STANDARD®

C78

430MHz TRANSCEIVER

INSTRUCTIONS MANUAL

STANDARD COMMUNICATIONS CORP.

INSTRUCTION MANNUAL SECTION

We are confident that you will be entirely satisfied with your 430MHz Transceiver Model C78. Our very strict quality control and inspection ensure that each transceiver unit leaves the factory in perfect condition. If the unit is damaged or fails to operate properly, immediately contact your dealer.

To obtain the best performance and longest use from your transceiver, study these instructions carefully.

1. PRECAUTIONS

■ ANTENNA

1. When you wish to use your C78 Transceiver as a portable operation, attach the supplied antenna to the BNC antenna jack on the front panel of the unit.
2. For mobile or base-station operation, disconnect the supplied antenna from its front jack and attach an appropriate external antenna to the jack on the rear of the unit. If an external antenna is used with the supplied antenna attached to the unit, in parallel unsatisfactory communication may result.

■ POWER SUPPLY

When inserting battery packs in the unit, check their polarity.
The required number of battery cells depends on battery type: ten (10) rechargeable Ni-Cad battery cells (1.2V each) or nine (9) UM-3 manganese or alkaline battery cells. External power sources are acceptable for mobile or base-station operation. For more details, see items (6) and (7) in paragraph 4.

■ INSTALLATION NOTES

1. Install your transceiver in a dry, dust-free and well-ventialted place. The unit should not be subjected to extremely high temperatures or humidity. It must not, under any circumstances, be exposed to direct sunlight.
2. Provide adequate space behind and under the unit for free circulation of air.
3. In a mobile installation, exercise special care to allow enough space behind the unit for adequate heat dissipation from the heat sink. Take measures to ensure that the unit is not subjected to excessive vibrations or shocks during operation.

2. FEATURES

The C78 Transceiver incorporates sophisticated microcomputer-assistance. The built-in microcomputer memorizes, computes and makes decisions for quick and precise channel frequency control.

The microcomputer provides the following useful features:

1. Memory capacity up to 5 channel frequencies can be stored arbitrarily.
2. Automatically scans up to five stored channel frequencies.
3. The internal offset memory holds a frequency shift span. This makes the C78 for repeater operation.
4. Divides the frequency band of 430 ~ 439 MHz into 10 sub-bands of 1 MHz bandwidth, and scans each 1MHz sub-band at 25kHz or 50kHz intervals.
5. Automatically searches either for busy or vacant channels.
6. Automatically switches frequency scan speed in two steps.
7. Allows channel scan stepping of 25kHz and 50kHz spans.
8. The MHz button achieves quick frequency advancement in 1MHz steps.

■ DIGITAL FREQUENCY READOUT USING LIQUID CRYSTAL DISPLAY (LCD)

The C78 employs a 4-digit frequency readout using LCD. The LCD has low power-consumption, is easy to read even in direct sunlight and thus makes the C78 suitable for outdoor operation.
At night, it is lit by LCD illumination. The digital readout panel also carries memory address and scan indicators and battery saver ON/OFF markings for simple operation checks. checks.
When the set is tuned to an off-band during cross operation, the frequency readout provides an OFF display instead of a frequency display.

■ FUNCTIONAL BENEFITS

- BATTERY SAVER

The battery saver senses the presence of receiver input signals and automatically reduces the power supply to the unit when it is set up in the reception standby mode. It thus saver battery power by half and can be activated by simple front key operation.

- 400 CHANNELS SELECTABLE

Up to 400 channels can be selected using the noncontact channel selector which has 18 steps per rotation (200 channels at 50 kHz interval and 400 channel at 25 kHz interval).

- MICROPHONE WITH A FREQUENCY UP-DOWN CONTROL:

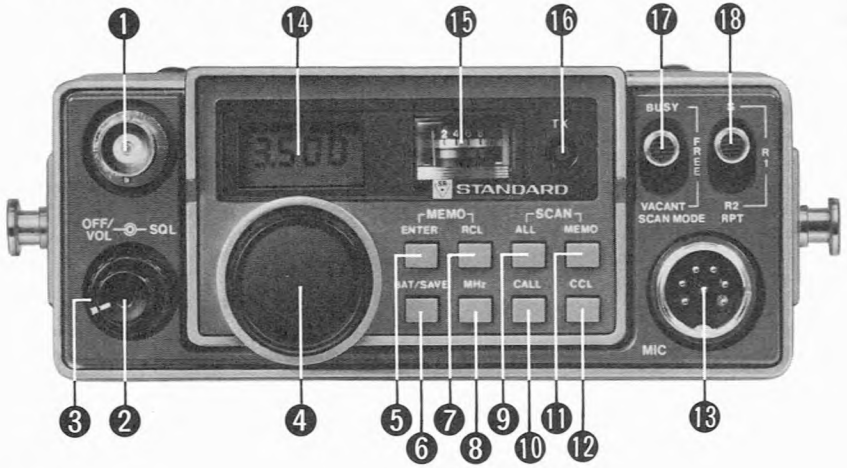
The attached hand microphone is a built-in frequency up-down control for easy and continuous chanel selection.

■ OTHER FEATURES

- A single VCO is shared by both the receiver and transmitter.
- APC circuit protects the final transistors against supply voltage variations.
- Audible check tone provided for key and up-down control operation.
- Built-in tone burst generator for 1750 Hz for repeater driving.

3. PANEL FEATURES

▪ FRONT PANEL FEATURES



❶ BNC CONNECTOR
This connector accepts the supplied antenna for portable operation.

❷ POWER/VOLUME CONTROL
This knob serves as both the POWER switch and VOLUME control. Clockwise rotation turns the unit on and then increases receiver output volume.

❸ SQL (SQUELCH) CONTROL
The SQL control is used to suppress annoying FM background noise heard when no input signal is present. Set this control at a point where background noise just disappears.

❹ CHANNEL SELECTOR
This selects channel frequencies in 25 or 50kHz steps. To increase channel frequency turn it clockwise.

❺ MEMO ENTRY KEY
Press this key to store the selected channel frequency in the memory. The memory can store up to 6 frequency data, the 6th memory address being assigned to an offset memory for repetitive operation.
The offset memory is used to shift channel frequencies for cross operation, by the stored frequency span.

❻ BAT/SAVE
This key, when pressed, activates the internal battery saver to saver battery consumption in the receiver standby mode. While this key is depressed, a small dot appears at the right margin of the frequency readout, indicating that the saver is activated.
The battery saver remains inactive when the squelch is off or during scan operation. When activated, power consumption in the reception standby mode is reduced by approximately half.

❼ MEMO RCL KEY
This key is used to recall stored channel frequencies. Each time it is pressed, frequency data stored in memory addresses M1 ~ M5 and in the offset memory address are recalled sequentially. The recalled memory address is displayed at the bottom of the frequency readout along with memory mark "M".
When the offset memory content is recalled, a small dot appears at the top left of the frequency readout along with memory mark "M" displayed at the bottom of the readout.

❽ MHz KEY
This key selects the mega-hertz order of channel frequencies from 340 to 439MHz in 1MHz steps. Each time this key is pressed, channel frequency is incremented 1MHz. When it is pressed and held, channel frequency automatically increases in 1MHz steps.

❾ SCAN ALL KEY
This key, when pressed, scans up over the currently-selected MHz band in 25 or 50kHz steps.

❿ CALL
Press this key to transmit a tone burst signal for repeater driving (tone frequency: 1750Hz).

⓫ SCAN MEMO KEY
When this key is pressed, the channel frequencies stored in memory addresses M1 ~ M5 are scanned sequentially (the frequency stored in the offset memory is not scanned). Memory addresses in which no frequency data is present are automatically skipped.

⓬ CCL KEY
This key is used to initialize all the unit's operation mode of the unit.

⓭ MIC JACK
This jack accepts the supplied microphone.

⓮ FREQUENCY READOUT AND MODE INDICATORS
This LCD display carries a frequency readout, SCAN, MEMO, BATT/SAVER, and offset memory indicators.
When a frequency of, for example, 433.500 MHz is received, the frequency readout displays the four low-order digits of the frequency as "3.500". In the SCAN mode, indicator "S" is displayed in the marginal area of the display. In the MEMORY mode, indicator "M" and a pertinent memory address of 1 to 5 are displayed at the bottom of the display. When an empty memory address is accessed, indicator "M" blinks. When the offset memory is accessed, a small dot appears at the top left of the display.

⓯ METER
The meter checks input signal strength (S), transmission power (RF) and battery voltage. The meter is switched automatically between S and RF as the unit is switched from the reception to transmission mode. When you wish to check battery voltage with the meter, set the rear slide switch (19) to the BAT CHECK position.

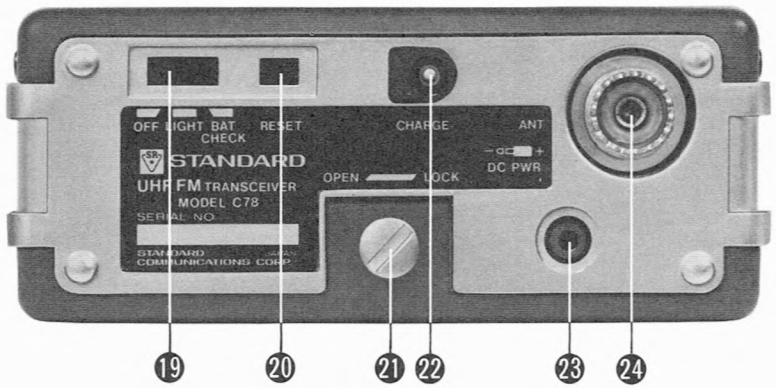
⓰ TX INDICATOR LAMP
This goes on when the unit is set up for the transmission mode.

⓱ SCAN MODE SWITCH
The BUSY position of this switch searches for busy channels during channel frequency scanning. The VACANT position searches for vacant channels. In both the BUSY and VACANT positions, channel scanning takes place at high speed (0.25 sec/step). In the FREE position, channel scanning takes place at low speed (2.0 sec/step).

⓲ RPT SWITCH
This switch selects between the simplex and repeater (R1 and R2) modes.
Position S: For normal simple operation.
Position R1: To shift the transmission frequency upwards by the frequency span stored in the offset memory.
Position R2: To shift the reception frequency upwards by the frequency span stored in the offset memory.

NOTE:
In the R1 and R2 modes, the memory write, recall, and scan modes are inhibited.

■ REAR PANEL FEATURES



⑲ LIGHT/BAT CHECK SWITCH
In the LIGHT position, the LCD and meter lamps glow. The BAT CHECK position causes the front meter to function as a battery voltage indicator while all the lamps are left on. The OFF position turns off all lamps.

⑳ RESET BUTTON
This switch is used to reset the internal microcomputer to its initial state in the case of a malfunction.

㉑ BATTERY COMPARTMENT COVER RETENTION SCREW
To open the battery compartment cover, loosen this screw with a coin.

㉒ CHARGE SOCKET
This socket accepts a Ni-Cad battery charger (see Fig. 3).

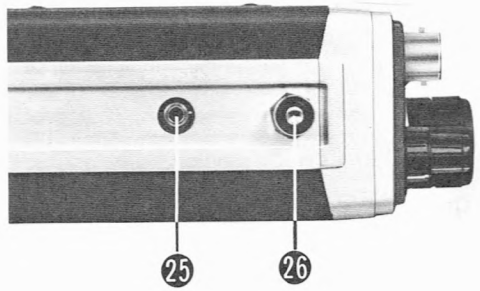
㉓ EXT. PWR SOCKET
This socket accepts an external DC power-source (13.8VDC) supplied via the DC adaptor (which is supplied with the unit). See Fig. 3.

㉔ ANT RECEPTALCE
This M-type socket accepts an external antenna with an impedance of 50Ω. When an external antenna is to be used, disconnect the supplied antenna from its front socket.

■ SIDE PANEL

㉕ EXT SPK JACK
This jack accepts an external speaker or earphone with an impedance of 8Ω.

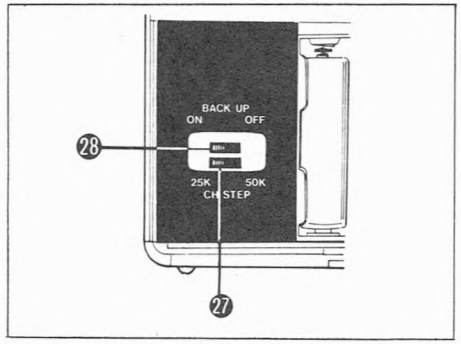
㉖ STRAPPING POST
Attach the supplied shoulder belt to this post. See Fig. 5.



■ INTERNAL SWITCHES

㉗ CH STEP SWITCH
This switch selects channel frequency scan stepping between 25 and 50kHz. It is located behind the battery compartment cover.

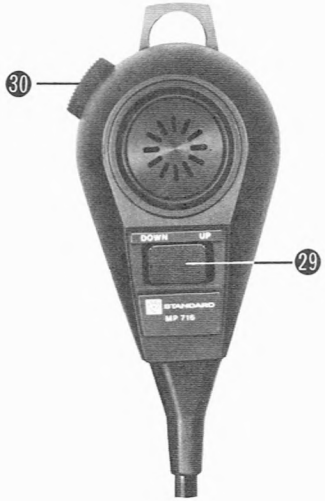
㉘ BACK UP SWITCH
When this switch is on, frequency data stored in the internal memory remains intact even when the power switch on the unit is turned off.
If the unit is to be out of use for any length of time, ensure that this switch is off.



■ MICROPHONE

㉙ UP-DOWN CHANNEL CONTROL BUTTON
If the button is held down, channel frequency is tepped up or down continuously.

㉚ PTT BUTTON
To put the transceiver into the transmission mode, push the PTT button.
To transmit a tone-burst signal for repeater driving, press this button twice consecutively.



4. BEFORE OPERATION

4.1 INSTALLING BATTERY PACKS

Install the specified battery packs in the unit's battery compartment of the unit as follows:

1. Loosen screw (21) on the rear of the unit with a coin and open the battery compartment cover (see Fig.).
2. The supplied battery holders are designed to hold 6 and 4 battery cells each. The smaller holder has a dummy cell in it.
3. Use nine manganese or alkaline battery cells (UM-3 1.5V) with the dummy cell left installed in the smaller holder.
4. Use ten rechargeable Ni-Cad battery cells (1.2V) with the dummy cell removed from the smaller battery holder.
5. After mounting batteries in the battery holders, install the holders in the unit's battery compartment as illustrated below. Close the compartment lid and tighten screw (21) with a coin.

NOTE:
When using UM-3 battery cells (1.5V), leave the dummy cell in the smaller battery holder.

HANDLING PRECAUTIONS FOR DRY CELLS

Careless handling of dry cells may result in electrolyte leakage or bursting. Note the following points.

1. When installing, be certain that their polarity is correct.
2. Do not mix new and used battery cells.
3. Some types of dry cells with similar shapes may have different voltages. Be sure to use the same type of battery cells.
4. Some types of dry cells are rechargeable while other types are not. Carefully read the notes on the cells before use.

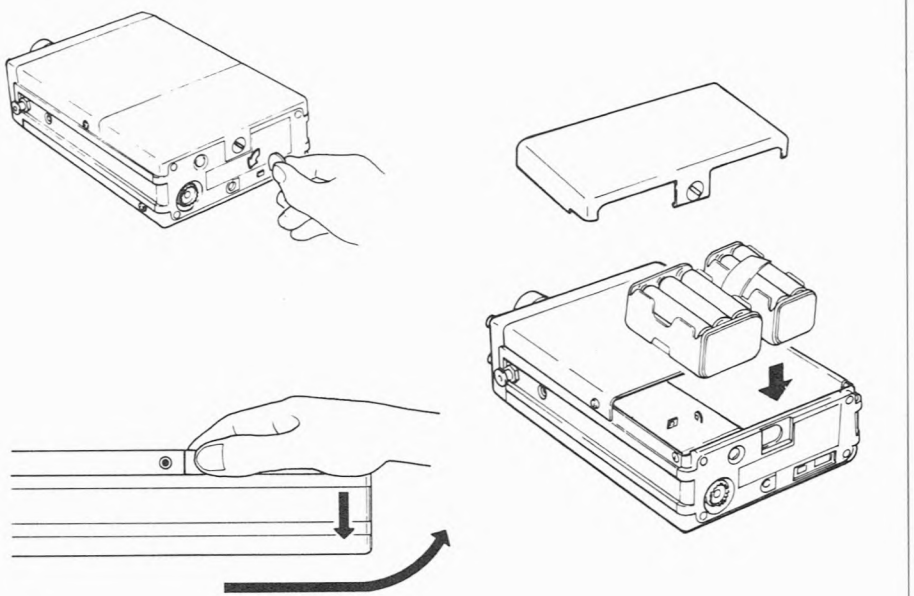


Fig. 1 Battery compartment lid removal

4.2 SUPPLY VOLTAGE CHECK

Check the supply voltage as follows:

1. Set the LIGHT/BAT CHECK switch (19) to the BAT CHECK position.
2. Turn the POWER/VOL control clockwise until the POWER switch clicks on. The lamps will glow and the meter will indicate the voltage supplied from the battery.
3. If the meter pointer is in the red zone on the meter scale (Fig.), the battery cells require replacement or recharding. When the battery cells installed in the unit are of UM-3 manganese or alkaline type, replace them. If they are rechargeable Ni-Cad cells, recharge them.
   When the transceiver is powered from an external power source, the meter will indicate the external source voltage.

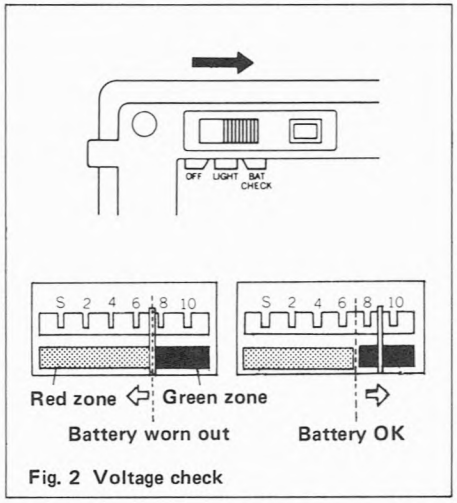


Fig. 2 Voltage check

4.3 RECHARGING Ni-Cad BATTERY CELLS

1. Ni-Cad battery cells used in the unit require recharging before the meter pointer falls into the red zone.
2. When recharging the battery, be sure to turn the POWER/VOL control fully counter-clockwise to the OFF position.
3. Plug the optional charger into the charging socket (22) on C78 for charging.
   Optional charger: C12/230-6: 10 hours for 80% charging

CAUTION:

1. **Do not try to recharge unrechargeable batteries such as UM-3 manganese or alkaline cells.**
2. **Avoid overcharging, as it shortens battery life.**
   For normal charing efficiency, the Ni-Cad cells should be charged under an environment temperature of more than 0°C.

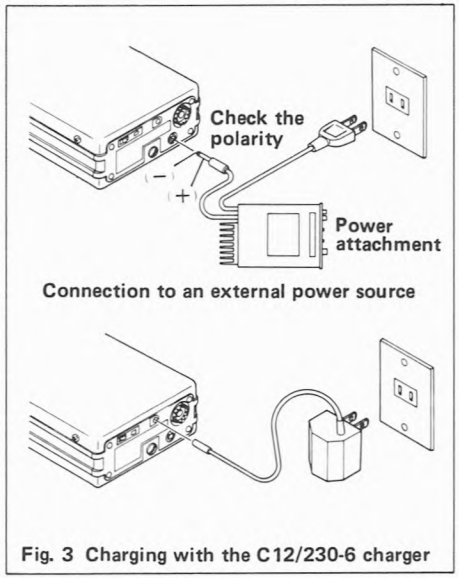


Fig. 3 Charging with the C12/230-6 charger

4.4 BATTERY TYPES AND THEIR CHARACTERISTICS

Different types of batteries have different discharging characteristics (see Fig. 4).
The manganese and alkaline batteries have a relatively linear discharging characteristic, while the Ni-Cad battery has a sudden voltage drop after it maintaining a relatively constant output voltage level.

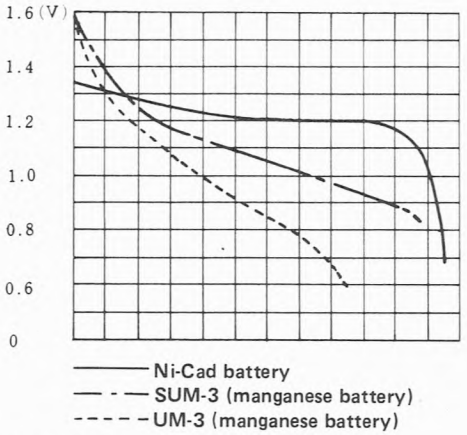


Fig. 4 Discharge characteristics

When used in the C78 transceiver, fully charged Ni-Cad batteries operate for approximately 4 hours for repetitions of one-minute transmission, one-minute reception, and 8-minute standby (with battery saver on). The manganese battery cells allow an operating duration of approximately 1.5 hours in the same operation mode.

4.5 PORTABLE OPERATION

1. For portable operation, attach the supplied shoulder belt to the strapping posts on the unit, and replace the microphone hanger in a convenient position on the shoulder belt. For mounting instructions, see Fig. 5.
2. We recommend the use of the optional carrying case CLC8, which will protect your equipment from possible damage and provide better maneuverability.

