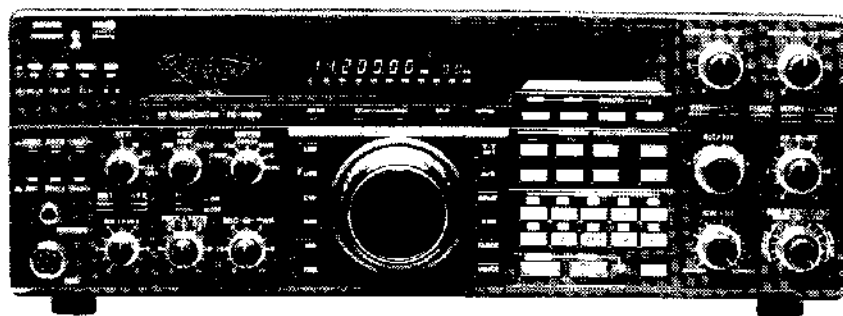


INSTRUCTION MANUAL

HF TRANSCEIVER

Model TS-940S



NOTES:

1. If the timer switch is set to ON, the unit sometimes does not function even when the POWER switch is set to ON.
2. When the squelch is not in use, turn the SQL control fully counterclockwise. If the control is turned fully clockwise, the reception sound sometimes cannot be heard.

KENWOOD

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■ UNPACKING

Remove the TS-940S from its shipping container and packing material and examine it for visible damage. If the equipment has been damaged in shipment, notify the transportation company immediately. Save the boxes and packing material for future shipping.

The following accessories should be included with the transceiver.

1. Instruction Manual (B50-8002-10)..... 1
2. 13-pin DIN plug (E07-1351-05)..... 1
3. 7 pin DIN plug (E07-0751-05) 1
4. Fuse (6A) (F05-6021-05) or
(4A) (F05-4022-05)..... 1
5. Power cable..... 1
6. Warranty card 1

■ OPERATING PRECAUTIONS: READ BEFORE OPERATING

Read this instruction manual carefully before attempting operation of your new TS-940S. While this set is similar to others you may have owned before, there are many features that are new or unique to this radio. Familiarize yourself with the operation of controls and procedures before you even apply power. Note that the final power transistors might be damaged during transmission if the transceiver is operated into an improper load.

1. If the built-in antenna tuner is used, operate at full power only after automatic tuning is completed.
2. Use only a resonant 50 ohm antenna which has been adjusted for an SWR of 1.5 to 1 or less.
3. DO NOT transmit without an Antenna or 50 ohm load.

THE FOLLOWING DEFINITIONS APPLY IN THIS MANUAL:

NOTE: If disregarded, inconvenience only – no damage or personal injury.

CAUTION: Equipment damage may occur, but not personal injury.

■ FEATURES

Circuit Configuration providing Receiver Performance of the Highest Quality.

1. Trio-Kenwood has succeeded in achieving the highest level dynamic range of 102 dB (with an IF bandwidth of 500 Hz.)
2. General coverage receiver section tunes from 150 kHz – 30 MHz.
3. The transceiver can operate in any mode (SSB, CW, AM, FM or FSK).
4. Every possible function has been adopted to eliminate radio interference.

- SSB slope tune
- CW VBT
- Notch (100 kHz IF notch)
- AF tune
- Variable CW pitch circuit
- Dual Noise Blankers
- 10 Hz Step RIT/XIT with a ± 9.99 kHz tuning range employing an optical encoder
- Four step RF ATT control prevents saturation upon reception of excessive signal inputs.

Transmitter Section with Low Distortion and High Reliability

1. The power supply voltage of 28V has been adopted to assure the lowest distortion.
2. Semi break-in or full break-in.
3. Auto tuner available built in or as an optional accessory.
4. Built-in RF speech processor.

Microprocessor Control of various Digital functions

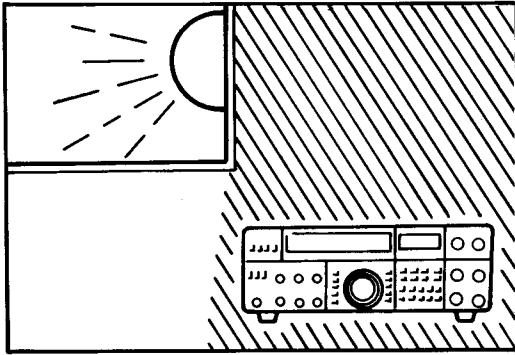
1. VFO with auto quick tuning function
2. Built-in Dual digital VFO's
3. Direct entry of frequency from the key board.
4. 40-Channel Memory
5. Two types of frequency scan
 - Program scan
 - Memory scan

Design and Construction Appropriate to a Quality Transceiver

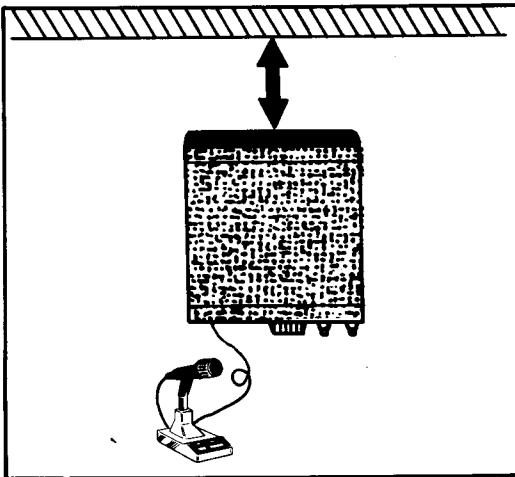
1. Dual displays
 - Main display is a large, two color fluorescent display.
 - Sub-display consists of a 2-line, 16 digit liquid crystal dot matrix.
2. Built-in 24 hour digital clock with timer
3. All-in-one type construction containing all components from AC power supply to speaker

1. PREPARATION BEFORE USE

1-1. INSTALLATION PRECAUTIONS



Choose an operating location that is dry and cool, and avoid operating the transceiver in direct sunlight.



