KENWOOD

INSTRUCTION MANUAL

HF/50 MHz TRANSCEIVER

TS-990S

JVC KENWOOD Corporation

09 08 07 06 05 04

EN
1.05

PRIOR TO YOUR FIRST QSO

Thank you for purchasing this TS-990S transceiver.

This chapter, Prior to your first QSO, gives you a product overview, conditions of your use, notations applied to this manual and safety precautions. Prior to your first QSO, carefully read through the following precautions to become familiar with the safety precautions applicable to this transceiver.

After reading through this instruction manual, store it with the warranty card and packing materials.

FEATURES

- A main receiver with a class-leading +40 dBm third-order IP and a sub receiver which incorporates the TS-590S receiver architecture. Capable of receiving two signals at once, in different bands.
- 7-inch wide and 3.5-inch color TFT displays can show independent contents.
- Covers the HF and 50 MHz bands.
- Clean 5 to 200 W transmit power through the 50 V FET final unit.
- High-speed relay-driven automatic antenna tuner built-in allows fast tuning.
- Built-in Baudot RTTY, PSK31, Demodulator and Modulator for PSK63.
- Compliant with SSB, CW, FSK, PSK (QPSK31, BPSK31, BPSK63), AM, and FM Modes.
- Three Analog Devices 32-bit floating-point arithmetic DSPs.
- Equipped as standard with USB, Serial and LAN ports.
- Video signal output for display by an external PC (main screen display only).
- Various PC applications (free software): ARCP-990 enabling PC control, ARHP-990 enabling remote control, and ARUA-10 enabling the USB audio interface.

SUPPLIED ACCESSORIES

The following accessories are supplied with the transceiver. After carefully unpacking the transceiver, identify the accessories listed in the table.

Description		Quantity
AC Power Cable	UL plug (K-type only)	1
	BS plug (E-type only)	1
	CE plug (E-type only)	1
7-pin DIN plug		1
13-pin DIN plug		1
Fuse 4 A for an external antenna tuner		1
Instruction Manual		1
Warranty Card		1
Circuit Diagram		4
Line Filter (E-type only)		1

MARKET CODES

K-type: The Americas

E-type: Europe

The market code is shown on the carton box.

- The AC power cable supplied with the product is suitable for AC 120V(K-type) or AC 220V-240V (E-type)
- Do not use a power cable other than supplied with this product.

NOTICE TO THE USER

One or more of the following statements may be applicable for this equipment.

FCC WARNING

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

INFORMATION TO THE DIGITAL DEVICE USER REQUIRED BY THE FCC

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can generate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer for technical assistance.

Information on Disposal of Old Electrical and Electronic Equipment and Batteries (applicable for countries that have adopted separate waste collection systems)

Products and batteries with the symbol (crossed-out wheeled bin) cannot be disposed as household waste.
Old electrical and electronic equipment and batteries should be recycled at a facility capable of handling these items and their waste byproducts.
Contact your local authority for details in locating a recycle facility nearest to you.
Proper recycling and waste disposal will help conserve resources whilst preventing detrimental effects on our health and the environment.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions : (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

NOTIFICATION

This equipment complies with the essential requirements of Directive 1999/5/EC.

The use of the warning symbol ⓘ means the equipment is subject to restrictions of use in certain countries.

This equipment requires a license and is intended for use in the countries below.

AT	BE	DK	FI	FR	DE	GR	IS
IE	IT	LI	LU	NL	NO	PT	ES
SE	CH	GB	CY	CZ	EE	HU	LV
LT	MT	PL	SK	SI	BG	RO	HR

ISO3166

CE 0682 ⓘ

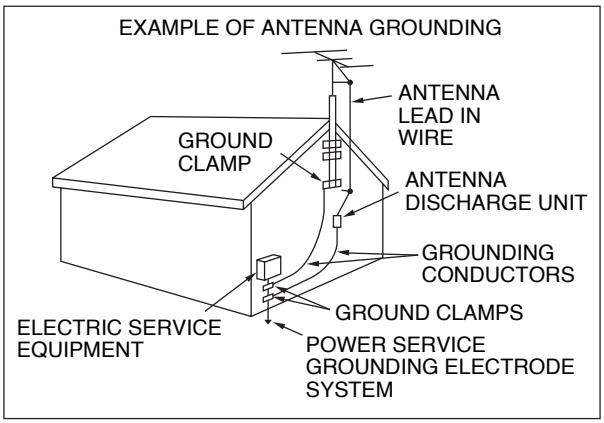
This product is designed for connection to an IT power distribution system.

Bu ürün 26891sayılı Resmi Gazete'de yayımlanan Elektrikli ve Elektronik Eşyalarda Bazı Zararlı Maddelerin Kullanımının Sınırlandırılmasına Dair Yönetmeliğe uygun olarak üretilmiştir.
This product complies with Directive, Number 26891 regarding "REGULATION ON THE RESTRICTION OF THE USE OF CERTAIN HAZARDOUS SUBSTANCES IN ELECTRICAL AND ELECTRONIC EQUIPMENT".

PRECAUTIONS

Please observe the following precautions to prevent fire, personal injury, and transceiver damage:

- Connect the transceiver only to a power source as described in this manual or as marked on the transceiver itself.
- Route all power cables safely. Ensure the power cables can neither be stepped upon nor pinched by items placed near or against the cables. Pay particular attention to locations near AC receptacles, AC outlet strips, and points of entry to the transceiver.
- Take care not to drop objects or spill liquid into the transceiver through enclosure openings. Metal objects, such as hairpins or needles, inserted into the transceiver may contact voltages resulting in serious electrical shocks. Never permit children to insert any objects into the transceiver.
- Do not attempt to defeat methods used for grounding and electrical polarization in the transceiver, particularly involving the power input cable.
- Adequately ground all outdoor antennas for this transceiver using approved methods. Grounding helps protect against voltage surges caused by lightning. It also reduces the chance of a build-up of static charge.



- Minimum recommended distance for an outdoor antenna from power lines is one and one-half times the vertical height of the associated antenna support structure. This distance allows adequate clearance from the power lines if the support structure fails for any reason.
- Locate the transceiver so as not to interfere with its ventilation. Do not place books or other equipment on the transceiver that may impede the free movement of air. Allow a minimum of 10 cm (4 inches) between the rear of the transceiver and the wall or operating desk shelf.
- Do not use the transceiver near water or sources of moisture. For example, avoid use near a bathtub, sink, swimming pool, or in a damp basement or attic.
- The presence of an unusual odor or smoke is often a sign of trouble. Immediately turn the power OFF and remove the power cable. Contact a KENWOOD service station or your dealer for advice.
- Locate the transceiver away from heat sources such as a radiator, stove, amplifier or other devices that produce substantial amounts of heat.
- Do not use volatile solvents such as alcohol, paint thinner, gasoline, or benzene to clean the cabinet of the transceiver. Use only a clean cloth with warm water or a mild detergent.
- Disconnect the input power cable from the power source when the transceiver is not used for long periods of time.
- Remove the transceiver's enclosure only to carry our accessory installations described in this manual or accessory manuals. Follow the provided instructions carefully, to avoid electrical shocks. If unfamiliar with this type of work, seek assistance from an experienced individual, or have a professional technician do the task.
- Enlist the services of qualified personnel in the following cases:
  a) The power supply or plug is damaged.
  b) Objects have fallen into or liquid has spilled into the transceiver.
  c) The transceiver has been exposed to rain.
  d) The transceiver is operating abnormally or performance has seriously degraded.
  e) The transceiver has been dropped or the enclosure damaged.
- Do not touch the power plug while your hands are wet to avoid risk of electric shock.
- Keep children away from the transceiver, to avoid unnecessary risk of harm to the child.
- Do not remove the plug from an AC outlet by pulling the AC cable.
- Plug the AC cable only into a grounded AC outlet.
- Do not block the transceiver air vent. Do not cover the transceiver. To maintain good ventilation, place the transceiver at least 10 cm (4 inches) away from the wall.

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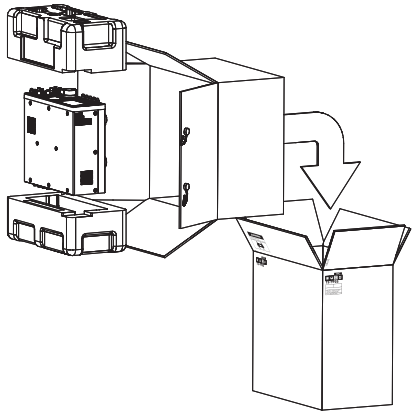
TRANSPORTATION, INSTALLATION AND PACKING MATERIAL STORAGE

This transceiver is precise and sensitive, and is heavy. Take care not to hurt yourself and damage the transceiver by dropping it.

To protect the transceiver from damage, the transceiver must be transported and installed by two or more persons securely holding the transceiver.



Store all packing materials for the transceiver for future use, such as when transporting the transceiver when moving or requesting after-sales service. To prevent it from being damaged during transportation, wrap the transceiver with the white protective cover in the same way as it wrapped the transceiver at the time of purchase, then the transceiver must be packed with its original packing materials and transported with the front panel facing up as illustrated above. Do not transport the transceiver placed sideways.

ABOUT THIS MANUAL

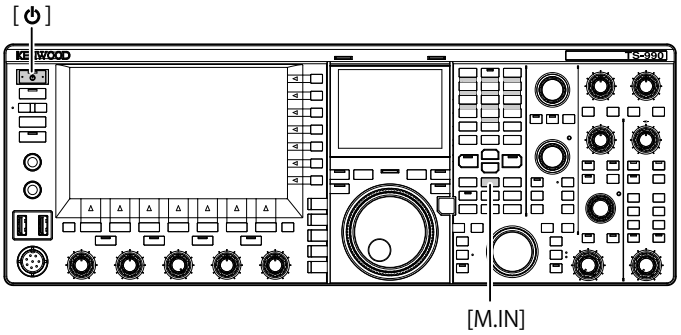
This manual was written subject to the specifications and designs described below.

Specifications are described in PRODUCT SPECIFICATIONS in chapter 19, "MISCELLANEOUS". {page 19-2}

Firmware Version: 1.02 (and later)

You can verify the firmware version as described below.

1 Press the main power switch (I/O) located on the rear panel, to the "I" (ON) position to apply power to the transceiver.
While the transceiver power (⏻) is turned OFF, the "⏻" LED lights orange. While the transceiver power (⏻) is turned ON, the "⏻" LED lights green.



2 Hold down **[M.IN]** (Memory), then press **[⏻]**.
After startup, the **Firmware Update** screen appears, and the firmware version can be viewed.

3 Press **[⏻]** to turn the transceiver power (⏻) OFF.

Note:

- There are two **[M.IN]** keys on this transceiver; one is for Memory and the other for Quick Memory. To view the firmware version, ensure to use **[M.IN]** (Memory).
- Refer to Chapter 4 "Basic Operations" for the details of the power sourcing. {page 4-1}

The latest firmware and its corresponding instruction manual, in PDF format, can be downloaded from the following URL:

http://www.kenwood.com/i/products/info/amateur/software_download.html

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SOFTWARE COPYRIGHTS

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Any modifying, reverse engineering, copying, reproducing or disclosing on an Internet website of the software is strictly prohibited.

A user is required to obtain approval from JVC KENWOOD corporation, in writing, prior to redistributing this manual on a personal web page or via packet communication.

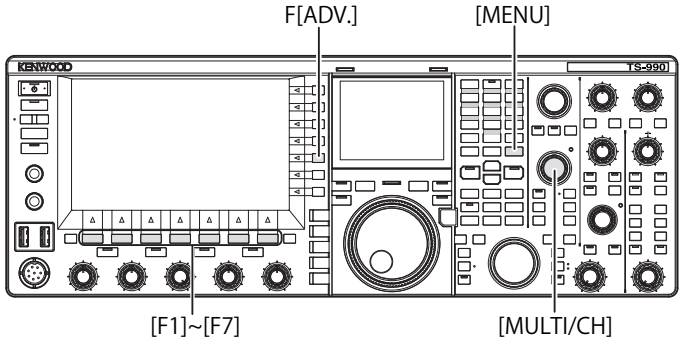
Furthermore, any reselling, assigning or transferring of the software is also strictly prohibited without embedding the software in KENWOOD product memories.

SOFTWARE LICENSE AGREEMENT

Software License Agreement contains the terms and conditions of use of the software embedded in or used with the transceiver. A user is entitled to use the software subject to the acceptance and agreement of this Software License Agreement by the user. Also, this Software License Agreement stipulates the terms and conditions of use of this software embedded in or used with the transceiver, and a user has the right to use the transceiver with the software embedded subject to the applicable laws and regulations, the description and defined in this manual and the warranty card.

The following procedures allow you to display the Software License Agreement on the main screen.

Refer to Menu for the details of configuration method in the **Menu** screen. {page 3-1}



1. Press **[ADV.]** (F) from the **Menu** screen to open the **Advanced Menu** screen.
2. Select Menu 28, "Software License Agreement", from the **Advanced Menu** screen.
3. Press **[SELECT]** (F4) to display the Software License Agreement.
4. Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to scroll through the Software License Agreement.
5. Press **[MENU]** to end.

IMPORTANT NOTICES CONCERNING THE SOFTWARE

The software embedded in this transceiver consists of a multiple number of and individual software components. Title to and ownership of copyrights for each software component is reserved for JVC KENWOOD Corporation and the respective bona fide holder.

This product employs the software component in accordance with the End User License Agreement (hereinafter referred to as the "EULA") stipulated by JVC KENWOOD Corporation and/or the respective bona fide holder.

There is free software stipulated and governed by the “EULA”, and this, a distribution condition of the software component in the executable format under the terms and conditions contained in the GNU General Public License or Lesser General Public License (hereinafter referred to as the “GPL/LGPL”), requires to make the source code for the relevant software components available.

Access the URL below for details of the software component stipulated in the "GPL/LPGL".

http://www2.jvckenwood.com/gpl/index.html

The following procedures allow you to display Important Notices concerning Free Open Source Software on the main screen.

1. Press **[ADV.]** (F) from the **Menu** screen to open the **Advanced Menu** screen.
2. Select Menu 29, "Important Notices concerning Free Open Source", from the **Advanced Menu** screen.
3. Press **[SELECT]** (F4) to display the Important Notices concerning Free Open Source.
4. Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to scroll through the texts about Important Notices concerning Free Open Source Software.
5. Press **[MENU]** to end.

ABOUT THE GPL/LPGL LICENSE

The following procedures allow you to display About the GPL/LPGL License on the main screen.

1. Press **[ADV.]** (F) from the **Menu** screen to open the **Advanced Menu** screen.
2. Select Menu 30, "About Various Software License Agreements", from the **Advanced Menu** screen.
3. Press **[SELECT]** to display About Various Software License Agreements.
4. Press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to scroll through the texts about About the GPL/LPGL License.
5. Press **[MENU]** to end.

COPYRIGHTS FOR RECORDED AUDIO

The broadcast content recorded in this transceiver may not be reused, except for the personal use, without prior consent of the right holder under the copyright laws.

TRADEMARKS

- KENWOOD is a registered trade mark of JVC KENWOOD Corporation.
- All other product names referenced herein are trademarks or registered trademarks of their respective manufacturers. Marks such as ™ and ® are omitted in the text of body.

INDEMNITY

- JVC KENWOOD Corporation takes all appropriate measures to ensure all descriptions in this manual are accurate; however, this manual may still contain typographical errors (“typos”) and expressions that are misleading. JVC KENWOOD Corporation is entirely free from any responsibilities arising from any losses or damages caused by such typos or expressions.
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- JVC KENWOOD Corporation is entirely free from any responsibilities for any failures, damages or losses arising from, or in connection with, use of the transceiver with or connected to any external equipment. Failures, damages or losses shall include the failures, damages or losses that may occur at the PC connected to the transceiver or in storage devices having memory area such as a USB flash drive. JVC KENWOOD Corporation is entirely free from any responsibilities for any secondary failures, damages or losses, including but not limited to the loss or damage of data or data files stored in these memories.
- JVC KENWOOD Corporation does not warrant that the quality and functions described in this manual comply with your purpose of use and, unless specifically described in this manual, JVC KENWOOD Corporation shall be free from any responsibilities for any defects and indemnities for any damages or losses. Selection and installation of any external equipment shall be done at your own risk. You are fully responsible for the use and effects of external equipment.
- JVC KENWOOD Corporation shall be free from any responsibilities for any incidental losses or damages, such as missing communications or call opportunities caused by a failure or performance error of the transceiver.

YOUR QUERIES ABOUT EXTERNAL DEVICES OR PC CONNECTED TO THE TRANSCEIVER

JVC KENWOOD Corporation are pleased to answer, within the scope of corporate efforts we can provide, your queries about your operation of this transceiver. Please bear in mind that we cannot answer any and all technical questions regarding methods of connection to, configuration for and operation of any external device and PC beyond our knowledge.

OPERATION OF THE OPTIONAL APPLICATIONS

This manual is dedicated to describe the operation of this transceiver. Refer to the help texts supplied with the ARCP-990 and ARHP-990 for details of operation of the ARCP-990 and ARHP-990 software installed onto your PC.

TREATMENT OF YOUR IMPORTANT DATA

There is always a risk of Losing your important data by a transceiver failure, occurrence of an unforeseen contingency, erroneous operation or faulty behavior of the transceiver. The data, such as the operating information, recorded audio, messages, configuration data, logs, etc., must be backed up as necessary by yourself and stored in the external storage device such as a USB flash drive.

TROUBLESHOOTING

If you aware of a failure, read through chapter 18, "TROUBLESHOOTING". {page 18-7}

Maintenance methods, troubleshooting, and a list of error messages are described.

Prior to transporting the transceiver for after-sales servicing, contact KENWOOD service center for transportation.

ABOUT THE URL AND CONTACTS OF JVC KENWOOD CORPORATION

The latest URL and contacts of JVC KENWOOD Corporation at the time when this manual was written are described in this manual. Due to changes of social circumstances or the management environment, the URL and contacts of JVC KENWOOD Corporation may change from time to time. If you are unable to access the URL or contacts, contact your dealer to determine the latest URL and contacts.

NOTATIONS APPLIED TO THIS MANUAL

This transceiver has many user operations, such as those for the main band and the sub band, keys and controls, function keys and operations with connected equipment, etc., as well as unique transceiver functionality. To clarify and simplify the descriptions provided in this manual, the following notations and writing conventions have been used.

The captioned display images may differ from what appears on your transceiver, due to your operating environment, design changes, etc.

■ MAIN BAND AND SUB BAND

Following a key or control name, (M) or (S) is shown, allowing you to distinguish on which band, either the main band or the sub band, the key or control is to be used. If the band that the key or control is to be used for is not specified as either the main band or the sub band, the band is specified as "the selected band" in this manual.

■ KEYS AND CONTROLS

The transceiver has many keys and controls. The notation "key" is omitted from individual keys; however, the notation "control" is not omitted, allowing you to distinguish controls from keys.

■ LED AND DISPLAYS

On the transceiver front panel, there are LEDs that indicate the status of the corresponding function as either active or inactive. Information that appears on the main screen or the sub screen is described as the "display". Refer to chapter 2, "PANEL DESCRIPTION", for further details. {page 2-1}

■ SCREEN AND MESSAGES

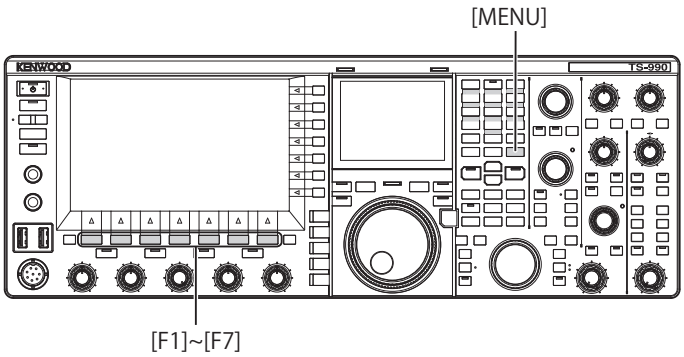
Information that appears on the main screen after pressing the MENU key or by a long press of any particular key is described as the "screen". A text string (mainly in a message box) navigating your operation or notifying you of an error is described as a "message".

■ AUDIBLE OPERATION AIDS

This transceiver assists your operation with a beep upon a key press and the use of voice guidance. Configuration methods for those audible operation aids are described in this manual.

■ FRONT PANEL ILLUSTRATION ONLY FOR [MENU] AND [X.X.X] (F1) TO [X.X.X] (F7)

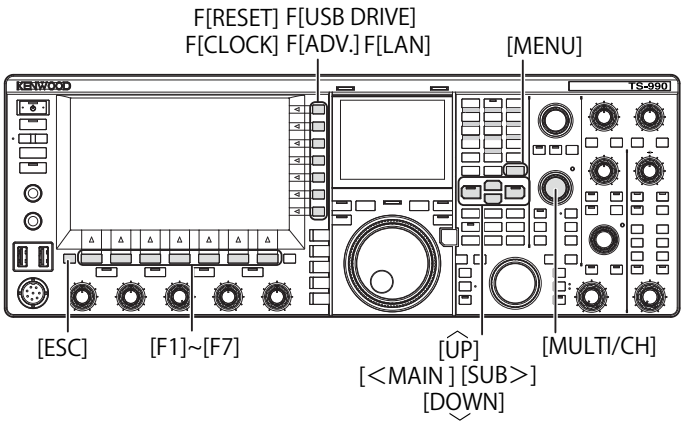
In this manual, due to availability of space, the front panel illustration which indicates locations only of **[MENU]** and **[X.X.X]** (F1) to **[X.X.X]** (F7) is exempted. When you read this manual for the first time, you must note the locations of the **[MENU]** and **[X.X.X]** (F1) to **[X.X.X]** (F7) keys. {page 2-7} {page 2-12}



■ IDENTICAL KEY OPERATION ON THE FRONT PANEL

There are several methods of key operations to select a parameter while the parameter box in the menu screen, sub-menu screen, or configuration screen allows your entry of the parameter. This manual describes operation methods using the function keys; however, the operations below are identical.

- Press **[** ▲ **]** (F2) or **[** ▼ **]** (F3).
- Press **[-]** (F4) or **[+]** (F5).
- Press **[UP]** or **[DOWN]**.
- Rotate the **MULTI/CH** control.



■ NOTATION FOR KEYS, CONTROLS AND DISPLAYS

In this manual, each key, control, and display are described.

Notation	Example	Overview
[x.x.x]	**[CW/CW-R]** **[M>S]** (M)	Keys located on the front panel
The **X.X.X** control	The **MULTI/CH** control The **NB 1** (M) control	Controls located on the front panel
The **Tuning** control	The **Tuning** (M) control The **Tuning** (S) control	The **Tuning** controls located on the front panel
The "x.x.x" LED	The "MAIN BUSY/TX" LED The "MONI/SEL" LED	LEDs located on the front panel or on the keys with the front panel
The **X.X.X** connector	The **ACC 2** connector	Connectors, jacks and ports located on the front and rear panels
The **x.x.x** screen	The **Menu** screen The **Bandscope** screen	Screens that appear on the main screen to configure or select a parameter.
"x.x.x"	"FSK" "Off"	What appears on the main screen and the sub-screen, or a selected parameter from the parameter box.
[X.X.X] (F)	**[ATT -12dB]** (F)	Function keys corresponding to the key guide along the right side of the main screen. The task name displayed on a key guide appears in brackets. This task name (key guide) may vary from screen to screen.
[X.X.X] (F1 to F7)	**[(RESET)]** **[MODE]** (F7)	Function keys corresponding to the key guide along the bottom of the main screen. The task name displayed on a key guide appears in brackets. This task name (key guide) may vary from screen to screen.

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■ NOTATIONS FOR USER OPERATION

In this manual, various user operations are described, as below.

Notation	Example	Overview
Press down the main power switch (I/O)		Press the main power switch (I/O) located on the rear panel, to the "I" (ON) or "O" (OFF) position.
Press **[⏻].**		Press **[⏻]** on the front panel.
Press	Press **[MENU].**	The **MENU** screen appears. If the **MENU** screen is open, the **MENU** screen closes.
Press	Press **[VOX].**	Press momentarily to activate the unique function of the key.
Press	Press **[ESC].**	Press to revert to the screen which was displayed prior to the current screen, or to close the screen assigned for the particular task.
Press and hold	Press and hold **[CW/CW-R].** Press and hold **[(RESET)]**	Press and hold a key for the time configured in Menu 0-12, "Long Press Duration of Panel Keys", to activate the unique function of the key or the function assigned to the key.
Hold down	Hold down the **[PTT]** switch.	Hold down a key to activate or enable the specific function or behavior, until the key is released.

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17 FIRMWARE UPDATING

18 TROUBLESHOOTING

19 MISCELLANEOUS

1 INSTALLING AND CONNECTING THE TRANSCEIVER

PRECAUTIONS FOR INSTALLATION

To carry and install the transceiver requires two or more persons. Due to the size and weight of the equipment, installing the transceiver by yourself may cause you personal injury and/or damage the transceiver.

Do not grasp the transceiver by the **Tuning** control, the knobs or connectors on the front and rear panels. Doing so may cause you personal injury and/or damage the transceiver knobs and connectors.

ANTENNA INSTALLATION AND CONNECTION

An antenna system consists of an antenna, a coaxial cable and a ground. With careful installation, a good antenna system can result in optimal performance for the transceiver.

Ensure that you are using a correctly tuned 50Ω antenna and that the coaxial cable and appropriate connectors also have an impedance of 50Ω. All connections must be clean and tight.

After making the connection, match the impedance of the coaxial cable and antenna until the SWR becomes 1.5:1 or less.

A high SWR results in a drop in the transmit power as well as radio frequency interference to consumer products such as broadcast radio and television.

If you are notified that the signal has been distorted, the antenna system may not be efficiently radiating the transceiver's power.

PRECAUTIONS

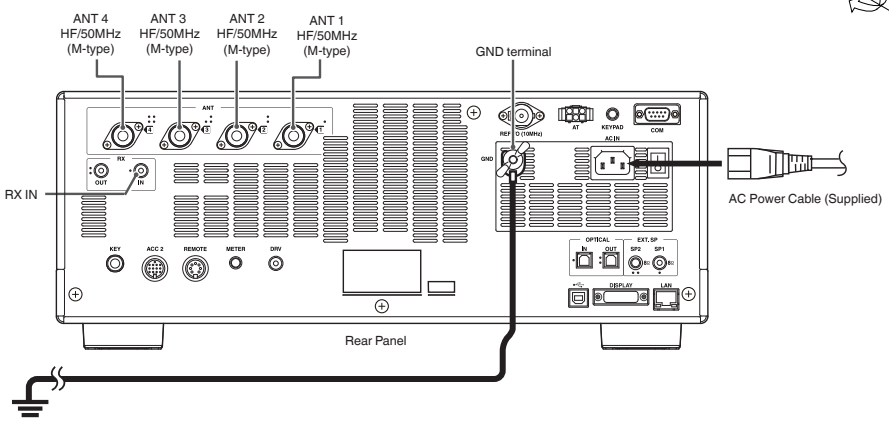
- Transmission without connecting an antenna to the transceiver may damage the transceiver. Prior to transmitting, connect an antenna or a 50Ω dummy load to the transceiver.
- When using the transceiver as a base station, we recommend you install an arrester so as to avoid fire, electric shock, damage and injury.
- If the antenna SWR exceeds 1.5:1 or more, the protection circuit activates in the transceiver. Ensure that the antenna SWR is 1.5:1 or lower.
- If the antenna dedicated for reception uses a semiconductor, such as an active antenna, do not transmit with it nor activate the antenna tuner. Doing so will supply power to the antenna system, damaging the semiconductor circuits of the antenna.

CONNECTING AN AC POWER CABLE

Use the supplied AC power cable to plug to an AC outlet with a protective grounding contact. Ensure that the grounding lead from the AC plug has been properly connected to the ground terminal before plugging the AC plug into the outlet. Likewise, remove the ground connection only after unplugging the AC plug. Failure to do so may result in an electrical shock.

PRECAUTIONS

- The AC power cable supplied with the K-type transceiver can only be used for the supply voltage AC 120V. Do not use or modify the supplied AC power cable with the UL plug for the supply voltage AC 220V - AC 240V.
- The AC power cable with the CE plug and the AC power cable with the BS plug are supplied with the E-type transceiver. Use one of the supplied cables that can correctly be plugged to an AC outlet.



GROUND CONNECTION

To avoid dangers such as electric shock, a good ground connection is necessary.

Bury one or more grounding rods or a large copper plate in the ground and connect it to the GND terminal on the rear panel of the transceiver using a thick conductive wire or a well fitted copper band plate.

PRECAUTION

- Do not use a gas pipe, an electrical conduit pipe, a plastic water pipe, etc., for grounding. These items will not create a proper ground and may cause an accident or fire.

LIGHTNING ARRESTER INSTALLATION

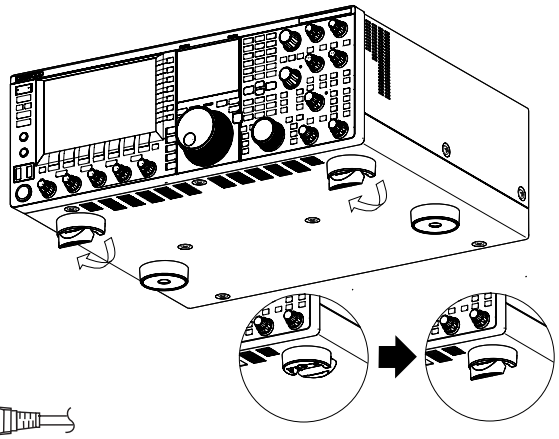
To avoid fire, electrification, damage, and injury by the lightning strike, install the lightning surge protector.

If a lightning storm is in the area, disconnect the antenna cable from the transceiver.

TRANSCEIVER TILT MECHANISM

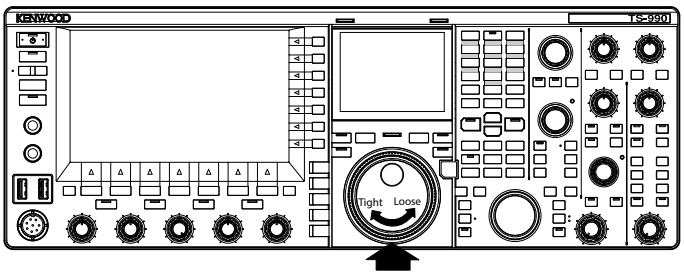
The lift-up supplementary bases are on the front bases on the bottom of the transceiver. To position the front panel slightly toward the upper side, pull the supplementary bases forward to the limit.

To use the front bases, be careful not to catch your fingers when lifting up the front bases' mechanism.



TORQUE ADJUSTMENT FOR TUNING (M) CONTROL

You can change the rotation torque of the **Tuning** (M) control as desired by pinching the ring at the back of the dial, then rotating the dial. Clockwise increases the rotation torque and counterclockwise decreases it.



Hold the ring securely, allowing you to rotate the knob.

