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## 9 SPECIALIZED COMMUNICATIONS

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### SLOW SCAN TV/ FACSIMILE

Slow-scan Television (SSTV) is a popular application for transmitting still images over the air, from one station to another. Instead of trying to describe your station, simply showing it is much faster. Transmitting images over the air requires a scan converter, besides a transceiver. A scan converter transforms images taken with a video camera into audio signals that can be fed into your transceiver. The recipient's scan converter transforms audio signals back into video images so that he or she can view them on a TV set.

Nowadays instead of a scan converter, many hams use a personal computer, a software application, and an interface attached to the transceiver. This is much cheaper, more flexible, and does not require a TV set. In recent years, many low cost digital cameras have become available. You can transfer images from these cameras into your computer.

For further information, consult reference books about Amateur Radio. The frequencies (measured in kHz) commonly used for SSTV operation are listed below:

U.S.A./ Canada	ARU Region 1 (Europe/ Africa)
3845, 3857	3730 ~ 3740
7171	7035 ~ 7045
14230, 14233	14225 ~ 14235
21340	21335 ~ 21345
28680	28675 ~ 28685
145500	—

Fax (facsimile) is one of the original image transmission modes. Using this mode allows you to exchange more detailed graphics than SSTV. Amateur Radio fax functions much like old analog fax systems. It scans paper and converts acquired image data into a series of tones representing white and black portions of the image. Because fax requires longer transmission time, you should use it only when band conditions are stable with strong signals.

Popular fax frequencies include the following:

- 7245, 14245, 21345 (International Net), and 28945 kHz

Operating on SSTV or fax mainly involves learning the functionality of your computer application or accessory hardware that supports these modes. Consult the instruction manual that comes with your software or accessory equipment.

**Note:** *When operating either SSTV or fax, use a fast AGC setting and switch OFF your Speech Processor, for best results.*

# REJECTING INTERFERENCE

## IF FILTER

The IF filters are designed for selecting the exact range of intermediate frequencies that are sent to the next stage in the receive circuit. Interference adjacent to the desired signal can be reduced by selecting a narrow bandwidth filter and/ or shifting the center frequency of the filter.

To more effectively remove interference, combine the IF filtering and the DSP filtering (AF) described on pages 46 and 47.

### CHANGING THE IF FILTER BANDWIDTH

When adjacent frequency interference is present at both sides of the desired signal, narrowing IF filter bandwidth may be the best way to remove the interference. Changing the filter bandwidth will not effect the current reception frequency.

You can install 2 optional IF filters for SSB, CW, and FSK modes. After installing the optional filters {page 83}, the transceiver automatically recognizes what type of optional filters are installed.

#### ■ SSB/ AM

When you operate the transceiver in SSB or AM mode, you can manually select the wide or narrow filter.

Press **[FIL/ NAR] (1 s)** to select another IF filter.

- Each press of **[FIL/ NAR] (1 s)** changes “ ” (Normal) → “**NAR**”, then back to “ ” (Normal).
- If Menu No. 17 is ON (default is OFF) and 2 IF filters have been installed, you can select secondary IF filter. In this case, each press of **[FIL/ NAR] (1 s)** changes “ ” (Normal) → “**NAR**” → “**NAR 2**”, then back to “ ” (Normal).

Mode	IF filter bandwidth	
	Normal	Narrow
SSB	2.4 kHz	1.8 kHz <sup>1</sup> / 500 Hz <sup>2</sup> / 270 Hz <sup>3</sup>
AM	6.0 kHz	2.4 kHz

<sup>1</sup> Optional YF-107SN filter must be installed.

<sup>2</sup> Optional YF-107C filter must be installed and Menu No. 17 must be set to ON.

<sup>3</sup> Optional YF-107CN filter must be installed and Menu No. 17 must be set to ON.

#### ■ CW/ FSK

When you operate in CW or FSK mode, the wide filter or narrow filter is automatically selected according to the DSP filter bandwidth that you select.

The following table describes how the optional filter is selected as you change the bandwidth of DSP filter. You cannot manually select the IF filter. To change the DSP filter bandwidth, refer to “CHANGING THE DSP FILTER BANDWIDTH” {page 46}.

IF Filter bandwidth			DSP Filter (AF) bandwidth		
YF-107CN 270 Hz	YF-107C 500 Hz	YF-107SN 1.8 kHz	~ 300 Hz	~ 600 Hz	~ 2.0 kHz
—	—	—	2.4 kHz (Normal)		
—	—	✓	1.8 kHz (Normal)		
—	✓	—	500 Hz (NAR)		2.4 kHz (Normal)
✓	—	—	270 Hz (NAR)	2.4 kHz (Normal)	
—	✓	✓	500 Hz (NAR)		1.8 kHz (Normal)
✓	—	✓	270 Hz (NAR)	1.8 kHz (Normal)	
✓	✓	—	270 Hz (NAR 2)	500 Hz (NAR)	2.4 kHz (Normal)

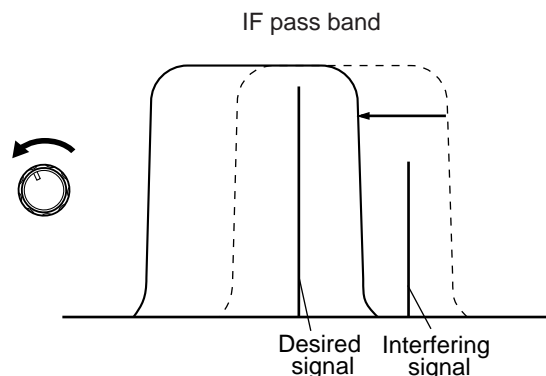
#### ■ FM

In FM mode, you cannot change the reception IF filter bandwidth. The bandwidth is fixed at 12 kHz.

### IF SHIFT (SSB/ CW/ FSK)

Shifting the center frequency of the filter pass band is an additional method of removing adjacent frequency interference. Shifting this center frequency does not change the current reception frequency.

To remove interference that is higher in frequency than the desired signal, turn the **IF SHIFT** control counterclockwise. To remove interference that is lower in frequency than the desired signal, turn the **IF SHIFT** control clockwise.



## 10 REJECTING INTERFERENCE

### DSP FILTERS

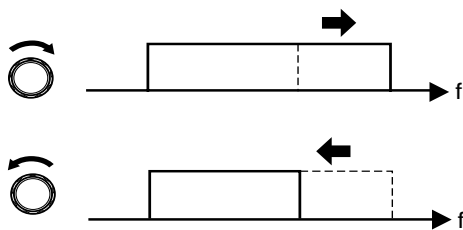
**KENWOOD** digital signal processing (DSP) technology is adapted to this transceiver. Using DSP filtering (AF), you can control the bandwidth, cancel the multiple jamming beat, and reduce the noise level using DSP filtering technology.

#### CHANGING THE DSP FILTER BANDWIDTH

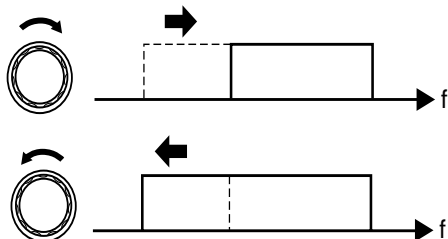
For improving interference reduction capability, this transceiver also provides the DSP filtering (AF) along with IF filters. When in SSB, FM, or AM mode, you can change the filter bandwidth by altering its low and/ or high cut-off frequency. For CW and FSK modes, you can change the filter bandwidth by directly specifying a bandwidth. Changing the DSP filter bandwidth (AF) does not affect the current reception frequency.

#### ■ SSB/ FM/ AM

- 1 Press **[MODE]** to select SSB, FM, or AM mode.
- 2 Press **[FIL/ NAR]**.
  - The current high-cut filter frequency for the mode appears on the sub-display.
- 3 Turn the **MULTI** control clockwise to raise the high cut-off frequency, or counterclockwise to lower the high cut-off frequency.



- 4 Press **[FIL/ NAR]** again.
  - The current low-cut filter frequency appears.
- 5 Turn the **MULTI** control clockwise to raise the low cut-off frequency, or counterclockwise to lower the low cut-off frequency.
- 6 To return to the normal operation, press **[FIL/ NAR]** or **[MTR/ CLR]**.



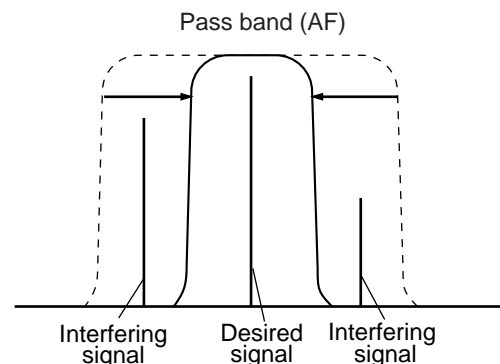
Adjust	Mode	Frequency Selections (Hz)
HI	SSB/ FM	1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3400 (default), 4000, 5000
	AM	2500, 3000 (default), 4000, 5000
LO	SSB/ FM	0, 50, 100 (default), 200, 300, 400, 500, 600, 700, 800, 900, 1000
	AM	0, 100 (default), 200, 500

#### Note:

- ◆ The cut-off frequencies (LO) can be adjusted independently for each operating mode. When you change the operating mode, the previous setting is recalled for each operating mode.
- ◆ When the DSP filter for data communication (Menu No. 45) is ON, you cannot change the DSP filter bandwidth. Select "oFF" to adjust the DSP filter bandwidth.

#### ■ CW/ FSK

- 1 Press **[MODE]** to select CW or FSK mode.
- 2 Press **[FIL/ NAR]**.
  - The current DSP filter bandwidth (AF) appears.
- 3 Turn the **MULTI** control clockwise to increase (wider) the bandwidth, or counterclockwise to decrease (narrower) the bandwidth.

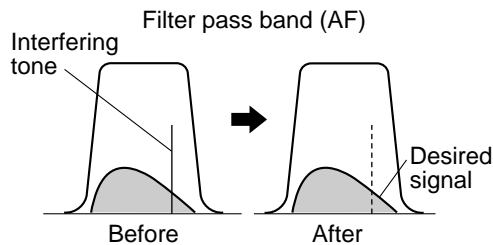


Mode	Bandwidth Selections (Hz)	Default (Hz)
CW	50, 80, 100, 150, 200, 300, 400, 500, 600, 1000, 2000	600
FSK	250, 500, 1000, 1500	1500

- 4 As for CW, you can further adjust the RX pitch frequency. Access Menu No. 34 and turn the **MULTI** control to adjust the RX pitch frequency from 400 to 1000 Hz in steps of 50 Hz. The default RX pitch frequency is 800 Hz {page 29}.
- 5 To return to the current operating mode, press **[MTR/ CLR]** or **[FIL/ NAR]**.

## BEAT CANCEL (SSB/ FM/ AM)

Two types of Beat Cancel DSP filters are available. Beat Cancel 1 (BC1) is effective for removing a weak beat or continuous beat signals. Beat Cancel 2 (BC2) is effective for removing intermittent beat signals, such as CW signals.



Press **[BC/ CW.T]** to cycle through Beat Cancel 1, Beat Cancel 2, and OFF.

- “1◀BC” or “BC▶2” appears when the Beat Cancel function is ON.
- The interfering beat signals are removed.

## NOISE REDUCTION (ALL MODES)

This transceiver provides 2 types of Noise Reduction functions (NR1 and NR2) for reducing random noise which interferes with the desired signal. Trying them both is the easiest way to judge which function works more effectively under the current conditions. Normally, select NR1 (Line Enhanced) in SSB mode and NR2 (SPAC) in CW mode.

Press **[N.R./ LEVEL]** to toggle between NR1, NR2, and OFF.

- “1◀NR” or “NR▶2” appears, depending on which type of noise reduction filter is selected.

### ■ Setting the NR1 Level Adjustment

The NR1 (Line Enhanced Method) uses an adaptive filter to reduce the noise element from the received signals. When the S/N ratio is reasonably good in SSB, using the NR1 will improve the S/N further.

While NR1 is ON, you can further adjust the noise reduction level by pressing **[NR] (1 s)**, then turn the **MULTI** control to select the level from 1 to 9 or AUTO. The default is AUTO.

### ■ Setting the NR2 Time Constant

You can change the correlation time for NR2 (SPAC). When in SSB mode, select the correlation time that allows you to hear signals with clarity. When receiving CW, it is best to select the longest correlation time that allows reliable reception. The longer the correlation time, the better the S/N ratio.

When NR2 is ON, press **[NR] (1 s)**, then turn the **MULTI** control to select the correlation time from 2 ms to 20 ms. The default is 20 ms.

**Note:** Using Noise Reduction 2 in SSB mode may lower the clarity of signals or induce pulse noise, depending on the conditions.

## NOISE BLANKER

Noise Blanker was designed to reduce pulse noise such as that generated by automobile ignitions. Noise Blanker does not function in FM mode.

Press **[NB/T/ 7]** to toggle the Noise Blanker ON and OFF.

- “NB” appears when the function is ON.



You can further adjust the Noise Blanker level from 1 to 10. The default level is 6.

Press **[NB/T/ 7] (1 s)**, then turn the **MULTI** control to adjust the Noise Blanker level.

- “NB LV.” and the current level appear on the sub-display.

**Note:** Noise Blanker is available only for SSB, CW, FSK, and AM modes.

## DIGITAL NOISE LIMITER (DNL)

Digital Noise Limiter (DNL) is designed to reduce pulse noise such as that generated by automobile ignitions. Try this function when the Noise Blanker function cannot remove the pulse noises effectively. Digital Noise Limiter does not function in FM mode.

Press **[DNL]** to toggle the DNL ON and OFF.

- “DNL” appears when the function is ON.



You can further adjust the DNL level from 1 to 3. The default level is 2.

Press **[DNL] (1 s)**, then turn the **MULTI** control to adjust the Digital Noise Limiter level.

- The current level appear on the sub-display.

**Note:**

- ◆ Digital Noise Limiter is available only for SSB, CW, FSK, and AM modes.
- ◆ Depending on a pulse type, the DNL function may not be able to remove the noise.
- ◆ Turning the DNL function ON when there is no pulse-type noise and the signal is relatively strong, it could degrade the signal readability.
- ◆ When the DNL function is ON, the high-cut filter frequency becomes 3.0 kHz regardless of the DSP filter settings.
- ◆ The DNL function can be used with the Beat Cancel (BC), Noise Reduction (NR), and Noise Blanker functions at the same time.

## DSP FILTER FOR DATA COMMUNICATION (SSB/ FM)

The DSP filter for Data Communication is designed to improve the reception tone readability, especially for PSK31 and other new digital modes.

- 1 Press **[MENU/ F.LOCK]** and turn the **MULTI** control to select Menu No. 45.
- 2 Press **[v]/ [^]** to select “oFF” or “on” (default is OFF).

While Menu No. 45 is ON:

- 1 Press **[FIL/ NAR]**.
  - “WDH -- nnnn” (where “nnnn” is DSP filter bandwidth in Hz) appears.
- 2 Turn **MULTI** control to select the desired bandwidth.
- 3 Press **[FIL/ NAR]**.
  - “CTR -- nnnn” (where “nnnn” is a center filter frequency in Hz) appears.
- 4 Turn **MULTI** control to select the desired center frequency for the filter.
- 5 Press **[FIL/ NAR]** to complete the settings.

The following center frequencies and bandwidth combinations are available.

1000/ 1500 Hz is used for the PSK31 operation and 2210 Hz is used for the RTTY operation.

Center Freq. (Hz)	Filter bandwidth (Hz)						
	50	100	250	500	1000	1500	2400
1000	50	100	250	500	1000	1500	2400
1500	50	100	250	500	1000	1500	2400
2210	50	100	250	500	1000	1500	2400

**Note:** While Menu No. 45 is ON, the DSP filter bandwidth {page 46} cannot be changed.

## DSP RX MONITOR

The DSP RX Monitor function temporarily cancels IF filter selection and DSP filter settings so that you can confirm the conditions of current reception frequency nearby.

To use the DSP RX Monitor function, first assign the PF key on the panel (or Mic PF keys) {page 64}.

- 1 Press **[MENU/ F.LOCK]** and turn the **MULTI** control to select Menu No. 48.
- 2 Press **[v]/ [^]** to select “64”.
- 3 Press **[MENU/ F.LOCK]** to store the setting and exit the Menu Mode.
- 4 Press **[PF]**.
  - While pressing **[PF]**, the transceiver cancels IF filter selection and DSP filter settings to its default values. When you release **[PF]**, the transceiver recovers the IF and DSP filter settings.

## PRE-AMPLIFIER

Switching the Pre-amplifier OFF may help reduce interference from adjacent frequencies.

Press **[ATT/PRE/ ANT 1/2]** to cycle through “ATT” → “PRE” → “ ” (OFF) then return to “ATT”. Select “PRE” to turn the pre-amplifier ON. When it is ON, the signal is amplified approximately 12 dB.

- “PRE” appears when the function is ON.



The ON/ OFF setting will be automatically stored in the current band. Each time you select the same band, the same setting will be automatically selected.

The frequency range of each band is provided in the table under “ATTENUATOR”.

## ATTENUATOR

The Attenuator reduces the level of received signals. This function is useful when there is strong interference from adjacent frequencies.

Press **[ATT/PRE/ ANT 1/2]** to cycle through “ATT” → “PRE” → “ ” (OFF) then return to “ATT”. Select “ATT” to activate the attenuator function. When it is ON, the signal is attenuated approximately 12 dB.

- “ATT” appears when the function is ON.



The ON/ OFF setting will be automatically stored in the current band. Each time you select the same frequency band, the attenuator setting will be automatically recalled.

The frequency range of each band is shown below.

Frequency Bands (MHz)	Pre-amplifier (Default)	Attenuator (Default)
0.03 ~ 2.5	OFF	OFF
2.5 ~ 4.1	OFF	OFF
4.1 ~ 6.9	OFF	OFF
6.9 ~ 7.5	OFF	OFF
7.5 ~ 10.5	ON	OFF
10.5 ~ 14.5	ON	OFF
14.5 ~ 18.5	ON	OFF
18.5 ~ 21.5	ON	OFF
21.5 ~ 25.5	ON	OFF
25.5 ~ 30.0	ON	OFF
30.0 ~ 60.0	ON	OFF

# MEMORY FEATURES

## MEMORY CHANNELS

The transceiver provides you with 100 memory channels, numbered 00 to 99, for storing operating frequency data, modes and other information. Memory channels 00 to 89 are called Conventional Memory Channels. Memory channels 90 to 99 are designed for programming VFO tuning ranges and scan ranges. The data you can store is listed below.