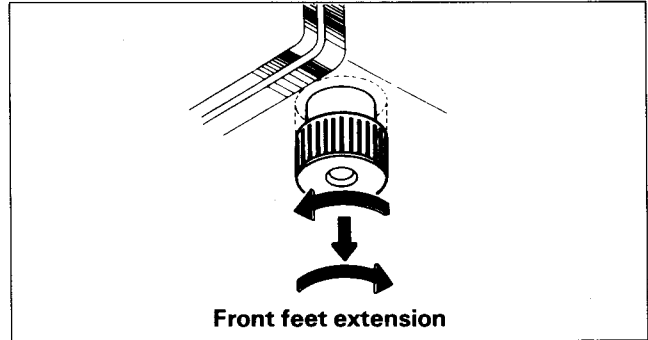
Allow at least 3 inches clearance between the back of the equipment to any object. This space allows an adequate airflow from the ventilating fans to keep the transceiver cool.

1-2. COOLING FAN OPERATION

The cooling fan operates automatically when the heat sink temperature rises, and stops when the temperature falls. The heat sink is die-cast aluminum integral with the rear panel for sufficient heat dissipation. Therefore, the cooling fan will rarely operate during ordinary operation. If the cooling fan operates, insure adequate ventilation to insure good heat dissipation.

1-3. FRONT FEET

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



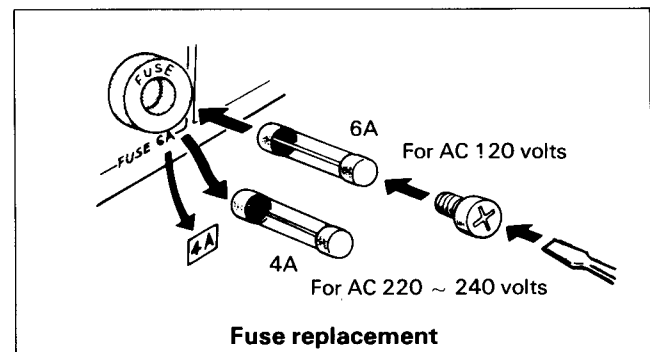
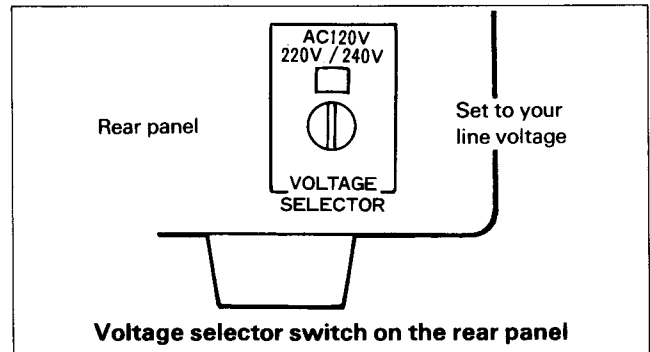
1-4. AC POWER

The TS-940S is supplied to operate from a 120V AC, 220V AC or 240V AC 50/60 Hz power source capable of supplying 510 watts or more.

For units shipped to the U.S.A., the switch is set for 120 VAC with a 6-ampere fuse installed.

For units shipped to European, Central, South American, and African countries, the switch is set for 220 VAC with a 4-ampere fuse installed.

