



# SERVICE MANUAL

UHF TRANSCEIVER

**IC-U68**

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## INTRODUCTION

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This service manual describes the latest information for the **IC-U68** UHF TRANSCEIVER at the time of publication.

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

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## DANGER

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**NEVER** connect the transceiver to an AC outlet or to a DC power supply that uses more than 9 V. This will ruin the transceiver.

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

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

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

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## ORDERING PARTS

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

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

**<SAMPLE ORDER>**

1110003390 S.IC AN8005M-(E1) IC-U68 MAIN UNIT 5 pieces  
8810008990 Screw PT BT M2 x 10 ZK IC-U68 Rear panel 10 pieces

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

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## REPAIR NOTES

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1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated 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 signal generator or a sweep generator.
7. **ALWAYS** connect a 40 dB to 50 dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to transceiver.



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## SECTION 1 SPECIFICATIONS

### ■ GENERAL

|                             |                                                                                                                                                                           |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| • Frequency range           | : 400 MHz to 470 MHz                                                                                                                                                      |
| • Mode                      | : FM (16K0F3E)                                                                                                                                                            |
| • Channel spacing           | : 25 kHz                                                                                                                                                                  |
| • Frequency resolution      | : 5 kHz, 12.5 kHz                                                                                                                                                         |
| • Number of channels        | : 40 channels                                                                                                                                                             |
| • Antenna impedance         | : 50 $\Omega$ (unbalanced)                                                                                                                                                |
| • Usable temperature range  | : -10 °C to +60 °C                                                                                                                                                        |
| • Power supply requirement  | : 9 V DC (nominal)                                                                                                                                                        |
| • Current drain (at 13.8 V) | : Receive            Standby            40 mA<br>Power saved       10 mA<br>Max. audio        190 mA<br>Transmit    at 5 W            1300 mA<br>at 0.5 W          500 mA |
| • Dimensions                | : 57 (W) $\times$ 145(H) $\times$ 35 (D) mm                                                                                                                               |
| • Weight                    | : 340g (include dry cell batteries)                                                                                                                                       |

### ■ TRANSMITTER

|                               |                                                              |
|-------------------------------|--------------------------------------------------------------|
| • Output power (at 13.8 V)    | : High 400 MHz to 470 MHz 5W<br>Low 400 MHz to 470 MHz 0.5 W |
| • Modulation system           | : Variable reactance frequency modulation                    |
| • Maximum frequency deviation | : $\pm 5$ kHz                                                |
| • Frequency tolerance         | : $\pm 0.0005$ % (5 ppm)                                     |
| • Spurious emissions          | : Less than -60 dB                                           |
| • Audio frequency response    | : -3 dB to +1 dB of 6 dB/octave with 300 Hz to 3000 Hz input |
| • Audio harmonic distortion   | : 10 %                                                       |
| • Noise and hum               | : More than 30 dB                                            |

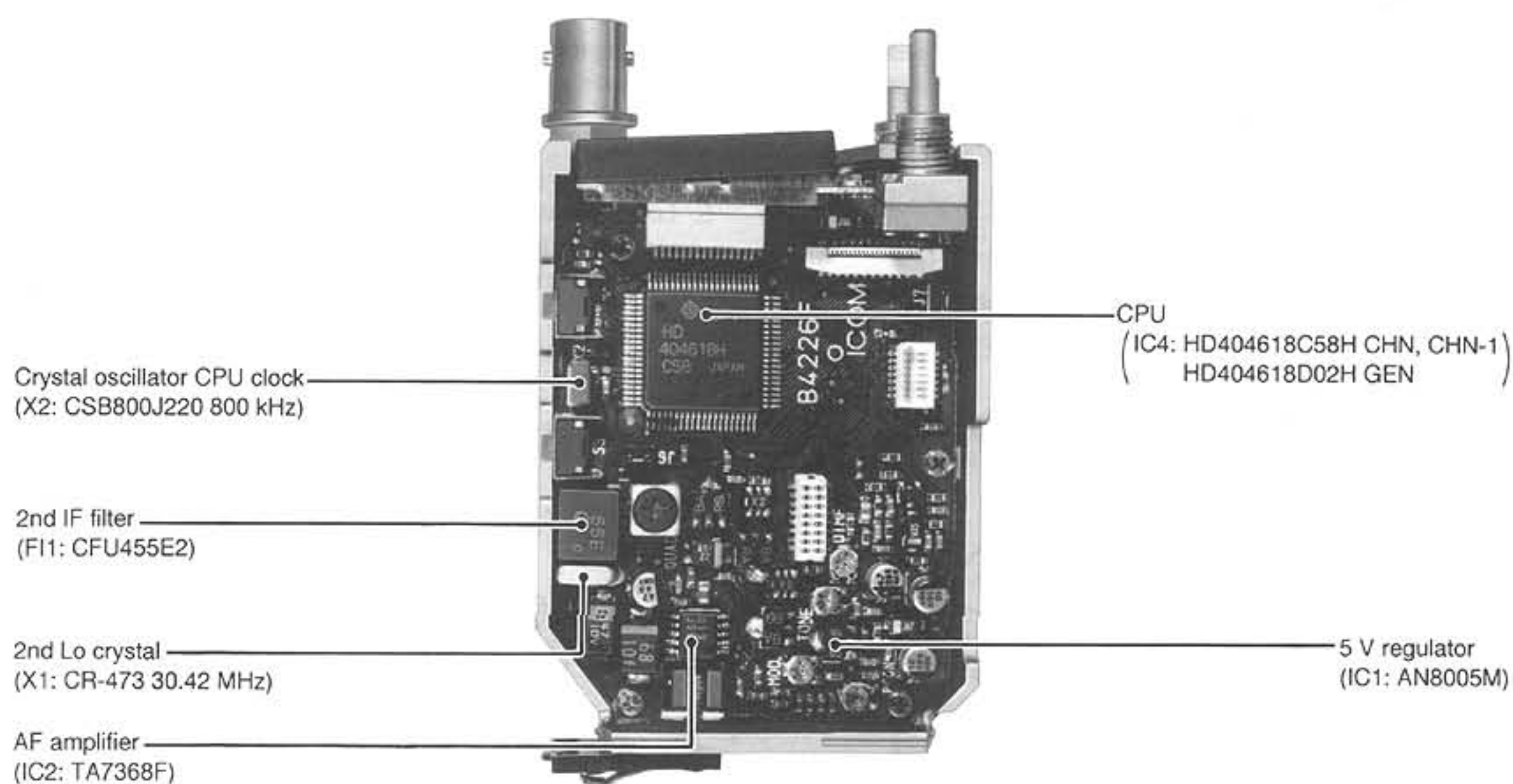
### ■ RECEIVER

|                                 |                                                           |
|---------------------------------|-----------------------------------------------------------|
| • Receive system                | : Double conversion superheterodyne                       |
| • Intermediate frequencies      | : 1st 30.875 MHz<br>2nd 455 kHz                           |
| • Sensitivity                   | : 0.3 $\mu$ V for 12 dB SINAD                             |
| • Squelch threshold sensitivity | : 0.3 $\mu$ V                                             |
| • Adjacent channel selectivity  | : Less than -50 dB                                        |
| • Spurious response             | : Less than -50 dB                                        |
| • Image rejection               | : Less than -50 dB                                        |
| • Intermodulation rejection     | : Less than -50 dB                                        |
| • Audio frequency response      | : -6 dB to +2 dB/octave with 500 Hz to 3000 Hz modulation |
| • Noise and hum                 | : More than 30 dB                                         |
| • Frequency tolerance           | : $\pm 0.0005$ % ( $\pm 5$ ppm)                           |
| • Audio output power            | : 350 mW at 10 % distortion with an 8 $\Omega$ load       |

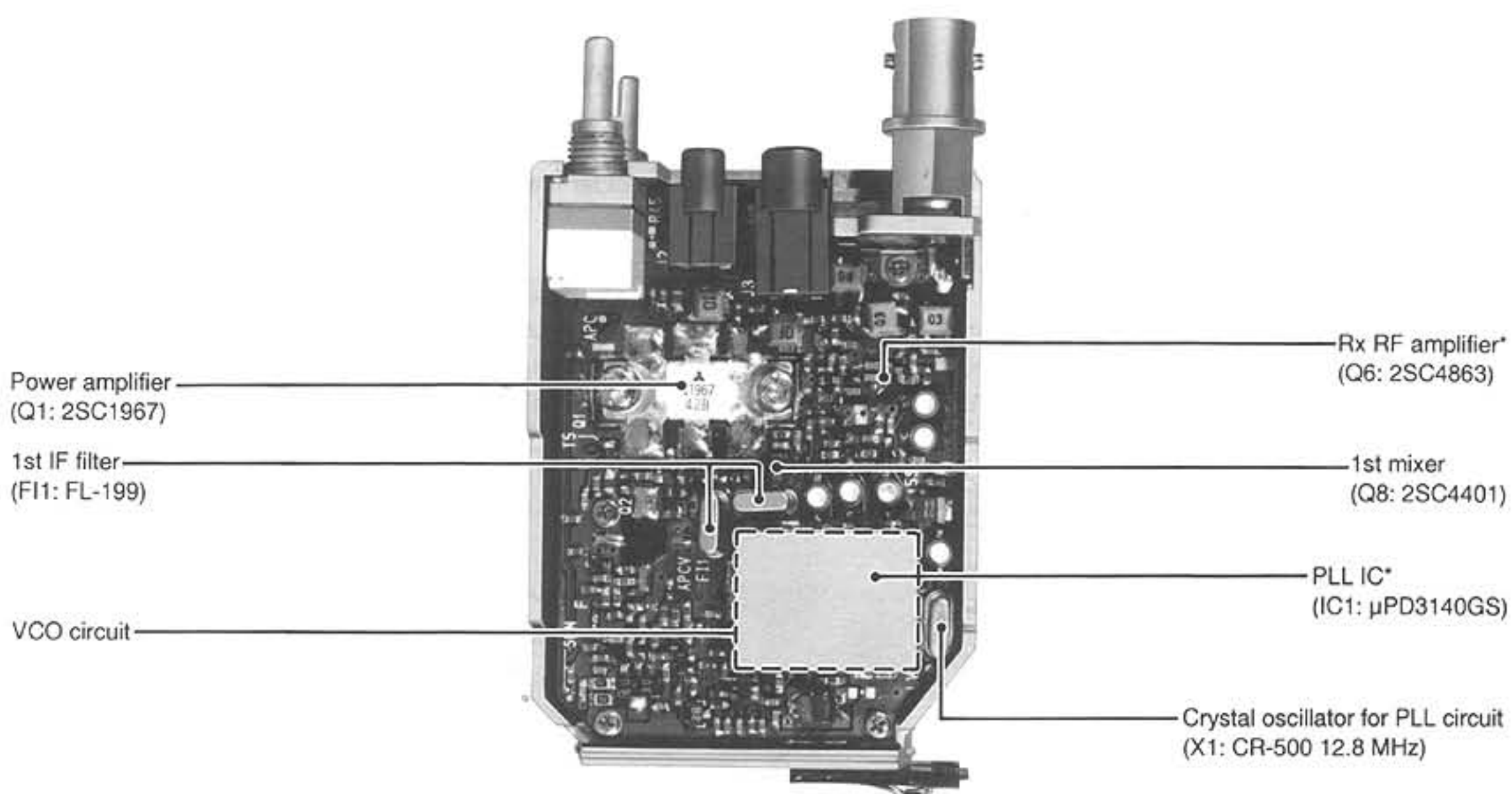
All stated specifications are subject to change without notice or obligation.

## SECTION 2 INSIDE VIEWS

### • MAIN unit



### • RF unit

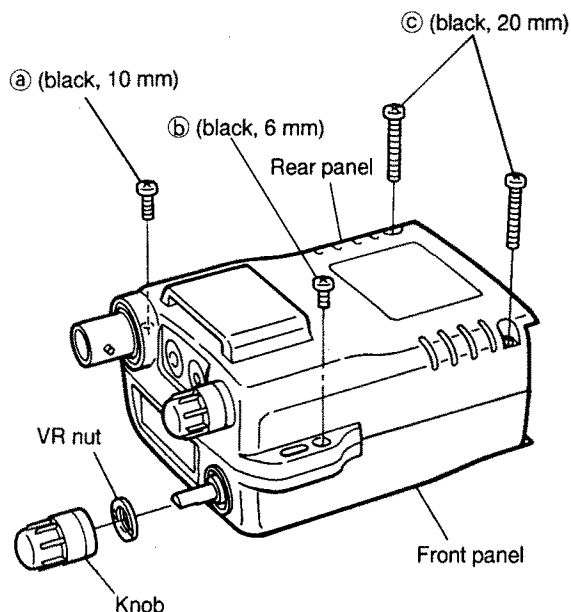


\* located under side of this point

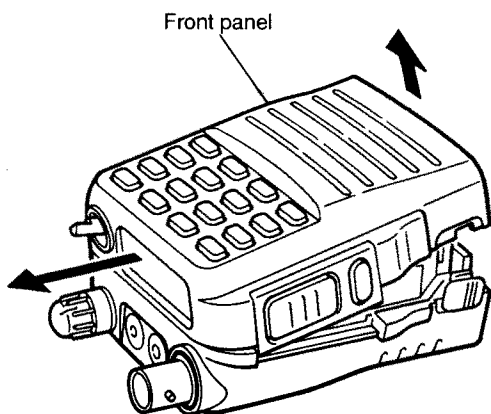
## SECTION 3 DISASSEMBLY INSTALLATIONS

### ● REMOVING THE FRONT PANEL

1. Turn the power OFF, then remove the battery pack.
2. Unscrew 4 screws ①, ② and ③ from the rear and front panels.
3. Pull off the [DIAL] knob, then unscrew the exposed VR nut.

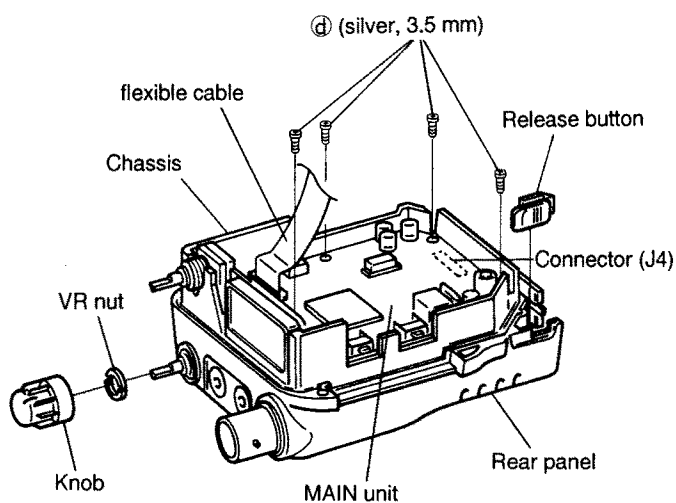


4. Carefully open the front panel from the bottom side.



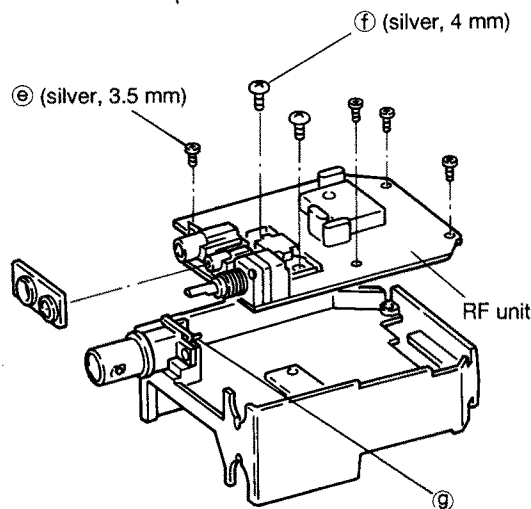
### ● REMOVING THE MAIN UNIT AND REAR PANEL

1. Unplug the flexible cable.
2. Remove the release button.
3. Pull off the [OFF/VOL] knob, then unscrew the exposed VR nut.
4. Unscrew 4 screws ④ from the MAIN unit.
5. Lift the MAIN unit to remove. (Disconnect J4 on reverse side of the MAIN unit to remove.)
6. Carefully open the rear panel from the chassis.



### ● REMOVING THE RF UNIT

1. Remove the jack seal.
2. Unscrew 6 screws ⑤ and ⑥.
3. Unsolder the point ⑦, then remove the RF unit.



## SECTION 4 CIRCUIT DESCRIPTION

### 4-1 RECEIVER CIRCUITS

#### 4-1-1 ANTENNA SWITCHING CIRCUIT (RF UNIT)

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

Received signals enter the antenna connector and then pass through the low-pass filter (L1, L2, C44, C50, C51, C57, C58) and high-pass filter (L3, C56, C59) to suppress out-of-band signals. The filtered signals are passed through the  $1/4\lambda$  type antenna switching circuit (D1, D2) and are then applied to the RF unit.

#### 4-1-2 RF AND 1ST MIXER CIRCUITS (RF UNIT)

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

The signals from the antenna switching circuit are amplified at the RF amplifier (Q6) and are then passed through the tunable bandpass filter (D8, D9, L17, L18). The filtered signals are again amplified at the another RF amplifier (Q7) and again passed through the another tunable bandpass filter (D10–D12, L20–L22).

D8–D12 employ varactor diodes that track the bandpass filters and are control by the PLL lock voltage. These diodes tune the center frequency of an RF passband for wide bandwidth receiving and good image rejection.

The filtered signals are then mixed at the 1st mixer (Q8) with a 1st LO signal coming from the PLL circuit to produce 30.875 MHz 1st IF signal. The 1st IF signal is passed through a pair of crystal filters (F11), amplified at Q9 and is then applied to the MAIN unit.

#### 4-1-3 2ND IF AND DEMODULATOR CIRCUITS (MAIN UNIT)

The 2nd mixer circuit converts the 1st IF signal to a 2nd IF signal. A double superheterodyne system (which converts receive signals twice) improves the image rejection ratio and obtain stable receiver gain.

The 1st IF signal from the RF unit is applied to a 2nd mixer section of IC3 (pin 16). The signal is then mixed with a 2nd LO signal for conversion to a 455 kHz 2nd IF signal.

IC3 contains the 2nd mixer, local oscillator, limiter amplifier, quadrature detector and noise detector. The local oscillator section generates 30.42 MHz using X1.

The 2nd IF signal from the 2nd mixer (IC3 pin 3) passes through a ceramic filter (F11) to remove unwanted heterodyned frequencies. It is then amplified at the limiter amplifier (IC3 pin 5) and applied to the quadrature detector (IC3 pin 10, L1, R43, C59) to demodulate the 2nd IF signal into AF signals. The AF signals (detector signals) are output from pin 9 and applied to the AF circuit.

#### 4-1-4 AF CIRCUIT (MAIN UNIT)

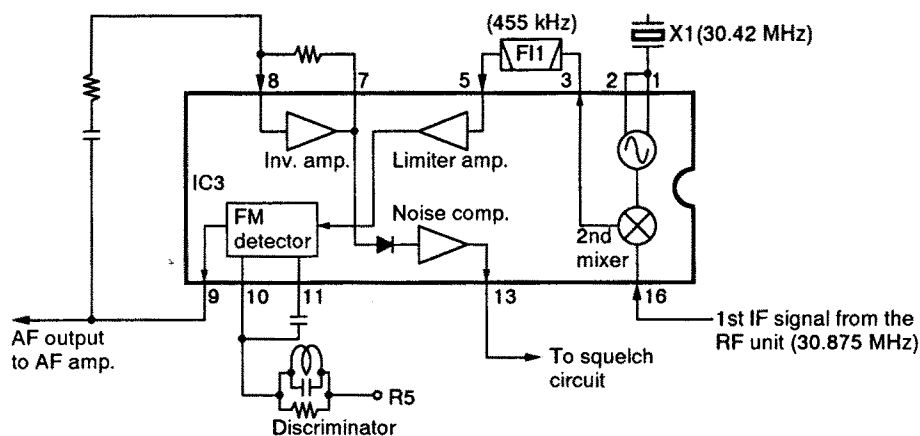
AF signals from the demodulator circuit are passed through the de-emphasis circuit and are then applied to the AF circuit.