Conventional memory channels are used for storing data you will often recall. For example, you may store the frequency where you regularly meet your club members.

Parameter	Channel 00 ~ 89	Channel 90 ~ 99
RX frequency	Yes	Yes <sup>1</sup> (simplex)
TX frequency	Yes	
RX mode	Yes	Yes <sup>1</sup> (simplex)
TX mode	Yes	
Programmable VFO Start/ End frequencies	No	Yes
RX frequency step size	Yes	Yes (simplex)
TX frequency step size	Yes	
Tone frequency	Yes	Yes
CTCSS frequency	Yes	Yes
Tone/ CTCSS ON/ OFF status	Yes	Yes
Memory name	Yes	Yes
Memory Channel Lockout ON/ OFF	Yes <sup>1</sup>	Yes <sup>1</sup>

<sup>1</sup> Changing the data after recalling a memory channel overwrites the contents of the channel.

## STORING DATA IN MEMORY

There are 2 methods used for storing transmission/reception frequencies and associated data in memory channels 00 to 89. Use either method, depending on the relationship of the reception and transmission frequencies you store:

- Simplex channels:  
RX frequency = TX frequency
- Split-frequency channels:  
RX frequency ≠ TX frequency

Memory channels 90 to 99 can also be used as simplex channels.

**Note:** When RIT or XIT is ON, the frequency that includes the RIT or XIT offset will be stored.

### ■ Simplex Channels

- 1 Press **[A/B / M/V]** to select VFO A or VFO B.
  - “◀A” or “◀B” appears to show which VFO is selected.
- 2 Select the frequency, mode, etc. to be stored.
- 3 Press **[QMI/ M.IN] (1 s)** to enter Memory Scroll mode.
  - “M.SCR” appears.



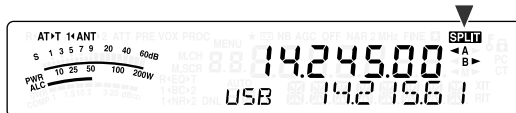
- To exit Memory Scroll mode and abort the storage process, press **[MTR/ CLR]**.
- 4 Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select a memory channel.
    - You can also select a channel by entering a 2-digit number, such as 12, using the numeric keys. Press **[1], [2]** for example.



- 5 Press **[QMI/ M.IN]** again to store the data.
  - The previous data stored in the channel is overwritten.

## Split-Frequency Channels

- Press **[A/B / M/V]** to select VFO A or VFO B.
  - “◀A” or “▶B” appears to show which VFO is selected.
- Select the frequency, mode, etc. to be stored.
  - This frequency and mode will be used for transmitting.
- Press **[A/B / M/V]** to select the other VFO.
- Select the reception frequency and mode.
- Press **[A=B/ SPLIT] (1 s)**.
  - “**SPLIT**” appears.



- Press **[QMI/ M.IN] (1 s)** to enter Memory Scroll mode.



- To exit Memory Scroll mode and abort the storage process, press **[MTR/ CLR]**.
- Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select a memory channel.
    - You can also select a channel by entering a 2-digit number, such as 12, using the numeric keys. Press **[1], [2]** for example.



- Press **[QMI/ M.IN]** to store the data.
  - The previous data stored in the channel is overwritten.

**Note:** When subtone frequencies differ between TX and RX while performing memory-VFO split operation, the subtone frequency for TX will be stored in the memory channel.

## MEMORY RECALL AND SCROLL

There are 2 modes which allow you to retrieve frequencies and associated data that you stored in a memory channel: Memory Recall and Memory Scroll.

### Memory Recall:

In this mode, the transceiver receives and transmits using a frequency that you retrieve. You can temporarily change the frequency and associated data without overwriting the contents of the memory channel when Menu No. 07 is ON (default is OFF).

### Memory Scroll:

Use this mode to check the contents of the memory channels without changing the current reception frequency. In this mode, frequencies you retrieve are not used for receiving and transmitting.

## Memory Recall

- Press **[A/B / M/V] (1 s)** to enter Memory Recall mode.
  - The memory channel that was last selected appears.



- Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select a memory channel.
  - Continuously holding down Mic **[UP]/ [DWN]** steps the transceiver through the memory channels until the key is released.
  - Memory channels which contain no data are skipped.
  - You cannot change memory channels while transmitting.
- To exit Memory Recall mode, press **[A/B / M/V] (1 s)**.

**Note:** If Menu No. 7 is selected “on”, the frequency of the split-memory channel can be changed while using the TF-SET function.



## 11 MEMORY FEATURES

### Memory Scroll

- Press **[QMI/ M.IN]** (1 s) to enter Memory Scroll mode.
  - The memory channel that was last selected appears.



- Turn the **MULTI** control, or press Mic **[UP]/[DWN]** to step through the memory channels.
  - You can also change channels by entering a 2-digit number. Press **[8]**, **[9]** for example.
- To exit Memory Scroll mode, press **[MTR/ CLR]**.
  - The transceiver re-displays the memory channel or VFO frequency that was selected before you activated Memory Scroll.

**Note:**

- While the transceiver is in Memory Scroll Mode, you can operate the following controls and keys only: **[QMI/ M.IN]**, **[MTR/ CLR]**, numeric keys (**[0]** ~ **[9]**), Mic **[UP]/[DWN]**, Mic **[PTT]**, **AF** control, **SQL** control, **MULTI** control and **[ϕ]** (**POWER**).
- Do not press **[QMI/ M.IN]** again after entering Memory Scroll mode. Pressing **[QMI/ M.IN]** results in over-writing the current VFO data to the memory channel you selected.

### Temporary Frequency Changes

After retrieving frequencies and associated data in Memory Recall mode, you can temporarily change the data without overwriting the contents of the memory channel.

- Access Menu No. 07 and select "on".
  - Skip this step when changing only the associated data (not the frequency).
- Recall a memory channel.
- Change the frequencies and associated data.
  - Use only the **Tuning** control to select a frequency.
- If necessary for future use, store the changed data in another memory channel. Refer to "Channel → Channel Transfer" {below}.

**Note:** If Menu No. 7 is selected "on", the frequency of the split-memory channel can be changed while using the **TF-SET** function.

## MEMORY TRANSFER

### Memory → VFO Transfer

After retrieving frequencies and associated data from Memory Recall mode, you can copy the data to the VFO. This function is useful, for example, when the frequency you want to monitor is near the frequency stored in a memory channel.

- Recall the desired memory channel {page 51}.
- Press **[QMR/ M▶VFO]** (1 s).
  - When a simplex channel is recalled, the data is copied to VFO A or VFO B, depending on which VFO was used to recall the channel.
  - When a split channel is recalled, the RX data is copied to VFO A and the TX data is copied to VFO B.

**Note:** Pressing **[QMR/ M▶VFO]** (1 s) after temporarily changing the retrieved data copies the new data to the VFO.

### Channel → Channel Transfer

You can also copy channel information from one memory channel to another. This function is useful when storing frequencies and associated data that you temporarily change in Memory Recall mode.

- Recall the desired memory channel {page 51}.
- Press **[QMI/ M.IN]** to enter Memory Scroll mode.
  - To exit Memory Scroll mode, press **[MTR/ CLR]**.
- Select the memory channel where you would like the data copied, using the **MULTI** control.
- Press **[QMI/ M.IN]** (1 s).

Channel 00 ~ 89	→	Channel 00 ~ 89
RX frequency	→	RX frequency
TX frequency	→	TX frequency
Mode for RX	→	Mode for RX
Mode for TX	→	Mode for TX
RX frequency step	→	RX frequency step
TX frequency step	→	TX frequency step
Tone frequency	→	Tone frequency
CTCSS frequency	→	CTCSS frequency
Tone/ CTCSS ON/ OFF status	→	Tone/ CTCSS ON/ OFF status
Memory Name	→	Memory Name
Memory Channel Lockout ON/ OFF	→	Memory Channel Lockout OFF

Channel 00 ~ 89	➔	Channel 90 ~ 99
RX frequency	➔	TX/ RX frequency (simplex)
TX frequency	➔	
Mode for RX	➔	Mode for TX/ RX (simplex)
Mode for TX	➔	
RX frequency step	➔	TX/ RX frequency step (simplex)
TX frequency step	➔	
Tone frequency	➔	Tone frequency
CTCSS frequency	➔	CTCSS frequency
Tone/ CTCSS ON/ OFF status	➔	Tone/ CTCSS ON/ OFF status
Memory Name	➔	Memory Name
Memory Channel Lockout ON/ OFF	➔	Memory Channel Lockout OFF

Channel 90 ~ 99	➔	Channel 00 ~ 89
TX/ RX frequency	➔	RX frequency
	➔	TX frequency
Mode for TX/ RX	➔	Mode for RX
	➔	Mode for TX
TX/ RX frequency step (simplex)	➔	RX frequency step
	➔	TX frequency step
Tone frequency	➔	Tone frequency
CTCSS frequency	➔	CTCSS frequency
Tone/ CTCSS ON/ OFF status	➔	Tone/ CTCSS ON/ OFF status
Memory Name	➔	Memory Name
Memory Channel Lockout ON/ OFF	➔	Memory Channel Lockout OFF

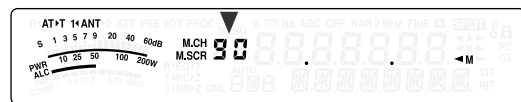
When copying a memory channel 90 ~ 99 ➔ channel 90 ~ 99, Memory Channel Lockout status changes to OFF, regardless of the original channel settings.

The tables above illustrate how data is transferred between memory channels.

### STORING FREQUENCY RANGES

Memory channels 90 to 99 allow you to store frequency ranges for VFO tuning and Program Scan. Program Scan is described in the next chapter. To tune or scan frequencies within a specified range, store the start and end frequencies for that range in advance.

- 1 Press **[A/B / M/V]** to select VFO A or VFO B.
- 2 Select the desired start frequency.
- 3 Press **[QMI/ M.IN]** (1 s) to enter Memory Scroll mode.
  - To exit Memory Scroll mode and abort the storage process, press **[MTR/ CLR]**.
- 4 Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select a memory channel in the range of 90 to 99.



- You can also select a channel by entering a 2-digit number. Press **[9]**, **[0]** for example.
- 5 Press **[QMI/ M.IN]** to store the start frequency in the memory channel.
    - “ENDINPUT” appears on the sub-display.



- 6 Turn the **Tuning** control or **MULTI** control to select the end frequency.
- 7 Press **[QMI/ M.IN]** to store the end frequency in the memory channel.
  - The previous data stored in the channel is overwritten.

#### ■ Confirming Start/ End Frequencies

Use this procedure to check the start and end frequencies that you stored in channels 90 to 99.

- 1 Press **[A/B / M/V]** (1 s) to enter Memory Recall mode.
- 2 Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select a memory channel from 90 to 99.
- 3 Press **[v]** to check the start frequency and **[^]** to check the end frequency.

## 11 MEMORY FEATURES

### ■ Programmable VFO

Using the start and end frequencies that you stored in channels 90 to 99, Programmable VFO restricts the frequency range that you can tune with the **Tuning** control. One application of this function is to help you operate within the authorized frequency limits of your license.

- 1 Press **[A/B / M/V]** (1 s) to enter Memory Recall mode.
- 2 Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select a memory channel from 90 to 99.
  - You can also select a channel by entering a 2-digit number. Press **[ENT]**, **[9]**, **[0]** for example.

Now you can only tune from the start frequency to the end frequency, using the **Tuning** control.

**Note:** Pressing Mic **[UP]/[DWN]** or turning the **MULTI** control changes the memory channel number while in Programmable VFO mode.

### Memory Channel Lockout

You can lock out memory channels that you prefer not to monitor during Memory Scan. Memory Scan is described in the next chapter {page 58}.

- 1 Press **[A/B / M/V]** (1 s) to enter Memory Recall mode.
- 2 Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select the desired memory channel.
  - You can also select a channel by entering a 2-digit number. Press **[ENT]**, **[3]**, **[4]** for example.
- 3 Press **[ENT]** (1 s).
  - A dot appears beside the right-most digit of the memory channel number to indicate the channel has been locked out.



- Pressing **[ENT]** (1 s) toggles between adding and removing the channel from the scan list.

### ERASING MEMORY CHANNELS

If there are memory channels that you will not recall in the future, you may prefer erasing the contents of those channels.

- 1 Press **[A/B / M/V]** to enter Memory Recall mode.
- 2 Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select the desired memory channel.
  - You can also select a channel by entering a 2-digit number. Press **[ENT]**, **[3]**, **[4]** for example.
- 3 Press **[MTR/ CLR]** (1 s).
  - A long beep sounds to confirm that the channel data has been erased.

### MEMORY CHANNEL NAME

You can assign a name to each memory channel. A maximum of 8 alpha-numeric characters can be stored.

- 1 Press **[A/B / M/V]** (1 s) to enter Memory Recall mode.
- 2 Turn the **MULTI** control, or press Mic **[UP]/ [DWN]** to select a memory channel.
- 3 Press **[QMR/ M▶ VFO]**.



- 4 Turn the **MULTI** control to select the desired alpha-numeric character. You can move the cursor to the left by pressing **[<]**, or to the right by pressing **[>]**. Press **[CL]** to erase the character at the cursor.

**Note:** You cannot name the Quick Memory channels.

- 5 After selecting all the necessary characters for the memory channel name, press **[QMR/ M▶ VFO]** to store the name.
- 6 When you recall a memory channel with a name, the name is displayed on the sub-display along with the memory channel number {page 51}.

### Available alpha-numeric characters

A	B	C	D	E	F	G	H	I	J	K	L	M	N
O	P	Q	R	S	T	U	V	W	X	Y	Z	SP	
+	-	/	0	1	2	3	4	5	6	7	8	9	

“SP” represents a space character.

## QUICK MEMORY

Quick memory is designed to quickly and temporarily save data without specifying a particular memory channel. Use Quick memory to store data you will not use in future operating sessions. For example, as you tune across the band looking for DX, it is convenient to store stations that you want to contact. You can quickly jump between several different memory channels as you monitor them.

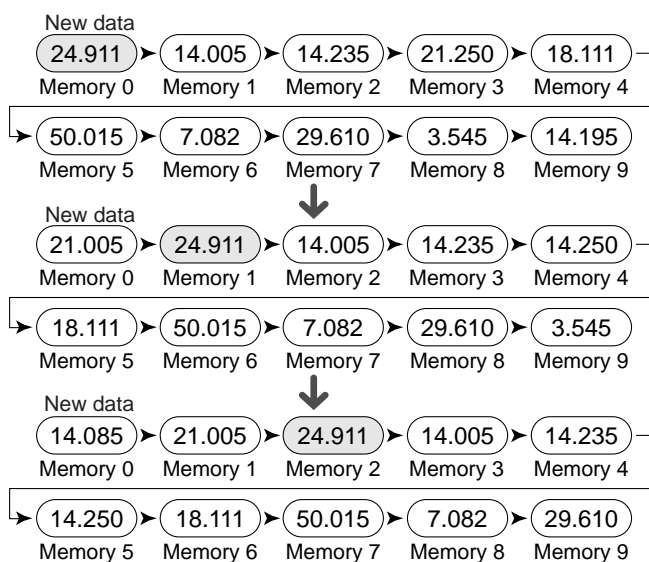
This transceiver provides 10 Quick memory channels ("0\_" to "9\_") that can store the following data:

VFO A frequency and operating mode	VFO B frequency and operating mode
RIT ON/ OFF	XIT ON/ OFF
RIT/ XIT offset frequency	DSP filter bandwidth
Noise Blanker ON/ OFF	FINE ON/ OFF
DSP Noise Reduction OFF/ 1/ 2	DSP Beat Cancel OFF/ 1/ 2
Digital Noise Limiter OFF/ 1 ~ 3	TX/ RX functions

## STORING INTO QUICK MEMORY

Each time you store a new frequency, all previously stored frequencies are bumped to the next respective Quick memory channel. When all 10 memory channels contain frequencies, storing one more frequency bumps the contents of memory channel 9 off the stack (the data is lost).

The following diagram illustrates how the Quick Memory stacks the data in memory each time you press [QMI/ M.IN].



You can store data in the Quick Memory only when you operate the transceiver in VFO mode.

- 1 Select the frequency, mode, etc. on the transceiver VFO.
- 2 Press [QMI/ M.IN].
  - Each time [QMI/ M.IN] is pressed, the current VFO data is written to the Quick Memory.

*Note: When RIT or XIT is ON, this ON status and the offset will also be stored.*

## RECALLING QUICK MEMORY CHANNELS

You can recall a Quick Memory channel only when you operate the transceiver in VFO mode.

- 1 Press [QMR/ M▶VFO].
  - The current memory channel number appears.



- If there is no data stored in any Quick memory channel, the data cannot be recalled to the current VFO, an error beep sounds.
- 2 Turn the **MULTI** control to select a Quick memory channel (0 to 9).
  - You cannot change memory channels while transmitting.
- 3 To exit, press [QMR/ M▶VFO] again.

*Note: Memory channels cannot be changed while using the TF-SET function.*

## TEMPORARY FREQUENCY CHANGES

After recalling a Quick memory channel, you can temporarily change the data without overwriting the contents of the channel. You can change the frequency even when you select "oFF" in Menu No. 07.

- 1 Press [QMR/ M▶VFO].
- 2 Turn the **MULTI** control to select a Quick memory channel (0\_ to 9\_).
- 3 Change the frequencies and associated data.
- 4 To store the changed data in the Quick memory, press [QMI/ M.IN].
  - This action stores the new data in the current channel and bumps the old frequency to the next higher Quick memory channel.
- 5 To exit, press [QMR/ M▶VFO] again.

*Note: Memory channel data can also be changed while using the TF-SET function.*

## QUICK MEMORY ⇒ VFO TRANSFER

This function copies the contents of the recalled memory channel to the VFO.

- 1 Recall a Quick Memory channel.
- 2 Press [QMR/ M▶VFO] (1 s).

*Note: Pressing [QMR/ M▶VFO] after temporarily changing the recalled data copies the new data to the VFO.*

Scan is a useful function for hands-off monitoring of your favorite frequencies. By becoming comfortable with all types of Scan, you will increase your operating efficiency.

This transceiver provides the following types of scans.

Scan Type		Purpose
Normal Scan	VFO Scan	Scans the entire frequency range of the transceiver.
	Program Scan	Scans the specific frequency ranges stored in Memory channels 90 ~ 99.
Memory Scan	All-Channel Scan	Scans all Memory channels, from 00 to 99.
	Group Scan	Scans the specific Memory channel groups.

