



## UHF ALL MODE TRANSCEIVER

# Model TR-9500



**INSTRUCTION MANUAL**

# INTRODUCTION

You are the owner of our latest product, the new TR-9500 transceiver. Please read this instruction manual carefully before placing your transceiver in service. The unit has been carefully engineered and manufactured to rigid quality standards, and should give you satisfactory and dependable operation for many years.

## AFTER UNPACKING

- Shipping container:  
Save the boxes and packing in the event your unit needs to be transported for remote operation, maintenance, or service.
- 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.

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# FEATURES

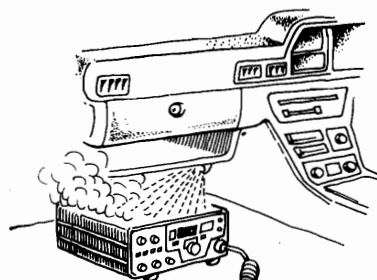
1. 70cm all band transceiver for FM, SSB (USB, LSB), and CW operation.
2. Rotary click, 100Hz step digital 2-VFO system specifically designed for mobile operation.
3. Five-digit display indicates frequency of all operating modes.
4. TX OFFSET switch shifts frequencies – 1.6 MHz and +1.6 MHz in the low band for standard repeater operation.
5. Six memory channels. Two different frequencies (transmit and receive) are stored in CH6, permitting "odd-split" repeater operation in FM mode.
6. Frequencies are searched quickly and automatically in SSB and CW mode by the digital step switch.
7. With the MHz switch set to ON, the operating frequency can be changed in MHz step by using the main dial
8. or the UP/DOWN switch on the microphone.
8. Incorporates auto scan circuit (BUSY signal stops in FM mode).
9. The transceiver has a memory scan circuit which scans only the channels stored in the memory.
10. The transceiver also has an MHz scan circuit which operates with the MHz switch.
11. In the SSB/CW mode, the transmit frequency is variable and can be used for Oscar communication.
12. Hand microphone with frequency UP-DOWN switch.
13. Automatic selection of RIT, NB, RF GAIN and AGC. Self-contained side tone circuit.
14. Unique escutcheon design allows easy installation for mobile operation.
15. Full variety of accessory terminals (KEY, BACK UP, STBY, EXT SP).

# BEFORE USE

**KEEP OUT**



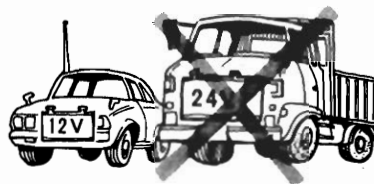
**Do not adjust coils, trimmers, or pots! These are factory adjustments.**



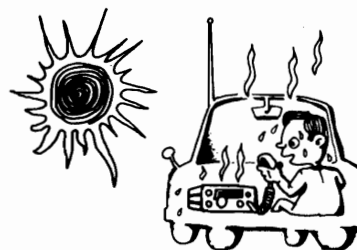
**Do not install near heater outlet.**



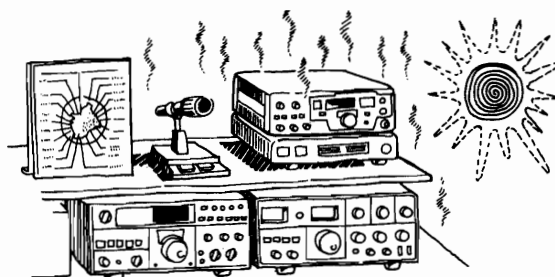
**BEFORE connection, check polarity.**



**This unit is designed for 12 V, negative ground ONLY.**



**After parking in the sun, and inside temperature is HOT, cool this unit BEFORE transmitting.**



**Keep equipment away from heat and out of direct sunlight.**

# SPECIFICATIONS

## [General]

<b>Semiconductors</b> .....	ICs	12
	FETs	17
	Transistors	111
	Diodes	115
<b>Frequency range</b> .....	430.000.0 to 439.999.9 MHz	
<b>Frequency synthesizer</b> .....	Digital control, phase locked VCO	
<b>Mode</b> .....	SSB (A3J), FM (F3), CW (A1)	
<b>Antenna impedance</b> .....	50 ohms	
<b>RPT. Tone burst frequency</b> .....	1,750 Hz	
<b>Power requirement</b> .....	13.8 V DC $\pm$ 15%	
<b>Grounding</b> .....	Negative	
<b>Operating temperature</b> .....	- 20°C to + 50°C	
<b>Current drain</b> .....	0.7A in receive mode with no input signal	
	3.8A in transmit mode (Approx.)	
	2.0 mA for memory back up	
<b>Dimensions</b> .....	170 mm (6-11/16") wide	
	68 mm (2-11/16") high	
	241 mm (9-1/2") deep	
<b>Weight</b> .....	2.7 kg (5.94 lbs)	
<b>[Transmitter Section]</b>		
<b>RF output power (at 13.8 V DC, 50 <math>\Omega</math> load)</b> .....	10 W	
<b>Modulation</b> .....	FM	Variable reactance direct shift
	SSB	Balanced modulation
<b>Frequency tolerance</b> .....	Less than $\pm 10 \times 10^{-6}$	
<b>Spurious radiation</b> .....	Less than - 60 dB	
<b>Carrier suppression</b> .....	Better than 40 dB	
<b>Unwanted side band suppression</b> .....	Better than 40 dB	
<b>Maximum frequency deviation (FM)</b> .....	$\pm 5$ kHz	
<b>Microphone</b> .....	Dynamic microphone with PTT switch, 500 $\Omega$	
<b>[Receiver Section]</b>		
<b>Circuitry</b> .....	Double conversion superheterodyne	
<b>Intermediate frequency</b> .....	1st IF	21.6 MHz
	2nd IF	(FM) 455 kHz, (SSB/CW) 8.83 MHz
<b>Receiver sensitivity</b> .....	FM	Better than 0.5 $\mu$ V for 35 dB S/N
		Better than 0.25 $\mu$ V for 12 dB SINAD
	SSB, CW	Better than 0.5 $\mu$ V for 20 dB S/N
<b>Receiver selectivity</b> .....	FM	More than 14 kHz (- 6 dB)
		Less than 20 kHz (- 60 dB)
	SSB, CW	More than 2.4 kHz (- 6 dB)
		Less than 4.8 kHz (- 60 dB)
<b>Spurious interference</b> .....	Better than 60 dB	
<b>Squelch sensitivity</b> .....	0.2 $\mu$ V (Threshold)	
<b>Auto scan stop level</b> .....	Less than 0.2 $\mu$ V (Threshold)	
<b>Audio output</b> .....	More than 2.0 watts across 8 ohms load (10% dist.)	

**Note:** Circuit and ratings are subject to change without notice due to developments in technology.

# SECTION 1. PREPARATION FOR USE

## 1.1 Accessories

Carefully unpack your TR-9500 and check that it is supplied with the following accessories:

- (1) Dynamic microphone (with U/D switch)  
(T90-0311-05) .....1 piece
- (2) Mounting bracket .....1 assy  
Mounting parts:  
Hex wrench (W01-0401-04) .....1 piece  
Nuts (5mm diameter) (N14-0510-04) .....4 pieces  
Hex-socket screw (N09-0008-04) .....4 pieces  
Flat washers (6mm diameter)  
(N15-1060-46) .....4 pieces  
Spring washer (6mm diameter)  
(N16-0060-46) .....4 pieces
- (3) Leg (for fixed station) (J02-0416-04) .....1 pieces
- (4) DC power cord (with 2P plug and fuse)  
(E30-1649-05) .....1 piece
- (5) Spare fuse (5A) (F05-5022-05) .....1 piece
- (6) Miniature plug (for stand-by) (E12-0401-04) .....1 piece
- (7) Miniature plug (for external speaker or key)  
(E12-0001-05) .....1 piece

- (8) Instruction manual .....1 copy

## 1.2 Installation

### 1.2.1 Interconnection

Connect the antenna and power supply as shown in Fig. 1-1 for fixed station or mobile operation.