The demodulated signals are applied to the de-emphasis circuit (Q1) and passed through the AF mute switch (Q2) and the [VOL] control (RF unit R45). The mute switch (Q2) cuts the audio line when the squelch closes.

The passed signals (via "AF IN") are amplified at the AF power amplifier (IC2) to a level needed to drive the speaker.

For power conservation, the power supply circuit for the AF power amplifier (Q5, Q6, D1) does not supply VCC voltage to the AF power amplifier (IC2) when the squelch closes. The power supply circuit (Q5, Q6, D1) is controlled by the CPU (IC4) via the AFOF line.

### FM DETECTOR AND SQUELCH CIRCUITS



#### 4-1-5 SQUELCH CIRCUIT (MAIN UNIT)

A squelch circuit cuts out AF signals when no RF signal is received. By detecting noise components in the AF signals, the squelch circuit switches the AF mute switch (Q2) in the MAIN unit.

A portion of the AF signals from the FM IF IC (IC3 pin 9) are applied to the active filter (IC3 pin 8) where noise components above 20 kHz are amplified. The signals are rectified at the noise detector and then applied to the noise comparator to obtain pulse signals.

The pulse signals output from IC3 pin 13 are applied to the differential circuit (IC5, Q12) for pulse width control. The resulting signals are applied to the CPU (IC4 pin 30).

The CPU counts the pulse signals and outputs the "TONL" signal from pin 79. The "TONL" signal is applied to the AF mute switch (Q2) to cut the AF signals.

### 4-2 TRANSMITTER CIRCUITS

#### 4-2-1 MICROPHONE AMPLIFIER (MAIN UNIT)

The microphone amplifier circuit amplifies audio signals with +6dB/octave pre-emphasis characteristic from the microphone to a level needed for the modulation circuit.

The AF signals from the microphone (MC1) pass through the TENKEY unit and enter the MAIN unit. The signals are amplified at the limiter amplifier (Q9-Q10) which has a negative feedback circuit for +6dB/octave pre-emphasis.

The amplified signals are filtered out at the splatter filter (Q9) and applied to the RF unit as the "MOD" signal.

#### 4-2-2 MODULATION CIRCUIT (RF UNIT)

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

While transmitting, the "RX" line becomes "HIGH", therefore, D302 and D303 turns OFF.

The audio signals (MOD) change the reactance of D302 and D303 on the RF unit to modulate the oscillated signal at the VCO (Q301, Q302). The oscillated signal is amplified at the buffer-amplifiers (IC301, IC321), then applied to the drive amplifiers (Q2, Q321, Q322) via the transmit/receive switch (D321).

#### 4-2-3 DRIVE/POWER AMPLIFIER CIRCUITS (RF UNIT)

The signal from the VCO circuit is passed through the transmit/receive switching circuit (D321) and amplified by the pre-drivers (Q321, Q322), YGR amplifier (Q2) and the power amplifier (Q1) in sequence to obtain 5 W (at 13.5 V DC) of RF power. The amplified signal is passed through the antenna switching circuit (D1, D2), high-pass filter (L3, C56, C59), low-pass filter (L1, L2, C44, C50, C51, C57, C58) and is then applied to the antenna connector.

The drive current of the pre-drivers (IC321, IC322) are controlled by the APC circuit to stabilize the output power.

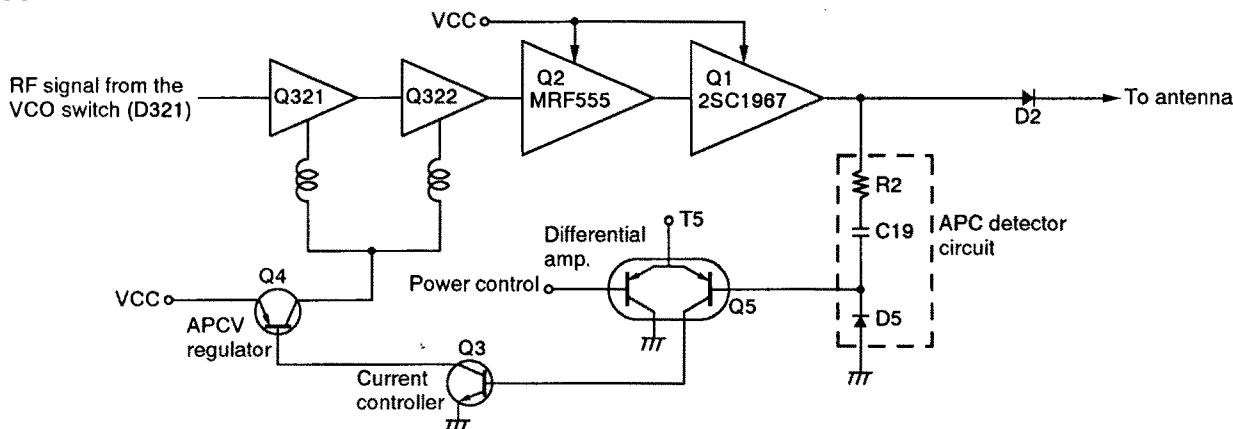
#### 4-2-4 APC CIRCUIT (RF UNIT)

The APC circuit provides stable output power from the power amplifier (Q1) even when the input voltage or temperature changes; and, selects high or low output power.

The APC detector circuit (D5, R2, C19) detects the output power level. The detected voltage increase according to the output power level.

The detected voltage is applied to one of the differential amplifier inputs (Q5a) and a power setting voltage is applied to the other input (Q5b). When the output power is increased, the detected voltage exceeds a power setting voltage, Q4 controls via voltage of Q321, Q322 via Q3 to reduce the RF output.

#### APC CIRCUIT



### 4-3 PLL CIRCUIT (RF UNIT)

A PLL circuit provides stable oscillation of the transmitter frequency and the receive 1st LO frequency. The PLL output frequency is controlled by the divided ratio (N-data) of the programmable divider.

The oscillated signal at the VCO (Q301, Q302, D301–D303) is amplified at the buffer-amplifiers (IC301, Q15) and then applied to the PLL IC (IC1 pin 2).

The PLL IC (IC1) contains a prescaler, two programmable dividers, and a phase detector, charge pump, etc. The entered signal is divided at the prescaler and programmable counter sections by the N-data ratio from the CPU. The divided signals are detected on phase at the phase detector using the reference frequency.

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

The VCO signal is amplified at the buffer-amplifier (IC321) and is then applied to the receive 1st mixer or transmit driver circuit.

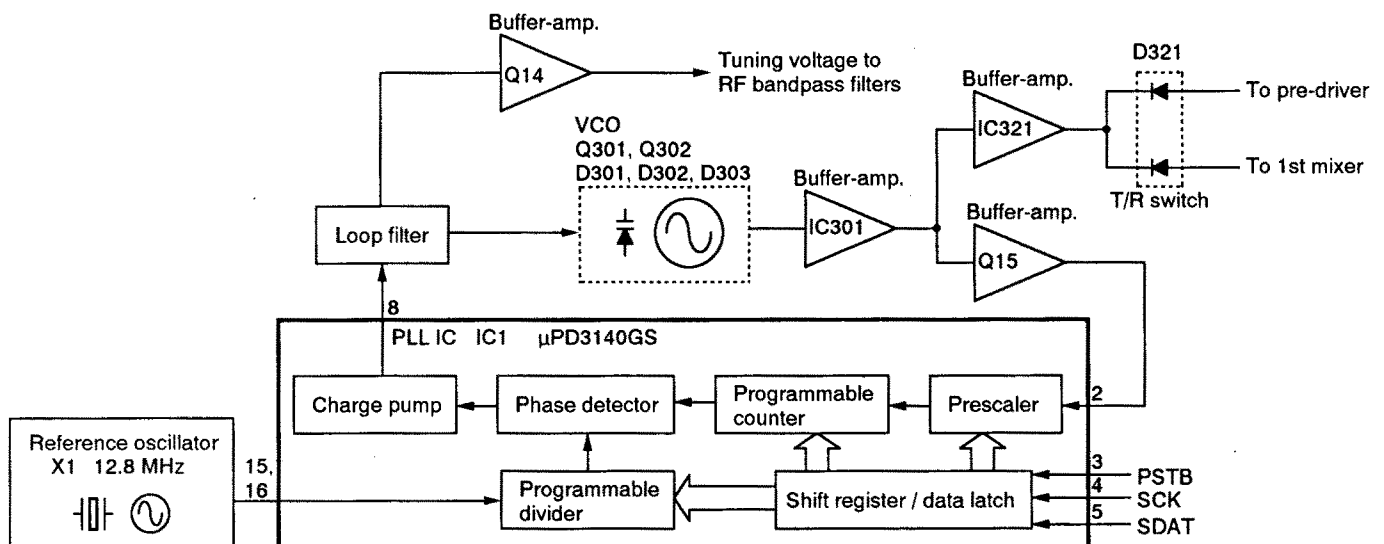
The lock voltage is also used for the receiver tunable bandpass filter to match the filter's center frequency to the desired receive frequency. The lock voltage is amplified at the buffer-amplifier (Q14) and then applied to the RF circuits.

### 4-4 POWER SUPPLY CIRCUITS

#### VOLTAGE LINES

| Line | Description                                                                                                                                                                                                         |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BT   | The voltage from the attached battery pack.                                                                                                                                                                         |
| VCC  | The same voltage as the BT line (battery voltage) which is controlled by the power switch ([VOL] control).                                                                                                          |
| +5   | Common 5 V converted from the VCC line by the 5 V regulator circuit (Q3, Q4) using the reference regulator (IC1) on the MAIN unit.                                                                                  |
| +5S  | Common 5 V controlled by the power saver function. The "+5S" regulator circuit (RF unit Q10) switches +5 V using the PLLP signal from the CPU (MAIN unit IC4).                                                      |
| R5   | 5 V for receiver circuit switched by Q12 on the RF unit with the RX signal from the CPU (MAIN unit IC4).                                                                                                            |
| T5   | 5 V for transmitter circuit converted from the VCC line by the 5 V regulator circuit (Q7, Q8) using the reference regulator (IC1) on the MAIN unit. T5 is controlled by the TX signal from the CPU (MAIN unit IC4). |

#### PLL CIRCUIT BLOCK DIAGRAM



## 4-5 PORT ALLOCATIONS

### CPU (MAIN UNIT)

| Pin number | Port name     | Description                                                                                                                                                                                              |
|------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | RX            | Output port for receiver circuits control signal.<br>"LOW": Activates receiver circuits.                                                                                                                 |
| 2          | LAMP          | Output port for display backlight control signal.<br>"LOW": Backlight ON.                                                                                                                                |
| 3          | BUSY/<br>COR  | Outputs the busy LED and DTMF decoder control signals.<br>"LOW": The busy LED lighting up and activates the DTMF decoder IC (TENKEY unit IC2).                                                           |
| 4          | MMUT/<br>FUNC | <b>【Transmit mode】</b> : MMU<br>Outputs a microphone mute signal.<br>"HIGH": Mute a mic audio.<br><b>【Receive mode】</b> : FUNC<br>Inputs a [FUNC] switch signal.<br>"HIGH": [FUNC] switch is pushed.     |
| 5          | CLO           | Output port for cloning data.                                                                                                                                                                            |
| 6          | EED           | DATA bus line for the EEPROM (TENKEY unit IC1) serial data.                                                                                                                                              |
| 7          | SQL           | Input port for squelch mute control signal from the optional tone squelch unit.<br>"LOW": Tone squelch is open.                                                                                          |
| 8          | PTT/CLI       | Input port for:<br><b>【Operation mode】</b> : PTT<br>Inputs controlled signals by the [PTT] switch.<br>"HIGH": When transmitting.<br><b>【Cloning mode】</b> : CLI<br>Input port for cloning data.          |
| 9          | OPB           | Input port for detecting a WST board installation.<br>"High": When WST board is installed.                                                                                                               |
| 10         | STD           | Input port for DTMF decoder circuit.<br>"HIGH": When correct DTMF signal is decoded.                                                                                                                     |
| 15         | SCK/DC        | Input/Output port for:<br><b>【Input】</b> : DC<br>Detects the tuning dial rotation while this port is "LOW".<br><b>【Output】</b> : SCK<br>Outputs serial clock signals to PLL, tone squelch and EEPROM IC. |

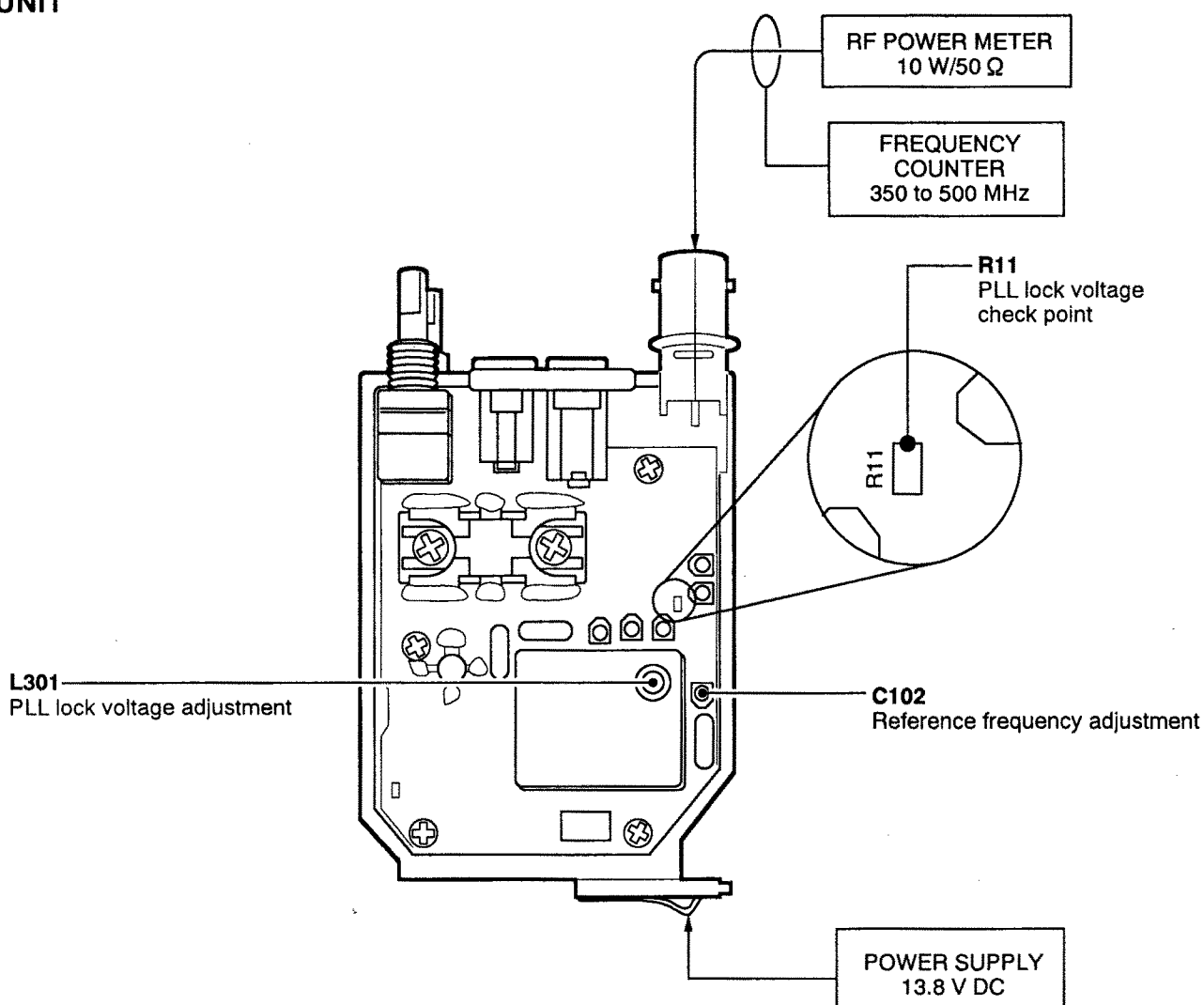
| Pin number | Port name     | Description                                                                                                                                                                                                                        |
|------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16         | PSTB          | Output port for PLL strobe signals.                                                                                                                                                                                                |
| 17         | SDAT/<br>UNLK | <b>【PLL locked】</b> : SDAT<br>Output port for serial data to the PLL IC (RF unit IC1) and optional tone squelch unit.<br><b>【PLL unlocked】</b> : UNLK<br>Input port for PLL unlock signal.                                         |
| 18         | IOST          | Output port for a strobe signals to the optional tone squelch unit.                                                                                                                                                                |
| 19–22      | KEY1–<br>KEY4 | Input ports for the key matrix, tuning dial and decoded DTMF code signals.                                                                                                                                                         |
| 23–26      | KEY5–<br>KEY8 | Outputs strobe signals ("LOW") for the key matrix.                                                                                                                                                                                 |
| 27         | TOE           | Outputs a DTMF decoder circuit (TENKEY unit IC2) control signal.<br>"HIGH": Activates the DTMF decoder circuit.                                                                                                                    |
| 28         | PLL P         | Outputs a PLL regulator circuit (RF unit Q13) control signal.                                                                                                                                                                      |
| 30         | NDET          | Input port for "NDET" signal (pulse type) from the noise amplifier (IC5, Q12) for noise squelch control.                                                                                                                           |
| 76         | RESET         | Input port for the CPU reset signal.                                                                                                                                                                                               |
| 77         | AFOF          | Outputs an AF regulator circuit (MAIN unit Q5, Q6) control signal.<br>"LOW": Activate the AF amplifier.                                                                                                                            |
| 78         | PCON          | Outputs a transmit high/low switching signal.<br>"HIGH": High power.                                                                                                                                                               |
| 79         | TONL          | Output port for:<br><b>【Receive mode】</b> : AMU<br>Outputs AF mute switch (MAIN unit Q2) control signal.<br>"HIGH": Turn ON the mute switch.<br><b>【Transmit mode】</b> : TON<br>Outputs an 88.5 Hz tone signal while transmitting. |
| 80         | TX            | Output port for transmitter circuit control signal.<br>"LOW": Activates transmitter circuits.                                                                                                                                      |

## SECTION 5 ADJUSTMENT PROCEDURES

### 5-1 PLL ADJUSTMENT

| ADJUSTMENT              | ADJUSTMENT CONDITIONS                                                                                                     | MEASUREMENT |                                                              | VALUE         | ADJUSTMENT POINT |        |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------|---------------|------------------|--------|
|                         |                                                                                                                           | UNIT        | LOCATION                                                     |               | UNIT             | ADJUST |
| PLL LOCK VOLTAGE        | 1 • Displayed frequency: 435.000 MHz<br>• Receiving                                                                       | RF          | Connect a digital multimeter or oscilloscope to R11.         | 2.6 V         | RF               | L301   |
|                         | 2 • Displayed frequency: 400.000 MHz<br>• Transmitting                                                                    |             |                                                              | More than 1 V |                  | Verify |
|                         | 3 • Receiving                                                                                                             |             |                                                              |               |                  |        |
| PLL REFERENCE FREQUENCY | 1 • Displayed frequency: 470.000 MHz<br>• Connect an RF power meter or a 50 $\Omega$ dummy load to the antenna connector. | Top panel   | Loosely couple a frequency counter to the antenna connector. | 470.000 MHz   | RF               | C102   |

