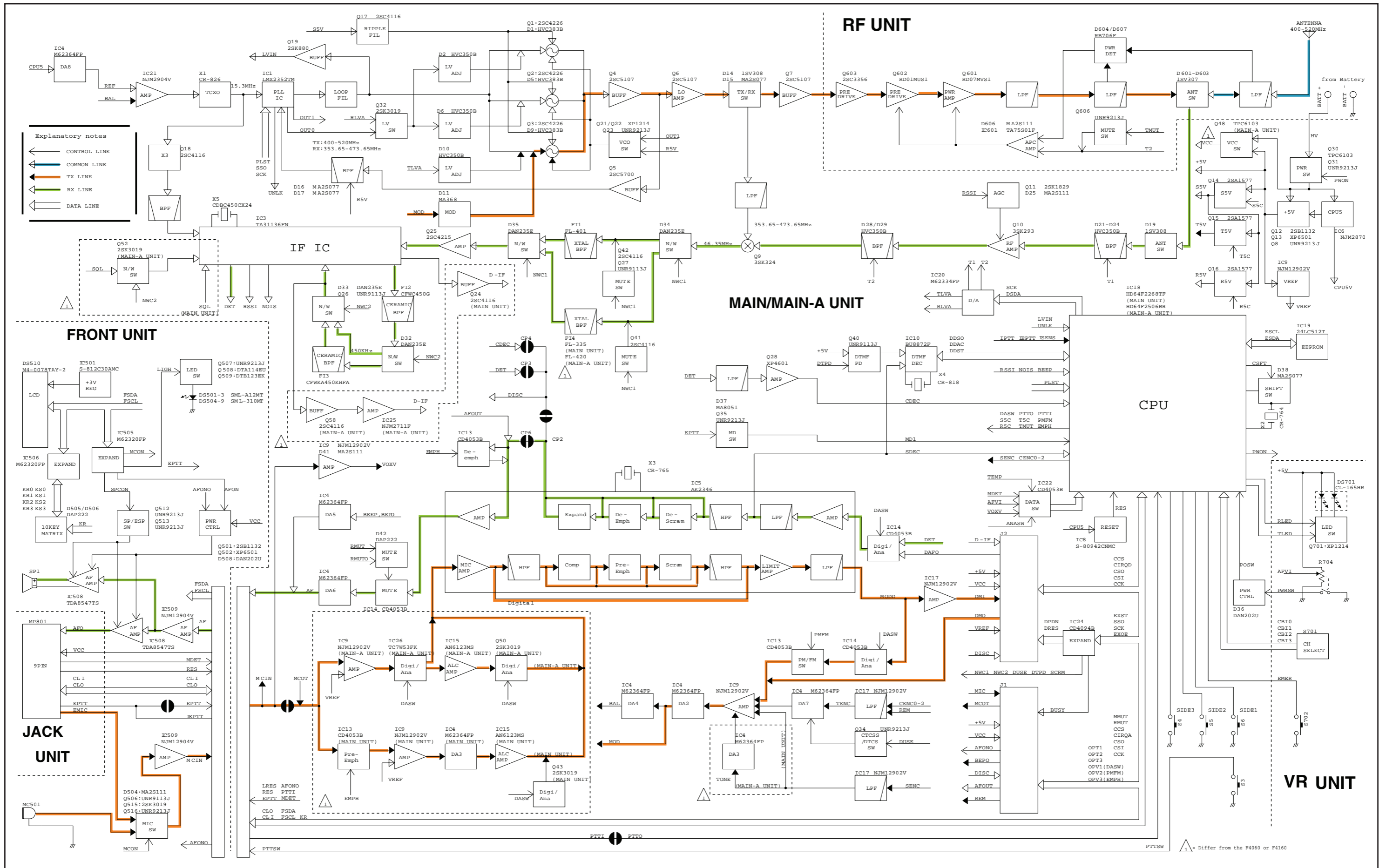
| | | | |
|------|------|-------------------|------|
| J503 | | to JACK unit J801 | |
| 10 | CLI | 1 | EPTT |
| 9 | RES | 2 | EMIC |
| 8 | GND | 3 | CLO |
| 7 | EAFO | 4 | VCC |
| 6 | NC | 5 | MDET |
| 5 | MDET | 6 | VCC |
| 4 | VCC | 7 | CLO |
| 3 | CLO | 8 | EMIC |
| 2 | EMIC | 9 | EPTT |
| 1 | EPTT | 10 | CLI |

