

KENWOOD

TRC-80

HF SSB RADIOTELEPHONE
INSTRUCTION MANUAL

RADIOTELEFONO DE HF SSB
MANUAL DE INSTRUCCIONES

短波通信机
使用说明书

KENWOOD CORPORATION

HF SSB RADIOTELEPHONE

TRC-80

INSTRUCTION MANUAL

KENWOOD CORPORATION

ENGLISH

CONTENTS

SAFETY PRECAUTIONS	1	AUTOMATIC ANTENNA TUNER	13
IMPORTANT NOTICE	1	PRESETTING (KAT-2 INTERNAL TUNER)	13
INTRODUCTION	1	KAT-2 INTERNAL TUNER (OPTIONAL)	13
SUPPLIED ACCESSORIES	1	KAT-1/ MAT-100 EXTERNAL TUNER (OPTIONAL)	13
BASE STATION INSTALLATION	2	COMPUTER ↔ RADIOTELEPHONE INTERFACE	14
ANTENNA CONNECTION	2	COMMUNICATION PARAMETERS	14
GROUND CONNECTION	2	HARDWARE DESCRIPTION	14
DC POWER SUPPLY CONNECTION	2	MAINTENANCE	15
Replacing Fuses	2	SERVICE	15
MOBILE INSTALLATION	3	SERVICE NOTE	15
ANTENNA CONNECTION	3	CLEANING	15
DC POWER CABLE CONNECTION	3	TROUBLESHOOTING	16
Replacing Fuses	3	ACCESSORY CONNECTIONS	17
GROUND CONNECTION	3	COMPUTER INTERFACE (ACC 1)	17
GETTING ACQUAINTED	4	PC-1A PHONE PATCH CONTROLLER (ACC 2)	17
FRONT PANEL	4	ANTENNA TUNER (AT)	17
REAR PANEL	5	DATA EQUIPMENT INTERFACE (ACC 2)	18
DISPLAY	6	CHANNEL MEMO	19
MICROPHONE	7	APPENDIX	A1
OPERATING BASICS	7	CONTROL OPERATION	A1
SWITCHING POWER ON/OFF	7	COMMANDS	A1
ADJUSTING VOLUME	7	COMMAND DESCRIPTION	A1
ADJUSTING SQUELCH	7	PARAMETER DESCRIPTION	A1
SELECTING A CHANNEL	8	TERMINATOR	A2
SELECTING A MODE	8	TYPES OF COMMANDS	A2
TRANSMITTING	8	COMPUTER CONTROL COMMANDS	A3
Changing Transmit Power	8	ERROR MESSAGES	A3
Voice Modes	8	COMMAND USE PRECAUTIONS	A3
VOX (Voice-operated Transmit)	8	READING COMMAND TABLES	A4
CW Mode	9	COMMAND TABLES	A4
DATA OPERATION	9		
FSK MODE	9		
AFSK MODE	9		
MENU SETUP	10		
CHANGING MENU SETTINGS	10		
MENU CONFIGURATION	10		
MEMORY BACKUP	10		
SCAN	11		
BUSY FREQUENCY STOP	11		
Scan Resume Methods	11		
CHANNEL LOCKOUT	11		
STARTING/ STOPPING SCAN	11		
NOISE BLANKER	11		
CLARIFIER	11		
KPE-1 SELECTIVE CALL UNIT (OPTIONAL)	11		
MANUAL CALLING	12		
MEMORY CALLING	12		
RECEIVING	12		
CHANGING IDENTIFICATION CODES	13		
CHANGING CHARACTER MESSAGES	13		

SAFETY PRECAUTIONS

It is important that the operator understands and is aware of hazards common to the operation of any radiotelephone.

WARNING!

1 EXPLOSIVE ATMOSPHERES (GASES, DUST, FUMES, ETC.)

Turn off and do not operate the radiotelephone while taking on fuel, or while parked in gasoline service stations. Do not carry spare fuel containers in the trunk of your vehicle if the radiotelephone is mounted in the trunk area.

2 INJURY FROM RADIO FREQUENCY TRANSMISSIONS

Do not operate the radiotelephone when anyone is touching the antenna, or when anyone is standing within two to three feet of the antenna, to avoid the possibility of radio frequency burns or related physical injury.

3 DYNAMITE BLASTING CAPS

Transmitter operation can cause dynamite blasting caps to explode if you operate within 500 feet of the blasting caps. Turn off and do not operate the radiotelephone in an area where blasting is in progress, or where "TURN OFF TWO-WAY RADIO" signs have been posted. If you are transporting blasting caps in your vehicle, make certain they are carried in a closed metal box having a padded interior. Do not transmit during the time that the caps are being placed into or removed from this container.

IMPORTANT NOTICE

Government law prohibits the operation of unlicensed radio transmitters within the territories under government control. Illegal operation is punishable by fine or imprisonment or both.

Refer service to a qualified licensed or certified technician only.

INTRODUCTION

All **KENWOOD** radiotelephones incorporate the latest in advanced technology, providing communications that can be counted on to keep vehicles and personnel operating at peak efficiency.

The easy-to-operate TRC-80 radiotelephone continues the **KENWOOD** tradition of dependable communications. When combined with the optional KPE-1 Selective Call Unit, the TRC-80 allows full flexibility for signaling and communicating with specific stations or groups of stations.

SUPPLIED ACCESSORIES

*Note: The following instructions are for use by your **KENWOOD** Dealer only (either an authorized **KENWOOD** service facility or the factory).*

Carefully unpack the radiotelephone. It is recommended that you identify the items listed and check them off before discarding the packing material.

If any damage has occurred to the equipment during shipment, file a claim with the carrier immediately.

Accessory	Part Number	Quantity
Microphone	T91-0562-XX	1
DC power cable	E30-3157-XX	1
Fuse (25 A)	F05-2531-XX	1
Fuse (4 A)	F06-4027-XX	1
instruction manual	B62-0485-XX	1

BASE STATION INSTALLATION

ANTENNA CONNECTION

The type of the antenna system, consisting of the antenna, ground, and feed line, will greatly affect the successful performance of the radiotelephone. Use a properly adjusted 50 Ω antenna of good quality to let your radiotelephone perform at its best. Use a good-quality 50 Ω coaxial cable and a first-quality connector for the connection. Match the impedance of the coaxial cable and antenna so that the SWR is 1.5:1 or less. All connections must be clean and tight.

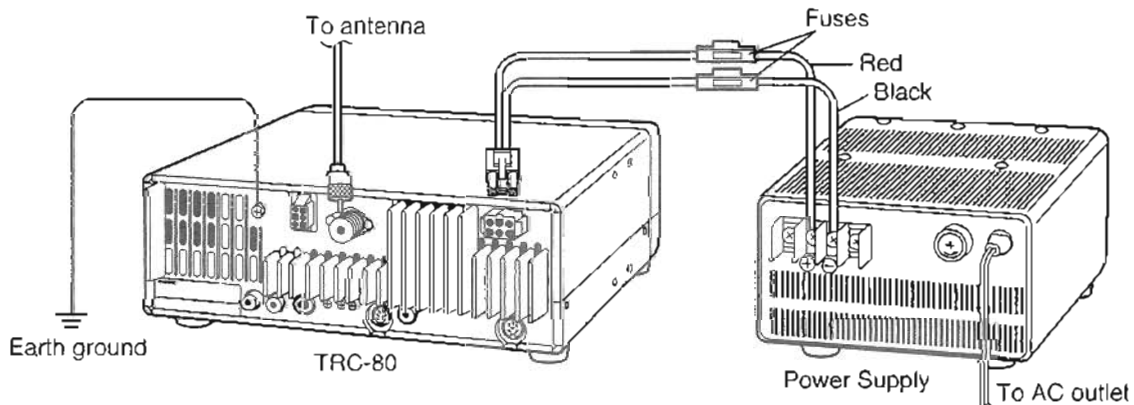
While the radiotelephone's protection circuit will activate if the SWR is greater than 2.5:1, do not rely on protection to compensate for a poorly functioning antenna system. High SWR will cause the transmit output to drop, and may lead to radio frequency interference to consumer products such as stereo receivers and televisions. You may even interfere with your own radiotelephone. Reports that your signal is garbled or distorted, especially at peak modulation, may indicate that your antenna system is not efficiently radiating the radiotelephone's power. If you feel a tingle from the radiotelephone's cabinet or the microphone's metal fittings when you modulate, you can be certain that, at the least, your coax connector is loose at the rear of the radio and, at the worst, your antenna system is not efficiently radiating power.

CAUTION:

- ◆ Transmitting without first connecting an antenna or other matched load may damage the radiotelephone. Always connect the antenna to the radiotelephone before transmitting.
- ◆ Use a lightning arrestor to prevent fire, electric shock, or damage to the radiotelephone.

GROUND CONNECTION

At the minimum, a good DC ground is required to prevent such dangers as electric shock. For superior communications results, a good RF ground is required, against which the antenna system can operate. Both of these conditions can be met by providing a good earth ground for your station. Bury one or more ground rods, or a large copper plate under the ground, and connect this to the radiotelephone GND terminal. Use heavy gauge wire or a copper strap, cut as short as possible, for this connection. All connections must be clean and tight.



DC POWER SUPPLY CONNECTION

In order to use this radiotelephone, you will need a separate 13.6 V DC power supply that must be purchased separately. DO NOT directly connect the radiotelephone to an AC outlet! Use the supplied DC power cable to connect the radiotelephone to a regulated power supply. Do not substitute a cable with smaller gauge wires. The current capacity of your power supply must be 20.5 A or more.

CAUTION:

- ◆ Before connecting the DC power supply to the radiotelephone, be sure to switch the radiotelephone and the DC power supply OFF.
- ◆ Do not plug the DC power supply into an AC outlet until you make all connections.