**Note:**

- ◆ While using CTCSS in FM mode, Scan stops only for the signals that contain the same CTCSS tone that you selected.
- ◆ Pressing Mic [PTT] causes Scan to stop.

## NORMAL SCAN

When you are operating the transceiver in VFO mode, 2 types of scanning are available.

- VFO Scan

The transceiver scans the entire frequency range of the transceiver. For example, if you are operating and receiving on the transceiver's VFO A at 14.195.00 MHz, it scans entire frequencies in the range of 30.00 kHz to 59.999.99 MHz. (Refer to available VFO frequency range in the Specifications.)

- Program Scan

By programming the start and end frequency in Memory channels 90 ~ 99 {page 53}, you can limit the scanning frequency range. Since there are 10 memory channels (90 ~ 99) available for specifying the start and end frequency, you can select one or more (a maximum of 10) ranges to scan. This is useful when you are waiting for a DX station on a certain frequency but the station may appear on a slightly higher or lower frequency.

## VFO SCAN

VFO Scan scans the entire frequency range that is available for the current VFO. When the Program Scan frequency range is not programmed or no Scan Group is selected for the Program Scan, the transceiver also scans the entire frequency range available for the current VFO.

The memory channel numbers 90 ~ 99 have alias names, "VGROUP". "VGROUP-0" represents channel 90, "VGROUP-1" represents channel 91, "VGROUP-2" represents channel 92, and so on up to "VGROUP-9" which represents channel 99.

If one or more Program Scan frequency ranges are programmed in VGROUP-0 to 9 (Memory channel numbers 90 ~ 99 in other words):

- 1 Press [**SCAN/ SG.SEL**] (1 s) in VFO mode.
  - "VGROUP -- n" (where n represents a VGROUP number from 0 to 9) appears on the sub-display.
- 2 Turn the **MULTI** control to select the Program Scan memory (VGROUP-0 to VGROUP-9). As you select the channel, "on" or "oFF" appears on the frequency display. "on" signifies that the selected VGROUP is active for the program scan and "oFF" signifies that the selected VGROUP is inactive for the Program Scan.



Configure all VGROUP channels (VGROUP-0 ~ VGROUP-9) as "oFF" by pressing [V].



- 3 Press [**SCAN/ SG.SEL**] or [**MTR/ CLR**] to return to the current VFO mode.
- 4 Press [**SCAN/ SG.SEL**] to start the VFO Scan.
- 5 Press [**SCAN/ SG.SEL**] or [**MTR/ CLR**] to stop the VFO Scan.

**Note:**

- ◆ While scanning, you can change the scan speed by turning the **RIT/ XIT** control. Turn the control clockwise/ counterclockwise to decrease/ increase the scan speed. The speed indicator appears on the sub-display, where P1 is the fastest speed and P9 is the slowest.
- ◆ You cannot change the VFO Scan speed in FM mode.

## PROGRAMSCAN

Program Scan monitors the range between the start and end frequencies that you have stored in Memory channels 90 ~ 99 (VGROUP-0 ~ 9). Refer to "STORING FREQUENCY RANGES" {page 53} for details on how to store the start and end frequencies to Memory channels 90 ~ 99 (VGROUP-0 ~ 9).

You can select a maximum of 10 memory channels (VGROUP 0 to 9) and sequentially scan the frequency ranges that you stored in these channels. If the current VFO frequency falls within the selected VGROUP frequency range, the Program Scan starts from the VGROUP number and then continues to scan the next larger VGROUP number. If the current VFO frequency is outside all of the VGROUP frequency ranges, the Program Scan starts from the smallest VGROUP number that is selected as "on" (each VGROUP can be set to either "on" or "oFF").

- 1 Press [**A/B / M/V**] to select VFO A or VFO B.
- 2 Press [**SCAN/ SG.SEL**] (1 s).



- 3 Turn the **MULTI** control or press Mic [**UP**] / [**DWN**] to select the memory channel (VGROUP-0 to

VGROUP–9). As you select the Memory Channel, “on” or “oFF” appears on the main frequency display. “on” signifies that the memory channel is active for the program scan and “oFF” signifies that the memory channel group is inactive for the program scan.

- To activate the Program scan frequency range, select the desired VGROUP number by turning the **MULTI** control. Then, press [**^**] to select “on” for the VGROUP (channel). When a channel is activated for the Program Scan, “on” appears on the display.

**Note:** At least one of the valid Program Scan channels (from 90 to 99) must be programmed and selected to perform the Program Scan. If no VGROUP (memory channel 90 ~ 99) is selected for the Program Scan, the transceiver performs the VFO Scan (above).



- Press [**SCAN/ SG.SEL**] or [**MTR/ CLR**] to return to the current VFO mode.
- Press [**SCAN/ SG.SEL**] to start the Program Scan.
  - To quickly move towards a desired frequency while scanning, turn the **Tuning** control or the **MULTI** control, or press Mic [**UP**]/ [**DWN**].
  - Turning the **RIT/ XIT** control clockwise decreases the scan speed and counterclockwise increases the speed, except while in FM mode. The current scan speed is shown on the display; P1 is the fastest speed and P9 is the slowest.
  - While in FM mode, Scan automatically stops on a frequency where a signal is present. The transceiver will either remain on that channel for a short time (Time-Operated mode) or until the signal drops out (Carrier-Operated mode), depending on which mode you select via Menu No. 11 {page 58}.
- To stop Scan, press [**SCAN/ SG.SEL**] or [**MTR/ CLR**].

**Note:**

- If you have turned the **SQL** control clockwise, far beyond the squelch threshold while in FM mode, Scan may fail to stop at a channel where a signal is present. If this happens, turn the **SQL** control slightly counterclockwise.
- If you press [**SCAN/ SG.SEL**] before storing any frequency range for memory channels 90 to 99, the transceiver starts VFO scan.
- When the current receive frequency is within one of the ranges that you selected with channel numbers, Scan starts with the current frequency. The operating mode stored in the memory channel is used.
- The operating mode can be changed while scanning, but the memory channel is overwritten with the changed mode.
- When the current Scan range is smaller than a single step of the **MULTI** control, turning the control clockwise causes Scan to jump to the start frequency, and counterclockwise to the end frequency.
- Starting Program Scan switches OFF the RIT and XIT functions.
- While in FM mode, the Program Scan monitors rounded off frequencies regardless of the Menu No. 05 setting.

## PROGRAMSCANPARTIALLYSLOWED

You can specify a maximum of 5 frequency points for each memory channel from 90 to 99 so that the Program Scan slows down the scanning speed. To specify the slow down frequency points, first program the start and end frequencies into a memory channel (90 ~ 99) {page 53}.

- Access Menu No. 08 to confirm that the function is ON (default is ON).
- You can further configure the slow down frequency width. Access Menu No. 09 to select the range from 100 Hz to 500 Hz (default is 300 Hz).

**Note:** If you select, for example, 500 Hz for Menu No. 09, the Program Scan slows down to a  $\pm 500$  Hz width, centering the frequency you marked below.

- Press [**A/B / V/M**] (1 s) and turn the **MULTI** control to recall the memory channel (90 ~ 99) for which you want to specify the scan slow down frequencies.
- Press [**√**]/ [**^**] to confirm the start ([**√**]) or end ([**^**]) frequency.
- Turn the **Tuning** control to the center frequency point that you want the Program Scan to slow down. Press [**QMI/ M.IN**] to mark the Slow down frequency point. The “**Q**” icon appears.
- Repeat step 5 to specify the center slow down frequency points. You can specify a maximum of 5 frequency points for each channel.
- If you want to clear a slow down frequency point that you previously stored, select the frequency that you stored. Press [**QMI/ M.IN**] at this frequency spot where “**Q**” appears.
  - A confirmation beep sounds and the transceiver “**Q**” disappears.
  - If you want to clear all the slow down frequency points at once, perform the Channel **→** Channel Transfer to overwrite the memory data to the same memory channel {page 52}. This operation removes all the frequency points that you stored.
- Press [**A/B / M/V**] to return to VFO mode.

- Press [**SCAN/ SG.SEL**] to start the Program Scan with the slow down frequency point(s).

**Note:**

- During the Program Scan, you can turn the **RIT/ XIT** control to adjust the scanning speed. Turn the control clockwise/ counterclockwise to slow down/ speed up the scan. The Program Scan speed indicator appears on the main dot-matrix display during the Program Scan; P1 is the fastest speed and P9 is the slowest.
- You cannot change the Program Scan speed in FM mode.
- You can specify the Program Scan slow down frequency point in FM mode but it does not function.

## SCANHOLD

This function stops Program Scan for approximately 5 seconds, then resumes Scan when you jump to the desired frequency by turning the **Tuning** control or the **MULTI** control, or by pressing Mic [**UP**]/ [**DWN**].

To use this function, access Menu No. 10, and select “on”. The default is OFF.

## MEMORY SCAN

Memory Scan monitors all memory channels in which you have stored frequencies (All-channel Scan) or only a desired group of memory channels (Group Scan).

Scan automatically stops at a channel where a signal is present, regardless of the operating mode. The transceiver will either remain on that channel for a short time (Time-Operated mode) or until the signal drops out (Carrier-Operated mode). Use Menu No. 11 to select the mode. The default is “to” (Time-Operated).

### SCAN RESUME METHOD

The transceiver stops scanning at the frequency (or memory channel) where a signal is detected. It then continues scanning according to which resume mode you have selected. You can choose one of the following modes. The default is Time-operated mode.

- **Time-Operated mode (“to”)**

The transceiver remains on a busy frequency (or memory channel) for approximately 6 seconds, then continues to scan, even if the signal is still present.

- **Carrier-Operated mode (“co”)**

The transceiver remains on the busy frequency (or memory channel) until the signal drops out. There is a 2 second delay between signal dropout and scan resumption.

- 1 Press **[MENU/ F.LOCK]** to enter Menu mode.
- 2 Turn the **MULTI** control to select Menu No. 11.
- 3 Press **[v]/ [^]** to select “to” (Time-Operated) or “co” (Carrier-Operated).



- 4 Press **[MENU/ F.LOCK]** to complete the setting and exit Menu mode.

You can lock out the memory channels that you prefer not to monitor while scanning. To do this, refer to “Memory Channel Lockout” {page 54}.

## ALGORITHM SCAN

Use the following procedure to scan all the memory channels that contain frequency data in sequence, ignoring the Memory Group number.

- 1 Select Time-operated or Carrier-operated mode via Menu No. 11.
- 2 Press **[A/B / V/M] (1 s)** to enter Memory Recall mode.
- 3 Turn the **SQL** control to adjust the squelch threshold to mute the speaker.
- 4 Press **[SCAN/ SG.SEL] (1 s)** to enter Scan Group Select mode.
  - Turn the **MULTI** control to select the Memory channel group.
  - MGROUP–0 represents Memory channel 0 ~ 9, MGROUP–1 represents Memory channel 10 ~ 19 and so on up to MGROUP–9 which represents Memory channel 90 ~ 99 {page 53}.
- 5 As you select the Memory Groups using the **MULTI** control, press **[v]** to select “oFF” for all Memory Groups.
- 6 Press **[SCAN/ SG.SEL]** to return to Memory Recall mode.
- 7 Press **[SCAN/ SG.SEL]** to start All-channel Scan.
  - Scan starts from the current memory channel and ascends up through the channel numbers. (The scan direction cannot be changed.)
  - To jump to a desired channel while scanning, turn the **MULTI** control, or press Mic **[UP]/ [DWN]**.
- 8 To stop Scan, press **[SCAN/ SG.SEL]** or **[MTR/ CLR]**.

**Note:**

- ◆ If you have turned the **SQL** control clockwise, far beyond the squelch threshold, Scan may fail to stop at a channel where a signal is present. If this happens, turn the **SQL** control slightly counterclockwise.
- ◆ Starting Memory Scan switches OFF the RIT and XIT functions.

## GROUPSCAN

100 memory channels are divided into 10 groups so that you can select one or more groups to be scanned, depending on the situation.

### ■ Memory Group

When you store frequency data in a memory channel {page 50}, the memory channel belongs to one of 10 groups as shown below.

Memory Channel No.	Memory Group No.	Memory Channel No.	Memory Group No.
0 ~ 9	MGROUP-0	50 ~ 59	MGROUP-5
10 ~ 19	MGROUP-1	60 ~ 69	MGROUP-6
20 ~ 29	MGROUP-2	70 ~ 79	MGROUP-7
30 ~ 39	MGROUP-3	80 ~ 89	MGROUP-8
40 ~ 49	MGROUP-4	90 ~ 99	MGROUP-9

### ■ Scan Group Select

You can select one or more groups to be scanned. First, select the groups to be scanned.

- 1 Press **[A/B / M/V] (1 s)** to enter Memory Recall Mode.
  - "M.CH" appears.
- 2 Press **[SCAN/ SG.SEL] (1 s)** to enter Scan Group Select Mode.
- 3 As you turn the **MULTI** control, the MGROUP number on the sub-display changes.
  - MGROUP-0 represents Memory channel 0 ~ 9, MGROUP-1 represents Memory channel 10 ~ 19 and so on up to MGROUP-9 which represents Memory channel 90 ~ 99.
- 4 Press **[^]** to select "on" to add the group to the Group Scan list.
  - If you do not wish the selected Group to be scanned, press **[v]** to select "oFF".
- 5 Press **[SCAN/ SG.SEL] (1 s)** to exit the Scan Group Select Mode.

### ■ Performing Group Scan

Group Scan starts with the smallest group number and repeats the sequence. For example, if you selected "on" for MGROUP-3, MGROUP-5, and MGROUP-7, the transceiver scans the channels in MGROUP-3 → MGROUP-5 → MGROUP-7 → MGROUP-3 and so on.

- 1 Select Time-operated or Carrier-operated mode via Menu No. 11.
- 2 Press **[A/B / M/V] (1 s)** to enter Memory Recall mode.
- 3 Turn the **SQL** control to adjust the squelch threshold.
- 4 Press **[SCAN/ SG.SEL]** to start Memory Group Scan.
  - Scan ascends up through the channel numbers. (The scan direction cannot be changed.)
  - To jump to a desired channel while scanning, turn the **MULTI** control or press and hold Mic **[UP]/ [DWN]**.
- 5 To stop Scan, press **[SCAN/ SG.SEL]** or **[MTR/ CLR]**.

#### Note:

- ◆ If you have turned the **SQL** control clockwise, far beyond the squelch threshold, Scan may fail to stop at a channel in which a signal is present. If this happens, turn the **SQL** control slightly counterclockwise.
- ◆ When the current channel is within one of the groups that you selected, Scan starts with the current channel.
- ◆ When the current channel is outside all the groups that you selected, Scan starts with the group number that is larger than and closest to the group number of the current channel.
- ◆ Starting Memory Scan switches OFF the RIT and XIT functions.



# OPERATOR CONVENIENCES

## ANTENNAS

Two antenna connectors are available for the HF/ 50 MHz band on the TX/ RX unit rear panel {page 16}.

Press **[ATT/ PRE/ ANT1/2]** (1 s) to select ANT 1 or ANT 2.

- “1◀ANT” or “ANT▶2” appears to indicate which antenna is selected.



The ANT 1/ ANT 2 setting will automatically be stored in the antenna band memory. Next time you select the same band, the same antenna will be automatically selected.

Antenna Selection Frequency Range (MHz)	
0.03 ~ 2.5	2.5 ~ 4.1
4.1 ~ 6.9	6.9 ~ 7.5
7.5 ~ 10.5	10.5 ~ 14.5
14.5 ~ 18.5	18.5 ~ 21.5
21.5 ~ 25.5	25.5 ~ 30.0
30.0 ~ 60.0	

**Note:** Connect an external antenna tuner to the ANT 1 connector only, then select ANT 1. The internal tuner will be automatically bypassed when the transceiver is switched ON.

## APO (Auto Power OFF)

You can set the transceiver to switch OFF automatically if no keys or controls are pressed or adjusted for a certain period of time. 1 minute before the transceiver switches OFF, “CHECK” is output in Morse code. You can select the time from OFF, 60, 120, and 180 minutes.

Press **[MENU/ F.LOCK]**, then turn the **MULTI** control to access Menu No. 59.

Select the APO time from “oFF”, “60”, “120”, or “180” minutes.

### Note:

- ◆ The APO function works even if the transceiver is scanning.
- ◆ The APO timer starts counting down the timer when no key presses, no control adjustments, and no command (COM connector) sequences are detected.

## AUTOMATIC ANTENNA TUNER

As explained in “ANTENNA CONNECTION” {pages 2, 4}, matching the impedance of the coaxial cable and antenna is important. To adjust the impedance between the antenna and the transceiver, you have the choice of using the internal tuner (TS-480SAT only) or an external tuner. This section describes how to use the internal tuner. For the external tuner, consult the instruction manual that comes with the tuner.

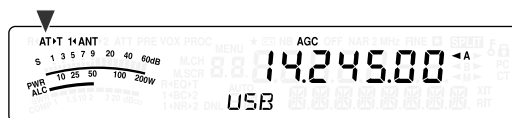
- 1 Select the transmit frequency.

- 2 Press **[ATT/ PRE/ ANT1/2]** (1 s) to select “1◀ANT” or “ANT▶2”.

- If the external tuner (AT-300) is connected to the ANT 1 connector, select ANT 2 to use the internal antenna tuner. The internal antenna tuner is automatically bypassed if the external antenna tuner (AT-300) is connected to ANT 1.

- 3 Press **[AT]** momentarily.

- “AT▶T” appears, indicating that the antenna tuner is in-line (not bypassed).



- 4 Press **[AT]** (1 s).

- CW mode is automatically selected and tuning begins.
- “AT▶T” blinks and the LED lights red.
- To cancel tuning, press **[AT]** again.
- If the SWR of the antenna system is extremely high (more than 10:1), an alarm (“SWR” in Morse code) sounds and the internal tuner is bypassed. Before attempting to tune again, adjust the antenna system to lower the SWR.

- 5 Monitor the display and check that tuning has successfully finished.

- If the tuning was successful, “AT▶T” stops blinking and the red LED turns OFF.
- If tuning does not finish within approximately 20 seconds, an alarm (“5” in Morse code) sounds. Press **[AT]** to stop the alarm and tuning.
- If you want the transceiver to stay in transmission mode after the tuning completes, access Menu No. 25 and select “on”.

If you access Menu No. 26 and select “on”, received signals will also pass through the internal tuner. When this function is ON, “R◀AT” appears. This may reduce interference on the receive frequency.