4.6 MOBILE OPERATION

1. For mobile operation, obtain the optional mobile bracket CMB8 from your dealer and mount it under the dash of your car. The unit can be popped in and out with the pop-out gear on the bracket (see Fig. 6).
2. Combining the mobile bracket (CMB8) with the optional power booster CPB78, your transceiver is powered to 10 watts just by sliding the unit into the mobile bracket (see Fig. 6).

NOTE:
When operating the C78 transceiver in combination with the CPB78 power booster, be sure to set the power switches on both the C78 and CPB78 at the ON position.
At the end of every operation, turn both power switches off.

3. For mobile operation, it is adviseable to use the optional line filter (CLF03) in the power supply line to prevent noise interference from the alternator line.
   When using only the C78 transceiver for mobile operation, use the supplied external power plug for power connection to the lighter socket and install in it a fuse with a 1A rating.

When the transceiver unit is used in the mobile bracket (CMB8), connect the supplied power cable to the socket.

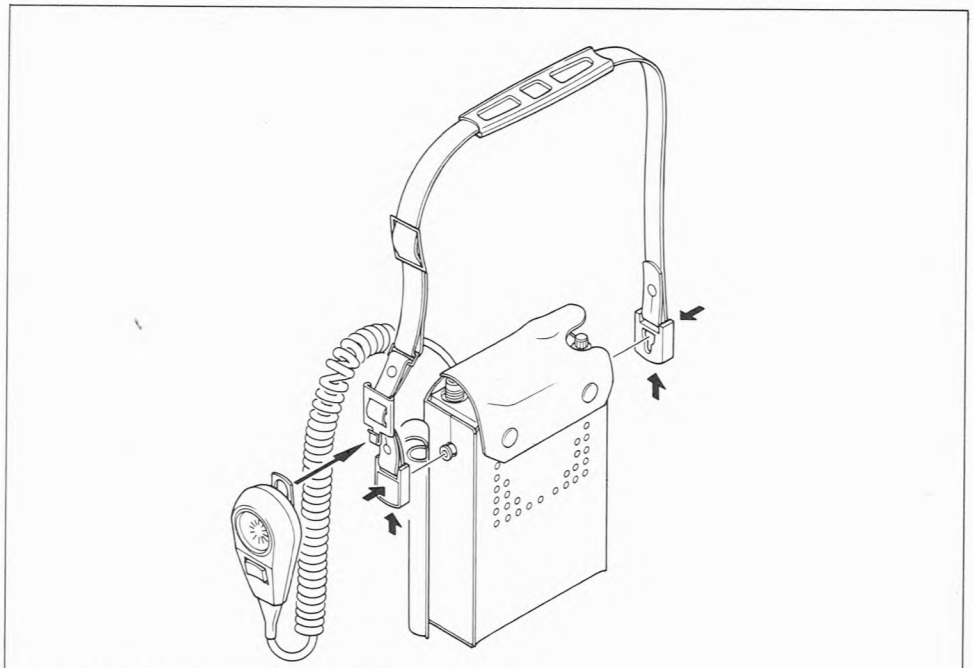


Fig. 5 INSTALLING ACCESSORIES

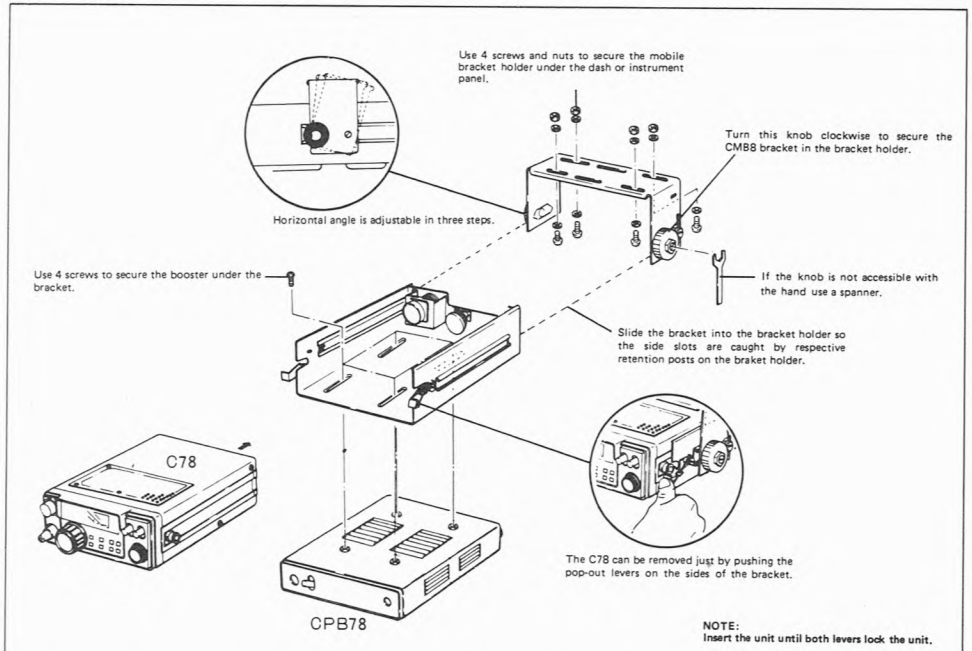


FIG. 6 INSTALLING MOBILE BRACKET AND POWER BOOSTER

4.7 BASE STATION OPERATION

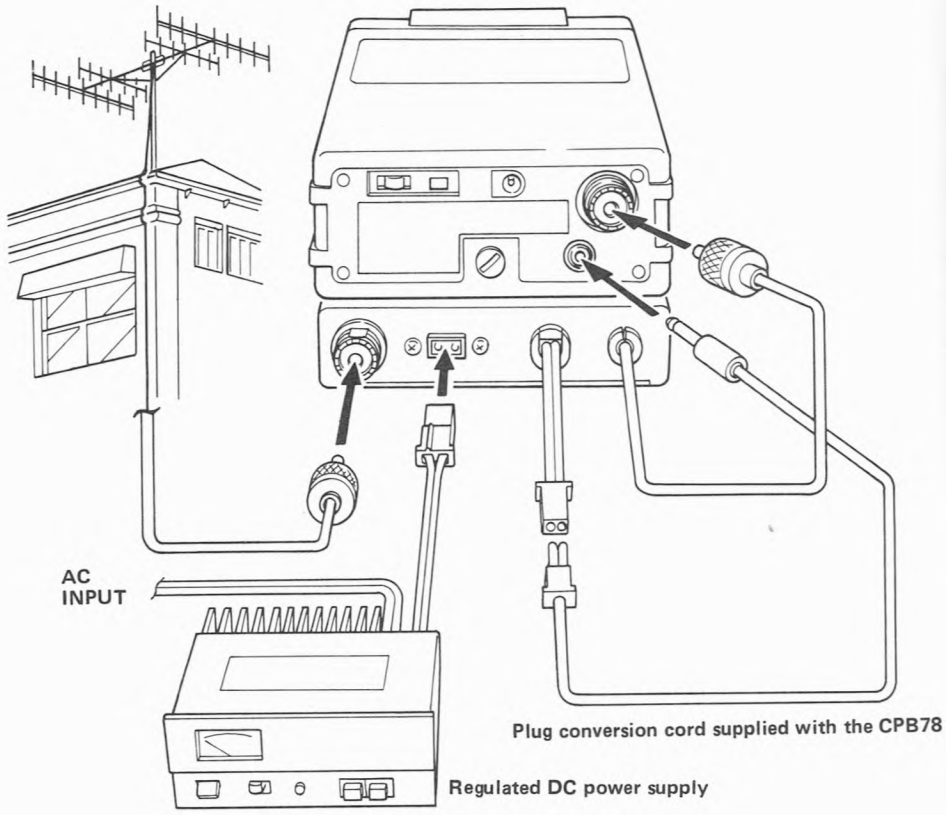
1. When the unit is to be powered from a commercial AC power source via a regulated DC power supply, use the supplied external power plug for connection and install in it a fuse with a 1A rating.

2. When the transceiver unit is used with the power booster (CPB78), the unit should be powered through the power cable attached to the booster.

NOTE:
The battery charger cannot be used as an external power supply.

3. When using an external antenna for base station operation, disconnect the supplied antenna from its front socket.

NOTE:
After a prolonged transmission interval, the power booster (CPB78) will become considerably hot, but this is normal. Allow free circulation of air around the unit for adequate ventialtion.



5. MICROCOMPUTER-ASSISTED OPERATION

5.1 MICROCOMPUTER OPERATION

5.1.1 SELECTING A CHENNEL SCAN STEPPING

The desired channel scan stepping of 25 or 50kHz/step can be selected with the STEP switch located behind the battery compartment lid. This switching may be done with the unit left on.

5.1.2 MEMORY BACK-UP

a. The memory BACK UP switch behind the battery compartment lid is factory set at the OFF position.
b. When the unit is turned on for the first time, a chennel frequency of 433.500 MHz is displayed in the frequency readout under the program control.
c. When the BACK UP switch is turned on and the POWER switch is turned off, the channel frequency displayed just before the POWER switch is turned off is stored in the memory. When the POWER switch is turned on again, the same frequency is displayed in the frequency readout. (The scan mode is not stored.) This memory back-up feature is also effective when the unit is powered from an external power source.

[Example]
When a channel frequency of 433.125MHz is displayed:

→ **POWER switch turned off.** →

POWER switch turned on. →

5.1.3 FREQUENCY SELECTION

Channel frequencies can be selected with the CHANNEL SELECTOR on the front panel of the unit or with the UP-DOWN control on the mic:

a. The Hand Microphone (MP-716) supplied with the C78 Transceiver is equipped with a channel frequency UP-DOWN control. Pressing and holding the control switch in the UP or DOWN position scans the channels (at a speed of 120ms/channel).
b. When the UP-DOWN seitch is released, channel scanning stops at the frequency currently being received.
c. Holding the UP-DOWN control switch for less than 0.5 second scans to the next channel where it stops.
d. When the UP-DOWN control switch is activated, all other key operations are disabled, except for the press-to-talk (PTT) button on the microphone which stops channel scanning.

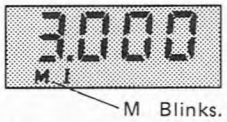
5.1.4 PROGRAMMING CHANNEL FREQUENCIES

■ **Initial frequency programming**

The C78 Transceiver has 5 channel memory addresses (M1—M5) and one offset memory address. The offset memory stores frequency shift span data. To store frequency data in each memory address, follow the programming steps described below:
The C78 incorporates five memory units M1, M2, M3, M4, and M5, each capable of storing up to one frequency i.e. six frequencies in all. To store the desired frequency in each memory unit, follow the procedure given below:

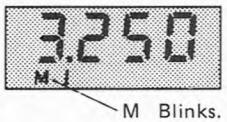
Storing a frequency datum in memory M1

a. Press RCL key to access memory **M1.**
(The channel frequency set up just before RCL key depression is 433.000MHz.)
When no frequency datum is stored in **M1**:

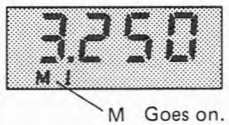


(Memory indicator **"M"** blinks and memory address indicator **"1"** goes on both just below the MSD, indicating that no frequency datum is present in **M1**).

b. Select the desired channel frequency with the CHANNEL selector on the unit or the **UP-DOWN** switch on the microphone (433.250MHz).
The selected frequency appears:



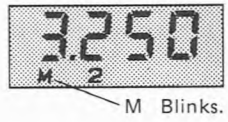
c. Press the ENTER key to store the displayed frequency datum in memory **M1.** Memory indicator **M** will go on.



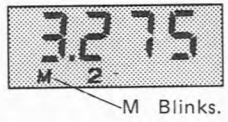
d. Press the RCL key to check the frequency datum stored in memory **M1**

Storing a frequency atum in memory M2

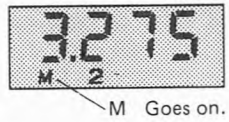
a. Press the RCL key again to access memory **M2.**
When no frequency datum is stored:



b. Select the desired channel frequency with the CHANNEL selector or the **UP-DOWN** switch (e.g. 433.275MHz).



c. To store the datum in memory **M2** press the ENTER key. Memory indicator **M** goes on.



d. Press the RCL key to check the frequency datum tored in memory **M1.**

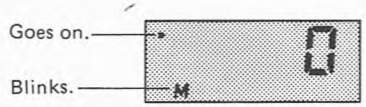
e. Press the RCL key again to check the frequency datum stored in memory **M2.**

Storing frequency data in memory address M3 ~ M5

The desired channel frequency data can be stored in memory addresses M3 ~ M5 in much the same way as the programming procedure for M1 and M2 described above.

Storing an offset datum in the offset memory

a. Press the RCL key 6 times to access the offset memory.



b. Select the desired frequency shift span with the MHz button and the CHANNEL selector or **UP-DOWN** switch (e.g. 7.6 MHz of shift span).

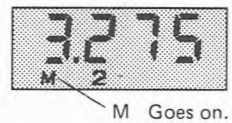
c. To store the datum in the offset memory, press the ENTER key. After storing the datum, ensure press the CCL key.

d. Press the RCL key 6 times to check the shift span datum stored in the offset memory.

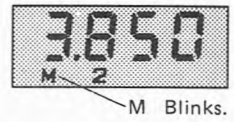
5.1.5 STORED FREQUENCY ALTERATION

[Example]
Changing channel frequency stored in M2 (this example shows stored frequency alteration from 433.275 to 433.850 MHz.)

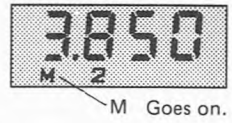
a. Press the RCL key repeatedly until memory **M2** is accessed.
When frequency 433.275 MHz is stored:



b. Select the desired replacement frequency with the CHANNEL selector or the **UP-DOWN** switch (e.g. 433.850MHz)



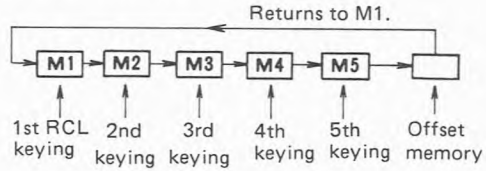
c. To store the frequency datum in M2 press the ENTER key.



d. Press the RCL key twice to check the frequency datum stored in M2.

5.1.6 RECALLING STORED FREQUENCY DATA

a. Pressing the RCL key initially recalls a frequency datum tored in memory **M1.** Pressing it a second time recalls a frequency datum stored in **M2.**
Each time the RCL key is depressed, frequency data are recalled sequentially from memory addresses M1 through M5 and the offset memory. When the RCL key is pressed after the contents of the offset memory are recalled, memory address **M1** is again accessed.



The recall operation takes higher priority over CHANNEL selector and scanning operation.

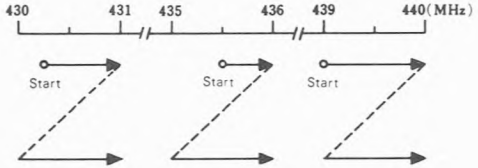
b. When the memory contents are recalled on the display by RCL operation, press the CCL key to clear the RCL function and bring back the data displayed before the RCL key was depressed.

5.1.7 FREQUENCY SCANNING

■ **How to scan the entire frequency band**

[A] frequency scanning includes two different approaches: one divides the frequency range from 430 ~ 439 MHz into ten 1 MHz bands and scans within each of those 1 MHz bands, and the other is memory frequency scanning. The scan stop mode includes three different types.

a. Scanning sub-band frequencies:
   * Select the desired sub-band to be scanned with the [MHz] key.
   * Press the [ALL] key to start scanning from the selected frequency.
   * Each time the [MHz] key is pressed during scanning, channel scanning is shifted to an upper sub-band.

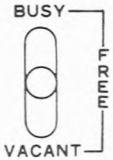


During scanning, scan indicator "S" appears just below the LSD of the frequency readout.

SCANNING TIME

Channel / switch	50kHz stepping (1MHz) 20 channels	25kHz stepping (1MHz) 40 channels
Busy Vacant	Approx. 5 sec.	Approx. 10 sec.
Free	Approx. 40 sec.	Approx. 1 min. 20 sec.

b. To search for a busy channel:
   * Set the SCAN MODE switch to BUSY.
   * Adjust the SQL control.
   * Scan stops at a busy channel where an input signal is present.
   * When the input signal is ceases, scanning recommences.



Also displayed during scan stop interval.

   * Once the transceiver is set to the transmission mode by pressing the PTT button, channel scan will not start even when the input signal ceases.

Goes off.

c. To search for a vacant channel:
   * Set the SCAN MODE switch to VACANT.
   * Adjust the SQL control.
   * Scan stops at a channel where no input signal is present.
   * When a signal is received on the channel, scan recommences.

Also remains on during the scan stop interval.

   * Once the transmission mode is temporarily activated by pressing the PTT button, channel scan will not start even when a signal is received.

Goes off.

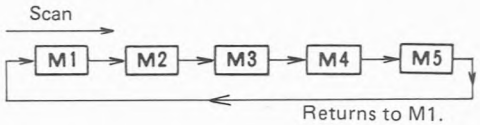
d. To scan sub-band channels without interruption:
   * Set the SCAN MODE switch to FREE.
   * Adjust the SQL control.
   * Channel scanning will go on at a rate of 2.0 sec per channel with no regard to input signal presence or absence.

e. To stop scanning:
   * Press the [CCL] key.
   * Or press the Press-To-Talk button to momentarily activate the transmission mode.

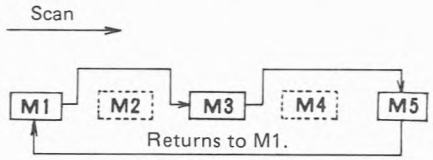
■ **Stored channel scanning**

a. When the [MEMO] key is pressed, channel frequencies stored in memory address M1 ~ M5 are scanned sequentially.

   * When frequency data are stored in all the 5 memory addresses, scanning takes place as follows:



   * When no frequency datum is stored in M2 or M4, these memory addresses are skipped as follows:



b. To search for a busy or vacant memory channel or to scan all memory channels consecutively, select the appropriate SCAN MODE switch position in the same manner as in sub-band scanning.

5.1.8 OTHER USEFUL OPERATIONS

a. Using the [RCL] and [CCL] Keys, you can recall a frequency stored in M1 and other arbitrarily selected frequencies alternately.

[Example]
When frequency 433.250MHz is held by M1 and another frequency 433.125MHz is selected with the CHANNEL selector or the UP-DOWN switch:

→Press the [RCL] key.→

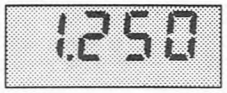
→Press the [CCL] key.→

b. Channel scanning can be stopped by momentarily pressing the Press-To-Talk button during sub-band or memory scan. Utilizing this fact, you can stop channel scanning exactly when the desired channel or searched-for station is picked up, just by pushing the PTT button.
c. The UP-DOWN switch on the microphone permits you manual channel scanning on a step-by-step basis.
d. Combining the [MHz] key, CHANNEL selector and **UP-DOWN** switch, you can quickly locate the desired channel within a 10MHz bandwidth.

5.1.9 REPEATER OPERATION

Shifting the transmitter frequency for repeater operation:

1. Store the desired shift frequency span in the offset memory (e.g. 7.6MHz.)
2. Select the desired reception channel frequency with MHz key and the CHANNEL selector or UP-DOWN switch.



3. Set the RPT switch to R1.
4. When the PTT button is pressed to activate the transmission mode, the transmission frequency is automatically shifted by the programmed frequency span (7.6MHz) as follows:

NOTE:
The transmission frequency is the sum of the reception frequency and the programmed frequency shift span. If it is shifted outside the amateur FM band, the frequency readout is "OFF".

[Example]
Shift span: 7.6MHz
Reception frequency: 434.000MHz
Transmission frequency: Shifted outside the amateur band by 1.6MHz.

Frequency display:

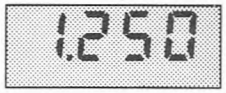
In this state, the transceiver provides no emission.

Shifting the reception frequency for repetition

1. Store the desired frequency shift span in the offset memory (e.g. 7.6 MHz).
2. Select the desired transmission channel frequency with the MHz key, CHANNEL selector of the **UP-DOWN** switch.

3. Set the RPT switch to R2. The reception channel frequency is obtained as follows (with 7.6MHz shift):

4. When the PTT button is pressed, the selected transmission channel frequency is restored as follows:



NOTE:
The reception channel frequency is the sum of the transmission channel frequency and the programmed frequency shift span. If it is shifted outside the amateur band, the frequency eadout is "OFF".

[Example]
Shift span: 7.6MHz
Transmission frequency: 434.000MHz
Reception frequency: Shifted outside the amateur band by 1.6MHz.

Frequency display:

When the reception frequency is shifted back within the amateur band with the MHz key, CHANNEL selector or UP-DOWN switch, the OFF message ceases and normal frequency display is restored in the readout.

5.2 OPERATING INSTRUCTIONS FOR RECEPTION

1. Turn the **VOL/OFF** control clockwise to the detent "OFF" position.
   The transceiver initially selects a channel frequency of 433.500MHz as long as the backed-up internal memory does not supply any frequency other than this.
2. Adjust the **VOL** control for the desired listening level.
3. Adjust the **SQL** control (3) clockwise until the back-ground noise, heard over the speaker, just disappears.
4. Select the desired channel by any of the following methods:
   a. Operate the **CHANNEL** selector (4).
   b. Operate the **UP-DOWN** switch (29).
   c. Use the **MHz** key to select the desired 1 MHz sub-band to be scanned one of the 10 sub-bands from 430.000 to 439.975MHz, then press the **ALL** key to start scanning in 25 or 50kHz steps.
      The **SCAN MODE** switch (17) selects the following scan modes:
      * **BUSY** position: Scan stops at a busy channel.
      * **VACANT** position: Scan stops at a vacant channel.
      * **FREE** position: Scans all channels within the selected sub-band.
   d. Press the **SCAN MEMO** key (11) to scan channel frequencies stored in the channel memory.
   e. Press the **MEMO RCL** key (7) to recall a stored channel frequency.