| | | | |
|------|--------|-----------------|-------|
| J501 | | to MAIN unit J3 | |
| 20 | GND | 1 | MCIN |
| 19 | MDET | 2 | GND |
| 18 | VCC | 3 | AF |
| 17 | VCC | 4 | EPTT |
| 16 | VCC | 5 | LRES |
| 15 | +5V | 6 | AFONO |
| 14 | +5V | 7 | KR |
| 13 | RES | 8 | CLI |
| 12 | RES | 9 | LI |
| 11 | FSCA | 10 | AFONO |
| 10 | FSDA | 11 | AFONO |
| 9 | PITTSW | 12 | AFONO |
| 8 | PITTI | 13 | AFONO |
| 7 | PITTI | 14 | AFONO |
| 6 | PITTI | 15 | AFONO |
| 5 | PITTI | 16 | AFONO |
| 4 | PITTI | 17 | AFONO |
| 3 | PITTI | 18 | AFONO |
| 2 | PITTI | 19 | AFONO |
| 1 | PITTI | 20 | AFONO |

| | | | |
|------|-------|--------|------|
| J502 | | to LCD | |
| 8 | V LCD | 1 | +5V |
| 7 | GND | 2 | LRES |
| 6 | GND | 3 | FSDA |
| 5 | FSCL | 4 | FSDA |
| 4 | FSCL | 5 | FSDA |
| 3 | FSCL | 6 | FSDA |
| 2 | FSCL | 7 | FSDA |
| 1 | FSCL | 8 | FSDA |

