KENWOOD

TS-850S

HF TRANSCEIVER
INSTRUCTION MANUAL

TRANSCEPTOR HF
MANUAL DE INSTRUCCIONES

EMETTEUR/RECEPTEUR DECAMETRIQUE
MANUEL D'UTILISATION

KENWOOD CORPORATION

©PRINTED IN JAPAN B62-0062-20(E, M, P)(MC)
94/12 11 10 9 8 7 6 5 4 3 2

Thank you for purchasing this new transceiver.

IMPORTANT
Please read this Instruction Manual carefully before placing the transceiver in service.

SAVE THIS INSTRUCTION MANUAL.

The following explicit definitions apply in this manual:
Note : If disregarded, inconvenience only, no risk of equipment damage or personal injury.
Caution : Equipment damage may occur, but not personal injury.

This Instruction Manual covers the TS-850S, with and without AT (Automatic Antenna Tuner) unit. When there are differences in operation, separate instructions will be given for each model. Illustrations show the TS-850S with AT unit.

Notice to the user:
One or more of the following statements may be applicable to 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.

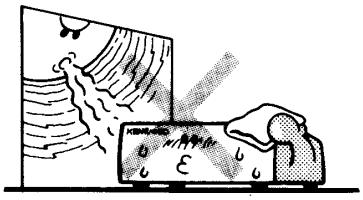
Information to the digital device user required by the FCC:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits

CONTENTS

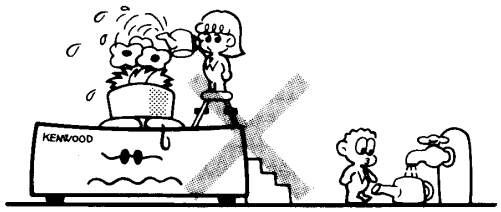
1. ⚠ WARNING BEFORE OPERATION

TO PREVENT ELECTRIC SHOCK, FIRE AND OTHER INJURY. PLEASE NOTE THE FOLLOWING:

Do not place this unit, where it will be exposed to direct sunlight or close to heating appliances.

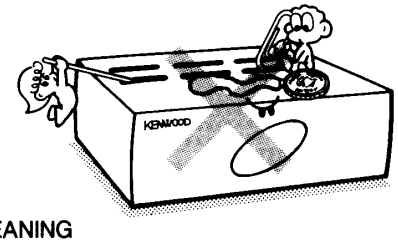


Do not place anything on top of the cabinet.



To ensure good ventilation, do not put anything on top of the cabinet and allow at least 15 cm (6 inches) of space behind the unit.

Do not drop pieces of metal, needles, coins and other electrically conductive materials into the unit.



CLEANING

1. Turn the power off, before cleaning the unit.
2. Do not use any type of abrasive pad, thinner, benzine or any substances which may damage the unit.
3. Wipe the front panel and other exterior surfaces of the unit with a soft dry cloth or a soft cloth lightly moistened with water.

2. SPECIFICATIONS AND ACCESSORIES

2-1. SPECIFICATIONS

Specifications \ Model			TS-850S
General	Mode		J3E(LSB, USB), A1A(CW), A3E(AM), F3E(FM), F1A(FSK)
	Memory Channels		100
	Antenna impedance		50 ohms With AT-850 Antenna Tuner 20~150 ohms
	Power requirement		12 to 16 VDC (13.8 VDC reference)
	Grounding		Negative
	Current drain	Receive mode with no input signal	2A
		Transmit mode	20.5A
	Operating temperature		−10°C to +50°C (+14°F to + 122°F)
	Frequency stability		Less than ±10 PPM
	Frequency accuracy		Less than ±10 PPM
	Dimensions [W×H×D] (Projections included)		339×135×375mm (13-11/32"×5-5/16"×14-3/4")
	Weight	With AT unit	10.9kg (24lbs)
		Without AT unit	9.4kg (20.7lbs)
Transmitter	Frequency range	160m band	1.8 to 2.0 MHz
		80m band	3.5 to 4.0 MHz
		40m band	7.0 to 7.3 MHz
		30m band	10.1 to 10.15 MHz
		20m band	14.0 to 14.35 MHz
		17m band	18.068 to 18.168 MHz
		15m band	21.0 to 21.45 MHz
		12m band	24.89 to 24.99 MHz
		10m band	28.0 to 29.7 MHz
	Output power	SSB, CW, FSK, FM MAX	100W**
		SSB, CW, FSK, FM MIN	20W
		AM MAX	40W
		AM MIN	10W
	Modulation	SSB	Balanced modulation
		FM	Reactance modulation
		AM	Low level modulation
	Spurious radiation		Less than −60dB
	Carrier suppression (with 1.5kHz reference)		More than 40dB

Specifications / Model				TS-850S
Transmitter	Unwanted sideband suppression (with 1.5kHz reference)			More than 40dB
	Maximum frequency deviation (FM)			Less than ±5kHz
	Frequency response (−6dB)			400 to 2600Hz
	XIT variable range		10 Hz step	More than ±1.2kHz
			20 Hz step	More than ±2.4kHz
	Microphone impedance			600Ω
Receiver	Circuitry			Triple conversion superheterodyne
	Frequency range			100kHz to 30MHz
	Intermediate frequency			1st : 73.05MHz, 2nd : 8.83MHz, 3rd : 455kHz
	Sensitivity	SSB, CW, FSK (at 10dB S + N/N)	100kHz~500kHz	Less than 0.2 μV
			500kHz~1.62MHz*	Less than 4 μV
			*1.62MHz~24.5MHz	Less than 0.2 μV
			24.5MHz~30MHz	Less than 0.13 μV
		AM (at 10dB S + N/N)	100kHz~500kHz	Less than 2 μV
			500kHz~1.62MHz*	Less than 32 μV
			*1.62MHz~24.5MHz	Less than 2 μV
			24.5MHz~30MHz	Less than 1.3 μV
		FM (at 12dB SINAD)	28MHz~30MHz	Less than 0.25 μV
	Selectivity		SSB, CW, FSK	−6dB:2.4kHz, −60dB:3.8kHz
			AM	−6dB:6kHz, −60dB:15kHz
			FM	−6dB:12kHz, −60dB:24kHz
	Image ratio			More than 80dB
	1st IF rejection			More than 80dB
	Notch filter attenuation			More than 40dB
	RIT variable range		10 Hz step	More than ±1.2kHz
			20 Hz step	More than ±2.4kHz
	Squelch sensitivity	SSB, CW, FSK, AM	100kHz~500kHz	Less than 2 μV
			500kHz~1.62MHz*	Less than 20 μV
			*1.62MHz~30MHz	Less than 2 μV
		FM	28MHz~30MHz	Less than 0.25 μV
	Output			1.5W across 8 ohms load (10% distortion)
	Output load impedance			8 ohms

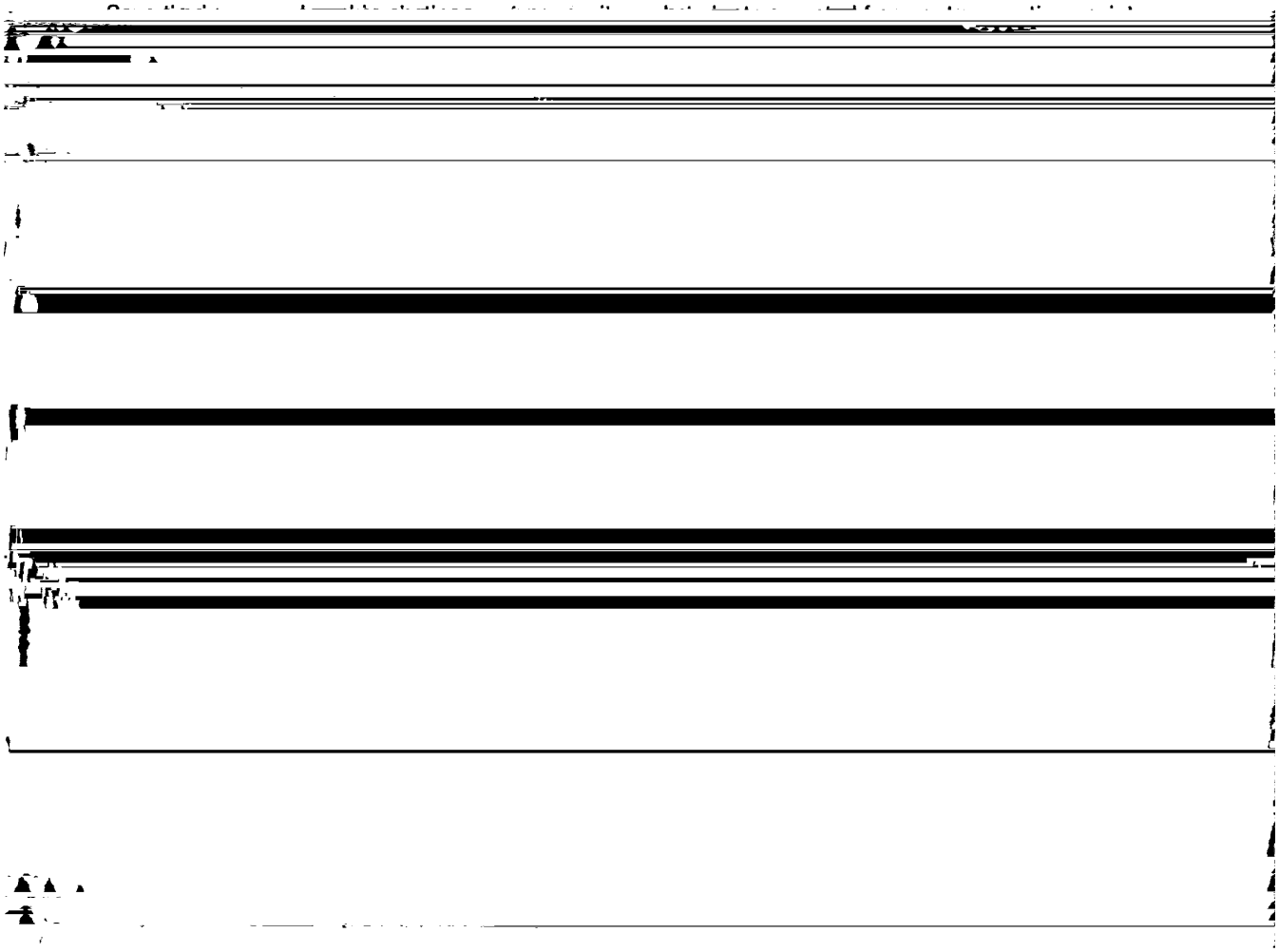
Notes
1. Circuit and ratings are subject to change without notice due to advancements in technology.
2. Remember to keep the transmit output power within the power limitations of your license.
3. * : The U.S.A. version is 1.705 MHz.
4. ** : With auto antenna tuner in "THRU" or bypass position.

2-2. ACCESSORIES

Unpack your TS-850S carefully and confirm that it is supplied with the following accessories.

Dynamic microphone	T91-0352-15	1 ea.
DIN plug (7-pin)	E07-0751-05	1 ea.
DIN plug (13-pin)	E07-1351-05	1 ea.
DC power cable assembly	E30-3035-05	1 ea.
Calibration cable	E31-2154-05	1 ea.
Fuse (25A)	F51-0011-05	1 ea.
Fuse (3A)	F06-3026-05	1 ea.
External control Instruction Manual	B62-0065-XX	1 copy
Instruction Manual	B62-0061-XX	1 copy
Warranty card (U.S.A., Canada and Europe version only)		1 ea.

After unpacking
Shipping container:



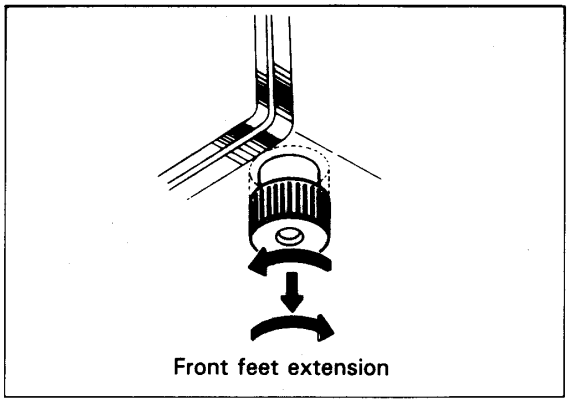
or service.

3. INSTALLATION AND CONNECTION

3-1. INSTALLATION

■FRONT FEET

By extending the front feet, the front panel can be elevated for operating convenience.
Turn the front foot left and pull down.
Then turn right to lock.

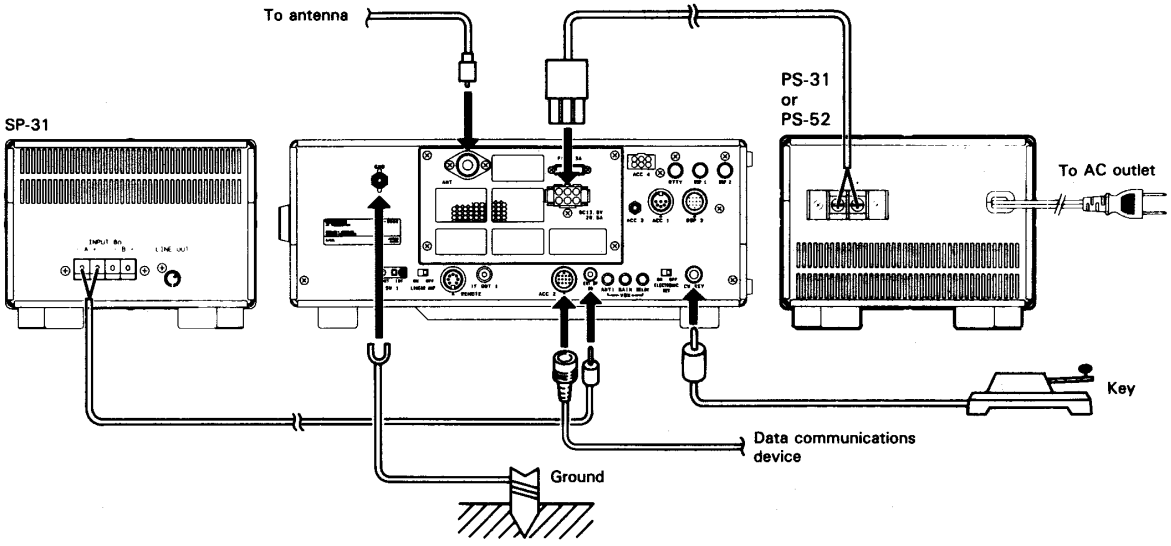


Front feet extension

3-2. CONNECTION

The TS-850S requires more than 20.5 A at 13.8 VDC when transmitting at full power. Use the PS-52 or PS-31 power supply for fixed station operation.

A. Rear Panel



(1) Antenna

Caution
Protect your equipment — Use a LIGHTNING ARRESTER.

The type of antenna that is used will greatly affect the performance of the transceiver. Use a properly adjusted antenna, of good quality, to enable your transceiver to perform at its best. The antenna input impedance is 50 ohms. Use 50-ohm coaxial cable such as 5D-2V or RG-213 / U (RG-8A / U) for this connection. If the antenna is far from the transceiver the use of low loss coaxial cable, such as 5D-2V or RG-213/U (RG-8A/U) are recommended. Match the impedance of the coaxial cable and that of the antenna so that the SWR is less than 1.5 to 1. The protection circuit in the transceiver will activate if the SWR is particularly poor (greater than 3 to 1). High SWR value will cause transmitter output to drop, and may lead to TVI or BCI reports.

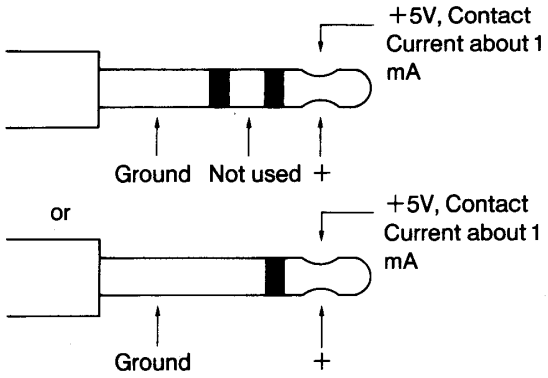
(2) Grounding

Caution

(4) Key connection

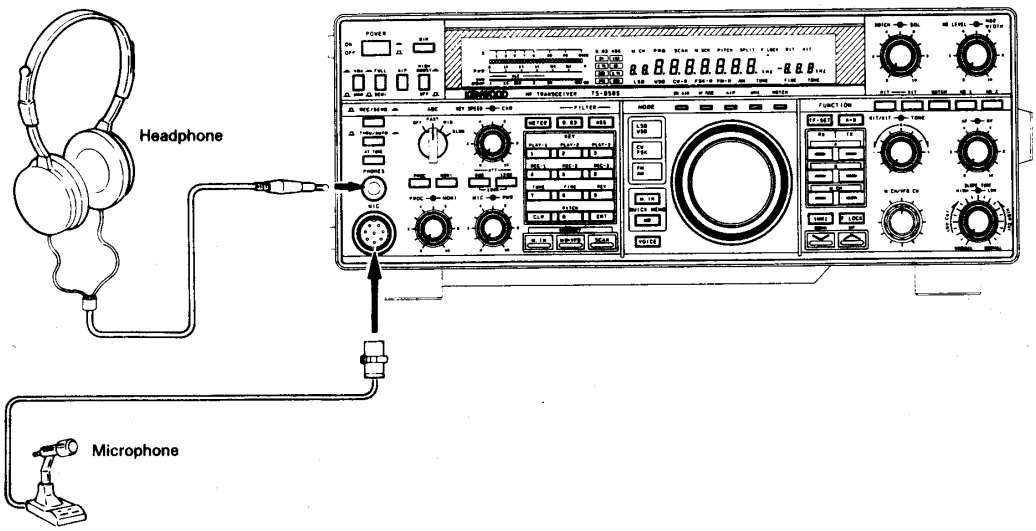
Your key should be connected as illustrated in the figure below. When using an electronic keyer, make sure that polarity is set for positive. Always use shielded line from the key to transceiver. (diameter 6.0 mm)

■To use external straight key



Note
Check the polarity of the plug when you use an

B. Front Panel



(1) Headphones

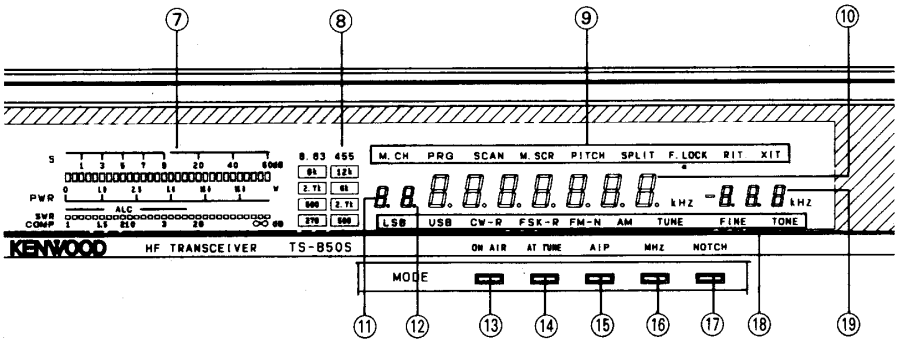
Any low-impedance (4-16 ohms) headphone may be used with the transceiver. Connect the headphones to the front panel PHONES jack. (diameter 6.0 mm). The optional HS-5 or HS-6 headphones are best

(2) Microphones

Any microphone with an impedance to 600Ω may be used with this transceiver. The KENWOOD microphones MC-43S (handheld), MC-60A, MC-80, MC-85 (table-top type) are recom-mended.

[redacted]

headphones can also be used.



⑦ Meter
During receive the meter is used as an S-meter. During transmit the meter is used as a POWER meter, and is controlled by the METER key, and provides either VSWR, COMP level or ALC level readings.

