KENWOOD

TM-702A/702E

144MHz, 430/440MHz FM DUAL BANDER
INSTRUCTION MANUAL

TRANSCEPTOR FM DUAL BANDA
MANUAL DE INSTRUCCIONES

EMETTEUR-RECEPTEUR FM BI-BANDES
MODE D'EMPLOI

KENWOOD CORPORATION

©PRINTED IN JAPAN B62-0003-00(E, M, P)(T)
91/12 11 10 9 8 7 6 5 4 3 2 1 90/12 11 10 9 8

INSTRUCTION MANUAL

Thank you for purchasing this new transceiver.

IMPORTANT:

Please read this instruction manual carefully before placing your transceiver in service.

SAVE THIS INSTRUCTION MANUAL.

CAUTION:

Long transmission or extended operation in the HI power mode might cause the rear of this transceiver to get warm.
Do not place the transceiver where the heat sink (rear panel) might come in contact with plastic or vinyl surfaces.

NOTE:

If disregarded, inconvenience only, no risk of equipment damage or personal injury.

CAUTION:

Equipment damage may occur, but not personal injury.

FCC WARNING
This equipment generates or uses radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.

ENGLISH

CONTENTS

2 SPECIFICATIONS AND ACCESSORIES

2-1 SPECIFICATIONS

			TM-702A		TM-702E
GENERAL	Frequency range (MHz)		144 to 148 / 438 to 450	144 to 146 / 430 to 440	144 to 146 / 430 to 440
	Mode		F3E (FM)		
	Antenna impedance		50 Ω		
	Operating temperature		−20°C to +60°C(−4°F to +140°F)		
	Power requirements		13.8VDC ± 15 %(11.7 to 15.8V)		
	Ground		Negative		
	Current drain	Transmit mode	Less than 8A		
		Receiver mode	Less than 0.6A		
	Frequency stability		Less than ± 10ppm		
	Dimensions (W × H × D)(Projections included)		140(5-1/2")×40(1-37/64")×200(7-7/8") (140(5-1/2")×40(1-37/64")×212(8-11/32"))		
	Weight		1.4kg(3.1lbs)		
TRANSMISSION	Output power *	HI	25W		
		MID	10W		
		LOW	Approx. 2W		
	Modulation		Reactance modulation		
	Spurious radiation		Less than − 60 dB		
	Maximum frequency deviation		± 5kHz		
	Audio distortion (at 60% modulation)		Less than 3% (300 to 3000 Hz)		
	Microphone impedance		500 to 600 Ω		
RECEIVER	Circuitry		Double conversion superheterodyne		
	Intermediate frequency 1st(U.S.A.)/2nd		144MHz : 30.3MHz(16.9MHz)/455kHz	430/440MHz : 30.825MHz(21.6MHz)/455kHz	
	Sensitivity(12dB SINAD)		Less than 0.16 μV		
	Selectivity		− 6 dB : More than 12 kHz, − 60 dB : Less than 24 kHz		
	Squelch sensitivity		Less than 0.1 μV		
	Output(5 % distortion)		More than 2 W across 8 Ω load (5% distortion)		
	External speaker impedance		8Ω		

Notes :
1. Circuit and ratings are subject to change without notice due to advancement in technology.
2. *Recommended duty cycle : 1 minute ; Transmission , 3minutes ; Reception

2-2 ACCESSORIES

Unpack your new transceiver carefully, and examine it for visible damage. If the equipment has been damaged in shipment, notify the transportation company immediately. Save the boxes and packing material for future shipping.

The following accessories should have been included in the box with the transceiver.

DTMF Microphone (U.S.A.and CANADA only)	T91-0380-X5	1 ea.
or		
Microphone (GENERAL market only)	T91-0379-X5	1 ea.
or		
Microphone (EUROPE market only)	T91-0382-X5	1 ea.
Microphone Hook (U.S.A. and CANADA only)	J20-0319-24	1 ea.
Mobile Mounting Kit		
Bracket	J29-0436-03	1 ea.
Screw set	N99-0331-05	1 ea.
Self tapping Screw (U.S.A. and CANADA only) ...	N46-3010-46	2 ea.
Hex wrench	W01-0414-04	1 ea
DC power Cable	E30-2111-05	1 ea.
Fuse (10A)	F05-1031-05	1 ea.
Instruction Manual	B62-0002-XX	1 copy
Warranty Card		1 ea.

(U.S.A., CANADA, EUROPE markets only)

3 INSTALLATION INSTRUCTIONS

3-1 INSTALLATION

Mounting Bracket

When installing the transceiver in a vehicle consider the ease of operation and safety when selecting the location for the mounting bracket.

1. Install the bracket using the supplied flat washers and self tapping screws (4 pcs.each).
2. Attach the transceiver loosely using the SEMS screws (4 pcs.).
3. Align the grooves in the bracket with the transceiver's screws (Fig. A) and slide the transceiver to the rear.
4. Adjust the viewing angle of the bracket to the desired position (Fig B).
5. Hold the transceiver in place and tighten the 4 SEMS screws using the supplied wrench.

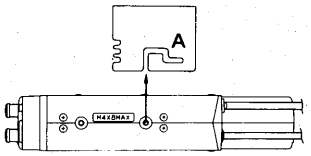


Fig. A

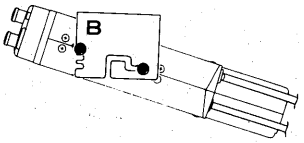


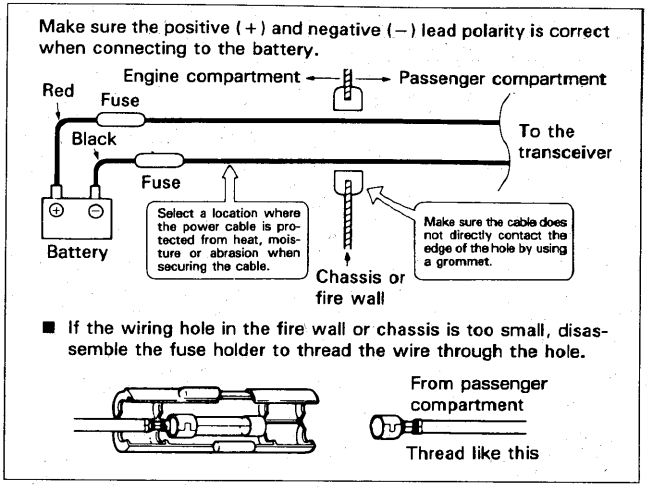
Fig. B

3-2 CONNECTION

3-2-1 Mobile Installations

Cautions :

1. Before installing the power cable, be sure to remove the negative lead from the battery for safety.
2. After installation and wiring, be sure to double check for correct installation before reconnecting the negative lead to the battery terminal.
3. If the fuse opens, be sure to check that each conductor has not been damaged by short circuiting, etc. Then replace with a new fuse of the same rating.
4. After completing the wiring, wrap the fuse holder with heat resistant tape to protect against heat and moisture.
5. Do not remove the fuse even if the power cable is too long.



A. Battery Connections

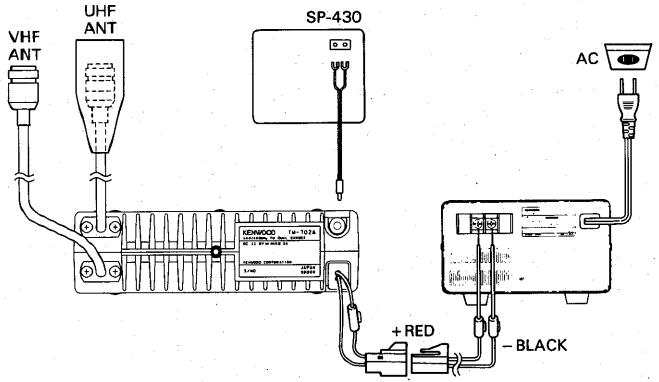
Connect the power cable directly to the battery terminals.Use of the cigarette lighter socket will lead to poor connection, and will result in poor performance. Pay close attention to the polarity of the cables when connecting them to the battery. Remember Red is positive and Black is negative!

B. Ignition Noise

This transceiver has been designed to suppress ignition noise; however, if excessive noise is present, it may be necessary to use suppressor spark plugs (with resistors).

3-2-2 Fixed Station

A regulated DC power supply (13.8 VDC capable of supplying at least 10 Amperes) is required. The PS-430 and the PS-50 are recommended.



Cautions :

1. Never connect the AC power cable to the AC outlet until all other connections have been made.
2. Before connecting and disconnecting the power connector, be sure to turn OFF the POWER switches of both the transceiver and the DC power supply.
3. Observe polarity of the DC power cable. The transceiver operates on 13.8 VDC, negative ground. Battery polarity must be correct. The power cable is color coded :
   Red → + (Positive polarity)
   Black → – (Negative polarity)

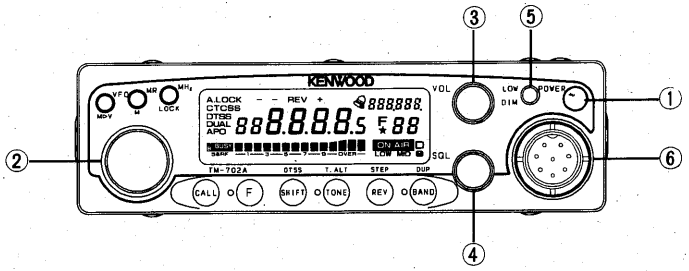
3-2-3 Antenna

The type of antenna that is used will greatly affect the performance of the transceiver. Use a properly adjusted antenna, of good quality, to enable your transceiver to perform at its best. The antenna input impedance is 50 ohms. Use 50-ohm coaxial cable such as RG-8U or 8D-2V for this connection. If the antenna is far from the transceiver the use of low loss coaxial cable, such as RG-8U is recommended. Match the impedance of the coaxial cable and that of the antenna so that the SWR is less than 1.5 to 1. The protection circuit in the transceiver will activate if the SWR is particularly poor (greater than 3 to 1).
High SWR values will cause the transmitter output to drop, and may lead to TVI or BCI reports.

Caution :
We recommend that you install a high quality lightening arrestor in your antenna lines for protection against fire,electric shock,personal injury,or damage to the radio itself.

4 OPERATION

4-1 CONTROL FUNCTIONS



① POWER switch
Press to turn the transceiver ON or OFF.

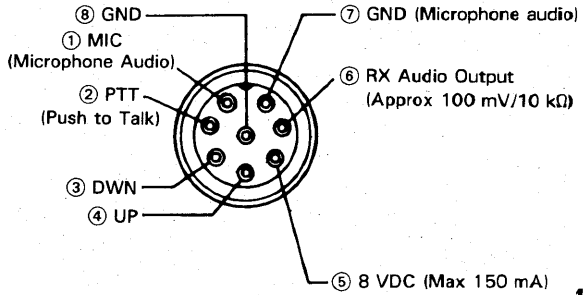
② Tuning control
This control is used to select the desired transmitter / receiver frequency, MHz step, Memory Channel, Frequency Step, Tone Frequency, Scan Direction, etc.