SECTION 11

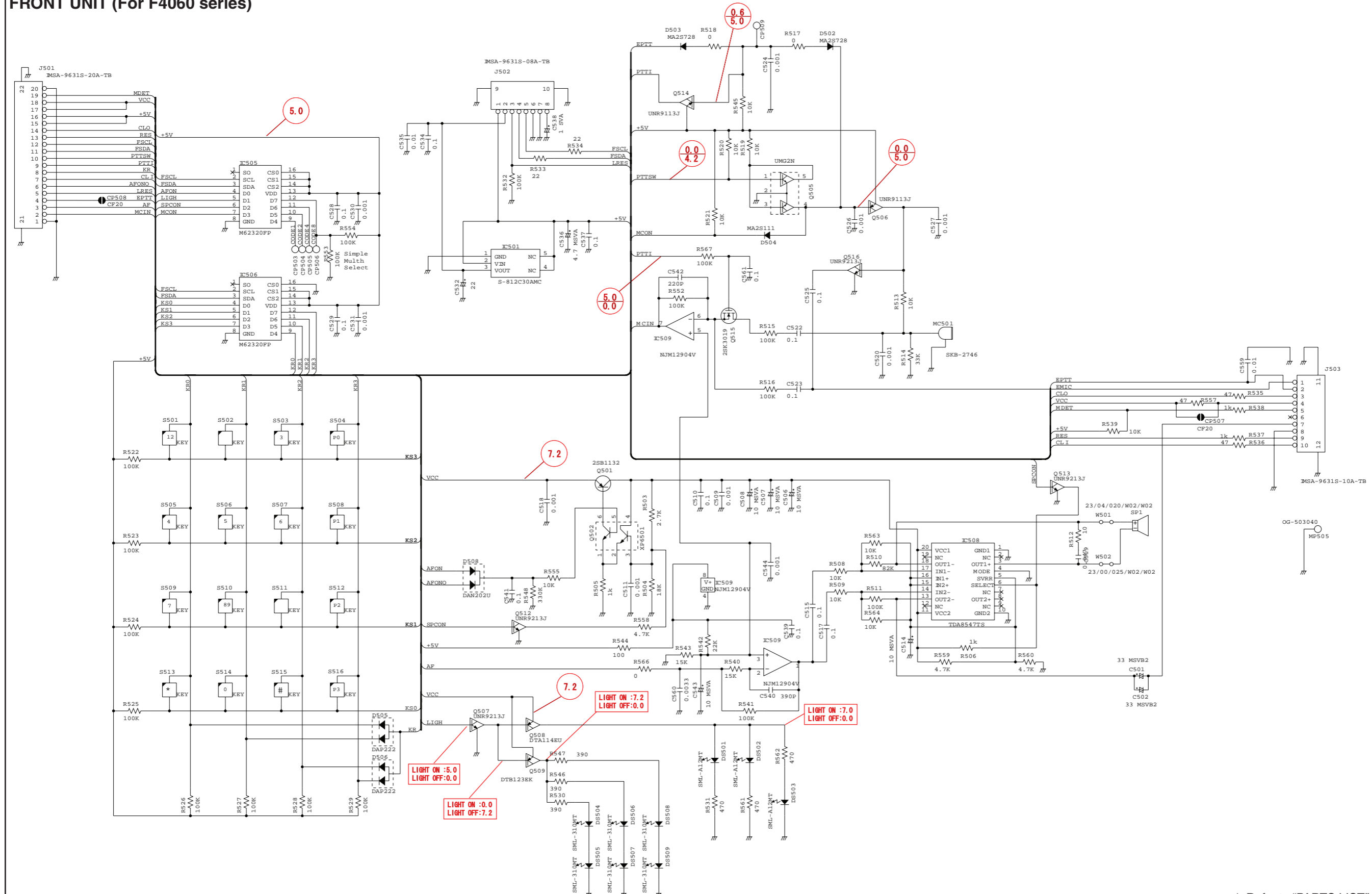
BLOCK DIAGRAM



SECTION 12

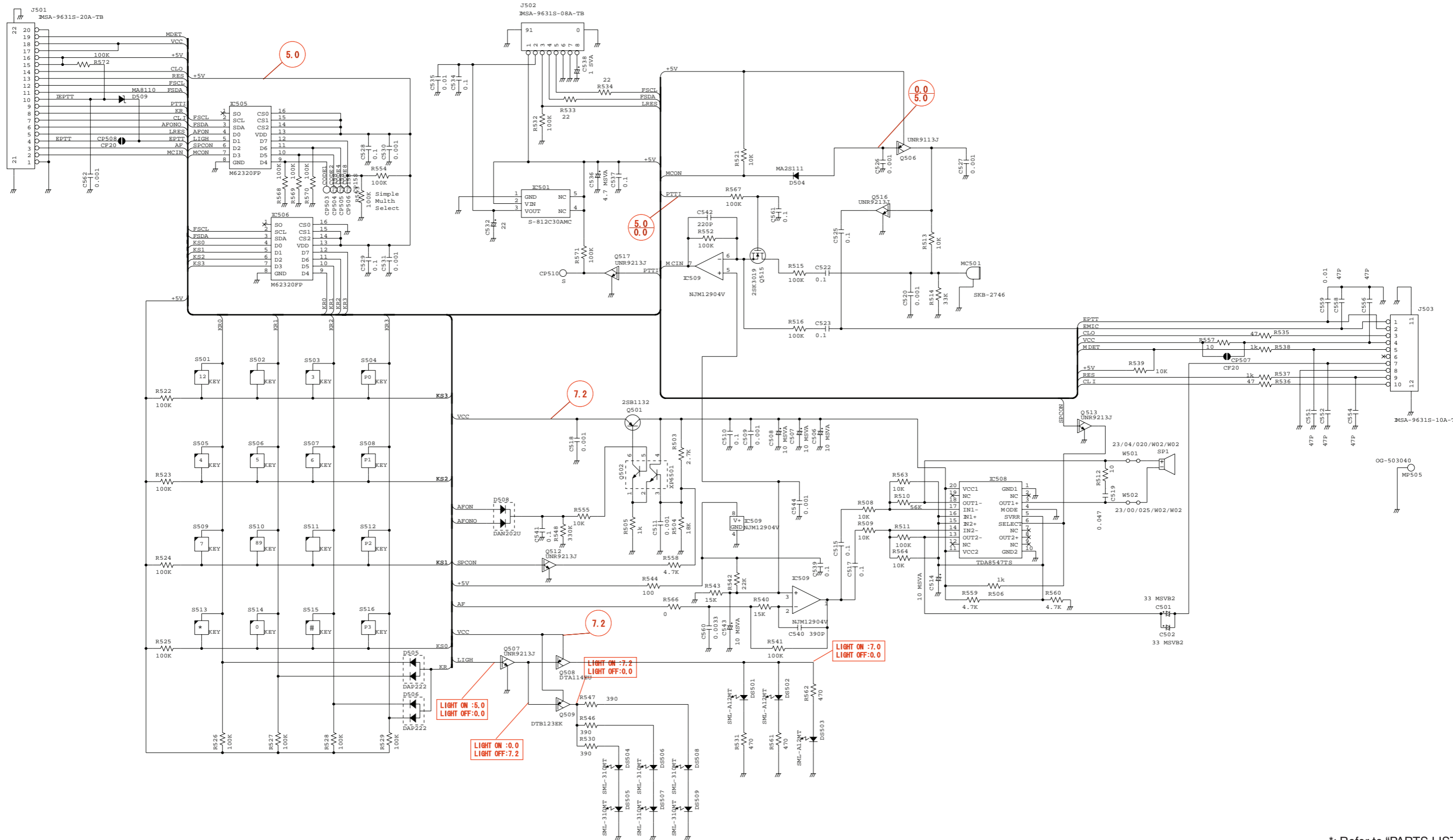
VOLTAGE DIAGRAM

FRONT UNIT (For F4060 series)



