



HF TRANSCEIVER

H. Schachtel

Model TS-830M



INSTRUCTION MANUAL

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AFTER UNPACKING

It is advisable to save all original packing cartons (inner and outer) to protect your valuable transceiver from damage should you wish to transport it for remote operation or ship it for after-sales service.

The following explicit definitions apply in this manual. Be sure to read these definitions:

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

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

WARNING: Personal injury may occur — do not disregard.

CAUTION: _____
Read Operating Manual Section 4. before placing transmitter in service.

WARNING: _____
HIGH VOLTAGES PRESENT.

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TS-830M SPECIFICATIONS

[GENERAL]

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 (10.0 MHz WWV) 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
Modes	SSB/AM/CW
Power Requirement	120/220 VAC (Selectable), 50/60 Hz
Power Consumption	Transmit: 295 watts Receive: 32 watts (with heaters off)
Dimensions	333 (13.3) × 133 (5.3) × 333 (13.3) mm (inch)
Weight	13.5 kg (29.8 lbs)

[TRANSMITTER]

Final Power Input	220W PEP for SSB operation 180W DC for CW operation 80W DC for AM operation
Audio Input Impedance	500Ω ~ 50 kΩ
RF Output Impedance	50Ω ~ 75Ω
Frequency Stability	Within 100 Hz during any 30 minute period after warmup. Within 1 kHz during the first hour after 1 minute of warmup.
Carrier Suppression	Better than 40 dB
Sideband Suppression	Better than 60 dB
Spurious Radiation	Better than 60 dB
Harmonic Radiation	Better than 40 dB
Audio Freq. Response	400 to 2,600 Hz, within -6 dB
3rd Order Intermodulation Distortion	Better than -36 dB

[RECEIVER]

Receiver Sensitivity	0.25 μV at 10 dB S + N/N for SSB, CW. 1 μV at 10 dB S + N/N for AM
Image Ratio	Better than 60 dB
IF Rejection	Better than 80 dB
Receiver Selectivity	
SSB/CW	2.4 kHz (-6 dB), 3.6 kHz (-60 dB)
AM	6 kHz (-6 dB), 12 kHz (-60 dB)
Variable Bandwidth	
SSB, CW	500 Hz ~ 2.4 kHz (-6 dB) continuously variable
AM	4.5 kHz ~ 6 kHz (-6 dB) continuously variable
Notch-filter Attenuation	Better than 40 dB
Audio Output Impedance	8 ~ 16Ω
Audio Output	1.5W (8Ω)

*Will transmit on the new 30, 17, and 12 meter bands. Diodes installed for preventing accidental transmission before government Amateur authorization.

NOTE: The circuit and ratings may change without notice due to developments in technology.

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SECTION 1. INTRODUCTION AND FEATURES

1.1 KENWOOD TS-830M

The TS-830M is a highly sophisticated solid state amateur band transceiver employing only three vacuum tubes.

Operating on all Amateur bands between 1.8 and 29.7 MHz, this unit is constructed modularly. The TS-830M includes many built-in features usually found as extras on other transceivers. Included are VOX, 25 kHz calibrator, RIT, RF attenuator, and an effective noise blanker. The TS-830M also includes automatic gain control (AGC), automatic level control (ALC), semi-break-in CW with sidetone, a speech processor, speaker and built-in AC power supply.

Designed for operation on SSB, AM or CW, the TS-830M delivers more than 220 watts PEP input.

Any complicated electronic device will be damaged if operated incorrectly, and this transceiver is no exception. Please read all of the operating instructions before putting the TS-830M on the air.

1.2 FEATURES

1. Interference-free DX operation

* Variable bandwidth IF filter circuit (VBT)

The built-in VBT (Variable Bandwidth Tuning) circuit allows IF filter pass-bandwidth to be varied as you wish to eliminate unpleasant interference. It is adjustable independent of the IF shift.

* IF shift circuit

The IF SHIFT is a circuit to shift IF pass-bandwidth without changing receive frequency. It eliminates interference or adjusts receive frequency characteristic as desired.

* High reliability 455 kHz notch circuit

Interference is also eliminated by the built-in notch circuit. The TS-830M uses 455 kHz notch-frequency. The notch circuit shifts the BFO frequency and the mixer local frequency at the same time, thereby equivalently changing the notch frequency. Thus, accurate notch characteristic is realized even when the notch point is changed, completely eliminating nearby interference signals.

* Variable tone control circuit.

2. WARC bands

The TS-830M fully covers 160-10 m Amateur bands, including the new WARC bands of 10, 18 and 24.5 MHz.

3. All-in-one, compact AC Power supply system

DC-DC Converter DS-2 (option) can be attached to the TS-830M for field or mobile operation.

4. Advanced circuit design for improved two-signal characteristics. Cleverly designed front-end circuit components and receive circuit system assure excellent two-signal characteristics. Cross-modulation and blocking are reduced.

5. TX final unit uses 6146B's

The finals are a pair of 6146B transmitting tubes. RF

negative feedback, and amplified ALC provide clear, strong signals with reduced cross modulation.

6. Variable level noise blanker

Conventional fixed level noise blankers are sometimes less than effective in removing pulsating noise over weak signals or rejecting strong interference signals. This variable level noise blanker is equipped to control the optimum threshold level of the gate pulse amplifier.

7. RF speech processor to increase average power during SSB operation

This is an RF clipper speech processor, using both the 455 kHz and 8.83 MHz IF's. Unwanted frequency components are removed by the 8.83 MHz crystal filter, providing a compression ratio of approximately 20 dB.

8. Transmit monitor circuit

The built-in monitor circuit permits easy adjustment of the RF processor and MIC GAIN.

9. XIT (Transmit Incremental Tuning) for fine adjustment of transmit frequency independent of receive frequency.

10. A combination of precise, easy-to-read digital frequency indicator and an analog dial.

The digital indicator has a Digital Hold memory function.

11. The controls are arranged on the die-cast front panel for easy operation.

12. A full variety of accessory circuits are provided:

The TS-830M includes:

VOX circuit (available for Semi-Break in), Marker circuit, side-tone oscillator, 3-position AGC circuit (OFF, FAST, SLOW), RF ATT, FIX circuit, Audio frequency characteristics selector circuit for each MODE, CW zero-in circuit, IF OUT terminal, HEATER switch, SG switch, Built-in speaker.

SECTION 2. INSTALLATION

2.1 UNPACKING

Remove the TS-830M 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 or moving.

The following accessories should be included with the transceiver.

1. AC power cord (E30-0181-05)(for 120VAC).... 1
AC power cord (E30-0585-05)(for 220 VAC)... 1
2. Plastic Extension Feet with Screws
(J02-0049-14)..... 2
3. Speaker Plug 1/8" (E12-0001-05)..... 1
4. 7P DIN Plug (E07-0751-05) 1
5. Fuse (6A)(F05-6021-05)(for 120 VAC)..... 1
Fuse (4A)(F05-4022-05)(for 220 VAC)..... 1

2.2 OPERATING LOCATION

As with any solid state electronic equipment, the TS-830M should be kept from extremes of heat and humidity. Choose an operating location that is dry and cool, and avoid operating the transceiver in direct sunlight. Also, allow at least 3 inches clearance between the back of the equipment to any object. This space allows an adequate air flow from the ventilating fan to keep the transceiver cool.

CAUTION:

Do not operate the radio in an RF Field greater than 6V RF. Receiver damage may occur.

2.3 CABLING (See Figure 2-1.)

■ GROUND

To prevent electric shock, and reduce the possibility of TVI and BCI, connect the transceiver to a good earth ground, through as short a lead as possible. Use ground rods or metal cold water feedline.

■ ANTENNA

Connect through a 50 ohm antenna feedline to the coaxial connector on the rear panel.

■ KEY

If CW operation is desired, connect a key to the KEY jack. Use shielded line or coaxial cable.

■ POWER CONNECTIONS

Make sure the POWER switch on the front panel is turned off, the stand-by switch is in the REC position, and the line voltage is correct. Then connect the POWER cord to the line source.

■ AC POWER

For fixed station operation, the TS-830M operates from 120/220 VAC (selectable) 50/60 Hz power source capable of supplying 280 watts or more.

The TS-830M is set for 220 VAC operation at the factory (A 4A fuse is installed).

For 120 VAC operation, change the power selector switch on the rear panel to the 120 VAC position and replace the fuse (4A \square 6A). Two types of the AC power cord are supplied for each AC voltage source.

2.4 MICROPHONE

Attach the microphone connector to a suitable microphone, as shown in Figure 2-1. Be sure the microphone PTT switch is separate from the microphone circuit, as shown in Figure 2-3.

It should be noted that a microphone with a 3P plug using a common ground terminal should not be used.

The microphone input is designed for 50 kohm microphones. The choice of microphone is important for good speech quality, and should be given serious consideration. The crystal lattice filter in the transceiver provides all the restriction necessary on audio response, and further restriction in the microphone is not required. It is more important to have a microphone with a smooth, flat response throughout the speech range.

Follow the microphone manufacturer's instructions for connecting the microphone cable to the plug. With many microphones, the push-to-talk button must be pressed to make microphone audio available. For VOX operation, this unwanted feature may be eliminated, if desired, by opening the microphone case and permanently connecting the contacts which control the microphone audio.

Standard microphone sensitivity is within the range of -50 dB to -60 dB. If a microphone having a higher sensitivity is used, the ALC and compressor circuits will not function properly. In this case, insert in the mike line an attenuator as shown in Fig. 2-1. A typical MIC gain control setting is 12 o'clock. If you must run this control at 9 o'clock or less, use an attenuator.

2.5 KEY

If CW operation is desired, connect a key to the KEY jack. Use shielded cable, and a standard (mono or 2P) phone plug.

Headphones

Use headphones of 4 to 16Ω impedance. The optional HS-4, HS-5 headphone is best suited for use with the TS-830M. Stereo-type stet phones can also be used.

Microphone

Either a low or high impedance microphone (500Ω to 50 kΩ) can be used. The P.T.T. switch should be isolated from the mic circuit (shown in "A"). Use a microphone with a separate switch and MIC line so both P.T.T. and VOX are available.

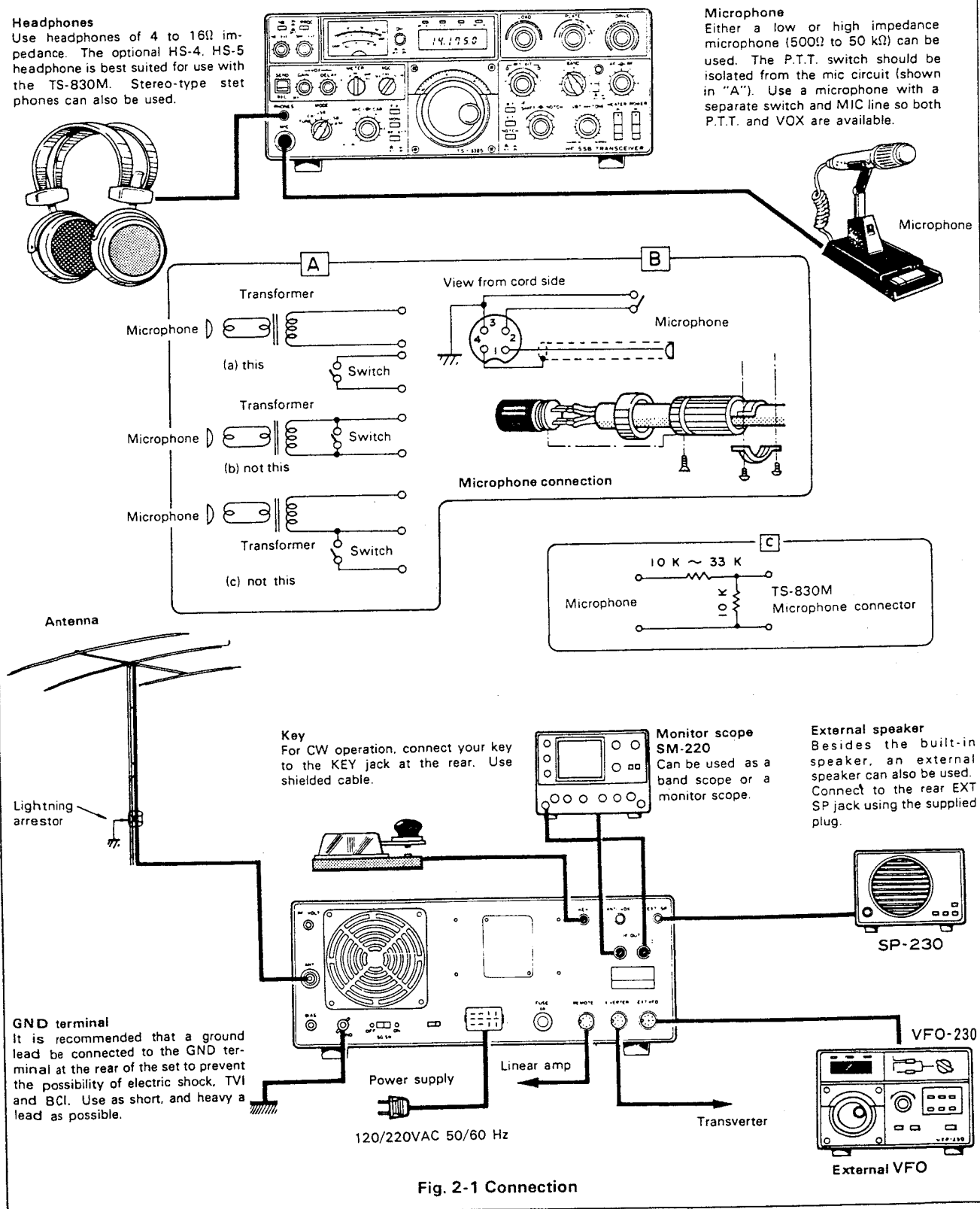


Fig. 2-1 Connection

2.6 EXTERNAL SPEAKER AND HEADPHONES

Receive audio output from the TS-830M is 1.5 watts at 4 to 16 ohms. The TS-830M has a built-in the SPEAKER jack on the rear panel. The speaker may be an 8-ohm permanent-magnet type, 4 inches or larger. The internal speaker is disconnected when an external speaker is used. Headphones should also be 4 to 16 ohms impedance. When the headphones are connected to the front-panel PHONES jack, the speaker is disabled.

2.7 GROUND

To prevent electric shock, and reduce the possibility of TVI and BCI, connect the transceiver to a good earth ground through as short and heavy a lead as possible.

2.8 ANTENNA

Any of the common antenna systems designed for use on the high frequency amateur bands may be used with the TS-830M, provided the input impedance of the transmission line is not outside the capability of the pi-output matching network. The transmission line should be coaxial cable. An antenna system which shows a standing wave ratio of less than 2:1 when using 50 or 75 ohm coaxial transmission line, or a system that results in a transmission line input impedance that is essentially resistive, and between 15 and 200 ohms will take power from the transceiver with little difficulty. If openwire 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, and 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 bands, will perform satisfactorily. For operation of the transceiver 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 powerful transceiver is useless without a proper antenna.

NOTE:

Protect your Equipment — Use a LIGHTING ARRESTOR.

Mobile Station — Mobile antenna installations are critical, since any mobile antenna for use on the high frequency bands represents a number of compromises. Many amateurs lose the efficiency of their antenna through improper tuning. Remember the following points when using the TS-830M with a mobile antenna.

The "Q" of the antenna loading coil should be as high as possible.

The loading coil must be capable of handling the power of the transceiver without overheating. In the CW mode the power output of the transceiver will exceed 80 watts.