⑫ Memory Channel Lockout Indicator
The ● display indicates the Memory Channel currently in the display will be skipped during Memory Channel scan.

⑬ ON AIR indicator

[redacted]

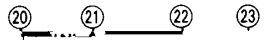
Note
One or two segments of the S meter may light when there is no signal, due to atmospheric noise.

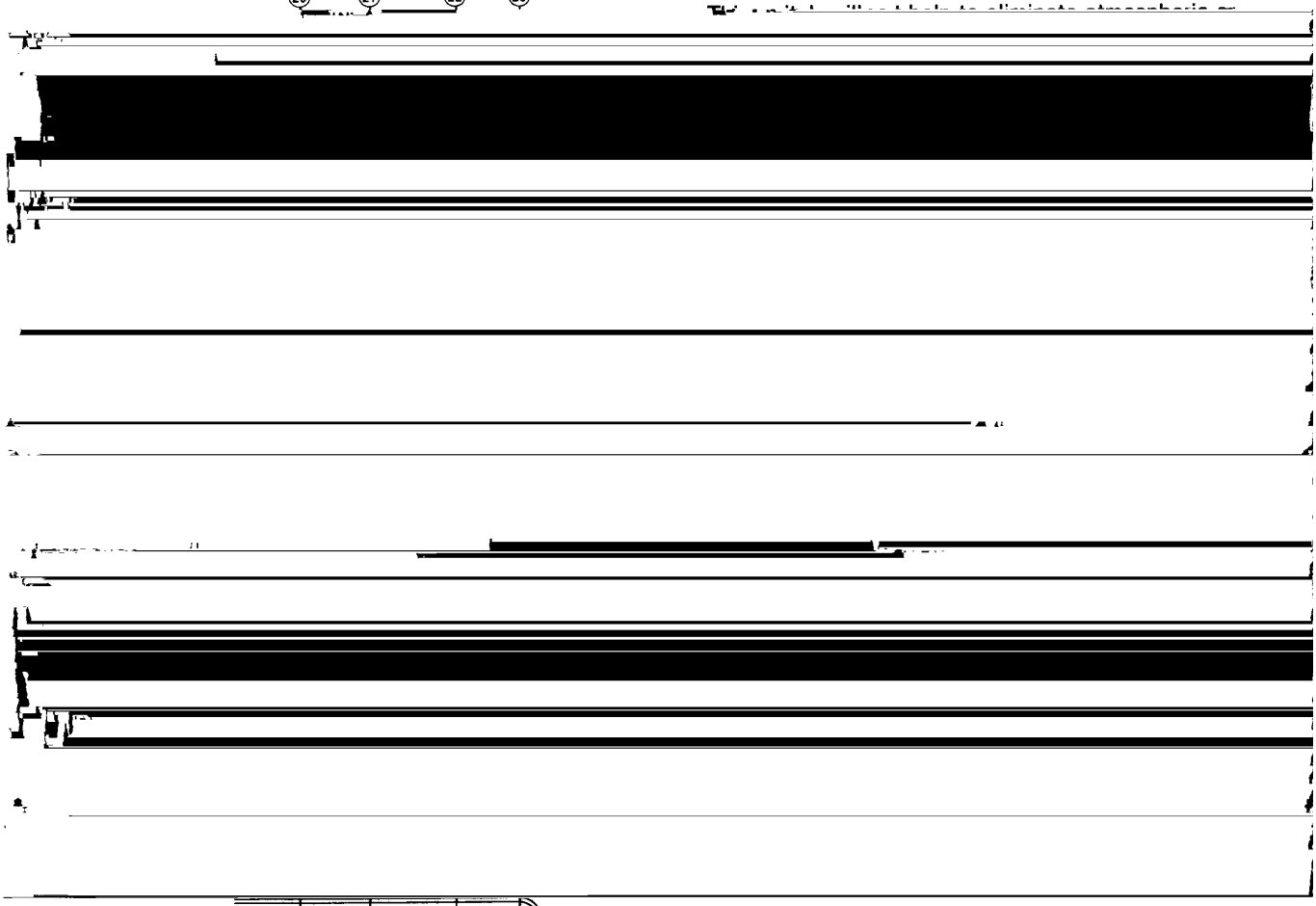
⑧ Filter indicators
Indicates which filters have been selected.

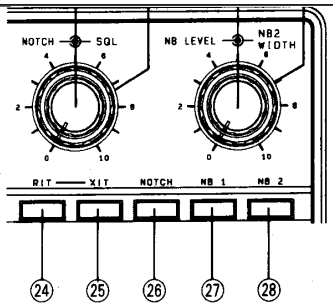
⑭ AT TUNE (Antenna Tuner) indicator
Lights to show that the automatic antenna tuner is in operation. Do not attempt to operate further until it goes off.

⑮ AIP(Advanced Intercept Point) indicator
Lights when the AIP switch is ON.

⑲ RIT/XIT frequency display
Shows the amount of RIT/XIT offset to the nearest 10 Hz. Minus "−" appears in the display when the RIT / XIT offset is below the transmit / receive frequency.
Shows the scan speed during scanning.







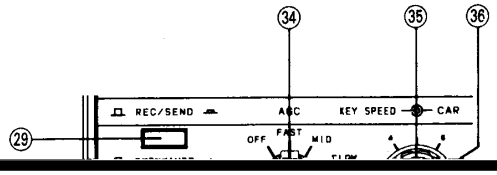
⑳ NOTCH control
The NOTCH function is used to reduce or eliminate heterodyne, or CW type signals. The NOTCH filter will not be effective against SSB, AM or FM type signals.

㉑ SQL (Squelch) control
This control is used to eliminate atmospheric noise, and receiver static noise during no signal periods. Slowly rotate the control clockwise to the point where the ambient noise just disappears, and the

Note
This switch is disabled during FM operation.

㉗ NB 1 switch
For pulse type noise, such as generated by automotive ignition systems, turn the NB 1 switch ON.

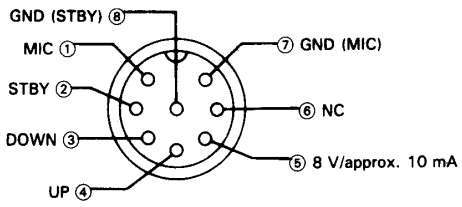
㉘ NB 2 switch
Noise blanker 2 is used for long duration pulse noise, like the "woodpecker". To reduce "woodpecker" radar noise interference, set switch NB 2 to the ON position (NB 2's effectiveness depends on the specific type of interference). If you use NB 2 for short duration pulse noise, the receive signal may become distorted, making it difficult to hear.
Unfortunately no noise blanker can remove all different types of interference; but the two noise blankers that have been provided in the TS-850 are effective in most cases.
If there is no "woodpecker" present, the switch should be in the OFF position.



tuner will be engaged and the tuner will try to match the antenna.

㉜ PHONES jack
Output terminal for headphones.

㉝ MIC jack
Microphone connection.



MIC connector (Front view)

㉞ AGC switch
This switch selects the operating time constant of the AGC (Automatic Gain Control) circuit. When the AGC switch is set to SLOW, the receiver gain and S-meter readings will react slowly to large input changes, and when set to FAST, the receiver gain and S-meter will react quickly to changes in the

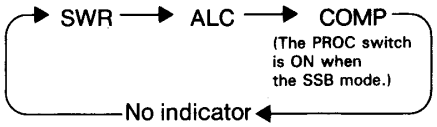
㊴ PROC (Processor) switch
Effective transmit power output will increase when the PROC switch is turned ON during SSB mode operations.

㊵ PROC (Processor) control
Adjust the PROC control while speaking into the microphone in a normal tone of voice, for a peak COMP scale reading of no more than 10 dB. Do not overdrive the COMPRESSOR.
Over driving the compressor will deteriorate voice quality, increase transmitter noise level, and in general make copying your signal more difficult.

㊶ MONI (Monitor) control
This controls the volume of the transmit monitor.
This control is operational in the SSB and FSK mode.

㊷ MONI (Monitor) switch
Allows monitoring of your transmit signal.
This control is operational in the SSB and FSK mode.

㊸ MIC gain control
Microphone gain can be adjusted during SSB and



SWR : Indicates voltage standing wave ratio (VSWR).

ALC : Indicates internal ALC voltage, or the ALC voltage fed back from a linear amplifier connected to this transceiver.

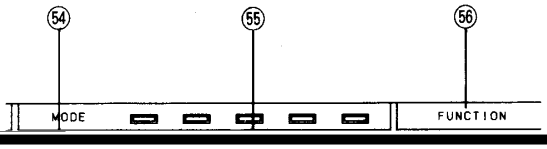
COMP : Indicates compression level during speech processor operations. Do not exceed 10 dB of compression. The PROC switch is ON when the SSB mode.

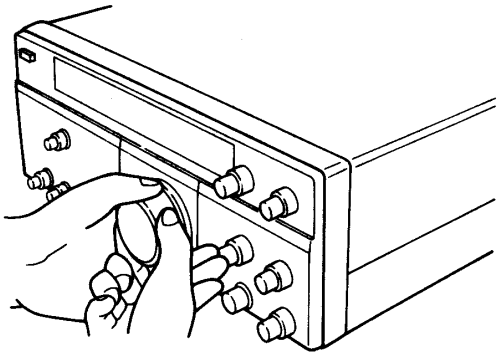
㊻ 8.83 FILTER key

㊶ M.IN key
Used to enter data into a memory channel.

㊷ M▶VFO key
Used to transfer a frequency from memory to the VFO.

㊸ SCAN key
Pressing during VFO operation will initiate program scan, and pressing during memory operation will initiate memory scan.





⑤⑥ FUNCTION keys

TF-SET key

Depressing this key will allow you to rapidly set or check the transmit frequency, during SPLIT operations, without the need of actually transmitting.

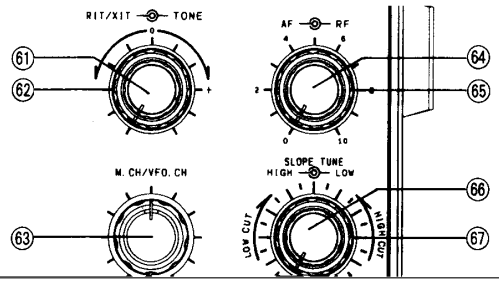
⑤⑨ VOICE key

Press this key to activate the optional voice synthesizer unit VS-2.

⑥⓪ UP/DOWN switch

Pressing the UP switch increases the frequency, and pressing the DOWN switch decreases it.

When the function setting at power on is on, this switch changes the setting.



The standard position is with the control turned fully clockwise. As the control is turned counterclockwise, high frequencies are cut.

⑬ M.CH/VFO CH control
This control is used to select the desired memory channel during Memory Channel Operation.
This control is also used to change the frequency in 10 kHz steps during VFO operations.
The control is also used to select the desired power on function you wish to change. See section 4-10-15.

⑭ AF gain control
Turn the knob to increase or decrease the volume. Clockwise rotation increases the volume and counterclockwise rotation decreases the volume.

> Note
> The output level of the "Beep" and "Sidetone" are not affected by adjusting of the AF gain control.

⑮ RF gain control
This control adjusts the gain of the receiver high-frequency amplifier section.
For normal receiver performance, and maximum gain, this control should be all the way to the right. If you are having trouble copying the desired signal make a note of the stations peak S-meter reading. Then, adjust the RF gain control left, so that the meter needle is stationary at this level. Now, all signals that were less than the desired signal will be attenuated, such as static noise, etc., making reception easier.
If the incoming signal pegs the S-meter you can also reduce the receiver gain by moving the RF gain control to the left. The S-meter pointer will always advance up-scale as the RF gain control is moved, to indicate that the gain has been reduced.

Simultaneous use of the RF gain control and AGC switch
If a strong signal (such as a local station) appears in the vicinity of the intended receive signal, the S-meter may show unusual deflection due to the AGC voltage developed from the strong disturbing signal. If this occurs, move the RF gain control to the left so the meter pointer remains at about the original deflection peak and turn the AGC switch to the FAST position. This will reduce the unwanted AGC voltage and permit clear reception.

> Note
> This control is disabled during FM operation.

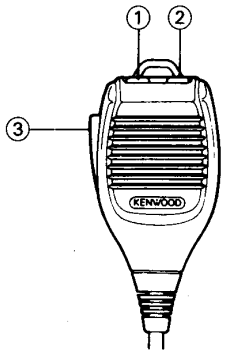
⑯ SLOPE TUNE HIGH CUT control
Adjust the HIGH CUT control counterclockwise, and interference from signals higher than the operating frequency will be reduced. The high-frequency components of the resulting receiver audio will also be reduced.

> Note
> This control is disabled during FM operation.

⑰ SLOPE TUNE LOW CUT control
Adjust the LOW CUT control clockwise, and interference from signals lower than the operating frequency will be reduced. As with the HIGH CUT control, use of the LOW CUT control will also affect the audio frequency passband. In this case the low frequency components of the audio signal will be reduced.

> Note
> This control is disabled during FM operation.

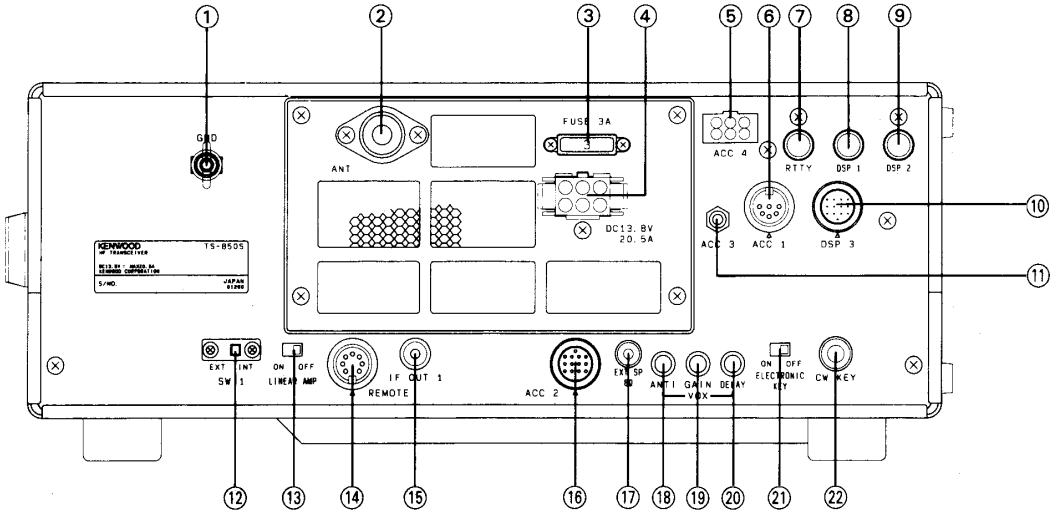
■Microphone



①②UP/DWN(Up/Down) switches
These switches are used to step the VFO frequency or memory channel up and down. The frequency will change continuously if the switches are pressed and held.

③ PTT (Push To Talk) switch
The transceiver will be placed into Transmit whenever this switch is pressed.

4-1-2. Rear Panel



① GND (Ground) terminal
To prevent electric shock, as well as RFI and BCI, connect the transceiver to a good earth ground.

② ANT (Antenna) connector
This connector should be attached to a suitable antenna for transmitting and receiving. The antenna cable should be 50-ohm coax, terminated with a PL-259 connector.

③ FUSE
Power fuse for the ACC 4 connector.

④ DC power connector
This is used to connect the DC power supply.

⑤ ACC 4 connector
The optional AT-300 may be connected here.

⑥ ACC 1 connector
The optional DSP-100 or the optional IF-232C is connected here.

⑦ RTTY terminal
For connection to an RTTY interface unit. (direct FSK keying) The terminal is equipped the short pin plug for the factory.

⑧ DSP 1 terminal
The optional DSP-100 is connected here.

⑨ DSP 2 terminal
The optional DSP-100 is connected here.

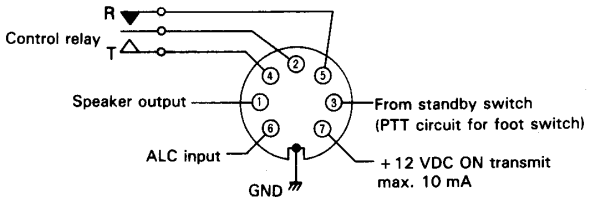
⑩ DSP 3 connector
The optional DSP-100 is connected here.

⑪ ACC 3 terminal
This is used to connect the remote controller.

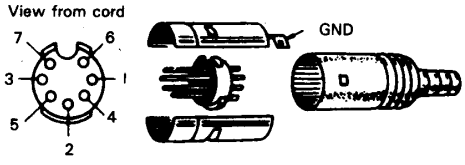
⑫ SW 1 switch
This transceiver has a cover on the back to protect against misoperation. To connect the external antenna tuner to this unit, remove the cover and slide switch SW1 to EXT. The built-in antenna tuner will then not operate.

⑬ LINEAR AMP switch
Activates the internal keying relay for linear amplifier control.

⑭ REMOTE connector
This connector is used when a linear amplifier is used.

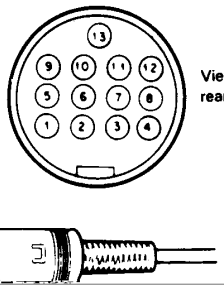


Internal wiring



⑮ IF OUT 1 terminal
This terminal is for the band scope of the station monitor.
IF 1 is for connection to the SM-230 for Pan Display. (8.83 MHz)

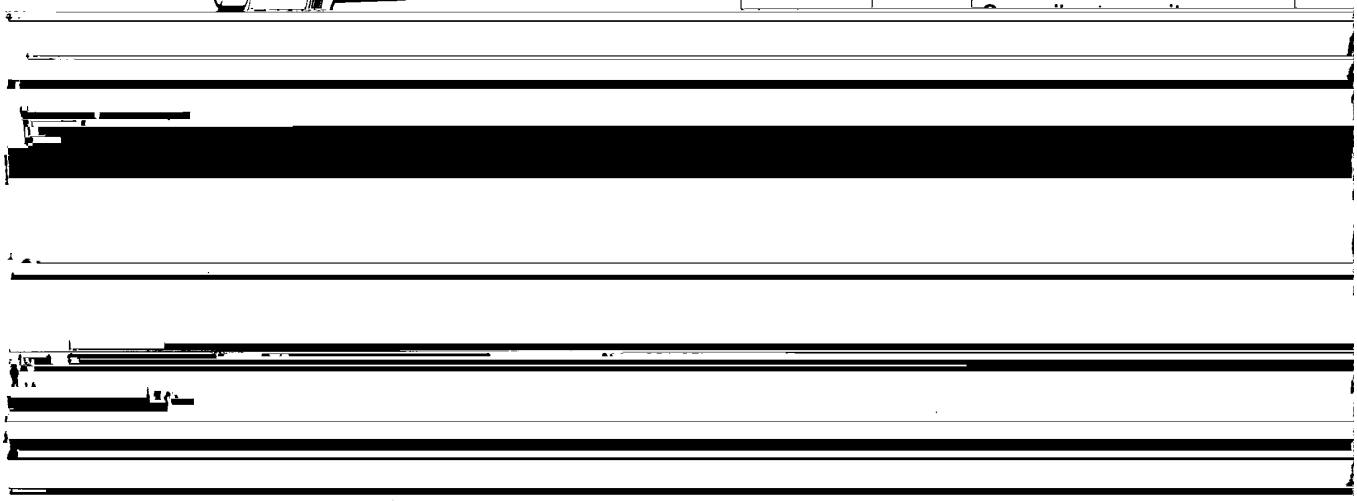
⑯ ACC 2 connector
Terminal numbers and their applications are as follows :



View from the rear panel.