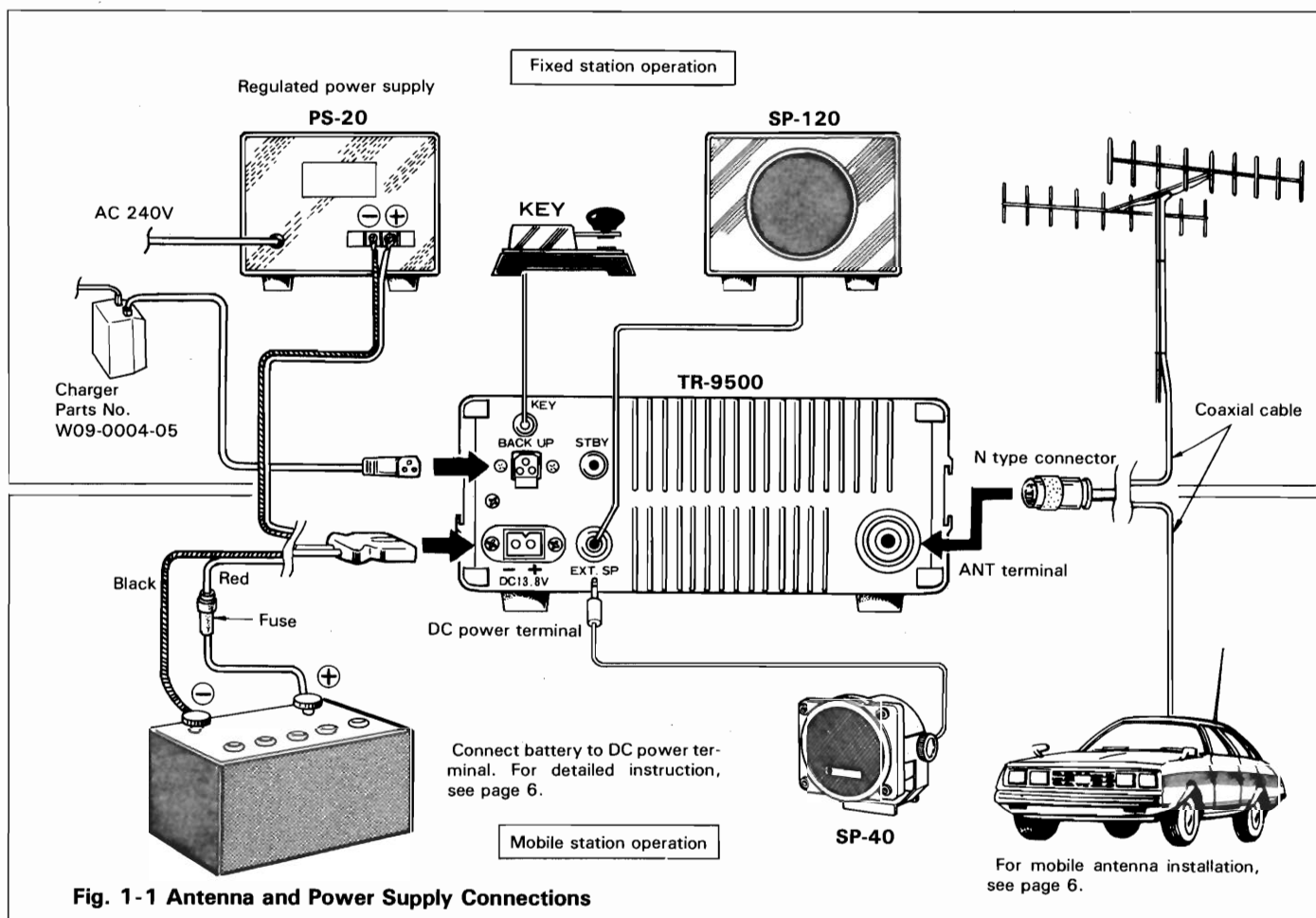


Fig. 1-1 Antenna and Power Supply Connections

## 1.2.2. MOBILE installation, [general]

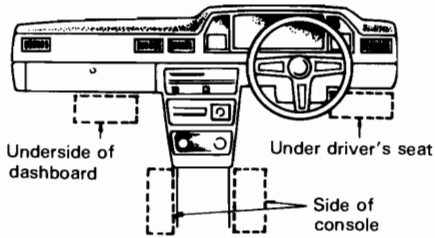
### • Installation location

Using the supplied mounting bracket, install the transceiver under the dashboard or on the side of console in your car.

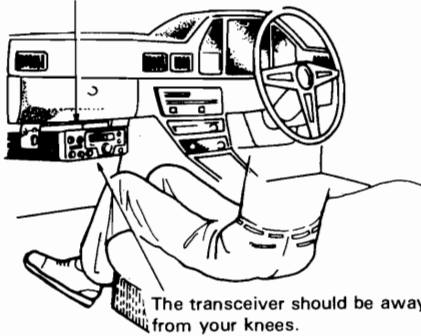
Refer to Fig. 1-2A and Fig. 1-2B.

If your car is equipped with an electronic fuel injector, the transceiver should be as far from the control, equipment as possible.

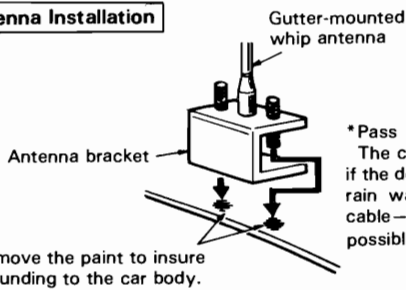
#### A. Installation position



Drill holes in the bottom of dashboard. Secure the mounting bracket with screws and nuts.



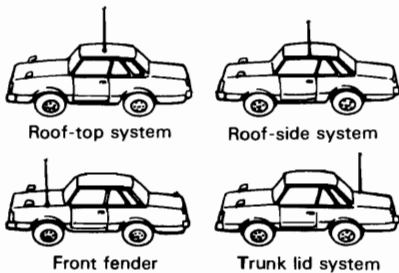
#### C. Antenna Installation



\*Pass through the door fitting. The cable can be inserted easily if the door cushion soft. Note that rain water may enter along the cable—use a \*lift the Drip-loop if possible.

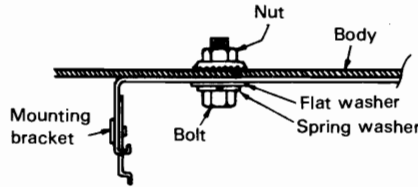
Trim plate and install the cable.

\*Insert through the bonnet.

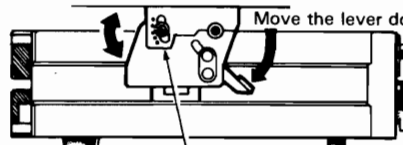
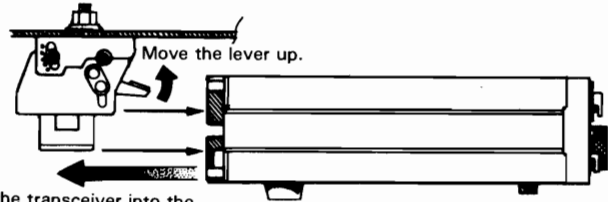


Be sure to use 70cm (430MHz) mobile antenna.

#### B. Installation of mounting bracket



Install the mounting bracket.



Adjust the installation angle and fully tighten 4 bolts using the hex wrench.

#### D. Coaxial cable connections

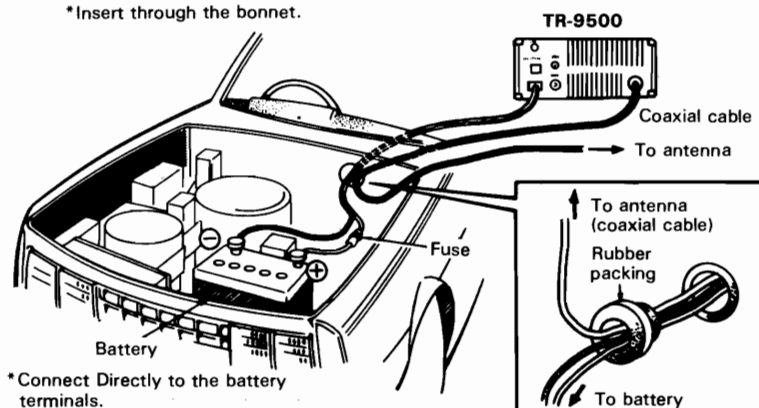
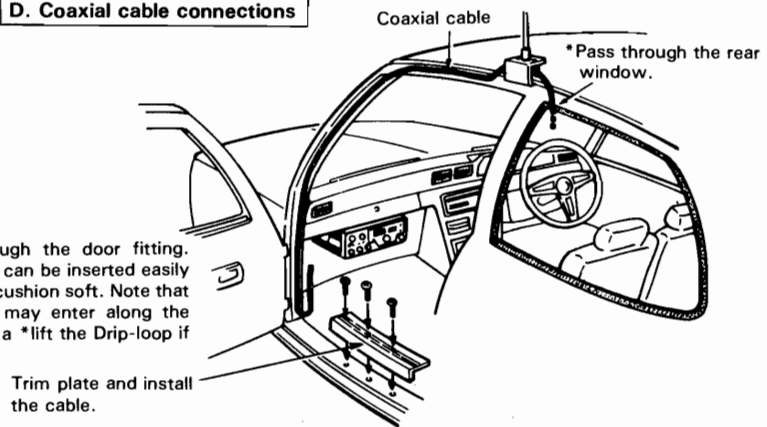


Fig. 1-2 Installation for Mobile Operation

• **Antenna installation**

Various types of antennas for 70cm mobile operation are available. (See Fig. 1-2C)

**NOTE:**

For gutter-mount installation, the antenna bracket must be grounded to the car body as shown in Fig. 1-2C. Affix the antenna securely, referring to the antenna instruction.

• **Power supply**

Connect the supplied power cord with fuse directly to the battery terminals. Connecting to the cigarette lighter socket can cause a poor connection, and excessive voltage drop.

• **Back up power for micro-computer**

With power supplied from battery, the micro-computer keeps operating even when the power switch is OFF. In this case, current drain is very low, approximately 2.0mA. The car can be parked overnight with little battery power consumed.

However, when the car is to be parked for a long period of time (more than 1 month), it is advisable to disconnect the power plug, in this case, the back up function is disabled.

• **Ignition noise**

The transceiver is designed to suppress ignition noise; however, if excessive noise is present, it may be necessary to use suppressor spark plugs (with resistors).