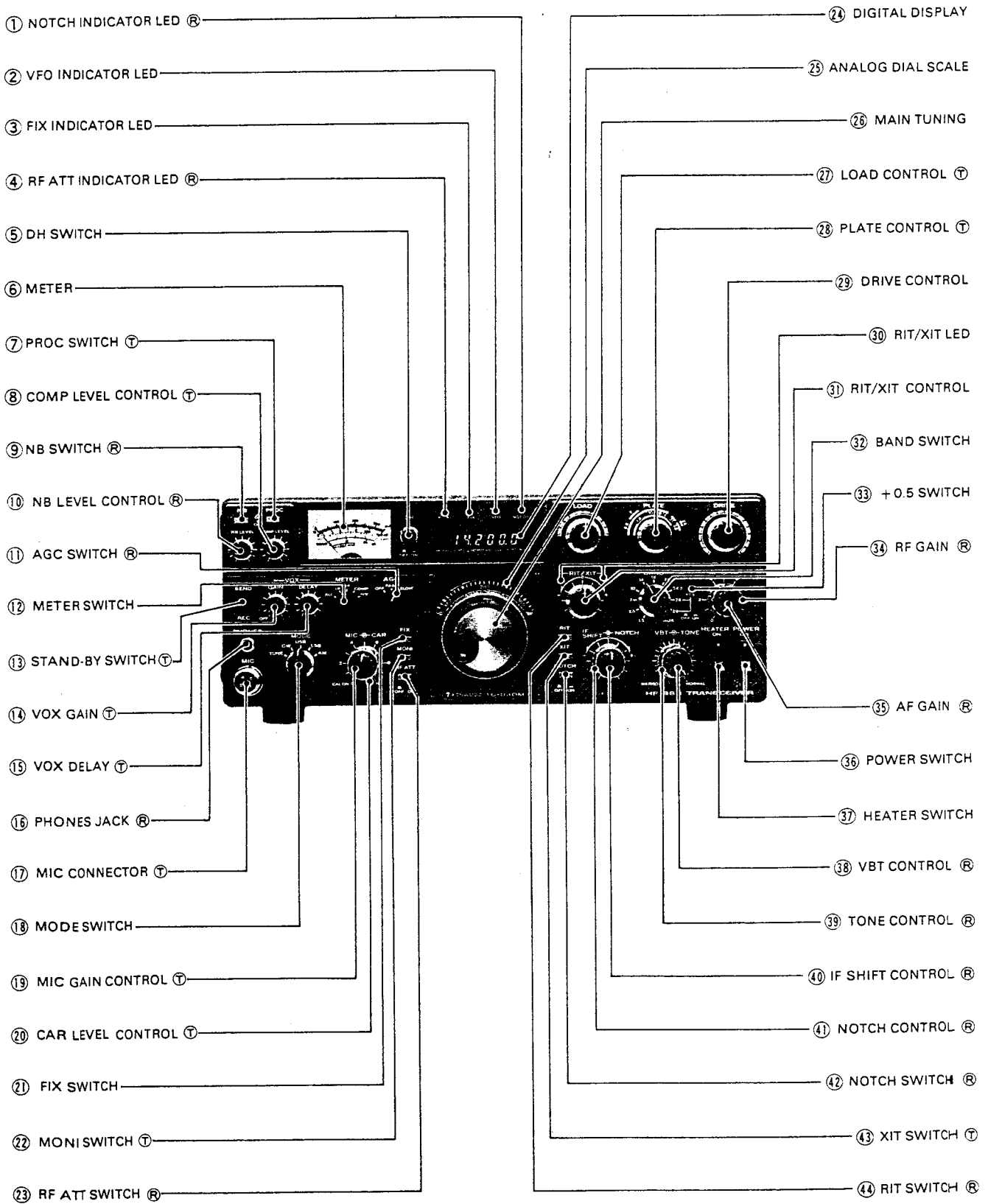
The SWR bridge is a useful instrument, but unfortunately it is quite often misunderstood, and overrated in importance. Basically, the SWR bridge will indicate how closely the antenna load impedance matches the transmission line. With long transmission lines, such as will be used in many fixed station installations, it is desirable to keep the impedance match fairly close in order to limit power loss. This is particularly true at the higher frequencies. The longer the line, and the higher the frequency, the more important SWR becomes. However, in mobile installations the transmission line seldom exceeds 20 feet in length, and an SWR of even 4 to 1 adds very little power loss. The only time SWR will indicate a low figure is when the antenna presents a load close the 50 ohms, but many mobile antennas will have a base impedance as low as 15 or 20 ohms at their resonant frequency. In such a case, SWR will indicate 3 or 4 to 1, and yet the system will be radiating efficiently.

The really important factor in your mobile antenna is that it should be carefully tuned to resonance at the desired frequency. The fallacy in using an SWR bridge lies in the fact that it is sometimes possible to reduce the SWR reading by detuning the antenna. Field strength may actually be reduced in an effort to bring SWR down. Since field strength is the primary goal, we recommend a field strength meter for antenna tuning.

For antenna adjustments, the transceiver may be loaded lightly, using the TUNE position instead of operating at full power output. This will limit tube dissipation during adjustments, and will also help to reduce interference on the frequency. In any case, do not leave the transmitter on for very long at one time. Turn it on just long enough to tune and load, and get a field strength reading. Start out with the antenna whip at about the center of its adjustment range. Set the VFO to the desired operating frequency and then adjust the PLATE control for a dip, and then the LOAD control. Then observe the field strength reading. The field strength meter may be set on top of the dash, on the hood, or at an elevated location some distance from the car.

Change the whip length a half inch or so at a time, retune the finals each time, and again check the field strength at the antenna. Continue this procedure until the point of maximum field strength is found. This adjustment will be most critical on 75 meters, somewhat less critical on 40, until on 10 meters the adjustment will be quite broad. After tuning the antenna to resonance, the finals can be loaded to full power.

SECTION 3. CONTROLS AND THEIR FUCTIONS



3.1 FRONT PANEL

The symbol after the part name indicates:

- Ⓡ: Active only during reception.
- Ⓣ: Active only during transmission
- No symbol: Always active

1. NOTCH INDICATOR LED Ⓡ

This indicator, (light emitting diode), illuminates when the NOTCH circuit is turned ON.

2. VFO INDICATOR LED

The VFO indicator illuminates when the internal VFO controls transceiver operation. The indicator is not lighted during fixed channel or remote VFO operation.

3. FIX (FIXED CHANNEL) INDICATOR LED

The FIX indicator illuminates when the internal fixed frequency oscillator controls transceiver operation.

4. RF ATT INDICATOR LED Ⓡ

This illuminates when the RF ATT is turned ON.

5. DH (DISPLAY HOLD) SWITCH

With this switch ON, the display frequency remains ON even if the main tuning is changed. This feature is used to memorize the original frequency when checking another frequency.

6. METER

The meter monitors six different functions, depending on METER switch position. In receive the meter is automatically an S-meter, and shows received signal strength on a scale of 0 to 40 dB over S9. In transmit, meter function depends on the position of the METER switch, as described below. This is an average-responding meter, NOT peak-reading.

7. PROC (SPEECH PROCESSOR) SWITCH Ⓣ

This switch is used during SSB operation. Set the switch to the ON position and the speech processor will be activated, increasing the average talk power. Compression level can be adjusted by the processor control (8).

8. COMP LEVEL CONTROL Ⓣ

This control adjusts compression level. Set the meter switch (12) to the COMP position and adjust this control while observing the meter COMP scale.

9. NB SWITCH Ⓡ

With the lever switch UP, the noise blanker circuit is turned ON reducing pulse-type (ignition) noise. Power-line, radar, QRM and atmospheric "white" noises will not operate the blanker. The noise blanker circuit operating level is adjustable by the noise blanker control (10).

10. NB LEVEL CONTROL Ⓡ

This control adjust the noise blanker circuit (operating level) according to receiving conditions or noise level.

11. AGC SWITCH Ⓡ

This controls the AGC (Automatic Gain Control) circuit:
OFF..... AGC disabled (no AGC).
FAST..... Normally used for CW operation.
SLOW..... Normally used for SSB and AM operation.

12. METER SWITCH

This determines the transmit meter function:

ALC (Automatic Level Control)

Monitors internal ALC voltage, or the ALC voltage feedback from a linear amplifier operated in conjunction with the TS-830M. For SSB operation the ALC reading for voice peaks should be within the indicated ALC range. ALC voltage adjustment is made with the MIC control for SSB and with the CAR control for CW.

IP (Plate Current)

In this position the meter monitors final tube plate current. The scale is calibrated from 0 to 350 ma.

RF (Output Power)

This monitors relative output power of the transceiver. There is no meter scale for this position. Normally the reading should be adjusted (with the RF VOLT control) for a 2/3 scale reading.

COMP

This indicates compression level when the speech processor is operating.

HV (High Voltage)

This position monitors the high voltage power supply. The meter scale is calibrated from 0 to 10, indicating 0 to 1000 volts.

13. STAND-BY SWITCH Ⓣ

This two-position lever switch selects:

REC..... The transceiver is receiving unless the microphone PTT switch, or the VOX circuit is activated.

SEND..... Locks the unit in transmit.

14. VOX GAIN $\text{\textcircled{T}}$

This controls sensitivity of the VOX (Voice Operated Transmit) circuit.

15. VOX DELAY CONTROL $\text{\textcircled{T}}$

The DELAY control adjusts the hold time for VOX or break-in CW operation. Adjust for individual preference.

16. PHONES JACK $\text{\textcircled{R}}$

The headphones jack allows use of a 4 to 16 ohm headphone through a 1/4" phone plug. When phones are used the speaker is disconnected.

17. MIC CONNECTOR $\text{\textcircled{T}}$

The four pin connector allows use of a PTT microphone. Figure 2-1B shows plug wiring.

18. MODE SWITCH

The mode switch selects type of emission, and TUNE.

TUNE This position provides reduced carrier and shorted key line for transceiver tuning. (Input power to the final section is reduced to prevent tube damage during tune-up.)

CW Used for CW operation. A high-cut filter is inserted in the receiver audio circuit to reduce unwanted noise. SSB filter selected for WIDE receive bandwidth.

USB Used for upper-sideband operation. International Amateur practice dictates the use of USB on the 10, 14, 18, 21, 24.5 and 28 MHz bands.

LSB Selects lower-sideband. International Amateur practice dictates the use of LSB on the 1.8, 3.5 and 7 MHz bands.

AM Used for AM operation.

19. MIC GAIN CONTROL $\text{\textcircled{T}}$

This control adjusts microphone amplifier gain for SSB and AM operation. Adjust for an on-scale ALC reading on voice peaks in SSB.

In AM, adjust for slightly movement of the meter pointer on the ALC scale on voice peaks.

Note that the transmission waveform will distort if the meter (ALC scale) deflects apparently.

In the CAL ON position, receive frequency can be calibrated at 25 kHz intervals using the built-in oscillator.

20. CAR LEVEL CONTROL $\text{\textcircled{T}}$

This controls carrier level during CW and AM operation. Adjust for approximately 250 mA of plate current in CW, 130 mA in AM.

21. FIX SWITCH

Place this switch ON for fixed channel operation; (an optional crystal is required. Trio-Kenwood does not supply these crystals.)

22. MONI (MONITOR) SWITCH $\text{\textcircled{T}}$

This delivers a sample of the demodulated transmit IF signal to the AF for monitoring modulation.

23. RF ATT SWITCH $\text{\textcircled{R}}$

With this switch ON, A 20 dB attenuator is inserted in the antenna circuit, protecting the RF amplifier and mixer from overload on strong input signals.

24. DIGITAL DISPLAY

The digital display indicates operating frequency to the nearest 100 Hz.

25. ANALOG DIAL SCALE

The mono-scale permits direct analog frequency readout over the 0 to 500 kHz range, graduated at 1-kHz intervals. Operating frequency equals the dial (in kHz) plus the BAND switch frequency (in MHz). An additional 50 kHz both above and below the 500 kHz range is also covered.

26. MAIN TUNING

This controls the VFO, selecting the transceiver's operating frequency. The indented knob is convenient for quick tuning.

27. LOAD CONTROL $\text{\textcircled{T}}$

This controls the loading of the network between the final section and the antenna. Adjustment is described in Section 4.

28. PLATE CONTROL $\text{\textcircled{T}}$

This controls the plate tuning of the final amplifiers. Calibration is approximate.

29. DRIVE CONTROL

This control tunes the plate tank circuit of the 12BY7A driver as well as the receiver's antenna and mixer coils. In receive the DRIVE control is tuned for maximum sensitivity (maximum S-meter deflection), and in transmit for a maximum ON-SCALE ALC reading. These points occur concurrently. Tuning for one also achieves the other.

30. RIT/XIT INDICATOR LED

This indicator will light when the RIT switch (44) or XIT switch (43) is ON.

31. RIT/XIT CONTROL

This control allows the receive frequency, transmit frequency or both to be shifted without using the main tuning control.

With the RIT switch (44) ON, the RIT circuit is activated to shift only the receive frequency.

With the XIT switch (43) ON, the XIT circuit is activated to shift only the transmit frequency.

When both switches are ON, both frequencies are shifted. The center (O) position equals no shift.

32. BAND SWITCH

The 10-position switch selects all Amateur bands from 1.8 to 29.7 MHz. To select the 28.5 or 29.5 MHz bands, push the +0.5 switch (33) ON.

Use the 10 MHz band for WWV reception. An AUX receive band is also available.

Coilpack (Receiver front-end) and PLL components must be installed and aligned for the specific receive frequency range desired.

33. +0.5 SWITCH

This switch is used in conjunction with the bandswitch (32.). Depress the switch with the bandswitch set to "28", and the transceiver will operate in the 28.5 MHz band. When the bandswitch is set to "29", the transceiver will operate in the 29.5 MHz band. This switch has no function at any other bandswitch position.

34. RF GAIN $\text{\textcircled{R}}$

This adjusts receiver RF amplifier gain. Turn fully clockwise for maximum gain and a correct S-meter reading.

35. AF GAIN $\text{\textcircled{R}}$

This adjusts receiver audio level. Volume increases clockwise.

36. POWER SWITCH

This switches all power to the transceiver.

37. HEATER SWITCH

This switch turns the three transmitting tube filaments ON.

38. VBT CONTROL $\text{\textcircled{R}}$

The VBT (Variable Bandwidth Tuning) continuously adjusts the IF Filter bandwidth to eliminate radio interference. For normal operation, this control may be left fully clockwise (NORMAL Position).

39. TONE CONTROL $\text{\textcircled{R}}$

This adjusts audio tone quality of received signals. Adjust as desired.

40. IF SHIFT CONTROL $\text{\textcircled{R}}$

During reception, the center frequency of the IF crystal filter can be shifted ± 1.2 kHz facilitating adjustment of tone quality, or eliminating interference from nearby frequencies. For normal operation, set to the center detent position (click stop).

41. NOTCH CONTROL $\text{\textcircled{R}}$

Turn the NOTCH switch ON to activate the Notch filter. Adjust the notch frequency to null a beat (tone interference) signal.