ACC2 pin assignments

Pin number	Symbol	Use
11	PKD	This is the MIC (microphone) input pin from the terminal unit. The input level is approximately 20 mV.
12	GND	Grounding (The shielded wire of the audio output terminal is connected here.)
13	SS	Standby terminal.



ACC2 pin assignments

Pin number	Symbol	Use
1	NC	No connection
2	NC	No connection
3	ANO	The receiver audio at a fixed level independent of AF gain control setting. Output voltage : 300 mV / 4.7kΩ or more at high input level
4	GND	Grounding (The shielded wire of the audio output terminal is connected here.)
5	PSQ	This pin is used for connecting a TNC (Terminal Node Controller) for use with packet radio. It is the Squelch Control terminal and will not allow packet communications while squelch is off.
6	Output voltage pin for S-meter.	Output voltage varies with S-meter indication.
7	NC	No connection
8	GND	Grounding

⑰ EXT SP (External speaker) jack
This jack is for connection of an external speaker.

⑱ ANTI control
VOX operations are sometimes difficult with high speaker volume control settings. The ANTI control is used to reduce the tendency of the VOX to activate from inputs from the speaker. The ANTI control is not active when headphones are connected.

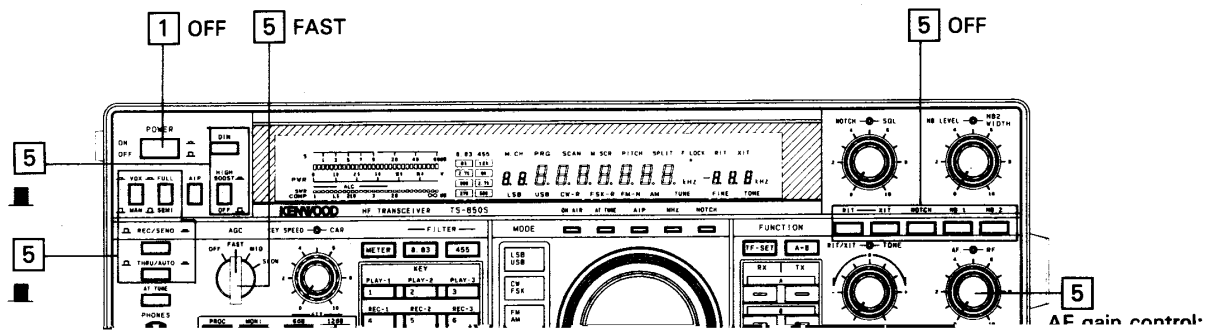
⑲ GAIN control
This control adjusts the sensitivity of VOX amplifier. Adjust this control for your personal preference.

⑳ DELAY control
This control adjusts how long the transceiver will remain keyed after voice input has stopped.

㉑ ELECTRONIC KEY switch
Turns the electronic keyer on or off. Turn the switch off when CW is initiated by a straight key or when using an external electronic keyer.

㉒ CW KEY jack
Using shielded line, connect a 6.0mm diameter phone plug to this jack for CW operation. Connect a paddle type key to the key jack use a 6.0mm diameter stereo plug. Open-terminal voltage is approximately 5 VDC. (See Section 4-4 for additional key information.)

4-2. INITIAL SETTING



4-3. SSB OPERATION

ATT switch
This switch allows attenuation of the input signal by 6, 12 or 18 dB.

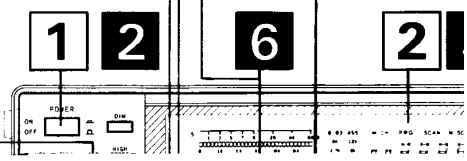
METER key
Used to select the meter function in tran

HIGH BOOST switch
The high-frequencies of the transmit audio signal are emphasized.

FILTER key
Changes the IF selectivity.

AIP switch
When switched on, it reduces interference from strong signals.

VOX/MAN switch
Used to operate VOX.



esired
it.

filter

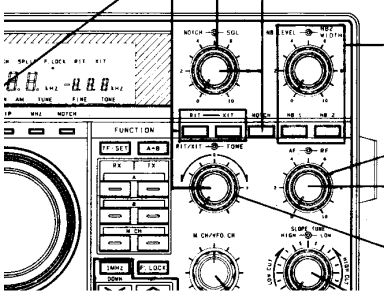
MODE key
Press the LSB / USB key to alternate between LSB and USB.

RIT/XIT switch/control

SQL(Squelch) control

NOTCH switch/control

NB switch/control
NB 1 : For pulse type noise, such as generated by automotive ignition systems.
NB 2 : Noise blanker 2 is used for long duration pulse noise, like the "woodpecker".



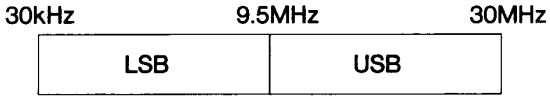
RF gain control
This control should be all the way to the right.

5

TONE control

4-3-1. SSB AUTO mode shift

This transceiver automatically selects the appropriate sideband when in the SSB mode.



Notes
1. USB is selected for 9.5 MHz and above.
2. The AUTO mode selection will not function when using RIT.

4-3-2. Speech Processor

The Speech Processor is used when signals from your station are weak at the distant station.
During SSB operation (especially DX operations), it may be desirable to increase the relative "talk-power" of the transmitter by using the speech processor circuitry. This may make the difference between a marginal, and a copyable signal.

●Operation

Turn the PROC switch ON and place the METER switch to COMP. Adjust the PROC control while speaking into the microphone in a normal tone of voice, for a peak COMP scale reading of no more than 10 dB. Do not overdrive the COMPRESSOR. This will deteriorate voice quality, increase transmitter noise level, and in general make copying your signal more difficult.
Next, set the METER switch to ALC and adjust the MIC gain control while speaking into the microphone. Ensure that the meter deflection is within the ALC zone!

4-4. CW OPERATION

AIP switch
When switched on, it reduces interference from strong signals.

FULL/SEMI switch
During CW operation, selects either Full Break-in (FULL) or Semi Break-in (SEMI).

VOX/MAN switch
Used to select Break-in operation.

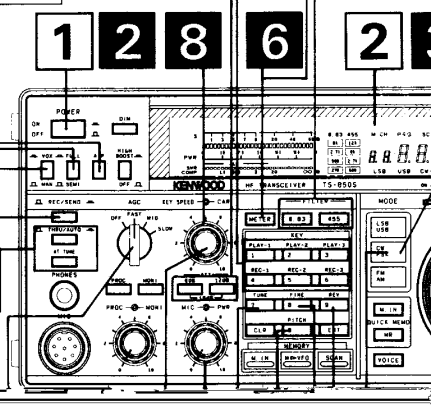
THRU/AUTO switch
THRU: Antenna tuner is off.
AUTO: Antenna tuner is on.

PLAY, REC keys
Records and plays CW messages for transmission.

ATT switch
This switch allows attenuation of the input signal by 6, 12 or 18 dB.

MET
Used
mete

FILT
Char
selec



R key
to select the desired function in transmit.

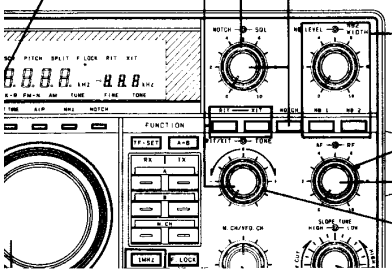
R key
es the IF filter vity.

MODE key
Press the CW / FSK key to alternate between CW and FSK.

RIT/XIT switch/control

SQL(Squelch) control

NOTCH switch/control



NB switch/control
NB 1 : For pulse type noise, such as generated by automotive ignition systems.
NB 2 : Noise blanker 2 is used for long duration pulse noise, like the "woodpecker".

RF gain control
This control should be all the way to the right.

5

TONE control
Turn the control to increase

ELECTRONIC KEY switch
Turns the electronic keyer on or off. Turn the switch off when

4-4-1. CW zero-beat Operation

In CW operation equalizing the receiving frequency

You can forceable change the ratio to you own personal preference or you can select AUTO-

Note
With either SEMI or FULL break-in operation, cross band / cross mode operation is not possible. Additionally, when you are using FULL break-in you should not work cross band splits, only in the same band.

This transceiver also provides a sidetone oscillator circuit to allow monitoring of your CW signal during transmission.

(a) Semi-automatic break-in
Depressing the CW key will automatically place the transceiver into the transmit mode. Transmit mode will be maintained for a period determined by the setting of the DELAY control on the front panel of the transceiver, even after the CW key is released.

(b) Full-automatic break-in
Depressing the CW key will automatically place the transceiver into the transmit mode. Releasing [redacted] immediately enabling reception between characters.

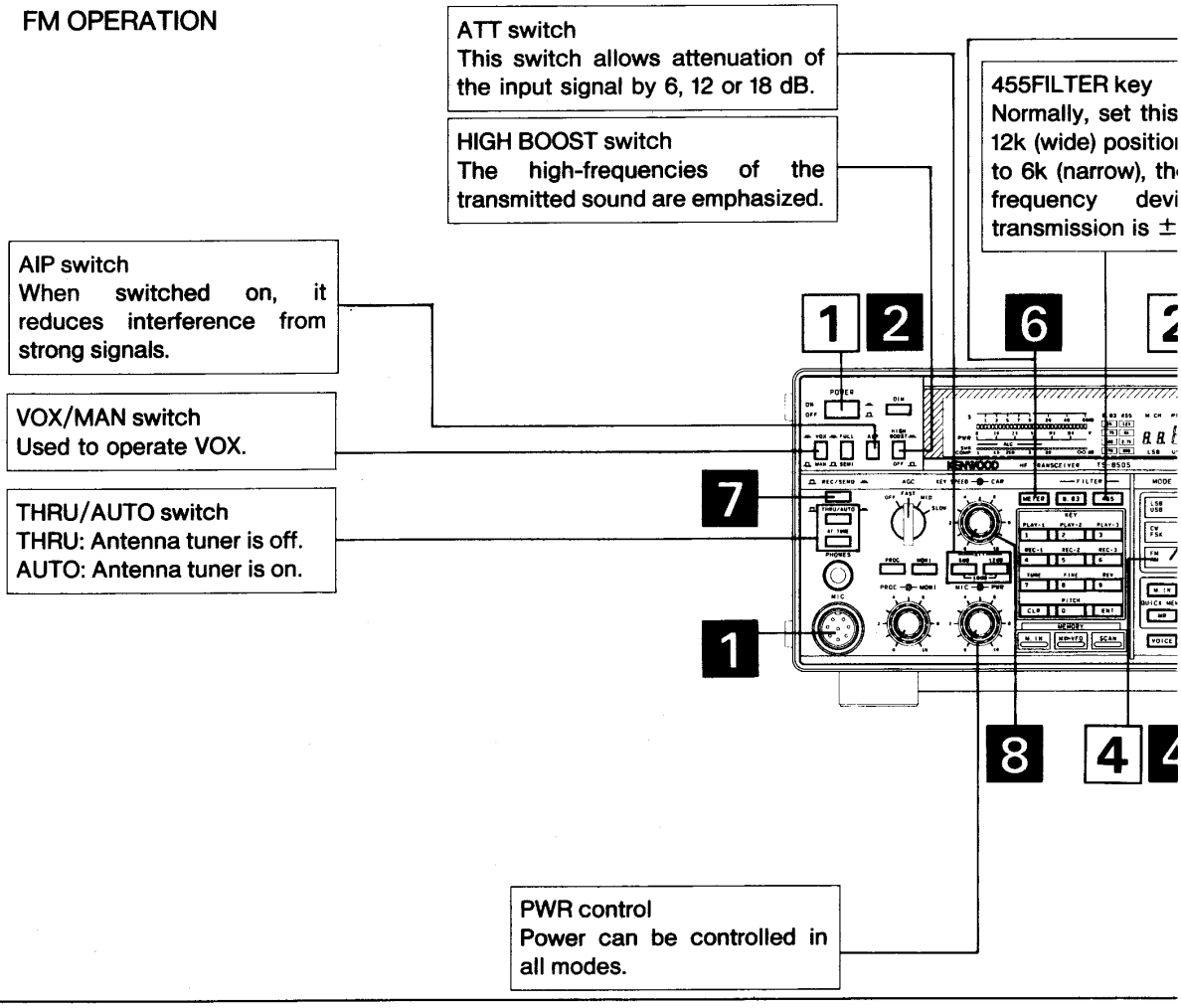
Cautions
1. The TL-922 / 922A linear amplifier is not designed for full break-in type operation. Attempting to use this accessory in the FULL break-in mode may cause damage to the linear amplifier.
2. The switching time between transmit and receive decreases as you increase your keying speed. This limits the maximum keying speed that is available during FULL break-in operation. When using high speed CW you should use SEMI break-in.
3. During SPLIT operations with FULL break-in, clicks may be heard in the monitoring tone or received signal depending on the combination of the transmit / receive frequencies.
4. During full break-in, the received audio that passes through the 250 Hz band CW narrow filter may click because of its delay time.
5. If the TS-850S is used with CW filter YK-88CN-1 (option) or YG-455CN-1 (option), it is not suitable for full break-in operation because it has a delay time when the signal passes through the narrow-band filter. In this case, you are recommended to perform [redacted]

■ When the electronic keyer is used as Bug key

When the electronic keyer is used as the Bug key, turn the function on with the function setting (menu number 24) at power on. (Please refer to Section 4-10-15.)

Note
When the ELECTRONIC KEY changeover switch is on, menu number 24 is displayed.

4-5. FM OPERATION



(RECEIVING)

[1] Turn on the DC power supply and then turn the transceiver's power switch ON.

[2] A frequency is shown in the display.

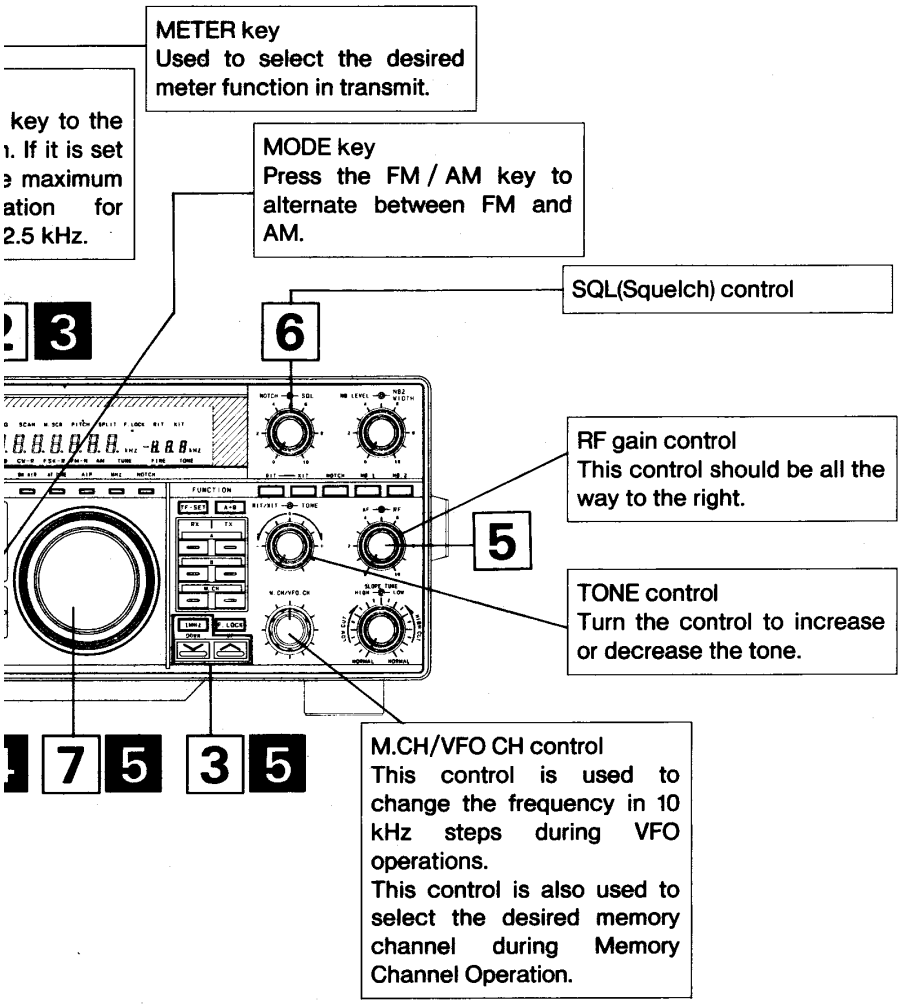
[3] Press the UP/DOWN switches to select the desired frequency within the 28 MHz amateur radio band.
When the 1 MHz step position is selected, the MHz indicator will light.

[4] Select FM with the MODE key.

[5] Turn the AF gain control clockwise until a signal or noise is heard.

[6] To eliminate the no signal noise turn the SQL control clockwise to the point the background noise just disappears
This point is known as the squelch threshold point.

[7] Rotate the TUNING knob and select an open channel.



(TRANSMISSION)

1 Connect a microphone to the MIC jack.

2 Turn on the DC power supply and then turn the transceiver's power switch ON.

3 A frequency is shown in the display.

4 Select FM with the MODE key.

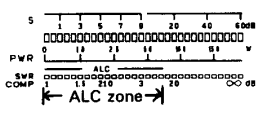
5 Enter the desired frequency within the 28 MHz amateur radio band.
Before transmitting check the frequency for activity so that you do not interrupt another QSO.

6 Press the METER key until the ALC meter lights.

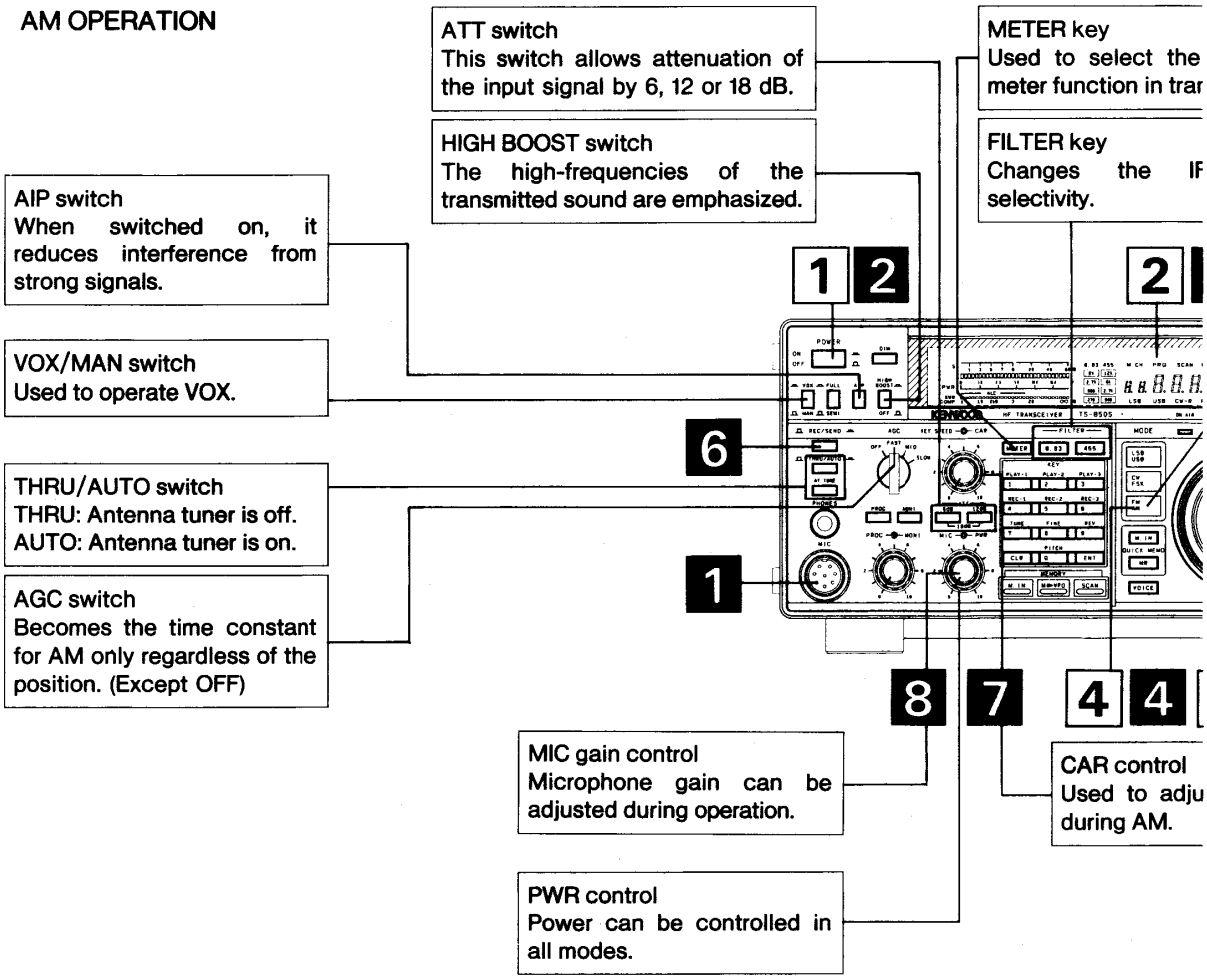
7 Press the microphone PTT switch, or set the REC/SEND switch to SEND.