First connect the DC power cable to the regulated DC power supply and check that polarities are correct (Red: positive, Black: negative). Then connect the connectorized end of the DC power cable to the DC 13.6 V power connector on the radiotelephone Rear Panel. Press the DC power cable connector firmly into the connector on the radiotelephone until the locking tab clicks.

■ Replacing Fuses

If the fuse blows, determine the cause then correct the problem. After the problem is resolved, only then replace the fuse. If newly installed fuses continue to blow, disconnect the power plug and contact your Dealer for assistance.

Fuse Location	Fuse Current Rating
TRC-80	4 A (for KAT-1/ MAT-100 Antenna Tuner)
Supplied Accessory Cable	25 A

CAUTION: Replace blown fuses only after investigating and correcting the cause of the failed fuse. Always replace a blown fuse by a new fuse with the specified ratings.

MOBILE INSTALLATION

Install the radiotelephone in a safe, convenient position inside your vehicle that minimizes danger to your passengers and yourself while the vehicle is in motion. For example, consider installing the radiotelephone under the dash in front of the passenger seat so that knees or legs will not strike the radiotelephone during sudden braking of your vehicle. Try to pick a well-ventilated location that is shielded from direct sunlight.

ANTENNA CONNECTION

Before operating mobile, you must first install an efficient, well-tuned antenna. The success of your mobile installation will depend largely on the type of antenna and its correct installation. The radiotelephone can give excellent results if the antenna system and its installation is given careful attention.

Your choice of antenna should have a 50 Ω impedance to match the radiotelephone input impedance. Use low-loss coaxial feed line that also has a characteristic impedance of 50 Ω . Coupling the antenna to the radiotelephone via feed lines having an impedance other than 50 Ω reduces the efficiency of the antenna system, and can cause interference to nearby broadcast television receivers, radio receivers, and other electronic equipment.

CAUTION: Transmitting without first connecting an antenna or other matched load may damage the radiotelephone. Always connect the antenna to the radiotelephone before transmitting.

DC POWER CABLE CONNECTION

Route the DC power cable supplied with the radiotelephone directly to the vehicle's battery terminals using the shortest path from the radiotelephone. If using a noise filter, it should be installed with an insulator to prevent it from touching metal on the vehicle. It is not recommended to use the cigarette lighter socket since some cigarette lighter sockets introduce an unacceptable voltage drop.

To prevent the risk of short circuits, disconnect other wiring from the negative (-) battery terminal before connecting the radiotelephone. Confirm the correct polarity of the connections before attaching the power cable; red connects to the positive (+) terminal, black connects to the negative (-) terminal. Use the full length of the cable without cutting off excess even if the cable is longer than required. In particular, never

remove the fuse holders from the cable. After completing radiotelephone connections to the battery, then reconnect any wiring removed from the negative terminal.

If the power cable must be routed through a hole in the vehicle chassis or body, for example in the firewall at the front of the passenger compartment, use a rubber grommet to protect the cable from abrasion. The entire length of the cable must be dressed so it is isolated from heat and moisture. After the cable is in place, wind heat-resistant tape around the fuse holder to protect it from moisture. Tie down the full run of cable.

The vehicle battery must have a nominal rating of 12 V. Never connect the radiotelephone to a 24 V battery. Be sure to use a 12 V vehicle battery that has sufficient current capacity. If the current to the radiotelephone is insufficient, the Display may darken during transmission, or transmit output power may drop excessively.

Only after completing the installation, connect the radiotelephone's power supply connector to the DC power cable. Press the connectors firmly together until the locking tab clicks.

Note: If you use the radiotelephone for a long period when the vehicle battery is not fully charged, or when the engine is OFF, the battery may become discharged, and will not have sufficient reserves to start the vehicle. Avoid using the radiotelephone under these conditions.

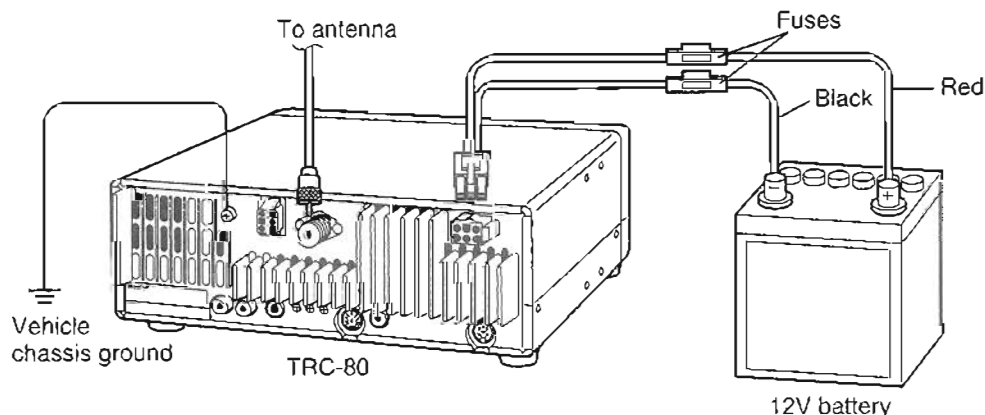
■ Replacing Fuses

If the fuse blows, determine the cause then correct the problem. Refer to additional information including fuse ratings on page 2.

CAUTION: Replace blown fuses only after investigating and correcting the cause of the failed fuse. Always replace a blown fuse by a new fuse with the specified ratings.

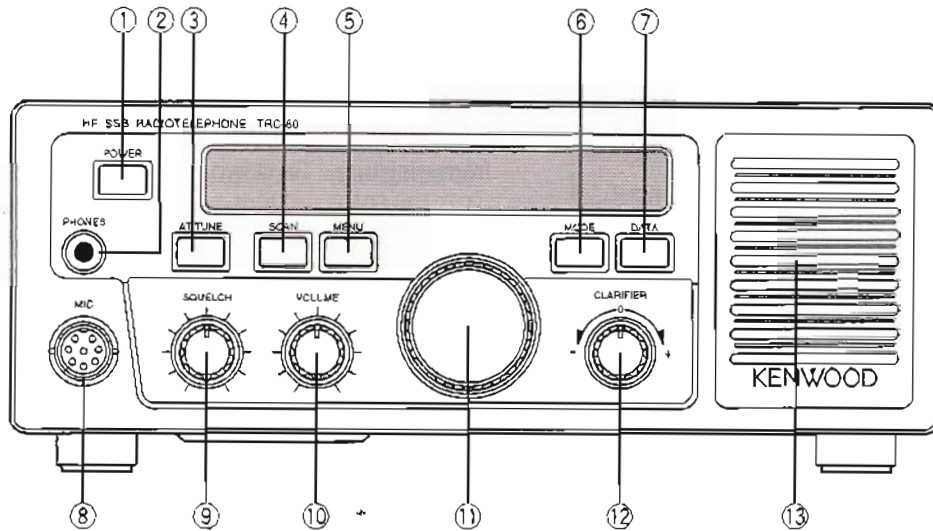
GROUND CONNECTION

For a mobile installation, it is extremely important to securely connect a low-resistance ground strap from the radiotelephone GND terminal to the metal vehicle chassis. This connection is necessary since mobile antennas are physically small and, therefore, less efficient than larger base station antennas. If a strap is not available, a large gauge copper wire is suitable. Always clean paint or dirt from the vehicle connection point and expose bare metal before connecting the ground. A high-quality ground installation significantly improves the performance of a mobile antenna.



GETTING ACQUAINTED

FRONT PANEL



Buttons ④, ⑤, ⑥, and ⑦ must be activated by your Dealer to function as described in this manual.

① POWER switch

Press and hold down briefly to switch ON the radiotelephone power. Press again and hold briefly to switch OFF the power.

② PHONES jack

Connect headphones to this jack. Use headphones having 4 to 32 Ω impedance. You can also use stereo headphones. When headphones are used, no sound is heard from the internal (or optional external) speaker. Use a 6.0 mm (1/4") diameter, 2-conductor (mono) or 3-conductor (stereo) plug.

③ AT TUNE button

Starts or stops the internal or external antenna tuner.

④ SCAN button

Starts or stops the Scan function.

⑤ MENU button

Press to access or exit the Menu mode.

⑥ MODE button

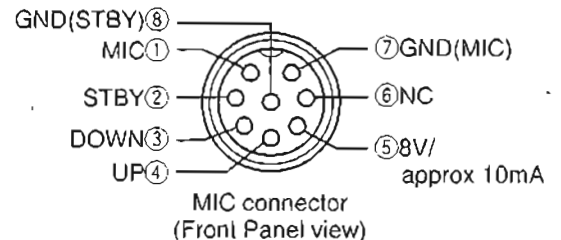
Selects the USB (J3E), LSB (J3E), AM (A3E), or CW (A1A) operating mode.

⑦ DATA button

Selects the Data mode which automatically enables the ACC 2 connector on the Rear Panel and disables the MIC pin on the MIC connector on the Front Panel.

⑧ MIC connector

Connect the supplied microphone to this connector. Insert the connector from the microphone fully, then screw the retaining ring clockwise until snug.



⑨ SQUELCH control

Controls the Squelch threshold level for muting the receiver during no signal periods. Leave fully counterclockwise for weak signal reception.

⑩ VOLUME control

Controls the receiver volume. Turn the control clockwise to increase the volume; turn counterclockwise to decrease the volume.

⑪ CHANNEL selector

Turn clockwise or counterclockwise to select a channel.