For details, see (5.1.) MICROCOMPUTER-ASSISTED OPERATION.

5.3 OPERATING INSTRUCTIONS FOR TRANSMISSION

■ PRECAUTION

There are numerous radio channels in service close to the amateur band. If your mobile station is in the close vicinity of one such service station, the emission from your rig may cause unexpected interference to the service communications even if your emission is completely in compliance with regulations. Avoid operation in the following locations:

1. Check that your transmission will cause no trouble to other communications.
2. Press the Press-To-Talk button and hold while you are transmitting. Speak distinctly into the microphone while holding it 3 ~ 5 cm away from your mouth.

5.4 ADJUSTING AUDIBLE KEYING TONE LEVEL

The keying tone level adjustment is located just below the speaker in the cabinet. For level adjustment, remove the top cover from the unit. Adjust the variable resistor located closer to the front panel on the PC board, with a Philips screwdriver.
This adjustment should be done with the squelch control activated.

5.5 RESETTING THE MICROCOMPUTER

If a malfunction occurs or key operation is ineffective, the internal microcomputer requires resetting.
To reset the microcomputer, press the rear RESET button (20) while the transceiver is on. Upon resetting, the frequency display will return to the initial frequency of "3.500".

6. RF ATTENUATOR MODIFICATION FOR FOX HUNTING

The C78 provides full maneuverability in outdoor portable operations. Particularly in fox hunting, the transceiver's receiver sensitivity is usually adjusted by connecting or disconnecting its antenna. If the receiver sensitivity is still too high even when the antenna is disconnected from the unit, it can be reduced by approximately 35dB by simple circuit modification and addition of an external variable resistor as follows:

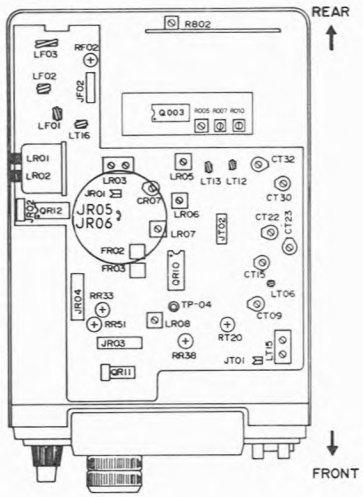
Modification Procedure

1. Remove the top cover from the unit (with the speaker).
2. Cut the jumper across JR05 and JR06 at the middle of the lead.
3. Solder lead wires to the free ends of the jumper leads.
4. Connect the other ends of the leads to a variable resistor of 10 ~ 20 kΩ as shown at right.

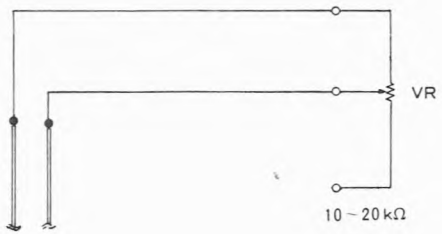
7. OPTIONAL FEATURES

The following optional features are available with the C78 for increased operation flexibility and convenience:

- Mobile bracket — CMB8
- 10 watt booster — CPB78
- Carrying case — CLC8
- Charger — C12/230-6
- Line filter — CLF03
- Base station power supply — CPS02



TOP VIEW



SERVICE MANUAL SECTION

OPERATING INSTRUCTIONS

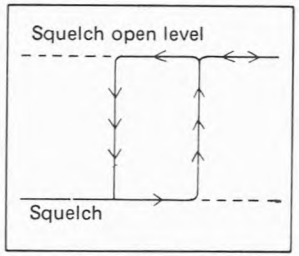
RECEIVER SECTION

* Reception system:
  Double conversion superheterodyne system using 21.4MHz for the 1st IF, and 455kHz for the 2nd IF.
* The input signal from the antenna terminal (J804) goes through an antenna switch circuit and a cavity, LR01 and LR02. The output of the cavity couples to gate 1 of QR01 (MOS FET), where it is amplified.
* The output of QR01 goes through another cavity consisting of LR03 and is fed to gate 1 of the 1st mixer QR02 (MOS-FET). Gate 2 of QR02 accepts the local signal (408.6MHz–418.58MHz) from the PLL board. The local signal is fed to JR01 and then fed to QR02 via LR04.
* The 21.4MHz output of QR02 goes through a monolithic filter, FR01, for better selectivity and intermodulation rejection.
* The output of the filter (FR01) is amplified by QR03 before being applied to pin 16 of IC QR10.
* QR10 (MC3357P) contains the 2nd local oscillator, 2nd mixer, IF amplifier, squelch switch, and detector.
* The 21.4MHz signal coupled to QR10 is converted to a 2nd IF signal, 455kHz, which passes through a dual stage ceramic filter that is externally provided across pins 3 and 5 of QR10. The output of the filter is internally amplified, subject to limiter detection, then coupled to pin 9 as an audio signal.
* The AF signal output goes to the preamplifier (QR06) and power amplifier (QR11). The output of the power amplifier drives the built-in speaker.

[Squelch Circuit]

* The noise component present at pin 9 of QR10 goes through an active filter utilizing an internal amplifier. The output of the active filter is rectified by QR20 and QR21 (OA99). The rectified DC voltage couples to pin 12 of QR10 to control the Schumitt-type squelch switch.
* When the squelch switch is activated due to the DC voltage applied to pin 12, pin 14 of QR10 is opened. When the squelch switch is turned off, pin 14 is shorted to ground.
* A + B voltage is applied to pin 14 or QR10 through RR40 (10kΩ). When the squelch switch is turned on, the emitter of the AF preamplifier (QR06) and the muting terminal (pin 8) of the AF power amplifier (QR11) rise muting out the noise component.
* The output voltage at pin 13 of QR10, used for scanning control, lowers when the squelch switch is on, and rises when the switch is off.

[Schumitt-Type Squelch Circuit Operation]



Low ⟵ Input signal level ⟶ High

[Meter Circuit]

* The S meter drive signal present at pin 5 of QR10 is amplified by meter amplifiers, QR04 and QR05, and applied to meter M801 via JR04.

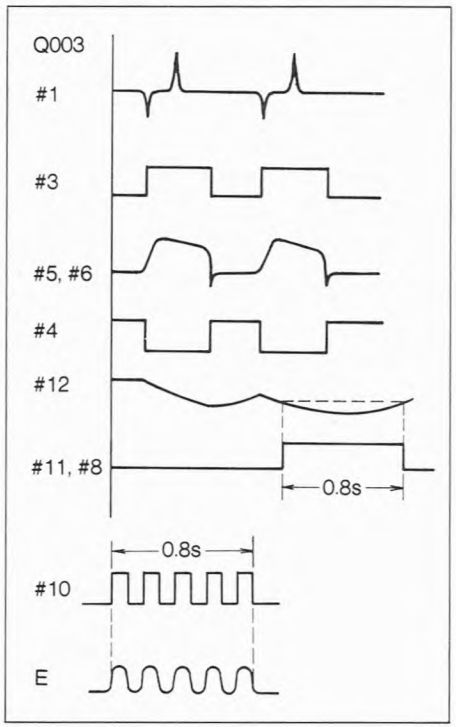
TRANSMITTER SECTION

* The external microphone (MP716) output is amplified by QR401 and QR402. The amplifier output goes through a low-pass filter where frequency components above 3kHz are filtered out. The signal is then applied to Q203 in the VCO circuit to directly frequency modulate the VCO output (reactance modulation).
* The output of the PLL board (J102) is fed to JT01 on the transmission younger stage stage board.
* The signal supplied from the PLL board is amplified by QT01, QT02, QT03 and QT04 in this order, then is applied to antenna connector (J804) via low pass filter and antenna switch.
* The Automatic Power Control (APC) circuit utilizes the voltage feedback principle.
  The output of QT04 is rectified by diodes QT11 and QT12. The rectified DC voltage is applied to the base of the APC control transistor QT06, to control the 2nd gate voltage of QT01 (MOS FET) and hence RF power.
* When the APC is inactive, RF power is approximately 2 watts.

Tone Burst Generator

When the PTT switch is used:

When the PTT switch is pressed initially, the potential at terminal A in the schematic diagram lowers. This causes #1 of Q003 to lower momentarily, causing #3 of Q003 to rise. As a result, #5 and #6 of Q003 also rise, which lowers #4 of Q003. The potential at #12 and #13 of Q003 starts dropping but does not reach its lowest level, leaving the tone burst circuit inactive.
When the PTT switch is pressed twice consecutively, the potential at #12 and #13 of Q003 goes to its lowest level. This causes #11 of Q003 to rise, activating the tone burst generator. The potential at #12 and #13 of Q003 gradually increases, and #11 of Q003 is maintained at a high level for 0.8 seconds. This means that the tone burst signal is transmitted for only 0.8 seconds when the PTT switch is pressed a second time.
The output of the tone burst generator is level-adjusted by R010, then applied to the PLL modulator via R011 and C006.



When the CALL button on the C78 is used:

* Pushing the CALL button applies a voltage, +9V, to terminal B in the schematic diagram. This brings up the potential at the base of Q001, turning it on and therefore causing terminal A to lower, putting transceiver in the TX mode.
* As a high level is applied to #5 and #6 of Q003 through Q002, #4 of Q003 is maintained at a low level while the CALL button is held down.
  Number 12 and #13 of Q003 are lowered, raising #11 and #8, which activates the tone-burst generator.
* When the CALL button is released, Q001 is turned off. This causes terminal A to rise, putting the transceiver in the RX mode.
* Q006, a voltage regulator, holds the voltage at Q003 at +9V.

PLL SECTION

* The PLL circuit in the C78 is controlled by 9-bit binary code and A/B band switching signal both coming from microcomputer QL01.

PLL Frequency Relationship at Transmission Mode in Bands A (430MHz) and B (435.00MHz)

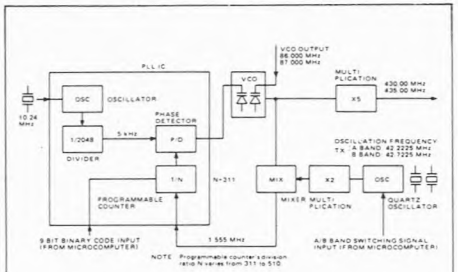


Fig. PLL Basic Block Diagram

* The VCO frequency is one fifth (80MHz) the object transmission and reception frequency.
  The 80MHz band signal oscillated by the VCO is multiplied by 5 in the PLL.
  For transmission, the object frequency is obtained, while for reception, a frequency 21.4 MHz lower than the object frequency is obtained.
  The A/B band switching signal is automatically supplied from the control IC (QL01) according to operation frequencies selected. The A/B band switching signal switches local oscillator frequencies inside the PLL.

A band ..... 430.000 ~ 434.975 MHz
B band ..... 435.000 ~ 439.975 MHz

1. PLL IC (Q113)

PLL IC Q113 integrates the following circuits on a single chip.
* Reference frequency oscillator: 10.24MHz
* Phase Detector: P/D
* Programmable Counter: I/N
* Unlock Detector

(1) PROGRAMMABLE COUNTER (1/N)

The programmable counter accepts a 9-bit binary code from the microprocessor (QL01) which determines the frequency division ratio. The output frequency from the mixer is divided by the programmable counter in accordance with the determined division ratio, and the divided frequency is fed to the phase detector.

(2) PHASE DETECTOR (P/D)

1. The phase detector detects the phase difference between 5kHz frequency, which is obtained by dividing the reference frequency of 10.24MHz by 2048, and the programmable counter output frequency.
2. The detector output obtained at pin 7 is converted into a DC voltage by an R/C integrating circuit. This DC voltage is applied to a varicap Diode (Q201) in the VCO to control the VCO output frequency. This DC voltage variation applies to the varicap diode which controls the VCO output frequency.

2. VCO CIRCUIT

1. The phase detector output from PLL IC Q113 is converted into a DC voltage by an R/C integrate circuit.
2. The DC voltage is applied to varicap diode Q201 to vary its capacitance.
3. The VCO output frequency is controlled by the variation of the varicap diode capacitance.
4. The VCO output frequency covers a maximum variation range of 3MHz according to input DC voltage variation.

3. LOCAL OSCILLATOR

1. The local oscillator uses the overtone oscillation system. It oscillates at the following frequencies.
   frequencies:
   RX-S 40.0825MHz in band A
   RX-S 40.5825MHz in band B
   TX-S 42.2225MHz in band A
   TX-S 42.7225MHz in band B
2. Each of the above frequencies is doubled before they are coupled to mixer:
   RX-S 80.165MHz in band A
   RX-S 81.165MHz in band B
   TX-S 84.445MHz in band A
   TX-S 85.445MHz in band B

4. MIXER

1. The output of the VCO circuit is fed to the mixer via buffer amplifier Q205 and Q117.
2. The VCO output and local oscillator output are mixed in mixer to create frequencies from 1.555 ~ 2.550 MHz.
   F(VCO) — F (Local OSC) = 1.555 ~ 2.550 MHz.
3. The mixer output goes through an LPF, Q101 and Q102 to be subject to waveform shaping before it is fed to Q113's pin 2 (1/N circuit).

5. PLL IC (Q113) UNLOCK

An unlock signal is obtained at pin 8 of the phase detector circuit in the PLL IC.

6. UNLOCK SWITCH CIRCUIT

The unlock output of the PLL IC is integrated into a DC voltage by a C/R circuit. Using this DC voltage, Q115 discriminates between locked and unlocked the PLL state.

7. UNLOCK PREVENTION CIRCUIT

In order to prevent faulty VCO circuit operation, a UL (unlock) voltage is applied from Q116 to the varicap (Q201) in the VCO circuit if the PLL circuit is unlocked. This maintains the VCO circuit within its stable operation range.

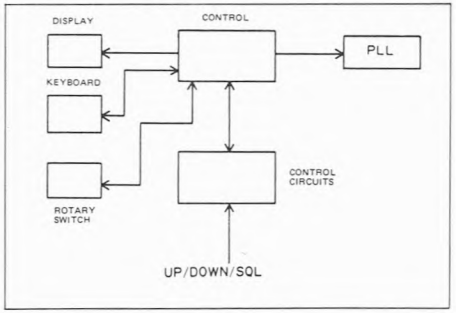
Frequency Display (MHz)	Dividing Ratio	Binary Code								
		R_0	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8
430.000	311	1	1	1	0	1	1	0	0	1
430.025	312	0	0	0	1	1	1	0	0	1
430.050	313	1	0	0	1	1	1	0	0	1
⋮										
434.975	510	0	1	1	1	1	1	1	1	1
⋮	Band Switching takes place.									
435.000	311	1	1	1	0	1	1	0	0	1
435.025	312	0	0	0	1	1	1	0	0	1
435.050	313	1	0	0	1	1	1	0	0	1
⋮										
439.975	510	0	1	1	1	1	1	1	1	1
⋮	Band Switching takes place.									
430.000	311	1	1	1	0	1	1	0	0	1

CONTROL SECTION

The control section consists of the following sub sections:

* Microprocessor section
* Display section
* keyboard section
* Channel switching section (manual)
* Control I/O decoder section

* Control LSI QL01 operates on a supply voltage +4.5 to +5.5V. With the C78, it operates on a supply voltage +5V.



1. THE FOLLOWING OUTPUT SIGNALS ARE AVAILABLE FOR EXTERNAL CIRCUIT CONTROL

(1) PLL IC programmable counter drive output:
9-bit binary code output for programmable counter drive is available at pins (22) through (30).

(2) LCD Drive
An LCD drive output (dynamic) is available at pins 8 through 13. ($D_0 \sim D_3$, E_0, E_1)

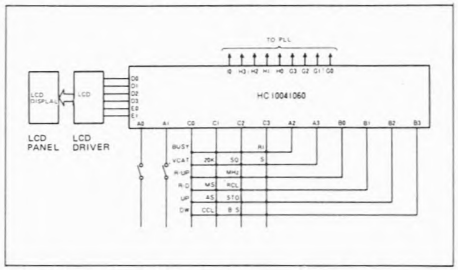
(3) Buzzer Drive
Output F1 at pin 17 conttols the buzzer tone generator provided within QL02.

(4) Battery Saver Control Output
When the BATT SAVE switch is turned on, output F0 at pin 16 provides a pulse array with a duty cycle of 1/8 to switch the RX+B control transistor, QS16, accordingly.

2. THE LSI REQUIRES THE FOLLOWING COMMANDS.

(1) Initial clear [pin 7]
A positive pulse is applied to pin 7 (RES) of the control LSI so as to reset all internal circuits to their initial state when the power to the unit is turned on.

(2) Matrix circuit [pins 2 – 5 and 35 – 40]
The matrix circuit permits up to 18 key inputs.
Pin 2(C_0), 3(C_1), 4(C_2), 5(C_3), 35(A_2), 36(A_3), 37(B_0), 38(B_1), 39(B_2), 40(B_3)



Channel Switching

* CHANNEL Knob
This rotary switch utilizes a pulse switch, which closes matrix C0 ~ B0 for up-going channel selection, and matrix C0 ~ B1 for down-going channel selection.
* UP-DOWN switch on the microphone
The UP-DOWN switch on the microphone controls internal analog switches, which close matrixes C0 ~ B2 and C0 ~ B3 which control channel frequencies in the respective directions. The up/down command from the microphone switch is applied to pins 13 and 5 of QL03.

Key Operation

1. MHz
Pressing the **MHz** key closes matrixes C2 and B0. Each depression of the **MHz** key increments the operation frequency by 1MHz.
When the MHz key is pressed and held, channel frequency automatically steps up at a rate of 2MHz/sec.

[Example]

Original frequency:	433.000MHz
1st depression:	434.000
2nd depression:	435.000
3rd depression:	436.000
	The 7th depression causes the frequency to return to 430.000.
7th depression:	430.000

2. BATT/SAVE
The BATT/SAVE feature is activated by closing matrixes C2 and B3. When it is activated, a small dot appears at the right margin of the LCD display, and output F0 at pin 16 provides a pulse array with a duty of 1/8 to control RX + B.
When the BATT/SAVE feature is inactive, output F0 is maintained at a high level.
If analog switch C2 – A3 for SQL control is closed or scan control key (AS or MS) is pressed when the BATT/SAVE feature is activated, output F0 is also maintained at a high level.

3. CCL
Pressing the CCL key closes matrixes C1 and B3. This resets the MEMO, RCL, SCAN ALL and SCAN MEMO features to their initial state.

4. SCAN MEMO
Pressing the SCAN-MEMO key closes matrixes C1 and B1. This scans the 5 stored channel frequencies in sequential order.

5. SCAN ALL
Pressing the SCAN-ALL key closes martixes C1 and B2. This starts channel scanning upward from the displayed frequency with a spacing of 1 MHz.

6. MEMO-RCL
Pressing this key closes matrixes C2 and B1. This recalls the stored frequency to the display.

7. MEMO-ENTER
Pressing the MEMO-ENTER key closes matrixes C2 and B2. This stores the displayed frequency in memory.

Slide Switch Function

1. VACANT SCAN
The vacant scan mode is activated when matrixes C0 and A3 are closed.

2. BUSY SCAN
The busy scan mode is activated when matrixes C0 and A2 are closed.

3. FREE SCAN
The free scan mode is activated when both matrixes Co — A3 and C0 — A2 are opened. Scan rate is automatically set high for the busy and vacant mode, and set low for the free mode.

4. S (Simplex)
When matrixes C3 and A3 are closed, the RPT mode is set to the simplex (S).

5. R1
When matrixes C3 and A2 are closed, the RPT mode is set to R1. In this mode, the transmission frequency is shifted up by the frequency data stored in the offset memory.

6. R2
When matrixes C3 — A3 and C3 — A2 are opened, the RPT mode is set to R2. In this mode, the reception frequency is shifted up by the frequency span data stored in the offset memory.

[Example]

Frequency selected	435.000 MHz
Offset memory data	3.00 MHz
R1 Tx	438.00 MHz
Rx	435.00 MHz
R2 Tx	435.00 MHz
Rx	438.00 MHz

Scan Operation Sequence

a. In the busy scan mode, scanning stops at a channel where an input signal is present.
   * When an input signal is present, an high level output is provided at pin 3 of QR12.
   * The high level output at pin 3 of QR12 couples to pin 6 of QL03 to close matrix C2 — A3. The microprocessor detects this closure of the matrix and stops scanning. In the busy scan mode, scanning stops when matrix C2 — A3 is closed.

b. In the vacant scan mode, scanning stops at a channel where no input signal is present.
   * When no input signal is present, pin 3 of QR12 provides a low level output. As a result, matrix C2 — A3 remains open if the low level output at pin 3 is coupled to pin 6 of QL03.
   * In the vacant scan mode, scanning stops when matrix C2 — A3 is opened.

c. The microprocessor monitors the scan modes (busy, free, vacant) and matrix C2 — A3 states to provide the following controls:

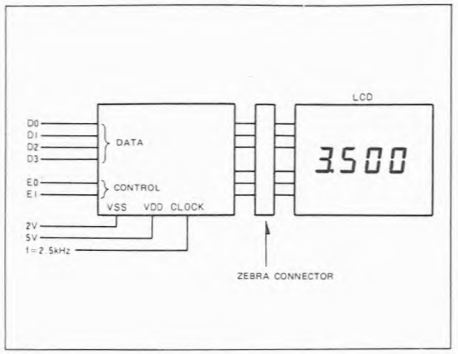
In the busy mode:	Scan stops when C2 — A3 is closed. Scan starts when C2 — A3 is opened.
In the Free mode:	Scan continues regardless of matrix states.
In the vacant mode:	Scan starts when C2 — A3 is closed. Scan stops when C2 — A3 is opened.