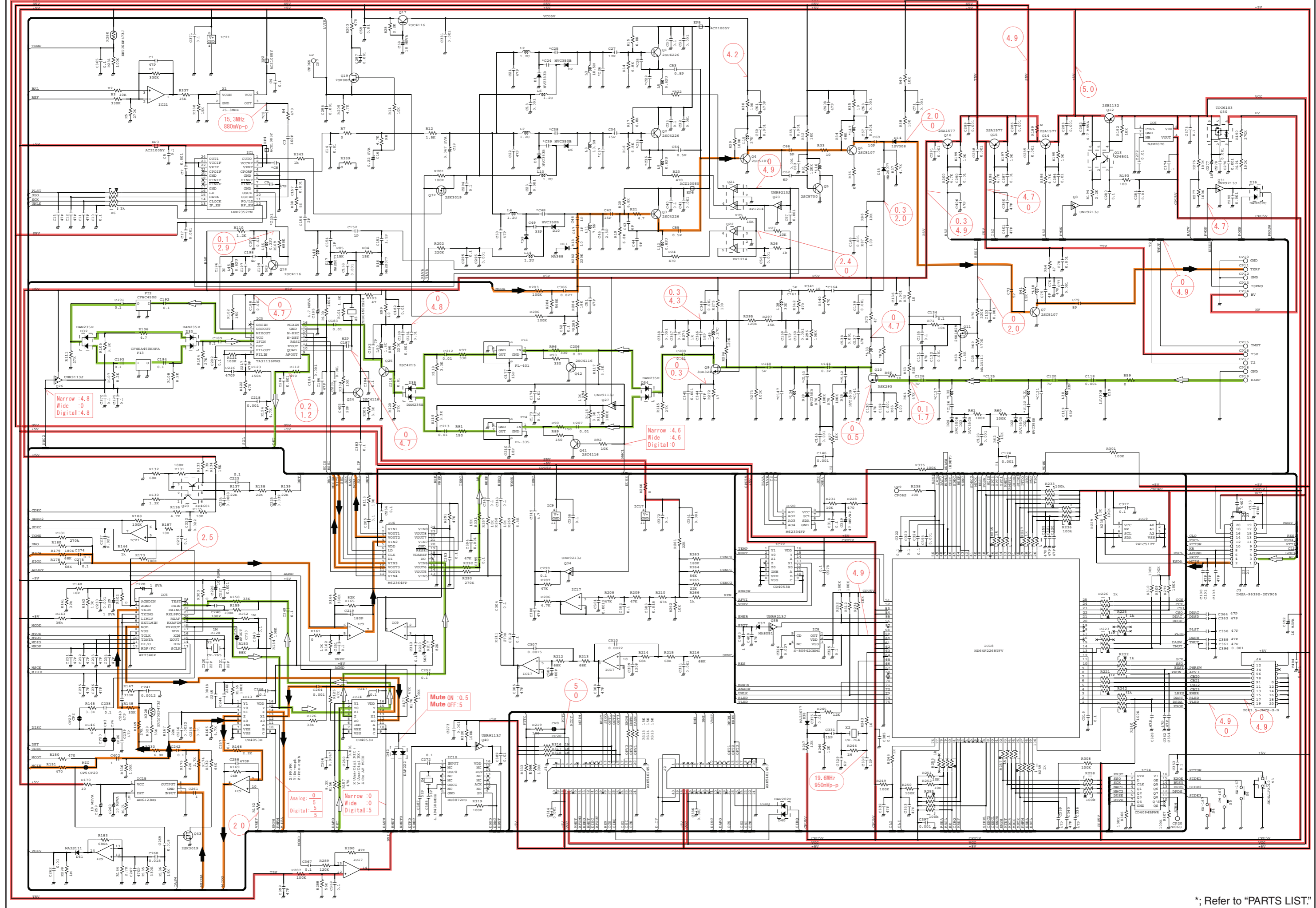
*; Refer to "PARTS LIST."