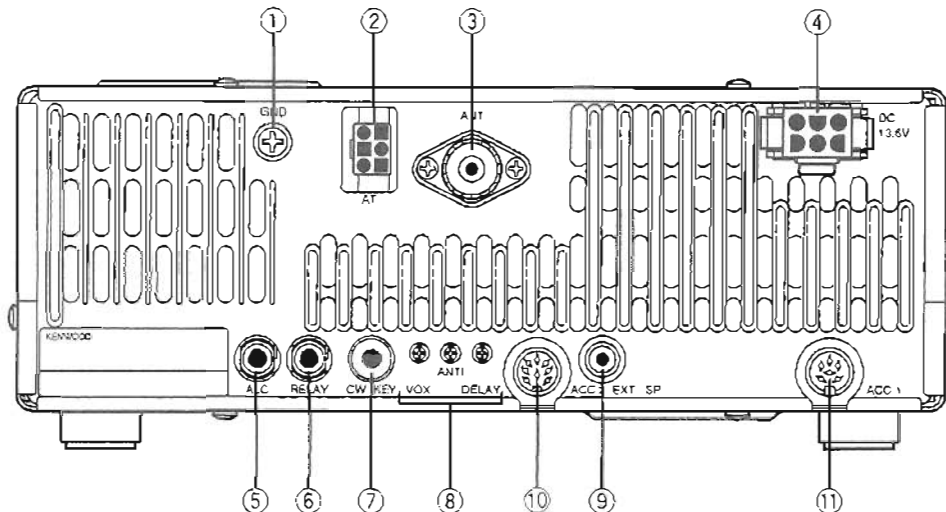
⑫ CLARIFIER control

Used for making minor adjustments of the receiver frequency. Turning the control shifts the receiver frequency to either side of the displayed frequency.

⑬ INTERNAL SPEAKER

Receiver audio is heard from this speaker if no external speaker or headphones are connected.

REAR PANEL



① GND terminal

Connect a heavy gauge wire or copper strap between the **GND** terminal and the nearest earth ground.

② AT connector

Mates with the connector on the cable supplied with the optional KAT-1 or MAT-100 External Tuner.

③ ANT connector

Connect the feed line from your 50 Ω antenna to this connector. Mates with a PL-259 male connector.

④ Power Input DC 13.6 V connector

Connect a 13.6 V DC power source. Use the supplied cable with a regulated DC power supply.

⑤ ALC jack

Used for connecting the Automatic Level Control voltage to an external linear amplifier. Mates with an RCA pin plug.

⑥ RELAY jack

Provides a ground on transmit. The relay contact capacity is 30 V DC / 0.5 A. Mates with an RCA pin plug.

⑦ CW KEY jack

Used for connecting a key for CW operation. Mates with a 6.0 mm (1/4") 2-conductor plug. External electronic keyers must use positive keying to be compatible with this radiotelephone. Use a shielded cable between the key and the radiotelephone. Open terminal voltage is approximately 5 V DC.

⑧ VOX/ ANTI/ DELAY controls

Used for adjusting the Voice-operated Transmit (VOX) function.

⑨ EXT SP jack

Used for connecting an external 4 ~ 8 Ω speaker. Mates with a 3.5 mm (1/8") diameter, 2-conductor (mono) plug. Connecting an external speaker cuts off the audio automatically to the internal speaker.

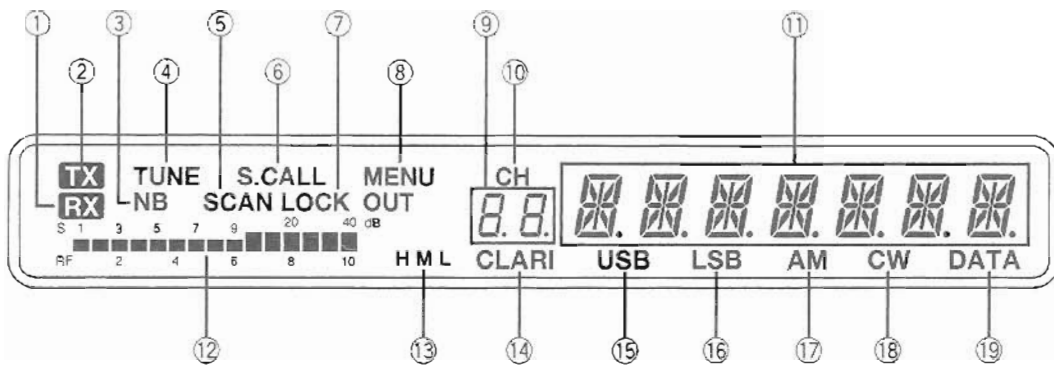
⑩ ACC 2 connector

Mates with an 8-pin male DIN connector for connecting various accessory equipment.

⑪ ACC 1 connector

Used for connecting the optional IF-232C Interface Unit. This unit allows radiotelephone control from a computer. Mates with a 6-pin male DIN connector.

DISPLAY



① **RX**

Appears while receiving with the squelch open.

② **TX**

Appears while transmitting or while the antenna tuner is tuning.

③ **NB**

Appears while the Noise Blanker function is ON.

④ **TUNE**

Blinks while the antenna tuner is presetting or tuning. Remains ON after a good match is obtained with the antenna system.

⑤ **SCAN**

Appears while the Scan function is activated.

⑥ **S. CALL**

Appears while the Selective Call function is activated.

⑦ **LOCK OUT**

Appears when a channel is locked out from the Scan function. These channels are not scanned.

⑧ **MENU**

Appears while the Menu system is being accessed.

⑨ **8.8.**

Shows the selected channel number or, while accessing the Menu mode, shows the selected Menu number. Your Dealer may have programmed the radiotelephone so as not to display channel numbers.

⑩ **CH**

Appears while the Channel mode is selected.

⑪

Shows the receive and transmit frequencies or messages that are stored by your Dealer. The messages may include alphanumeric characters, spaces or symbols.

⑫

While receiving, serves as an S-meter to display the received signal strength. While transmitting, serves as a relative transmit RF meter. While acting as an RF meter, a full-scale indication corresponds to the programmed maximum power.

⑬ **H M L**

One of these characters appear as an indication of the transmit power level. The characters represent High, Medium, and Low power respectively. If none of these characters are visible, either the maximum transmit power is selected, or the Dealer has disabled this character display.

⑭ **CLARI**

Appears while the **CLARIFIER** control is turned from its detent "0" position.

⑮ **USB**

Appears while Upper Sideband mode is selected.

⑯ **LSB**

Appears while Lower Sideband mode is selected.

⑰ **AM**

Appears while Amplitude Modulation mode is selected.

⑱ **CW**

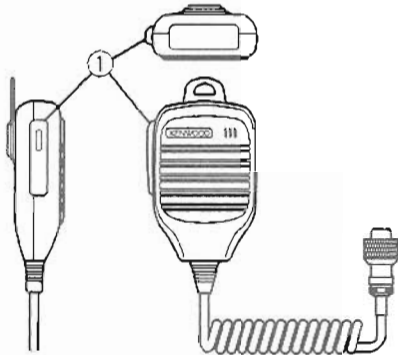
Appears while Continuous Wave (Morse) mode is selected.

⑲ **DATA**

Appears while Data mode is selected.

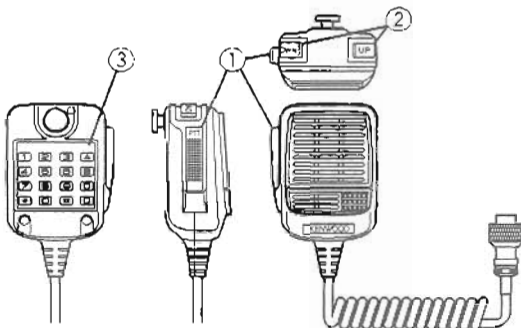
MICROPHONE

SUPPLIED



OPTIONAL

(SUPPLIED WITH KPE-1 SELECTIVE CALL UNIT)



① PTT (Push-to-Talk) switch

The radiotelephone is placed in transmit mode when this non-locking switch is held down. Releasing the switch returns the radiotelephone to receive mode.

② UP/DWN buttons

Press these buttons to step through the channels similar to using the **CHANNEL** selector. Holding a button down sequentially steps through all channels.

③ KEYPAD

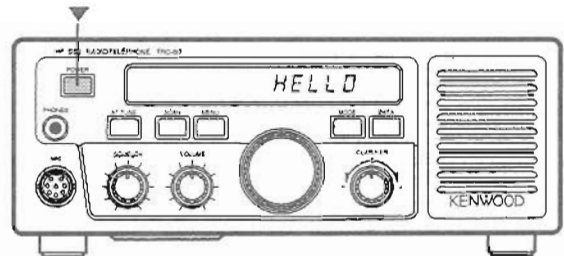
Use for entering the digits when placing a selective call.

OPERATING BASICS

Note: The radiotelephone outputs a short beep each time a button is pressed and the button stroke is accepted.

SWITCHING POWER ON/OFF

Switch **ON** the DC power supply, then press and hold down **[POWER]** until "HELLO" appears on the Display.

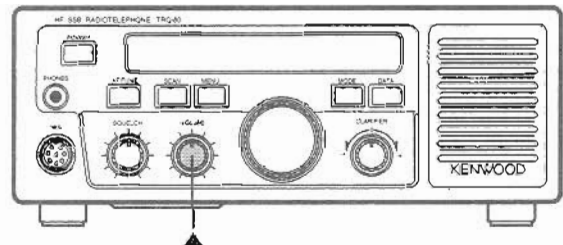


To switch **OFF** the radiotelephone, press **[POWER]** again.

- After the radiotelephone has been switched **ON**, it can then be switched **OFF** or **ON** by using only the power switch on the DC power supply.

ADJUSTING VOLUME

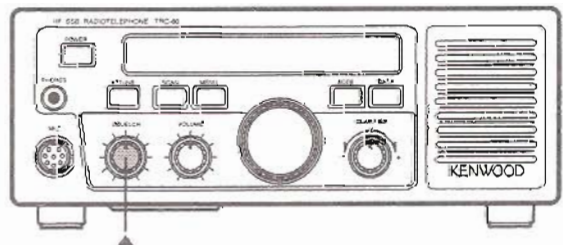
Turn the **VOLUME** control clockwise to increase the audio level; turn counterclockwise to decrease the level.



