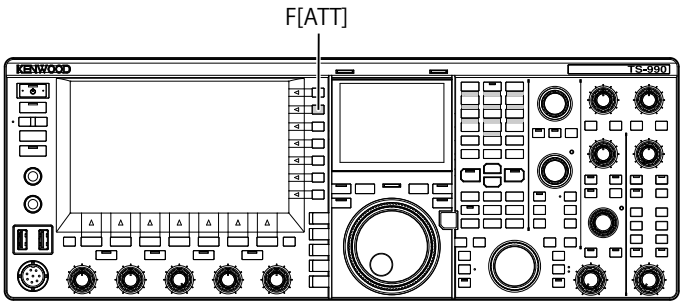
ATTENUATOR (ATT)

An attenuator is a function that attenuates or reduces the received signal level. When there is a strong signal present near the target signal, attenuating the adjacent signals can reduce or eliminate the interference.

The target signal will also be attenuated; however, this will facilitate you distinguishing the weak signal.

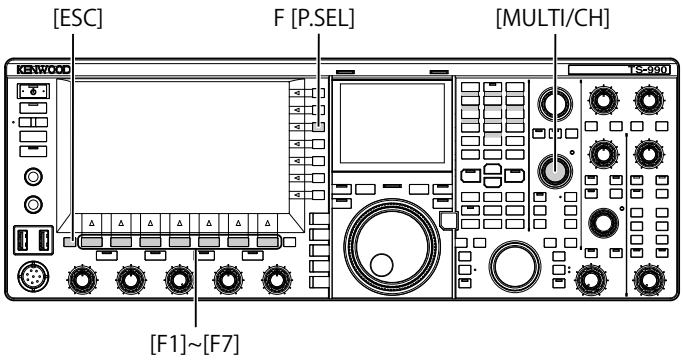
This will help a very strong signal from being distorted. The transceiver is equipped with three levels of attenuation, -6 dB, -12 dB, and -18 dB.



1 **[ATT]** (F) to select the attenuation level of the received signal.
- The attenuation level appears on the key guide displayed on the right side of the main screen.
- Each time you press **[ATT]** (F), the level cycles as follows: OFF > -6 dB > -12 dB > -18 dB > +10 dB > OFF. Each time you press and hold **[ATT]** (F), the attenuation level cycles in the reversed sequence.

PRESELECTOR

Selecting the narrow bandwidth tunable filter attenuates the interfering signal which has 2 to 3 MHz separation from the target frequency, instead of the strong interfering signal in the adjacent frequencies.



1 Select the main band.

2 Press **[P.SEL]** (F) to enable or disable the Preselector. The default is "OFF".

In the key guide **[P.SEL]** (F), the status of attenuator is indicated on the lower line.

While the Preselector is active, the status indicators below show how the operating band is shifted from the center frequency.

◄ON:
The filter bandwidth has been shifted to below the center frequency.

On
The filter bandwidth has been positioned at the center frequency.

ON►:
The filter bandwidth has been shifted to above the center frequency.

Note:
- The Preselector can only be used for the main band.
- The preselector can be used in the 1.8 MHz band, 3.5 MHz band, 7 MHz band, 10 MHz band, 14 MHz band, 18 MHz band, 21 MHz band, 24 MHz band, and 28 MHz band.
- Preamplifier and Preselector cannot be enabled at the same time. Enabling the Preselector while the Preamplifier is active temporarily disables the Preamplifier. The Preamplifier will be enabled again when the Preselector is disabled.

The center frequency of the narrow bandwidth tunable filter can be selected by moving the Preselector bandwidth.

1 Select the main band.

2 Press and hold **[P.SEL]** (F) while Preselector is enabled to open the **Preselector** screen.

3 Press [◄||] (F4) or [||►] (F5), or rotate the **MULTI/CH** control to shift the center frequency.

- You can shift and determine the filter position. Pressing **[CENTER]** (F1) places the filter center at the center frequency.
- The default is at the center position.

4 Press **[ESC]** to exit.

Note:

- Pressing **[P.SEL]** (F), when the frequency shifted outside the amateur band while operating in the main band, cannot enable the Preselector.
- "Outside of the Band" appears when the frequency is changed while the Preselector screen is open and when that frequency would shift outside the amateur band. The key guide display will be changed to **[P.SEL OFF]** (F) in place of **[P.SEL]** (F). Pressing **[P.SEL OFF]** (F) disables the Preselector, and the Preselector screen closes.

DSP FILTER

The transceiver was designed with integral digital signal processing (DSP) technologies. Changing the filter bandwidth using the DSP function can help suppress the interference, and reduce the noise level.

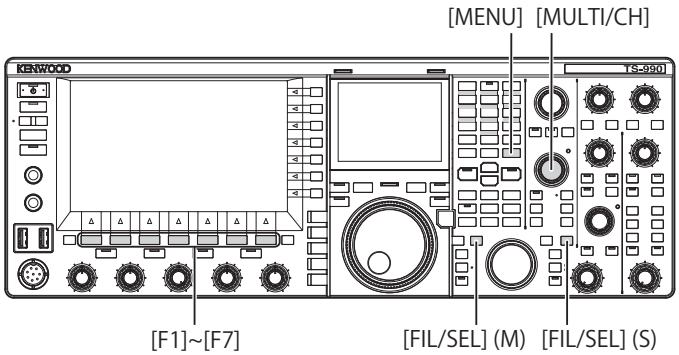
CHANGING THE IF FILTER BANDWIDTH CHARACTERISTICS

SWITCHING THE RX FILTER CONFIGURATIONS

The configurations (Types A, B and C) for the IF filters can instantly be switched according to your operating needs.

For example, wide bandwidth characteristics can be configured for A, standard bandwidth characteristics is configured for B, and narrow bandwidth characteristics for use during the contest or with the DX station can be configured for C in advance. To search for a station you wish to communicate, you may select the filter type A with the wide bandwidth configured, and for use during the contest or with the DX station, you may select the filter type C with the narrow bandwidth configured to increasing the readability.

The bandwidth characteristics can be configured by combining the roofing filter, the IF filter and the AF filter, the high frequency cutoff filter and the low frequency cutoff filter, and WIDTH and SHIFT. Also, the RX filter type (Type A, B, or C) can be configured for use in SSB, CW, FSK, PSK, FM, and AM modes respectively.



1 Press **[FIL/SEL]** (M) or **[FIL/SEL]** (S) to switch the receive filter.
Each key press cycles the RX filter type as follows: A > B > C > A.

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Note:

- RX filter type C cannot be selected if "2" is configured for Menu 6-06, "RX Filter Numbers".

CONFIGURING THE NUMBER OF RX FILTERS SELECTABLE

You can configure 3 (for A, B, and C) or 2 (for A and B) for the number of RX filters.

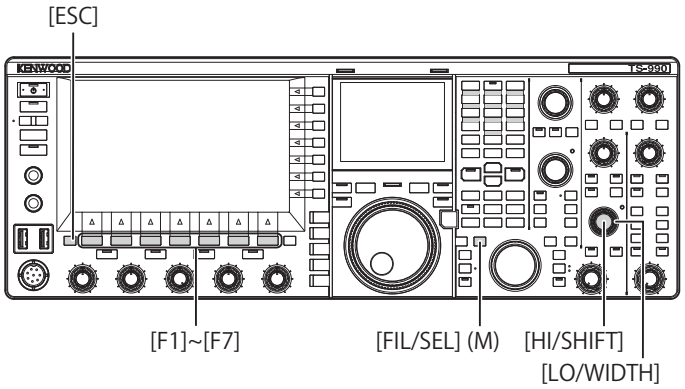
1. Select Group No. 6, "TX/RX Filters & Misc", from the **Menu** screen.
2. Access Menu 06, "RX Filter Numbers".
3. Press **[SELECT]** (F4) to allow editing of the parameter box.

4. Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to select the filter.
   You can select either "2" or "3". The default is "3".
5. Press [ ] (F1).
6. Press **[MENU]** to exit.

SELECTING THE ROOFING FILTER

The roofing filter suppresses strong radio interference signals adjacent to the target signal. The filter selections for the main band are Auto, 270 Hz, 500 Hz, 2.7 kHz, 6 kHz, 15 kHz, and Add (an additional roofing filter).

The sub band is locked to Auto.



1. Select the main band.
2. Press and hold **[FIL/SEL]** (M) to open the **RX Filter** screen.

3. Press **[FILTER]** (F2) or **[FIL/SEL]** (M) to select the receive filter.
   You can select the desired RX filter (A, B, or C).
4. Press **[ROOF]** (F3) to enable to edit the Roof Filter.
5. Subsequently, press **[ROOF]** (F3) to select the passband width.
   - Each time you press **[ROOF]** (F3), the selection cycles as follows: Auto > 270 > 500 > 2.7 k > 6 k > 15 k > Add > Auto.
   - Each long press of **[ROOF]** (F3) cycles the selection in the reversed sequence. Rotating the **MULTI/CH** control can also change the passband width.
   - The default is "Auto" for RX filters A, B, and C.
6. Press **[ESC]** to exit.

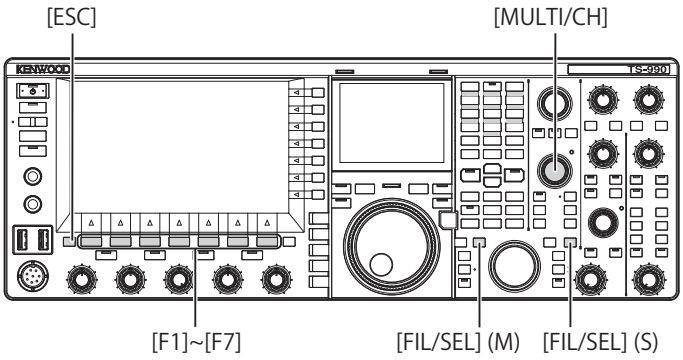
Note:

- The roofing filter, the bandwidth of which is wider than the passband width of the DSP filter, will be selected if there are any changes in the cutoff frequencies (low and high frequencies), and passband width and its shift from the center frequency while Auto is selected for the current filter.
- "Add." in the passband width appears if the additional roofing filter is installed in the transceiver and anything other than "Off" is configured for Advanced Menu 6. {page 16-22}
- While the **RX Filter** screen is open, rotating the **HI/SHIFT** or **LO/WIDTH** control will change the activated cutoff frequencies (low and high frequencies). The cutoff frequencies (low and high frequencies) appear on the **RX Filter** screen.
- In FM mode, 15 kHz will be configured and cannot be changed.

♦ If "Off" is configured for Advanced Menu 06, "Bandwidth (Additional Roofing Filter)", "Add." does not appear as the parameter for passband width.

SWITCHING THE IF FILTER TYPE

You can select from one of three types of IF filters (Sharp, Medium, and Soft) following the type of interference and the operating environment.



1 Press and hold **[FIL/SEL]** (M) or **[FIL/SEL]** (S) to open the **RX Filter** screen.
The selected band and the mode name while receiving appear, and the selected RX filter (A, B, or C) can be edited.

2 Press **[FILTER]** (F2) or **[FIL/SEL]** (M) or **[FIL/SEL]** (S) to select the receive filter.
- Each press cycles the type of the RX filter through A > B > C). In the main screen, the letter "A", "B", or "C" appears above the frequency display of the selected band.
- The filter type, if appears in the sub-screen, changes according to the RX filter type selected.

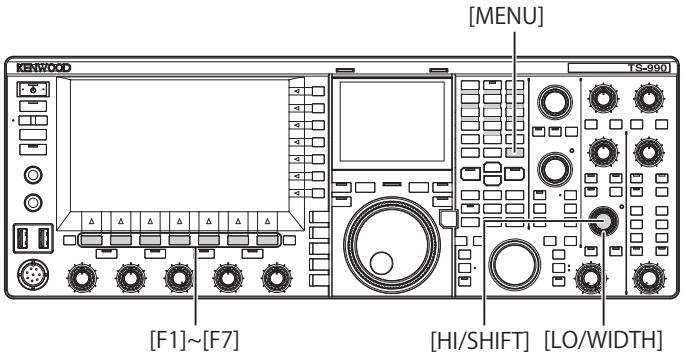
3 Press **[IF]** (F4) to enable to edit the IF Filter.

4 Subsequently, press **[IF]** (F4) to select the filter shape.
Each time you press **[IF]** (F4), the selection cycles as follows: Medium > Sharp > Soft > Medium. The default is "Medium".

5 Press **[ESC]** to exit.

CONFIGURING THE BEHAVIOR OF HI/SHIFT AND LO/WIDTH (SSB AND SSB-DATA ONLY)

For use in SSB or SSB-DATA mode, you can configure the cutoff frequencies (low and high frequencies) or passband width and its amount of shift from the center frequency using the **HI/SHIFT** control and **LO/WIDTH** control.



■ Behavior of the HI/SHIFT and LO/WIDTH controls in SSB mode

1 Select Group No. 6, "TX/RX Filters & Misc", from the **Menu** screen.

2 Access Menu 07, "Filter Control in SSB Mode (High/Low and Shift/Width)".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.

4 Press **[-]** (F4) or **[+]** (F5) to select either "High & Low Cut" or "Shift & Width" for the behavior of the control.
The changes of the shift and filter type appear on the **RX Filter** screen. The default is "High & Low Cut".

If "High & Low Cut" is selected:
A value for cutoff frequency (either low or high) will vary.

If "Shift & Width" is selected:
Values for the passband width and the amount of the shift will vary.

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

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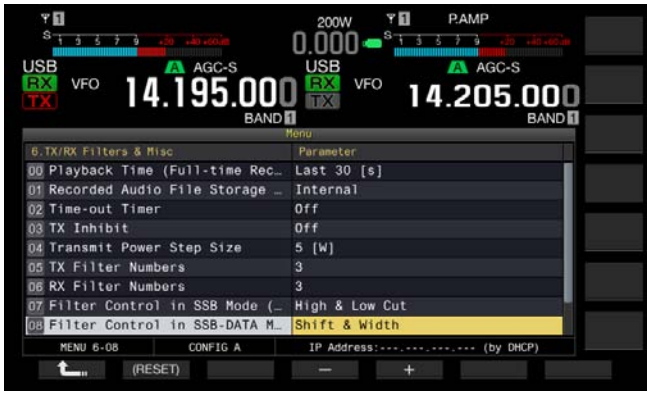
■ Behavior of the HI/SHIFT and LO/WIDTH controls in SSB-DATA mode

1 Select Group No. 6, "TX/RX Filters & Misc", from the **Menu** screen.

2 Access Menu 08, "Filter Control in SSB-DATA Mode (High/Shift and Low/Width)".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5) to select either "High & Low Cut" or "Shift & Width" for the behavior of the control.
The changes of the shift and filter type appear on the **RX Filter** screen. The default is "Shift & Width".

If "High & Low Cut" is selected:
The value of the cutoff frequency (either low or high) will vary.

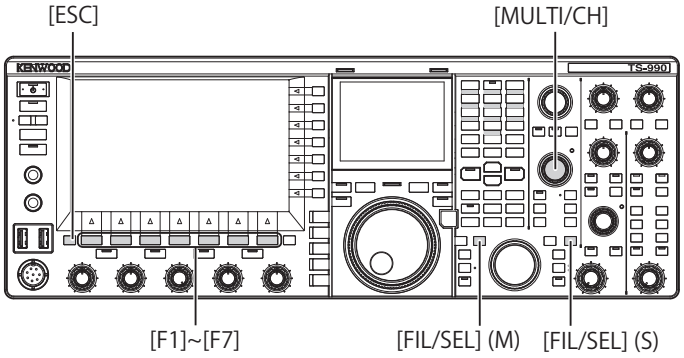
If "Shift & Width" is selected:
Values for the passband width and the amount of the shift will vary.

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

CHANGING THE AF FILTER TYPE

Like the IF filters, the passband width of audio frequencies can be selected from three types (Narrow, Medium, and Wide).



1 Press and hold **[FIL/SEL]** (M) or **[FIL/SEL]** (S) to open the **RX Filter** screen.
The selected band and the mode name while receiving appear, and the selected RX filter (A, B, or C) will be enabled.

2 Press **[FILTER]** (F2) or **[FIL/SEL]** (M) or **[FIL/SEL]** (S) to select the receive filter.
Each press cycles the RX filter through A > B > C.

3 Press **[AF]** (F5) to enable to edit the AF Filter.

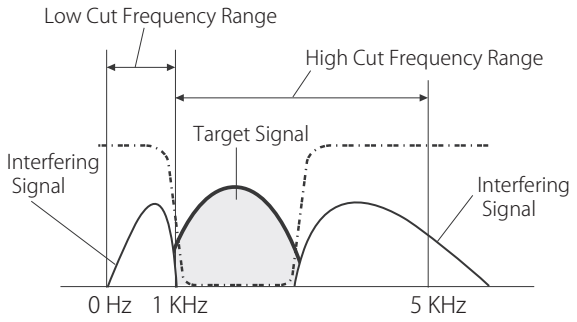
4 Subsequently, press **[AF]** (F5) to select the filter shape.
- Each time you press **[AF]** (F5), the selection cycles as follows: Medium > Wide > Narrow >Medium Rotating the **MULTI/CH** control can also change the filter shape.
- The default is "Medium".

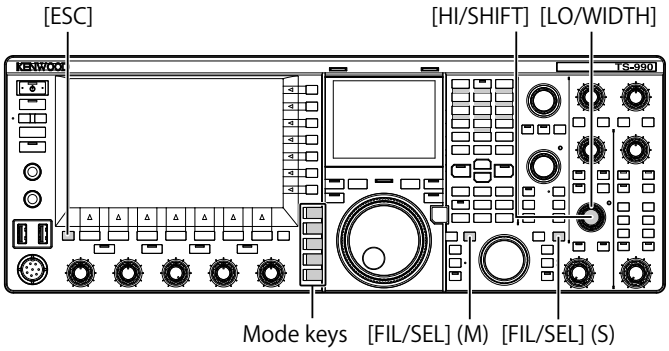
5 Press **[ESC]** to exit.
Pressing **[FIL/SEL]** (M) or **[FIL/SEL]** (S) closes the **RX Filter** screen as well.

CHANGING THE CUTOFF FREQUENCIES (LOW AND HIGH FREQUENCY) TO ADJUST THE PASSBAND WIDTH CHARACTERISTICS

In the SSB, AM, or FM mode, you can modify the passband width of the filter by changing the cutoff frequencies (low and high frequency).

You can change the passband width so that interference will be outside the bandwidth of the filter.





1 Press one of mode keys to select LSB, USB, FM, or AM mode.

2 Press and hold **[FIL/SEL]** (M) or **[FIL/SEL]** (S) to open the **RX Filter** screen.
The selected band and the mode name while receiving appear, and the selected RX filter (A, B, or C) is activated.

3 Rotate either **HI/SHIFT** or **LO/WIDTH** control.
- Rotating the **HI/SHIFT** control clockwise increases the high cutoff frequency and rotating it counterclockwise decreases the high cutoff frequency.
- Rotating the **LO/WIDTH** control clockwise increases the low cutoff frequency and rotating it counterclockwise decreases the high cutoff frequency.
- The changes of the shift and filter type appear on the **RX Filter** screen.

4 Press **[ESC]** to exit.
Pressing **[FIL/SEL]** (M) or **[FIL/SEL]** (S) closes the **RX Filter** screen.

Note:

♦ You can view the progress of adjustments while the sub-scope appears on the sub-screen.

Mode	Cutoff frequency (low) (Hz)		Cutoff frequency (high) (Hz)	
	Range	Default	Range	Default
LSB/USB/FM	0, 50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000	200	1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3400, 4000, 5000	2800
AM	0, 100, 200, 300	100	2500, 3000, 4000, 5000	5000

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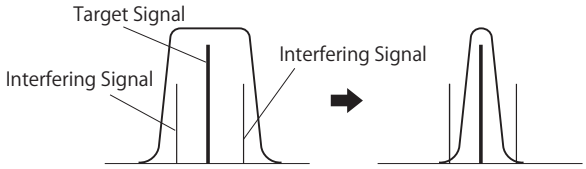
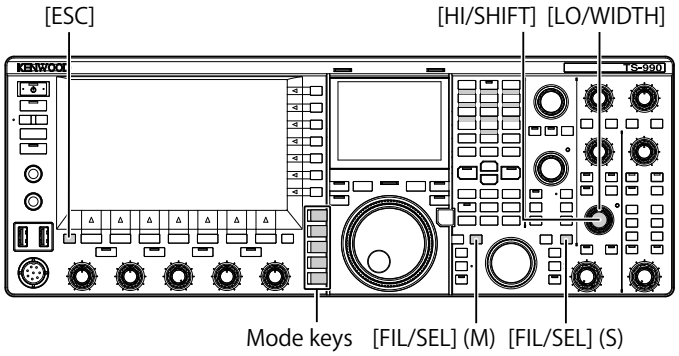
CHANGING THE PASSBAND WIDTH AND SHIFT TO ADJUST PASSBAND CHARACTERISTICS

For use in CW or SSB-DATA mode, you can change the passband width of the DSP filter and its amount of shift from the center frequency. For use in RTTY (FSK) or PSK mode, you can change the passband width. You can change the passband width so that interference will be outside the bandwidth of the filter.





1 Press a mode key to select CW, USB-DATA, LSB-DATA, FSK, or PSK mode.

2 Press and hold **[FIL/SEL]** (M) or **[FIL/SEL]** (S) to open the **RX Filter** screen.
The selected band and the mode name while receiving appear, and the selected RX filter (A, B, or C) can be edited.

3 Rotate the **LO/WIDTH** control to change the passband width.
Rotating the control clockwise increases the passband width and counterclockwise decreases the passband width.

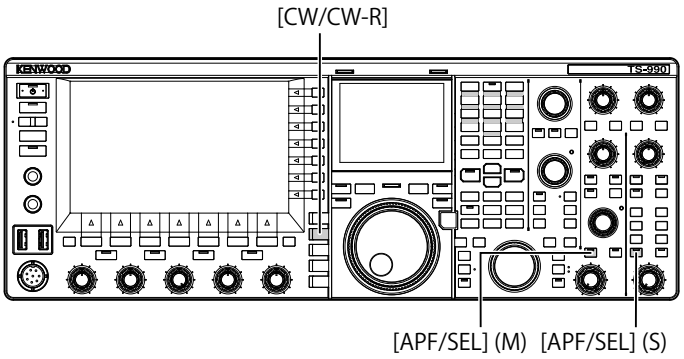
4 Rotate the **HI/SHIFT** control.
Rotating the control clockwise shifts the frequency passband width higher and counterclockwise shifts the frequency passband width lower. The frequency range for use in FSK and PSK mode cannot be adjusted.

5 Press **[ESC]** to exit.
Pressing **[FIL/SEL]** (M) or **[FIL/SEL]** (S) closes the **RX Filter** screen.

Mode	Passband width (Hz)		Shift Frequency (Hz)	
	Range	Default	Range	Default
CW	50, 80, 100, 150, 200, 250, 300, 400, 500, 600, 1000, 1500, 2000, 2500	500	-800, -750, -700, -650, -600, -550, -500, -450, -400, -350, -300, -250, -200,-150,-100, -50, 0, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800	800
DATA	50, 80, 100, 150, 200, 250, 300, 400, 500, 600, 1000, 1500, 2000, 2200, 2400, 2600, 2800, 13000	2600	1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2210	1500
FSK	250, 300, 400, 500, 1000, 1500	500	2210 only	
PSK	50, 80, 100, 150, 200, 250, 300, 400, 500, 600, 1000, 1500	500	1500 only	

ACTIVATING AUDIO PEAK FILTER FOR USE IN CW MODE

If the readability of a signal is affected by noise or any other interference while receiving in CW mode, passing the receive signal through a bandwidth centered on the CW pitch frequency improves its readability.

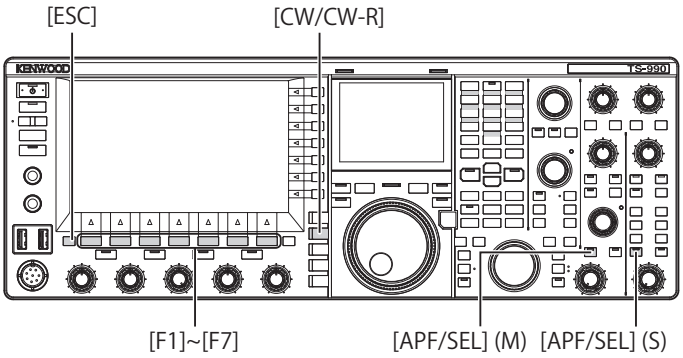


1 Press **[CW/CW-R]** to select CW mode.

2 Press **[APF/SEL]** (M) or **[APF/SEL]** (S).
- Each time you press either one of the keys, the audio peak filter for the selected band toggles between active and inactive. While the audio peak filter is active, the "APF/SEL" (M) or "APF/SEL" (S) LED lights green.
- The audio peak filter for the selected band is disabled by a press of the same key.

CHANGING THE PASSBAND CHARACTERISTICS OF THE AUDIO PEAK FILTER (APF)

You can select the passband width of the audio peak filter from three types, Narrow (80 Hz), Middle (160 Hz), and Wide (320 Hz).



1 Press **[CW/CW-R]** to select CW mode.

2 Press and hold **[APF/SEL]** (M) or **[APF/SEL]** (S) to open the **APF** screen for the selected band.

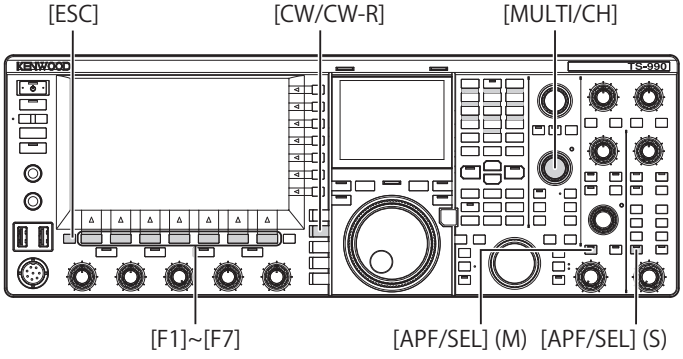
3 Press [▲] (F2) or [▼] (F3) to select the passband width.
- You can select “Nar (80 Hz)”, “Mid (160 Hz)”, or “Wide (320 Hz)” from available range.
- The default is “Mid (160 Hz)”

4 Press **[ESC]** to exit.
Pressing and holding **[APF/SEL]** (M) or **[APF/SEL]** (S) closes the **APF** screen.

SHIFTING THE PASSBAND OF THE AUDIO PEAK FILTER

You can avoid interference from adjacent frequencies by shifting the passband of the audio peak filter.

The amount of shift for the passband width is ±200 Hz from the CW pitch frequency.



1 Press **[CW/CW-R]** to select CW mode.

2 Press and hold **[APF/SEL]** (M) or **[APF/SEL]** (S) to open the **APF** screen for the selected band.

3 Press [◀] (F4) or [▶] (F5), or rotate the **MULTI/CH** control to shift the passband width.
- The passband width of the selected audio peak filter is shifted above or below the CW pitch frequency.
- The default is "0" (zero shift from the pitch frequency).

4 Press **[ESC]** to exit.
Pressing and holding **[APF/SEL]** (M) or **[APF/SEL]** (S) closes the **APF** screen.

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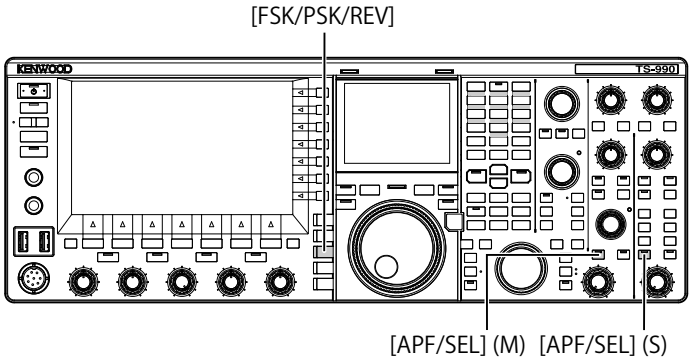
AUDIO PEAK FILTER WHILE IN FSK MODE

While the transceiver receives a signal in FSK mode, the audio peak filter allows the mark frequency and space frequency each to have a peak, thus reducing the occurrence of garbled characters and increasing the readability of the signal. The audio peak filter supports not only high-tone signals with a mark frequency of 2125 Hz but also low-tone signals with a mark frequency of 1275 Hz. {page 5-46}



1 Press **[FSK/PSK/REV]** to select FSK mode.

2 Press **[APF/SEL]** (M) or **[APF/SEL]** (S) to enable the audio peak filter for the selected band.
While the audio peak filter is active, the "APF/SEL" (M) or "APF/SEL" (S) LED lights green.

Note:

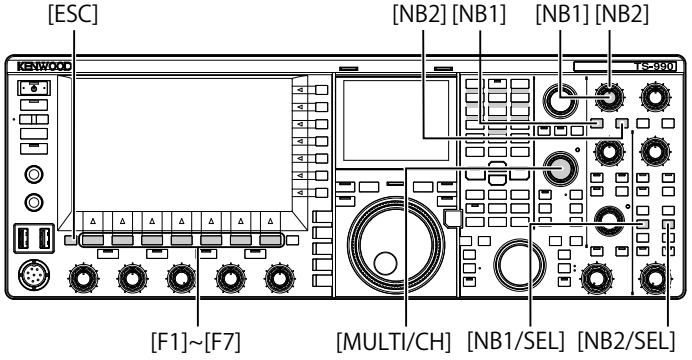
- If the shift width for RTTY mode exceeds 170 Hz, the audio peak filter for the selected band cannot be enabled
- The audio filter for use in FSK mode does not process the signal to be demodulated internally.

NOISE BLANKER

The noise blanker suppresses “crunching” pulse noise. The transceiver incorporates two types of noise blanker; Noise Blanker 1 (NB1) for analog signal processing, and Noise Blanker 2 (NB2) for digital signal processing at the IF stage by means of a DSP. You can select either NB1 or NB2 as desired depending on the noise status. Both can be enabled at the same time.

Note:

- In FM mode, you cannot use Noise Blanker.
- Noise is suppressed more effectively if a larger value is configured, but there may be some effect on the received signal.



■ Activating or deactivating the Noise Blankers for the main band

1 Press **[NB1]** or **[NB2]**.
- Noise Blanker 1 or 2 for the main band is activated or deactivated.
- While Noise Blanker 1 or Noise Blanker 2 is active, "NB1" or "NB2" appears on the upper left side of the main screen. While both Noise Blanker 1 and Noise Blanker 2 are active, "NB1 2" appears on the upper left side of the main screen.
- Pressing the key again deactivates Noise Blanker for the main band.