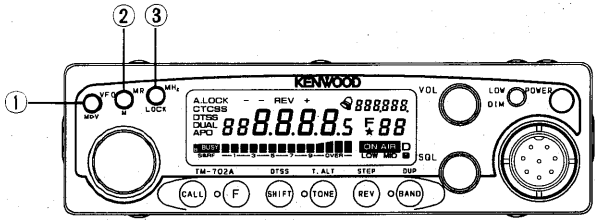
③ VOL control
This control is used to adjust the volume from the internal and external speaker (if used). Clockwise rotation will increase the volume and counterclockwise rotation will decrease the volume.

④ SQL (Squelch) control
This control is used to select the desired squelch threshold level.

⑤ LOW/DIM key
LOW
This function is used to select the transmit output power level (HI, MID, or LOW).
DIM
This function is used to select the intensity of the front panel display illumination. (See page 42)

⑥ Microphone connector
Attach the supplied microphone to this connector. The pin out of the connector is described in the accompanying illustration.





① VFO/M▶V key
This key is used to return to VFO operation after operating in the MR or CALL channel mode. Pressing this key will allow the tuning control and microphone UP / DWN keys to increase or decrease the operating frequency.

Press and hold the key for longer than 1 second to initiate VFO scan. Pressing the key after scan has been initiated will cause scan to stop.

Pressing the key within 10 seconds of pressing the F key will copy the memory channel or call channel data to the VFO. This allows you to change parameters of that channel without actually changing the data that has been stored in memory.

Pressing the F key for longer than 1 second and then pressing the VFO key will cause the radio to toggle the hold / resume mode between Time Operated scan and Carrier Operated scan.

If you press and hold the VFO key while you turn on the POWER switch you will reset the microprocessor's VFO memory, without destroying the memory channel or call channel data.

② MR/M key
This key is used to select MR (Memory Recall) mode from the VFO mode. The tuning control can then be used to select the desired Memory channel.

Pressing the key for longer than 1 second will initiate memory channel scanning.

Pressing the key within 10 seconds of pressing the F key will store the displayed data into memory.

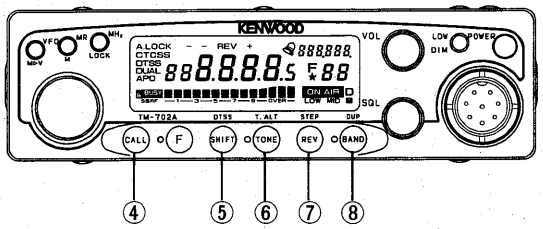
In the MR channel mode pressing the F key for longer than 1 second and then pressing the MR / M key will cause that Memory channel to be skipped during Memory channel scan.

If you hold and press this key while you turn on the POWER switch you will clear all the microprocessor's, operator programmed memory.

③ MHz/LOCK key
This key is used to tell the microprocessor that you wish to increase or decrease the operating frequency in 1 MHz increments.

Pressing this key within 10 seconds of pressing the F key will cause the key lock function to activate, protecting the currently displayed data from accidental erasure. (See page 43)

Pressing the F key for longer than 1 second and then pressing MHz / LOCK key will turn the AUTO POWER OFF function on or off. (See page 42)



④ CALL key
Press this key to activate the call channel function.

Press the F key momentarily and then press the CALL key to store the currently displayed data into the CALL channel. The radio will allow you up to 10 seconds to press the CALL key after pressing the F key.

TOT(Time-out timer)
The TOT limits the continuous transmission time to 30 minutes.
Press the F key for longer than 1 second and then press the CALL key while the F indicator is flashing will turn the time-out timer function on and off.

To operate the transceiver with the RC-10 press and hold the CALL key on the transceiver and then turn on the POWER switch.

⑤ SHIFT/DTSS key
SHIFT function
Press this key to select the desired transmitter offset direction. Pressing the key will cause the radio to shift from one offset direction to the other, i.e. "+" to "−" to simplex where no indicator shows. ("−"to"− −" for European versions(UHF BAND))

DTSS function
Select the DTSS or paging function. (See page 34)
The DTSS or paging code is displayed, and can be changed with the tuning control. (See page 33,36)
If the DTMF unit is not installed, the operating frequency can be output thou the sperker as a series of musical tones.

⑥ TONE/T.ALT key
TONE function
Pressing this key by itself causes the radio to select the desired tone signaling mode. When the "T" indicator is illuminated in the display the transceiver will transmit the selected subaudible tone. When the "CTCSS" indicator is illuminated the transceiver will both transmit the subaudible tone and will also remain squelched until the proper subaudible tone is received.

TONE frequency selection
Pressing the F key for longer than 1 second and then pressing the TONE / T.ALT key will allow you to select the desired tone frequency. To change to a different tone frequency rotate the tuning control or press the UP / DWN switches on the microphone until the desired tone frequency appears in the display. To return to the normal frequency display you can press any front panel key except the power switch.

TONE ALERT function
Pressing the F key momentarily and then pressing the TONE / T.ALT key will activate the Tone Alert function This function will cause the radio to emit a series of beeps when an incoming signal is received that will open the squelch.(See page 41)

⑦ REV/STEP key

This key is used to reverse the transmit / receive frequencies during repeater operations. If you have selected simplex this key will not function!

Pressing the F key momentarily and then the REV/STEP key will allow you to select the desired VFO tuning step and Scan step size. Use the tuning control to select the desired tuning step and then press any front panel key except the POWER switch to return to the normal frequency display.

Pressing the F key for longer than 1 second and then pressing the REV/STEP key will turn the BEEP function Off or ON.

⑧ BAND/DUP key

BAND function

Each time the BAND/DUP key is pressed, the VHF and UHF bands are switched.

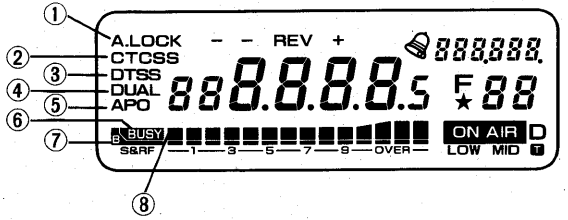
Pressing the key for longer than 1 second starts dual scanning.

DUP function

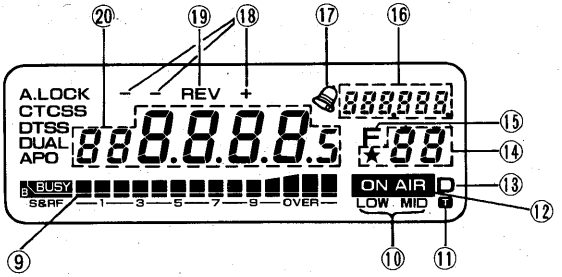
Pressing the F key momentarily and then the BAND / DUP key will allow you to select simplex, duplex, or dual band reception

The delay time for DTSS code transmission can be changed by pressing the F key for longer than 1 second and then pressing the BAND / DUP key within 10 seconds. (SEE PAGE 34)

4-1-2 LCD Display Panel



①	LOCK	On when the Lock function has been activated.
	A.LOCK	On when the All Lock function has been activated.
②	T	On when the Tone Encode function has been activated.
	CTCSS	On when the Tone Decode and Encode function.has been activated.
③	DTSS	On when the DTSS function has been activated.
④	DUAL	On when dual band reception has been activated.
⑤	APO	On when the Auto Power Off function has been activated.
⑥	BUSY	On whenever the main band squelch is open.
⑦	B	On whenever the sub-band squelch is open.
⑧	▬▬▬▬▬▬▬▬	This level meter indicates the relative receiver signal strength of MAIN BAND or the relative transmitter power output.



⑨ ---------- This level meter indicates the relative receiver signal strength of the SUB. BAND

⑩ LOW MID Indicates the relative output power setting for transmit. No indicator indicates full power.

⑪ T On when the Time Out Timer function has been activated.

⑫ ON AIR On during transmit.

⑬ D On during duplex operation.

⑭ ★88 Indicates the active memory channel number. ★ indicates that the channel is locked out.
C is displayed during call channel.
Either P0, P1, P2, P3, or PA is displayed during paging.

⑮ F On whenever the F key has been depressed. Also shows the last memory channel number that had been selected.

⑯ 888.888. Indicates the sub-band frequency.
On during dual band reception.

Indicate the selected 0.5kHz direction

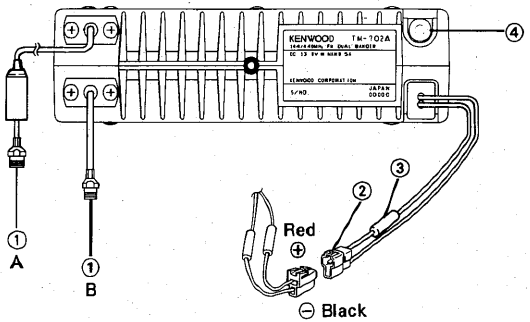
⑰ On when the Tone Alert function is active. The indicator flashes when an incoming signal has opened the squelch.

⑱ – + Display the selected transmitter offset direction.
– – Both – and + are lit during split channel operation.

⑲ REV On when the Reverse function has been activated.

⑳ 88.8.8.8.5 Displays the operating frequency to the nearest kHz digit; or the tone frequency etc.
The indicator flashes when scanning.

4-1-3 Rear Panel



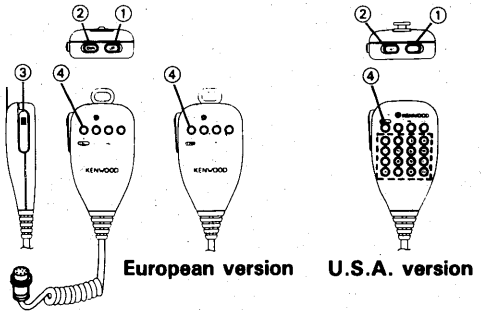
① ANTENNA connector
Attach an antenna with a low SWR and impedance of 50 ohms.
A for 430MHz or 440MHz
B for 144MHz

② 13.8 VDC power input connector
Connect the supplied DC power cable to this connector.
Pay close attention to the polarity. Red is positive and black is negative.

③ Fuse holder
Contains a 10 A fuse. Do not use a larger fuse as damage might result to the transceiver.

④ External speaker jack
This jack is used to connect an external speaker. The speaker should have an impedance of 8 ohms.

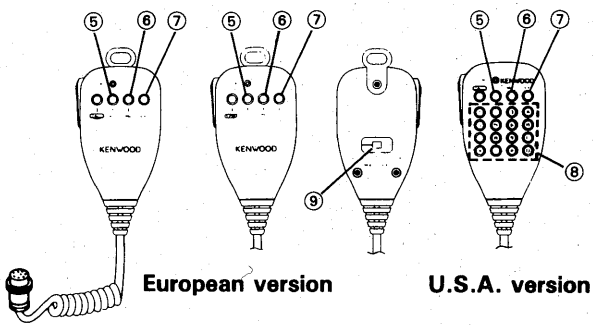
4-1-4 Microphone



①②UP/DOWN switches
These switches can be used to increase or decrease the VFO frequency, the Memory channel number, and the Tone frequency, etc..