42. NOTCH SWITCH $\text{\textcircled{R}}$

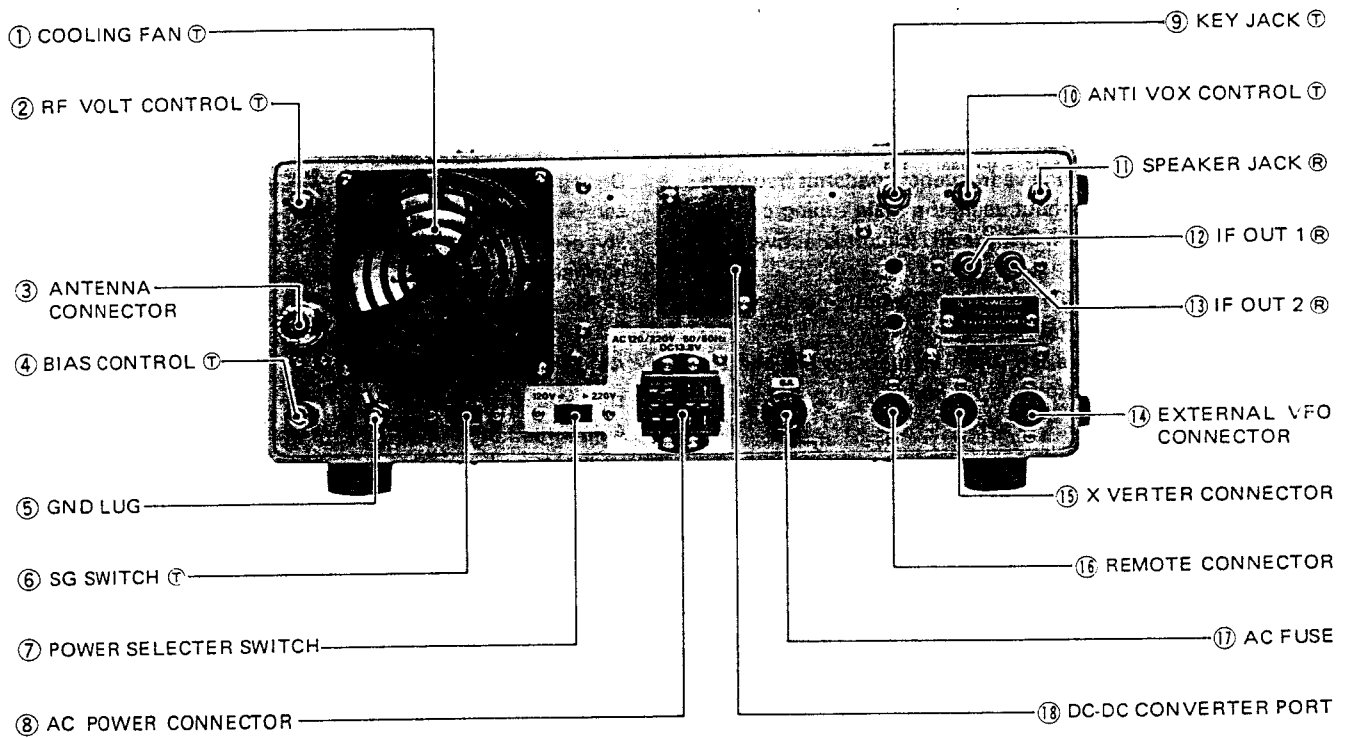
This switch controls the NOTCH circuit and indicator.

43. XIT SWITCH $\text{\textcircled{T}}$

This push switch activates the XIT (Transmit Incremental Tuning) circuit and the XIT indicator. By adjusting the XIT control, the VFO transmit frequency can be varied ± 2 kHz without changing the receive frequency.

44. RIT SWITCH $\text{\textcircled{R}}$

This push switch activates the RIT (Receiver Incremental Tuning) circuit, and the RIT indicator. By adjusting the RIT control, the VFO receive frequency can be varied ± 2 kHz, without changing the transmit frequency. If, both switches are ON, both the transmit and receive frequencies will shift simultaneously.



3.2 REAR PANEL

1. COOLING FAN (T)

This fan cools the RF amplifier section to insure reliable and efficient operation.

2. RF VOLT CONTROL (T)

This adjusts the RF output meter reading. Set for 2/3 scale reading during CW transmission.

3. ANTENNA CONNECTOR

This SO-239 coax connector should be attached to a suitable 50Ω antenna for transmitting and receiving.

4. BIAS CONTROL (T)

This adjusts the bias voltage to the (6146B) amplifier tubes. Clockwise rotation increases the idling plate current. Section 4 describes adjustment to 60 ma.

5. GND (GROUND) LUG

To prevent electric shock, as well as RFI and BCI, connect the transceiver to a good earth ground.

6. SG SWITCH (T)

This slide switch controls the screen grid voltage to the final tubes. For neutralizing, switch OFF. The switch remains ON for normal operation.

7. POWER SELECTER SWITCH

This switches power transformer primary, selecting 120 VAC and 220 VAC windings. This is preset to the 220 VAC position.

8. AC POWER CONNECTOR

This cable is used to connect an AC power source to the transceiver. Two types of the AC power cord are supplied for each AC voltage source.

9. KEY JACK (T)

Using shielded line, connect a key to this 1/4" phone jack for CW operation. Key open-terminal voltage is approximately -65V.

10. ANTI VOX CONTROL $\text{\textcircled{T}}$

Adjust the control to prevent speaker output from tripping the VOX.

11. SPEAKER JACK $\text{\textcircled{R}}$

The receiver audio output can be connected through this jack to an external 4 to 16 ohm speaker. The internal speaker is disconnected when an external speaker is connected.

12. IF OUT 1 $\text{\textcircled{R}}$

A Buffered Mixer output for pan display use. This is a wide-band, low-level IF signal.

13. IF OUT 2 $\text{\textcircled{R}}$

A high-level, narrow-band IF output, taken before the RX Produce Detector, for scope display of received signal waveform.

14. EXTERNAL VFO CONNECTOR

This DIN connector is used to interface the KENWOOD VFO230 external VFO. The interconnecting cable is provided with the VFO-230.

PIN	FUNCTION	PIN	FUNCTION
1	VFO signal	5	VFO control
2	Relay control (+ on transmit)	6	Display control
3	+9V	7	Ground
4	CW freq. shift control	8	+12V

15. XVERTER CONNECTOR

This DIN connector is used to interface a VHF transverter.

PIN	FUNCTION	PIN	FUNCTION
1	Ground	5	Transverter input
2	Relay control (+ on transmit)	6	Transverter ALC input
3	Ground	7	Transverter output
4	X-verter ON-OFF control	8	HF ANT output

16. REMOTE CONNECTOR

This connector is used to interconnect a linear amplifier or other accessory item.

PIN	FUNCTION	PIN	FUNCTION
1	Record output (100~150 mV AF)	5	Normally closed (relay contact)
2	Relay common terminal (NOT grounded)	6	ALC input ALC threshold level approx. -6V
3	PTT line	7	No connection
4	Normally opened (relay contact)		

17. AC FUSE

This fuse protects the transmitter power supply against short circuits. Never use a higher amperage fuse than specified; it will eventually cause extensive damage. If the fuse blows, try to determine the cause before replacing.

For 120 VAC operation use a 6 ampere fuse.
For 220V AC operation use a 4 ampere fuse.

18. DC-DC CONVERTER PORT

DC-DC Converter DS-2 (option) can be installed in this space. When wiring, remove the cover.

SECTION 4. OPERATION

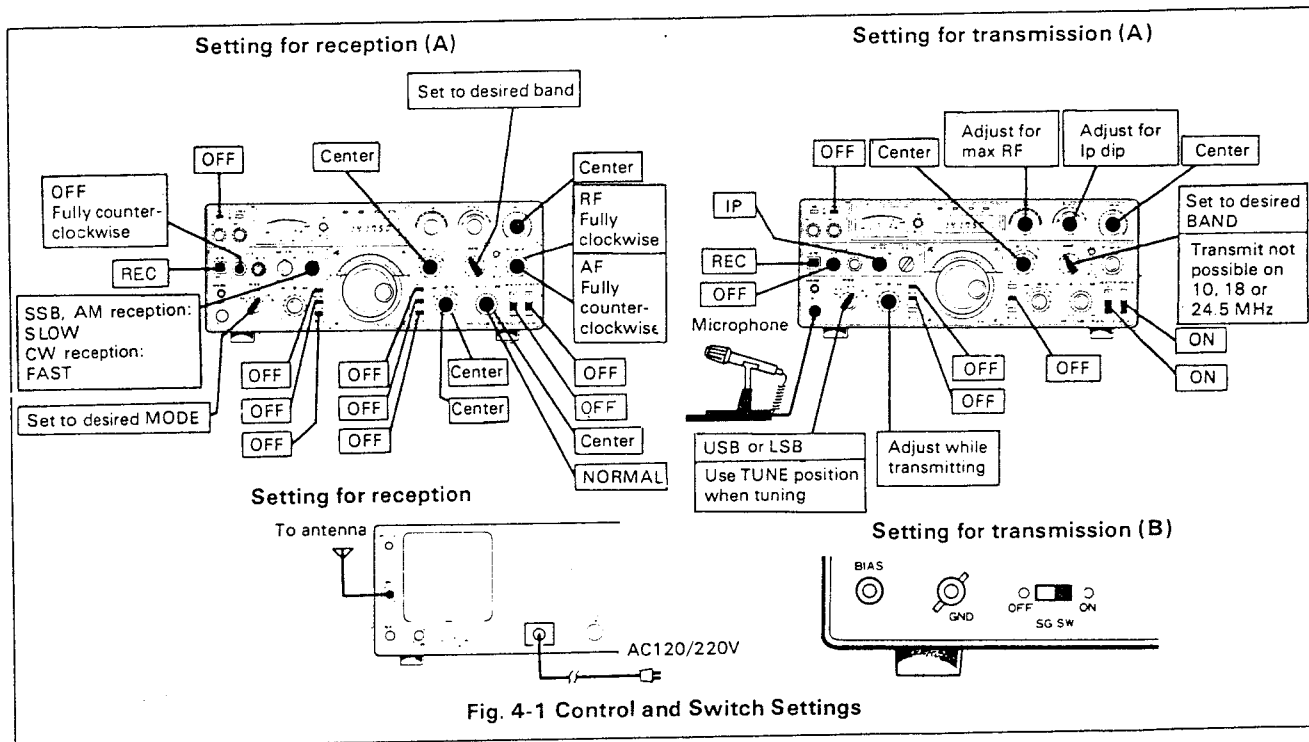


Fig. 4-1 Control and Switch Settings

4.1 RECEPTION (I)

NOTE:

Set the MIC and CAR controls to minimum to prevent accidental transmission before tune-up is completed. The TS-830M must be operated into a 50 ohm antenna or dummy load with an SWR less than 2:1. Random length wire antennas or light-bulb dummy loads cannot be used. Conventional half-wave dipoles and beam antennas should only be used at or near their resonant frequency. Exceeding an SWR of 2:1 can damage the output stage of the transceiver.

(1) Basic Procedures for Receive Operation

The TS-830M has many advanced features such as VBT, IF SHIFT, NOTCH, etc. to assure enhanced receive operation. For the use of these specialized controls and switches, refer to Section 4.2 "Reception (II)".

With a suitable antenna and microphone or key connected to the transceiver, set the controls as described in Fig. 4-1

Turn the POWER switch ON. The meter, dial scale, and VFO indicator will light, indicating the transceiver is operating. Advance the AF GAIN control clockwise until some receiver noise is heard in the speaker. Turn the main tuning dial within the frequency range of the Amateur band chosen until a signal is heard. Tune the signal for clearest reception, and then adjust the DRIVE control for maximum S-meter deflection.

(2) WWV Reception

Set the band switch to "10" and turn the main tuning control to 10.0 MHz.

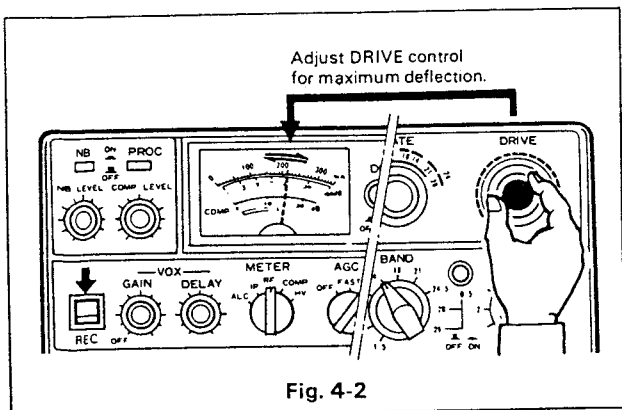


Fig. 4-2

4.2 RECEPTION (II)

This section covers operation of controls and switches to provide the maximum performance from the TS-830S.

(1) RF ATT SWITCH

The input to the receive RF amplifier is attenuated approximately 20 dB, providing distortion-free reception. This feature may be used in cases of receiver overload, caused either by a strong local signal, or during weak signal reception when a strong adjacent signal may blank the receiver.

(2) RF GAIN CONTROL

RF GAIN is controlled by changing the AGC threshold voltage. Adjust the RF GAIN so the S-meter does not deflect excessively. This also reduces noise during reception. For normal operation, this control should be turned fully clockwise for maximum sensitivity.

(3) AGC (AUTOMATIC GAIN CONTROL)

Set the AGC switch to the appropriate position: Generally for SSB, AM, SLOW, for CW FAST, and for very weak signals, the AGC may be turned OFF.

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, turn the RF GAIN down so the meter pointer remains at about the original deflection peak and turn the AGC switch OFF. This will eliminate the unwanted AGC voltage and permit clear reception.

(4) RIT/XIT

First set the RIT/XIT control to center, and turn the RIT switch ON.

The RIT/XIT control allows shifting the receive frequency by approximately ± 2 kHz without changing the transmit frequency.

With the RIT switch ON, the receive frequency can be adjusted by using the RIT control.

With both the RIT and XIT switches ON, both the transmit and receive frequencies can be shifted.

For XIT switch operation, refer to Section 4.4 "Transmission (II)".

NOTE:

When the RIT is ON, transmit frequency is different from the receive frequency. For normal operation, leave the RIT switch OFF. It should be turned ON only when needed.

(5) VBT CONTROL (Variable Bandwidth Tuning)

This control is used to eliminate radio interference by changing the IF passband-width. Use this control in

conjunction with the IF SHIFT and NOTCH filter to obtain optimum results. By setting the VBT control to the NORMAL position, maximum passband-width is obtained. The IF filter passband-width is narrowed as the control is adjusted counterclockwise, while center frequency remains unchanged. Fig. 4-4 illustrates operation. The range of variability depends on the type of optional filter used.

When the filter bandwidth is 2.4 kHz (without an optional filter), the passband-width varies within the range of 500 Hz to 2.4 kHz. See Fig. 4-3.