8 Speak into the microphone and adjust the CAR control so that the meter deflection does not exceed the ALC zone on voice peaks.

Note
Speak into the microphone, holding the microphone about 5 cm away from your mouth. Close talking or talking too loudly may reduce transmission clarity or spread the side bands too much.



4-6. AM OPERATION



(RECEIVING)

[1] Turn on the DC power supply and then turn the transceiver's power switch ON.

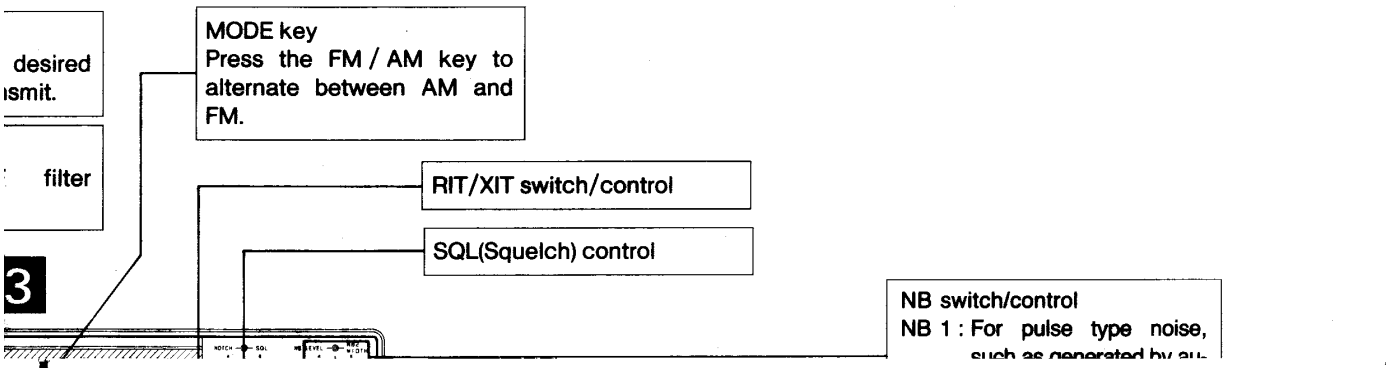
[2] A frequency is shown in the display.

[3] Press the UP/DOWN switches to select the desired frequency band.
When the 1 MHz step position is selected, the MHz indicator will light.

[4] Select AM with the MODE key.

[5] Turn the AF gain control clockwise until a signal or noise is heard.

[6] Rotate the TUNING knob and select an open channel.


desired
ısmit.
filter
3
MODE key
Press the FM / AM key to alternate between AM and FM.
RIT/XIT switch/control
SQL(Squelch) control
NB switch/control
NB 1 : For pulse type noise,

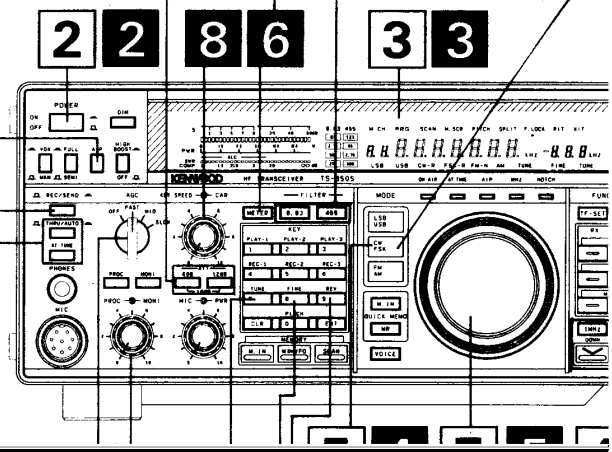
4-7. FSK OPERATION

ATT switch
This switch allows attenuation of the input signal by 6, 12 or 18 dB.

METER key
Used to select the meter function in trans

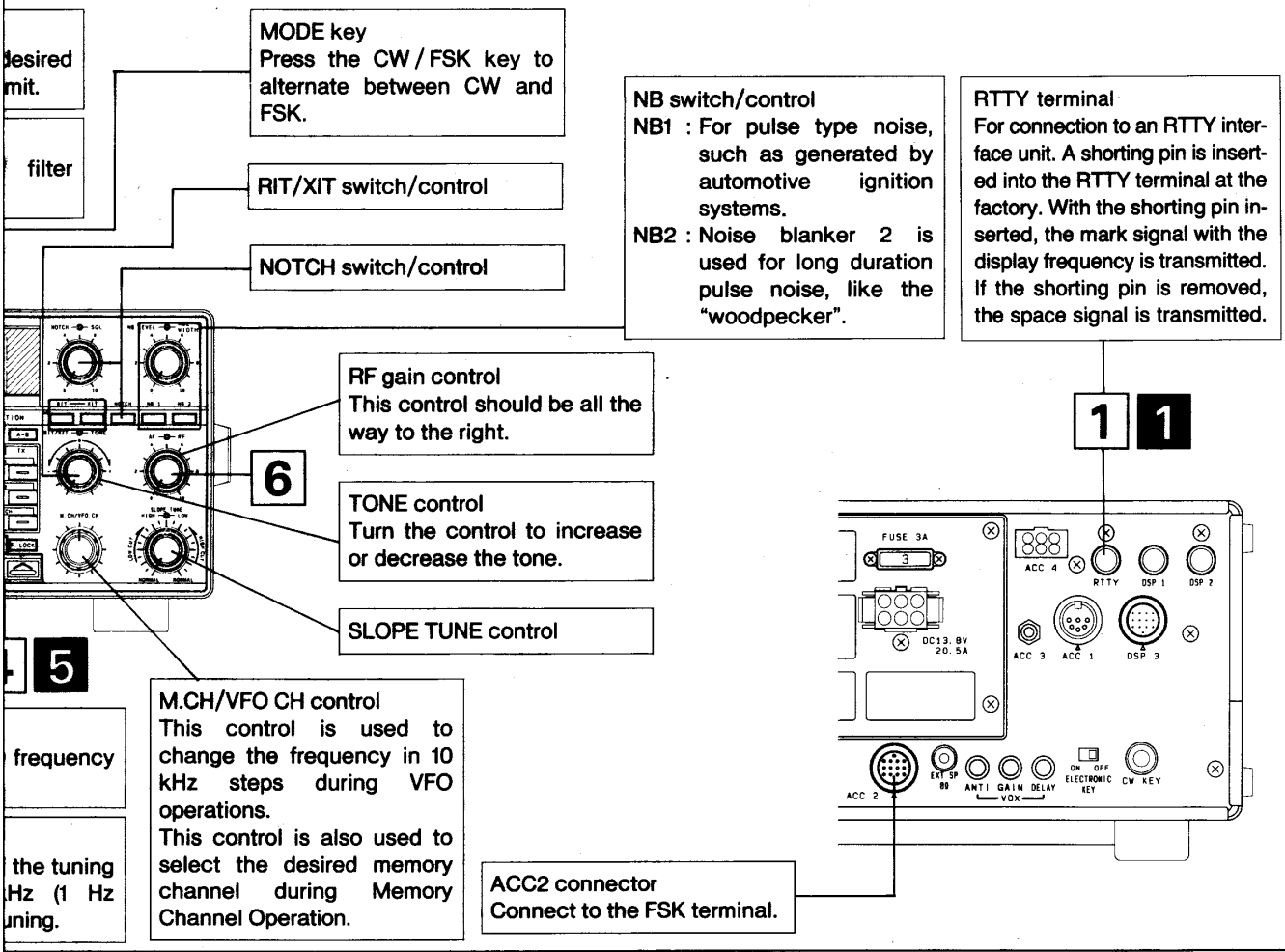
FILTER key
Changes the IF selectivity.

AIP switch
When switched on, it reduces interference from strong signals.



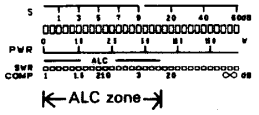
THRU/AUTO switch
THRU: Antenna tuner is off.
AUTO: Antenna tuner is on.

AGC switch



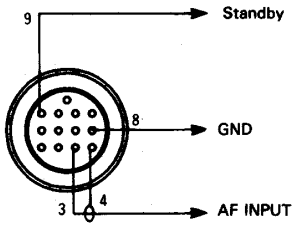
(TRANSMISSION)

1. Connect the RTTY keyboard to the RTTY terminal on the rear panel.
2. Turn on the DC power supply and then turn the transceiver's power switch ON.
3. A frequency is shown in the display.
4. Select FSK with the MODE key.
5. Enter the desired frequency.
   Before transmitting check the frequency for activity so that you do not interrupt another QSO.
6. Press the METER key until the ALC meter lights.
7. Set the REC/SEND switch to SEND. Or key the transceiver from the FSK terminal.
8. Adjust the CAR control so that the meter deflection is within the ALC zone.



9. Operate the RTTY keyboard.
10. Set the REC/SEND switch to REC or unkey the transceiver from the FSK terminal to return to the receive mode.

ACC 2 connections.



The FSK shift width is set to 170 Hz. It can be changed to 200, 425 or 850 Hz. (Please refer to Section 4-10-15.)

The FSK receive tone is set to 2125 Hz (high). It can be changed to 1275 Hz (low). (Please refer to Section 4-10-15.)

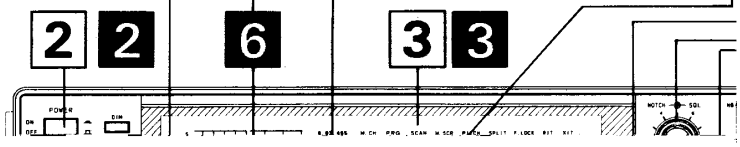
4-8. PACKET(AFSK) OPERATION

AIP switch
When switched on, it reduces interference from strong signals.

ATT switch
This switch allows attenuation of the input signal by 6, 12 or 18 dB.

METER key
Used to select the desired meter function in transmit.

FILTER key
Changes the IF filter selectivity.



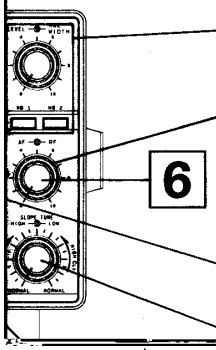
MODE key
Press the LSB / USB key to alternate between LSB and USB.

RIT/XIT switch/control

SQL(Squelch) control

NOTCH switch/control

NB switch/control
NB1 : For pulse type noise, such as generated by automotive ignition systems.
NB2 : Noise blanker 2 is used for long duration pulse noise, like the "woodpecker".

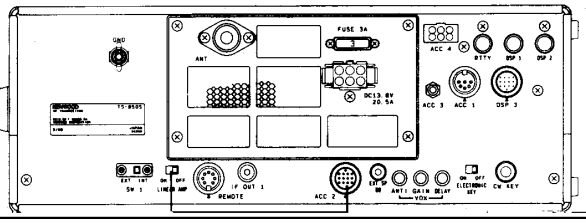


RF gain control
This control should be all the way to the right.

6

TONE control
Turn the control to increase or decrease the tone.

SLOPE TUNE control



4-8-1. RTTY

RTTY operation requires a demodulator and a teletypewriter. A demodulator including 2125 and 2295 Hz (170 Hz shift) filters, will be acceptable and [redacted]

- Normally a mark frequency is transmitted when the key is closed, and the space frequency is transmitted when the key is open. Since a shorting pin is inserted into the RTTY terminal at the factory, the mark frequency is transmitted.

4-9. AUTO ANTENNA TUNER OPERATION

2. Set the AT TUNE switch to ON.
   The transceiver switches to the CW mode, the AT TUNE indicator lights, and the unit starts tuning.

4-10. OTHER OPERATION

4-10-1. Beep Tones

Audible confirmation of various microprocessor functions is provided in the form of a series of audio beeps. The output level of the "Beeper" is adjustable with a variable resistor located inside the set. (Please refer to Section 6-6-3.)

4-10-2. Audible Mode Announcement

When a Mode key is pressed, the first character of the mode is sounded in Morse code thru the speaker. (Note that FSK is announced with an "R")

Mode	Morse Code
LSB	• — • •
USB	• • —
CW	— • — •
FSK	• — •
AM	• —
FM	• • — •

4-10-3. Alarm Function

Several alarms have been included to signal errors that you might encounter. The chart below lists the possible causes and the resulting Morse code alarm. Morse code will be heard from the speaker.

Indication	Morse Code
● When the SCAN key is pressed and the receiver is unable to execute memory scan. ● When all memory channels are full and attempt is made to find an empty channel with the 1 MHz switch ON. ● When all memory channels are empty and an attempt is made to select memory channel with the 1 MHz switch ON.	CHECK
When you exceed the operating limits while using the numeric keys to enter a frequency.	OVER

4-10-4. Frequency Step

A. TUNING knob

The frequency step depends on the mode that has been selected.

Mode	Frequency Step	One revolution of TUNING knob
SSB/CW/FSK	10 Hz	10 kHz
AM/FM	100 Hz	50 kHz

When the FINE function is ON, the frequency step is 1 Hz.

The frequency step in the AM and FM modes can be set to 10 Hz. (Please refer to Section 4-10-15.)

B. M.CH/VFO CH control

1. The active VFO frequency step is as shown below.

Frequency Step	One revolution of M.CH/VFO CH control
10 kHz	240 kHz

The frequency step may be reprogrammed when turning on the POWER switch. (Please refer to Section 4-10-15.)

2. This control is also used to select the desired memory channel during Memory Channel Operation.

4-10-5. Amateur Radio Bands selection

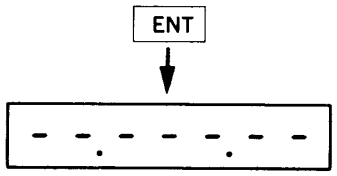
Press the UP/DOWN switch to change amateur radio bands.

4-10-6. Direct keyboard frequency entry

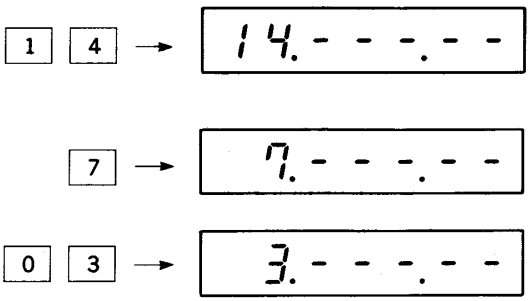
Direct keyboard entry of the operating frequency is possible using the Numeric Keypad on the transceiver. This allows rapid changes in frequency without the delays encountered when using other tuning methods.

Note
You cannot enter any frequency which is outside the coverage of the radio.

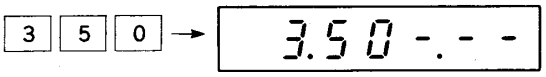
1. Press the ENT key. The display will indicate.



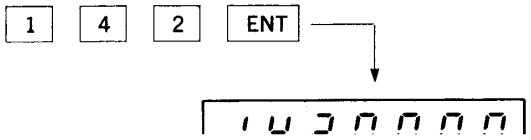
2. Enter the desired operating frequency from Most Significant Digit to the Least Significant Digit. You do not have to enter trailing zeros, but you must enter leading zeros.



When 3 is entered into the 10 MHz digit and then a number is entered into the 100 kHz digit, the band is shifted to the 3 MHz band.



3. After the least significant digit has been entered press the ENT key again to signify you want the radio to change frequency. If you entered the frequency down to the nearest 10 Hz a beep will sound and the radio will automatically change to the new frequency without the need of pressing the ENT key for the second time.
   For example:
   To enter 14.200.00 MHz there are two methods:
   Method one: Press [ENT], [1], [4], [2], [ENT]
   Method two: [ENT], [1], [4], [2], [0], [0], [0], [0]

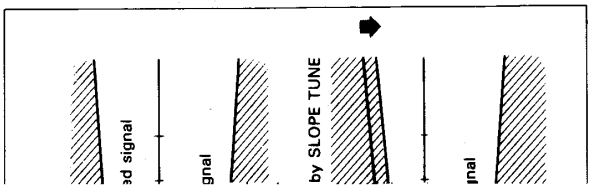


is possible to work cross band, cross mode if desired.

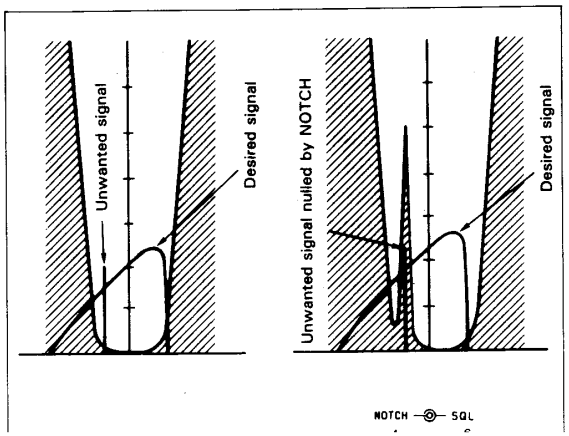
To avoid confusion during contest, or pile-up operations we recommend using VFO A for receive and VFO B for transmit.

●TF-SET key
Depressing this key will allow you to rapidly set or check the transmit frequency, during SPLIT operations, without the need of actually transmitting.

This key is especially convenient when you are trying to locate the transmit frequency of the station currently in contact with the DX station, since depressing this key allows you to receive on the transmit frequency as long as the key is held depressed. The TUNING knob is active when this key is depressed, so it is easy to change your transmitter frequency at the same time, if necessary.



Notes
1. In the FM mode, only 12 kHz (wide) and 6 kHz (narrow) can be selected.
2. Some bandwidths cannot be selected unless the required filter is installed.
3. Either optional YG-455C-1 or YG-455CN-1



●NB2 WIDTH control

Controls the width of the blanking pulse when NB 2 operates. Adjust the width so that the desired signal can be received most clearly.

Notes

1. The control only works when there is woodpecker noise.
2. If this control is turned too far, the received signal may be interrupted. Set the control to the best position.