③ PTT (Push to Talk) switch
The transceiver will transmit whenever this switch is depressed. Scan operations may be cancelled by pressing this switch without transmitting.

④ CALL key (except European version)
This key functions just like the CALL key on the front of the radio.
1750 key (European version)
The transceiver will transmit with 1750 Hz repeater access tone whenever this switch is depressed.



European version **U.S.A. version**

⑤ VFO key
This key functions just like the VFO key on the front of the radio.

⑥ MR key
This key function just like the MR key on the front of the radio.

⑦ PF (Programmable Function) key
This key can be programmed to perform any of the following functions:
BAND key (Initial setting from the factory); MHz key; SHIFT key; TONE key; REV key;or LOW key.
To program the key use the following procedure:
1. Turn the POWER switch on the transceiver OFF.
2. Press and hold the key on the front panel of the set that corresponds with the function you wish to program the microphone key to perform.
3. Turn on the POWER switch while the key on the front panel is held in.
4. Release the front panel key.

One additional function can be programmed that is not included on the front panel of the transceiver. This is known as the MONITOR function. This will allow you to open squelch to check the band for a clear frequency. This will function even if you are operating in the CTCSS decode mode.

MONITOR programming
Press and hold the F key on the front panel as you turn on the POWER switch of the transceiver and then release the F key.

⑧ 16-Tone DTMF keypad (U.S.A. version only)
These buttons are used to activate the DTMF encoder.

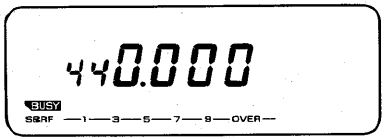
⑨ LOCK key
This key will deactivate all functions of the microphone except the PTT function and DTMF key pad.

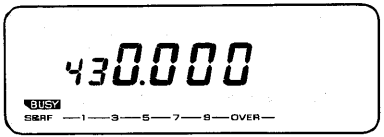
4-2 RECEIVER OPERATIONS

4-2-1 Reception

1. Connect the power supply, antenna, and microphone and then adjust the controls as follows:
   - Power Switch ..... OFF
   - Vol Control ..... Full Counterclockwise
   - Power switch of power supply (Fixed station) ..... OFF
   - SQL Control ..... Full Counterclockwise
2. Turn on the Power Supply and then turn on the transceivers POWER switch. The display should indicate a frequency. Fig,1 shows examples of frequencies that will appear on the various models. In addition to the frequency you may see one or more control indicator turn on in the display.

U.S.A. version





Note
The frequencies shown above are the default frequencies after a microprocessor reset. If the display shows incomplete data or you think the displayed frequency is in error you should reset the microprocessor. See Memory Initialization on page 23.

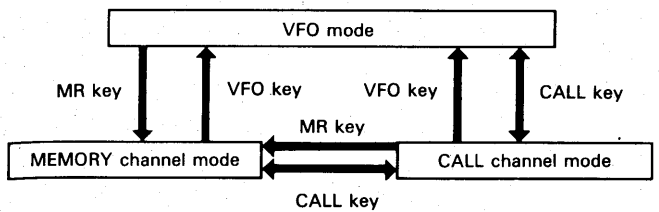
3. Rotate the VOL control clockwise until a signal or noise is heard coming from the speaker.
4. Rotate the tuning control or press the microphone UP / DWN switches to select an open channel. Then rotate the SQL control clockwise until the noise just disappears and the BUSY indicator turns off. This point is known as the Squelch Threshold point. The squelch control must be adjusted to this setting for the Scan functions to operate properly.
5. Select the desired operating frequency using the microphone or tuning control. When a signal is received the S-meter will deflect and the BUSY indicator will turn ON.

Caution
Turn off the transceivers POWER switch before you start or stop your vehicles engine, or turn your home power supply ON or OFF.

4-2-2 Frequency Selection

You can change the dial frequency while in the VFO mode. The frequency can then be stored in memory, or in the call channel using the techniques that will be described in later sections of this manual.

To select the another band press the BAND / DUP key momentarily. You will not be able to select a band in the MR mode, if you have not previously programmed at least one memory channel for that band.



● VFO Mode Frequency Selection

1. Press the VFO/M▶V key to select the VFO mode.
2. Rotate the tuning control or press the microphone UP/DWN switches to select the desired frequency.

● Memory Channel Selection

1. Press the MR/M key.
2. Rotate the tuning control or press the microphone UP / DWN switches to select the desired memory channel.

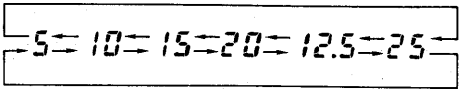
● CALL Channel Selection

Press the CALL key to select the Call channel.

4-2-3 Frequency Step Selection

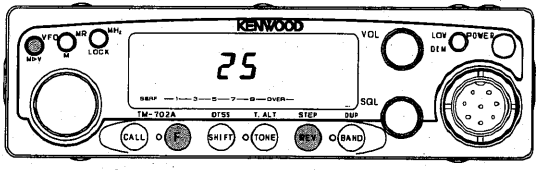
The available frequency step steps are shown below.

STEP



To select the desired tuning or scan step size use the following procedure:

1. Press the VFO/M▶V key to select the VFO mode.
2. Press the F key momentarily. The F indicator should light in the display.
3. Press the REV / STEP key within 10 seconds of pressing the F key. The current frequency step size will be displayed.



4. Rotate the tuning control or press the UP / DWN switches on the microphone until the desired tuning step size appears in the display.
5. To complete the programming of the step size you can press any key on the front panel except the POWER switch, or simply wait 10 seconds and the microprocessor will automatically return to the normal frequency display.

The displayed frequency will be effected by the step selection as shown in the charts below:

5,10,15,20 to 12.5,25

0,5,10,15	0
20,25,30,35	25
40,45,50,55	50
60,65,70,75, 80,85,90,95	75

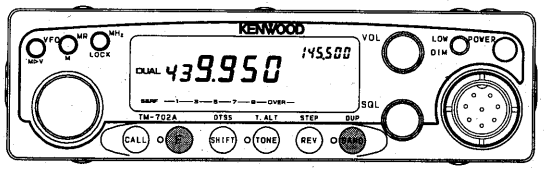
12.5,25 to 5,10,15,20

0	0
12.5	10
25	20
37.5	30
50	50
62.5	60
75	70
87.5	80

Example: When 439.920 MHz is set and the 20kHz step is changed to 12.5kHz step, the frequency becomes 439.925 MHz.

4-2-4 Dual band reception

Pressing the F key and then the BAND / DUP key the operation to change between simplex, duplex, and dual band reception, and the DUAL and sub-band frequency indicators to go on.



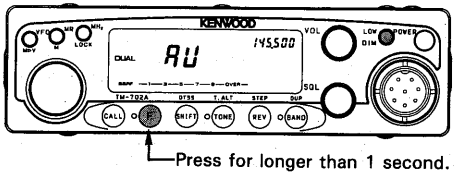
Dual reception is enabled in each mode by pressing the VFO / M▶V, MR / M, or CALL key. The displayed frequency is the last selected frequency for the selected mode.

Note
1. If there is no channel for which the frequency of another band is stored in the memory channel mode, dual reception is enabled.
2. If a controller is connected, dual band reception is not enabled.

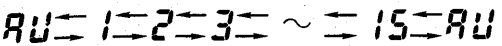
4-2-5 MAIN band and SUB band volume level

The radio of the MAIN band and SUB band volume levels can be set by decreasing the SUB band volume. The SUB band volume can be set to one of 16 preset levels.

1. Press the F key for longer than 1 second, then press the LOW / DIM key to enter the volume balance setting mode. This mode can also be entered by pressing the PF key on the microphone during transmission.



2. Select the SUB band volume level with the tuning control.



The larger the number, the higher the subband volume.

AU	Automatic mode (Initial setting) MAIN band volume level:SUB band volume level = 1:1. When a call is received on the MAIN band, the SUB band volume is automatically reduced (to about 1/10).
1~15	The SUB band volume decreases one level at a time. If a call is received on the MAIN band, the SUB band volume stays the same.

3. Press any key or wait 10 seconds, to return to the normal frequency display.

4-2-6 SUB BAND Frequency Selection

The SUB band frequency should be select in the MAIN band and then moved to the SUB band by pressing the BAND/DUP key.

4-3 TRANSMITTER OPERATION

Caution:
1. Ensure that an antenna with a low standing wave ratio (SWR) is attached to the antenna connector before attempting to transmit. Failure to provide proper termination may result in damage to the final amplifier section.
2. Always check to ensure the frequency is clear before transmitting.

Note
The use of LOW power is recommended, whenever possible, to avoid interfering with other stations.

4-3-1 Transmit Basics

1. Select the desired operating frequency in the MAIN band using any of the methods previously discussed.
2. Check the frequency to see if it is occupied before you transmit.
3. Press the PTT switch. The ON AIR indicator will light, and the RF meter will deflect to the right.
   If you have selected the LOW power position, the low indicator will appear in the display and the RF meter will only deflect slightly. When HI power has been selected the RF meter will swing full scale.
4. Speak into the microphone.The recommended distance to the microphone is 5 cm (2 inches).

Talking closer may result in overdeviation of your transmit signal, which might be reported as a loss of clarity or of an excessively wide transmit signal. Talking too far away may result in reports of weak audio.

5. Release the PTT switch to return to the receive mode. The ON AIR indicator should go out,and the RF meter will return to zero.

4-3-2 Duplex Operation

Press the PTT switch on the microphone allows the simultaneous reception on the MAIN band frequency and transmit on a SUB band frequency.

> Notes
> 1. The SHIFT, REV, tone and split channels set to the transmit frequency are released during duplex operation. To transmit a tone during duplex operation, display T when the receive frequency is set.
> 2. If the receive frequency is three times the transmit frequency, the transceiver may receive the transmit signal from it (for example: Transmit frequency: 144.600, receive frequency: 433.800).

■ VFO mode

1. Select the desired transmitter frequency.
2. Press the BAND / DUP key and select the desired receive frequency.
3. Press the F key momentarily, and then press the BAND / DUP key. The D indicator will turn on in the display to remind you that duplex operation has been activated.
4. Press the PTT switch. The ON AIR indicator, and the transmitter frequency will appear in the display.

■ MR mode

1. Select the desired transmitter Memory channel.
2. Press the BAND / DUP key and select the receive Memory channel.
3. Press the F key momentarily, and then press the BAND / DUP key. The D indicator will turn on in the display.
4. Press the PTT switch. The ON AIR indicator, and the transmitter frequency will appear in the display.

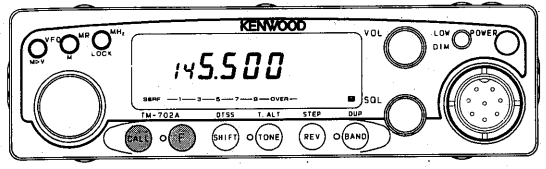
■ CALL mode

1. Press the CALL key.
2. Press the BAND / DUP key to alternate between the two CALL channel display.
3. Press the F key momentarily, then press the BAND / DUP key. The D indicator will turn on in the display.
4. Press the PTT switch. The ON AIR indicator,and the transmitting frequency will appear in the display.