#### RF UNIT



## 5-2 RECEIVER ADJUSTMENT

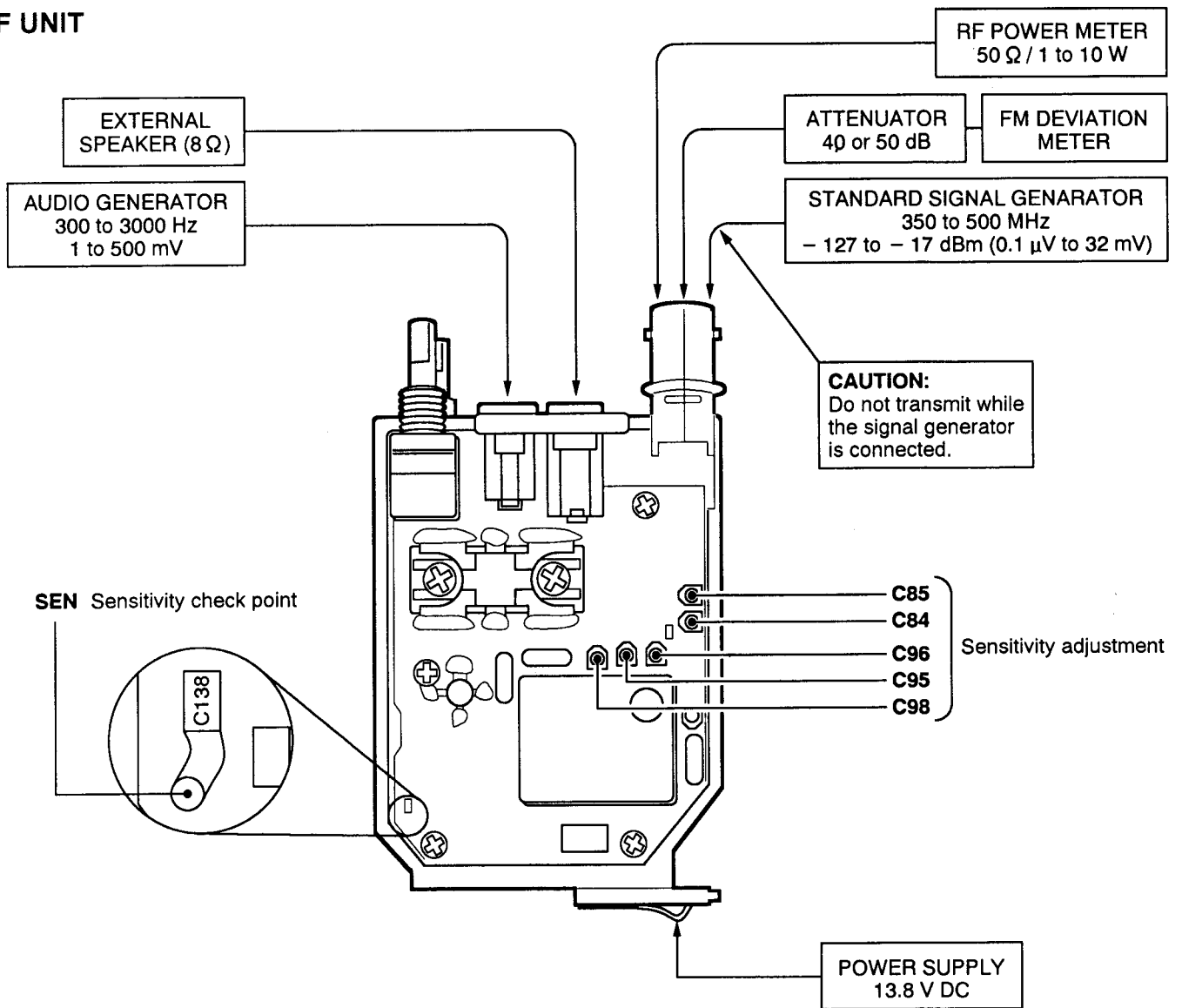
| ADJUSTMENT  |   | ADJUSTMENT CONDITIONS                                                                                                                                                                                                                                                                                                                       | MEASUREMENT |                                                             | VALUE              | ADJUSTMENT POINT |                                          |
|-------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------|--------------------|------------------|------------------------------------------|
|             |   |                                                                                                                                                                                                                                                                                                                                             | UNIT        | LOCATION                                                    |                    | UNIT             | ADJUST                                   |
| SENSITIVITY | 1 | <ul style="list-style-type: none"> <li>Displayed frequency: 415.000 MHz</li> <li>Connect the SSG to the antenna connector and set as: <ul style="list-style-type: none"> <li>Level : 5.6 <math>\mu</math>V* ( - 92 dBm)</li> <li>Modulation : 1 kHz</li> <li>Deviation : <math>\pm</math> 3.0 kHz</li> </ul> </li> <li>Receiving</li> </ul> | RF          | Connect a DC voltmeter to the check point, "SEN" terminal.  | Maximam DC voltage | RF               | Adjust in sequence C98, C95 C96, C84 C85 |
|             |   |                                                                                                                                                                                                                                                                                                                                             | MAIN        | Connect a DC voltmeter to the check point, "QUAD" terminal. | 1.0 V              | MAIN             | L1                                       |

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

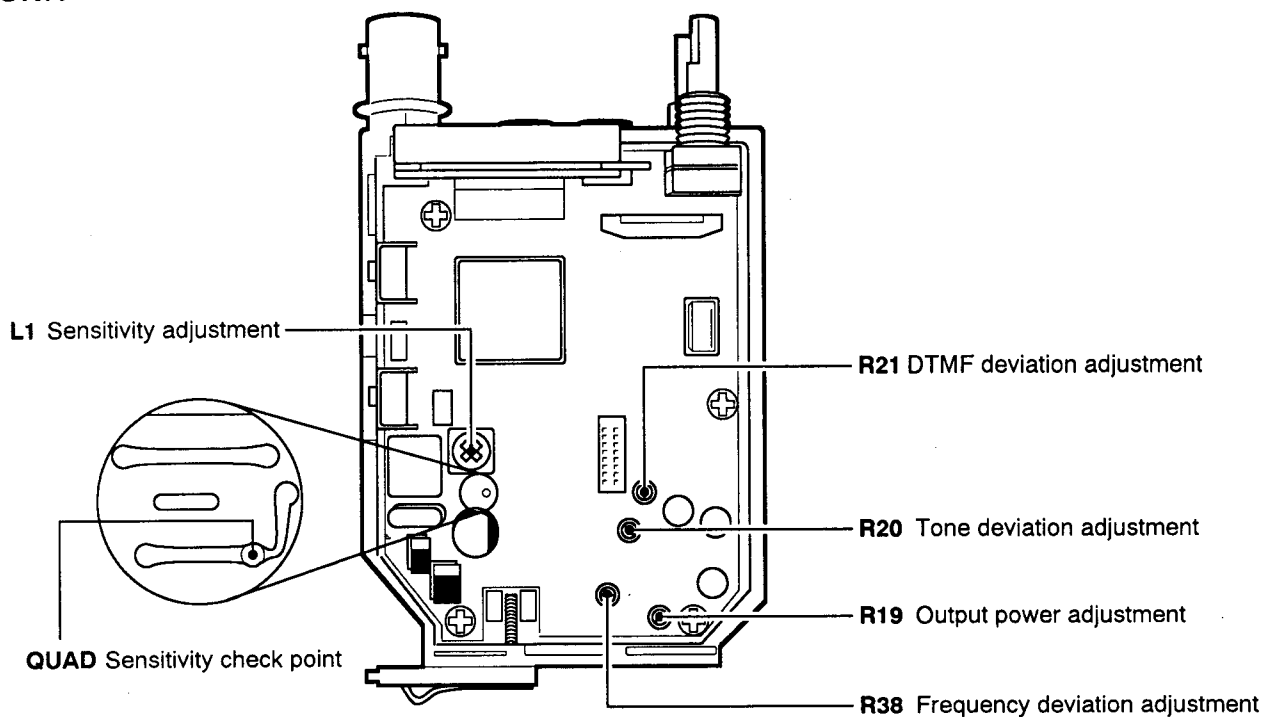
## 5-3 TRANSMITTER ADJUSTMENT

| ADJUSTMENT          |   | ADJUSTMENT CONDITIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MEASUREMENT |                                                                           | VALUE         | ADJUSTMENT POINT |        |
|---------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------------------------------------------|---------------|------------------|--------|
|                     |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | UNIT        | LOCATION                                                                  |               | UNIT             | ADJUST |
| OUTPUT POWER        | 1 | <ul style="list-style-type: none"> <li>Displayed frequency : 435.000 MHz</li> <li>Output power : High</li> <li>Transmitting</li> </ul>                                                                                                                                                                                                                                                                                                                                     | Top panel   | Connect an RF power meter to the antenna connector.                       | 5.0 W         | MAIN             | R19    |
| FREQUENCY DEVIATION | 1 | <ul style="list-style-type: none"> <li>Displayed frequency: 435.000 MHz</li> <li>Connect an audio generator to the microphone connector and set as: <ul style="list-style-type: none"> <li>1 kHz/120 mVrms</li> </ul> </li> <li>Set the FM deviation meter as: <ul style="list-style-type: none"> <li>HPF : 50 Hz</li> <li>LPF : 20 kHz</li> <li>De-emphasis : OFF</li> <li>Detector : (P - P)/2</li> </ul> </li> <li>Output power : High</li> <li>Transmitting</li> </ul> | Top panel   | Connect an FM deviation meter to the antenna connector via an attenuator. | $\pm$ 4.2 kHz | MAIN             | R38    |
| TONE DEVIATION      | 1 | <ul style="list-style-type: none"> <li>Displayed frequency: 435.000 MHz</li> <li>No signal is applied to the microphone connector.</li> <li>Set the the FM deviation meter as: <ul style="list-style-type: none"> <li>HPF : OFF</li> <li>LPF : 20 kHz</li> <li>De-emphasis : OFF</li> <li>Detector : (P - P)/2</li> </ul> </li> <li>Subaudible tone encoder: ON</li> <li>Transmitting</li> </ul>                                                                           | Top panel   | Connect an FM deviation meter to the antenna connector via an attenuator. | $\pm$ 0.7 kHz | MAIN             | R20    |
| DTMF DEVIATION      | 1 | <ul style="list-style-type: none"> <li>Displayed frequency: 435.000 MHz</li> <li>No signal is applied to the microphone connector.</li> <li>Set the the FM deviation meter as: <ul style="list-style-type: none"> <li>HPF : 50 Hz</li> <li>LPF : 20 kHz</li> <li>De-emphasis : OFF</li> <li>Detector : (P - P)/2</li> </ul> </li> <li>Press [D] key while transmitting.</li> </ul>                                                                                         | Top panel   | Connect an FM deviation meter to the antenna connector via an attenuator. | $\pm$ 3.0 kHz | MAIN             | R21    |

## RF UNIT



## MAIN UNIT



# SECTION 6 PARTS LIST

[RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION  |                      |
|----------|------------|--------------|----------------------|
| IC1      | 1130007610 | S.IC         | μPD3140GS-E1 (DS8)   |
| IC301    | 1110003080 | S.IC         | μPC2715T-E3          |
| IC321    | 1110003370 | S.IC         | μPC2748T-E3          |
| Q1       | 1530003250 | TRANSISTOR   | 2SC1967              |
| Q2       | 1590002020 | TRANSISTOR   | MRF555               |
| Q3       | 1530000160 | S.TRANSISTOR | 2SC2712-Y (TE85RTEM) |
| Q4       | 1520000460 | S.TRANSISTOR | 2SB1132 T100 R       |
| Q5       | 1590000620 | S.TRANSISTOR | FMS1 T148            |
| Q6       | 1530003170 | S.TRANSISTOR | 2SC4863-4-TR         |
| Q7       | 1530003170 | S.TRANSISTOR | 2SC4863-4-TR         |
| Q8       | 1530003330 | S.TRANSISTOR | 2SC4401-3-TL         |
| Q9       | 1530002380 | S.TRANSISTOR | 2SC4215-Y (TE85R)    |
| Q10      | 1590001730 | S.TRANSISTOR | UN9113(TX)           |
| Q11      | 1590001470 | S.TRANSISTOR | UN9213(TX)           |
| Q12      | 1590001230 | S.TRANSISTOR | RN2302 (TE85R)       |
| Q13      | 1590002040 | S.TRANSISTOR | HN1B01F-GR (TE85R)   |
| Q14      | 1560000540 | S.FET        | 2SK880-Y (TE85R)     |
| Q15      | 1530003170 | S.TRANSISTOR | 2SC4863-4-TR         |
| Q301     | 1530002920 | S.TRANSISTOR | 2SC4226-T2 R25       |
| Q302     | 1530002920 | S.TRANSISTOR | 2SC4226-T2 R25       |
| Q321     | 1530002560 | S.TRANSISTOR | 2SC4403-3-TL         |
| Q322     | 1530002340 | S.TRANSISTOR | 2SC2954-T2B          |
| D1       | 1790000450 | S.DIODE      | MA862(TX)            |
| D2       | 1790000620 | S.DIODE      | MA77(TW)             |
| D3       | 1750000390 | S.DIODE      | 1SS353 TE-17         |
| D4       | 1750000390 | S.DIODE      | 1SS353 TE-17         |
| D5       | 1790000660 | S.DIODE      | MA728(TW)            |
| D7       | 1750000390 | S.DIODE      | 1SS353 TE-17         |
| D8       | 1720000370 | S.VARICAP    | HVU350TRF            |
| D9       | 1720000370 | S.VARICAP    | HVU350TRF            |
| D10      | 1720000370 | S.VARICAP    | HVU350TRF            |
| D11      | 1720000370 | S.VARICAP    | HVU350TRF            |
| D12      | 1720000370 | S.VARICAP    | HVU350TRF            |
| D13      | 1790000680 | S.DIODE      | SB20-03P-TD          |
| D301     | 1720000370 | S.VARICAP    | HVU350TRF            |
| D302     | 1790000620 | S.DIODE      | MA77(TW)             |
| D303     | 1790000620 | S.DIODE      | MA77(TW)             |
| D321     | 1790000580 | S.DIODE      | HSM2693TR            |
| FI1      | 2010001600 | XTAL         | FL-199 (30.875 MHz)  |
| X1       | 6050009250 | XTAL         | CR-500 (12.8 MHz)    |
| L1       | 6200005780 | S.COIL       | 33CS-Y655LY-03K=P3   |
| L2       | 6200005780 | S.COIL       | 33CS-Y655LY-03K=P3   |
| L3       | 6200005770 | S.COIL       | 33CS-Y655LY-04K=P3   |
| L4       | 6200005790 | S.COIL       | 33CS-Y655LY-01M=P3   |
| L5       | 6200002850 | S.COIL       | NL 252018T-R82J      |
| L6       | 6200005790 | S.COIL       | 33CS-Y655LY-01M=P3   |
| L7       | 6200003700 | S.COIL       | BLM21A10PT           |
| L8       | 6200004260 | S.COIL       | MLR1608M 2N2S-T      |
| L9       | 6200004580 | S.COIL       | MLR1608M 8N2D-T      |
| L11      | 6200004070 | S.COIL       | MLR1608M 22NJ-T      |
| L12      | 6200004260 | S.COIL       | MLR1608M 2N2S-T      |
| L13      | 6200004060 | S.COIL       | MLR1608M 18NJ-T      |
| L14      | 6200004060 | S.COIL       | MLR1608M 18NJ-T      |
| L15      | 6200004290 | S.COIL       | MLR1608M 10NJ-T      |
| L16      | 6200004810 | S.COIL       | MLR1608M 5N6D-T      |
| L17      | 6200003470 | S.COIL       | LL2012-F4N7K         |
| L18      | 6200002320 | S.COIL       | LQN 1A 8N8J04        |
| L19      | 6200004580 | S.COIL       | MLR1608M 8N2D-T      |
| L20      | 6200003470 | S.COIL       | LL2012-F4N7K         |
| L21      | 6200002320 | S.COIL       | LQN 1A 8N8J04        |

[RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                         |
|----------|------------|-------------|-------------------------|
| L22      | 6200002320 | S.COIL      | LQN 1A 8N8J04           |
| L23      | 6200004650 | S.COIL      | MLR1608M 68NJ-T         |
| L24      | 6200003090 | S.COIL      | NL 322522T-2R7J-3       |
| L25      | 6200004220 | S.COIL      | MLR1608M 27NJ-T         |
| L26      | 6200003960 | S.COIL      | MLF1608A 1R0K-T         |
| L27      | 6200003960 | S.COIL      | MLF1608A 1R0K-T         |
| L28      | 6200003960 | S.COIL      | MLF1608A 1R0K-T         |
| L29      | 6200003590 | S.COIL      | EXCCL3225U1             |
| L301     | 6200003690 | S.COIL      | MC152-E558ANA-1         |
| L302     | 6200002850 | S.COIL      | NL 252018T-R82J         |
| L321     | 6200004220 | S.COIL      | MLR1608M 27NJ-T         |
| L322     | 6200004220 | S.COIL      | MLR1608M 27NJ-T         |
| L323     | 6200004280 | S.COIL      | MLR1608M 6N8D-T         |
| R1       | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)   |
| R2       | 7030003430 | S.RESISTOR  | ERJ3GEYJ 821 V (820 Ω)  |
| R3       | 7030003240 | S.RESISTOR  | ERJ3GEYJ 220 V (22 Ω)   |
| R4       | 7030003500 | S.RESISTOR  | ERJ3GEYJ 332 V (3.3 kΩ) |
| R5       | 7030003380 | S.RESISTOR  | ERJ3GEYJ 331 V (330 Ω)  |
| R6       | 7030003240 | S.RESISTOR  | ERJ3GEYJ 220 V (22 Ω)   |
| R7       | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ) |
| R8       | 7030003720 | S.RESISTOR  | ERJ3GEYJ 224 V (220 kΩ) |
| R9       | 7030003580 | S.RESISTOR  | ERJ3GEYJ 153 V (15 kΩ)  |
| R10      | 7030003380 | S.RESISTOR  | ERJ3GEYJ 331 V (330 Ω)  |
| R11      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)   |
| R12      | 7030003580 | S.RESISTOR  | ERJ3GEYJ 153 V (15 kΩ)  |
| R14      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)   |
| R15      | 7030003720 | S.RESISTOR  | ERJ3GEYJ 224 V (220 kΩ) |
| R16      | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)  |
| R17      | 7030003600 | S.RESISTOR  | ERJ3GEYJ 223 V (22 kΩ)  |
| R19      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)  |
| R20      | 7030003530 | S.RESISTOR  | ERJ3GEYJ 562 V (5.6 kΩ) |
| R22      | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ) |
| R23      | 7030003590 | S.RESISTOR  | ERJ3GEYJ 183 V (18 kΩ)  |
| R24      | 7030003200 | S.RESISTOR  | ERJ3GEYJ 100 V (10 Ω)   |
| R25      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)   |
| R26      | 7030003320 | S.RESISTOR  | ERJ3GEYJ 101 V (100 Ω)  |
| R27      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ) |
| R28      | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ) |
| R29      | 7030003830 | S.RESISTOR  | ERJ3GEYJ 185 V (1.8 MΩ) |
| R30      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ) |
| R31      | 7030003410 | S.RESISTOR  | ERJ3GEYJ 561 V (560 Ω)  |
| R32      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 683 V (68 kΩ)  |
| R33      | 7030003510 | S.RESISTOR  | ERJ3GEYJ 392 V (3.9 kΩ) |
| R34      | 7030003400 | S.RESISTOR  | ERJ3GEYJ 471 V (470 Ω)  |
| R35      | 7030003450 | S.RESISTOR  | ERJ3GEYJ 122 V (1.2 kΩ) |
| R36      | 7030003480 | S.RESISTOR  | ERJ3GEYJ 152 V (1.5 kΩ) |
| R37      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)  |
| R38      | 7030003380 | S.RESISTOR  | ERJ3GEYJ 221 V (220 Ω)  |
| R39      | 7030003700 | S.RESISTOR  | ERJ3GEYJ 154 V (150 kΩ) |
| R40      | 7030003510 | S.RESISTOR  | ERJ3GEYJ 392 V (3.9 kΩ) |
| R41      | 7030000300 | S.RESISTOR  | MCR10EZJH 220 Ω (221)   |
| R42      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)   |
| R43      | 7030003510 | S.RESISTOR  | ERJ3GEYJ 392 V (3.9 kΩ) |
| R44      | 7030003580 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)  |
| R45      | 7210002520 | VARIABLE    | TP96N00N-16F-10KA-1517  |
| R46      | 7030003720 | S.RESISTOR  | ERJ3GEYJ 224 V (220 kΩ) |
| R47      | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)  |
| R48      | 7030003240 | S.RESISTOR  | ERJ3GEYJ 220 V (22 Ω)   |
| R50      | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)  |
| R51      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)   |
| R52      | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)  |
| R53      | 7030000280 | S.RESISTOR  | MCR10EZJH 150 Ω (151)   |
| R54      | 7030003590 | S.RESISTOR  | ERJ3GEYJ 183 V (18 kΩ)  |
| R55      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ) |
| R56      | 7030003320 | S.RESISTOR  | ERJ3GEYJ 101 V (100 Ω)  |
| R57      | 7030003760 | S.RESISTOR  | ERJ3GEYJ 474 V (470 kΩ) |
| R58      | 7030003280 | S.RESISTOR  | ERJ3GEYJ 470 V (47 Ω)   |
| R59      | 7030003430 | S.RESISTOR  | ERJ3GEYJ 821 V (820 Ω)  |