4-10-11. VOX OPERATION

Depress the VOX switch. While speaking into the microphone, increase the GAIN control until the VOX

Note
When the RIT is ON the transmit frequency may be different from the receive frequency. For normal

No.	Programmable functions	Initial state
	UP/DOWN switch step	

No.	Programmable functions	Initial state
23	Select the Manual weight (When Auto weight function is OFF.)	3.0
24	Bug key: ON(Used)/OFF(Not used) (When the ELECTRONIC KEY switch is ON.)	OFF
25	When split is selected, the temporary display of the transmit frequency can be turned on and off.	ON
26	Display for the 50 MHz converter : ON/OFF	OFF
27	Display for the 144 MHz converter : ON/OFF	OFF
28	Display for the 430 MHz converter : ON/OFF	OFF
29	Change the REC 1 recording time to 8 or 16 seconds. (When optional DRU-2 is installed)	8 seconds
30	Change the REC 2 recording time to 8 or 16 seconds. (When optional DRU-2 is installed)	8 seconds
31	Change the REC 3 recording time to 16 or 32 seconds. (When optional DRU-2 is installed)	16 seconds
32	Transfer function when two TS-850 are connected : ON/OFF	OFF
33	Turn on and off direct writing into VFO by the transfer function when two TS-850 are connected.	OFF
34	The IF and AF circuits of this transceiver can be switched off (mute mode) so the transceiver will not transmit even if the standby terminal is grounded.	OFF
35	Transfer function when two TS-850 are connected (SPLIT) : ON/OFF	OFF

Notes
1. When menu number 26, 27, or 28 is turned on, the other two menu numbers are not displayed.
2. Menu number 34 can mute the IF and AF circuits only, not the RF circuit. So if excessive power is applied to the ANT connector during muting, the RF circuit may be damaged. Do not apply excessive power directly to the muted side of the transceiver.

4-11. MEMORY

The transceiver incorporates a convenient 100 channel memory that can be used to store and recall commonly used frequencies.

4-11-1. Microprocessor back-up lithium battery

A lithium battery is contained in the transceiver to retain memory. Turning off the POWER switch, disconnecting the power cable, or a power failure will not erase the memory. The battery should last for approximately five years. When the battery discharges, an erroneous display may appear in the display. Lithium battery replacement should be performed by an authorized KENWOOD service facility; either your KENWOOD servicing dealer authorized service center, or the factory, since this unit contains CMOS type circuitry.

4-11-4. Memory Contents

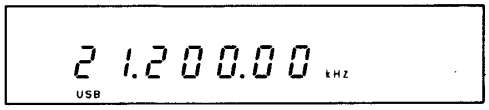
Each Memory Channel is capable of storing the following information: ○=yes, ×=no

	00~89	90~99
Frequency	○	○
Mode	○	○(※2)
Filter	○	○(※2)
Tone Frequency data	○(※1)	×
Tone ON/OFF	○(※1)	×
Highest/Lowest operating frequency	×	○
AIP ON/OFF	○	○(※2)

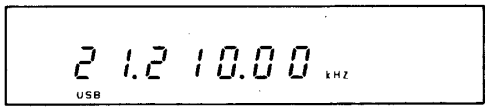
※1 When the memory is used as a split memory in

B. Split Memory Channel

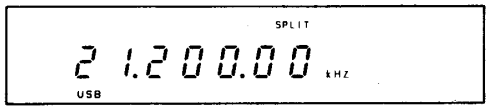
1. Select the receive frequency, the mode and the filter.
   Example:21.200 MHz is selected on VFO A.



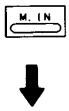
2. Press the A=B key.
3. Set the RX VFO to B and select the desired transmit frequency.
   Example:21.210 MHz is selected on VFO B.

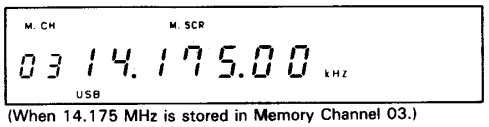


4. Set the RX VFO to A and set the TX VFO to B. Indicate the SPLIT display. When the TX VFO B key is pressed, the transmit frequency is displayed momentarily. This momentary display may be suppressed with the function setting at power on. (Please refer to Section 4-10-15.)



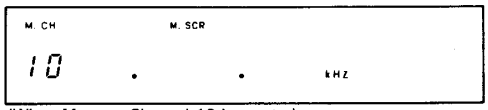
5. Press the M.IN key.





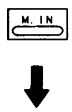
(When 14.175 MHz is stored in Memory Channel 03.)

6. Select the desired Memory Channel number.



(When Memory Channel 10 is empty.)

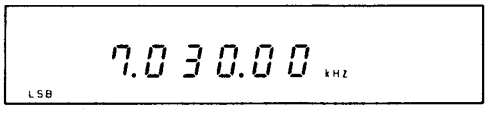
7. When the desired memory channel is found and displayed, press the M.IN key again. The current frequency, mode and filter will be stored, the Memory Scroll mode will be canceled. The transceiver will return to the operating mode and frequency that was displayed before the M.IN key was pressed initially.



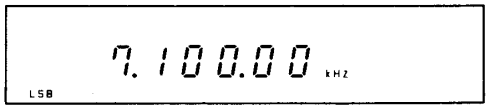
C. Programmed Scan Memory Channel

The highest and lowest frequency are stored in this memory channel. This channel can be used as a standard memory channel if the highest and lowest frequencies are identical.

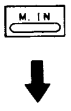
1. Select the lowest operating frequency and the mode.
   Example:7.030 MHz is selected on VFO A.

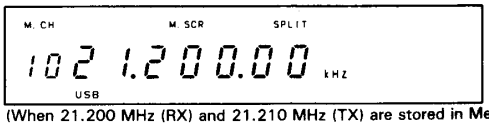


2. Press the A=B key.
3. Select the highest operating frequency.
   Example: 7.100MHz is selected on VFO B.



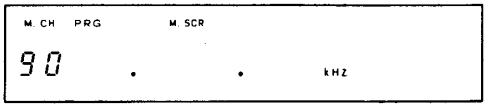
4. Press the RX-A key and Press the M.IN key.





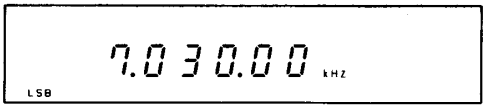
(When 21.200 MHz (RX) and 21.210 MHz (TX) are stored in Memory Channel 10.)

5. Select the desired Programmed Scan Memory Channel number (90-99ch).



(When Memory Channel 90 is empty.)

6. When the desired program scan memory channel is found and displayed, press the M.IN key again. The current frequency, mode and filter will be stored, the Memory Scroll mode will be canceled, and the transceiver will return to the operating frequency that was displayed before the M.IN key was pressed initially.



4-11-11. Mode and Filter Changes during Memory Channel Operation (00-89ch)

Modes and filters can be changed during memory channel operation, but, with the exception of the transmit / receive frequencies, the contents of memory channels for the selected memory channel cannot be changed.

4-11-12. Clearing a Memory Channel

To erase a specific Memory Channel:
Press and hold the CLR key for approximately 2 seconds or transfer data from an empty Memory Channel to the Memory Channel you wish to clear.

4-11-13. Quick Memory Channel

There are five quick memory channels in total.
Quick Memory Channel is capable of storing the [illegible]

[redacted]

Receive frequency, mode and filter
Transmit frequency, mode and filter
RIT ON/OFF, XIT ON/OFF, AIP ON/OFF,
FINE ON/OFF, TUNE ON/OFF, 1 MHz key ON/OFF,
Select the meter indicate.

■Quick Memory Channel Entry
[1] Memory entry when the VFO operation.
1. Select the receive frequency, the mode and the filter.
2. Press the M.IN key of QUICK MEMO. The data is written to quick memory channel 1.

> Note
> If RX VFO or TX VFO or both are M.CH, data cannot be written.

3. This is a stacking memory. If there is already data in channel 1, it is moved automatically to channel 2. If there is data in channel 2, it is moved automatically to channel 3 and so on. If there is data in channel 5, it is erased automatically.

[2] Memory entry when the Quick Memory Channel operation.
1. When the quick memory channel is recalled, the frequency, the mode, or other data in the memory channel can be modified.
2. To store the modified frequency or the mode in [illegible]

[redacted]

■Quick Memory Channel Recall
If the MR key is pressed and the M.CH/VFO CH control turned, a quick memory channel can be recalled. The frequency and mode can be modified, but if you move to another channel or VFO and then return to the original channel, the frequency and mode return to the original values stored in the memory channel. To return to VFO operation, press the MR key again. To shift the quick memory channel contents to the VFO, press the M▶VFO key.

> Note
> If all quick memory channels are empty, nothing happens even when the QUICK MEMO MR key is pressed.

[redacted]

4-12. SCAN

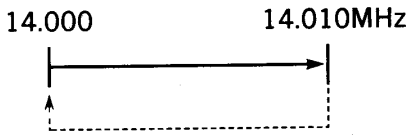
Both Memory Scan and Program Scan are possible.

4-12-1. Memory Scan

2. Select the Memory Channel that you want to skip using the M.CH/VFO CH control.
3. Press the CLR key.

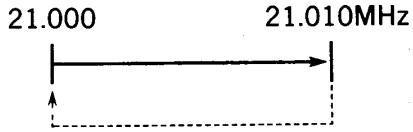
Note
Holding the CLR key depressed for longer than

Memory channel 91



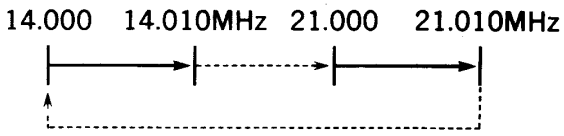
[II] Press Numeric key 2 while holding down the SCAN key. Scanning will proceed thru the range stored in channel 92.

Memory channel 92



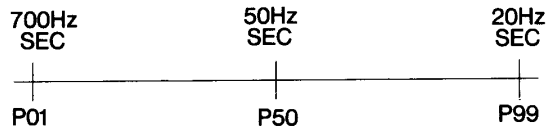
[III] Press Numeric keys 1 and then 2 while holding down the SCAN key. Scanning will be repeated within the ranges stored in channels 91 and 92.

Memory channel 91 Memory channel 92



4-12-5. Scan Speed

The scanning speed is adjustable from the front panel by using the RIT / XIT control during SCAN operations. Clockwise rotation increases the scan speed and counterclockwise rotation decreases the scan speed. This speed adjustment is effective in both VFO and M.CH scan modes. Once set the scan speed remains in memory until it is again changed by the RIT/XIT control. You must be in the SCAN mode in order to alter the scan speed.
The approximate scan speed adjustment range is shown below.



If the RIT/XIT control is turned fully counterclockwise (or clockwise) and you want to increase (or decrease) the scan speed, turn the control back and then rotate it.

4-12-6. Scan Hold

The Scan Hold function is selected by using the Power on function selection described in Section 4-10-15.
After you stop turning the TUNING knob during program scan, scanning will stop for a while and then restart.

4-13. DRS(Digital Recording System) FUNCTION

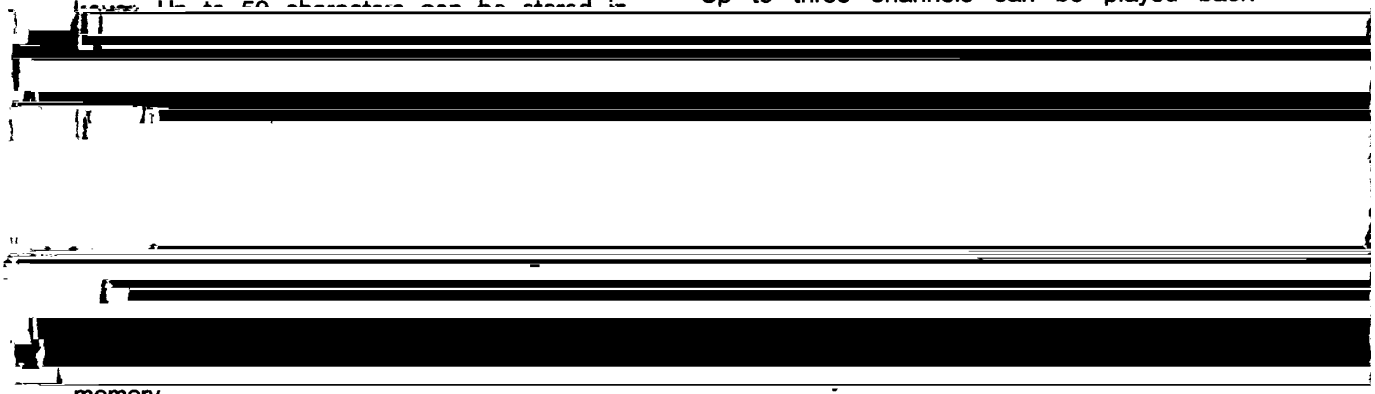
CW messages or sound to be transmitted can be recorded and played back. (The optional DRU-2 digital recording unit is required.)

> Note
> This function does not work if the transmit mode is different from the receive mode. If the POWER switch is turned off during recording or playback, the recorded or stored data may be lost.

4-13-1. CW Message

1. Data Entry

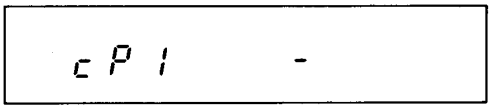
Input the message you wish to transmit into memory by simply sending the desired message with you



memory.

> Note
> The CW message can only be entered into memory when the built-in electronic keyer is used. It cannot be put in memory with an external electronic keyer or key.

1. Set the MODE key to CW.
2. Place the ELECTRONIC KEY switch on the rear panel to ON.
3. Set the VOX/MAN switch to MAN.
   Set the FULL/SEMI switch to SEMI.
4. Press REC1, REC2, or REC3.
   Example: When REC1 is pressed.



5. When a CW message is sent with the paddle, it is automatically stored into memory.
6. When the CLR key is pressed, memory storage is terminated, and the transceiver returns to normal.

> Note
> When the message length exceeds about 50 characters, memory storage is terminated, and the transceiver returns to its normal state.

2. Playback method

Connect a paddle to the rear panel CW KEY jack.

1. Select the receive mode.
2. Set the VOX/MAN switch to MAN.
3. Press the PLAY key for the desired channel to

> Note
> When the CLR key is pressed during playback, the transceiver returns to its normal state.

3. Transmitting a message

■From the receive mode

1. Set the VOX/MAN switch to VOX.
2. Press the desired PLAY key to start transmission.
3. When the transmission is complete, the radio will automatically return to the receive mode.

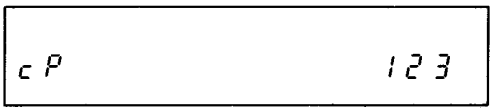
■From the transmit mode

Press the desired PLAY key to start transmission.

4. Continuous playback

Up to three channels can be played back

Example: When PLAY1, PLAY2, and PLAY3 are pressed successively during playback.



When PLAY1 transmission is complete.

4-13-2. Voice Recording (When the optional DRU-2 digital recording unit is installed)

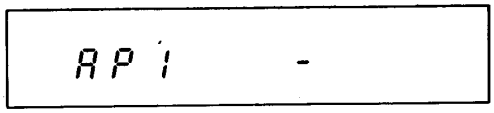
1. Recording method

The message to be transmitted is recorded with your normal microphone.

1. Select the desired mode.

> Note
> This function is disabled during FSK and TUNE operations.

2. Set the VOX/MAN switch to MAN.
3. Press REC1, REC2, or REC3.
   Example: When REC1 is pressed.



4. Recording will continue as long as while the REC

Note
If the CLR key is pressed during recording, the recorded data is erased.

5. When the REC key is released, recording is terminated, and the normal receive mode returns automatically.

Note
If the available time is used up during recording, recording is terminated, and the normal receive mode returns automatically.

2. Playback method

1. Select the receive mode.
2. Set the VOX/MAN switch to MAN.
3. Press the PLAY key for the desired channel to start playback. Adjust the volume with the MONI control.
   Example:

4. When the playback ends, the transceiver returns to its normal state.

Note
When the CLR key is pressed during playback, the transceiver returns to its normal state.

3. Transmitting a message

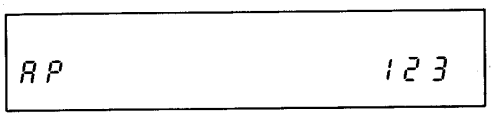
■From the receive mode
1. Set the VOX/MAN switch to VOX.
2. Press the PLAY key for the desired channel to start transmission. For information about the microphone gain adjustment, see the SSB or AM transmission section.
3. When the transmission is complete, the receive mode will return automatically.

■From the transmit mode
Press the PLAY key for the desired channel to start transmission.

To transmit recorded voice without delay, switch VOX off or turn the GAIN control on the rear of the radio fully counterclockwise.

4. Continuous playback

Up to three channels can be played back continuously.
Example: When PLAY1, PLAY2, and PLAY3 are pressed successively during playback.



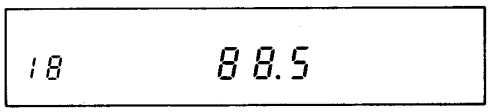
When PLAY1 transmission is complete.

4-14. REPEATER OPERATION

Repeaters permit a very wide coverage area at relatively low power levels using the FM mode. The combination of low noise combined with the generally good propagation offered by this band makes for some excellent low power contacts.

1. Press and hold the LSB/USB key and turn on the POWER. Select number 18 by rotating the M.CH/VFO CH control. The tone frequency will be displayed.

> Note
> The tone frequency is available during SPLIT operation when both the transmit and receive frequencies are in the FM mode.



2. Select the tone frequency by using the UP/DOWN switch. The 38 built-in tone frequencies are shown below.

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

3. Press the CLR key, or turn the POWER switch OFF and back ON.
4. First select the desired receiver frequency in RX VFO.
5. Press the A=B key.
6. Set the RX VFO to B and select the transmit frequency for repeater operation.
7. Set the RX VFO to A and set the TX VFO to B. SPLIT will display. When the TX VFO B key is pressed, the transmit frequency is displayed momentarily. This momentary display may be suppressed with the function setting at power on. (Please refer to Section 4-10-15.)
8. Press the M.IN key and put the data in the desired memory channel (00 to 89).
9. Set the TX and RX VFO's to the M.CH and recall the input memory channel.
10. Press the microphone PTT switch, or set the REC/SEND switch to SEND and speak into the microphone.

> Note
> Check the intended transmitter frequency before transmitting to avoid interrupting another QSO.

11. Release the PTT switch, or place the REC / SEND switch to REC.

4-15. OPERATION WITH A PERSONAL COMPUTER (Requires optional IF-232C)

Control with a personal computer is possible with the optional IF-232C interface. For more information, refer to the manuals provided with the interface.

■Function list

● AUTO INFORMATION ON/OFF setting

4-17. DIGITAL MODULATION FUNCTION [The Digital Signal Processor DSP-100 (option) is required.]

SSB, CW, AM, or FSK modulation and detection in SSB receive mode are done by the 16-bit A/D and D/A converters and DSP (digital signal processor).

(1)Features of each Mode

①SSB mode

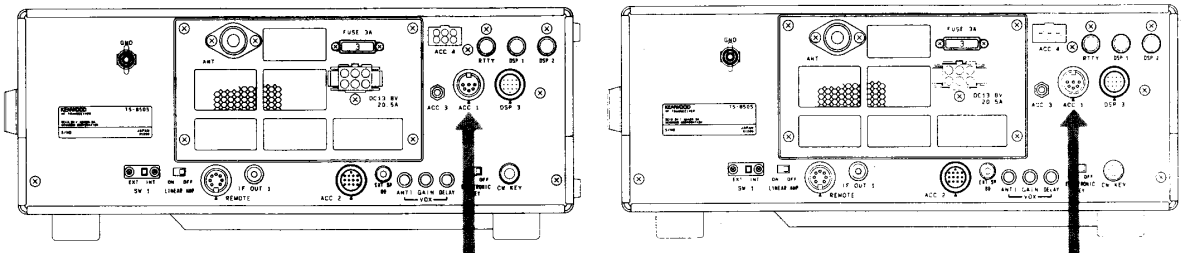
4-18. Transfer function when two TS-850S transceivers are connected together

When two TS-850 are connected together, operation data can be transferred from one TS-850S (master) to the other (slave).

Notes
1. Other functions may be slowed down while the data is being transferred.
2. All operation data can not be transferred if the master transceiver is in memory channel mode or the slave transceiver is in Quick memory channel mode.