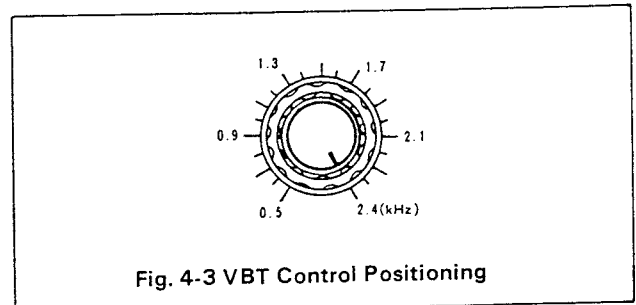


Fig. 4-3 VBT Control Positioning

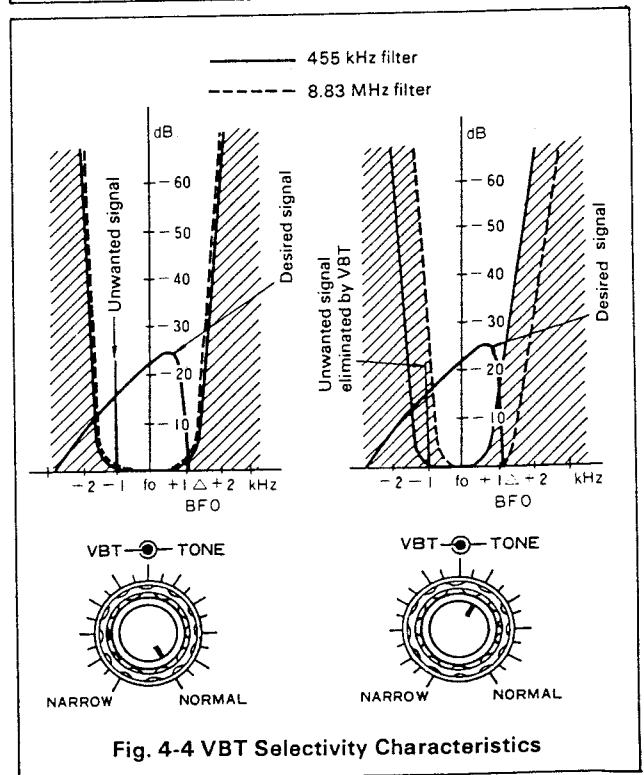


Fig. 4-4 VBT Selectivity Characteristics

(6) IF SHIFT

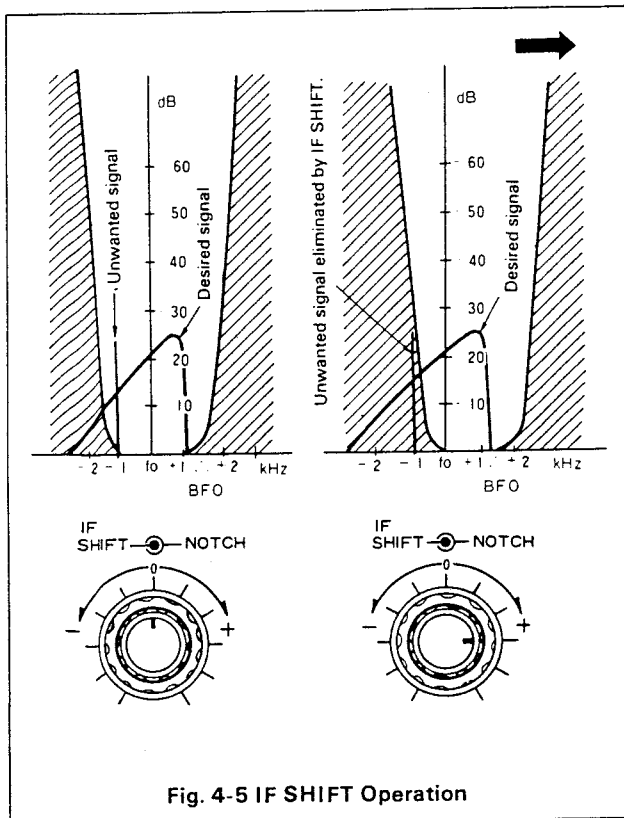
By using the IF SHIFT during reception, the crystal filter passband frequency can be shifted approximately ± 1.2 kHz. This is achieved by use of a PLL (Phase-Locked Loop) in the L.O. (local oscillator) circuit. This is a major feature of the TS-830M and can be used in the following cases:

1. Adjustment of tone quality and interference rejection during SSB Reception.

When the transceiver is on 20 meters and above, USB mode, turn the IF SHIFT in the "+" direction and the lower frequencies are attenuated. Turning the knob in the "-" direction cuts the higher frequencies. (These procedures are reversed for LSB operation below 20 meters). Adjust the control to your listening preference. The IF SHIFT is also effective in eliminating interference from adjacent receive signals.

2. Adjustment of tone quality during CW operation.

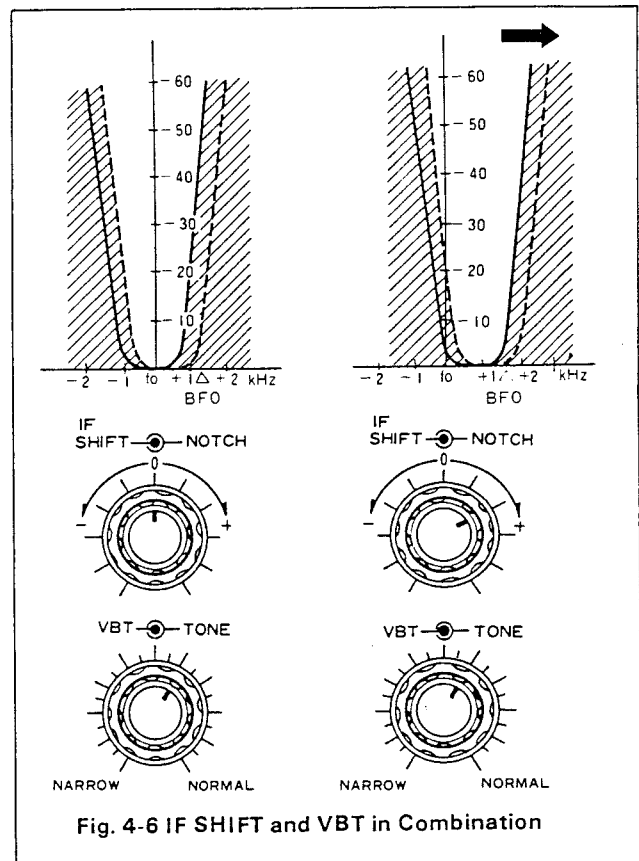
For detailed descriptions, refer to Section 4.4 (5) "CW operation".



(7) VBT AND IF SHIFT COMBINATION

If excessive radio interference is encountered during SSB operation, adjust the VBT for optimum bandwidth, and the IF SHIFT for maximum intelligibility.

In CW mode, first adjust the VBT. Turn the IF SHIFT "-" (counter clockwise), adjusting for approximately 800 Hz tone. If pitch lower than 800 Hz is desired, adjust the RIT and IF SHIFT.



(8) NOTCH CONTROL

If a single tone such as a CW signal is superimposed on the receive signal, turn the NOTCH ON and adjust the NOTCH control to eliminate or minimize the beat signal. A beat of approximately 1.5 kHz can be eliminated at the center position of the control. In USB or CW mode, a beat signal lower than 1.5 kHz can be eliminated by turning the control clockwise. In LSB mode, adjust the control counterclockwise.

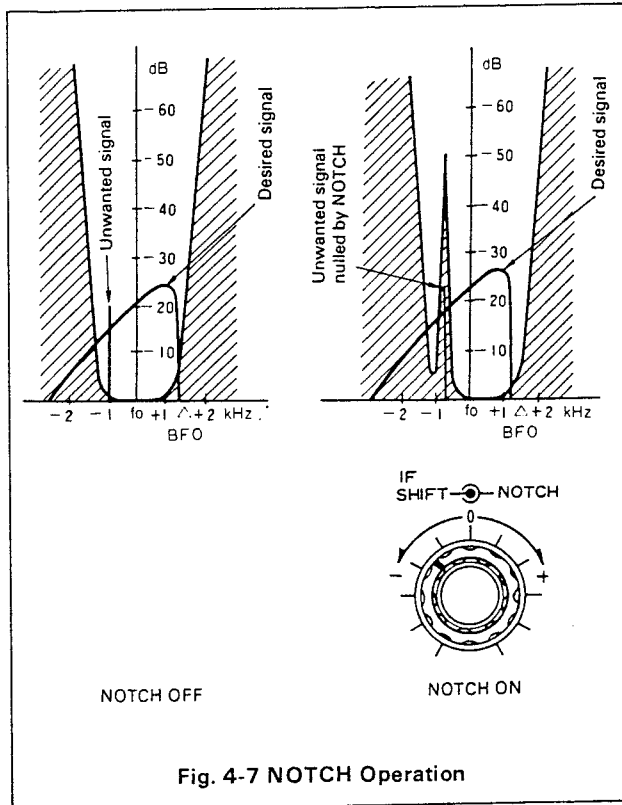


Fig. 4-7 NOTCH Operation

(9) NOISE BLANKER (NB)

For pulse type noise, such as generated by automotive ignition systems, turn the NB switch ON. Adjusting the NB LEVEL control varies the blanker's threshold, eliminating even low level noises.

If high level signal or noise is present on an adjacent frequency, do not use excessive NB threshold LEVEL as it may distort the received signal.

(10) TONE CONTROL

Adjust this control to obtain desired tone quality.

4.3 TRANSMISSION (I)

This section covers adjustment of the transceiver for transmission.

Refer to Fig. 4-1 for initial transmitter switch settings. Set the main tuning to the desired operating frequency. (Refer to Table 4-1 for a summary of the following.)

CAUTION:

DO NOT turn the BANDSWITCH while the transceiver is in transmit mode.

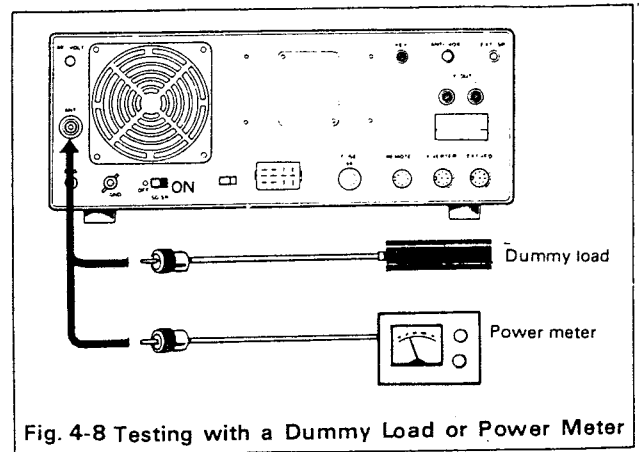


Fig. 4-8 Testing with a Dummy Load or Power Meter

1. Connect a 50Ω antenna for the band you will operate or a dummy load, and connect a Key. SWR must be 2: 1 or better. The life of the final tubes is directly related to the SWR of the antenna, and to the length of tuning periods.
2. Turn POWER and HEATER Switches ON.
3. Place the MODE switch to SSB, METER switch to Ip.
4. Place the STAND-BY switch to SEND and adjust bias to 60 mA with the BIAS control on the rear panel.

CAUTION:

If the plate current is higher than 60 mA do not leave the stand-by switch on for more than a few seconds. Excessive plate current shortens the life of the final tubes.

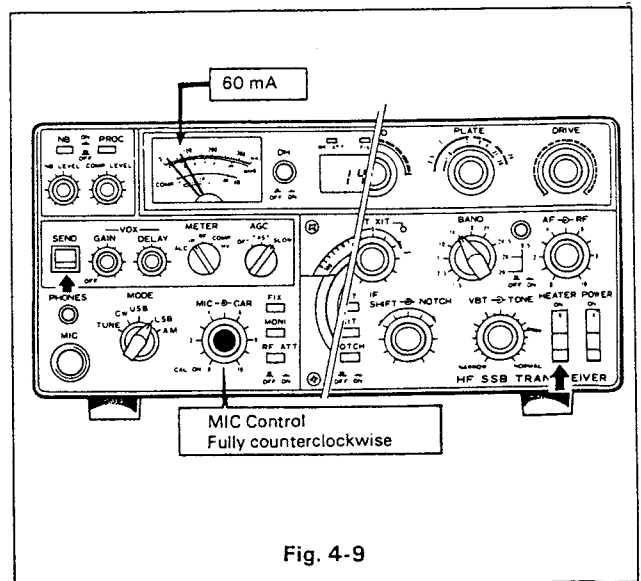
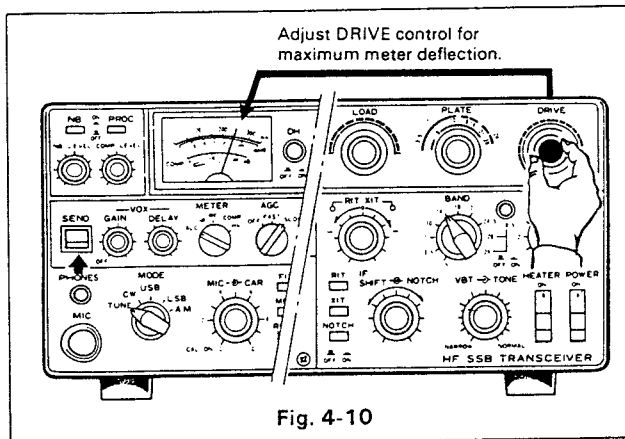


Fig. 4-9

- Place MODE switch to TUNE, METER switch to ALC. Peak the DRIVE control. If the meter pegs or goes out of the ALC range, reduce the CARRIER control setting for an on-scale reading. (the CAR control is a level adjustment, while the drive control is a resonative adjustment.)

NOTE:

The TUNE position permits tuning of the final tank circuit at reduced power without danger to the tubes. In the TUNE position, the screen voltage to the finals is reduced approximately 50% and the keying circuit is closed.



- Place the METER switch to RF and peak the PLATE control.

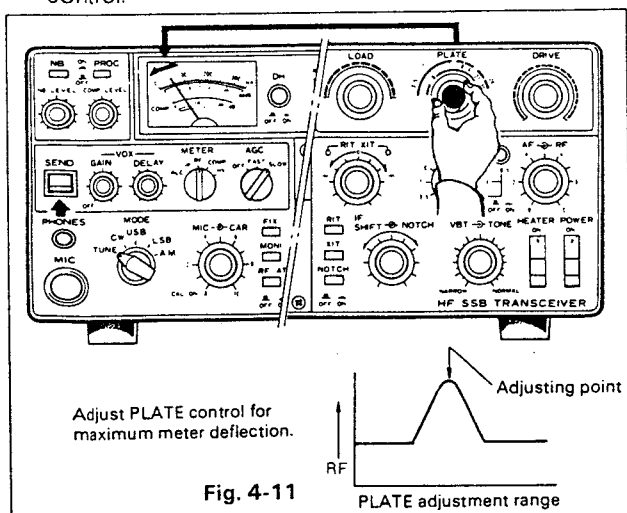
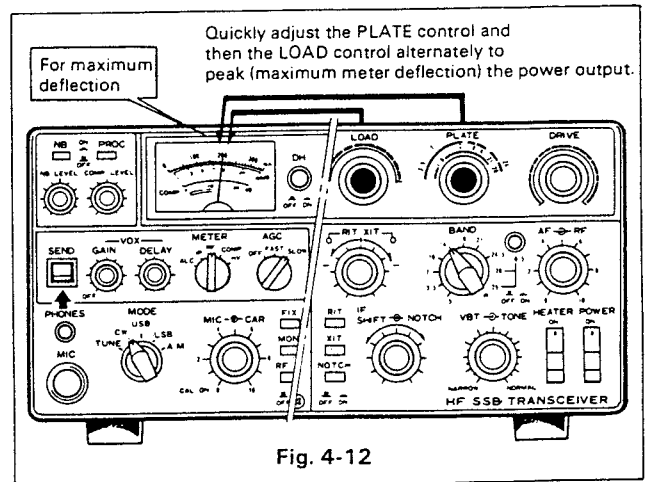


Table 4-1. Summary of Transmitter Tuning Procedure

MODE Switch	METER Switch	Stand-by Switch	Procedure
USB or LSB	IP	REC → SEND	Adjust BIAS control for 60 ma.
TUNE	ALC	REC → SEND	Peak the ALC reading with the DRIVE control.
TUNE	RF	REC → SEND	Peak the RF reading with the PLATE control.
CW	RF	REC → SEND	Peak RF output by alternately adjusting the PLATE and LOAD controls.



- Place the METER switch to RF, MODE switch to CW. Close the Key and repeat the LOAD and PLATE for maximum RF output. You may at your option also redip the Plate for maximum RF output. Open the Key. You are tuned up for CW operation. If necessary, adjust the RF VOLT control on the rear panel to bring the output reading to about 2/3 scale. This is a meter adjustment, not an output adjustment.

(1) SSB OPERATION

Tune the TS-830M as described in steps 1 through 9. Set the MODE switch per Table 4-2, to USB or LSB and connect a microphone to the MIC input.

NOTE:

International Amateur practice dictates using USB or LSB as in Table 4-2.

To operate SSB, connect a microphone. (The Key and CARRIER control have no effect in SSB mode.) Place the MODE switch to SSB, METER switch to ALC. Adjust the MIC gain control for an on scale ALC reading on voice peaks. (Disregard RF and Ip meter readings in SSB- they are not accurate or relevant.)

TABLE 4-2.