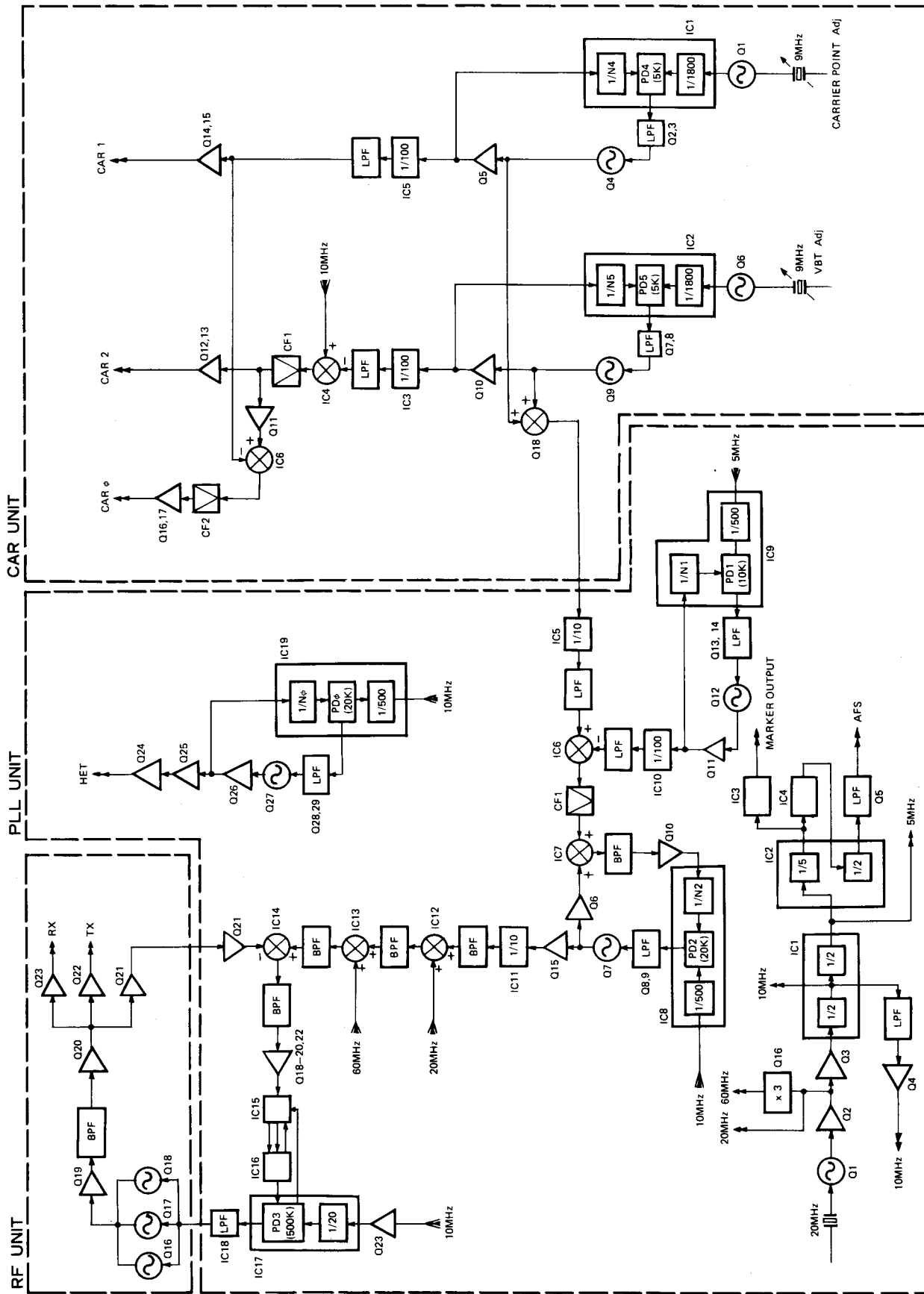
For units shipped to Oceania countries, and U.K. the switch is set for 240 VAC with a 4-ampere fuse installed.



Sensitivity	
150 kHz ~ 500 kHz	10 dB S/N 0 dB μ (1 μ V) or less in SSB, CW and FSK 10 dB S/N 20 dB μ (10 μ V) or less in AM
500 kHz ~ 1.8 MHz	10 dB S/N 12 dB μ (4 μ V) or less in SSB, CW and FSK 10 dB S/N 30 dB μ (32 μ V) or less in FM
1.8 MHz ~ 30 MHz	10 dB S/N -14 dB μ (0.2 μ V) or less in SSB, CW and FSK 10 dB S/N 6 dB μ (2 μ V) or less in AM 12 dB SINAD -6 dB μ (0.5 μ) or less in FM
Squelch Sensitivity	-10 dB μ (0.32 μ V) or less
Image Ratio	80 dB or more in 1.8 - 30 MHz
IF Rejection	70 dB or more in 1.8 - 30 MHz
Selectivity:	
N: Denotes the filter setting is NARROW.	
W: Denotes the filter setting is WIDE.	
(SSB, CW, AM(N), FSK)	2.4 kHz/-6 dB 3.6 kHz/-60 dB
(AM (W))	6 kHz/-6 dB 15 kHz/-50 dB
(FM)	12 kHz/-6 dB 22 kHz/-60 dB
Variable Range	With SSB Filter
(SSB Slope Tune)	High-cut: 1500 Hz or more Low-cut: 700 Hz or more Without SSB filter
(CW VBT)	600 Hz ~ 2.4 kHz continuously variable
RIT/XIT Variable range	\pm 9.99 kHz
Notch Filter Attenuation	40 dB or more
Audio Output	1.5 W (at 8 ohm load/10% distortion)
Audio Load Impedance	8 ohms

Note: Circuits and ratings subject to change without notice due to developments in technology.