S.=Surface mount

## [RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                         |
|----------|------------|-------------|-------------------------|
| R60      | 7030003430 | S.RESISTOR  | ERJ3GEYJ 821 V (820 Ω)  |
| R61      | 7030000420 | S.RESISTOR  | MCR10EZJH 2.2 kΩ (222)  |
| R62      | 7030003380 | S.RESISTOR  | ERJ3GEYJ 331 V (330 Ω)  |
| R63      | 7030000300 | S.RESISTOR  | MCR10EZJH 220 Ω (221)   |
| R65      | 7030000420 | S.RESISTOR  | MCR10EZJH 2.2 kΩ (222)  |
| R301     | 7030003320 | S.RESISTOR  | ERJ3GEYJ 101 V (100 Ω)  |
| R302     | 7030003330 | S.RESISTOR  | ERJ3GEYJ 121 V (120 Ω)  |
| R303     | 7030003550 | S.RESISTOR  | ERJ3GEYJ 822 V (8.2 kΩ) |
| R304     | 7030003360 | S.RESISTOR  | ERJ3GEYJ 221 V (220 Ω)  |
| R305     | 7030003550 | S.RESISTOR  | ERJ3GEYJ 822 V (8.2 kΩ) |
| R306     | 7030003300 | S.RESISTOR  | ERJ3GEYJ 680 V (68 Ω)   |
| R307     | 7030003400 | S.RESISTOR  | ERJ3GEYJ 471 V (470 Ω)  |
| R308     | 7030003500 | S.RESISTOR  | ERJ3GEYJ 332 V (3.3 kΩ) |
| R309     | 7030003440 | S.RESISTOR  | ERJ3GEYJ 102 V (1 kΩ)   |
| R310     | 7030003400 | S.RESISTOR  | ERJ3GEYJ 471 V (470 Ω)  |
| R311     | 7030003440 | S.RESISTOR  | ERJ3GEYJ 102 V (1 kΩ)   |
| R312     | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)  |
| R313     | 7030003540 | S.RESISTOR  | ERJ3GEYJ 682 V (6.8 kΩ) |
| R314     | 7030003600 | S.RESISTOR  | ERJ3GEYJ 223 V (22 kΩ)  |
| R321     | 7030000280 | S.RESISTOR  | MCR10EZJH 150 Ω (151)   |
| R322     | 7030003280 | S.RESISTOR  | ERJ3GEYJ 470 V (47 Ω)   |
| R323     | 7030003320 | S.RESISTOR  | ERJ3GEYJ 101 V (100 Ω)  |
| R324     | 7030003660 | S.RESISTOR  | ERJ3GEYJ 683 V (68 kΩ)  |
| R325     | 7030003440 | S.RESISTOR  | ERJ3GEYJ 102 V (1 kΩ)   |
| R326     | 7030003600 | S.RESISTOR  | ERJ3GEYJ 223 V (22 kΩ)  |
| R327     | 7030003260 | S.RESISTOR  | ERJ3GEYJ 330 V (33 Ω)   |
| R328     | 7030003300 | S.RESISTOR  | ERJ3GEYJ 680 V (68 Ω)   |
| R329     | 7030000280 | S.RESISTOR  | MCR10EZJH 150 Ω (151)   |
| R330     | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)  |
| R331     | 7030003260 | S.RESISTOR  | ERJ3GEYJ 330 V (33 Ω)   |
| R332     | 7030003420 | S.RESISTOR  | ERJ3GEYJ 681 V (680 Ω)  |
|          |            |             |                         |
| C1       | 4030007020 | S.CERAMIC   | C1608 CH 1H 120J-T-A    |
| C2       | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A    |
| C3       | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A    |
| C4       | 4030006940 | S.CERAMIC   | C1608 CH 1H 030C-T-A    |
| C5       | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C6       | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C7       | 4030009500 | S.CERAMIC   | C1608 CH 1H 0R5B-T-A    |
| C8       | 4030006920 | S.CERAMIC   | C1608 CH 1H 010C-T-A    |
| C9       | 4030006880 | S.CERAMIC   | C2012 JF 1C 105Z-T-A    |
| C10      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C11      | 4030009350 | S.CERAMIC   | C1608 CH 1H 3R5B-T-A    |
| C12      | 4030007110 | S.CERAMIC   | C1608 CH 1H 680J-T-A    |
| C13      | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A    |
| C14      | 4030007110 | S.CERAMIC   | C1608 CH 1H 680J-T-A    |
| C15      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C16      | 4030007010 | S.CERAMIC   | C1608 CH 1H 100D-T-A    |
| C17      | 4030007160 | S.CERAMIC   | C1608 CH 1H 181J-T-A    |
| C18      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C19      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C21      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C22      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C23      | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A    |
| C24      | 4550006800 | S.TANTALUM  | TEMSVB2 1D 475M-8R      |
| C25      | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A    |
| C26      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A    |
| C27      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C28      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C29      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C30      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C31      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C33      | 4030006880 | S.CERAMIC   | C2012 JF 1C 105Z-T-A    |
| C34      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C35      | 4030006920 | S.CERAMIC   | C1608 CH 1H 010C-T-A    |
| C36      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A    |
| C38      | 4550006110 | S.TANTALUM  | TEMSVB2 0J 336M8L       |
| C39      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A    |
| C40      | 4030006880 | S.CERAMIC   | C2012 JF 1C 105Z-T-A    |
| C41      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A    |
| C42      | 4030006940 | S.CERAMIC   | C1608 CH 1H 030C-T-A    |
| C43      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A    |
| C44      | 4030009550 | S.CERAMIC   | C1608 CH 1H 2R5B-T-A    |
| C45      | 4030006970 | S.CERAMIC   | C1608 CH 1H 080D-T-A    |
| C46      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |

## [RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                      |
|----------|------------|-------------|----------------------|
| C47      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C48      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C49      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C50      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C51      | 4030006920 | S.CERAMIC   | C1608 CH 1H 010C-T-A |
| C52      | 4550002980 | S.TANTALUM  | TESVA 1C 155M1-8L    |
| C53      | 4550000530 | S.TANTALUM  | TESVA 1V 104M1-8L    |
| C55      | 4030006970 | S.CERAMIC   | C1608 CH 1H 080D-T-A |
| C56      | 4030007020 | S.CERAMIC   | C1608 CH 1H 120J-T-A |
| C57      | 4030009550 | S.CERAMIC   | C1608 CH 1H 2R5B-T-A |
| C58      | 4030006970 | S.CERAMIC   | C1608 CH 1H 080D-T-A |
| C59      | 4030007020 | S.CERAMIC   | C1608 CH 1H 120J-T-A |
| C60      | 4030006990 | S.CERAMIC   | C1608 CH 1H 080D-T-A |
| C61      | 4030006920 | S.CERAMIC   | C1608 CH 1H 010C-T-A |
| C62      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C63      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C64      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A |
| C66      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A |
| C67      | 4030006940 | S.CERAMIC   | C1608 CH 1H 030C-T-A |
| C69      | 4030006850 | S.CERAMIC   | C1608 CH 1H 471K-T-A |
| C70      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C71      | 4030006880 | S.CERAMIC   | C2012 JF 1C 105Z-T-A |
| C72      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C73      | 4030006940 | S.CERAMIC   | C1608 CH 1H 030C-T-A |
| C74      | 4550006121 | S.TANTALUM  | TEMSVA 0G 226M-8R    |
| C75      | 4030006960 | S.CERAMIC   | C1608 CH 1H 050C-T-A |
| C77      | 4030007070 | S.CERAMIC   | C1608 CH 1H 330J-T-A |
| C78      | 4030006970 | S.CERAMIC   | C1608 CH 1H 080D-T-A |
| C79      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C81      | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A |
| C82      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C83      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C84      | 4610001910 | S.TRIMMER   | CTZ3E-10A-W1         |
| C85      | 4610001910 | S.TRIMMER   | CTZ3E-10A-W1         |
| C86      | 4030007020 | S.CERAMIC   | C1608 CH 1H 120J-T-A |
| C87      | 4030007000 | S.CERAMIC   | C1608 CH 1H 090D-T-A |
| C89      | 4030006960 | S.CERAMIC   | C1608 CH 1H 050C-T-A |
| C90      | 4030009500 | S.CERAMIC   | C1608 CH 1H 0R5B-T-A |
| C91      | 4030006930 | S.CERAMIC   | C1608 CH 1H 020C-T-A |
| C92      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C93      | 4030006950 | S.CERAMIC   | C1608 CH 1H 040C-T-A |
| C94      | 4030007020 | S.CERAMIC   | C1608 CH 1H 120J-T-A |
| C95      | 4610001910 | S.TRIMMER   | CTZ3E-10A-W1         |
| C96      | 4610001910 | S.TRIMMER   | CTZ3E-10A-W1         |
| C97      | 4030007000 | S.CERAMIC   | C1608 CH 1H 090D-T-A |
| C98      | 4610001910 | S.TRIMMER   | CTZ3E-10A-W1         |
| C99      | 4030009500 | S.CERAMIC   | C1608 CH 1H 0R5B-T-A |
| C100     | 4030006970 | S.CERAMIC   | C1608 CH 1H 080D-T-A |
| C101     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C102     | 4610001910 | S.TRIMMER   | CTZ3E-10A-W1         |
| C103     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C106     | 4030007060 | S.CERAMIC   | C1608 CH 1H 270J-T-A |
| C108     | 4030007070 | S.CERAMIC   | C1608 CH 1H 330J-T-A |
| C109     | 4030008580 | S.CERAMIC   | C1608 CH 1H 300J-T-A |
| C110     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C111     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C112     | 4030009560 | S.CERAMIC   | C1608 CH 1H R75B-T-A |
| C113     | 4030009560 | S.CERAMIC   | C1608 CH 1H R75B-T-A |
| C114     | 4030009560 | S.CERAMIC   | C1608 CH 1H R75B-T-A |
| C115     | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A |
| C117     | 4030007120 | S.CERAMIC   | C1608 CH 1H 820J-T-A |
| C118     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C119     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C121     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C123     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C124     | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A |
| C125     | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A |
| C126     | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A |
| C128     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C129     | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A |
| C130     | 4030006880 | S.CERAMIC   | C2012 JF 1C 105Z-T-A |
| C134     | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A |
| C135     | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A |
| C136     | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A |
| C137     | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A |
| C138     | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |

S.=Surface mount

## [RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                      |
|----------|------------|-------------|----------------------|
| C139     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C140     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C141     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C142     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C143     | 4030006880 | S.CERAMIC   | C2012 JF 1C 105Z-T-A |
| C144     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C145     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C146     | 4030006900 | S.CERAMIC   | C1808 JB 1E 103K-T-A |
| C147     | 4030006900 | S.CERAMIC   | C1808 JB 1E 103K-T-A |
| C148     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C150     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C151     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C153     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C154     | 4030006900 | S.CERAMIC   | C1808 JB 1E 103K-T-A |
| C157     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C159     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C160     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C161     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C162     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C163     | 4030006900 | S.CERAMIC   | C1808 JB 1E 103K-T-A |
| C301     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C302     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C303     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C304     | 4030009540 | S.CERAMIC   | C1808 CH 1H 1R5B-T-A |
| C305     | 4030006970 | S.CERAMIC   | C1808 CH 1H 080D-T-A |
| C306     | 4030009540 | S.CERAMIC   | C1808 CH 1H 1R5B-T-A |
| C307     | 4030007010 | S.CERAMIC   | C1808 CH 1H 100D-T-A |
| C308     | 4030009520 | S.CERAMIC   | C1808 CH 1H 020B-T-A |
| C309     | 4030009510 | S.CERAMIC   | C1808 CH 1H 010B-T-A |
| C310     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C311     | 4030007090 | S.CERAMIC   | C1808 CH 1H 470J-T-A |
| C312     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C313     | 4030009570 | S.CERAMIC   | C1808 CH 1H 0R3B-T-A |
| C314     | 4030006960 | S.CERAMIC   | C1808 CH 1H 050C-T-A |
| C315     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C316     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C317     | 4030006940 | S.CERAMIC   | C1808 CH 1H 030C-T-A |
| C318     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C319     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C321     | 4030007010 | S.CERAMIC   | C1808 CH 1H 100D-T-A |
| C322     | 4030008560 | S.CERAMIC   | C1808 CH 1H 300J-T-A |
| C323     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C324     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C325     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C326     | 4030006940 | S.CERAMIC   | C1808 CH 1H 030C-T-A |
| C327     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C328     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C329     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| C331     | 4030007070 | S.CERAMIC   | C1808 CH 1H 330J-T-A |
| C332     | 4030006990 | S.CERAMIC   | C1808 CH 1H 080D-T-A |
| C333     | 4030006850 | S.CERAMIC   | C1808 JB 1H 471K-T-A |
| J2       | 6450001430 | CONNECTOR   | HSJ1462-01-010       |
| J3       | 6450001440 | CONNECTOR   | HSJ1403-01-010       |
| J4       | 6510016080 | S.CONNECTOR | 53281-2490           |
| W1       | 7120000380 | JUMPER      | JPW 01 R-01          |
| W2       | 7030003860 | S.JUMPER    | ERJ3GE JPW V         |
| W4       | 7030003860 | S.JUMPER    | ERJ3GE JPW V         |
| W6       | 7030003860 | S.JUMPER    | ERJ3GE JPW V         |
| W7       | 7030003860 | S.JUMPER    | ERJ3GE JPW V         |
| W8       | 7030003860 | S.JUMPER    | ERJ3GE JPW V         |
| EP1      | 0910042546 | PCB         | B 4245F              |

## [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION  |                               |
|----------|------------|--------------|-------------------------------|
| IC1      | 1110003390 | S.IC         | AN8005M-(E1)                  |
| IC2      | 1110001810 | S.IC         | TA7368F(TP1)                  |
| IC3      | 1110003330 | S.IC         | TA31136F(EL)                  |
| IC4      | 1140004710 | S.IC         | HD404618C58H [CHN]<br>[CHN-1] |
| IC5      | 1140004950 | S.IC         | HD404618D02H [GEN]            |
|          | 1130001910 | S.IC         | μPD4011BG-T1                  |
| Q1       | 1530000160 | S.TRANSISTOR | 2SC2712-Y (TE85RTEM)          |
| Q2       | 1590001390 | S.FET        | 2SJ144-Y (TE85R)              |
| Q3       | 1520000460 | S.TRANSISTOR | 2SB1132 T100 R                |
| Q4       | 1590001930 | S.TRANSISTOR | IMX2 T108                     |
| Q5       | 1520000460 | S.TRANSISTOR | 2SB1132 T100 R                |
| Q6       | 1590001930 | S.TRANSISTOR | IMX2 T108                     |
| Q7       | 1520000460 | S.TRANSISTOR | 2SB1132 T100 R                |
| Q8       | 1590001930 | S.TRANSISTOR | IMX2 T108                     |
| Q9       | 1590001930 | S.TRANSISTOR | IMX2 T108                     |
| Q10      | 1510000110 | S.TRANSISTOR | 2SA1162-Y (TE85R)             |
| Q11      | 1590001930 | S.TRANSISTOR | IMX2 T108                     |
| Q12      | 1510000110 | S.TRANSISTOR | 2SA1162-Y (TE85R)             |
| Q13      | 1510000110 | S.TRANSISTOR | 2SA1162-Y (TE85R)             |
| Q14      | 1590000420 | S.TRANSISTOR | RN1404 (TE85R)                |
| Q15      | 1590001930 | S.TRANSISTOR | IMX2 T108                     |
| Q16      | 1590000630 | S.TRANSISTOR | RN1403 (TE85R)                |
| Q17      | 1530000160 | S.TRANSISTOR | 2SC2712-Y (TE85RTEM)          |
| Q18      | 1590000410 | S.TRANSISTOR | RN2404 (TE85R)                |
| Q19      | 1510000110 | S.TRANSISTOR | 2SA1162-Y (TE85R)             |
| D1       | 1790001170 | S.ZENER      | MA8068-M(TX)                  |
| D2       | 1790001010 | S.ZENER      | MA8043-L(TX)                  |
| D3       | 1750000120 | S.DIODE      | DWA010-TE                     |
| D4       | 1750000020 | S.DIODE      | 1SS184 (TE85R)                |
| D5       | 1750000020 | S.DIODE      | 1SS184 (TE85R)                |
| D6       | 1750000020 | S.DIODE      | 1SS184 (TE85R)                |
| FI1      | 2020000080 | CERAMIC      | CFU455E2                      |
| X1       | 6050008810 | XTAL         | CR-473 (30.41909 MHz)         |
| X2       | 6060000260 | CERAMIC      | CSB800J220                    |
| L1       | 6150002770 | COIL         | LS-293                        |
| R2       | 7030003330 | S.RESISTOR   | ERJ3GEYJ 121 V (120 Ω)        |
| R3       | 7030003400 | S.RESISTOR   | ERJ3GEYJ 471 V (470 Ω)        |
| R4       | 7030003200 | S.RESISTOR   | ERJ3GEYJ 100 V (10 Ω)         |
| R5       | 7030003620 | S.RESISTOR   | ERJ3GEYJ 333 V (33 kΩ)        |
| R6       | 7030003600 | S.RESISTOR   | ERJ3GEYJ 223 V (22 kΩ)        |
| R7       | 7030003660 | S.RESISTOR   | ERJ3GEYJ 683 V (68 kΩ)        |
| R8       | 7030003540 | S.RESISTOR   | ERJ3GEYJ 682 V (6.8 kΩ)       |
| R9       | 7030003560 | S.RESISTOR   | ERJ3GEYJ 103 V (10 kΩ)        |
| R10      | 7030003560 | S.RESISTOR   | ERJ3GEYJ 103 V (10 kΩ)        |
| R11      | 7030003440 | S.RESISTOR   | ERJ3GEYJ 102 V (1 kΩ)         |
| R12      | 7030003520 | S.RESISTOR   | ERJ3GEYJ 472 V (4.7 kΩ)       |
| R13      | 7030003640 | S.RESISTOR   | ERJ3GEYJ 473 V (47 kΩ)        |
| R14      | 7030003580 | S.RESISTOR   | ERJ3GEYJ 153 V (15 kΩ)        |
| R15      | 7030003660 | S.RESISTOR   | ERJ3GEYJ 683 V (68 kΩ)        |
| R16      | 7030003840 | S.RESISTOR   | ERJ3GEYJ 225 V (2.2 MΩ)       |
| R17      | 7030003560 | S.RESISTOR   | ERJ3GEYJ 103 V (10 kΩ)        |
| R18      | 7030003440 | S.RESISTOR   | ERJ3GEYJ 102 V (1 kΩ)         |
| R19      | 7310002740 | S.TRIMMER    | RV-150<br>(RH03A3A14X0FC)103  |
| R20      | 7310002770 | S.TRIMMER    | RV-153<br>(RH03A3AN4X02A)333  |
| R21      | 7310002600 | S.TRIMMER    | RV-110<br>(RH03A3AS4X0AA)473  |
| R22      | 7030003650 | S.RESISTOR   | ERJ3GEYJ 563 V (56 kΩ)        |
| R23      | 7030003750 | S.RESISTOR   | ERJ3GEYJ 394 V (390 kΩ)       |
| R24      | 7030003710 | S.RESISTOR   | ERJ3GEYJ 184 V (180 kΩ)       |
| R25      | 7030003530 | S.RESISTOR   | ERJ3GEYJ 562 V (5.6 kΩ)       |
| R26      | 7030003570 | S.RESISTOR   | ERJ3GEYJ 123 V (12 kΩ)        |