25/50kHz Channel Stepping Selection
Channel stepping is selected with the channel stepping selector switch SL01.
Closing matrix C1 — A3 selects 25kHz stepping.
Opening matrix C1 — A3 selects 50kHz stepping.

(1) Memory Back-Up
a. The SW + B is monitored at pin 33 (A0) of QL01.
b. When the C78 is switched off, the potential at A0 lowers.
c. When A0 lowers, the microprocessor lowers all its outputs.
d. The memory is backed up since the microprocessor remains alive even when its A0 is low.

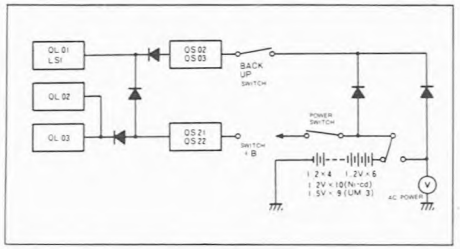
(2) Control Section State in the TX Mode
In the TX mode, TX + B is applied to A1 to render all input to the microprocessor ineffective and hold all output at a DC level. Since in this state no pulse enters or leaves the microprocessor, the signal-to-noise ratio in the TX mode is significantly improved.

3. DISPLAY SECTION
The display section consists only of an LCD and LCD driver.
Four data lines (D0 ~ D3) and two control lines (E0 and E1) are coupled from QL01 to the LCD driver (Q801). Power supply voltages VDD and VSS, and a clock signal are also applied to the LCD driver.
Based on these signals, the LCD driver dynamically drives the LCD display with 1/3 duty pulse.
The presence of dynamic drive means that the LCD driver requires a clock signal.



4. OTHER PERIPHERAL CIRCUITS

(1) Back-Up Circuit
When the C78 is switched on, necessary DC power is supplied by voltage regulator QS21.
When the C78 is switched off, the back-up power from the 12V battery goes through the back-up switch, SL02, and couples to the voltage regulator, QS02, where it is converted into +5V DC before being supplied to the memory.
When an external power source is used, the microprocessor is also backed up as long as the BACK UP switch is on.



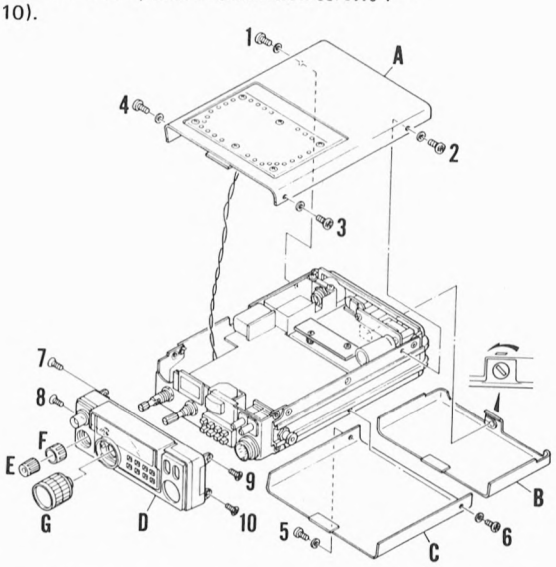
(2) Reset Circuit
When the RESET switch is pressed,the base of QL01 is grounded. This applies a +5V to pin 7 of QL01, thus resetting the entire internal circuits of QL01, including the memory.

1. DISASSEMBLING THE CASE OF THE UNIT

1) Remove top cover A (retention screws 1 – 4).
2) Remove battery compartment cover B.
3) Remove bottom cover C (retention screws 5 and 6).

NOTE:
When removing, exercise sufficient care to avoid damaging the wiring to the speaker and other components.

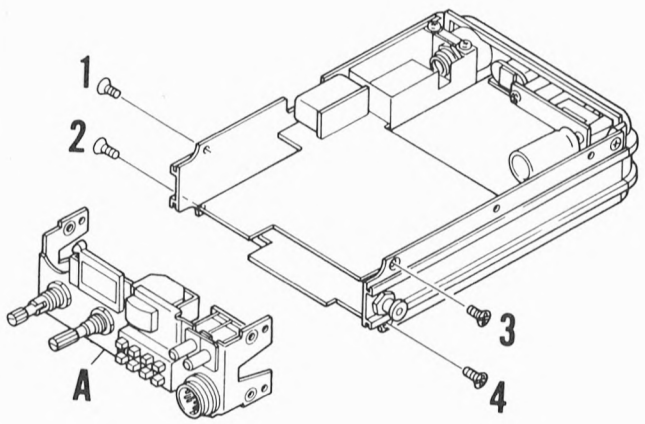
4) Remove knobs E, F, and G.
5) Remove front panel D (retention screws 7 ~ 10).

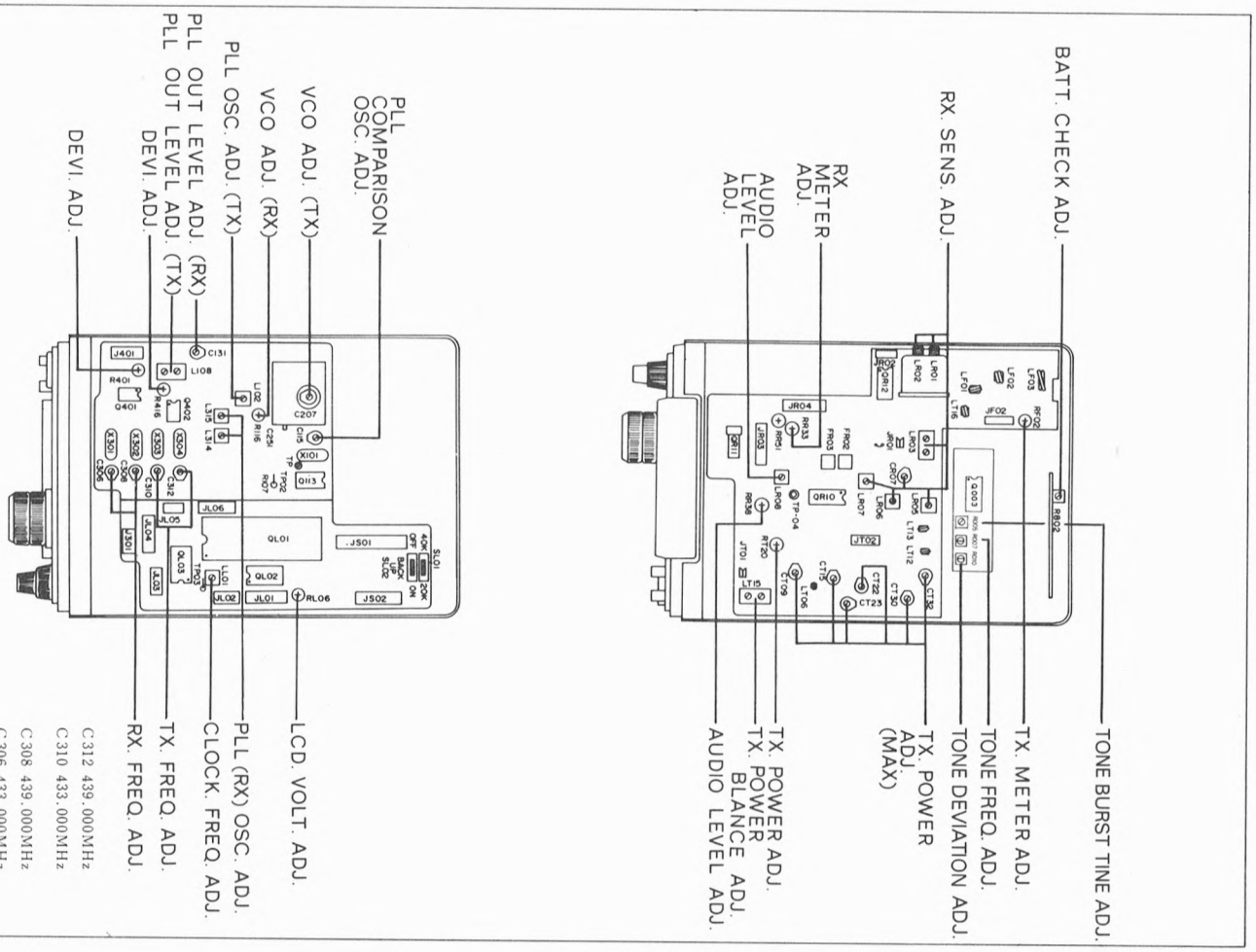


2. FRONT BRACKET

To remove the front bracket from the chassis, remove retention screws 1 ~ 4.

CAUTION:
Avoid damaging the wiring to the front bracket parts.

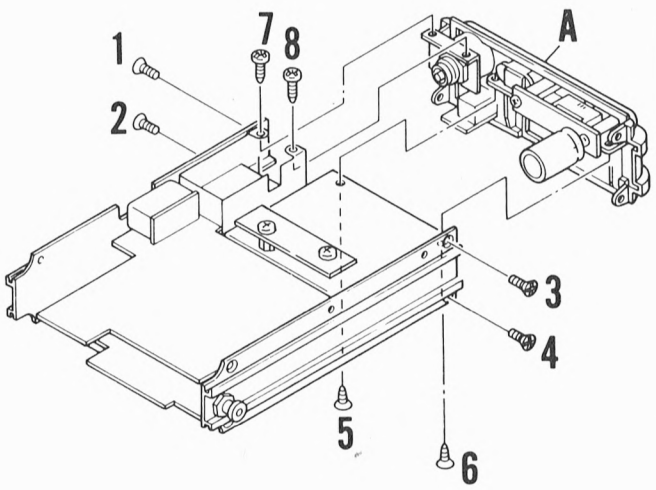




3. REAR PANEL

To remove rear panel A from the chassis, remove retantion screws 1 ~ 8.

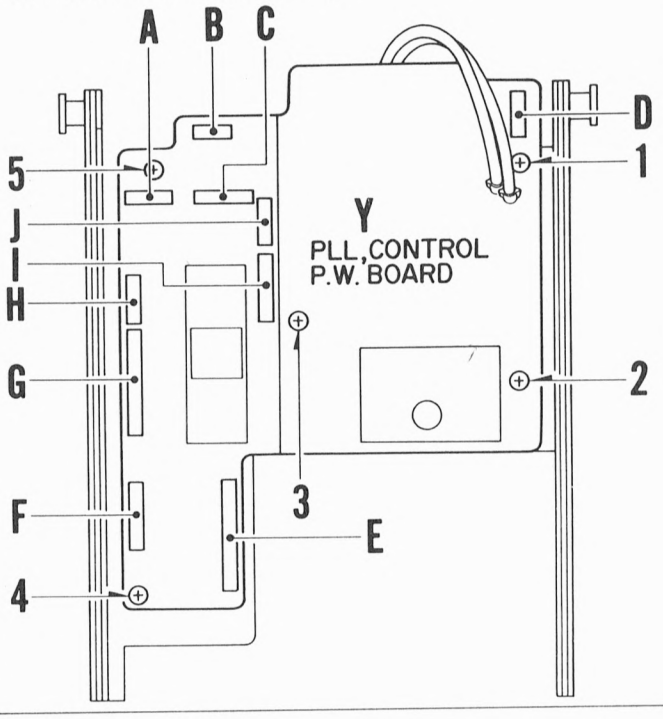
CAUTION:
Avoid damaging the wiring to the rear panel.



4. REMOVING PC BOARD ASSEMBLIES

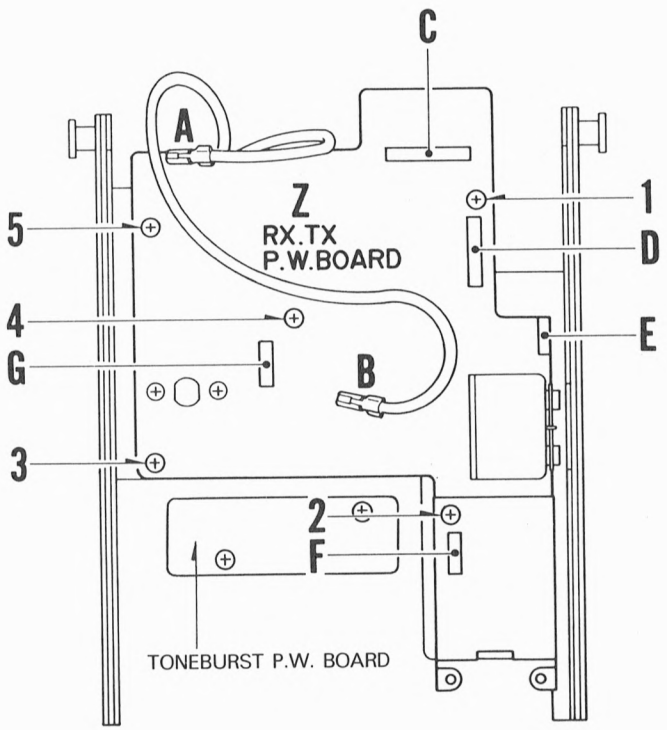
PLL, CONTROL BOARD

1. Disconnect the two coaxial cables from the board.
2. Disconnect connector plugs (A) ~ (J) from the board.
3. Remove retention screws 1 ~ 5.



RX, TX BOARD

1. Disconnect coaxial cables (A) and (B) from the board.
2. Disconnect connector plugs (C) ~ (G) from the board.
3. Remove retention screws 1 ~ 5.



ALIGNMENT PROCEDURE

CONDITIONS

* All adjustments have been completed prior to shipment. Further adjustments should be limited to a necessary minimum.
* Make sure that all measuring instruments required for alignment are completely calibrated and operate normally.
* Before starting measurement, idle the instruments for half-an-hour.

Required Measuring Instruments

1. UHF standard signal generator
2. RF power meter
3. Audio signal generator
4. AC/DC voltmeter (VTVM)
5. RF voltmeter
6. Frequency counter
7. Oscilloscope
8. Galvanometer
9. Regulated DC power supply
10. DC ammeter
11. (Spectrum analyzer)
12. (Digital voltmeter)

Required Alignment Tools

1. Philips screwdriver . . . for casing and boards
2. Standard screwdriver. . for trimmer resistor and IF adjustment
3. Non-metallic standard screwdriver . . . . . for RF and trimmer capacitor adjustment
4. Box screwdriver . . . . for support (2.6, 3.0mm)

For RF circuit and frequency adjustment, use a non-metallic screwdriver.

C78 ALIGNMENT PROCEDURE

1. Standard Alignment Conditions

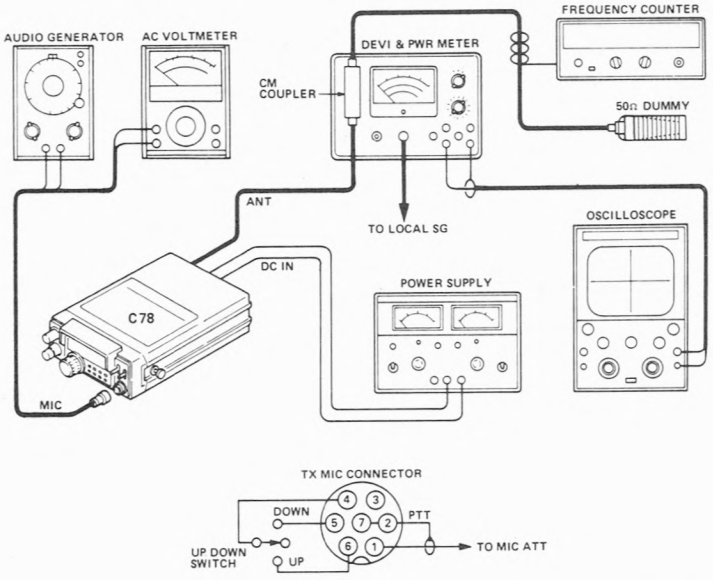
Supply voltage:	13.8V DC
Audio output:	0.7 watts
Audio output loading: . . .	8.0Ω
Frequency deviation: . . .	±3.5kHz
Modulation frequency: . .	1kHz
Transmitter load:	50Ω
Reception frequency: . . .	435.00MHz
Transmission frequency: .	435.20MHz

2. Alignment Notes

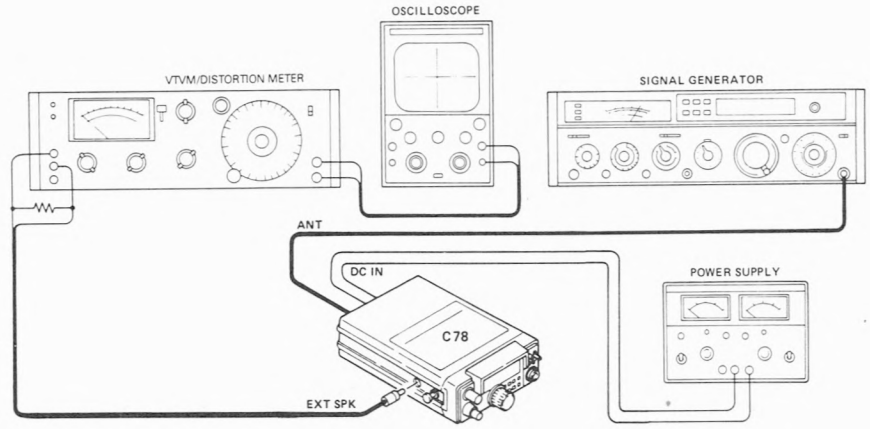
Handle all trimmer resistors and capacitors gently. Unless otherwise specified, set the switches and controls as follows:

1. SQL:	Minimum
2. VOL:	Minimum or most adequate level
3. SCAN MODE switch: . .	FREE
4. RPT switch:	S
5. CHANNEL STEP switch:	50kHz
6. Supply voltage:	13.8V DC
7. Frequency:	RX: 435.00MHz TX: 435.20MHz

TX ADJUSTMENT SET-UP



RX ADJUSTMENT SET-UP



MICROCOMPUTER SECTION

• LCD Supply Voltage Adjustment

1. Switch on C78.
2. Connect a voltmeter across pins 2 and 3 of connector JL01. Adjust RL06 until the voltmeter reads 3.0V DC.

NOTE:
1. **Use a DC voltmeter with high accuracy.**
2. **Application of a voltage exceeding the LCD's rated voltage (3.5V) may damage the LCD.**
3. **Pins 3 and 2 of JL01 are positive and negative respectively.**

Clock Frequency Adjustment

1. Connect a frequency counter to TP03.
2. Adjust the frequency at TP03 to 400.0kHz with LL01.

PLL SECTION

NOTES:
1. **Unless otherwise specified, leave the PTT switch off during PLL section adjustment.**
2. **Complete PLL section adjustment before adjusting TX and RX.**
3. **During PLL section adjustment, disconnect the coaxial cables from jacks JR01 and JT01.**
   After completing the adjustment, reconnect them.

• PLL Comparison Oscillator Adjustment

1. Connect a frequency counter to TP101, and adjust the frequency at TP101 to 5.1200MHz with C115.

• Reference Frequency Adjustment

1. Connect a RF VTVM to TP02 (R107).
2. Set up C78 for a channel frequency readout of 430.00MHz.
3. In the RX mode, adjust L314 and L315 until the maximum level is obtained at TP02.
4. Set up C78 for a frequency readout of 439.95MHz.
5. In the TX mode, adjust L102 until the maximum level is obtained at TP02.
6. Adjust L314 and L315 until there is no level difference at TP02 in the TX and RX modes. (Level: approx. 1.5Vrms)

• VCO Adjustment

1. Set up C78 for a channel frequency readout of 430.00 MHz.
2. Connect a voltmeter to C251.
3. In the TX mode, adjust the voltage at C251 to 2.25V with C207.
4. In the RX mode, adjust the voltage at C251 to 2.0V with R116.

• Output Adjustment

1. Connect an RF VTVM with a 50Ω dummy load to the TX output coaxial.
2. When C78 is in the TX mode, the VTVM will read approximately 200mV (when the slug of L108 is turned clockwise by 2.5 turns into the coil bobbin).

NOTE:
When L108 is replaced, turn its slug 2.5 turns into the bobbin in advance.

3. Check that no output level difference exists between output frequencies 430.00 and 439.95MHz. If there are any, adjust the two slugs in L108 until the difference is eliminated. (The two slugs of L108 should be located at around the same level when adjustment is completed.)

NOTE:
Turning the slug into the coil bobbin reduces the frequency, while turning it out of the coil bobbin increases the frequency.

4. Set C78 in the RX mode, and select a channel frequency of 435.000MHz.
5. Connect an RF VTVM with a 50Ω dummy load to the RX output coaxial, and adjust C131 until a maximum reading is obtained in the RF VTVM.

NOTE:
After completing the adjustment, connect the TX and RX output coaxials to JT01 and JR01 respectively.