4-3-3 TOT(Time-out Timer)

The TOT can limit the continuous transmission time to 30 minutes. The TOT does not work when a remote controller is connected.

1. Press the F key for longer than a second, then press the CALL key. The T indicator lights. To cancel the setting, repeat the operation, and the T indicator will go off.



2. When the time-out timer reaches the time limit, the transceiver returns to the receive mode. To transmit again, release and press the PTT switch again.

4-3-4 Output Power selection

The transmit power is changed each time the LOW / DIM key is pressed.

High power: No display

Middle power: MID indicator lights.

Low power: LOW indicator lights.

4-4 MEMORY

4-4-1 Microprocessor Memory back-up

A lithium battery is contained in the transceiver to retain memory.Turning off the POWER switch, disconnecting the power cable, or a power failure will not erase the memory.The battery should last for approximately five years. When the battery discharges, an erroneous display may appear in the display.

Lithium battery replacement should be performed by an authorized KENWOOD service facility; either your KENWOOD dealer , or the factory, since unit contains CMOS type circuitry.

4-4-2 Initial state

Initial state of the microprocessor from the factory is shown in the chart below.

	144MHz BAND	430MHz BAND	440MHz BAND U.S.A.version
VFO frequency、memory channel 1、CALL channel frequency	144.000 MHz	430.000 MHz	440.000 MHz
VFO frequency step	5kHz 12.5kHz (European version)	25kHz	25kHz
memory channel	2CH	1CH	1CH
Tone frequency	88.5Hz	88.5Hz	88.5Hz

4-4-3 Microprocessor Initialization

● Memory channel Initialization

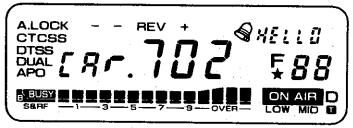
When you want to erase all programed data, or if the display should show erroneous information,you should initialize (reset) the microprocessor using the following procedure.

1. Turn the POWER switch off.
2. Press and hold the MR/M key and turn on the POWER switch.
3. Release the MR/M key.

● VFO Initialization

All the settings, except the contents of the memory and call channels, are initialized.

1. Turn the power switch off.
2. Press and Hold the VFO/M▶V key then turn the power switch on.
   No transmit / receive operation occurs when this is done.



3. Press the VFO/M▶V key again.

4-4-4 Memory Channel

This transceiver provides 20 Memory Channels.
In addition to serving as a normal Memory Channel some of the Memory Channels serve a dual purpose to specify other parameters. The functions of those Memory Channels are described below.

CH1～3	Turn DTSS on and off and set the DT code.
CH13	Lower frequency limit for the VHF ba program scan
CH14	Upper frequency limit for the VHF ba program scan
CH15	Lower frequency limit for the UHF ba program scan
CH16	Upper frequency limit for the UHF ba program scan
CH17～20	Different transmit and receive frequenci can be stored in memory. (Odd Split mer ory)

4-4-5 Memory Contents

Each Memory channel is capable of storing t following information.
(○:Can be stored in memory ×:Cannot be stored memory)。
When the DTMF unit is not installed

	CH1～3	CH4～12	CH13～16	CH17～2
Simplex/Normal shift	○	○	○	○
odd split repeater data.	×	×	×	○
Tone(CTCSS)Frequency Tone(CTCSS)ON / OFF	○	○	○	○
Frequency step	○	○	○	○
Shift REV ON / OFF	○	○	○	×
DTSS code DTSS ON/OFF	×	×	×	×

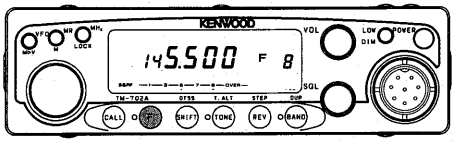
When the DTMF unit is installed

	CH1～3	CH4～12	CH13～16	CH17～20
Simplex/Normal shift	○	○	○	○
odd split repeater data.	×	×	×	○
Tone(CTCSS)Frequency Tone(CTCSS)ON / OFF	○	○	○	○
Frequency step	○	○	○	○
Shift REV ON / OFF	○	○	○	×
DTSS code DTSS ON/OFF	○	×	×	×

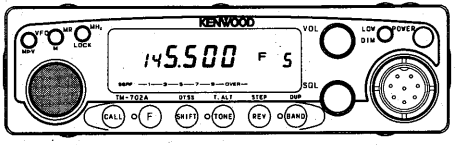
4-4-6 Memory Entry

●Simplex/Normal shift

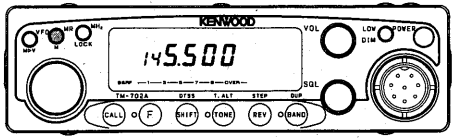
1. Press the VFO/M▶V key to select the VFO mode.
2. Select the desired operating frequency, offset,tone frequency,etc. (For example 145.500MHz)
3. Press the F key. The F indicator and a memory channel indicator will light.(For example CH 8)



4. Select the desired Memory Channel using the Tuning control or microphone UP / DWN switches.(For example CH 5)

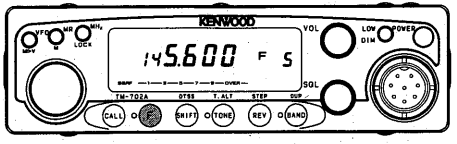


5. Press the MR / M key within 10 seconds of selecting the Memory Channel. A long beep will sound and the F indicator and the Memory Channel number will turn OFF, and the transceiver will return to the VFO mode.

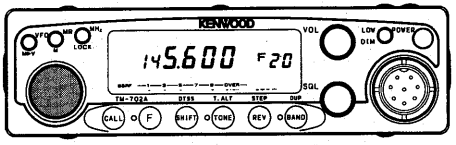


● Odd.Split Channels

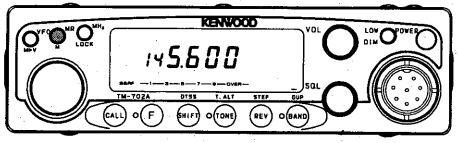
1. Press the VFO/M▶V key to select the VFO mode.
2. Select the desired receiving frequency, tone frequency, etc. (For example 145.600MHz)
3. Press the F key.The F indicator and a memory channel indicator will light.(For example CH 5)



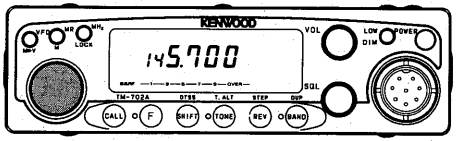
4. Select any Memory Channel from 17 thru 20 using the Tuning control or the microphone UP / DWN switches. (For example CH 20)



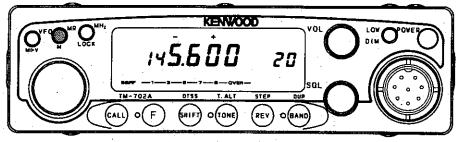
5. Press the MR / M key within 10 seconds of selecting the Memory Channel number. A beep will sound and the F indicator and the Memory Channel number will turn OFF.



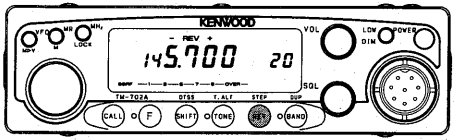
6. Within 10 seconds of pressing the MR / M key, you should select the desired transmit frequency using the Tuning control or microphone UP / DWN switches. (For example 145.700MHz)



7. Press the MR / M key within 10 seconds of selecting the transmit frequency. A beep will sound to signal the data has been successfully stored.
8. To confirm the contents of the Split Memory Channel press the MR / M key and recall the channel. The receiving frequency and − + indicator will appear in the display.

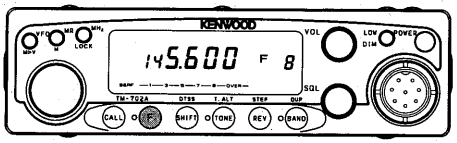


9. To check the transmit frequency press the REV / ST key or Microphone PTT switch. The transmitting fr quency will appear in the display.

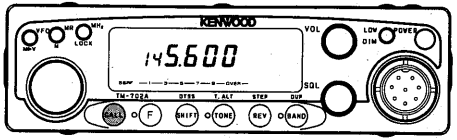


● CALL Channel

1. Press the VFO/M▶V key to select the VFO mode.
2. Select the desired operating frequency, offset, to frequency,etc.(For example 145.600MHz).
3. Press the F key.The F indicator and the memory channel indicator will light.(For example CH 8)



4. Press the CALL key within 10 seconds of pressing the key. The F indicator and the Memory Channel nur ber will turn OFF, to confirm data entry.



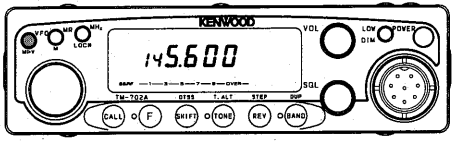
4-4-7 Memory Channel Recall

A memory channel can be recalled by pressing the MR / M key in the VFO mode. Select the desired memory channel with the tuning control or the UP / DWN key on the microphone.

4-4-8 Memory Shift

This feature copies Memory Channel or Call channel data to the VFO.
This will allow you to alter these frequencies without changing the actual contents of the memory or CALL channel.

1. Press the MR / M key or CALL key to select the MR mode or CALL channel mode.
2. Press the F key. The F indicator will light.
3. Press the VFO/M▶V key within 10 seconds of pressing the F key. The F indicator and the Memory or CALL Channel indicator will turn OFF to signal the data has been successfully transferred to the VFO.



4. The frequency can be changed with the tuning control or the UP/DWN key on the microphone.

Note
If an Odd Split Memory channel is selected, only the receive data will be copied to the VFO.

4-5 SCAN

When the scan function is turned on, turn the tone alert function off. If the tone alert function is on, the scan operation will not activate.

4-5-1 Scan Operation

1. Band scan
   Scan proceeds over the entire band.This function operates in the VFO mode only.
2. Programmable Band scan
   The scan range for the 2 meter band is specified in Memory Channels 13 and 14.
   The scan range for the 70 cmeter band is specified in Memory Channels 15 and 16. This function operates in the VFO mode only.
3. Memory Channel Scan
   Scan proceed thru those memory channels that have data stored and have not been locked out.
4. Dual Scan
   Scan proceeds alternately between the last VHF and UHF channels. This function operates in the VFO mode,the MR mode and the CALL channel mode.

4-5-2 Hold / Resume programming

Two types of scan hold / resume have been provided in this transceiver.

1. Time Operate scan
   You may select for the radio to stop on a busy channel, remain there approximately 5 seconds ,and then continues to scan even if the signal is still present.
2. Carrier Operated scan
   In this mode the radio will stop scanning on a busy channel and remain there until the signal drops out. The radio allows a 2 second delay before it resumes scanning so that you do not loose the station when operators change.