**1.2.3. FIXED STATION installation, [general]**

• **Power Supply (Fig. 1-3)**

The PS-20 optional power supply is recommended.

• **Antenna (Fig. 1-3)**

Various types of fixed station antennas are commercially available. Select your desired antenna according to your installation space and application (DX, local QSO, etc.). Note that the SWR of your antenna should be less than 1.5. A high SWR will cause the TR-9500 protective circuit to operate, reducing the transmit output power.

The TR-9500 is factory adjusted to deliver the rated RF output (10W) at about 435MHz, where the RF meter indicates "8" on the 10-division (lower) uniform scale. The RF meter will indicate about this point when the antenna SWR is less than 1.5.

• **Micro-computer back up (retention of memory function)**

Unless the power source is disconnected, the micro-computer keeps its back up function even if the power switch is turned OFF. If you desire back-up with the power source disconnected, plug the battery charger (W09-0004-05) or BO-9 System Base (option) back-up power cable into the back-up power socket on the rear of the TR-9500.

\* This is the same charger with the supplied accessory of the TR-2300.

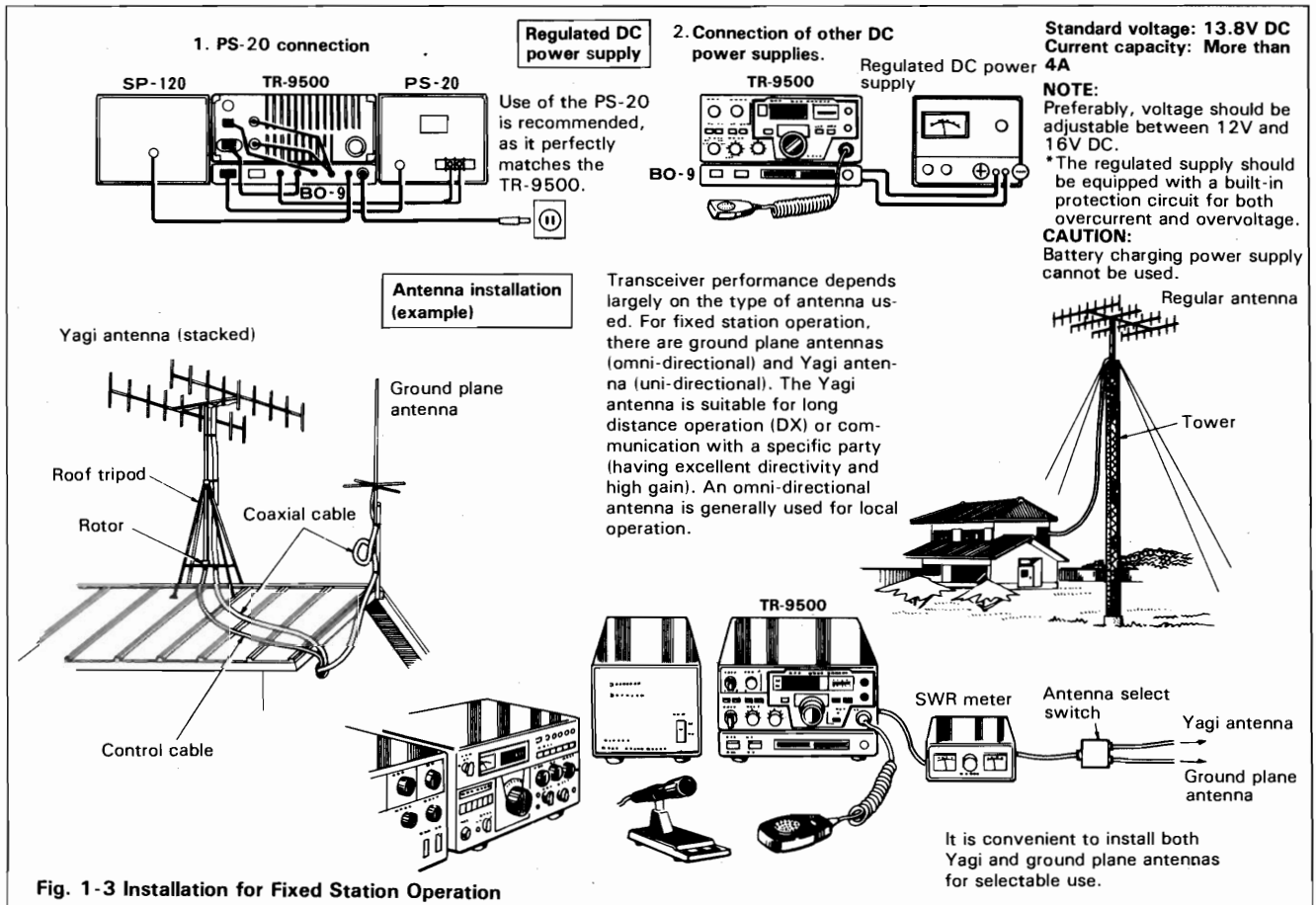
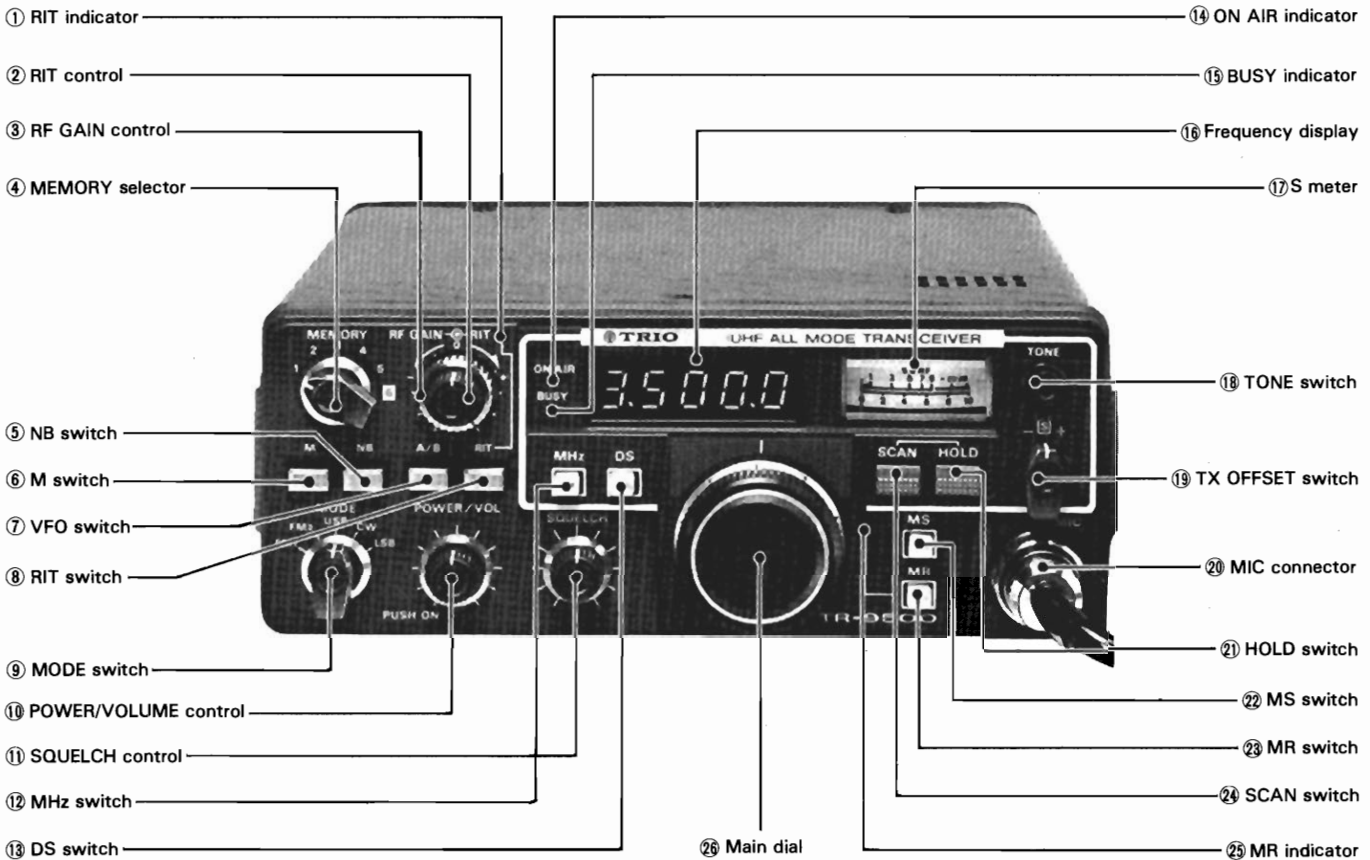


Fig. 1-3 Installation for Fixed Station Operation

# SECTION 2. CONTROLS AND TERMINALS



## 1 RIT indicator

This indicator lights when the RIT circuit is operated.

## 2 RIT control

In SSB or CW mode, the receive frequency can be fine adjusted without changing the transmit frequency. The center position "0" is RIT-OFF.

## 3 RF GAIN control

This control adjust the gain of the receiver. Maximum gain is obtained at the full clockwise position. Normally, this control should be left fully clockwise.