1.8 MHz Band	LSB
3.5 MHz Band	LSB
7 MHz Band	LSB
10 MHz Band	USB
14 MHz Band	USB
18 MHz Band	USB
21 MHz Band	USB
24.5 MHz Band	USB
28 MHz Band	USB

■ PTT (Push to talk) OPERATION

By using a microphone equipped with a PTT switch, the transceiver is ready for PTT operation. To key, depress the PTT switch with the stand-by switch left in the REC position.

NOTE:

1. Transmission is impossible with the BAND switch set to AUX 10, 18 or 24.5.
2. Do not set the unit to the transmission mode when the BAND switch is set to AUX or is in midway between AUX and 1.5. Doing so will damage the drive vacuum tube 12BY7A.

(2) AM OPERATION

Set the MODE switch to AM, the METER switch to IP and the MIC GAIN control counterclockwise.

With the stand-by switch set to SEND, adjust the CAR control for the meter reading of 130 mA.

Next turn the METER switch to ALC. While speaking into the microphone in a normal voice, increase the MIC GAIN control so that the meter pointer slightly moves on voice

peaks.

Additional increase in the MIC GAIN control setting will result in distortion, so care should be taken for this adjustment.

4.4 TRANSMISSION (II)

To obtain maximum transmitter performance from your TS-830M you should understand the proper operation of the following controls and switches.

(1) SPEECH PROCESSOR

In SSB operation (particularly DX operation), it may be desirable to increase "talk-power" by using the speech processor. This may make the difference between a marginal, and a copiable signal.

Operation

The speech processor system in the TS-830M is an RF clipper using two filters, one in the VBT circuit and the other in the IF.

Turn the PROCESS switch ON and place the METER switch to COMP. Adjust the COMP LEVEL control while speaking into the microphone in a NORMAL tone of voice for a peak COMP scale reading of about 10-20 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 control while speaking into the microphone. Ensure that meter deflection is within the ALC zone.

(2) VOX (Voice Operated Transmit) OPERATION

Adjust the transceiver as described in the previous paragraph. Flip the VOX switch on and while speaking into the microphone, increase the VOX GAIN control until the VOX relay just operates. For VOX operation it is sometimes desirable to close-talk the microphone to prevent background noises from tripping the transmitter.

Check that the ALC reading for voice peaks is still within range on the meter. If necessary, adjust the MIC control for proper ALC reading.

If the VOX circuit is activated by speaker output, adjust the ANTI-VOX control (on the rear panel) as necessary for proper VOX operation.

Do not use excessive VOX or ANTI VOX gain more than necessary to control VOX operation. If the VOX circuit transfers between words, or holds too long, adjust the release time constant by the DELAY control.

(3) XIT

By using XIT, transmit frequency can be shifted independent of receive frequency.

With the XIT switch ON, the XIT is controlled by the RIT/XIT knob and transmit frequency can be shifted by about ± 2 kHz. When both the RIT and XIT switches are ON, both receive and transmit are shifted without adjusting the main tuning.

(4) MONITOR

To monitor transmitted SSB signal quality, turn the MONITOR switch ON to demodulate and sample a part of the transmit IF signal.

This feature is useful for checking modulation, or when adjusting the speech processor.

When monitoring, use a headphone to avoid audio feedback.

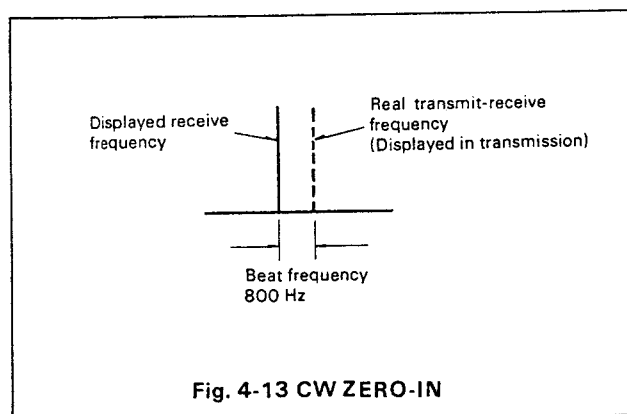
NOTE:

If the HEATER switch is OFF or the DRIVE control is incorrectly adjusted, the ALC circuit will not operate properly, causing excessively high transmit IF signal level, resulting in a distorted monitor signal.

(5) CW OPERATION

Tune and load the TS-830M as described in Sections 4.3. Using shielded line, connect a key to the rear panel KEY jack, set the MODE switch to CW, and set the stand-by switch to SEND for transmitting.

CW transmission is automatically monitored through the transceiver's speaker. Sidetone audio gain can be adjusted through the opening in the bottom cover.



■ RECEPTION

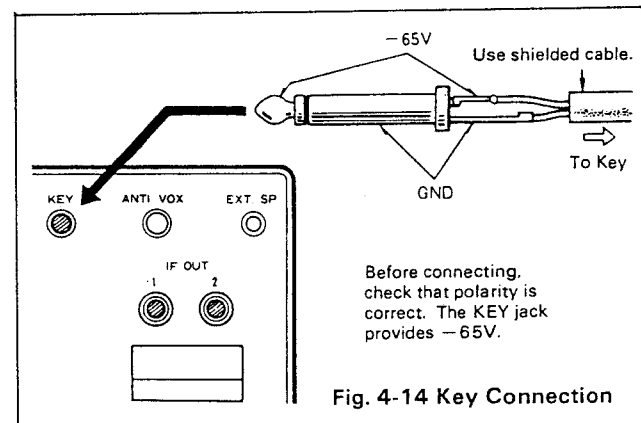
To receive CW, set the IF SHIFT control to its center position and the RIT switch to OFF. Adjust the main tuning for about an 800 Hz beat and your transmit frequency will be tuned (zeroed) to the transmit frequency of the station you are receiving. During reception, the side tone is activated by the key (VOX off). In this case, listen to the side tone superimposed on the receive signal and adjust the main tuning for similar side tone and incoming CW audio tone. By doing so, transmit frequencies will be zeroed. You may now adjust the RIT for a pitch which suits your preference. If interference is encountered, adjust the IF SHIFT.

■ KEY CONNECTION (Fig. 4-7)

Your key should be connected as illustrated in Fig. 4-14. When using an electronic keyer, make sure that polarity is correct. Use shielded line from the key to transceiver.

NOTE:

When using an electronic keyer, set polarity of the keyer for NEGATIVE keying.



■ SEMI-BREAK-IN OPERATION

The TS-830M has a built-in side-tone oscillator to permit semi-break-in operation, besides the normal CW operation. During semi-break-in operation, the transceiver is set in transmit mode when the key is depressed, and returns to receive mode when the key is released. For semi-break-in operation, place the STANDBY switch to REC and turn the VOX GAIN control ON. Adjust the DELAY control for your preference.

4.5 FIXED CHANNEL OPERATION

A fixed channel is available for common use on all bands by installing a crystal in the socket on the PLL unit (X50-1680-00). The crystal frequency can be computed by the following formula:

$$\text{Crystal Frequency (MHz)} = 5.5 \text{ MHz} - X + \text{Operating Frequency (MHz)}$$

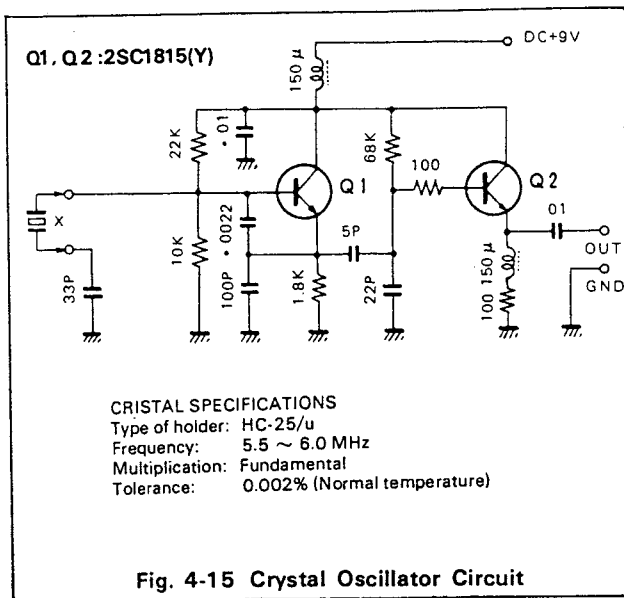
X = Band Switch frequency (1.5, 3.5, etc.)
Crystal specifications: See Fig. 4-15

NOTE:

TRIO-KENWOOD does not supply crystals.

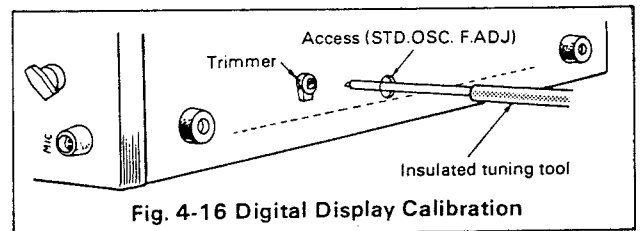
The shift stet circuit CW frequency between transmit and receive, and the RIT/XIT circuit are not effective in FIXED CHANNEL OPERATION.

To use the fixed frequency oscillator, depress the FIX push switch.



4.6 DIGITAL DISPLAY CALIBRATION

Connect the antenna and set the BAND switch to WWV. Turn the main tuning dial to receive 10 MHz WWV. Adjust the dial until a low-frequency beat is heard. Next, turn the MIC control to the CAL position and a marker signal will be superimposed on the WWV signal. A double beat (two beat signals of high and low frequencies) will now be heard. Adjust the IF shift for low AF response. While receiving this double beat, adjust the Standard oscillator trimmer through the reference frequency adjustment access opening (on the bottom of the TS-830S) so the two beats are heard as a single beat. Repeat this procedure 2 or 3 times. This completes calibration of the Digital Display. After calibration turn of the CAL switch.

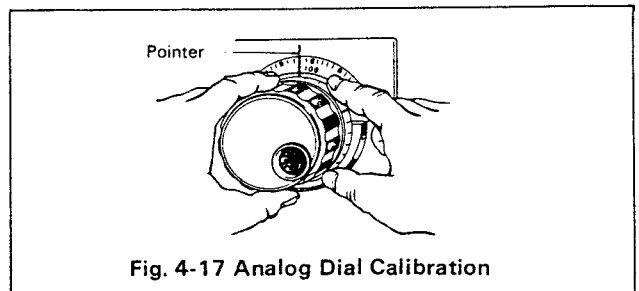


4.7 ANALOG DIAL CALIBRATION

The main dial scal is graduated at 1 kHz intervals. One revolution of the main dial covers 25 kHz. To calibrate the scale, turn the MIC control to the CAL position. Zero-beat in SSB or CW mode. Hold the main tuning knob from rotating and slip the calibration ring to the nearest major (5 kHz) graduation. The dial is now calibrated.

NOTE:

For exact frequency, read the Digital Display.



4.8 MOBILE OPERATION

Mobile operation of the TS-830M is achieved through the use of the DC-DC unit "DS-2" available as an optional accessory.

Select a suitable location where the transceiver is to be installed taking account of car space and operating position. Satisfactory mobile operation is achieved through proper power and antenna connection, and thoughtful transceiver installation and antenna connection, and thoughtful transceiver installation and adjustment.

■ INSTALLATION

Secure the TS-830M under the dash or on the floor using a mounting bracket. As an alternative, use strapping, making sure that the TS-830M will not slip out of place while driving.

NOTE: _____

1. Do not install near the heater outlet.
2. Allow sufficient space behind the TS-830M to ensure proper ventilation and fan operation.

■ HOW TO HANDLE THE POWER CABLE

When connecting or disconnecting the power cable to or from the power connector, be sure that the power switch is always in the "OFF" position.

Observe polarity of the cable. The TS-830M operates on 13.8 VDC, negative ground. Battery polarity must be correct. The power cable is color coded:

CAUTION: _____

Observe battery polarity.

■ POWER CABLE

Red and White + (plus)
Black and Gray - (minus)

First, determine that the cars power system (the battery and generator or alternator) will handle the increased load of the TS-830M.

Connect the power cable to the battery terminals, with consideration to current requirements and noise prevention. The maximum current drawn by the TS-830M is approximately 15A when transmitting. Therefore, the cable

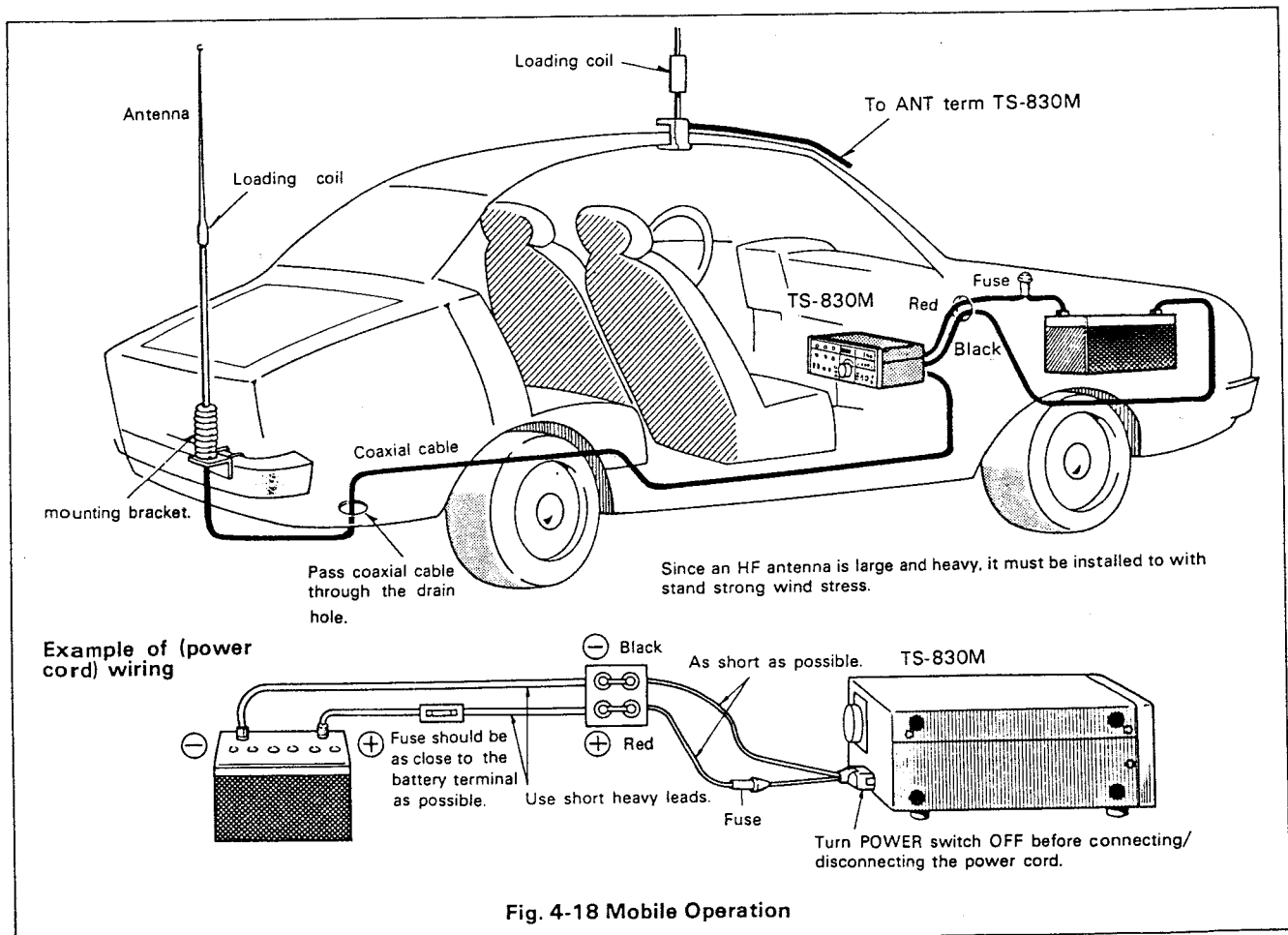


Fig. 4-18 Mobile Operation

should be as short as possible. Route battery and antenna leads away from all high voltage secondary circuits to prevent ignition noise interference.