> Note
> When CTCSS is on, the scanning stops only on the stations which have the matching CTCSS signal. When DTSS is on, the scanning stops and audio signals are received only when the DTSS code matches.

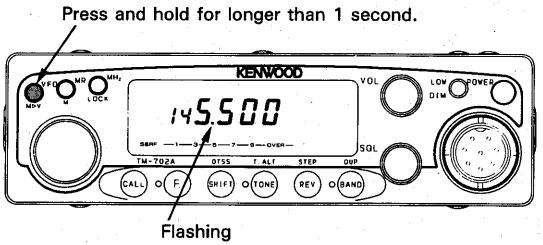
● The radio is delivered from the factory in the Time operated scan mode. To switch between the two modes use the following procedure.

1. Press the F key for longer than 1 second.The F indicator will flash.
2. While the indicator is flashing press the VFO / M ▶ V key. This will toggle the Scan / Resume mode to the Carrier operated mode.
3. To turn to Time operated mode repeat steps 1 and 2.

4-5-3 Band Scan

The entire frequency band of the main VFO is scanned.

1. Press the VFO / M ▶ V key to select the VFO mode. A just the SQL control to the threshold point.
2. Press the BAND / DUP key to select either the VHF UHF band.
3. Press and hold the VFO / M ▶ V key for longer than second. The MHz indicator will begin flashing to s nal the radio is scanning.



4. Scan will begin in an upward direction.You can verse the direction of scan by rotating the Tun control counterclockwise, or by pressing the mic phone DWN switch. Clockwise rotation of the tun control or pressing the UP switch will cause the ra to begin upwards again.The tuning step size d pends upon the current STEP selection
5. Scan will stop on a busy channel ,i.e a station that strong enough to open squelch and turn on the BU indicator.
6. You can cancel scan with any front panel key or t microphone PTT switch

4-5-4 Programmable Band Scan

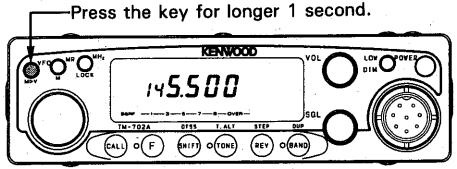
Both VHF and UHF programmable band scan are possible. Before scanning store the lower and upper programmable scan limits for each of the bands in memory.

In VHF band the lower scan limit should be stored into Memory Channel 13, and the upper scan limit should be stored into Memory Channel 14.

In UHF band the lower scan limit should be stored into Memory Channel 15, and the upper scan limit should be stored into Memory Channel 16 .

CAUTION
If the frequency in Memory Channel 13 (or 15) is equal to or higher than the frequency stored in channel 14(or 16) scan will proceed over the entire tuning range of the set ,i.e.it will function like the Band Scan previously described.

1. Adjust the SQL control to the squelch threshold point.
2. Press the VFO /M▶V key to select the VFO mode.
3. Select a frequency between the two programmed scan limits.
4. Press the VFO/M▶V key for longer than 1 second. The MHz indicator will begin flashing. as a visual reminder the transceiver is scanning.



5. Scan will begin in an upward direction.You can change the direction of scan by turning the Tuning control , or by pressing the microphone UP / DWN switches.
6. Scan will stop whenever a signal is received that will open the squelch of the radio.
7. Press the PTT switch or any front panel key to stop scan.

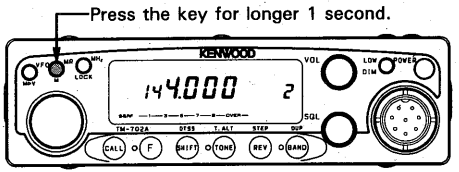
4-5-5 Memory Channel Scan

Memory channel scan can be used to scan the memory channels that contain VHF frequencies only,UHF frequencies only, or all channels (VHF and UHF). Use the following procedures to select the desired scanning method:

NOTE
Only those memory channels that have data entered, and that have not been locked out will be scanned.

●Memory scan for each frequency band

1. Adjust the SQL control to the threshold point.
2. Press the MR/M key to select the MR mode.
3. Press the BAND / DUP key to select either the VHF or UHF band. The band that is selected will determine which memory channels will be scanned. As an example, if the VHF band is selected, only the memory channels that contain a VHF frequency will be scanned.
4. Press the MR / M key for longer than 1 second. The MHz indicator will begin flashing and the Memory channel indicator will show which memory channels are being scanned.



●All memory scan

4. If you want to scan the contents of all VHF and UHF memory channels, press the BAND / DUP key while scanning is in progress. If you only want to scan the memory channels of the band selected in step 2, do not press the BAND/DUP key.
5. Scan will begin at the current memory channel and proceed upwards thru the memory channels. You can change the direction of scan by turning the Tuning control , or by pressing the microphone UP / DWN switches.
6. Scan will stop whenever a signal is received that is capable of opening squelch.
7. To cancel scan press the microphone PTT switch or any front panel key.

4-5-6 Dual Scan

Scan proceeds alternately between the last VHF and UHF channels. This function operates in the VFO mode,the MR mode ,and the CALL channel mode.
This function does not work in the dual band reception mode.

●Dual VFO Scan

Press and hold the BAND / DUP key for longer than 1 second in the VFO mode scan proceed alternately the last UHF and VHF VFO frequencies .

●Dual MR Scan

Press and hold the BAND / DUP key for longer than 1 second in the MR mode scan proceed alternately the last UHF and VHF Memory channels .

●Dual Call channel Scan

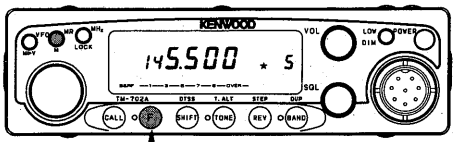
Press and hold the BAND / DUP key for longer than 1 second in the Call channel mode scan proceed alternately the two Call channels

To cancel Dual Scan press the PTT switch or any fr panel key except BAND/DUP key.

4-5-7 Memory Channel Lockout

This function allows you to specify which mem channels you wish to scan during Memory Channel sc function.

1. Press the MR / M key to select the Memory Chan mode.
2. Select the Memory Channel that you wish to skip turning the Tuning control or by pressing the mic phone UP/DWN switches .
3. Press the F key for longer than 1 second.The F indic tor will flash. Within 10 seconds of pressing the F k press the MR / M key. A ★ will appear to the left the Memory Channel number. This indicates t Memory Channel will be skipped during the Mem Channel scan mode.



Press the key for longer 1 second.

4. Repeat steps 2 and 3 to lock out any other chann you wish to skip.
5. To cancel the lockout, select the desired Mem Channel as described in step 1,2,and 3 above.The s (★) should turn off.

4-6 REPEATER OPERATIONS

4-6-1 Transmitter Offsets

All amateur radio repeaters utilize a separate receive and transmit frequency. The receiver frequency may be either above or below that of the transmit frequency. The configuration of most repeaters will fall into one of the categories listed below:

	VHF BAND	TM-702A UHF BAND	TM-702E UHF BAND
+	+600 kHz	+5 MHz	+1.6 MHz
−	−600 kHz	−5 MHz	−1.6 MHz
− −			−7.6 MHz

● Offset Direction

To select the desired transmitter offset direction press the SHIFT / DTSS key. Each time you press the key the transceiver will advance from one offset direction to the other, i.e. "+" to "−" ("−" to "− −" with European versions) to no offset (simplex).

● Automatic Offset Selection (U.S.A., Canada and Oceania version)

The TM-702A has been programmed according to the standard ARRL (Amateur Radio Relay League) Band Plan with regard to transmitter offset direction. Please see the accompanying chart for addition information on this programming. You can, of course, override this by using the SHIFT/DTSS key if desired.

145.1	145.5	146.0	146.4	146.6	147.0	147.4	147.6	148.0
S	−	S	+	S	−	+	S	−	S

S: simplex

4-6-2 Reverse Function

Some repeaters utilize a "Reverse Pair", i.e. the transmit / receive frequencies are exactly the reverse of another repeater. For example repeater A uses 146.000 for a transmit frequency (INPUT) and 146.600 for a receiver frequency (OUTPUT). Repeater B might use 146.600 for a transmit frequency and 146.000 for a receiver frequency. It would be inconvenient to have to reprogram the transceiver each time you wanted to use these repeaters.

The REV/STEP key allows you to easily reverse the transmit and receiver frequencies. To use the REV function press the REV/STEP key. The REV indicator will turn on in the display to remind you that you are working a reverse pair.

To return to normal press the REV / STEP key again. The REV indicator will turn off.

This function is also useful to check the input frequency of the repeater so that you can determine if you are within range for simplex communications.

4-6-3 Tone operation

Some repeaters require the use of a control signal to activate the repeater. Several different methods are currently in use.

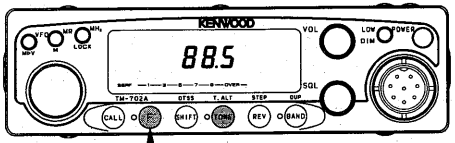
In the United States sub-audible tones are sometimes used. 38 different Sub-audible frequencies are possible.

In Europe and United Kingdom a 1750 Hz tone is used in transmit. Press and hold the microphone 1750 key to transmit with the access tone, you need not press the PTT switch.

Since this tone is required in Europe and the United Kingdom a 1750 Hz tone encoder is included with models delivered to these countries.

● Tone Frequency Selection

1. Press the F key for longer than 1 second. The F indicator will begin to flash.
   Press the TONE / T.ALT key within 10 seconds of pressing the F key. The current tone frequency will show in the display.



Press the key for longer 1 second.

2. Rotate the tuning control or press the microphone UP / DWN switches to select the desired tone frequency.

3. Press any front panel key to return to the normal frequency display.

Tone Frequency(Hz)

67.0	107.2	167.9
71.9	110.9	173.8
74.4	114.8	179.9
77.0	118.8	186.2
79.7	123.0	192.8
82.5	127.3	203.5
85.4	131.8	210.7
88.5	136.5	218.1
91.5	141.3	225.7
94.8	146.2	233.6
(97.4)	151.4	241.8
100.0	156.7	250.3
103.5	162.2	

Note:97.4 Hz is available only for encode.

4-6-3 Autopatch Operations (U.S.A. versions only)

Some repeaters offer a service known as autopatch. This feature allows you to dial a telephone number from your transceiver and carry out a telephone conversion, much like a car telephone, or cellular telephone. This function requires the use of a DTMF (Dual Tone Multi Frequency) pad. The MC-44DM microphone provides the normal keys you would have on your telephone at home,as well as 4 additional keys, the A, B, C and D keys. These keys are used for control purposes on some repeater system. You should check with the control operator of the repeater to see if they offer autopatch services.

To activate the keypad:

1. Press and hold the PTT switch.
2. Press the keys just like you would dial your telephone at home.
3. The transceiver will remain keyed for approximately 2 seconds after you press each number, so you can release the PTT switch without unkeying the transceiver.

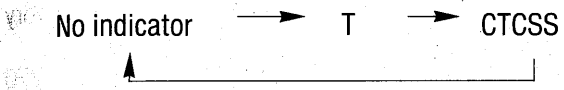
> Note
> Some repeaters will require the use of a special key sequence to activate the autopatch function. You should check with your control operator for this sequence.