S.=Surface mount

## [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                              |
|----------|------------|-------------|------------------------------|
| R27      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R28      | 7030003690 | S.RESISTOR  | ERJ3GEYJ 124 V (120 kΩ)      |
| R29      | 7030003450 | S.RESISTOR  | ERJ3GEYJ 122 V (1.2 kΩ)      |
| R30      | 7030003620 | S.RESISTOR  | ERJ3GEYJ 333 V (33 kΩ)       |
| R31      | 7030003590 | S.RESISTOR  | ERJ3GEYJ 183 V (18 kΩ)       |
| R32      | 7030003480 | S.RESISTOR  | ERJ3GEYJ 222 V (2.2 kΩ)      |
| R33      | 7030003720 | S.RESISTOR  | ERJ3GEYJ 224 V (220 kΩ)      |
| R34      | 7030003450 | S.RESISTOR  | ERJ3GEYJ 122 V (1.2 kΩ)      |
| R35      | 7030003440 | S.RESISTOR  | ERJ3GEYJ 102 V (1 kΩ)        |
| R36      | 7030003650 | S.RESISTOR  | ERJ3GEYJ 563 V (56 kΩ)       |
| R37      | 7030003650 | S.RESISTOR  | ERJ3GEYJ 563 V (56 kΩ)       |
| R38      | 7310002740 | S.TRIMMER   | RV-150<br>(RH03A3A14X0FC)103 |
| R39      | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ)      |
| R40      | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ)      |
| R41      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R42      | 7030003400 | S.RESISTOR  | ERJ3GEYJ 471 V (470 Ω)       |
| R43      | 7030003600 | S.RESISTOR  | ERJ3GEYJ 223 V (22 kΩ)       |
| R44      | 7030003420 | S.RESISTOR  | ERJ3GEYJ 681 V (680 Ω)       |
| R45      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R46      | 7030003740 | S.RESISTOR  | ERJ3GEYJ 334 V (330 kΩ)      |
| R47      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ)      |
| R48      | 7030003460 | S.RESISTOR  | ERJ3GEYJ 152 V (1.5 kΩ)      |
| R49      | 7030003490 | S.RESISTOR  | ERJ3GEYJ 272 V (2.7 kΩ)      |
| R50      | 7030003460 | S.RESISTOR  | ERJ3GEYJ 152 V (1.5 kΩ)      |
| R51      | 7030003300 | S.RESISTOR  | ERJ3GEYJ 680 V (68 Ω)        |
| R52      | 7030003380 | S.RESISTOR  | ERJ3GEYJ 331 V (330 Ω)       |
| R53      | 7030003440 | S.RESISTOR  | ERJ3GEYJ 102 V (1 kΩ)        |
| R54      | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ)      |
| R55      | 7030003840 | S.RESISTOR  | ERJ3GEYJ 225 V (2.2 MΩ)      |
| R56      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)        |
| R57      | 7030003200 | S.RESISTOR  | ERJ3GEYJ 100 V (10 Ω)        |
| R58      | 7030003400 | S.RESISTOR  | ERJ3GEYJ 471 V (470 Ω)       |
| R59      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R60      | 7030003400 | S.RESISTOR  | ERJ3GEYJ 471 V (470 Ω)       |
| R61      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R62      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ)      |
| R63      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)        |
| R64      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ)      |
| R65      | 7030003490 | S.RESISTOR  | ERJ3GEYJ 272 V (2.7 kΩ)      |
| R66      | 7030003750 | S.RESISTOR  | ERJ3GEYJ 394 V (390 kΩ)      |
| R67      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ)      |
| R68      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R69      | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ)      |
| R70      | 7030003600 | S.RESISTOR  | ERJ3GEYJ 223 V (22 kΩ)       |
| R71      | 7030003650 | S.RESISTOR  | ERJ3GEYJ 563 V (56 kΩ)       |
| R72      | 7030003720 | S.RESISTOR  | ERJ3GEYJ 224 V (220 kΩ)      |
| R73      | 7030003380 | S.RESISTOR  | ERJ3GEYJ 331 V (330 Ω)       |
| R74      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)        |
| R75      | 7030003520 | S.RESISTOR  | ERJ3GEYJ 472 V (4.7 kΩ)      |
| R76      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R77      | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kΩ)      |
| R78      | 7030003760 | S.RESISTOR  | ERJ3GEYJ 474 V (470 kΩ)      |
| R79      | 7030003600 | S.RESISTOR  | ERJ3GEYJ 223 V (22 kΩ)       |
| R80      | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)       |
| R81      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R82      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)        |
| R83      | 7030003760 | S.RESISTOR  | ERJ3GEYJ 474 V (470 kΩ)      |
| R84      | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)       |
| R85      | 7030003800 | S.RESISTOR  | ERJ3GEYJ 105 V (1 MΩ)        |
| R86      | 7030003660 | S.RESISTOR  | ERJ3GEYJ 683 V (68 kΩ)       |
| R87      | 7030003740 | S.RESISTOR  | ERJ3GEYJ 334 V (330 kΩ)      |
| R88      | 7030003660 | S.RESISTOR  | ERJ3GEYJ 683 V (68 kΩ)       |
| R89      | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kΩ)       |
| R90      | 7030003630 | S.RESISTOR  | ERJ3GEYJ 393 V (39 kΩ)       |
| R91      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| R92      | 7030003560 | S.RESISTOR  | ERJ3GEYJ 103 V (10 kΩ)       |
| C1       | 4030006860 | S.CERAMIC   | C1608 JB 1H 102K-T-A         |
| C2       | 4030006830 | S.CERAMIC   | C1608 JF 1C 104Z-T-A         |
| C3       | 4030006830 | S.CERAMIC   | C1608 JB 1H 822K-T-A         |
| C4       | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A         |
| C5       | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A         |
| C6       | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A         |
| C8       | 4030006900 | S.CERAMIC   | C1608 JB 1E 103K-T-A         |

## [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION    |                      |
|----------|------------|----------------|----------------------|
| C9       | 4030008960 | S.CERAMIC      | C2012 JB 1C 104K-T-A |
| C10      | 4030006860 | S.CERAMIC      | C1608 JB 1H 102K-T-A |
| C11      | 4030006860 | S.CERAMIC      | C1608 JF 1C 224Z-T-A |
| C12      | 4030008960 | S.CERAMIC      | C2012 JB 1C 104K-T-A |
| C13      | 4030008920 | S.CERAMIC      | C1608 JB 1C 473K-T-A |
| C14      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C15      | 4030006850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C16      | 4030006900 | S.CERAMIC      | C1608 JB 1E 103K-T-A |
| C17      | 4030008920 | S.CERAMIC      | C1608 JB 1C 473K-T-A |
| C18      | 4030008880 | S.CERAMIC      | C1608 JB 1C 223K-T-A |
| C19      | 4030009970 | S.CERAMIC      | C1608 JB 1H 182K-T-A |
| C21      | 4510004630 | S.ELECTROLITIC | ECEV1CA100SR         |
| C22      | 4510006090 | S.ELECTROLITIC | ECEV0GA470SR         |
| C23      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C24      | 4550006890 | S.TANTALUM     | ECST1AC476R          |
| C25      | 4030006850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C26      | 4510004650 | S.ELECTROLITIC | ECEV1EA4R75SR        |
| C27      | 4550006130 | S.TANTALUM     | ECST1VY224R          |
| C28      | 4510004630 | S.ELECTROLITIC | ECEV1CA100SR         |
| C29      | 4030006870 | S.CERAMIC      | C1608 JB 1H 222K-T-A |
| C30      | 4030006850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C31      | 4030006850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C32      | 4030008920 | S.CERAMIC      | C1608 JB 1C 473K-T-A |
| C33      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C34      | 4550006280 | S.TANTALUM     | TEMSVD2 1A 686M-12L  |
| C35      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C36      | 4030007130 | S.CERAMIC      | C1608 CH 1H 101J-T-A |
| C37      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C38      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C39      | 4030007160 | S.CERAMIC      | C1608 CH 1H 181J-T-A |
| C40      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C41      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C42      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C43      | 4550006200 | S.TANTALUM     | ECST0JY106R          |
| C44      | 4030006850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C45      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C46      | 4030008860 | S.CERAMIC      | C1608 JB 1H 102K-T-A |
| C47      | 4030006860 | S.CERAMIC      | C1608 JB 1H 102K-T-A |
| C48      | 4030008860 | S.CERAMIC      | C1608 JB 1H 102K-T-A |
| C49      | 4030006900 | S.CERAMIC      | C1608 JB 1E 103K-T-A |
| C50      | 4030008900 | S.CERAMIC      | C1608 JB 1E 103K-T-A |
| C51      | 4030006900 | S.CERAMIC      | C1608 JB 1E 103K-T-A |
| C52      | 4030007130 | S.CERAMIC      | C1608 CH 1H 101J-T-A |
| C53      | 4030006850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C54      | 4030008680 | S.CERAMIC      | C2012 JF 1C 105Z-T-A |
| C55      | 4030007100 | S.CERAMIC      | C1608 CH 1H 560J-T-A |
| C56      | 4030007040 | S.CERAMIC      | C1608 CH 1H 180J-T-A |
| C57      | 4030009580 | S.CERAMIC      | C1608 JB 1H 681K-T-A |
| C58      | 4030009580 | S.CERAMIC      | C1608 JB 1H 681K-T-A |
| C59      | 4030007010 | S.CERAMIC      | C1608 CH 1H 100D-T-A |
| C60      | 4030008850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C61      | 4030007170 | S.CERAMIC      | C1608 CH 1H 221J-T-A |
| C62      | 4030007170 | S.CERAMIC      | C1608 CH 1H 221J-T-A |
| C65      | 4550006320 | S.TANTALUM     | ECST0JY475R          |
| C66      | 4030008850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C67      | 4030010740 | S.CERAMIC      | C1608 JB 1A 104K-T-A |
| C68      | 4030006900 | S.CERAMIC      | C1608 JB 1E 103K-T-A |
| C69      | 4030008870 | S.CERAMIC      | C1608 JB 1C 183K-T-A |
| C70      | 4030010740 | S.CERAMIC      | C1608 JB 1A 104K-T-A |
| C71      | 4030008850 | S.CERAMIC      | C1608 JB 1H 471K-T-A |
| C72      | 4030006860 | S.CERAMIC      | C1608 JB 1H 102K-T-A |
| C75      | 4030009660 | S.CERAMIC      | C1608 JF 1C 224Z-T-A |
| C76      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C77      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C78      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C79      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C80      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C81      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C82      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C83      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C84      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C85      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C86      | 4030008630 | S.CERAMIC      | C1608 JF 1C 104Z-T-A |
| C88      | 4030007090 | S.CERAMIC      | C1608 CH 1H 470J-T-A |
| C94      | 4030008880 | S.CERAMIC      | C1608 JB 1C 223K-T-A |
| C95      | 4030008880 | S.CERAMIC      | C1608 JB 1C 223K-T-A |

S.=Surface mount

**[MAIN UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION |                      |
|----------|------------|-------------|----------------------|
| C96      | 4550006210 | S.TANTALUM  | ECST1CX106R          |
| C97      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C98      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| C99      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A |
| S1       | 2250000200 | ENCODER     | TP90N00E20-16F-1517  |
| S2       | 2260001900 | SWITCH      | SW-149 (SKHLLD)      |
| S3       | 2260001900 | SWITCH      | SW-149 (SKHLLD)      |
| J1       | 6510018430 | S.CONNECTOR | 53307-1491           |
| J2       | 6510017640 | S.CONNECTOR | 52559-2090           |
| J3       | 6510018040 | S.CONNECTOR | 52357-2490           |
| J4       | 6510017450 | S.CONNECTOR | 3-178750-0           |
| J5       | 6510017860 | S.CONNECTOR | 52357-1690           |
| J6       | 6910007660 | CONNECTOR   | IMSA-9210B-1-02T     |
| J7       | 6910007660 | CONNECTOR   | IMSA-9210B-1-02T     |
| P1       | 6910007600 | CONNECTOR   | IMSA-9215H-T         |
| P2       | 6910007600 | CONNECTOR   | IMSA-9215H-T         |
| W1       | 7030003860 | S.JUMPER    | ERJ3GE JPW V         |
| EP1      | 0910042506 | PCB         | B 4228F              |

**[TENKEY UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION |                         |
|----------|------------|-------------|-------------------------|
| IC1      | 1130007670 | S.IC        | 24LC04BT-I/SN           |
| IC2      | 1130004330 | S.IC        | LC7385M                 |
| D1       | 1750000120 | S.DIODE     | DWA010-TE               |
| D2       | 1750000120 | S.DIODE     | DWA010-TE               |
| D3       | 1790001170 | S.ZENER     | MA8068-M(TX)            |
| X1       | 6060000550 | S.CERAMIC   | PBRC 3.58AR             |
| R1       | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kQ)  |
| R2       | 7030003640 | S.RESISTOR  | ERJ3GEYJ 473 V (47 kQ)  |
| R3       | 7030003680 | S.RESISTOR  | ERJ3GEYJ 104 V (100 kQ) |
| R4       | 7030003620 | S.RESISTOR  | ERJ3GEYJ 333 V (33 kQ)  |
| R5       | 7030003740 | S.RESISTOR  | ERJ3GEYJ 334 V (330 kQ) |
| R6       | 7030003410 | S.RESISTOR  | ERJ3GEYJ 561 V (560 Q)  |
| C1       | 4030007050 | S.CERAMIC   | C1608 CH 1H 220J-T-A    |
| C2       | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C4       | 4030006630 | S.CERAMIC   | C1608 JF 1C 104Z-T-A    |
| C5       | 4030007050 | S.CERAMIC   | C1608 CH 1H 220J-T-A    |
| C6       | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| C7       | 4030006630 | S.CERAMIC   | C1608 JF 1C 104Z-T-A    |
| C8       | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A    |
| C9       | 4030007090 | S.CERAMIC   | C1608 CH 1H 470J-T-A    |
| C10      | 4030006880 | S.CERAMIC   | C2012 JF 1C 105Z-T-A    |
| C11      | 4030006850 | S.CERAMIC   | C1608 JB 1H 471K-T-A    |
| J1       | 6510017640 | S.CONNECTOR | 52559-2090              |
| W1       | 9015170010 | WIRE        | 71/98/015/X98/X98       |
| W2       | 9015170010 | WIRE        | 71/98/015/X98/X98       |
| W3       | 9018095084 | WIRE        | 72/98/012/X98/X98       |
| W4       | 9018095084 | WIRE        | 72/98/012/X98/X98       |
| W5       | 8900005310 | CABLE       | OPC-518                 |
| SP1      | 2510000841 | SPEAKER     | T036S23A0020            |
| MC1      | 7700002070 | MICROPHONE  | KUC3523-03245           |
| EP1      | 0910042526 | PCB         | B 4228F                 |

**[DISP UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION |              |
|----------|------------|-------------|--------------|
| DS1      | 5040001760 | S.LED       | SEC 2422C    |
| DS2      | 5010000120 | S.LED       | LN1371G-(TR) |
| DS3      | 5010000120 | S.LED       | LN1371G-(TR) |
| DS4      | 5030001130 | LCD         | LD-B4234J    |
| J1       | 6510017480 | S.CONNECTOR | 3-178749-0   |
| EP1      | 0910042532 | PCB         | B 4229B      |
| EP2      | 8930035050 | LCD CONTACT | SRCN-1517    |

S.=Surface mount

## SECTION 7 MECHANICAL PARTS

### [CHASSIS PARTS]

| REF. NO. | ORDER NO.  | DESCRIPTION                                  | QTY. |
|----------|------------|----------------------------------------------|------|
| J1       | 6510005240 | Antenna connector BNC-RM 107                 | 1    |
| MP1      | 8010015590 | 1517 chassis                                 | 1    |
| MP3      | 8930032520 | 1517 contact base                            | 1    |
| MP4      | 8930032510 | 1517 keyboard                                | 1    |
| MP5      | 8510009240 | 1517 front shield                            | 1    |
| MP6      | 8930033290 | 1517 key sheet                               | 1    |
| MP7      | 8310033800 | 1517 window plate                            | 1    |
| MP8      | 8930029121 | 1257 release button (A) -1                   | 1    |
| MP9      | 8210011832 | 1517 front panel (A) -2 (incl. window plate) | 1    |
| MP10     | 8210011112 | 1517 rear panel -2                           | 1    |
| MP11     | 8930035090 | 1517 rear seal                               | 1    |
| MP12     | 8930032560 | 1517 PTT rubber                              | 1    |
| MP14     | 8930034230 | 1518 jack seal                               | 1    |
| MP15     | 8810006620 | Screw PH No.0 M2 x 3.5 NI                    | 1    |
| MP16     | 8810008580 | Screw PH M2 x 10 NI                          | 1    |
| MP17     | 8810006620 | Screw PH No.0 M2 x 3.5 NI                    | 4    |
| MP18     | 8810006620 | Screw PH No.0 M2 x 3.5 NI                    | 4    |
| MP19     | 8810006620 | Screw PH No.0 M2 x 3.5 NI                    | 1    |
| MP20     | 8810006460 | Screw FH M2 x 3                              | 1    |
| MP21     | 8810006040 | Screw PH M3 x 4 NI                           | 2    |
| MP22     | 8610009200 | Knob N214 [CH]                               | 1    |
| MP23     | 8610009250 | Knob N216 [OFF/VOL]                          | 1    |
| MP25     | 8830000570 | VR nut (A)                                   | 2    |
| MP26     | 8810008990 | Screw PH BT M2 x 10 ZK                       | 1    |
| MP27     | 8810008620 | Screw PH BT M2 x 20 ZK                       | 2    |
| MP28     | 8810008280 | Screw M2 x 6 ZK                              | 1    |
| MP29     | 8810006550 | Screw PH B0 No.0-3 M1.4 x 3 NI               | 4    |
| MP30     | 8930030041 | 1452 contact spring -1                       | 2    |
| MP31     | 8930034220 | 1518 MIC seal                                | 1    |
| MP32     | 8930032530 | 1517 connector seal                          | 1    |