■ MOBILE ANTENNA

(1) Antenna Installation

HF antennas are larger, have more wind load, and are heavier than VHF antennas. A bumper mount is recommended for general use. The mount must be perfectly grounded to the car body since the body itself functions as the ground plane for the mobile antenna. (Refer to Fig. 4-19)

NOTES:

1. Some cars have a urethane plastic bumper. For such cars, ground the antenna mount to the body.
2. When tuning the newly installed antenna, use the tune mode, and reduce CARRIER injection for minimum transmit power.

(2) Coaxial Cable Connection (Fig. 4-18)

When the antenna is bumper mounted, the coaxial cable can be routed through a drain hole into the trunk.

(3) Antenna Adjustment (Fig. 4-19)

Some mobile antennas are not designed for 50-ohm impedance. In this case, impedance matching between the antenna and the coaxial cable (50Ω) is required. This can be achieved by using an antenna matching device or coupler.

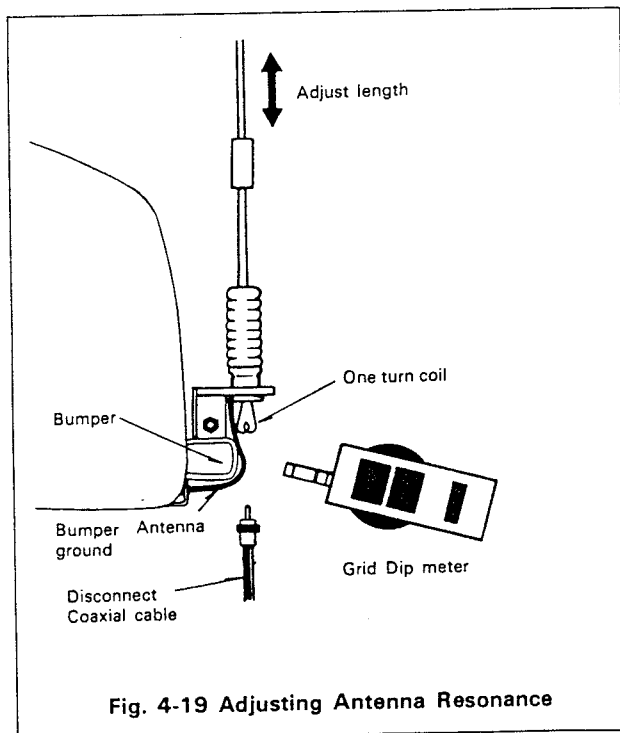


Fig. 4-19 Adjusting Antenna Resonance

The antenna should initially be adjusted with a dip meter, then impedance matching be checked with an SWR meter. (See Fig. 4-19)

Preferably SWR should be less than 2:1 for satisfactory operation. Refer to the antenna instruction manual for the manufacturers tuning recommendations.

■ NOISE REDUCTION

In motor vehicles, ignition noise is generated by the ignition coil or distributor. Other sources of noise include the wiper or heater motors.

Although the TS-830M is equipped with a noise blanker to minimize ignition noise, it is imperative that some preventive measures be taken to reduce the noise to the lowest possible level.

(1) Antenna Location Selection

Since ignition noise is generated by the vehicles engine, the antenna must be installed as far from the engine as possible.

(2) Antenna Matching

In general, mobile antennas have a lower impedance than 50ohm coaxial cable, resulting in a mismatch between the antenna and the coax. Such trouble can be eliminated by using an antenna tuner.

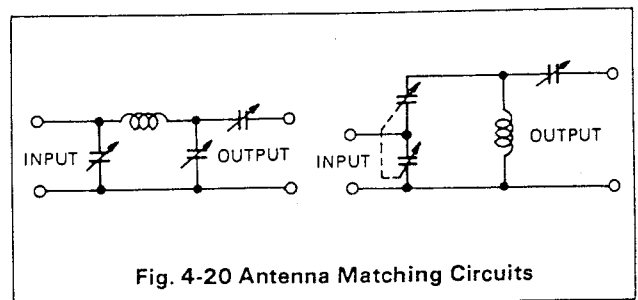


Fig. 4-20 Antenna Matching Circuits

(3) Bonding

The component parts of motor vehicles, such as the engine, transmission, muffler system, accelerator, etc., are coupled to one another at DC and low frequencies, but are isolated at high frequencies. By connecting these parts using heavy, braided ground straps, ignition noise can be reduced. This connection is called "bonding".

(4) Use Ignition Suppressor Cable or Suppressor Spark Plugs

Noise can be reduced by using spark plugs with internal resistors, or resistive suppressor ignition cable.

(5) Battery Power Connection

Battery power should be supplied directly to the transceiver from the battery terminals.

(6) Battery Capacity

The power system of a motor vehicle is comprised of a battery and an alternator (which generates power while the engine is running) to supply current to loads or to charge the battery.

Since the transceiver draws high current during transmit, care should be exercised not to overload the power system. When using the transceiver, the following points

should be observed from the viewpoint of battery maintenance:

Turn the transceiver OFF when the lights, heater, wipers and other high-draw accessories are used.

Avoid "Heaters-ON" operation when the engine is not running.

If necessary, use an ammeter and/or a voltmeter to check battery condition.

SECTION 5. OPTIONAL ACCESSORIES

5.1 OPTIONAL ACCESSORIES

The following optional accessories are available for use with the TS-830M.

■ REMOTE VFO

VFO-230:

The VFO-230 digital VFO provides maximum efficiency and flexibility for all operating conditions, including split-frequency operation, by combining a 20 Hz step digital VFO with five memories.

■ ANTENNA TUNER

AT-230:

The AT-230 antenna tuner includes the three new bands and such functional features as a through-line wattmeter, SWR meter and antenna selector switch.

■ EXTERNAL SPEAKER

SP-230:

The SP-230 is a low-distortion speaker with selectable frequency response for high intelligibility in any mode. The frequency response is determined by the built-in audio filters, which are effective in improving signal-to-noise ratio under certain interference conditions, or when receiving weak signals.

■ LINEAR AMPLIFIER

TL-922:

The TL-922 is an HF linear amplifier operating at maximum legal power, and employing a pair of 3-500Z high performance transmitting tubes.

■ STATION MONITOR

SM-220:

Based on a wide-frequency-range oscilloscope (up to 10 MHz), the SM-220 station monitor features, in combination with a built-in two-tone generator, a wide variety of waveform-observing capabilities. An optional feature is a unique pan-display capability.

■ HEAD PHONES

HS-5, HS-4: 8 Ω communications headphones.

■ MICROPHONE

MC-50: Desk Microphone (50 k Ω /500 Ω)

MC-35S: Noise Cancelling Hand Microphone (50 k Ω)

MC-30S: Noise-Cancelling Hand Microphone (500 Ω)

■ DIGITAL WORLD CLOCK

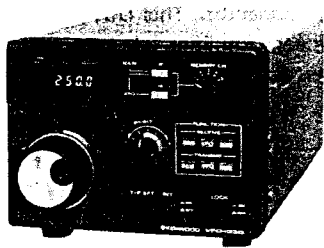
HC-10:

The HC-10 is a highly advanced world clock with dual display which can memorized 10 world major cities and 2 additional regions.

■ DC-DC CONVERTER

DS-2:

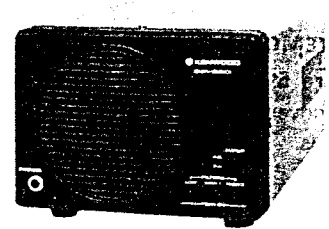
The DS-2 is a DC-DC converter for DC (12 ~ 16V) operation.



VFO-230



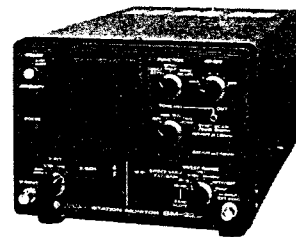
AT-230



SP-230



TL-922



SM-220



HC-10



HS-4



HS-5



MC-50



DS-2

5.2 INSTALLATION OF ACCESSORIES

■ REMOVING THE CABINET (See Fig. 5-1)

Figure 5-1 illustrates cabinet removal. Remove the eight top-cover and eight bottom-cover screws and lift away the panels.

NOTE:
This product uses metric hardware.

CAUTION:
The speaker lead is attached to the chassis, so be careful when removing the top cover. The lead can be unplugged, if necessary.

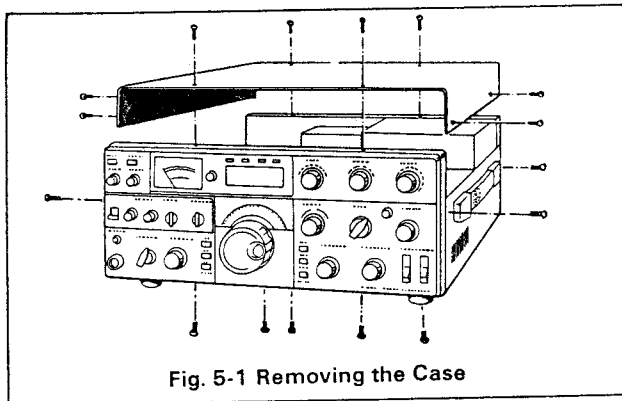


Fig. 5-1 Removing the Case

■ VFO-230 CONNECTION (Fig. 5-2)

Connect the VFO-230 as shown in Fig. 5-2. You will enjoy advanced operation including split-frequency capability by combining a 20 Hz step digital VFO with five memories.

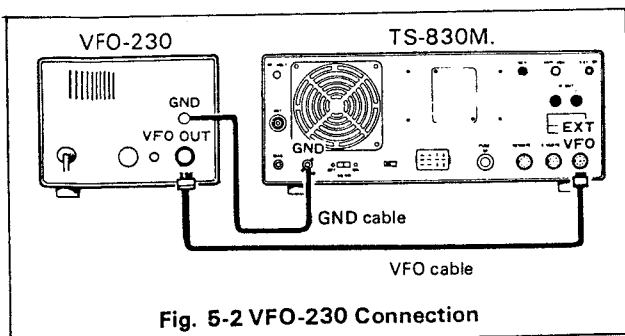


Fig. 5-2 VFO-230 Connection

■ ACCESSORY CONNECTIONS

Fig. 5-4 shows the ACSY connector. This DIN plug can be used for attaching a linear amplifier or other external accessories to the transceiver. Always use shielded line for all functions.

NOTE:
ALWAYS use shielded line for all connections.

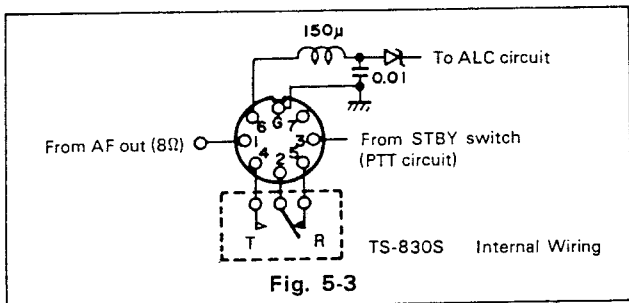


Fig. 5-3

■ SSTV, AFSK OPERATION

The TS-830M will adapt very well to slow scan television or AFSK RTTY operation. For SSTV, the only cabling required are connections between the MIC connector of the TS-830M and the camera output, and between the SPEAKER jack and the monitor input.

When transmitting, adjust the transmitter output so that final input power is less than 100W (less than 125 mA Ip), or for approximately 1/2 of normal output power. For AFSK, connect the T.U. output to the MIC input, and speaker output to the T.U. input.

■ INSTALLING THE DS-2 DC TO DC CONVERTER (OPTIONAL)

1. Remove the blind plate located on the rear panel of TS-830S.
2. Secure the DC-DC unit to the rear panel using the four selftapping screws supplied.
3. Select the correct color coded lead from the DC-DC unit corresponding to the leads connected to the DC-DC terminal board adjacent to the power transformer.
4. Carefully solder each lead to the terminal board.

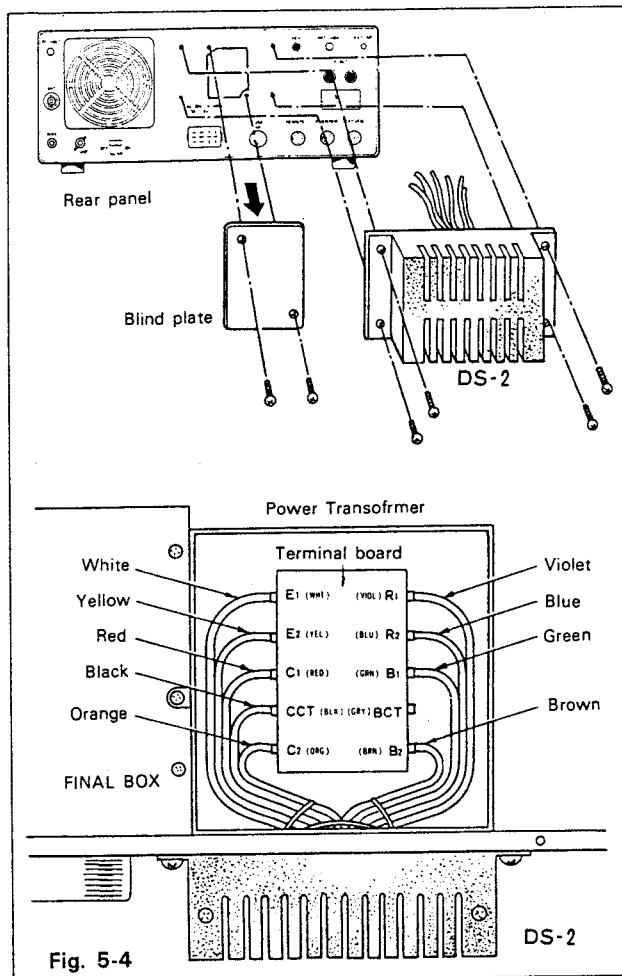


Fig. 5-4

■ EXTENSION FEET

The TS-830M is provided with two extension feet which can be used to elevate the front panel. In some operating positions the tilt makes it easier to read the dial and meter. Fig. 5-6 shows how to install the feet. shows how to install the feet.

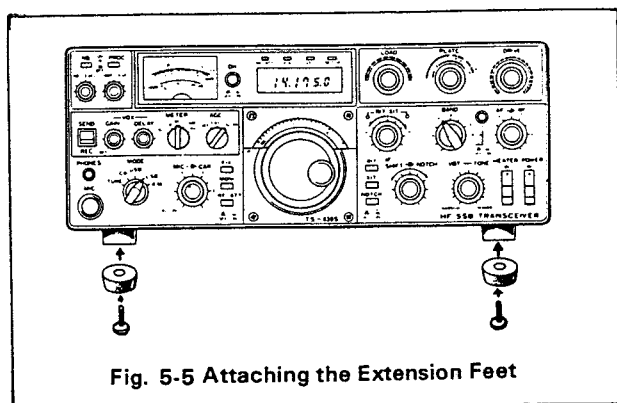


Fig. 5-5 Attaching the Extension Feet

SECTION 6. MAINTENANCE AND ALIGNMENT

CAUTION: DANGEROUS HIGH VOLTAGES ARE PRESENT WITHIN THE CASE OF THE TS-830S WHEN THE TRANSCEIVER IS TURNED ON. EXERCISE EXTREME CAUTION TO AVOID ELECTRIC SHOCK.

6.1 GENERAL

Your TS-830M 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 without factory authorization can void the transceivers warranty.