ADJUSTING SQUELCH

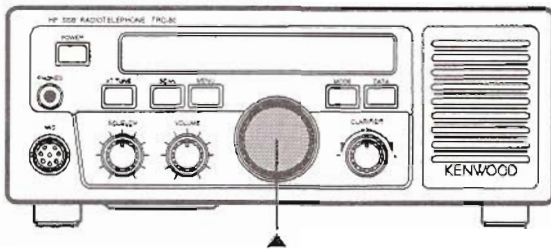
The purpose of squelch is to silence audio output from the speaker when no signals are present. Setting the squelch threshold too high causes the squelch to remain closed while a weak signal is present. Setting the threshold too low allows noise to be heard between transmissions from other stations.

Turn the **SQUELCH** control to just eliminate the background noise when no signal is present. If signals are weak, set the control fully counterclockwise.



SELECTING A CHANNEL

Turn the **CHANNEL** selector to choose a channel.



- When using the microphone supplied with the optional KPE-1 Selective Call Unit, you can press Microphone [UP] or Microphone [DWN] to choose channels. Holding either button down sequentially switches through all channels.

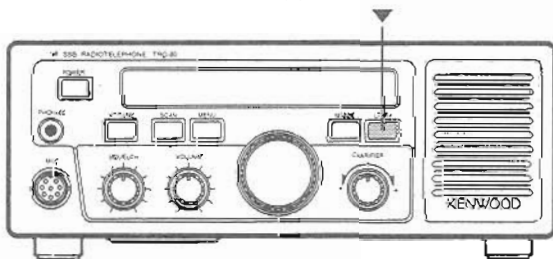
SELECTING A MODE

The [MODE] button must be activated by your Dealer to function as described here.

The mode stored with each channel can be temporarily changed. To change the operating mode, press [MODE]. Each time this button is pressed, the mode changes in a cyclical manner as shown below:



To select Data mode, press [DATA] while in USB or LSB mode. The Dealer sets either AFSK or FSK operation for use in Data mode. If AFSK has been set, then "USB" or "LSB" plus "DATA" appear. When FSK has been set, only "DATA" appears.



Pressing [MODE], pressing [DATA], or changing the channel after entering Data mode cancels Data mode.

TRANSMITTING

The cooling fan operates automatically when long transmissions are made or after extended operation in the High power mode. Also, the Rear Panel heat sink temperature will increase. The protection circuit in the radiotelephone activates if the temperature rises over the design limit. In this case, the output power is automatically reduced to the Low position. Although the "L" indicator does not appear, the power meter indication will be less than full scale, and "THERMAL PROTECTION" appears.

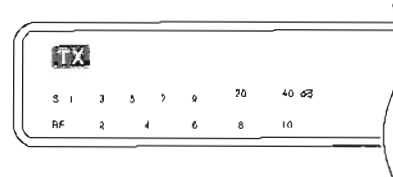
You cannot transmit on a channel that has only a receive frequency stored. Attempting this causes "RX ONLY" to appear.

Changing Transmit Power

You can change the default transmit power setting stored for a channel by accessing the Menu mode. Refer to Menu Setup on page 10 for details. However, you cannot change the transmit power beyond the limits specified by the Dealer.

Voice Modes

- 1 Select a voice mode (USB, LSB, AM) channel.
- 2 Press and hold down the PTT switch.
 - "TX" appears.



- Refer to "VOX" below for information on automatic TX/RX switching.
- 3 Speak into the microphone holding it about 5 cm (2 in.) from your mouth for best results. Speak in a normal tone and level of voice.
 - 4 When you have finished transmitting, release the PTT switch to return to the receive mode.
 - The "TX" indicator disappears.

VOX (Voice-operated Transmit)

VOX must be activated by the Dealer before you can use this function.

VOX eliminates the necessity of manually switching to the transmit mode each time that you transmit. The radiotelephone automatically switches to transmit when the VOX circuitry senses that you have begun speaking into the microphone.

The VOX function has three adjustments on the Rear Panel as follows:

VOX control

Adjust this control to set the VOX amplifier sensitivity to the correct level for your voice. When set correctly, the radiotelephone changes to the transmit mode immediately after you begin speaking into the microphone.

ANTI control

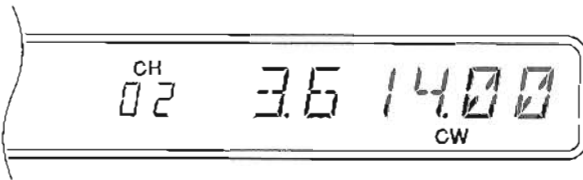
VOX operation is sometimes difficult when using high speaker volumes. Adjust this control to reduce the tendency of the radiotelephone to switch into transmit mode due to the speaker output. Use the minimum ANTI control settings to achieve reliable VOX operation.

DELAY control

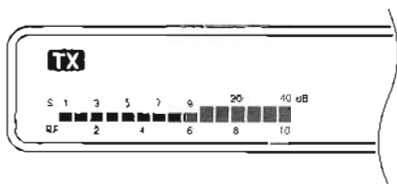
Adjust this control to change the amount of time that the radiotelephone remains in the transmit mode after you stop speaking.

■ CW Mode

- 1 Select a CW channel.



- 2 With a CW key connected to the Rear Panel, begin sending.
 - Closing the key contacts causes the radiotelephone to automatically switch into transmit mode, and "TX" appears.



- 3 Stop sending.
 - The radiotelephone automatically changes back to the receive mode a moment after you stop sending, and "TX" disappears.

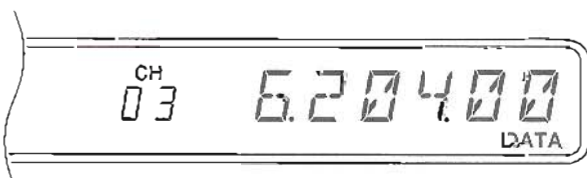
Note: Adjusting the DELAY control on the Rear Panel allows you to vary the time that the radiotelephone waits before returning to receive mode after you stop sending. The same control allows you to select full break-in (receiver ON continuously except while key is down).

DATA OPERATION

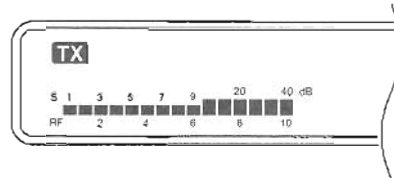
The [DATA] button must be activated by your Dealer to function as described here. Also, the Dealer sets either AFSK or FSK operation, FSK shift, key-down polarity, high/low tone, and FSK Reverse functions for your radiotelephone.

FSK MODE

- 1 Select an FSK channel, then press [DATA].
 - "DATA" appears ("USB"/"LSB" disappears).

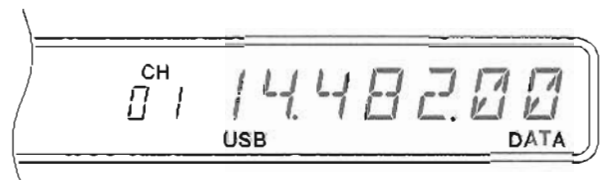


- 2 Following the instructions provided with your Multimode Communications Processor (MCP) or Terminal Unit (TU), begin sending data.
 - "TX" appears each time the radiotelephone enters transmit mode.

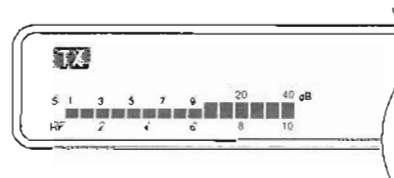


AFSK MODE

- 1 Select an AFSK channel, then press [DATA].
 - "DATA" plus "LSB" or "USB" is visible.



- 2 Following the instructions provided with your Multimode Communications Processor (MCP) or Terminal Node Controller (TNC), begin sending data.
 - "TX" appears each time the radiotelephone enters transmit mode.



MENU SETUP

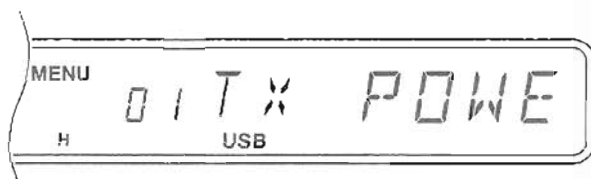
Some functions on this radiotelephone are selected or configured via a software-controlled Menu instead of physical controls on the radiotelephone. Once familiar with the Menu system, you will appreciate the versatility it offers.

CHANGING MENU SETTINGS

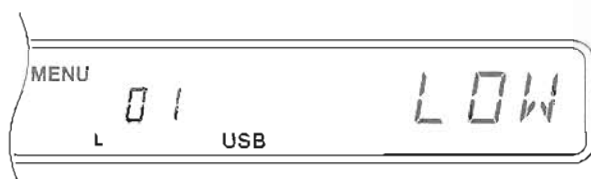
The [MENU] button must be activated by your Dealer to function as described here.

The following procedure explains how to check or change any of the Menu items.

- 1 Press [MENU].
- 2 Press [MODE] or [DATA] to select the desired Menu number.
 - [DATA] increments the Menu number; [MODE] decrements the Menu number.
 - A message that briefly describes the selected Menu item scrolls. This message can be interrupted by turning the CHANNEL selector.



- 3 Turn the CHANNEL selector to choose the desired selection for the Menu number.



- 4 Press [MENU] again to exit Menu mode.

Settings for Transmit Power and Channel Lockout can only be done by accessing Menu Setup. Also, the settings for these functions apply only to the channel selected at the time the setting is changed. Therefore, before changing these functions, first select the applicable channel. Refer to additional information for Channel Lockout on page 11.

MENU CONFIGURATION

Note:

- ◆ Menu Nos. 08-15 may be unavailable depending on the Dealer settings.
- ◆ Without the optional KPE-1 Selective Call Unit installed, Menu Nos. 06 and 07 can be accessed, but they cannot be used.