## 4 MEMORY selector

This switch is used to select memory channels "1" through "6". The operating frequency can be stored in or called back from the channel selected by this switch. In channel "6", two different frequencies (transmit and receive) can be stored for non-standard repeater operation in FM mode. In SSB and CW modes, channel "6" is used as a normal simplex memory.

## 5 NB (noise blanker) switch

This switch is used to eliminate pulsating noise such as ignition noise from a car. Press ( ) the switch ON in SSB or CW mode.

## 6 M switch

This is used to input desired frequencies to each channel for memory. By pressing ( ) the switch, a memory check signal is heard and the frequency indicated on the display is stored in the selected channel.

## 7 VFO switch

This is used to select VFO-A or VFO-B. The VFO-A and VFO-B are actually the same.

Reset frequency: VFO-A...433.000 MHz  
VFO-B...430.000 MHz

## 8 RIT switch

RIT ON-OFF switch. Press ( ) the switch to ON. The RIT lamp will light to indicate the RIT circuit is in use.

## 9 MODE switch

This switch is used to select the mode of operation, FM1, FM2, USB, CW, or LSB. The frequency step and the number of digits displayed are controlled by the DS switch. In the FM1 mode, frequency is changed in 25kHz steps regardless of the DS switch position.

## 10 POWER/VOL knob

Push button type power switch and volume control are combined. Clockwise rotation will increase the volume.



In the power OFF position, about 2.0mA current is drawn to back-up the micro-computer, provided the power cable is connected to a constant power source.

To completely disable the transceiver, disconnect the power cable.

### 11 SQUELCH control

The squelch control is used to eliminate noise during no signal time. Normally, this control is adjusted clockwise until the noise disappears and the BUSY indicator goes off (threshold level). The squelch circuit operates only in the FM mode. For SCAN operation (AUTO scan, MEMORY scan, MHz scan), it is indispensable to set this control to the threshold level.

### 12 MHz switch

Depressing this switch allows quick tuning in 1 MHz steps with the main dial or with the UP-DOWN switch on the accessory microphone. By setting this switch and SCAN switch to on the TR-9500 works in MHz scan operation

### 13 DS switch

By using this switch, frequencies are shifted rapidly. Press the switch to ON. In the FM1 mode, frequencies are shifted in 25kHz step regardless of switch position. In the FM2 mode, the frequency step is 5kHz when the switch is ON. In the SSB or CW mode, the "kHz" and "100Hz" frequency data being displayed are set to "0.0", then the frequencies up to 10kHz are searched at 100Hz intervals. Frequency is shifted rapidly during search.

### 14 ON AIR indicator

A light emitting diode (L.E.D.) will light in the transmit mode.

### 15 BUSY indicator

This indicator will light when the squelch is open in FM receive mode.

### 16 Frequency display

LEDs display the operating frequency in 5 digits (MHz—100Hz) and 4 digits (MHz—1kHz) according to the frequency step.

### 17 S-meter

This meter indicates receive input signal strength (S) or transmit output (RF). The upper scale is used for reading "S" in SSB or CW mode. The lower 10-division uniform scale is used in FM mode.

### 18 TONE switch

When this switch is pressed, the repeater control tone burst signal (1,750 Hz) is emitted for about 0.5 second at the beginning of each transmission.

### 19 TX OFFSET switch

Shifts the transmit frequency for repeater operation.

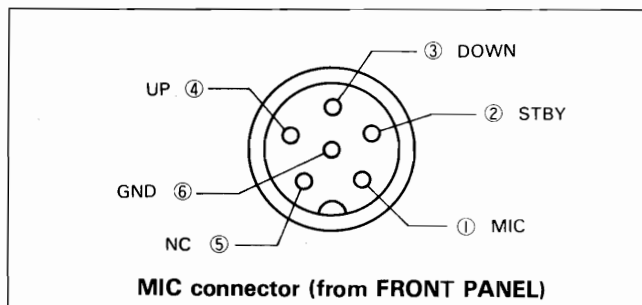
⊖: Switches the transmit frequency down 1.6 MHz from the receive operation.

S: Simplex (receive and transmit frequencies are the same.)

⊕: Switches the transmit frequency up 1.6 MHz from the receive frequency.

### 20 MIC connector (6-pin)

For connection of the supplied microphone.



### 21 HOLD switch

This switch is used to release scan operation. In MS (memory scan) operation, this acts as the temporary stop switch.

### 22 MS (memory scan) switch

With this switch depressed the TR-9500 scans only memory channels in which frequencies have been preset and the dot indicating MHz digit in the frequency display cycles on and off. For returning to the usual operation, push this switch again

### 23 MR switch

This is used to output memory frequencies from each channel. By pressing ( ) the switch, a memory frequency is displayed in 5 digits, regardless of the operating mode.

### 24 SCAN switch

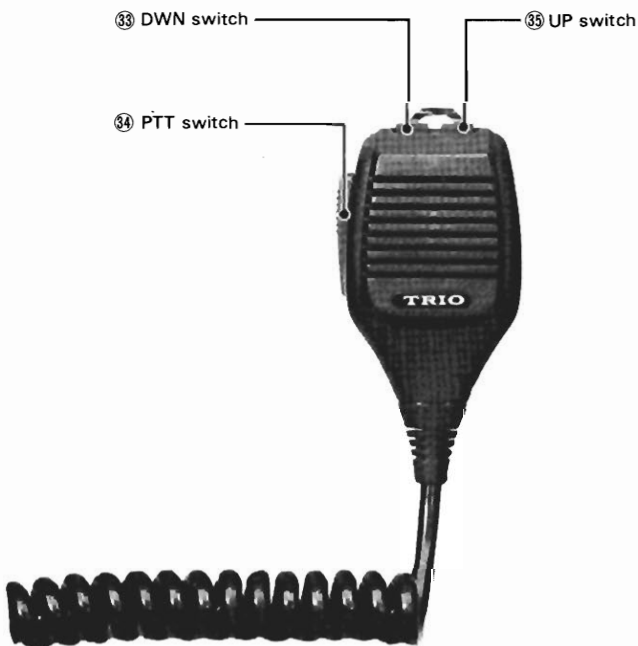
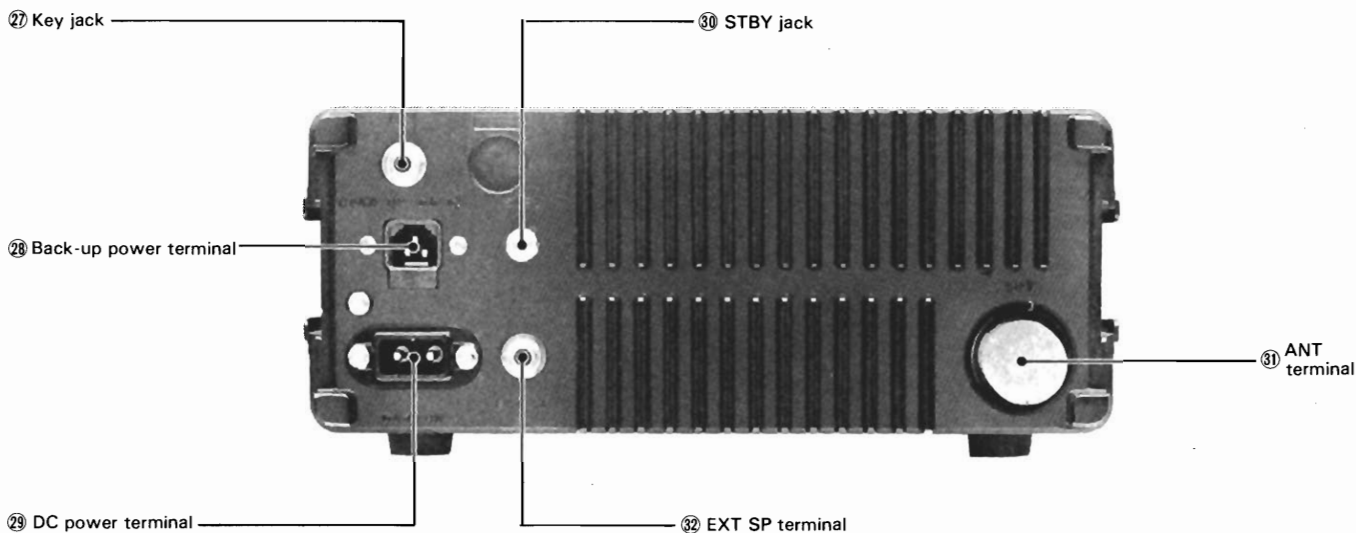
By using this switch, the scan operation is started according to the mode step (VFO should be used). In MS (memory scan) operation, this acts as a restart switch after pressing the HOLD switch. In FM mode, the SQUELCH control should be set the threshold level for SCAN operation.

### 25 MR indicator

This indicator will light when the MR switch is depressed.

### 26 Main dial

A click type rotary digital VFO control selects transmit and receive frequencies. Frequency is changed at each click according to the mode step. This digital VFO control is an endless type, changing frequency continuously from the upper to lower end of the band.



**27. KEY jack**

For connection of a key using the supplied plug. Use shielded Line and observe polarity.

**28. Back up power terminal**

Used for fixed station operation. The micro-computer retains the VFO frequency memory function even when the power supply is turned OFF, when back-up power is supplied.