■ Activating or deactivating the Noise Blankers for the sub band

1 Press **[NB1/SEL]** or **[NB2/SEL]**.
- Noise Blanker 1 or Noise Blanker 2 for the sub band becomes active or inactive.
- While Noise Blanker 1 or Noise Blanker 2 is active, "NB1" or "NB2" appears on the upper left side of the main screen. While both Noise Blanker 1 and Noise Blanker 2 are active, "NB1 2" appears on the upper left side of the main screen.
- To deactivate Noise Blanker 1 or Noise Blanker 2 for the sub band, press the key again.

■ Adjusting the Noise Blanker levels for the main band.

1 Rotate the **NB1** or **NB2** control.
- You can adjust the level of NB1 or NB2.
- Rotating the **NB1** or **NB2** control clockwise suppresses noise.

■ Adjusting the Noise Blanker levels for the sub band.

1 Press and hold **[NB1/SEL]** or **[NB2/SEL]**.
The **Noise Blanker 1 (Sub)** screen or **Noise Blanker 2 (Sub)** screen appears.

Note:

♦ If the transceiver receives the CW signal while Noise Blanker 2 is active, the received audio may be distorted.

2 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to adjust the level.

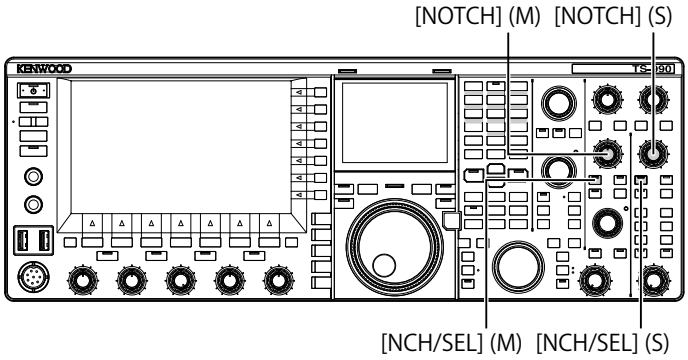
- You can adjust the level of Noise Blanker 1 or Noise Blanker 2.
- The available range is "1" to "10". The default is "6". Noise is suppressed more effectively if a larger value is configured.

3 Press **[ESC]** to exit.
Pressing and holding **[NB1/SEL]** or **[NB2/SEL]** closes the **Noise Blanker 1 (Sub)** screen or **Noise Blanker 2 (Sub)** screen.

MANUAL NOTCH FILTER (SSB, CW, FSK, and PSK)

The manual notch filter is an IF-stage notch filter that suppresses beat interference.

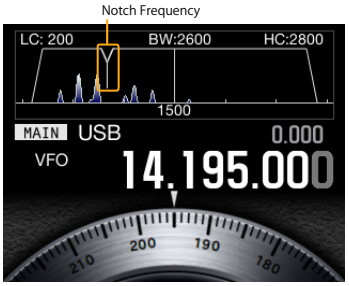
You can use the manual notch filter to eliminate beat noise and catch weak signals or operate the transceiver while checking the status of noise.



■ Activating or deactivating the Manual Notch filter

1 Press **[NCH/SEL]** (M) or **[NCH/SEL]** (S) to enable the manual notch filter for the selected band.

- The "NCH/SEL" (M) LED or "NCH/SEL" (S) LED lights green. In the main screen, "NOTCH" appears on the upper left side of the frequency display for the selected band.
- The letter "Y" appears to indicate the notch frequency if the filter type is displayed in the sub screen.
- Press the key again to deactivate the manual notch filter for the selected band.



2 Rotate the **NOTCH** (M) or **NOTCH** (S) control.
Adjust the notch frequency to the point where the beat or interference is suppressed. The letter "Y" indicating the notch frequency moves left and right if the filter type appears on the sub-screen.

Note:

♦ The manual notch filter is deactivated if the auto notch filter or band elimination filter is active.

♦ The notch point against an interfering beat cannot be changed even if a pitch and shift is changed after the notch point is determined in CW mode.

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■ Changing the bandwidth of the manual notch filter

Configure Wide or Normal for the stopband width of the manual notch filter. If Wide is configured for the bandwidth, the stopband width of the manual notch filter will be expanded twice as wide as Normal.

1 Press **[NCH/SEL]** (M) or **[NCH/SEL]** (S) to enable the manual notch filter for the selected band.
The manual notch filter for the selected band will be alternated between enabled and disabled.

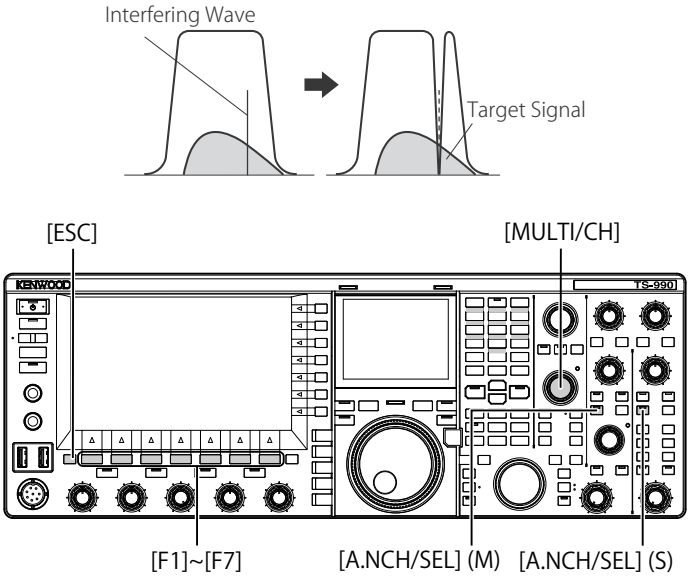
2 Press and hold **[NCH/SEL]** (M) or **[NCH/SEL]** (S) .
- "Normal" or "Wide" is configured for the passband width.
- If "Wide" is selected, "NOTCH W" will appear above the frequency display of the selected band, in the main screen.

Auto Notch Filter (SSB)

If there is a single interfering tone (i.e., a cyclic signal like CW) in the receive bandwidth, the auto notch filter searches for, finds, and suppresses the interfering tone automatically.

This function occasionally slightly suppresses the S-meter readout or the target signal.

If there is a weak interference signal, beat cancellation may be able to eliminate it more effectively.



■ Activating the auto notch filter

1 Press **[A.NCH/SEL]** (M) or **[A.NCH/SEL]** (S) to enable the auto notch filter for the selected band.
- The “A.NCH/SEL” (M) or “A.NCH/SEL” (S) LED lights green.
- In the main screen, "A.NOTCH" will appear above the frequency display of the selected band.
- The auto notch filter for the selected band is deactivated when the corresponding key is pressed again.

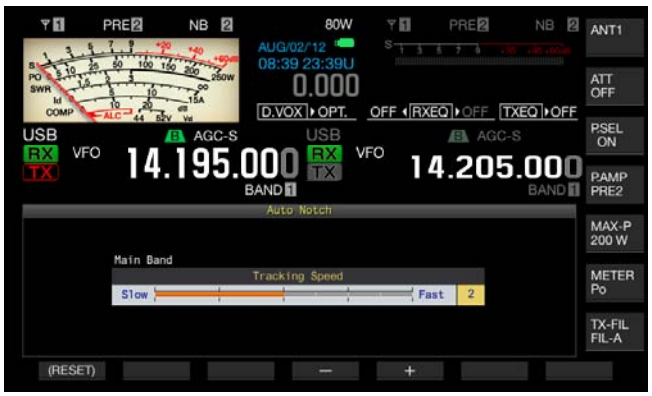
Note:

♦ The auto notch filter is deactivated if the manual notch filter or band elimination filter is active while the auto notch filter is active.

■ Adjusting the tracking speed of the Auto Notch

Adjust the speed of the notch filter to follow the interference according to the changing status of the interfering signal.

1 Press and hold **[A.NCH/SEL]** (M) to open the **Auto Notch** screen.



2 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to select the level for each frequency band.
Available range is "0" (disable the tracking) and from "1" (slow) to "4" (fast). The default is "2".

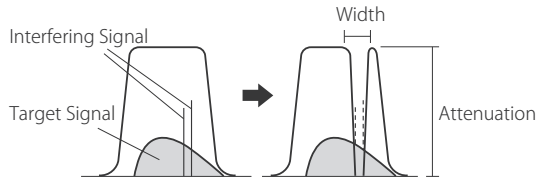
3 Press **[ESC]** to exit.
Pressing and holding **[A.NCH/SEL]** (M) or **[A.NCH/SEL]** (S) closes the Auto Notch screen.

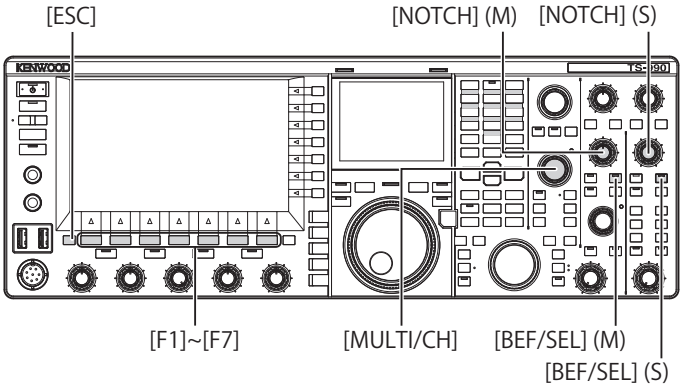
BAND ELIMINATION FILTER

Band Elimination Filter is the notch filter that can change the bandwidth and attenuation at the IF stage.

The stopband width can be selected from the available range of 300 Hz to 1200 Hz (in steps of 100 Hz) and the amount of attenuation can be selected from the available range of 20 dB to 80 dB (in steps of 20 dB).

If there are two or more interfering signals, you can adjust the stopband width and attenuation level according to the strength of the interfering signals, thus making the target signal clear.





■ Activating or deactivating the Band Elimination Filter.

1 Press **[BEF/SEL]** (M) or **[BEF/SEL]** (S) to enable the band elimination filter for the selected band.

- The "BEF/SEL" (M) LED or "BEF/SEL" (S) LED lights green. In the main screen, "BEF" will appear above the frequency display of the selected band.
- The letter "Y" appears to indicate the notch frequency if the filter type is displayed in the sub screen.
- Press the key again to disable the band elimination filter for the selected band.

2 Rotate the **NOTCH** (M) or **NOTCH** (S) control to adjust the notch filter frequency.
You can adjust the notch frequency to the point where the beat or interference is suppressed. The letter "Y" indicating the notch frequency moves left and right if the filter type appears on the sub-screen.

Note:

- The band elimination filter is deactivated if the manual notch filter or band elimination filter is active.
- The notch point against an interfering beat cannot be changed even if a pitch and shift is changed after the notch point is determined in CW mode.

■ Changing the stopband width of the Band Elimination Filter

1 Press and hold **[BEF/SEL]** (M) or **[BEF/SEL]** (S) to open the **Band Elimination Filter** screen for the selected band.

2 Press **[▲]** (F2) or **[▼]** (F3) to select "Wide" for the bandwidth.

3 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to select the stopband width.

- You can select the stopband width of the band elimination filter.
- Available range is "300" Hz to "1200" Hz (in steps of 100 Hz).
- The default is "400".

4 Press **[ESC]** to exit.
Pressing and holding **[BEF/SEL]** (M) or **[BEF/SEL]** (S) closes the **Band Elimination Filter** screen.

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■ Changing the attenuation level of the Band Elimination Filter

1 Press and hold **[BEF/SEL]** (M) or **[BEF/SEL]** (S) to open the **Band Elimination Filter** screen for the selected band.

2 Press **[▲]** (F2) or **[▼]** (F3) to allow editing of "Depth" (attenuation level).

3 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to select the amount of attenuation.
- You can select the attenuation level of the band elimination filter.
- Available range is "20" Hz to "80" dB (in steps of 20 dB).
- The default is "40".

4 Press **[ESC]** to exit.
Pressing and holding **[BEF/SEL]** (M) or **[BEF/SEL]** (S) closes the **Band Elimination Filter** screen.

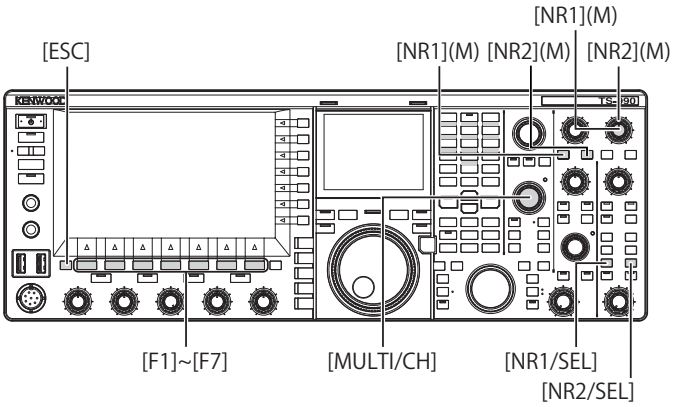
NOISE REDUCTION

The transceiver incorporates two types of noise reduction, i.e., Noise Reduction 1 (NR1) and Noise Reduction 2 (NR2).

With Noise Reduction 1 selected, spectrum subtraction noise reduction filter that attaches importance to readability is activated while the transceiver is receiving an audio signal in SSB, FM, or AM mode. While the transceiver is receiving an audio signal in CW, FSK, or PSK mode, a LSM type noise reduction that emphasizes the periodic signal is activated instead.

This is suitable for communication in CW mode because the SPAC system can function during reception to extract periodic signals using the Noise Reduction 2.

Note:
- When Noise Reduction 1 in SSB, FM, or AM mode is suppressing beat signals, wanted signals may also be slightly suppressed. This is a normal action of Noise Reduction 1, and not a failure.
- If Noise Reduction 2 is active while the transceiver is in SSB mode, the readability of the wanted signal may drop or pulse noise or distortion may occur.
- Noise Reduction 2 cannot be used for FM mode.



■ Activating the Noise Reduction for the main band

1 Press **[NR1]** or **[NR2]**.
- Noise Reduction 1 or Noise Reduction 2 for the main band is activated or deactivated.
- While Noise Reduction 1 or Noise Reduction 2 is active, "NR1" or "NR2" appears on the upper left side of the main screen.
- Press the key again to deactivate the noise reduction for the main band.

■ Activating the Noise Reduction for the sub band

1 Press **[NR1/SEL]** or **[NR2/SEL]**.
- Noise Reduction 1 or Noise Reduction 2 for the sub band becomes active or inactive. While Noise Reduction 1 or Noise Reduction 2 is active, "NR1" or "NR2" appears on the upper left side of the main screen.
- Pressing the key again deactivates the noise reduction for sub band.

Note:
- Noise Reduction 1 and Noise Reduction 2 cannot both be enabled at the same time for both main band and sub band.

■ Adjusting the Noise Reduction Levels for the main band

1 Rotate the **NR1** or **NR2** control to adjust the effect level for the Noise Reduction 1 or the time constant for Noise Reduction 2.
Rotating the **NR1** or **NR2** control clockwise suppresses noise.

■ Adjusting the Noise Reduction Levels for the sub band

1 Press and hold **[NR1/SEL]** or **[NR2/SEL]** to open the **Noise Reduction 1 (Sub)** or **Noise Reduction 2 (Sub)** screen.

Noise Reduction 1

Noise Reduction 2

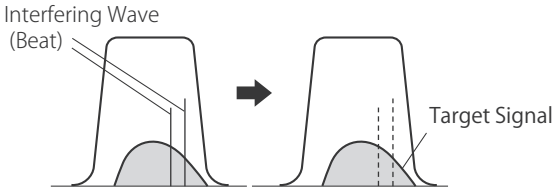
2 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to adjust the effect level for the Noise Reduction 1 or the time constant for Noise Reduction 2.
- Noise is suppressed more effectively if a larger value is configured.
- The available range for Noise Reduction 1 is from "1" to "10". The default is "5". The available range for Noise Reduction 2 is from "2" to "20". The default is "20".

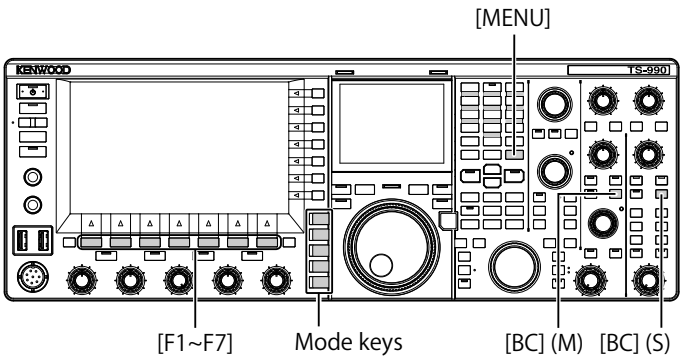
3 Press **[ESC]** to exit.
Pressing and holding **[NR1/SEL]** or **[NR2/SEL]** closes the **Noise Reduction 1 (Sub)** or **Noise Reduction 2 (Sub)** screen.

BEAT CANCELLER (SSB, AM AND FM)

The beat canceller performs digital processing at the AF stage, thus making it possible to suppress a number of periodic interference signals (beat signals) in the receive bandwidth.

You can use the beat canceller for SSB, AM, and FM modes.





1 Press one of the mode keys to select USB, FM, or AM mode.

2 Press **[BC]** (M) or **[BC]** (S) to select the Beat Canceller.
- Each time you press the key, the beat canceller for the selected band cycles as follows: Off > BC1 > BC2 > Off
In the main screen, "BC1" appears above the frequency display of the selected band with Beat Canceller 2 enabled.
- In the main screen, "BC2" appears above the frequency display of the selected band if Beat Canceller 2 is active.
- If BC1 is configured, it suppresses weak or continuous beat signals. If BC2 is configured, it suppresses intermittent beat signals like CW signals.

Note:

♦ Beat Canceller can suppress the overall audible beat; however, the gain of the target signal cannot be recovered by the AGC function. Therefore, if the beat signal is larger than the target signal, use of the manual notch filter, auto notch filter or band elimination filter may activate the AGC function making the target signal clearly.

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DSP MONITOR

The DSP monitor is a function that temporarily expands the passband width of IF filter and AF filter by means of the DSP filter allowing you to temporarily distinguish the wave status of the waveform while the transceiver receives the particular frequency, for instance during the contest, using the narrow passband width filter.

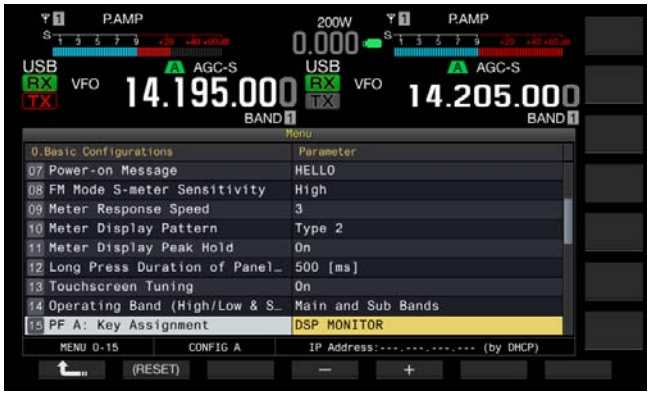
While pressing down the PF key assigned as the DSP monitor, the passband width can be expanded.

ASSIGNING THE DSP MONITOR TO THE PF KEY

1 Select Group No. 0, "Basic Configurations", from the **Menu** screen.

2 Access Menu 15, "PF A: Key Assignment", to Menu 32, "Microphone UP: Key Assignment".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F3) or **[+]** (F5) to select "DSP MONITOR".

5 Press **[ ]** (F1).

6 Press **[MENU]** to exit.

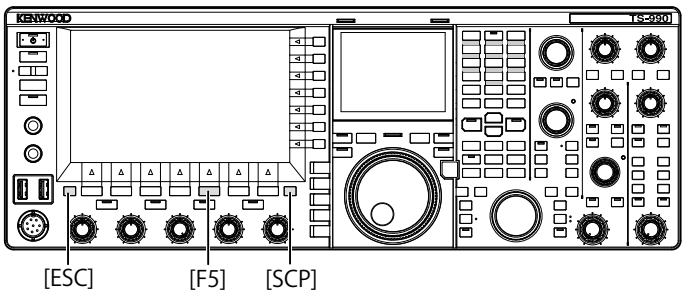
EXPANDING THE PASSBAND WIDTH OF THE FILTER USING THE DSP MONITOR

1 Press down the PF key assigned as the DSP monitor.
While pressing down the key, the passband width of the filter expands.

BANDSCOPE

The Bandscope displays the signal strength along the vertical axis and the frequency along the horizontal axis, allowing you to observe the status of the received frequency.

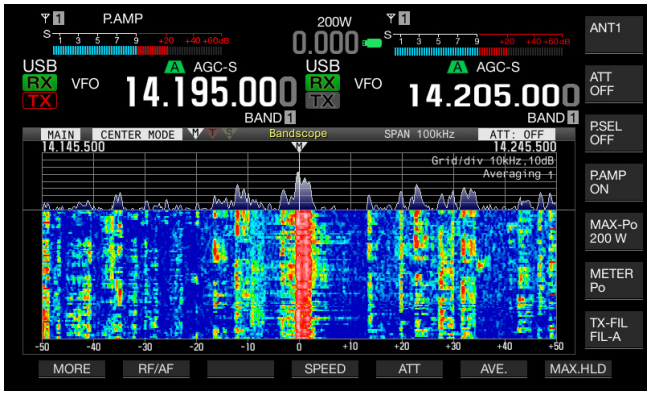
There are two modes available: Center mode, which places the receive frequency at the center of the horizontal axis, and Fixed mode, where the lower limit frequency and upper limit frequency for the displayed band are fixed.



DISPLAYING THE BANDSCOPE

1 Press **[SCP]** to display the bandscope on the main display.

Each time you press **[SCP]**, the screen cycles through Bandscope > Bandscope and Waterfall > No Bandscope Display > Bandscope.



2 Press **[ESC]** to exit.

WATERFALL

Displaying the waterfall below the bandscope allows you to observe the transition of the signal strength in addition to the state of the received signal and its adjacent frequencies.

In the waterfall display, the vertical axis represents elapsed of time and the horizontal axis represents the frequency.

The signal strength is distinguished by its color on the display; white (strong), red to yellow (medium) and green to blue (weak).

The spectrum of the signal strength for the range equivalent to the four times of the red marker appears vertically. The span until the next red marker appears (in other words, waterfall fall speed) can be changed.

While the Waterfall is being displayed, the bandscope height is reduced to one third compared to when only the bandscope is displayed.

Note:

- In Center mode, the waterfall display pauses if the receive frequency is changed.
- In Fixed mode, with the observation of the target signal (vertical trace) displayed on the Waterfall, shift the marker position to tune the signal.

ADJUSTING THE REFERENCE LEVEL

If it is not easy to distinguish the target signal from the noise in the noisy environment or if you observe a weak signal on a quiet band, the reference level for the bandscope can be adjusted to allow you to distinguish the target signal.

1 Press **[REF.LEV]** (F5) to display the current value of the reference level at the center of the **Bandscope** screen.

2 Observe the spectra of the bandscope waveform and waterfall on the **Bandscope** screen, rotate the **MULTI/CH** control to adjust the reference level in the range from -20.0 dB to +20.0 dB.

3 Press **[REF.LEV]** (F5) to finish the adjustment for the reference level.

Note:

- If the target signal cannot be distinguished due to the excessively large input signal even after the reference level has been adjusted, the attenuation level of the bandscope can be changed. {page 7-8}

CONFIGURING THE WATERFALL DISPLAY FALL SPEED

The fall speed of the waterfall display can be configured.

1 Press **[SPEED]** (F4) to select the waterfall speed.
- Each time you press **[SPEED]** (F4), the fall speed cycles through "Speed 1" (60 seconds) > "Speed 2" (20 seconds) > "Speed 3" (8 seconds) > "Speed 1". The default is "Speed 3".
- If **[SPEED]** (F4) is unavailable in the key guide, press **[MORE]** (F1).
- Each long press of **[SPEED]** (F4) cycles the fall speed in the reversed sequence.

CHANGING THE DISPLAY OF THE BANDSCOPE (MAIN BAND AND SUB BAND)

The signal to be displayed in the bandscope can be selected from the main band signal or sub band signal.

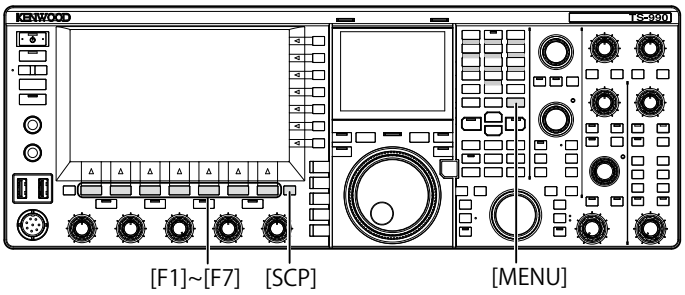
Follow the procedure below while the bandscope appears.

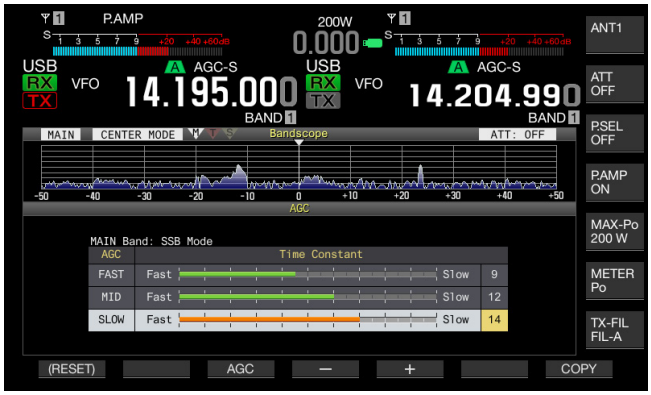
1 Press **[M/S]** (F2) to toggle the selected band between the main band and the sub band.
- Each time you press **[M/S]** (F2), the selection toggles between **[MAIN]** and **[SUB]**. Each time the selection is toggled, the markers for the lower limit frequency displayed on the upper left side of the grid, and the upper limit frequency displayed on the upper right side of the grid will change.
- If **[M/S]** (F2) is unavailable in the key guide, press **[MORE]** (F1).

DISPLAYING THE BANDSCOPE AND ANOTHER SCREEN

You can display the bandscope while the **RTTY Encode/Decode** or **PSK Encode/Decode** screen appears, provided that the transceiver is in FSK or PSK mode or the configuration screen is displayed.

Press **[SCP]** to display the **Bandscope** screen with the scale in the vertical direction compressed to 1/3. The **[RF/AF]** (F2), **[ATT]** (F5), or other function keys for the bandscope do not appear along the bottom of the main screen while the bandscope appears coupled with the other screen; hence, you cannot change the configurations for the bandscope.





TOGGLING THE CENTER MODE AND FIXED MODE

There are two modes available, the Center mode which always places the receive frequency at the center of the bandscope, and the Fixed mode which displays fixed lower and upper frequency limits.

Follow the procedure below while the bandscope appears.

1 Press **[CRT/FIX]** (F3) to change the display.
- Each time you press **[MODE]** (F7), the selection toggles between "CENTER MODE" and "FIXED MODE".
- If **[CTR/FIX]** (F3) is unavailable in the key guide, press **[MORE]** (F1).

Note:

♦ In Fixed mode, with the observation of the target signal (vertical trace) displayed on the Waterfall, shift the marker position to tune the signal. This enables you to tune more easier than in Center mode.

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CHANGING THE DISPLAYED FREQUENCY SPAN (CENTER MODE)

You can change the displayed frequency span (the width of the lower limit and upper limit frequencies on the Bandscope screen) while the bandscope is displayed in Center mode.

1 Press **[SPAN]** (F4) to change the frequency display span.

- Each key press cycles the frequency span through 5 kHz > 10 kHz > 20 kHz > 50 kHz > 100 kHz > 200 kHz > 500 kHz > 5 kHz.
- Each long press of **[SPAN]** (F4) cycles the selection in the reversed sequence.
- The selected frequency span appears as "SPAN 50 kHz" on the toolbar of the **Bandscope** screen.
- The default is “50 kHz”.
- If **[SPAN]** (F3) is unavailable in the key guide, press **[MORE]** (F1).

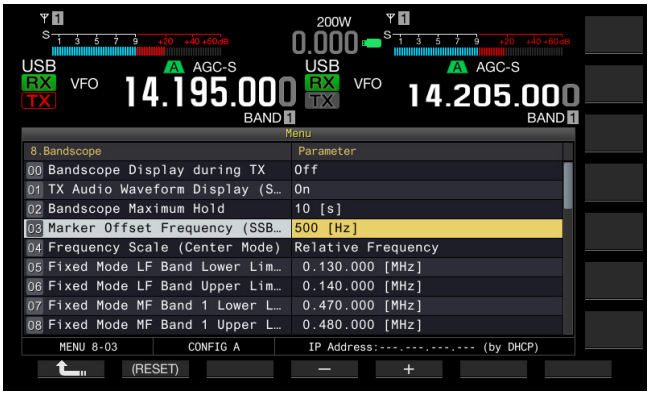
SWITCHING THE MARKER OFFSET FREQUENCY (SSB ONLY)

The marker display location while the bandscope for SSB mode is displayed can be switched to the carrier point which is the same as the frequency display or to a frequency offset from the carrier point.

1 Select Group No. 8, "Bandscope", from the **Menu** screen.

2 Access Menu 03, "Marker Offset Frequency (SSB Mode)".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5) to select "Off (Carrier Point)" or the offset frequency.
The default is "500 [Hz]" (near the peak of the frequency spectra for the typical human vocal). While the bandscope and Waterfall are displayed, placing a marker near the frequency having the strongest level can easily zero-in even in SSB mode. The peak of the frequency spectra may vary or may not be distinguished due to the audio quality of the transmitting station.

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

Note:

- If the bandscope is in Center mode, the frequency which is added by the frequency configured in Menu 8-03 to the carrier point frequency will be the center frequency for USB mode, and the frequency which is subtracted by the frequency configured in Menu 8-03 from the carrier point frequency will be the center frequency for LSB mode. The lower limit frequency and upper limit frequency appear following the center frequency.
- If the bandscope is in Fixed mode, the frequency which is added by the frequency configured in Menu 8-03 to the carrier point frequency will be the marker frequency for USB mode, and the frequency which is subtracted by the frequency configured in Menu 8-03 from the carrier point frequency will be the marker frequency for LSB mode.

SELECTING THE FREQUENCY DISPLAY IN THE GRID (RELATIVE FREQUENCY OR ABSOLUTE FREQUENCY)

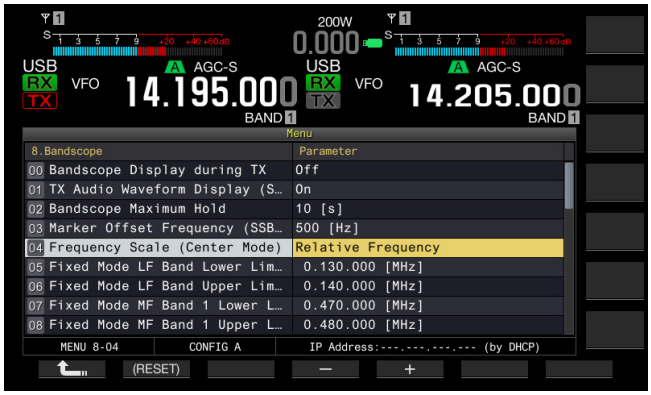
The **Bandscope** screen shows the signal strength in the vertical axis and the frequency in the horizontal axis. This allows you to select the desired frequency to appear under the grid.