ACCESSORIES CONNECTIONS (FRONT PANEL)

HEADPHONES (PHONES)

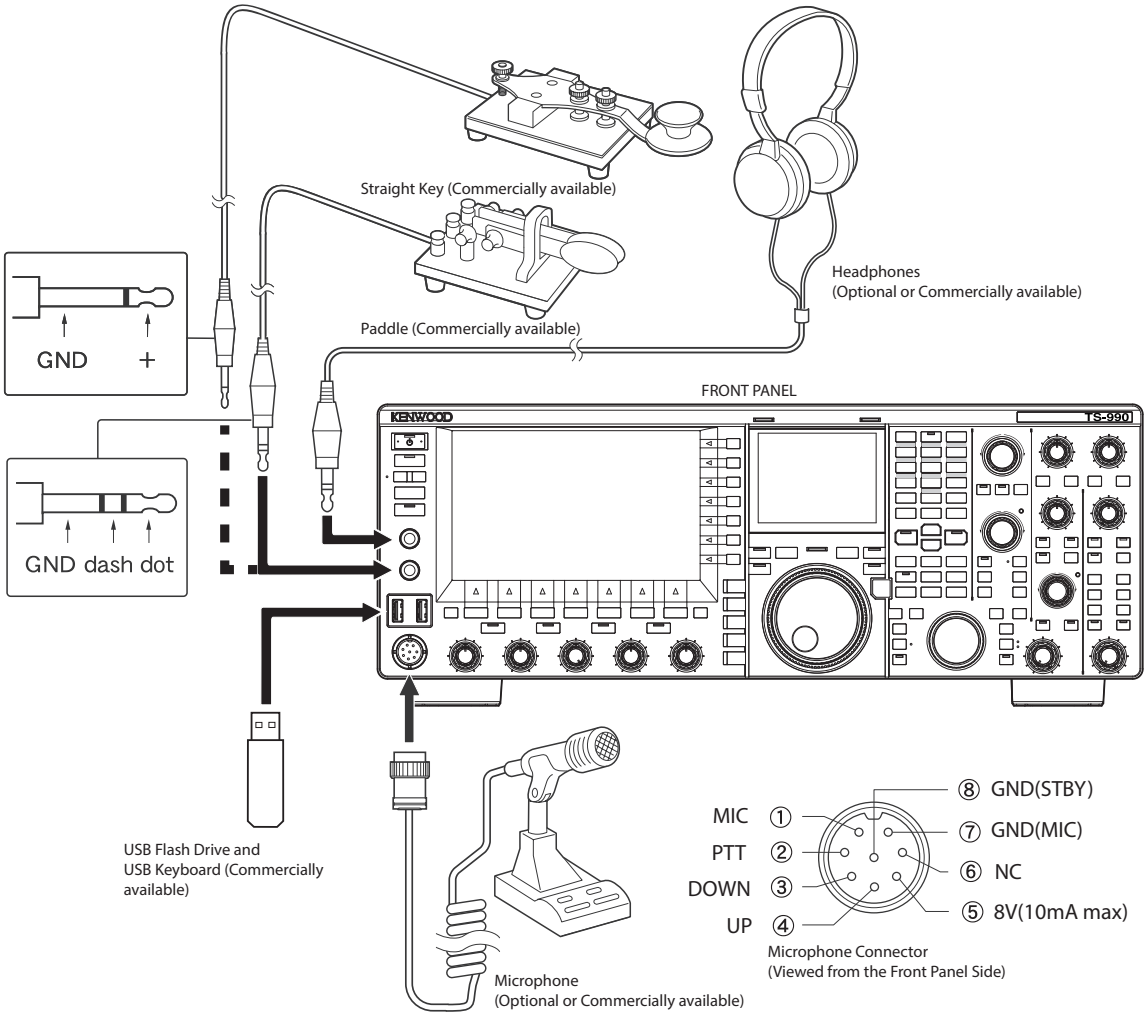
The PHONES jack accepts 2-conductor (mono) or 3-conductor (stereo) headphones with an impedance of 4Ω to 32Ω (standard is 8Ω) and a 6.3 mm (1/4") diameter plug.

While the headphones are plugged in, the audio line for the internal speaker (or an optional external speaker) is muted and the audio is heard through the headphones. The following optional headphones can be used with this transceiver:

• HS-5 (monaural) • HS-6 (monaural)

Note:

- Headphones with a higher impedance also have a higher volume level.
- Refer to "BASIC OPERATIONS" for details of configuration for the mixing balance to the headphones output and the left and right reverse. {page 4-23}



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MICROPHONE (MIC)

The MIC jack accepts a microphone with an impedance of 250Ω to 600Ω.

Connect the microphone plug to the **MIC** socket on the front panel and screw the retaining ring until the microphone is securely tightened.

The following optional microphones can be used with this transceiver:

- MC-43S
- MC-60A
- MC-90
- MC-47

The following microphones cannot be used with this transceiver.

- MC-44
- MC-44DM
- MC-45
- MC-45DM

PADDLE (PADDLE)

For CW operation using the built-in electronic keyer, connect a keyer to the **PADDLE** jack. The **PADDLE** jack accepts a 3-conductor plug with a 6.3 mm (1/4") diameter. The straight key can be connected to the **PADDLE** jack. In this case, select "Straight Key" from Menu 5-00, "Paddle Jack Configuration (Front)". {page 5-18}

USB FLASH DRIVE/USB KEYBOARD (•⇆)

You can connect any commercially available USB flash drive or USB keyboard to the USB-A port.

Connect it securely to the •⇆(USB-A) port.

Note:

- Do not disconnect the USB flash drive from the transceiver while it is in use, such as while reading or writing data. Additionally, do not turn the main power switch (I/O) OFF. {page 12-1}
- To avoid any damage to the data, you must remove the USB flash drive after executing Safe Removal of USB Flash drive. {page 12-1}
- Only a USB flash drive or a keyboard can be connected to the **USB** connector.

EXTERNAL SPEAKERS (EXT.SP1/EXT.SP2, 8Ω)

The transceiver is equipped with two independent receivers. In general, audio from both receivers sounds from the internal speaker. However, connecting an external speaker allows you to separate the audio outputs.

On the rear panel, two jacks for external speakers are available, allowing you to connect two external speakers.

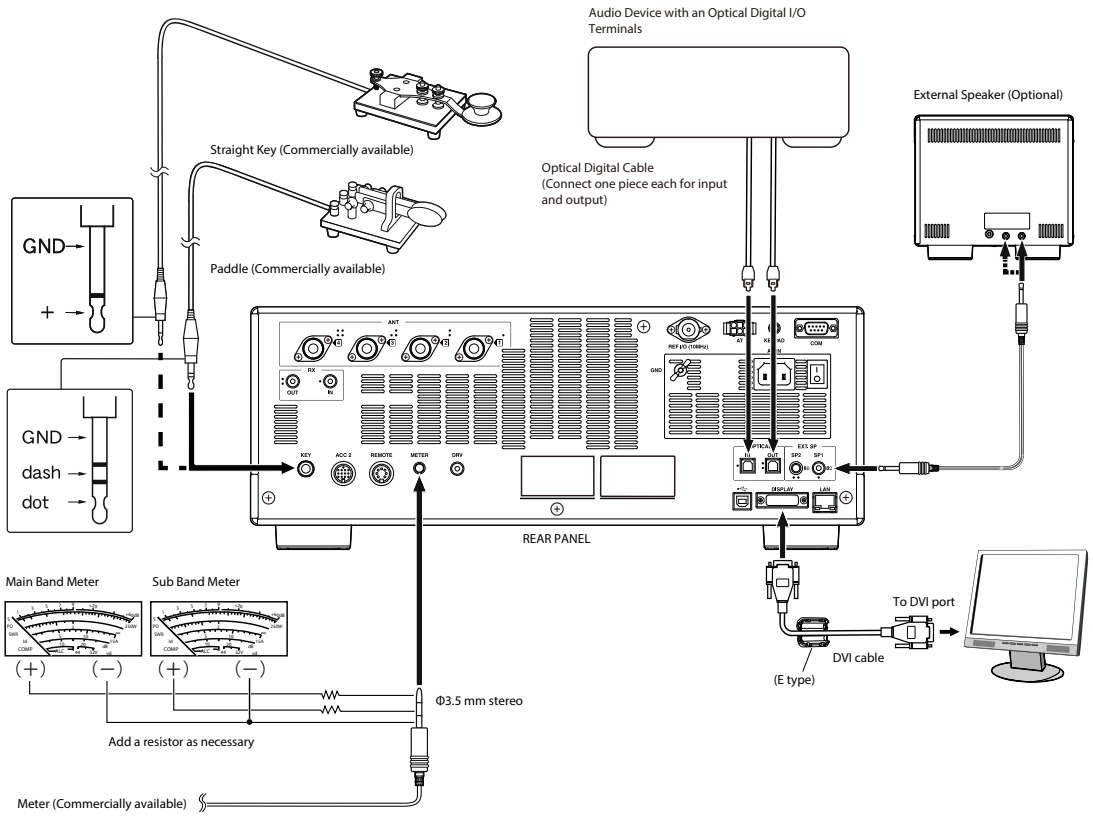
An external speaker with an impedance of 4Ω to 8Ω (standard is 8Ω) can be connected using the 2-conductor (mono) plug with a 3.5 mm (1/8") diameter.

If an external speaker is connected to **EXT.SP1**, no audio sounds from the internal speaker.

If an external speaker is connected to **EXT.SP2**, the audio sounds from both the external speaker and the internal speaker.

Note:

- The **EXT.SP1** and **EXT.SP2** jacks with 8Ω impedance are dedicated for external speakers. Do not connect headphones to these jacks. Doing so will result in a high audio volume level which may cause an auditory disorder.
- Audio to sound from an external speaker can be selected from the menu. {page 16-17}



KEY FOR CW (KEY)

For CW operation without using the built-in electronic keyer, the plug from a electronic key, a straight key, a external electronic keyer or a PC keyer can be connected. The KEY jack accepts a 2-conductor (mono) plug with a 3.5 mm (1/8") diameter.

Shorting the center pin of the jack to its outer represents “keydown”.

Depending on how you configure the menu, you can connect a paddle to the **KEY** jack and use the internal electronic keyer instead. {page 5-18}

Note:

- Refer to Chapter 5 "ASSISTING YOUR SMOOTH QSO" for the details of the built-in electronic keyer. {page 5-18}

KEYPAD (KEYPAD)

You can connect a personalized (self-made) PF keypad to the **KEYPAD** connector. {page 16-7}

CONNECTION TO AUDIO DEVICES WITH OPTICAL DIGITAL INPUT TERMINAL

With a commercially available optical digital cable an audio device can be connected to the transceiver.

Note:

- Connect the transceiver to the audio device using the commercially available optical digital cable with the TOSLINK connector.
- If the transceiver is connected to the audio device, the transceiver may not work correctly depending on the operating environment of your PC. {page 18-11}
- Turn the transceiver power (⏻) and audio device OFF, then connect the transceiver to the audio device.
- If you turn the transceiver power (⏻) ON while the audio signal sourced from the transceiver is being recorded by the audio device, the digital processing cannot be synchronized when you turn the transceiver power (⏻) ON next time; hence, the audio device cannot correctly record. Turn the transceiver power (⏻) after the recording by the audio device has been stopped completely.

CONNECTION TO THE EXTERNAL DISPLAY UNIT

You can connect the transceiver to an external display using the commercial available DVI cable. The ferrite core is supplied with the transceiver (E-type only), and to connect the transceiver with an external display, you must attach the ferrite core to the DVI cable.

You can view the same contents using an external display as those that are displayed on the main screen. {page 16-18}

Note:

- Use an external display with 800x600 or 848x480 resolution.

METER

Connect to a commercially available meter. {page 16-15}

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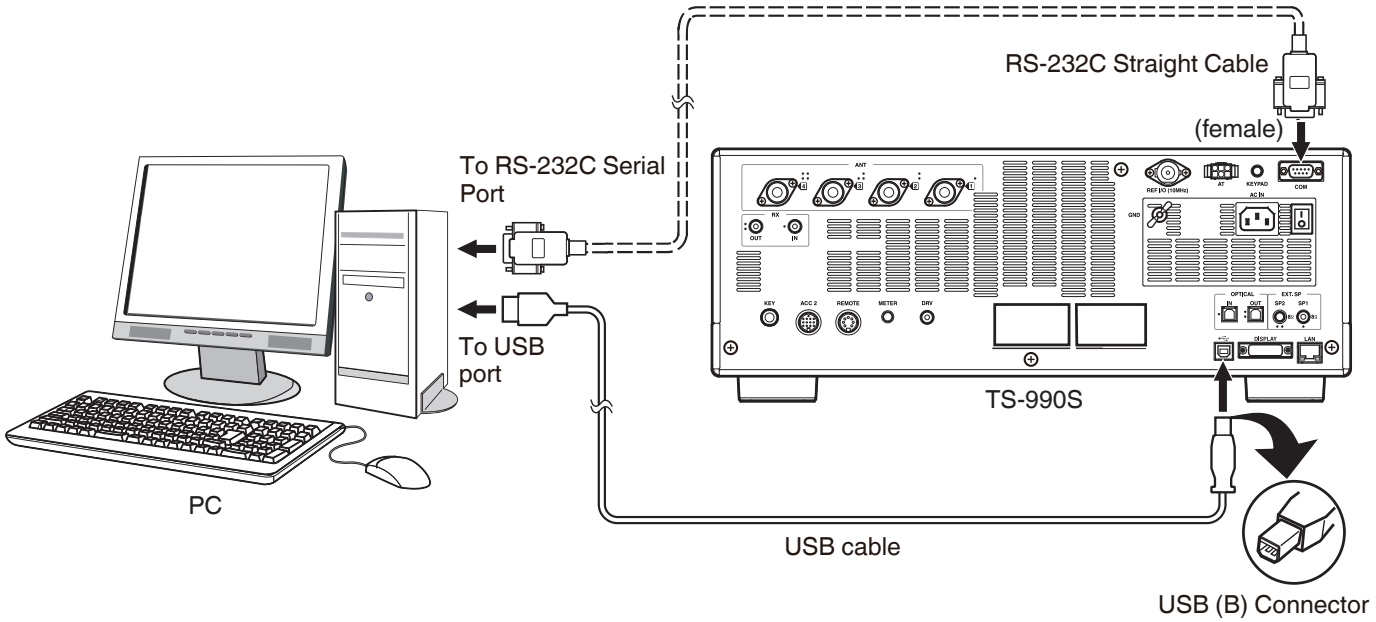
CONNECTION TO A PC

The transceiver can be connected to a PC using a USB cable or an RS-232C straight-through cable.

Note:

- Turn the transceiver and your PC OFF prior to connecting your PC to the transceiver using the cable.
- Use the commercial available USB cable or RS-232C straight-through (not “crossed”) cable.
- In principle, using the USB audio results in a delay. Additionally, audio interruptions may occur depending on the characteristics of your PC and the status of the load. Use USB audio for communications where time lag is inconsequential or for recording received audio in the PC.
- To control the transceiver via the USB connector using a PC, you need to install the virtual COM port driver onto the PC.
- To use the USB audio, the driver available in your PC as standard will be used. You can down load the ARUA-10 USB Audio Controller from the KENWOOD web site.

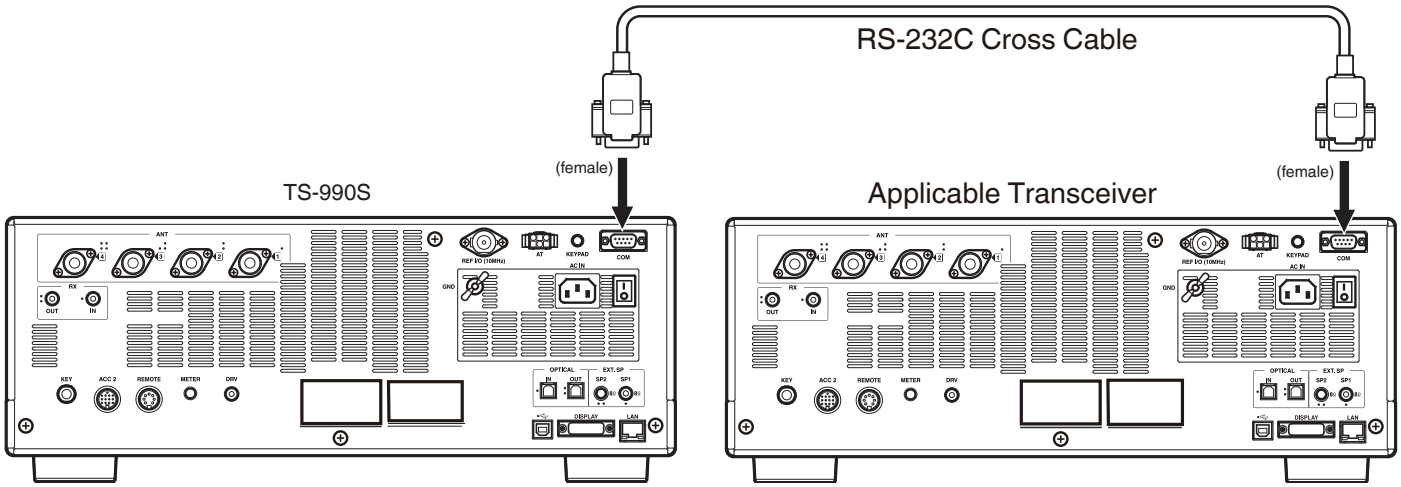


CONNECTION TO AN APPLICABLE TRANSCEIVER (QUICK DATA TRANSFER)

For data transfer, use an RS-232C cross-cable (female to female) to connect the transceiver **COM** connector to the COM connector of the secondary transceiver. {page 16-26}

You can connect this transceiver to the following applicable transceivers:

• TS-990 series • TS-590 series • TS-480 series • TS-2000 series • TS-570 series



CONNECTION TO THE LINEAR AMPLIFIER

You can connect a linear amplifier to the **REMOTE** connector.

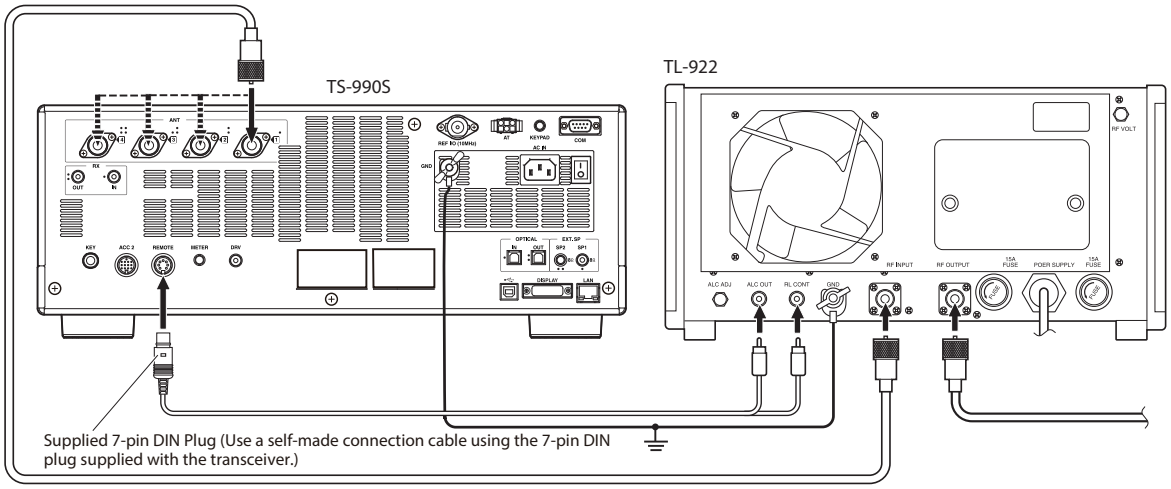
Prior to activating the linear amplifier, ensure that you have configured the linear amplifier controls. {page 16-31} {page 16-32}

10 ms is the response time from when the transceiver changes from receive to transmit to when is actually transmitted. In operation other than CW Full Break-in, changing the menu configuration extends the response time to 25 ms (45 ms for SSB, FM and AM modes).

Note:

- TL-922 have been discontinued and is no longer available.

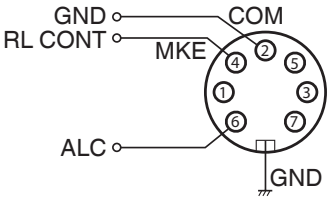
CONNECTION TO THE TL-922



CONTROL RELAY

Allocate pin number 2 (COM) in the REMOTE connector to connect to the GND of the TL-922, and pin number 4 (MKE) to the RL CONT of the TL-922. Additionally, connect pin number 6 (ALC) to the ALC OUT of the TL-922.

Configure Advanced Menu 11 "Linear Amplifier Control (HF Band)" to “Active High + Relay & TX Delay Control”.



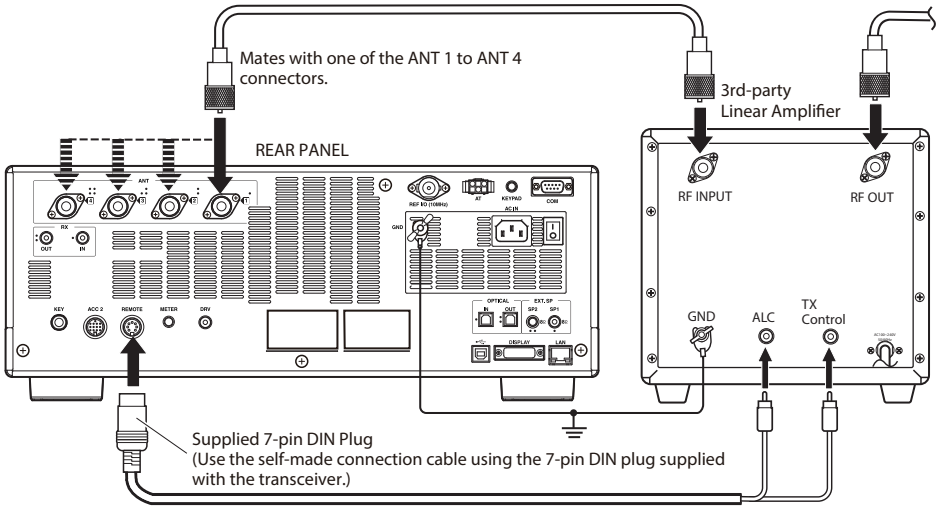
REMOTE CONNECTOR {page 1-10}
(View from the rear panel)

CONNECTING A TYPICAL LINEAR AMPLIFIER

To connect a commercially available linear amplifier to the transceiver, follow the instructions given in the illustration below.

Note:

- Use a linear amplifier that has the ALC output level in the range from -7V to -10V.
- Refer to the instruction manual supplied with the linear amplifier for connection to the linear amplifier.



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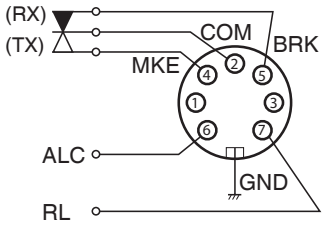
TX/RX CONTROL

To connect a linear amplifier, configure to enable the control signal state in Advanced Menu 11 "Linear Amplifier Control (HF Band)" and Advanced Menu 12 "Linear Amplifier Control (50 MHz Band)", and make the appropriate connections between the TX/RL control terminals of the TS-990S and the linear amplifier.



REMOTE CONNECTOR {page 1-10}
(View from the rear panel)

Note:

- The TX/RX control method may vary depending on the type of linear amplifier. Some linear amplifiers may enter TX mode when the control terminal is switched to the ground line. For such a linear amplifier, allocate pin number 2 (COM) in the REMOTE connector to connect to the GND terminal and pin number 4 (MKE) to the control terminal of the linear amplifier.

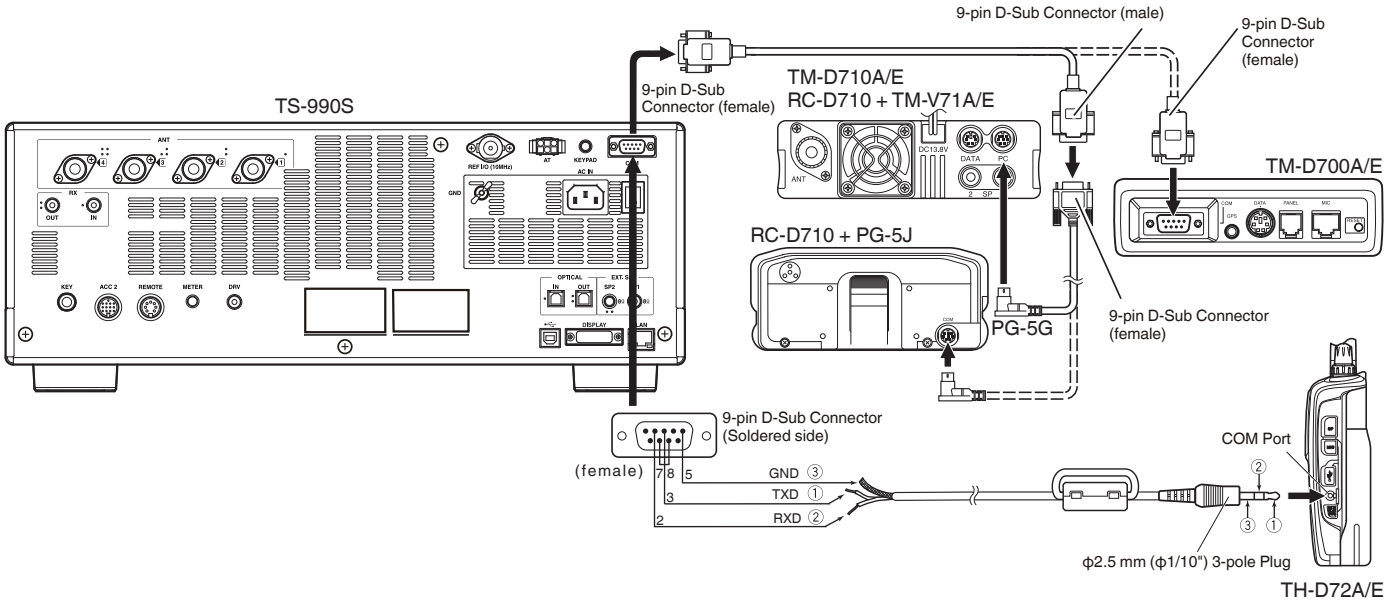
CONNECTION TO OTHER KENWOOD TRANSCEIVERS WITH A TNC TERMINAL

The connection illustrated below allows packet cluster tuning using a TH-D72A/E, TM-D710A/E, or TM-D700A/E. {page 16-27}

You can connect the TS-990S to a TM-D710A/E or RC-D710 using an optional PG-5G and a commercially available RS-232C cross-cable. If the RS-232C cross-cable has female plugs or male plugs, use a female to male conversion plug. You can connect the transceiver to a TM-D700A/E using a commercially available RS-232C cross-cable.

Note:

- TM-D700A/E has been discontinued and is no longer available.
- Refer to the instruction manual supplied with the device with the built-in TNC for details of connection.



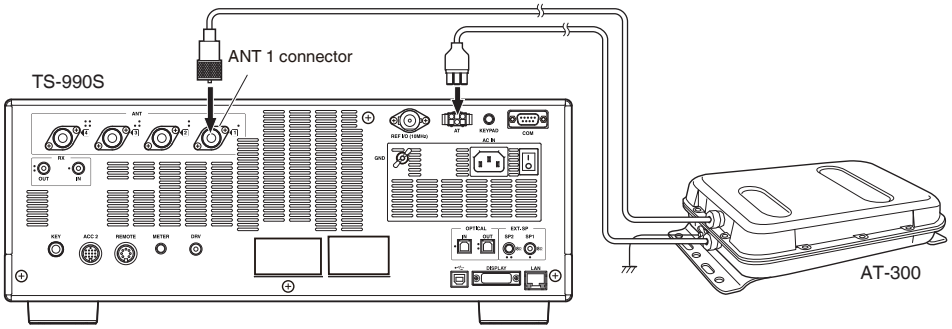
CONNECTION TO AN EXTERNAL ANTENNA TUNER AT-300

The external antenna tuner AT-300, can be connected to the ANT1 connector and AT connector.

The AT-300 does not function if it is connected to a connector other than the ANT1 connector. The AT connector is dedicated for AT-300. Other external antenna tuners cannot be controlled. If another external antenna tuner is connected to the transceiver, use the TX tuning function. {page 9-14}

Note:

- Connect the AT-300 to the transceiver after the main power (I/O) shuts down.
- The AT-300 cannot be used in the 50 MHz band. The antenna for the 50 MHz band must be connected to an antenna connector other than antenna connector 1 (**ANT1**).
- Connecting the AT-300 to the AT connector using the ANT 1 results in the signal bypassing the internal antenna tuner (through).
- If you connect the AT-300 to the AT terminal, the transmit power will be limited to 100 W. (Depending on the specifications for AT-300)
- The AT-300 has been discontinued and is no longer available.



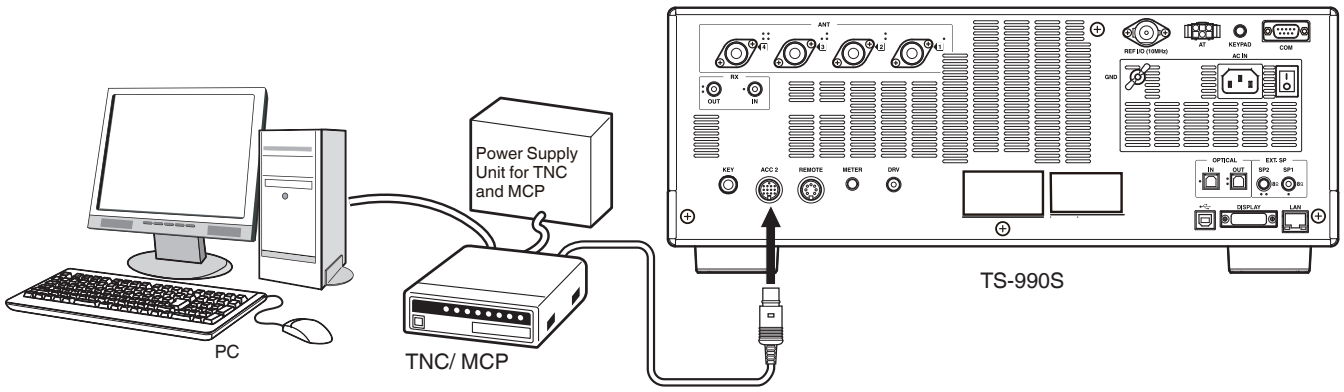
CONNECTION TO A TNC, MCP, ETC.

For packet communications, use an external TNC (terminal node controller) or MCP (multi-mode communication processor) terminal, or the sound capability in a PC. For digital communications such as RTTY, PSK and SSTV, use the **ACC2** connector on the rear panel of the transceiver.

- Use a cable with a 13-pin DIN plug to connect the transceiver to an external device such as a TNC, MCP or a PC having sound capability.
- To connect the PC to a TNC or MCP, use a commercially available RS-232C cable.

Note:

- To avoid any noise interference, keep the distance between the transceiver and a PC as great as possible.
- The external device can be connected to the ACC 2 connector with the self-made cable.



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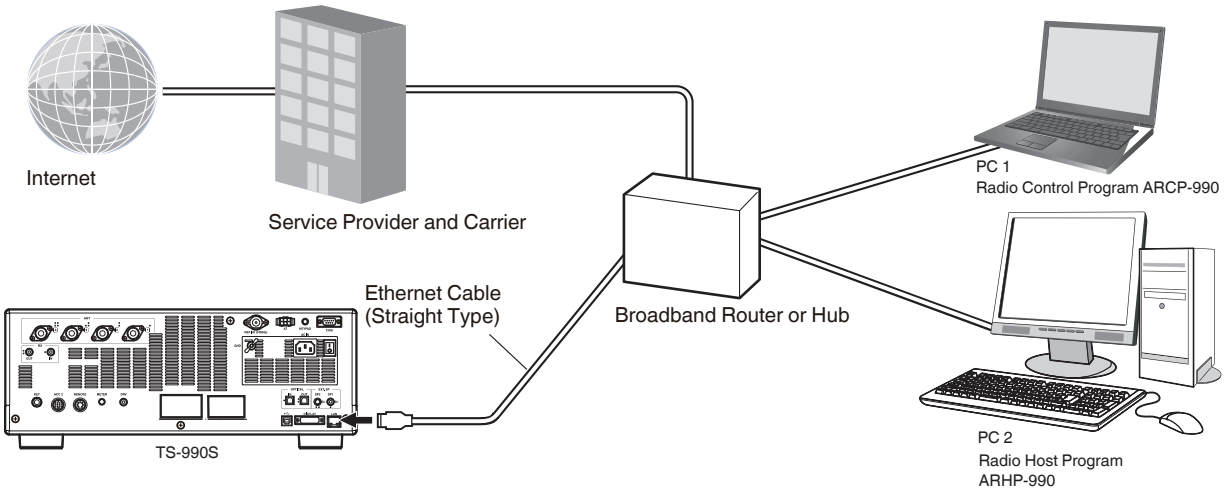
CONNECTING TO YOUR LAN

To connect the transceiver to your LAN so as to automatically correct the clock or to operate with KNS (KENWOOD NETWORK COMMAND SYSTEM), use an Ethernet cable (straight type) as shown in the illustration below.

{page 15-3} {page 16-12}

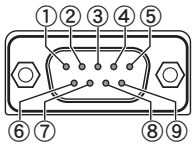
Note:

♦ Use a commercially available Ethernet cable.