### Note:

- ◆ The AT-300 external antenna tuner does not work on 50 MHz band.
- ◆ When the AT-300 is used with the TS-480HX transceiver, the transmission output power is automatically reduced to 100 W.
- ◆ The internal tuner will not tune outside the available transmission frequency limits.
- ◆ Pressing **[AT]** for more than one second while transmitting, interrupts transmitting and starts tuning.
- ◆ While using CW Full Break-in, the internal tuner will be in-line for both transmission and reception.
- ◆ Tuning automatically turns OFF in approximately 60 seconds. “AT” disappears and the error beeps stop.
- ◆ Tuning may still continue when the SWR meter indicates 1:1. This happens due to the tuning algorithm; this is not a malfunction.
- ◆ Even though the SWR meter shows more than one segment, the internal tuner may not re-tune. This happens because of an SWR calculation algorithm tolerance.
- ◆ If tuning does not finish even though the SWR meter indicates smaller than 3:1, adjust the antenna system to lower the SWR, then attempt to tune again.
- ◆ Tuning may not reach an SWR of 1:1, depending on the transceiver conditions.

■ Presetting

After each successful tuning session, the AT Preset memory function stores the position of the tuning capacitor in the memory. The position of the capacitor is stored for each of the antenna tuner bands (see the following table) and for each antenna connector (ANT 1 and ANT 2).

Press **[AT]** momentarily.

- “**AT▶T**” will appear, showing that the antenna tuner is in-line (not bypassed).
- Each time you go across the antenna tuner band, the AT Preset memory is automatically recalled to position the tuning capacitor without the need for retuning. If no preset data exists for a particular band/antenna combination, then the default data of 50 Ω is used.

*Note: Tuning may restart in order to obtain the optimum matching condition even though the current antenna tuner band has the preset data.*

AT Preset Frequency Range (MHz)	
0.03 ~ 1.85	1.85 ~ 2.50
2.50 ~ 3.525	3.525 ~ 3.575
3.575 ~ 3.725	3.725 ~ 4.10
4.10 ~ 6.90	6.90 ~ 7.03
7.03 ~ 7.10	7.10 ~ 7.50
7.50 ~ 10.50	10.50 ~ 14.10
14.10 ~ 14.50	14.50 ~ 18.50
18.50 ~ 21.15	21.15 ~ 21.50
21.50 ~ 25.50	25.50 ~ 29.00
29.00 ~ 30.00	30.00 ~ 51.00
51.00 ~ 52.00	52.00 ~ 53.00
53.00 ~ 60.00	

■ External Antenna Tuner type

If you want to use the external antenna tuner, AT-300 with the TS-480 transceiver, access Menu No. 27 and confirm that “At1” is selected (default). “At2” is reserved for the future updates.

*Note: When the AT-300 is used with the TS-480HX transceiver, TX power is automatically reduced to 100 W (AM mode: 25 W). Also, the AT-300 cannot be used for 50 MHz operation.*

ATTENUATOR

The attenuator function is useful when extremely strong signals exist nearby your receiving frequency. When these type of signals exist nearby your receiving frequency, the AGC function may be erroneously controlled by the strong signals, rather than by the target receiving signal. If this happens, the target receiving signal can be masked and buried by the strong signals. In this case, turn the Attenuator function ON. When it is ON, the signal is attenuated approximately 12 dB.

- 1 Press **[ATT/PRE/ ANT 1/2]** until the **ATT** icon appears on the display.
  - “ATT” appears when it is turned ON.

To return to normal operation, press **[ATT/PRE/ ANT 1/2]** until both the **ATT** and the **PRE** icons disappear.

AUTO MODE

You can configure a maximum of 32 frequency borders (VFO A and B) to change the operating mode automatically as you change the VFO frequency.

As a default, the following modes are programmed on each operating band.

0.03 MHz ~ 9.5 MHz: LSB

9.5 MHz ~ 60 MHz: USB

To add the frequency borders to the Auto Mode selection:

- 1 Press and hold **[MODE]+[ϕ]** (POWER) to turn the transceiver ON.



- “AUTOMODE” appears on the sub-display.
- 2 Select an Auto Mode frequency memory channel number by turning the **MULTI** control. Auto Memory channels 00 to 31 are available.
  - 3 Turn the **Tuning** control to select a desired frequency border (or enter the frequency with the keypad {page 34}) to change the operating mode.
  - 4 Press **[MODE]** or **[MODE] (1 s)** until the desired communication mode appears {page 19}.



- 5 Repeat steps 2 ~ 4 until you have added all the data.
- 6 Press **[MTR/ CLR]** to exit the Auto Mode frequency configuration.

The table below shows the default Auto Mode frequency borders for the transceiver. When you access Menu No. 2 and select “on”, “AUTO” appears. The transceiver automatically selects the mode; LSB for frequencies below 9.5 MHz and USB for frequencies greater than or equal to 9.5 MHz (default).

Channel No.	Data	Operating mode
0	9.5 MHz LSB	0.03 MHz ≤ LSB < 9.5 MHz  9.5 MHz ≤ USB ≤ 60.0 MHz
1	9.5 MHz LSB	
2	9.5 MHz LSB	
3	9.5 MHz LSB	
•	•	
•	•	
31	9.5 MHz LSB	

## 13 OPERATOR CONVENIENCES

The table below is an example of how to add the frequency border of 1.62 MHz/ AM into memory. With this set up, the transceiver selects AM mode below 1.62 MHz, LSB mode from 1.62 MHz to 9.5 MHz and USB mode from 9.5 MHz to 60.0 MHz.

Channel No.	Data	Operating mode
0	1.62 MHz AM	0.03 MHz ≤ AM < 1.62 MHz
1	9.5 MHz LSB	
2	9.5 MHz LSB	1.62 MHz ≤ LSB < 9.5 MHz
3	9.5 MHz LSB	
•	•	9.5 MHz ≤ USB ≤ 60.0 MHz
•	•	
31	9.5 MHz LSB	

The next table is an example of adding 4 frequency points into memory. With this setup, the transceiver selects AM mode below 1.62 MHz, CW mode from 1.62 MHz to 2.0 MHz, LSB mode from 2.0 MHz to 9.5 MHz, FM mode from 9.5 MHz to 53.0 MHz and USB mode from 53.0 MHz to 60.0 MHz. If multiple data contains the same frequency but a different mode is entered into memory, the lowest numbered memory channel is reflected as the Auto Mode.

Channel No.	Data	Operating mode
0	1.62 MHz AM	0.03 MHz ≤ AM < 1.62 MHz
1	2.0 MHz CW	
2	7.0 MHz LSB	1.62 MHz ≤ CW < 2.0 MHz
3	9.5 MHz LSB	
•	•	2.0 MHz ≤ LSB < 9.5 MHz
•	•	
31	53.0 MHz FM	9.5 MHz ≤ FM < 53.0 MHz
		53.0 MHz ≤ USB ≤ 60.0 MHz

To activate the AUTO MODE function,

- 1 press **[MENU/ F.LOCK]**.
- 2 Turn the **MULTI** control to select Menu No. 02.
- 3 Press **[^]** to select "on".
- 4 Press **[MENU/ F.LOCK]** to store the setting and exit Menu mode.

### BEEP FUNCTION

The Beep function provides you confirmation of entry, error status, and malfunctions of the transceiver. Although you can turn the beep function OFF by accessing Menu No. 12, we recommend you leave it

ON in order to detect unexpected errors and malfunctions.

You can also change the output level of the beeps by accessing Menu No. 12 and selecting "1" to "9" or "OFF".

The transceiver generates Morse code to tell you which mode is selected when you change operating modes.

When you change operating Modes, the following Morse code sounds:

Mode	Morse Code Output
LSB	. - - . (L)
USB	.. - (U)
CW	- - - . (C)
CWR	- - - . - - . (CR)
FSK	. - . (R)
FSR	. - - . - - . (RR)
AM	. - (A)
FM	.. - . (F)

The transceiver also generates the following warning, confirmation, and malfunction beeps.

Beeps	What it means
A high pitched short beep	A valid key is pressed.
A high pitched double beep	When a secondary function is selected.
A high pitched long beep	A key entry is accepted, Scan starts, or AT tune has completed.
A regular short beep	A function is turned OFF.
A low pitched short beep	An invalid key is pressed.
"UL" in morse code	The internal PLL circuit unlock status is detected.
"S" in morse code	CW Auto Tune cannot be completed, or an invalid frequency is entered.
"5" in morse code	AT Tune cannot be completed within the specified time.
"SWR" in morse code	The antenna's SWR is too high (over 10:1) to perform AT Tune.
"CHECK" in morse code	1 minute before the APO (Auto Power Off) function switches the transceiver OFF. A protection circuit is ON. Invalid voltage is detected.
"BT" in morse code	Waiting for a CW message to be recorded.
"AR" in morse code	The current message memory is full.

## DISPLAY

### BRIGHTNESS

The brightness of the LCD display can be selected from OFF, and 1 to 4 by accessing Menu No. 00.

- 1 Press **[MENU/ F.LOCK]**, then turn the **MULTI** control to access Menu No. 00.
- 2 Press **[▽]/ [△]** to select “oFF”, “1”, “2”, “3”, or “4”.
- 3 Press **[MENU/ F.LOCK]** to store the setting and exit Menu mode.

### KEY ILLUMINATION

The front panel key illumination can be switched ON or OFF.

- 1 Press **[MENU/ F.LOCK]**, then turn the **MULTI** control to access Menu No. 01.
- 2 Press **[▽]/ [△]** to select “oFF” or “on”.
- 3 Press **[MENU/ F.LOCK]** to store the setting and exit Menu mode.

### LINEAR AMPLIFIER CONTROL

When you connect an external HF or 50 MHz linear amplifier to the transceiver using the **REMOTE** connector, select “1”, “2”, or “3” to activate the internal relay and/ or DC output (12 V) so you can interface with the HF/ 50 MHz linear amplifier {page 80}. The DC output (12 V) works without any annoying chattering sounds (“1”) but the output current is limited to 10 mA. If your linear amplifier control circuit draws more than DC 12 V/ 10 mA, use the relay switching (“2” or “3”) instead.

Also, some linear amplifiers require a long transmission delay time because of the slow antenna relay switching time. In this case, select “3” for the slow switching (25 ms delay).

- 1 Press **[MENU/ F.LOCK]**, then turn the **MULTI** control to select Menu No. 28 (HF) or 29 (50 MHz).
- 2 Press **[▽]/ [△]** to select “oFF”, “1”, “2”, or “3”.

Parameter	Linear Amp. control	
oFF	All controls	OFF
1	Transistor switch Relay TX delay	ON OFF 10 ms
2	Transistor switch Relay TX delay	ON ON 10 ms
3	Transistor switch Relay TX delay	ON ON 25 ms

**Note:** If CW full break-in is enabled, 10 ms transmission delay is applied regardless of the settings in Menu Nos. 28 and 29.

## LOCK FUNCTIONS

### FREQUENCY LOCK FUNCTION

Frequency Lock disables some keys and controls to prevent you from accidentally activating a function or changing the current settings.

Press **[MENU/ F.LOCK]** (1 s) to turn the Frequency Lock function ON or OFF.

- “**ℒ**” appears while this function is ON.



The following keys and controls are disabled by Frequency Lock:

Tuning control	MULTI control	ENT
QMI/ M.IN	SCAN/ SG.SEL	MODE
CW.T	QMR/ M▶ VFO	A/B / M/V
A=B/ SPLIT	MHz	Mic [UP]
Mic [DWN]	▽	△

#### Note:

- ◆ After activating Frequency Lock, the **MULTI** control and **[▽]/ [△]** are still available in Menu mode.
- ◆ After activating Frequency Lock, you can still change the transmit frequency with the **Tuning** control while in TF-SET mode.
- ◆ After activating Frequency Lock, the **MULTI** control is still available for selections other than frequency and memory channel changes.
- ◆ After activating Frequency Lock, **[MTR/ CLR]** may be available in some situations.

### TUNING CONTROL LOCK FUNCTION

The Tuning control lock function disables the Tuning control. The function can be used in the following situations:

- You do not want to change the operating frequency while you are driving the car.

To use the Tuning control lock function, first assign the function to the PF key on the panel (or Mic PF keys).

- 1 Press **[MENU/ F.LOCK]** and turn the **MULTI** control to select Menu No. 48.
  - 2 Press **[▽]/ [△]** to select “65”.
  - 3 Press **[MENU/ F.LOCK]** to store the setting and exit the Menu Mode.
  - 4 Press **[PF]**.
- “**ℒ**” appears and the **Tuning** control is now locked.
- To return to normal operation, press **[PF]** again.

## 13 OPERATOR CONVENIENCES

### MICROPHONE PF KEYS

When using the optional MC-47 or MC-52DM microphone with the MJ-88 plug adaptor, you can customize the functions of the Microphone PF1 (CALL), PF2 (VFO), PF3 (MR), and PF4 (PF) keys. You can assign the following types of functions to these keys via Menu Nos. 49 ~ 52:

- Directly select a Menu No. without pressing **[MENU/ F.LOCK]** and turning the **MULTI** control.
- Activate the same function as one of the front panel keys.

One of the following functions can be assigned to each PF key. Selecting “99” assigns no function to the PF key.

### PF KEY

You can program the front panel **[PF]** key to assign a function that you frequently use. The default is Voice 1 for the optional Voice Guide and Storage unit, VGS-1 {page 68}. You can assign one of the functions in “MICROPHONE PF KEYS” {above} to this PF key, accessing Menu No. 48.

Number	Function	Number	Function
0 ~ 60	Menu No. 00 ~ 60	80	M.IN
61	VOICE1	81	CW.T
62	VOICE2	82	CH1
63	RX Monitor	83	CH2
64	DSP RX Monitor	84	CH3
65	Freq. Lock	85	FINE
66	Send (TX)	86	CLR
67	TX tune	87	MTR
68	LSB ÷ USB	88	MHz
69	CW ÷ FSK	89	AT 1/2
70	FM ÷ AM	90	NB
71	TF-SET	91	NR
72	QMR	92	BC
73	QMI	93	DNL
74	SPLIT	94	—
75	A/B	95	—
76	M/V	96	—
77	A=B	97	—
78	SCAN	98	—
79	M▶VFO	99	No function

### RX DSP EQUALIZER

#### EQUALIZING RECEIVING AUDIO

Use Menu No. 18 to change the receiver frequency responses of the target signal. You can select one from 8 different receiver profiles including the default flat response. Selecting any of the following items from the Menu causes “**R¼EQ**” to appear on the display.

- **Off (oFF):**  
The default frequency response.
- **High boost 1 (hb1):**  
Emphasizes higher audio frequencies.
- **High boost 2 (hb2):**  
Emphasizes higher audio frequencies but lower audio frequency attenuation is less than High boost1 (hb1).
- **Formant pass (FP):**  
Improves clarity by suppressing audio frequencies outside the normal voice frequency range.
- **Bass boost 1 (bb1):**  
Emphasizes lower audio frequencies.
- **Bass boost 2 (bb2):**  
Emphasizes lower audio frequencies but higher audio frequency attenuation is less than Bass boost1 (bb1).
- **Conventional (c):**  
Attenuates 2 kHz or more audio frequency slightly.
- **User (U):**  
Reserved for the ARCP software. Off is programmed at the factory as a default.

### RX MONITOR

RX monitor disables the squelch function temporarily to monitor the current frequency activities.

To use the RX Monitor function, first assign the function to the PF key on the panel (or Mic PF keys).

- 1 Press **[MENU/ F.LOCK]** and turn the **MULTI** control to select Menu No. 48.
- 2 Press **[v]/ [^]** to select “63”.
- 3 Press **[MENU/ F.LOCK]** to store the setting and exit the Menu Mode.
- 4 Press **[PF]**.
  - While **[PF]** is pressed, the speaker unmutes.

## TIME-OUT TIMER

The Time-out Timer limits the time of each transmission. It is also useful to prevent a long accidental transmission.

- 1 Press **[MENU/ F.LOCK]**, then turn the **MULTI** control to access Menu No. 22.
- 2 Press **[V]/ [^]** to select "oFF", "3" minutes, "5" minutes, "10" minutes, "20" minutes, or "30" minutes.
- 3 Press **[MENU/ F.LOCK]** to store the settings and exit Menu mode.

## TRANSVERTER

If you have a transverter that converts the TS-480 operating frequencies to other frequencies, you can use this TS-480 transceiver as a transverter exciter. Consult the instruction manual that came with the transverter for interfacing to the TS-480 transceiver.

### ■ Frequency display

- 1 Connect the transverter to the **ANT 1** or **ANT 2** connector from the TX/ RX unit.
- 2 Select the exciter operating frequency on the transceiver.
  - The transverter will use this frequency as the reference for converting frequencies.
- 3 Access Menu No. 23, and select "on".
  - The output power is automatically set to the lowest power for that frequency (default). Refer to TX POWER (below).
- 4 Press **[MENU/ F.LOCK]** to store the setting and exit the Menu mode.
- 5 Press **[ENT]**, then set the target converting frequency using the numeric keys.
- 6 Press **[ENT]** to complete the entry.
- 7 The transceiver displays the target transverter frequency instead of the actual operating frequency.

**Note:** When using a transverter, not all the functions of this transceiver are available.

### ■ Transmission output power

If Menu No. 23 is selected "on" {above}, the transceiver automatically decreases the output power to 5 watts. However, if you do not wish to decrease the output power, you can turn this function OFF. Access Menu No. 24 and select "oFF". The transceiver transmits at full power even if Menu No. 23 is ON {above}.

## TX MONITOR

TX monitor allows you to monitor the on-going transmission sound. This is convenient when you want to check the modulation sound quality of the transmission. In FSK mode, you can monitor the FSK signal that the transceiver is transmitting.

- 1 Press **[PWR/ 4/ TX MON] (1 s)**.
- 2 The current TX monitor setting appears on the sub-display.
- 3 Turn the **MULTI** control to select the monitor sound level from "oFF", and "1" to "9".
- 4 Press **[MTR/ CLR]** to store the selected TX monitor level.

### **Note:**

- ◆ We recommend you use headphones when you monitor SSB, AM, or FM mode, in order to avoid howling.
- ◆ The CW transmission signal cannot be monitored using the TX monitor function. Use the CW sidetone function to monitor CW transmissions (Menu Nos. 13 and 34).

## TX POWER

You can adjust the transmission output power by pressing **[PWR/ 4/ TX MON]** and turning the **MULTI** control. If more precise power adjustment is required, access Menu No. 21 and select "on". When this function is activated, the power adjustment steps change as shown in the table below.