• Frequency Alignment

1. Disconnect the coaxial cable from JT01, and connect a frequency counter to the free end of the coaxial cable.
2. Set up C78 for a channel frequency readout of 433.00MHz and for the TX mode. Adjust C310 until the frequency counter reading is 433.00MHz.
3. Set up C78 for a channel frequency readout of 439.00MHz and for the TX mode. Adjust C312 until the frequency counter reading is 439.00 MHz.
4. Disconnect the coaxial cable from JR01, and connect the frequency counter to the free end of the coaxial cable.
5. Set up C78 for a channel frequency readout of 439.00MHz and for the RX mode. Adjust C308 until the frequency counter reading is 417.60MHz.
6. Set up C78 for a frequency readout of 433.00MHz and for the RX mode. Adjust C306 until the frequency counter reading is 411.60MHz.
7. After completing the adjustment, connect the coaxial cables to their original jacks.

TRANSMITTER SECTION

RF Power Adjustment

1. Set C78 for a frequency readout of 435.20 MHz.
2. Turn the slug of LT15 by 2.5 turns into the coil bobbin. (Only when LT15 is replaced.)
3. Adjust CT09, CT15, CT22, CT23, CT32, and CT30 until the maximum RF power is obtained. In this case, leave RT20 in the fully clockwise position.
4. Adjust LT15 until the RF power difference between frequencies 430.00 and 439.95MHz is minimized.
5. The maximum RF power will reach approx. 1.8 watt. Reduce RF power to 1.3 watts with RT20.
6. Increase the RF power by adjusting LT14, then again reduce the RF power to 1.3 watts with RT20.
7. Adjust LT15 until there is no RF power difference between both band edges.

• Deviation Adjustment

1. Turn R401 and R416 fully clockwise.
2. Set up an audio signal generator output level for 30 mV AC and couple it to the MIC jack.
   Set up the unit for the TX mode and adjust the maximum frequency deviation to ±5kHz with R416.
3. Set the AF generator output level to 3.0 mV (AC).
   Set up the unit for the TX mode and adjust the frequency deviation to ±3.5kHz with R401.
4. Depress the CALL button and adjust R010 so that the tone deviation is ±3.5 kHz. Adjust R007 so that the tone frequency is 1750 kHz.
5. After adjusting the frequency, depress the PTT switch twice and adjust R005 so that the function time of the tone burst circuitry is 0.8~1.2 seconds.

NOTE:
The tone burst circuitry should not function when the PTT switch is depressed once.
When the function time is adjusted with a jig, it is not necessary to adjust R005.

To measure the function time of the tone burst circuitry, connect an oscilloscope or synchroscope to one of the following.
1. To J402 and J403
2. To the speaker terminal of the receiver
3. To the AF output of a linear detector

- **Meter Adjustment (TX)**

1. Adjust RF02 until the meter pointer deflects to position "9" at a TX output of 1.3 watt.

RX SECTION

- **Sensitivity Adjustment**

1. Set the C78's channel frequency to 435.00MHz.
2. Couple an RF signal generator output of 435.00MHz to the ANT jack on the C78.
3. Adjust LR01 and LR02 until C78's S meter pointer deflection is a maximum.

NOTE:
If the S meter pointer deflects only slightly, turn RR33 fully clockwise.

4. Adjust LR03's slug until the S meter pointer deflection is a maximum.
5. Adjust LR05, LR06, and LR07 until the S meter pointer deflection is a maximum.
   Adjust CR07 until the optimum SIND point is obtained.

NOTE:
After replacing a trimmer capacitor or coil, adjust them until maximum noise output level is obtained.

6. Repeat steps 1sto 5 several times. After the adjustment is completed, turn the slug of LR02 by 1/2 a turn into the coil bobbin.
7. Adjust LR08 until the maximum audio output level is obtained.
8. Adjust until no sensitivity difference exists between frequencies 430.00 and 439.95 MHz.

NOTES:
1. **Set up the RF signal generator output for a modulation frequency of 1kHz with a deviation of 3.5 kHz, and set the output level to a minimum.**
2. **Adjust until no sensitivity difference exists between frequencies 430.00 and 439.95 MHz.**
3. **When using a center meter, connect a voltmeter to RX TP04, and obtain the point where the voltmeter reads the same level when a 455kHz signal is applied to the input and when a signal is received at the antenna. The 455kHz signal should be applied to pin 5 of QR10 via capacitor 0.001μF.**

- **Audio Output Level Adjustment**

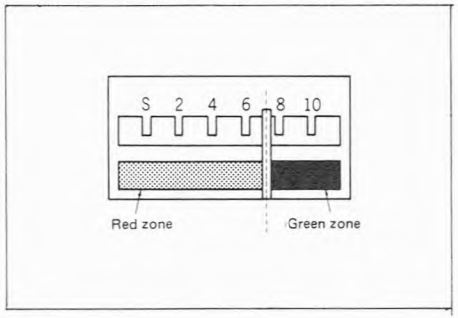
1. Set up the RF signal generator output for a frequency of 435.00MHz, a modulation frequency of 1 KHz, deviation of 3.5 kHz, and a level of 60dB, and couple it to the ANT jack on the Unit.
2. Connect the VTVM to the EXT. SPK jack, and adjust RR38 until the VTVM redds approx. 3.2 V (1.3 W).

- **Meter Adjustment (S meter)**

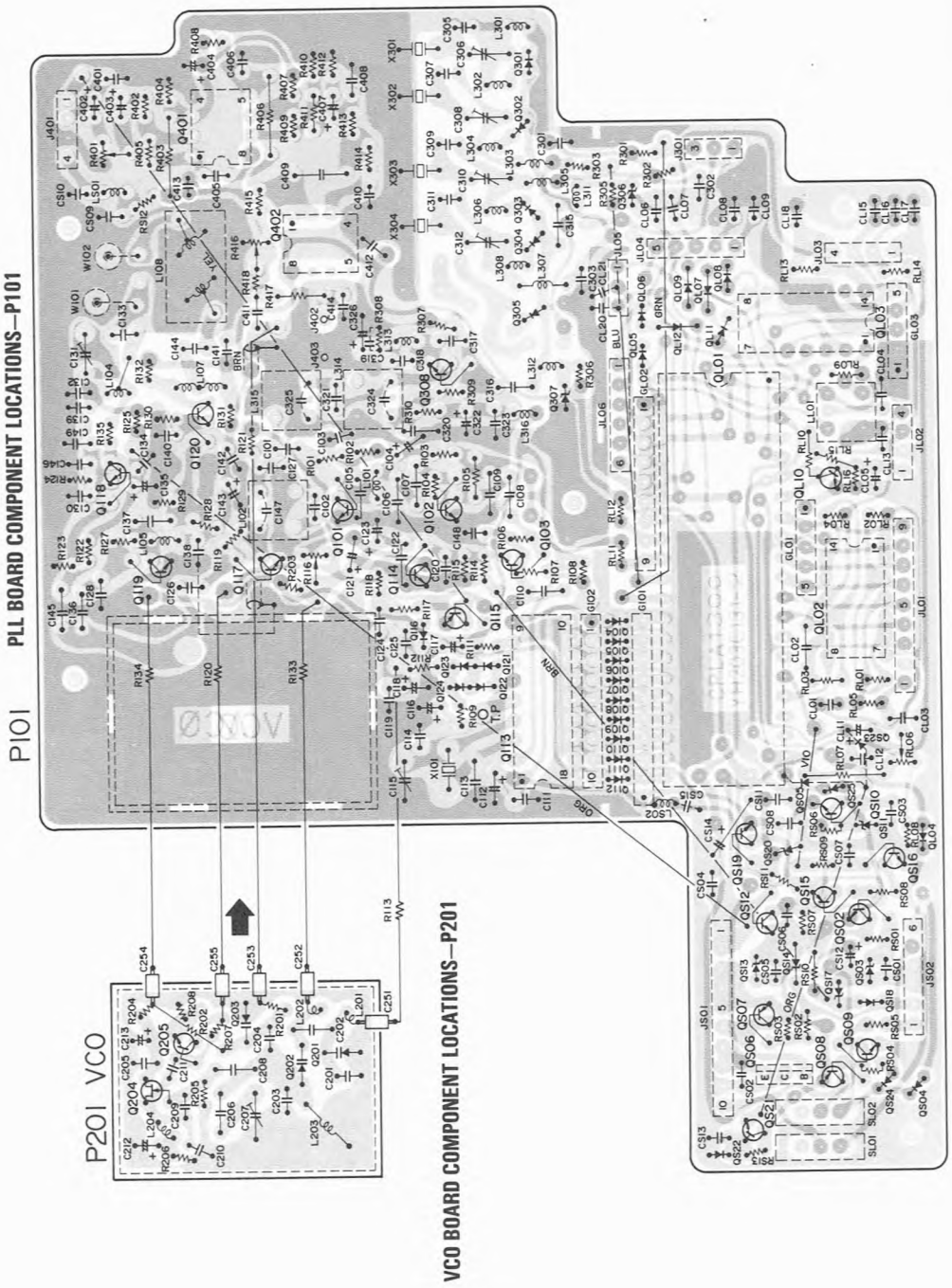
1. After completing sensitivity adjustment, couple a 10dB non-modulated carrier signal from the RF to the ANT jack on the unti. Adjust RR33 until the S meter pointer indicates "6".

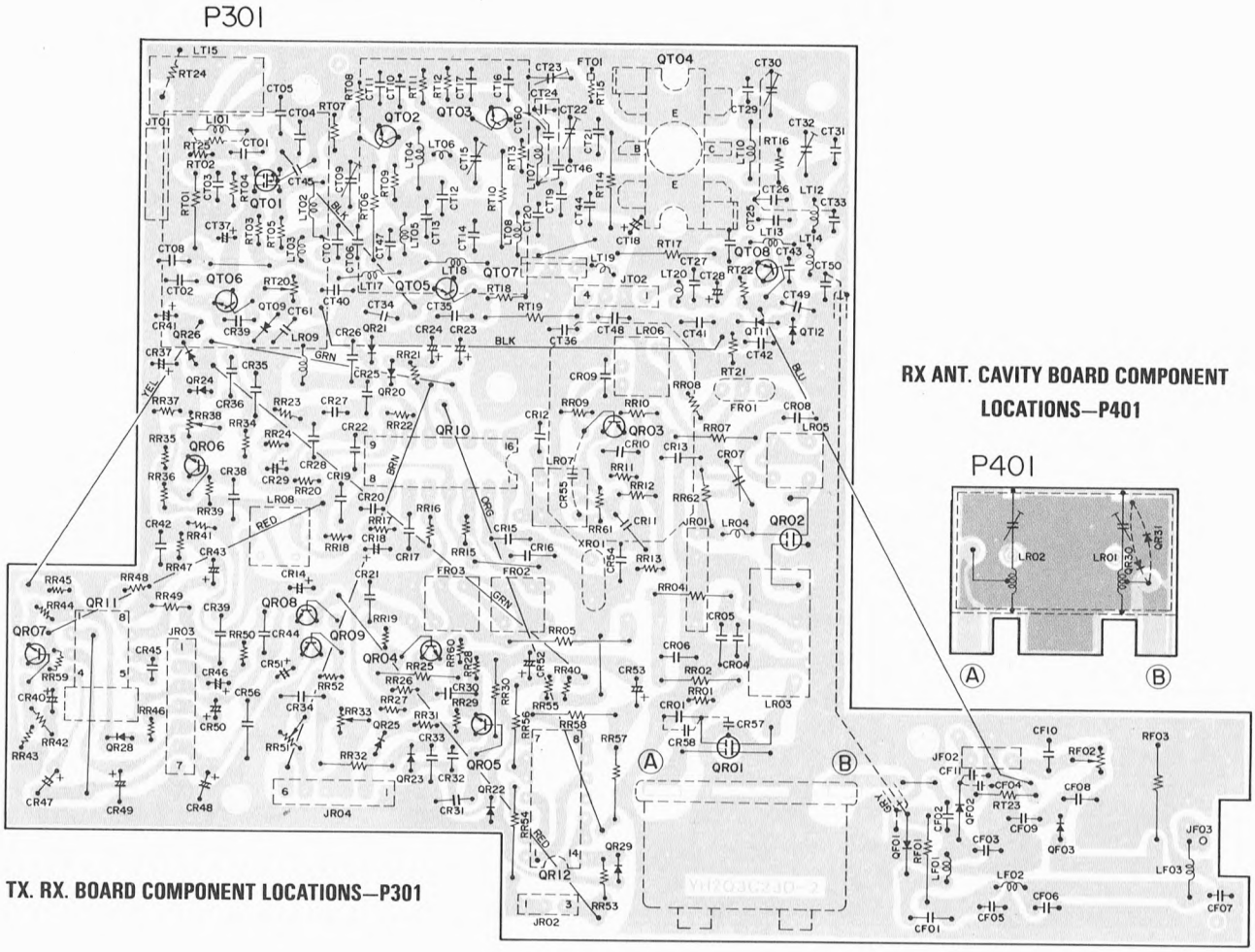
OTHER ADJUSTMENTS

- **Meter Adjustment (battery check)**
1. Set the rear slide switch to BATT CHECK.
2. Set the supply voltage to 9.6V. Adjust R802 until the meter pointer deflects to the boundary of the red and green zones on the meter scale as shown below.



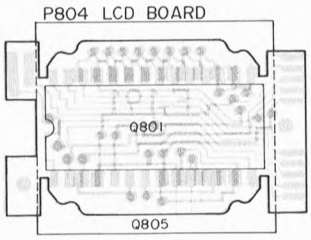
COMPONENT LOCATIONS



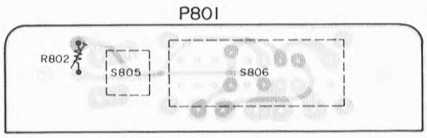


TX. RX. BOARD COMPONENT LOCATIONS—P301

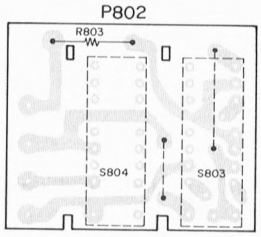
RX ANT. CAVITY BOARD COMPONENT LOCATIONS—P401



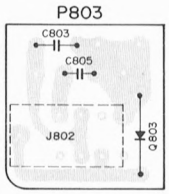
LCD BOARD COMPONENT LOCATIONS—P804



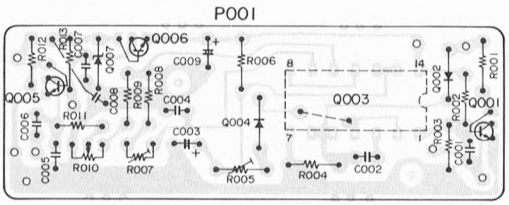
REAR SWITCH BOARD COMPONENT LOCATIONS—P801



FRONT SWITCH BOARD COMPONENT LOCATIONS—P802

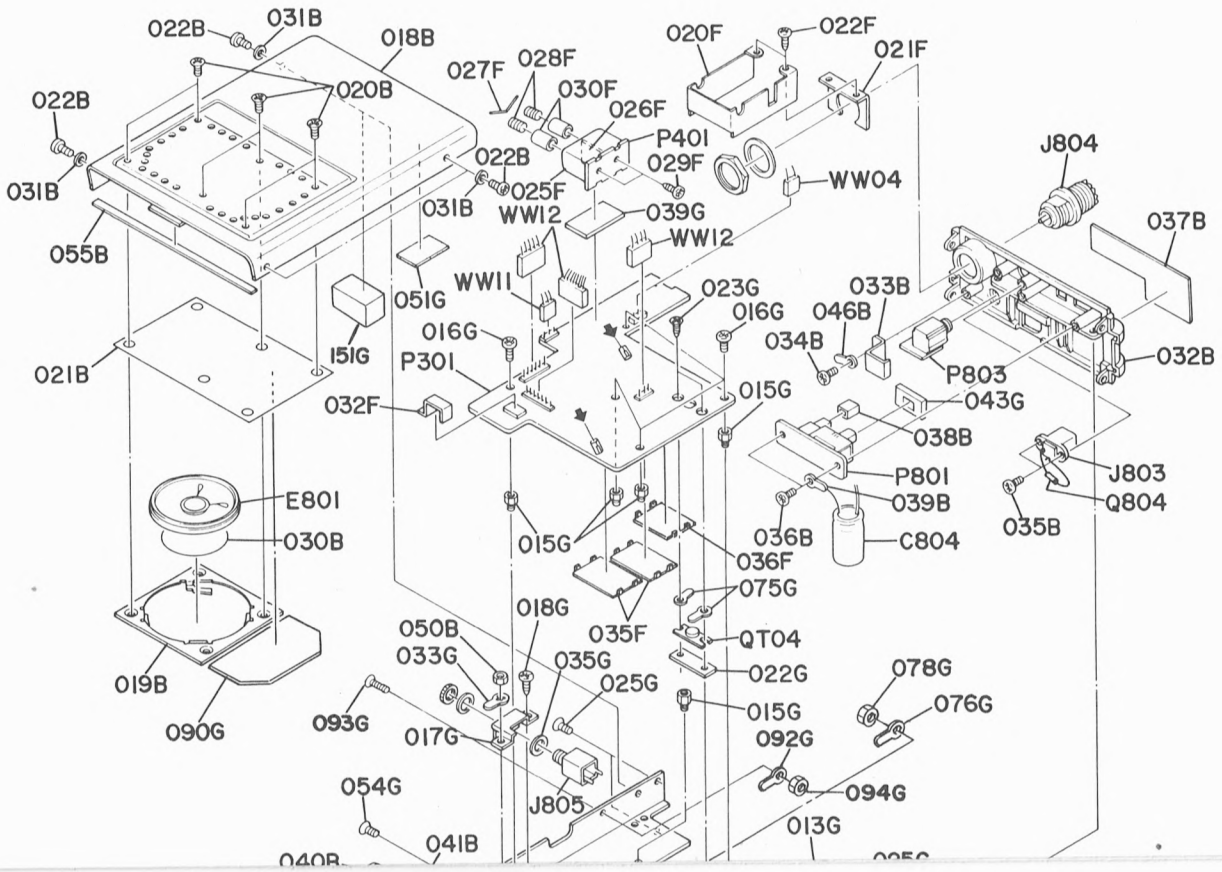


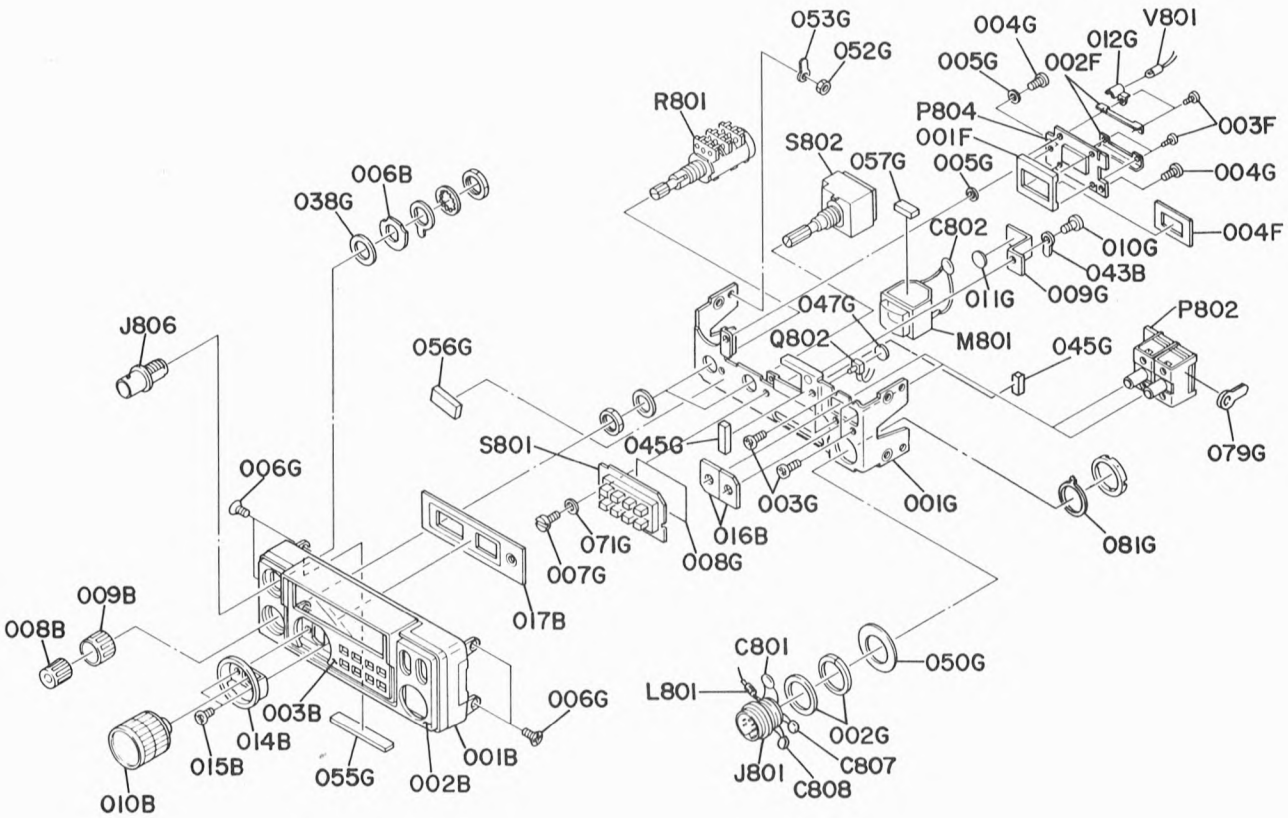
EXT. POWER BOARD COMPONENT LOCATIONS—P803