FRONT-A UNIT (For F4160 series)

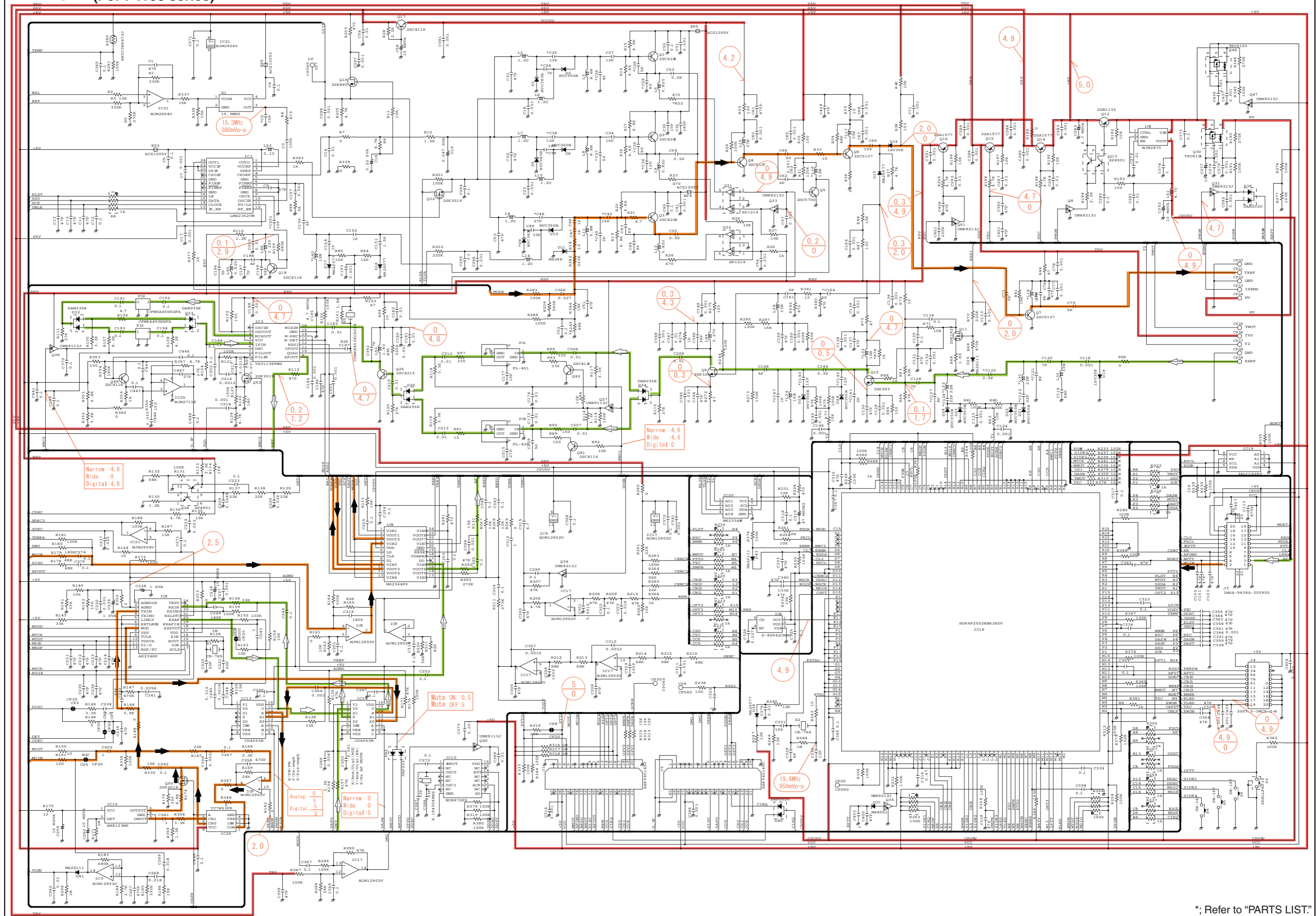


*; Refer to "PARTS LIST"

MAIN UNIT (For F4060 series)