(PLL - CAR UNIT)



15. SPECIFICATIONS

[GENERAL]

Transmitter Frequency Range:	160 m Band 1.8 ~ 2.0 MHz 80 m Band 3.5 ~ 4.0 MHz 40 m Band 7.0 ~ 7.3 MHz 30 m Band 10.1 ~ 10.15 MHz 20 m Band 14.0 ~ 14.35 MHz 17 m Band 18.068 ~ 18.168 MHz 15 m Band 21.0 ~ 21.45 MHz 12 m Band 24.89 ~ 24.99 MHz 10 m Band 28.0 ~ 29.7 MHz
Receiver Frequency Range:	150 kHz ~ 30 MHz
Mode:	A3J (USB, LSB), A1 (CW), F1 (FSK), A3 (AM), F3 (FM)
Frequency Stability	$\pm 10 \times 10^{-6}$ (-10°C ~ +50°C)
Frequency Accuracy	$\pm 10 \times 10^{-6}$ (Room temperature)
Antenna Impedance	50 ohms
With AT-940 Antenna Tuner	20 ~ 150 ohms (Transmission only)
Power Requirement:	120/220/240 VAC, 50/60 Hz
Power Dissipation:	Max. 510 W during transmission, 80 W during reception
Dimensions	W 401 x H 141 x D 350 mm (Projections Inc.) W 409 x H 154 x D 420 mm W 160.4 x H 56.4 x D 140 inch (Projections Inc.) W 163.6 x H 61.6 x D 168 inch
Weight	With antenna tuner: Approx. 20 kg (44.0 lbs) Without antenna tuner: Approx. 18.5 kg (41.0 lbs)

[TRANSMITTER]

Rated Final Power Input	250W PEP (160 ~ 10 m bands in SSB, CW, FSK, FM) 140W (in AM)
Modulation	SSB: Balanced modulation FM: Reactance modulation AM: Low level modulation
Maximum Frequency Deviation	± 5 kHz
RTTY Shift	170 Hz
Harmonic Content	-40 dB or less (in CW)
Carrier Suppression	40 dB or more (with 1.5 kHz modulation)
Unwanted Sideband Suppression	Better than 50 dB (with 1.5 kHz modulation)
3rd order intermodulation	-37 dB or less (based on Single tone output)
Microphone Impedance	500 Ω ~ 50k Ω
Frequency Response	400 ~ 2600 Hz at -6 dB in SSB

[RECEIVER]

Circuitry	Quadruple conversion for SSB, CW, AM, FSK Triple conversion for FM
Intermediate Frequencies	1st IF: 45.05 MHz 2nd IF: 8.83 MHz 3rd IF: 455 kHz 4th IF: 100 kHz

Model TS-940S

Serial No. _____

Date of Purchase _____

Dealer _____

KENWOOD CORPORATION

Shionogi Shibuya Building, 17-5, 2-chome Shibuya, Shibuya-ku, Tokyo 150 Japan

KENWOOD U.S.A. CORPORATION

2201 E. Dominguez Street, Long Beach, California 90810 U.S.A.

KENWOOD ELECTRONICS DEUTSCHLAND GMBH

Rembrücker Str. 15, 6056 Heusenstamm, West Germany

KENWOOD ELECTRONICS BENELUX N.V.

Mechelsesteenweg 418 B-1930 Zaventem, Belgium

KENWOOD ELECTRONICS AUSTRALIA PTY. LTD.

(INCORPORATED IN N.S.W.)

4E. Woodcock Place, Lane Cove, N.S.W. 2066 Australia

1-5. ANTENNA

Any of the common antenna systems designed for use on the high frequency amateur bands may be used with the TS-940S, provided the input impedance of the transmission line is not outside the capability of the AT-940 Automatic Antenna Tuner pi-output matching network. The transmission line should be coaxial cable. An antenna system which shows a standing wave ratio of less than 1.5 : 1 when using 50 ohm coaxial transmission line, or a system that results in a transmission line input impedance that is essentially resistive, and between 20 and 150 ohms will take power from the transceiver through the AT-940. 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, or similar publications. 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.

CAUTION:

Protect your Equipment – Use a LIGHTNING ARRESTOR.