**29. DC power terminal**

DC power input terminal. Connect the supplied power cord with plug. Input voltage is 13.8V DC. Observe plus (+) and minus (-) polarity is correct.

**30. STBY jack**

For connection of an external standby switch (transmit/receive select switch). Use the supplied plug.

**31. ANT terminal**

N type coaxial antenna terminal. Connect an antenna of 50 ohms impedance.

**32. EXT SP terminal**

External speaker terminal. Connect a speaker of 8 ohms impedance using the supplied plug.

**33. DWN switch**

This switch is used to step down the digital VFO frequency. When operating the switch, tone will sound.

**34. PTT switch**

Press-to-talk switch used for transmission. This will also release scan operation in FM mode.

**35. UP switch**

This switch is used to step up the digital VFO frequency. When operated, a tone will sound. When the DWN or UP switch is continuously the frequency shifts rapidly. Pressing both the UP and DOWN switches simultaneously results in stopping the VFO operation.

# SECTION 3. OPERATION

## 3.1 MODE SWITCH

The five-position MODE switch functions as follows:

- FM1: FM frequency is selected in 25 kHz steps by using the VFO, regardless of the DS switch position.
- FM2: In this mode, FM frequencies are selected in either 1 kHz or 5kHz steps.
- USB: Normal mode for 70cm SSB. Frequencies are tuned in 100 Hz steps.
- CW: CW mode operates A1. KEY jack and STBY jack are provided on the rear of the TR-9500. Connect a key for CW operation. The filter for SSB mode is also used for CW mode. The AGC time constant is automatically "fast".
- LSB: This mode is not used for 70cm SSB, but is used for special operation such as Oscar satellite communication.

## 3.2 DIGITAL VFO

The TR-9500 incorporates a digital 100 Hz step 2-VFO system (click type rotary) controlled by micro-computer.

### Note:

1. Since all the functions are controlled by a microcomputer, the transceiver must be operated in the priority order given in the following Table.  
For example, the digital VFO will not operate when the main dial is turned during MR operation. Also, it will not operate unless scan operation is released by the HOLD switch or the microphone PTT switch, even if scan is stopped for a brief period of time in receive mode.

Sequence	Function	Switch and Controls
1	Memory scan	MS ON
2	Memory recall	MR ON
3	MHz step operation	MHz ON
4	UP/DOWN operation	UP/DOWN ON
5	Scan operation	SCAN, HOLD
6	Digital VFO	Main dial
7	Memory write	M ON

**Table 3-1**

2. The digital VFO operates according to the MODE switch position as follows:

**FM mode: Only RECEIVE frequency variable.**

**SSB/CW mode: Both RECEIVE and TRANSMIT frequencies variable.**

Consequently, in SSB/CW mode, the priority functions (MS, MR, SCAN, etc.) can be accepted in transmission. In FM mode, those functions can not be accepted in transmission.

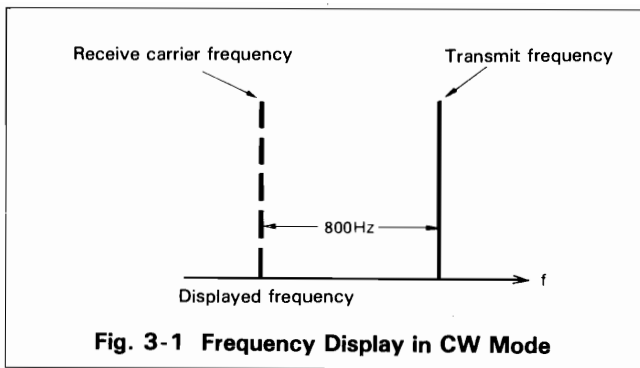
3. The digital VFO is factory adjusted under rigid quality standards to insure excellent frequency linearity and stability.

### • Tuning

1. Operating frequencies are basically tuned by the main dial. Turning the dial to the right will shift the frequency UP. If fine adjustment is desired in SSB or CW mode, the RIT circuit may be operated.
2. The digital VFO can be step tuned by the microphone UP/DWN switches. A tone will sound at each switch press. The VFO frequency shifts rapidly when the switch is continuously depressed. The tone will then become continuous.
3. When the MHz switch is depressed, operating frequency changes in MHz step with the main dial or with the UP/DOWN switch of the microphone.
4. The digital VFO covers the 70cm band from 430.0000 to 439.9999MHz in continuous mode. The VFO can be tuned either left or right.
5. The transceiver incorporates two VFOs, VFO-A and VFO-B. VFO Selection is by the VFO switch. VFO-A and VFO-B are the same in function, except that each has its own reset frequency.
6. In SSB mode, the VFO frequency is tuned in 100Hz steps. In 70cm SSB operation, the USB mode is generally used. If the VFO frequency is shifted UP in 100Hz steps, the demodulated audio signal changes from high to low pitch. For optimum SSB operation, tune the VFO so the demodulated signal is clear and natural. Frequency can be fine tuned by the RIT,  $\pm 800$  Hz from the frequency displayed.
7. In general, tuning in FM mode is made in 25 kHz steps, so 25 kHz step tuning in FM 1 mode, instead of 1 kHz tuning, can be used to easily receive the signal of opposite station. Unless your opposite station is a DX station, the signal can be received clearly even when FM frequency is deviated  $\pm 1.0$  kHz. The RIT circuit of this transceiver does not operate in FM mode.
8. When the operating frequency of the digital VFO is other than 25 kHz step:
  - (1) The transceiver is set to the original mode passing over FM 1 mode.
  - (2) The transceiver is shifted to the priority operation (MS, MR, etc.) and the mode switch is set to the original mode passing over FM 1 mode.  
In either case, the frequency is switched to 25 kHz step.

### • Frequency display

1. The digital frequency display indicates carrier frequency in SSB and FM modes. The frequency displayed is the operating frequency.
2. In CW mode, the frequency display indicates the receiver carrier frequency. Transmit frequency is 800Hz higher than displayed. (Operating frequency is 800Hz higher than displayed when receiving an 800Hz beat note.) (See Fig. 3-1).



### 3.3 MHz switch

The 70cm band is as wide as 10 MHz and it takes a little time to change the operating frequency even when the DS switch and the fast-forward are used. With the MHz switch set to ON, the operating frequency can be changed in MHz step by using the main dial or MIC UP/DOWN switch. When the main dial is used, continuous tone is heard to discriminate it from normal VFO operation. By using the MHz switch and SCAN switch, the MHz scan operation can be made.

### 3.4 DS SWITCH

This is one of the special features of the TR-9500. The basic function of this switch is to change the frequency shift from 1 kHz to 5 kHz step. In FM1 mode, the frequency shift step is independent of the DS switch. In SSB/CW mode, both search and frequency shift are in 10 kHz step.

Function Mode	DS:OFF		DS:ON	
	Step	No. of display digits	Step	No. of display digits
FM1	25 kHz	4 digits	25 kHz	4 digits
FM2	1 kHz	4 digits	5 kHz	4 digits
USB CW LSB	100 Hz	5 digits	10 kHz 5 digits The 0.0-9.9 kHz range is repeatedly searched in 100 Hz steps.	

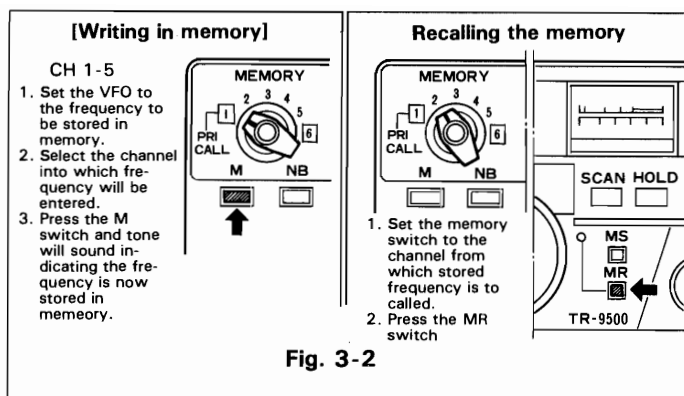
When the DS switch is ON in SSB/CW mode, the frequency is searched, that is, the digits for "kHz" and "100Hz" are set to "00" and the 0.0 to 9.9kHz frequency range is swept repeatedly at a speed of 10mS per step.

If a signal is present during search swept, tone will be heard, allowing you to check the signal in SSB mode. It is thus possible to locate stations quickly.

### 3.5 MEMORY SWITCH

Using this switch, commonly used frequencies (repeaters, etc.) can be stored in the memory. Frequencies set by the VFO are stored in channels 1 through 6 by using the M switch. Stored frequencies can be called-up by placing the MR switch ON.