### [RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION                                        | QTY. |
|----------|------------|----------------------------------------------------|------|
| J2       | 6450001430 | Connector HSJ1462-01-010 [MIC]                     | 1    |
| J3       | 6450001440 | Connector HSJ1403-01-010 [SP]                      | 1    |
| R45      | 7210002520 | Variable resistor TP96N00N-16F-10KA-1517 [OFF/VOL] | 1    |
| MP1      | 8510009110 | 1518 VCO case                                      | 1    |
| MP2      | 8930032550 | 1517 terminal                                      | 1    |
| MP3      | 8930038710 | 1518 TR plate                                      | 1    |
| MP4      | 8930038750 | 1518 ANT plate                                     | 1    |
| MP10     | 8930040150 | 1518 VR plate                                      | 1    |
| MP11     | 8930040310 | VCO sheet (E)                                      | 1    |

### [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION                        | QTY. |
|----------|------------|------------------------------------|------|
| S1       | 2250000200 | Encoder TP90N00E20-16F-1517 [DIAL] | 1    |

### [TENKEY UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION              | QTY. |
|----------|------------|--------------------------|------|
| W5       | 8900005310 | Flat cable OPC-518       | 1    |
| MC1      | 7700002070 | Microphone KUC3523-03245 | 1    |
| SP1      | 2510000641 | Speaker T036S23A0020     | 1    |

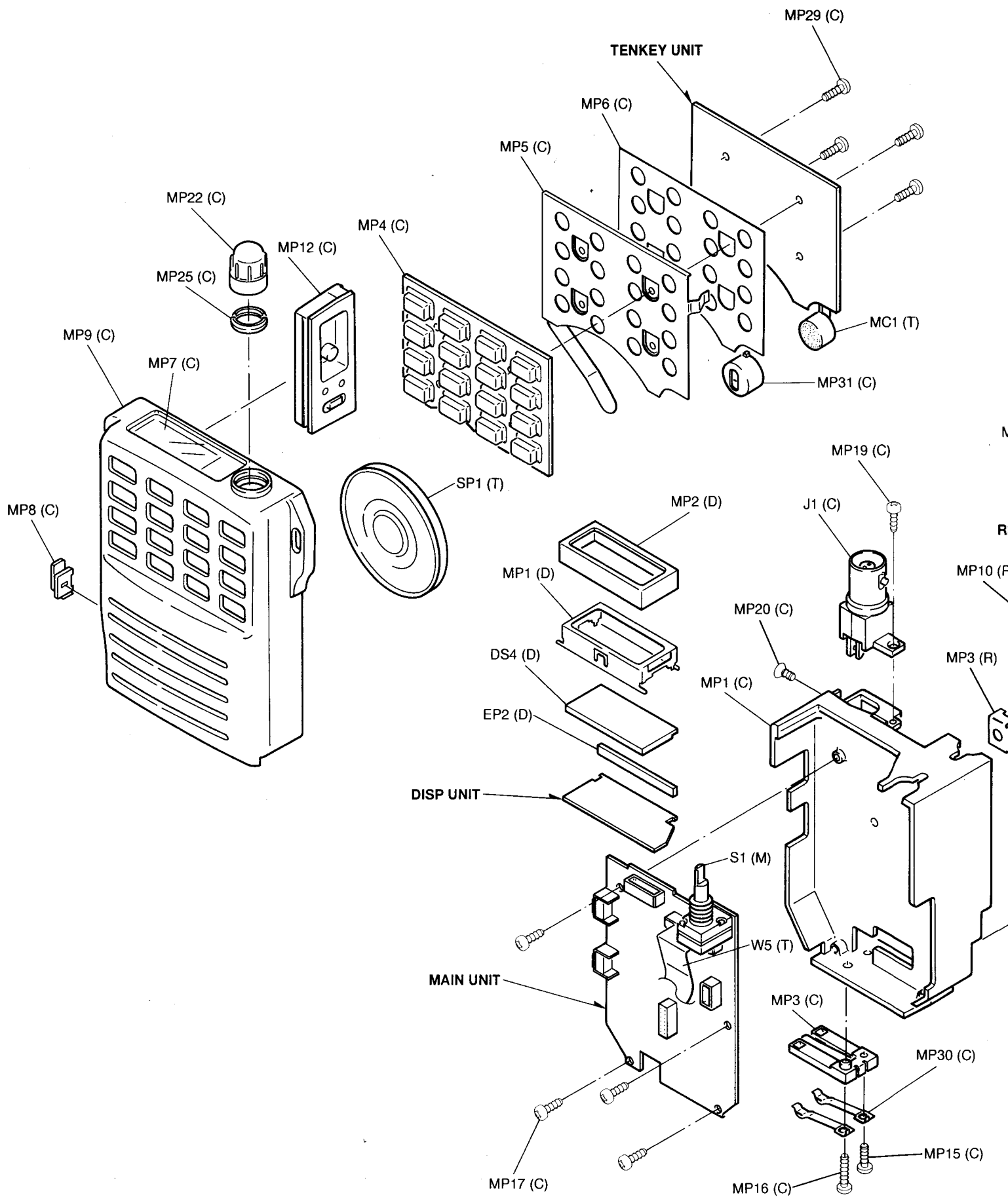
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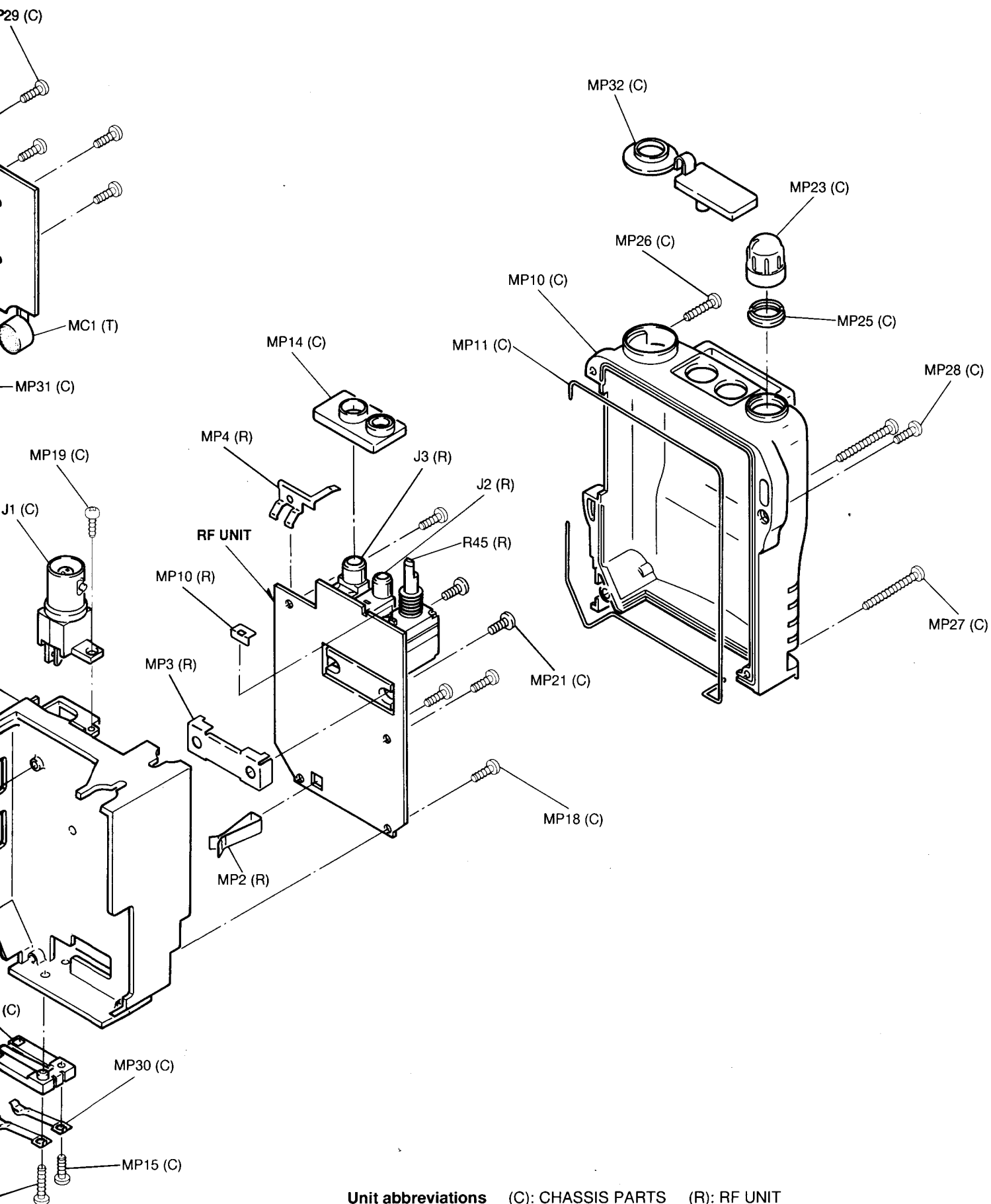
| REF. NO. | ORDER NO.  | DESCRIPTION               | QTY. |
|----------|------------|---------------------------|------|
| DS4      | 5030001130 | LCD LD-B4234J             | 1    |
| EP2      | 8930035050 | LCD contact SRCN-1517 ZCC | 1    |
| MP1      | 8930032540 | 1517 LCD holder           | 1    |
| MP2      | 8930032650 | 1517 LCD rubber           | 1    |

### [UNPACKING]

| REF. NO. | ORDER NO.        | DESCRIPTION     | QTY. |
|----------|------------------|-----------------|------|
| EP1      | Optional product | ANTENNA FA-B56U | 1    |
| EP2      | Optional product | BATTERY BP-99   | 1    |
| MP1      | Optional product | 1517 BELT CLIP  | 1    |

**Screw abbreviations** B0, BT: Self-tapping PH: Pan head  
FH: Flat head NI: Nickel ZK: Black

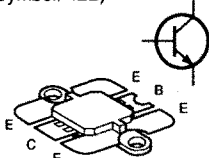
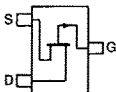
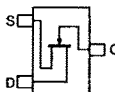
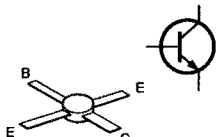




**Unit abbreviations** (C): CHASSIS PARTS (R): RF UNIT  
(M): MAIN UNIT (T): TENKEY UNIT (D): DISP UNIT

## SECTION 8 SEMI-CONDUCTOR INFORMATION

### • TRANSISTORS AND FET'S

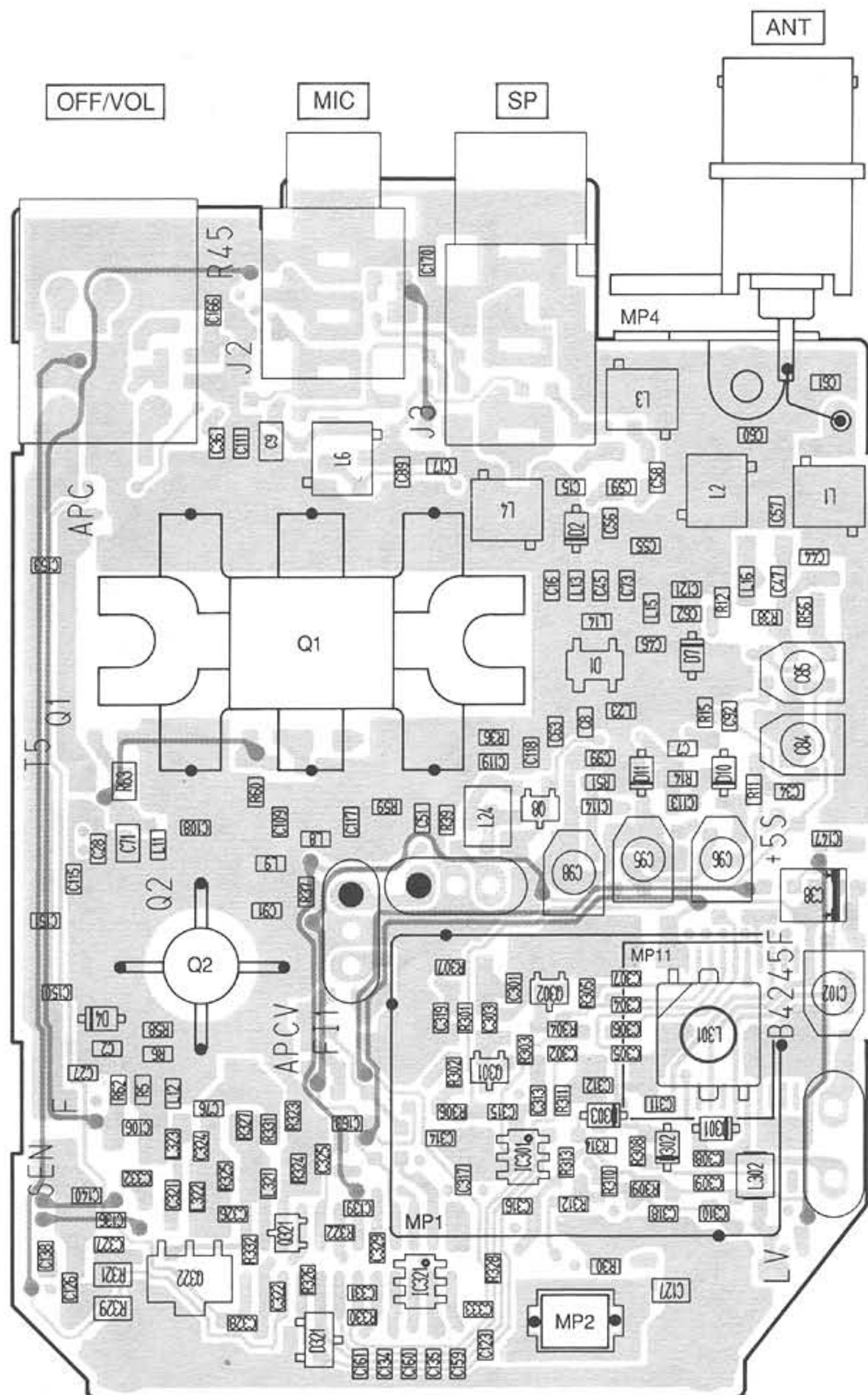
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|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>2SA1162 Y</b><br>(Symbol: SY)<br> | <b>2SB1132 R</b><br>(Symbol: BAR)<br> | <b>2SC1863 4</b><br>(Symbol: FN4)<br>   | <b>2SC1967</b><br>(Symbol: 42B)<br>   | <b>2SC2712 Y</b><br>(Symbol: LY)<br>  |
| <b>2SC2954</b><br>(Symbol: QK)<br>   | <b>2SC4215 Y</b><br>(Symbol: QY)<br>  | <b>2SC4226 R25</b><br>(Symbol: R25)<br> | <b>2SC4401 3</b><br>(Symbol: OT3)<br> | <b>2SC4403 3</b><br>(Symbol: LY3)<br> |
| <b>2SJ144 Y</b><br>(Symbol: VY)<br> | <b>2SK880 Y</b><br>(Symbol: XY)<br>  | <b>FMS1</b><br>(Symbol: SI)<br>        | <b>IMX2</b><br>(Symbol: X2)<br>      | <b>MRF555</b><br>                    |
| <b>RN1403</b><br>(Symbol: XC)<br>  | <b>RN1404</b><br>(Symbol: XD)<br>   | <b>RN2302</b><br>(Symbol: YB)<br>     | <b>RN2404</b><br>(Symbol: YD)<br>   | <b>UN9113</b><br>(Symbol: 6C)<br>   |
| <b>UN9213</b><br>(Symbol: 8C)<br>  |                                                                                                                        |                                                                                                                          |                                                                                                                         |                                                                                                                          |

### • DIODES

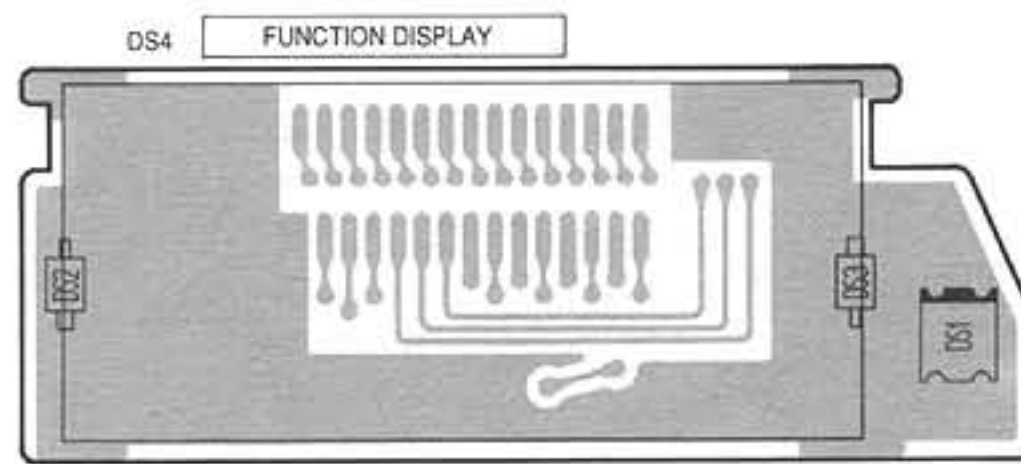
|                                                                                                                      |                                                                                                                      |                                                                                                                         |                                                                                                                       |                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>1SS184</b><br>(Symbol: B3)<br> | <b>DWA010</b><br>(Symbol: W8)<br> | <b>HSM2693TR</b><br>(Symbol: B2)<br> | <b>MA862</b><br>(Symbol: M11)<br> | <b>SB20 03P</b><br>(Symbol: SC)<br> |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|