■ CLEANING

The knobs, front panel and cabinet of the TS-830M are likely to become soiled after extended use. The knobs should be removed from the transceiver and cleaned with a neutral soap and warm water. Use a neutral soap (not harsh chemicals) and a damp cloth to clean the cabinet and front panel.

■ FUSE REPLACEMENT

When the fuse blows, there is some cause. Be sure to find the cause before attempting operation. Use a 6 amp fuse for 120VAC operation. Under no circumstances use a higher amperage fuse than specified. Extensive damage can be caused. Also, the warranty will be void if an oversized fuse is used.

■ FAN MOTOR LUBRICATION

Every 8 months dust out the final compartment, and apply a few drops of light machine oil to the front and rear fan motor bearings.

WARNING: Be certain to disconnect power, and to discharge high voltage before servicing in the final compartment.

6.2 SERVICE POSITION

The TS-830M should be placed on its side, with the final section up, for any alignment or service. This position permits adequate ventilation for the final tubes as well as easy accessibility to the modules. Most of the described adjustments can be made without removing the boards from the transceiver.

6.3 RECEIVER ADJUSTMENTS

■ RIT ZERO (AF-AVR UNIT)

When the RIT circuit is turned on, and the RIT control is set to zero, the receive frequency should be exactly the same as the transmit frequency. If the frequency is not the same, adjust the RIT zero preset control, VR2.

To zero the RIT, turn on the calibrator and tune the VFO for about a 1000 Hz calibrator tone. Turn the RIT control to zero. Turn the RIT switch ON and adjust VR2 for the same 1000 Hz tone. Push the RIT switch ON and OFF to be sure the tones are identical.

■ NOTCH ADJUSTMENT (IF UNIT)

Turn the NOTCH switch OFF and center THE NOTCH control.

Receive a 25 kHz marker signal at 1.9 MHz with a 1.5 kHz beat frequency.

Turn the NOTCH switch ON.

While monitoring AF output through the speaker, adjust L10 and VR1 alternately to minimize this signal.

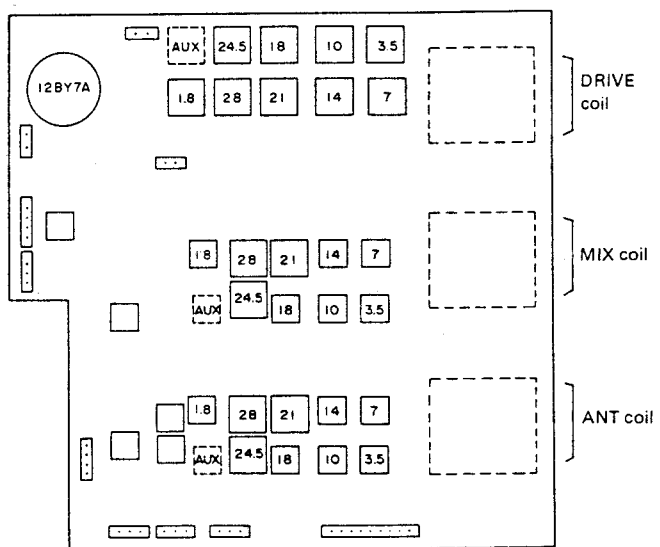


Fig. 6-1

FRONT Panel

BAND Switch	Frequency for adjustments
1.5	1.9 MHz
3.5	3.75
7	7.15
10	10.125
14	14.175
18	18.125
21	21.225
24.5	24.95
28.5	28.8

Table 6-1

■ **ADJUSTMENT OF ANT AND MIX COILS
(COIL PACK UNIT)**

The ANT and MIX coils are included in the coil pack unit. Use the 25 kHz calibrator as a signal. Connect a 50Ω dummy load to terminate the receiver input. Set the DRIVE control to 12 o'clock. Adjust the ANT and MIX coils for maximum S meter deflection, following the frequency table. Start with the 1.8 MHz band and then proceed to other bands. To adjust the 10m band, use only 28.8 MHz in the 28.5 MHz band.

■ **ADJUSTMENT OF RECEIVE IF COILS
(RF AND IF UNITS)**

Receive a marker signal using any frequency. Adjust the DRIVE and the main tuning for maximum S meter deflection. Adjust T2 on the RF unit and L5, L6, L7, L11 and L12 on the IF unit for maximum S meter indication. DO NOT adjust L3, L4, L5 and L9.

■ **S METER ADJUSTMENT (IF UNIT)**

Disconnect the antenna with the transceiver in receive mode. Zero-point adjustment:
Adjust VR2 for meter pointer zero indication. If a standard SIGNAL GENERATOR (SSG) is available, adjust VR3 so the S-meter indicates "S-9", at 14.175 MHz, 40 dB signal.

6.4 TRANSMITTER ADJUSTMENTS

■ **TRANSMITTER NEUTRALIZATION
(See Internal View Bottom)**

The TS-830M requires neutralization every time the final tubes are changed.

Tune up the TS-830M into a 50 ohm dummy load at 28.5 MHz for CW operation as described in Section 4. Set the SG switch to OFF and place a sensitive RF milli-voltmeter across the dummy load. Flip the stand-by switch to SEND and adjust TC1 (at the bottom of the final section) for a minimum reading on the voltmeter. After the final section is neutralized, flip the stand-by switch to REC and slide the SG switch ON.

A receiver tuned to 28.5 MHz works very well for neutralizing if an RF voltmeter is not available. Instead of tuning for a minimum voltage, tune for a minimum S-meter reading.

NOTE:

Since the drive tube operates into a fixed load (the finals) it is not always necessary to replace this tube when replacing the finals.

CAUTION:

Neutralization of the final section should be carried out with the chassis shield in place. Dangerous high voltages are present in the final section when the transceiver is turned on. Use an insulated tool to make this adjustment.

■ **TRANSMIT DRIVE COIL ADJUSTMENT
(RF UNIT)**

The drive coils are part of the coil pack unit. Set the SG switch on the rear panel to OFF and center the DRIVE control (12 o'clock). Set the METER switch to ALC and the MODE switch to CW.W, CW.N or TUN.

With the standby switch in the SEND position, adjust the drive coils for maximum ALC deflection for each band using the same frequency and in the same order as for adjustment of ANT and MIX coils.

During adjustment, adjust the CAR control so there is just enough injection to swing the ALC meter.

■ **TRANSMIT IF COIL ADJUSTMENT
(IF AND RF UNITS)**

Using any frequency, place the transceiver in transmit mode in the CW.N, CW.W or TUN position. Adjust L28, 29 on the IF unit and T4 in the RF unit for maximum ALC deflection.

■ **CARRIER BALANCE ADJUSTMENT (IF UNIT)**

With a 50Ω dummy load connected to the ANT terminal, adjust for maximum output at 14.175 MHz. Reduce mic gain to zero. Set the transceiver in LSB mode and adjust the RF VOLT control on the rear panel for maximum sensitivity. The RF meter will deflect if the carrier is unbalanced. To balance the carrier, alternately adjust trimmer TC2 and trimpot VR4 until the meter indicates minimum. Switch to USB mode and if the pointer deflects, readjust so the pointer deflects equally for both LSB and USB.

■ **ADJUSTMENT OF SIDE TONE LEVEL (AF-AVR
UNIT)**

Adjust VR1 to your preference.

■ **ADJUSTMENT OF MONITOR LEVEL (IF UNIT)**

Adjust VR8 to your preference.

6.5 TRANSMITTING ON WARC BANDS

As supplied, the TS-830M will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required.

1. For all 3 bands: Break the line between the RF unit X44-1360-00, connector #6, Pin #1 (TOF terminal) and AF unit X49-1140-00, connector #6, Pin #4 (TOF terminal).
2. Or, for individual Bands: On the RF unit X44-1360-00:

Band	Remove (or Cut) Part
10 MHz	D4
18 MHz	D5
24.5 MHz	D6

SECTION 7. TROUBLESHOOTING

7.1 GENERAL

The problems described in this table are failures caused in

general by improper operation or connection of the transceiver, not by defective components. There is a separate service manual for repair of the TS-830-M.

TRANSMITTER SECTION

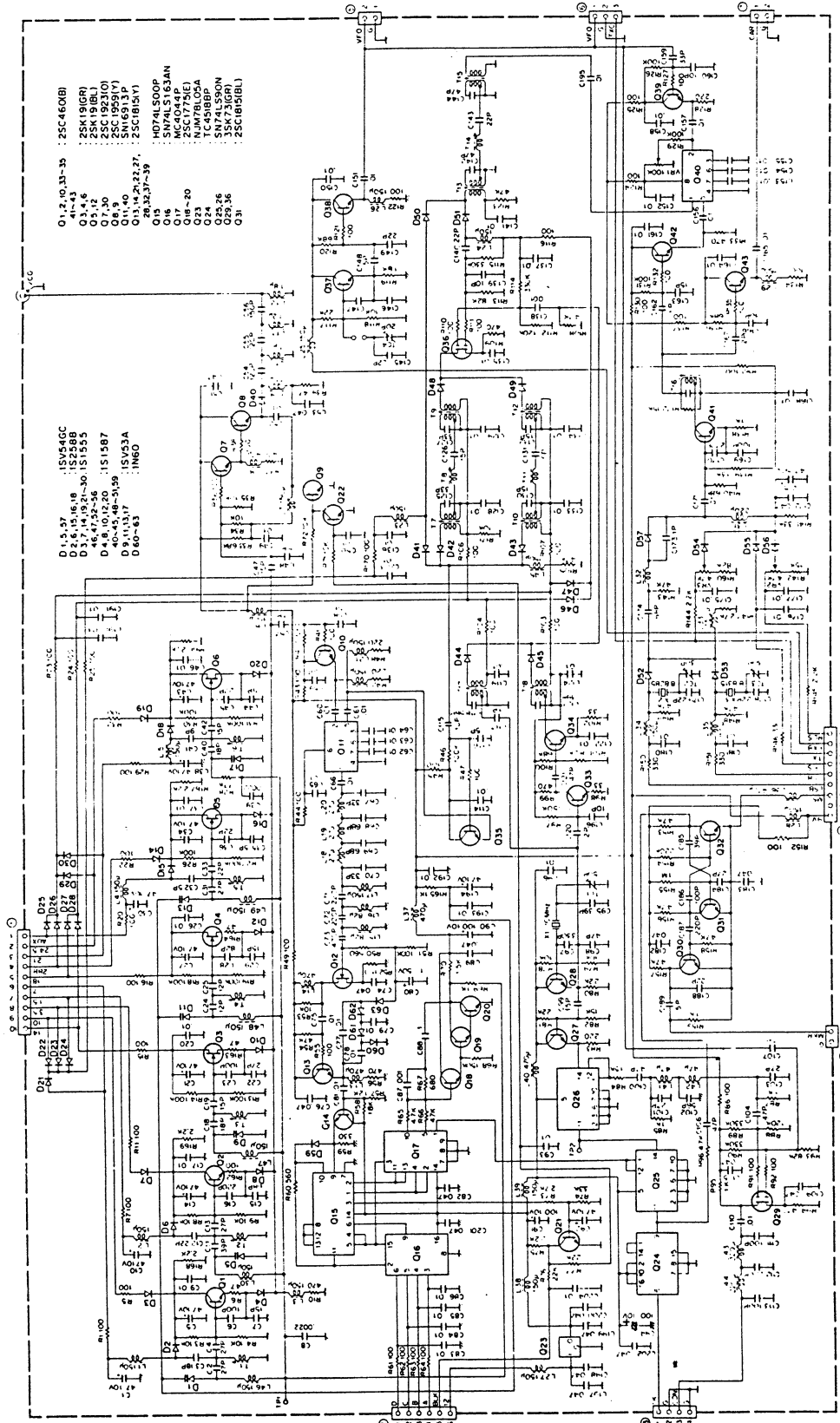
SYMPTOMS	CAUSE	REMEDY
No output (No plate current)	No voltage on the screen grid of the final tubes.	Turn the SG switch on the rear panel ON.
No output on SSB, AM (No plate current)	1. Open microphone cable or bad microphone. 2. Low microphone gain.	1. Check the microphone. 2. Increase the MIC control.
There is output, but the RF meter shows no output.	RF VOLT control not adjusted correctly.	Adjust control for 2/3 scale reading at full output.
VOX does not operate.	1. VOX GAIN control too low. 2. ANTI VOX control requires adjustment.	1. See section 4.4 2. See section 4.4
VOX trips by speaker output.	ANTI VOX control requires adjustment.	See section 4.4
XIT control inoperative	XIT switch is off.	Push XIT switch
Mic or radio chassis is "hot" during TX.	Excess RF in the shack. No earth ground, poor ground, or antenna is too close to the radio.	See section 2
Poor audio in SSB, TX-feedback	Excess RF in the shack.	See section 2
RF volt reading varies by band.	SWR differences between bands	Retune antenna system.
AM transmission distorts.	Excessive increase of MIC GAIN control.	See section 4-3-(2)

RECEIVER SECTION

SYMPTOM	CAUSE	REMEDY
Pilot lights do not light and there is no receiver noise when the POWER switch is turned on.	1. Bad power cable or connections. 2. Blown power supply fuse.	1. Check cables and connections. 2. Check for the cause of the blown fuse and replace the fuse.
An antenna is connected but no signals are heard.	1. FIX SW is turned ON. 2. Microphone PTT switch (or stand-by switch) is in the transmit position.	1. Turn the FIX SW off. 2. Release the PTT switch.
An antenna is connected but S-meter deflects without a received signal.	1. RF GAIN control closed. 2. Low AC line voltage.	1. Open RF GAIN control. 2. Use a step-up transformer to raise the line voltage.
SSB signal unintelligible	1. MODE switch is set to wrong sideband. 2. MODE switch is set to AM	Turn MODE switch to desired sideband.
RIT control inoperative.	RIT switch is off.	Push RIT switch
SSB received signal is extremely high cut or low cut.	1. IF shift is out of adjustment. 2. VBT is out of adjustment. 3. TONE control is out of adjustment.	1. Set to the center (click) position. 2. Set to the NORMAL position. 3. Set to the center position.
AM signal unintelligible with beat.	MODE switch is set to wrong position.	Set the MODE switch to AM.