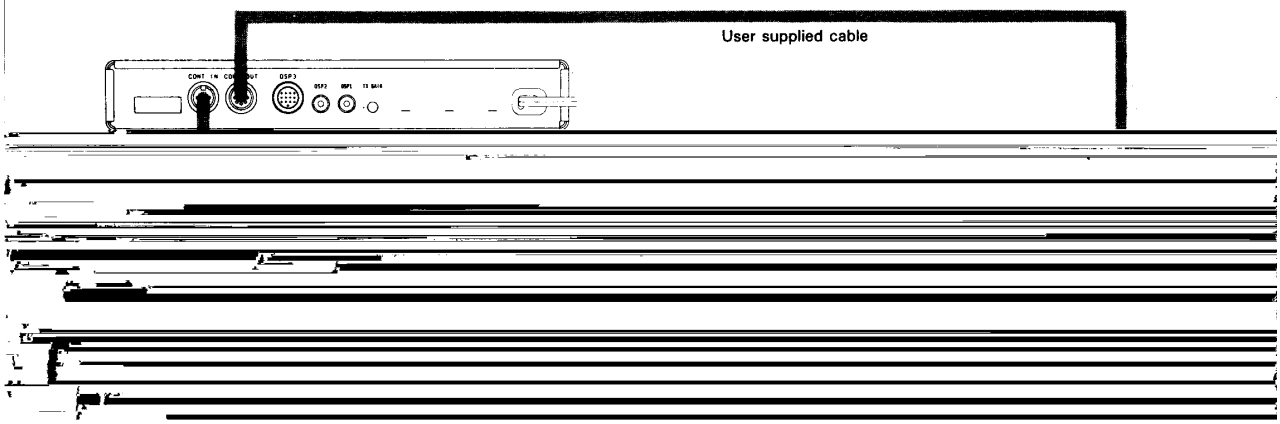
4-18-1. Connection

Make up a connection cable with 6-pin DIN plugs, or use a 6-pin DIN cord (1m) to connect the ACC1 connectors of the two TS-850S. For 6-pin DIN plugs (option, part No. E07-0654-05) or 6-pin DIN cord (option, part No. E30-3047-05), contact your nearest KENWOOD authorized service center or dealer.



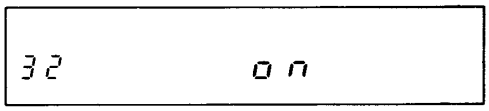
Pin No.	Signal Name	
1	GND	Signal ground
2	$\overline{\text{TXD}}$	Transmit data
3	$\overline{\text{RXD}}$	Receive data
4	CTS	Transmit enable
5	RTS	Receive enable
6	NC	No connection

If a DSP-100 is connected to one of the transceivers, connect as shown in Figure 1.



4-18-2. Function setting

Turn both transceivers on with the function setting (menu number 32) at power on. (Please refer to Section 4-10-15.)



4-18-3. Data that can be transmitted

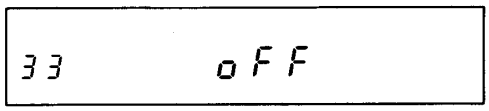
Data that can be transmitted includes the following:

VFO frequency, VFO A / B, Filter, Mode (with the TUNE mode), Selected the meter indication, AIP ON/OFF, 1MHz ON/OFF, FINE ON/OFF

4-18-4. Operation

■ To write the same data to the quick memory channels of both transceivers

1. Turn the slave transceiver off with the function setting (menu number 33) at power on. (Please refer to Section 4-10-15.)

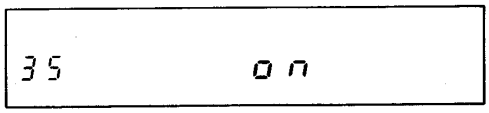


2. Press the CLR key.
3. Set the data, such as the frequency to be stored

data, such as the VFO frequency, in the slave transceiver is replaced by the data in the master transceiver. The same data is also written to quick memory channel 1 of the master transceiver.

4-18-5. SPLIT Function setting

Turn both transceivers on with the function setting (menu number 35) at power on. (Please refer to Section 4-10-15.)



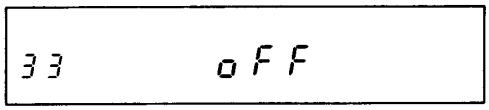
(1) Data that can be transmitted

Data that can be transmitted includes the following: VFO frequency, Mode (with the TUNE mode)

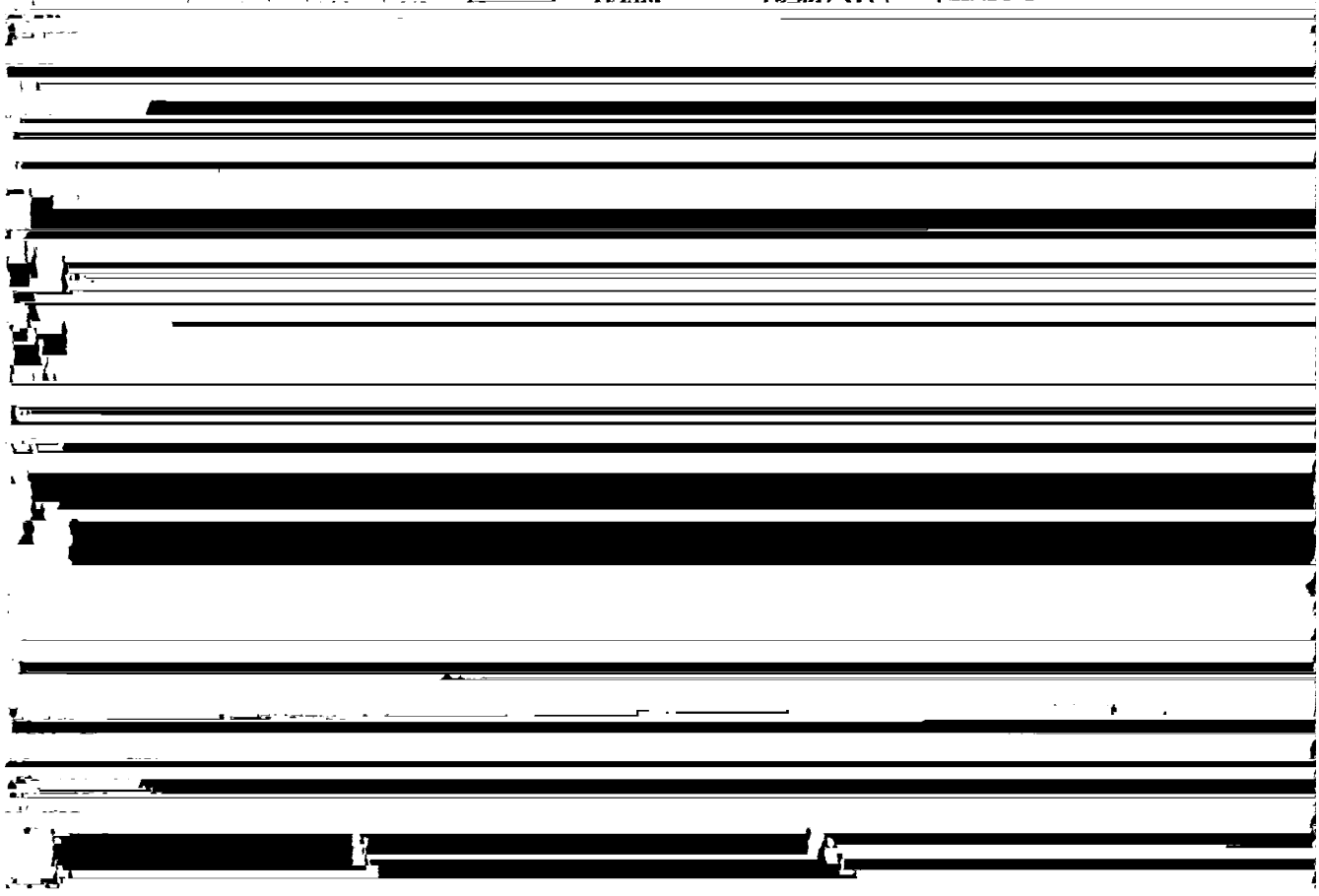
(2) Operation

■ To write the data to the quick memory channels of slave transceiver

1. Turn the slave transceiver off with the function setting (menu number 33) at power on. (Please refer to Section 4-10-15.)



2. Press the CLR key.
3. Set the data, such as the frequency to be stored in the master transceiver, and press the QUICK

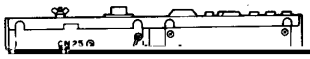


4-19. When used as the master machine for the transverter

Notes
1. Be sure to unplug the DC power cable before starting work.
2. Advanced skills and knowledge will be needed for this type of operation. Be very careful to make connections exactly as shown.

■Preparation

1. Removing the bottom cover from the transceiver.



2. Removing the shield cover

■DISPLAY INDICATOR

The frequencies corresponding to the 50, 144, and 430 MHz bands can be displayed with the function setting (menu numbers 26 to 28) at power on. (Please refer to Section 4-10-15.)

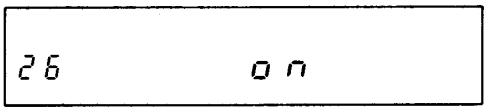
For example:
When the 28 MHz band is used as the 50 MHz band.

1. Set the receive frequency is 28.000 MHz.

2. Turn the POWER switch OFF.

3. Press and hold the LSB/USB key and turn on the POWER switch.

4. Select the desired number 26 by rotating the M.CH / VFO CH control and turn ON the UP/DOWN switch.



5. When the CLR key is pressed, the menu mode is terminated, and the display frequency becomes 50.000.00 MHz.

6. When menu number 27 is selected, the 144 MHz band is displayed, and when menu number 28 is selected, the 430 MHz band is displayed.

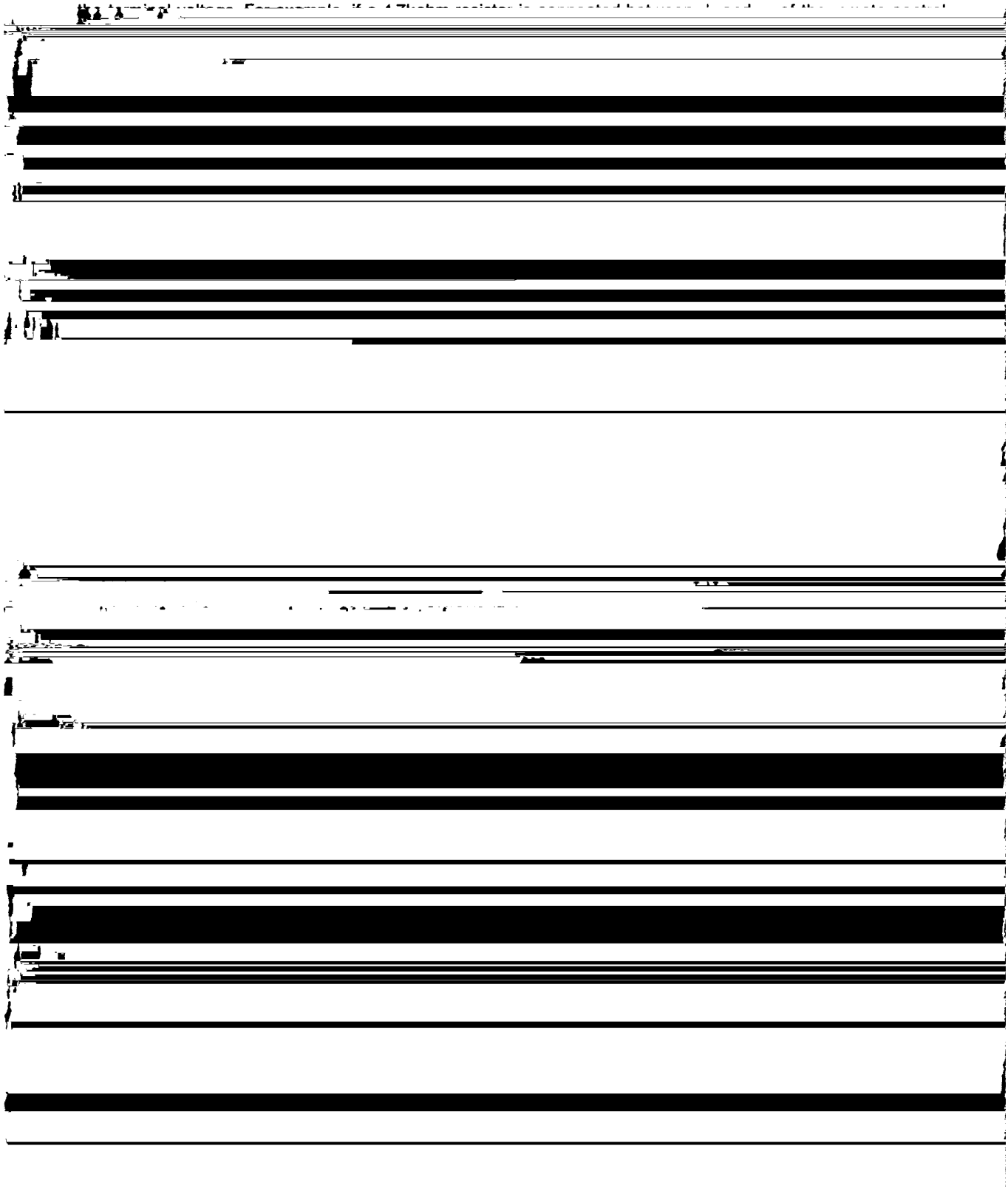
Notes
1. When menu number 27 or 28 is selected, deselect menu number 26.
2. If the display frequency is in the 50, 144, or 430 MHz band, the frequency cannot be set with the numeric keys.

4-20. Remote control function

The front panel keys can be operated remotely via the remote control terminal (ACC3) on the rear. The following eleven functions can be remotely controlled.

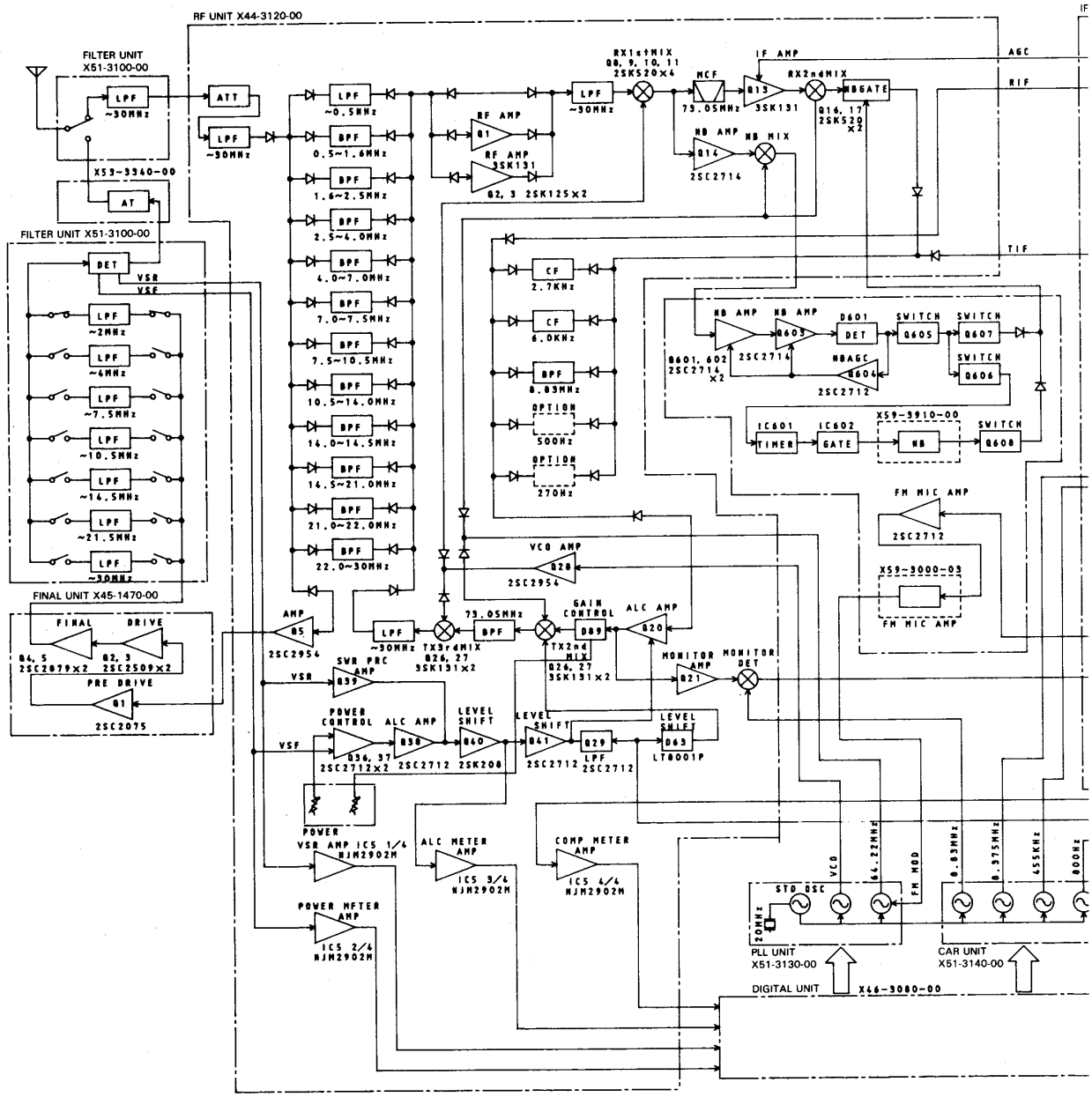
PLAY-1, PLAY-2, PLAY-3, REC-1, REC-2, REC-3, CLR,
TF-SET, QUICK M.IN, QUICK MR, VOICE

The remote control terminal circuit in the transceiver is as follows. When the A/D converter terminal voltage reaches the voltage determined by the built-in program, the microprocessor performs operations according to