4-7 CTCSS OPERATION

With the use of the optional Sub-Audible tone decoder unit (TSU-6) you will be able to operate in a Tone Operated Squelch Mode. When this option is installed and the CTCSS function has been activated the radio will not open squelch until the proper PL tone is received.

4-7-1 CTCSS Operation

Press the SHIFT / T.ALT key and select the desired Tone mode. When the T indicator appears in the display the transmitter will transmit the desired tone. When the CTCSS indicator appears in the display the transceiver will transmit the desired tone and will also operate in the Tone Squelch mode. i.e. squelch will not open until the same tone is received as a portion of the incoming receive signal. When no indicator is on the radio will not make use of either tone feature.



Notes
1. Set TONE to OFF for transmission with a repeater or transmission without tone squelch (CTCSS).
2. Tone signals can be transmitted even if the TSU-6 is not installed.

4-8 DTSS (Dual Tone Squelch System) [Requires optional DTU-2]

This function allows squelch to be turned on in the receive mode on reception of a three-digit code matching the DTSS code selected in your radio.
Once squelch is turned on by reception of a matching code, it operates normally from then on. If no signal is received for longer than 2 seconds, squelch is turned off until a matching code is agein received.
CTCSS tone might not pass through the repeater, but generally DTSS tone can.

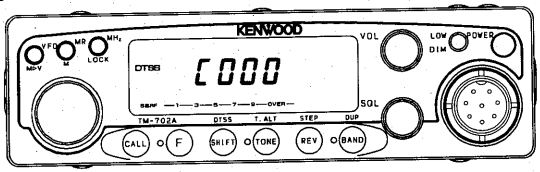
NOTE
This function is not available in some areas.

4-8-1 Selecting and Storing the DTSS code

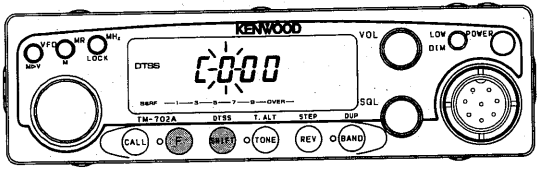
DTSS codes from 000 through 999 can be selected from the VFO mode and stored in to memory.
Memory channels 1 through 3 can each store a separate DTSS code.
The DTSS codes cannot be stored in memory channels 4 to 20 or the call channel. The DTSS code can also be set in the VFO mode.

4-8-2 VFO DTSS Code Selection

1. Press the F key and then the SHIFT / DTSS key 1 or 2 times until DTSS appears in the display.
2. Press the F key for longer than 1 second and then press the SHIFT / DTSS key. The display will change to the DTSS code entry mode(See example below). The digit just to the right of the "C" will be flashing.



3. Select any digit from 0-9 by rotating the tuning control, by pressing the UP / DWN keys on the microphone, or pressing the desired digit on the microphone keypad.



4. After you select the first digit a beep will sound and the middle digit will begin flashing. Select the desired digit by using any of the methods described above.
5. Select the final digit as describe above. After the last digit has been entered the display will return to the nomal frequency mode, indicating the tone selectio process has been successfully completed.

Notes
1. If any key other than the SHIFT / DTSS key is pressed during the code selection mode you will cancel the function and return to the nomal frequency display.
2. If no action is taken for longer than 10 seconds, the code selection process will also be canceled.

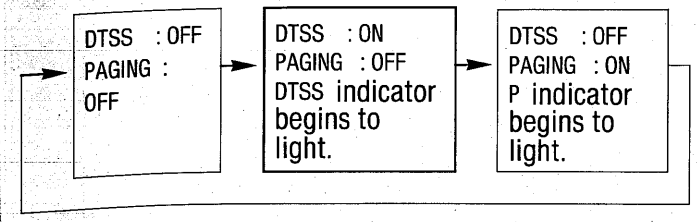
4-8-3 Memory Channel 1-3 DTSS Cod Selection

The TM-702 also allows you to store a DTSS code to b used in conjuction with memory channels 1-3.
A seperate code may be selected for erch memo channel.

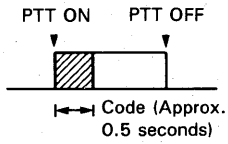
1. Select the desired operating frequency in the VF mode.
2. Select the desired DTSS code by following the ste described in Section 4-8-2(1-5).
3. Select the desired memory channel (1,2 or 3) .with t tuning control or the UP / DWN keys on t microphone.
4. Press the MR/M key to store the data into memory.

4-8-4 DTSS Operation

1. Adjust the SQL control to the threshold point.
2. Press the F key and then the SHIFT / DTSS key 1 or 2 times until the DTSS indicator appears in the display.



3. Squelch will now remain closed until the correct code group is received.
4. When the PTT switch is pressed on the microphone the selected code group will be transmitted. It will take about 1 / 2 second to transmit the 3 tones. The microphone will be muted while the tones are being transmitted.



5. To cancel the DTSS operation press the F key and then press the SHIFT / DTSS key until the DTSS indicator turns off.

4-8-5 Using DTSS with Repeater

The DTSS signal is not transmitted immediately after you press the PTT switch. A programmable delay time has been incorporated to allow the DTSS signal to be passed by repeaters with slow response times. You can select a delay time of 250mS,450mS, 750mS, 850mS or 1 second.

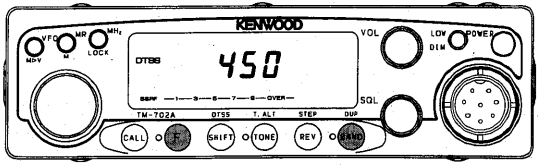
When operating in the simprex mode the 250mS delay will automatically be selected for you. No other choice is available in this mode, even though you may have selected a different delay.

in modes other than simplex you may select between the remaining delay periods (450,750,850, or 1 second.)

Note: 250mS cannot be selected for offset modes.

●To select the desired delay time:

1. Press the F key for longer than 1 second and then press the BAND / DUP key. The display will indicate the current delay (Note: 250mS is not displayed even in the simplex mode).

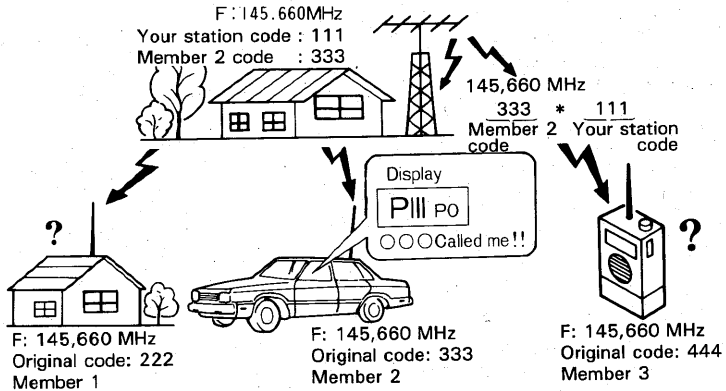


2. Rotate the tuning control or press the microphone UP / DWN push buttons to select the desired delay time.
3. To return to the nomal frequency display wait 10 seconds for automatic return, or press any key.

4-9 PAGING (Requires optional DTU-2)

The function is useful for net operations or for selectively calling an individual station.

Example: When Member 2 is called



Normal operating procedure would require that you make prior arrengements with all members of the group / net, so that all interested parties know which DTMF code will be used for individual / group calls, and that everyone knows who uses which individual code. Since the paging system makes use of a 3 digit code (000 thru 999) you could have a very large group and still have extra code groups available.

The paging function permits the 3 digit code of the calling station to be displayed in the display to allow easy identification of the calling station.

Simplified operation procedure

Set your individual DTMF code.

↓

Select the desired operating frequency .

↓

Enter the paging mode.

↓

To call other stations

1). Select the DTMF code for the distant station.

2). Transmit

3). Make the QSO.

To listen for a call, wait for the squelch to open.

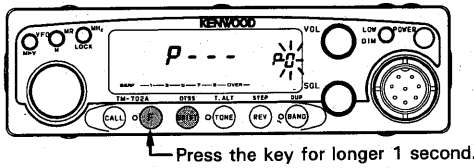
4-9-1 Paging Code Memories

Five different paging code memories have been priovided.

Paging Code Memory No.	Usage
A	Stores your own station code.
0	Automatically stores the calling station's code during receive. Can be used to temporarily store the code for the station to be called.
1~3	Stores group codes, and the codes of other stations.

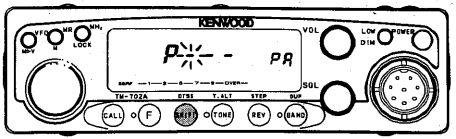
4-9-2 Code Selection

1. Press the F key and then press the SHIFT / DTSS key until the Page indicator lights in the display.
2. Press the F key for longer than 1 second. A beep will sound and the F indicator will begin flashing. While the F indicator is flashing press the SHIFT/DTSS key.
3. The display will change to the Page Code Entry Screen and the Paging Code Memory Channel indicator will begin flashing. Rotate the tuning control or press the microphone UP / DWN push buttons to select the desired Page Code Memory Channel.

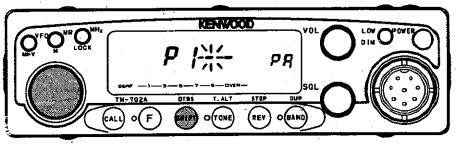


Press the key for longer 1 second.

4. Press the SHIFT / DTSS key to complete Page Code Memory Channel Selection and enter the Page Code Selection mode. The first digit to the right of the Large "P" will begin flashing.



5. Rotate the main tuning control, press the microphone UP / DWN push buttons, or press the appropriate key on the microphone keypad to select the first digit of the Page code.
6. Press the SHIFT/DTSS key to enter this digit into memory. The middle digit will then begin flashing.



7. Repeat steps 5 and 6 to complete the programming of this particular Page Code. After you enter the final digit of the code the display will return the Page Code Entry screen.
8. Select the next Page Code Memory you wish to program as described in 3-7 above.
9. After you have completed programming the Page Code menories you can return to the nomal frequency display by wating 10 seconds,or any front panel key.

For example, the following groups communicate with each other.

Predetermined frequency	145.660MHz
Your indivisual cord	111
Member 1's indivisual code	222
Member 2's indivisual code	333
Member 3's indivisual code	444
Group code	789

Your memory
PA 111
P0
P1
P2 444
P3 789

Member 1 memory
PA 222
P0
P2 789

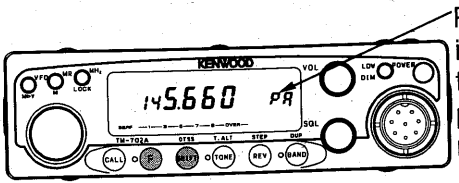
Member 2 memory
PA 333
P0
P1 789

Member 3 memory
PA 444
P0
P1 789
P2 111

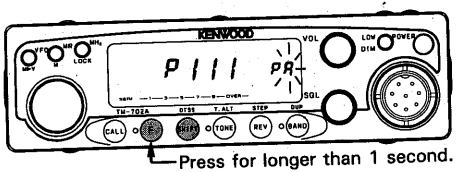
4-9-3 Paging Transmission

Your station ID code should be programmed in Paging Code Memory Channel A.