1-6. GROUNDING

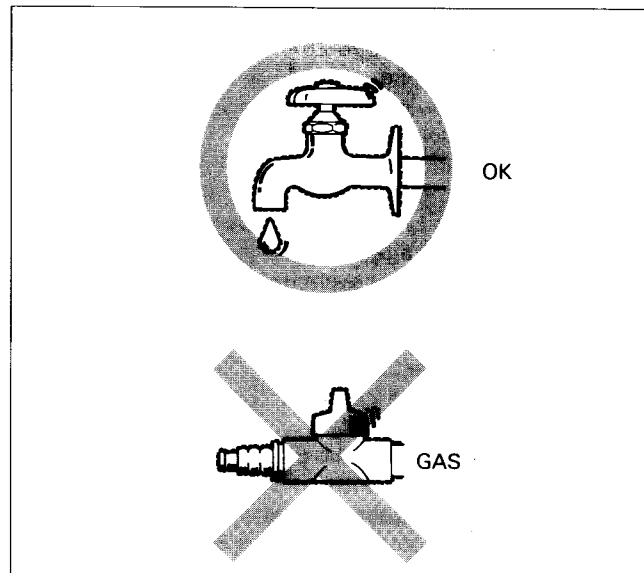
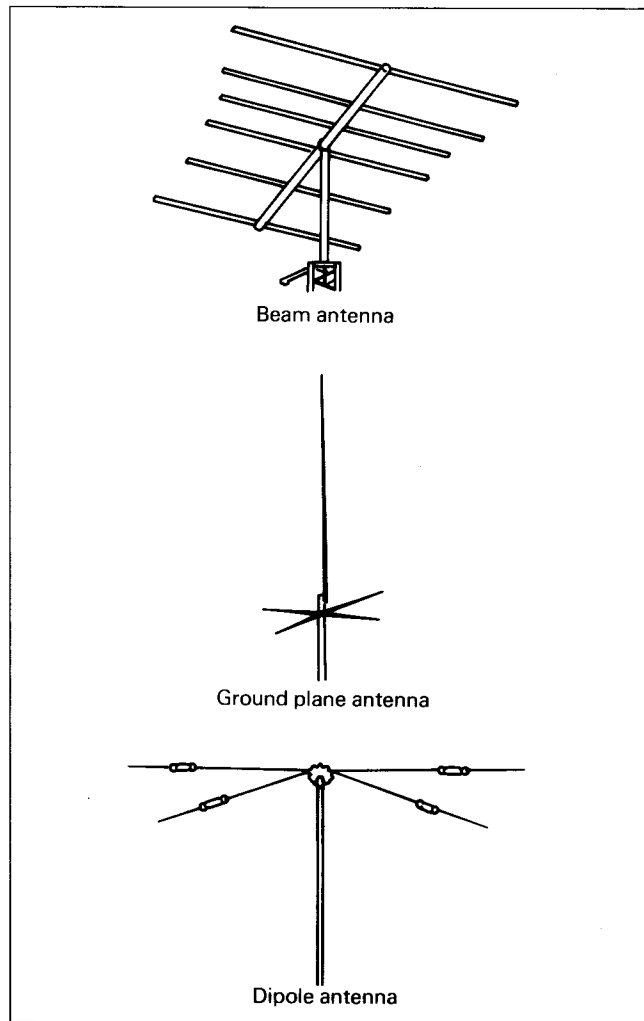
Making a good earth connection is important for preventing dangers such as electric shock and for emitting a high quality signal with minimum spurious radiation. Bury a commercially available ground rod or copper plate under the ground and connect it to the GND terminal of the TS-940S. A thick wire, cut as short as possible, should be used for the connection.

A city water pipe cannot be used as a good earth in some cases. To make a good earth connection, connect the GND terminal to a metal water pipe grounded.

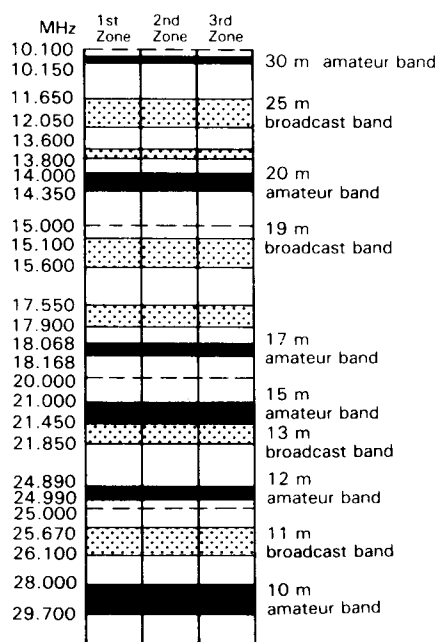
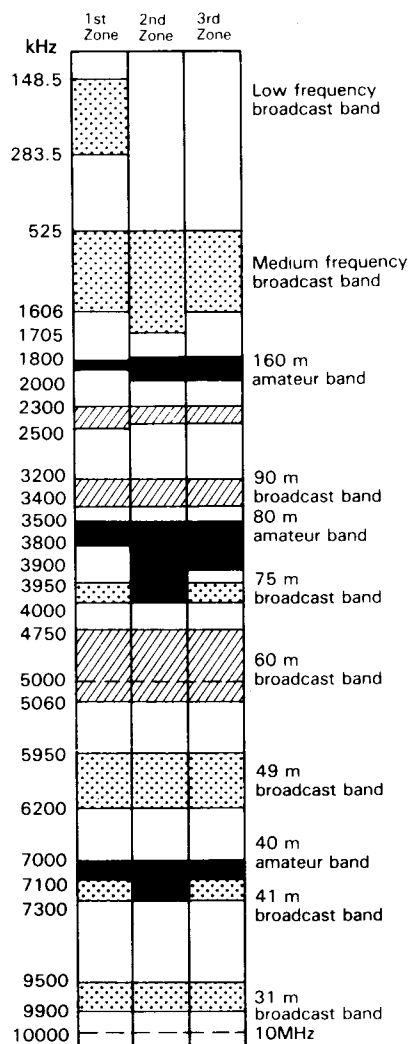
Never use a gas pipe or electrical conduit pipe.

NOTE:

A ground connection that is a 1/4 wavelength or its multiple may provide a good DC ground, but it will not provide a good RF ground.



1-7. SHORT WAVE RECEPTION



1st Zone:
Europe and Africa (Soviet Russia, Turkey and Mongolia included)
2nd Zone:
South and North America
3rd Zone:
Asia and Oceania (Soviet Russia, Turkey and Mongolia excluded)

● In some countries, frequencies allocations do not accord with this table.

--- Standard time frequency General broadcast band
 Tropical broadcast band Amateur band
 Other stations

Radio Frequency Allocation

Frequency Distribution in the Broadcast and Amateur Bands.

The TS-940S receiver covers from 150 kHz to 30 MHz, to receive international broadcast and communication services.