Menu No.	Function	Selections
01	TX power	Low/ Medium/ High/ Maximum
02	NB (Noise Blanker)	OFF/ ON
03	Alphanumeric display	OFF/ ON
04	Memory channel lockout	OFF/ ON
05	Busy stop	OFF/ Time operated (TO)/ Carrier operated (CO)
06	Selection call	OFF/ ON
07	Identification code	000-999
08	*A code	** * ¹ , 000-999
09	*B code	** * ¹ , 000-999
10	*C code	** * ¹ , 000-999
11	*D code	** * ¹ , 000-999
12	*A character	AAAAAAA~ZZZZZZZ, 0000000~9999999, miscellaneous symbols
13	*B character	AAAAAAA~ZZZZZZZ, 0000000~9999999, miscellaneous symbols
14	*C character	AAAAAAA~ZZZZZZZ, 0000000~9999999, miscellaneous symbols
15	*D character	AAAAAAA~ZZZZZZZ, 0000000~9999999, miscellaneous symbols

¹ "*" is used as a wild card.

Note: Default selections are shown in **bold face** in the above table.

MEMORY BACKUP

This radiotelephone contains an EEPROM to retain channel data for channels 1-10. Turning OFF the POWER switch, or a power failure, will not erase this memory.

A lithium battery is installed that preserves Display and setting data whether the radiotelephone is switched ON or OFF. The lithium battery should last for approximately five years. When the battery discharges, erratic information may appear on the Display. Your KENWOOD Dealer should replace the lithium battery when the battery becomes discharged.

SCAN

Scan allows each of the channels that has a receive frequency stored to be automatically monitored for activity.

BUSY FREQUENCY STOP

The radiotelephone automatically stops scanning when a signal is detected if Busy Frequency Stop is switched ON by Menu No. 05. The radiotelephone remains on the same channel for either a short time or until the signal drops depending on which Scan Resume method is selected (see below). The squelch must be adjusted to the noise threshold point with no signals present for Busy Frequency Stop to work.

If Busy Frequency Stop is switched OFF by Menu No. 05, then all channels that contain a receive frequency are scanned, but the scan never stops on any channel.

■ Scan Resume Methods

Scan Resume controls when the radiotelephone continues scanning after stopping due to a busy channel.

Time-operated Scan: After stopping, Scan checks the busy channel approximately three seconds later. If the channel is still busy, Scan waits another three seconds then resumes scanning. If the channel is not busy three seconds after stopping, Scan resumes immediately.

Carrier-operated Scan: The radiotelephone remains on the same channel until the signal drops, then Scan resumes approximately two seconds later.

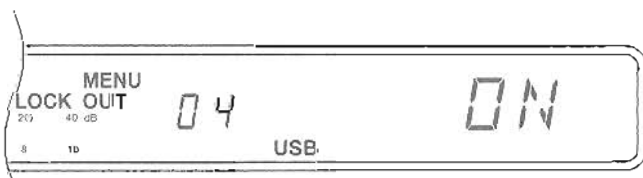
Select your preferred Scan Resume method via Menu No. 05. The default is Time-operated.

Note: Carrier-operated Scan is automatically used for scanning in Selective Call mode. However, when a signal is received, scanning stops only during the unmuted period.

CHANNEL LOCKOUT

If you want to exclude any channels from being scanned, these channels should be locked out.

- 1 Select the channel that you want to lock out.
- 2 Access Menu No. 04, then choose "ON".
 - "LOCK OUT" appears.



- 3 Exit Menu mode.

STARTING/ STOPPING SCAN

The [SCAN] button must be activated by your Dealer to function as described here.

To start or stop scanning, press [SCAN].

- You can also press Microphone PTT to stop scanning.
- If all channels are locked out or if only one channel has a frequency stored, pressing [SCAN] causes the radiotelephone to generate a triple error beep.

NOISE BLANKER

The Noise Blanker is effective in reducing or eliminating pulse-type noise. Switch the Noise Blanker OFF or ON by Menu No. 02.

CLARIFIER

The CLARIFIER control changes the receive frequency (without affecting the transmit frequency) by ± 1.1 kHz using steps of 10 Hz. The Dealer may have modified the function for an overall range of ± 110 Hz using steps of 1 Hz.

KPE-1 SELECTIVE CALL UNIT (OPTIONAL)

After the Dealer installs the optional KPE-1 Selective Call Unit, you can place calls to other stations by using the Microphone keypad to "dial" their unique Identification code. You can also receive calls from other stations that have dialed your Identification code.

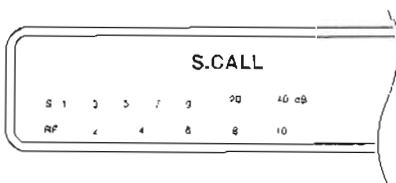
In addition, Group calls allow you to call and communicate with a group of stations in your system. With a single call, you can contact a number of stations at the same time, and transmit a message that will be heard by all of these stations. The "*" symbol is used as a wild card when programming Group codes. For example, sending the Group code "*0*" would allow you to contact all stations that have the number "0" in the second digit of their Identification codes.

Group Communication Network Example		
Predetermined frequency		14.482 MHz
Your Identification code		101
Member 1	Identification code	102
Member 2	Identification code	113
Member 3	Identification code	114
Group	Group code	1**

Your Menu	
Menu#07	101
Menu#08	102
Menu#09	113
Menu#10	114
Menu#11	1**

MANUAL CALLING

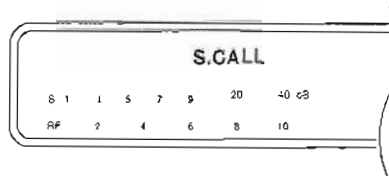
- 1 Adjust the **SQUELCH** control for the noise threshold so the channel noise is just muted.
- 2 Activate Selective Call via Menu No. 06.
 - "S.CALL" appears, and the receiver audio is muted.



- 3 Hold down Microphone **PTT** and enter a 3-digit Identification code via the Microphone keypad.
 - To make a call with a Group code, use "*" as a wild card.
- 4 While still holding down Microphone **PTT**, enter "#".
 - You can release Microphone **PTT** immediately after pressing "#".
 - The Identification code of the station being called (their individual code or a Group code) plus your Identification code is transmitted.
 - After the codes have been transmitted, the word "CALL" plus the Identification code of the station that was called are displayed. For example, "CALL102".
- 5 If you do not receive a response to your call within about 10, 20, or 30 seconds (Dealer selectable), your receiver mutes, and the radiotelephone is ready to receive a selective call.
 - Instead of waiting for the programmed time period to pass, you can also press [#] again (without pressing Microphone **PTT**) to restore the radiotelephone standby status.

MEMORY CALLING

- 1 Adjust the **SQUELCH** control for the noise threshold so the channel noise is just muted.
- 2 Activate Selective Call via Menu No. 06.
 - "S.CALL" appears, and the receiver audio is muted.



- 3 Hold down Microphone **PTT**, then enter "*" plus "A", "B", "C", or "D". For example, "*A".
- 4 While still holding down Microphone **PTT**, enter "#".
 - You can release Microphone **PTT** immediately after pressing "#".
 - The Identification code that is stored in memory A, B, C, or D plus the Character message that is stored for the same memory are sent. For example, the Identification code and Character message stored in memory A are sent.
 - After the code and message have been transmitted, the word "CALL" plus the Identification code of the station that was called are displayed. For example, "CALL102".
- 5 If you do not receive a response to your call within about 10, 20, or 30 seconds (Dealer selectable), your receiver mutes, and the radiotelephone is ready to receive a selective call.
 - Instead of waiting for 10 seconds to pass, you can also press [#] again (without pressing Microphone **PTT**) to restore the radiotelephone standby status.

RECEIVING

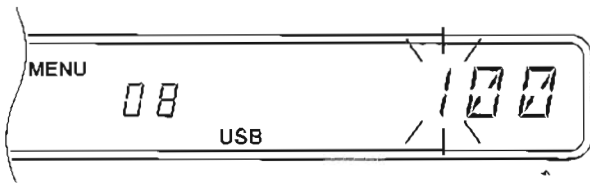
Adjust the **SQUELCH** control for the noise threshold so the channel noise is just muted. After activating Selective Call via Menu No. 06 and receiving a call, alert beeps sound for about 10, 20, or 30 seconds (Dealer selectable). Stop these beeps by pressing any button or key. Pressing [#] stops the alert beeps and mutes the receiver. Your Display may show either the Identification code of the station calling you or a Character message that the caller has sent. Pressing [*] unmutes the receiver and allows you to monitor channel activity.

If you receive a call while scanning, the receiver unmutes and stops on the channel for a period of time. Pressing Microphone **PTT** during this period cancels the alert beeps and the Scan function, and places the radiotelephone in the transmit mode; pressing [SCAN] cancels the alert beeps and the Scan function.

CHANGING IDENTIFICATION CODES

Your Identification code has been stored in Menu No. 07 by the Dealer. This code is fixed. However, the Dealer also stored Identification codes for the stations with which you will communicate. You can use the procedure below to change these codes. Acceptable Group codes can be set by using "*" as a wild card such as "10*", "*0*", "*x4", or "*x*x".

- 1 Press [MENU] to enter Menu mode.
- 2 Press [MODE] or [DATA] to select Menu No. 08, 09, 10, or 11.
- 3 Enter the first digit by turning the CHANNEL selector, or by pressing a Microphone [UP] or [DWN] key.

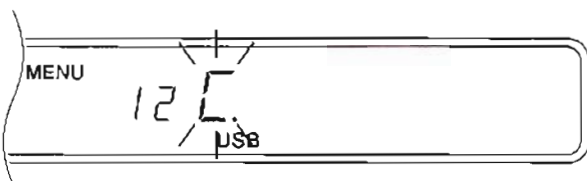


- 4 Press [SCAN] to move to the next digit.
- 5 Enter the second digit.
- 6 Press [SCAN] to move to the third digit.
- 7 Enter the third digit.
- 8 Press [MENU] to exit Menu mode.