If "Off (Carrier Point)" is selected in Menu 8-03, "Marker Offset Frequency (SSB Mode)", the frequency to be displayed below the bandscope for use in Center mode can be switched to the relative frequency from the scope center, i.e. ±25 kHz, or to the absolute frequency.

1 Select Group No. 8, "Bandscope", from the **Menu** screen.

2 Access Menu 04, "Frequency Scale (Center Mode)".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5) to select "Relative Frequency" or "Absolute Frequency" in the parameter box.
The default is "Relative Frequency".

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

Note:

- If anything other than "Off (Carrier Point)"is selected in Menu 8-03, the relative frequency display is applied, and the absolute frequency may not be displayed.
- In Fixed mode, the absolute frequency always appears regardless of the configuration in Menu 8-03.

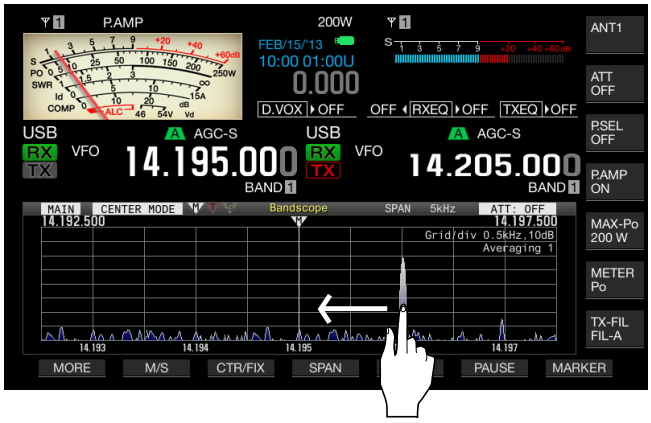
CHANGING THE RECEIVE FREQUENCY USING YOUR FINGERTIP (CENTER MODE)

Simply by touching the **Bandscope** screen with your fingertip, you can change the receive frequency. You can tune a new signal in the bandscope without rotating the **Tuning** control.

The main band frequency will change to the frequency touched by your fingertip if "MAIN" appears on the upper left side of the **Bandscope** screen. Likewise, the sub band frequency will change to the frequency touched by your fingertip if "SUB" appears.

Touching with your fingertip on the left side of the center frequency decrements the center frequency value, and touching with your fingertip on the right side of the center frequency increments the center frequency value.

If "Off" has been configured in Menu 0-13, "Touchscreen Tuning", no frequency can be changed even with a touch with your fingertip. Refer to "TOUCHING THE SCREEN TO SELECT A FREQUENCY" for the configuration method of the touchscreen tuning. {page 16-3}



Note:

- If you feel the screen is incorrectly recognizing the frequency when you touch the screen, you can calibrate the contact spots of the touchscreen. Refer to "CALIBRATING THE TOUCHSCREEN" for further details. {page 16-3}
- In CW mode, touching the screen longer than the time configured for the long key press in Menu 0-12 activates the Auto Zero-in function. {page 5-17}
- In AM and FM modes, if you change the frequency with a touch of the screen, the step frequency of the **MULTI/CH** control configured in Menus 3-02, 3-03, and 3-05 will be applied. {page 4-13}

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CONFIGURING THE LOWER AND UPPER LIMIT

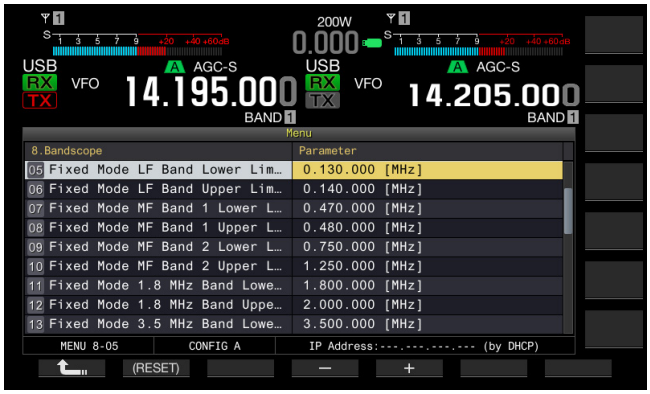
In Fixed mode, you can fix the frequency display range of the bandscope on a band-by-band basis and can display markers for the receive frequency and transmit frequency of your transceiver.

Follow the procedure below to configure the lower limit frequency and upper limit frequency of each band displayed in Fixed mode.

1 Select Group No. 8, "Bandscope", from the **Menu** screen.

2 Access Menu 05, "Fixed Mode LF Band Lower Limit" (min. 0.03 MHz), to Menu 32, "Fixed Mode 50 MHz Band Upper Limit (max. 60 MHz)".
The following list of default configurations shows the lower and upper limit frequencies on a band-by-band basis for each menu.

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



The following list shows the default configurations.

Band	Range [MHz]	Menu	Lower Limit Frequency [MHz]	Menu	Upper Limit Frequency [MHz]
LF	0.030 to 0.300	8-05	0.130.000	8-06	0.140.000
MF1	0.300 to 0.522	8-07	0.470.000	8-08	0.480.000
MF2	0.522 to 1.705	8-09	0.750.000	8-10	1.250.000
1.8 MHz	1.705 to 2.00	8-11	1.800.000	8-12	2.000.000
3.5 MHz	2.00 to 4.00	8-13	3.500.000	8-14	4.000.000
5 MHz	4.00 to 6.00	8-15	5.000.000	8-16	5.500.000
7 MHz	6.00 to 8.00	8-17	7.000.000	8-18	7.500.000
10 MHz	8.00 to 11.00	8-19	10.100.000	8-20	10.150.000
14 MHz	11.00 to 15.00	8-21	14.000.000	8-22	14.500.000
18 MHz	15.00 to 20.00	8-23	18.000.000	8-24	18.200.000
21 MHz	20.00 to 22.00	8-25	21.000.000	8-26	21.500.000
24 MHz	22.00 to 26.00	8-27	24.890.000	8-28	24.990.000
28 MHz	26.00 to 30.00	8-29	28.000.000	8-30	28.500.000
50 MHz	30.00 to 60.00	8-31	50.000.000	8-32	50.500.000

4 Press **[-]** (F4) or **[+]** (F5) to select the lower limit frequency or upper limit frequency from the parameter box.

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

Note:

- The difference between the lower limit frequency and the upper limit frequency is a minimum of 5 kHz and a maximum of 500 kHz. No lower or upper limit frequency can be configured in excess of this range. Also, the minimum step frequency for the lower limit frequency and upper limit frequency is 1 kHz.

APPLYING THE LOWER LIMIT FREQUENCY OR UPPER LIMIT FREQUENCY FOR CENTER MODE TO FIXED MODE

The display frequency range (the lower limit frequency and the upper limit frequency) configured for Center mode can be applied to Fixed mode. This is a convenient function to quickly apply the display area for Center mode to Fixed mode.

1 Press and hold **[CTR/FIX]** (F3).
- The lower limit frequency and upper limit frequency selected for use in Center mode replace the lower limit frequency and upper limit frequency for use in Fixed mode, and the **Bandscope** screen switches to Fixed mode.
- If **[CTR/FIX]** (F5) is unavailable in the key guide, press **[MORE]** (F1).

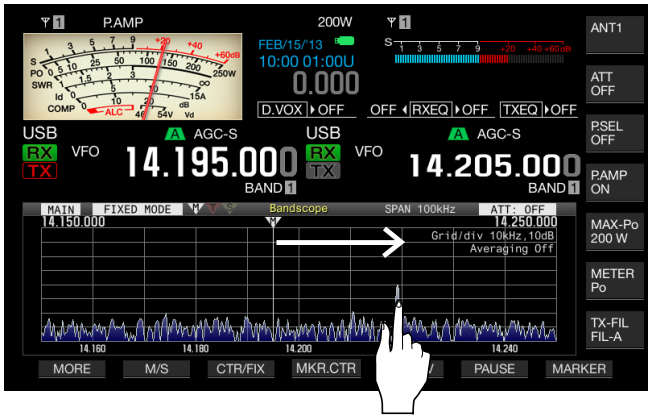
Note:

- If the lower limit frequency and upper limit frequency are in different band, the lower limit frequency and upper limit frequency will not be refreshed and the display does not change to Fixed mode even with a long press of **[CTR/FIX]** (F3).
- When the bandscope is switched from Center mode to Fixed mode with a long press of **[CTR/FIX]** (F3), the lower limit frequency and upper limit frequency will be rounded off so as to fully justify the frequency grids of the bandscope. Therefore, depending on the receive frequency, the marker display position will be shifted for one grid or less from the center.

CHANGING THE RECEIVE FREQUENCY USING YOUR FINGERTIP (FIXED MODE)

As well as Center mode, you can select the target frequency in the **Bandscope** screen using your fingertip to change the frequency into a receive frequency while in Fixed mode.

The main band frequency will change to the frequency touched by your fingertip if “MAIN” appears on the upper left side of the **Bandscope** screen. Likewise, the sub band frequency will change to the frequency touched by your fingertip if “SUB” appears.



Note:

- In CW mode, touching the screen longer than the time configured for the long key press in Menu 0-12 activates the Auto Zero-in. {page 5-17}
- In AM and FM modes, if you change the frequency with a touch of the screen, the step frequency of the **MULTI/CH** control configured in Menus 3-02, 3-03, and 3-05 will be applied. {page 4-13}
- If “Off” has been configured in Menu 0-13, “Touchscreen Tuning”, no frequency can be changed even with a touch with your fingertip. Refer to “TOUCHING THE SCREEN TO SELECT A FREQUENCY” for the configuration method of the touchscreen tuning. {page 16-3}

DISPLAYING THE MARKERS

Markers indicate the whereabouts of the transmit and receive frequencies in the **Bandscope** screen. The marker for the receive frequency always appears.

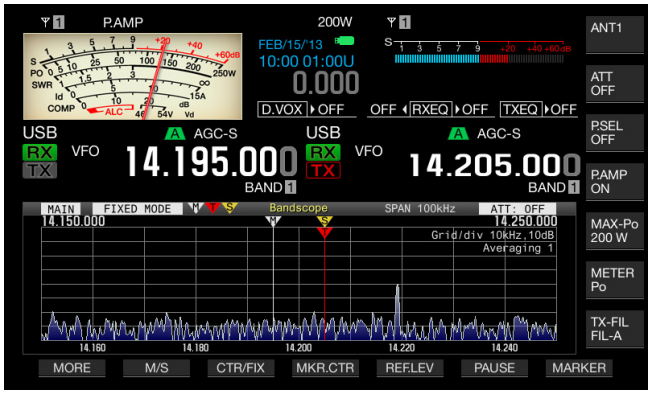
In split operation, a transmit frequency can easily be changed by sliding the transmit frequency marker to the desired transmit frequency spot with while viewing the **Bandscope** screen.

■ If the main band is displayed in the **Bandscope** screen

1 Press **[MARKER]** (F7) to alternate the marker display.

- Each time you press this key, the displayed marker cycles as follows:

  Marker for the receive frequency of the main band only > Markers for the receive frequencies of the main band and sub band > Markers for the receive and transmit frequencies of the main band > Markers for the receive frequencies of the main band and sub band and the marker for the transmit frequency > Marker for the receive frequency of the main band only
- If **[MARKER]** (F7) is unavailable in the key guide, press **[MORE]** (F1).



■ With the Sub Band displayed in the Bandscope Screen

1 Press **[MARKER]** (F7) to alternate the marker display.

- Each time you press this key, the displayed marker cycles as follows:

  Marker for the receive frequency of the sub band only > Markers for the receive frequencies of the main band and sub band > Markers for the receive and transmit frequencies of the sub band > Markers for the receive frequencies of the main band and sub band and the marker for the transmit frequency > Marker for the receive frequency of the sub band only
- If **[MARKER]** (F7) is unavailable in the key guide, press **[MORE]** (F1).

Note:

- Frequency markers are distinguished by color as shown below.
  - White: Receive frequency in the main band
  - Yellow: Receive frequency in the sub band
  - Red: Transmit frequency
- Shifting the marker while the Waterfall is displayed extends the marker line to the Waterfall display area. If the marker becomes static, the marker length reverts to the original length after two seconds.

OFF-RANGE MARKERS FOR FREQUENCIES BEYOND THE LOWER AND UPPER LIMITS

While the frequency markers appear on the bandscope and in Fixed mode, if the marked frequency goes beyond the display range of the bandscope, different markers will appear, notifying you that the marked frequency is outside the range of the bandscope.

The ◁ marker will appear on the left side of the **Bandscope** screen if the marked frequency drops below the lower limit frequency and the ▷ marker will appear on the right side if the marked frequency exceeds the upper limit frequency.

Note:

- The off-range markers for frequencies beyond the upper and lower limits are distinguished by color as shown below.
  - White: Receive frequency in the main band
  - Yellow: Receive frequency in the sub band
  - Red: Transmit frequency

SHIFTING THE SCOPE AREA BY PLACING THE MARKER NEAR CENTER (FIXED MODE)

If the frequency marker, representing the frequency received in Fixed mode, is on the edge of the display area or outside the display area, touching with your fingertip shifts the frequency marker near the center.

1 Press **[MKR.CTR]** (F4) to shift the marker near the center.

- The scope area shifts with the same frequency width retained in order to display the marker for the selected band near the center (within one grid horizontally from the center).
- If **[MKR.CTR]** (F4) is unavailable in the key guide, press **[MORE]** (F1).

Note:

- The marker cannot shift if the scope range is outside the lower limit frequency and upper limit frequency in a certain amateur band.
- If the lower limit frequency and upper limit frequency are changed with a press of **[MKR.CTR]** (F4), the lower limit frequency and upper limit frequency configured in the menu will be overwritten.

DISPLAYING THE MAXIMUM WAVEFORM VALUE

Indication of the maximum waveform value to be retained and displayed on the **Bandscope** screen enables you to distinguish the status of the signal.

■ Displaying the Peak Values of Waveform

1 Press **[SCP]** to display the bandscope on the main display.

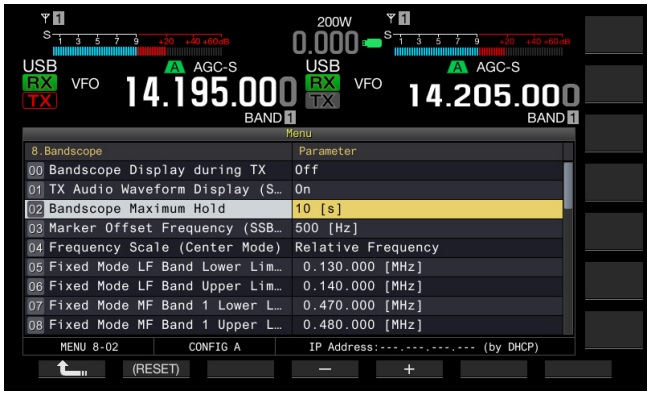
2 Press **[MAX.HLD]** (F7) to toggle the peak value of the waveform between maximized and normal.
If **[MAX.HLD]** (F7) is unavailable in the key guide, press **[MORE]** (F1).

■ Configuring the Waveform Display Type

1 Select Group No. 8, "Bandscope", from the **Menu** screen.

2 Access Menu 02, "Bandscope Maximum Hold".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5) to select "10 [s]" or "Continuous" from the parameter box.
- 10 [s]: Retains and displays the maximum waveform value of the last 10 seconds.
- Continuous: Retains and displays the maximum waveform after the bandscope has appeared.
- The default is "10 [s]".

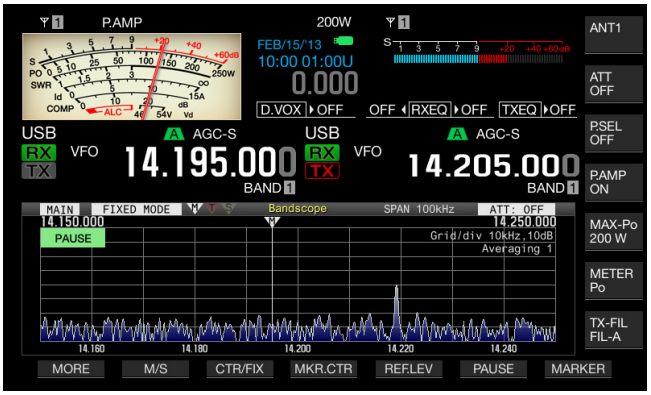
5 Press [ ] (F1).

6 Press **[MENU]** to exit.

PAUSING THE WAVEFORM DISPLAY

You can pause the waveform display on the **Bandscope** screen.

1 Press **[PAUSE]** (F5) to pause the displayed waveform.
- "PAUSE" appears while the waveform display is paused.
- If **[PAUSE]** (F6) is unavailable in the key guide, press **[MORE]** (F1).



- Pressing any key other than **[MORE]** (F1) and **[MARKER]** (F7) releases the pause of the waveform display.

AVERAGING THE WAVEFORM DISPLAY ON THE BANDSCOPE

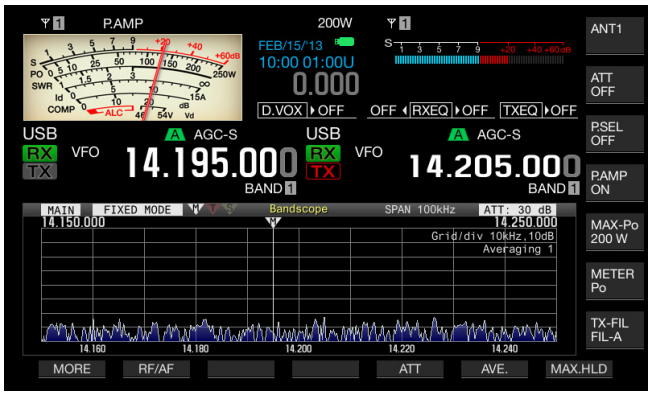
If the waveform display on the bandscope is averaged, the waveform transition on the display becomes gradual, hence intermittent signals such as Morse code can easily be observed.

1 Press **[AVE.]** (F6) to change the averaging level.
- Each key press cycles the averaging level through "Off" (no averaging) > "1" (minimum) > "2" > "3" (maximum) > "Off". The averaging level appears on the upper right side of the grid.
- Pressing and holding **[AVE.]** (F6) cycles the averaging level in the reversed sequence.
- The default is "1".
- If **[AVE.]** (F6) is unavailable in the key guide, press **[MORE]** (F1).

CHANGING THE ATTENUATOR FOR THE BANDSCOPE

If the target signal cannot easily be distinguished on the Bandscope screen due to excessive input signal even after the adjustment of the reference level, change the attenuator for the bandscope to attenuate the bandscope input level.

1 Press **[ATT]** (F5) to select an attenuator.
- Each time you press **[ATT]** (F5), the level cycles as follows: Off > 10 dB > 20 dB > 30 dB. The attenuated value appears on the upper right side of the grid.
- Pressing and holding **[ATT]** (F5) cycles through the attenuation in the reversed sequence.
- The default is "Off".
- If **[ATT]** (F5) is unavailable in the key guide, press **[MORE]** (F1).



Note:

♦ Changing of the attenuation for the bandscope does not influence the receive sensitivity.

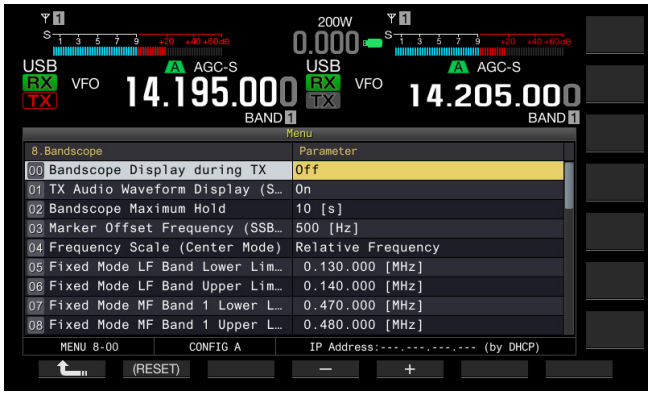
DISPLAYING THE TRANSMISSION SIGNAL WAVEFORM

While transmitting with the bandscope displayed in Center mode, you can select whether or not to display the waveform of the transmit signal.

1 Select Group No. 8, "Bandscope", from the **Menu** screen.

2 Access Menu 00, "Bandscope Display during TX".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5) to select either "On" or "Off" from the parameter box.
The default is "Off".

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

Note:

♦ In Fixed mode, the transmission signal waveform cannot be displayed.

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Operation Example: SSB Mode

1. Select "500 [Hz]" (near the peak of the frequency spectra for the typical human vocal) in Menu 8-03, "Marker Offset Frequency (SSB Mode)".
2. Press **[SCP]** to display the Bandscope and Waterfall.
3. Press **[CTR/FIX]** (F3) to enter Center mode.
4. Press **[SPAN]** (F4) to select the displayed frequency span from "20 [kHz]" through "100 [kHz]".
5. Press and hold **[CTR/FIX]** (F3) to enter Fixed mode with the displayed frequency span retained.
6. Press **[REF.LEV]** (F5) to adjust the reference level in order to facilitate the signal observation on the Waterfall display.
7. Place a marker for the receive frequency to the position where the signal strength is the strongest so as to zero in.
8. Rotate the **Tuning** control to change the receive frequency until the receive signal is zeroed in.

Operation Example: CW Mode

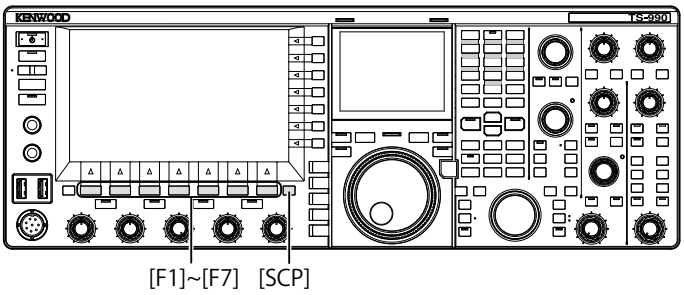
1. Press **[SCP]** to display the Bandscope and Waterfall.
2. Press **[CTR/FIX]** (F3) to enter Center mode.
3. Press **[SPAN]** (F4) to select the displayed frequency span from "5 [kHz]" through "20 [kHz]".
   This helps to distinguish the CW signal.
4. If you wish to observe the weak signal that hardly moves the pointer of the S-meter, select "5 [kHz]" or "10 [kHz]" for the displayed frequency span.
5. Press and hold **[CTR/FIX]** (F3) to enter Fixed mode with the displayed frequency span retained.
6. Place a marker for the receive frequency to the position where the signal strength is the strongest so as to zero in.
   - Pressing **[CW T]** activates the Auto Zero-in (CW Auto Tune).
   - If the receive frequency is changed by long touching with your fingertip on the **Bandscope** screen, Auto Zero-in (CW Auto Tune) is executed without a press of **[CW T]**.

DISPLAYING THE AUDIO SCOPE AND OSCILLOSCOPE

This transceiver has an Audio Scope and oscilloscope, coupled with waterfall capability, allowing you to observe the status of an audio signal. Received and transmitted audio can be displayed using the spectrum and waveforms, to observe the communication quality and status of the audio.

Displaying the waterfall below the Audio Scope allows you to observe the transition of the signal strength in addition to the state of the audio signal.

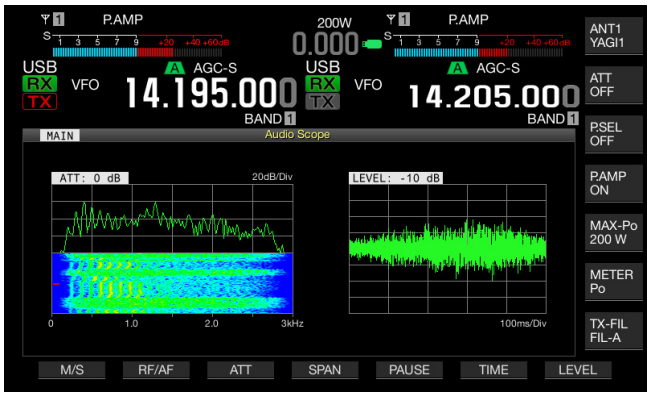
In the waterfall display, the vertical axis represents elapsed time and the horizontal axis represents the frequency. The signal strength distinguished by white (strong), red to yellow (medium) and green to blue (weak) is expressed on the display. The spectrum of the signal strength for the last 9.3 seconds appears vertically. Every 5 seconds, a 2-mm (1/10") long red marker appears on the left side of the waterfall display, showing the lapse of time.



1 Press **[SCP]** to display the **Bandscope** screen.

2 Press **[RF/AF]** (F1) to select either the **Bandscope** screen or the **Audio Scope** screen.

- In the **Audio Scope** screen, the Audio Scope appears on the left side and the oscilloscope appears on the right side.
- If **[RF/AF]** (F2) is unavailable in the key guide for function keys, press **[MORE]** (F1) to alternate the key guide.



3 Press **[ESC]** to exit.

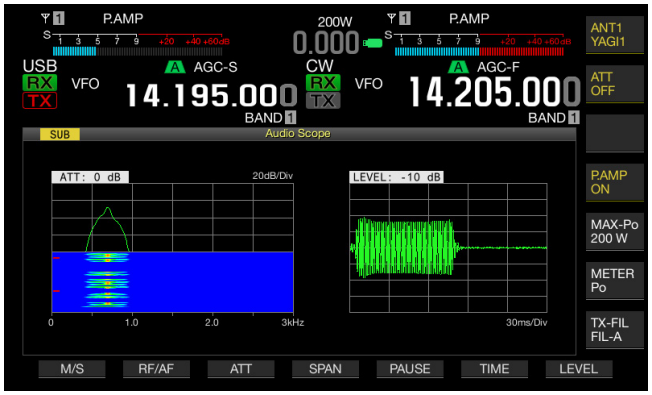
CHANGING THE AUDIO SOURCE FOR THE AUDIO SCOPE

You can select from the received audio for the main band and for the sub band.

1 Press **[RF/AF]** (F2) on the **Bandscope** screen to open the **Audio Scope** screen.
If **[RF/AF]** (F2) is unavailable in the key guide for function keys, press **[MORE]** (F1) to alternate the key guide.

2 Press **[M/S]** (F1) to toggle the selected band between the main band and the sub band.

- Each key press cycles through Received audio in the main band (Main band) > Received audio in the sub band (Sub Band) > Received audio in the main band (Main Band).
- The name of the selected band appears. The main band and sub band cannot be replaced while transmitting.



Note:

♦ You can observe the waveform of the transmitting signal while transmitting.

CHANGING THE ATTENUATOR FOR THE AUDIO SCOPE

If the signal level applied to the Audio Scope is excessively high, attenuating the level will reduce the amplitude of the waveform. This optimizes the display on the Audio Scope facilitating you to observe the waveform.

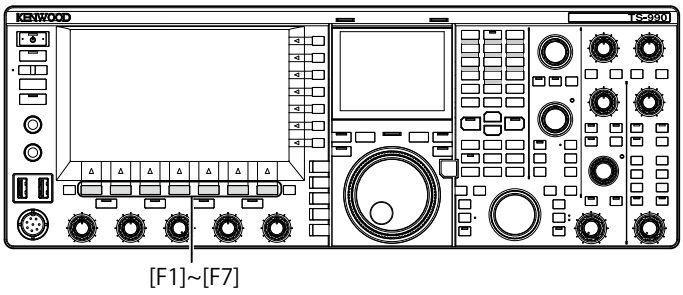
1 Press **[RF/AF]** (F2) on the **Bandscope** screen to open the **Audio Scope** screen.
If **[RF/AF]** (F2) is unavailable in the key guide for function keys, press **[MORE]** (F1) to alternate the key guide.

2 Press **[ATT]** (F3) to select an attenuator.

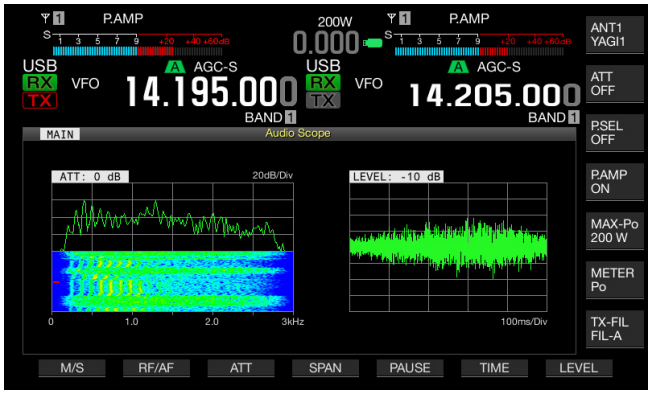
- Each time you press **[ATT]** (F3), the level cycles as follows: 0 dB > 10 dB > 20 dB > 30 dB > 0 dB. The attenuation level appears on the upper left side of the grid. The default is "0 dB".
- Each long press of **[ATT]** (F4) cycles the attenuation level in the reversed sequence.

CHANGING THE AUDIO SCOPE FREQUENCY DISPLAY SPAN

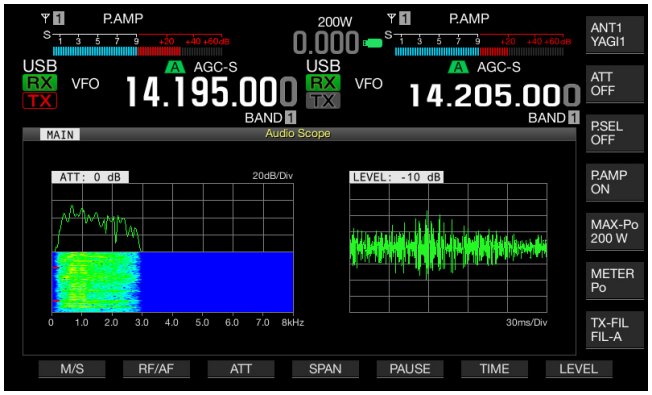
The displayed frequency span for the audio scope can be toggled between 3 kHz and 8 kHz. You can configure the frequency display span following the configuration for the filter bandwidth or the frequency to be observed.



1 Press **[RF/AF]** (F1) on the **Bandscope** screen to open the **Audio Scope** screen.
If **[RF/AF]** (F2) is unavailable in the key guide for function keys, press **[MORE]** (F1) to alternate the key guide.



2 Press **[SPAN]** (F4) to select the frequency display span.
- Each time you press **[SPAN]** (F4), the frequency toggles between 3 kHz and 8 kHz.
- With the frequency display span of 3 kHz, the frequency step size will be 0.5 kHz and the audio scope will appear with six frequency steps in the horizontal direction.
- With the frequency display span of 8 kHz, the frequency step size will be 1 kHz and the audio scope will appear with eight frequency steps in the horizontal direction.
- The default is "3 kHz".