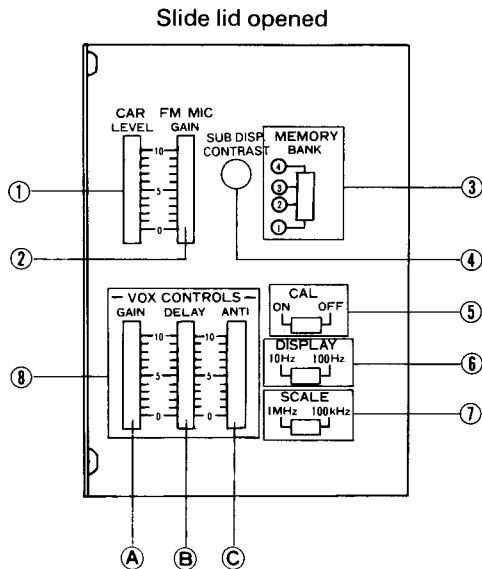
As shown in the Frequency Allocation Chart, above figure, broadcast and Amateur radio station frequencies are allocated in specific bands expressed in megahertz (MHz) or wavelength in-meters (m). Also in the above figure the frequencies of "other stations" are assigned for fixed station business use, marine mobile, aviation mobile, land mobile, radio beacon stations, etc.

NOTE:

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 construction details, see the **ARRL ANTENNA HANDBOOK**, or similar publications.

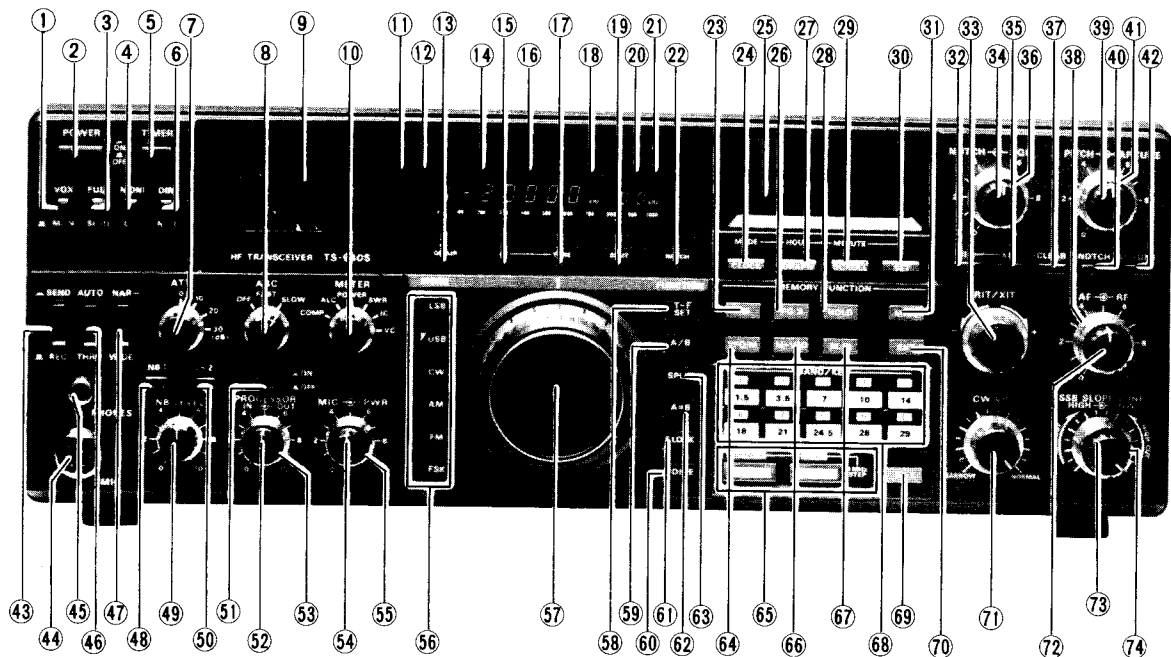
2. CONTROLS, INDICATORS AND CONNECTORS

TOP COVER

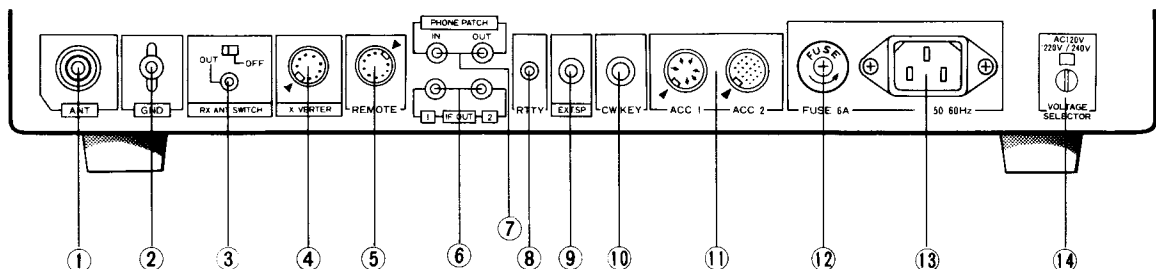


- ① **CAR LEVEL (carrier level) control**
Used to adjust carrier level during CW.
- ② **FM MIC GAIN (microphone gain) control**
Used to adjust microphone amplifier gain in FM.
- ③ **Memory group selector switch**
Allows to selection of the desired memory channel group.
- ④ **SUB DISP. CONTRAST control**
Allows you to adjust the contrast of the sub display, using a (-) screwdriver.
- ⑤ **CAL (marker) switch**
When this switch is ON during reception, the built-in oscillator will generate a marker signal at 100 kHz intervals. This switch is also used to zero beat the internal oscillator frequency with a standard frequency (WWV).
- ⑥ **10 Hz indication switch**
Allows frequency indication down to the nearest 10 Hz digit.
- ⑦ **Analog SCALE selection switch**
Used to select the analog scale range, 1 MHz or 100 kHz.
- ⑧ **VOX control**
 - ① **A** GAIN: Used to adjust VOX amplifier gain.
 - ② **B** DELAY: Used to adjust delay time.
 - ③ **C** ANTI: Used so that VOX will not be actuated by the internal speaker sound.