CHANGING CHARACTER MESSAGES

The Dealer may have programmed the radiotelephone so that it sends out Character messages instead of the radiotelephone's Identification code when you communicate with other stations. The messages programmed by the Dealer may be changed by you via Menu mode.

- 1 Press [MENU] to enter Menu mode.
- 2 Press [MODE] or [DATA] to select Menu No. 12, 13, 14, or 15.
- 3 Enter a digit by turning the CHANNEL selector, or by pressing a Microphone [UP] or [DWN] key.



- 4 Press [SCAN] to move to the next digit.
- 5 Repeat Steps 3 and 4 to enter up to 7 digits.
- 6 Press [MENU] to exit Menu mode.

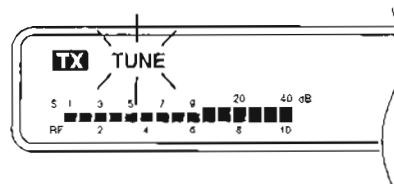
AUTOMATIC ANTENNA TUNER

PRESETTING (KAT-2 INTERNAL TUNER)

After each successful tuning session, the Preset function stores the data for the position of the tuning capacitors. Then, if the channel is changed, the Preset function automatically positions the capacitors using data that was previously stored for the new channel. The first time that a channel is used, the Preset function uses default data.

KAT-2 INTERNAL TUNER (OPTIONAL)

- 1 Press [AT TUNE] to start tuning.
 - "TUNE" begins blinking.

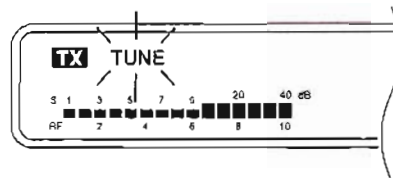


- Pressing [AT TUNE] again cancels tuning.
- 2 Tuning completes and the Preset data is updated.
 - "TUNE" remains visible on the Display.
 - If tuning does not complete within approximately 20 seconds, five beeps sound over a 10 second period and the tuning action stops.

KAT-1/ MAT-100 EXTERNAL TUNER (OPTIONAL)

Always switch OFF the power to the radiotelephone before connecting the KAT-1 or MAT-100 tuner.

- 1 Press [AT TUNE] to start tuning.
 - "TUNE" begins blinking.



- Pressing [AT TUNE] again cancels tuning.
- 2 Tuning completes.
 - "TUNE" remains visible on the Display.
 - If tuning does not complete within approximately 20 seconds, five beeps sound over a 10 second period and the tuning action stops.

Note: Tuning with the KAT-1 or MAT-100 External Tuner does not store any Preset data. Therefore, each time that a new channel is selected, you must retune.

COMPUTER ↔ RADIOTELEPHONE INTERFACE

The TRC-80 interfaces easily with a computer by using the optional IF-232C Interface Unit. After you manually switch OFF the radiotelephone power, you can then switch ON the radiotelephone power using commands from the computer. Similarly, after switching OFF the power from the computer, it is then possible to switch ON the power from the Front Panel.

COMMUNICATION PARAMETERS

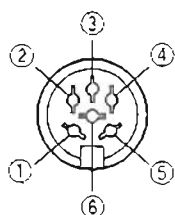
In order to control the radiotelephone with your computer, you must set the correct communication parameters in the computer terminal application. Configure your computer application for 9600 bps, 8 data bits, 1 stop bit, and no parity.

HARDWARE DESCRIPTION

The TRC-80 uses a full-duplex, asynchronous, serial interface for communicating through the female 6-PIN DIN ACC 1 connector. Bytes are constructed with 1 start bit, 8 data bits, and 1 stop bit. No parity is used.

The pinout and the pin functions of the ACC 1 connector are as shown below:

ACC 1 CONNECTOR



Viewed from the radiotelephone Rear Panel

Pin No.	Pin Name	Function	I/O
1	GND	Signal ground	—
2	$\overline{\text{TXD}}$	Transmit data	Output
3	$\overline{\text{RXD}}$	Receive data	Input
4	CTS	Transmit enable	Input
5	RTS	Receive enable	Output
6	NC	Not connected	—

GND: This is the signal ground pin.

$\overline{\text{TXD}}$: The transmit data is the serial data transferred from the radiotelephone to the computer. The output uses negative logic.

$\overline{\text{RXD}}$: The receive data is the serial data transferred from the computer to the radiotelephone. The input uses negative logic.

CTS: This signal is supplied from the computer to the radiotelephone. It is used to inhibit transmit data from the radiotelephone when the computer is not ready to receive the data. The input uses positive logic. Inhibit is requested when the level is low.

RTS: This signal is supplied from the radiotelephone to the computer. It is used to inhibit transmit data from the computer when the radiotelephone is not ready to receive the data. The output uses positive logic. Transmit data is stopped when the level is low.

Note: Refer to the Appendix beginning on page A1 for additional information regarding computer control.

MAINTENANCE

The radiotelephone has been factory aligned and tested to specification before shipment. Under normal circumstances, the radiotelephone will operate in accordance with these operating instructions. All adjustable trimmers, coils and resistors in the radiotelephone were preset at the factory. They should only be readjusted by a qualified technician who is familiar with this radiotelephone and has the necessary test equipment. Attempting service or alignment without factory authorization can void the radiotelephone warranty.

When operated properly, the radiotelephone will provide years of service without requiring further realignment. The information in this section gives some general service procedures requiring little or no test equipment.

SERVICE

If it is ever necessary to return the equipment to your Dealer or Service Center for repair, pack the radiotelephone in its original box and packing material. Include a full description of the problems experienced. Include both your telephone number and fax number (if available) along with your name and address in case the service technician needs to call for further explanation while investigating the problem. Don't return accessory items unless you feel they are directly related to the service problem.

You may return the radiotelephone for service to the authorized **KENWOOD** Dealer from whom you purchased it or any authorized **KENWOOD** service center. A copy of the service report will be returned with the radiotelephone. Please do not send subassemblies or printed circuit boards. Send the complete radiotelephone.

Tag all returned items with your name for identification. Please mention the model and serial number of the radiotelephone in any communication regarding the problem.

SERVICE NOTE

If you desire to correspond on a technical or operational problem, please make your note short, complete, and to the point. Help us help you by providing the following:

- 1 Model and serial number of equipment
- 2 Question or problem you are having
- 3 Other equipment in your station pertaining to the problem
- 4 Meter readings
- 5 Other related information (Menu setup, mode, frequency, button sequence to induce malfunction, etc.)

CAUTION: Do not pack the equipment in crushed newspapers for shipment! Extensive damage may result during rough handling or shipping.

Note:

- ◆ Record the date of purchase, serial number and Dealer from whom the radiotelephone was purchased.
- ◆ For your own information, retain a written record of any maintenance performed on the radiotelephone.
- ◆ When claiming warranty service, please include a photocopy of the bill of sale, or other proof-of-purchase showing the date of sale.

CLEANING

The buttons, controls and case of the radiotelephone are likely to become soiled after extended use. Remove the controls from the radiotelephone and clean them with a neutral detergent and warm water. Use a neutral detergent (no strong chemicals) and a damp cloth to clean the case.

TROUBLESHOOTING

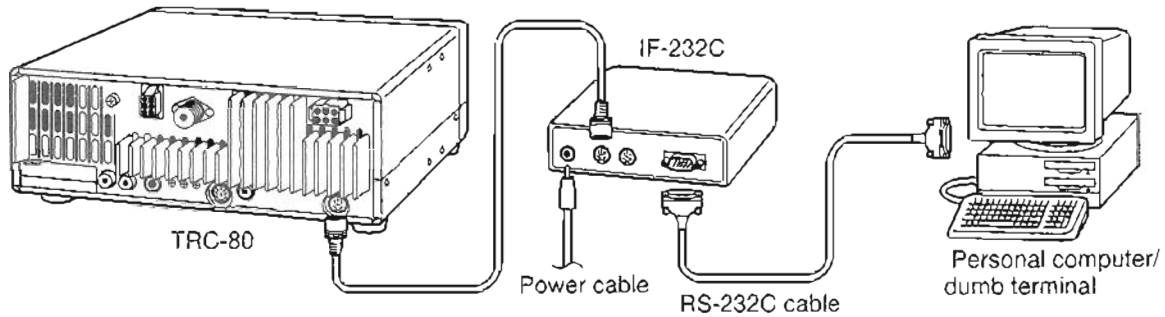
The problems described in this table are commonly encountered operational malfunctions. These types of difficulties are usually caused by improper hook-up, accidental incorrect control settings, or operator error due to incomplete programming, and are not caused by circuit failure. Please review this table, and the appropriate section(s) of this instruction manual, before assuming the radiotelephone is defective.