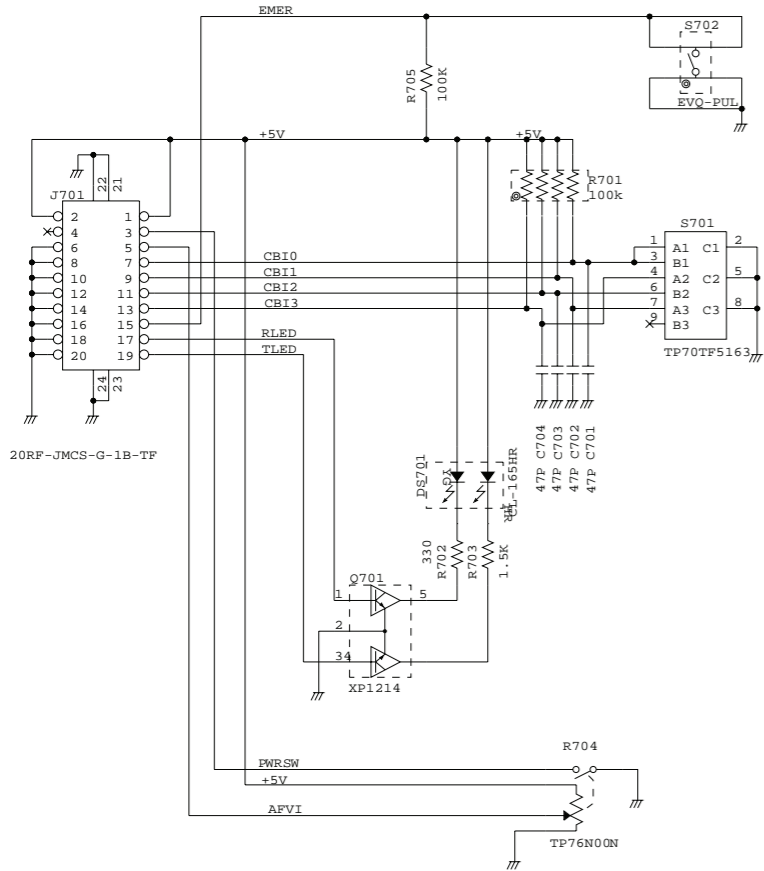


MAIN-A UNIT (For F4160 series)

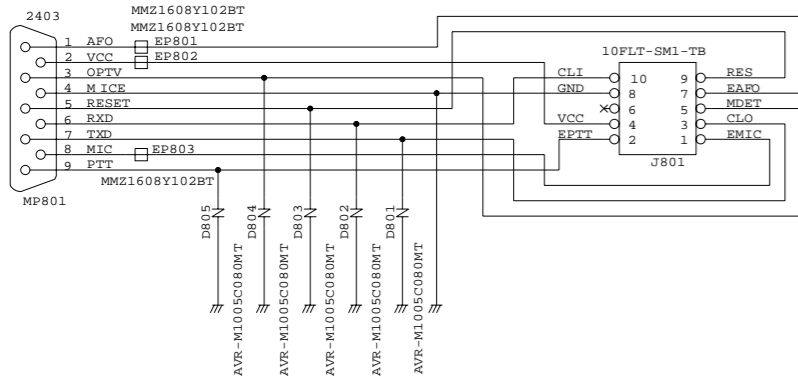


*; Refer to "PARTS LIST."