## SECTION 9 BOARD LAYOUTS

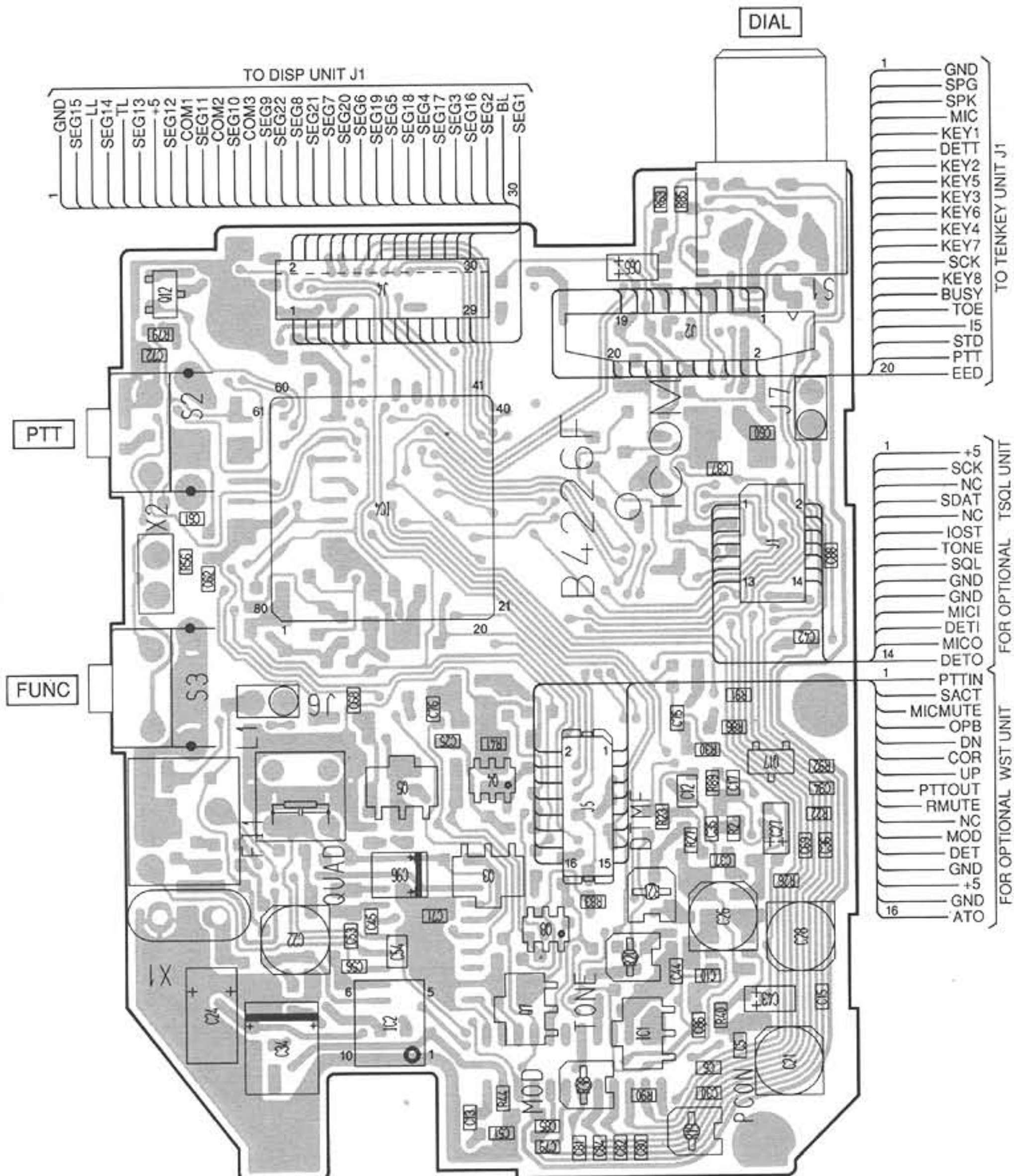
### ● RF UNIT



## ● DISP UNIT

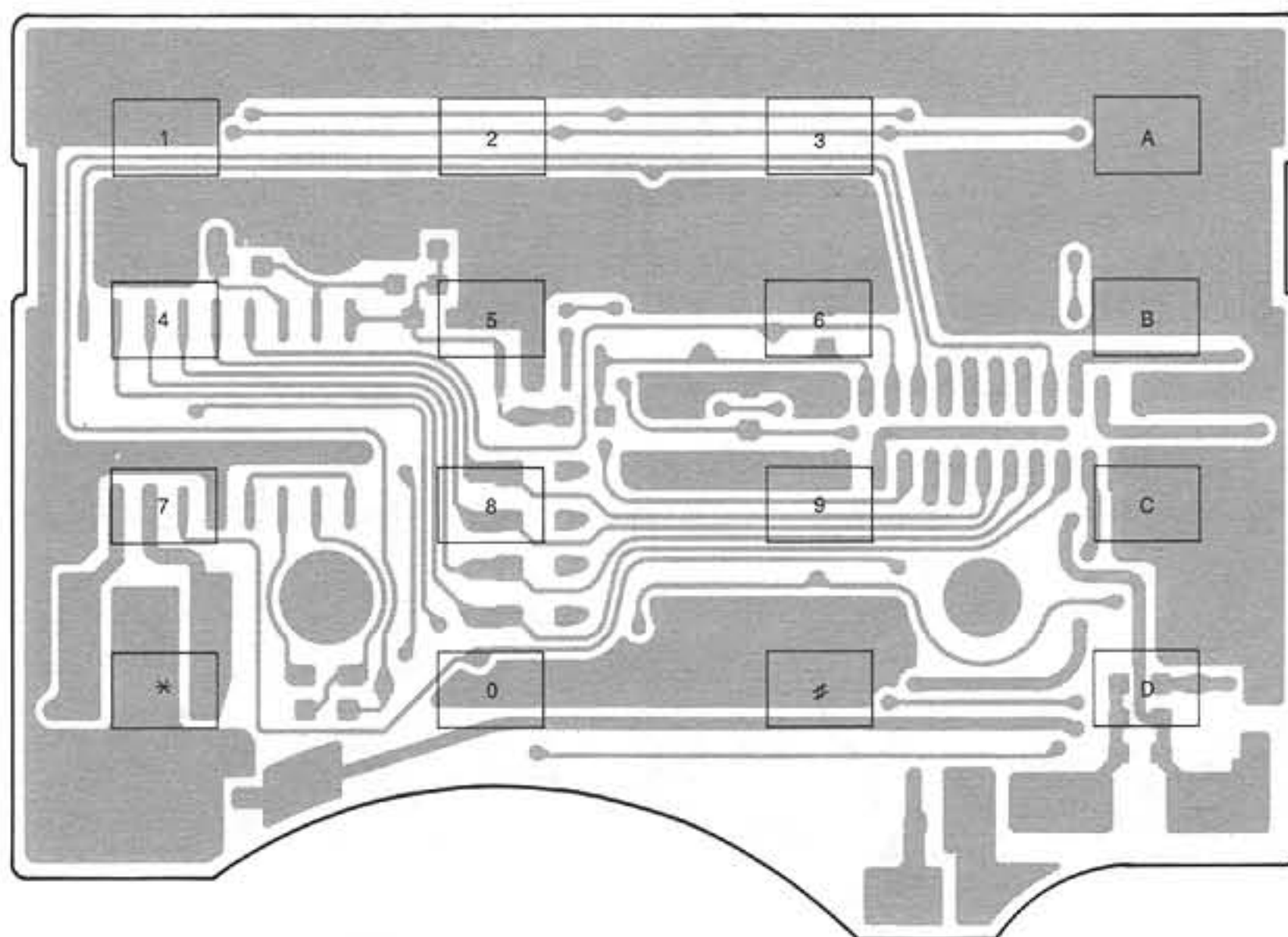


## ● MAIN UNIT

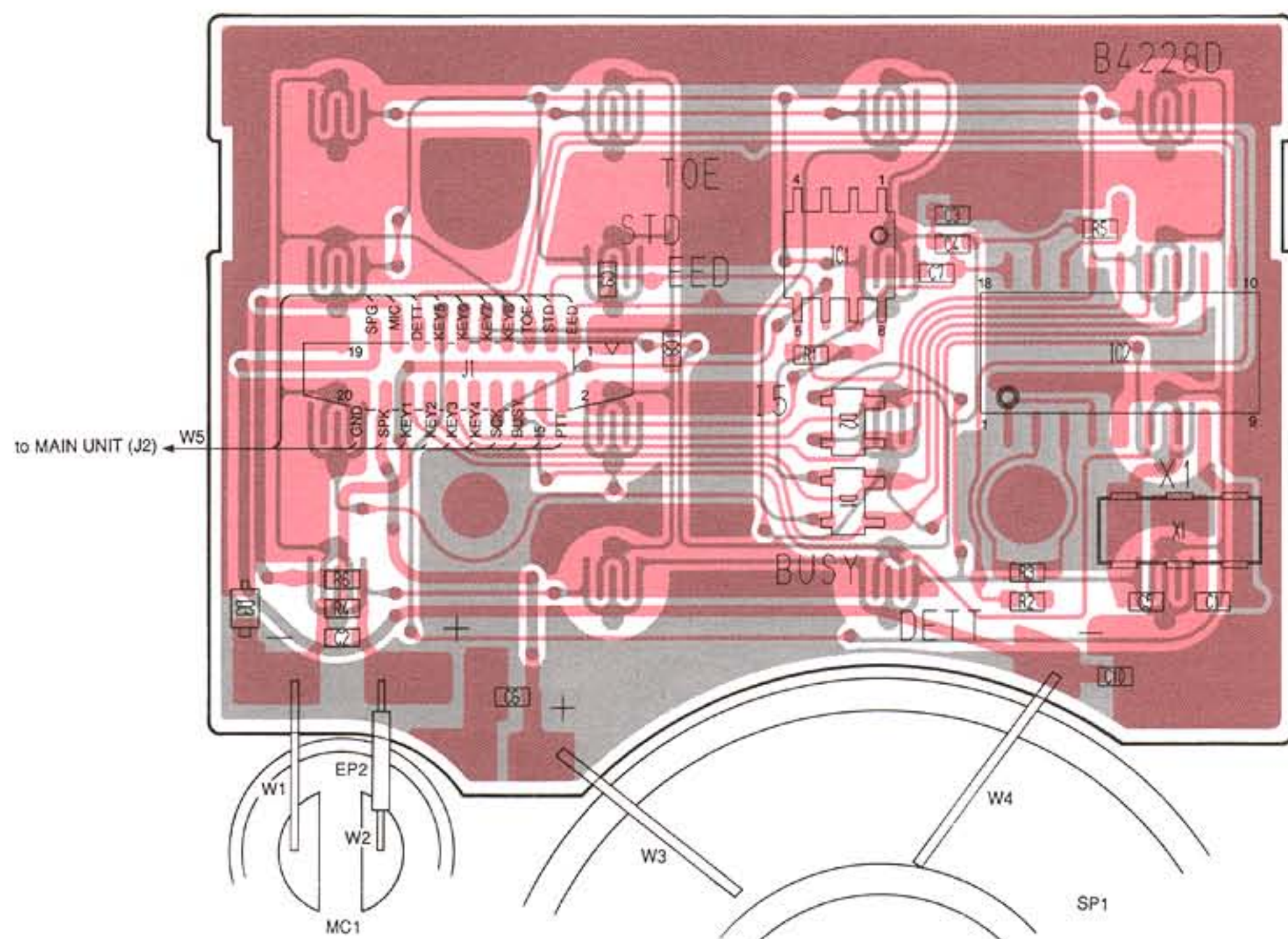


● TENKEY UNIT

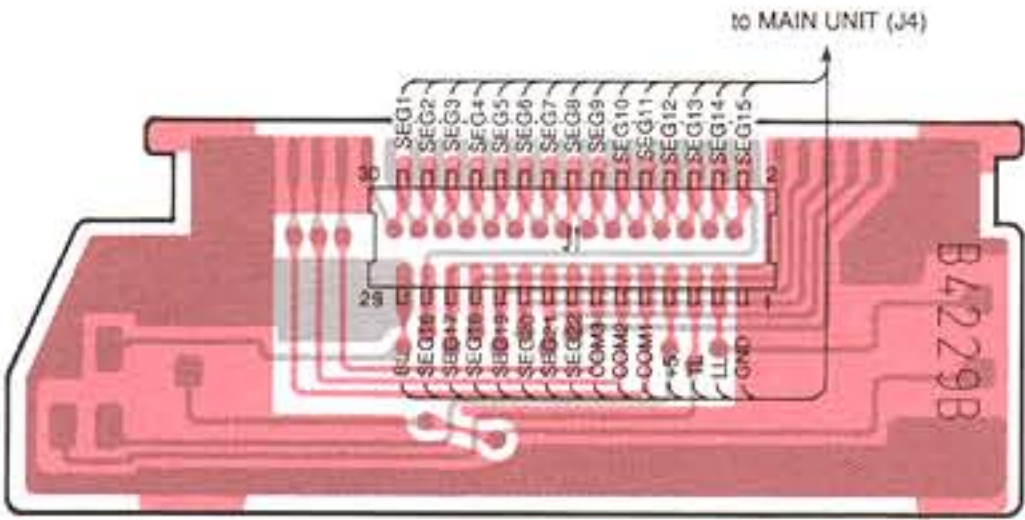
The combination of this page and the next page show the unit layout in the same configuration as the actual P. C. Board.