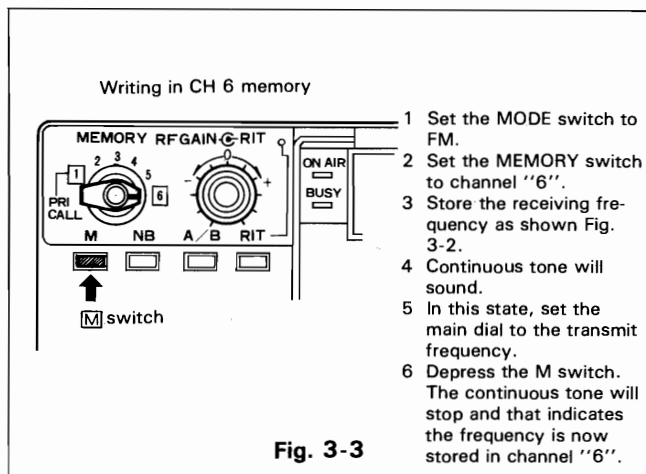
Two different frequencies (transmit and receive) can be stored in channel 6 in FM mode, so the transceiver will operate on any repeater split. The receiver frequency is stored in memory just as for channels 1-5. To store the transmit frequency in memory, set the transmit frequency



in receive mode and then press the M switch. (See Fig. 3-3). In SSB and CW modes, channel "6" is used as a normal simplex memory.

#### NOTE:

1. When a memory is vacant, the memory frequency is 430.0000MHz. However, the frequency of 1 CH is 433.0000MHz.
2. The memory frequency called-up by the MR switch is displayed in 5 digits, regardless of mode.



3. To clear a frequency stored in memory, simply store a new frequency in that memory.
4. If you desire to retain the memories, back-up power should be supplied to the micro-computer
  - (1) A power cord should be connected directly to the battery terminal.
  - (2) A back-up supply (W09-0004-05) should be used. In either case, back-up current of about 2 mA is required.
5. If power is disconnected, the back-up function is retained for only 1-1.5 sec. If instantaneous voltage drop at engine starting continues for more than 2 sec, the micro computer will be reset and the memory cleared.
6. If you wish to retain the memories even when changing the installation between the car and the fixed station, utilize a back-up cord as shown in Fig. 3-4.

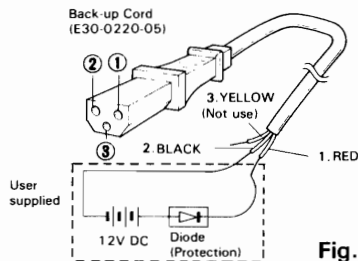


Fig. 3-4

### 3.6 SCAN OPERATION

TR-9500 scan operation is classified into auto scan (signal stops at a certain point and scan restarts when signal is absent) and free scan.

#### • Auto scan

Auto scan is available only in the FM mode.

1. Set the squelch control to the threshold point (noise disappears at no-signal time and BUSY indicator goes off).
2. Next, press the SCAN switch to start scan operation.
3. When a signal is present, scanning stops. When the signal drops scan restarts automatically.
4. Under SCAN or busy stop in SCAN, the dot indicating MHz digit in the frequency display cycles on and off. This dot cycling enables you to distinguish between the SCAN operation and the usual VFO operation.
5. If you desire to hold the frequency at which the scan stops, press the HOLD switch or press the microphone PTT switch ON momentarily. Scan will be released and the transceiver will return to normal operation.
6. Scan speed is about 200mS for each channel. When the scan switch is continuously depressed, scan speed becomes 8 times.
7. In the auto scan operation, it may be better to use FM 1 mode (25 kHz step) in FM areas.
8. Effective auto scan operation cannot be obtained with 1 kHz step FM (FM2, DS, OFF).

#### • Free scan

1. In SSB or CW mode, press the SCAN switch and the transceiver will operate in a free scan mode. Auto scan is not possible in SSB/CW mode.
2. When the SCAN switch is pressed with DS ON (search operation), your SSB frequency is rapidly shifted automatically.
3. To stop the scan, press the HOLD switch. The transceiver will return to normal operation. By depressing the microphone PTT switch the transceiver does not return to normal operation.

#### • Memory Scan

This transceiver has 6 memory channels. The MEMORY SCAN is used to scan only the channels stored in the memory.

1. Turn the MS switch to ON (■).
2. The operating frequency is indicated on all the digits.
3. Auto scan operation is also possible in FM mode.
4. When the HOLD switch is depressed or the MIC PTT is set to on momentarily, the frequency stops while the

MHz dot flickers.

5. To restart the scan, depress the SCAN switch.
6. To release the memory scan, depress (■) the MS switch once again.
7. The 430.00 MHz signal preset in the channels 2 through 6 is not a memory frequency.

#### • MHz SCAN

The MHz scan operation is made by using the MHz switch and SCAN. In the auto scan mode, it takes a little time until the 10 MHz band is scanned completely. The MHz scan reduces the scanning time.

1. Turn the MHz switch to ON and set to the desired MHz.
2. Depress the SCAN switch.
3. The frequency of 1 MHz band is scanned according to the step determined by the mode switch.
4. The transceiver operates the same as in other scan mode.

#### • Scan Operation Precautions

1. During scan operation, including temporary scan stop, the frequency can not be changed by the VFO or the microphone UP/DWN switches. To change frequency, it is first necessary to release the scan by pressing the HOLD switch or MIC PTT switch.
2. If the MR switch is pressed during scan operation, the memory frequency is output. When this switch is released, scanning will start again.

### 3.7 TX OFFSET SWITCH

The TX OFFSET switch, used for selecting simplex or repeater operation, has three positions.

If the transmitter frequency is shifted beyond the high or low frequency limits, the transceiver will operate in simplex mode, and a warning tone will sound.

- ⊖: The transmitter frequency is 1.6 MHz lower than the receiver frequency in the low band (430.000 ~ 434.999 MHz).
- S: The TR-9500 operates in the usual simplex mode. That is, receive and transmit frequencies are the same.
- ⊕: The transmitter frequency is 1.6 MHz higher than the receiver frequency in the low band (430.000 ~ 434.999 MHz).

#### NOTE:

OFFSET is available for FM mode.

### 3.8 SQUELCH

The squelch circuit operates only in the FM mode.

To eliminate the noise at no-signal condition turn the squelch slowly clockwise until the noise disappears and the BUSY lamp goes off (threshold point).

Adjust the VFO to an empty frequency. The BUSY indicator will light and the speaker will operate when a signal is received. The squelch control is also used for auto scan operation control.

If the signal is weak or fades during mobile operation, readjust the squelch for the clearest reception.

### 3.9 RIT AND RIT SWITCH

"RIT" is an abbreviation for "receiver incremental tuning". The RIT feature enables you to shift receive frequency approximately  $\pm 800\text{Hz}$ . By adjusting the RIT control in the "+" direction, the receive frequency will be higher than the transmit frequency (and vice versa).

When the RIT control is set to the center "0" position, the frequency is the same as that at RIT OFF, and the frequency indicated on the digital display remains unchanged.

If the receive frequency is incorrect, it can be adjusted by turning the RIT switch ON (the RIT indicator will light). Since the receive frequency can be varied without changing the transmit frequency, there is a difference between the transmit and receive frequencies. Therefore, the RIT switch should be turned OFF when the QSO is finished.

Note that the RIT circuit is available in SSB or CW mode and does not operate in FM1 or FM2 modes.

### 3.10 NB (NOISE BLANKER)

The noise blanker is used to reduce ignition type impulse noise generated from a car, and allows reception of weak CW or SSB signals. The noise blanker will not operate in the FM modes.

### 3.11 RF GAIN AND S METER

The RF GAIN control, which is used to control receiver gain has a range of more than 60 dB in SSB or CW mode. Since the RF GAIN function is interlocked with the AGC, it is used to control strong signals. Receiver gain is maximum at full clockwise position, and is reduced by adjusting the control counterclockwise.

In SSB mode, receiver noise can be reduced by using the RF GAIN control. Adjust as necessary, according to signal conditions. Normally, it should be set for maximum gain.

**In FM mode, the RF GAIN has a range of about 20dB. It is not interlocked with the S meter.**

- FM mode.....The lower 0-10 division linear scale of the S meter is used. Full scale occurs at  $10\mu\text{V}$ .
- SSB/CW mode .....The upper scale of the S meter is used.  
The meter reads S-9 at  $5\mu\text{V}$  input and full scale at 1mV.

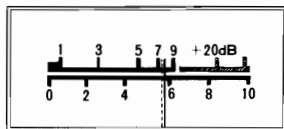


Fig. 3-5 S Meter

### 3.12 TRANSMITTER PRECAUTIONS

1. The TR-9500 antenna impedance is 50 ohms. Be sure to connect an antenna of 50 ohms impedance.
2. Check the transmit frequency before operating to insure that you do not interfere with other stations.
3. By pressing the microphone PTT switch, The TR-9500 is set in transmit mode; the ON AIR indicator will light and the meter indicate transmit power. Hold the

microphone about 5cm from your mouth and speak.

4. In SSB mode, microphone gain has been adjusted for optimum ALC for normal tone of voice. If you speak too loud, the signal will distort, reducing intelligibility.
5. In CW mode:

- (1) If a key is not connected, CW is transmitted when the PTT switch is pressed.
- (2) With a key connected, operate the key with the PTT switch depressed (or the BO-9, optional accessory) STBY SW to send).

The SIDE TONE circuit will provide a tone about 800 Hz from the speaker.

### 3.13 CW OPERATION

For CW operation, make connections as shown in Fig. 3-6.