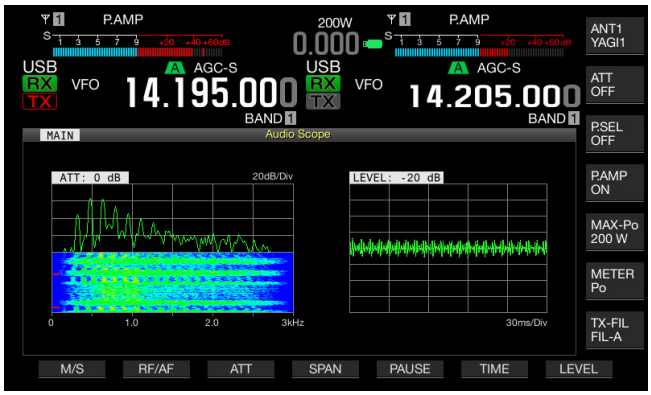


CHANGING THE LEVEL OF THE OSCILLOSCOPE

The amplitude of the waveform will change if the signal level applied to the oscilloscope is changed. Optimizing the amplitude of the waveform into an easy-to-see size will make it easy to observe the waveform.

1 Press **[RF/AF]** (F2) on the **Bandscope** screen to open the **Audio Scope** screen.

2 Press **[LEVEL]** (F7) to change the signal input level
- Each time you press **[ATT]** (F3), the level cycles through dB > -10 dB > -20 dB > -30 dB > 0 dB. The audio signal level applied to the oscilloscope appears on the upper left side of the grid. The default is "0 dB".
- Each long press of **[LEVEL]** (F7) cycles the signal level in the reversed sequence.



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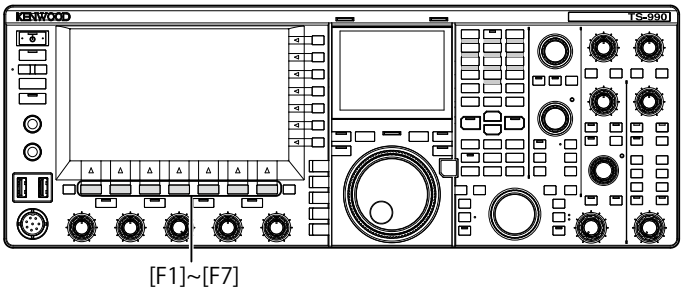
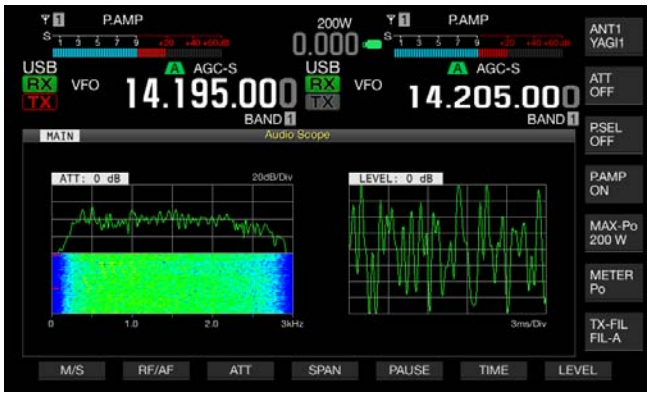
CHANGING THE SWEEP TIME

If you change the oscilloscope sweep time, the time scale appearing on the oscilloscope changes. Following the conditions of the signal to observe, you can change the sweep time.



1 Press **[RF/AF]** (F2) on the **Bandscope** screen to open the **Audio Scope** screen.
If **[RF/AF]** (F2) is unavailable in the key guide for function keys, press **[MORE]** (F1) to alternate the key guide.



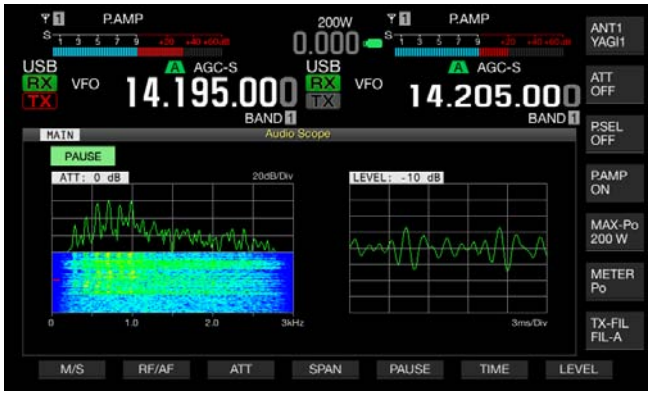
2 Press **[TIME]** (F6) to select the sweep time.
- Each time you press **[TIME]** (F6), the sweep time cycles as follows: 1 ms/Div > 3 ms/Div > 10 ms/Div > 30 ms/Div > 100 ms/Div > 300 ms/Div. The sweep time appears on the lower right side of the grid. The default is “100 ms/Div”.
- Each long press of **[TIME]** (F6) cycles the sweep time in the reversed sequence.

PAUSING THE AUDIO SCOPE AND OSCILLOSCOPE

If the waveform displayed in the **Audio Scope** screen is paused, the paused waveform will be kept on hold until **[PAUSE]** (F5) is pressed again. Pausing the screen allows you to analyze the waveform without interference from the screen continuously refreshing.

1 Press **[RF/AF]** (F2) on the **Bandscope** screen to open the **Audio Scope** screen.
If **[RF/AF]** (F2) is unavailable in the key guide for function keys, press **[MORE]** (F1) to alternate the key guide.

2 Press **[PAUSE]** (F5) to pause the displayed the waveform.
“PAUSE” appears while the waveform display is paused.



SELECTING THE AUDIO LINE FOR TRANSMISSION

There are audio lines to input the audio signal for transmission to the transceiver. According to your operating mode, you can select the audio line to enter the audio signal.

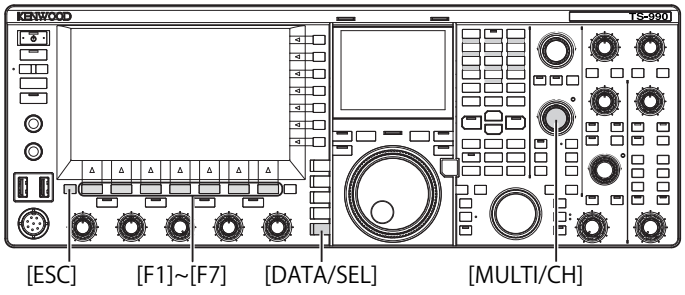
Location	Modulation Source	Overview
Front Panel	MIC	With "MIC" enabled, the voice signal spoken into the microphone is sourced to the transceiver.
Rear Panel	ACC2	With ACC 2 enabled, the audio signal sourced from the device connected to the **ACC 2** connector is processed.
	(USB-B)	With the USB Audio enabled, the audio signal from a PC is sent to the transceiver.
	OPTICAL IN	With OPTICAL enabled, the audio signal from the audio device connected to the optical digital terminal is processed.

In SSB, USB, FM, FMN and AM modes, each press of **[DATA/SEL]** cycles through "Off" > "DATA 1" > "DATA 2" > "DATA 3" > "Off", and three audio lines for the audio source can be configured.

SELECTING THE AUDIO SOURCE FOR TRANSMISSION BY SEND/PTT

The audio sourced from the **MIC** connector on the front panel of the transceiver or from the **ACC 2**, (USB-B), or **OPTICAL IN** connectors can be configured for each transmit method.

- The audio modulation source when the front panel **[SEND]** or the **PTT** (microphone) switch is pressed
- The audio modulation source when the PF key for which "DATA SEND" was configured in Menu 0-15, "PF A: Key Assignment" to Menu 0-32, "Microphone UP: Key Assignment" is pressed



SELECTING THE AUDIO SOURCE TRANSMISSION BY SEND/PTT

The audio sourced from the **MIC** connector on the front panel of this transceiver or from the **ACC 2**, (USB-B), **OPTICAL IN** connectors is transmitted upon pressing **[SEND]** or the **PTT** (microphone) switch.

1 Press and hold **[DATA/SEL]** to open the **Modulation Source** screen.

2 Press [ ] (F2) or [ ] (F3) to select "SEND/PTT".

3 Press [ ] (F4) or [ ] (F5) to select the audio source.
You can select the audio source to transmit when **[SEND]** or the **PTT** (microphone) switch is pressed.

4 Press **[ON/OFF]** (F5) to enable the audio source.
The following table shows the default settings.

Status of DATA Mode	Modulation Source			
	MIC	ACC 2	USB Audio	OPTICAL
DATA Off	On	Off	Off	Off
DATA 1 to DATA 3	On	Off	Off	Off

5 Press **[ESC]**, or press and hold **[DATA/SEL]** to exit.

Note:

- The audio signal from the audio source will be transmitted by pressing **[SEND]** on the front panel or the **PTT** (microphone) switch.
- Both USB Audio and ACC 2 cannot be enabled at the same time. Enabling one will disable the other.

SELECTING THE AUDIO SOURCE FOR TRANSMISSION BY DATA SEND

You can transmit the audio sourced from the **MIC** connector, **ACC 2**, •⇆(USB-B), or **OPTICAL IN** connector when the PF key for which **[DATA SEND]** was assigned is pressed.

1 Press and hold **[DATA/SEL]** to open the **Modulation Source** screen.

2 Press [▲] (F2) or [▼] (F3) to select "DATA SEND".

3 Press [◀] (F4) or [▶] (F5) to select the audio source.
You can select the audio source to be transmitted upon pressing **[DATA SEND]**.

4 Press **[ON/OFF]** (F5) to enable the audio source.
The following table shows the default settings.

Status of DATA Mode	Modulation Source			
	MIC	ACC 2	USB Audio	OPTICAL
DATA Off	Off	On	Off	Off
DATA 1 to DATA 3	Off	Off	On	Off

5 Press **[ESC]**, or press and hold **[DATA/SEL]** to exit.

Note:

- The audio signal from the selected audio source will be transmitted by pressing **[DATA SEND]**. Refer to "CONVENIENT FUNCTIONS" for the method to assign "DATA SEND" to a PF key. {page 16-6}
- Both USB Audio and ACC 2 cannot be enabled at the same time. Enabling one disables the other.

VOX (VOICE-OPERATED TRANSMIT)

VOX is a function that allows you to transmit automatically while you are speaking into a microphone and to revert to the receive state when you stop speaking. After speaking into the microphone, pause momentarily to place the transceiver in the receive state.

Data VOX enables you to transmit data sourced from connectors other than the **MIC** connector.

SWITCHING VOX (VOICE) ON OR OFF

In SSB, FM and AM modes, you can automatically transmit by simply speaking into the microphone.

1 Press **[VOX/SEL]** to enable or disable the VOX function.
The "VOX" LED lights green while VOX is active.

Note:

- To transmit with VOX enabled, the audio from the microphone is transmitted regardless of the audio source configuration.
- If the transceiver cannot automatically receive with VOX enabled, reduce the VOX gain, increase the distance between the microphone and speaker or reduce the receive audio volume. Use headphones if the transceiver still cannot automatically receive.

SELECTING OR DISABLING THE AUDIO SOURCE FOR DATA VOX

In SSB, FM, or AM mode, the transceiver can automatically transmit by entering the minimum level or greater of the data transmit audio from the ANI terminal (**ACC 2** connector on the rear panel) or from •⇆ (USB-A or USB-B), or the **OPTICAL IN** connector. This function is called Data VOX.

Follow the procedure below to change the audio source to be used for Data VOX.

1 Press and hold **[DATA/SEL]** to open the **Modulation Source** screen.

2 Press **[D.VOX]** (F7) to select the audio source for Data VOX.

- Each key press cycles the audio source for Data VOX as follows: Off (no audio source for Data VOX) > ACC 2 > USB Audio > Optical > Off.
- The default is "Off".
- "Off", "ACC 2", "USB" or "OPT." appears on the right side of "D.VOX" on the upper side of the main screen.

3 Press **[ESC]**, or press and hold **[DATA/SEL]** to exit.

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Note:

- If the audio source with Data VOX disabled is selected while the transceiver is left connected to a PC, the transceiver may occasionally be placed in the transmit state by the signal from the audio source.
- If you leave the transceiver connected to the audio source, disable the audio source for Data VOX.
- If **"DATA VOX"** is assigned to a PF key, the audio source can be changed with a press of the key. {page 16-6}

ADJUSTING THE VOX GAIN

VOX Gain for the VOX function (Voice) allows you to adjust the VOX Gain following the volume of audio sourced from the MIC connector and the ambient noise conditions.

Data VOX for the data allows you to adjust the VOX Gain of the data sourced from the ANI terminal of the **ACC 2** connector and from the ⇔ (USB-A and USB-B) and **OPTICAL IN** connectors on the rear panel.

■ VOX Function (Voice)

VOX will operate correctly if you adjust the VOX gain level so that the audio from the **MIC** but not the ambient noise level keys the transmitter.

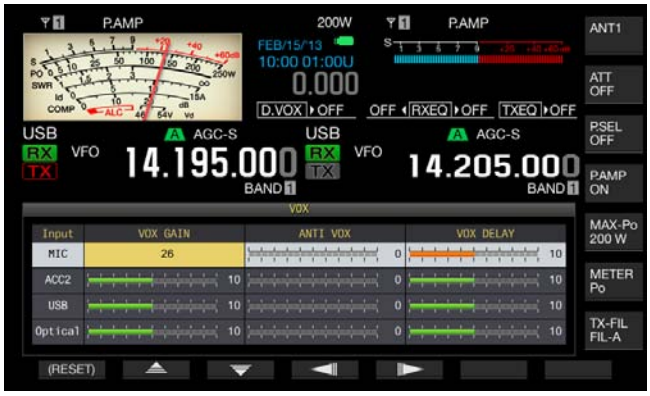
1 Speak into the microphone and rotate the **[VOX GAIN]** control to adjust the VOX gain.
You can adjust the VOX gain, enabling the transceiver to reliably transmit each time you speak into the microphone. Rotate the **VOX GAIN** control clockwise to increase the sensitivity level, allowing VOX to recognize even a soft-spoken voice. The VOX function may occasionally be activated by background noise.

Note:

- Pressing and holding **[VOX/SEL]** also opens the **VOX** screen. You can adjust the VOX gain level of a signal input from the **MIC** jack in the range of "0" to "255".
- In this configuration, you can adjust the VOX level for the audio sourced from the **MIC** jack. Even if the audio source is selected for Data VOX in the **Modulation Source** screen, the parameter configured for VOX Gain cannot be applied.

■ Data VOX

1 Press and hold **[DATA/SEL]** to open the **VOX** screen.
In the **VOX** screen, a line highlights the selected audio source, and a row highlights the selected configuration item.



2 Press [▲] (F2) or [▼] (F3) to select the row for the audio source.
You can select the "ACC 2", "USB" or "Optical" row for the audio line to be adjusted.

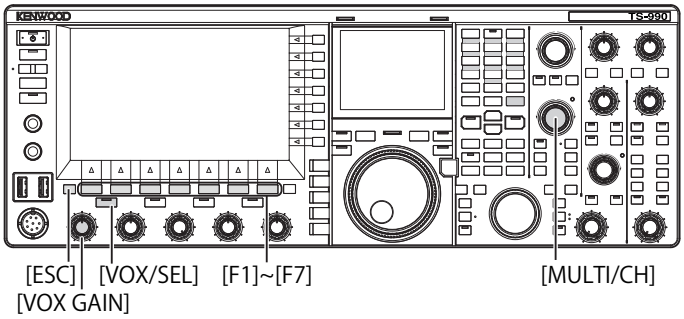
3 Press [◀] (F4) or [▶] (F5) to select the line for "VOX GAIN".

4 Press **[-]** (F6) or **[+]** (F7), or rotate the **MULTI/CH** control to adjust the VOX level.
- Applying the audio signal from the modulation source selected in step 2, you can select the VOX level to allow the transceiver to transmit by receiving an audio signal.
- The available range is "0" to "20" (in steps of 1). The default is "10".

5 Press **[ESC]**, or press and hold **[VOX/SEL]** to exit.

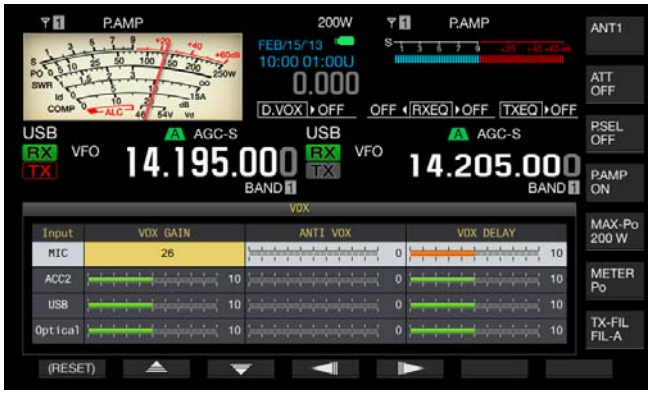
ADJUSTING THE VOX DELAY TIME

There may be times when the transceiver reverts to the receive state during the transmission of an audio signal or data with the VOX function or when the end of your conversation or data is interrupted and cannot be transmitted. To avoid such problems, adjust the delay time so that the transceiver does not immediately revert to the receive state.



■ VOX Function (Voice)

1 Press and hold **[VOX/SEL]** to open the **VOX** screen.
In the **VOX** screen, a line highlights the selected audio source, and a row highlights the selected configuration item.



2 Press [▲] (F2) or [▼] (F3) to highlight the row for Microphone.
The parameter box becomes active, and the parameter can be changed.

3 Press [◀] (F4) or [▶] (F5) to select the line for "VOX DELAY".
The parameter box becomes active, and the parameter can be changed.

4 While you are speaking into the microphone, press **[-]** (F6) or **[+]** (F7), or rotate the **MULTI/CH** control to adjust the VOX Delay Time.
Adjusts the VOX delay time for when to revert to the receive state after you stop speaking.

The available range is “Off” or from “1” to “20” (in steps of 1). The default is “10”.

5 Press **[ESC]**, or press and hold **[VOX/SEL]** to exit.

Note:

- Even if the audio source is configured for Data VOX in the **Modulation Source** screen, the same delay time adjusted for the VOX delay time will be applied to the Data VOX delay time.
- The configurations described above do not apply to Data VOX.

■ Data VOX

1 Press and hold **[VOX/SEL]** to open the **VOX** screen.
In the **VOX** screen, a line highlights the selected audio source, and a row highlights the selected configuration item.

2 Press [▲] (F2) or [▼] (F3) to select the row for the audio source.
You can select the “ACC 2”, “USB” or “Optical” row for the audio line to be adjusted.

3 Press [◀] (F4) or [▶] (F5) to select the line for “VOX DELAY”.

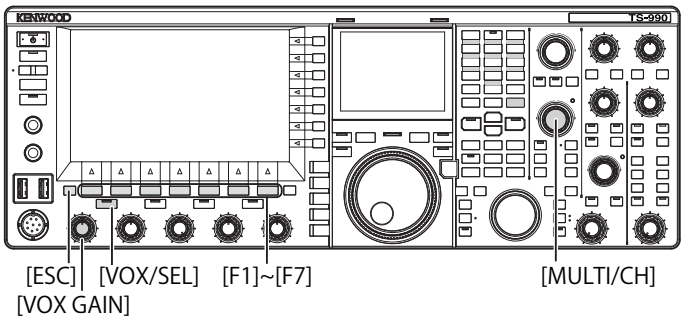
4 Press **[-]** (F6) or **[+]** (F7), or rotate the **MULTI/CH** control to select the delay time.
- Sourcing the audio signal from the audio source selected in step 2, you can adjust the delay time to revert to the receive state after finishing the entry of the audio signal.
- The available range is “0” to “20” (in steps of 1). The default is “10”.

5 Press **[ESC]**, or press and hold **[VOX/SEL]** to exit.

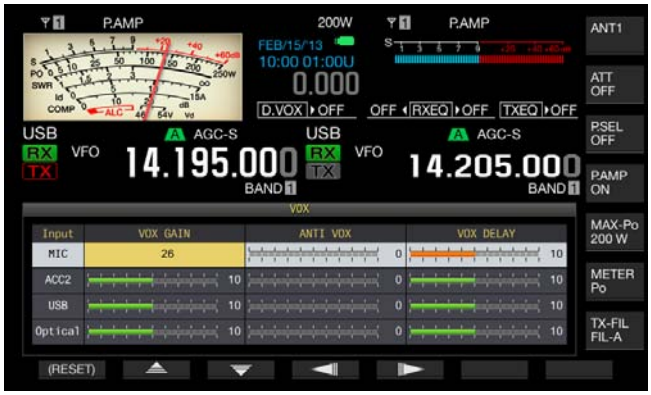
ADJUSTING THE ANTI VOX GAIN LEVEL

While VOX is active, sound from not only the microphone but also from the speaker may cause VOX to start transmitting. The transceiver will transmit if the speaker volume is set too high. Adjust the anti-VOX level based on the sound from the speaker and set a lower audio limit to activate the VOX function to avoid accidental transmission.

Operations for the VOX function (Voice) and Data VOX are identical.



1 Press and hold **[VOX/SEL]** to open the **VOX** screen.
In the **VOX** screen, a line highlights the selected audio source, and a row highlights the selected configuration item.



2 Press [▲] (F2) or [▼] (F3) to select the row for the audio source.

3 Press [◀] (F4) or [▶] (F5) to highlight the column for ANTI VOX.
The parameter box becomes active, and the parameter can be changed.

4 Press **[-]** (F6) or **[+]** (F7), or rotate the **MULTI/CH** control to adjust the sensitivity of the Anti VOX Gain.
- Adjust the sensitivity of the anti-VOX level so that the sound from the speaker does not result in transmitting.
- The available range is “0” to “20” (in steps of 1). A smaller value will be more susceptible to the sound of the speaker.
- The following list shows the default settings.
  - MICROPHONE (MIC): 10
  - ACC 2: 0
  - USB: 0
  - OPTICAL: 0

5 Press **[ESC]**, or press and hold **[VOX/SEL]** to exit.

Note:

- If a set of headphones is connected to the **PHONES** connector, the sound from the speaker does not activate the VOX function to transmit regardless of configurations for the audio line and Anti VOX Level.
- Anti VOX Gain for audio sources other than Data VOX can be adjusted. {page 9-4}

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DELAYING THE AUDIO SIGNAL

While using VOX, there is a time lag between the time you start talking on the microphone and the time the transceiver begins transmitting. As a result, speech clipping may occur. To prevent this as much as possible, set a VOX voice delay time (a time lag) to transmit the audio signal after the transceiver is placed into a transmit state.

1 Select Group No. 6, “TX/RX Filters & Misc”, from the **Menu** screen.

2 Access Menu 09, “VOX Voice Delay (Microphone)”.
If anything other than the Microphone is configured for the audio source for transmission, access Menu 10, “VOX Voice Delay (Except Microphone)”. {page 9-1}

3 Press **[SELECT]** (F4) to allow editing of the parameter box.

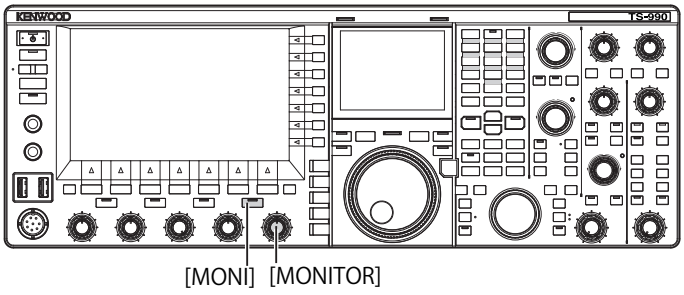
4 Press [▲] (F2) or [▼] (F3) to select the VOX Voice Delay Time.
- Select “Off”, “Short”, “Medium”, or “Long”.
- The default is “Medium”.

5 Press [↵] (F1).

6 Press **[MENU]** to exit.

TX MONITOR

You can monitor the audio during transmission. This function is convenient when you check the effectiveness of the speech processor or TX DSP equalizer. In FSK and PSK modes, you can monitor FSK and PSK signals to be transmitted from the transceiver.



1 Press **[MONI]** to enable or disable the transmit monitor.
The "MONI" LED lights green while the TX monitor is active.

ADJUSTING THE TX MONITOR LEVEL

With this transceiver, you can adjust the monitor level of the transmission audio.

1 Rotate the **MONITOR** control to adjust the volume level of the TX Monitor.

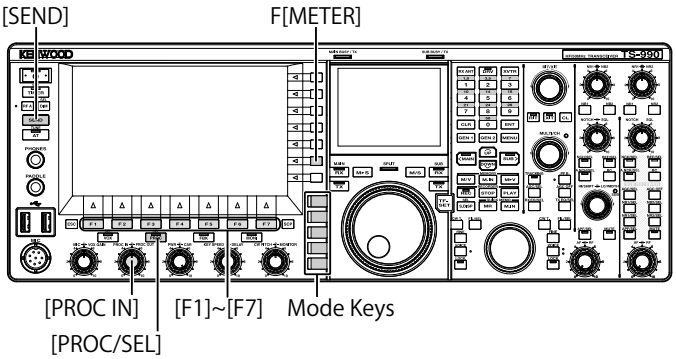
Note:

- In SSB, AM and FM modes, an acoustic feedback may result while the speaker is in use. Use a set of headphones, instead.
- The transmission of the CW message cannot be monitored using the TX monitor. You can monitor a CW transmission using the CW sidetone.
- In FM, FSK and BPSK mode, the audio in the TX monitor differs from the audio signal actually transmitted.
- This transceiver has an RF monitor that demodulates the modulated waves while in SSB and AM modes and an AF monitor while in FM, FSK and PSK modes. The audio in the AF monitor differs from the audio actually transmitted.

SPEECH PROCESSOR

In SSB mode, the audio level of the transmitting transceiver reflects the level of the transmit power and propagates to the receiving transceiver; hence, the audio quality degrades on the receiving transceiver. With the speech processor enabled, the signal is compressed by means of digital signal processing and is transmitted after the average transmit power is increased.

In AM and FM modes, the degree of modulation is stabilized regardless of the audio level of the transmitting transceiver, resulting in an improvement in readability.



SPEECH PROCESSOR

1 Press a mode key to select SSB, AM, or FM mode.

2 Press **[PROC/SEL]** to enable or disable the Speech Processor.
The "PROC/SEL" LED lights green while the speech processor is active.

Note:

♦ The speech processor can function for the audio signal from the ANI terminal of the **ACC 2** connector or from the ⇔ (USB-B) connector on the rear panel.

ADJUSTING THE SPEECH PROCESSOR INPUT LEVEL

1 Press a mode key to select SSB, AM, or FM mode.

2 Press **[PROC/SEL]** to enable or disable the Speech Processor.

3 Press **[METER]** (F) to display the compression level meter (COMP).

Note:

♦ The **[METER/COMP]** (F) key appears only if the speech processor is active (the "PROC" LED is lit).

4 Press **[SEND]**, or hold the **PTT** (microphone) switch.
The transceiver is placed into the transmit state.

5 While you are speaking into the microphone, rotate the **PROC IN** control to adjust the compression level.
While observing the compression level from the compression level meter (COMP), adjust the input level to the speech processor. The readability will drop if the compression level is excessively high.

Note:

♦ The Speech Processor Input Level allows you to adjust the input level of the mixed audio from the audio sourced as configured for Mic Gain and the audio source configured in the **Modulation Source** screen.

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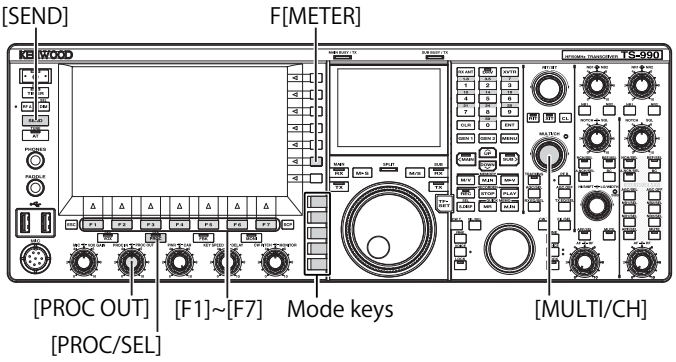
ADJUSTING THE SPEECH PROCESSOR OUTPUT LEVEL



1 Press one of the mode keys to enter SSB or AM mode.

2 Press **[PROC/SEL]** to enable or disable the Speech Processor.

3 Press **[METER/ with Meter name]** (F) to select "METER/ALC".

- If "Type 2" or "Type 3" is configured for the Meter Type, each key press cycles the key name as follows: "METER/ALC" > "METER/Vd" > "METER/Po" > "METER/SWR" > "METER/Id" > "METER/COMP" > "METER/ALC". Select the "METER/ALC" function key.
- The meter on the main screen will work as a transmit power level meter (ALC).

4 Press **[SEND]**, or press down the **PTT** (microphone) switch.
The transceiver is placed into the transmit state.

5 While you are speaking into the microphone, rotate the **PROC OUT** control to adjust the output level.
You can adjust the output level so that the meter needle will swing more or less.

Note:

- If you excessively increase the output level, the transmit signal may be distorted resulting in the deterioration of the waveform.
- The output level of the speech processor is applied to both the audio entered from the microphone and the audio source configured in the **Modulation Source** screen.
- In FM mode, the output level of the speech processor is fixed; you cannot change the level.

ADJUSTING THE EFFECT OF THE SPEECH PROCESSOR

You can configure how to process the transmit signal with the speech processor. You can select either "Hard", which prioritizes an increase in the mean transmit power in spite of the distortion that may be left in the transmit signal, or "Soft", which has a smaller effect but less distortion may occur.

1 Press and hold **[PROC/SEL]** to open the **Speech Processor Effect** screen.

2 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select the desired effect of the speech processor.
You can select "Hard" or "Soft".

3 Press **[ESC]**, or press and hold **[PROC/SEL]** to exit.

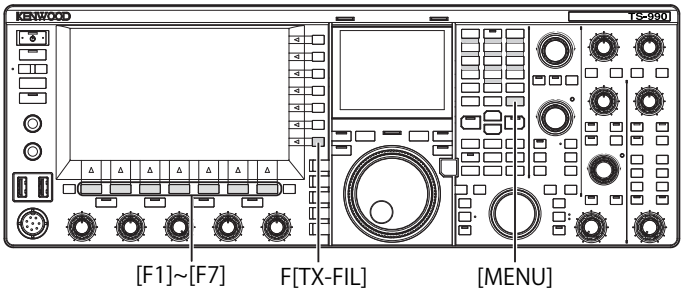
TRANSMIT FILTER

You can configure three different TX filters for operation in SSB and AM modes, respectively. Change the filter according to your operating status.