TERMINAL DESCRIPTIONS

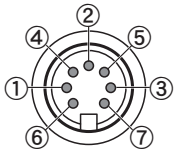
COM



COM CONNECTOR

Pin No.	Pin Name	Function	Input/Output
1	NC	No connection	—
2	RXD	Sends the serial data to a PC.	O
3	TXD	Receives the serial data from a PC.	I
4	NC	No connection	—
5	GND	Ground	—
6	NC	No connection	—
7	RTS	Sends from a PC to the transceiver. If the PC cannot accept serial data, the PC sends the "L" state signal to disable the transceiver from sending serial data.	I
8	CTS	Sends from the transceiver to a PC. If the transceiver cannot accept serial data, the transceiver sends an "L" state signal to disable the PC from sending serial data.	O
9	NC	No connection	—

REMOTE



REMOTE CONNECTOR

Pin No.	Pin Name	Function	Input/Output
1	SPO	Speaker output	O
2	COM	Common terminal of the linear amplifier control relay	I/O
3	SS	PTT Input • Shorting the SS terminal to Ground starts transmission.	I
4	MKE	The make terminal of the linear amplifier control relay • Advanced Menu 11 “Linear Amplifier Control (HF Band)” and Advanced Menu 12 “Linear Amplifier Control (50 MHz Band)” enable the MKE terminal to short to the common terminal during TX. {page 16-31} {page 16-32}	I/O
5	BRK	The break terminal of the linear amplifier control relay • Shorts to the common terminal when the MKE terminal is not shorted to the common terminal. {page 16-31} {page 16-32}	I/O
6	ALC	ALC input from the linear amplifier	I
7	RL	Linear amplifier control output • Advanced Menu 11 “Linear Amplifier Control (HF Band)” and Advanced Menu 12 “Linear Amplifier Control (50 MHz Band)” enable to configure the status during TX. Active High : During TX, outputs 12V DC. (10mA max.) Active Low : During TX, becomes “Low” level. (Shorted to GND) During RX, becomes “High” level when an external bias voltage is fed. (+15V DC 10mA max.) {page 16-31} {page 16-32}	O

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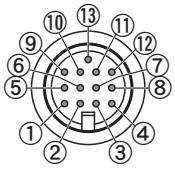
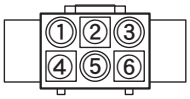
ACC 2



ACC2 CONNECTOR

Pin No.	Pin Name	Function	Input/Output
1	SANO	Audio Output for the Sub Band Audio Sends the audio signal to external devices, such as TNC, MCP and PC. • The audio output level cannot be changed with the **AF** control on the front panel. • Audio output level can be changed in Menu 7-11, "Sub Band Audio Output Level (ACC 2)". 0 Vp-p audio signal is transferred with “0” configured for the audio output level, 0.5 Vp-p audio signal is transferred with “50” as the default, and 1 Vp-p audio signal is transferred with “100” configured. (Output Impedance: 10kΩ)	O
2	RTTY	RTTY (FSK keying terminal) • The keying polarity can be changed in Menu 2-07, "FSK Keying Polarity".	I
3	MANO	Audio Output for the Man Band Audio Sends the audio signal to external devices, such as TNC, MCP and PC. • The audio output level cannot be changed with the **AF** control on the front panel. • Audio output level can be changed in Menu 7-10, "Main Band Audio Output Level (ACC 2)". 0 Vp-p audio signal is transferred with “0” configured for the audio output level, 0.5 Vp-p audio signal is transferred with “50” as the default, and 1 Vp-p audio signal is transferred with “100” configured. (Output Impedance: 10kΩ)	O
4	GND	Ground	—
5	MSQ	Sends the main band squelch control signal. • Connects to the squelch input terminal of the TNC or MCP, or the interface terminal for connection to a PC. • Open Squelch: Low impedance • Tight Squelch: High impedance	O
6	MMET	Sends the main band meter levels.	O
7	SSQ	Sends the sub band squelch control signal.	—
8	GND	Ground	—
9	PKS	PTT Input for data communication (DATA SEND) • Connecting to the PTT output interface for the TNC, MCP and PC connection • Shorting the PKS pin to Ground starts the transmission. • During transmission using the PKS pin, mutes the unnecessary modulation input signal. INPUT LINES FOR TRANSMIT AUDIO {page 5-11}	I
10	SMET	Sends the sub band meter levels. Type of output signal and its output level can be selected from Advanced Menus 1, "Indication Signal Type (Main Band)", and 3, "Output Level (Sub Band)".	O
11	ANI	Audio input for data communication • Connects to the audio output of the TNC, MCP, PC (or the interface for connection to a PC). • The audio input level cannot be changed with the **MIC** control on the front panel. • Audio input level can be changed in Menu 7-06, "ACC2: Audio input Level". If “0” is configured, the transceiver transmits nearly without modulation. With the default of “50”, the transceiver transmits with standard modulation by 10 mVrms input. If “100” is configured, the transceiver transmits with standard modulation by 1 mVrms input. (Input Impedance: 10kΩ)	I
12	GND	Ground	—
13	SS	PTT Input • Has the same function the SS terminal assigned to 2nd pin of **MIC** connector on the front panel and 3rd pin of **REMOTE** connector on the rear panel. • The same behavior as when **[SEND]** on the front panel is pressed • Shorting the SS terminal to Ground starts the transmission. • During transmission using the SS pin, mutes the unnecessary modulation input signal. INPUT LINES FOR TRANSMIT AUDIO {page 5-11}	I

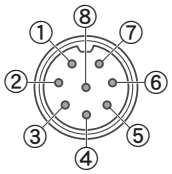
AT



EXT.AT CONNECTOR

Pin No.	Pin Name	Function	Input/Output
1	GND	Ground	—
2	TT	EXT.AT control (TTI/TTO)	I/O
3	GND	Ground	—
4	NC	No connection	—
5	TS	EXT.AT control (TSI/TSO)	I/O
6	14S	13.8 V DC source for EXT.AT	O

MIC

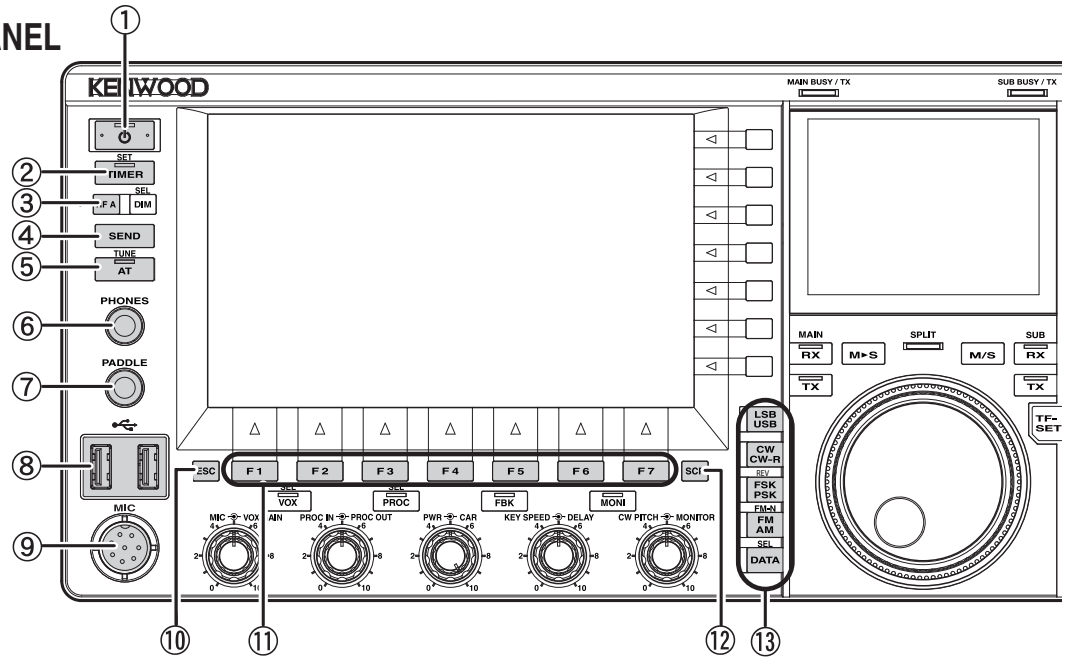


MIC CONNECTOR

Pin No.	Pin Name	Function	Input/Output
1	MIC	Signal input from the microphone	I
2	SS	Microphone standby (PTT) control	I
3	MD	Microphone Down control	I
4	MU	Microphone Up control	I
5	8 A	Provides DC 8 V to the microphone.	O
6	NC	No connection	—
7	MSG	Microphone Ground	—
8	MCG	Ground	—

2 PANEL DESCRIPTION

FRONT PANEL



① Power Switch: [⏻](POWER)
Press to turn the transceiver power (⏻) ON or OFF. {page 4-1}

"⏻" LED

Lights green when the transceiver power (⏻) is ON.

Lights orange when the transceiver turns power (⏻) is OFF.
Blinks orange when the transceiver power is turning OFF.

Note:

- While the main power switch (I/O) on the rear panel is pressed down to the "O" position, the transceiver power (⏻) cannot be turned ON even with a press of [⏻]. {page 4-1}
- Pressing the main power switch (I/O) while the "⏻" LED is blinking may cause the transceiver to malfunction.

② Timer key: **[TIMER/SET]**
Press to toggle the timed task by a timer or programmable timer between active and inactive. {page 15-4}

Press and hold to open or close the Timer screen. {page 15-4}

"TIMER" LED

Lights green while the timer is counting down.

Blinks green while the timed task by a timer is about to begin.

③ Programmable Function A key: **[PF A]**
Press to activate the function assigned to **[PF A]**. The default is "VOICE 2". {page 14-1}

④ Send key: **[SEND]**
Press to toggle the operating state between TX and RX. A key press places the transceiver into the TX state, and the next key press places the transceiver into the RX state. {page 4-17}

⑤ Antenna Tuning key: **[AT/TUNE]**
Press to toggle the internal antenna tuner between active and inactive. {page 4-21}

Press and hold to begin tuning the internal antenna tuner. {page 4-21}

"AT" LED

Lights green while the antenna tuner is active. Blinks green during tuning.

⑥ PHONES jack
Connect a set of headphones(4 to 32Ω). {page 1-2}

⑦ PADDLE jack
Connect a paddle for CW operation. {page 1-3}

⑧ ⇽(USB-A) connector
You can connect any commercially available USB flash drive or USB keyboard to the USB-A ports. {page 1-3}, {page 12-1}

It is possible to connect to USB hub.

⑨ MIC connector
Connect a microphone(250 to 600Ω). {page 1-3}

⑩ Escape key: **[ESC]**
Press to close the displayed screen.

⑪ PF 1 to PF 7 keys: **[PF 1]** to **[PF 7]** with Key Guide on the bottom of Main Screen
Press to activate or select the function specified with a key guide on the bottom of the main screen.

⑫ Scope key: **[SCP]**
Press to open the Bandscope screen on the main screen.

With the **Bandscope** screen open, press to cycles through the **Bandscope** screen, the **Bandscope with Waterfall** screen and no scope screen. {page 7-1}

⑬ Mode keys

LSB/USB key: [LSB/USB]

Press to toggle between LSB mode and USB mode. {page 4-10}

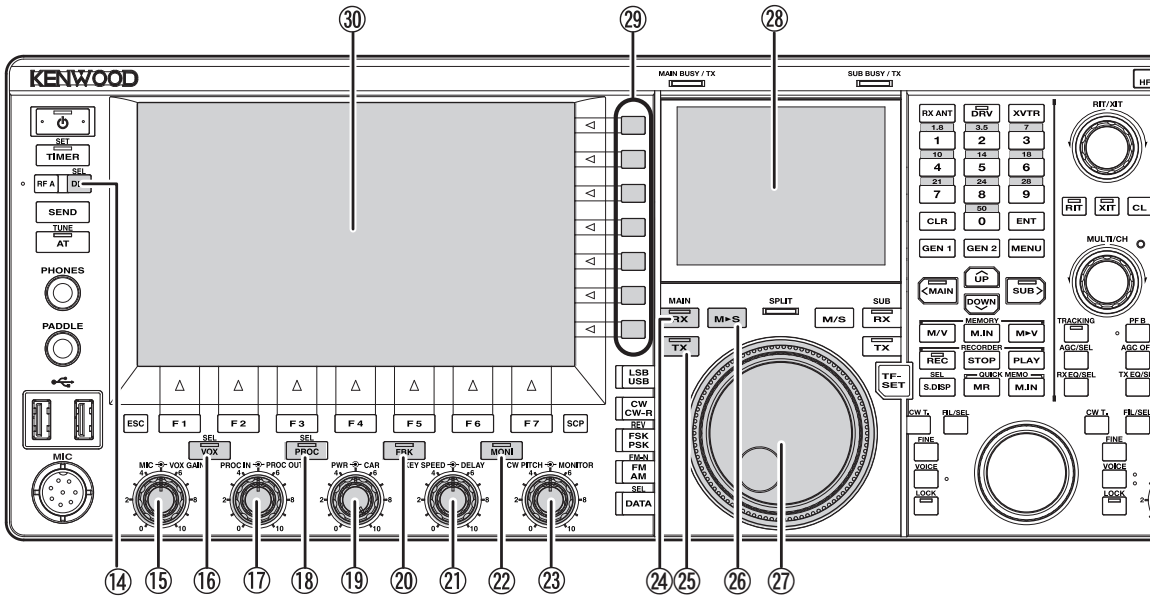
CW/CW-R key: [CW/CW-R]

Press to toggle the side band between CW and CW-R. {page 4-10}

FSK/PSK/REV key: [FSK/PSK/REV]

Press to toggle between FSK mode and PSK mode. {page 4-10}

Press and hold to toggle the side band between normal and reverse (FSK and FSK-R or PSK and PSK-R). {page 4-10}



FM/AM/FM-N key: [FM/AM/FM-N]

Press to toggle between FM mode and AM mode.

Press and hold to toggle FM mode between narrow (FM-N) and wide (FM).

• Narrow: FM-N • Wide: FM

Using Narrow FM reduces the IF filter bandwidth during RX, allowing you more accurate selection. During TX, the shift frequency is narrowed and the occupied bandwidth decreases. {page 4-10}

Data key: [DATA/SEL]

Press to cycle the DATA mode through Data Off, 1, 2 and 3. {page 4-10}

Press and hold to open or close the Modulation Source screen. {page 5-11}

⑭ Dimmer key: **[DIM/SEL]**

Press to change the display brightness. {page 4-6}

Press and hold to open or close the **Dimmer** screen. {page 4-6}

⑮ MIC ◉ VOX GAIN control

MIC control: Adjusts the microphone gain level. {page 4-17} {page 5-14} {page 5-28}

VOX GAIN control: Adjusts the VOX gain level of the microphone. {page 9-4}

⑯ VOX key: **[VOX/SEL]**

Press to toggle VOX of a microphone or semi break-in between active and inactive. {page 9-2}

Press and hold to open or close the **VOX** screen. {page 9-3}

"VOX" LED

Lights green while the VOX of the microphone or semi break-in is active,

⑰ Speech Processor Input ◉ Speech Processor Output controls

PROC IN control: Rotate to adjust the input level to the speech processor. {page 9-6}

PROC OUT control: Rotate to adjust the output level from the speech processor. {page 9-7}

⑱ Speech Processor key: **[PROC/SEL]**

Press to toggle the Speech Processor between active and inactive. {page 9-6}

Press and hold to open or close the Speech Processor screen. {page 9-7}

"Speech Processor" LED

Lights green while the Speech Processor is active.

⑲ Power ◉ Carrier controls

TX POWER control: Rotate to adjust the transmit power. {page 4-17}

CAR control: Rotate to adjust the carrier level for use in CW, FSK, PSK, or AM mode. {page 5-13}

⑳ Full Break-in key: **[FBK]**

Press to toggle the Full Break-in function between active and inactive. {page 5-15}

"FBK" LED

Lights green while Full Break-in is active.

㉑ KEY SPEED ◉ DELAY controls

KEY SPEED control: Rotate to adjust the keying speed. {page 5-19}

DELAY control: Rotate to adjust the delay time for the semi break-in function. {page 5-15}

㉒ Monitor key: **[MONI]**

Press to toggle the TX monitor between active and inactive. {page 9-5}

"MONI" LED

Lights green while the TX monitor is active. {page 9-5}

㉓ CW PITCH ◉ MONITOR controls

CW PITCH control: Rotate to adjust the CW pitch frequency. {page 5-16}

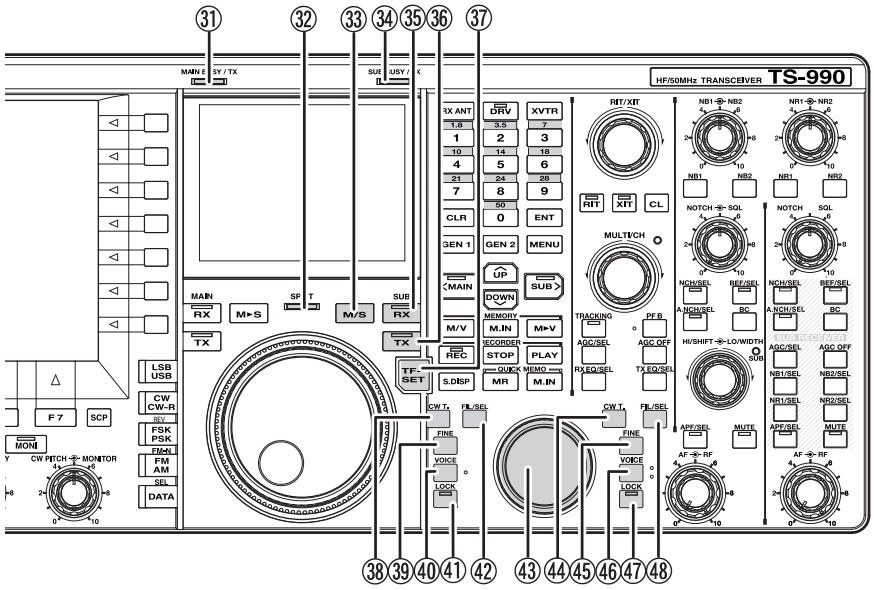
MONITOR control: Rotate to adjust the transmit monitor and sidetone levels. {page 9-5} {page 5-16}

㉔ RX (Main band) key: **[RX]** (M)

Press to finish reception on two frequencies. {page 5-3}

"RX" (Main band) LED

Lights green when the transceiver power (⏻) is ON. {page 5-1}



㉕ TX (Main band) key: **[TX]** (M)
Press to switch Split mode to Simplex mode. {page 5-1}

"TX" (Main band) LED

Lights green while in Simplex mode. {page 5-1}

㉖ Main to Sub key: **[M►S]**
Press to copy the main band frequency and mode configuration data to the sub band. {page 5-1}

㉗ Tuning (M) control
Rotate to select transmit and receive frequencies for the selected band. Rotating it clockwise increments the frequency and rotating it counterclockwise decrements the frequency. The rotation torque for the **Tuning** control can be adjusted.

㉘ Sub-screen
A 3.5" Color TFT LCD. {page 2-15}

㉙ Function keys: **[x.x.x]** (F) with Key Guide on the right side of Main Screen
Press to activate or select the function specified with a key guide on the right side of the main screen.

㉚ Main Screen
A 7" Color TFT LCD. {page 2-12}

㉛ MAIN BUSY/ TX LED
Lights red during transmit using the main band. Lights green while the main band squelch is open.

㉜ SPLIT LED
Lights yellow while in the Split mode. Blinks yellow while the split frequency is being entered.

㉝ Main Band and Sub band key: **[M/S]**
Press to toggle the frequency and operating mode between main band and sub band. {page {page 5-36}}

㉞ SUB BUSY/ TX LED
Lights red during transmit using the sub band. Lights green while the sub band squelch is open.

㉟ RX (Sub band) key: **[RX]** (S)
Press to toggle reception on the sub band between active and inactive. {page 5-3}

"RX" (Sub band) LED

Lights green while the sub band is in receive mode.

㊱ TX (Sub band) key: **[TX]** (S)
Press while in Simplex mode to switch the operating mode to Split mode. Press again to reverts to Simplex mode. {page 5-1}

Press and hold to enable the configuration for split frequency operation. {page 5-1}

"TX" (Sub band) LED

Lights green while the transceiver is placed in Split operation.

㊲ TX Frequency Set key: **[TF-SET]**
Press down to receive using the transmit frequency. {page 5-2}

㊳ CW Auto Tune (Main Band) key: **[CW T.]** (M)
Press to activate CW auto tuning for the main band. {page 5-17}

㊴ Fine Tuning (Main Band) key: **[FINE]** (M)
Press to toggle Fine tuning for the main band between active and inactive. {page 4-14}

㊵ Voice (Main Band) key: **[VOICE]** (M)
Press to activate the function assigned to **[VOICE]** (M). The default is "VOICE 1" for the main band. {page 14-3}

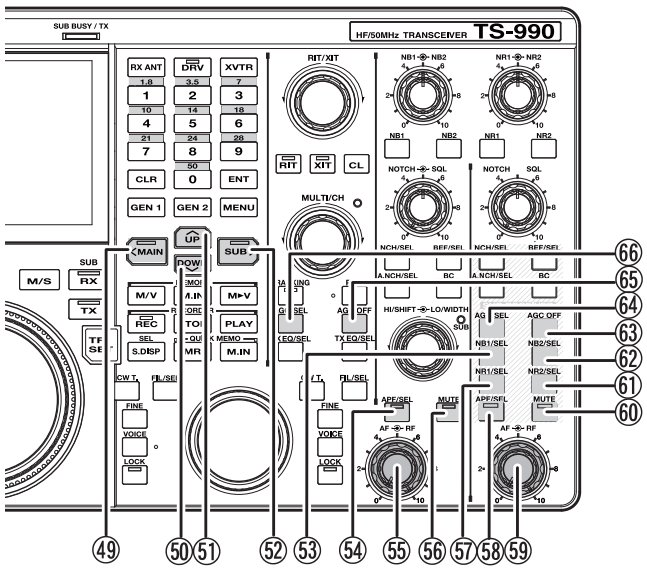
㊶ Lock (Main Band) key: **[LOCK]** (M)
Press to toggle the main band frequency lock between active and inactive. {page 4-16}

"LOCK" (Main) LED

Lights orange while the frequency lock for the main band is active. {page 4-16}

㊷ Filter (Main Band) key: **[FIL/SEL]** (M)
Press to cycle the receive filter for the main band through Filter A, Filter B and Filter C. {page 6-2}

Press and hold to open or close the Receive Filter screen. {page 6-3}



㊸ Tuning (S) control
Rotate to select the transmit and receive frequencies for the sub band. Rotate it clockwise increments the frequency and rotate it counterclockwise decrements the frequency.

㊹ CW Auto Tune key for Sub band: **[CW T.]** (S)
Press to activate CW auto tuning for the sub band. {page 5-17}

㊺ Fine Tuning (Sub band) key: **[FINE]** (S)
Press to toggle the fine tuning for the sub band between active and inactive. {page 4-14}

㊻ Voice (Sub band) key: **[VOICE]** (S)
Press to activate the function assigned to **[VOICE]** (S). The default is "VOICE 1" for the sub band. {page 14-3}

㊼ Lock (Sub band) key: **[LOCK]** (S)
Press to toggle the sub band frequency lock between active and inactive. {page 4-16}

"LOCK" (Sub) LED

Lights orange while the frequency lock for the sub band is active. {page 4-16}

㊽ Receive Filter (Sub band) key: **[FIL/SEL]** (S)
Press to cycle the receive filter for the sub band through Filter A, Filter B and Filter C. {page 6-2}

Press and hold to open or close the **Receive Filter** screen. {page 6-3}

㊾ Main Band access key: **[<MAIN]**
Press to switch the current operating band to the main band. This key also shifts the cursor to the left while the configuration screen is open. {page 4-7}

"Main band" LED

Lights green while the main band is the current operating band.

㊿ Down key: **[DOWN]**
Press to decrease the frequency in steps of 1 MHz. Hold the key down to continuously decrease the frequency. While a configuration screen is open, press to execute the key task which varies depending on the configuration screen. For example, press to decrease or continuously decrease the parameter in the proper step size. {page 4-14}

(51) Up key: **[Up]**
Press to increase the frequency in steps of 1 MHz. Hold the key down to continuously increase the frequency. While a configuration screen is open, press to execute the key task which varies depending on the configuration screen. For example, press to increase or continuously increase the parameter in the proper step size. {page 4-14}

(52) Sub Band access key: **[SUB>]**
Press to switch the current operating band to the sub band. This key also shifts the cursor to the left while the configuration screen is open. {page 4-7}

"Sub band" LED

Lights green while the sub band is the current operating band.

(53) Noise Blanker 1 (Sub band) key: **[NB1/SEL]** (S)
Press to toggle the Noise Blanker 1 for the sub band between active and inactive. {page 6-9}

Press and hold to open or close the Noise Blanker 1 (Sub Band) screen. {page 6-10}

(54) Audio Peak Filter (Main band) key: **[APF/SEL]** (M)
Press to toggle the Audio Peak Filter for the main band between active and inactive. {page 6-7}, {page 6-8}

Press to open the **Audio Peak Filter** screen for the main band. {page 6-8}

"APF" (Main band) LED

Lights green while Audio Peak Filter for the main band is active. {page 6-7}, {page 6-8}

(55) AF ◉ RF (M) control
AF (M) control: Rotate to adjust the AF level for the main band.

RF (M) control: Rotate to adjust the RF level for the main band.

(56) Mute key for Main band received audio: **[MUTE]** (M)
Press to toggle the mute for the received audio of the main band between On and Off. {page 4-7}

"Mute" (Main band) LED

Lights orange while the audio line for the main band is being muted.

(57) Noise Reduction 1 (Sub band) key: **[NR1/SEL]** (S)
Press to toggle the Noise Reduction 1 for the sub band between active and inactive. {page 6-13}

Press and hold to open or close the **Noise Reduction 1 (Sub Band)** screen.

{page 6-14}

(58) Audio Peak Filter (Sub Band) key: **[APF/SEL]** (S)
Press to toggle the Audio Peak Filter for the sub band between active and inactive. {page 6-7}, {page 6-8}

Press to open the **Audio Peak Filter** screen for the main band.

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"APF" (Sub band) LED

Lights green while Audio Peak Filter for the sub band is active. {page 6-7}, {page 6-8}

⑲ AF RF (S) control

AF (S) control: Rotate to adjust the AF level for the sub band.

RF (R) control: Rotate to adjust the RF level for the sub band.

⑳ Mute key for Sub band received audio: **[MUTE]** (S)

Press to toggle the mute for the received audio of the sub band between On and Off. {page 4-7}

"Mute" (Sub band) LED

Lights orange while the audio line for the sub band is being muted.

㉑ Noise Reduction 2 (Sub band) key: **[NR2/SEL]** (S)

Press to toggle the Noise Reduction 2 for the sub band between active and inactive. {page 6-13}

Press and hold to open or close the **Noise Reduction 2 (Sub Band)** screen. {page 6-14}

㉒ Noise Blanker 2 (Sub band) key: **[NB2/SEL]** (S)

Press to toggle the Noise Blanker 2 for the sub band between active and inactive. {page 6-9}

Press and hold to open or close the **Noise Blanker 2 (Sub Band)** screen. {page 6-10}

㉓ AGC OFF key for Sub band: **[AGC OFF]** (S)

Press to toggle the Automatic Gain Control (AGC) for the sub band between active and inactive. {page 5-5}

㉔ AGC key for Sub band: **[AGC/SEL]** (S)

Press to cycle the speed of the Automatic Gain Control (AGC) for the sub band through Fast, Medium and Slow. {page 5-4}

Press and hold to open or close the AGC screen for the sub band. {page 5-4}

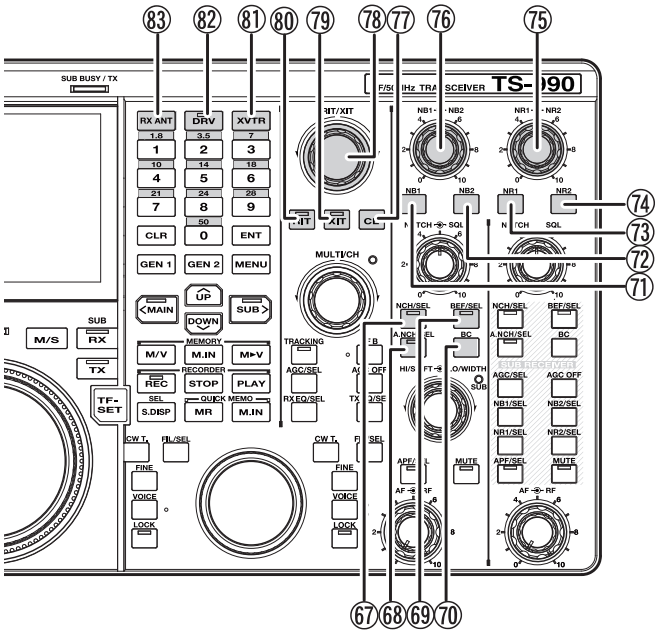
㉕ AGC OFF key for Main band: **[AGC OFF]** (M)

Press to toggle the Automatic Gain Control (AGC) for the main band between active and inactive. {page 5-5}

㉖ AGC key for Main band: **[AGC/SEL]** (M)

Press to cycle the speed of the Automatic Gain Control (AGC) for the main band through Fast, Medium and Slow. {page 5-4}

Press and hold to open or close the **AGC** screen for the main band. {page 5-4}



67 Notch Filter (Main band) key: **[NCH/SEL]** (M)
Press to toggle the Manual Notch Filter for the main band between active and inactive. {page 6-10}

Press and hold to toggle the bandwidth for the manual notch filter for the main band between narrow and wide. {page 6-11}

"NCH" (Main band) LED

Lights green while the manual notch for the main band is active. {page 6-10}

68 Automatic Notch Filter (Main band) key: **[A.NCH/SEL]** (M)
Press to toggle the Auto Notch Filter between active and inactive. {page 6-11}

Press and hold to open or close the Auto Notch Filter screen. {page 6-11}

"A.NCH" (Main band) LED

Lights green while the auto notch filter for the main band is active. {page 6-11}

69 Band Elimination Filter (Main band) key: **[BEF/SEL]** (M)
Press to toggle the Band Elimination Filter for the main band between active and inactive. {page 6-12}

Press and hold to open the Band Elimination Filter screen for the main band. {page 6-12}

"BEF" (Main band) LED

Lights green while the Band Elimination Filter for the main band is active.

70 Beat Cancel (Main band) key: **[BC]** (M)
Press to cycle the Beat Cancel for the main band through Beat Cancel 1, Beat Cancel 2 and Off. {page 6-14}

71 Noise Blanker 1 (Main band) key: **[NB1]** (M)
Press to toggle the Noise Blanker 1 for the main band between active and inactive. {page 6-9}

72 Noise Blanker 2 (Main band) key: **[NB2]** (M)
Press to toggle the Noise Blanker 2 for the main band between active and inactive. {page 6-9}

73 Noise Reduction 1 (Main band) key: **[NR1]** (M)
Press to toggle the Noise Reduction 1 for the main band between active and inactive. {page 6-13}

74 Noise Reduction 2 (Main band) key: **[NR2]** (M)
Press to toggle the Noise Reduction 2 for the main band between active and inactive. {page 6-13}

75 NR1 NR2 (M) controls
NR1 control: Rotate to adjust the level of Noise Reduction 1 for the main band. {page 6-14}

NR2 control: Rotate to adjust the level of Noise Reduction 2 for the main band. {page 6-14}

76 NB1 NB2 (M) controls
NB1 control: Rotate to adjust the Noise Blanker 1 level for the main band. {page 6-9}

NB2 control: Rotate to adjust the Noise Blanker 2 level for the main band. {page 6-9}

77 Clear key: **[CL]**
Press to clear the RIT and XIT frequencies. {page 5-13}

78 RIT/XIT control
Rotate to precisely tune the receive and transmit frequencies. {page 5-13}

The RIT frequency adjusted while "RIT" LED lights green will be activated, and the XIT frequency adjusted while "XIT" LED lights green will be activated.

79 XIT key: **[XIT]**
Press to toggle the XIT between ON and OFF. {page 5-13}

"XIT" LED

Lights green while the XIT is active. {page 5-13}

80 RIT key: **[RIT]**
Press to toggle the XIT between ON and OFF. {page 5-13}

"RIT" LED

Lights green while the RIT is active. {page 5-13}

81 Transverter key: **[XVTR]**
Press to toggle the Transverter between active and inactive. {page 16-33}

82 TX Drive Output key: **[DRV]**
Press to toggle the TX Drive Output between active and inactive. {page 4-21}

"DRV" LED

Lights green while the TX Drive Output is active.