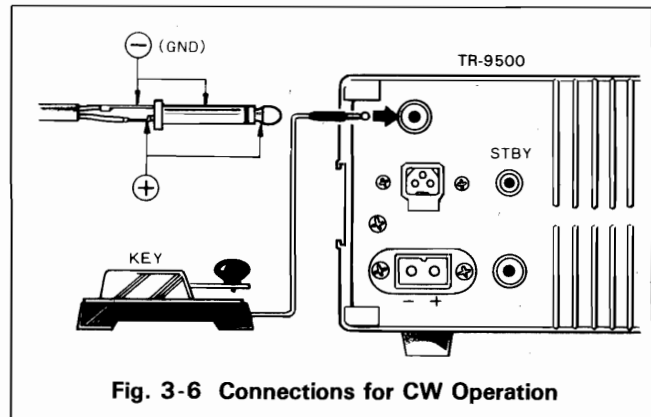


Fig. 3-6 Connections for CW Operation

#### • Preparation

1. Connect the supplied plug to the key.
  2. Standby switch:
    - (1) The microphone PTT switch can be used.
    - (2) Connect the supplied standby plug to the STBY terminal at the rear. Your standby switch should have a contact rating of more than 100mA.
    - (3) By connecting the optional BO-9 system base, the standby switch on the BO-9 can be used.
- Use any of these 3 methods for CW operation.

#### NOTE:

1. CW receive mode is USB. The AGC time constant is automatically switched to "fast" in CW mode, and to "slow" in USB mode.
2. The built-in SIDE TONE circuit allows you to monitor your station's CW signal.
3. When the key is closed, the SIDE TONE circuit provides a tone of about 800Hz even in receive mode. Use this tone as a reference for receiver tuning.

## SECTION 4. OPTIONAL ACCESSORIES

The following accessories are available for more sophisticated operation of the TR-9500:

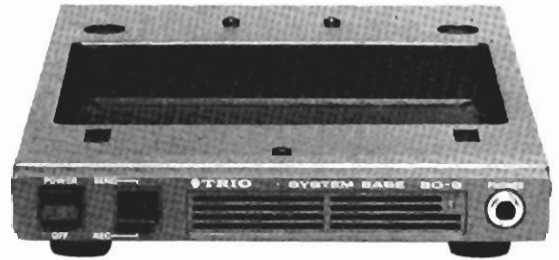
### 1. FIXED STATION DC POWER SUPPLY PS-20

The PS-20 DC power supply perfectly matches the TR-9500's design. It incorporates a circuit for protecting the transceiver against shorted output and overload.



### 2. SYSTEM BASE BO-9

Specifically designed for the TR-9500, it incorporates back-up power supply, headphone jack, standby switch and AC power switch for integrated fixed station operation with PS-20 or SP-120.



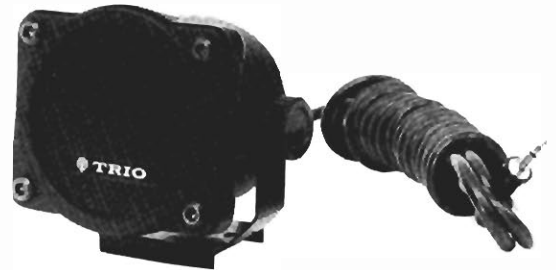
### 3. EXTERNAL SPEAKER SP-120

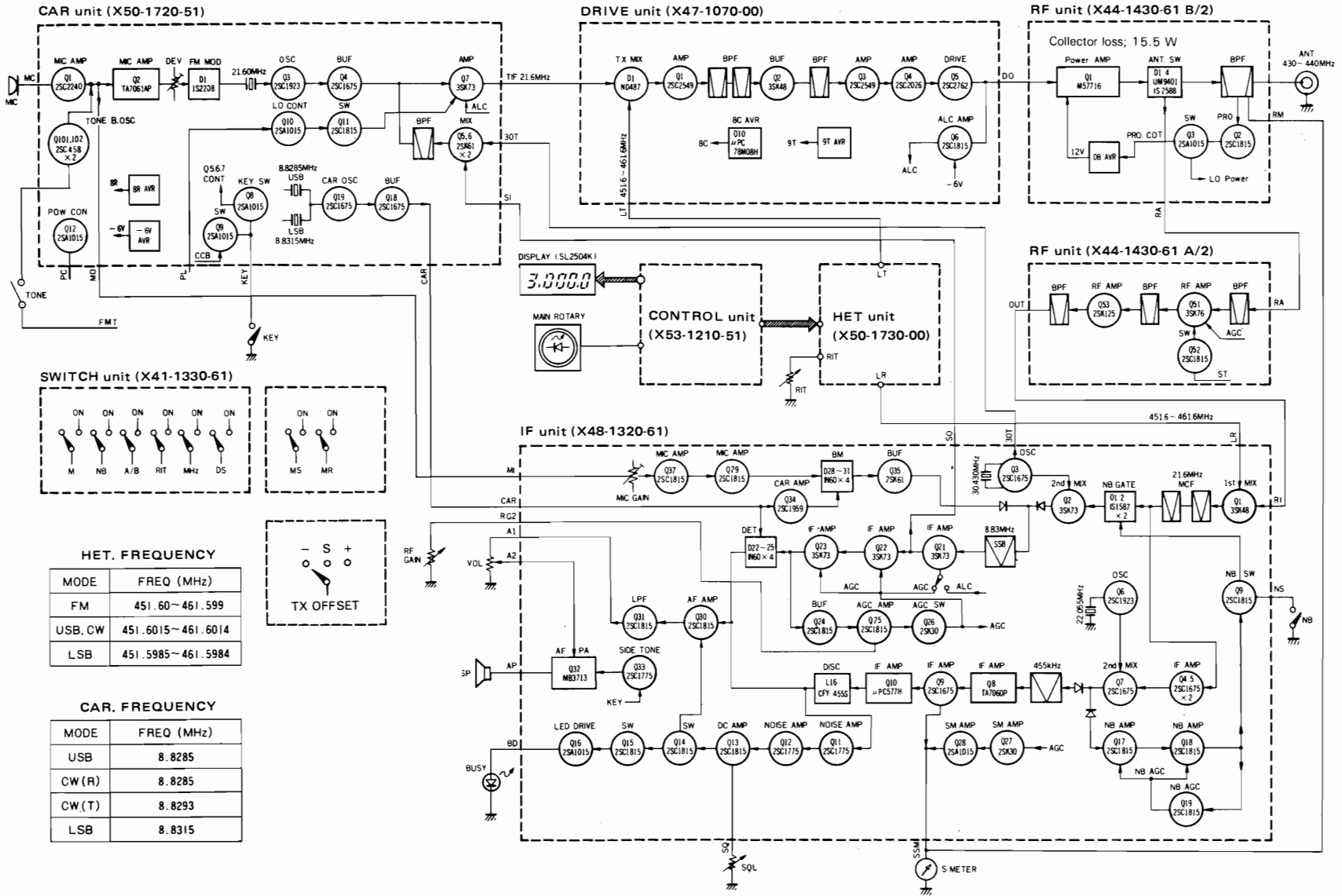
Designed for fixed station operation. Styling and tone quality match the TR-9500 perfectly.



### 4. SP-40 Mobile Speaker

Specifically designed for mobile operation to provide low distortion and high efficiency. Matches any car interior.