### ■ TS-480SAT

Band	Mode	Menu No. 21 OFF	Menu No. 21 ON
HF band	SSB/ CW/ FM/ FSK	5 ~ 100 W in steps of 5	5 ~ 100 W in steps of 1
	AM	5 ~ 25 W in steps of 5	5 ~ 25 W in steps of 1
50 MHz	SSB/ CW/ FM/ FSK	5 ~ 100 W in steps of 5	5 ~ 100 W in steps of 1
	AM	5 ~ 25 W in steps of 5	5 ~ 25 W in steps of 1

### ■ TS-480HX

Band	Mode	Menu No. 21 OFF	Menu No. 21 ON
HF band	SSB/ CW/ FM/ FSK	5 ~ 200 W in steps of 5	5 ~ 200 W in steps of 1
	AM	5 ~ 50 W in steps of 5	5 ~ 50 W in steps of 1
50 MHz	SSB/ CW/ FM/ FSK	5 ~ 100 W in steps of 5	5 ~ 100 W in steps of 1
	AM	5 ~ 25 W in steps of 5	5 ~ 25 W in steps of 1

### **Note:**

- ◆ The output power settings are stored independently for HF and 50 MHz. As shown in the table above, you can also store different output power settings for AM and other modes for HF bands and the 50 MHz band.
- ◆ If the TS-480HX transceiver is connected to the AT-300 external antenna tuner, the TX power is automatically reduced to 100 W (AM mode: 25 W).

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## 13 OPERATOR CONVENIENCES

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### TX TUNE

TX tuning allows you to adjust the antenna length while transmitting CW signal.

To use the TX Tune function, first assign the function to the PF key on the panel (or Mic PF keys).

- 1 Press **[MENU/ F.LOCK]** and turn the **MULTI** control to select Menu No. 48.
- 2 Press **[v]/ [^]** to select "67".
- 3 Press **[MENU/ F.LOCK]** to store the setting and exit the Menu Mode.
- 4 Press **[PF]**.
  - The transceiver automatically switches to CW mode, and transmits. The transceiver selects SWR meter function automatically.
  - While in TX Tune mode, most of keys are disabled.
- 5 Press **[PF]** again to exit the TX Tune Mode.

### QUICK DATA TRANSFER

This transceiver has the capability to quickly and conveniently transfer the reception frequency and mode to another compatible transceiver. Compatible transceivers include:

- TS-480SAT/HX    • TS-2000(X)
- TS-570S/ 570D    • TS-870S

Data transfer could be useful while contesting. A spotting station that is searching for new contest multipliers can quickly transfer a frequency over to the running (main) station.

### SETTING UP

#### ■ Equipment Needed

In addition to a compatible transceiver, the following equipment is required:

#### Transfer to TS-480SAT/HX, TS-2000(X), TS-570, or TS-870S:

- One cross-wired cable. This cable must have a DB-9 female connector at both ends.

#### ■ Connections

For diagrams on how to connect the two transceivers, see "CONNECTING PERIPHERAL EQUIPMENT" {page 79}.

### USING QUICK TRANSFER

When connecting with another TS-480SAT/ HX, TS-2000(X), TS-570, or TS-870S, use the same **COM** connector baud rate on each transceiver.

*Note: While transferring data, other functions may work slower.*

#### ■ Transferring Data

The TS-480SAT/ HX transceiver works as the Master, sending data to the Slave transceiver.

- 1 Turn ON the Transfer function of each transceiver.
  - On the TS-480SAT/ HX, access Menu No. 53 and select "on". For the compatible transceiver, refer to the instruction manual that came with the transceiver.
- 2 On the Master, while in VFO mode, select an operating frequency and mode.
- 3 On the Master, press **[QMI/ M.IN]**.
  - When using another TS-480SAT/ HX as the Slave, "PC" appears on the Slave.
  - The displayed data is stored in Quick memory channel 0 on the Master and transferred to the Slave.

*Note: If the Master has RIT switched ON, the offset frequency is added to the reception frequency to be transferred.*

#### ■ Receiving Data

The TS-480SAT/ HX transceiver works as the Slave, receiving data from the Master transceiver. The Slave can receive data using either Quick memory channel 0 or the VFO.

- 1 Switch ON the Transfer function of each transceiver.
  - On the TS-480SAT/ HX, access Menu No. 53 and select "on". For the compatible transceiver, refer to the instruction manual that came with the transceiver.
- 2 On the Slave, access Menu No. 54 and select either "oFF" (QUICK MEMO channel 0) or "on" (the VFO).
  - The default is "oFF" (QUICK MEMO).
- 3 On the Master, perform the appropriate operation to send data.
  - For the correct method, refer to the instruction manual that came with the transceiver.

#### Note:

- ◆ *If you always use the TS-480SAT/ HX for receiving only, activate the TX Inhibit function, accessing Menu No. 55 to avoid unintentional transmission.*
- ◆ *When the Slave receives data using the VFO programmed with a simplex frequency, the received data replaces the data on both VFOs. On the Slave, both RIT and XIT are set to OFF.*
- ◆ *When the Slave receives data using the VFOs programmed with split frequencies, the received data replaces the data only on the TX side of the VFO. On the Slave, XIT is set to OFF but RIT is not changed.*

## COMPUTER CONTROL

By connecting this transceiver to a computer, you can change the computer into an electronic console from which you can remotely control functions of the transceiver. This capability makes remote operation of your transceiver possible from across the room, from another room, or when coupled with other commercially available products and where lawful, from another city, state, or country via a telephone connection.

### Note:

- ◆ *You can use the front panel controls while using computer control. Settings done from the front panel are effective immediately.*
- ◆ *After the computer is disconnected or turned off, all values and settings on the front panel are restored.*

## SETTING UP

### ■ Equipment Needed

- A PC equipped with a COM (serial) port.
- One straight cable. This cable must have a DB-9 female connector at one end, and a DB-9 or a DB-25 female connector that mates with the COM port of your computer at the other end.
- Transceiver control application.

To create your programs, access the KENWOOD website and download the TS-480SAT/ HX command reference documents (PDF format) for details.

### ■ Connections

Connecting the transceiver to the computer is easy. Refer to the diagram in "CONNECTING PERIPHERAL EQUIPMENT" {page 79}.

**Note:** *Before connecting this transceiver to the computer, switch OFF the power to both the transceiver and the computer.*

## COMMUNICATION PARAMETERS

In order to control the transceiver by computer, you must first choose the communication parameters.

- 1 On the computer, configure your transceiver control application for 8 data bits, 1 stop bit, and no parity.
- 2 On the transceiver, select the same transfer rate via Menu No. 57.
  - The defaults are 9600 bps and 1 stop bit.
  - 4800 bps is used for the Master/ Slave operation only (Parity ON and 2 stop bits).

## CONTROLLING THE TS-480 FROM PC

If a PC and the TS-480SAT/ HX are connected using a serial cable {page 79}, you can remote control the functions of the TS-480 from a PC. Download the free ARCP-480 software from the following URL.

<http://www.kenwood.com/i/products/info/amateur.htm>

The detailed remote controlling instructions are available in accompanied documents and help file.

## REMOTE CONTROLLING THE TS-480 ON THE NETWORK

In addition to the ARPC-480 program, the ARHP-10 program can also be downloaded from the above site. This ARHP-10 program is a ARCP-480 host program that allows a user who is connected in the network to remote control the TS-480 transceiver from a distant location. If you make interface cables that transfer the audio between the TS-480 transceiver and PC on the host transceiver, you can receive signals and transmit your voice over the network. For detailed information, download the ARHP-10 program and consult accompanied documents.







- To interrupt playback, press **[MTR/ CLR]**.
- 5 To play back another message in sequence, press the corresponding key (**[CH1/ 1/ REC]**, **[CH2/ 2/ REC]**, or **[CH3/ 3/ REC]**) while the first message is being played.
    - Up to 3 channels can be queued.
  - 6 Release Mic **[PTT]**.

### ■ Erasing a Recorded Message

- 1 Press **[1/ CH1/REC]** (1 s) or **[2/ CH2/REC]** (1 s) or **[3/ CH3/REC]** (1 s) to select the message which you want to erase.
  - “APn –” appear, where “n” represents the channel number.
- 2 To erase the recorded message, press and hold the same key as in step 1 (**[1/ CH1/ REC]**, **[2/ CH2/ REC]**, or **[3/ CH3/ REC]**), while simultaneously pressing **[MTR/ CLR]**.
  - A beep sounds and the message is erased.

### ■ Changing Inter-message Interval Time


For repetitive message playback, you can change the interval between each series of messages. Use Menu No. 32, and select the time in the range of 0 to 60 seconds.

### ■ Changing Message Playback Volume

Turning the **AF** control does not change the volume for the message playback. To change the message playback volume, access Menu No. 14 to select the playback volume level from “1” to “9” or “oFF”.

## CONSTANT RECORDING

By utilizing the digital recording capability of the VGS-1, you can configure the VGS-1 to record the last 30-second of the incoming reception signal to the VGS-1. It is similar to a flight recorder that is used in an aircraft. You can play back the last 30 seconds of the reception signal to confirm what has been heard.

To activate the Constant Recording function, access Menu No. 30 and select “on”. While the Constant Recording function is ON, “” appears. When you press **[CH3/ 3/ REC]** (1 s), the VGS-1 stores the last 30-second of the reception audio signal to the flash memory. While writing the audio signal data to flash memory for approximately 15 seconds, “FLASH WR” appears. To playback the stored reception signal, press **[CH3/ 3/ REC]**.

To play back the stored reception sound, press **[CH3/ 3/ REC]**. To quit, press **[MTR/ CLR]**.

**Note:** While the Menu No. 30 is ON, you cannot use the Channel 3 (CH3) message memory to record and playback your voice message. However, the message in CH3 is not erased. When the Constant Recording function is turned OFF (Menu No.30 is OFF), you can playback the message on Channel 3 (CH3).

## VOICE GUIDE

When the optional VGS-1 is installed, each time you change the transceiver mode such as VFO A/B or Memory Recall, the transceiver automatically announces the new mode. In addition, you can program the front panel **[PF]** key so that pressing it makes the transceiver announce the displayed information. If you have the optional MC-47 microphone with MJ-88 plug adaptor, you can program one of the Mic **[PF]** keys for this function as well.

The table below indicates what the transceiver automatically announces when it changes the settings.

Key Pressed	Operation	Announcement
<b>[A/B]</b>	VFO A	A/B + Frequency
	VFO B	
<b>[v], [^]</b>	Band change	Frequency
<b>[A/B / M/V]</b> (1 s)	VFO or Memory Recall	VFO + A/B + Frequency or Channel + Memory No. + Frequency
<b>[MENU/ F.LOCK] + MULTI control</b>	Menu No. selection	Menu + No. + Selected number/ parameter
<b>[v], [^]</b>	Menu Parameter change	Selected parameter
<b>[QMI/ M.IN]</b> (1 s)	Memory Scroll mode	Memory in + Memory No. + Frequency
<b>[ENT]</b>	Frequency entry	Enter
<b>MULTI control</b>	Menu No. changes	No. + Selected number/ parameter
	Memory channel No. changes	Memory channel No. + Frequency
	Settings for various functions	Parameter value
<b>Numeric key entry</b>	Entering numbers	Every number entered
<b>Function key</b>	Selecting a function	Function name + parameter
<b>Freq. Lock function</b>	Frequency lock status	Frequency lock ON/ OFF
<b>Quick Memory recall</b>	Recall Quick Memory	Quick memory + memory number + A/B + Frequency

**Note:** The PF key assignment parameter is announced as the number shown below.

## 13 OPERATOR CONVENIENCES

Menu number	61	VOICE1	62	VOICE2	63	RX MONI	
64	DSP RX MONI	65	FREQ. LOCK	66	SEND (PTT)	67	TX TUNE
68	USB LSB	69	CW FSK	70	FM AM	71	TF-SET
72	QMR	73	QMI	74	SPLIT	75	M>VFO
76	M/V	77	A=B	78	SCAN	79	FINE
80	M.IN	81	CW.T	82	CH1	83	CH2
84	CH3	85	FINE	86	CLR.	87	MTR
88	MHz	89	AT 1/2	90	NB	91	NR
92	BC	93	DNL	99	OFF		

For the **[PF]** key, the transceiver will announce different information, depending on whether VOICE1 or VOICE2 is selected.

### VOICE1:

- The frequency on display, channel number, various mode settings, and Menu settings are announced.
- The frequency for the VFO or memory channel will be announced to 10 Hz digit. For the MHz decimal point, "point" is announced. If the memory channel has no data stored, "blank" is announced.
- If a memory channel that has no data is selected in Memory Scroll mode, "blank" is announced.

*Note: If operating a key or a control changes the contents of the display while an announcement is in progress, the announcement is interrupted.*

### VOICE2:

- The S-meter readings at the time you pressed the key, are announced, for example, "S5" or "20 dB".

The table below shows the available announcements when the **[PF]** (VOICE2) is pressed.

S-Meter Level	Announcement	S-Meter Level	Announcement
1 ~ 3	S1	11	S9
4	S2	12	10 dB
5	S3	13 ~ 14	20 dB
6	S4	15	30 dB
7	S5	16 ~ 17	40 dB
8	S6	18	50 dB
9	S7	19 ~ 20	60 dB
10	S8		

- 1 Assign VOICE1 (61) or VOICE2 (62) to the front panel **[PF]** key by accessing Menu No. 48. Or, if you are using the optional MC-47 or MC-52DM microphone, assign one of the Mic **[PF]** keys to either VOICE1 or VOICE2. For programming Mic **[PF]** keys, refer to "MICROPHONE PF KEYS" {page 64}.
- 2 Press the **[PF]** key that you programmed.
  - An announcement is made based on the VOICE1 or VOICE2 selection.
  - To interrupt the announcement, press the **[PF]** key again.

### ■ Voice Guide Announcement Volume

Turning the **AF** control does not change the volume for the Voice Guide announcement volume. To change the announcement volume, access Menu No. 15 to select the volume level from "1" to "9" or "oFF".

### ■ Voice Guide Announcement Speed

If you feel the Voice Announcement speed is too slow or fast, you can adjust the Voice Announcement speed. Five different speed can be configured. Access Menu No. 16 and select "0" to "4". 0 is the slowest speed and 4 is the fastest speed. The default speed is 1.

## CROSSBAND REPEATER

If you have a TM-D700 transceiver and another VHF or UHF transceiver, you can set up the TS-480 transceiver and TM-D700 transceiver as a crossband repeater. The TM-D700 will receive signals you transmit from the additional VHF or UHF transceiver when both transceivers are set with the same frequency. The signal is then routed to the TS-480 transceiver and retransmitted on the frequency you have set upon the TS-480 transceiver. Likewise, signals received on the TS-480 transceiver are routed to the TM-D700 and retransmitted to the transceiver you have with you, allowing you to hear the received call in a distant location.

To interface between the TS-480 transceiver and TM-D700 transceiver, refer to “CONNECTING PERIPHERAL EQUIPMENT” for details {page 82}. You need a cable that has mini-DIN (6-pin) male connector at both ends.

**Note:** For the repeater function to operate, the squelch levels of both transceivers (TS-480 and TM-D700) must be adjusted properly so that no background noise can be heard. Because the transmission is controlled by monitoring the squelch status only.

### Operation

The crossband repeater function uses 2 frequency bands to receive and transmit signals. When a signal is received on one band, it is retransmitted on the other band.

- 1 Select a desired transmission/ reception VHF or UHF frequency on the TM-D700 transceiver.
- 2 Confirm PTT icon is visible on the crossband repeater frequency on the TM-D700 transceiver.
- 3 Select same frequency for the terminal transceiver.
- 4 Select a desired HF/ 50 MHz frequency on the TS-480 transceiver.
- 5 Adjust the squelch threshold level so that both TS-480 transceiver and TM-D700 transceiver mute.
- 6 Press **[MENU/ F. LOCK]** on the TS-480, then turn MULTI control to access Menu No. 57.
- 7 Press **[^]** to select “on”.
  - When the TS-480 transceiver’s squelch opens, the TM-D700 transceiver retransmits the incoming audio signal on the VHF or UHF frequency at the same time.
  - When the TM-D700 transceiver’s squelch opens, the TS-480 transceiver retransmits the incoming audio signal on the HF/ 50 MHz frequency.
- 8 Access Menu Nos. 46 and 47 and press **[v]/ [^]** to adjust the input/ output audio level.
- 9 To quit the TM-D700 repeater operation, disconnect the interface cable between transceivers and access Menu No. 57 on the TS-480 transceiver and select “oFF”.

**Note:** You can also reverse the reception and transmission bands, so that you receive on the TS-480 transceiver and transmit on the reception frequency of the TM-D700.

## PACKETCLUSTER TUNE

If you have the TM-D700 transceiver, you can connect the TM-D700 to the TS-480SAT/ HX transceiver to use the DX PacketCluster Tune function. Connect the 2 transceiver with a cross-wired DB-9 cable as shown on page xx.

- 1 Press **[MENU/ F. LOCK]** and turn **MULTI** control to select Menu No. 56 on the TS-480 transceiver.
- 2 Press **[v]/ [^]** to select the same communication baud rate that the TM-D700 transceiver is configured.
- 3 Tune to the DX PacketCluster node frequency on the TM-D700 transceiver.
- 4 Press **[F] (1 s), [TNC]** on the TM-D700 transceiver.
  - “TNC APRS” appears on the TM-D700 display.
- 5 Press **[F] (1 s), [DX]** on the TM-D700 transceiver.
  - Every time the DX station’s information is reported to the PacketCluster node, the TM-D700 stores and list the report to the memroy.
- 6 Select a desired DX station data with **[↑]/ [↓]** on the TM-D700 transceiver.
- 7 Press **[MHz]** on the TM-D700 to transfer the frequency data to the TS-480 transceiver.
  - If the transferred frequency data is available on the TS-480 transceiver, the frequency data will be overwritten to the current operating frequency. Otherwise, the operating frequency of the TS-480 transceiver remains unchanged.

For more detailed operation on the DX PacketCluster operation of the TM-D700 transceiver, refer to page 6 of the TM-D700 instruction manual (Specialized Communications).