83 Receive Antenna key: **[RX ANT]**
Press to toggle the input and output of the receive antenna between active and inactive. {page 4-21}

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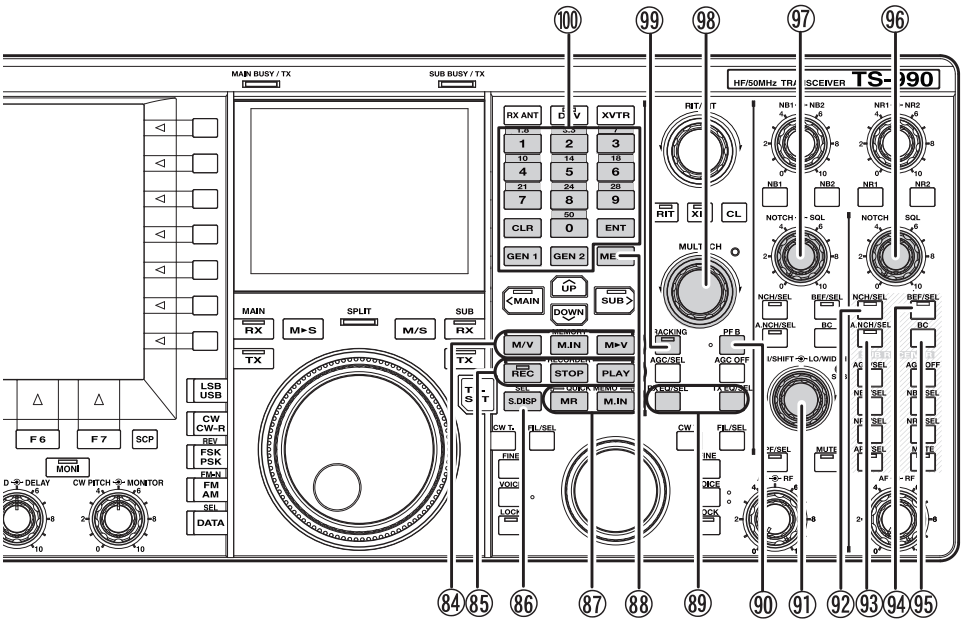


⑧④ Memory keys

[M/V] key

Press to toggle between Memory Channel mode and VFO mode. {page 10-4}

Press and hold to switch between Dual Memory Channel mode and VFO mode. {page 10-4}

[M.IN] key

Press to open the **Memory Channel List** screen. {page 10-7}

[M►V] key

The operating mode configured for the Memory Channel will be copied to the VFO. {page 10-6}

⑧⑤ Recorder keys

[REC] key

Press to start normal recording. Press while recording to pause the recording. {page 13-4} {page 13-5}

Press and hold to start constant recording. Depending on the configuration, the constant recorder function will retain the last 30 seconds audio. {page 13-6}

"REC" LED

Lights red while recording.

[STOP] key

Press to stop recording or playback.

[PLAY] key

Press to play back the latest audio file recorded. Press this key during playback to pause. {page 13-6} {page 13-2}

⑧⑥ [S.DISP/SEL] key

Press to change the display contents for the sub screen. {page 4-4}

Press and hold to switch between the standard display mode and the expanded display mode. {page 4-4}

⑧⑦ Quick Memory keys

[MR] key

Press to toggle the Quick Memory mode between active and inactive. {page 10-8}

Press and hold to clear all the operating data stored in Quick Memory Channels. {page 10-9}

[M.IN] key

Press to save data in Quick Memory Channels. {page 10-8}

⑧⑧ [MENU] key

Press to open the Menu screen. Press again while the **Menu** screen is open to close the **Menu** screen. {page 3-1}

⑧⑨ DSP Equalizer keys

[RXEQ/SEL] key

Press to toggle the RX DSP equalizer between active and inactive. {page 5-6}

Press and hold to open or close the RX Equalizer screen. {page 5-6}

[TXEQ/SEL] key

Press to toggle the TX DSP equalizer between active and inactive. {page 9-9}

Press and hold to open or close the TX Equalizer screen. {page 9-10}

⑨⓪ Programmable Function B key: [PF B]

Press to activate the function assigned to **[PF B]**. The default is "VOICE 3". {page 14-10}

⑨① HI/SHIFT LO/WIDTH controls

HI/SHIFT control

High Cut/Low Cut mode: Rotate to adjust the high cut frequency. {page 6-4}

Shift/Width Mode: Rotate to adjust the shift frequency. {page 6-5}

LO/WIDTH control

High Cut/Low Cut mode: Rotate to adjust the low cut frequency. {page 6-4}

Shift/Width mode: Rotate to adjust the bandwidth. {page 6-5}

"SUB" LED (HI/SHIFT LO/WIDTH controls)

Lights orange while the frequency can be changed using the **HI/SHIFT** and **LO/WIDTH** controls. {page 4-7}

⑫ Notch Filter (Sub band) key: **[NCH/SEL]** (S)

Press to toggle the Manual Notch Filter for the sub band between active and inactive. {page 6-10}

Press and hold to toggle the Manual Notch Filter bandwidth for the sub band between normal and wide. {page 6-10}

"NCH" (Sub band) LED

Lights green while the manual notch for the sub band is active. {page 6-11}

⑬ Automatic Notch Filter (Sub band) key: **[A.NCH/SEL]** (S)

Press to toggle the Auto Notch Filter between active and inactive.

Press and hold to open or close the Auto Notch Filter screen for the sub band. {page 6-11}

"A.NCH" (Sub band) LED

Lights green while the Automatic Notch Filter for the sub band is active.

⑭ Band Elimination Filter key: **[BEF/SEL]** (S)

Press to toggle the Band Elimination Filter for the sub band between active and inactive. {page 6-12}

Press and hold to open or close the Band Elimination Filter screen for the sub band. {page 6-12}

"BEF" (Sub band) LED

Lights green while the Band Elimination Filter for the sub band is active.

⑮ **[BC]** (S)

Press to cycle the Beat Cancel for the sub band through Beat Cancel 1, Beat Cancel 2 and Off. {page 6-14}

⑯ NOTCH SQL (S) control

NOTCH (S) control: Rotate to adjust the notch frequency while the manual notch filter is active. Rotate to adjust the center frequency while the band elimination filter is active. {page 6-10}

SQL (S) control: Rotate to adjust the squelch level for the sub band. {page 4-8}

⑰ NOTCH SQL (M) control

NOTCH (M) control: Rotate to adjust the notch frequency while the manual notch filter for the main band is active. Rotate to adjust the center frequency while the band elimination filter is active. {page 6-10}

SQL (M) control: Rotate to adjust the squelch level for the main band. {page 4-8}

⑱ MULTI/CH control

Rotate to increment or decrement the frequency step while in VFO mode. {page 4-13}

Rotate to increment or decrement the channel number while in Memory Channel mode or Quick Memory Channel mode. {page 10-5}

Rotate to show the next or previous parameter while the menu or a configuration screen appears.

"Multi/Channel" LED

Lights orange when changing the channel number, or when the configuration item or parameter other than the frequency is changed.

⑲ Tracking key: **[TRACKING]**

Press to toggle frequency tracking between active and inactive. {page 5-3}

"TRACKING" LED

Lights green while frequency tracking is active. {page 5-3}

⑳ Numeric and Band Selection Keypad

[ENT] key

Press to enter an operating frequency using the keypad (numeric mode). After entering the frequency, press again to apply the new frequency.

[0 (50)] to [9 (28)]

Press (in numeric mode) to enter a number. Press to enter a number for the shift frequency while in split mode. Press, as the band selection key, to select the frequency band.

[GEN1]

Press to select General Coverage Band 1.

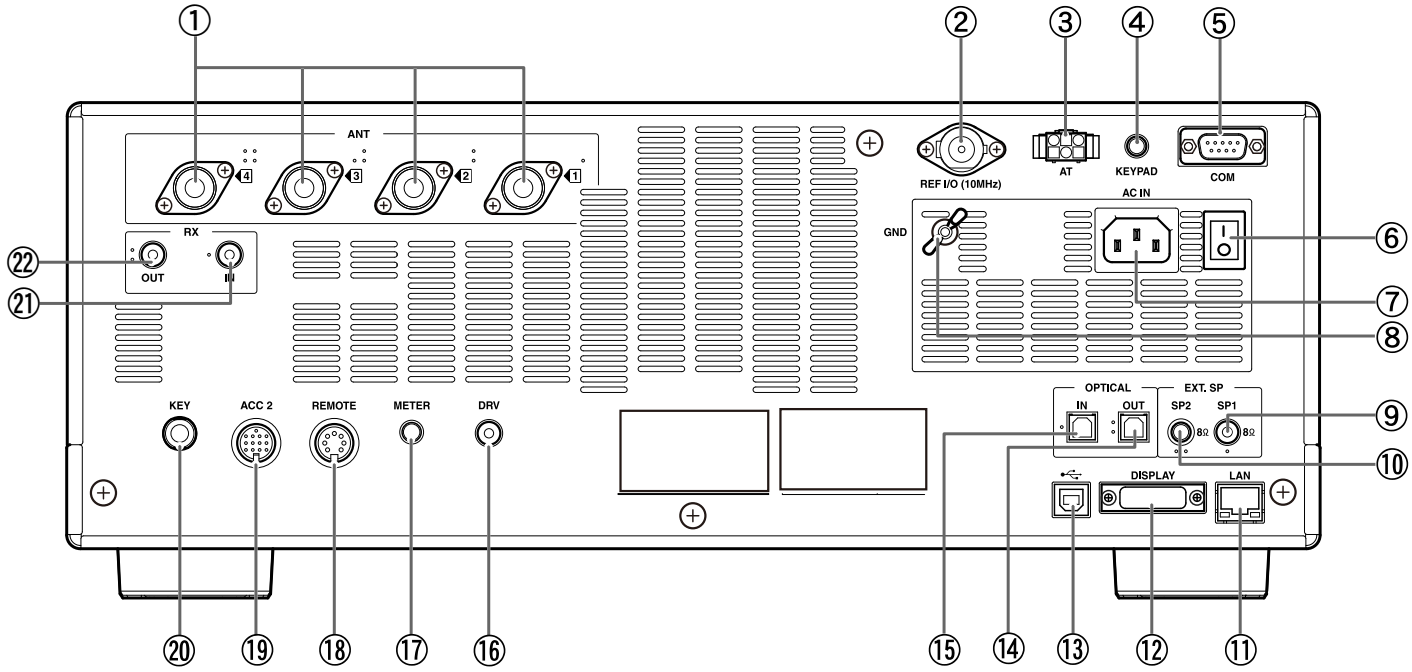
[GEN2]

Press to select General Coverage Band 2.

[CLR]

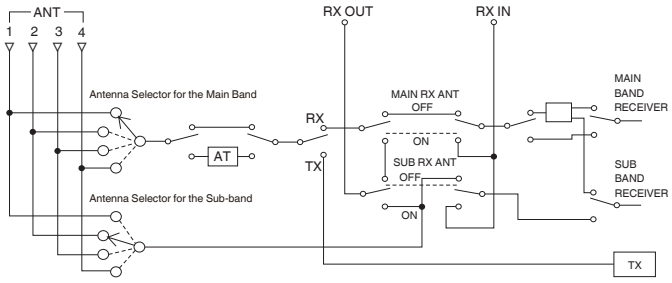
Press to discard an entered value.

REAR PANEL



① ANT 1 to ANT 4 (Antenna 1 to Antenna 4) connectors
For use with 50Ω antenna. These SO-239 / M-type coaxial connectors can connect a maximum of four antennas. {page 4-20}

Refer to the antenna systems conceptual drawing shown below:



② REF I/O (10 MHz) connector
Sends and receives the 10 MHz reference signal. {page 16-22}

③ AT Connector
Connect a control cable for an external antenna tuner. {page 1-8}, {page 1-12}

Refer to the instruction manuals supplied with the antenna tuner for further details.
- Input Impedance: 50Ω
- Input Level: 0 dBm ± 10 dB
- Output Level: 0 dBm

④ KEYPAD jack
You can connect a personalized (self-made) PF keypad to the **KEYPAD** connector. You can assign the desired function to the keypad from the specified functions. {page 16-7}

⑤ COM connector
This is an RS-232C connector for connection to a PC. This enables PC control and memory management. Connects to a PC using a commercially available RS-232C straight cable; do not use a "crossed" type cable. {page 1-5}, {page 1-10}}

⑥ Main Power (I/O) switch
Shuts down (O) or applies (I) the main power source to the transceiver.

While the main power (I/O) switch is in the "O" position, you cannot start up the transceiver by pressing [⏻] (⏻). {page 4-1}

⑦ AC IN connector
This is the connector for the AC main power source input. Use the supplied AC power cable to connect to a 120 V rating AC outlet (K-Type) or a 220-240 V rating AC outlet (E-Type). Do not use a power cable other than supplied with this product. Do not use or modify K-Type Cable for AC 220 - 240 V Operation. Do not use or modify E-Type Cables for AC 120 V Operation. {page 1-1}

⑧ GND terminal
Connects to ground. Ensure that this terminal has been grounded, to prevent electric shock or equipment interference. {page 1-1}

⑨ EXT SP1 (External Speaker 1) jack

⑩ EXT SP2 (External Speaker 2) jack
Connects to an external speaker. Use only external speakers with an impedance 4Ω to 8Ω. You can configure the audio signal sent to the external speaker using the menu. {page 16-17}

If an external speaker is connected to the **EXT SP1** connector, the audio line to the internal speaker is muted. If an external speaker is connected to the **EXT SP 2** connector, the audio line to the internal speaker will not be muted.

⑪ LAN connector
Connects to a PC and LAN so as to operate with KNS (KENWOOD NETWORK COMMAND SYSTEM) or to automatically correct the clock. {page 1-9}

⑫ DISPLAY connector

Connects to an external display unit. You can mirror the main screen display onto an external monitor. {page 16-18}

The **DISPLAY** connector contains a DVI-I connector which can transfer both digital and analog RGB signals.

To connect to an analog RGB display having a D-sub 15-pin connector, use a commercially available conversion connector.

Note:

- To connect to an external display unit, you must use a DVI cable with a line filter (commercially available). If no snap-on ferrite core is available on the cable, you must snap the line filter, supplied with the transceiver (E-type only), on to the DVI cable.
- Use an external display with 800x600 or 848x480 resolution.

⑬ (USB-B) connector

Connects to a PC. This can be used when the transceiver is remotely controlled using ARCP-990, when the received audio is played using a PC, or when the firmware is being updated. Use a commercially available USB cable with a USB-B type connector. {page 1-5}

⑭ OPTICAL OUT (Optical Digital Audio Output) connector

An audio device with an optical digital input terminal can be connected. {page 16-19}

Sampling Rate/Bit: 48 kHz/ 24 bits

⑮ OPTICAL IN (Optical Digital Audio Input) connector

An audio device with an optical digital output terminal can be connected. {page 16-19}

Sampling Rate/Bit: 48 kHz and 44.1 kHz/24 bits and 16 bits

Note:

- To connect to external equipment, use a commercially available optical cable.

⑯ DRV (Drive Output) terminal

Connects to a transverter or linear amplifier (1 mW typical output level). {page 4-21}, {page 16-33}

⑰ METER connector

Connects to a meter (commercially available). Use a meter with the following specifications:

- Input Impedance: 4.7kΩ
- Open End Voltage: 0 to 5 V

Note:

- The default is 50% of the open end voltage (2.5 V). The output level can be changed in Advanced Menu 2. {page 16-15}

⑱ REMOTE connector

Mates with a linear amplifier, foot switch and other external equipment. Use the supplied 7-pin DIN plug to mate with. {page 1-6}, {page 1-10}

⑲ ACC 2 connector

Connects to an external equipment such as an external terminal. Use the supplied 13-pin DIN plug to mate with. {page 1-8}, {page 1-11}

⑳ KEY jack

Connects to an electronic keyer such as a bug key or electronic keyer, and a PC keyer. Depending on the menu configuration, you can use the internal electronic keyer with a paddle connection. {page 5-19}

㉑ RX IN connector

Connects to an antenna dedicated for reception, an external BPF, transverter output, etc. When active, signals from this connector replace those from ANT1 - ANT4 (for RX only). {page 4-21}

No signals from the ANT1 to ANT4 connectors can be input if the reception antenna I/O is turned ON by pressing **[RX ANT]**.

㉒ RX OUT connector

Connects to a device, such as an external BPF. Connecting the signal from the **RX OUT** connector to the **RX IN** connector enables reception by the internal receiver. {page 4-21}

Note:

- The RX IN and RX OUT connectors will be available if the reception antenna I/O is turned ON by pressing **[RX ANT]**. In that case, signals from the ANT1 to ANT4 connectors will be output to the RX OUT connectors and the signal input to the RX IN connector will be received.
  The signal cannot be received unless it is properly input to the RX IN connector.

MICROPHONE (OPTION)

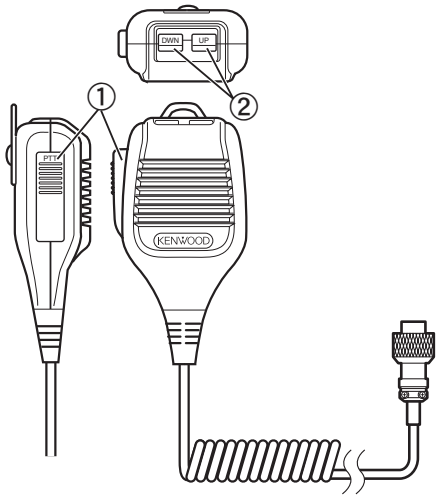
① PTT (Push-to-talk) switch
Hold down this switch to transmit. Release the switch to receive.

② UP/ DOWN keys: **[UP]**/**[DOWN]** (microphone)
Press to increment or decrement the VFO frequency or select the previous or next items in the following mode.

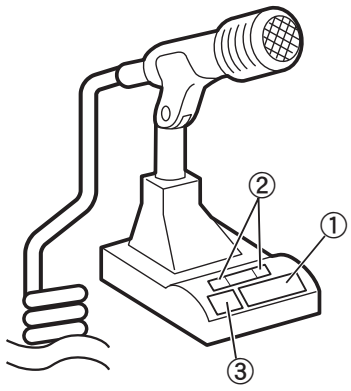
Press and hold these keys to continuously increment or decrement the parameters. You can assign functions to the keys, as function keys. {page 16-5}

- VFO mode: Press to increment or decrement the VFO frequency.
- Memory Channel Mode; Press to increment or decrement the memory channel number.
- Memory Scroll Mode: Press to increment or decrement the memory scroll number.
- CW Paddle: This function allows you to send CW without using an external key/paddle. The Mic [UP] and Mic [DWN] keys can be used as a manual paddle keyer.
- Menu: Press to show the next or previous parameter.

③ LOCK key **[LOCK]** (MC-60A/MC-90 only)
Press to lock the PTT key in Transmit. Press again to revert to Receive mode.

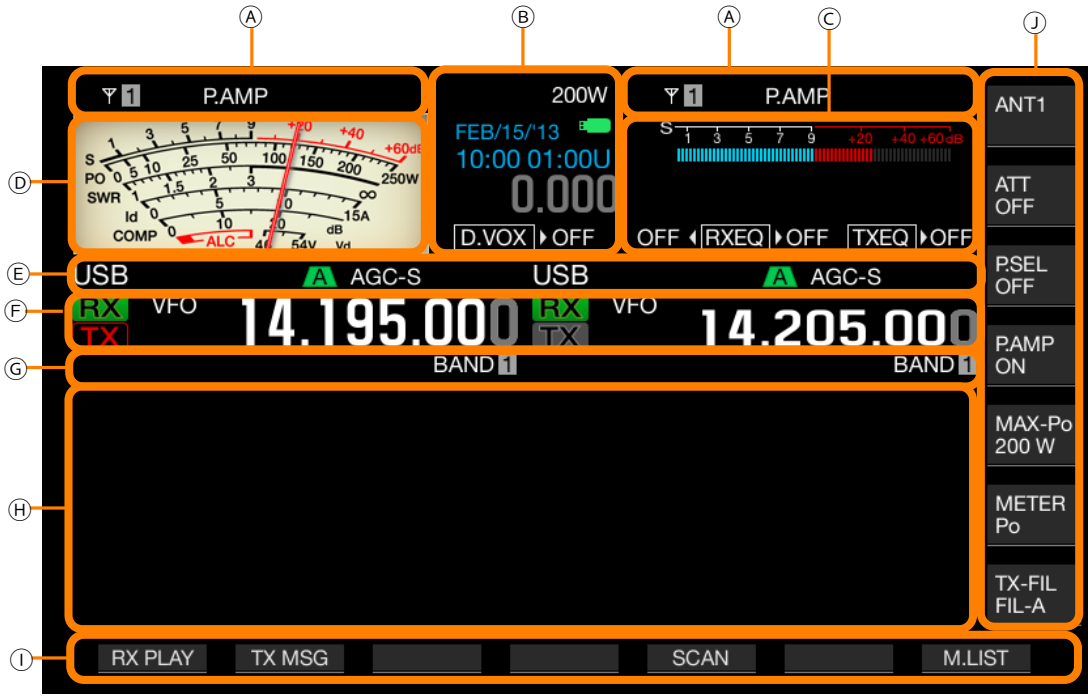


MC-43S



MC-60A/MC-90

MAIN SCREEN



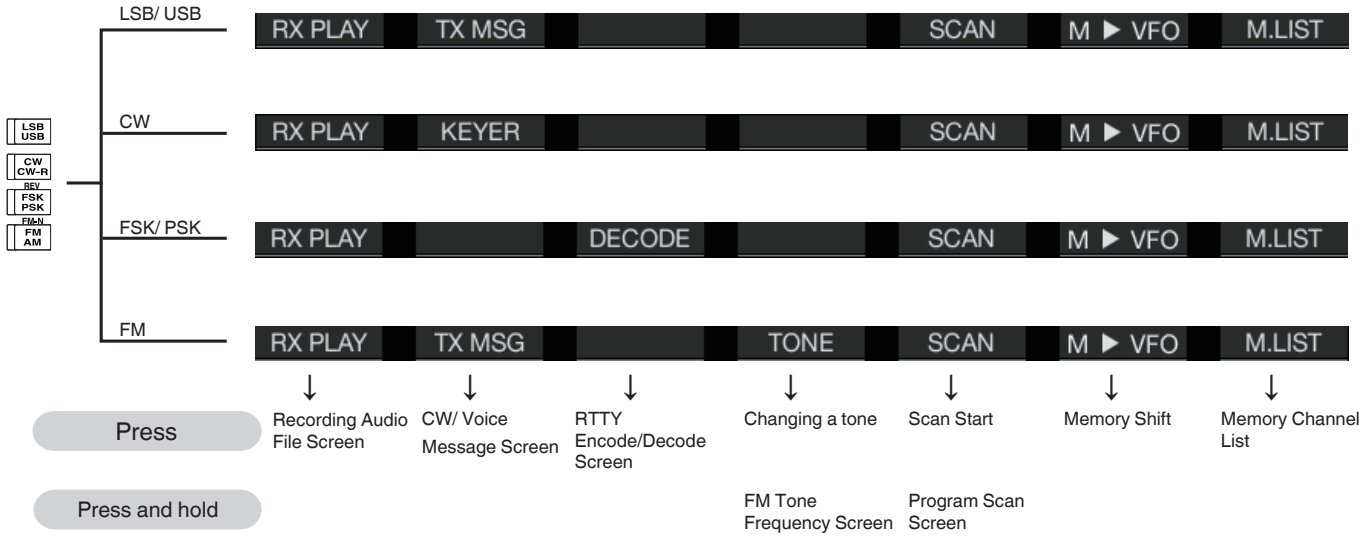
Area	Display	Description	Ref. Page
A	1	Displays the antenna number. The antenna number changes when you change the antenna. Disappears when the transmit signal is sent through the DRV connector to a transverter.	{page 4-20}
	RX	Appears while the antenna dedicated for reception is active.	{page 4-21}
	ATT	Appears if "-6 dB", "-12 dB" or "-18 dB" has been selected for the reception attenuator.	{page 6-1}
	P.AMP	Appears while Receive Preamplifier is active.	{page 5-9}
	NR1 NR2	Appears while Noise Reduction 1 (NR1) is active. Appears while Noise Reduction 2 (NR2) is active.	{page 6-13}
	NB1 NB2 NB1 2	Appears while Noise Blanker 1 (NB1) is active. Appears while Noise Blanker 2 (NB2) is active. Appears while Noise Blanker 1 (NB1) and Noise Blanker 2 (NB2) are active.	{page 6-9}
B	AT T	Appears while the internal antenna tuner is active. "T" blinks while in tuning.	{page 4-21}
	R AT T	Appears while an external antenna tuner or the internal antenna tuner for RX is active. "R" and "T" blinks while tuning.	{page 4-21}
	XVTR	Appears while a transverter is active.	{page 16-33}
	TX TUNE	Appears and disappears alternately while TX Tuning is active.	{page 9-13}
	200W	Displays the transmit power level. Disappears when the transmit signal is sent through the **DRV** connector.	{page 4-17}
	30WPM	Displays the keying speed. When rotating the **KEY SPEED** control, displays the keying speed value (4 to 60 words per minute) in the TX display for two seconds.	{page 5-19}
	FEB/15/'13	Displays the date for the local clock. You can select the display format from the English, US and Japanese.	{page 15-1}
	10:00 01:00U	Displays the clock in the 24-hour format. Left: Displays the time for the local clock. Right: Displays the time for the second clock ("U" is added to the end of the second clock).	{page 15-1}
		Starts blinking when a USB flash drive is connected and lights after the transceiver recognizes the USB flash drive.	{page 12-1}
	RIT	Appears while RIT is active.	{page 5-13}
	XIT	Appears while XIT is active.	{page 5-13}

Area	Display	Description	Ref. Page
B	-4.120	Displays the RIT or XIT frequency in the range from -9.999 kHz to 9.999 kHz.	{page 5-13}
	D.VOX NONE	The status varies depending on the audio source for the transmit audio selected using the Data VOX. OFF: Appears if no source is selected. "ACC 2" appears when the audio source is the **ACC 2** connector. "USB" appears when the audio source is the USB audio line. "OPT." appears when the audio source is the SPD I/F.	{page 9-2}
C	PLAY	Appears during quick replay of audio that was recorded using normal or constant recording.	{page 13-4}
	PAUSE	Appears while quick replay of audio that was recorded using normal or constant recording is paused.	
	REC	Appears during the normal recording.	
		Appears during quick replay of audio after recording and while play of the audio is paused.	{page 13-6}
	TXEQ BB2	Appears followed by the configuration for the TX DSP equalizer. OFF, HB1, HB2, FP, BB1, BB2, C, U1, U2, U3	{page 9-9}
	FLAT RXEQ BB2	Left: Appears according to the configuration of the main band RX DSP Equalizer. OFF, HB1, HB2, FP, BB1, BB2, FLAT, U1, U2, U3 Right: Appears according to the configuration for RX DSP Equalizer for the sub band. OFF, HB1, HB2, FP, BB1, BB2, FLAT, U1, U2, U3	{page 5-6}
		Displays the S-meter dedicated to the sub band.	{page 4-18}
D		Displays the meter dedicated to the main band. • The meter can be displayed as either analog or digital. • Two styles of analog meter can be selected.	{page 4-19}
E	USB	Displays the operating mode in use. Appears in yellow while Auto Mode is active. Displays the mode name and the sub number (D1, D2 and D3) while in the DATA mode.	{page 4-10} {page 4-11}
	NOTCH	Appears while Manual Notch, for which Normal has been configured for the notch bandwidth, is active.	{page 6-10}
	NOTCH W	Appears while Manual Notch, for which Wide has been configured for the notch bandwidth, is active.	{page 6-10}
	BEF	Appears while the Band Elimination Filter is active.	{page 6-12}
	NOTCH	Appears while the Auto Notch Filter is active.	{page 6-11}
	A B C	Displays the selected IF filter.	{page 9-8}
	BC 1	Appears while Beat Canceller 1 (BC1) is active.	{page 6-14}
	BC 2	Appears while Beat Canceller 2 (BC2) is active.	
	AGC OFF	Appears while the AGC is inactive.	{page 5-4}
	AGC-S	Appears while the AGC is in the slow state.	
	AGC-F	Appears while the AGC is in the fast state.	
	AGC-M	Appears while the AGC is in the medium speed.	
	TONE	Appears while the tone function is active.	{page 5-30}
	CT	Appears while the CTCSS is active.	{page 5-33}
	CROSS	Appears while Cross Tone is active.	{page 5-34}
F	TX	Appears while receiving on the transmit band.	{page 5-1}
	TX	Displays the transmitting band. (Only one transmit band for the main band and sub band can be displayed.) Appears while transmitting on the transmit band.	