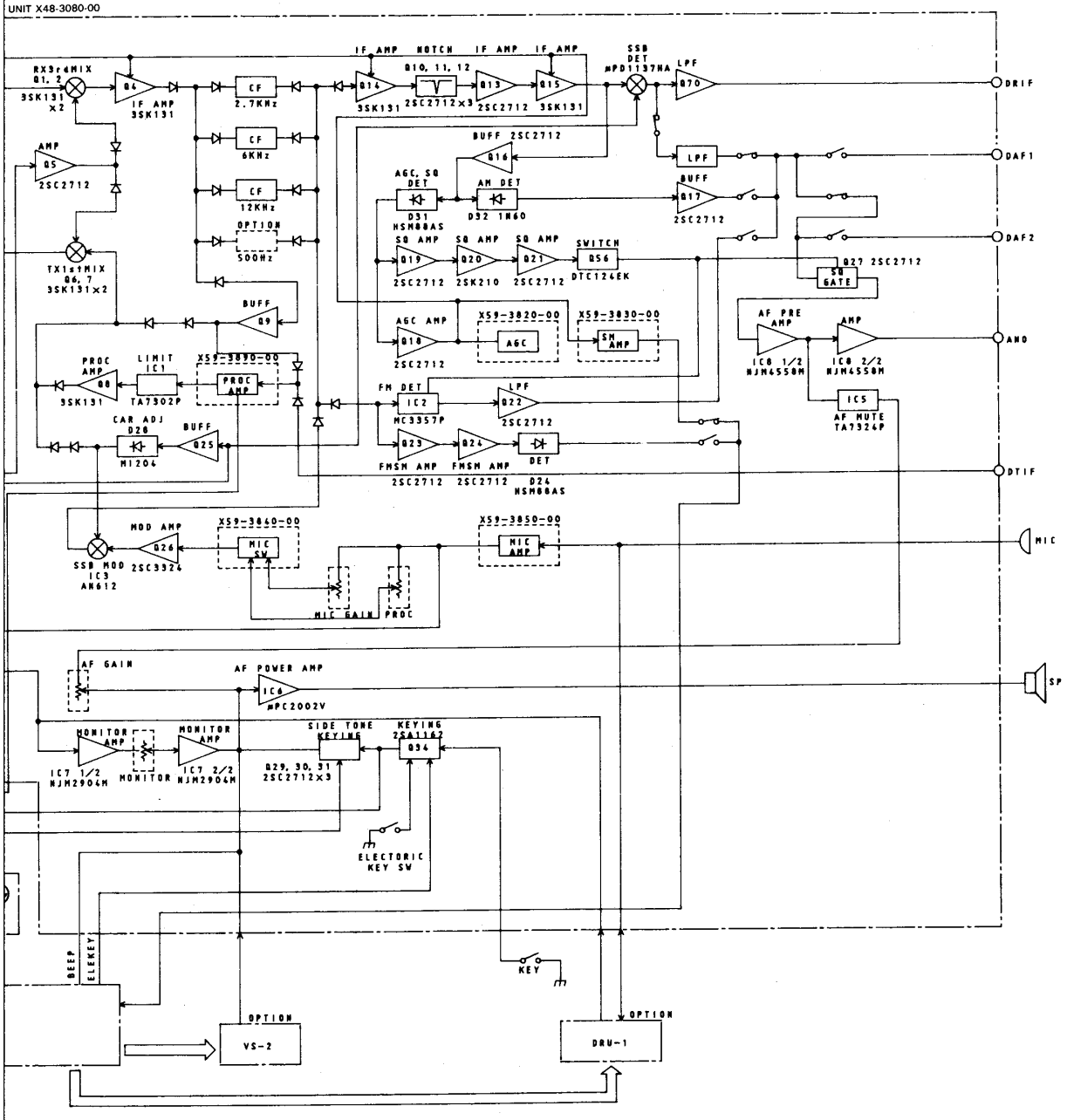


5. BLOCK DIAGRAM AND CIRCUIT DIAGRAM

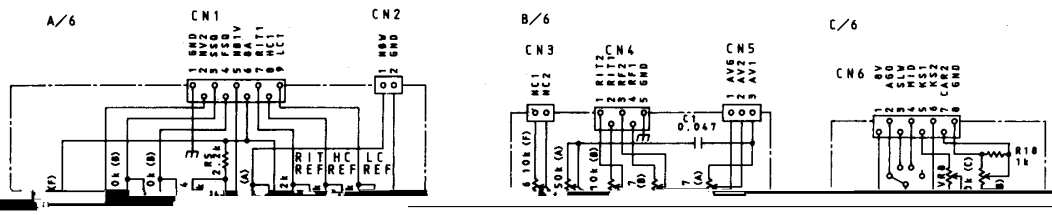
5-1. BLOCK DIAGRAM



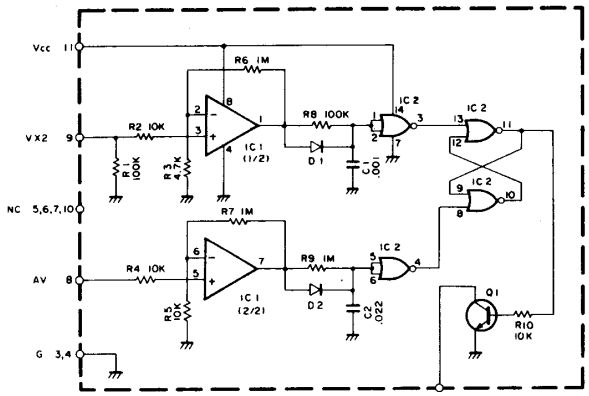
UNIT X48-3080-00



SWITCH UNIT A (X41-3130-00)

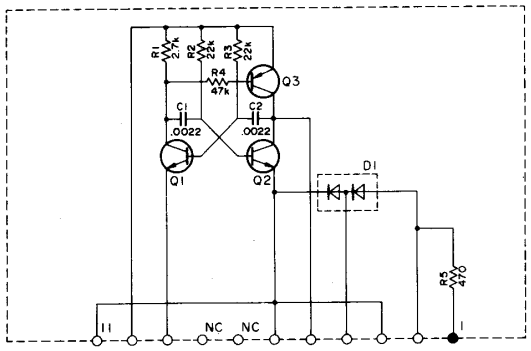


VOX UNIT (X59-1080-00)



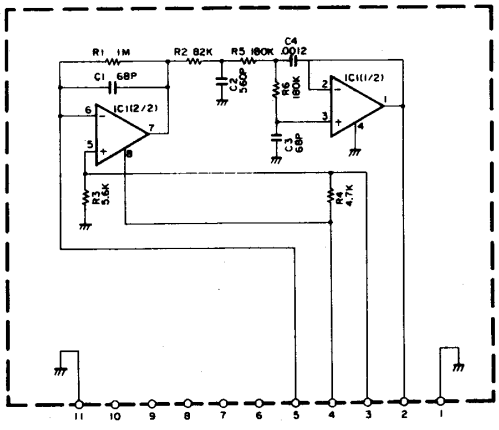
IC 1 : NJM2904M
IC 2 : TC4001BF
Q 1 : 2SC2712(Y)
D1,2 : DAP202K

DC-DC UNIT (X59-1100-00)



Q1, Q2 : 2SC2712(Y)
Q3 : 2SA1162(Y)
D1 : 1SS226

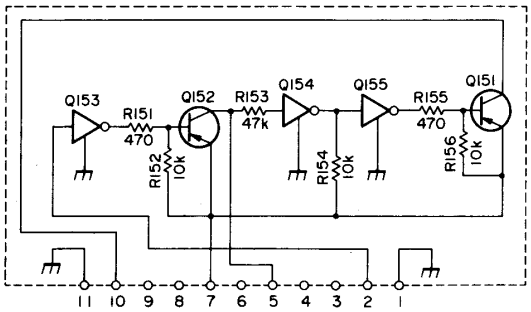
FM MIC AMP UNIT (X59-3000-03)



IC 1 : NJM4558M
Q 1 : 2SC2712(Y)

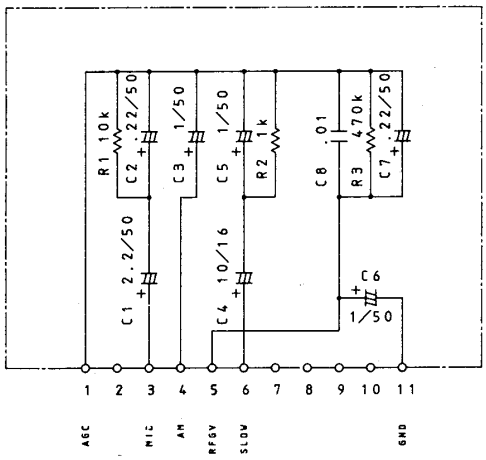
Note
Circuit Diagram is subject to change without notice due to advancements in technology.

TRX UNIT (X59-3680-00)

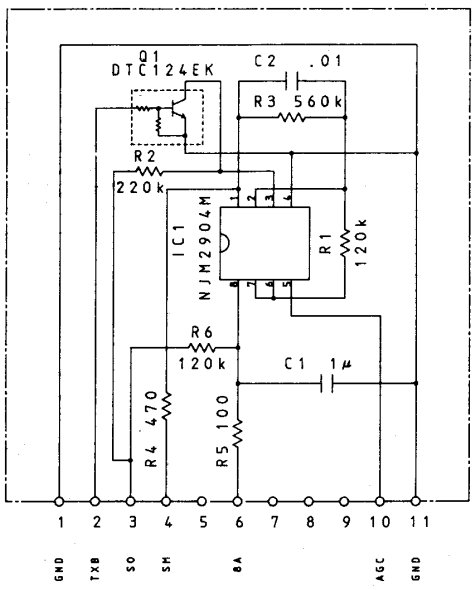


Q151,152 : 25A1213(Y)
Q153,154,155 : DTC114TK

AGC UNIT (X59-3820-00)

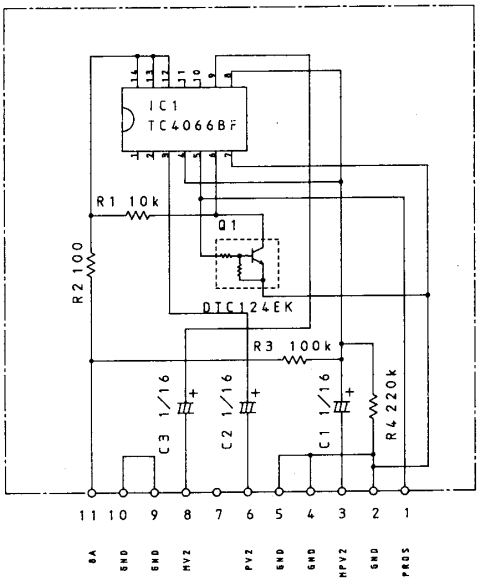


SM AMP UNIT (X59-3830-00)

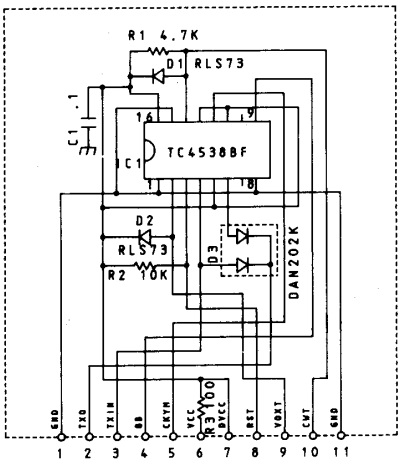


Note
Circuit Diagram is subject to change without notice due to advancements in technology.

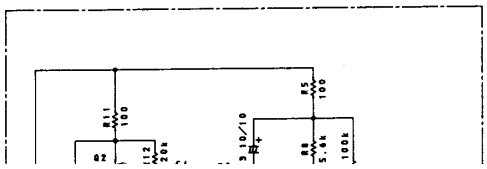
MIC-SW UNIT
(X59-3840-00)



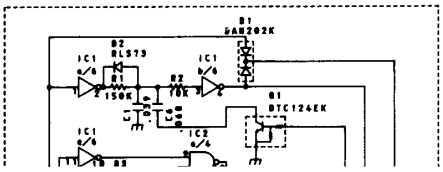
DELAY UNIT
(X59-3860-00)



MIC AMP UNIT
(X59-3850-00)

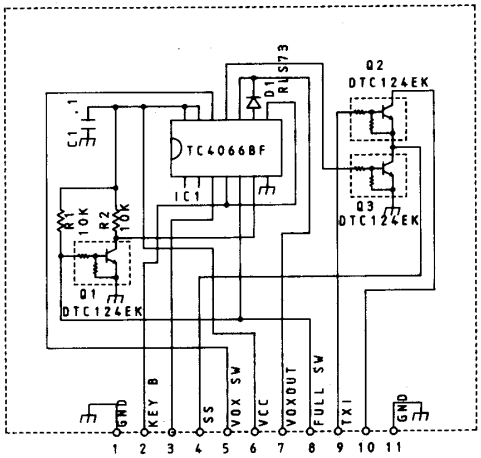


BREAK-IN UNIT
(X59-3870-00)

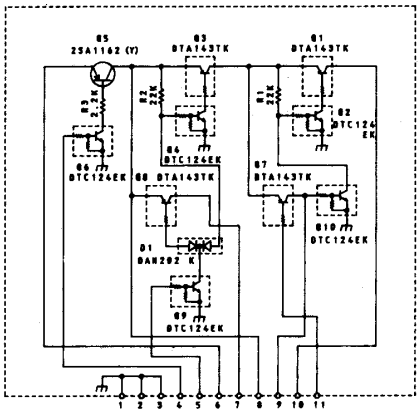


[redacted]

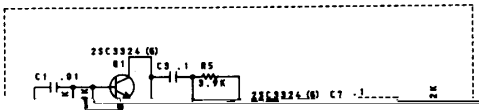
BK SWITCH UNIT
(X59-3880-00)



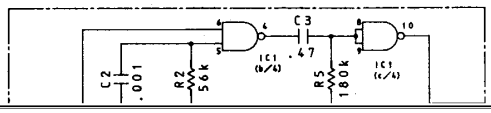
AIP UNIT
(X59-3900-00)



PROCK UNIT
(X59-3890-00)



NB2 UNIT
(X59-3910-00)



6. MAINTENANCE AND ADJUSTMENTS

6-1. GENERAL INFORMATION

Your transceiver has been factory aligned and tested to specification before shipment. Under normal circumstances the transceiver will operate in accordance with these operating instructions. All adjustable trimmers and coils in your transceiver were preset at the factory and should only be readjusted by a qualified technician with proper test equipment. Attempting service or alignment

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

[redacted]

When operated properly, the transceiver can give years of service without requiring realignment. The information in this section gives some general

The knobs, front panel and cabinet of the transceiver are likely to become soiled after extended use. The knobs should be removed from the transceiver and cleaned with a neutral soap

[redacted]

6-4. IN CASE OF DIFFICULTY

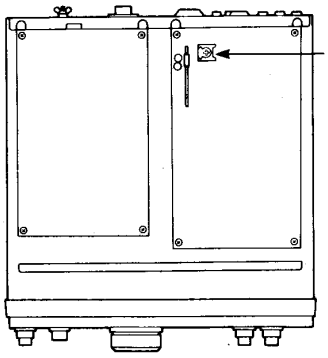
The problems described in this table are failures caused in general by improper operation or connection of the transceiver, not by defective components. Check according to the following table. If the problem persists, contact an authorized agent or service station.

RECEPTION

Symptom	Probable cause	Corrective action
Indicators do not light and no receiver noise is heard when the POWER switch is turned on.	1. Bad power cable or connections. 2. Blown power supply fuse. 3. Power supply is OFF.	1. Check cables and connections. 2. Check for the cause of the blown fuse and replace the fuse. 3. Switch power supply ON.
Nothing is displayed or improper digits are displayed when the POWER switch is turned on.	The microprocessor may malfunction if the input voltage is too low.	1. Use a step-up transformer to raise the line voltage to the power supply. Use a 12 to 16 V battery. 2. Turn on the POWER switch while depressing the A = B (or RX-A) key, and then release the A=B (or RX-A) key.
When you press the POWER switch, "14 MHz USB" is displayed ... or the receive sensitivity is low.	The backup battery voltage is low.	Please refer to Section 4-11-1.
No signal is received even when the antenna is connected, or the receiver sensitivity is low.	1. SQL control fully clockwise. 2. The ATT switch is ON. 3. The REC/SEND switch is in the SEND position. 4. Microphone PTT switch is in the transmit position. 5. SLOPE TUNE control is improperly adjusted.	1. Turn the SQL control counterclockwise. 2. Set the ATT switch to 0dB. 3. Set the REC / SEND switch to REC. 4. Set the PTT switch to the receive position. 5. HIGH control : Fully clockwise LOW control : Fully counterclockwise
An antenna is connected, but no signal is received and the S-meter deflects fully.	RF gain control is too low.	Turn the RF gain control MAX clockwise.
The S-meter deflects and stays at a certain position even with no signal.	1. Low DC or AC line voltage. 2. RF gain control closed.	1. Use a step-up transformer to raise the line voltage. Use a 12 to 16 V battery. 2. Turn the RF gain control fully clockwise.
Signal is received, but no sound is heard.	MODE key position is incorrect.	Change the MODE key to the correct mode.
SSB received signal is extremely high cut or low cut.	SLOPE TUNE control is improperly adjusted.	HIGH control: Fully clockwise LOW control : Fully counterclockwise
Frequency is not changed by pressing the UP/DOWN switches, turning the TUNING knob, or M.CH/VFO CH control.	F.LOCK key is ON.	Set F.LOCK key to OFF.
Memory scan fails. ("CHECK")	Nothing is stored in memory.	Store the frequency.

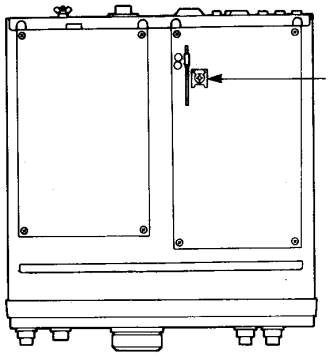
Note
Beat tones may be heard on the following frequencies. This is due to the internal frequency configuration of

6-6-2. Sidetone Level



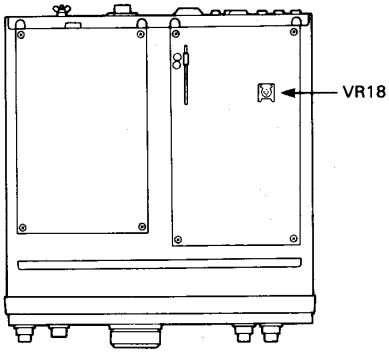
Turn VR5 while holding down the key in the CW mode for the desired tone level.

6-6-3. Beep Tone Level



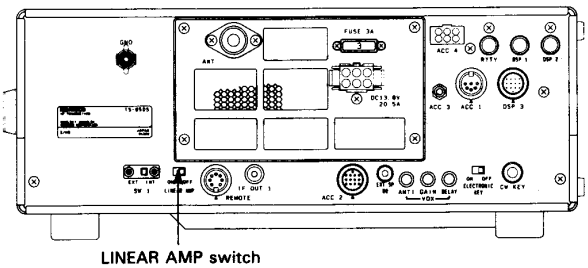
Turn VR4 to the desired tone volume.

6-6-4. Adjusting the Data Communications Modulation Input Level



Set the input level for the desired modulation level with VR18. Input is reduced by turning the control counterclockwise, and increased by turning clockwise.

6-6-5. Linear Amplifier Control



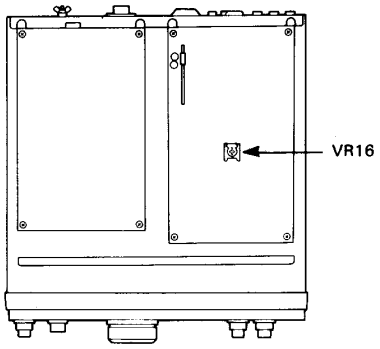
The external control relay is not activated at the factory so that the operation of the radio will remain at the lowest mechanical noise level during CW Full break-in operation. If the use of this control relay is required, such as for use with an external linear amplifier it may be activated by setting the LINEAR AMP switch to ON.

12 volts at approximately 10 mA maximum is available at pin number 7 of the REMOTE connector for control of an external keying relay, if necessary. We recommend the use of a 7 pin DIN plug for this connection. When operation of this transceiver with the TL-922/922A is anticipated you should use the control cable supplied with the linear amplifier.
Most linear amplifiers require a ground on transmit. This is available by connecting pin 2 of the remote connector to ground. Then connect the center conductor of your

linear's relay control line to pin 4. The relay in this transceiver is capable of handling 100V DC at 500 mA.

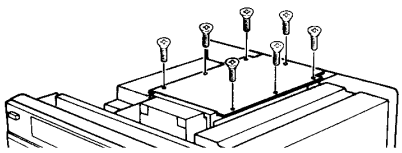
> Note
> The TL-922/922A is NOT designed for Full Break-in operation. Attempting operation of the linear in this mode might lead to damage in the linear amplifier.

6-6-6. Adjusting the NOTCH



1. Rotate the tuning knob so that a stable signal of about S9 is received in USB mode and the beat frequency of the audio output is about 1.5 kHz.
2. Rotate the HIGH side of the SLOPE TUNE control fully clockwise and the LOW side fully counterclockwise.
3. Activate the NOTCH switch, and rotate the NOTCH control to minimize the audio output.
4. Adjust VR16 to further reduce the audio output.
5. Perform steps 3 and 4 repeatedly.
6. The best point is where the audio output does not change.