1. Select the desired operating frequency.
2. Press the F key and then the SHIFT/DTSS key until the Page Mode Indicator appears. (The Page Mode should be active on the other trancseiver also !)



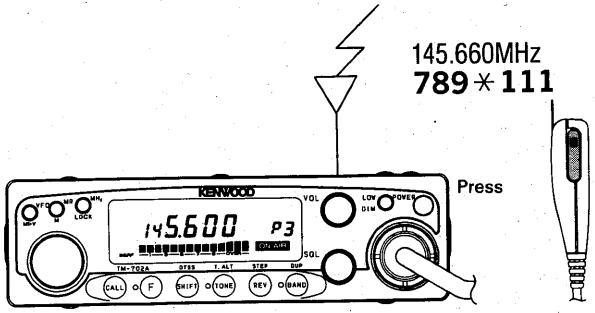
3. Press the F key for longer than 1 second and then the SHIFT / DTSS key. The Page Mode Memory Channel Indicator will begin flashing.



4. Select the desired Page Code Memory Channel with the tuning control or microphone UP / DWN push buttons.

Calling all members of the group

1. To call all members of the group, select the number of the memory in which the group code is stored. In this example, the number of member code is P3.
2. Press the PTT switch once or press a key other than TONE/T.ALT or MR/M to display the frequency again.
3. Press the PTT switch .



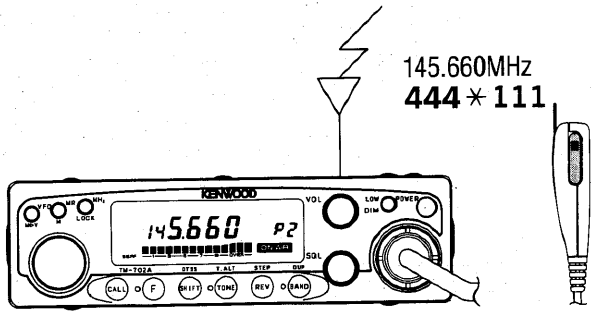
Group code 789 and your station ID code 111 are transmitted.

A DTMF tone sounds is heard during transmitting.

Calling a specific member (For example calling member 3)

To call a specific member (for example, member 3), use the following procedure:

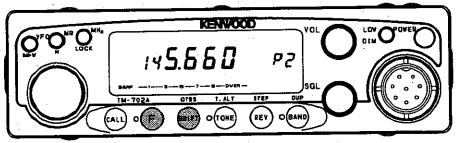
1. Select the memory in which the local station code is stored (in this example, select memory P2.) or Enter the individual code of the local station in memory 0.
2. Press the PTT switch once or press a key other than TONE/T.ALT or MR/M to display the frequency again.
3. Then press the PTT switch .



Local station code 444 and your station ID code 111 are transmitted. A DTMF tone sounds is heard during transmitting.

4-9-4 Paging Code Monitoring

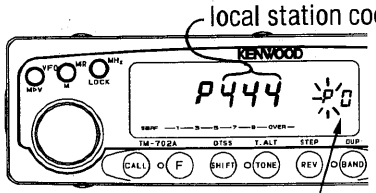
1. Select the desired operating frequency.
2. Press the F key and then the SHIFT/DTSS key until the Page Mode Memory Channel Indicator appears in the display.



Stand by with individual code (Example: Stand by for member 3.)

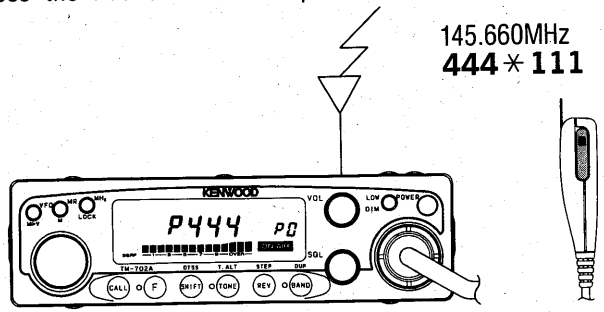
3. When called with your station ID code, the memory number automatically change to "0". The ID code of the member 3 is displayed.

(Example: Frequency: 145.660 MHz, member 3's indivisual code: 444)



Zero is displayed to indicate that the station is being called.

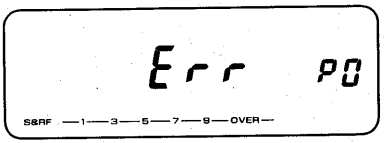
4. When the proper code is received, your squelch will open and you will hear an alert tone sequence coming from the speaker.
5. The individual code of the calling station is stored in memory 0.
   Press the PTT switch to respond to the calling station.



When the transmission ends, the frequency will be displayed again.

After the local station has been called, cancel paging mode. Communication can be performed more efficiently.

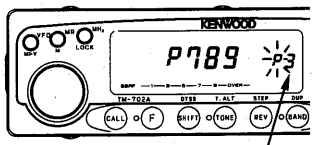
If the local station code could not be recognized, "Err" appears on the display panel.



Stand by with group code

1. If the calling station transmits the group code, the group code and the Paging Mode Memory Channel Number that contains that code will display.
   (Example: Group code 789 is stored in channel 3.)

Group code



Flashing

3 is displayed to indicate that the station is being called.

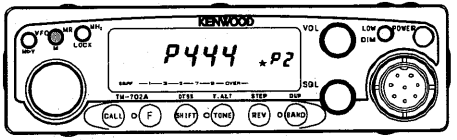
2. When the PTT switch is pressed, group code 789 (as displayed) and your station ID code are transmitted. You can participate in the group-roundtable.
3. When the remote station has been called, cancel paging.
   Communication can be performed more efficiently.

4-9-5 CODE LOCKOUT

(Codes are locked out only for receive during the Paging Mode.)

It is possible to temporarily disable Paging Code Memories 1,2 and 3 during receive. This will allow you to more closely control which individuals, or groups can open your squelch at any given time.
Paging Code Memories 0 and A cannot be locked out. Locking out a particular code for receive will not prevent the code from being transmitted, should you select that particular Code Memory.

1. Enter the code setting mode and display the number (except memory 0and A) to be locked out using the tuning control.
2. Press the MR/M key.
   ★mark lights and the memory is locked out.



3. To cancel, repeat steps 1 and 2.

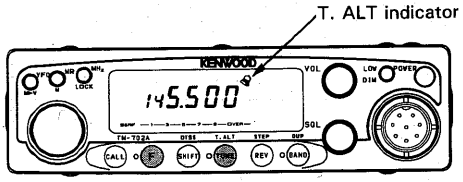
ENGLISH

4-10 TONE ALERT

The Tone Alert function will provide an audible "Alarm" to signal when someone is transmitting on the frequency you are monitoring. When used in conjunction with the CTCSS function this would allow the transceiver to act similar to a private pager system!

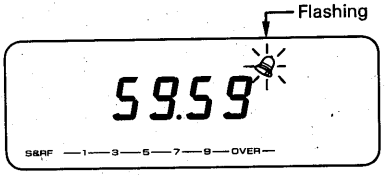
Note
1. When using the CTCSS function the incoming signal must be present for approximately 2 seconds in order for the Tone Alert function properly.
2. When the DTSS function is on, the bell function works only when the DTSS code matches.
3. When the paging function is on, the bell function works only when the paging code matches.

1. Adjust the SQL control to the threshold point.
2. If you will be using the CTCSS function you should select the proper tone frequency and ensure the CTCSS indicator is on in the display.
3. Press the F key and then press the TONE / T.ALT key. The T.ALT indicator will light.



4. When a signal is received and the squelch is open, an alarm sounds for about five seconds, the T.ALT indicator flashes, and the elapsed time count begins.

5. The time that has elapsed since the last call time is displayed in minutes up to 59 hours 59 minutes. If a new signal is received during counting, the elapsed time is cleared, and the elapsed time from the new signal being received is counted.



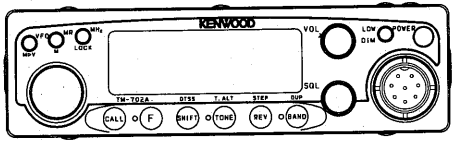
6. If any key is pressed while the elapsed time is being displayed, the T.ALT function is released.
7. To release the T.ALT function press the F key and then press TONE / T.ALT key again.

Notes
1. When the PF key on the microphone is set as the monitor key, signals can be monitored by pressing the PF key while the T.ALT function is working.
2. The T.ALT function may fail if the received signal is distorted (audio low-frequency distortion, ignition noise, etc.). The interference can be reduced by installing an optional TSU-6 and setting the CTCSS frequency to 141.3 Hz or lower.
   When a repeater is used, the CTCSS function may not use. It is recommended that you use DTSS function instead.
3. The Tone Alert System can not be use in conjunction with Scan.

4-11 APO (AUTOMATIC POWER OFF)

The automatic power-off function turns the power off automatically when you forget. It does not operate during scanning. The initial setting is OFF.

1. To turn the APO function on and off, press the F key for longer than 1 second, then press the MHz / LOCK key within 10 seconds. The APO indicator lights.
2. If, after 2 hours 59 minutes in receive mode, no key has been pressed, the APO indicator will begin to flash and a beep will sound. If no key is pressed for 1 minute after that, the display indicates the following, all the functions are disabled, and the TM-702A/E enters the auto power-off state.



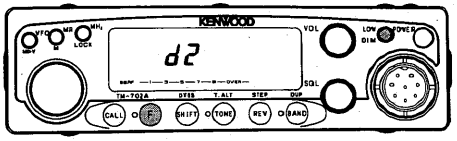
3. To cancel the auto power-off state, turn the power switch off and on again.

Notes
1. A small current flows during the auto power off state. If the TM-702A/E is not going to be used, be sure to switch the power off.
2. If the APO function is turned on and then the bell function is turned on, the auto power-off function does not work until the Tone Alert function is turned off (Even though the indicator lights).
3. This function is not available when the remote controller is connected.

4-12 DIM (DIMMER)

The intensity of illumination can be set to one of four levels.

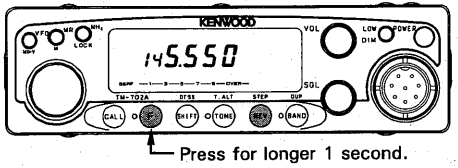
1. Press the F key, then press the LOW / DIM key while the F indicator lights.



2. Select the desired value with the tuning control or the UP/DWN key on the microphone.
3. If, after 10 seconds, no key has been pressed, the displayed level is set and the original frequency is redisplayed.

4-13 BEEP

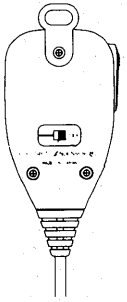
The beep can be turned on and off.
Press the F key for longer than 1 second, then press the REV/STEP key while the F indicator is flashing.
Each time this is done, the beep is turned on and off.