TONE-BURST BOARD COMPONENT LOCATIONS—P001

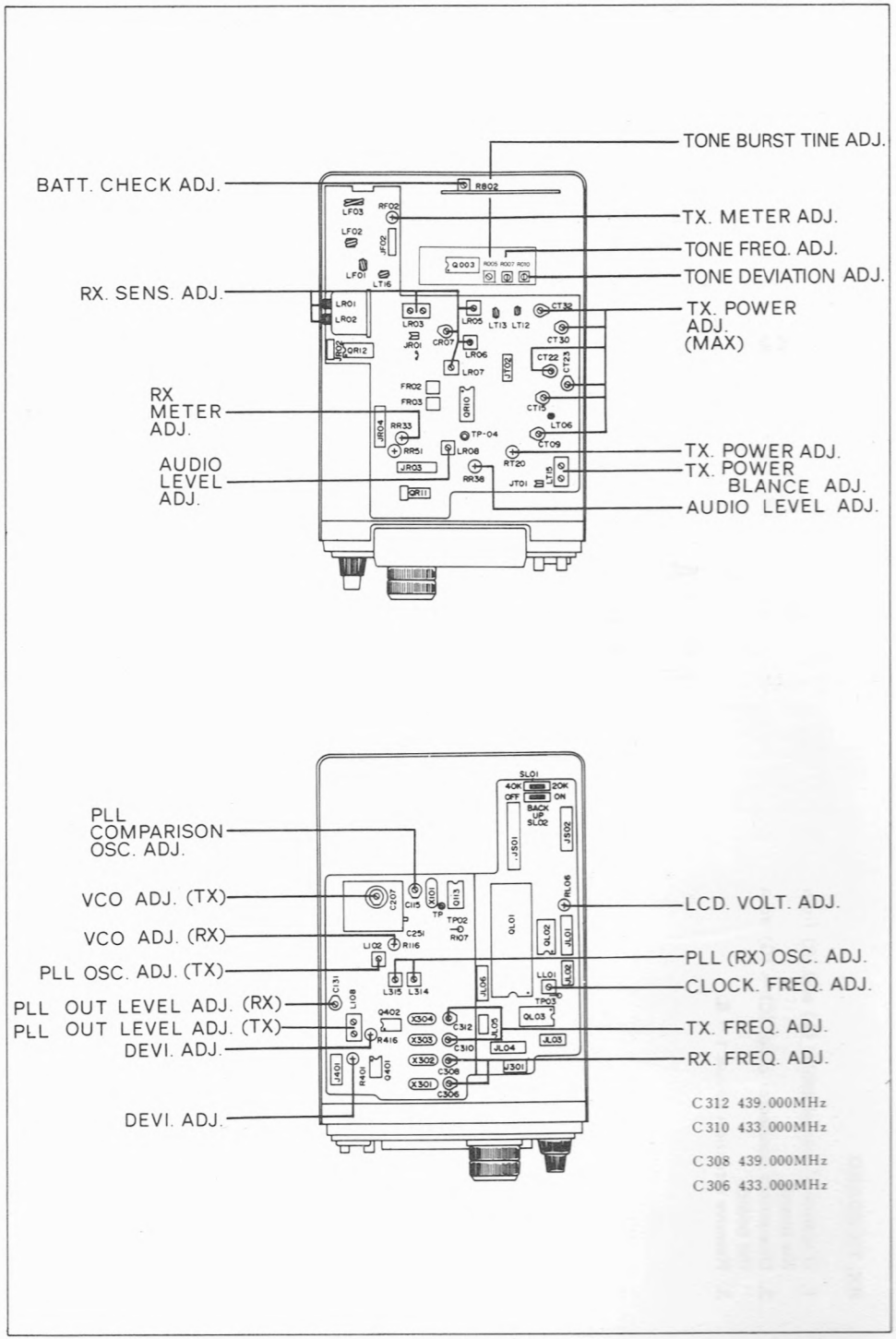
[M01-99] VARIOUS BOARDS AND COMMON PARTS





REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
001B	1	200C064010	Case, Front
002B	1	203C063010	Escutcheon, Mould
003B	1	200C063120	Escutcheon, Acryl
017B	1	200C063030	Escutcheon, Alumi Plate
006B	1	203C114010	Stopper
008B	1	4723154020	Knob, VOL
009B	1	4723154030	Knob, SQL
010B	1	200C154500	Knob, Channel
014B	1	200C353010	Ring
015B	2	51100205E0	B.H.M. Screw B2 x 4
016B	2	200C118010	Spacer, Slide SW
043B	1	62021030W0	Lug
001G	1	200C105010	Chassis, Front
002G	2	4656118010	Spacer
003G	4	51062603A0	P.H.M. Screw P2.6 x 3
004G	2	51060203A0	P.H.M. Screw P2 x 3
005G	2	59020403G0	Washer
006G	4	51042604A0	F.H.M. Screw F2.6 x 4
007G	1	200C005030	Clamper
008G	1	4723120050	Insulator
009G	1	200C005010	Clamper
010G	1	51100204A0	B.H.M. Screw B2 x 4
011G	1	200C056030	Buffer
012G	1	200C271010	Holder, Lamp
038G	1	203C118010	Spacer
045G	2	200C056040	Buffer
047G	1	200C056030	Buffer
050G	1	200C053020	Cover
052G	1	53112603A0	Hexagon Nut
053G	1	62031650W0	Lug

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
055G	1	200C056060	Buffer
056G	1	200C056070	Buffer
057G	1	200C056080	Buffer
071G	1	59264702G9	Washer
079G	1	62031340W0	Lug
081G	1	62150019E0	Lug
001F	1	200C064060	Case, LCD
002F	2	200C005040	Clamper
003F	4	51400019K0	B.H. Tapped Screw
004F	1	200C053030	Cover
C801	1	DK16102300	Ceramic Cap. 1000pF ±10%
C802	1	DK16102300	Ceramic Cap. 1000pF ±10%
C807	1	DD15470370	Ceramic 470pF ±5%
C808	1	DD15470370	Ceramic 470pF ±5%
L801	1	LC12010012	Choke Coil, 8T
M801	1	IM11020030	D.C. Meter
Q802	1	HI10009020	L.E.D.
R801	1	RD12030080	Variable Resistor 20KΩ(A)-20KΩ(B)
S801	1	SK08080020	Keyboard Switch
S802	1	SR18020010	Rotary Switch
V801	1	IN10140080	Lamp, 40mA 14V
J801	1	YJ10001250	Jack, Mic (7P)
J806	1	YJ10001620	Jack, Antenna



ALIGNMENT PROCEDURE

CONDITIONS

* All adjustments have been completed prior to shipment. Further adjustments should be limited to a necessary minimum.
* Make sure that all measuring instruments required for alignment are completely calibrated and operate normally.
* Before starting measurement, idle the instruments for half-an-hour.

Required Measuring Instruments

1. UHF standard signal generator
2. RF power meter
3. Audio signal generator
4. AC/DC voltmeter (VTVM)
5. RF voltmeter
6. Frequency counter
7. Oscilloscope
8. Galvanometer
9. Regulated DC power supply
10. DC ammeter
11. (Spectrum analyzer)
12. (Digital voltmeter)

Required Alignment Tools

1. Philips screwdriver . . . for casing and boards
2. Standard screwdriver. . for trimmer resistor and IF adjustment
3. Non-metallic standard screwdriver . . . . . for RF and trimmer capacitor adjustment
4. Box screwdriver . . . . for support (2.6, 3.0mm)

For RF circuit and frequency adjustment, use a non-metallic screwdriver.

C78 ALIGNMENT PROCEDURE

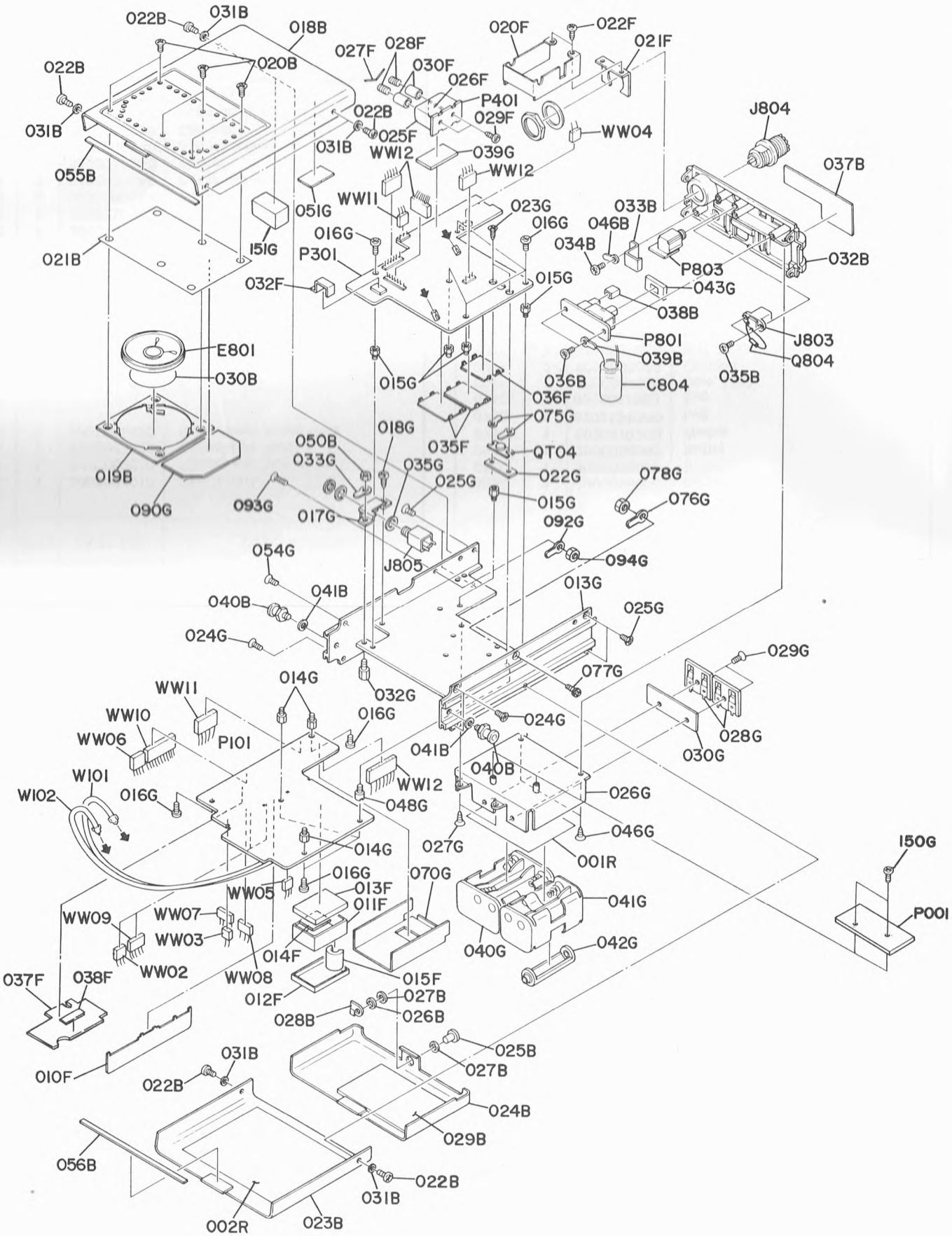
1. Standard Alignment Conditions

Supply voltage:	13.8V DC
Audio output:	0.7 watts
Audio output loading: . . .	8.0Ω
Frequency deviation: . . .	±3.5kHz
Modulation frequency: . .	1kHz
Transmitter load:	50Ω
Reception frequency: . . .	435.00MHz
Transmission frequency: .	435.20MHz

2. Alignment Notes

Handle all trimmer resistors and capacitors gently. Unless otherwise specified, set the switches and controls as follows:

1. SQL:	Minimum
2. VOL:	Minimum or most adequate level
3. SCAN MODE switch: . .	FREE
4. RPT switch:	S
5. CHANNEL STEP switch:	50kHz
6. Supply voltage:	13.8V DC
7. Frequency:	RX: 435.00MHz TX: 435.20MHz


022B
031B
018B
020B
027F
028F
030F
026F
P401
029F
025F
039G
WW12
WW11
051G
151G
016G
P301
032F
015G
020F
022F
021F
WW04
J804
037B
033B
046B
034B
P803
032B
043G
038B
P801
039B
036B
C804
J803
Q804
035B
036F
075G
035F
QT04
022G
078G
076G
092G
094G
013G
025G
029G
028G
030G
077G
024G
041B
040B
026G
046G
001R
027G
040G
042G
041G
150G
P001
070G
013F
011F
014F
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027B
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031B
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056B
010F
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038F
WW09
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WW03
WW02
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WW05
WW10
WW06
P101
W101
W102
048G
014G
016G
032G
054G
041B
040B
024G
050B
033G
035G
025G
017G
093G
090G
019B
E801
030B
055B
021B

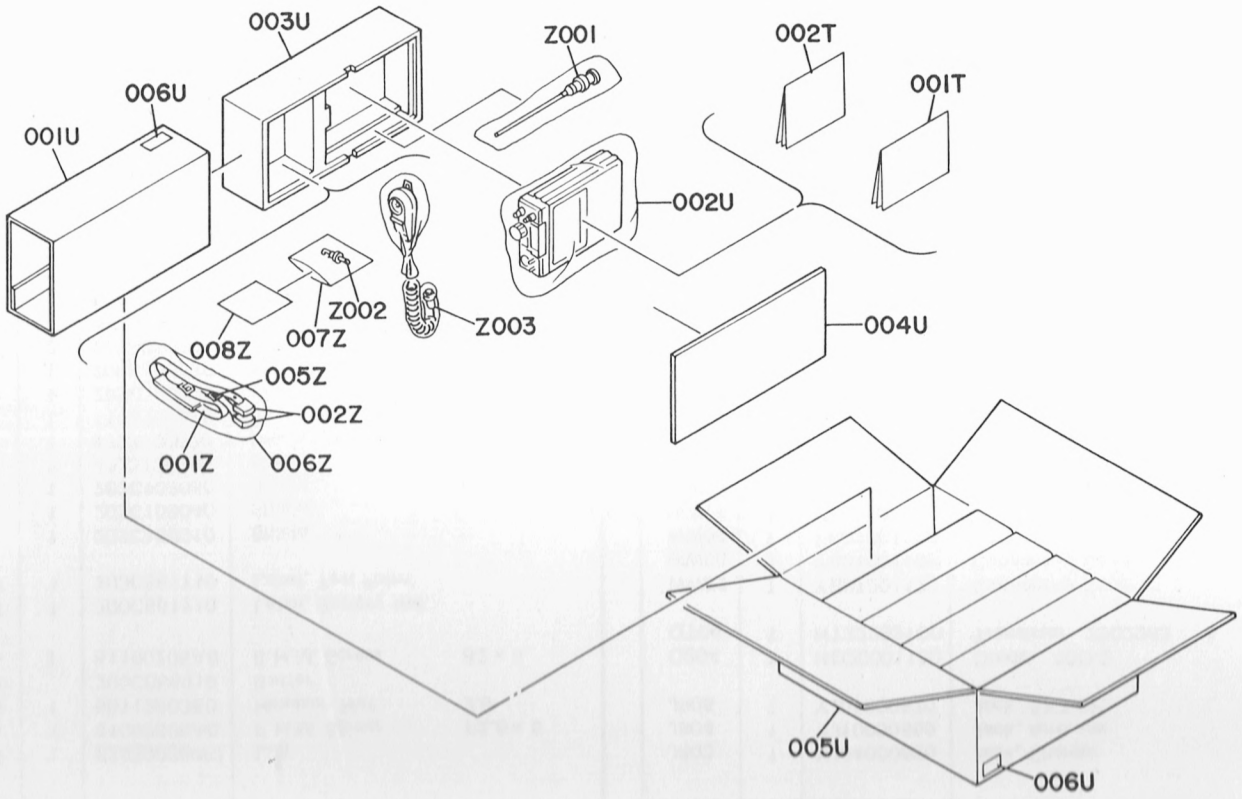
REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
018B	1	203C257010	Lid, Upper Case
019B	1	200C160010	Bracket, Speaker
020B	6	51142606S0	O.C.H.M. Screw 2.6 x 6
021B	1	200C202010	Net, Speaker
022B	6	51402604T0	B.H. Tapped Screw B2.6 x 4
023B	1	200C257020	Lid, Bottom Case
024B	1	200C257030	Lid, Battery Case
025B	1	200C102030	Lock
026B	1	200C055010	Collar
027B	2	59069505G9	Washer
028B	1	200C102040	Lock
029B	1	200C056020	Buffer
030B	1	200C120060	Insulator, Speaker
031B	6	54012600A0	Washer
032B	1	200C064020	Case, Rear
033B	1	200C005020	Clamper
034B	1	51102604E0	B.H.M. Screw B2.6 x 4
035B	2	51100204E0	B.H.M. Screw B2 x 4
036B	2	51102604E0	B.H.M. Screw B2.6 x 4
037B	1	200C265310	Indicator
038B	1	200C270010	Button
039B	1	62261240W0	Lug
040B	2	200C155010	Hanger
041B	2	54040402B0	Spring Washer
046B	1	62261240W0	Lug
050B	1	53110303E9	Hexagon Nut
055B	1	200C118040	Spacer
056B	1	200C118040	Spacer
013G	1	200C105110	Chassis, H
014G	3	200C101010	Support

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
015G	5	200C101020	Support
016G	10	51102604A0	B.H.M. Screw B2.6 x 4
017G	1	200C160020	Bracket, EXT Speaker
018G	1	51400305P0	B.H. Tapped Screw B3 x 5
022G	1	200C267010	Heatsink
023G	2	51382608P0	P.H. Tapped Screw P2.6 x 8
024G	3	51042604A0	F.H.M. Screw F2.6 x 4
025G	4	51042604A0	F.H.M. Screw F2.6 x 4
026G	1	200C064310	Case, Battery Tray
027G	2	51342605P0	F.H. Tapped Screw F2.6 x 5
028G	2	200C123110	Contactor
029G	2	51342605P0	F.H. Tapped Screw F2.6 x 5
030G	1	200C120040	Insulator
032G	1	200C101030	Support
033G	1	62030039W0	Lug, Ear Jack
035G	1	200C118030	Spacer
039G	1	203C118020	Spacer
040G	1	200C064040	Case, Battery (6)
041G	1	200C064050	Case, Battery (4)
042G	1	200C121010	Link, Dummy
043G	1	200C118020	Spacer
046G	2	51342605P0	F.H. Tapped Screw F2.6 x 5
048G	1	203C101010	Support
051G	1	200C056050	Buffer
054G	1	51042606A0	F.H.M. Screw F2.6 x 6
070G	1	200C053120	Cover
075G	2	62261240W0	Lug
076G	1	1210005010	Lug
077G	1	51042604A0	F.H.M. Screw F 2.6 x 4
078G	1	53112603E0	Hexagon Nut 2.6
090G	1	200C053040	Buffer

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
092G	1	62030039W0	Lug
093G	1	51042605A0	F.H.M. Screw F2.6 x 5
094G	1	53112603E0	Hexason Nut 2.6
151G		203C056010	Buffer
150G	1	51100205A0	B.H.M. Screw B2 x 5
001R	1	200C861110	Label, Battery Ind.
002R	1	203C861110	Label, Test Point
010F	1	203C109010	Shield
011F	1	203C109040	Shield
012F	1	203C109060	Shield
013F	1	4723109240	Shield
014F	1	4723120020	Insulator
015F	1	1143259010	Bushing
020F	1	203C109020	Shield
021F	1	203C109030	Shield
022F	2	51282605B0	B.H. Tapped Screw B2.6 x 5
025F	1	4724109120	Shield
026F	1	4724109130	Shield
027F	1	4724115010	Spring
028F	2	4724161020	Ferric Core
029F	2	51282606B0	B.H. Tapped Screw B2.6 x 6
030F	2	4724275010	Bobin
032F	1	200C267030	Heatsink
035F	2	203C109070	Shield
036F	1	203C109080	Shield
037F	1	203C109090	Shield
038F	1	4295120060	Insulator
E801	1	QK00578010	Speaker, 57mm
C804	1	EA10802530	Elect Cap. 1000μF 25V

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
J803	1	YJ04000620	Jack, Charger
J804	1	YJ10000550	Jack, Antenna
J805	1	YJ01000570	Jack, EXT SP.
Q804	1	HD20001100	Diode 10D-2
QT04	1	HT322831O0	Transistor 2SC2283
WW02	1	YB01001170	Connective Cord
WW03	1	YB01001180	Connective Cord
WW04	1	YB01001190	Connective Cord
WW05	1	YB01001202	Connective Cord
WW06	1	YB01001210	Connective Cord
WW07	1	YB01001220	Connective Cord
WW08	1	YB01001230	Connective Cord
WW09	1	YB01001240	Connective Cord
WW10	1	YB01001250	Connective Cord
WW11	1	YB01001260	Connective Cord
WW12	1	YB01001272	Connective Cord
W101	1	YB01001300	Connective Cord
W102	1	YB01001310	Connective Cord

PACKAGING



REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
001T	1	203C851010	Instructions
002T	1	203C856020	Circuit Diagram
001U	1	203C804020	Packing Case
002U	1	9012035010	Polyethylene Bag
003U	1	200C809010	Cushion
004U	1	200C803010	Partitioner
005U	1	203C505020	Master Carton
006U	3	9523019010	Serial No. Card