Area	Display	Description	Ref. Page
F	RX	Displays the receiving band.	{page 5-1}
	VFO	Appears while the VFO mode or auto mode frequency is being configured.	{page 4-11}
	E9	Displays the entry history while in VFO mode or in frequency entry mode.	{page 4-15}
	M.CH 01	Appears while transmitting or receiving using the operating information from a memory channel. Displays the memory channel in the range of 00 to 99, P0 to P9 and E0 to E9.	{page 10-4}
	M.CH 01	Appears while transmitting or receiving using the operating information from a dual memory channel. Displays the memory channel in the range of 00 to 99 and E0 to E9.	{page 10-3}
	Q.MR Q1	Appears while in Quick Memory Channel mode. Displays one of the quick memory channel numbers Q0 to Q9.	{page 10-8}
	14.195.000	Displays the current frequency. This example displays the status during fine tuning.	{page 4-12}
G	MEMONAME10	Displays the Memory Channel name.	{page 10-8}
	SCAN-SPDn	Displays the scan speed (not in FM mode)	{page 11-2}
	SCANNING	Appears during program scan, memory scan, or quick memory scan.	{page 11-1}
	SCAN-SLOW	Appears during Program Slow Scan.	{page 11-3}
	CW TUNE	Appears during CW Auto Tune.	{page 5-17}
	BAND 1	Displays the memory band name of the inquired memory number.	{page 10-8}
	L.OUT	Appears if a locked-out channel has been selected.	{page 11-5}
H	Configuration Screen BANDSCOPE	Opens the configuration or **Bandscope** screen. Normally, the display is blank.	{page 7-1}
I	Key Guide (F1 to F7)	Displays the function key names along the bottom edge of the main screen.	{page 4-3}
J	Key Guide (F)	Displays the function key names along the right side of the main screen.	{page 4-3}

Note:

- If displays for the main band are identical to those for the sub band, selecting the main band for operation deactivates the sub band and displays for the sub band gray out.
- The principle display of the key guide is as follows:



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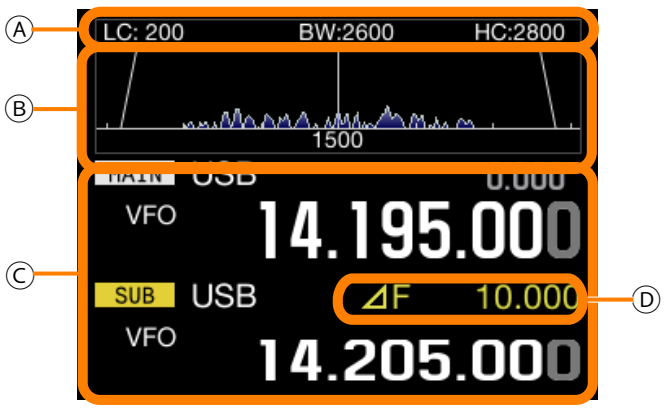
SUB-SCREEN



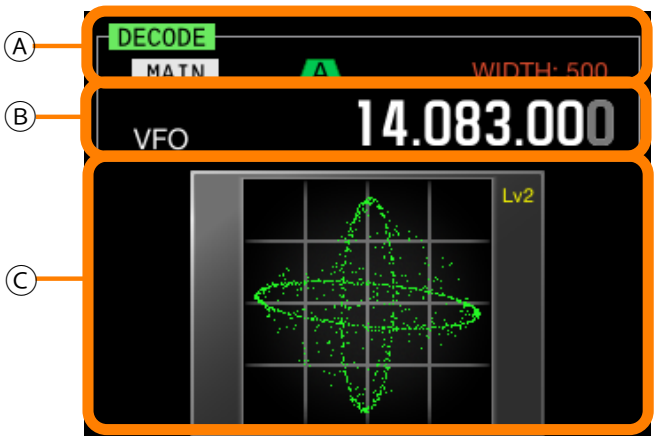
Dual Frequency Display
(Main Band Frequency and Sub-band Frequency)

Single Frequency Display
(Main Band Frequency/Dial)

Note:

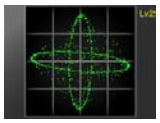
♦ Pressing **[S.DISP/SEL]** changes the sub screen displays. Refer to "BASIC OPERATIONS" for further details. {page 4-4}

Area	Display	Description	Ref. Page
A	BW:2600 BW:2600 HC:2800	Displays the passband characteristics of the RX filter. Rotating the **HI/SHIFT** or **LO/WIDTH** control reverses the display numerals (from white on black to black on white) for 2 seconds. WIDTH: Appears while in CW, FSK, PSK, or DATA mode. SHIFT: Appears while in CW, or DATA mode. LC: Appears while in SSB, FM or AM mode. HC: Appears while in SSB, FM, or AM mode. BW: Appears while in SSB, FM, or AM mode.	{page 4-4}
B		Displays the filter width, followed by the low cut or high cut frequency and the shift frequency, as well as the filter type.	{page 4-4}
		Displays the frequency spectra which are fast Fourier transformed (FFT) on the AF stage while transceiver is in the transmit state.	
		Displays the center pointer of the notch frequency. Appears while either the Manual Notch Filter or the Band Elimination Filter is active. Rotating the **NOTCH** control shifts the center pointer of the notch frequency to the left or right.	
		In the center, the pitch frequency is displayed in CW mode - the center frequency is displayed in all other modes. In CW mode, the frequencies of the passband width appears appear at both outer edges. If the passband of the filer for the shift operation is wider than the display area, a triangle appears.	
C	MAIN / SUB	Shows the selected band, either the main band or the sub band.	{page 4-7}
	USB	Displays the operating mode in use. Appears in yellow while Auto Mode is active. Displays the mode name and the sub number (-D1, -D2 and -D3) while in the DATA mode.	{page 4-10}
	RIT or XIT	Appears coupled with the frequency while either RIT or XIT is active.	{page 5-13}
	M.SCR	Displays while scrolling the memory channels.	{page 10-4}
	M.CH 01	Appears while transmitting or receiving using the operating information from a memory channel.	{page 10-4}
	M.CH 01	Appears while in Dual Memory Channel mode.	{page 10-4}
	Q.MR Q1	Appears while in Quick Memory Channel mode.	{page 10-8}
	VFO	Appears while in VFO mode.	{page 10-4}
	00	Shows E0 to E9 in the entry history display, 00 to 99 for M.CH or M.SCR, and Q0 to Q9 for Quick Memory Channel as the channel number.	{page 10-8}
D	ΔF 10.000	Displays the frequency difference between the main band frequency and the sub band frequency. Appears while in Split mode.	{page 5-1}
E		Displays a dial. (Displays while only main band frequency in the standard mode is selected.) Displays the sub band frequency while both the main band frequency and the sub band frequency are displayed.	{page 4-4}



X-Y Scope

Vector Scope

Area	Display	Description	Ref. Page
A	DECODE	Appears while decoding in RTTY (FSK) or PSK mode.	{page 5-35}
	MAIN SUB	Displays the selected band to decode, either the main band or the sub band.	{page 5-36}
	A B C	Displays the selected IF filter.	{page 9-8}
	WIDTH: XXXX	Displays the passband width for the IF filter. Rotating the **LO/WIDTH** control reverses the display numerals (from white on black to black on white) for 2 seconds.	{page 6-2}
B	14.195.000	Displays the current frequency.	{page 4-12}
	MAIN / SUB	Shows the selected band, either the main band or the sub band.	{page 4-7}
	M.SCR	Appears while scrolling the memory channels.	{page 10-4}
	M.CH 01	Appears while in Memory Channel mode.	{page 10-4}
	M.CH 01	Appears while in Dual Memory Channel mode.	{page 10-4}
	Q.MR Q1	Appears while in Quick Memory Channel mode.	{page 10-4}
	VFO	Appears while in VFO mode.	{page 10-4}
	00	Displays the channel number, 00 to E9 while in Memory Channel mode or Memory Scroll mode or Q0 to Q9 while in quick Memory mode.	{page 10-8}
C		Displays the X-Y scope. Displays the tracing speed and level of roughness (Level 1 to Level 3) of the X-Y scope.	{page 4-4}
		Displays the vector scope. Displays the type of PSK, either BPSK or QPSK.	{page 4-4}

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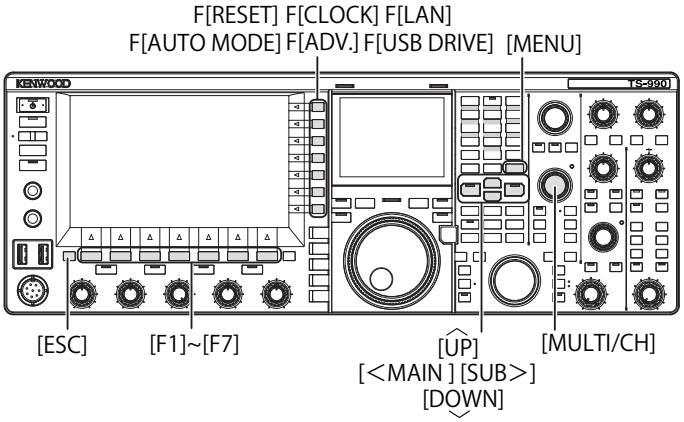
MENU CONFIGURATIONS

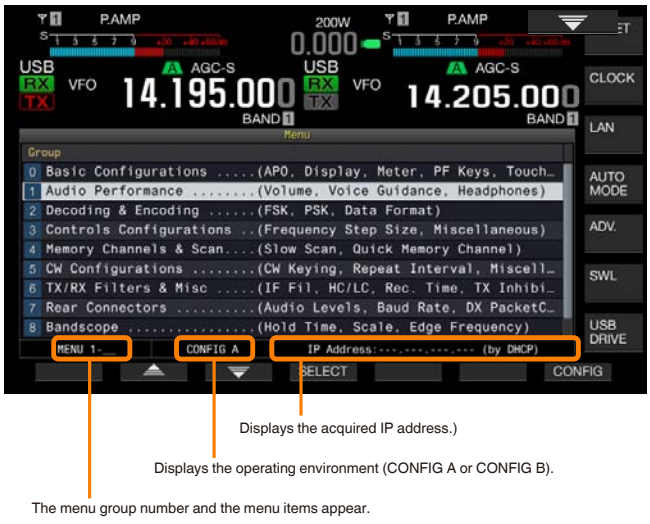
In the **Menu** screen, you can configure and edit various functions of this transceiver as well as change the operating environment.

This transceiver's Menu contains common functions and configurations, along with 5 sub menus categorized for those sub menu groups.



OPENING THE MENU

1 Press **[MENU]** to open the **Menu** screen.



2 Press [▲] (F2) or [▼] (F3) to select a group.

3 Press **[SELECT]** (F4) or **[SUB>]** to display the menu items of the selected group.

4 Press [▲] (F2) or [▼] (F3) to select a menu item.

5 Press **[SELECT]** (F4) or **[SUB>]** to allow editing of the parameter box.
The parameter box becomes active, and the parameter can be changed.

6 Press **[–]** (F4) or **[+]** (F5) to select a parameter.
The parameter for the menu item varies.

7 Press [↩] (F1) to revert to the previous screen.
The selected parameter has determined.

8 Press **[MENU]** to end.

OPENING THE SUB MENU

1 Press **[MENU]** to open the **Menu** screen.

2 Press the function key for the key guide on the right side of the main screen.
Following are the sub menu that appears on the screen.

Sub Menu	Key Guide	Summary of Changes
Reset	**RESET**	A menu which allows you to reset the transceiver to its default state.
Clock	**CLOCK**	A menu which allows you to configure the internal clocks.
LAN	**LAN**	A menu which allows you to configure the connections to your LAN.
AUTO MODE	**AUTO MODE**	A menu which allows you to configure the upper and lower limit frequencies.
Advanced	**ADV.**	An advanced menu that allows detailed advanced configurations including connections to external devices.
SWL	**SWL**	A key which activates and displays “Short Wave Listener” style horizontal dials with a vertical meter.
USB Flash Drive	**USB DRIVE**	A menu which allows you to manage a USB flash drive.

COMMON OPERATION IN THE MENU SCREEN

- Pressing **[MENU TOP]** (F) reverts to the **Menu** screen.
- Press [▲] (F2) or [▼] (F3) to scroll through the menu groups.
- Each menu can be selected with the operation below.
  - Rotate the **MULTI/CH** control.
  - Press [▲] (F2) or [▼] (F3).

  Press **[UP]** or **[DOWN]**.
- The parameter for the menu item with an editable parameter box can be selected as follows:
  - Rotate the **MULTI/CH** control.
  - Press **[UP]** or **[DOWN]**.
  - Press **[–]** (F4) or **[+]** (F5).
  - Press [◀] or [▶].
  - Press the **[UP]** or **[DOWN]** (microphone).
- Pressing and holding **[(RESET)]** (F1) reverts the parameters to their defaults.

CLOSING THE MENU

If you finish the configuration or edit in the Menu screen, or if you wish to finish the operation during the menu item configuration, follow the procedure below. The **Menu** screen closes, the normal screen reappears.

1 Press **[MENU]** or **[ESC]**.

Note:

- All configurations in the **Menu** screen can be reset to the default parameters. {page 16-4}
- Menu contents, such as the menu item name and default parameters, are subject to change due to design change and innovations.
- During configuration of the screen saver or the power-on message, pressing **[MENU]** does not close the **Menu** screen.

SWITCHING THE OPERATING DATA BETWEEN CONFIG A AND CONFIG B

Parameters configured in the menu and various configurations for operation are jointly called the operating environment. The transceiver has CONFIG A and CONFIG B as two separate environments. Both contain the same configuration items, allowing you to configure them individually. For example, CONFIG A might be configured for DX hunting and CONFIG B for rag-chewing, and you can quickly switch from one to another.

1 Press **[MENU]** to open the **Menu** screen.

2 Press **[CONFIG]** (F7).

3 Press **[OK]** (F4) to switch CONFIG A to CONFIG B.
After changing the configuration, you can immediately operate the transceiver with the new configuration enabled. Pressing **[CANCEL]** (F7) reverts to the **Menu** screen.

Note:

- The current status of the operating environment, either "CONFIG A" or "CONFIG B", appears on the status bar of the **Menu** screen. Also, the operating environment data can be stored to or read from a USB flash drive. {page 12-1}
- Following are the configurations that are common to CONFIG A and CONFIG B.
  - Baud rate for the COM port
  - Baud rate for the USB port
  - The number of quick memories
- The [MR] (Quick Memory) function {page 10-8} includes some operating environment parameters. Changes made to CONFIG A or CONFIG B here will clear the QM operating environment and then switch to the new operating environment.

MENU ITEMS

Basic Configurations (Group 0)					
Menu	Display	Configuration	Range	Default	Reference Page
Display					
0-00	Color Display Pattern (Main Screen)	The background color pattern for the main screen	Type 1, Type 2, Type 3	Type 1	4-5
0-01	Color Display Pattern (Sub Screen)	The background color pattern for the sub-screen	Type 1, Type 2, Type 3, Same as Main	Same as Main	4-5
0-02	Font Style (Frequency Display)	Font style to be applied to the frequency display	Font 1, Font 2, Font 3	Font 1	4-5
0-03	Dial Color Pattern	The background color pattern for the sub-screen dial	Type 1, Type 2	Type 1	4-6
0-04	Screen Saver	Pattern of the screen saver	Off, Type 1, Type 2	Off	16-1
0-05	Screen Saver Wait Time	Wait time until the screen saver activates	Preview (5 [sec]), 5, 15, 30, 60 [min]	Preview (5 [sec])	16-2
0-06	Screen Saver Message	A message embedded in the screen saver	A maximum of 10 alphanumeric characters	TS-990	16-2
0-07	Power-on Message	A message appearing during power up	A maximum of 15 alphanumeric characters	HELLO	16-1
Meter					
0-08	FM Mode S-meter Sensitivity	S-meter sensitivity in FM mode	Low, High	High	5-29
0-09	Meter Response Speed	ANALOG METER RESPONSE SPEED	1 to 4	3	4-19
0-10	Meter Display Pattern	Display pattern for a meter	Type 1, Type 2, Type 3	Type2	4-18
0-11	Meter Display Peak Hold	METER PEAK-VALUE HOLD	Off, On	On	4-19
Key					
0-12	Long Press Duration of Panel Keys	Duration for a long press of the panel keys	200 to 2000 [ms] (in steps of 100 [ms])	500 [ms]	16-5
0-13	Touchscreen Tuning	Touchscreen Tuning function (Main display)	Off, On	On	16-3
0-14	Operating Band (High/Low & Shift/Width Controls)	Selection of band for the **High/Low** and **Shift/Width** controls	Main and Sub Bands, Main Band only	Main and Sub Bands	16-4
0-15	PF A: Key Assignment	Assignment of the programmable function to **[PF A]**	Refer to the programmable function key list.	VOICE 2	16-6
0-16	PF B: Key Assignment	Assignment of the programmable function to **[PF B]**	Refer to the programmable function key list.	VOICE 3	16-6
0-17	VOICE (Main Band): Key Assignment	Assignment of the programmable function to **[VOICE]** (M)	Refer to the programmable function key list.	VOICE1 (Main Band)	16-6
0-18	VOICE (Sub Band): Key Assignment	Assignment of the programmable function to **[VOICE]** (S)	Refer to the programmable function key list.	VOICE1 (Sub Band)	16-6
0-19	External PF 1: Key Assignment	Assignment of the programmable function to **[PF 1]** (Keypad)	Refer to the programmable function key list.	Message Memory CH1	16-7
0-20	External PF 2: Key Assignment	Assignment of the programmable function to **[PF 2]** (Keypad)	Refer to the programmable function key list.	Message Memory CH2	16-7

Basic Configurations (Group 0)					
Menu	Display	Configuration	Range	Default	Reference Page
0-21	External PF 3: Key Assignment	Assignment of the programmable function to **[PF 3]** (Keypad)	Refer to the programmable function key list.	Message Memory CH3	16-7
0-22	External PF 4: Key Assignment	Assignment of the programmable function to **[PF 4]** (Keypad)	Refer to the programmable function key list.	Message Memory CH4	16-7
0-23	External PF 5: Key Assignment	Assignment of the programmable function to **[PF 5]** (Keypad)	Refer to the programmable function key list.	Message Memory CH5	16-7
0-24	External PF 6: Key Assignment	Assignment of the programmable function to **[PF 6]** (Keypad)	Refer to the programmable function key list.	Message Memory CH6	16-7
0-25	External PF 7: Key Assignment	Assignment of the programmable function to **[PF 7]** (Keypad)	Refer to the programmable function key list.	Message Memory CH7	16-7
0-26	External PF 8: Key Assignment	Assignment of the programmable function to **[PF 8]** (Keypad)	Refer to the programmable function key list.	Message Memory CH8	16-7
0-27	Microphone PF 1: Key Assignment	Assignment of the programmable function to **[PF 1]** (microphone)	Refer to the programmable function key list.	MAIN	16-7
0-28	Microphone PF 2: Key Assignment	Assignment of the programmable function to **[PF 2]** (microphone)	Refer to the programmable function key list.	TX (Sub Band), (Split Frequency)	16-7
0-29	Microphone PF 3: Key Assignment	Assignment of the programmable function to **[PF 3]** (microphone)	Refer to the programmable function key list.	SUB	16-7
0-30	Microphone PF 4: Key Assignment	Assignment of the programmable function to **[PF 4]** (microphone)	Refer to the programmable function key list.	M▶V (Memory)	16-7
0-31	Microphone DOWN: Key Assignment	Assignment of the programmable function to **[DOWN]** (Microphone)	Refer to the programmable function key list.	DOWN Key (Microphone)	16-7
0-32	Microphone UP: Key Assignment	Assignment of the programmable function to **[UP]** (Microphone)	Refer to the programmable function key list.	UP Key (microphone)	16-7
0-33	Automatic Power Off	APO (Automatic Power Off)	Off/ 60/ 120/ 180 [min]	Off	15-7

Audio Performance (Group 1)					
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1-00	Beep Volume	Beep Volume	Off or 1 to 20 (in steps of 1)	10	16-5
1-01	Voice Message Volume (Play)	Volume level during playback of a Voice Message	Off or 1 to 20 (in steps of 1)	10	13-3
1-02	Sidetone Volume	Volume level of the sidetone	Linked with Monitor Control, Off, or 1 to 20 (in steps of 1)	Linked with Monitor Control	5-16
Voice Guidance					
1-03	Voice Guidance Volume	Volume for Voice Guidance	Off or 1 to 20 (in steps of 1)	10	14-1
1-04	Voice Guidance Speed	Selecting the Voice Guidance Speed	1 to 4 (in steps of 1)	1	14-1
1-05	User Interface Language (Voice Guidance & Messages)	The language applied to Voice Guidance and Message displays	English, Japanese	English	14-1
1-06	Automatic Voice Guidance	Enabling the Automatic Voice Guidance	On, Off	Off	14-2
Headphones					
1-07	Headphones Mixing Balance	Mixing balance for a set of headphones	0 to 10 (in steps of 1)	10	4-23
1-08	Headphones Left/Right Reverse	Reversing the left and right position of the headphones	Off, On	Off	4-23

Decoding & Encoding (Group 2)					
Menu	Display	Configuration	Range	Default	Reference Page
FSK Decode					
2-00	FFT Scope Averaging (RTTY Decode)	Averaging in the FFT scope (RTTY Decode)	0 to 9 (in steps of 1)	0	5-38
2-01	RX UOS	RX Unshift On Space	Off, On	On	5-42
2-02	Newline Code	Type of newline code (RX)	CR+LF, All	All	5-43
2-03	Diddle	Diddle	Off, Blank Code, Letters Code	Blank Code	5-43
2-04	TX UOS	TX Unshift On Space	Off, On	On	5-44
2-05	Automatic Newline Insertion	Automatic insertion of a newline code	On, Off	On	5-44
FSK key					
2-06	FSK Spacing	Bandwidth for the FSK shift	170, 200, 425, 850 [Hz]	170 [Hz]	5-46
2-07	FSK Keying Polarity	Polarity of the FSK keying	Off, On	Off	5-47
2-08	FSK Tone Frequency	Tone frequency for FSK	1275, 2125 [Hz}]	2125 [Hz]	5-46
PSK Decode					
2-09	FFT Scope Averaging (PSK Decode)	Averaging in the FFT scope (PSK Decode)	0 to 9 (in steps of 1)	0	5-52
2-10	PSK AFC Tuning Range	Tuning range for PSK AFC	±15, ±8 [Hz]	±15 [Hz]	5-54
2-11	PSK Tone Frequency	Tone frequency for PSK	1.0, 1.5, 2.0 [kHz]	1.5 [kHz]	5-60
Common					
2-12	RTTY/PSK Log File Format	Log file format for RTTY and PSK logs	html, txt	txt	5-51
2-13	RTTY/PSK Time Stamp	Timestamp for the RTTY and PSK logs	Off, Time Stamp, Time Stamp+Frequency	Time Stamp + Frequency	5-59
2-14	Clock (RTTY/PSK Time Stamp)	Clock applied to the time stamp for the RTTY and PSK logs	Local Clock, Secondary Clock	Local Clock	5-60

Controls Configurations (Group 3)					
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Control Values					
3-00	Frequency Rounding Off (Multi/Channel Control)	Rounding off of the frequency when using the **Multi/Channe**l control	Off, On	On	4-13
3-01	SSB/CW/FSK/PSK Mode Frequency Step Size (Multi/Channel Control)	Frequency step size of the **Multi/Channel** control for use in SSB, CW, SK and PSK modes	0.5, 1, 2.5, 5, 10 [kHz]	5 [kHz]	4-13
3-02	AM Mode Frequency Step Size (Multi/Channel Control)	Frequency step size of the **Multi/Channel** control for use in AM mode	5, 6.25, 10, 12.5, 15, 20, 25, 30, 50, 100 [kHz]	5 [kHz]	4-13
3-03	FM Mode Frequency Step Size (Multi/Channel Control)	Frequency step size of the **Multi/Channel** control for use in FM mode	5, 6.25, 10, 12.5, 15, 20, 25, 30, 50, 100 [kHz]	10 [kHz]	4-13
3-04	Frequency Step Size (Up/Down Keys)	Frequency step size for the Up and Down keys	100, 500, 1000 [kHz]	1000 [kHz]	4-14
3-05	9 kHz Step in AM Broadcast Band (Multi/Channel Control)	Frequency step size of the **MULTI/CH** control for the BC band (AM mode)	Off, On	Off (K-type) On (E-type)	4-14
3-06	Tuning Control (Main): Number of Steps per Revolution	The number of steps per revolution of the **Tuning** (M) control	250, 500, 1000 [Step]	In steps of 1000	4-12
3-07	Tuning Control (Sub): Number of Steps per Revolution	The number of steps per revolution of the **Tuning** (S) control	250, 500, 1000 [Step]	In steps of 1000	4-12
3-08	Number of Band Memories	The number of band memories	1, 3, 5	3	4-9

Memory Channels & Scan (Group 4)					
Menu	Display	Configuration	Range	Default	Reference Page
Memory					
4-00	Number of Quick Memory Channels	The number of quick memory channels	3, 5, 10 [ch]	5 [ch]	10-8
4-01	Temporary Change (Memory Channel Configurations)	Temporary change of configurations for Memory Channels	Off, On	Off	10-5
Scan					
4-02	Program Slow Scan	Program Slow Scan	Off, On	On	11-2
4-03	Program Slow Scan Range	The range of program slow scan	100, 200, 300, 400, 500 [Hz]	300 [Hz]	11-3
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4-05	Scan Resume	Scan resume conditions	Time-operated/ Carrier-operated	Time-operated	11-6

Mode					
Menu	Display	Configuration	Range	Default	Reference Page
Jacks					
5-00	Paddle Jack Configuration (Front)	Paddle Jack Configuration (Front)	Straight Key, Paddle, Paddle (Bug Key Mode)	Paddle	5-18
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Mode					
5-02	Electronic Keyer Squeeze Mode	Selecting the Electronic Keyer Squeeze Mode	Mode A, Mode B	Mode B	5-21
5-03	Dot and Dash Reversed Keying	Reversing the Dot and Dash Keying	Off, On	Off	5-21
5-04	Paddle (Microphone Up/Down Keys)	Paddle (**[UP]** and **[DOWN]** (microphone))	Off, On	Off	5-19
Weight and Timing					
5-05	Automatic CW TX with Keying in SSB Mode	Automatic CW transmission with keying while in SSB mode	Off, On	Off	5-18
5-06	Carrier Frequency Offset (SSB mode to CW mode)	Correcting the carrier frequency when changing from SSB mode to CW mode	Off, On	Off	5-17
5-07	CW Keying Weight Ratio	Keyer Weight	Automatic, 2.5 to 4.0 (in steps of 0.1)	Automatic	5-20
5-08	CW Keying Reversed Weight Ratio	Reversing the Weight Ratio for CW keying	Off, On	Off	5-20
5-09	Interrupt Keying	Interrupt keying	Off, On	Off	5-27
Memory					
5-10	CW Message Entry	Entry method of a CW message	Text String, Paddle	Paddle	5-22
5-11	Contest Number	The contest number	001 to 9999 (in steps of 1)	001	5-25
5-12	Contest Number Format	Format of the contest number	Off, 190 to ANO, 190 to ANT, 90 to NO, 90 to NT	Off	5-25
5-13	Channel Number (Count-up Message)	The channel number for the count-up message	Off, Channel 1 to Channel 8	Off	5-24
5-14	CW Rise Time	CW Rise Time	1, 2, 4, 6 [ms]	6 [ms]	5-16
5-15	CW/ Voice Message Retransmit Interval Time	Interval time to retransmit a CW or voice message	0 to 60 [s] (in steps of 1 [s])	10 [s]	5-27

TX/RX Filter & Misc. (Group 6)					
Menu	Display	Configuration	Range	Default	Reference Page
Message					
6-00	Playback Time (Full-time Recording)	Playback time for the full-time recording	Last 10 [s], Last 20 [s], Last 30 [s]	Last 30 [s]	13-5
6-01	Recorded Audio File Storage Location	Location of holder where the recorded files will be stored	Internal, USB	Internal	13-4
Transmit Management					
6-02	Time-out Timer	Maximum continuous transmit time (time-out timer)	Off, 3, 5, 10, 20, 30 [min]	Off	9-14
6-03	TX Inhibit	Transmit inhibit	Off, On	Off	16-27
6-04	Transmit Power Step Size	Step size in W to increment or decrement the transmit power	1 or 5 [W]	5 W	4-17
Filter					
6-05	TX Filter Numbers	The number of transmit filters	2, 3	3	9-8
6-06	RX Filter Numbers	The number of receive filters	2, 3	3	6-3
6-07	Filter Control in SSB Mode (High/Low and Shift/Width)	Toggling the filter type between the high-cutoff and the low-cutoff, and the frequency type between the width and the shift for use in SSB mode.	High & Low Cut, Shift &Width	High & Low Cut	6-4
6-08	Filter Control in SSB-DATA Mode (High/Low and Shift/Width)	Toggling the filter type between high-cutoff and low-cutoff, and the frequency type between width and shift for use in SSB-DATA mode.	High & Low Cut, Shift &Width	Shift & Width	6-5
6-09	VOX Voice Delay (Microphone)	Voice Delay Time (Microphone) while the VOX is active	Off, Short, Medium, Long	Medium	9-5
6-10	VOX Voice Delay (Except Microphone)	Voice Delay Time (other than for the microphone line) while the VOX is active	Off, Short, Medium, Long	Medium	9-5

Rear Connectors (Group 7)					
Menu	Display	Configuration	Range	Default	Reference Page
Baud Rate					
7-00	Baud Rate (COM Port)	Baud Rate for the COM connector	4800, 9600, 19200, 38400, 57600, 115200 [bps]	9600 [bps]	16-10
7-01	Baud Rate (USB Port)	Baud Rate for the USB port	4800, 9600, 19200, 38400, 57600, 115200 [bps]	115200 [bps]	16-10
Data Transfer					
7-02	Quick Data Transfer	Quick Data Transfer	Off, On	Off	16-26
7-03	Overwrite Location (Quick Data Transfer)	The location where the split operation status is overwritten	VFO, Quick Memory	Quick Memory	16-26
7-04	Overwrite Location (DX PacketCluster Tuned Data)	The location where the packet cluster tuned data is saved	Operating Band, Sub Band	Sub Band	16-27
Audio Input					
7-05	USB: Audio Input Level	Input level of the USB audio	0 to 100 (in steps of 1)	50	16-21
7-06	ACC 2: Audio Input Level	Input level from the **ACC2** connector	0 to 100 (in steps of 1)	50	16-20
7-07	Optical: Audio Input Level	Input level for the audio signal from the **OPTICAL IN** connector	0 to 100 (in steps of 1)	50	16-19
Audio Output					
7-08	USB: Audio Output Level (Main Band)	Output level of the main band audio signal from the **USB** connector	0 to 100 (in steps of 1)	100	16-21
7-09	USB: Audio Output Level (Sub Band)	Output level of the sub band audio signal from the **USB** connector	0 to 100 (in steps of 1)	100	16-21
7-10	ACC 2: Audio Output Level (Main Band)	Output level of the main band audio signal from the **ACC 2** connector	0 to 100 (in steps of 1)	50	16-20
7-11	ACC 2: Audio Output Level (Sub Band)	Output level of the sub band audio signal from the **ACC 2** connector	0 to 100 (in steps of 1)	50	16-20
7-12	Optical: Audio Output Level (Main Band)	Output level of the main band audio signal from the **OPTICAL OUT** connector	0 to 100 (in steps of 1)	100	16-19
7-13	Optical: Audio Output Level (Sub Band)	Output level of the sub band audio signal from the **OPTICAL OUT** connector	0 to 100 (in steps of 1)	100	16-19

7-14	Audio Output Type (Rear Connectors)	Audio output from the rear panel connectors	All, Received Audio Only	All	16-6
7-15	Speaker Output Configuration	Speaker output format	Normal, Reversed, Mixed	Normal	16-17
7-16	USB: Audio Output Configuration	USB: Audio output format	Normal, Reversed, Mixed	Normal	16-21
7-17	ACC 2: Audio Output Configuration	ACC 2: Audio output format	Normal, Reversed, Mixed	Normal	16-20
7-18	Optical: Audio Output Configuration	Optical: Audio output format	Normal, Reversed, Mixed	Normal	16-19

Bandscope (Group 8)					
Menu	Display	Configuration	Range	Default	Reference Page
Common					
8-00	Bandscope Display during TX	Bandscope Display during the transmission	Off, On	Off	7-8
8-01	TX Audio Waveform Display	TX AF Waveform display (Sub screen)	On, Off	On	9-13
8-02	Bandscope Maximum Hold	Bandscope Peak Hold	Off, 10 [s], Continuous	10 [s]	7-7
8-03	Marker Offset Frequency (SSB Mode)	Marker offset frequency in SSB mode	Off (Carrier Point), 300, 400, 500, 600, 700, 800, 1000, 1500, 2210 [Hz]	500 [Hz]	7-3
8-04	Frequency Scale (Center Mode)	The frequency scale for the center mode	Relative Frequency, Absolute Frequency	Relative Frequency	7-4
Bandwidth					
8-05	Fixed Mode LF Band Lower Limit (min. 0.03 MHz)	Selecting the lower limit frequency for the LF Band in Fixed mode (min. 0.03 MHz)	0.030.000 [MHz] to 0.295.000 [MHz] (in steps of 0.001 [MHz])	0.130.000 [MHz]	7-5
8-06	Fixed Mode LF Band Upper Limit (max. 0.300 MHz)	Selecting the upper limit frequency for the LF Band in Fixed mode (max. 0.300 MHz)	0.035.000 [MHz] to 0.300.000 [MHz] (in steps of 0.001 [MHz])	0.140.000 [MHz]	7-5
8-07	Fixed Mode MF Band 1 Lower Limit (min. 0.300 MHz)	Selecting the lower limit frequency for the MH1 Band in Fixed mode (minimum 0.300 MHz)	0.300.000 [MHz] to 0.517.000 [MHz] (in steps of 0.001 [MHz])	0.470.000 [MHz]	7-5
8-08	Fixed Mode MF Band 1 Upper Limit (max. 0.522 MHz)	Selecting the upper limit frequency for the MF1 Band in Fixed mode (maximum 0.522 MHz)	0.305.000 [MHz] to 0.522.000 [MHz] (in steps of 0.001 [MHz])	0.480.000 [MHz]	7-5
8-09	Fixed Mode MF Band 2 Lower Limit (min. 0.522 MHz)	Selecting the lower limit frequency for the MF2 Band in Fixed mode (minimum 0.522 MHz)	0.522.000 [MHz] to 1.700.000 [MHz] (in steps of 0.001 [MHz])	0.750.000 [MHz]	7-5
8-10	Fixed Mode MF Band 2 Upper Limit (max. 1.705 MHz)	Selecting the upper limit frequency for the MF2 Band in Fixed mode (maximum 1.705 MHz)	0.527.000 [MHz] to 1.705.000 [MHz] (in steps of 0.001 [MHz])	1.250.000 [MHz]	7-5
8-11	Fixed Mode 1.8 MHz Band Lower Limit (min. 1.705 MHz)	Selecting the lower limit frequency for the 1.8 MHz Band in Fixed mode (minimum 1.705 MHz)	1.705.000 [MHz] to 1.995.000 [MHz] (in steps of 0.001 [MHz])	1.800.000 [MHz]	7-5
8-12	Fixed Mode 1.8 MHz Band Upper Limit (max. 2.0 MHz)	Selecting the upper limit frequency for the 1.8 MHz Band in Fixed mode (maximum 2.0 MHz)	1.710.000 [MHz] to 2.000.000 [MHz] (in steps of 0.001 [MHz])	2.000.000 [MHz]	7-5
8-13	Fixed Mode 3.5 MHz Band Lower Limit (min. 2.0 MHz)	Selecting the lower limit frequency for the 3.5 MHz Band in Fixed mode (minimum 2.0 MHz)	2.000.000 [MHz] to 3.995.000 [MHz] (in steps of 0.001 [MHz])	3.500.000 [MHz]	7-5
8-14	Fixed Mode 3.5 MHz Band Upper Limit (max. 4.0 MHz)	Selecting the upper limit frequency for the 3.5 MHz Band in Fixed mode (maximum 4.0 MHz)	2.005.000 [MHz] to 4.000.000 [MHz] (in steps of 0.001 [MHz])	4.000.000 [MHz]	7-5
8-15	Fixed Mode 5 MHz Band Lower Limit (min. 4.0 MHz)	Selecting the lower limit frequency for the 5 MHz Band in Fixed mode (minimum 4.0 MHz)	4.000.000 [MHz] to 5.995.000 [MHz] (in steps of 0.001 [MHz])	5.000.000 [MHz]	7-5
8-16	Fixed Mode 5 MHz Band Upper Limit (max. 6.0 MHz)	Selecting the upper limit frequency for the 5 MHz Band in Fixed mode (maximum 6.0 MHz)	4.005.000 [MHz] to 6.000.000 [MHz] (in steps of 0.001 [MHz])	5.500.000 [MHz]	7-5
8-17	Fixed Mode 7 MHz Band Lower Limit (min. 6.0 MHz)	Selecting the lower limit frequency for the 7 MHz Band in Fixed mode (minimum 6.0 MHz)	6.000.000 [MHz] to 7.995.000 [MHz] (in steps of 0.001 [MHz])	7.000.000 [MHz]	7-5
8-18	Fixed Mode 7 MHz Band Upper Limit (max. 8.0 MHz)	Selecting the upper limit frequency for the 7 MHz Band in Fixed mode (maximum 8.0 MHz)	6.005.000 [MHz] to 8.000.000 [MHz] (in steps of 0.001 [MHz])	7.500.000 [MHz]	7-5
8-19	Fixed Mode 10 MHz Band Lower Limit (min. 8.0 MHz)	Selecting the lower limit frequency for the 10 MHz Band in Fixed mode (minimum 8.0 MHz)	8.000.000 [MHz] to 10.995.000 [MHz] (in steps of 0.001 [MHz])	10.100.000 [MHz]	7-5