For example, if a wide-band TX filter and narrow-band TX filter are installed in the transceiver, you can select the narrow-band TX filter for the readability improvement in DX hunting and contests or the wide-band TX filter for rag-chewing.

Note:

- Use the TX filter only in a manner which does not violate the laws and regulations relating to the occupation of the bandwidth in SSB mode.



SELECTING A TX FILTER

1. Press a mode key to select SSB, AM, SSB-DATA, or AM-DATA mode.
2. Press **[TX-FIL]** (F) to select a TX Filter.
   Each time you press **[TX-FIL]** (F), the filter cycles as follows:
   FIL-A > FIL-B > FIL-C

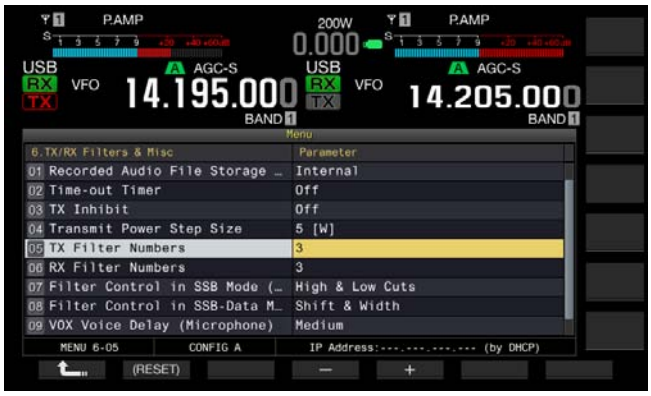
Note:

- If “2” is selected for Menu 6-05, “TX Filter Numbers”, you can select “FIL-A” or “FIL-B”.

CHANGING THE NUMBER OF AVAILABLE TX FILTERS

You can change the number of available TX filters.

1. Select Group No. 6, "TX/RX Filters & Misc", from the **Menu** screen.
2. Access Menu 05, "TX Filter Numbers".
3. Press **[SELECT]** (F4) to allow editing of the parameter box.



4. Press **[-]** (F4) or **[+]** (F5) to select the number of available TX Filters.
   The default is "3".
5. Press **[ ]** (F1).
6. Press **[MENU]** to exit.

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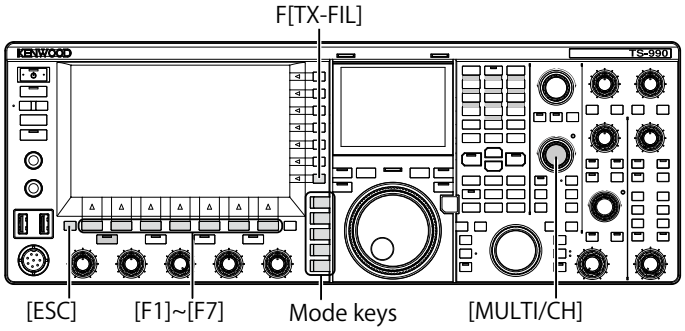
CHANGING THE BANDWIDTH OF THE TX FILTER

The transceiver is equipped with TX filters A to C. You can change the bandwidth for SSB and AM modes independently. You can select a TX filter optimal to the selected operating mode.



1 Press a mode key to select SSB, AM, SSB-DATA, or AM-DATA mode.

2 Press and hold **[TX-FIL]** (F) to open the **TX Filter** screen.

3 Press **[TX-FIL]** (F2) to select a TX Filter.
Each time you press **[TX-FIL]** (F2), the filter cycles as follows: FIL-A > FIL-B > FIL-C.

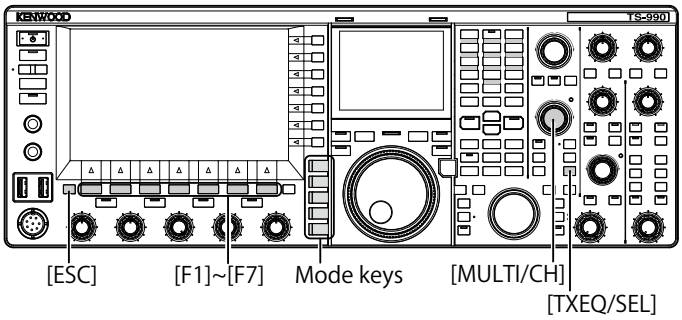
4 Press **[LO/HI]** (F3) to select the cutoff frequency.
You can select the low-cut frequency or the high-cut frequency.

5 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to select the low cutoff frequency and the high cutoff frequency.
- Each time you press **[-]** (F4) or **[+]** (F5) or rotate the **MULTI/CH** control one step, the bandwidth cycles as shown below. Rotate the **MULTI/CH** control counterclockwise to cycle the cutoff frequencies in the reverse sequence.
  Low Cut: 10, 100, 200, 300, 400, 500 Hz
  High Cut: 2500, 2600, 2700, 2800, 2900, 3000, 3500, 4000 Hz
- The default is 300 Hz for the low-cut frequency and 2700 Hz for the high-cut frequency.

6 Press **[ESC]**, or press and hold **[TX-FIL]** (F) to exit.

TX DSP EQUALIZER

The Digital Signal Processor (DSP) allows you to change the frequency characteristics of the transmitting audio signal. This function makes it possible to correct the frequency characteristics of the microphone and audio transmission quality according to your voice characteristics and preference.



SWITCHING THE TX DSP EQUALIZER ON OR OFF

1 Press a mode key to select SSB, AM, or FM mode.

2 Press **[TXEQ/SEL]** to enable or disable the TX DSP Equalizer.
"TXEQ▷nnn" appears while the TX DSP equalizer is active (refer to the list below for the "nnn" display). "TXEQ▷OFF" appears while the TX DSP equalizer is inactive.
- TXEQ▷HB1: High Boost 1 is selected
- TXEQ▷HB2: High Boost 2 is selected
- TXEQ▷FP: Formant Pass is selected
- TXEQ▷BB1: Bass Boost 1 is selected
- TXEQ▷BB2: Bass Boost 2 is selected
- TXEQ▷C: Conventional is selected
- TXEQ▷U1 - U3: User 1, 2, or 3 is selected

Note:

♦ The TX DSP equalizer will automatically deactivate if the transceiver enters a mode other than SSB, AM or FM.

SELECTING THE FREQUENCY CHARACTERISTICS OF THE TX DSP EQUALIZER

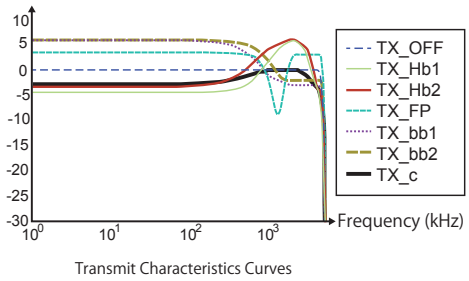
The transceiver is equipped with six types of frequency characteristics for the TX DSP equalizer. In addition, three types of frequency characteristics are available, each of which can be changed according to your preference. Select a frequency characteristic as follows.

1 Press a mode key to select SSB, AM, or FM mode.

2 Press and hold **[TXEQ/SEL]** to open the **TX Equalizer** screen.

3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select the desired characteristics of the speech processor.
You can select the desired option from the equalizer effects as shown in the table below.

Effect	Purpose
High Boost 1 (High-pass boost 1)	High-pass frequency components are emphasized. This configuration is effective for audio that contains low-pass frequency components.
High Boost 2 (High-pass boost 2)	High-pass frequency components are emphasized. This configuration provides characteristics that halve the low-pass attenuation level of High Boost 1.
Formant Pass (Formant pass)	This configuration attenuates frequency components outside the audio band, thus providing legible characteristics.
Bass Boost 1 (Low-pass boost 1)	Low-pass frequency components are emphasized. This configuration is effective for audio that contains high-pass frequency components.
Bass Boost 2 (Low-pass boost 2)	Low-pass frequency components are emphasized. This configuration provides characteristics that further emphasize the low-passband, compared with Bass Boost 1.
Conventional (Pseudo-analog characteristics)	The frequency domain ranging from 600 Hz and above is emphasized by 3 dB. This configuration is suitable for communication characteristics that loosely attenuate low-pass frequency components.
User 1 (User Configuration 1)	You can save your preferred frequency characteristics as User 1, User 2 and User 3. The default is the flat characteristics.
User 2 (User Configuration 2)	
User 3 (User Configuration 3)	

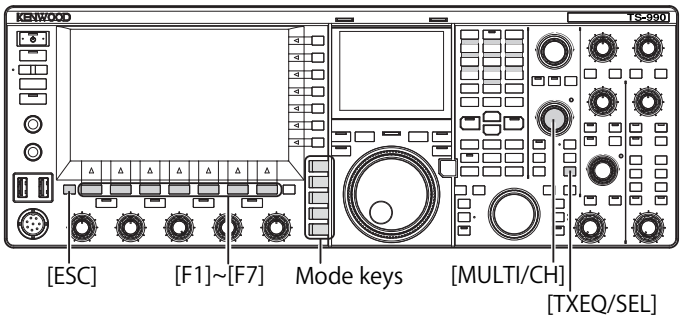


Transmit Characteristics Curves

4 Press **[ESC]**, or press and hold **[TXEQ/SEL]** to exit.

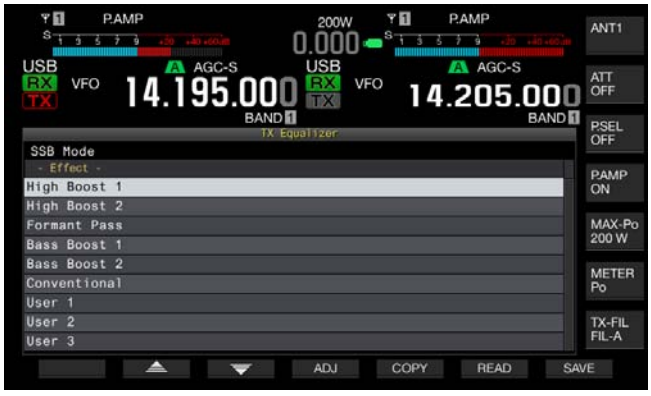
ADJUSTING THE TX DSP EQUALIZER

You can adjust the frequency characteristic using the TX DSP equalizer to reach your preferred audio quality.



1 Select SSB, AM, or FM mode on the transmit mode.

2 Press and hold **[TXEQ/SEL]** to open the **TX Equalizer** screen.



3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select the desired characteristics.

4 Press **[ADJ]** (F4) to open the **TX Equalizer** screen.

5 Press [◀] (F3) or [▶] (F4) and select the

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target frequency to be adjusted.

6 Press **[-]** (F5) or **[+]** (F6), or rotate the **MULTI/CH** control to select the level for each frequency band.
Press and hold **[(RESET)]** (F2) to revert all frequency levels to their defaults.

7 Press **[ESC]**, or press and hold **[TXEQ/SEL]** to exit.
Press [ ] (F1) to revert to the **TX Equalizer** screen.

Note:

- The configurations for frequency characteristics other than User 1 to User 3

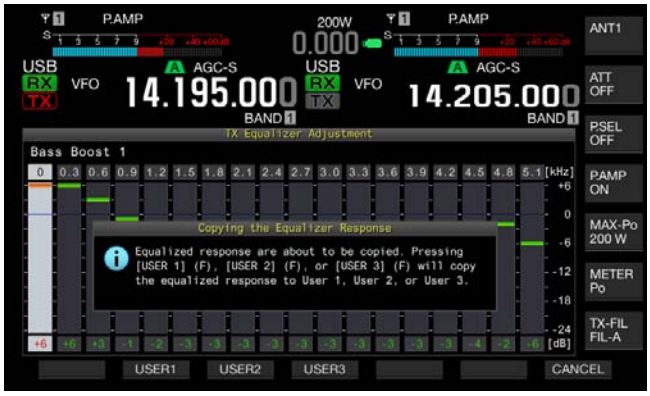
COPYING THE CONFIGURATION DATA FOR THE TX DSP EQUALIZER

After adjusting the TX Equalizer according to your preference, you can copy and save the configuration data as the user.

1 Press and hold **[TXEQ/SEL]** to open the **TX Equalizer** screen.

2 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select the desired characteristics of the speech processor.

3 Press **[COPY]** (F5) to copy the configuration data.
A message notifying you about how to specify the destination of the copied configuration data appears.



4 Press **[USER1]** (F2), **[USER2]** (F3), or **[USER3]** (F4) to specify the target to copy the configuration data.
- The data copying the configurations for the TX DSP equalizer is complete and the **TX Equalizer** screen reappears.
- Pressing **[CANCEL]** (F7) reverts to the **TX Equalizer** screen without reading the configuration data.

In the following procedure, you can edit and copy the configuration data for the TX DSP equalizer.

1 Press and hold **[TXEQ/SEL]** to open the **TX Equalizer** screen.

2 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select the desired characteristics of the speech processor.

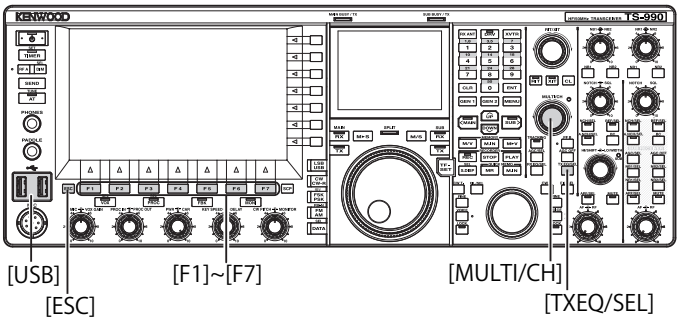
3 Press **[ADJ]** (F4) to open the **TX Equalizer** screen.
For the adjustment of the TX DSP equalizer, refer to "ADJUSTING THE TX DSP EQUALIZER". {page 9-10}

4 Press **[COPY]** (F7) to start a copy.
A message prompting you for the destination of the copy appears.

5 Press **[USER1]** (F2), **[USER2]** (F3), or **[USER3]** (F4) to specify the target to copy the configuration data.
- The data copying the configurations for the TX DSP equalizer is complete and the **TX Equalizer** screen reappears.
- Pressing **[CANCEL]** (F7) returns you to the **TX Equalizer** screen without copying the configuration data.

SAVING THE CONFIGURATION DATA FOR THE TX DSP EQUALIZER

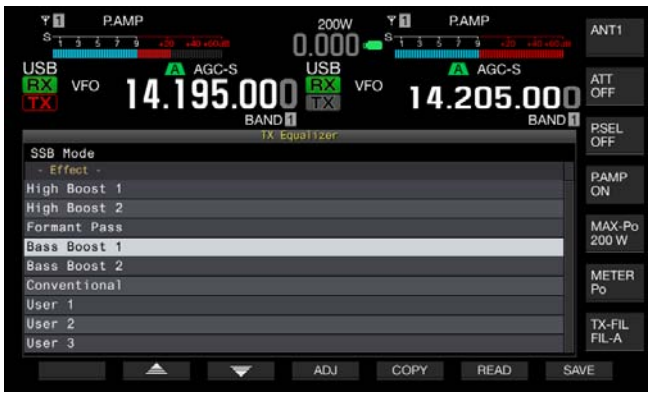
You can write the configuration data for the TX DSP equalizer onto a USB flash drive.



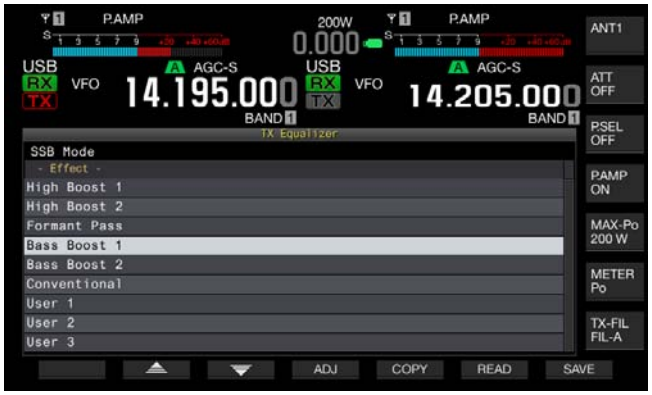
1 Press and hold **[TXEQ/SEL]** to open the **TX Equalizer** screen.

2 Insert a USB flash drive, which has been formatted by the transceiver, into the •⇨ (USB-A) connector.
After the USB flash drive has been correctly recognized, "▭" appears on the main screen.

3 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select the desired characteristics of the speech processor.



4 Press **[SAVE]** (F7) to save the configuration data.



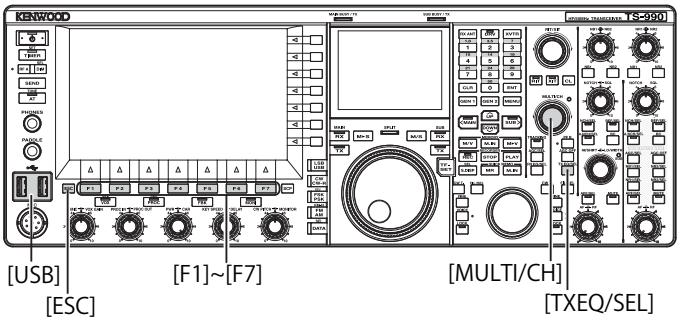
5 Press **[OK]** (F4) to exit.

Note:

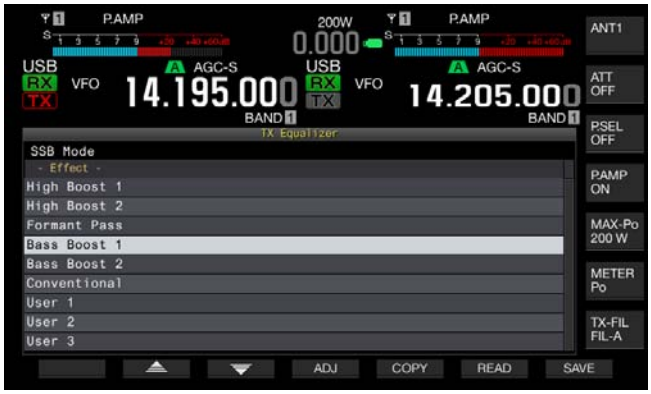
- The saved file is named with the year, month, day, hour, minute and second. The file extension is ".equ".
  Example: In the case of 30 seconds past 10:20, February 15, 2013, the saved file name would look like: 20130215_102030.equ
- The name of the storage folder is as follows:
  KENWOOD/TS-990/SETTINGS/TX_EQ
- Remove the USB flash drive only after executing the Safe Removal of USB Flash Drive. {page 12-1}

READING THE CONFIGURATION DATA FOR THE TX DSP EQUALIZER

You can read the configuration data for the TX DSP equalizer from a USB flash drive.



1 Press and hold **[TXEQ/SEL]** to open the **TX Equalizer** screen.



2 Insert a USB flash drive, for which data files have been saved, into the ⇠ (USB-A) connector.
Once the USB flash drive is recognized, the "▭" icon appears at the center top of the main screen.

3 Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select the type of equalizer to which configuration data read from a USB flash drive will be applied.

4 Press **[READ]** (F6) to open the **File (TX EQ)** screen.

- The File (TQ EQ) screen appears.
- Pressing **[CANCEL]** (F7) returns you to the **TX Equalizer** screen without selecting the configuration data.
- After pressing **[DELETE]** (F6), a message prompting you to ensure the deletion of the file appears. Pressing **[OK]** (F4) deletes the file.
- Pressing **[NAME]** (F5) enables you to rename the configuration data. {page 12-4}

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5 Press [▲] (F2) or [▼] (F5), or rotate the **MULTI/CH** control to select the desired file.

6 Press **[OK]** (F4) to start reading the configuration data.
- A message notifying you of the progress will appear. After the configuration data has been read, another message notifying you that the configuration data has been read will appear.
- Pressing **[CANCEL]** (F7) returns you to the **TX Equalizer** screen without reading the configuration data.

7 Press **[OK]** (F4).

8 Press **[ESC]** to exit.

Note:
- Remove the USB flash drive only after executing the Safe Removal of USB Flash Drive. {page 12-1}
- If the TX Equalizer type selected at step 3 differs from the equalizer type linked to the file to be read, the configuration data for TX Equalizer selected at step 3 will be overwritten with the configuration data for the TX Equalizer to be read.

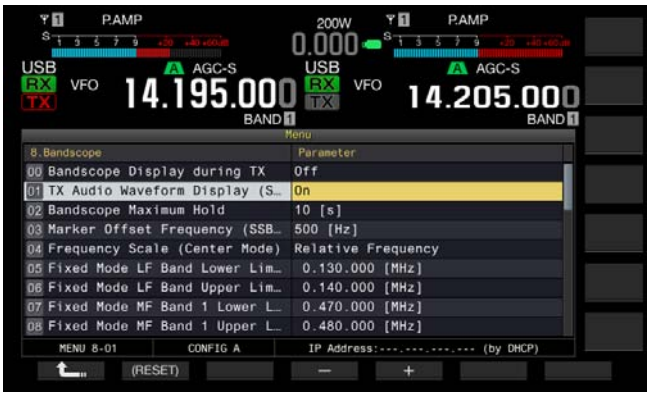
DISPLAYING THE SUBSCOPE DURING TX

You can display the waveform on the subscope also displaying the bandwidth of the TX filter while transmitting in SSB, FM, or AM mode. This enables you to observe the status of the transmitting audio.

1 Select Group No. 8, "Bandscope", from the **Menu** screen.

2 Access Menu 01, "TX Audio Waveform Display (Sub Screen)".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5) to select "On" to display the waveform on the sub scope.
The default is "On".

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

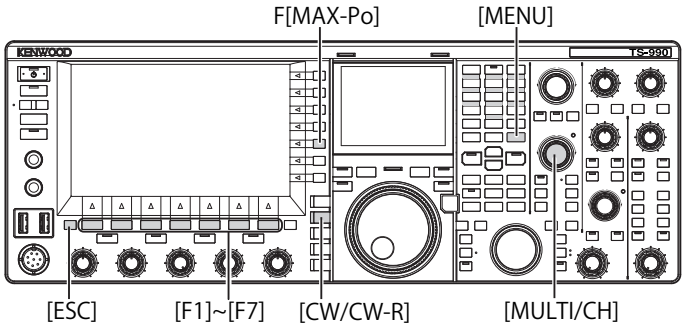
The Sub Scoop with Waveform displayed

Note:
- While transmitting, the configuration for Menu 8-01 cannot be changed.
- The marker represents the center frequency of the notch filter or the band elimination filter.
- The waveform does not appear on the subscope while an audio scope is active on the main screen.

TX TUNING

This function continuously transmits a carrier at a certain level of output regardless of the current transmission mode. This is useful for adjusting an external antenna tuner or linear amplifier.

It would be convenient if TX tuning (TX Tune) has been assigned to a PF key. Refer to "PF (Programmable Function" for further details. {page 16-6}

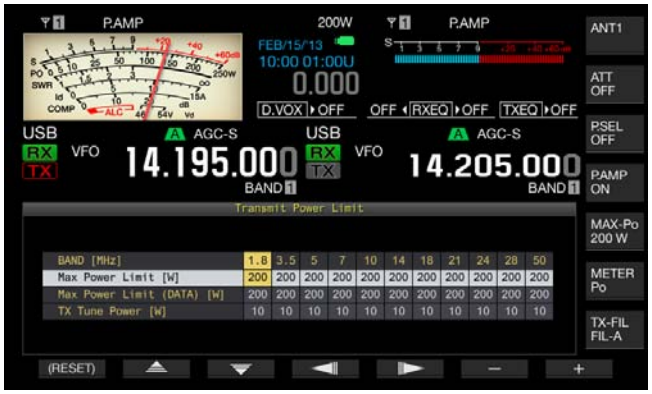


1 Press the PF key to which TX tuning is assigned.
- A continual carrier in CW mode is transmitted.
- "TX TUNE" appears.
- The meter indication switches to SWR.

2 Press the PF key to which TX tuning is assigned, again.
Transmission is interrupted and the transceiver reverts to the previous mode.

ADJUSTING THE TRANSMIT POWER FOR TX TUNING

1 Press **[MAX-Po]** (F) to open the **TX Output Limit** screen.



2 Press [◀] (F4) or [▶] (F5) to highlight a line for a frequency band.
The configuration can be changed in the selected line for a frequency band.

3 Press [▲] (F2) or [▼] (F3) to select "TX Tune Power".

4 Press **[-]** (F6) or **[+]** (F7), or rotate the **MULTI/CH** control to select the transmit power.
- The default is "10W".
- Press and hold **[(RESET)]** (F1) to reset the parameter for the selected item to its default.

5 Press **[ESC]** or **[MAX-Po]** (F) to exit.

Note:

♦ Once TX tuning begins, the wattage displayed inside the key guide of **[MAX-Po]** (F) on the right side of the main screen is replaced by the value configured for the transmit power during TX tuning (TX Tune Power).

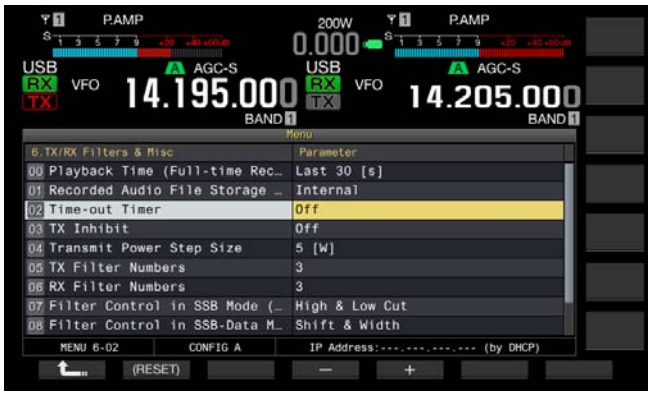
TIME-OUT TIMER (TOT)

The Time-out Timer is a function to stop transmission and forcibly place the transceiver into a receive state if the length of time configured for transmitting exceeds the preconfigured length of time.

1 Select Group No. 6, "TX/RX Filters & Misc", from the **Menu** screen.

2 Access Menu 02, "Time-out Timer".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to select the maximum transmit time.
Available options are "Off", "3 [min]", "5 [min]", "10 [min]", "20 [min]", and "30 [min]". The default is "Off".

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

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10 MEMORY CHANNELS

MEMORY CHANNEL

This transceiver has 120 memory channels and operating data can be configured for each channel.

There are three types of Memory Channels available, numbered from 00 to 99, P0 to P9, and E0 to E9. The outline of the Memory Channels is as follows:

- 00 to 99: Typical Memory Channels to which you can configure frequently used operating data.
- P0 to P9: Program Memory Channels to which you can configure the frequency range for the programmable VFO or the program scan.
- E0 to E9: Extensive Memory Channels which you can use the same as typical Memory Channels.

There are two types of memory modes for typical Memory Channels and extensive Memory Channels: single-band Memory Channel mode and dual-band Memory Channel mode.

- Single-band Memory Channel mode: Mode to which the information (simplex frequency, etc.) for operation in either the main band or the sub band are configured.
- Dual-band Memory Channel mode: Mode to which the operating data for the operation (split frequency, dual frequency reception, transmit frequency during split operation) using the main band and the sub band simultaneously can be configured.

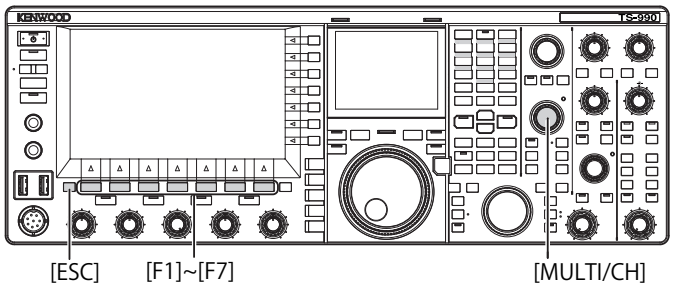
The following data can be configured in each memory channel.

Operating Data	Channel		
	00 to 99	P0 to P9	E0 to E9
RX Frequency	Yes	Yes (Simplex)	Yes
TX Frequency	Yes		Yes
Receive Mode	Yes	Yes (Simplex)	Yes
Transmit Mode	Yes		Yes
Operation category of this transceiver (split operation or dual-band reception)	Yes	No	Yes
Start Frequency	No	Yes	No
End Frequency	No	Yes	No
Tone, CTCSS cross tone	Yes	Yes	Yes
Tone Frequency	Yes	Yes	Yes
CTCSS Frequency	Yes	Yes	Yes
Memory Name	Yes	Yes	Yes
Lockout	Yes	Yes	Yes

DISPLAYING THE MEMORY CHANNEL LIST

The memory channel configurations can be displayed on the **Memory Channel List** screen. In the **Memory Channel List** screen, you can select a channel to configure the operating data or channel to operate.

You can assign a name to a Memory Channel.



You can select a memory channel in the **Memory Channel List** screen.

1 Press **[M/V]** to enter single-band Memory Channel mode or press and hold **[M/V]** to enter dual-band Memory Channel mode.

2 Press **[M.LIST]** (F7) to open the **Memory Channel List** screen.
- The **Bandscope** screen must be closed with a press of **[SCP]** if the **Bandscope** screen opens.
- The selected Memory Channel is highlighted in white. During the configuration of a Memory Channel, it is highlighted in pink.
- Press **[EXTEND]** (F7) to extend the **Memory Channel** screen. Press **[EXTEND]** (F7) again to revert the screen area to its original size.

3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select a Memory Channel.

4 Press **[ESC]** to exit.

Note:

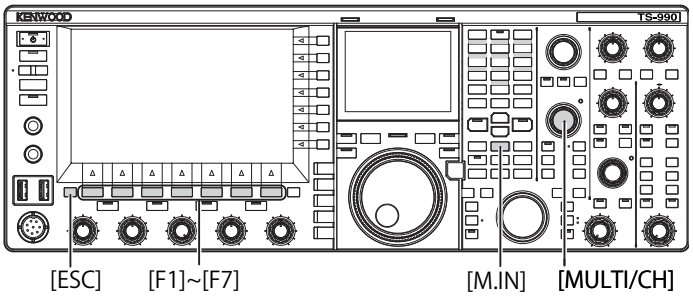
♦ You can view the Memory Channel List in VFO mode without pressing or holding **[M/V]**.

The following operating data appear on the **Memory Channel List** screen.

Items	Description
Channel	The channel code below appears. 00 to 99: Typical Memory Channels P0 to P9: Program Memory Channels E0 to E9: Extensive Memory Channels
Type	The Memory Channel type appears. S: Single-band Memory Channels D: Dual-band Memory Channels P: Program Memory Channels
Frequency 1	You can configure operating data such as the frequency and operating mode to be used in the main band or the sub band for single-band Memory Channels. You can configure the frequency and operating mode to be used as the main band frequency for Dual-band Memory Channels. You can configure the start frequency that specifies the start point of the program and the operating mode for Program Memory Channels.
Frequency 2	Nothing appears for Single-band Memory Channels. You can configure the frequency and operating mode to be used as the sub band frequency for Dual-band Memory Channels. You can configure the end frequency that specifies the end point of the program and the operating mode for Program Memory Channels.
TX/RX Func.	You can view the operating category of the transceiver for Dual-band Memory Channels. Nothing appears for Single-band Memory Channels. SPLIT: Split Operation DUAL RX: Dual-band Receive Operation SPLIT/DUAL: Displayed when receiving with the transmit frequency during split operation (TF watch).
NAME	Displays the Memory Channel name.
L.OUT	Displays the lockout status of each Memory Channel. The channels with check marks are not subject to the memory scan.