## 13 OPERATOR CONVENIENCES

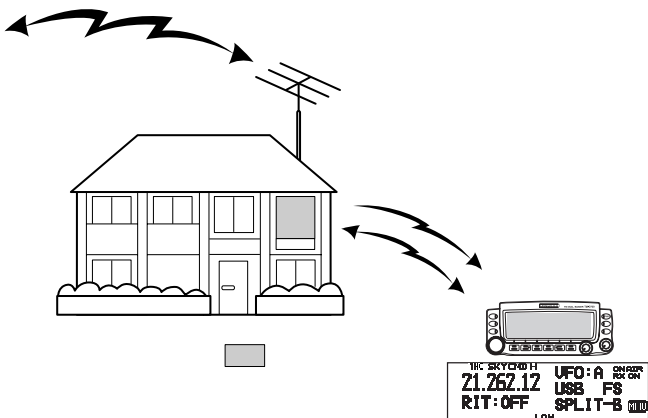
### SKY COMMAND II (K-TYPE ONLY)

The Sky Command II allows you to remotely control the TS-480SAT/ HX transceiver from a separate location.

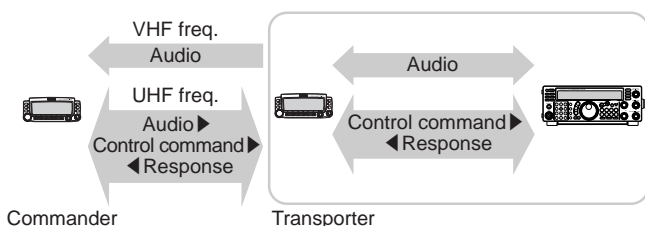
If you have more than 2 TH-D7A and/or TM-D700A transceivers, you can perform Sky Command II operation to remotely control the HF/ 50 MHz band of your TS-480 transceiver.

You will use one transceiver (TH-D7A or TM-D700A) as a remote control unit, called a "Commander". The other VHF/ UHF transceiver (TH-D7A or TM-D700A) with the TS-480 transceiver is called the "Transporter". This TH-D7A or TM-D700A transceiver will function as an interface between the Commander (a remote control unit) and the HF/ 50 MHz band of the TS-480 transceiver.

This system allows you, for example, to watch for and hunt DX while washing your car, or to operate the HF transceiver while relaxing in your car, living room, or patio, instead of actually operating inside your shack.



### SKY COMMAND II DIAGRAM



### PREPARATION

Although you can use either a TM-D700A, a TH-D7A transceiver as a "Commander" (an external remote control unit), the following procedure shows how to set up your TS-480 and TH-D7A or TM-D700A transceivers as a "Transporter" at a base station and the TM-D700A transceiver as a "Commander".

### Starting Sky Command II operation:

After you have completed the following setups, you can start Sky Command II operation. Without programming these parameters, you cannot perform Sky Command II operation.

#### TS-480 + TH-D7A/ TM-D700A (Transporter) Setup:

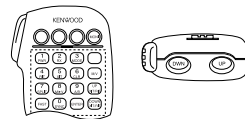
- 1 Configure the TH-D7A or TM-D700A as a "Transporter" and connect all the necessary cables to the TS-480 transceiver.
- 2 Select a frequency (HF/ 50 MHz band) on the TS-480 transceiver.
- 3 On the TS-480 Press **[MENU/ F.LOCK]**, then turn the **MULTI** control to access Menu No. 56, then select the desired communication speed.
- 4 Select same communication parameters matches to the TH-D7A or TM-D700A transceiver.
- 5 Press **[MENU/ F.LOCK]** to complete.
- 6 Configure and start the Transporter Mode on the TH-D7A or TM-D700A transceiver.

#### On the TM-D700A (Commander):

- 1 Select the same VHF and UHF frequencies that you selected for the Transporter.
- 2 Access Menu 4-4 to select COMMANDER.
  - "PRESS [0] KEY TO START COMMANDER!!" appears.
- 3 Press **[0]** on the DTMF Mic of the TM-D700A to start the Sky Command II operation.

### CONTROL OPERATION

After setting up both the Transporter and the TM-D700A (Commander) for Sky Command II operation, press Mic **[0]** on the Commander. While in Sky Command II mode, the Mic keys of the Commander will function as described below.



Each time you press a key, the Commander will automatically enter transmit mode and send the corresponding control command to the Transporter.

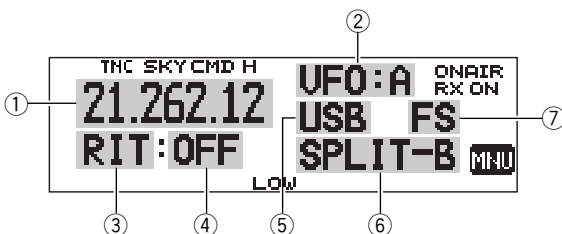
To switch the HF transceiver OFF	Press Mic <b>[1]</b> .
To change the frequency or memory channel on the HF transceiver	Press Mic <b>[UP]/ [DWN]</b> .
To transmit audio on an HF frequency	Press and hold Mic <b>[PTT]</b> , then speak into the microphone.
To receive audio on an HF frequency	Press Mic <b>[2]</b> .
To monitor the UHF band on the Commander	Press the Mic <b>PF</b> key assigned to the Monitor function.

Mic Key	Function
1	Power OFF
2	HF frequency receive ON/ OFF
3	Modulation mode switch
4	RIT ON/ OFF
5	XIT ON/ OFF
6	RIT offset or XIT offset clear
7	Split-frequency ON/ OFF
8	Transfer from Memory to VFO
9	In VFO mode: VFO A/ VFO B switch In Memory Recall mode: no change
0	Current settings retrieve (from HF transceiver)
B	VFO/ Memory Recall mode switch
C	XIT/ RIT offset frequency increase
D	XIT/ RIT offset frequency decrease
* <sup>1</sup>	In LSB, USB, or CW mode: 10 Hz/ 1 kHz switch In FM or AM mode: 1 kHz/ 10 kHz switch
# <sup>2</sup>	In VFO mode: frequency entry ON In Memory Recall mode: channel number entry ON

<sup>1</sup> "FS" appears when you select 1 kHz step (LSB/ USB/ CW) or 10 kHz step (FM/ AM).

<sup>2</sup> After pressing Mic [#], press Mic [0] to [9] to enter a frequency or memory channel number.

When Mic [0] is pressed, the Commander shows the current settings of the HF transceiver:



- ① HF frequency
- ② VFO: A, VFO: B,  
MR: 00 ~ 99 (memory channel number)
- ③ RIT, XIT
- ④ OFF, -9.99 ~ +9.99
- ⑤ LSB, USB, CW, FM, or AM
- ⑥ SPLIT-A: VFO A is used for transmitting.  
SPLIT-B: VFO B is used for transmitting.  
SPLIT-M: A memory channel is used for transmitting.
- ⑦ "FS" appears when Mic [\*] is pressed.

**Note:**

- ◆ After pressing [MENU], you can access only Menu 4-4.
- ◆ The Transporter will transmit its call sign in Morse code every 10 minutes, using the 144 MHz band.
- ◆ The APO timer will not operate on the transceiver while the Transporter is ON.

**USING TH-D7A AS A COMMANDER**

To use a TH-D7A transceiver as a "Commander" (an external remote control unit), follow the steps below. Basically, it is the same as using a TM-D700A as a "Commander" (described on the previous page).

**TS-480 + TH-D7A/ TM-D700A (Transporter) Setup:**

- 1 Configure the TH-D7A or TM-D700A as a "Transporter" and connect all the necessary cables to the TS-480 transceiver.
- 2 Select a frequency (HF/ 50 MHz band) on the TS-480 transceiver.
- 3 On the TS-480 Press [MENU/ F.LOCK], then turn the MULTI control to access Menu No. 56.
- 4 Select same communication parameters that you selected for the TH-D7A or TM-D700 transceiver.
- 5 Press [MENU/ F.LOCK] to complete.
- 6 Start the Transporter mode on the TH-D7A or TM-D700A transceiver.

**TH-D7A (Commander) Setup:**

- 1 Access Menu 4-1 to enter the same callsign that you entered for the Commander (ex: WD6DJY).
- 2 Access Menu 4-2 to enter the same callsign that you entered for the Transporter (ex: WD6DJY-1).
- 3 Access Menu 4-3 to select the same CTCSS tone frequency that you selected for the Transporter.
- 4 Set the same frequencies that you selected for the "Transporter" for the VHF and UHF bands.

**Note:** Refer to Chapter 19, Sky Command II, of the TH-D7A instruction manual for details on how to enter the callsign and CTCSS tone frequency.

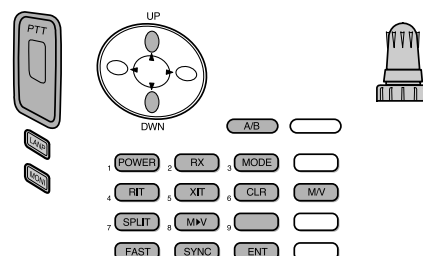
**CONTROL OPERATION**

First, switch the TS-480 and TH-D7A or TM-D700 transceivers (Transporter) ON. Configure the TH-D7A or TM-D700 to enter the "Transporter" Mode.

Then, access Menu 4-4 on the TH-D7A and select "COMMANDER". "PUSH [0] KEY TO START COMMANDER!!" appears.

Press [0] on the TH-D7A to start Sky Command mode.

When in Sky Command mode, the keys of the TH-D7A (Commander) will function as described below. Only [LAMP], [MONI], and the VOL control functions will not change.



### 13 OPERATOR CONVENIENCES

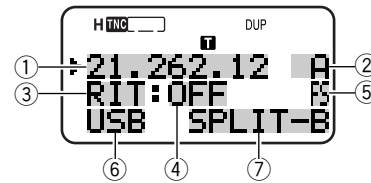
Each time you press the desired key, the Commander will automatically enter transmit mode and send the corresponding control command to the Transporter.

To switch the HF transceiver OFF	Press <b>[POWER]</b> .
To transmit audio on a HF frequency	Press and hold the <b>PTT</b> switch, then speak into the microphone.
To receive audio on an HF frequency	Press <b>[RX]</b> .
To monitor the UHF band on the Commander	Press and hold <b>[MONI]</b> .

Key	Function
<b>Tuning control</b>	Frequency or memory channel number change
<b>UP/DWN</b>	RIT offset or XIT offset change
<b>A/B</b>	In VFO mode: VFO A/ VFO B switch In Memory Recall mode: no change
<b>POWER</b> <sup>1</sup>	Power ON/ OFF
<b>RX</b> <sup>1</sup>	HF frequency receive ON/ OFF
<b>MODE</b> <sup>1</sup>	Modulation mode switch
<b>RIT</b> <sup>1</sup>	RIT ON/ OFF
<b>XIT</b> <sup>1</sup>	XIT ON/ OFF
<b>CLR</b> <sup>1</sup>	RIT offset or XIT offset clear
<b>SPLIT</b> <sup>1</sup>	Split-frequency ON/ OFF
<b>M↔V</b> <sup>1</sup>	Transfer from Memory to VFO
<b>FAST</b>	In LSB, USB, or CW mode: 10 Hz/ 1 kHz switch In FM or AM mode: 1 kHz/ 10 kHz switch
<b>SYNC</b> <sup>1</sup>	Current settings retrieve (from HF transceiver)
<b>ENT</b>	In VFO mode: frequency entry ON In Memory Recall mode: channel number entry ON
<b>M/V</b>	VFO/ Memory Recall mode switch

<sup>1</sup> After pressing **[ENT]**, you can use these keys as numeric keys to enter a frequency or memory channel number.

When **[0/ SYNC]** is pressed, the Commander shows the current settings of the TS-480 transceiver:



- ① HF frequency
- ② A (VFO A), B (VFO B), 00 ~ 99 (memory channel number)
- ③ RIT, XIT
- ④ OFF, -9.99 ~ +9.99
- ⑤ "FS" appears when **[FAST]** is ON.
- ⑥ LSB, USB, CW, FM, or AM
- ⑦ SPLIT-A: VFO A is used for transmitting.  
SPLIT-B: VFO B is used for transmitting.  
SPLIT-M: A memory channel is used for transmitting.

**Note:**

- ◆ On the Transporter, only **[LAMP]**, **[MONI]**, and **[MENU]** will function. Pressing any other key will simply cause the Transporter to generate an error beep.
- ◆ After pressing **[MENU]**, you can access only Menu 4-4.
- ◆ The Transporter will transmit its call sign in Morse code every 10 minutes, using the 144 MHz band.
- ◆ The APO timer will not operate on the transceiver while the Transporter is ON.



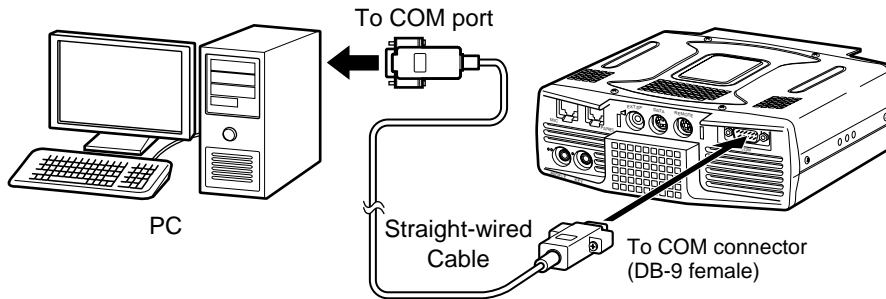


# CONNECTING PERIPHERAL EQUIPMENT

## COMPUTER

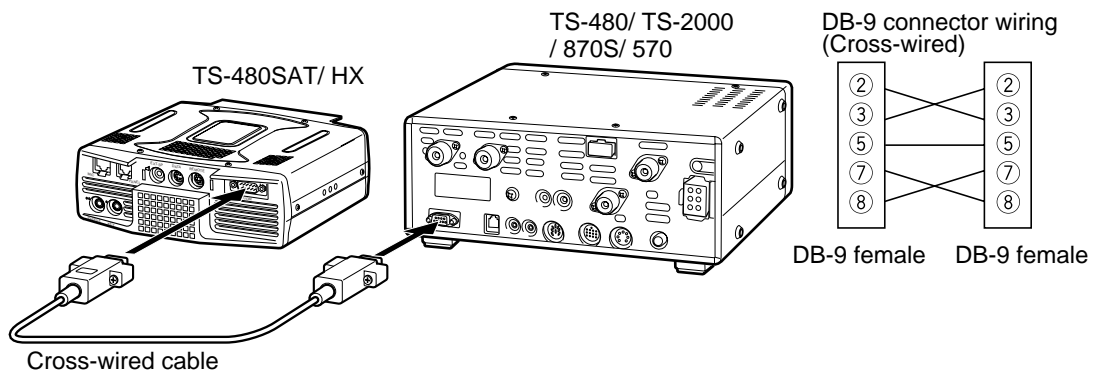
The **COM** connector allows you to directly connect a computer or dumb terminal by using a straight-wired cable, having a DB-9 female connector at each end.

No external hardware interface is required between your computer and the transceiver.



## COMPATIBLE TRANSCEIVER

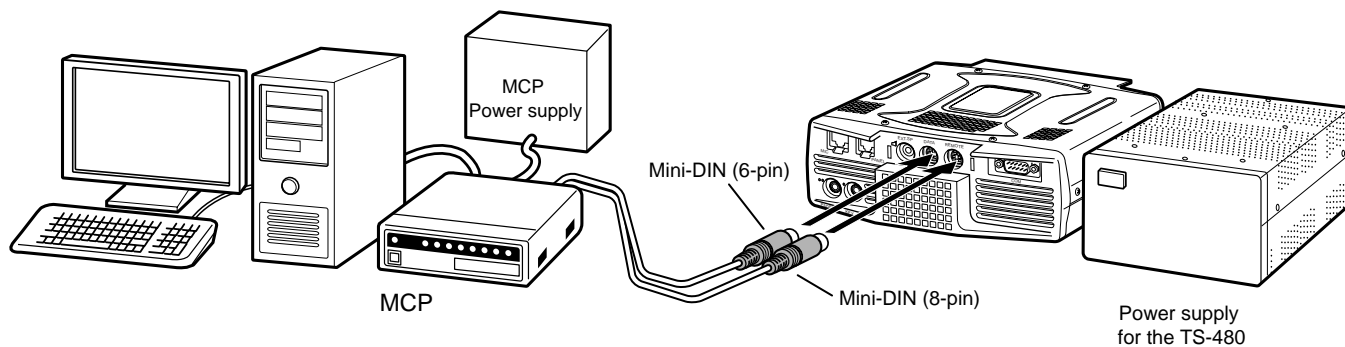
When transferring data to or from another TS-480, TS-2000, TS-570, or TS-870S, directly connect the 2 transceivers using the **COM** connectors.



## RTTY OPERATION

Use the **REMOTE** and **DATA** connectors to interface with your MCP. If your MCP supports RTTY keying output, connect the output to pin 8 of the **REMOTE** connector. Connect the demodulation input line of the MCP to pin 5 of the **DATA** connector {page 78}. Also, connect the transmission control line of the MCP to pin 3 of the **REMOTE** terminal. Select "FSK" or "FSR" when you operate the RTTY mode. Adjust the audio level by changing the parameters in Menu No. 46 if necessary.

**Note:** Do not share a single power supply between the transceiver and the RTTY equipment. Keep as wide a separation as possible between the transceiver and the RTTY equipment to reduce noise-pickup by the transceiver.



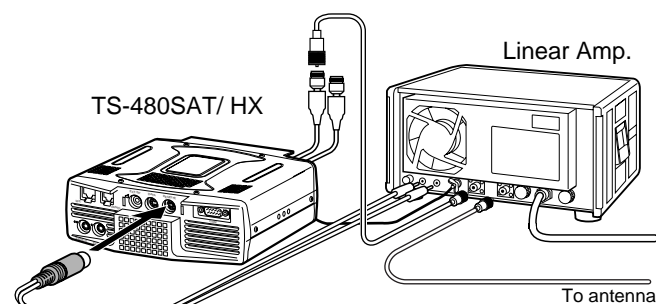
## HF/ 50 MHz LINEAR AMPLIFIER

Connect an external transmission power amplifier to the **REMOTE** connector (One mini DIN 6-pin male **REMOTE** connector (E57-0404-XX) is supplied). Switch ON the linear amplifier control relay via Menu Nos. 28 (HF) and 29 (50 MHz). Select "2" or "3" if you use the internal relay to control the linear amplifier status.

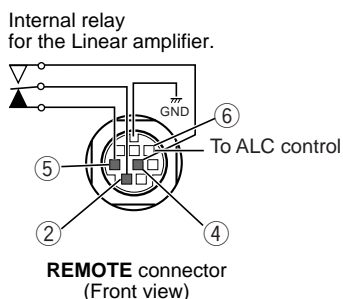
The TX/ RX relay response time is 10 ms when you have selected CW Full Break-in and 25 ms when you have selected CW Semi Break-in.