8-20	Fixed Mode 10 MHz Band Upper Limit (max. 11 MHz)	Selecting the upper limit frequency for the 10 MHz Band in Fixed mode (maximum 11 MHz)	8.005.000 [MHz] to 11.000.000 [MHz] (in steps of 0.001 [MHz])	10.150.000 [MHz]	7-5
8-21	Fixed Mode 14 MHz Band Lower Limit (min. 11 MHz)	Selecting the lower limit frequency for the 14 MHz Band in Fixed mode (minimum 11 MHz)	11.000.000 [MHz] to 14.995.000 [MHz] (in steps of 0.001 [MHz])	14.000.000 [MHz]	7-5
8-22	Fixed Mode 14 MHz Band Upper Limit (max. 15 MHz)	Selecting the upper limit frequency for the 14 MHz Band in Fixed mode (maximum 15 MHz)	11.005.000 [MHz] to 15.000.000 [MHz] (in steps of 0.001 [MHz])	14.500.000 [MHz]	7-5
8-23	Fixed Mode 18 MHz Band Lower Limit (min. 15 MHz)	Selecting the lower limit frequency for the 18 MHz Band in Fixed mode (minimum 15 MHz)	15.000.000 [MHz] to 19.995.000 [MHz] (in steps of 0.001 [MHz])	18.000.000 [MHz]	7-5
8-24	Fixed Mode 18 MHz Band Upper Limit (max. 20 MHz)	Selecting the upper limit frequency for the 18 MHz Band in Fixed mode (maximum 20 MHz)	15.005.000 [MHz] to 20.000.000 [MHz] (in steps of 0.001 [MHz])	18.200.000 [MHz]	7-5
8-25	Fixed Mode 21 MHz Band Lower Limit (min. 20 MHz)	Selecting the lower limit frequency for the 21 MHz Band in Fixed mode (minimum 20 MHz)	20.000.000 [MHz] to 21.995.000 [MHz] (in steps of 0.001 [MHz])	21.000.000 [MHz]	7-5
8-26	Fixed Mode 21 MHz Band Upper Limit (max. 22 MHz)	Selecting the upper limit frequency for the 21 MHz Band in Fixed mode (maximum 22 MHz)	20.005.000 [MHz] to 22.000.000 [MHz] (in steps of 0.0010 [MHz])	21.500.000 [MHz]	7-5
8-27	Fixed Mode 24 MHz Band Lower Limit (min. 22 MHz)	Selecting the lower limit frequency for the 24 MHz Band in Fixed mode (minimum 22 MHz)	22.000.000 [MHz] to 25.995.000 [MHz] (in steps of 0.001 [MHz])	24.890.000 [MHz]	7-5
8-28	Fixed Mode 24 MHz Band Upper Limit (max. 26 MHz)	Selecting the upper limit frequency for the 24 MHz Band in Fixed mode (maximum 26 MHz)	22.005.000 [MHz] to 26.000.000 [MHz] (in steps of 0.001 [MHz])	24.9900.000 [MHz]	7-5
8-29	Fixed Mode 28 MHz Band Lower Limit (min. 26 MHz)	Selecting the upper limit frequency for the 28 MHz Band in Fixed mode (minimum 26 MHz)	26.000.000 [MHz] to 29.995.000 [MHz] (in steps of 0.001 [MHz])	28.000.000 [MHz]	7-5
8-30	Fixed Mode 28 MHz Band Upper Limit (max. 30 MHz)	Selecting the upper limit frequency for the 28 MHz Band in Fixed mode (maximum 30 MHz)	26.005.000 [MHz] to 30.000.000 [MHz] (in steps of 0.001 [MHz])	28.500.000 [MHz]	7-5
8-31	Fixed Mode 50 MHz Band Lower Limit (min. 30 MHz)	Selecting the upper limit frequency for the 50 MHz Band in Fixed mode (minimum 30 MHz)	30.000.000 [MHz] to 59.995.000 [MHz] (in steps of 0.001 [MHz])	50.000.000 [MHz]	7-5
8-32	Fixed Mode 50 MHz Band Upper Limit (max. 60 MHz)	Selecting the upper limit frequency for the 50 MHz Band in Fixed mode (maximum 60 MHz)	30.005.000 [MHz] to 60.000.000 [MHz] (in steps of 0.001 [MHz])	50.500.000 [MHz]	7-5

USB (Group 9)					
Menu	Display	Configuration	Range	Default	Reference Page
USB Keyboard					
9-00	Send Message by Function Keys (USB Keyboard)	Key assignment to the PF keys on the USB keyboard	Off, On	On	16-11
9-01	Keyboard Language (USB Keyboard)	The language applied to the USB keyboard	Japanese, English (US), English (UK), French, French (Canadian), German, Portuguese, Portuguese (Brazilian), Spanish, Spanish (Latin American), Italian	English (US)	16-10
9-02	Repeat Delay Time (USB Keyboard)	USB Keyboard Key-repeat delay time	1 to 4 (in steps of 1)	2	16-11
9-03	Repeat Speed (USB Keyboard)	Configuring the key-repeat speed for the USB keyboard	1 to 32 (in steps of 1)	1	16-11

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RESET MENU ITEMS

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Menu Reset	Resetting the Menu configurations	16-4
Memory Channel Reset	Resetting the Memory Channel configurations	
VFO Reset	Resetting the VFO configurations	
Standard Reset (Clock, TX Inhibit and Transmit Power Upper Limit will not be reset)	Resetting the standard configurations	
Full Reset	Resetting all configurations	

CLOCK MENU ITEMS

Menu	Display	Configuration	Range	Default	Reference Page
Date and Time					
00	Date (Local Clock)	Date of the local clock	Year: '13 (2013) to '99 (2099) Month: JAN, FEB. MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC Day: 1 to 31	Year: "12 Month: JAN Day: 01	15-1
01	Time (Local Clock)	Clock of the local clock	00:00 to 23:59 (Hour: 00 to 23, minute: 00 to 59)	00:00	15-1
02	Timezone (Local Clock)	Time zone of the local clock	UTC -14:00 to UTC ±00:00 to UTC +14:00 (in steps of 15 min.)	UTC +00:00	15-2
03	Timezone (Secondary Clock)	Time zone of the secondary clock	UTC -14:00 to UTC ±00:00 to UTC +14:00 (in steps of 15 min.)	UTC +00:00	15-2
04	Secondary Clock Identification Letter	Identification letter for the secondary clock	One letter (A to Z)	U	15-2
05	Date Display Format	Display format for the date	MMM/ DD/ 'YY, DD/ MMM/ 'YY, 'YY/ MMM/ DD	MMM/ DD/'YY	15-2
Automatic Time Correction (1)					
00	Clock Correction using the NTP Server	Automatic clock correction using the NTP Server	Off, On	Off	15-4
01	NTP Server Address	NTP Server Address	A maximum of 50 alphanumeric characters	(Blank)	15-3

LAN MENU ITEMS

Menu	Display	Configuration	Range	Default	Reference Page
00	DHCP	DHCP	Off, On	On	16-12
01	IP Address	IP Address	1.0.0.0 to 223.255.255.255	192.168.1.100	16-13
02	Subnet Mask	Subnet Mask	0.0.0.0 to 255.255.255.252	255.255.255.0	
03	Default Gateway	Default Gateway	1.0.0.0 to 223.255.255.255	blank	
04	Primary DNS Server	Primary DNS server	1.0.0.0 to 223.255.255.255	blank	
05	Secondary DNS Server	Secondary DNS server	1.0.0.0 to 223.255.255.255	blank	
06	MAC Address	MAC Address	-	Unique for each transceiver	16-13
07	Administrator ID	Administrator ID	A maximum of 8 alphanumeric characters	admin	16-14
08	Administrator Password	Administrator Password	A maximum of 8 alphanumeric characters	Kenwood	16-14

ADVANCED MENU ITEMS

Menu	Display	Configuration	Range	Default	Reference Page
0	Indication Signal Type (Main Band)	Output signal type (main band) to an external meter	Automatic, TX Power, ALC, Drain Voltage (Vd), Compression Level (COMP), Current (Id), SWR	Automatic	16-15
1	Indication Signal Type (Sub Band)	Output signal type (sub band) to an external meter	TX Power, ALC, Drain Voltage (Vd), Compression Level (COMP), Current (Id), SWR	ALC	16-16
2	Output Level (Main Band)	Output signal level (main band) to an external meter	0 to 100 [%] (in steps of 1)	50 [%]	16-16
3	Output Level (Sub Band)	Output signal level (sub band) to an external meter	0 to 100 [%] (in steps of 1)	50 [%]	16-16
4	REF I/O Connector Configuration	Configurations for the REF I/O connector	Off, Output, Input	Off	16-22
5	Reference Oscillator Calibration	Frequency calibration for the reference oscillator	-255 to +255 (in steps of 1)	0	18-1
6	Bandwidth (Additional Roofing Filter)	Passband width of the additional roofing filter	Off, 300 to 3500 [Hz] (in steps of 100 [Hz])	Off	16-22
7	Attenuation (Additional Roofing Filter)	Attenuation of the additional roofing filter	-20 to 0 to +20 (in steps of 1)	0	16-23
8	TX Power Down with Transverter Enabled	Transmit power reduction while the transverter is enabled	Off, On	On	16-33
9	TX Hold After Antenna Tuning	Transmit hold time after completing the antenna tuning	Off, On	Off	4-23
10	Antenna Tuner during RX	Antenna tuner behavior while receiving	Off, On	Off	4-22
11	Linear Amplifier Control (HF Band)	Linear Amplifier Control for use in the HF band	Off, Active High, Active High + Relay Control, Active High + Relay & TX Delay Ctrl, Active Low, Active Low + TX Delay Control	Off	16-31
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18	MSQ Logic State	Selecting the MSQ Logic	Low, Open	Low	16-24
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20	MSQ Reverse Condition	Reversing conditions of the MSQ logic state	Off, Busy, Sql, Send, Busy-Send, Sql-Send	Sql	16-24
21	SSQ Reverse Condition	Reversing conditions of the SSQ logic state	Off, Busy, Sql, Send, Busy-Send, Sql-Send	Sql	16-24
22	Standby State Low Power Consumption	Standby Power Saving	Off, On	Off (K-Type) On (E-type)	4-2
23	Cooling Fan Control after Shutdown	Cooling fan behavior after shutdown	Off, On	Off	4-2
24	MSQ/ PKS Pin Assignment (COM Connector)	Pin assignment of MSQ/PKS to the COM connector	Off, On	Off	16-25
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LIST OF USB MENU ITEMS

Display	Configuration	Reference Page
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USB Flash Drive Formatting	Formatting the USB flash drive	12-1
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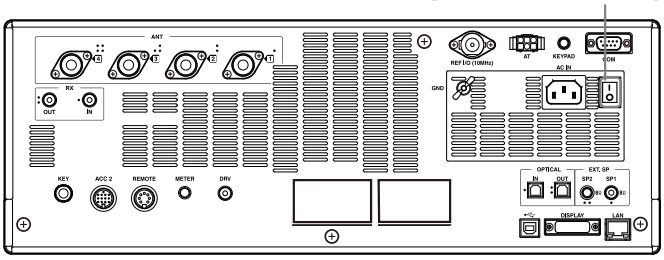
TURNING THE TRANSCEIVER ON

Prior to switching the main power (I/O) ON, read carefully through "INSTALLING AND CONNECTING THE TRANSCEIVER" and be sure that the transceiver and external devices have been correctly installed and connected. {page 1-1}

Positions of the front panel controls are not influenced by switching the main power (I/O) ON or OFF or by turning the transceiver power (⏻) ON or OFF. However, an unintentional event, such as very loud volume audio, may take pace so the **PWR** control, **[AF]** (M) control, and **[AF]** (S) control must be fully rotated counterclockwise, before pressing the main I/O power switch or the [⏻].

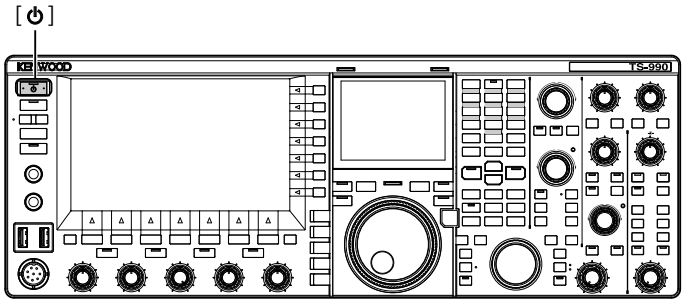
1 Press the main **I/O** power switch located on the rear panel, to the "I" (ON) to source the power to the transceiver.
The "⏻" LED on the front panel lights orange and the status of the transceiver, before it was previously turned OFF, is retained in the transceiver. The transceiver retains the status of the **[⏻]**, ON or OFF, when the main power **I/O** switch is pressed down to the "O" position so the transceiver starts up with the same status of the **[⏻]** when the main I/O power switch is pressed to the "I" position next time.

[Main Power Switch]



2 Press **[⏻]** on the front panel to turn the transceiver power (⏻) ON.
The "⏻" LED lights green after blinking orange. The startup screen appears and then the normal operating screen appears.

[⏻]



PRECAUTION

- When the transceiver power (⏻) is first turned ON, be sure that you set the clock (your local time) for the first time. The clock is utilized for time stamping of various types of the files. Also, timed tasks, such as timer recording, may not be function correctly if the clock is not set.
- Refer to "CLOCK DISPLAY AND TIMER" for the configuration method for the clock. {page 15-1}

Note:

- When the transceiver is switched ON by pressing the main **I/O** power switch, power is sourced from the household AC outlet using the AC cable; it may take time to start up regardless of the configuration in Advanced Menu 22.
- "HELLO" is the default power-on message. You can change this to any text, such as your desired message and your call sign. {page 16-1}
- If the transceiver or the ambient environment is too cold, it may take time for the main screen or the sub screen to brighten.

TURNING THE TRANSCEIVER OFF

The transceiver is equipped with the main I/O power switch on the rear panel and with the **[⏻]** on the front panel.

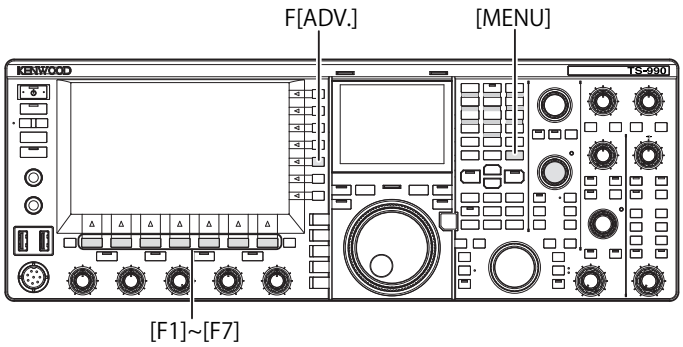
Pressing the main **I/O** power switch to the "O" position removes all power from the transceiver. Pressing **[⏻]** without shutting down the transceiver by pressing the main **I/O** power switch to the "O" position turns the transceiver power (⏻) OFF and places it in the Standby state.

1 Press and hold **[⏻]** on the front panel to turn the transceiver power (⏻) OFF.
A message notifying you of the end of operation appears, and the transceiver enters the standby state. The "⏻" LED on the front panel lights orange.

2 Press the main **I/O** power switch on the rear panel to the "I" position.
The main power from the household AC outlet is shut down.

Note:

- Even after the display disappears after turning the transceiver power (⏻) OFF, the "⏻" LED blinks a few seconds. The transceiver enters the standby state, when the LED starts blinking. While the **[⏻]** is blinking, shutting down the main power (I/O) or disconnecting the AC cable from the household AC outlet may cause the transceiver to malfunction.
- The transceiver has a function (low power consumption mode) that can significantly reduces the power consumption while in the standby state. Refer to **"Standby State Low Power Consumption"** for further details. {page 4-2}
- While the main power (I/O) is shut down, the transceiver power (⏻) cannot be turned ON even with a press of **[⏻]**. A timed task by a programmable timer cannot be activated.
- Even after the transceiver power (⏻) turns OFF, the cooling fan may continue to run until the internal temperature cools down.
- You must first configure the Standby State Low Power Consumption to be active while in the standby state, after the transceiver is turned OFF by pressing **[⏻]**, and the cooling fan control.



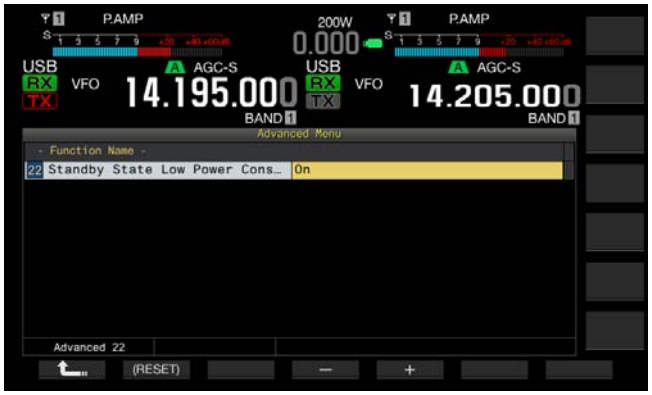
ENABLING THE STANDBY STATE LOW POWER CONSUMPTION

If Standby State Lower Power Consumption is enabled, the power consumption while the transceiver is in the standby state can be reduced to below 0.5 W; however, it may take longer time to start up compared with the same for the normal operation.

1 Press **[ADV.]** (F) from the **Menu** screen to open the **Advanced Menu** screen.

2 Access Menu 22, "Standby State Low Power Consumption".

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



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

The default is "Off" (K-type) (disabling the Standby State Low Power Consumption) and "On" (E-type). Selecting "On" reduces the power consumption to 0.5 W during the standby state; however, it takes 40 seconds to start up.

5 Press [ ] (F1).

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

Note:

- If Standby State Low Power Consumption is enabled, the transceiver cannot accept a PC command. To start up the transceiver using a PC, be sure to disable, in Advanced Menu 22, the Standby State Low Power Consumption.
- 20 W Standby Electricity is consumed even after the transceiver power (⏻) turns OFF and if "Off" has been configured in Advanced Menu 22. Therefore, the cooling fan may run depending on the operating temperature in order to limit the temperature increase of the power supply unit during the standby state. If the rotation of the cooling fan during the standby state for the power supply unit is noticeable, you can select "On" in Advanced Menu 22 not to increase the temperature of the power supply unit. To make the standby state power consumption not exceed 0.5 W, you can enable the Standby State Low Power Consumption, or press the main power switch (I/O) on the rear panel to the "O" position to shut down the electricity. In this case, it takes 40 seconds to start up.

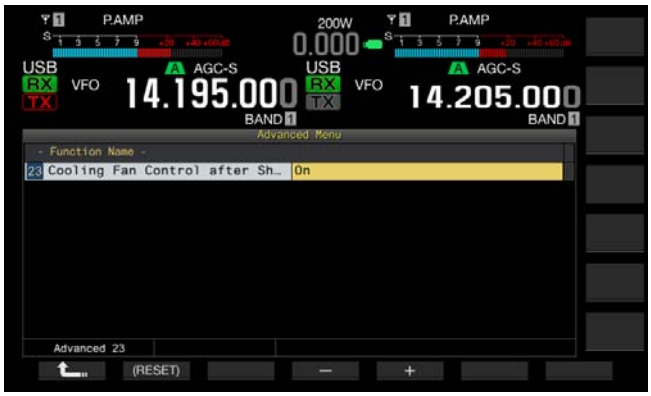
CONTROLLING THE COOLING FAN WHILE IN THE STANDBY STATE

Even after the transceiver power (⏻) is turned OFF (standby state) and the "⏻" LED lights orange, the cooling fan for the final unit can be activated to quickly cool down the final unit.

1 Press **[ADV.]** (F) from the **Menu** screen to open the **Advanced Menu** screen.

2 Access Menu 23, "Cooling Fan Control after Shutdown".

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



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

The default is "Off" (not activating the cooling fan after the transceiver power (⏻) turns OFF). Selecting "On" allows the cooling fan to run even while the transceiver power (⏻) turns OFF.

5 Press [ ] (F1).

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

Note:

- The cooling fan automatically stops when the temperature of the transceiver has decreased.
- If you select "Off" from Menu 22, "Standby State Low Power Consumption", in the Advanced Menu screen, the cooling fan will be reactivated due to any increase in the internal temperature of the transceiver, even after the cooling fan has completely stopped.
- Standby electricity is consumed even after the transceiver power (⏻) has turned OFF. This causes the cooling fan to run unexpectedly.

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COOLING FAN AND TEMPERATURE PROTECTION FOR FINAL UNIT

To protect internal circuits from high temperatures, the transceiver senses the temperature of the final unit regardless of the operation state, either transmitting or receiving, and controls the cooling fan rotation speed for the final unit and the transmit power as described below.

If a thermistor detects a temperature increase in the final unit, the cooling fan at first starts rotating at low speed. If the temperature increases further, the cooling fan rotates at high speed.

If excessively high temperature is detected, the transmit power is limited until the internal temperature cools down.

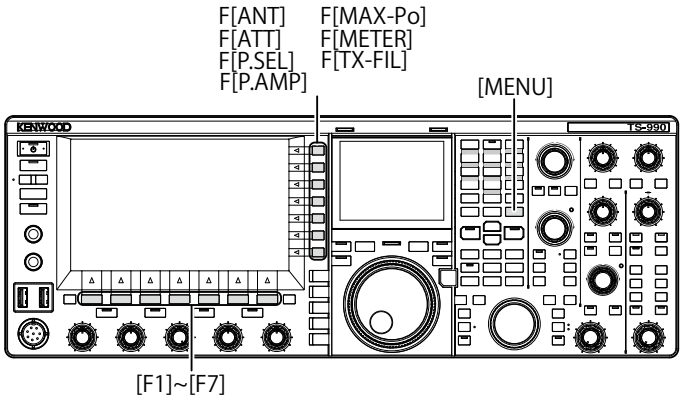
Note:

- If a message notifies you of a detected high temperature, do not shut down the transceiver with a press down of the main **I/O** power switch to the "O" position.
- If the main power (I/O) is shut down, the cooling fan stops, and it may take longer until the transceiver cools down.

MAIN AND SUB SCREEN DISPLAYS

In the main display, the bandscope, waterfall and audio scope in addition to the meter display can be displayed.

A dial, the audio FFT scope (the bandpass spectrum frequency display) and the ΔF value can be displayed on the sub screen.



MAIN SCREEN

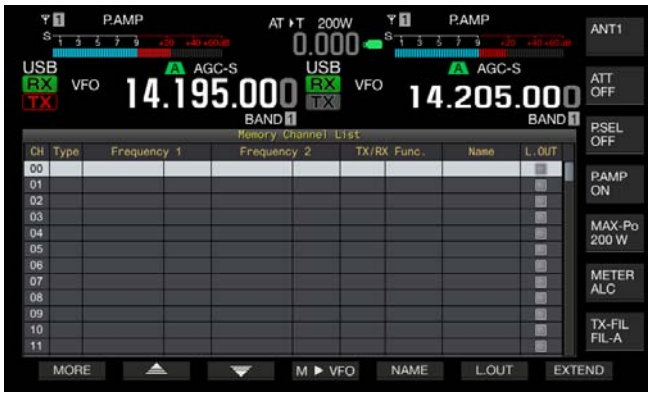
After the startup screen that appears when turning the transceiver power (⏻) ON disappears, the same display was retained when the transceiver power (⏻) was turned OFF last time appears.

In this case, pressing **[MENU]** or **[EXTEND]** (F) while **[EXTEND]** (F) is in the key guide compresses the displays to be the compressed mode screen.

As explained below, the function keys located below and right side of the main screen can activate key tasks and change the display for configuration.

Press **[ESC]** while a screen is open to close the screen and revert to the normal operating screen.

Standard Mode Screen



Compressed Mode Screen

■ Function Keys on the bottom of the Main Screen

- **[RXPLAY]** (F1) {page 13-7}

  Press to open the **Recording Audio Files** screen.

- **[TXMSG]** (F2) {page 13-1}

  Press in other than CW, FSK and PSK modes to open the **Voice Message** screen.

- **[KEYER]** (F2) {page 5-21}

  Press in CW mode to open the **CW Message** screen.

- **[DECODE]** (F3) {page 5-35}

  Appears while in FSK or PSK mode. This key does not appear while in other operating modes.

- **[TONE]** (F4) {page 5-31}

  Appears while in FM mode. This key does not appear while in other operating modes.

- **[SCAN]** (F5) {page 11-1}

  Press to start scanning.

- **[M▸V]** (F6) {page 10-6}

  Appears while in the memory channel mode or quick memory channel mode. This key does not appear while in other operating modes. Press to activate the memory shift.

- **[M.LIST]** (F7) {page 10-1}

  Press to open the **Memory Channel List** screen.

■ Function Keys on the right side of the Main Screen

- **[ANT]** (F) {page 4-20}

  Press to switch the antenna configuration.

  Press and hold to open the **Antenna Name** screen.

- **[ATT]** (F) {page 6-1}

  Each time you press the key, the attenuation level of the selected band switches. Press and hold to change the attenuation level for the selected band, in reversed sequence.

- **[P.SEL]** (F) {page 6-1}

  Press to toggle the Preselector between active and inactive.

  Press and hold while Preselector is enabled to open the **Preselector** screen. (Main Band only)

- **[P.AMP]** (F) {page 5-9}

  Press to toggle the Preamplifier for the selected band between active and inactive.

- **[MAX-Po]** (F) {page 4-18}

  Press to cycle the maximum transmit power through On > Off > maximum transmit power value [W].

- **[METER]** (F) {page 4-19}

  Press to cycle the transmit meter through the active meters: Po > SWR > Id > COMP > ALC > Vd (analog meter) SWR > Id > COMP > Vd > TEMP (digital meters) Po > SWR > Id > COMP > ALC > Vd > TEMP (reduced digital meter)

- **[TX-FIL]** (F) {page 9-8}

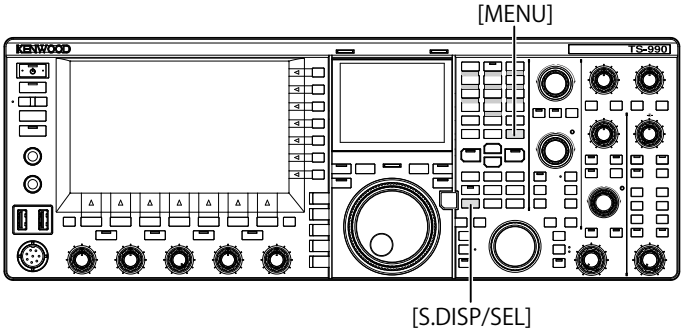
  Press to cycle the transmit filter through FIL-A > FIL-B > FIL-C filters. Press and hold to open the **TX Filter** screen.

Note:

- The function names guided on the main screen vary depending on the functions and configurations.
- Some function keys along the bottom of the main screen do not appear, depending on the functions and configurations.
- Frames and letters for the function keys along the right side of the main screen turn to yellow when the available band is switched to the sub band. Functions that cannot be used for the sub band do not appear.

SUB SCREEN

On the sub screen, pressing **[S.DISP/SEL]** changes various displays, such as the standard mode display and the enhanced display.



■ Switching to the Standard Mode and to the Enhanced Mode

1 Press and hold **[S.DISP/SEL]** to switch to the standard or enhanced mode.
A long press displays or hides a dial on the sub-display.

■ Changing the Display in each mode

1 Press and hold [S.DISP/SEL] to change the display.

In Normal Operation

In the standard mode display:

Each key press cycles the display through the following sequence.

Selected Band Frequency <-> Main band and sub band frequencies

In the enhanced mode display:

Each key press cycles the display through the following sequence.

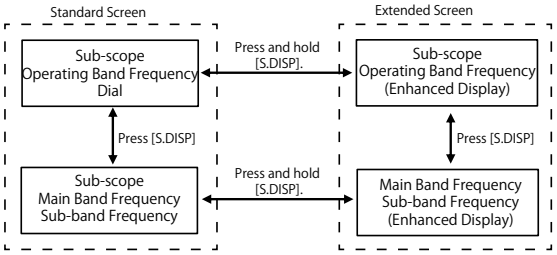
Selected Band Frequency <-> Main Band and sub band frequencies

While the Encode/ Decode Screen appears:

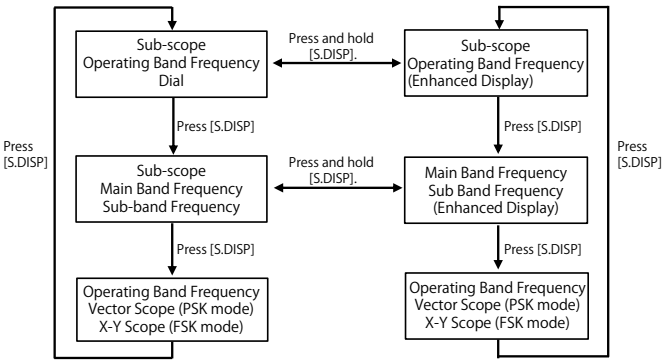
Each key press cycles the display through the following sequence.

The selected band frequency > Main band and sub band frequencies > Band frequency to decode, X-Y scope (FSK mode only), or Band frequencies to decode (PSK mode only) > The selected band frequency

● Normal Operation



● While the Encode/Decode Screen Opens



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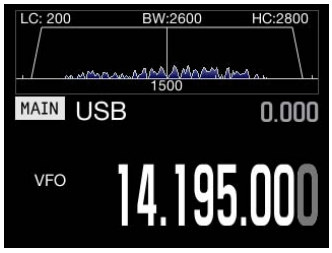
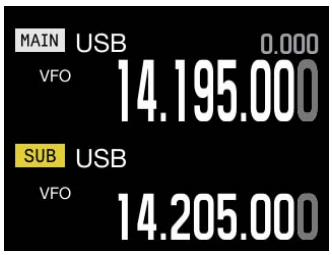
The selected band frequency
Audio Band Scope & Dial Display



The selected band frequency (enhanced)
Audio Band Scope Display

Main Band Frequency & Sub Band Frequency
Audio Scope & Bandscope Display



Main Band & Sub Band

X-Y Scope

Vector Scope

Note:

- A dial does not appear on the sub-screen while the single frequency for normal operation is displayed.
- The X-Y scope appears only if the **RTTY** screen appears on the main screen.
- The Vector scope appears only if the **PSK** screen appears on the main screen.