CONFIGURING THE OPERATING DATA TO A MEMORY CHANNEL

You can configure the operating data to single-band Memory Channels and dual-band Memory Channels.



CONFIGURING THE OPERATING DATA TO A SINGLE-BAND MEMORY CHANNEL

The main band or sub band frequency and operating mode can be configured in Memory Channels.

1 Select the frequency and operating mode to configure for the selected band.

2 Press **[M.IN]** (Memory) to open the **Memory Channel List** screen.

3 Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select the Memory Channel to configure the operating data.
Select a Memory Channel from the ranges of 00 to 99 and E0 to E9.

4 Press **[M.IN]** (F4) or **[M.IN]** (Memory) to configure the operating data.

- The operating data of the band selected with "Frequency 1" is configured for the Memory Channel and the **Memory Channel List** screen closes.
- Press **[CANCEL]** (F1) or **[ESC]** to close the **Memory Channel List** screen without configuring operating data to a Memory Channel.

Note:

♦ If a Memory Channel with no operating data stored in the selected band is used, no operating data is configured for the single-band Memory Channels.

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CONFIGURING THE OPERATING DATA TO A DUAL-BAND MEMORY CHANNEL

You can configure operating data such as the frequency, operating mode and operating status (split frequency, dual-band receive frequencies, transmit frequency during split operation) for use with a split operation or dual-band reception Memory Channel.

1 Configure the frequency, operating mode, and operating status (split operation, dual frequency reception, TF watch) to the main band and sub band.

2 Press **[M.IN]** (Memory) to open the **Memory Channel List** screen.

3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select the Memory Channel (00 to 99 or E0 to E9) to configure the operating data.

4 Press **[D-M.IN]** (F6) to configure the operating data.

- The operating data is configured for the main band in Frequency 1, for the sub band in Frequency 2 and the operating status is configured for TX/RX Func for the Memory Channels selected at step 3, and then the **Memory Channel List** screen closes.
- Press **[CANCEL]** (F1) or **[ESC]** to close the **Memory Channel List** screen without configuring operating data to a Memory Channel.

Note:

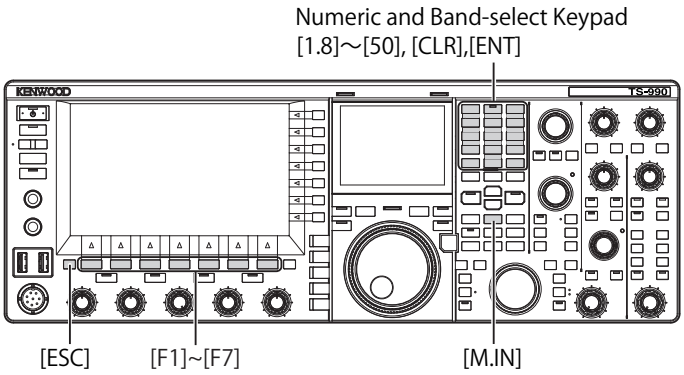
♦ Operating data cannot be configured for a Dual-band Memory Channel in the following cases:

- When a Memory Channel with no operating data configured in the main band or sub band is used
- When the single-band reception is selected during simplex operation ("RX" and "TX" in the sub band displays are both grayed out)

CONFIGURING OPERATING DATA BY DIRECTLY ENTERING A FREQUENCY

You can configure a frequency for Memory Channels or change existing Memory Channel operating data using the numeric and band select keypad.

This is useful when tuning the frequency to a station with a fixed frequency.



1 Press **[M/V]** to enter single-band Memory Channel mode or press and hold **[M/V]** to enter dual-band Memory Channel mode.

2 Rotate the **MULTI/CH** control to select the Memory Channel (00 to 99 or E0 to E9) to configure the operating data.

3 Press **[ENT]** to enable the use of numeric keys.

- Press to turn the backlight for the numeric keypad ON.
- Frequency entry mode is activated for the target band and the numbers in the frequency display are all replaced with "-" (dash).
- Press the mode key to change the operating mode.

4 Press the numeric keys to enter a frequency.

- Enter a number with the numeric key, and the dashes are replaced by the entered number, starting with the uppermost digit. To enter 1.82 MHz, press **[0/50]**, **[1/1.8]**, **[8/24]**, and **[2/3.5]** and then press **[ENT]** to complete the entry.
- Press **[CLR]** to clear the entered number, and the frequency entry ends.

5 Press **[ENT]** to configure the operating data.
The operating data is configured for the Memory Channel selected at step 2.

Note:

♦ If a frequency is entered directly in a Memory Channel with no operating data configured, the frequency is configured as the operating data of the single-band Memory Channel.

♦ To enter main band and sub band frequencies in a dual-band Memory Channel, press and hold **[M>V]** to enter dual-band Memory Channel mode. Enter the frequency to the main band and then to the sub band.

MEMORY CHANNEL MODE

There are two Memory Channel modes allowing you to use the operating data configured for Memory Channels: Single-band Memory Channel mode and Dual-band Memory Channel mode. You can transmit and receive with operating data diverted from Memory Channels. You can temporarily change the operating data such as the transmit and receive frequencies, operating mode and tones.

OPERATING IN SINGLE-BAND MEMORY CHANNEL MODE

You can divert the operating data of a Memory Channel configured in the main band or the sub band. The operating data for the Memory Channel configured for "Frequency 1" in the Memory Channel List is diverted.

1 Press **[M/V]** while in VFO mode to enter Single-band Memory Channel mode.
The selected band is switched to the operating data set for Frequency 1 in the Memory Channel List and the corresponding memory channel number appears on the main screen.

2 Press **[M/V]** again to exit Single-band Memory Channel mode.
The transceiver diverts to VFO mode.

OPERATING IN DUAL-BAND MEMORY CHANNEL MODE

The same Memory Channel can be diverted to the main band and sub band at the same time, and the operating status, such as split operation, dual frequency reception, and TF watch, can be stored to a Memory Channel.

You can divert the operating data of the Memory Channels configured for the main band and the sub band. The operating data for the Memory Channel configured with "Frequency 1", "Frequency 2", and "TX/RX Func." in the Memory Channel List is diverted.

1 Press and hold **[M/V]** while in VFO mode to enter Dual-band Memory Channel mode.
The operating data is switched to those configured in "Frequency 1", "Frequency 2", and "TX/RX Func." in the Memory Channel List for the main band and the sub band, and the corresponding Memory Channel number appears on the main screen reversing the outlined letter to white or black.

2 Press **[M/V]** again to exit Dual-band Memory Channel mode.
The transceiver diverts to VFO mode.

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SELECTING A MEMORY CHANNEL

The Memory Channel selected for the main band and the sub band can be switched individually.

1 Press **[<MAIN]** to select a main band Memory Channel or **[SUB>]** to select a sub band Memory Channel.

2 Press **[UP]** (microphone) or **[DOWN]** (microphone), or rotate the **MULTI/CH** control to select a Memory Channel.

Note:

- In Dual-band Memory Channel mode, the Memory Channels of both bands are switched simultaneously with whichever band is selected.

DIRECTLY ENTERING THE MEMORY CHANNEL NUMBER

The channel number for a single-band Memory Channel or dual-band Memory Channel can be selected using the numeric and band select keypad.

1 Press **[<MAIN]** or **[SUB>]** to select a band.

2 Enter the number of the tenths digit for the Memory Channel with a numeric key.
The number is displayed to the tenths digit for the Memory Channel number of the selected band, and "-" (dash) is displayed for the units digit.

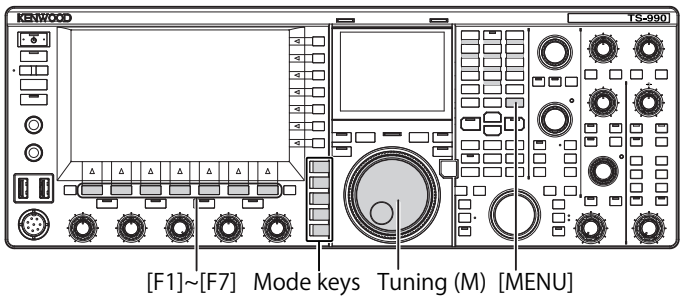
3 Enter the number of the units digit for the Memory Channel with a numeric keypad.
- The operating data for the corresponding channel number is diverted and channel number entry ends.
- Press **[CLR]** to cancel entry and the Memory Channel number entry ends.

Note:

- In Dual-band Memory Channel mode, when the operating data is diverted for a band, the unselected band also receives the data from the same channel number.
- While a Quick Memory Channel is in use, the number of the Quick Memory Channel cannot be configured.

TEMPORARILY CHANGING THE OPERATING DATA

While using operating data configured in a Memory Channel, you can temporarily change the frequency and other operating data without changing the operating data.

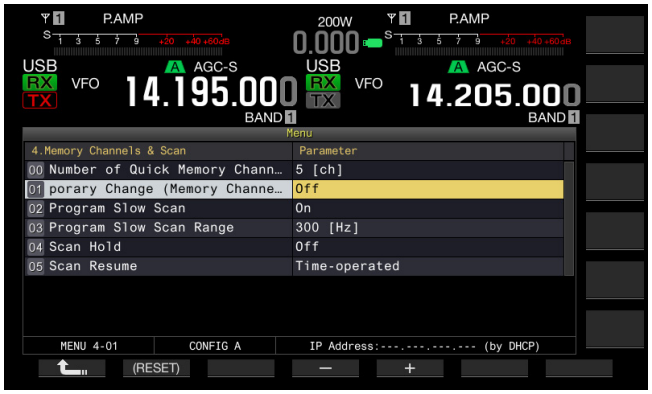


TEMPORARILY CHANGING THE FREQUENCY

Change the configuration as follows to temporarily change the frequency.

1 Select Group No. 4, "Memory Channels & Scan", from the **Menu** screen.

2 Access Menu 01, "Temporary Change (Memory Channel Configurations)".



3 Press **[SELECT]** (F4) to allow editing of the parameter box.

4 Press **[-]** (F4) or **[+]** (F5) to select "On".
The default is "Off".

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

7 Press **[M/V]** to enter single-band Memory Channel mode or press and hold **[M/V]** to enter dual-band Memory Channel mode.

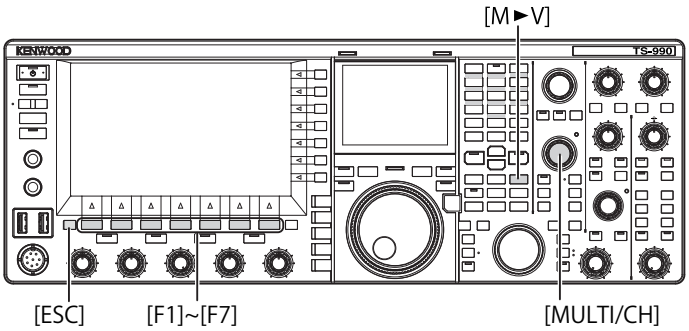
8 Rotate the **Tuning** (M) control to change the frequency.
To configure the changed frequency, configure it to a different Memory Channel. {page 10-2} {page 10-3}

Note:

- For Program Memory Channels, the operating data configured in the Memory Channel is updated when the frequency or mode is changed regardless of this configuration.
- The operating data related to the operating mode and FM tone can be temporarily changed regardless of this configuration.

COPYING OPERATING DATA FROM THE MEMORY CHANNEL

You can copy the operating data from a Memory Channel to the VFO or to another Memory Channel.



MEMORY SHIFT (MEMORY TO VFO)

You can copy the operating data from a Memory Channel to the VFO. This is useful when the frequency to be used is similar to the frequency configured in a Memory Channel.

■ Select a Memory Channel and Copy its Data to the VFO.

1 In Memory Channel mode, rotate the **MULTI/CH** control to select a Memory Channel.

2 Press **[M►V]** or **[M ► VFO]** (F6) to copy the operating data to the VFO.
- The operating data in the selected Memory Channel is copied to the VFO.
- Memory Channel mode ends and the transceiver enters VFO mode.
- If an operating data is changed temporarily, the changed operating data is copied to the VFO.
- You cannot copy operating data from a Program Memory Channel to the VFO.
- In Single-band Memory Channel mode, the operating data configured in "Frequency 1" is copied to the VFO of the selected band.
- In Dual-band Memory Channel mode, the operating data configured in "Frequency 1" is copied to the main band, the operating data configured in "Frequency 2" is copied to the sub band, and the operating status in "TX/RX Freq." is copied to the VFO.

■ Copy the Memory Channel Data to the VFO on the Memory Channel List Screen

1 Press **[M.LIST]** (F7) to open the **Memory Channel List** screen.

2 Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select a Memory Channel.

3 Press **[M►V]** or **[M ► VFO]** (F6) to copy the operating data to the VFO.
- When the operating data is copied to the VFO, the current operating data in the VFO will be cleared.
- Memory Channel mode ends and the transceiver enters VFO mode.
- You cannot copy operating data from a Program Memory Channel to the VFO.
- If "S" appears on the "Type" field in the **Memory Channel List** screen while in VFO mode, the operating data configured in "Frequency 1" is copied to the VFO of the selected band.
- If "D" appears on the "Type" field in the **Memory Channel List** screen while in VFO mode, the operating data configured in "Frequency 1" is copied to the main band, the operating data configured in "Frequency 2" is copied to the sub band, and the operating status in "TX/RX Freq." is copied to the VFO.

4 Press **[ESC]** to exit.

COPYING OPERATING DATA FROM ONE MEMORY CHANNEL TO ANOTHER MEMORY CHANNEL (CHANNEL TO CHANNEL)

You can copy the operating data in a Memory Channel to another Memory Channel. This is useful when sorting the order of the configured Memory Channels.

1 Press **[M.LIST]** (F7) to open the **Memory Channel List** screen.

2 Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select the Memory Channel to copy the operating data.

3 Press **[COPY]** (F6) to copy the operating data.
- If **[COPY]** (F6) is unavailable in the function key guide, press **[MORE]** (F1).
- The Memory Channel to be copied is highlighted in pink.

4 Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select the Memory Channel to configure the copied operating data.

5 Press **[M.IN]** (F4) to exit.
- The operating data in the Memory Channel selected in step 2 is copied to the Memory Channel selected at step 4.
- Press **[CANCEL]** (F1) or **[ESC]** to exit without copying the operating data.

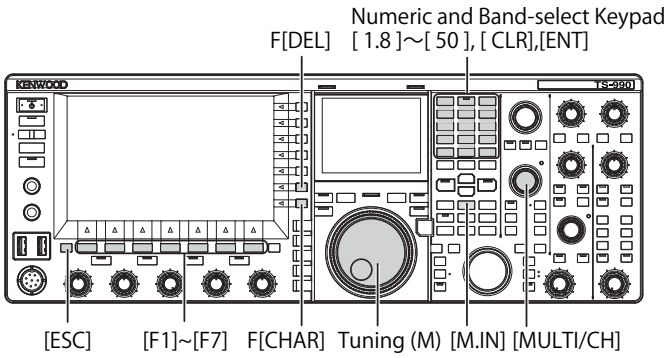
Note:

- You cannot copy the operating data in typical Memory Channels and extensive Memory Channels (00 to 99, E0 to E9) to Program Memory Channels (P0 to P9). Additionally, you cannot copy in the reverse direction.
- You cannot copy operating data from a Memory Channel with no operating data configured.

CONFIGURING THE PROGRAM SCAN FREQUENCY RANGE

For Memory Channels P0 to P9, you can configure the frequency range for the Programmable VFO and the program scan. To change the frequency in a certain range or to activate the scanning process, configure the start frequency and the end frequency in advance.

Refer to the next chapter for details of program scan.



1 In VFO mode, rotate the **Tuning** (M) or **MULTI/CH** control to tune the VFO frequency to the start frequency of scanning.

2 Press **[M.IN]** (Memory) to open the **Memory Channel List** screen.

3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select the Memory Channel (P0 to P9) to configure the frequency range.

4 Press **[M.IN]** (F4) or **[M.IN]** (Memory) to configure the start frequency.
The start frequency is saved in "Frequency 1".

5 Rotate the **Tuning** or **MULTI/CH** control to tune the VFO frequency to the end frequency.

6 Press **[M.IN]** (F4) or **[M.IN]** (Memory) to configure the end frequency.
The end frequency is saved in "Frequency 2" and the **Memory Channel List** screen closes.

CLEARING THE MEMORY CHANNEL

You can clear the configured operating data of a Memory Channel.

1 Press **[M.LIST]** (F7) to open the **Memory Channel List** screen.

2 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select a Memory Channel.

3 Press and hold **[(CLEAR)]** (F4) to clear the operating data.
If **[(CLEAR)]** (F4) is unavailable in the function key guide, press **[MORE]** (F1).

4 Press **[ESC]** to exit.

Note:

- If the operating data in one of the Memory Channels is cleared while operating in Memory Channel mode, the Memory Channel has no operating data but with the same channel number.
- To clear all Memory Channels, execute the Memory Channel reset. {page 16-4}

CONFIGURING NAMES FOR MEMORY CHANNELS

You can configure a name for each Memory Channel. You can configure the Memory Channel name with a maximum of 10 alphanumeric characters and symbols.

1 Press **[M.LIST]** (F7) to open the **Memory Channel List** screen.

2 Press [▲] (F2) or [▼], (F3) or rotate the **MULTI/CH** control to select the Memory Channel to be named.

3 Press **[NAME]** (F5) to enable editing of "NAME".
If **[NAME]** (F5) is unavailable in the function key guide, press **[MORE]** (F1).

4 Use function keys, the **MULTI/CH** control, or a USB keyboard to enter the name.
A maximum of 10 characters can be entered.

[SPACE] (F1): Press to insert a space.

[-] (F2)/**[+]** (F3): Press to select a character.

[◀] (F4) and [▶] (F5): Press to move the cursor to the left or right.

[SAVE] (F6): Press to save the edited characters.

[BACK SPACE] (F): Press to delete the character to the left of the cursor.

[DEL] (F): Press to delete the character to the right of the cursor.

[CHAR] (F): Press to change the character type to be edited. Each time you press **[CHAR]** (F), the character type cycles as follows:

ABC (upper case) > abc (lower case) > ÀÁÂ (upper case) > àáâ (lower case) > !"# (symbols) > ABC (upper case)

5 Press **[SAVE]** (F6) to configure the name.
- Press **[CANCEL]** (F7) to revert to the **Memory Channel List** screen without naming the Memory Channel.

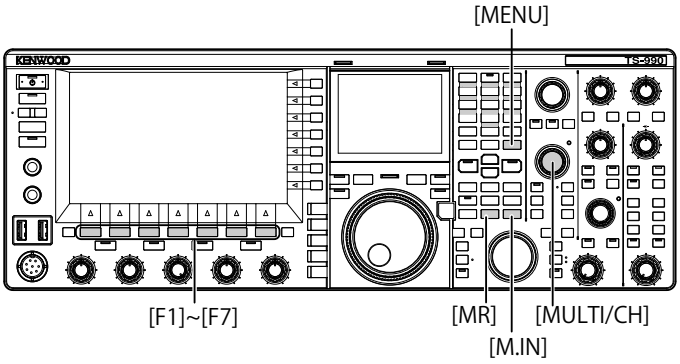
6 Press **[ESC]** to exit.

Note:

- The characters to be entered depend on the keyboard selected in Menu 9-01. {page 16-10}
- You cannot configure a name for the Quick Memory Channels. {page 10-8}
- A name can be given only to a Memory Channel where operating data has been stored.

QUICK MEMORY

Quick Memory allows you to quickly and temporarily configure the operating data without specifying a Memory Channel. For instance, it is useful to configure the operating data of the radio station to be communicated in advance when searching in the specific band to search DX.



QUICK MEMORY CHANNELS

Quick Memory Channels can only be recalled during VFO mode operation. You can configure the following operating data for a Quick Memory Channel.

- Frequency and operating mode for the main band
- Frequency and operating mode for the sub band
- Operation category of this transceiver (split operation or dual-frequency reception)
- RIT and XIT
- RIT/XIT frequencies
- Fine tuning
- Noise blanker
- Noise reduction
- Beat cancel
- Notch
- RX filter

CONFIGURING IN QUICK MEMORY

A maximum of 10 Quick Memory Channels (Q0 to Q9) can be configured for the transceiver. The last saved operating data is configured in Q0. When configuring new operating data, the last operating data is moved to Q1 and the new operating data is configured in Q0.

1 Press **[M.IN]** (Quick Memory) to configure the operating data in the Quick Memory Channel.
   - Pressing **[M.IN]** (Quick Memory) while in VFO mode configures the operating data in Channel 0. Pressing **[M/IN]** (Quick Memory) while in Quick Memory Channel mode configures the operating data in the selected Quick Memory Channel.
   - Each time new operating data is stored, individual operating data is shifted to the channel with the channel number incremented by 1.

Note:

- If the transceiver is placed in Memory Channel mode in the main band or the sub band, the operating data cannot be configured in the Quick Memory Channel even with a press of **[M.IN]** (Quick Memory).
- If the operating data is configured in all the Quick Memory Channels and press **[M.IN]** (Quick Memory), the oldest operating data configured in the Quick Memory Channel (the data with the largest Quick Memory Channel number) is cleared.

RECALLING QUICK MEMORY CHANNELS

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

1 Press **[MR]** (Quick Memory) to recall the operating data in a Quick Memory Channel.
   - The Quick Memory Channel number appears on the main band and sub band.

2 Rotate the **MULTI/CH** control to select a Quick Memory Channel.
   - Pressing **[MR]** (Quick Memory) again exits Quick Memory Channel mode and places the transceiver in VFO mode.

Note:

- When using operating data read from main band or sub band Memory Channel or when no operating data is configured in the Quick Memory Channel, the operating data cannot be read from the Quick Memory Channels even with a press of **[MR]** (Quick Memory).
- You can temporarily change the frequency and other operating data without changing the operating data configured in the Quick Memory Channel. To save the changed operating data, press **[M.IN]** (Quick Memory) to configure in Quick Memory. {page 10-8}

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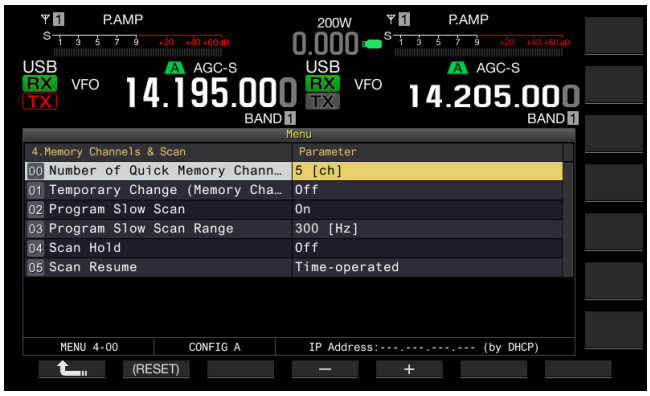
CONFIGURING THE NUMBER OF QUICK MEMORY CHANNELS

This transceiver has 10 Quick Memory Channels (Q0 to Q9). However, you can adjust the maximum number of available Quick Memory Channels.

1 Select Group No. 4, "Memory Channels & Scan", from the **Menu** screen.

2 Access Menu 00, "Number of Quick Memory Channels".

3 Press **[SELECT]** (F4) to enable editing of the parameter box.



4 Press **[–]** (F4) or **[+]** (F5) to select "3 [ch]", "5 [ch]", or "10 [ch]".
The default is "5 [ch]".

5 Press [⮌] (F1).

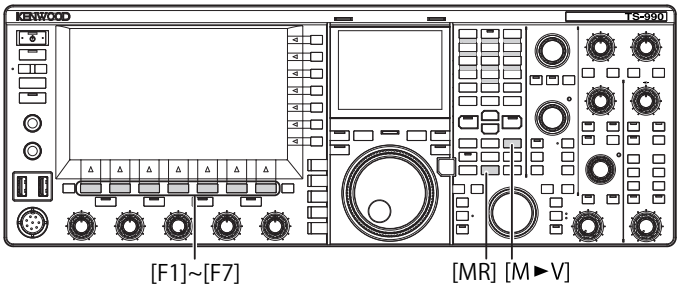
6 Press **[MENU]** to exit.

Note:

♦ When the configuration of Number of Quick Memory Channels is decreased, the oldest operating data is cleared from the Quick Memory Channel (the data with the largest Quick Memory Channel number).

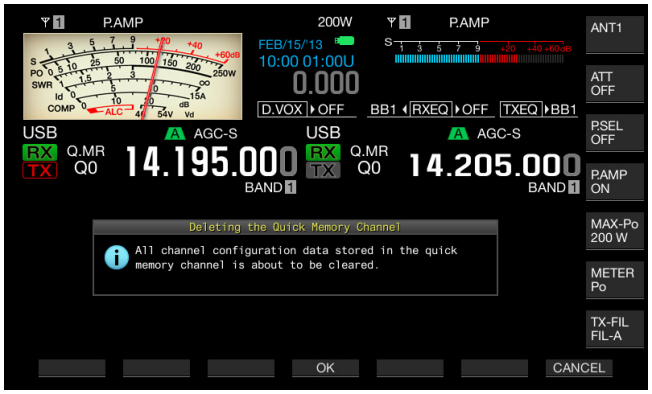
CLEARING QUICK MEMORY CHANNELS

You can clear all operating data configured in Quick Memory Channels.



1 Press **[MR]** (Quick Memory) to call the Quick Memory Channels.

2 Press and hold **[MR]** (Quick Memory).
A message appears prompting you to clear all operating data configured in the Quick Memory Channels.



3 Press **[OK]** (F4) to clear the operating data.
- All operating data in the Quick Memory Channel is cleared and VFO mode is selected.
- Press **[CANCEL]** (F7) to close the message without clearing the operating data in the Quick Memory Channels.

MEMORY SHIFT (QUICK MEMORY TO VFO)

You can copy the operating data of a Quick Memory Channel to the VFO.

1 Press **[MR]** (Quick Memory) to recall the Quick Memory Channels.

2 Rotate the **MULTI/CH** control to select a Quick Memory Channel to which the operating data will be copied.

3 Press **[M►V]** or [M ▶ VFO] (F6).
- Operating data in the Quick Memory Channel is copied to the VFO and VFO mode is selected.
- If an operating data is changed temporarily, the changed operating data is copied to the VFO.

Note:

♦ If the operating data is temporarily changed, the temporarily changed operating data is copied to the VFO.

♦ When the operating data is copied to the VFO, the operating data copied to the VFO until then will be overwritten.

11 SCAN

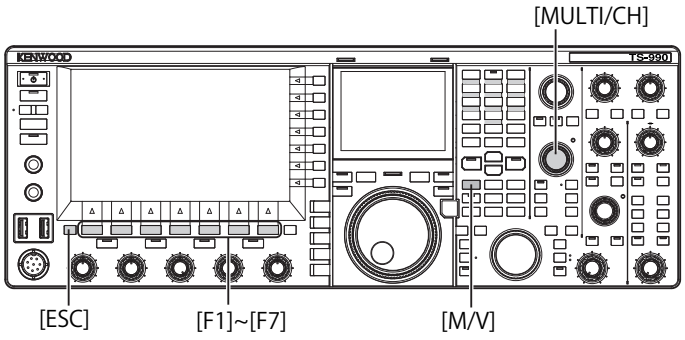
Scan is a function that searches for the availability of a signal by shifting the frequency. This transceiver has the following scans to search for a signal.

Scan Type		Purpose
Normal Scan	Program Scan	Scans the frequency range stored in the Programmable Memory Channels P0 to P9.
	VFO Scan	Scans all receive frequency range. If all Programmable Memory Channels are deselected (do not allow scanning), the transceiver does VFO scan, instead of Program Scan.
Scans using Memory Channels	All Channel Scan	Scans all Memory Channels, 00 to 99, P0 to P9, and E0 to E9.
	Group Scan	Scans the grouped Memory Channels.
	QUICK MEMORY SCAN	Scans the Quick Memory Channels.

PROGRAM SCAN

Program Scan scans in the frequency range between the Start frequency and End frequencies configured for the Program Memory Channels P0 to P9.

You can configure the frequency range for Program Scan for Program Memory Channels P0 to P9. A maximum of 10 frequency ranges may be used by the specific station. If the transceiver can be on standby state on the adjacent frequencies, it is easy to tune to a specific station after the station starts a QSO using the frequency range.



Note:

- With Program Scan, the transceiver scans the frequency range between the start frequency and the end frequency of the Programmable Memory Channel, and moves to the next channel after the transceiver finishes scanning the specified frequency range.
- With the transceiver power OFF, press **[⏻]** while pressing down **[PF A]** to start up the transceiver with Auto Voice Guidance enabled.
- The transceiver scans from the lower frequency to the higher frequency. If the end frequency is changed to be lower than the start frequency with a rotation of the **Tuning** or **MULTI/CH** control, the transceiver scans from the higher frequency to the lower frequency.
- The step frequency for scanning is the same frequency step size as that of the **Tuning** control for use in SSB, CW, FSK, and PSK modes, 100 Hz for use in AM mode, and the same frequency step size as that of the **MULTI/CH** control for use in FM mode.
- Scan stops when the transceiver receives a signal during Program Scan (VFO Scan) in FM mode or during Memory Scan (All Channel Scan, Group Scan) or Quick Memory Scan. Refer to "RESUMING THE SCANNING" for the conditions to resume scanning. {page 11-6}
- While the transceiver is on standby, in FM mode, to receive a CTCSS tone, the scan stops only if the received CTCSS tone matches the CTCSS tone configured for the transceiver.
- In FM mode, if the transceiver exceeds the critical squelch level by rotating the **SQL** control clockwise, scan does not stop even if a signal is present. The squelch level must be set near the critical squelch level.
- If the transceiver receives only using the main band, the transceiver does not scan using the sub band.
- While Frequency Tracking is active, scan does not start.

STARTING THE PROGRAM SCAN (VFO SCAN)

1. Press **[M/V]** to enter VFO mode.
2. Press **[SCAN]** (F5) to start the Program Scan (VFO Scan).
   Pressing **[SCAN]** (F5) again or pressing **[ESC]** stops Program Scan (VFO Scan).

CONFIGURING THE PROGRAM SCAN (VFO SCAN) FREQUENCY RANGE

You can configure whether the transceiver scans the frequency range specified with the Program Memory Channel (Program Scan), or receive all frequency range (VFO Scan).