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
001Z	1	4223156010	Strap
002Z	2	200C155500	Hanger, (K)
005Z	1	200C155020	Hanger, Mic
006Z	1	9011020010	Polyethylene Bag
007Z	1	9010510010	Polyethylene Bag
008Z	1	200C851130	Instructions
Z001	1	YR01010020	Whip Antenna
Z002	1	YP01000310	Plug, Non Short
Z003	1	MP11000690	Microphone

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
001T	1	203C851010	Instructions
002T	1	203C856020	Circuit Diagram
001U	1	203C804020	Packing Case
002U	1	9012035010	Polyethylene Bag
003U	1	200C809010	Cushion
004U	1	200C803010	Partitioner
005U	1	203C505020	Master Carton
006U	3	9523019010	Serial No. Card

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
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002Z	2	200C155500	Hanger, (K)
005Z	1	200C155020	Hanger, Mic
006Z	1	9011020010	Polyethylene Bag
007Z	1	9010510010	Polyethylene Bag
008Z	1	200C851130	Instructions
Z001	1	YR01010020	Whip Antenna
Z002	1	YP01000310	Plug, Non Short
Z003	1	MP11000690	Microphone

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
			P101-PLL CIRCUIT BOARD
P101	1	YH203C1310	P.W. Board, PLL
			P101-CAPACITORS
CL01	1	DS17153010	Semicon 0.015μF ±20%
CL02	1	DS17153010	Semicon 0.015μF ±20%
CL03	1	DS17182010	Semicon 8200pF ±20%
CL04	1	DF16102300	Film 0.001μF ±10%
CL05	1	EV47403560	Elect. 0.47μF 35V
CL06	1	DD15220370	Ceramic 22pF ±5%
CL07	1	DD15220370	Ceramic 22pF ±5%
CL08	1	DD15220370	Ceramic 22pF ±5%
CL09	1	DD15220370	Ceramic 22pF ±5%
CL11	1	EA22601630	Elect 22μF 16V
CL12	1	DK18103030	Ceramic 0.01μF
CL13	1	DK16102300	Ceramic 0.001μF ±10%
CL14	1	DK16102300	Ceramic 0.001μF ±10%
CL15	1	DK16102300	Ceramic 0.001μF ±10%
CL16	1	DK16102300	Ceramic 0.001μF ±10%
CL17	1	DK16102300	Ceramic 0.001μF ±10%
CL18	1	DK16102300	Ceramic 0.001μF ±10%
CL20	1	DD10050300	Ceramic 5pF ±0.025pF
CL21	1	DD10050300	Ceramic 5pF ±0.025pF
CS01	1	DK16102300	Ceramic 0.001μF ±10%
CS02	1	DK16102300	Ceramic 0.001μF ±10%
CS03	1	DK16102300	Ceramic 0.001μF ±10%
CS04	1	DK16102300	Ceramic 0.001μF ±10%
CS05	1	DK16102300	Ceramic 0.001μF ±10%
CS06	1	DK16102300	Ceramic 0.001μF ±10%
CS07	1	DK16102300	Ceramic 0.001μF ±10%
CS08	1	DK16102300	Ceramic 0.001μF ±10%
CS09	1	DK16102300	Ceramic 0.001μF ±10%
CS10	1	DK16102300	Ceramic 0.001μF ±10%

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
CS11	1	DK16102300	Ceramic 0.001μF ±10%
CS12	1	EJ10601610	Elect 10μF 16V
CS13	1	DK16102300	Ceramic 0.001μF ±10%
CS14	1	EA47601630	Elect 47μF 16V
C101	1	DD10050300	Ceramic 5pF ±0.25pF
C102	1	DD10030300	Ceramic 3pF ±0.25pF
C103	1	DK16102300	Ceramic 0.001μF ±10%
C104	1	EJ10601610	Elect 10μF 16V
C105	1	DD15151370	Ceramic 150pF ±5%
C106	1	DD15151370	Ceramic 150pF ±5%
C107	1	DD15101350	Ceramic 100pF ±5%
C108	1	DD15101350	Ceramic 100pF ±5%
C109	1	DK18103310	Ceramic 0.01μF
C110	1	DK16122300	Ceramic 1200pF ±10%
C111	1	DK16102300	Ceramic 0.001μF ±10%
C112	1	EV10601660	Elect 10μF 16V
C113	1	DD15390300	Ceramic 39pF ±5%
C114	1	DD15150300	Ceramic 15pF ±5%
C115	1	CT12000090	Trimming 20pF
C116	1	EV22601060	Elect 22μF 10V
C117	1	EV47501060	Elect 4.7μF 10V
C118	1	EV10403560	Elect 0.1μF 35V
C119	1	DK16102300	Ceramic 0.001μF ±10%
C120	1	DK16102300	Ceramic 0.001μF ±10%
C121	1	EV22601660	Elect 22μF 16V
C122	1	DK18102030	Ceramic 0.001μF
C123	1	EV47403560	Elect 0.47μF 35V
C124	1	DK16102300	Ceramic 0.001μF ±10%
C125	1	DK16102300	Ceramic 0.001μF ±10%
CS15	1	DK16102300	Ceramic 0.001μF ±10%
CS16	1	EV47501060	Elect. 4.7μF 10V

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
C126	1	DD10050300	Ceramic 5pF ±0.25pF
C127	1	DK16102300	Ceramic 0.001μF ±10%
C128	1	DD15430300	Ceramic 43pF ±5%
C130	1	DK16102300	Ceramic 0.001μF ±10%
C131	1	CT10600090	Trimming 6pF
C132	1	DK17102010	Ceramic 0.001μF ±20%
C133	1	DD10050300	Ceramic 5pF ±0.25pF
C134	1	DK16102300	Ceramic 0.001μF ±10%
C135	1	EJ10405010	Elect 0.1μF 50V
C136	1	DD15240300	Ceramic 24pF ±5%
C137	1	DD15200300	Ceramic 20pF ±5%
C138	1	DK16102300	Ceramic 0.001μF ±10%
C139	1	DD15470370	Ceramic 47pF ±5%
C140	1	DK16102300	Ceramic 0.001μF ±10%
C141	1	DK16102300	Ceramic 0.001μF ±10%
C142	1	DK16102300	Ceramic 0.001μF ±10%
C143	1	EJ10405010	Elect 0.1μF 50V
C144	1	DD15160300	Ceramic 16pF ±5%
C145	1	DD15180300	Ceramic 18pF ±5%
C146	1	DD15470370	Ceramic 47pF ±5%
C147	1	DD10020300	Ceramic 2pF ±0.25pF
C148	1	DD10020300	Ceramic 2pF ±0.25pF
C149	1	DK18502010	Ceramic 0.005μF
C301	1	DK18103030	Ceramic 0.01μF
C302	1	DK18103030	Ceramic 0.01μF
C303	1	DK18103030	Ceramic 0.01μF
C305	1	DD10040300	Ceramic 4pF ±0.25pF
C306	1	CT11000020	Trimming 10pF
C307	1	DD10040300	Ceramic 4pF ±0.25pF
C308	1	CT11000020	Trimming 10pF
C309	1	DD10040300	Ceramic 4pF ±0.25pF

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
C310	1	CT11000020	Trimming 10pF
C311	1	DD10040300	Ceramic 4pF ±0.25pF
C312	1	CT11000020	Trimming 10pF
C315	1	DK18103310	Ceramic 0.01μF
C316	1	DK18103310	Ceramic 0.01μF
C317	1	DD15101050	Ceramic 100pF ±5%
C318	1	DD15620010	Ceramic 62pF ±5%
C319	1	DK18103310	Ceramic 0.01μF
C320	1	DK18103310	Ceramic 0.01μF
C321	1	DD10015300	Ceramic 1.5pF ±0.25pF
C322	1	EA10602530	Elect 10μF 25V
C323	1	DK16102300	Ceramic 0.001μF ±10%
C324	1	DD10020300	Ceramic 2pF ±0.25pF
C325	1	DD10020300	Ceramic 2pF ±0.25pF
C401	1	DK16102300	Ceramic 0.001μF ±10%
C402	1	EJ22505010	Elect 2.2μF 50V
C403	1	EV10403560	Elect 0.1μF 35V
C404	1	EJ22505010	Elect 2.2μF 50V
C405	1	DK16471300	Ceramic 470pF ±10%
C406	1	DK16471300	Ceramic 470pF ±10%
C407	1	EV22403560	Elect 0.22μF 35V
C408	1	DF16103300	Film 0.01μF ±10%
C409	1	DF17823300	Film 0.082μF ±20%
C410	1	DK16391300	Ceramic 390pF ±10%
C411	1	DF16472300	Film 4700pF ±10%
C412	1	DK16102300	Ceramic 0.001μF ±10%
C413	1	DK16102300	Ceramic 0.001μF ±10%
C326	1	EV22403560	Elect. 0.22μF 35V
C414	1	DK16102300	Ceramic 0.001μF ±10%

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
			P101-RESISTORS
			(All Resistors are ±5% and ¼W)
RL01	1	GD05103180	10KΩ 1/8W
RL02	1	GD05103180	10KΩ 1/8W
RL03	1	GD05822180	8.2KΩ 1/8W
RL04	1	GD05103180	10KΩ 1/8W
RL05	1	GD05103140	10KΩ
RL06	1	RA01020330	1KΩ(B) Trimming
RL07	1	GD05272140	2.7KΩ
RL08	1	GD05152140	1.5KΩ
RL09	1	GD05333140	33KΩ
RL10	1	GD05104140	100KΩ
RL11	1	GD05393140	39KΩ
RL12	1	GD05473140	47KΩ
RL13	1	GD05472140	4.7KΩ
RL14	1	GD05563140	56KΩ
RL15	1	GD05563180	56KΩ 1/8W
RL16	1	GD05563180	56KΩ 1/8W
RS01	1	GD05333140	33KΩ
RS02	1	GD05332140	3.3KΩ
RS03	1	GD05103140	10KΩ
RS04	1	GD05102140	1KΩ
RS05	1	GD05103140	10KΩ
RS06	1	GD05682140	6.8KΩ
RS07	1	GD05392140	3.9KΩ
RS08	1	GD05223140	22KΩ
RS09	1	GD05474140	470KΩ
RS10	1	GD05103140	10KΩ
RS11	1	GD05103140	10KΩ
RS12	1	GD05102140	1KΩ
RS13	1	GD05333140	33KΩ

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
R101	1	GD05104140	100KΩ
R102	1	GD05222140	2.2KΩ
R103	1	GD05101140	100Ω
R104	1	GD05224140	220KΩ
R105	1	GD05332140	3.3KΩ
R106	1	GD05823140	82KΩ
R107	1	GD05681140	680Ω
R108	1	GD05101140	100Ω
R109	1	GD05221140	220Ω
R110	1	GD05221140	220Ω
R111	1	GD05332140	3.3KΩ
R112	1	GD05822140	8.2KΩ
R113	1	RC00000140	0Ω
R114	1	GD05822140	8.2KΩ
R115	1	GD05272140	2.7KΩ
R116	1	RA04720120	4.7KΩ Trimming
R117	1	GD05273140	27KΩ
R118	1	GD05103140	10KΩ
R119	1	GD05224140	220KΩ
R120	1	GD05101140	100Ω
R121	1	GD05182140	1.8KΩ
R122	1	GD05472140	4.7KΩ
R123	1	GD05391140	390Ω
R124	1	GD05101140	100Ω
R125	1	GD05101140	100Ω
R127	1	GD05563140	56KΩ
R128	1	GD05103140	10KΩ
R129	1	GD05102140	1KΩ
R130	1	GD05470140	47Ω

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
R131	1	GD05101140	100Ω
R132	1	GD05681140	680Ω
R133	1	GD05473140	47KΩ
R134	1	RC00000140	0Ω
R135	1	GD05027180	2.7Ω 1/8W
R203	1	GD05222140	2.2KΩ
R301	1	GD05182140	1.8KΩ
R302	1	GD05182140	1.8KΩ
R303	1	GD05182140	1.8KΩ
R305	1	GD05222140	2.2KΩ
R306	1	GD05222140	2.2KΩ
R307	1	GD05152140	1.5KΩ
R308	1	GD05471140	470Ω
R309	1	GD05182140	1.8KΩ
R310	1	GD05151140	150Ω
R401	1	RA01020330	1KΩ Trimming
R402	1	GD05152140	1.5KΩ
R403	1	GD05472140	4.7KΩ
R404	1	GD05472140	4.7KΩ
R405	1	GD05334140	330KΩ
R406	1	GD05472140	4.7KΩ
R407	1	GD05153140	15KΩ
R408	1	GD05104140	100KΩ
R409	1	GD05105140	1MΩ
R410	1	GD05123140	12KΩ
R411	1	GD05123140	12KΩ
R412	1	GD05333140	33KΩ
R413	1	GD05822140	8.2KΩ
R414	1	GD05822140	8.2KΩ
R415	1	GD05822140	8.2KΩ
R416	1	RA01020330	1KΩ Trimming
R417	1	GD05473140	47KΩ
R418	1	GD05103180	10KΩ 1/8W

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
GL01	1	BW10563020	56KΩ Resistor Compo.
GL02	1	BW10563020	56KΩ Resistor Compo.
GL03	1	BW10563020	56KΩ Resistor Compo.
G101	1	BW10823010	82KΩ
G102	1	BW10393010	39KΩ
			P101-SEMICONDUCTORS
QL01	1	HC10041060	IC μPD650C
QL02	1	HC10014170	IC MC14011BCP
QL03	1	HC10012170	IC MC14016BCP
QL04	1	HD20011050	Diode 1S1555
QL05	1	HD20011050	Diode 1S1555
QL06	1	HD20011050	Diode 1S1555
QL07	1	HD20011050	Diode 1S1555
QL08	1	HD20011050	Diode 1S1555
QL09	1	HD20011050	Diode 1S1555
QL10	1	HT305360F0	Transistor 2SC536F
QL11	1	HD20011050	Diode 1S1555
QL12	1	HD20011050	Diode 1S1555
QS02	1	HT309451Q0	Transistor 2SC945(Q)
QS03	1	HD30077090	Zener XZ062
QS04	1	HD20011050	Diode 1S1555
QS05	1	HD20011050	Diode 1S1555
QS06	1	HC10022060	IC μPC78L08
QS07	1	HT107381B0	Transistor 2SA738(B)
QS08	1	HT107381B0	Transistor 2SA738(B)
QS09	1	HT309451Q0	Transistor 2SC945(Q)
QS10	1	HT312131B0	Transistor 2SC1213(B)
QS11	1	HD30078090	Zener XZ076

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
QS12	1	HT313681B0	Transistor 2SC1368(B)
QS13	1	HD30060090	Zener XZ090
QS14	1	HD20011050	Diode 1S1555
QS15	1	HT107381B0	Transistor 2SA738(B)
QS16	1	HT309451Q0	Transistor 2SC945(Q)
QS17	1	HD30033090	Zener WZ052
QS18	1	HD20011050	Diode 1S1555
QS19	1	HT309451Q0	Transistor 2SC945(Q)
QS20	1	HD30078090	Zener XZ076
QS21	1	HT309451Q0	Transistor 2SC945(Q)
QS22	1	HD30077090	Zener XZ062
QS23	1	HD20011050	Diode 1S1555
QS24	1	HV00002060	Varistor VD1212
QS25	1	HD20011050	Diode IS1555
Q101	1	HT305351B0	Transistor 2SC535(B)
Q102	1	HT304601B0	Transistor 2SC460(B)
Q103	1	HT304601B0	Transistor 2SC460(B)
Q104	1	HV00002060	Varistor VD1212
Q105	1	HV00002060	Varistor VD1212
Q106	1	HV00002060	Varistor VD1212
Q107	1	HV00002060	Varistor VD1212
Q108	1	HV00002060	Varistor VD1212
Q109	1	HV00002060	Varistor VD1212
Q110	1	HV00002060	Varistor VD1212
Q111	1	HV00002060	Varistor VD1212
Q112	1	HV00002060	Varistor VD1212
Q113	1	HC10011170	IC MC145106P
Q114	1	HT309451Q0	Transistor 2SC945(Q)
Q115	1	HT107331R0	Transistor 2SA733(R)
Q116	1	HD20011050	Diode 1S1555
Q117	1	HT305351B0	Transistor 2SC535(B)

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
Q118	1	HT326440O0	Transistor 2SC2644
Q119	1	HT305351B0	Transistor 2SC535(B)
Q120	1	HT326440O0	Transistor 2SC2644
Q121	1	HD20011050	Diode IS1555
Q122	1	HD20011050	Diode IS1555
Q123	1	HD20011050	Diode IS1555
Q124	1	HD20011050	Diode IS1555
Q301	1	HD20011050	Diode 1S1555
Q302	1	HD20011050	Diode 1S1555
Q303	1	HD20011050	Diode 1S1555
Q304	1	HD20011050	Diode 1S1555
Q306	1	HD300330Q0	Zener WZ052
Q307	1	HD300330Q0	Zener WZ052
Q308	1	HT304611B0	Transistor 2SC461(B)
Q401	1	HC10003090	IC NJM4558D
Q402	1	HC10003090	IC NJM4558D
			P101-MISCELLANEOUS
JL01	1	YJ07000490	Jack (9P)
JL02	1	YJ07000440	Jack (4P)
JL03	1	YJ07000440	Jack (4P)
JL04	1	YJ07000450	Jack (5P)
JL05	1	YJ07000430	Jack (3P)
JL06	1	YJ07000460	Jack (6P)
JS01	1	YJ07000500	Jack (10P)
JS02	1	YJ07000460	Jack (6P)
J301	1	YJ07000430	Jack (3P)
J401	1	YJ07000440	Jack (4P)
J402	1	YP10002210	Plug
J403	1	YP10002210	Plug
LL01	1	LI70329040	I.F.T. Coil, Control Clock
LS01	1	LC11020070	Choke Coil, 1μH
LS02	1	LC11040010	Choke Coil, 100μH

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
L101	1	LC14730050	Choke Coil, 47μH
L102	1	LA70280030	Antenna Coil, VCO Buff.
L104	1	LC15000140	Choke Coil, 2T
L105	1	LC11020070	Choke Coil, 1μH
L107	1	LM42518010	Twist Coil, 5T
L108	1	LA70260060	Antenna Coil, Cavity
L301	1	LC12230090	Choke Coil, 22μH
L302	1	LC11220030	Choke Coil, 1.2μH
L303	1	LC12230090	Choke Coil, 22μH
L304	1	LC11220030	Choke Coil, 1.2μH
L305	1	LC12230090	Choke Coil, 22μH
L306	1	LC11220030	Choke Coil, 1.2μH
L307	1	LC12230090	Choke Coil, 22μH
L308	1	LC11220030	Choke Coil, 1.2μH
L311	1	LC13940010	Choke Coil, 390μH
L312	1	LC13940010	Choke Coil, 390μH
L313	1	LC11020070	Choke Coil, 1μH
L314	1	LA70280030	Antenna Coil, PLL Local OSC
L315	1	LA70280030	Antenna Coil, PLL Local OSC
L316	1	LC13940010	Choke Coil, 390μH
SL01	1	SS01020340	Slide Switch, CH Step 20K-40K
SL02	1	SS01020340	Slide Switch, Back Up
W101	1	YB01001300	Connective Cord
W102	1	YB01001310	Connective Cord
X101	1	XY41024002	Crystal 10.24MHz
X301	1	XB303007G2	Crystal 40.0825MHz
X302	1	XB303008G2	Crystal 40.5825MHz
X303	1	XB303009G2	Crystal 42.2225MHz
X304	1	XB303010G2	Crystal 42.7225MHz

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
			P201-VCO CIRCUIT BOARD
P201	1	YF203C0010	P.W. Board, VCO
			P201-CAPACITORS
C201	1	DD10020300	Ceramic 2pF ±0.25pF
C202	1	DD15330300	Ceramic 33pF ±5%
C203	1	DD10030300	Ceramic 3pF ±0.25pF
C204	1	DD10010300	Ceramic 1pF ±0.25pF
C205	1	DK16102300	Ceramic 0.001μF ±10%
C206	1	DD15150300	Ceramic 15pF ±5%
C207	1	CT10600090	Trimming 6pF
C208	1	DD15240300	Ceramic 24pF ±5%
C209	1	DD11100300	Ceramic 10pF ±0.5pF
C210	1	DD11100300	Ceramic 10pF ±0.5pF
C211	1	DD15150300	Ceramic 15pF ±5%
C212	1	EV33501660	Elect 3.3μF 16V
C213	1	EJ10601610	Elect 10μF 16V
C251	1	DC18202020	Feedthru 2000pF
C252	1	DC18202020	Feedthru 2000pF
C253	1	DC18202020	Feedthru 2000pF
C254	1	DC18202020	Feedthru 2000pF
C255	1	DC18202020	Feedthru 2000pF
			P201-RESISTORS
			(All Resistors are ±5% and ¼W)
R201	1	GD05103140	10KΩ
R202	1	GD05473140	47KΩ
R204	1	GD05101140	100Ω
R205	1	GD05104140	100KΩ
R206	1	GD05101140	100Ω
R207	1	GD05104140	100KΩ
R208	1	GD05560140	56Ω