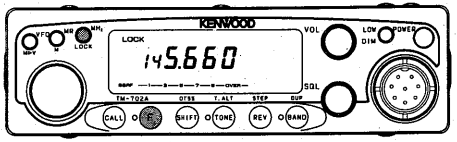
4-14 LOCK / A.LOCK

There are three types of lock function.

① Microphone key lock
When the switch on the rear of the microphone is set to the LOCK position, all the microphone keys except the PTT key are disabled.

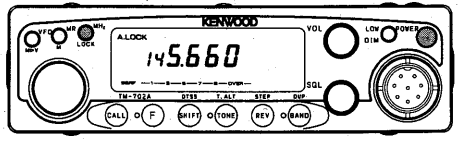


② LOCK
All the panel keys and the tuning control are disabled. However, the microphone function works.
Press the F key, then press the MHz/LOCK key within 10 seconds. The LOCK indicator lights.



To release the lock, press the F key again, then press the MHz/LOCK key within 10 seconds.

③ A.LOCK(ALL LOCK)
All operations, except the power switch, volume, and squelch, are disabled.
Switch the power off while the LOCK indicator is on, hold down the MHz/LOCK key, and switch the power on again. The A.LOCK indicator lights.



To release A.LOCK, switch the power off while the A. LOCK indicator is on, hold down the MHz/LOCK key, and switch the power on again.
The A.LOCK operation cannot be canceled by VFO or MR reset.

6 MAINTENANCE

6-1 GENERAL INFORMATION

Your transceiver has been factory aligned and tested to specification before shipment. Under normal circumstances the transceiver will operate in accordance with these operating instructions. All adjustable trimmers and coils in your transceiver has been adjusted at the factory and should only be readjusted by a qualified technician with proper test equipment. Attempting service or alignment without factory authorization can void the transceiver's warranty.
When operated properly, the transceiver will provide many years of service without requiring realignment. The information in this section gives some general service procedures which can be accomplished without sophisticated test equipment.

6-2 SERVICE

Should it ever become necessary to return the equipment to your dealer or service center for repair, pack it in its original box and packing, and include a full description of the problems involved. Also include your telephone number. You need not return accessory items unless directly related to the service problem.

Service note:
Dear OM, if you desire to correspond on a technical or operational problem, please make your note short, complete, and to the point, and PLEASE make it readable.

Please list: Model and serial number.
The problem you are having.

Please give sufficient detail to diagnose. Information such as other equipment in the station, meter readings and anything else you feel might be useful in attempting diagnosis.
Caution:
Do not pack the equipment in crushed newspapers for shipment. Extensive damage may result during shipment.
Notes:

1. Record the date of purchase, serial number and dealer from whom purchased.
2. For your own information, retain a written record of any maintenance performed on the unit.
3. When claiming warranty service, please include a photocopy of the bill of sale, or other proof of purchase showing the date of sale must accompany the transceiver.

6-3 IN CASE OF DIFFICULTY

The problems described in this table are failures caused, in general, by improper operation or connection of the transceiver, not by defective components. Examine and check according to the following table.

Symptom	Probable cause	Corrective action
Indicators do not light and no receiver noise is heard when the POWER switch is turned on.	1. Bad power cable or connections. 2. Blown power supply fuse.	1. Check cables and connections. 2. Check for the cause of the blown fuse and replace the fuse.
No sound from the speaker. No signal can be received.	1. Squelch is closed. 2. With the TSU-6 : CTCSS is operating.	1. Turn the SQL control counterclockwise. 2. Press the TONE/T.ALT key to turn off the CTCSS.
No transmitter output.	1. Microphone jack is not plugged in. 2. Poor antenna connection.	1. Plug jack in. 2. Connect antenna securely.
Weak signal cannot be received.	Poor antenna connection.	Connect antenna securely.
Display is dark.	1. Power voltage is low. 2. The DIM had been selected to dark.	1. Check voltage for 13.8 VDC ±15 %. 2. Press the F key and the LOW/DIM key. See page 42
Memory cannot be backed up.	Back up battery voltage is low.	See Microprocessor memory backup page 22.
The display does not change when the tuning control is rotated.	1. The LOCK function is on. 2. The A.LOCK function is on.	1. Press the F key, then press the MHz/LOCK key within 10 seconds. 2. Hold down the MHz/LOCK key, switch the power on, then perform the operation in 1.

7 OPTIONAL ACCESSORIES

CAUTION
Before installation , be sure to disconnect the DC power supply,or battery, or damage may occur the equipment.

7-1 CTCSS unit TSU-6

The use of the optional sub-audible tone decoder TSU-6 allows for CTCSS (Tone squelch) operations. When this option is active squelch will only open when the proper tone is received.

Installation

1. Remove the 6 screws securing the Top cover.
2. Gently remove the top cover. . (Fig.1)
3. Remove the backing from the small cushion provided with the TSU-6 and attach it to the back of the TSU-6 as shown in Fig. 2
4. Attach the cable from TSU-6 as shown in Fig 2.
5. Remove the backing from the other side of the small cushion and attach the TSU-6 to the transceiver as shown.

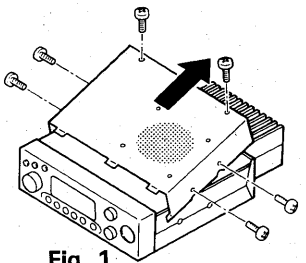


Fig. 1

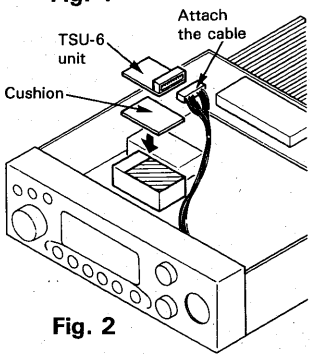


Fig. 2

6. Replace the cover and tighten the screws to complete the installation.

7-2 DTMF unit DTU-2

1. Remove the 6 screws securing the Top cover.
2. Gently remove the top cover. (Fig.1)
3. Remove the backing from the small cushion provided with the DTU-2 and attach it to the back of the DTU-2 as shown in Fig. 3
4. Plug the three connectors into the sockets in the units.
5. Attach the cable from DTU-2 as shown in Fig 3.
6. Replace the cover and tighten the screws to complete the installation.

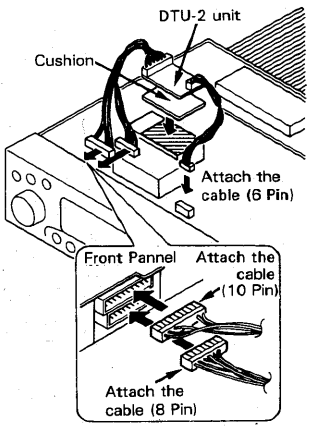
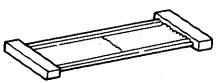


Fig. 3



(Not use this connector)

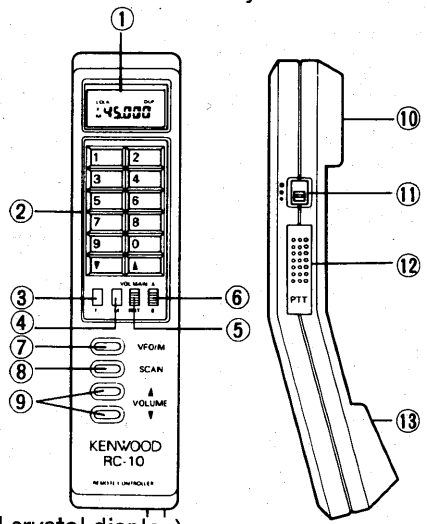
7-3 REMOTE CONTROLLER RC-10

To operate the transceiver with the RC-10 press and hold the CALL key on the transceiver and then turn on the POWER switch.

To select the CALL channel when using the RC-10 press the F key on the RC-10 and then the VFO key.

Please refer to the Instructions provided with the RC-10 for a description of the other RC-10 functions.

Functions that can be controlled by the RC-10



①LCD (liquid crystal display)
Indicates the transmit/receive frequencies and other conditions.

②Keyboard
Can be used to select the transmit/receive frequencies (0 to 9, ▲and▼ keys), to select memory channels (1 to 10), and to select channel 11 or subsequent channels during memory calling (▲ and ▼keys).

③F (Function) key
The following functions can be invoked by combining the F key with other keys.

F.1	Switching to duplex and simplex takes place each time this key is pressed.
F.2	When the transceiver squelch is on, the squelch is brought in and taken out each time this key is pressed.
F.3	The shift can be switched to +, -, and simplex each time this key is pressed.
F.4	REV (reverse) is turned on and off each time this key is pressed.
F.5	The TONE and CTCSS functions are turned on and off each time this key is pressed.
F.7	The memory channel lockout is turned on and off each time this key is pressed.
F.8	The RC-10 keys are locked and unlocked each time this key is pressed.
F.0	Switching to duplex by two transceivers takes place.
F.VFO	The call channel is turned on and off each time this key is pressed.
F.SCAN	The band is switched each time this key is pressed.

④M (memory) key
Used to store data in a memory channel. Data cannot be stored in memory channel 11 or subsequent channels by the RC-10, but it can be stored in the channels by the transceiver.
⑤VOL MAIN/RMT switch
When this switch is set to the VOL MAIN position, the transceiver volume is controlled by the VOL control on the transceiver. When the switch is set to the RMT position, the transceiver volume is controlled by the VOLUME ▲ and ▼ keys on the RC-10.
⑥A/B switch
This switch selects the transceiver to be controlled remotely when two transceivers are connected. The switch is ineffective when only one transceiver is connected.
⑦VFO/M key
Each time this key is pressed, the VFO and memory operations are switched alternately.
⑧SCAN key
Turns the scan operation on and off.
⑨VOLUME key
When the VOL MAIN/RMT switch is set to the RMT position, the transceiver volume can be adjusted.
The transceiver volume increases while the ▲ key is pressed, and decreases while the ▼ key is pressed.
⑩Speaker
⑪Volume set switch
The handset speaker volume can be set to one of three levels. This switch is independent of the transceiver VOL control and VOLUME ▲ and ▼ keys.
⑫PTT (transmit) switch
The transceiver transmits while the key is held down. When the switch is pressed during scanning, the scan operation is stopped.
⑬Microphone

Functions that do not operate when the RC-10 is connected.
1. Dual band receive function
2. DTSS and paging functions
3. DIM setting function
4. Time-out timer and auto power-off functions
5. Functions other than the PTT switch, UP/DWN key, and the microphone when connected to RC-10 connector B

For details, see the RC-10 Instruction Manual.

7-4 REMOTE CONTROLLER RC-20

To change control to the RC-20, connect the RC-20, hold down the transceiver VFO/M▶V key, and turn the power switch on.

Before starting operation, read the RC-20 Instruction Manual.

Functions that do not operate when the RC-20 is connected
1. DTSS and paging functions.
2. DIM setting function.
3. Time-out timer and auto power-off functions.
4. Dual band receive function.

The other functions are the same as the TM-701 functions described in the RC-20 Instruction Manual.