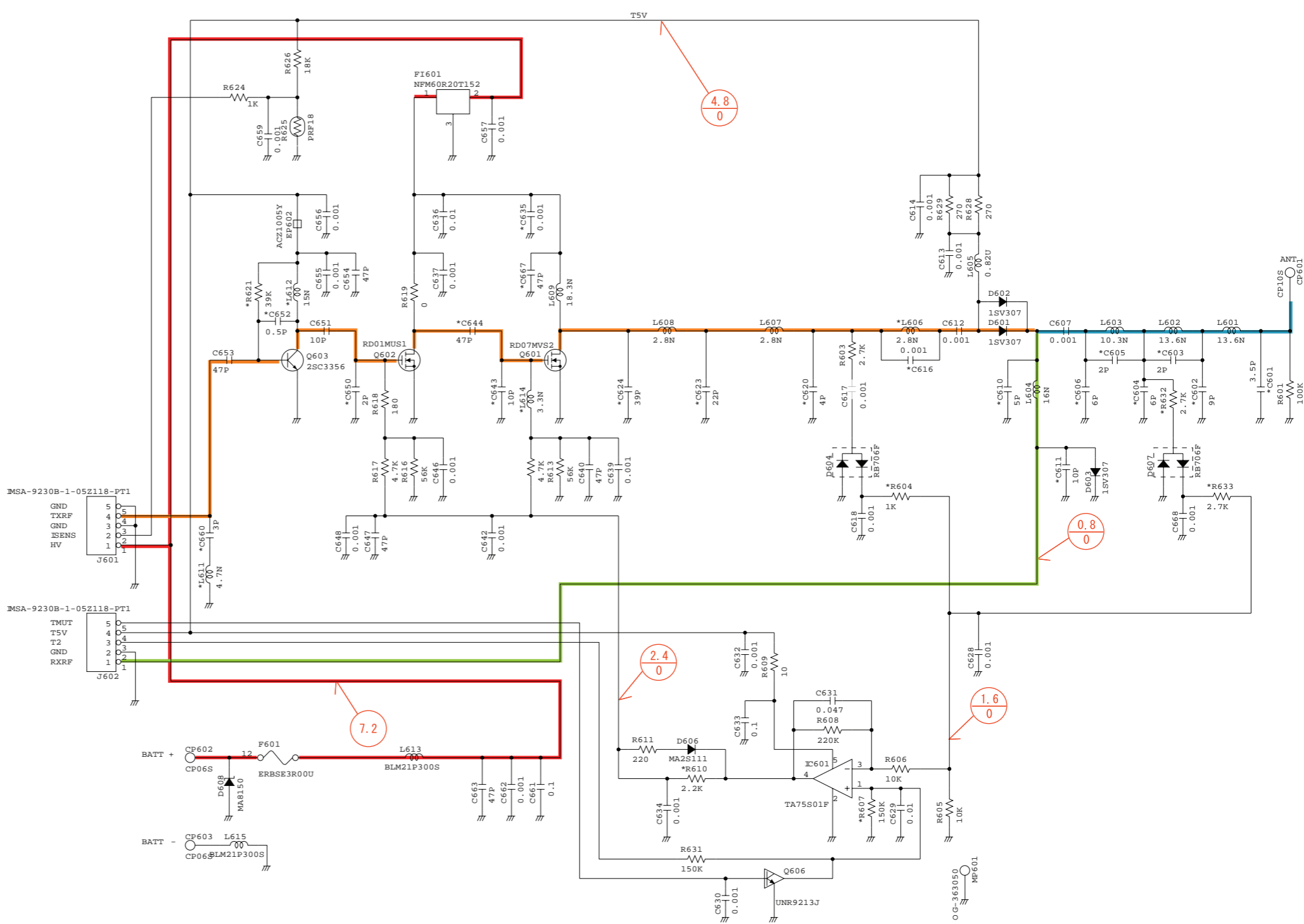
VR UNIT



JACK UNIT



RF UNIT



*; Refer to "PARTS LIST."

SECTION 13

BC-160 (Optional)

[CHASSIS PARTS]