Refer to "CONFIGURING NAMES FOR MEMORY CHANNELS" for the configuration of the Program Memory Channel. {page 10-7}

1. Press **[M/V]** to enter VFO mode.
2. Press and hold **[SCAN]** (F5) to open the **Program Scan** screen.

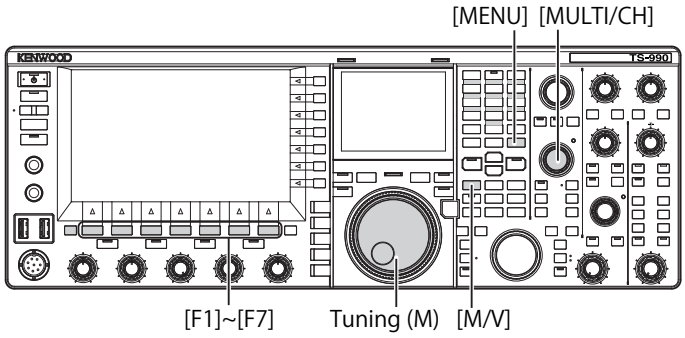
3. Press [◀] (F2) or [▶] (F3) to select a channel for Program Memory Channel.
4. Press [■ ⇆ ✓] (F4) to determine whether or not the transceiver scans the Program Memory Channels.
   - Each key press toggles a tick mark on (allows scanning) or off (does not allow scanning).
   - To use VFO Scan, all tick marks on all Program Memory Channels must be removed (deselected).
   - Pressing **[SEL.ALL]** (F6) selects and places a tick mark on all Program Memory Channels.
   - Pressing **[CLR.ALL]** (F7) deselects and removes the tick marks from all Program Memory Channels.
5. Press **[ESC]** to exit.

Note:

♦ Configuration examples for Program Scan and VFO Scan:
- Place tick marks to the Program Memory Channels, P1, P3 and P5, and then press **[SCAN]** (F5). The transceiver starts the Program Scan and scans the frequency range stored on each channel.
- Remove all tick marks from all Program Memory Channels, and then press **[SCAN]** (F5). The transceiver starts the VFO Scan and scans all receive frequency ranges.
- A tick mark will be removed from a Program Memory Channel to which no operating data has been configured, and you cannot place a tick mark.

CHANGING THE SCAN SPEED

In any mode other than FM mode, you can change the scan time to remain on each frequency for Program Scan (VFO Scan).



1 Press **[-]** (F3) or **[+]** (F4) during Program Scan (VFO Scan).
The scan speed appears below the frequency display.

The scan time to remain on each channel varies as below.

Display	Time Intervals
SCAN-SPD1	10 ms
SCAN-SPD2	30 ms
SCAN-SPD3	100 ms
SCAN-SPD4	150 ms
SCAN-SPD5	200 ms
SCAN-SPD6	250 ms
SCAN-SPD7	300 ms
SCAN-SPD8	350 ms
SCAN-SPD9	400 ms

Note:

♦ In FM mode, the scan time to retain each frequency during Program Scan and VFO Scan is fixed to 80 ms, and you cannot change the scan time. However, if the transceiver receives a CTCSS tone, the scan time is extended to 400 ms. In FM mode, "SCANNING" appears in place of the scan speed.

SCAN HOLD

In any mode other than FM mode, changing the frequency with a rotation of the **Tuning** or **MULTI/CH** control during Program Scan (VFO Scan) stops scanning for five seconds.

The transceiver can temporarily receive without stopping the scan.

Follow the procedure below to enable Scan Hold.

1 Select Group No. 4, "Memory Channels & Scan", from the **Menu** screen.

2 Access Menu 04, "Scan Hold".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.

4 Press **[-]** (F4) or **[+]** (F5) to select "On".
The default is "Off".

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

If Scan Hold is enabled in Menu 4-04, the transceiver can receive a signal by stopping the Program Scan for five seconds.

7 Press **[SCAN]** (F5) to start the Program Scan (VFO Scan).

8 Rotate the **Tuning** or **MULTI/CH** control to increase or decrease the frequency.
Program Scan (VFO Scan) stops for five seconds. Then, the transceiver resumes Program Scan (VFO Scan).

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PROGRAM SLOW SCAN

Program Slow Scan is a function that extends, at the preconfigured frequency (frequency point) and its adjacent frequency range, the scan time to remain on each frequency (to slow down the scan) during Program Scan. If scan slows down on a certain frequency (frequency points) and its adjacent frequency range, you can carefully watch the traffic status. {page 10-7}

ENABLING OR DISABLING THE PROGRAM SLOW SCAN

To do Program Slow Scan during Program Scan, you need to enable Program Slow Scan in advance.

If the transceiver, during Program Scan, scans the frequency that is in the frequency range preconfigured for Program Slow Scan, "SCAN-SLOW" appears on the main screen, and the scan time slows down.

1 Select Group No. 4, "Memory Channels & Scan", from the **Menu** screen.

2 Access Menu 02, "Program Slow Scan".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.

4 Press **[-]** (F4) or **[+]** (F5) to select "On" or "Off".
The default is "On" (enabling the Program Slow Scan). Selecting "Off" does not allow you to execute the Program Slow Scan.

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

Note:

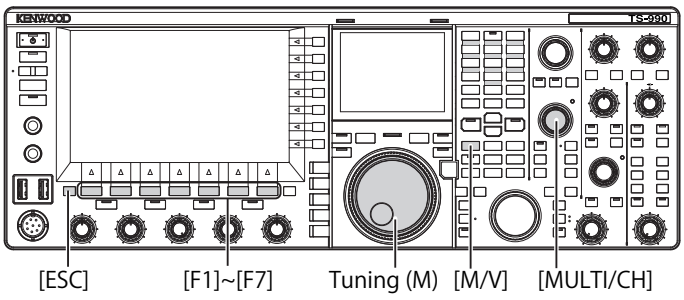
- Select "Off" from Menu 4-02, if you do not use Program Slow Scan.

CONFIGURING THE PROGRAM SLOW SCAN FREQUENCY RANGE

The frequency point where the scan time is extended during Program Slow Scan can be configured.

A maximum of five frequency points for each Program Memory Channel,P0 to P9, can be configured.

To configure the frequency point, the frequency range must initially be configured for the Program Memory Channel. {page 10-7}



1 Press **[M/V]** to enter Memory Channel mode.

2 Press **[M.LIST]** (F7) to open the **Single Memory Channel List** screen.

3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select a Program Memory Channel.

4 Press and hold **[SLW.SCAN]** (F5) to open the **Program Slow Scan** screen.
If **[MEMORY]** (F5) is unavailable in the function key guide, press **[MORE]** (F1).

5 Rotate the **Tuning** (M) control to tune the current frequency as the frequency point of the program slow scan.

6 Press one of the function keys **[POINT1]** (F2) to **[POINT5]** (F6) to configure the frequency point.

- Pressing and holding the same function key clears the stored frequency point.
- Pressing and holding **[(ALL.CLR)]** (F7) clears all frequency points.

7 Press and hold [↩] (F1) to close the **Program Slow Scan** screen.
The transceiver reverts to the **Memory Channel List** screen.

Note:

- If the frequency point has been configured, pressing the corresponding function key, **[POINT1]** (F2) to **[POINT5]** (F6), overwrites the frequency stored for that frequency point.
- The value configured for the frequency point is rounded off to a value below 10 Hz.
- The frequency point cannot be configured for use other than Single Memory Channel Mode. Therefore, **[SLOW.SCN]** (F5) does not appear until the selected band is placed in Program Slow Scan mode.

CONFIGURING THE PROGRAM SLOW SCAN FREQUENCY RANGE

The scan time for Program Scan while the transceiver slows down the scanning on the frequency points for Program Slow Scan and its adjacent frequency range. This adjacent frequency range is called the frequency range. Follow the procedure below to configure the frequency range for the slow scan frequency.

1 Select Group No. 4, "Memory Channels & Scan", from the **Menu** screen.

2 Access Menu 03, "Program Slow Scan Range".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.

4 Press **[-]** (F4) or **[+]** (F5), or rotate the **MULTI/CH** control to select "100 [Hz]", or "200 [Hz]", "300 [Hz]", "400 [Hz]", or "500 [Hz]".
- The default is "300 [Hz]".
- For instance, if "500 [Hz]" is selected, the transceiver slows down the scanning at the frequency point within ±500 Hz of the frequency range.

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

MEMORY SCAN

Memory Scan enables the transceiver to change the preconfigured Memory Channels at certain time intervals for scanning.

There are two Memory Scans: All Channel Scan which scans all Memory Channels to which the operating data has been stored, and Group Scan which scans the selected and grouped Memory Channels.

STARTING THE SCAN

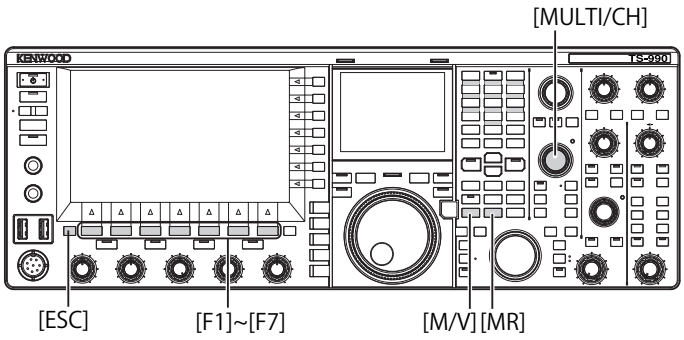
1 Press **[M/V]** while in VFO mode to enter Single-band Memory Channel mode, or press and hold **[M/V]** to enter Dual-band Memory Channel mode.

2 Press **[SCAN]** (F5) to activate Memory Scan.
- Rotating the **MULTI/CH** control fast-forwards or fast-reverses the scanning sequence.
- Pressing **[SCAN]** (F5) again or pressing **[ESC]** stops the Memory Scan.

Note:

- Memory Scan stops if the transceiver receives a signal on the main band or sub band while in Dual-band Memory Channel mode.
- The scan time for each frequency during Memory Scan is 400 ms. However, if the transceiver receives a CTCSS tone in FM mode, the scan time is extended to 600 ms. "SCANNING" appears in place of the scan speed.

EXAMPLES OF CONFIGURATIONS FOR THE ALL CHANNEL SCAN AND THE GROUP SCAN



1 Press **[M/V]** while in VFO mode to enter Single-band Memory Channel mode, or press and hold **[M/V]** to enter Dual-band Memory Channel mode.

2 Press and hold **[SCAN]** (F5) to open the **Program Scan** screen.

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3 Press [ ] (F2) or [ ] (F3) to select a Group for Group Scan.

4 Press [ ] (F4), or rotate the **MULTI/CH** control to specify whether or not the transceiver scans the Memory Channels in the grouped Memory Channels.
- Each key press toggles a tick mark on (allows scanning) or off (does not allow scanning).
- To start All Channel Scan, place a tick mark on all memory groups.
- Pressing **[SEL.ALL]** (F6) selects and places a tick mark on all Memory Channels.
- Pressing **[CLR.ALL]** (F6) deselects and removes the tick mark from all Memory Channels.

5 Press **[ESC]** to exit.

Note:

♦ If the Memory Group to be scanned has been configured as below, Memory Scan does not start even with the press of **[SCAN]** (F5).
- Tick marks on all Memory Groups are removed (deselected).
- Even if a tick mark is placed on a Memory Group, no operating data is stored on the Memory Channels in this Memory Group.
- Even if a tick mark is placed on a Memory Group, all Memory Channels in this Memory Group are locked out.

♦ The Memory Channels in the Memory Groups are listed below. Combinations of the Group number and Memory Channel numbers.

Group	Memory Channel	Group	Memory Channel
0	00 to 09	6	60 to 69
1	10 to 19	7	70 to 79
2	20 to 29	8	80 to 99
3	30 to 39	9	90 to 99
4	40 to 49	P	P0 to P9
5	50 to 59	E	E0 to E9

♦ Examples of Configurations for All Channel Scan and Group Scan
- If you place tick marks on Memory Groups 1 and 5, pressing **[SCAN]** (F5) starts the Group Scan. The Memory Channels in Memory Groups 1 and 5 will be scanned.
- If you place tick marks on all Memory Groups, pressing **[SCAN]** (F5) starts All Channel Scan.

♦ Even if a tick mark is placed for a Memory Channel (the scan is enabled), the transceiver does not scan the Memory Channel to which no operating data is stored for the Memory Channel in a Memory Group or the Memory channel is locked out.
If the transceiver starts scanning while in Dual Memory Channel mode, the transceiver does not scan Program Memory Channels P0 to P9.

LOCKING OUT A MEMORY CHANNEL

You can select Memory Channels to be exempted from Memory Scan.

1 Press **[M.LIST]** (F7) to open the **Memory Channel List** screen.

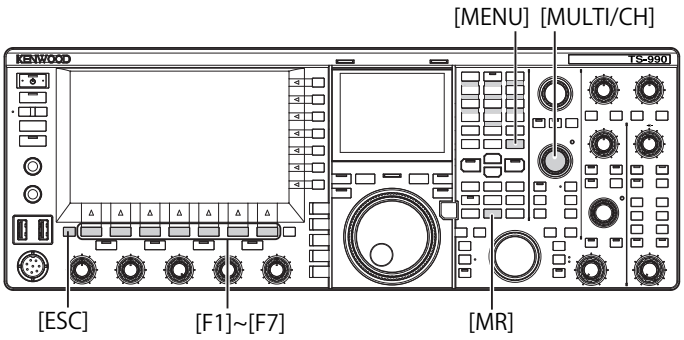
2 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select a Memory Channel.

3 Press **[L.OUT]** (F6) to lock out a Memory Channel.
- A tick mark is placed on the section of "L.OUT" of the selected Memory Channel.
- If **[L.OUT]** (F6) is unavailable in the function key guide, press **[MORE]** (F1).
- Pressing **[L.OUT]** (F6) again disables the Lockout for the Memory Channel.

4 Press **[ESC]** to exit.

QUICK MEMORY SCAN

Quick Memory Scan enables the transceiver to change the configured Quick Memory Channels at certain time intervals, to scan.



1 Press **[MR]** (Quick Memory) to read a Quick Memory Channel.

2 Press **[SCAN]** (F6) to start Quick Memory Scan.
- Rotating the **MULTI/CH** control fast-forwards or fast-reverse the scanning sequence.
- Pressing **[SCAN]** (F5) again or pressing **[ESC]** stops Quick Memory Scan.

Note:
- If the transceiver starts the reception in the main band or sub band, scan stops.
- The scan time for each frequency during Quick Memory Scan is 400 ms. However, if the transceiver receives a CTCSS tone while in FM mode, the scan time for each frequency is extended to 600 ms.
- During Quick Memory Scan, "SCANNING" appears in place of the scan speed.

RESUMING THE SCANNING

Scan stops if the transceiver receives a signal during the Program Scan (VFO Scan) while in FM mode or during Memory Scan or Quick Memory Scan regardless of the operating data.

The conditions to resume scanning after scanning stops can be configured.

Time-operated:
Scan stops for three seconds upon receipt of a signal. If the reception continues even after three seconds, scan stops for the three seconds once a signal is received and continues even after three seconds, and again after three seconds.

After this, the transceiver resumes scanning even if the transceiver continues receiving. (In other words, the maximum scan stop time while in Time-operated mode is six seconds.)

Carrier-operated:
Scan stops while the transceiver receives a signal. The transceiver resumes scanning two seconds after there is no longer a signal.

1 Select Group No. 4, "Memory Channels & Scan", from the **Menu** screen.

2 Access Menu 05, "Scan Resume".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.

4 Press **[-]** (F4) or **[+]** (F5) to select either "Carrier-operated" or "Time-operated".
The default is "Time-operated".

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

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ABOUT THE USB FLASH DRIVE

The configuration data for the transceiver or audio data can be stored in a USB flash drive. Also, the configuration data or the audio data stored in the USB flash drive can be read.

Note:

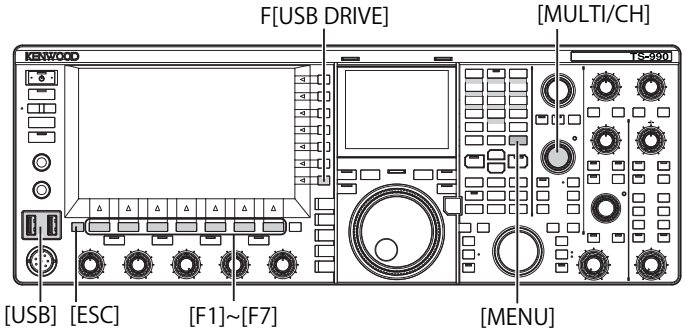
- A USB flash drive is not supplied with this transceiver. You can use a commercially available USB flash drive which conforms to the USB1.1/2.0 (Full Speed) specifications.
- The USB flash drive may not work properly, depending on the type of USB flash drive. Additionally, USB flash drives with the security features mentioned below cannot be used.
  - Virus Check
  - Encryption
  - Password Authentication
  - Fingerprint Authentication
- Do not connect a USB flash drive to an extension cable with a length exceeding 3 m (10 ft).

FORMATTING A USB FLASH DRIVE

To use a USB flash drive, you must format the USB flash drive with this transceiver. A USB flash drive not formatted by this transceiver will be recognized by the transceiver.

PRECAUTION:

- If a USB flash drive is formatted with the transceiver, all data files saved in the USB flash drive will be erased. Necessary data must be stored in your PC or other external storage device.

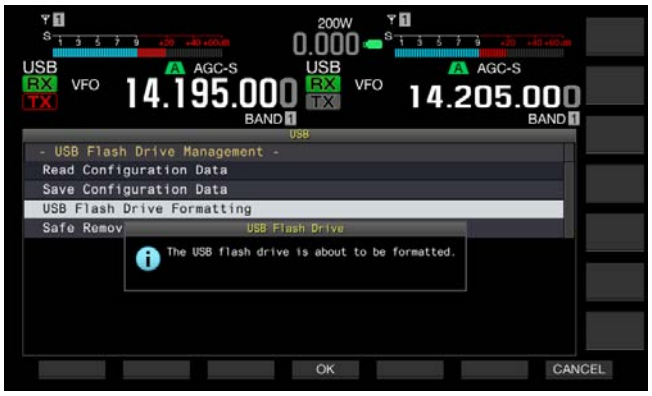


1 Insert a USB flash drive to the ⇐ (USB-A) connector.
"[redacted]" blinks on the main screen, and "[redacted]" lights when the transceiver recognizes the USB flash drive. Wait until the "[redacted]" icon appears.

2 Press **[USB DRIVE]** (F) on the Menu screen to open the USB screen.

3 Select "USB Flash Drive Formatting".

4 Press **[SELECT]** (F4) to start formatting.
- A message prompting you the start of the formatting appears.
- Pressing **[CANCEL]** (F7) aborts the procedure without formatting the USB flash drive.



5 Press **[OK]** (F4).
Upon completion of formatting, the **USB** screen reappears.

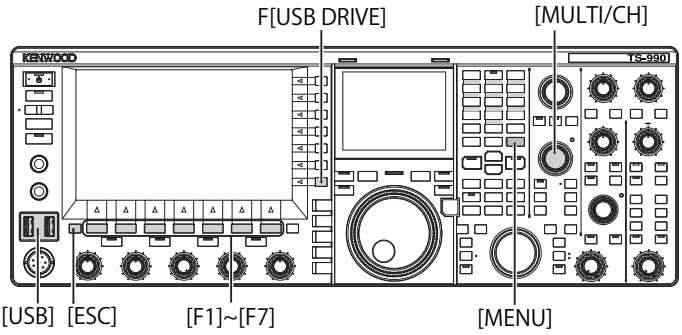
6 Press **[MENU]** to exit.

Note:

- "[redacted]" does not light unless the transceiver properly recognizes the USB flash drive.

SAFELY REMOVING THE USB FLASH DRIVE

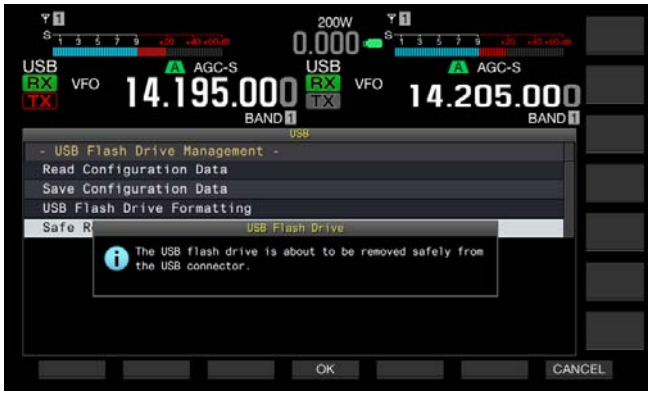
To safely remove a USB flash drive from the transceiver, you must follow the procedure below . Otherwise, failure in the safe removal of the USB flash drive may cause damage to USB flash drive, the configuration data file, the audio data file and malfunction of the transceiver.



1 Press **[USB DRIVE]** (F) on the Menu screen to open the USB screen.

2 Select **"Safe Removal of USB Flash Drive"**.

3 Press **[SELECT]** (F4) to start the safe removal of USB flash drive.
- A message notifying you of the safe removal of USB flash drive appears.
- Press **[CANCEL]** (F7) to abort this procedure without Safe Removal of USB Flash Drive executed.



4 Press **[OK]** (F4).
Upon execution of Safe Removal of USB Flash Drive, the **USB** screen reappears.

5 Press **[MENU]** to exit.

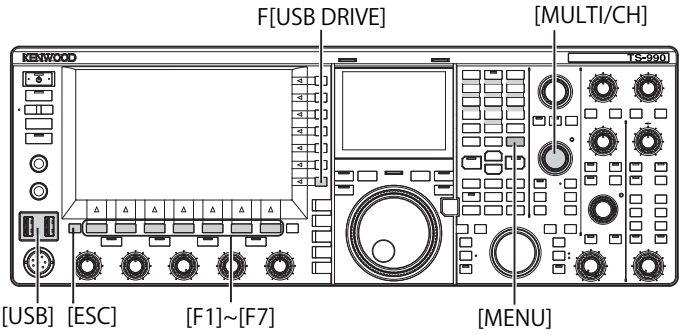
6 Disconnect the USB flash drive.

Note:

- If "Safe Removal of USB Flash Drive" is assigned to a PF key, pressing the PF key executes the Safe Removal of USB Flash Drive, and you can safely remove the USB flash drive. {page 16-6}

SAVING A FILE IN USB FLASH DRIVE

The configuration data and audio data made with this transceiver can be saved in a USB flash drive.



1 Insert a USB flash drive into the ⇐ (USB-A) connector.
"■" blinks on the main screen, and "■" lights when the transceiver recognizes the USB flash drive.

2 Press **[USB DRIVE]** (F) on the Menu screen to open the **USB** screen.

3 Select Menu "Save Configuration Data".

4 Press **[SELECT]** (F4) to start writing the file.
- The message associated with the data writing appears if no USB flash drive is detected.
- Pressing **[CANCEL]** (F7) aborts the procedure without saving the data.

5 Press **[OK]** (F4) to exit.

PRECAUTION:

- Do not remove the USB flash drive while the configuration data file or the audio data file is being saved in the USB flash drive. Also, do not shut down the main power switch (I/O). Otherwise, failure in the safe removal of the USB flash drive may cause damage to the USB flash drive, the configuration data file, the audio data file and malfunction of the transceiver.

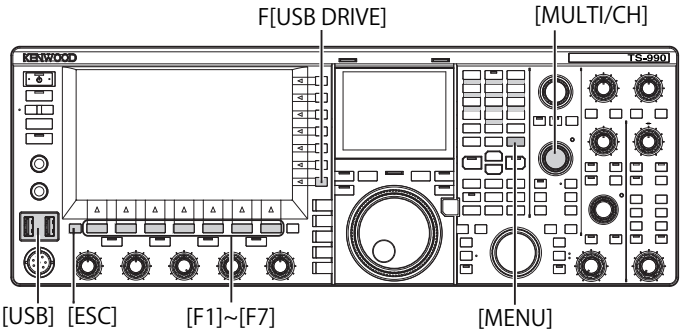
Note:

- The extension of the saved file is ".dat".
- Data files will be saved using a file name consisting of the current date and time ("YYYYMMDD_HHMMSS.dat").
  Example:
  20130215_102030.dat (the name of a file saved on February 15, 2013 at 10:20:30)
- The path to the saved file will be “KENWOOD/TS-990/SETTINGS/DATA”.
- Prior to storing a file in a USB flash drive, be sure of the followings.
  - The USB flash drive has been formatted with the transceiver.
  - The USB flash drive must be inserted in place.
  - The USB flash drive must have sufficient memory space available.
  - The USB flash drive must not be write protected or the file system cannot be corrupted.

READING A FILE FROM USB FLASH DRIVE

The configuration data file and the audio data file stored in a USB flash drive can be read with the transceiver. The transceiver can read the configuration data after adding the following configuration data to the readable configuration data.

- Configuration data for the operation environment
- Configuration data associated with a CW message
- Configuration data associated with a recording
- Audio data associated with an audio message



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Prepare a USB flash drive where the target files are stored, then follow the procedure below.

1 Insert a USB flash drive to the (USB-A) connector.
"" blinks on the main screen, and "" lights when the transceiver recognizes the USB flash drive.

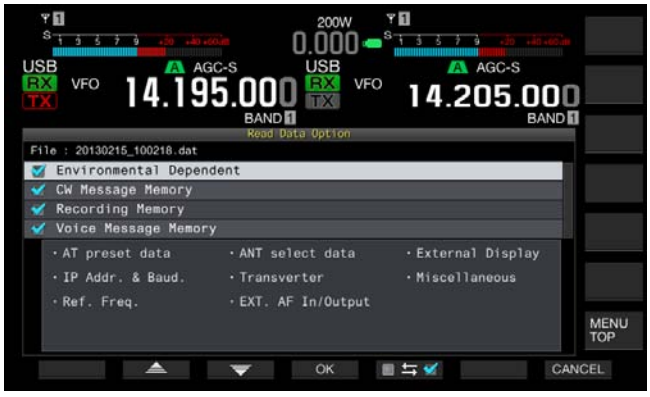
2 Press **[USB DRIVE]** (F) on the Menu screen to open the **USB** screen.

3 Select Menu "Read Configuration Data".

4 Press **[SELECT]** (F4) to open the File (Configuration Data) screen.
- File names stored in the USB flash drive appear.
- Pressing **[CANCEL]** (F7) aborts the procedure without reading the data.

5 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select the desired file.

6 Press **[OK]** to open the **Read Data Option** screen.
Pressing **[CANCEL]** (F7) aborts the procedure without reading the data.



7 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select the configuration data to be read.

8 Press [ ] to place a tick mark on the left side of the configuration data name.
Each key press places a tick mark (reading the configuration data) or removes the tick mark (not reading the configuration data).

9 Repeat steps 7 and 8 to configure whether or not each configuration data will be read.

10 Press **[OK]** (F4) to start reading of the file.
Upon completion of the reading, a message notifying you the end of configuration data reading appears.

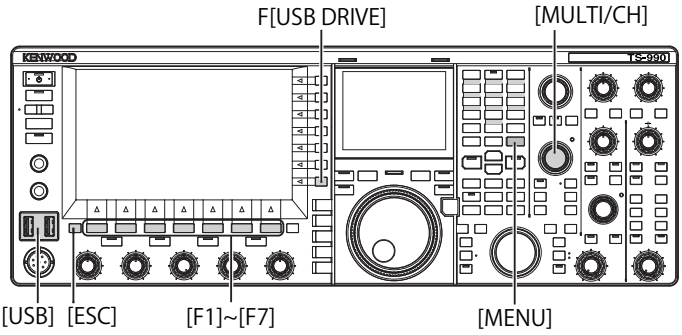
11 Press **[OK]** (F4) to exit.
The transceiver automatically restarts.

PRECAUTION:

♦ Do not remove the USB flash drive while the configuration data file or the audio data file is being read from the USB flash drive. Also, do not shut down the main power switch (I/O). Otherwise, failure in the safe removal of the USB flash drive may cause damage to the USB flash drive, the configuration data file, the audio data file and the malfunction of the transceiver.

DELETING A FILE FROM USB FLASH DRIVE

The configuration data file and the audio data file stored in a USB flash drive can be deleted from the USB flash drive.



Prepare a USB flash drive where the target files are stored, then follow the procedure below to delete a file.

1 Insert a USB flash drive to the (USB-A) connector.
"" blinks on the main screen, and "" lights when the transceiver recognizes the USB flash drive.

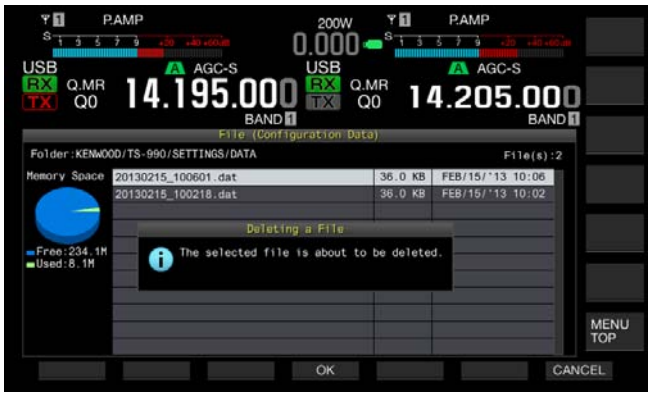
2 Press **[USB DRIVE]** (F) on the **Menu** screen to open the **USB** screen.

3 Access Menu "Read Configuration Data".

4 Press **[SELECT]** (F4) to open the **File (Configuration Data)** screen.
- File names stored in the USB flash drive appear.
- Pressing **[CANCEL]** (F7) aborts the procedure without deleting the file.

5 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select the desired file.

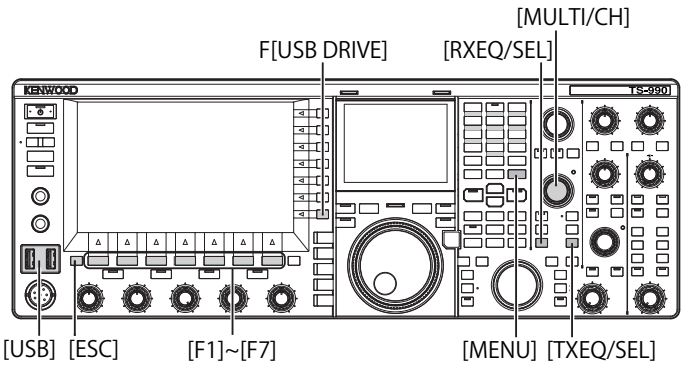
6 Press **[DELETE]** (F6) to delete the file.
A message prompting you to delete the file appears.



7 Press **[OK]** (F4) to exit.
Pressing **[CANCEL]** (F7) aborts the procedure without deleting the file.

CHANGING A FILE NAME IN THE USB FLASH DRIVE

You can change the names of the data files, such as configuration data files, RX DSP equalizer data files, TX DSP equalizer data files, etc., saved in a USB flash drive.