FRONT PANEL



REAR PANEL



FRONT PANEL

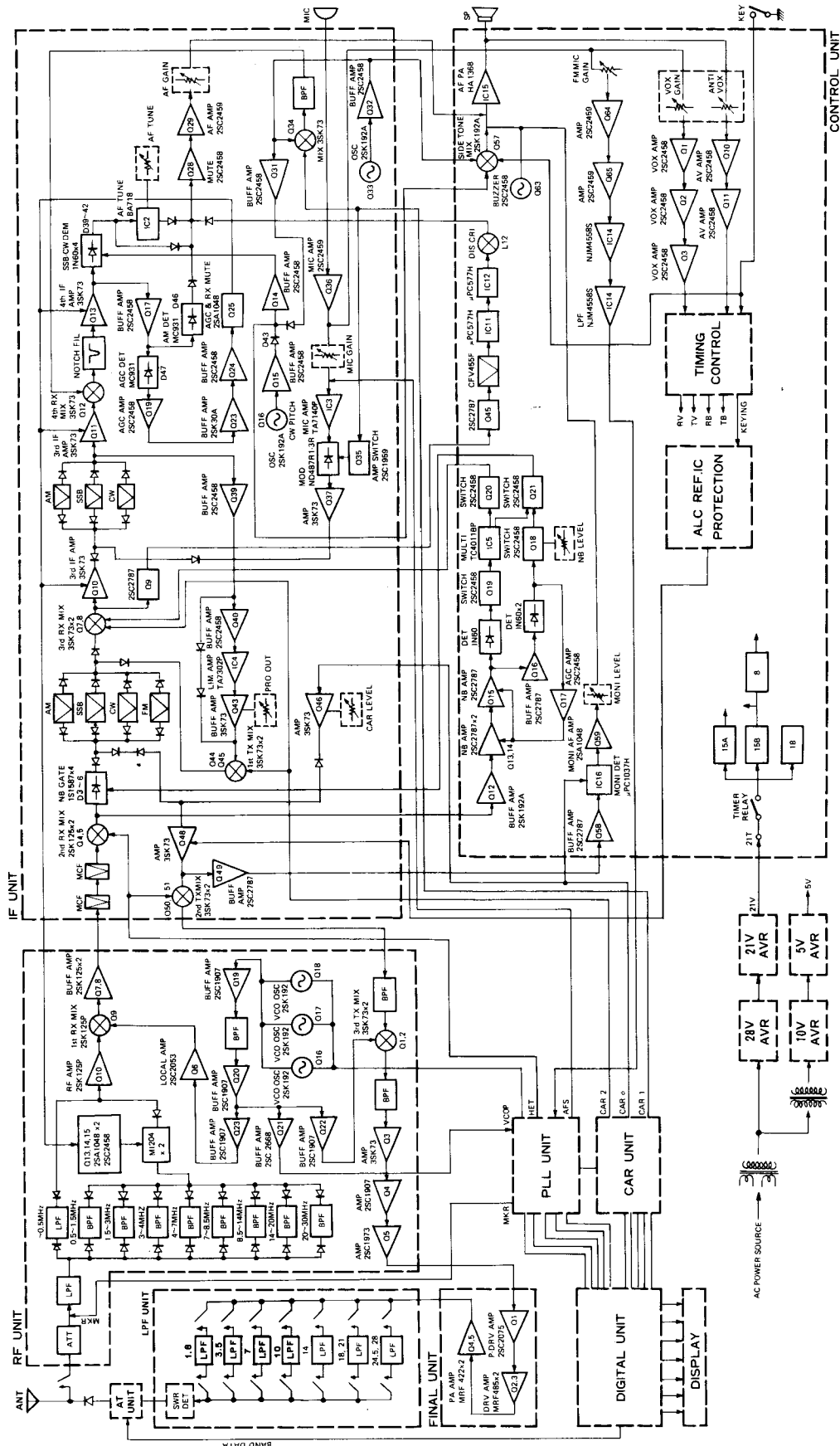
- ① VOX switch ⇨ page 24
- ② POWER switch
- ③ CW break-in selector switch ⇨ page 23
- ④ MONI (monitor) switch ⇨ pages 8, 10, 14, 16
- ⑤ TIMER switch ⇨ page 38
- ⑥ DIM (Dimmer) switch ⇨ page 19
- ⑦ ATT switch ⇨ page 24
- ⑧ AGC switch ⇨ page 25
- ⑨ Meter ⇨ page 20
- ⑩ METER switch ⇨ page 20
- ⑪ Main display
- ⑫ F. LOCK indicator ⇨ page 19
- ⑬ ON AIR indicator ⇨ page 19
- ⑭ VFO A indicator ⇨ page 19
- ⑮, ⑰ ANT TUNE indicator ⇨ page 19
- ⑯ VFO B indicator ⇨ page 19
- ⑱ MEMO (Memory) channel indicator ⇨ page 19
- ⑲ SPLIT indicator ⇨ page 19
- ⑳ RIT indicator ⇨ page 19
- ㉑ XIT indicator ⇨ page 19
- ㉒ NOTCH indicator ⇨ page 19
- ㉓ MS (Memory scan) switch ⇨ page 33
- ㉔ CLOCK switch ⇨ page 35
- ㉕ Sub-display ⇨ page 35
- ㉖ PG. S (Program scan) switch ⇨ page 33
- ㉗ GRAPH switch ⇨ pages 35, 36
- ㉘ HOLD switch ⇨ page 33
- ㉙ SCROLL switch ⇨ pages 34, 35
- ㉚ SET switch ⇨ page 35
- ㉛ M. CE switch ⇨ page 34
- ㉜ RIT switch ⇨ page 26
- ㉝ RIT/XIT control ⇨ page 26
- ㉞ NOTCH control ⇨ page 22
- ㉟ XIT switch ⇨ page 26
- ㊱ SQL control ⇨ pages 9, 13, 15, 17
- ㊲ CLEAR switch ⇨ page 26
- ㊳ RF (gain) control ⇨ page 25
- ㊴ PITCH control ⇨ page 26
- ㊵ NOTCH switch ⇨ page 22
- ㊶ AF TUNE control ⇨ page 26
- ㊷ AF TUNE switch ⇨ page 26
- ㊸ REC/SEND stand-by switch ⇨ pages 9, 11, 15, 17
- ㊹ MIC (Microphone) connector ⇨ pages 7, 29
- ㊺ PHONES jack ⇨ pages 7, 29
- ㊻ AUTO-THRU selector switch ⇨ page 18
- ㊼ NAR/WIDE switch ⇨ pages 10, 12
- ㊽ NB 1 switch ⇨ page 22
- ㊾ NB control ⇨ page 22
- ㊿ NB 2 switch ⇨ page 22
- ① PROC switch ⇨ page 24
- ② PROCESSOR-IN control ⇨ page 24
- ③ PROCESSOR-OUT control ⇨ page 24
- ④ MIC (microphone gain) control ⇨ pages 9, 15
- ⑤ PWR (RF power) control ⇨ pages 8, 10, 14, 16
- ⑥ MODE switch ⇨ pages 8 ~ 17