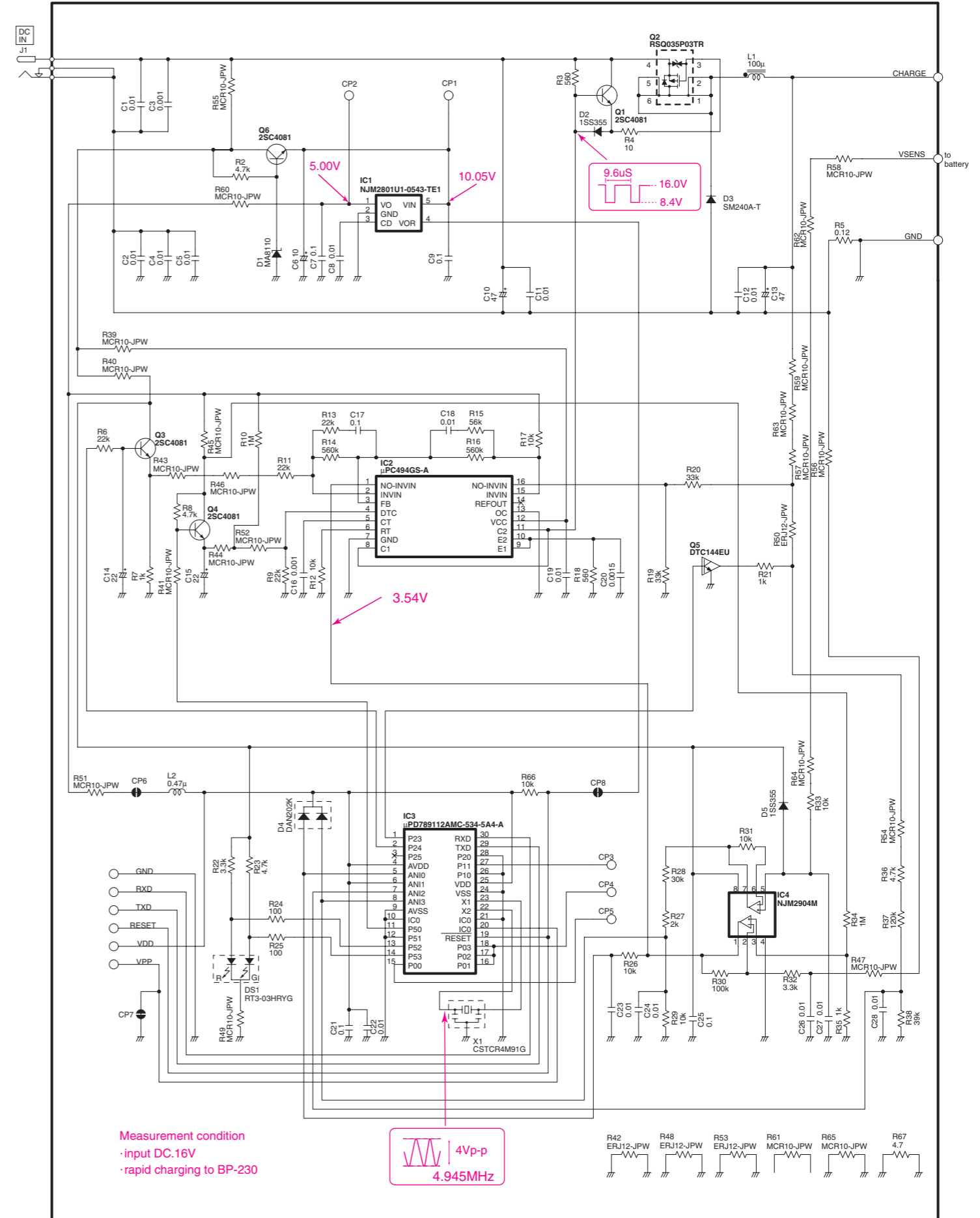
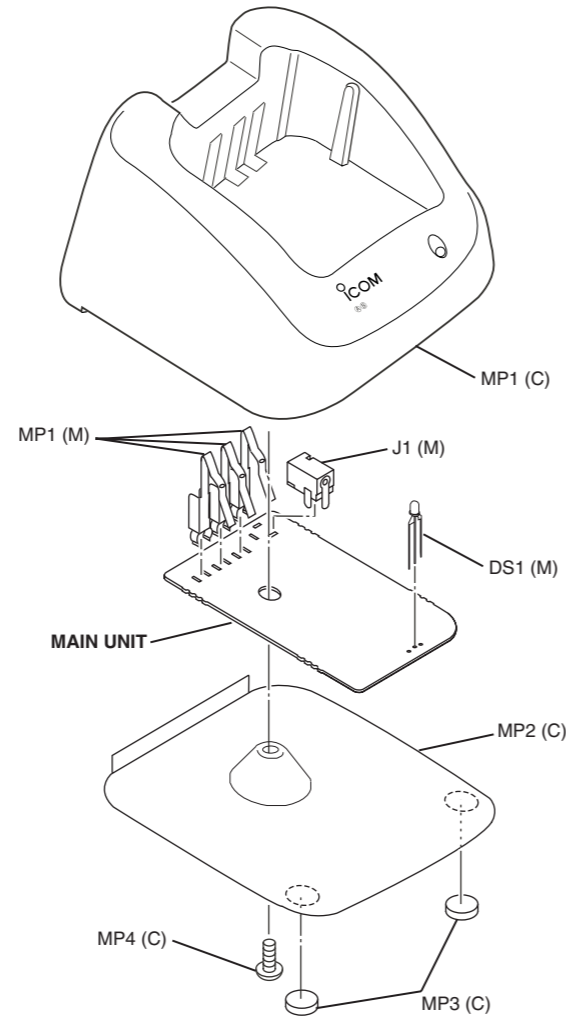
| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|--------------------------|------|
| MP1 | 8010019750 | 2830 case | 1 |
| MP2 | 8110008220 | 2830 cover | 1 |
| MP3 | 8930039620 | Leg cushion (A) | 2 |
| MP4 | 8810008630 | Screw PH BT M3 x 6 NI-ZU | 1 |

[MAIN UNIT]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|--------------------------|------|
| J1 | 6510023070 | Connector HEC2305-01-250 | 1 |
| DS1 | 5040002740 | LED RT3-03HRYG | 1 |
| MP1 | 8930064410 | 2830 TERMINAL | 3 |

[ACCESSORIES]

| REF. NO. | ORDER NO. | DESCRIPTION | QTY. |
|----------|------------|-----------------------|------|
| EP1 | 0800006050 | Charger BC-145A [USA] | 1 |
| | 0800006060 | Charger BC-145E [EUR] | 1 |



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