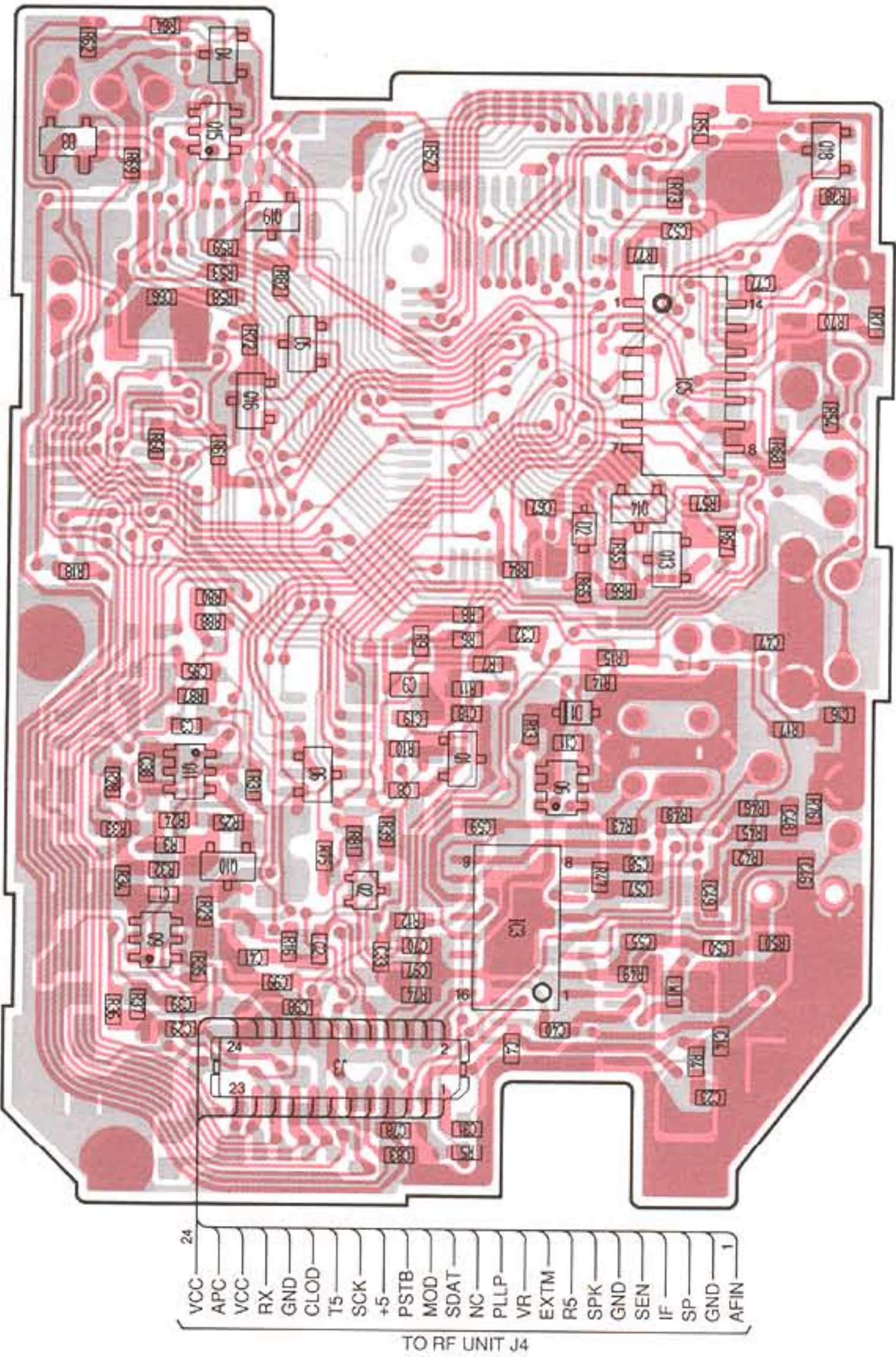
- **TENKEY UNIT**



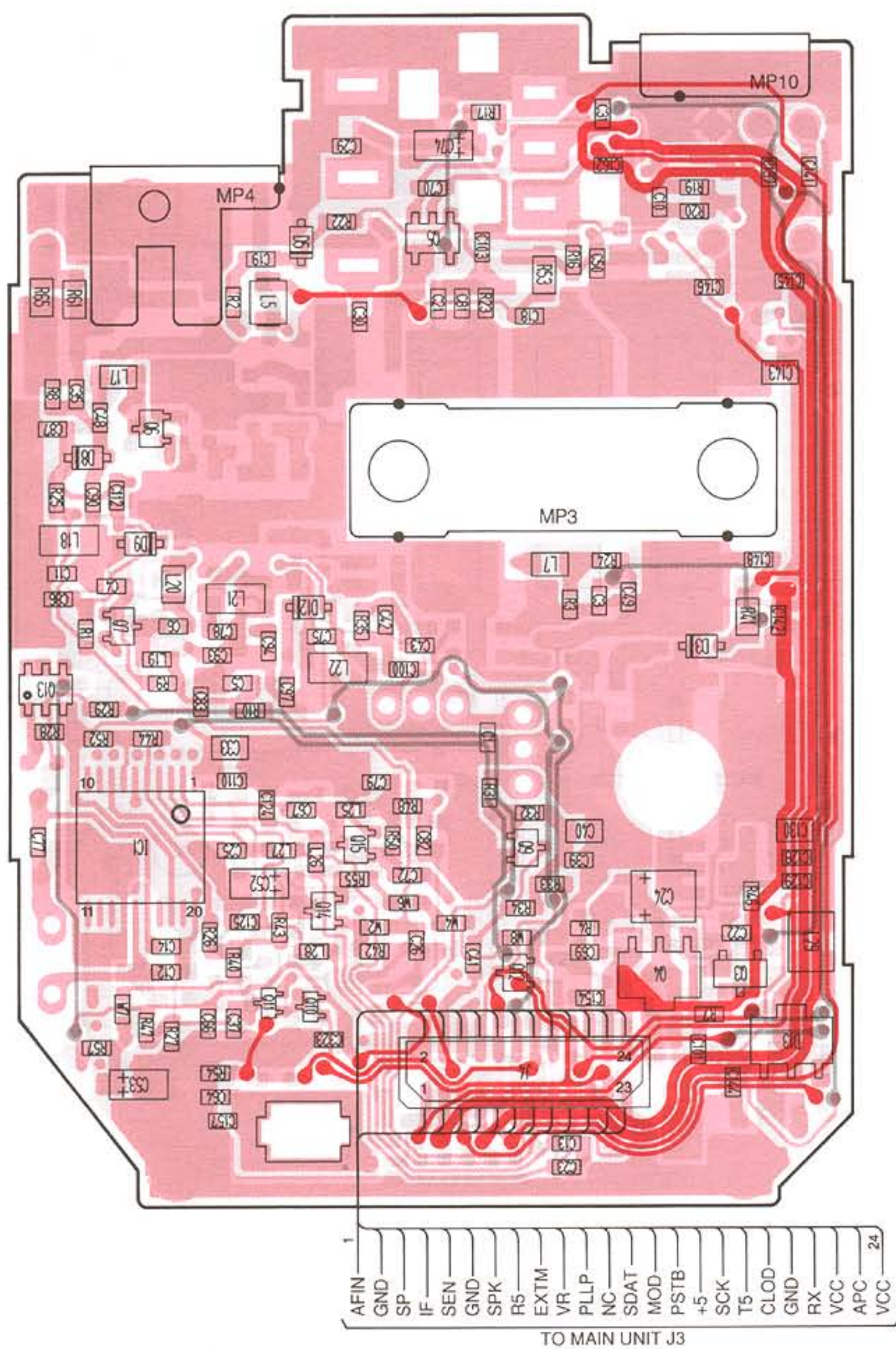
● DISP UNIT



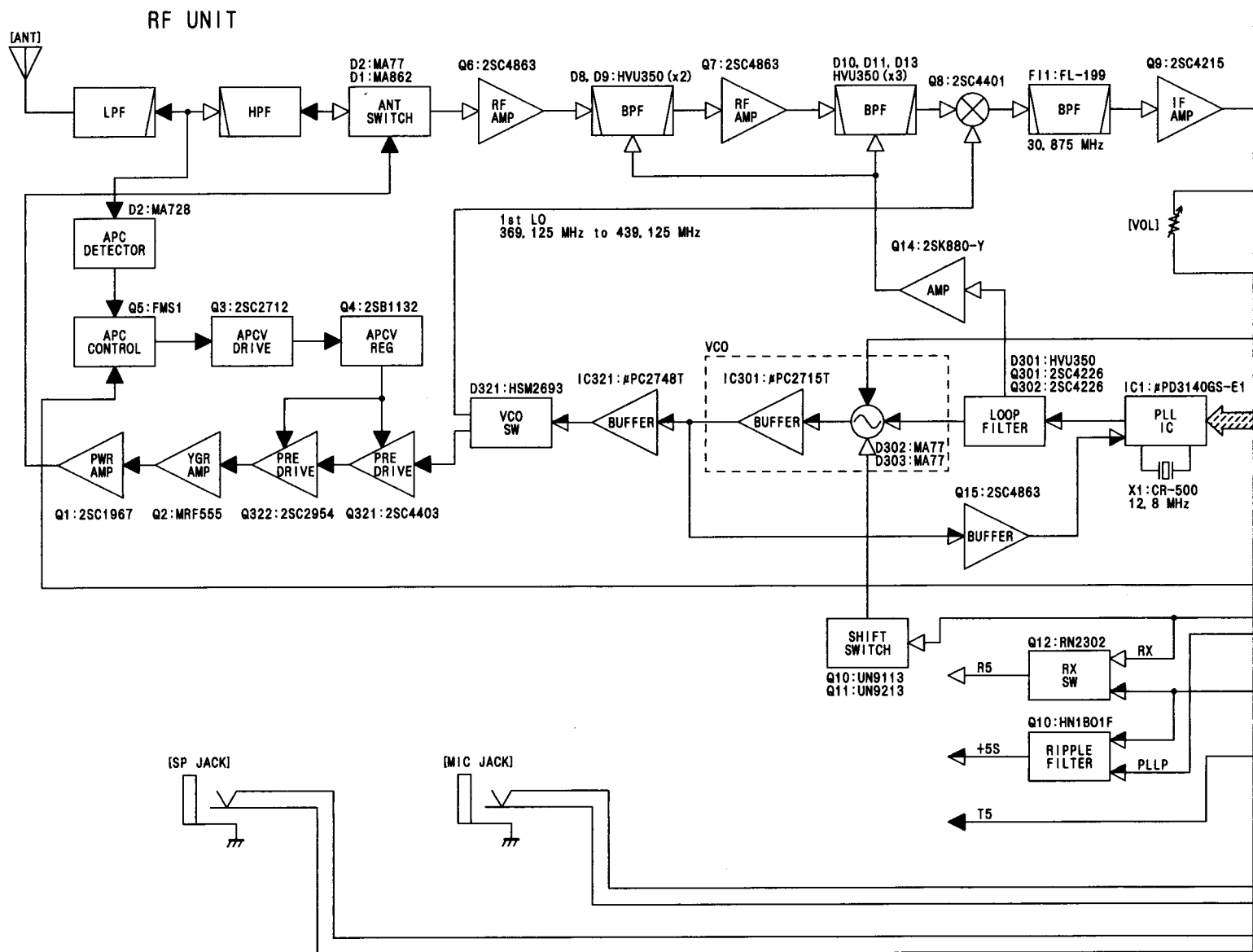
● MAIN UNIT



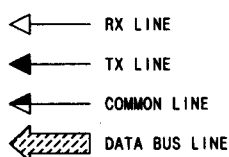
● RF UNIT



# SECTION 10 BLOCK DIAGRAM

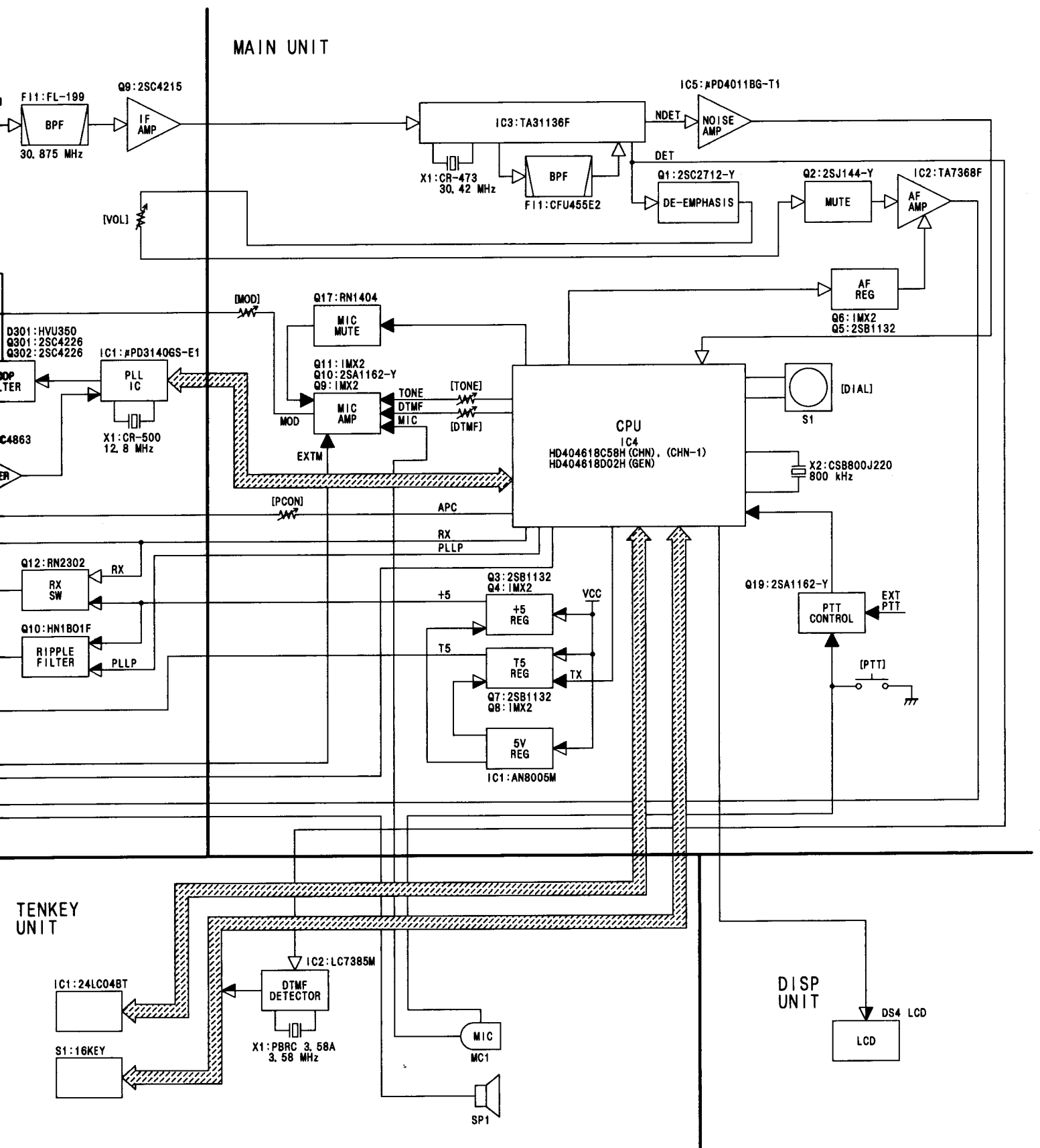


## TENKEY UNIT



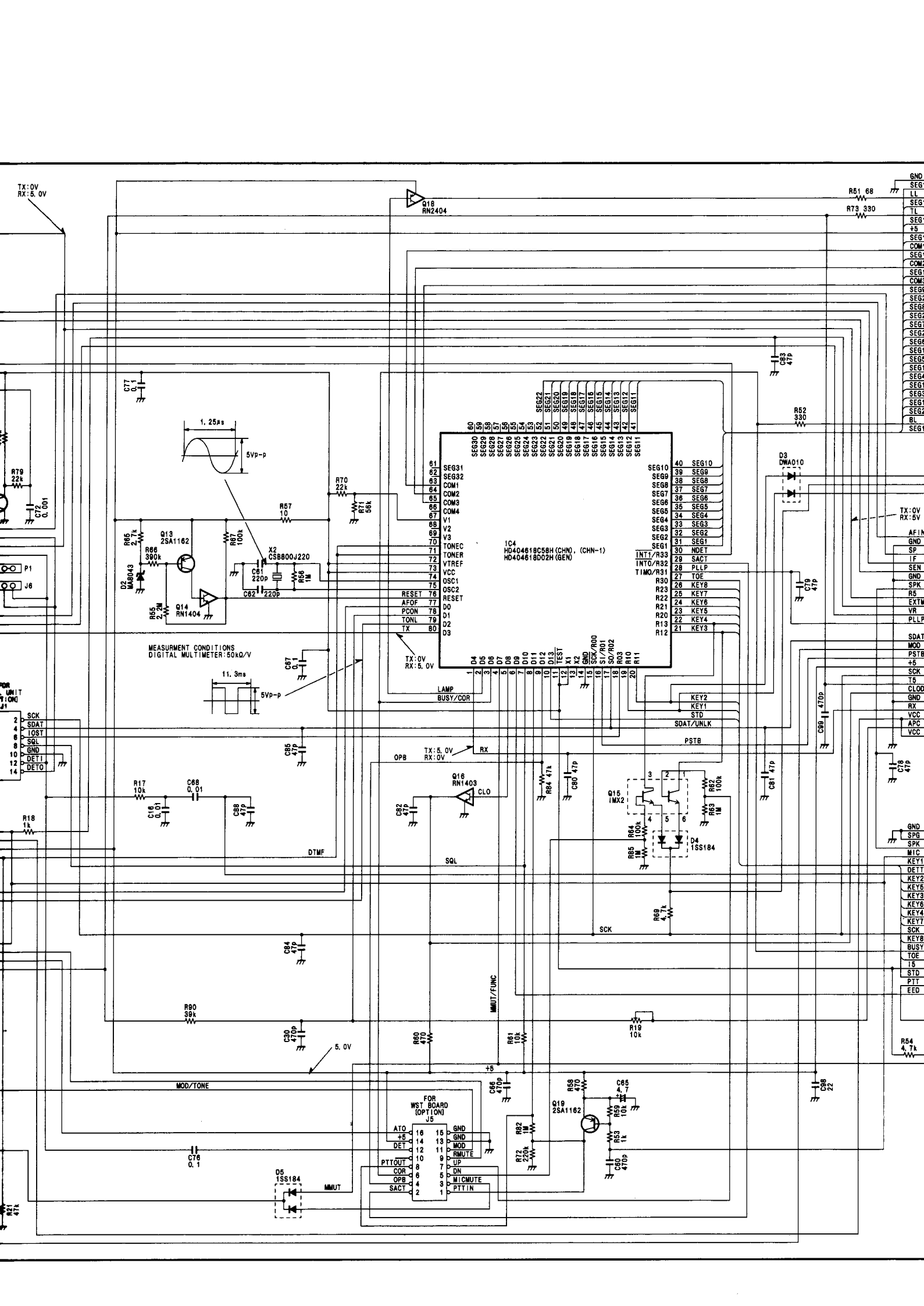
IC1:24LC048T

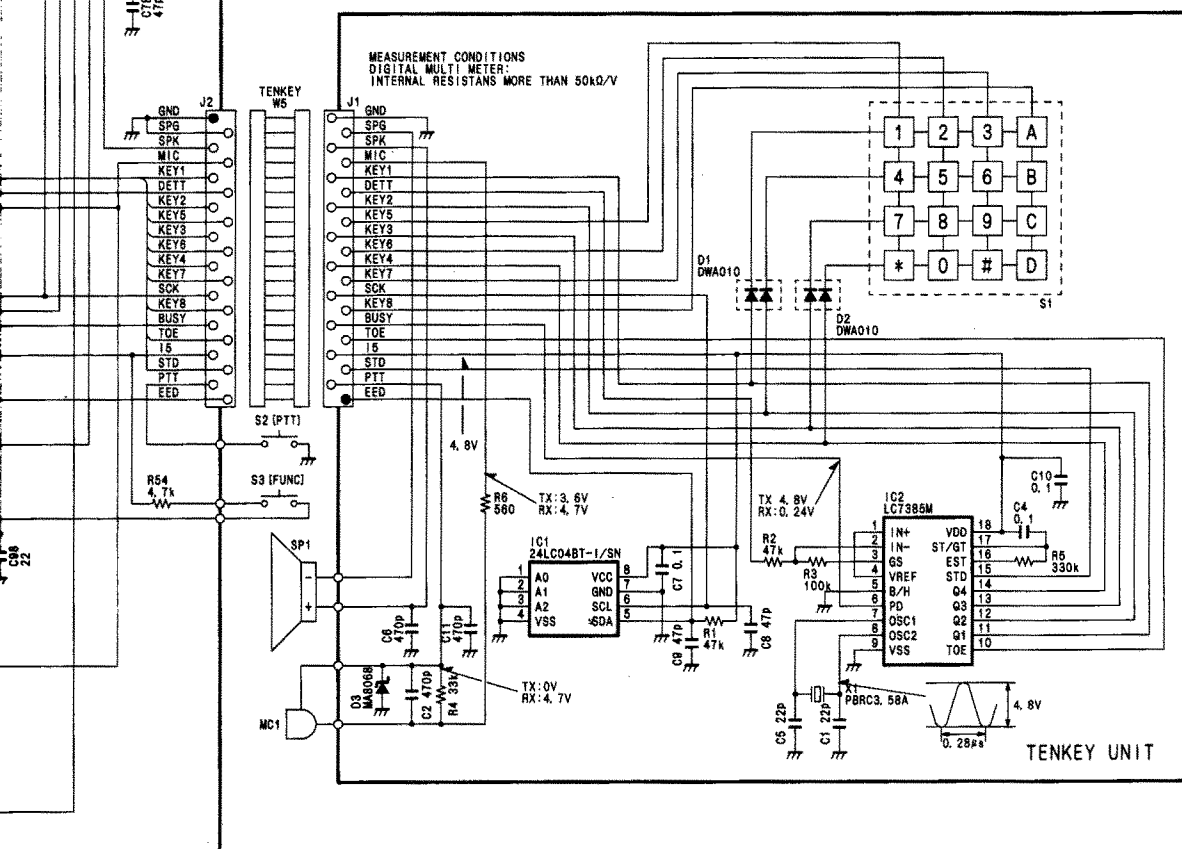
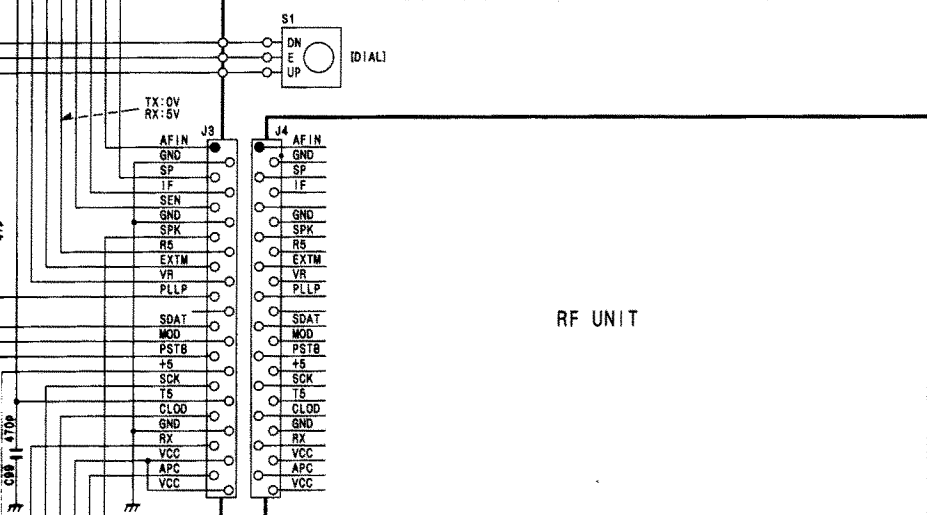
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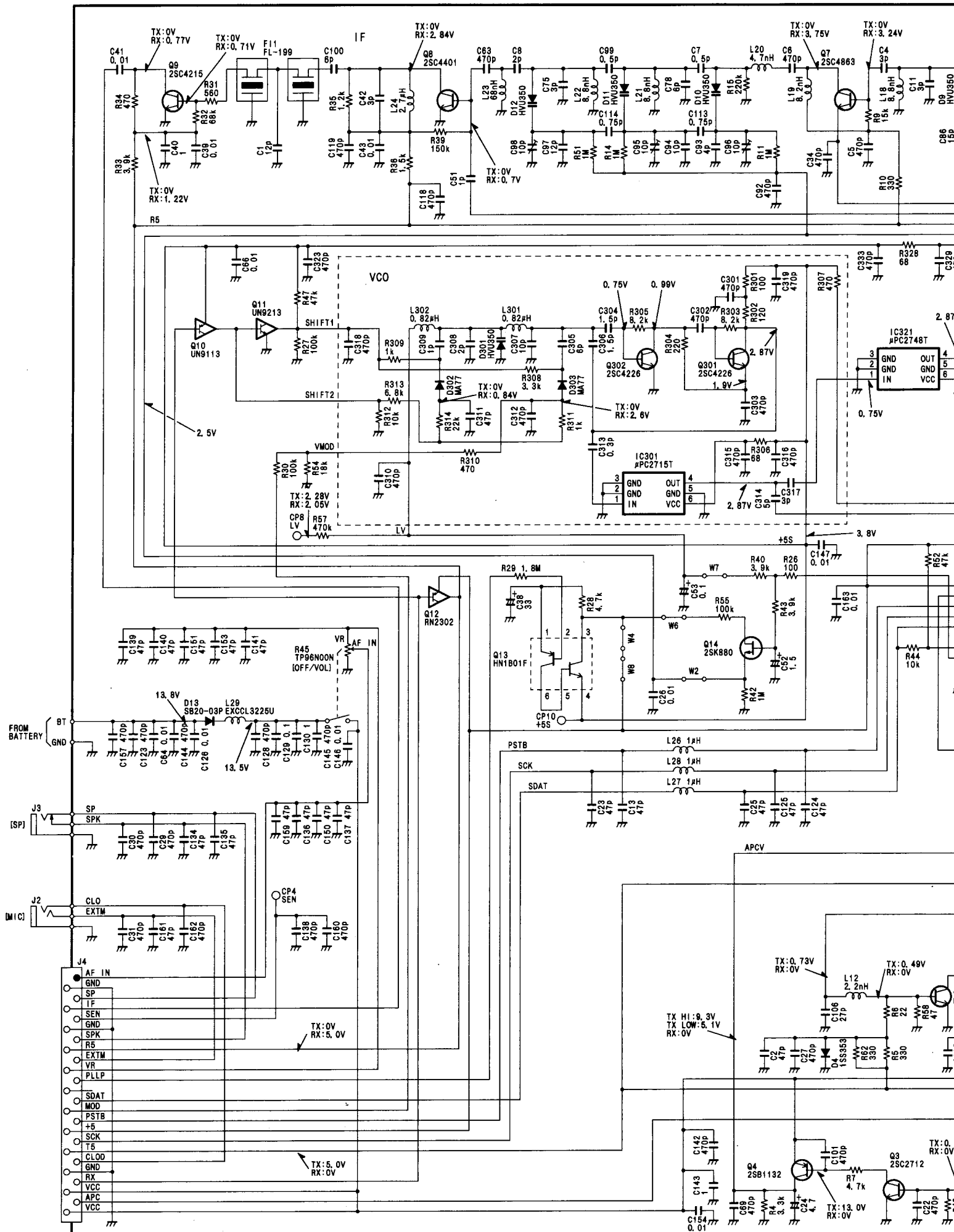


## VOLTAGE DIAGRAM











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