**Note:**

- ◆ The TX/ RX control method differs, depending on external amplifier models. Some amplifiers enter the TX mode when the control terminal is grounded. For those amplifiers, connect pin 2 of the **REMOTE** connector to the GND terminal of the amplifier and connect pin 4 of the connector to the control terminal of the amplifier.
- ◆ The mini DIN connectors (**DATA** and **REMOTE** connectors) look alike. Confirm the number of pins before plugging into the transceiver connectors. The **REMOTE** connector is an 8-pin mini DIN connector and the **DATA** connector is a 6-pin mini DIN connector.



Use the supplied mini DIN (8-pin) connector to interface with the Linear Amp.



### REMOTE terminal pin assignment (8-pin mini DIN)

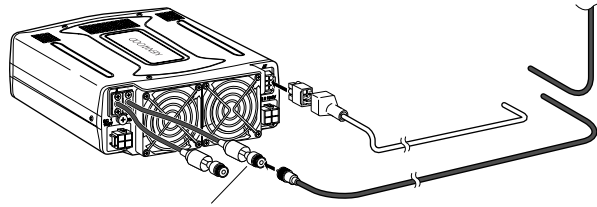
Pin No.	Pin Name	Function
1	SPO	Speaker output.
2	COM	Common terminal of the relay.
3	SS	Ground this terminal to transmit.
4	MKE	Connects to COM (pin 2) when the transceiver transmits.
5	BRK	Connects to COM (pin 2) when the transceiver receives.
6	ALC	ALC input from amplifier (-7 V).
7	RL	Approx. +12 V DC is output when the transceiver transmits (10 mA max.).
8	RTK	RTTY (FSK) keying input. Ground this terminal to alternate Mark and Space.
Metal cover	-	Ground

## 14 CONNECTING PERIPHERAL EQUIPMENT

### ANTENNA TUNER

Use the **ANT 1** and **AT** connectors to connect an AT-300 external antenna tuner. If you connect the external tuner to the **ANT 2** connector, the external antenna tuner will not function.

**Note:** When the AT-300 is used with the TS-480HX transceiver, the TX output power is automatically reduced to 100 W (AM mode: 25 W). Also, the AT-300 cannot be used for 50 MHz operation.



ANT 1 connector

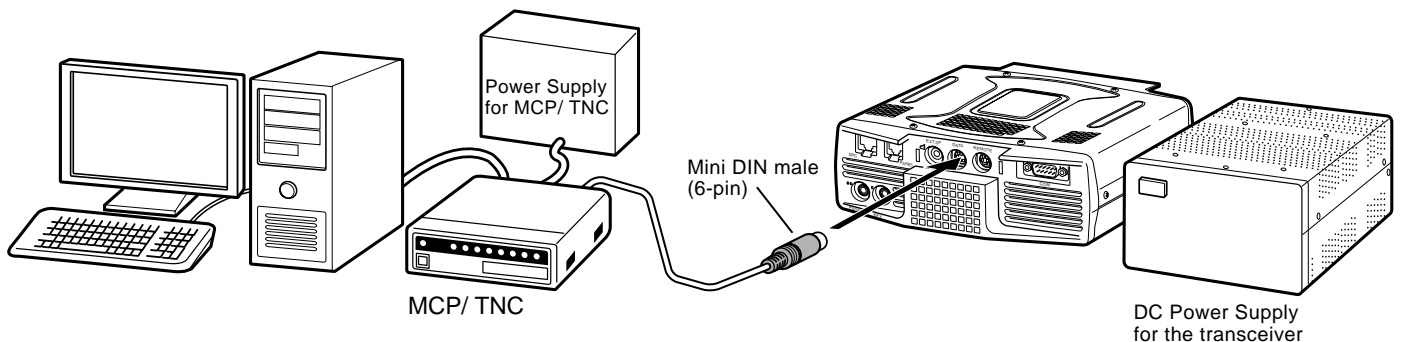
### MCP AND TNC

Use the **DATA** connector to connect the AF input/output lines from a Terminal Node Controller (TNC) for Packet operation, a Multimode Communications Processor (MCP) for operation on AFSK, Packet, PacTOR, AMTOR, G-TOR™, PSK31, or FAX, or a Clover interface. Also use the **DATA** connector to connect SSTV and phone patch equipment (1 male, 6-pin mini DIN connector (E57-0404-XX) is supplied).

- Connect the TNC or MCP to the **DATA** connector using a cable equipped with a 6-pin mini DIN plug.
- Connecting the TNC or MCP to a personal computer or dumb terminal requires an RS-232C cable.
- Select LSB or USB mode (it depends on the communication mode) when you operate the MCP/ TNC.

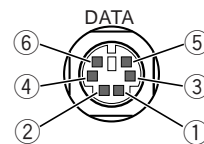
**Note:**

- ◆ Do not share a single power supply between the transceiver and the TNC or MCP. Keep as wide a separation as possible between the transceiver and the computer to reduce noise-pickup by the transceiver.
- ◆ The mini DIN connectors (**REMOTE** and **DATA** connectors) look alike. Confirm the number of pins before plugging into the transceiver connectors. The **DATA** connector is a 6-pin mini DIN connector and the **REMOTE** connector is an 8-pin mini DIN connector.



#### DATA terminal pin assignment (6-pin mini DIN)

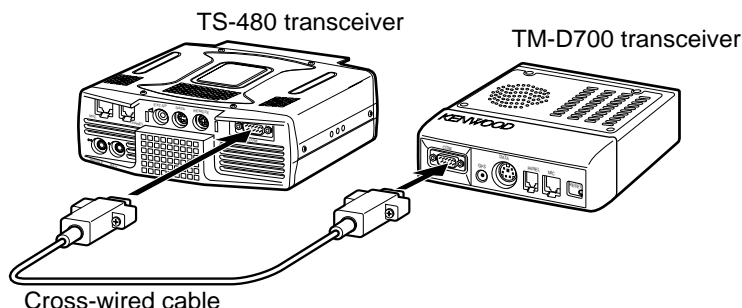
Pin No.	Pin Name	Function
1	ANI	Audio input from MCP/ TNC.
2	ANG	Audio signal ground.
3	DTS	Ground this terminal to transmit.
4	NC	No connection.
5	ANO	Audio output for MCP/ TNC.
6	SQC	Squelch status • Squelch open: Low impedance • Squelch close: High impedance
Metal cover	GND	Ground



**DATA connector**  
Front view  
(TX/ RX unit)

## DX PACKETCLUSTER TUNE

If you have a TM-D700 transceiver, you can connect the TM-D700 to the TS-480 transceiver to use the DX PacketCluster Tune function. Connect the 2 transceivers with a cross-wired RS-232C cable as shown below. Configure the TM-D700 transceiver to the DX Packet Cluster node frequency.



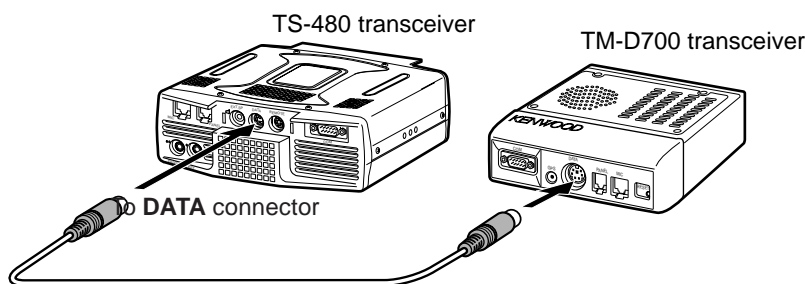
- 1 Press **[MENU/ F.LOCK]** and turn the **MULTI** control to select Menu No. 56 on the TS-480 transceiver.
- 2 Press **[>]/ [<]** to select the same communication baud rate configured on the TM-D700 transceiver.
- 3 Tune to the DX Packet Cluster node frequency on the TM-D700 transceiver.
- 4 Press **[F] (1 s), [TNC]** on the TM-D700 transceiver.
  - “TNC APRS” appears on the TM-D700 transceiver.
- 5 Press **[F] (1 s), [DX]** on the TM-D700 transceiver.
- 6 Select a desired DX station data with **[↑]/ [↓]** on the TM-D700 transceiver.
- 7 Press **[MHz]** on the TM-D700 transceiver to transfer the frequency data to the TS-480 transceiver.
  - If the transferred frequency data is available on the TS-480 transceiver, the frequency data will be overwritten to the current operating frequency. Otherwise, the operating frequency of the TS-480 transceiver remains unchanged.

For more detailed operation on the DX PacketCluster operation of the TM-D700 transceiver, refer to page 6 of the TM-D700 instruction manual (Specialized Communications).

**Note:** The firmware of the TM-D700 transceiver must be version G2.0 or later to use the PacketCluster function with the TS-480 transceiver.

## CROSSBAND REPEATER

If you have a TM-D700 transceiver, you can connect the TM-D700 transceiver to the TS-480 transceiver to use the Crossband repeater function. Connect the 2 transceivers with a mini DIN cable (6-pin) as shown below.



After connecting the 2 transceivers with the cable, access Menu No. 57 (DTS polarity) on the TS-480 transceiver and select “on”. You will further need to adjust the audio input/ output level of the TS-480 transceiver using Menu Nos. 46 and 47.

## 14 CONNECTING PERIPHERAL EQUIPMENT

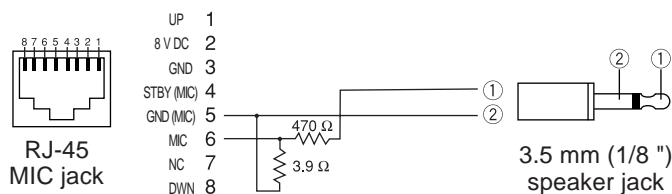
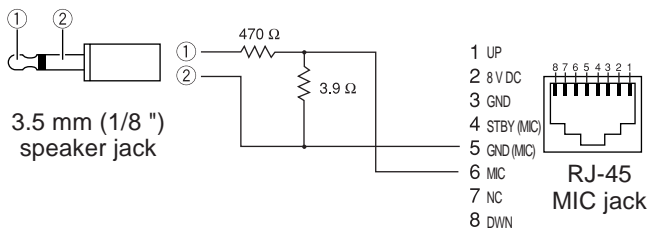
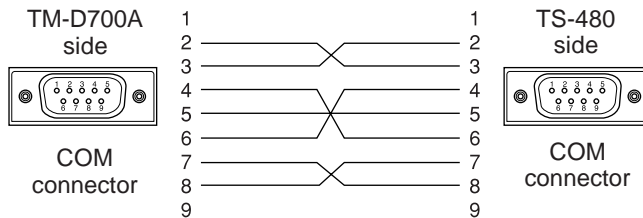
### SKY COMMAND II

#### ■ TM-D700A

In order to connect the TS-480 transceiver to the TM-D700 transceiver, you need to prepare 3 cables by yourself. For the connection between the COM connectors on the 2 transceivers, you may use a commercially available RS-232C cross-wired cable.

#### Note:

- ◆ Switch OFF both the TM-D700 and TS-480 transceiver before making the connection.
- ◆ The TM-D700 transceiver automatically transmits its call sign in Morse code at regular intervals because of legal requirements; therefore, transmit sidetone must be output from the TS-480 transceiver.
- ◆ When the TM-D700 transceiver is too close to the TS-480 transceiver, unwanted feedback may cause malfunction.
- ◆ Do not share a regulated power supply between the TM-D700 transceiver and the TS-480 transceiver. Unwanted feedback may cause malfunction.



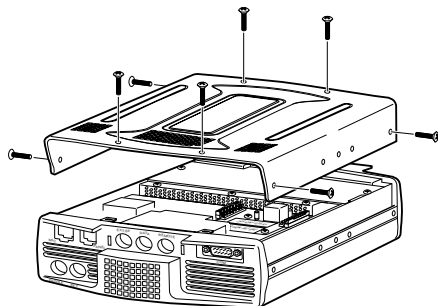
# INSTALLING OPTIONS

You will require a #1 Philips screwdriver to install the VGS-1. To install the YK-107 IF filters and/ or SO-3 TCXO, you will also need a soldering iron (approx. 30 watts).

## REMOVING THE TOP COVER

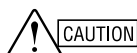
When installing the optional VGS-1, YK-107 IF filters or SO-3, remove the top cover of the transceiver:

- 1 Remove the 8 screws.



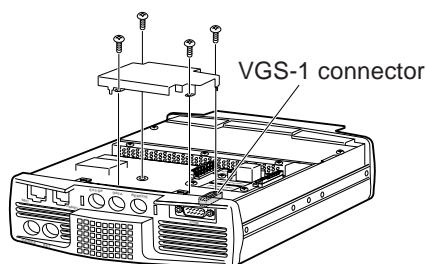
- 2 Lift off the top cover.

## VGS-1 VOICE GUIDANCE & STORAGE UNIT

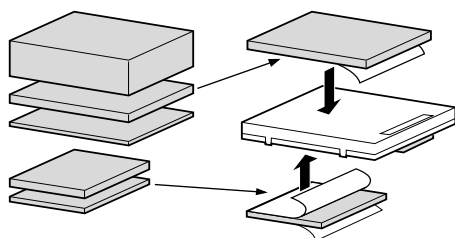


**CAUTION**  
SWITCH OFF THE POWER AND UNPLUG THE DC POWER CABLE BEFORE BEGINNING INSTALLATION.

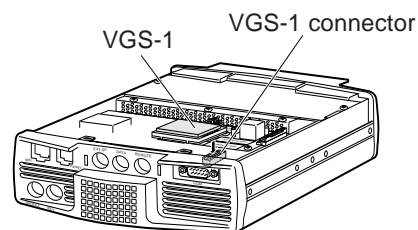
- 1 Remove the top case (8 screws) {above}.
- 2 Loosen the 4 screws to remove the shield cover.



- 3 There are 5 rubber cushions in the VGS-1 package. Use the 2 rubber cushions shown below and attach them to the VGS-1. The remaining cushions are not used.



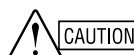
- 4 Plug the VGS-1 into the VGS-1 connector of the PC board, pressing down on the top of the VGS-1 until secure.



- 5 Replace the shield cover and tighten the 4 screws.
- 6 Replace the top case (8 screws).

**Note:** After the installation, you can adjust the VGS-1 playback volume by selecting Menu No. 14.

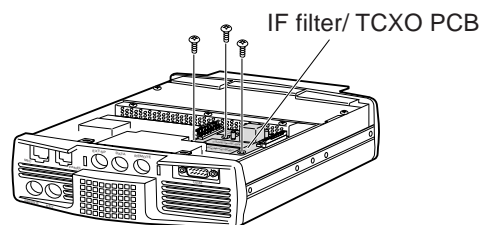
## YF-107C/ CN/ SN IF FILTERS AND SO-3 TCXO



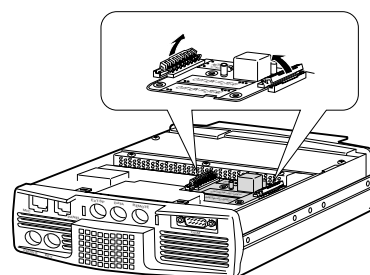
**CAUTION**  
SWITCH OFF THE POWER AND UNPLUG THE DC POWER CABLE BEFORE BEGINNING INSTALLATION.

Three different types of IF filters (YF-107C, YF-107CN, and YF-107SN) are available for the TS-480SAT/ HX transceiver. You can install a maximum of 2 IF filters in the transceiver. Refer to page 91 for the bandwidth information on each filter. As for the SO-3 option improves the transceiver frequency stability to  $\pm 0.5$  ppm.

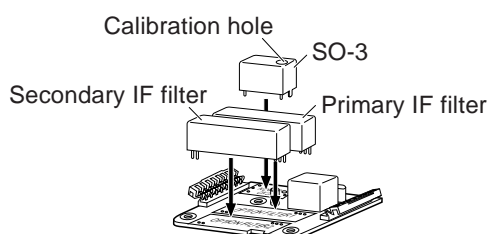
- 1 Remove the top case (8 screws).
- 2 Locate the filter and TCXO PCB and loosen the 3 screws.



- 3 Unlatch the connectors by pressing the connector tabs upwards.



- 4 Insert the IF filter(s) and/ or SO-3 TCXO.



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## 15 INSTALLING OPTIONS

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- SO-3: The calibration hole must be on the right side, looking from the front panel.
  - IF filters: Insert a primary IF filter in the OPTION FILTER1 location, and a secondary IF filter in the OPTION FILTER2 location.
- 5 Solder all pins on the reverse side of the PCB.
  - SO-3: Cut the 2 wires marked as R103 and R104, as shown below.
  - 6 Replace the PCB in the transceiver and press both the tabs downwards until secure.
  - 7 Tighten the 3 screws and replace the top cover.
- 5 TS-480 transceiver without SO-3:  
Adjust the trimmer (TC1) to minimize the frequency difference between the received 800 Hz tone and the 800 Hz sidetone.  
TS-480 transceiver with SO-3:  
Adjust the trimmer in the SO-3 with the supplied plastic adjustment tool (W01-0406-XX) to minimize the frequency difference between the received 800 Hz tone and the 800 Hz sidetone.
  - 6 Replace the top cover (8 screws).

## REFERENCE FREQUENCY CALIBRATION

**Note:** *The transceiver is adjusted at the factory prior to shipping. Unless necessary, DO NOT perform this adjustment.*

- 1 Set the following on the transceiver:
  - Mode: CW
  - **AF** control: Center
  - Menu No. 34 (CW RX pitch): 800 Hz
  - **IF SHIFT** control: Center
  - RIT function: OFF
  - Break-in function (VOX): OFF
- 2 Remove the top case (8 screws) from the transceiver.
- 3 Tune in a standard frequency station such as WWV or WWVH at, for example, 10.000 or 15.000 MHz.
  - Adjust the **Tuning** control so that the display reads the exact frequency of the station.
  - You should hear a beat tone of approximately 800 Hz.
  - For 800 Hz:  
 $f_{af} = (f_{display}/15.600 \times \Delta f_{reference}) + 800 \text{ Hz}$   
where  $\Delta f_{reference}$  is the shift from the 15.6 MHz reference frequency.
- 4 Close your CW key. You will hear a transmit sidetone of approximately 800 Hz.
  - This sidetone produces a double beat tone when it combines with the received signal.
  - Adjust the **AF** control to hear the double beat clearly.
  - For 800 Hz:  
 $f_{sidetone} = 800 \text{ Hz} \pm 50 \text{ ppm} (= 800 \pm 0.04 \text{ Hz})$   
where  $\Delta f_{reference}$  is the shift from the 15.6 MHz reference frequency.