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
			P201-SEMICONDUCTORS
Q201	1	HD40001060	Varicap 1SV50
Q202	1	HD40001060	Varicap 1SV50
Q203	1	HD40001060	Varicap 1SV50
Q204	1	HT200191B0	F.E.T. 2SK19-GR
Q205	1	HT305351C0	Transistor 2SC535(C)
			P201-MISCELLANEOUS
L201	1	LC12720080	Choke Coil, 2.7μH
L202	1	LC12720080	Choke Coil, 2.7μH
L203	1	LA70350010	Antenna Coil, VCO
L204	1	LC12720080	Choke Coil, 2.7μH
			P301-TX. RX. CIRCUIT BOARD
P301	1	YH203C2310	P.W. Board, TX. RX
			P301-CAPACITORS
CF01	1	DD15101370	Ceramic 100pF ±5%
CF02	1	DK18102030	Ceramic 0.001μF
CF03	1	DD10030310	Ceramic 3pF ±0.25pF
CF04	1	DK46102300	Ceramic 0.001μF ±10%
CF05	1	DD11100300	Ceramic 10pF ±0.25pF
CF06	1	DD10050300	Ceramic 5pF ±0.25pF
CF07	1	DD10050300	Ceramic 5pF ±0.25pF
CF08	1	DD15470370	Ceramic 47pF ±5%
CF09	1	DK18102030	Ceramic 0.001μF
CF10	1	DK18102030	Ceramic 0.001μF
CF11	1	DD45470300	Ceramic 470pF ±5%

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
CR01	1	DK16122300	Ceramic 1200pF ±10%
CR04	1	DD15470300	Ceramic 47pF ±5%
CR05	1	DK16122300	Ceramic 1200pF ±10%
CR06	1	DK18103310	Ceramic 0.01μF
CR07	1	CT10600090	Trimming 6pF
CR08	1	DK18103310	Ceramic 0.01μF
CR09	1	DS17223010	Semicon 0.022μF ±20%
CR10	1	DS17223010	Semicon 0.022μF ±20%
CR11	1	DS17223010	Semicon 0.022μF ±20%
CR12	1	DD15101350	Ceramic 100pF ±5%
CR13	1	DK18103310	Ceramic 0.01μF
CR14	1	EV33601060	Elect 33μF 10V
CR15	1	DD15360300	Ceramic 36pF ±5%
CR16	1	DD15560330	Ceramic 56pF ±5%
CR17	1	DS17223010	Semicon 0.022μF ±20%
CR18	1	EJ10405010	Elect 0.1μF 50V
CR19	1	DD15430330	Ceramic 43pF ±5%
CR20	1	DD15120300	Ceramic 12pF ±5%
CR21	1	DK18103310	Ceramic 0.01μF
CR22	1	DS17152010	Semicon 1500pF ±20%
CR23	1	EV10503560	Elect 1μF 35V
CR24	1	EV10502560	Elect 1μF 25V
CR25	1	DF16153300	Film 0.015μF ±10%
CR26	1	DS17473010	Semicon 0.047μF ±20%
CR27	1	DS17332010	Semicon 3300pF ±20%
CR28	1	DK16471300	Ceramic 470pF ±10%
CR29	1	EJ10505010	Elect 1μF 50V
CR30	1	DK16102300	Ceramic 0.001μF ±10%
CR31	1	DS17223010	Semicon 0.022μF ±20%
CR32	1	DS17222010	Semicon 2200pF ±20%

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
CR33	1	DS17223010	Semicon 0.022μF ±20%
CR34	1	DS17223010	Semicon 0.022μF ±20%
CR35	1	DS17473010	Semicon 0.047μF ±20%
CR36	1	DS17473010	Semicon 0.047μF ±20%
CR37	1	EJ10603510	Elect 10μF 35V
CR38	1	DS17223010	Semicon 0.022μF ±20%
CR39	1	DF16223300	Film 0.022μF ±10%
CR40	1	EV10502560	Elect 1μF 25V
CR41	1	EA47601030	Elect 47μF 10V
CR42	1	DF16103300	Film 0.01μF ±10%
CR43	1	EA47601630	Elect 47μF 16V
CR44	1	DF16103300	Film 0.01μF ±10%
CR45	1	DK16331300	Ceramic 330pF ±10%
CR46	1	EV10403560	Elect 0.1μF 35V
CR47	1	EA22701030	Elect 220μF 10V
CR48	1	EV10403560	Elect 0.1μF 35V
CR49	1	EA22701630	Elect 220μF 16V
CR50	1	EA22601630	Elect 22μF 16V
CR51	1	EJ47502510	Elect 4.7μF 25V
CR52	1	EV10403560	Elect 0.1μF 35V
CR53	1	EV10403560	Elect 0.1μF 35V
CR54	1	DK18103310	Ceramic 0.01μF
CR55	1	DD10020300	Ceramic 2pF ±0.25pF
CR56	1	DF16104010	Film 0.1μF ±10%
CR57	1	DD15470300	Ceramic 47pF ±5%
CR58	1	DD10020300	Ceramic 2pF ±0.25pF
CT01	1	DD15200300	Ceramic 20pF ±5%
CT02	1	DK18102030	Ceramic 0.001μF
CT03	1	DD15470370	Ceramic 47pF ±5%
CT04	1	DD15470370	Ceramic 47pF ±5%
CT05	1	DK18102030	Ceramic 0.001μF

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
CT06	1	DK18102030	Ceramic 0.001μF
CT07	1	DD15470370	Ceramic 47pF ±5%
CT08	1	DK18102030	Ceramic 0.001μF
CT09	1	CT11000020	Trimming 10pF
CT10	1	DK18102030	Ceramic 0.001μF
CT11	1	DD15470370	Ceramic 47pF ±5%
CT12	1	DK18102030	Ceramic 0.001μF
CT13	1	DD15470370	Ceramic 47pF ±5%
CT14	1	DK18102030	Ceramic 0.001μF
CT15	1	CT11000020	Trimming 10pF
CT16	1	DK18102030	Ceramic 0.001μF
CT17	1	DD15470370	Ceramic 47pF ±5%
CT18	1	EA22601630	Elect 22μF 16V
CT19	1	DK18102030	Ceramic 0.001μF
CT20	1	DD15470370	Ceramic 47pF ±5%
CT21	1	DD10020300	Ceramic 2pF ±0.25pF
CT22	1	CT11000020	Trimming 10pF
CT23	1	CT11000020	Trimming 10pF
CT24	1	DD11070300	Ceramic 7pF ±0.5pF
CT25	1	DK18102030	Ceramic 0.001μF
CT26	1	DD15470370	Ceramic 47pF ±5%
CT27	1	DK18102030	Ceramic 0.001μF
CT28	1	EA22602530	Elect 22μF 25V
CT29	1	DD10020300	Ceramic 2pF ±0.25pF
CT30	1	CT11000020	Trimming 10pF
CT31	1	DD11070300	Ceramic 7pF ±0.5pF
CT32	1	CT11000020	Trimming 10pF
CT33	1	DD10050300	Ceramic 5pF ±0.25pF
CT34	1	DK18102030	Ceramic 0.001μF
CT35	1	DK18102030	Ceramic 0.001μF
CT36	1	DK18102030	Ceramic 0.001μF

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
CT37	1	EA22601630	Elect 22μF 16V
CT38	1	DK18102030	Ceramic 0.001μF
CT39	1	DK18102030	Ceramic 0.001μF
CT40	1	DD15470370	Ceramic 47pF
CT41	1	DK18102030	Ceramic 0.001μF
CT42	1	DD15470370	Ceramic 47pF ±5%
CT43	1	DM15001510	Minic 0.15pF ±5%
CT44	1	DK18102030	Ceramic 0.001μF
CT45	1	DK18102030	Ceramic 0.001μF
CT60	1	DD15470300	Ceramic 47pF ±5%
CT46	1	DK16102300	Ceramic 0.001μF ±10%
CT47	1	DK16102300	Ceramic 0.001μF ±10%
CT48	1	DK16102300	Ceramic 0.001μF ±10%
CT49	1	DK16102300	Ceramic 0.001μF ±10%
CT50	1	DD10020300	Ceramic 2pF ±0.25pF
CT61	1	DD15470300	Ceramic 47pF ±5%
			P301-RESISTORS
			(All Resistors are ±5% and ¼W)
RF01	1	GD05272140	2.7KΩ
RF02	1	RA02230090	22KΩ Trimming, VR
RF03	1	GD05221140	220Ω
RR01	1	GD05153140	15KΩ
RR02	1	GD05103140	10KΩ
RR04	1	GD05101140	100Ω
RR05	1	GJ05101010	100Ω 1W
RR07	1	GD05101140	100Ω 1W
RR08	1	GD05331140	330Ω
RR09	1	GD05123140	12KΩ
RR10	1	GD05273140	27KΩ
RR11	1	GD05102140	1KΩ
RR12	1	GD05221140	220Ω

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
RR13	1	GD05101140	100Ω
RR15	1	GD05222140	2.2KΩ
RR16	1	GD05222140	2.2KΩ
RR17	1	GD05473140	47KΩ
RR18	1	GD05123140	12KΩ
RR19	1	GD05103140	10KΩ
RR20	1	GD05103140	10KΩ
RR21	1	GD05103140	10KΩ
RR22	1	GD05224140	220KΩ
RR23	1	GD05392140	3.9KΩ
RR24	1	GD05562140	5.6KΩ
RR25	1	GD05103140	10KΩ
RR26	1	GD05823140	82KΩ
RR27	1	GD05222140	2.2KΩ
RR28	1	GD05104140	100KΩ
RR29	1	GD05334140	330KΩ
RR30	1	GD05471140	470Ω
RR31	1	GD05222140	2.2KΩ
RR32	1	GD05471140	470Ω
RR33	1	RA02230090	22KΩ Trimming
RR34	1	GD05333140	33KΩ
RR35	1	GD05273140	27KΩ
RR36	1	GD05333140	33KΩ
RR37	1	GD05822140	8.2KΩ
RR38	1	RA04720120	4.7KΩ Trimming
RR39	1	GD05822140	8.2KΩ
RR40	1	GD05103140	10KΩ
RR41	1	GD05223140	22KΩ
RR42	1	GD05223140	22KΩ

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
RR43	1	GD05104140	100KΩ
RR44	1	GD05102140	1KΩ
RR45	1	GD05391140	390Ω
RR46	1	GD05153140	15KΩ
RR47	1	GD05393140	39KΩ
RR48	1	GD05224140	220KΩ
RR49	1	GD05103140	10KΩ
RR50	1	GD05103140	10KΩ
RR51	1	RA02230090	22KΩ Trimming
RR52	1	GD05103140	10KΩ
RR53	1	GD05182140	1.8KΩ
RR54	1	RC00000140	0Ω
RR55	1	GD05105140	1MΩ
RR56	1	GD05332140	3.3KΩ
RR57	1	GD05104140	100KΩ
RR58	1	GD05332140	3.3KΩ
RR59	1	GD05102140	1KΩ
RR60	1	RC00000140	0Ω
RR61	1	GD05103140	10KΩ
RR62	1	GD05151140	150Ω
RT01	1	GD05682140	6.8KΩ
RT02	1	GD05152140	1.5KΩ
RT03	1	GD05472140	4.7KΩ
RT04	1	GD05472140	4.7KΩ
RT05	1	GD05122140	1.2KΩ
RT06	1	GD05332140	3.3KΩ
RT07	1	GD05821140	820Ω
RT08	1	GD05220140	220Ω
RT09	1	GD05221140	220Ω
RT10	1	GD05332140	3.3KΩ
RT11	1	GD05821140	820Ω
RT12	1	GD05150140	150Ω

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
RT13	1	GD05221140	220Ω
RT14	1	GD05821140	820Ω
RT15	1	GD05680140	68Ω
RT16	1	GD05101140	100Ω
RT17	1	GD05561140	560Ω
RT18	1	GD05222140	2.2KΩ
RT19	1	GD05102140	1KΩ
RT20	1	RA04720120	4.7KΩ Trimming
RT21	1	GD05271140	270Ω
RT22	1	GD05152140	1.5KΩ
RT23	1	GD05102140	1KΩ
RT24	1	GD05151180	150Ω 1/8W
			P301-SEMICONDUCTORS
QF01	1	HF20001200	Diode MI301
QF02	1	HF20001200	Diode MI301
QF03	1	HD10005020	Diode OA99
QR01	1	HF400481O0	F.E.T. 3SK48
QR02	1	HF400481O0	F.E.T. 3SK48
QR03	1	HT304601B0	Transistor 2SC460(B)
QR04	1	HT309451Q0	Transistor 2SC945(Q)
QR05	1	HT309451Q0	Transistor 2SC945(Q)
QR06	1	HT309001E0	Transistor 2SC900(E)
QR07	1	HT309451Q0	Transistor 2SC945(Q)
QR08	1	HT309451Q0	Transistor 2SC945(Q)
QR09	1	HT107331Q0	Transistor 2SA733(Q)
QR10	1	HC10015170	IC MC3357-P
QR11	1	HC10037060	IC μPC575C2
QR12	1	HC10013170	IC MC14001CP
QR20	1	HD10005020	Diode OA99
QR21	1	HD10005020	Diode OA99
QR22	1	HD10005020	Diode OA99

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
QR23	1	HD10005020	Diode OA99
QR24	1	HD20011050	Diode 1S1555
QR25	1	HD20011050	Diode 1S1555
QR26	1	HD20011050	Diode 1S1555
QR28	1	HD20011050	Diode 1S1555
QR29	1	HD30029090	Zener WZ090
QR30	1	HD20011050	Diode IS1555
QR31	1	HD20011050	Diode IS1555
QR32	1	HD20011050	Diode IS1555
QT01	1	HF400701O0	F.E.T. 3SK70
QT02	1	HT324071O0	Transistor 2SC2407
QT03	1	HT326440O0	Transistor 2SC2644
QT04	1	HT322831O0	Transistor 2SC2283
QT05	1	HT106731B0	Transistor 2SA673(B)
QT06	1	HT309451Q0	Transistor 2SC945(Q)
QT07	1	HC10022060	IC μPC78L08
QT08	1	HT107381B0	Transistor 2SA738(B)
QT09	1	HD10005020	Diode O1399
QT11	1	HD20005060	Diode 1SS16
QT12	1	HD20005060	Diode 1SS16
			P301-MISCELLANEOUS
FR01	1	XU421400M5	Crystal 21.4MHz
FR02	1	FG455304E0	Ceramic Filter CFU455B
FR03	1	FG455304E0	Ceramic Filter CFU455B
FT01	1	FC90050010	Ferrite Core
JF02	1	YJ07000430	Jack (3P)
JR01	1	YJ07000360	Jack
JR02	1	YJ07000430	Jack (3P)
JR03	1	YJ07000470	Jack (7P)
JR04	1	YJ07000460	Jack (6P)
JT01	1	YJ07000360	Jack
JT02	1	YJ07000440	Jack (4P)

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
LF01	1	LC15000110	Choke Coil, 2T
LF02	1	LC15000110	Choke Coil, 2T
LF03	1	LC15000110	Choke Coil, 2T
LR03	1	LA70260070	Antenna Coil
LR04	1	LC15000110	Choke Coil, 2T
LR05	1	LI70280020	I.F.T. Coil, 21.4MHz
LR06	1	LI70280020	I.F.T. Coil, 21.4MHz
LR07	1	LI70280010	I.F.T. Coil, 21.4MHz
LR08	1	LI71016090	I.F.T. Coil, 455KHz
LR09	1	LC24760010	Choke Coil,4.7mH
LT01	1	LM42417010	Twist Coil, 1 - 4
LT02	1	LM42417010	Twist Coil, 1 - 4
LT03	1	LC12010012	Choke Coil, 8T
LT04	1	LM42518010	Twist Coil, 5T
LT05	1	LC12010012	Choke Coil, 8T
LT06	1	LC15000110	Choke Coil, 2T
LT07	1	LM42518010	Twist Coil, 5T
LT08	1	LC12010012	Choke Coil, 8T
LT10	1	LM42518010	Twist Coil, 5T
LT11	1	LC12010012	Choke Coil, 8T
LT12	1	LC15000110	Choke Coil, 2T
LT13	1	LC13320070	Choke Coil, 3.3μH
LT14	1	LC15000110	Choke Coil, 2T
LT15	1	LA70260060	Antenna Coil
LT17	1	LC12010012	Choke Coil, 8T
LT18	1	LC12010012	Choke Coil, 8T
LT19	1	LC12010012	Choke Coil, 8T
LT20	1	LC12010012	Choke Coil, 8T
XR01	1	XZ42094505	Crystal 20.945MHz

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
			P401-RX ANT. CAVITY CIRCUIT BOARD
P401	1	YH203C1330	P.W. Board, RX Ant. Cavity
LR01	1	LC11810030	Choke Coil, Cavity
LR02	1	LC11810040	Choke Coil, Cavity
			P801-REAR SWITCH CIRCUIT BOARD
P801	1	YH203C1320	P.W. Board, Rear Switch
R802	1	RA01040290	Trimming Resistor 100KΩ(B)
S805	1	SK02010010	Push Switch, Reset
S806	1	SS04030150	Slide Switch, Light/Bat. Check
			P802-FRONT SWITCH CIRCUIT BOARD
P802	1	YH203C2320	P.W. Board, Front Switch
R803	1	GD05104140	Resistor 100KΩ ±5% ¼W
S803	1	SS04030140	Slide Switch
S804	1	SS04030140	Slide Switch
			P803-EXT. POWER CIRCUIT BOARD
P803	1	YH203C2330	P.W. Board, EXT. Power
C803	1	DK16102300	Ceramic Cap. 0.001μF ±10%
C805	1	DK16102300	Ceramic Cap. 0.001μF ±10%

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
Q803	1	HD20001100	Diode 10D2
J802	1	YJ01001390	Jack, EXT. Power
			P804-LCD CIRCUIT BOARD
P804	1	YF200C0030	P.W. Board, LCD
Q801	1	HC10006370	IC TP0401, LCD Driver
Q805	1	HQ20401440	Display Unit
J807	1	YJ90000280	Jack, Connector
J808	1	YJ90000280	Jack, Connector
J809	1	YJ10000520	Jack 9 pin
			P001-TONE CIRCUIT BOARD
P001	1	YF2030C0020	P.W. Board, Tone
			P001-CAPACITORS
C001	1	DK26103020	Ceramic 0.01μF 50V
C002	1	DK26104020	Ceramic 0.001μF 50V
C003	1	EV33501660	Elect. 3.3μF 16V
C004	1	DK26333010	Ceramic 0.033μF 50V
C005	1	DK16471300	Ceramic 470pF ±10%
C006	1	DK26473010	Ceramic 0.047μF 50V
C007	1	DK16102300	Ceramic 0.001μF ±10%
C008	1	DK16102300	Ceramic 0.001μF ±10%
C009	1	EV47501660	Elect 4.7μF 16V
			P001-RESISTOR
R001	1	GD05103180	10KΩ, 8/1W
R002	1	GD05104180	100KΩ, 1/8W
R003	1	GD05105180	1MΩ, 1/8W
R004	1	GD05224180	220KΩ, 1/8W

REF. DESIG.	Q'TY	PART NO.	DESCRIPTION
R005	1	RA01030520	10KΩ, Trimming
R006	1	GD05824180	820KΩ, 1/8W
R007	1	RA04730100	47KΩ, Trimming
R008	1	GD05393180	39KΩ, ±5%, 1/8W
R009	1	GD05682180	6.8KΩ, ±5%, 1/8W
R010	1	RA01030530	10KΩ, Trimming
R011	1	RA01030530	10KΩ, Trimming
R012	1	GD05224180	220KΩ, ±5% 1/8W
R013	1	GD01503180	10KΩ, ±5% 1/8W
			P001-SEMI CONDUCTORS
Q001	1	HT305360F0	Transistor 22C536(F)
Q002	1	HD20011050	Diode IS1555
Q003	1	HC10019170	IC MC14093BCP
Q004	1	HD20011050	Diode IS1555
Q005	1	HT305360F0	Transistor 2SC536(F)
Q006	1	HT305360F0	Transistor 2SC536(F)
Q007	1	HD30029090	Diode WZ090
J001	1	YP10001060	Plug 9 pin

(W01-99)	**Assembly and Wiring**
(T01-99)	**Adjustment**
(X01-00)	**Correction**

8. SPECIFICATIONS

1. General Specifications

Frequency:	430 ~ 440MHz
Type of emission:	F3
Microphone input impedance:	600Ω
Speaker impedance:	8Ω
Operating supply voltage range:	9.6 ~ 16V DC
Normal power supply:	
External:	13.8V DC
Internal:	1. UM-3 Ni-Cad battery x 10 2. UM-3 dry cell x 9
Dimensions:	129 (W) x 52 (H) x 190.5 (D) mm
Weight:	1.25kg (1.45kg including batteries)
Power consumption:	Reception standby: 25mA with battery saver ON Transmission: 600mA (at 1 watt into 50Ω load)

2. Reception Specifications

Reception system:	Double superheterodyne
Intermediate:	1st IF: 21.4MHz 2nd IF: 455kHz
Sensitivity:	−5dB (20dB QS) −7dB (12dB SINAD)
Pass bandwidth:	±7.5kHz
Selectivity:	Better than 60dB
Squelch sensitivity:	−14dB
AF output:	0.7 watt (into 8 ohms with 10% THD)
Load impedance:	8Ω

3. Transmission Specification

Power output:	1 watt
Load impedance:	50Ω
Spurious attenuation:	60dB
Maximum frequency deviation:	±5kHz
Modulation:	Reactance modulation
Audio frequency response:	300 ~ 3000Hz

* These specifications are subject to change without notice in the event of improvements.

ACCESSORIES

- Hand-held microphone with UP-DOWN switch (MP-716) 1
- Shoulder belt 1
- External power plug 1
- Instructions manual 1
- Schematic diagram 1