Problem Symptom	Probable Cause	Corrective Action
The radiotelephone will not power up after connecting a 13.6 V DC power supply and pressing [POWER]. Nothing appears on the Display, and no receiver noise is heard.	<ol style="list-style-type: none"> 1 The DC power supply is not switched ON. 2 The power cable is faulty. 3 The power cable is not connected securely. 4 A power cable fuse is open. 	<ol style="list-style-type: none"> 1 Switch ON the DC power supply. 2 Inspect the power cable. Confirm polarities are correct. Red: positive (+); Black: negative (-). 3 Confirm that the power connector is locked against the radiotelephone Rear Panel. Confirm the connections to the DC power supply are secure. 4 Look for the cause of the blown fuse. After inspecting and correcting any problems, install a new fuse with the same rating.
No sound comes from the speaker; signals cannot be received.	<ol style="list-style-type: none"> 1 The VOLUME control is fully counterclockwise. 2 The SQUELCH control is fully clockwise. 3 The Microphone PTT switch is pressed. 	<ol style="list-style-type: none"> 1 Turn the VOLUME control clockwise. 2 Turn the SQUELCH control counterclockwise. 3 Release the Microphone PTT switch.
After switching ON the power, the Display is dark.	The input voltage is outside 13.6 V DC $\pm 15\%$ (11.6 to 15.6 V DC).	Correct the input voltage.
SSB audio quality is poor.	The receiver is not tuned to the correct frequency.	Turn the CLARIFIER control to tune the receiver for a clearer signal.
The radiotelephone is automatically changing channels.	The Scan function is working.	Press [SCAN] to stop scanning.
You cannot transmit even though you press [PTT].	<ol style="list-style-type: none"> 1 The microphone plug is not inserted completely in the Front Panel MIC connector. 2 Poor antenna connection 3 The selected channel is receive only. 4 You have selected the CW or DATA mode instead of a voice mode. 	<ol style="list-style-type: none"> 1 Turn OFF the power, ensure the MIC connector on the Front Panel has no foreign objects in it, then plug in the microphone connector. Secure the connector with the locking ring. 2 Check the antenna system. 3 Select a channel programmed for transmit and receive. 4 Press [MODE] to select a voice mode.
The antenna tuner will not finish tuning successfully.	<ol style="list-style-type: none"> 1 Poor antenna connection 2 The antenna length is wrong. 3 If using an external tuner, it is not grounded correctly. 	<ol style="list-style-type: none"> 1 Check the antenna system. 2 Use the correct antenna length. 3 Ground the tuner.

ACCESSORY CONNECTIONS

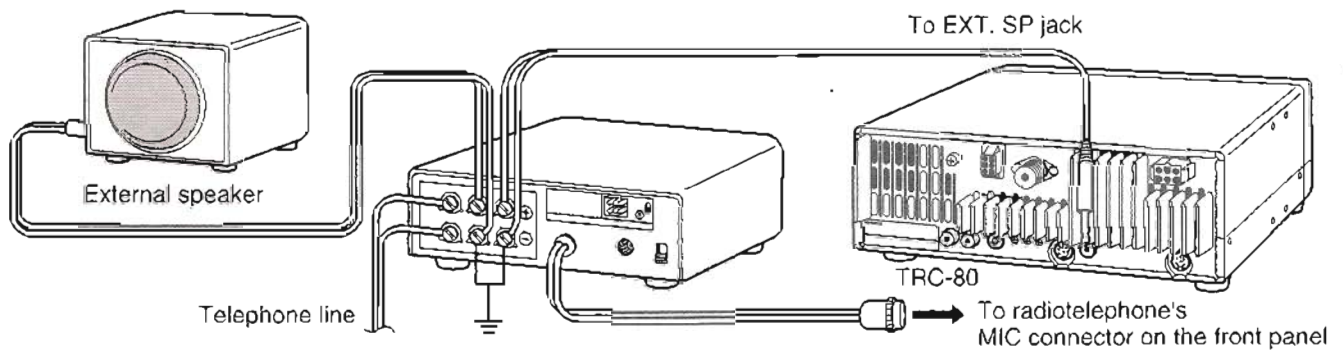
COMPUTER INTERFACE (ACC 1)

This connector allows you to connect a computer or dumb terminal via an optional IF-232C Interface Unit. Refer to "COMPUTER ↔ RADIOTELEPHONE INTERFACE" beginning on page 14 and the Instruction Manual supplied with the IF-232C for further information.



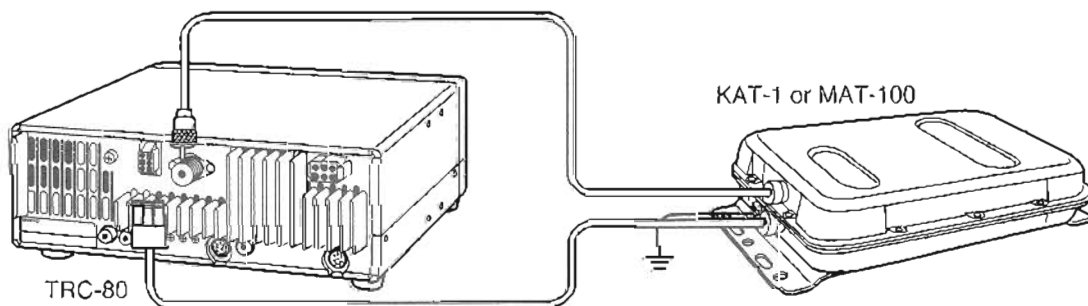
PC-1A PHONE PATCH CONTROLLER (ACC 2)

The PC-1A Phone Patch allows you to interface the radiotelephone with a telephone line.



ANTENNA TUNER (AT)

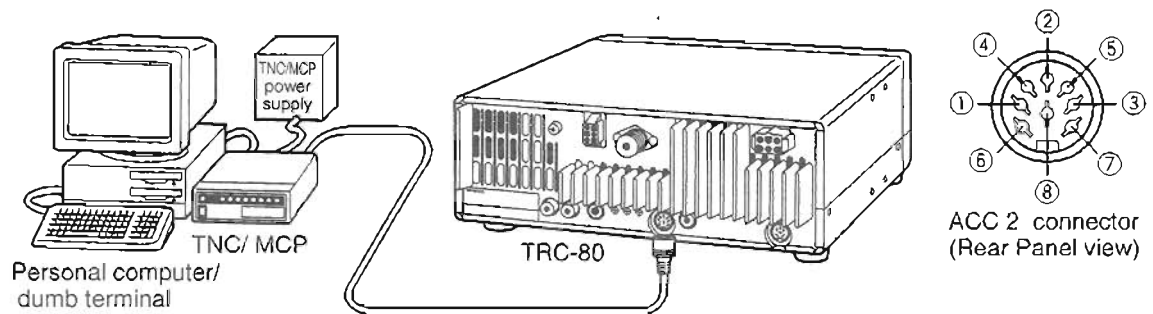
If using an optional KAT-1 or MAT-100 External Tuner, connect it here using the cable supplied with the antenna tuner.



DATA EQUIPMENT INTERFACE (ACC 2)

The ACC 2 connector allows connection of a Terminal Node Controller (TNC) or a Multimode Communications Processor (MCP) for data communications.

Pin No.	Pin Name	Function
1	NC	Not connected
2	RTK	RTTY modulation (input) <ul style="list-style-type: none"> Connect the transmit lead from your RTTY equipment for FSK operation.
3	ANO	Fixed-level audio from receiver (output) <ul style="list-style-type: none"> Connect to TNC or MCP receive data lead. Audio level is independent of VOLUME control setting.
4	GND	Chassis ground
5	PSQ	Squelch control <ul style="list-style-type: none"> Connect to TNC or MCP squelch control pin. Prevents the TNC/MCP from transmitting while the receiver squelch is open. Squelch open: High impedance Squelch closed: Low impedance
6	PKS	Radiotelephone PTT line control <ul style="list-style-type: none"> Connect to TNC or MCP transmit/receive switching pin. Microphone audio input at the MIC pin on the Front Panel MIC connector is muted when in transmit mode.
7	PKD	Microphone audio (input) <ul style="list-style-type: none"> Connect the transmit lead from your TNC or MCP for AFSK operation.
8	PKDG	Shield for Pin 7.



CHANNEL MEMO

Ch. No.	RX Freq.	TX Freq.	Function
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
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Ch. No.	RX Freq.	TX Freq.	Function
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PARAMETER TABLE

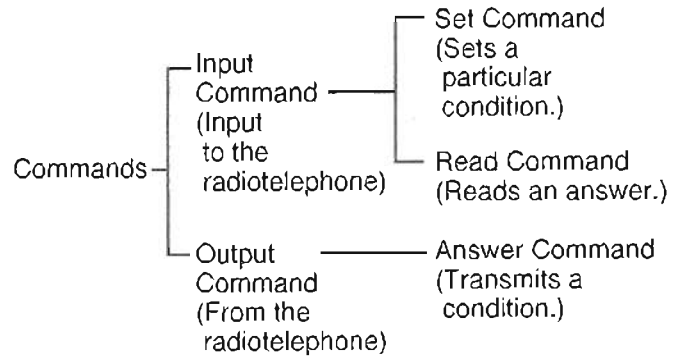
Form- mat No.	Name	No. of Digits	Format
1	SW	1	0: OFF 1: ON
2	MODE	1	1: LSB 5: AM 2: USB 6: DATA 3: CW
4	FREQUENCY	11	Represented in Hz. Ex.: 00008192000 is 8.192 MHz
5	CLARIFIER FREQUENCY	5	The first digit is "+" or "-", and the remaining four digits indicate the frequency in Hz. Ex.: +1000 is +1.00 kHz "_" can be used for "+".
7	MEMORY CHANNEL	2	Represented using 01~80.
9	MEMORY CHANNEL SPLIT DATA	1	0: Receive 1: Transmit
10	MEMORY LOCKOUT	1	0: Not locked out 1: Locked out
11	TX/RX	1	0: Receive 1: Transmit
22	METER VALUE	4	Represented using 0000 (min.)~0015 (max.). Relative values are output.
25	PITCH	2	00: 400 Hz 01: 800 Hz
30	ANTENNA TUNER	1	0: Antenna tuner thru 1: Antenna tuner in-line
31	GAIN	3	AF gain: Represented using 000 (min.)~255 (max.). MIC gain: 000: Low gain 001: High gain
46	LEVEL	3	Represented using 000 (min.)~255 (max.).
47	POWER CONTROL	3	015: Low power 025: Medium power 050: High power 100: Maximum power
49	SEMI BREAK- IN DELAY TIME	4	Represented in msec using 0000~1800 (200 Hz steps).
51	VOX DELAY TIME	4	Represented in msec using 0200~2000 (200 Hz steps).