CONFIGURING THE SCREEN TYPE

The background color or the font type can be changed as desired.

CHANGING THE BACKGROUND COLOR

You can select the background color for the main screen and sub screen from three options.

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

2 Access Menu 00, "Color Display Pattern (Main Screen)", or Menu 01, "Color Display Pattern (Sub Screen)".

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

4 Press **[-]** (F4) or **[+]** (F5) to select "Type 1", "Type 2", or "Type 3".
"Same as Main" can be configured for Menu 01, "Color Display Pattern (Sub Screen)" allowing the sub-screen to have the same background color as the main screen. The default is "Type 1" for Menu 0-00 and "Same as Main (Main)" for Menu 0-01.

5 Press [ ] (F1).

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

CHANGING THE DISPLAY FONT

You can select the font type applied to the frequency display from three types.

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

2 Access Menu 02, "Font Style (Frequency Display)".

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

4 Press **[-]** (F4) or **[+]** (F5) to select "Font 1", "Font 2", or "Font 3".
The default is "Font 1".

5 Press [ ] (F1).

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

CHANGING THE DIAL COLOR (SUB SCREEN)

You can select the dial color pattern for the sub screen from two patterns.

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

2 Access Menu 03, "Dial Color Pattern".

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

4 Press **[-]** (F4) or **[+]** (F5) to select "Type 1" or "Type 2".
The default is "Type 1".

5 Press [ ] (F1).

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

CAPTURING AND SAVING SCREEN IMAGES

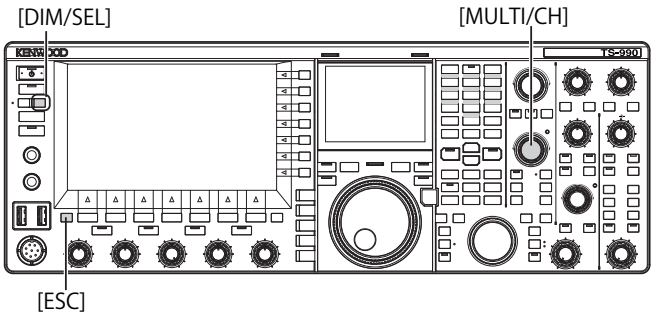
You can capture screen images from the main screen or the sub-screen and save them to a USB flash drive in PNG (.png) format. {page 16-12}

SELECTING THE DIMMER

Dimmer is a function to change the brightness of the screen and LED as you wish.

CHANGING BRIGHTNESS

You can change the brightness of the screens and LEDs using preset dimmer settings (below). For example, you can adjust the brightness to be brighter for daytime operation and darker for nighttime operation.



1 Press **[DIM/SEL]** to switch the dimmer.
Can be selected from “Dimmer 1” to “Dimmer 4”.

ADJUSTING THE DIMMER LEVEL

You can create four preset dimmer settings for each of the main display, sub display, and LEDs. You can then use these preset settings to easily adjust the display and LED brightness while operating the transceiver.

1 Press and hold **[DIM/SEL]** to open the **Dimmer** screen.

2 Press [ ] (F3) or [ ] (F4) to select “Main Display”, “Sub Display”, or “LED”.

3 Press **[-]** (F5) or **[+]** (F6), or rotate the **MULTI/CH** control to adjust the brightness.
Available range is from "5" (dark) to "100" (bright).

4 Press **[DIMMER]** (F2) to switch the dimmer.
Each key press cycles through Dimmer 1 > Dimmer 2 > Dimmer 3 > Dimmer 4 > Dimmer 1.

5 Repeat steps 2 and 3.

Note:

- Pressing and holding **[(RESET)]** (F1) resets the configurations so as to revert to the default.
- Brightness of the "TIMER" LED and the "⏻" LED are fixed while the transceiver power (⏻) turns OFF. The configured brightness does not apply.

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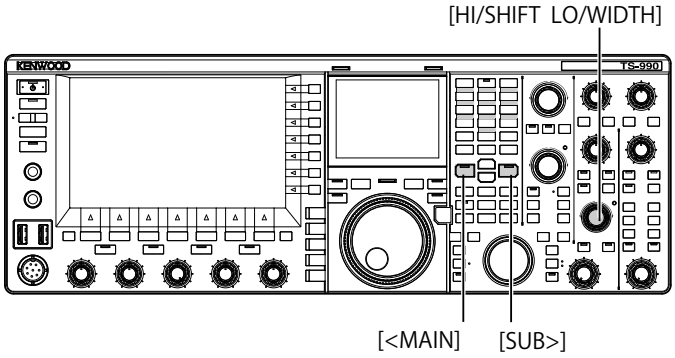
SWAPPING THE OPERATING DATA BETWEEN MAIN BAND AND SUB BAND

There two independent receivers in this transceiver, such as the main band and the sub band. These two receivers can behave separately; hence, you can configure different frequencies and modes for each band. If there is only one key available for the main band and sub band, you can operate the transceiver with the key by swapping the operating band for the main band and sub band.

The frequency displayed on the left side of the main screen is the main band, and the one on the right side is the sub band.



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

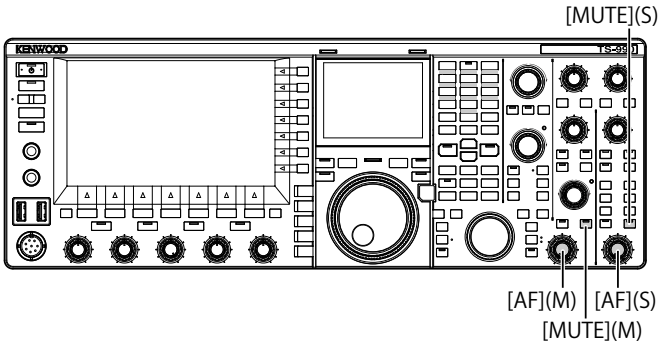
- Frequency display for the band to operate will be larger in the main screen.
- Main Band: The "MAIN" LED lights green.
- Sub Band: The "SUB" LED lights green.

Note:

- The "HIGH/SHIFT LOW/WIDTH" (Sub) LED turns Off upon selection of the main band, and lights orange upon selection of the sub band so as to prevent fault operation.

ADJUSTING THE AF GAIN

You can adjust the speaker volume. Two independent **AF** controls are available for the main band and for the sub band, respectively.



1 Rotate the **AF** (M) or **AF** (S) control.

- Clockwise increases the volume and counterclockwise decreases it.

Note:

- Depending on the configurations for Squelch and CTCSS, no audio sounds even with a rotation of the **AF** control. In such a case, rotate the **SQL** control counterclockwise or deactivate the CTCSS.

MUTING THE RECEIVED AUDIO

You can mute the received audio with a simple key press, rather than by rotating the **AF** control. You can press **[MUTE]** for the main band and the sub band respectively.

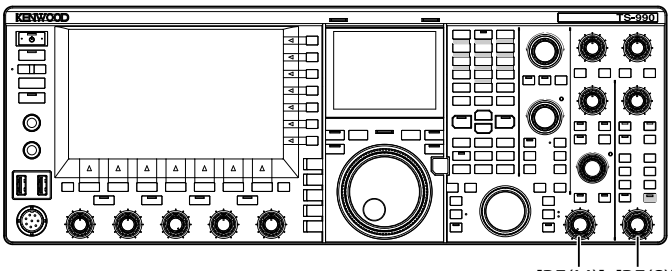
For example, if you are receiving on both the main band and the sub band, but would like to concentrate on listening to the received audio of the station calling on the main band, you can temporarily mute the sub band.

1 Press **[MUTE]** (M) or **[MUTE]** (S) to mute the received audio.

- The "MUTE" (M) or "MUTE" (S) LED light orange.
- Press again to make the received signal audible.

ADJUSTING THE RF GAIN

You can adjust the received sensitivity gain. Two independent **RF** controls are available for the main band and for the sub band, respectively. In normal operation, you can fully rotate the **RF** control counterclockwise. If an external noise or interference by another station is present, rotate the control counterclockwise slightly to decrease the gain and listen to the received audio.



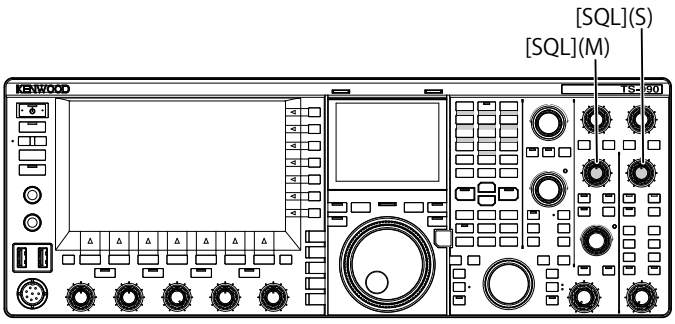
1 Rotate the **RF** (M) or **RF** (S) control to adjust the RF gain.
Rotate the **RF** control counterclockwise and adjust the signal to not be below the peak value range, while viewing the peak value on the S-meter. Signals weaker than this level are attenuated.

Note:

- Depending on the type of antenna and the band conditions, better reception may sometimes be obtained if the control is rotated slightly counterclockwise rather than always positioned fully clockwise.

ADJUSTING THE SQUELCH LEVEL

The threshold level for Squelch, a function to eliminate the audible noise on the frequency where no signal is present, can be adjusted. Two independent **SQL** controls are available for the main band and the sub band, respectively.



1 Rotate the **SQL** (M) or **SQL** (S) control to adjust the squelch level.
- Rotating the **SQL** control clockwise raises tightens the squelch level and counterclockwise opens it.
- You can rotate the **SQL** control until the squelch noise disappears.

Note:

- The position of the **SQL** control, where noise disappears, varies depending on the signal, temperature, and operating environment.
- The position of the **SQL** control in FM mode, where noise disappears, differs from other modes.

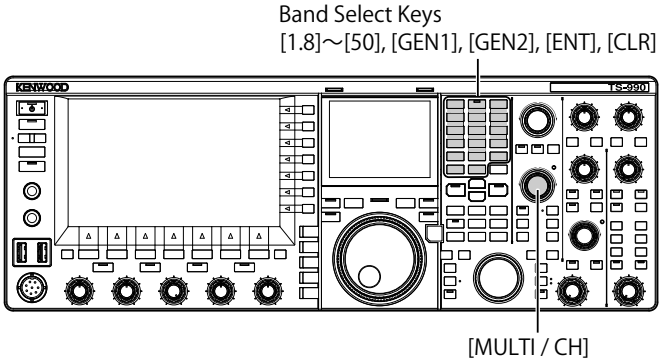
CONFIGURING THE OPERATING BAND

You can select your desired operating band.

The band can be configured for the main band and the sub band, respectively. With the numeric keypad, you can instantly select an amateur band ranging from the 1.8 MHz band to the 50 MHz band and the general band.

The transceiver's band memory function allows you to store up to five configurations for each band, with the last used frequency and operating mode.

This can be convenient if you are in a contest, in order to return the frequency and operating mode to their original states each time you change bands.



1 Press the band keys **[1.8]** to **[50]**, **[GEN1]**, and **[GEN2]** to store the frequency and operating mode.
When you press a key, the transceiver stores the VFO frequency and the status of the operating band at that moment, and then enables the operation of the next memory band. Each time you press a key, the band memory cycles from Band Memory 1 to Band Memory 5. The band memory number appears below the frequency display, on the main screen.

Note:

- Frequencies outside the band memory frequency range cannot be stored.

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■ Band Memory Defaults

Band Name and Frequency Range (MHz)	Default (MHz) and Mode				
	Band Memory 1	Band Memory 2	Band Memory 3	Band Memory 4	Band Memory 5
1.8 MHz/ 1.62 to 2.00	1.8/ CW (K-type) 1.83/ CW (E-type)	1.81/ CW (K-type) 1.84/ CW (E-type)	1.82/ CW (K-type) 1.85/ CW (E-type)	1.83/ CW (K-type) 1.81/ CW (E-type)	1.84/ CW (K-type) 1.82/ CW (E-type)
3.5 MHz/ 3 to 4	3.5/ LSB	3.6/ LSB (K-type) 3.55/ LSB (E-type)	3.7/ LSB (K-type) 3.6/ LSB (E-type)	3.8/ LSB (K-type) 3.65/ LSB (E-type)	3.9/ LSB (K-type) 3.7/ LSB (E-type)
7 MHz/ 6.5 to 7.5	7.0/ LSB	7.05/ LSB (K-type) 7.05/ LSB (E-type)	7.1/ LSB (K-type) 7.1/ LSB (E-type)	7.15/ LSB (K-type) 7.15/ LSB (E-type)	7.2/ LSB (K-type) 7.2/ LSB (E-type)
10 MHz/ 10 to 10.5	10.1/ CW	10.11/ CW	10.12/ CW	10.13/ CW	10.14/ CW
14 MHz/ 13.5 to 14.5	14.0/ USB	14.1/ USB	14.15/ USB	14.20/ USB	14.25/ USB
18 MHz/ 18 to 19	18.068/ USB	18.1/ USB	18.11/ USB	18.15/ USB	18.16/ USB
21 MHz/ 20.5 to 21.5	21.0/ USB	21.1/ USB	21.15/ USB	21.2/ USB	21.3/ USB
24 MHz/ 24 to 25	24.89/ USB	24.92/ USB	24.94/ USB	24.96/ USB	24.98/ USB
28 MHz/ 27.5 to 30	28/ USB	28.3/ USB	28.5/ USB	29/ FM	29.3/ FM
50 MHz/ 50 to 54	50/ USB	50.125/ USB (K-type) 50.15/ USB (E-type)	50.2/ USB	51/ FM	52/ FM
General 1/ 0.030 to 60	0.1357/ CW	0.472/ CW	1.000/ AM (K-type) 0.999/ AM (E-type)	5.3305/ USB (K-type) 5.2585/ USB (E-type)	5.4035/ USB
General 2/ 0.030 to 60	2.5/ AM	5.0/ AM	10.0/ AM	15.0/ AM	20.0/ AM

CHANGING THE NUMBER OF BAND MEMORIES

You can change the number of band memories to be applied to the transceiver. The default quantity is 3.

1 Select Group No. 3, "Basic Configurations", from the **Menu** screen.

2 Access Menu 08, "Number of Band Memories".

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

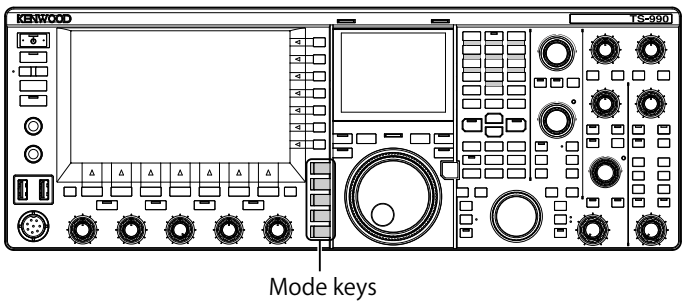
4 Press **[-]** (F4) or **[+]** (F5) to select "1", "3", or "5".
The default is "3".

5 Press [⮌] (F1).

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

SELECTING THE OPERATING MODE

The operating mode can be selected. The transceiver can be operated in SSB (LSB/USB), CW (CW-R), FSK (FSK-R), PSK (PSK-R), FM and AM modes.



LSB OR USB MODE

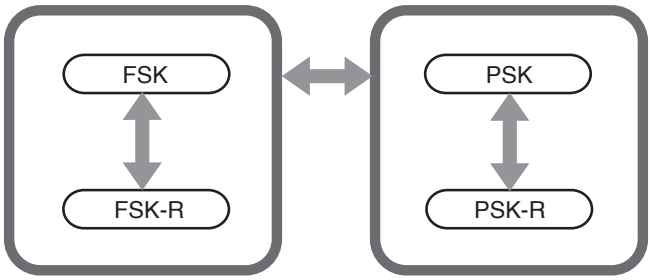
1 Press **[LSB/USB]**.
Each key press toggles the operating mode between LSB and USB modes.

CW/CW-R MODE

1 Press **[CW/CW-R]**.
Each key press toggles the operating mode between CW and CW-R modes.

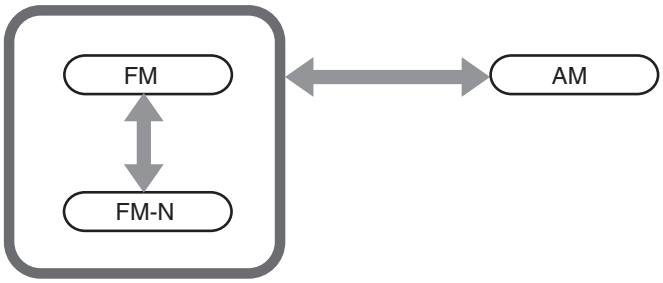
FSK/FSK-R OR PSK/PSK-R MODE

1 Press **[FSK/PSK/REV]**.
Each key press toggles the operating mode between FSK and PSK modes. While in each operating mode, press and hold **[FSK/PSK/REV]** to reverse the operating mode.



FM/AM MODE

1 Press **[FM/AM]**. Each key press toggles the operating mode between FM and AM modes. While in FM mode, press and hold **[FM/AM]** to toggle the FM mode between FM and FM-N (FM Narrow).



CONFIGURING THE DATA MODE

The DATA mode is the operating mode with which you can connect external equipment to the transceiver, enabling communicate in RTTY, PSK31 and other formats.

1 Press one of the mode keys to select FM, AM, or SSB (LSB/USB) mode.

2 Press **[DATA/SEL]**.
Each key press cycles through the following sequence.
(blank) > D1 > D2 > D3 > (blank)

	DATA OFF	DATA1	DATA2	DATA3
In the LSB mode	LSB	LSB-D1	LSB-D2	LSB-D3
In the USB mode	USB	USB-D1	USB-D2	USB-D3
In the FM mode	FM	FM-D1	FM-D2	FM-D3
In the FMN mode	FMN	FM-N-D1	FM-N-D2	FM-N-D3
In the AM mode	AM	AM-D1	AM-D2	AM-D3

PRECAUTION

- Activating the speech processor while in DATA mode may disrupt data communications. {page 9-6}
- The standby method and muting of the audio not used for transmission can be configured for each status, DATA OFF, DATA 1, DATA 2, and DATA 3. {page 5-11}

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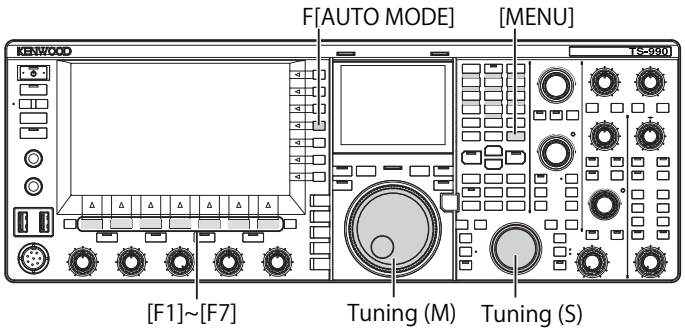
AUTO MODE

Auto Mode is a convenient function allowing you to automatically switch to the correct operating mode according to your band plan.

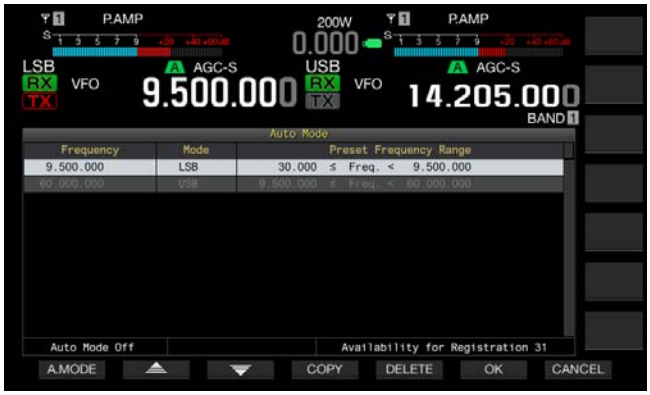
You can preconfigure the auto mode frequency points and the corresponding operating modes. This enables you to automatically switch the operating mode when tuning from one auto mode frequency range into another.

ENABLING/DISABLING AUTO MODE



1 Press **[MENU]**.

2 Press **[A.MODE]** (F1) to open the **Auto Mode** screen.



3 Press **[A.MODE]** (F1) to toggle the Auto Mode between active and inactive.
While Auto Mode is active, the key guide is yellow regardless of whether or not the key is operable. While Auto Mode is inactive, the key guide is white.

4 Press **[OK]** (F6).

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

CONFIGURING AUTO MODE FREQUENCY POINTS

You can configure up to 32 auto mode frequency points.

1 Press **[MENU]**.

2 Press **[A.MODE]** (F1) to open the **Auto Mode** screen.

3 Rotate the **Tuning** control to select the frequency point.

4 Press or press and hold one of mode keys to select the mode you wish to store.

5 Press **[COPY]** (F4) to copy the frequency and operating data.
- The selected band frequency point and mode are stored.
- To delete a stored frequency point and mode, press [▲] (F2) or [▼] (F3), or rotate the **MULTI/CH** control to select the row to delete, then press **[DELETE]** (F5). The points listed below the deleted point will move up, and the display will refresh.

6 Repeat steps 3 to 5 until frequency and operating data are configured for all points.

7 Press **[OK]** (F6).

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

While Auto Mode is active, you can select the operating band automatically assigned to each channel. For normal Amateur Radio use, LSB mode should be selected for SSB frequencies lower than 10.1 MHz and USB mode should be selected for SSB frequencies higher than 10.1 MHz.

The following list shows an example of the configurations for the auto mode frequencies in the HF or 50 MHz bands.

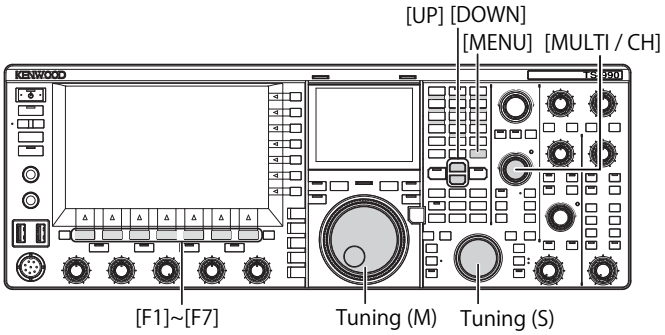
Frequency	Mode	Preset Frequency Range
1.620 MHz	AM	30 kHz ≤ freq. < 1.62 MHz
2.000 MHz	CW	1.62 MHz ≤ freq. < 2.0 MHz
3.500 MHz	LSB	2.0 MHz ≤ freq. < 3.5 MHz
3.525 MHz	CW	3.5 MHz ≤ freq. < 3.525 MHz
10.100 MHz	LSB	3.525 MHz ≤ freq. < 10.1 MHz
10.150 MHz	CW	10.1 MHz ≤ freq. < 10.15 MHz
14.000 MHz	USB	10.15 MHz ≤ freq. < 14.0 MHz
14.070 MHz	CW-R	14.0 MHz ≤ freq. < 14.07 MHz
14.112 MHz	FSK	14.07 MHz ≤ freq. < 14.112 MHz
18.068 MHz	USB	14.112 MHz ≤ freq. < 18.068 MHz
18.110 MHz	CW	18.068 MHz ≤ freq. < 18.11 MHz
21.000 MHz	USB	18.11 MHz ≤ freq. < 21.0 MHz
21.070 MHz	CW	21.0 MHz ≤ freq. < 21.07 MHz
21.125 MHz	FSK	21.07 MHz ≤ freq. < 21.125 MHz
21.150 MHz	CW	21.125 MHz ≤ freq. < 21.15 MHz
24.890 MHz	USB	21.15 MHz ≤ freq. < 24.89 MHz
24.930 MHz	CW	24.89 MHz ≤ freq. < 24.93 MHz
28.000 MHz	USB	24.93 MHz ≤ freq. < 28.0 MHz
28.070 MHz	CW	28.0 MHz ≤ freq. < 28.07 MHz
28.150 MHz	FSK	28.07 MHz ≤ freq. < 28.15 MHz
28.200 MHz	CW	28.15 MHz ≤ freq. < 28.2 MHz
29.000 MHz	USB	28.2 MHz ≤ freq. < 29.0 MHz
30.000 MHz	FM-DATA	29.0 MHz ≤ freq. < 30.0 MHz
50.000 MHz	USB	30.0 MHz ≤ freq. < 50.0 MHz
50.100 MHz	CW	50.0 MHz ≤ freq. < 50.1 MHz
51.000 MHz	USB	50.1 MHz ≤ freq. < 51.0 MHz
52.000 MHz	FM	51.0 MHz ≤ freq. < 52.0 MHz
60.000 MHz	USB	52.0 MHz ≤ freq. < 60.0 MHz

Note:

♦ No auto mode frequencies above 52.0 MHz are configured. The frequency range of 52.0 MHz ≤ freq < 60.0 MHz is grouped as FM mode.

TUNING THE FREQUENCY

There are another methods to tune the frequency other than the basic methods of rotating the Tuning control or pressing **[UP]** or **[DOWN]** (microphone). This section describes how to select the frequency quickly.



TUNING WITH THE TUNING CONTROL

1 Rotate the **Tuning** (M) or **Tuning** (S) control to increment or decrement the frequency.
- Rotate it clockwise to increase the frequency and rotate it counterclockwise to decrement the frequency.
- You can adjust the number of steps per revolution of the **Tuning** control. If Fine Tuning is inactive in SSB, CW or FSK mode, the Tuning control will use 10 Hz per step.
- With the default of 1000 steps, a single rotation of the Tuning control changes the frequency by 10 kHz.

2 Select Group No. 3, "Basic Configurations", from the **Menu** screen.

3 Access Menu 06, "Tuning Control (Main): Number of Steps per Revolution", or Menu 07, "Tuning Control (Sub): Number of Steps per Revolution".

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

5 Press **[-]** (F4) or **[+]** (F5) to select "250 [Step]", "500 [Step]", or "1000 [Step]".

The default is “1000” for both Menus 06 and 07.

6 Press **[** ⮌ **]** (F1).

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

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USING THE MICROPHONE KEYS

1 Press **[UP]** (microphone) or **[DOWN]** (microphone) to increment or decrement the frequency.

Note:

- Different functions can be assigned to the **[UP]** (microphone) and **[DOWN]** (microphone).

CHANGING THE FREQUENCY

Rotating the **MULTI/CH** control enables you to change the frequency more quickly. The frequency step size can be increased or decreased via the menu.

1 Rotate the **MULTI/CH** control to increment or decrement the frequency.
The default step frequency is "5 kHz" for AM, SSB, CW, FSK and PSK modes and "10 kHz" for FM mode.

CHANGING THE STEP FREQUENCY

1 Select Group No. 3, "Basic Configurations", from the **Menu** screen.

2 Access Menu 01, "SSB/CW/FSK/PSK Mode Frequency Step Size (Multi/Channel Control)", Menu 02, "AM Mode Frequency Step Size (Multi/Channel Control)", or Menu 03, "FM Mode Frequency Step Size (Multi/Channel Control)".

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

4 Press **[-]** (F4) or **[+]** (F5) to select "On".
You can configure the frequency step size as listed below.

Menu 3-01 (SSB, CW, FSK, PSK mode)
0.5 kHz, 1 kHz, 2. 5 kHz, 5 kHz, 10 kHz

Menu 3-02, "FM mode", and Menu 3-03, "AM mode"
5 kHz, 6. 25 kHz, 10 kHz, 12. 5 kHz, 15 kHz, 20 kHz, 25 kHz, 30 kHz, 50 kHz, 100 kHz

5 Press [ ] (F1).

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

ROUNDING OFF THE FREQUENCY

When selecting a frequency using the **MULTI/CH** control, the new frequency may fall between two integer points, thus the frequency will be rounded off to the nearest integer. You can deactivate the rounding off capability of the frequency.

1 Select Group No. 3, "Basic Configurations", from the **Menu** screen.

2 Access Menu 00, "Frequency Rounding Off (Multi/Channel Control)".

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

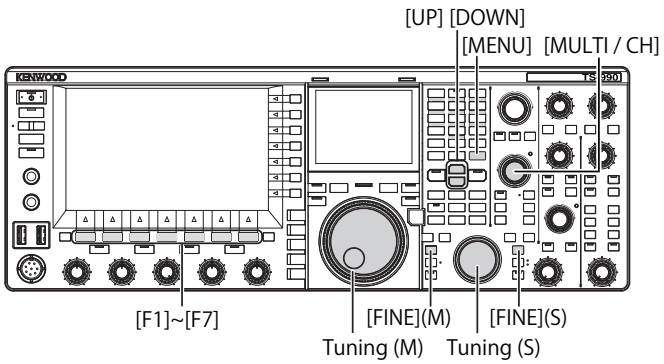
4 Press **[-]** (F4) or **[+]** (F5) to select "On" or "Off".
The default is "On" (rounding off the frequency per each step). Selecting "Off" does not allow the transceiver to round off the frequency per each step.

5 Press [ ] (F1).

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

FINE TUNING

You can change the frequency step size of the Tuning control to be 1/10th of the default step size. Fine Tuning enables you to precisely tune the received frequency where it cannot be easily tuned using the default step size.



■ Fine Tuning the Main Band Frequency

1 Press **[FINE]** (M) to toggle the Fine Tuning between active and inactive.

■ Fine Tuning the Sub Band Frequency

1 Press **[FINE]** (S) to toggle the Fine Tuning between active and inactive.

Note:

- While Fine Tuning is inactive, the 1 Hz digit in the frequency display will be grayed out.
- In FM or AM mode, the 10 Hz and 1 Hz digits are normally grayed out. While Fine Tuning is active, the grayed out frequency display is cancelled and all digits, including the 1 Hz digit, appear.

TUNING IN MHZ STEP

1 Press **[UP]** or **[DOWN]** to change the frequency in steps of 1 MHz.
- While holding down the key, the frequency continuously increases or decreases.
- You can change the step size that applies when **[UP]** or **[DOWN]** is pressed.

2 Select Group No. 3, "Basic Configurations", from the **Menu** screen.

3 Access Menu 04, "Frequency Step Size (Up/Down Keys)".

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

5 Press **[-]** (F4) or **[+]** (F5) to select “100 [kHz]”, “500 [kHz]”, or “1000 [kHz]”.
The default is "1000".

6 Press [ ] (F1).

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

SELECTING THE STEP FREQUENCY FOR AM BROADCAST LISTENING

When listening to the AM broadcast band ranging from 522 kHz to 1710 kHz, the receive frequency can be changed by rotating the **MULTI/CH** control with 9 kHz frequency step size.

1 Select Group No. 3, "Basic Configurations", from the **Menu** screen.

2 Access 05, "9 kHz Step in AM Broadcast Band (Multi/Channel Control)".

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

4 Press **[-]** (F4) or **[+]** (F5) to select “On” or “Off”.
Selecting “Off” allows you to change the receive frequency at the step frequency configured in Menu 3-03.

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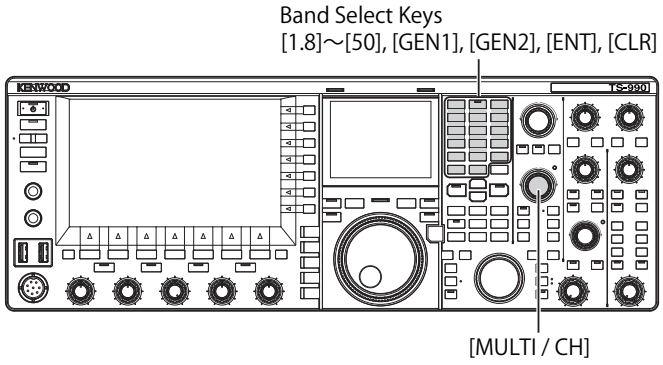
The default is “Off” (K-type) and “On” (E-type).

5 Press [ ] (F1).

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

DIRECTLY ENTERING THE FREQUENCY

If your desired frequency is far from the current frequency, directly entering the numbers using the numeric keypad is the fastest method to enter the frequency.



1 Press **[ENT]**.
A series of dashes ("-") appear on the frequency display for the selected operating band.

2 Press the numeric keys to enter a frequency.
- Pressing the numeric key replaces the dashes with the entered number, starting with the leftmost digit.
- To enter 1.82 MHz, pressing **[0/50]**, **[1/1.8]**, **[8/24]**, **[2/3.5]**, and then **[ENT]** completes the entry. Always enter a leading “0” for frequencies below 6MHz.
- Pressing **[CLR]** during the entry aborts the entry, and the VFO frequency before the entry began reappears.