## 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, coils and resistors in the transceiver were preset at the factory. They should only be readjusted by a qualified technician who is familiar with this transceiver and has the necessary test equipment. Attempting service or alignment without factory authorization can void the transceiver warranty.

When operated properly, the transceiver will provide years of service and enjoyment 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 transceiver 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 your problem. Don't return accessory items unless you feel they are directly related to the service problem.

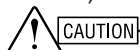
You may return your transceiver for service to the authorized **KENWOOD** dealer from whom you purchased it or any authorized **KENWOOD** service center. A copy of the service report will be returned with the transceiver. Please do not send subassemblies or printed circuit boards. Send the complete transceiver.

Tag all returned items with your name and call sign for identification. Please mention the model and serial number of the transceiver 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, key 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 transceiver was purchased.
- ◆ For your own information, retain a written record of any maintenance performed on the transceiver.
- ◆ 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 keys, controls and case of the transceiver are likely to become soiled after extended use. Remove the controls from the transceiver 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.

## BACKUP BATTERY

This transceiver uses an EEPROM (a.k.a. Flash ROM) to store memory channel data, menu configurations and all necessary operation parameters. So, you never have to worry about replacing batteries to operate the transceiver.



## 16 TROUBLESHOOTING

### 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. These problems are usually not caused by circuit failure. Please review this table, and the appropriate section(s) of this instruction manual, before assuming your transceiver is defective.

**Note:** *Placing a powered portable transceiver near this transceiver may cause noise in the transceiver.*

Problem	Probable Cause	Corrective Action	Page Ref.
The transceiver will not power up after connecting a 13.8 V DC power supply and pressing [ $\phi$ ]. Nothing appears on the display, and no receiver noise is heard.	<ol style="list-style-type: none"> <li>1 DC power supply is OFF.</li> <li>2 Faulty power cable.</li> <li>3 The power cable is not connected securely.</li> <li>4 Power cable fuse is open.</li> </ol>	<ol style="list-style-type: none"> <li>1 Switch ON the DC power supply.</li> <li>2 Inspect the power cable. Confirm polarities are correct. Red: positive (+); Black: negative (-)</li> <li>3 Confirm the connections to the DC power supply are secure.</li> <li>4 Look for the cause of the blown fuse. After inspecting and correcting any problems, install a new fuse of the specified rating.</li> </ol>	
After switching ON the power, the transceiver does not function normally. For example, no digits or incorrect digits appear on the display.	<ol style="list-style-type: none"> <li>1 The input voltage is outside 13.8 V DC <math>\pm 15\%</math> (11.7 to 15.8 V DC).</li> <li>2 The microprocessor has malfunctioned.</li> </ol>	<ol style="list-style-type: none"> <li>1 Correct the input voltage or use a 12 to 16 V battery.</li> <li>2 Review "MICROPROCESSOR RESET". After understanding what data will be lost, do a Partial Reset. If the problem remains, do a Full Reset.</li> </ol>	
After switching ON the transceiver, the transceiver refuses to transmit.	<ol style="list-style-type: none"> <li>1 The current rating of the DC power supply is too low.</li> <li>2 Two DC power supplies must be connected to the TS-480HX.</li> </ol>	<ol style="list-style-type: none"> <li>1 Use the DC power supply that has 20.5 A or more current rating.</li> <li>2 Connect 2 DC power supplies to the TS-480HX transceiver. The voltage difference between 2 DC power supplies must be within 1.0 V to transmit. Also, confirm each DC power supply has a 20.5 A or higher current rating.</li> </ol>	
The transceiver does not respond correctly after pressing key combinations or turning controls per instructions in this manual.	<ol style="list-style-type: none"> <li>1 Procedures are not being followed precisely.</li> <li>2 The Frequency Lock function is ON.</li> <li>3 The microprocessor and its memory need resetting.</li> <li>4 The keys on the transceiver are unavailable while operating the <b>Tuning</b> control.</li> </ol>	<ol style="list-style-type: none"> <li>1 Review "WRITING CONVENTIONS FOLLOWED".</li> <li>2 Press [MENU/ F.LOCK] (1 s) to switch the function OFF.</li> <li>3 Review "MICROPROCESSOR RESET". After understanding what data will be lost, do a Partial Reset. If the problem remains, do a Full Reset.</li> <li>4 Stop operating the <b>Tuning</b> control, then press the appropriate keys.</li> </ol>	
The frequency cannot be changed.	The Frequency Lock function or Lock All function is ON.	Press [MENU/ F.LOCK] (1 s) to turn the Frequency Lock function OFF. The " " icon disappears.	
SSB audio quality is very poor; the high or low audio frequencies are absent.	<ol style="list-style-type: none"> <li>1 The wrong operation mode is selected for the receiver.</li> <li>2 The AF DSP filter is incorrectly set.</li> <li>3 Noise Reduction 1 or 2 is ON.</li> <li>4 Beat Cancel 1 or 2 is ON.</li> </ol>	<ol style="list-style-type: none"> <li>1 Select USB or LSB for the mode.</li> <li>2 Press [FIL/ NAR] then turn the <b>MULTI</b> control to adjust the DSP filter width.</li> <li>3 Press [NR] until the NR function turns OFF.</li> <li>4 Press [BC/ CW.T] until the BC function turns OFF.</li> </ol>	

Problem	Probable Cause	Corrective Action	Page Ref.
No signals are received or receive sensitivity seems poor.	<ol style="list-style-type: none"> <li>1 The <b>SQL</b> control is fully clockwise.</li> <li>2 The Attenuator function is ON.</li> <li>3 Mic [<b>PTT</b>] is pressed.</li> <li>4 The IF filter bandwidth was incorrectly set.</li> <li>5 The wrong antenna connector (ANT 1 or ANT 2) was selected.</li> <li>6 The preamplifier is OFF.</li> </ol>	<ol style="list-style-type: none"> <li>1 Turn the <b>SQL</b> control counterclockwise.</li> <li>2 Press [<b>ATT/PRE/ ANT1/2</b>] until “ATT” and “PRE” disappear.</li> <li>3 Release Mic [<b>PTT</b>].</li> <li>4 Review “DSP FILTERS”, “CHANGING THE IF FILTER BANDWIDTH” and set the controls accordingly.</li> <li>5 Press [<b>ATT/PRE/ ANT1/2</b>] (1 s) to select the other antenna connector.</li> <li>6 Press [<b>ATT/PRE/ ANT1/2</b>] to switch the function ON.</li> </ol>	
No signals are received or receive sensitivity seems poor; S-meter is reading full scale.	The RF gain was set too low.	Press [ <b>MIC/ 5/ RF.G</b> ] (1 s) and turn the <b>MULTI</b> control clockwise to increase the RF gain.	
Received signals are totally unintelligible.	The wrong modulation mode was selected.	Press [ <b>MODE</b> ] or [ <b>MODE</b> ] (1 s) to select the correct modulation mode.	
Memory Scan will not start scanning.	<ol style="list-style-type: none"> <li>1 The <b>SQL</b> control was not set correctly.</li> <li>2 Less than 2 memory channels were unlocked.</li> <li>3 Less than 2 memory channels were programmed.</li> <li>4 The <b>SQL</b> control was not set correctly.</li> </ol>	<ol style="list-style-type: none"> <li>1 Adjust the <b>SQL</b> control to just eliminate background noise.</li> <li>2 Unlock at least 2 memory channels.</li> <li>3 Store data in at least 2 memory channels.</li> <li>4 Adjust the <b>SQL</b> control.</li> </ol>	
Memory Scan will not scan one of the stored channels; the desired channel is NOT locked out.	With Group Scan selected, the channel you want to scan is in a different group.	Select the group that contains the memory channel you want to scan.	
Program Scan will not start scanning.	The start and end frequencies are identical.	Store different start and end frequencies.	
AT does not finish successfully.	The impedance of the coaxial cable and antenna was not matched. Tuning does not successfully finish depending on conditions although the SWR meter indicates smaller than 3:1.	Adjust the antenna system to lower the SWR.	
The internal tuner is bypassed immediately after tuning is started.	The SWR of the antenna system is too high.	Adjust the antenna system to lower the SWR.	
You cannot transmit even though you press Mic [ <b>PTT</b> ] or transmissions result in no contacts.	<ol style="list-style-type: none"> <li>1 The microphone plug was not inserted completely into the MIC connector.</li> <li>2 The Transmit Inhibit function is ON.</li> <li>3 CW or FSK was selected instead of a voice mode.</li> <li>4 The DSP TX filter bandwidth was improperly selected.</li> <li>5 The wrong antenna connector (ANT 1 or ANT 2) was selected.</li> </ol>	<ol style="list-style-type: none"> <li>1 Turn OFF the power, ensure the MIC connector has no foreign objects in it, then plug in the connector firmly.</li> <li>2 Change Menu No. 55 to OFF.</li> <li>3 Press [<b>MODE</b>] to select a voice mode.</li> <li>4 Adjust the settings in Menu No. 20.</li> <li>5 Press [<b>ATT/PRE/ ANT1/2</b>] (1 s) to select the other antenna connector.</li> </ol>	

## 16 TROUBLESHOOTING

Problem	Probable Cause	Corrective Action	Page Ref.
Attempting to transmit results in the "HELLO" message appearing and the reception mode being restored.	<ol style="list-style-type: none"> <li>1 The antenna is not connected correctly.</li> <li>2 The impedances of the antenna and transceiver are not properly matched.</li> <li>3 The input voltage is outside 13.8 V DC <math>\pm</math>15% (11.7 to 15.8 V DC).</li> <li>4 The current rating of the DC power supply is not enough.</li> </ol>	<ol style="list-style-type: none"> <li>1 Check the antenna connection. Correct as necessary.</li> <li>2 Reduce the SWR of the antenna system.</li> <li>3 Correct the input voltage or use a 12 to 16 V battery.</li> <li>4 Use a DC power supply that has a current rating of more than 20.5 A at 13.8 V DC. As for the TS-480HX, 2 DC power supplies are required to transmit.</li> </ol>	
The transceiver has low transmission power.	<ol style="list-style-type: none"> <li>1 The microphone gain is set too low.</li> <li>2 Poor antenna system connections are causing high SWR.</li> </ol>	<ol style="list-style-type: none"> <li>1 When in SSB or AM mode, increase the microphone gain.</li> <li>2 Check the antenna connections. Confirm that the antenna tuner is reporting a low SWR.</li> </ol>	
VOX does not operate.	The VOX gain is set too low.	Increase the VOX gain.	
HF/ 50 MHz Linear amplifier does not operate.	<ol style="list-style-type: none"> <li>1 The linear amplifier control is OFF.</li> <li>2 The <b>REMOTE</b> connector wiring is wrong or faulty.</li> </ol>	<ol style="list-style-type: none"> <li>1 Set Menu No. 28 (HF) or 29 (50 MHz) to 1, 2, or 3.</li> <li>2 Inspect the <b>REMOTE</b> connector wiring and correct it as necessary.</li> </ol>	
The transceiver's output power decreases after a short operating time.	<ol style="list-style-type: none"> <li>1 The air filters for the cooling fan(s) have been congested with dust.</li> <li>2 The cooling fan(s) cannot provide enough air flow to cool the transceiver down.</li> </ol>	<ol style="list-style-type: none"> <li>1 Contact a <b>KENWOOD</b> authorized service center to clean the filters.</li> <li>2 Relocate the transceiver so that air can easily flow through the TX/ RX unit to keep the unit cooled.</li> </ol>	
You cannot access and use repeaters.	<ol style="list-style-type: none"> <li>1 Many repeaters require a subtone or 1750 Hz tone to access.</li> <li>2 Transmission and/ or reception frequency is wrong.</li> </ol>	<ol style="list-style-type: none"> <li>1 Review "FM REPEATER OPERATION" and select the correct frequency and type of subtone.</li> <li>2 You must transmit on the repeater's input frequency and receive on the repeater's output frequency. Refer to "FM REPEATER OPERATION".</li> </ol>	
Digital operation results in few or no connects or contacts with other stations.	<ol style="list-style-type: none"> <li>1 Physical connections between the transceiver, computer, and TNC/ MCP is incorrect, or software settings in the TNC/ MCP are wrong.</li> <li>2 Different transmission and reception frequencies are being used.</li> <li>3 The levels between the transceiver and the TNC/ MCP are incorrect.</li> <li>4 Your transmitted signal or the incoming receive signal is too weak.</li> <li>5 The TX delay time parameter in your TNC/ MCP was incorrectly set.</li> </ol>	<ol style="list-style-type: none"> <li>1 Re-check all connections using this manual, your TNC/ MCP manual, and your computer hardware manual as references.</li> <li>2 Confirm that the RIT and XIT functions are switched OFF. Confirm that you are NOT operating split frequency.</li> <li>3 Adjust TX and RX levels using Menu No. 46 and 47, and level controls on your TNC/ MCP.</li> <li>4 Reorient/ relocate your antenna or increase your antenna gain.</li> <li>5 Set the TNC/ MCP TX delay time to more than 300 ms.</li> </ol>	
Attempts at controlling the transceiver with the computer have failed.	<ol style="list-style-type: none"> <li>1 Problem with the cable that connects the PC to the TS-480SAT/ HX.</li> <li>2 Communication parameters set in your terminal program do not match the transceiver parameters.</li> </ol>	<ol style="list-style-type: none"> <li>1 Check the cable and cable connections.</li> <li>2 Use the same parameters in the terminal program and the transceiver. Check Menu No. 56.</li> </ol>	

Problem	Probable Cause	Corrective Action	Page Ref.

### MICROPROCESSOR RESET

If your transceiver seems to be malfunctioning, resetting the microprocessor default settings may resolve the problem. There are 2 levels of resetting the microprocessor of the TS-480 transceiver: Partial Reset and Full Reset.

#### INITIAL SETTINGS

For each VFO, the factory defaults for the operating frequency and mode are as follows:

- VFO A: 14.000.000 MHz/ USB
- VFO B: 14.000.000 MHz/ USB

The Memory channels and Quick Memory channels have no data stored.

#### PARTIAL RESET

Perform a Partial Reset if a key or control does not function according to the instructions in this manual. The following data is NOT erased by performing a Partial Reset.

- Memory channel data
- Menu settings
- Antenna tuner preset data
- ANT 1/ ANT 2 selection data
- Frequency and mode data for the Auto Mode function
- Various adjustment setting values

Reset the transceiver by pressing **[A/B / M/V]+[ ⏏ ]**.

- A confirmation message appears when performing the Partial Reset. Press **[A/B / M/V]** to proceed. Otherwise, press any other key to cancel the Partial Reset and return to normal operation.
- The VFOs reset to the factory default values.

#### FULL RESET

Perform a Full Reset if you want to erase all the data in all the memory channels. In addition, this function resets all the settings that you customized, to the factory defaults (i.e.- menu settings, antenna tuner preset data, etc.).

Reset the transceiver by pressing **[A=B/ SPLIT]+[ ⏏ ]**.

A confirmation message appears when performing Full Reset. Press **[A=B/ SPLIT]** to proceed. Otherwise, press any other key to cancel the Full Reset and return to normal operation.

When you perform the full reset:

- All frequencies, modes, memory data, adjustment values, and AT preset data are set to the factory default values.

### OPERATION NOTICES

#### NEW AMATEUR RADIO BAND IN THE U.S.

The transceiver has been designed and engineered to avoid possible hardware glitches. However, you may notice the following symptoms when you operate the transceiver. These symptoms are not malfunctions.

#### DC POWER SUPPLY

As stated in the SPECIFICATIONS {page 91}, this transceiver requires a supplied DC voltage source of 13.8 V  $\pm$ 15%. If you find that the transceiver cannot be switched ON, or that it shuts OFF automatically, the DC voltage may be outside the specified range.

In such a case, remove the DC cable from the transceiver immediately and confirm that the supplied voltage is within the specified range.

#### INTERNAL BEATS

On some spots of the transceiver bands, the S-meter moves or you cannot receive any signals. This is inevitable when you use superheterodyne receivers. You may notice the signals on the following spots of the bands.

1.234.56 MHz, 12.345.67 MHz

#### FAN NOISES

When the TX/ RX unit is installed in a non-ventilated area, the cooling fan(s) may increase in speed and emit a high level of noise for a long time. This is because the TX/ RX unit cannot be cooled down with the regular fan speed. In this case, relocate the TX/ RX unit so that air can easily flow through the TX/ RX unit to keep the unit cooled.

#### AGC

When you turn the AGC function OFF {page 35}, the receiving audio signals can be distorted. In this case, decrease the RF GAIN, turn the pre-amplifier OFF, or turn the attenuator ON. In general, the RF GAIN is greatly reduced when the AGC is turned OFF.

## DEMONSTRATION MODE

The transceiver can be configured to enter the demonstration mode for display purposes. To enter the demonstration mode:

- 1 Switch the transceiver OFF.
- 2 Press **[MENU/ F.LOCK]+[  $\phi$  ]** to switch the transceiver ON.
  - The display brightness changes, the LED turns ON/ OFF, and alpha-numeric segments turn ON/ OFF automatically.
  - If you operate the transceiver while in the demonstration mode, the demonstration is temporarily paused. But, if no operation is performed for more than 10 seconds, the demonstration starts again.
- 3 To exit the demonstration mode, first turn the transceiver OFF, then press **[MENU/ F.LOCK]+[  $\phi$  ]** to turn the transceiver ON.

**Note:** *You cannot exit the demonstration mode by simply switching the transceiver OFF or performing a full reset (page 88). You must switch the transceiver OFF then press **[MENU/ F.LOCK]+[  $\phi$  ]** to turn the transceiver ON in order to exit the demonstration mode.*

# OPTIONAL ACCESSORIES

## ARCP-480

Remote control software

Refer to page 68 for details.

## HS-5

Delux Headphones



## HS-6

Small Headphones



## LF-30A

Low-pass Filter



TS-480SAT only

## MC-43S

Microphone

MJ-88 is required.

## MC-47

Multi-function Microphone



MJ-88 is required.

## MC-60A

Desk-top Microphone

MJ-88 is required.

## MJ-88

Plug adaptor  
(8-pin metal to RJ45)

## PG-20

DC cable



## PG-4Z

Remote Control panel  
cable extension kit



## PS-53

Regulated DC Power  
Supply (22.5 A)



## SO-3

TCXO unit

## SP-50B

Mobile Speaker



## SP-23

External Speaker

## VGS-1

Voice Guide and Storage  
unit

## YF-107C

270 Hz IF filter

## YF-107CN

500 Hz IF filter

## YF-107SN

1.8 kHz IF filter

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