- ⑦ Main tuning control ⇨ pages 8 ~ 17
- ⑧ T-F SET switch ⇨ page 20
- ⑨ A/B switch ⇨ page 19
- ⑩ VOICE switch ⇨ page 19
- ⑪ F. LOCK switch ⇨ page 19
- ⑫ A = B switch ⇨ page 19
- ⑬ SPLIT switch ⇨ page 19
- ⑭ VFO/M switch ⇨ page 31
- ⑮ 1 MHz step switch ⇨ pages 8 ~ 17
- ⑯ M ► VFO switch ⇨ page 33
- ⑰ M. IN switch ⇨ page 31
- ⑱ BAND KEY (1 - 10) switch ⇨ pages 8 ~ 17
- ⑲ AT. T switch ⇨ page 18
- ⑳ ENT (Enter) switch ⇨ page 34
- ㉑ VBT control ⇨ page 21
- ㉒ AF (audio gain) control ⇨ page 26
- ㉓ SSB SLOPE TUNE HIGH CUT control ⇨ page 21
- ㉔ SSB SLOPE TUNE LOW CUT control ⇨ page 21

REAR PANEL

- ① Antenna connector
Connect an antenna with an impedance of 50 Ω , with an SWR of 1.5 or less.
- ② GND (ground) terminal
Used to make TS-940S ground. Connect using as thick and short a wire as possible.
- ③ RX ANT terminal selector switch
Used to disconnect the TS-940S receiver. Supplies an antenna connection to an external receiver.
- ④ Transverter connector
For details, see page 29.
- ⑤ Remote connector
This connector is used when a linear amplifier is used.
- ⑥ IF OUT jack
IF 1 is for connection to the SM-220 for Pan Display. (8.83 MHz)
IF 2 is for connection to the SM-220 for RX Modulation Display. (100 kHz)
- ⑦ PHONE PATCH jacks
The IN terminal is used for transmit audio from the phone patch (600 Ω).
The OUT terminal is used for received audio from the transceiver to the phone patch (600 Ω). These jacks can also be used for input to and from SSTV, or RTTY terminals.
- ⑧ RTTY jack
For connection to an RTTY interface unit. (direct keying)
- ⑨ EXT SP (external speaker)
This terminal is for an external speaker.
- ⑩ CW KEY jack
Used to connect the key during use of CW.
- ⑪ Accessory terminals
- ⑫ Fuse Holder
- ⑬ AC power connector
Connect the supplied power cord.
- ⑭ VOLTAGE SELECTOR switch
Used to select the correct line voltage.

14. BLOCK DIAGRAMS



ANTENNA TUNER AT-940