Note:
- The maximum frequency you can enter is 59.99999 MHz for Fine Tuning, you cannot enter 60 MHz.
- Pressing **[ENT]** while entering a frequency fills the remaining digits with 0's.
- If you enter a value outside the transmit and receive frequency range, a beep sounds and the entry will be rejected.
- If the first entered value is from 0 to 5, that digit will automatically be set as the 10 MHz digit; entering a first value from 6 to 9 will set that digit as the 1 MHz digit.
- Even if you enter the 10 Hz digit, "0" will not appear.
- Entering the frequency deactivates the RIT and XIT. However, the respective offset frequencies cannot be released.
- In any mode other than AM and FM mode and when Fine Tuning is disabled, the 10 Hz digit will be the least digit that you can enter, and in AM and FM modes, 100 Hz digit is the least digit you can enter.
- After entering a frequency while in Auto mode, the operating mode automatically changes. {page 4-11}

DISPLAYING THE HISTORY OF THE FREQUENCY ENTRIES

A maximum of the last 10 frequencies entered using the numeric keypad can be stored in the transceiver. To reuse a frequency you previously entered, that frequency can be recalled from the last 10 entered frequencies.

1 Press **[ENT]** to allow you to enter the frequency.
All digits for the frequency are displayed with "-" (dash).

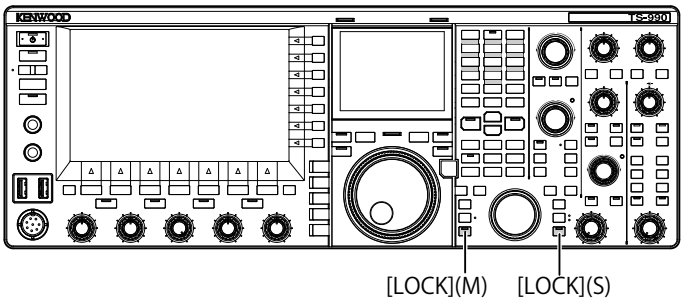
2 Rotate the **MULTI/CH** to display the histories.
- Stored frequencies along with their log numbers appear. The most recent frequency along with the earliest log number appears first.
- Rotate the **MULTI/CH** control clockwise to increase the log number and display the older logs in sequence.

3 Press **[ENT]** to transfer the selected frequency to the VFO.

Note:
- If the frequency was not correctly entered, the entry will not be stored as a last entered frequency.
- If no frequency has been entered, nothing appears as a last entered frequency.
- If you enter a frequency while the auto mode frequency point is being configured, nothing appears as a last entered frequency.
- If you activate the transverter, all frequency logs will be cleared.

USING THE FREQUENCY LOCK

Frequency Lock can lock particular keys and controls so they are not accidentally operated to change the frequency.



■ Locking the Main Band Frequency

1 Press **[LOCK]** (M) to lock the frequency for the main band.
The "LOCK" (M) LED lights orange.

■ Locking the Sub Band Frequency

1 Press **[LOCK]** (S) to lock the frequency for the main band.
The "LOCK" (S) LED lights orange.

Following are the keys that are locked while the frequency is being locked. Refer to the following table.

Keys/Controls	Remarks
Tuning (M) and **Tuning** (S) controls	The Tuning (M) control can be rotated during your operation with TF-SET.
MULTI/CH control	During the configuration, rotate to scroll the items you can edit.
[ENT] key	
[M.IN] key	
[SCAN] (F5) key	Can still be used by pressing and holding to open the configuration screen.
[UP] (microphone) and **[DOWN]** (microphone)	Can be used while TF-SET is being operated in VFO mode. Can still be used by pressing **[UP]** (microphone) and **[DOWN]** (microphone) to change a parameter in the Menu. Can still be used by pressing **[UP]** (microphone) and **[DOWN]** (microphone) to "Paddle" if it has been configured for Menu 04 (Paddle (Microphone Up/Down Keys)).
[M/V] key	
[RX] (M) and **[RX]** (S) keys	Can be operated only if the main band frequency is locked.
[TX] (M) and **[TX]** (S) keys	
Band Select Keypad	
[M►VFO] (F), **[M>V]**	
[M>S] key	
[M/S] key	
Mode keys	Press and hold while in FM mode to enter to FM narrow mode.
[FINE] (M) and **[FINE]** (S) key	
[CW T.] (M) and **[CW T.]** (S)	
[Q.MR] key	
[QM.IN] key	
Touchscreen Tuning	
[UP] and **[DOWN]**	
[TRACKING]	Can be operated only if the main band frequency is locked.

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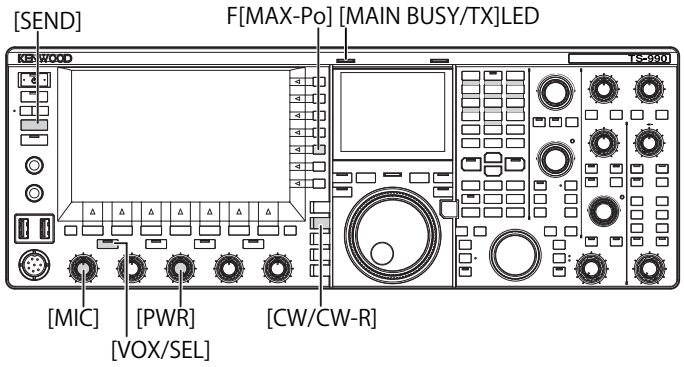
TRANSMITTING

AUDIO TRANSMISSION



1 Press down the **[PTT]** (microphone), or press **[SEND]**.
2 Speak into the microphone in your normal voice.
3 Release the **[PTT]** (microphone), or press **[SEND]**.
The transceiver reverts to the receive state.

CW TRANSMISSION

If a keyer or paddle is connected to the transceiver, you can transmit in CW mode.

1 Press **[CW/CW-R]** to select CW mode.
2 Press **[VOL/SEL]** or **[FBK]** to enable the break-in.
3 Operate your keyer or paddle.

Note:
♦ While transmitting, the "TX" LED for the selected band lights.

ADJUSTING THE MICROPHONE GAIN

You can adjust the microphone gain when you transmit in SSB or AM mode.

1 Press down the **[PTT]** (microphone), or press **[SEND]**.
The "MAIN BUSY/TX" LED lights red.
2 Speak into the microphone in your normal voice.
3 Rotate the **MIC** control to adjust the microphone gain.
SSB Mode
Rotate the **MIC** control while speaking into the microphone to adjust the level. The ALC meter display varies depending on the audio level. Adjust the level so as not to exceed the tolerance of the ALC range. {page 4-19}
AM Mode
Rotate the **MIC** control while speaking into the microphone to adjust the level. Adjust the level until the indication in the PWR meter slightly varies by the audio level.
4 Release the **[PTT]** (microphone), or press **[SEND]**.
The "MAIN BUSY/TX" LED light green or turns Off, depending on the configuration for the squelch level.

Note:
♦ For FM mode, configure the microphone gain in Advanced Menu 13, "Microphone Gain (FM Mode)". {page 5-28}

ADJUSTING THE TX POWER

Reduce the transmit power as long as you can make a QSO securely. This prevents you from interfering with or disturbing other stations.

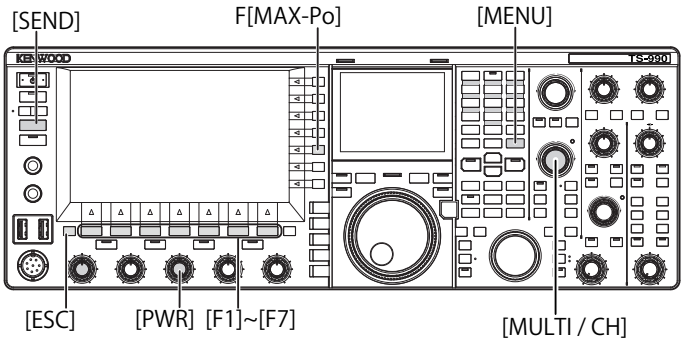
With this transceiver, you can adjust the transmit power even while you are transmitting.

1 Rotate the **PWR** control to adjust the transmit power.
Clockwise increases the transmit power and counterclockwise decreases it. The available transmit power range varies, depending on the band and operating mode. Refer to the following table.

	TS-990S	
	Other than AM	AM
HF Band	5 to 200 [W]	5 to 50 [W]
50 MHz Band	5 to 200 [W]	5 to 50 [W]

PRECISELY ADJUSTING THE TX POWER

You can select the number of steps when you rotate the **PWR** control.



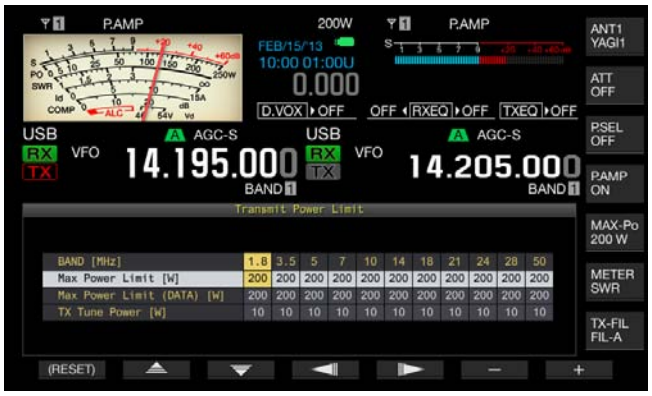
1 Select Group No. 6, "TX/RX Filter & Misc.", from the **Menu** screen.
2 Access Menu 04, "Transmit Power Step Size".
3 Press **[SELECT]** (F4) to allow editing of the parameter box.

4 Press **[-]** (F4) or **[+]** (F5) to select "1 [W]", or "5 [W]".
The default is "5 [W]".
5 Press [ ] (F1).
6 Press **[MENU]** to exit.

TRANSMIT POWER LIMITER

You can place a limit on the transmit power of your transceiver. This function prevents the transmit power from exceeding the configured transmit power limit even with further rotation of the **PWR** control. You can also set a different transmit power limit for the DATA mode.

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.

3 Press [▲] (F2) or [▼] (F3) to select the transmit power to be controlled.
As shown below, you can select the item to limit the transmit power.

Max Power Limit
Transmit power limit for normal transmission.

Max Power Limit (DATA)
Enables the configuration for the transmit power limit while in DATA Mode.

TX Tune Power
Enables the configuration for the transmit power limit for the TX Tuning. {page 9-14}

4 Press **[-]** (F6) or **[+]** (F7), or rotate the **MULTI/CH** control to select the limit value for the transmit power.
Press and hold **[(RESET)]** (F1) to revert the limit value for the selected item to the default.

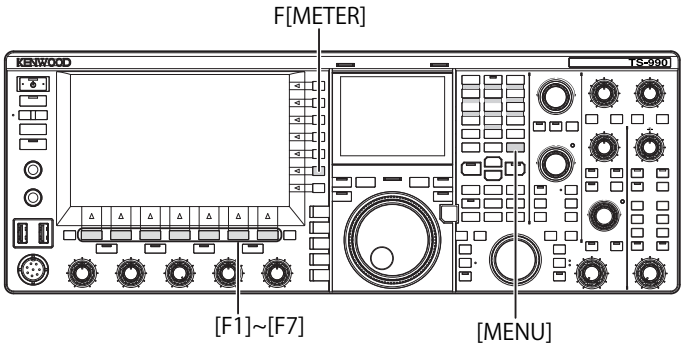
5 Press **[MAX-Po]** (F) or **[ESC]** to exit.

Note:

- If "On" (with the 5 W transmit power reduction enabled) is configured in Advanced Menu 08, "TX Power Down with Transverter Enabled", **[MAX-Po]** (F) on the right side of the main screen and the wattage value on the key guide will disappear when the transverter or drive-out is activated.
- If ANT1 is selected for the transceiver for use with an external antenna tuner, the maximum transmit power is limited to 100 W. Even if greater than 100 W is configured for the transmit limiter, the display on the key guide of **[MAX-Po]** (F) remains as 100 W as well as the display on the main screen (100 W).

METER

The meter for the main band displays the signal as an S-meter while receiving and as the selected meter while transmitting. The meter for the sub band always displays the readout of the S-meter. The meter type for the main band displayed on the main screen can be changed.



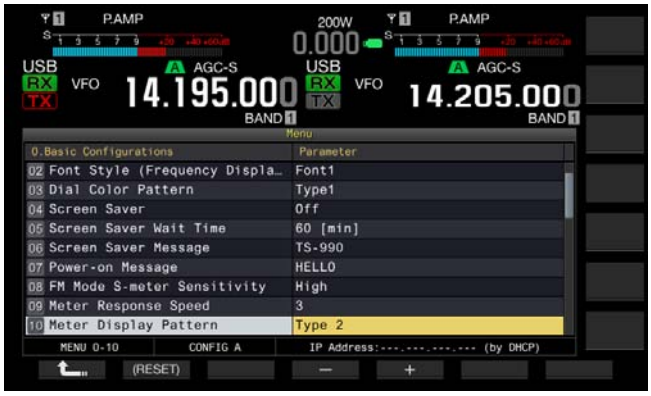
CHANGING THE METER TYPE

You can select the meter display pattern, showing the main band status, from a digital pattern or two analog patterns.

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

2 Access Menu 10, "Meter Display Pattern".

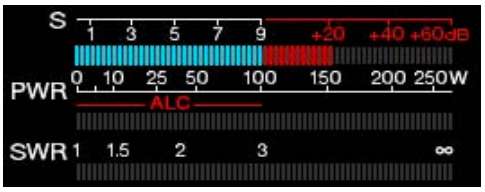
3 Press **[SELECT]** (F4) to allow editing of the parameter box.



4 Press **[-]** (F4) or **[+]** (F5) to select "Type 1" (Digital), "Type 2" (Analog 1), or "Type 3" (Analog 2).
The default is "Type 2" (Analog 1).

5 Press [↩] (F1).

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



Type 1 (Digital Meter)

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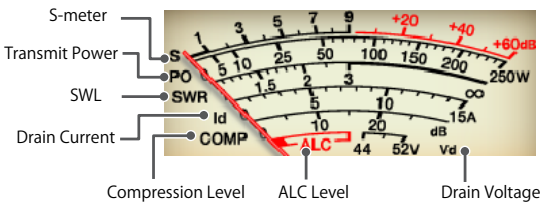


Type 2 (Analog 1 Meter)

CHANGING THE TRANSMIT METER

1 Press **[METER]** (F)
Parameters vary according to the meter type:

For Type 1 (Digital Meter)
SWR > Id > Vd > TEMP > SWR

For Type 1 (Digital Meter) and displayed as the compressed mode
Po > SWR > Id > ALC > Vd > TEMP

For Type 2 or Type 3 (Analog Meter)
P0 > SWR > Id > COMP > ALC > VD

P0	Indicates the transmit power. (Indicates the peak transmit power value.)
SWR	Indicates the Standing Wave Ratio showing the antenna impedance matching state.
COMP	Displays the amount of compression of the transmit signal by the speech processor.
ALC	Indicates the voltage in the Automatic Level Control circuit.
Id	Indicates the drain current in the final FET circuit.
Vd	Indicates the drain voltage in the final FET circuit.
TEMP	Indicates the temperature of the internal circuit.

S-meter for the sub band appears on the upper right side of the main display.

S-meter for the sub band

Note:

- If an analog meter is connected to the **METER** terminal on the rear panel, the signal level can be observed on both the front panel and the external meter. {page 16-15}
- COMP meter can be selected while the Speech Processor is active.

METER PEAK-VALUE HOLD

Indicates the held peak-value in the digital meter.

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

2 Access Menu 11, "Meter Display Peak Hold".

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

4 Press **[-]** (F4) or **[+]** (F5) to select "Off" or "On".
The default is “On” (use with Meter Peak Hold). Selecting “Off” disables the Meter Peak Hold. In this case, the peak values remain displayed for the duration below.

Upper Display: 0.5 seconds

Middle and Lower displays: 0.3 seconds (except SWR meter)

5 Press [ ] (F1).

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

ANALOG METER RESPONSE SPEED

You can configure the response speed of the needle on the analog meter.

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

2 Access Menu 09, "Meter Response Speed".

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

4 Press **[-]** (F4) or **[+]** (F5) to select one from "1" to "4".
The default is “3”.

5 Press [ ] (F1).

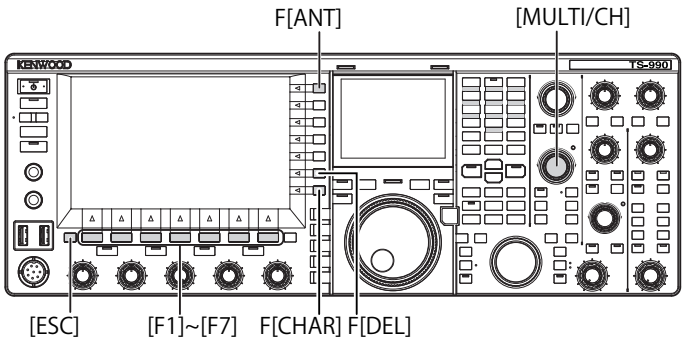
6 Press **[MENU]** to exit.

Note:

- The configured parameter also applies for the vertical meter used in SWL mode.

STORING THE ANTENNA NAME

You can store an antenna name for the connected antenna. If multiple antennas are used, band by band, displaying the antenna name allows you to distinguish which antenna you want to select.



1 Press and hold **[ANT]** (F) to open the **Antenna Name** screen.

2 Press [ ] (F2) or [ ] (F3), or rotate the **MULTI/CH** control to select the antenna connector to which a name will be given.

3 Press **[NAME]** (F6) to allow editing of the parameter box.

4 Enter the antenna name by pressing the function keys or rotating the **MULTI/CH** control.
A maximum of 5 alphanumeric characters and symbols can be entered.

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

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

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

[SAVE] (F6): Stores 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): Changes 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)

■ Available Characters and Symbols (A maximum of 5 characters)

Following are the available characters and symbols with “English” selected in Menu 9-01. If you wish to enter the Japanese characters, download the Japanese instruction manual to refer to the available characters and symbols for the Japanese characters.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	E	X	Y	Z			
0	1	2	3	4	5	6	7	8	9					
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z				
!	#	$	%	&	'	(	)	*	+	,	/	:	<	=
>	?	@	[	\	^	_	`	{	|	}	~			
｡	｢	｣	､											

5 Press **[SAVE]** (F6) to save the antenna name.

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

CHANGING THE ANTENNA

You can change the antenna connected to the rear panel according to your operating band. ANT1 to ANT4, RX ANT, and DRV settings will automatically be saved in the antenna band memory. If you select the same band next time, the same antenna will automatically be selected. The antenna band memory is set independently for the sub band and the main band.

1 Press **[ANT]** (F) to select the antenna.
Each key press cycles the operating mode through the following sequence.

ANT1 > ANT2 > ANT3 > ANT4> ANT1

Frequency Range for the Selected Antenna (MHz)	
0.03 to 0.522	10.5 to 14.5
0.522 to 2.5	14.5 to 18.5
2.5 to 4.1	18.5 to 21.5
4.1 to 6.9	21.5 to 25.5
6.9 to 7.5	25.5 to 30.0
7.5 to 10.5	30.0 to 60.0

If the same antenna is set for the main band and the sub band, the signal from the antenna will pass the divider circuit, and will be distributed equally to the main band

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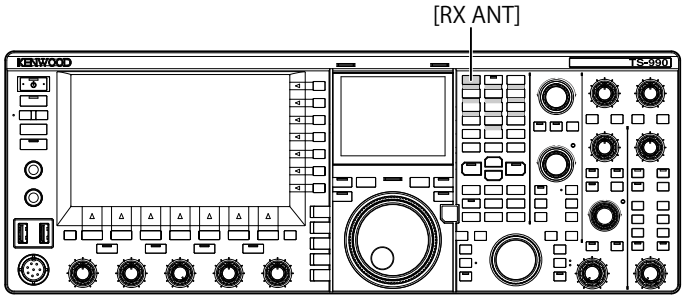
receiver and the sub band receiver. This will result in a sensitivity reduction of approximately 3 dB with a noise level rise by 3 dB.

To prevent the sensitivity reduction, turn OFF the sub band receiver or connect an antenna different from that for the main band.

RX ANTENNA

You can select an antenna to be dedicated for reception.

To operate the transceiver with an antenna dedicated for reception, such as an HF low band Beverage antenna or a directional loop antenna, you must connect the antenna to the **RX IN** connector on the rear panel. You can insert a homemade or commercially available BPF, trap filter, etc. between the RN IN connector and the RX OUT connector.



1 Press **[RX ANT]**.

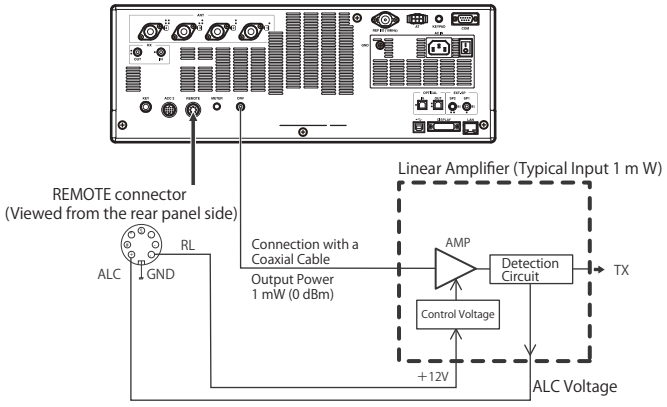
Each key press toggles the antenna for the selected operating band between active and inactive.

While active, "RX" appears on the main screen.

If the same antenna (ANT1 to ANT4) is configured for the main band and sub band, the RX antenna for the deselected band is also changed. RX ANT settings, if any, made for non-operating bands will be disabled when the RX ANT settings are made for the target operating band, provided that the antenna for the main band is different from that for the sub band.

DRIVE OUTPUT (DRV)

The frequency ranges that can be output from the Drive (DRV) jack are 135 kHz (135.700 kHz to 137.799 kHz) and the 1.9 to 50 MHz amateur bands. The output level is approximately 1 mW (0 dBm).



1 Press **[DRV]**.

- The "DRIVE" LED lights green.
- If the transmit signal is sent from the DRV connector, no signal can be transmitted from the **ANT1** to **ANT4** connectors.
- Following the configuration in Advanced Menus 11 (Linear Amplifier Control (HF Band)) and 12 (Linear Amplifier Control (50 MHz Band)), +12 V is sent from pin 7 (RL) of the **REMOTE** connector.
- The PWR meter is inactive while transmitting from the DRV connector. The automatic level control (ALC) circuit will operate if the ALC voltage input from external equipment is applied to the ALC pin of the REMOTE connector. In that case, the ALC meter will indicate the operating status. The DRV output level will be in control only if the ALC voltage input is applied. Therefore, the output level will be determined according to the MIC input or the CAR control setting. Furthermore, you can turn the **[PWR]** control to reduce the output.

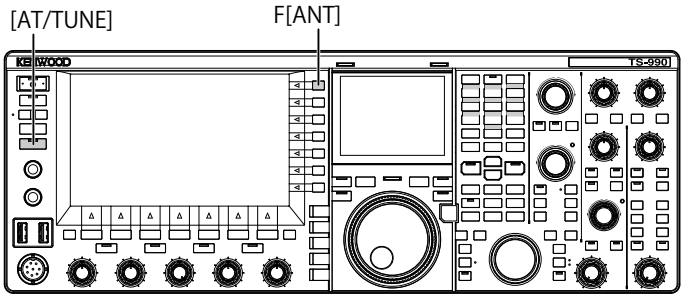
Note:

♦ Be sure that the connection for use with the drive output is in place, as described above.

INTERNAL ANTENNA TUNER

As explained in "ANTENNA INSTALLATION AND CONNECTION", you will have the best performance when matching the impedance of the coaxial cable with the antenna. {page 1-1}

To adjust the impedance between the antenna and the transceiver, use an external antenna tuner or the internal antenna tuner.



SECURING THE MATCHING TO THE ANTENNA

1 Select the transmit frequency.

2 Press **[ANT]** (F) to select the antenna.

- Ensure that "ANT 2" has been selected if the internal antenna tuner will be used and if the external antenna has been connected to the **ANT1** connector.
- If the external antenna has been connected to the **ANT1** connector, the internal antenna tuner cannot be used with "ANT1" selected.

3 Press and hold **[AT/TUNE]** to tune.

- The transceiver is placed in CW mode, and tuning begins. The transmit power will be "10 W", the SWR meter will be selected as the transmit meter.
- After the tuning has completed, the blinking ">T" lights. While the antenna tuner is enabled during the reception, the blinking "R>" also lights.
- To stop tuning, press **[AT/TUNE]** again.
- If the Standing Wave Ratio of the antenna is extremely high, such as 10:1 or higher, a Morse code "SWR" alert sounds and the internal antenna tuner turns off.
- Adjust the antenna system to lower the Standing Wave Ratio before tuning again.

4 Ensure that the antenna tuning has completed.

- Upon normal completion of the antenna tuning, a Morse code "T" sounds.
- "R<AT>T" stops flashing on and off, and remains on upon completion of the antenna tuning. The "AT" LED lights.
- If the antenna tuning does not complete in 20 seconds, a Morse code "5" alert sounds. In this case, pressing **[AT/TUNE]** stops the tuning function and returns to receive mode.

Note:

- The internal antenna tuner does not tune outside the licensed transmit frequency range.
- Press and hold **[AT/TUNE]** during transmission to start tuning.
- If 60 seconds lapse and no matching is established, the tuning automatically ends. In this case, the antenna tuner circuit is switched Off, "AT", ">T" and "R<" disappear from the main screen, and the "AT" LED becomes unlit.
- If the antenna tuning does not complete even with the antenna having a Standing Wave Ratio of 3:1 or less, adjust the antenna system to lower the Standing Wave Ratio, then restart the tuning process.
- Even if the antenna tuning completes, there may be cases where the Standing Wave Ratio is not 1:1 or less.
- If ANT1 is selected for the transceiver for use with an external antenna tuner, the maximum transmit power is limited to 100 W. {page 4-21}

PRESET

Results of the tuning in each preset band can be stored in the internal antenna tuner as preset tuning information.

While the internal antenna tuner is active, the preset tuning information corresponding to the current transmit frequency is applied to the internal antenna tuner.

1 Press **[AT/TUNE]**.

- "AT>T" appears on the main screen. "R>" appears while an external antenna tuner is active. The preset tuning information corresponding to the current transmit frequency is applied to the internal antenna tuner.
- If you change the transmit frequency, the preset tuning information followed by the preset band will be automatically configured for the internal antenna tuner.
- To deactivate the internal antenna tuner, press **[AT/TUNE]** again.

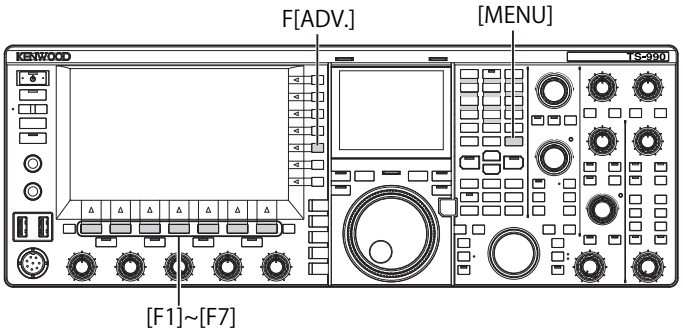
Preset Band (MHz) for the Internal Antenna Tuner	
0.03 to 1.85	14.10 to 14.50
1.85 to 2.50	14.50 to 18.50
2.50 to 3.525	18.50 to 21.15
3.525 to 3.575	21.15 to 21.50
3.575 to 3.725	21.50 to 25.50
3.725 to 4.1	25.50 to 29.0
4.1 to 6.9	29.0 to 30.0
6.9 to 7.05	30.0 to 51.00
7.05 to 7.1	51.00 to 52.00
7.1 to 7.50	52.00 to 53.00
7.50 to 10.50	53.00 to 60.0
10.50 to 14.10	

Note:

- Even if the present frequency information is used, factors such as rain on the antenna may increase the Standing Wave Radio. In this a case, tune the frequency again until the Standing Wave Radio drops.

CHANGING THE ANTENNA BEHAVIOR FOR RECEPTION

You can pass received signals through the internal antenna tuner. If the internal antenna tuner is active, reception interference from adjacent frequencies may be reduced.



1 Press **[ADV.]** (F) from the **Menu** screen to open the **Advanced Menu** screen.

2 Access Menu 10, "Antenna Tuner during RX".

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

4 Press **[-]** (F4) or **[+]** (F5) to select "On" or "Off".
The default is "Off" (not using the internal antenna tuner during reception). Selecting "On" allows the use of the internal antenna tuner during reception.

5 Press [ ] (F1).

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

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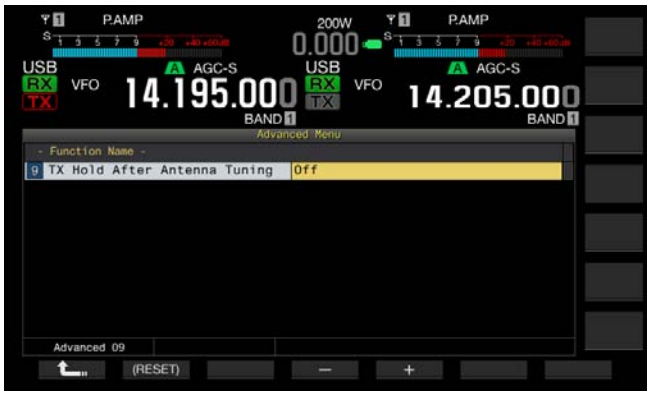
Note:

- If Full Break-in for use in CW mode is active, the antenna tuner for reception can be active regardless of the above configuration.
- If the band for transmission and reception during the Split operation differs, the antenna tuner does not behave regardless of the above configuration.

TRANSMIT HOLD AFTER ANTENNA TUNING COMPLETES

You can continue transmitting even after the antenna tuning completes.

1. Press **[ADV.]** (F) from the **Menu** screen to open the **Advanced Menu** screen.
2. Access Menu 09, "TX Hold After Antenna Tuning".
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.

CONFIGURING THE STEREO HEADPHONES OUTPUT

CONFIGURING THE MIX BALANCE OF THE STEREO HEADPHONES OUTPUT

You can adjust the mixing balance of the received audio between the left and right channels, for operation with stereo headphones.

1. Select Group No. 1, "Audio Performance", from the **Menu** screen.
2. Access Menu 07, "Headphones Mixing Balance".
3. Press **[SELECT]** (F4) to allow editing of the parameter box.
4. Press **[-]** (F4) or **[+]** (F5) to configure the mix balance from the available range "0" to "10".
   - The default is "10". The received audio in the main band and the received audio in the sub band are equally distributed.
   - If "0" has been configured for menu 1-07 "Headphones Mixing Balance", the received audio in the main band and the received audio in the sub band are completely separated for the left and right channels.
   - If "Off" has been configured for menu 1-08 "Headphones Left/Right Reverse", the received audio in the main band will be allocated to the left channel, and the received audio in the sub band will be allocated to the right channel.
   - Increasing the configured value causes the level of the audio in one channel mixed with the audio in other channel to also be increased.
5. Press [↩] (F1).
6. Press **[MENU]** to exit.

Note:

- Following the configuration in Menu 1-08, "Headphones Left/Right Reverse", the channel that mainly emits the received audio of the main band can be swapped.

SWAPPING THE RIGHT AND LEFT OUTPUT OF THE HEADPHONES

You can reverse the audio of the **PHONES** jack left and right channels.

1. Select Group No. 1, "Audio Performance", from the **Menu** screen.
2. Access Menu 08, "Headphones Left/Right Reverse".
3. Press **[SELECT]** (F4) to allow editing of the parameter box.

4. Press **[-]** (F4) or **[+]** (F5) to select "Off" or "On".
   Following is the example of configuration when "0" has been configured for Menu, "Headphone Mixing Balance".

Configuration	Left Channel	Right Channel
Off	Received Audio in the Main Band	Received Audio in the Sub Band
On	Received Audio in the Sub Band	Received Audio in the Main Band

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

Note:

- The wiring in the headphones jack plug determines whether the right channel audio or the left channel audio sounds from the left or right channels of the headphones.