6-6-7. Digital display calibration



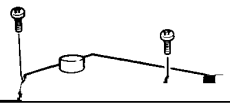
1. Remove the case.
2. Remove the shield cover of the final unit.
3. Remove the CAR unit.
4. Plug the accessory calibration cable to any one of the CAL pins on the PLL unit.

7. OPTIONAL ACCESSORIES

Be sure to unplug the DC power cable before starting work.

7-1. FILTER INSTALLATION

1. Remove the bottom cover of the transceiver.



Notes
1. Avoid catching your fingers or the wiring harness when closing.
2. When the YK-88SN-1 and YG-455CN-1 are installed, 500 or 270 is displayed for the YK-88SN-1, and 500 is displayed for the YG-455CN-1. They are different from the actual bands.

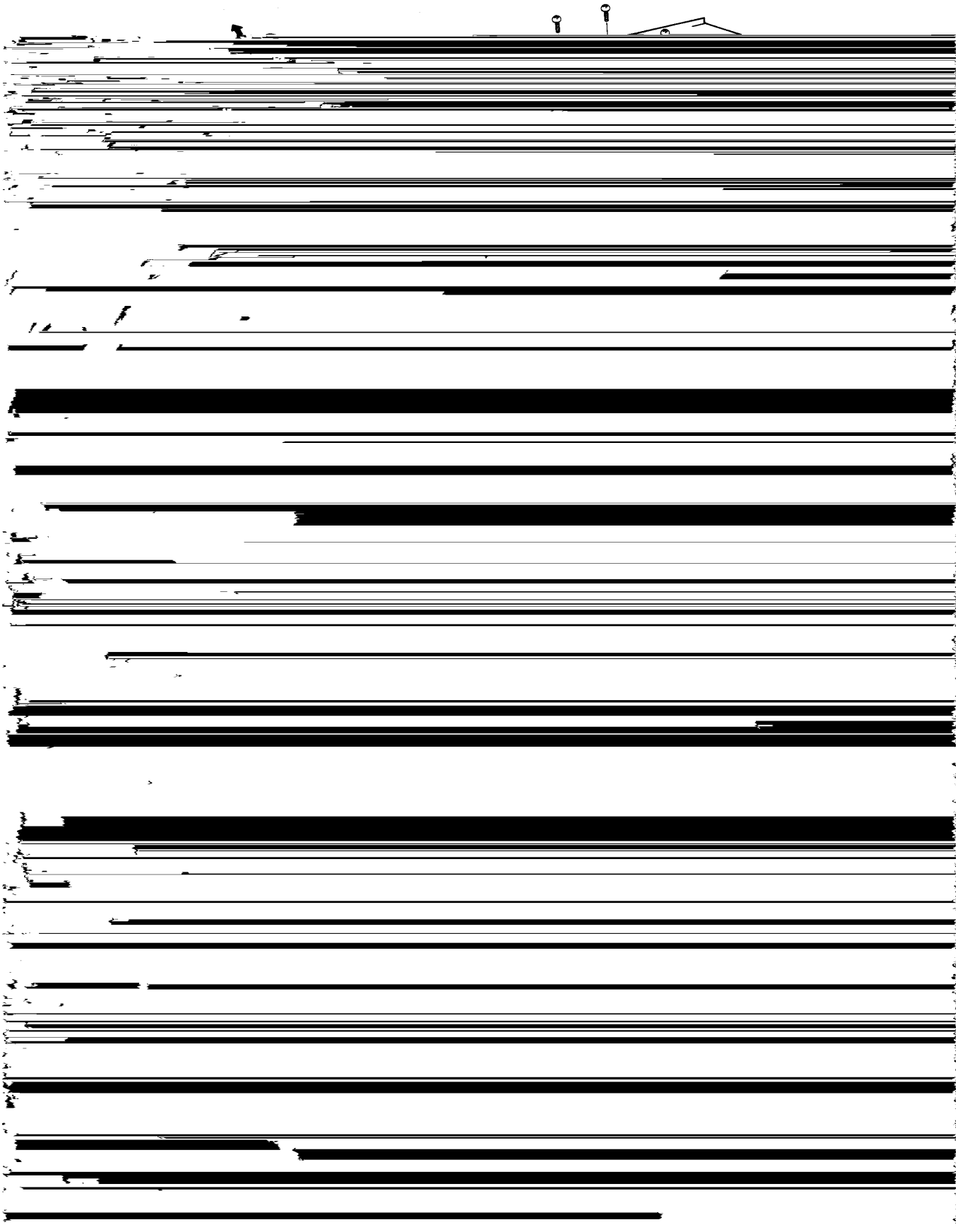
7-2. VS-2 VOICE SYNTHESIZER

7-3. DRU-2 DIGITAL RECORDING UNIT INSTALLATION

1. Remove the top cover of the transceiver.

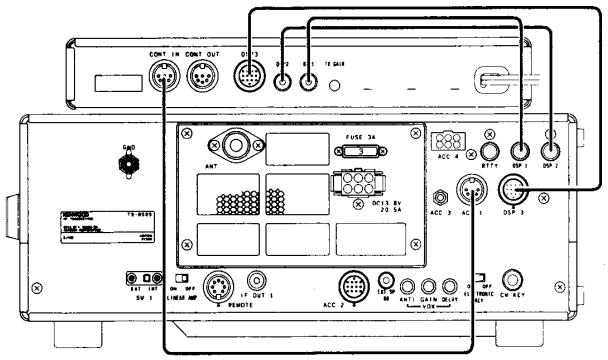
7-4. SO-2 TCXO UNIT INSTALLATION

1. Remove the case. Refer to Section 6-6-1.
2. Remove the CAR unit.

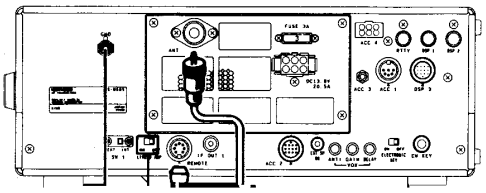


7-5. DSP-100 DIGITAL SIGNAL PROCESSOR CONNECTION

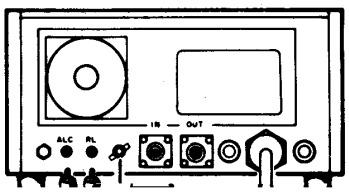
Connect the cable supplied with the DSP-100.



7-6. TL-922/922A LINEAR AMPLIFIER CONNECTION

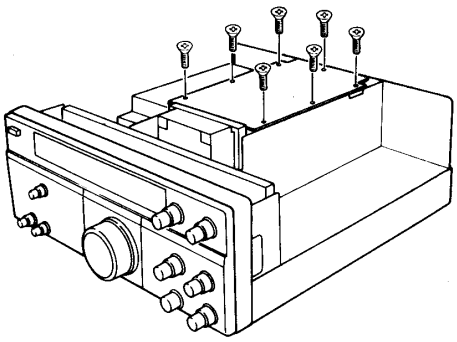


TL-922/922A

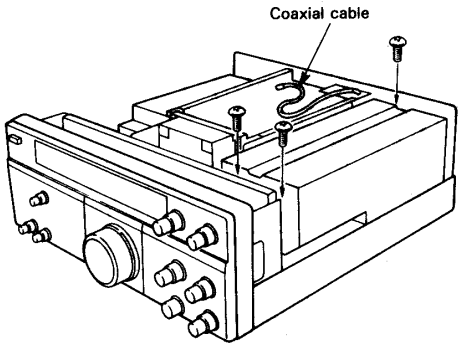


7-8. AT-850 AUTOMATIC ANTENNA TUNER UNIT INSTALLATION

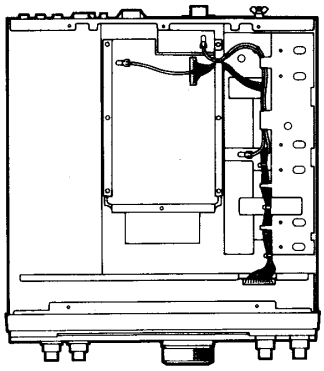
1. Remove the top cover of the transceiver. Refer to Section 6-6-1.
2. Remove the shield cover of the filter unit.



3. Carefully remove the coaxial cable.
4. Attach the AT-850 and screw it on.



5. Attach the cables from the AT-850 as shown.



6. Replace the shield cover and the top cover.

7-9. AT-300 AUTOMATIC ANTENNA TUNER CONNECTION

When the AT-300 is connected to this unit, slide switch SW1 on the back to EXT. The built-in antenna tuner will then not operate. Use the PS-52 DC power supply when connecting the AT-300 to this transceiver.

7-10. OTHER ACCESSORIES

■PS-52 HEAVY DUTY DC POWER SUPPLY
Designed to match the TS-850S. Supplies regulated 13.8 VDC at 20.5 A with built-in cooling fan and protection circuits for maximum reliability.

■PS-31 DC POWER SUPPLY

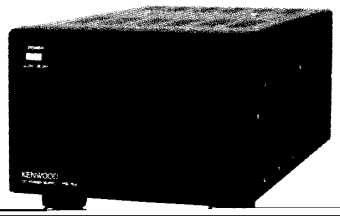
■AT-300 AUTOMATIC ANTENNA TUNER

■AT-850 AUTOMATIC ANTENNA TUNER UNIT
The TS-850S is available either with or without a built-in automatic antenna tuner. The tuner covers all amateur bands from 160 through 10 meters bands.

■MC-85 MICROPHONE(8-pin)
The MC-85 is a unidirectional high-class electret condenser microphone provided with an output selector switch, audio level compensation circuit, low cut filter, level meter, PTT and LOCK switches. An 8-pin cable is provided, with optional cables, up to three outputs are possible.

■MC-80 MICROPHONE(8-pin)
The MC-80 is an omnidirectional electret condenser microphone provide with UP / DOWN switches, volume adjustment for output level, PTT and LOCK switches, built-in preamplifier.

■MC-60A MICROPHONE(8-pin)
The zinc die-cast base provides high stability, and the MC-60A is complete with PTT and LOCK switches, UP / DOWN switches, and impedance selector switch and a built-in preamplifier.



■MC-43S UP/DOWN HAND MICROPHONE
The MC-43S is handy dynamic microphone with PTT switch and UP/DOWN switches.

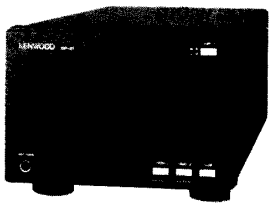
■LF-30A LOW PASS FILTER

■SP-31 EXTERNAL SPEAKER
Designed to match the TS-850S.

■TL-922/922A HF LINEAR AMPLIFIER
(Not for QSK operation.)
The TL-922/922A is an HF linear amplifier operating at maximum legal power, and employing a pair of 3-500Z high performance transmitting tubes. TL-922A (without 10 meter band) is available only in U.S.A.

■SM-230 STATION MONITOR
Built around a basic 10 MHz oscilloscope, the SM-230 station monitor features, in combination with a built-in two-tone generator, a variety of waveform-observing capabilities.

■IF-232C INTERFACE
The IF-232C Interface is the adapter for connection between the RS-232C terminal of a personal computer and the interface terminal of the TS-850S.



SP-31

■ HS-6 COMMUNICATIONS HEADPHONES (12.5 OHMS)
Deluxe, very light-weight headphones designed for communications equipment.

■ HS-5 COMMUNICATIONS HEADPHONES (8 OHMS)
Headphones designed for communications equipment. These light-weight open air-type

[redacted]

■YG-455C-1 CW FILTER

Center frequency	: 455.0 kHz
Pass band width	: 500 Hz (-6 dB)
Attenuation band width	: 820 Hz (-60 dB)
Guaranteed attenuation	: More than 80 dB

■YG-455CN-1 CW FILTER

Center frequency	: 455.0 kHz
Pass band width	: 250 Hz (-6 dB)
Attenuation band width	: 480 Hz (-60 dB)
Guaranteed attenuation	: More than 80 dB

■YK-88C-1 CW FILTER

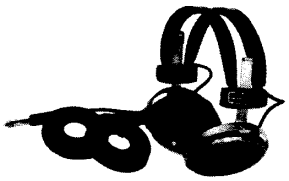
Center frequency	: 8830.0 kHz
Pass band width	: 500 Hz (-6 dB)
Attenuation band width	: 1.5 kHz (-60 dB)
Guaranteed attenuation	: More than 80 dB

■YK-88CN-1 CW FILTER

Center frequency	: 8830.0 kHz
Pass band width	: 270 Hz (-6 dB)
Attenuation band width	: 1.1 kHz (-60 dB)
Guaranteed attenuation	: More than 80 dB

■YK-88SN-1 SSB FILTER

Center frequency	: 8830.0 kHz



HS-5

8. REFERENCE

8-1. ANTENNA INSTALLATION

■Fixed Station

For HF fixed-station operation, an antenna specifically designed for amateur operation is recommended. Antenna types include wire antennas, verticals, rotary beams, and other antenna types. (Fig. 8-1) HF antennas are quite large and must be installed to withstand strong wind, heavy rain, etc.
Any antenna used with this transceiver should be of 50-ohm impedance and should be connected using

8/U).

Impedance matching is important. Impedance mismatching will result in a high VSWR and power loss, or can cause unwanted harmonic radiation and interference (TVI, BCI).
The impedance match can be checked with the SWR meter. Generally, satisfactory operation is assured when the VSWR (Voltage Standing Wave Ratio) is less than 1.5 : 1.

A rotary beam antenna is very effective for DX communication in the 14, 21 and 28 MHz bands. (Fig. 8-2) If open wire or balanced type transmission line is used with the antenna, a suitable antenna tuner with balun is recommended between the transceiver and the feed line. Methods of construction and operating such tuners are described in detail in the ARRL Antenna Handbook,

For operation on the 160, 75 and 40 meter bands, a simple dipole antenna, cut to resonance in the most used portion of the band, will perform satisfactorily.
For operation on the 10, 15 and 20 meter bands, the efficiency of the station will be greatly increased if a good directional rotary antenna is used. Remember that even the most sophisticated transceiver is useless without a good antenna.

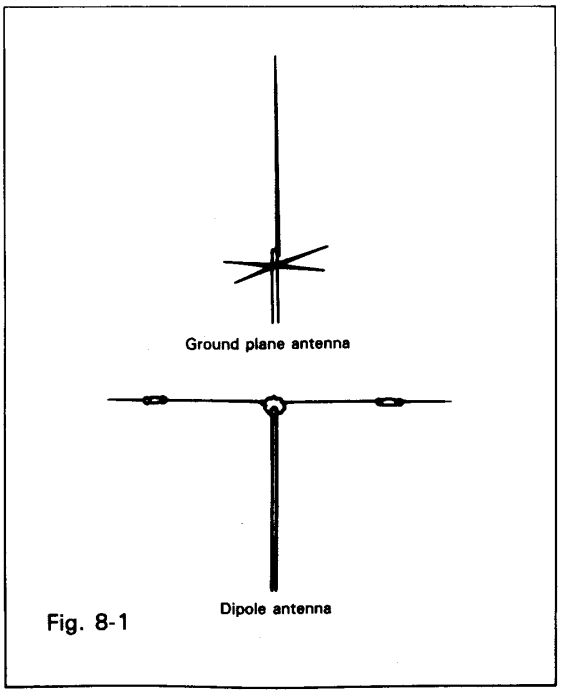


Fig. 8-1

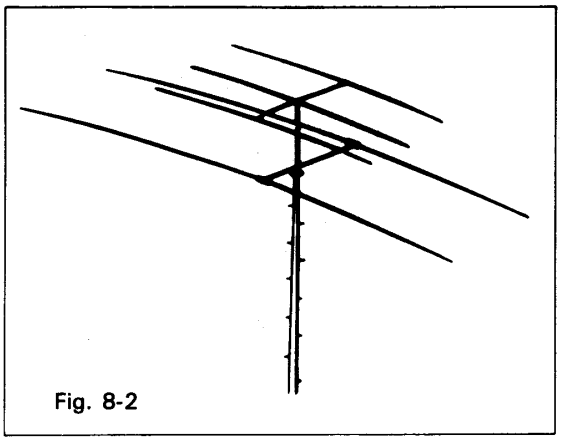
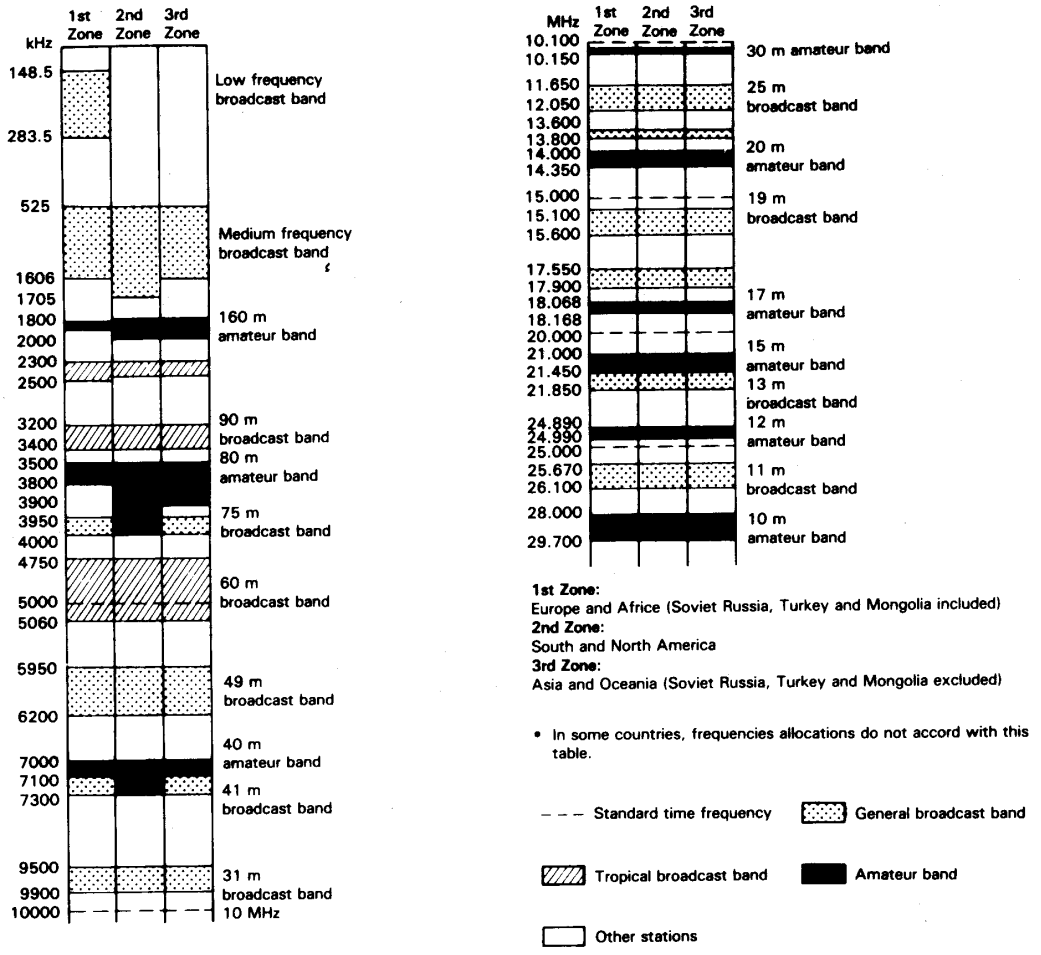


Fig. 8-2

8-2. RADIO FREQUENCY ALLOCATION



Radio Frequency Allocation

Frequency distribution in the broadcast and amateur bands

The general coverage receiver covers from 30 kHz to 30 MHz, to receive international broadcast and communication services.

As shown in the frequency allocation chart, above figure, broadcast and amateur radio station [illegible]

Notes

1. Radio stations throughout the world are listed in the WORLD RADIO TV HANDBOOK or similar publications.
2. Antennas designed for ham band operation will generally provide satisfactory reception for SW stations near the ham bands. For antenna