TERMINATOR

To signal the end of a command, it is necessary to use a semicolon (;). The digit where this special character must appear differs depending on commands.

TYPES OF COMMANDS

Commands can be classified as shown below:



For example, note the following in the case of the MD command (Operating mode):

- To set the mode to USB, the following command is sent from the computer to the radiotelephone:
"MD2;" **(Set Command)**
- To read the mode, the following command is sent from the computer to the radiotelephone:
"MD;" **(Read Command)**
- When the Read Command above has been sent, the following command is returned to the computer:
"MD2;" **(Answer Command)**

COMPUTER CONTROL COMMANDS

A summary of the command library for communication between a computer and the TRC-80 is included in this section.

Command	Function
AC	Antenna Tuner THRU/IN LINE, and tuning START/CANCEL
AG	Sets or reads AF gain.
BY	Reads Busy signals.
ID	Reads model number of the radiotelephone.
IF	Reads status of the radiotelephone.
LO	Returns control from the computer back to the radiotelephone.
MC	Sets or reads channels.
MD	Sets or reads modes.
MG	Sets or reads MIC gain (High/Low).
MR	Reads memory.
MX	Sets or reads AIP (OFF/ON).
NB	Sets or reads Noise Blanker (OFF/ON).
PC	Sets or reads transmit power.
PS	Sets or reads power (OFF/ON).
PT	Sets or reads the pitch frequency.
RC	Clears Clarifier frequency.
RD	Lowers Clarifier frequency.
RU	Raises Clarifier frequency.
RX	Selects receive mode.
SC	Sets or reads Scan (OFF/ON).
SD	Sets or reads Semi Break-in delay time.
SM	S-meter and TX RF meter readings
SQ	Sets or reads squelch level.
TX	Selects transmit mode.
VD	Sets or reads VOX delay time.
VX	Sets VOX (OFF/ON).

ERROR MESSAGES

In addition to the Answer Command, the radiotelephone can send the following error messages:

Error Message	Reason for Error
?	<ul style="list-style-type: none"> Command syntax was incorrect. Command was not executed due to the current status of the radiotelephone (even though the command syntax was correct). <p><i>Note: Occasionally this message may not appear due to microprocessor transients in the radiotelephone.</i></p>
E;	A communication error occurred such as an overrun or framing error during a serial data transmission.
O;	Receive data was sent but processing was not completed.

COMMAND USE PRECAUTIONS

- 1 The control characters 00 to 1Fh are ignored when included in receive data.
- 2 Program execution may be delayed while turning the CHANNEL selector rapidly.

AG AF GAIN

		Parameter	Format	Parameter function
Function	Sets or reads AF gain.			P1 31 AF GAIN
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 A G P1 :		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 A G :		
Output commands	Answer command	1 2 3 4 5 6 6 7 8 8 10 11 12 13 14		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		
<p>Note:</p> <ul style="list-style-type: none"> P1=000: Fully CCW P1=255: Fully CW When the AF gain is set using this command, the VOLUME control becomes unfunctional. Use the LO command to restore the function of the VOLUME control. 				

BY BUSY

		Parameter	Format	Parameter function
Function	Reads Busy signals.			P1 1 BUSY OFF/ON
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 /		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 B Y :		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 B Y P1 :		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

ID ID

		Parameter	Format	Parameter function
Function	Reads model number of the radiotelephone.			Note: • The TRC-80 model number is 016
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 /		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 I D :		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 I D 0 1 6 .		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

IF INFORMATION

		Parameter	Format	Parameter function
Function	Reads status of the radiotelephone.			P1 4 DISPLAY FREQUENCY P8 5 CLARIFIER FREQUENCY P4 1 CLARIFIER ON/OFF P7 7 MEMORY CHANNEL P8 11 TX/RX P9 2 MODE P11 1 SCAN ON/OFF P12 1 SPLIT ON/OFF
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 /		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 I F :		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 I F P1		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28 P3 P4 P7		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42 P8 P9 P11 P12		

LO LOCAL

		Parameter	Format	Parameter function																																																																																			
Function	Returns control from the computer back to the radiotelephone.			Note: • After using the AG command, this command restores the function of the VOLUME control																																																																																			
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>L</td><td>O</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	L	O	:																																																																		
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Output commands	Answer command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>		1	2	3	4	5	6	7	8	9	10	11	12	13	14	/														15	16	17	18	19	20	21	22	23	24	25	26	27	28															29	30	31	32	33	34	35	36	37	38	39	40	41	42														
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MC MEMORY CHANNEL

		Parameter	Format	Parameter function																																																																																			
Function	Sets or reads memory channels.			P2 7 MEMORY CHANNEL																																																																																			
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>M</td><td>C</td><td>:</td><td>P2</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	C	:	P2	:																																																																
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MD MODE

		Parameter	Format	Parameter function																																																																																			
Function	Sets or reads modes.			P1 2 MODE																																																																																			
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>M</td><td>D</td><td>:</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	D	:	P1	:																																																																
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MG MIC GAIN

		Parameter	Format	Parameter function																																																																																			
Function	Sets or reads MIC gain.			P1 31 MIC GAIN Note: • P1=000: Low gain P1=001: High gain																																																																																			
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>M</td><td>G</td><td>:</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	G	:	P1	:																																																																
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Output commands	Answer command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>M</td><td>G</td><td>:</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>		1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	G	:	P1	:										15	16	17	18	19	20	21	22	23	24	25	26	27	28															29	30	31	32	33	34	35	36	37	38	39	40	41	42														
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MR MEMORY READ

		Parameter	Format	Parameter function
Function	Reads memory.	P1	9	SPLIT DATA
Input commands	Set command	P3	7	MEMORY CHANNEL
	Read command	P4	4	FREQUENCY
Output commands	Answer command	P5	2	MODE
		P6	10	MEMORY LOCKOUT

Input commands	Output commands
Set command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 M R P1 :	Answer command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 M R P1 : P3 : P4 : P5 P6 :

Note:
 - For a vacant channel, the Answer command sends "0" for all commands.

MX MIXER

		Parameter	Format	Parameter function
Function	Sets AIP OFF/ON or reads status.	P1	1	AIP OFF/ON

Input commands	Output commands
Set command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 M X P1 :	Answer command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 M X P1 :

NB NOISE BLANKER

		Parameter	Format	Parameter function
Function	Sets Noise Blanker OFF/ON or reads status.	P1	1	NOISE BLANKER OFF/ON

Input commands	Output commands
Set command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 N B P1 :	Answer command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 N B P1 :

PC POWER CONTROL

		Parameter	Format	Parameter function
Function	Sets or reads transmit power.	P1	47	POWER CONTROL

Input commands	Output commands
Set command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 P C P1 :	Answer command: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 P C P1 :

Note:
 - P1=000: Low power
 - P1=025: Medium power
 - P1=050: High power
 - P1=100: Maximum power

PS POWER SWITCH

		Parameter	Format	Parameter function																												
Function	Sets Power OFF/ON or reads status.	P1	1	Power OFF/ON																												
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>P</td><td>S</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	P	S	P1	:										
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Read command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>P</td><td>S</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	P	S	:														
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PT PITCH

		Parameter	Format	Parameter function																												
Function	Sets or reads the pitch frequency.	P1	25	PITCH																												
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>P</td><td>T</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	P	T	P1	:										
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P	T	P1	:																													
Read command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>P</td><td>T</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	P	T	:														
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Output commands	Answer command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>P</td><td>T</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	P	T	P1	:										
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RC RIT (CLARIFIER) CLEAR

		Parameter	Format	Parameter function																												
Function	Sets or Clarifier frequency shift to "0".																															
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>R</td><td>C</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	R	C	:											
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R	C	:																														
Read command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14																	
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Output commands	Answer command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14														
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RD RU RIT (CLARIFIER) DOWN/UP

		Parameter	Format	Parameter function																												
Function	Lowers/raises Clarifier frequency.																															
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>RD</td><td>RU</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	RD	RU	:											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14																		
RD	RU	:																														
Read command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14																	
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Output commands	Answer command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14														
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RX TX RX/TX

		Parameter	Format	Parameter function
Function	Selects receive/transmit mode.			
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 RX :		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 /		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 /		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

SC SCAN

		Parameter	Format	Parameter function
Function	Sets Scan OFF/ON or reads status.			
Input commands	Set command	P1	1	SCAN OFF/ON
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S C P1 :		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S C P1 :		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

SD SEMI BREAK-IN DELAY TIME

		Parameter	Format	Parameter function
Function	Sets or reads Semi Break-in delay time.			
Input commands	Set command	P1	49	SEMI BREAK-IN DELAY TIME
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S D P1 :		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S D P1 :		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

Note:
 P1=0000: FULL
 P1=0200-1800: SEMI (200 Hz steps)

SM S-METER

		Parameter	Format	Parameter function
Function	S-meter and TX RF meter readings			
Input commands	Set command	P1	22	S-METER VALUE (RX)
	Read command	P1	22	RF-METER VALUE (TX)
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S M :		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

SQ SQUELCH LEVEL

Function		Parameter	Format	Parameter function
Sets or reads squelch level.		P1	46	SQUELCH LEVEL
Note: • P1=000: Fully CCW P1=255: Fully CW				
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S Q P1 ;		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S Q .		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 S Q P1 ;		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

VD VOX DELAY TIME

Function		Parameter	Format	Parameter function
Sets or reads VOX delay time.		P1	51	VOX DELAY TIME
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 V D P1 ;		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 V D .		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 V D P1 ;		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

VX VOX FUNCTION

Function		Parameter	Format	Parameter function
Sets VOX OFF/ON.		P1	1	VOX OFF/ON
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 V X P1 ;		
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 V X .		
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13 14 V X P1 .		
		15 16 17 18 19 20 21 22 23 24 25 26 27 28		
		29 30 31 32 33 34 35 36 37 38 39 40 41 42		

KENWOOD