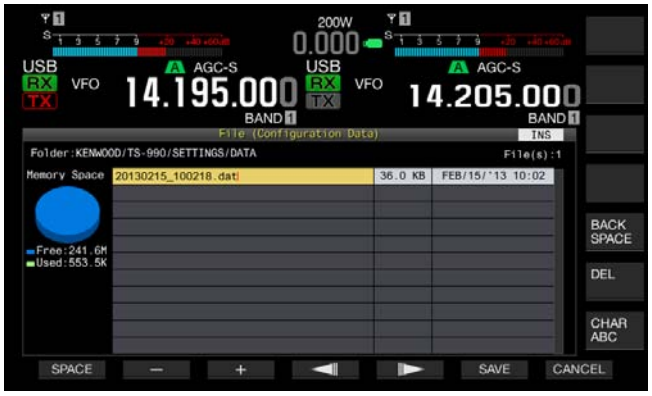
Prepare a USB flash drive where the files to be renamed are stored, then follow the procedure below to rename.

1 Insert a USB flash drive to the ⇠ (USB-A) connector.
"▭" blinks on the main screen, and "▭" lights when the transceiver recognizes the USB flash drive.

2 Open the corresponding screen to the file type.
- Configuration Data: Press **[USB DRIVE]** (F) on the **Menu** screen, select "Read Configuration Data", then press **[SELECT]** (F3).
- RX DSP Equalizer: Press **[READ]** (F6) in the **RX Equalizer** screen.
- TX DSP Equalizer: Press **[READ]** (F6) in the **TX Equalizer** screen.
- File names stored in the USB flash drive appear.

3 Press **[▲]** (F2) or **[▼]** (F3) to select a file.

4 Press **[NAME]** (F) to allow file name to be changed.



5 Use the functions keys and the **MULTI/CH** control to edit or enter a text string for the file name.
A maximum of 255 alphanumeric characters and symbols can be entered.

[SPACE] (F1): Press to enter a space.

[-] (F2) and **[+]** (F3): Press to display the previous or next character.

[◀] (F4) and **[▶]** (F5): Press to move the cursor to the left or right.

[SAVE] (F6): Press to store the selected characters.

[BACK SPACE] (F): Press to delete the character to the left of the cursor.

[DEL] (F): Press to delete the character to the right of the cursor.

[CHAR] (F): Press to change the character type. Each time you press **[CHAR]]** (F), the characters cycle through the following sequence:

ABC (upper case) > abc (lower case) > ÀÁÂ (upper case) > àáâ (lower case) > !"# (symbols) > ABC (upper case)

6 Press **[SAVE]** (F6) to save the file.
Pressing **[CANCEL]** (F7) clears the entered parameter and reverts to the USB screen.

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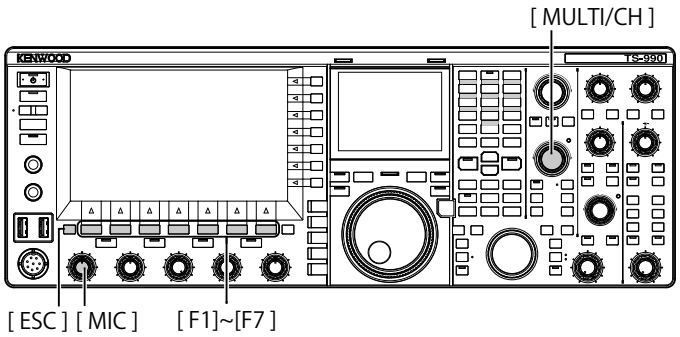
13 VOICE MESSAGE AND AUDIO FILE

This transceiver can record, play, and transmit stylized voice messages, and record and play transmitted and received audio.

RECORDING AND PLAYING VOICE MESSAGE

Voice messages can be recorded in a maximum of 6 channels. You can transmit messages recorded using a microphone.

This is useful for DXpedition or contest use when long times of repetitive calling is required, or for adjustment of the antenna or transceiver by transmitting a test radio wave. The maximum recording time is 100 seconds. You can record until the total recording time of all channels reaches 100 seconds.



RECORDING A VOICE MESSAGE

You can record voice messages on the voice message channels (TX CH1 to TX CH6).

1 Press a mode key to select SSB, FM, or AM mode.

2 Press **[TX MSG]** (F2) to open the **Voice Message** screen.

3 Press and hold the function key (**[CH1]** (F2) to **[CH6]** (F7) to which the channel is assigned to start recording of the voice message.

- A message prompting you to start recording the voice message appears.
- If **[CH1]** (F2) to **[CH6]** (F7) are unavailable in the function key guide, press **[MORE]** (F1).

4 Press **[REC IN]** (F2) to select the source of the voice message to be recorded.

- Each key press cycles the display through the following sequence: "MIC" (microphone) > "ACC 2" (ACC 2 connector) > "USB" (USB-B connector) > "OPTICAL" (Optical digital input) > "MIC".
- The default is "MIC".

- Rotating the **MIC** controls adjusts the recording level. Observe the peak recording level with the recording level meter and adjust the recording level so that the peak does not reach the red zone.
- Press **[CANCEL]** (F7) to end recording.

5 Hold down **[REC]** (F4).
While holding down **[REC]** (F4), the voice message is being recorded continuously and its recording time appears.

6 Release **[REC]** (F4) to end the recording and save the voice message.

7 Press **[ESC]** to exit.

Note:

- Recording ends when the recording time expires.
- You cannot continuously record voice messages using multiple channels.
- Recording a new voice message overwrites the saved voice message.

NAMING A VOICE MESSAGE

You can name a recorded voice message.

1 Press a mode key to select SSB, FM, or AM mode.

2 Press **[TX MSG]** (F2) to display the **Voice Message** screen, press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select a channel for which a voice message will be named.
If **[▲]** (F2) or **[▼]** (F3) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

3 Press **[NAME]** (F6) to enable editing of the voice message name.

4 Use function keys, the **MULTI/CH** control, or a USB keyboard to enter the text string for naming.
[SPACE] (F1): Press to enter a space.

[-] (F2)/**[+]** (F3): Press to display the previous or next character.

[◄] (F4)/**[►]** (F5): Press to move the cursor.

[BACK SPACE] (F): Press to delete the character on the left side of the cursor.

[DEL] (F): Press to delete the character on the right side of the cursor.

[CHAR] (F): Press to change the character type. Each time you press **[CHAR]** (F), the character type cycles through the following sequence:

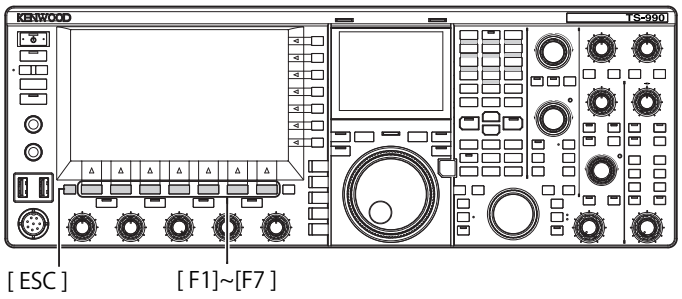
ABC (upper case) > abc (lower case) > ÀÁÂ (upper case) > àáâ (lower case) > !”# (symbols) > ABC (upper case)

5 Press **[SAVE]** (F6) to save the voice message name.
Press [**CANCEL**] (F7) to discard the text string entered and end editing process of the voice message name.

6 Press **[ESC]** to exit.

PLAYING A VOICE MESSAGE

You can play the recorded voice message.



1 Press a mode key to select SSB, FM, or AM mode.

2 Press **[TX MSG]** (F2) to open the **Voice Message** screen.

3 Press **[▲]** (F2) or **[▼]** (F3), or the **MULTI/CH** control to select the voice message channel to be played.
If **[▲]** (F2) or **[▼]** (F3) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

4 Press **[PLAY]** (F4) to play a voice message.
The **Voice Message Play** screen opens.

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You can do the following operations while playing a voice message.

Operation	Action
Hold down **[FF►►]** (F6).	Fast forwards the voice message. Release the key to return to normal play speed.
Hold down **[◄◄REW]** (F2).	Fast rewinds the voice message. Release the key to return to normal play speed.
Press **[IIPAUSE]** (F3).	Pauses the voice message.
Press **[►PLAY]** (F3) while paused	Resume the play from the paused location.
Press **[■STOP]** (F4).	Stops the voice message.
Press **[ESC]**.	The **Voice Message** screen closes and playing of the voice message ends.

ADJUSTING THE VOLUME OF VOICE MESSAGE

You can adjust the volume to play a voice message.

1 Select Group No. 1, "Audio Performance", from the **Menu** screen.

2 Access Menu 01, "Voice Message Volume (Play)"

3 Press **[SELECT]** (F4) to enable editing of the parameter box.

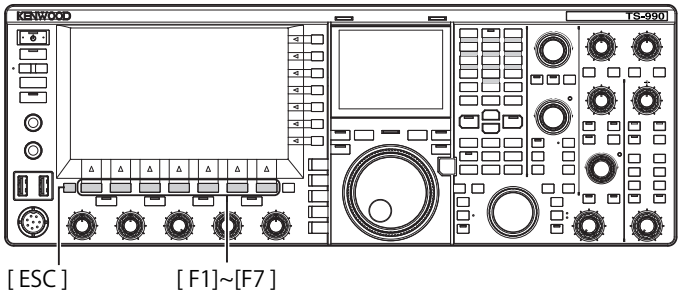
4 Press **[–]** (F4) or **[+]** (F5) to select "Off", or a volume level from "1" to "20".
The volume increases as the number increases. Select "Off" to mute the voice message. The default is "10".

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

TRANSMITTING A VOICE MESSAGE

You can transmit the recorded voice message while playing.



1 Press a mode key to select SSB, FM, or AM mode.

2 Press **[TX MSG]** (F2) to open the **Voice Message** screen.

3 Press the function key (**[CH1]** (F2) to **[CH6]** (F7)) to be recorded to which the voice message channel number is assigned.
- If **[CH1]** (F2) to **[CH6]** (F7) are unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.
- The **Voice Message Play** screen opens and the voice message is transmitted.

You can do the following operations while playing a voice message.

Operation	Action
Press **[REPEAT]** (F5).	Starts transmitting and the voice message is played repeatedly. Pressing **[REPEAT]** (F5) again stops the repeated play and reverts to the receive mode. You can configure the interval time to repeatedly transmit the voice message. {page 13-4}
Press **[■STOP]** (F4).	Stops transmission of a voice message and exits the **Voice Message** screen.
Press **[ESC]**.	The **Voice Message** screen closes and playing of the voice message ends.

CLEARING A VOICE MESSAGE

You can clear a recorded voice message.

1 Press a mode key to select SSB, FM, or AM mode.

2 Press **[TX MSG]** (F2) to open the **Voice Message** screen.

3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select the voice message channel to be cleared.
If [▲] (F2) and [▼] (F3) are unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

4 Press and hold **[(DELETE)]** (F7) to clear the selected voice message.

5 Press **[ESC]** to exit.

CONFIGURING INTERVAL TIME FOR RETRANSMIT

You can configure the interval time to repeatedly play the voice message.

1 Select Group No. 5, "CW Configurations", from the **Menu** screen.

2 Access Menu 15, "CW/Voice Message Retransmit Interval Time"

3 Press **[SELECT]** (F4) to enable editing of the parameter box.

4 Press **[–]** (F4) or **[+]** (F5) to select from the range from "0 [s]" to "60 [s]".
The default is "10 [s]".

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

RECORDING AND PLAYING COMMUNICATION AUDIO

You can record the contents of communications and play the recorded audio with this transceiver.

You can select an internal or external memory (USB) to save the recorded audio file. The following recording functions are available.

MANUAL RECORDING

You can record a maximum of 30 seconds of audio data per file to internal memory or a maximum of 9 hours of audio data per file to a USB flash drive.

FULL-TIME RECORDING

A maximum of 30 seconds of the most recent audio is recorded to a file.

TIMER RECORDING (USB FLASH DRIVE ONLY)

Audio is recorded to a USB flash drive according to the configured time and conditions. Refer to "CLOCK DISPLAY AND TIMER" for details on how to perform timer recording. {page 15-1}

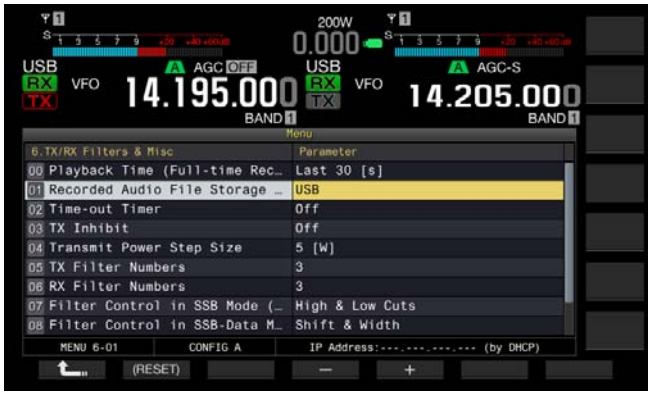
CONFIGURING THE SAVE DESTINATION OF AUDIO FILE

You can configure the save destination of the recorded audio files to either internal memory or a USB flash drive.

1 Select Group No. 6, "TX/RX Filter & Misc.", from the **Menu** screen.

2 Access Menu 01, "Recorded Audio File Storage Location".

3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[–]** (F4) or **[+]** (F5) to select an "Internal" (internal memory) or a "USB" (USB flash drive).
The default is "Internal" (Internal memory).

5 Press [↩] (F1).

6 Press **[MENU]** to exit.

Note:

♦ To save on a USB flash drive, insert a USB flash drive into the **(USB-A) connector** before recording. {page 12-1}

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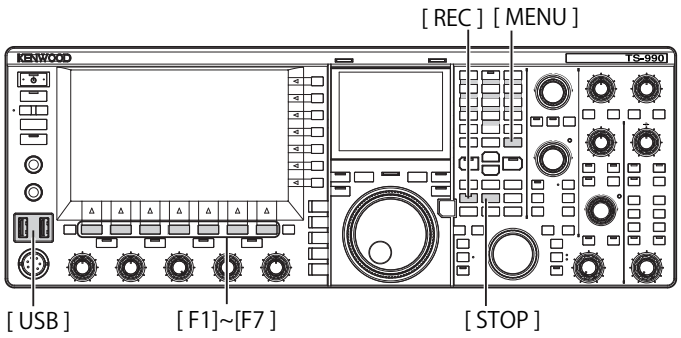
MANUAL RECORDING

You can start or stop recording the communications contents to this transceiver with a press of **[REC]** or **[STOP]**. The recording time differs depending on the destination of the saved audio file.

Internal Memory: A maximum of 30 seconds per file (300 seconds in total of the recording time for full-time recording and manual recording)

USB flash drive: A maximum of 9 hours per file



1 Press **[REC]** to start recording.
- "●REC" appears on the main screen and the "REC" LED lights.

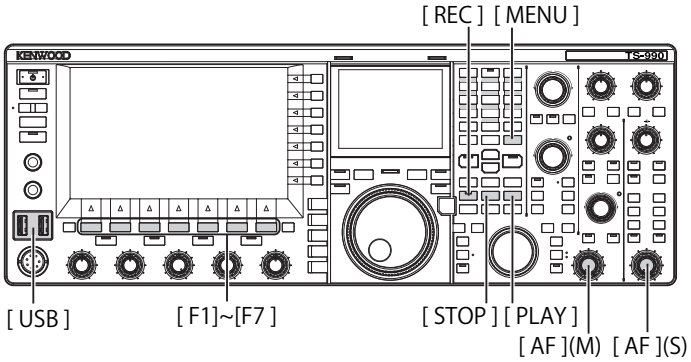
2 Press **[STOP]** to stop recording.
- "●REC" disappears from the main screen and the "REC" LED turns Off.

Note:

- If the remaining memory size becomes insufficient while saving an audio file to internal memory, the audio files with the oldest time stamp will be deleted. You can configure the transceiver so as not to automatically delete the audio file when the remaining memory size becomes insufficient. {page 13-10}
- The audio file stored in the internal memory can be copied to the USB flash drive. {page 12-1}
- While saving an audio file to a USB flash drive, the recording stops when a message appears to notify you when the available USB flash drive space becomes low.

FULL-TIME RECORDING

Full time recording is the function that allows recording of the audio (communications contents) for a maximum of the last 30 seconds. You can audibly listen to the most recent communication.

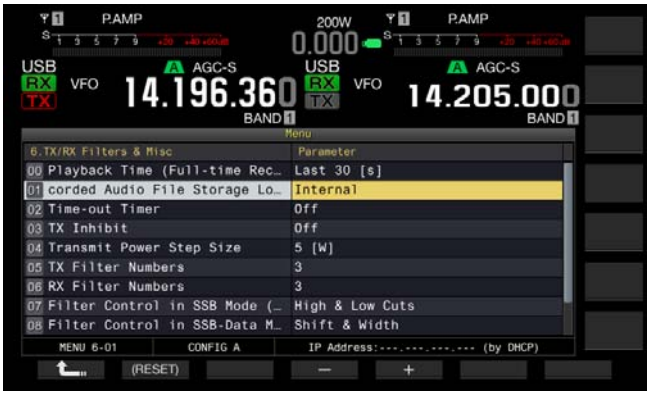


CONFIGURING THE MAXIMUM TIME FOR FULL-TIME RECORDING

1 Select Group No. 6, "TX/RX Filter & Misc.", from the **Menu** screen.

2 Access Menu 00, "Playback Time (Full-time Recording)".

3 Press **[SELECT]** (F4) to enable editing of the parameter box.



4 Press **[–]** (F4) or **[+]** (F5) to select "Last 10 [s]", "Last 20 [s]" or "Last 30 [s]".
The default is "Last 30 [s]".

5 Press [ ] (F1).

6 Press **[MENU]** to exit.

SAVING AUDIO WITH FULL-TIME RECORDING

1 Press and hold **[REC]**.
- "●REC" blinks for 1 second.
- The most recent audio recorded until **[REC]** is pressed and held, which has the same number of seconds as the maximum recording time configured for the full-time recording, will be stored in the internal memory or USB flash drive.

Note:

- During the manual recording, the transceiver does not operate anything even when pressing **[RX PLAY]** (F1) or **[TX MSG]** (F2).
- While saving an audio file to internal memory, recording stops when the recording time exceeds 30 seconds. If the remaining memory size becomes insufficient, the audio file with the oldest time stamp will be deleted. You can configure the transceiver so as not to automatically delete the audio file when the remaining memory size becomes insufficient. {page 13-10}
- While saving an audio file to a USB flash drive, the recording stops when a message appears to notify you when the available USB flash drive space becomes low.
- The audio file stored in the internal memory can be copied to the USB flash drive. {page 12-1}

PLAYING AN AUDIO FILE

Plays the audio files saved with manual, full-time or timer recording.

■ Playing the Latest Recorded Audio File

1 Press **[PLAY]** to play the latest audio file.
- "►PLAY" and a progress bar indicating the playing status appear.
- If the **Audio File** screen is open, plays the highlighted audio.

■ Pausing Play

1 Press **[PLAY]** to pause the audio file while playing.
- "IIPAUSE" appears.
- Resumes the playing with a press of **[PLAY]** again.

■ Stopping Play

1 Press **[STOP]** to stop the audio file playing.
- "►PLAY" and the progress bar indicating the playing status disappear.

ADJUSTING THE VOLUME OF VOICE MESSAGE

You can adjust the play volume by rotating the **AF** (M) and **AF** (S) controls.

The received audio in the main band and sub band are recorded in separate audio channels.

The transmitted audio is recorded in both audio channels, so the volume configured with each **AF** control is reflected to both channels.

The following can be adjusted by turning the **AF** (M) and **AF** (S) controls.

Recording status	AF (M) control	AF (S) control
With RX in the sub band disabled	• Play volume for received audio in the main band • Play volume for transmitted audio	Play volume for transmitted audio
With RX in the sub band enabled	• Play volume for received audio in the main band • Play volume for transmitted audio	• Play volume for received audio in the sub band • Play volume for transmitted audio

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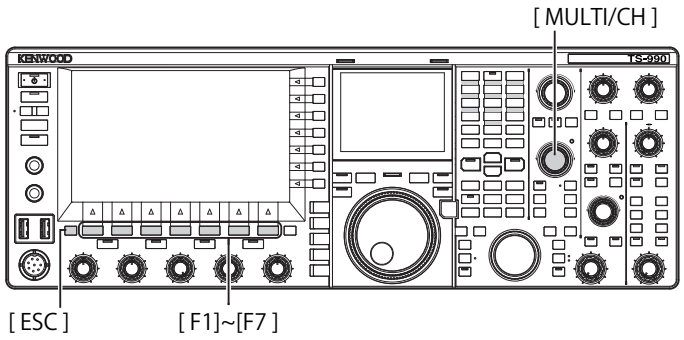
AUDIO FILES

On the **Audio File** screen, you can operate the transceiver using the audio file stored in the internal memory or USB flash drive.



COPYING AUDIO FILE FROM INTERNAL MEMORY TO USB FLASH DRIVE

You can copy the audio file stored in the internal memory to a USB flash drive.

To use a USB flash drive, insert a USB flash drive in ⇔ (USB-A) and be sure that the transceiver has recognized the USB flash drive.

1 Press **[RX PLAY]** (F1) to open the **Audio File** screen.

2 Press **[INT.MEM]** (F7) to display the **Audio File (Internal)** screen.

3 Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select the audio file to be saved in the USB flash drive.
If **[▲]** (F2) and **[▼]** (F3) are unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

4 Press **[SAVE]** (F4).
- A message prompting you to save the configuration data appears.
- Press **[CANCEL]** (F) to close the **Data Save Confirmation** screen and return to the **Audio File (Internal)** screen.

If **[SAVE]** (F4) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

5 Press **[OK]** (F4) to save the audio file.

6 Press **[ESC]** to exit.

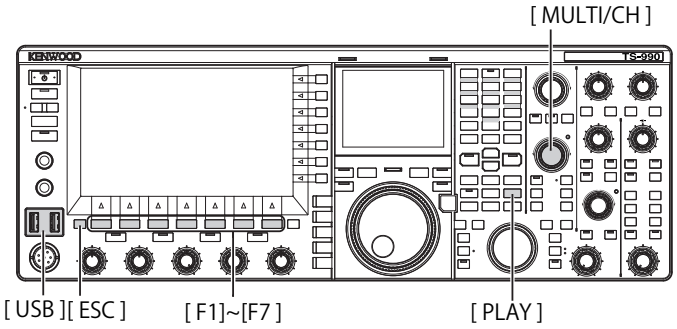
Note:

♦ Prior to removing a USB flash drive, be sure to execute "Safe Removal of the USB Flash Drive" {page 12-1}

PLAYING AN AUDIO FILE

You can play an audio file saved in internal memory or a USB flash drive.

To use a USB flash drive, insert a USB flash drive in ⇔ (USB-A) and be sure that the transceiver has recognized the USB flash drive.



1 Press **[RX PLAY]** (F1) to open the **Audio File** screen.

2 Press **[INT.MEM]** (F7) or **[USB MEM]** (F7) to alternate the screen.
- Press **[INT.MEM]** (F7) to open the **Audio File (Internal)** screen.
- Press **[USB MEM]** (F7) to open the **Audio File (USB)** screen.
- If **[INT.MEM]** (F7) or **[USB MEM]** (F7) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.
- If the **Audio File (USB)** screen opens with a press of **[USB MEM]** (F7), pressing **[FOLDER]** (F1) to switch the referred folder. The file recorded with the timed task is stored in the TIMER_REC folder and other files are stored in the RX_REC folder.

3 Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select an audio file to be played.

4 Press **[PLAY]** (F4) or **[PLAY]** to play the audio file.

Note:

- While the **Audio File (USB)** screen is open, press **[FOLDER]** (F1) to change the folder storing the file.
- The **Audio File (USB)** screen will not appear if no USB flash drive is connected to or correctly recognized by the transceiver.
- Prior to removing a USB flash drive, be sure to execute "Safe Removal of the USB Flash Drive" {page 12-1}

You can do the following operations while playing an audio file.

Operation	Action
Hold down **[FF►►]** (F6).	Fast forwards the audio file. Release the key to return to normal play speed.
Hold down **[◄◄REW]** (F2).	Fast rewinds the audio file. Release the key to return to normal play speed.
Press **[IIPAUSE]** (F3).	Pause the audio file. Press **[PLAY]** (F3) again to resume from the paused location.
Press **[NEXT►►]** (F7).	Plays the next (earlier saved) audio file from the beginning.
Quickly press **[◄◄PREV]** (F1) twice.	Plays the previous (later saved) audio file from the beginning.
Press **[◄◄PREV]** (F1) once.	Plays the current audio file from the beginning.
Press **[■STOP]** (F4).	Ends playing the audio file.
Press **[ESC]**.	Closes the **Audio File Play** screen and **Recorded Audio File List** screen.
Rotate the **MULTI/CH** control.	If two or more audio files are saved, you can cue the audio file.

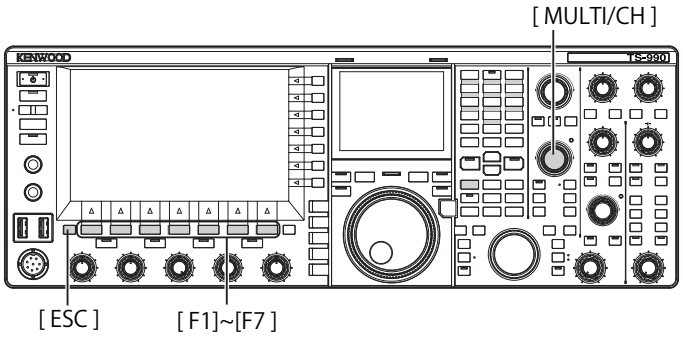
Note:

- Prior to removing a USB flash drive, be sure to execute "Safe Removal of the USB Flash Drive" {page 12-1}.

NAMING AN AUDIO FILE

You can name an audio file saved in internal memory or a USB flash drive.

To use a USB flash drive, insert a USB flash drive in ⇻ (USB-A) and be sure that the transceiver has recognized the USB flash drive.



1. Press **[RX PLAY]** (F1) to open the **Audio File** screen.
2. Press **[INT.MEM]** (F7) or **[USB MEM]** (F7) to alternate the screen.
   - Press **[INT.MEM]** (F7) to open the **Audio File (Internal)** screen.
   - Press **[USB MEM]** (F7) to open the **Audio File (USB)** screen.
   - If **[INT.MEM]** (F7) or **[USB MEM]** (F7) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.
   - If the **Audio File (USB)** screen appears with a press of **[USB MEM]** (F7), pressing **[FOLDER]** (F1) switches the referred folder. The file recorded with the timed task is stored in the TIMER_REC folder and other files are stored in the RX_REC folder.
3. Press **[▲]** (F2) or **[▼]** (F3), or rotate the **MULTI/CH** control to select an audio file to be named.
4. Press **[NAME]** (F5) to enable editing of the audio file name.
   If **[NAME]** (F5) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

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5 Use function keys, the **MULTI/CH** control, or a USB keyboard to enter the name.
[SPACE] (F1): Press to enter a space.

[-] (F2) and **[+]** (F3): Press to display the previous or next character.

[ ] (F4)/**[ ]** (F5): Press to move the cursor.

[SAVE] (F6): Press to save the edited characters.

[BACK SPACE] (F): Press to delete a character to the left side of the cursor.

[CHAR] (F): Press to change the character type. Each time you press **[CHAR]** (F), the character type cycles through the following sequence:

ABC (upper case) > abc (lower case) > ÀÁÂ (upper case) > àáâ (lower case) > !"# (symbols) > ABC (upper case)

6 Press **[SAVE]** (F6) to save the file name.
Press **[CANCEL]** (F7) to discard the text string entered and end entering the audio file name.

7 Press **[ESC]** to exit.

Note:

- Prior to removing a USB flash drive, be sure to execute "Safe Removal of the USB Flash Drive" {page 12-1}

DELETING AN AUDIO FILE

You can delete an audio file saved in internal memory or a USB flash drive.

To use a USB flash drive, insert a USB flash drive in (USB-A) and be sure that the transceiver has recognized the USB flash drive.

1 Press **[RX PLAY]** (F1) to open the **Audio File** screen.

2 Press **[INT.MEM]** (F7) or **[USB MEM]** (F7) to alternate the screen.
- Press **[INT.MEM]** (F7) to open the **Audio File (Internal)** screen.
- Press **[USB MEM]** (F7) to open the **Audio File (USB)** screen.
- If **[INT.MEM]** (F7) or **[USB MEM]** (F7) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.
- If the **Audio File (USB)** screen appears with a press of **[USB MEM]** (F7), pressing **[FOLDER]** (F1) switches the referred folder to the file recorded with the timed task stored in the TIMER_REC folder and other files are stored in the RX_REC folder.

3 Press **[ ]** (F2) or **[ ]** (F3), or rotate the **MULTI/CH** control to select an audio file to be deleted.

4 Press **[DELETE]** (F6).
A message prompting you to delete the audio file appears.

5 Press **[OK]** (F4) to delete the audio file.
Press **[CANCEL]** (F7) to revert to the **Audio File** screen without deleting the audio file.

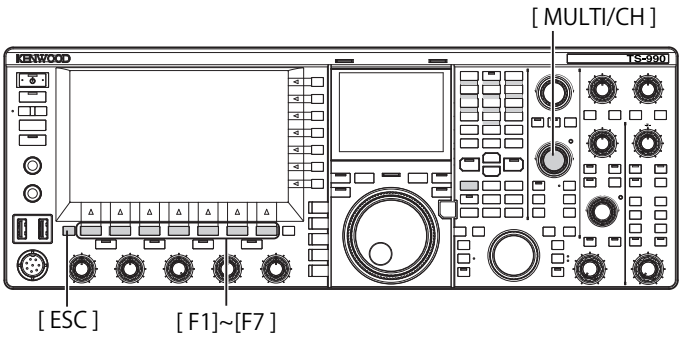
6 Press **[ESC]** to exit.

Note:

- You cannot delete an audio file that is protected.
- Prior to removing the USB flash drive, be sure to execute "Safe Removal of the USB Flash Drive" {page 12-1}

PROTECTING AN AUDIO FILE FROM DELETION (ONLY FOR INTERNAL MEMORY)

If the remaining memory size becomes insufficient while saving an audio file to the internal memory, the audio files with the oldest time stamp will be deleted. You can configure the transceiver so as not to automatically delete the audio file when the remaining memory size becomes insufficient.



1 Press **[RX PLAY]** (F1) to open the **Audio File** screen.

2 Press **[INT.MEM]** (F7) to open the **Audio File (Internal)** screen.
If **[INT.MEM]** (F7) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

3 Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select an audio file to be prevented from deleting.
If [▲] (F2) or [▼] (F3) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

4 Press [🔒] (F6) to prevent the file from deleting.
- Press [🔒] (F6) again to deselect the protection of the file.
- If [🔒] (F6) is unavailable in the function key guide, press **[MORE]** (F1). An alternate key guide will appear.

5 Press **[ESC]** to exit.

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