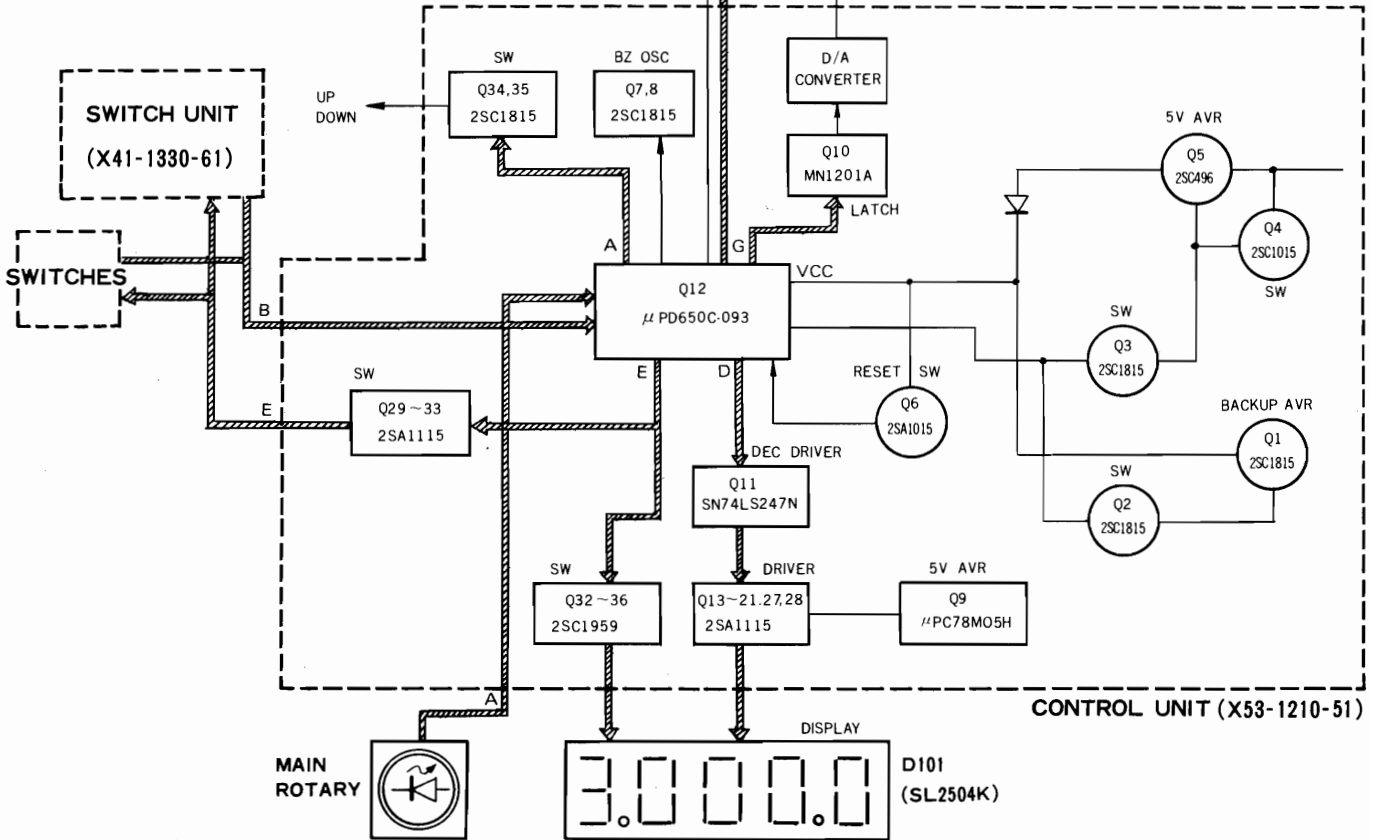
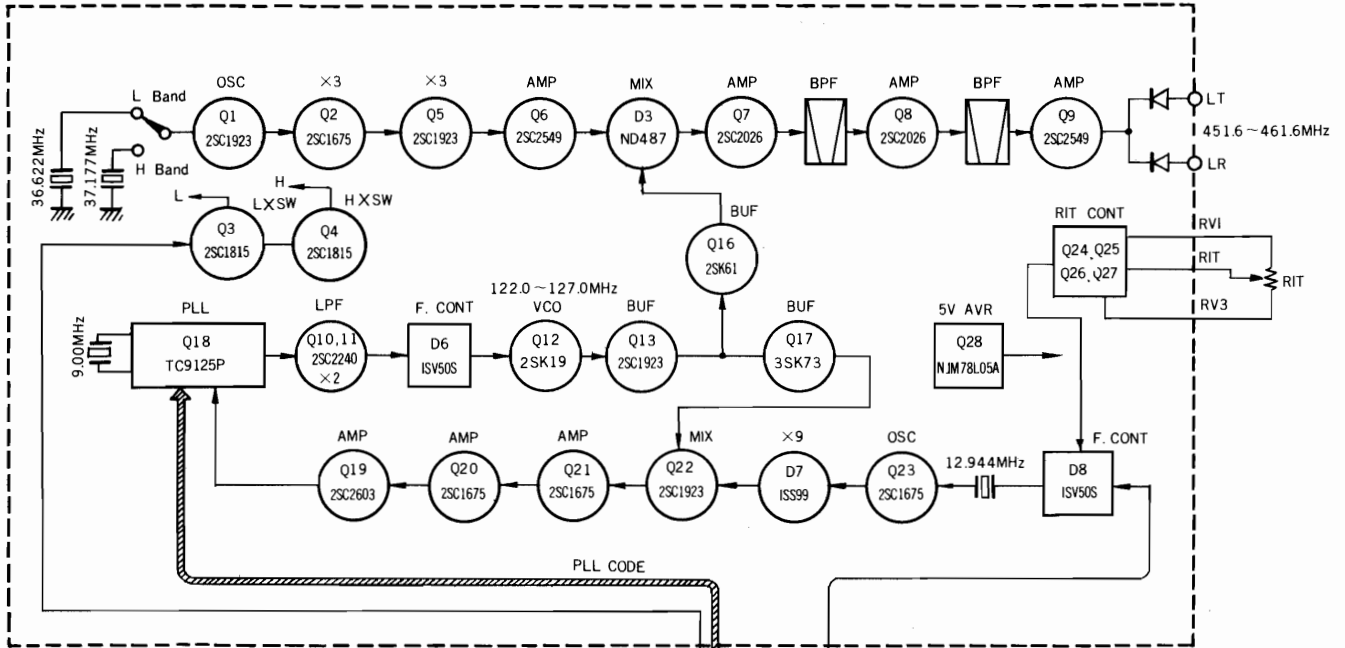


**BLOCK DIAGRAM**

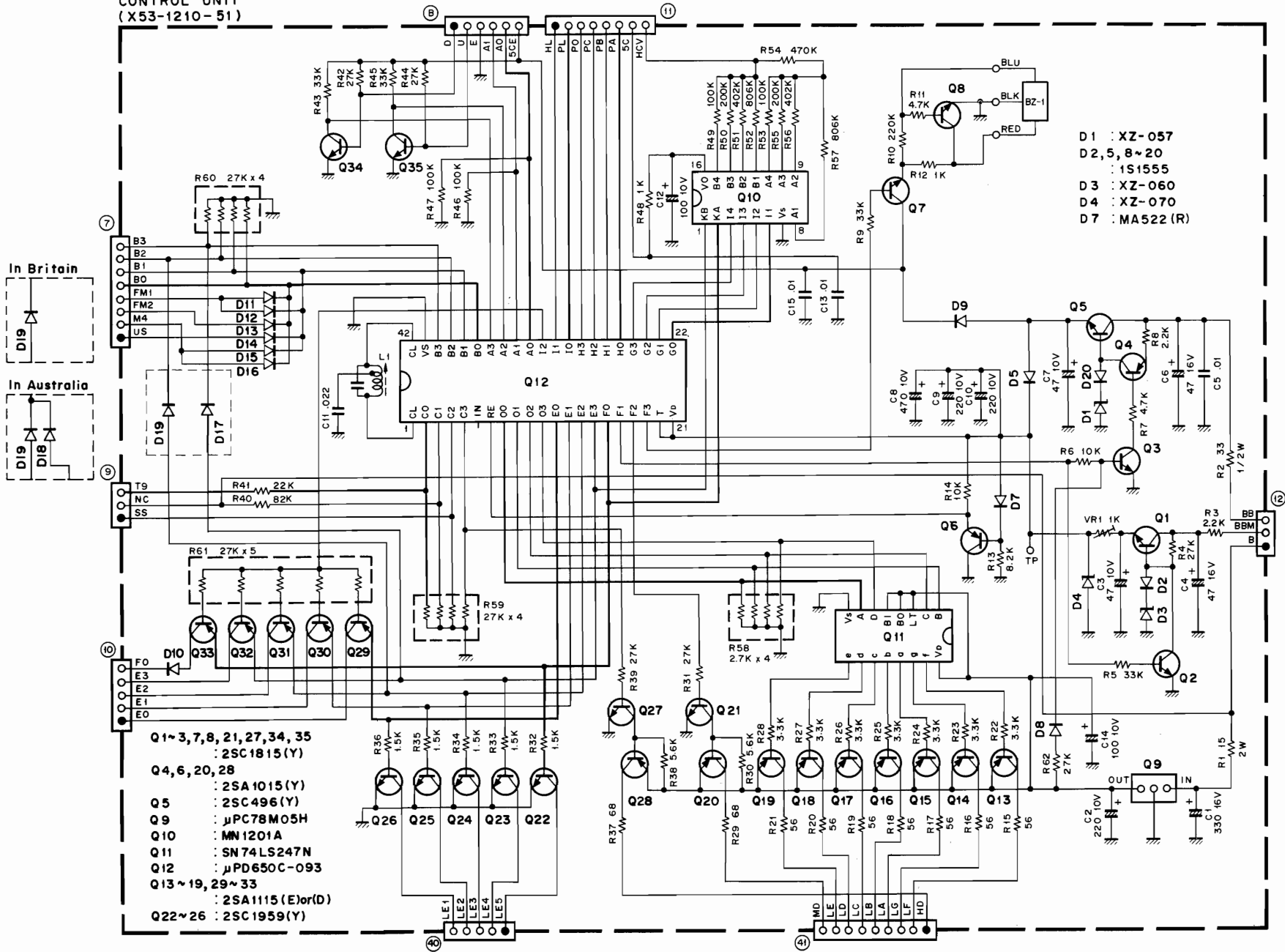


# BLOCK DIAGRAM

## HET UNIT (X50-1730-00)



CONTROL UNIT  
(X53-1210-51)



- Q1~3, 7, 8, 21, 27, 34, 35 : 2SC1815(Y)
- Q4, 6, 20, 28 : 2SA1015(Y)
- Q5 : 2SC496(Y)
- Q9 :  $\mu$ PC78M05H
- Q10 : MN1201A
- Q11 : SN74LS247N
- Q12 :  $\mu$ PD650C-093
- Q13~19, 29~33 : 2SA1115(E)or(D)
- Q22~26 : 2SC1959(Y)

- D1 : XZ-057
- D2, 5, 8~20 : 1S1555
- D3 : XZ-060
- D4 : XZ-070
- D7 : MA522(R)

**SCHEMATIC DIAGRAM**

# TR-9500 SCHEMATIC DIAGRAM