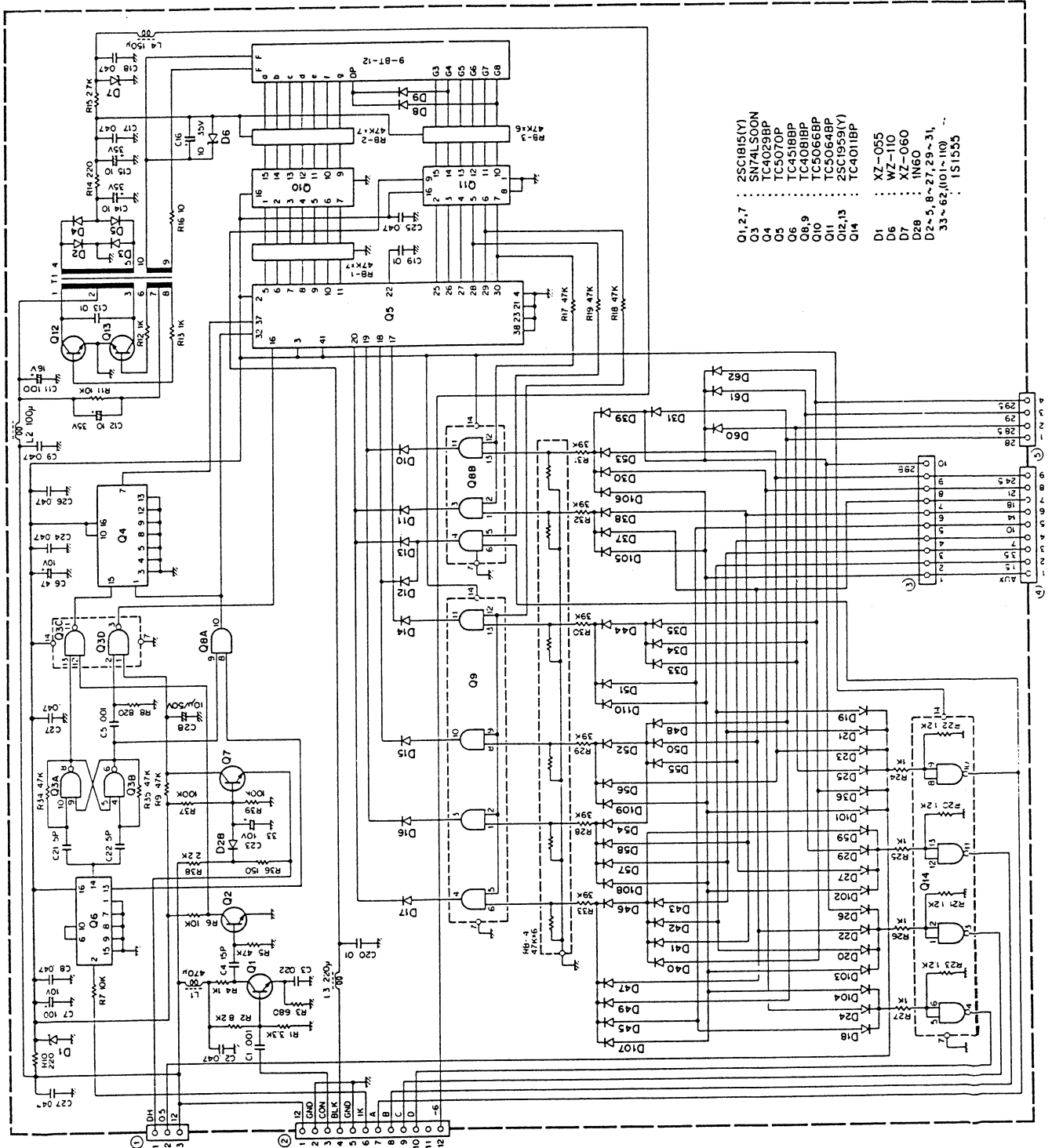
TS-830M SCHEMATIC DIAGRAM

PLL UNIT (X50-1680-00)



TS-830M SCHEMATIC DIAGRAM

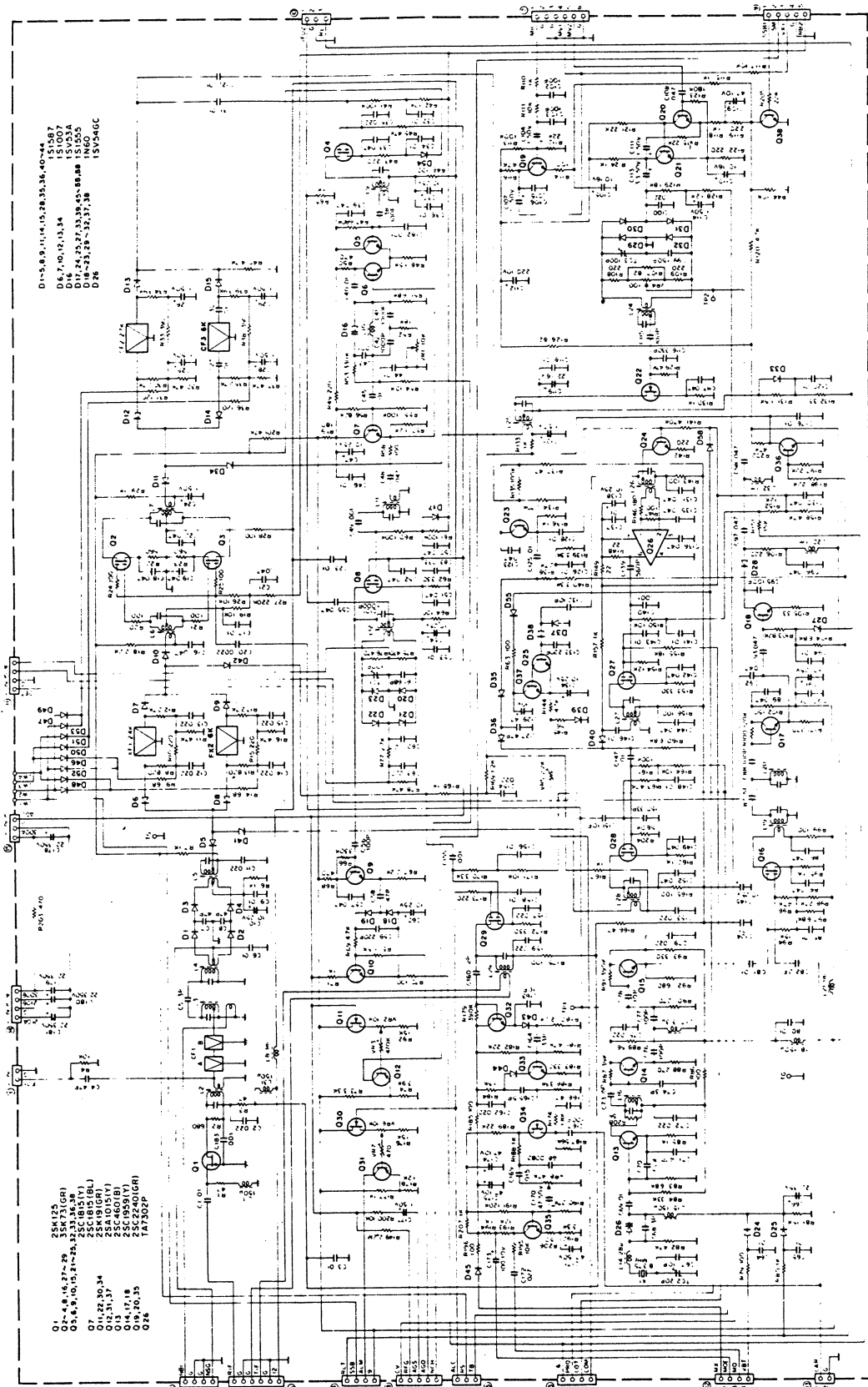
COUNTER UNIT (X45-1540-00)



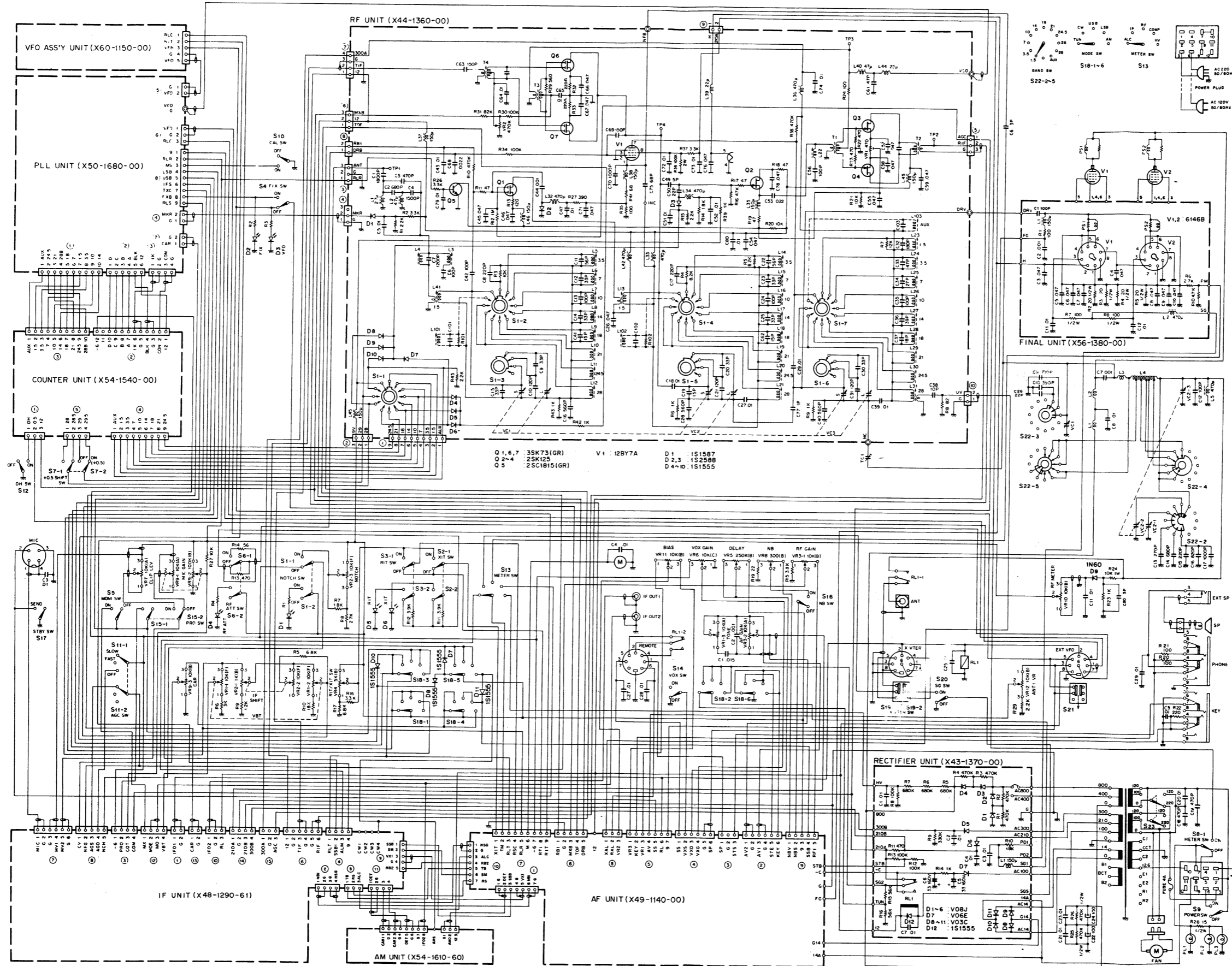
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TS-830M SCHEMATIC DIAGRAM

IF UNIT (X48-1290-61)



TS-830M SCHEMATIC DIAGRAM



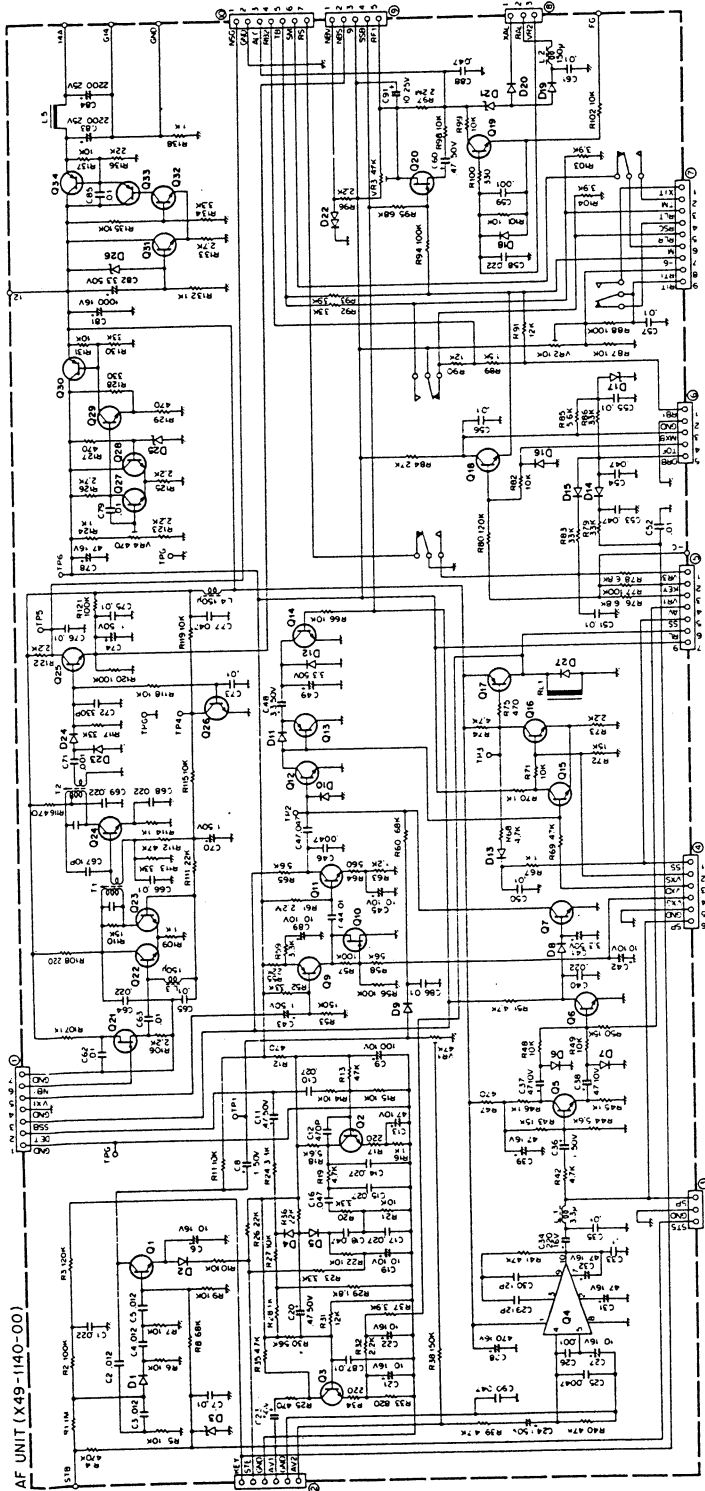
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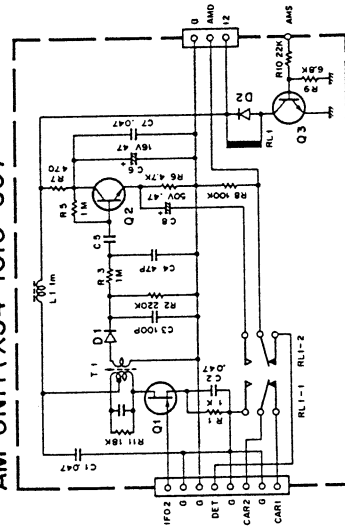
AF UNIT (X49-1140-00)

VFO UNIT (X40-1170-00)

AM UNIT (X54-1610-60)

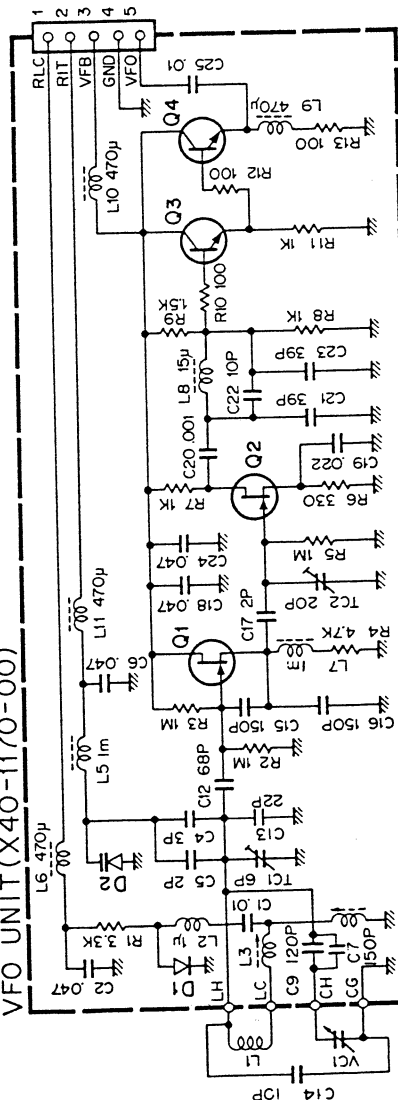


AM UNIT (X54-1610-60)



D1: 1N60
D2: 1S1555
D3: 2SC945(Q)

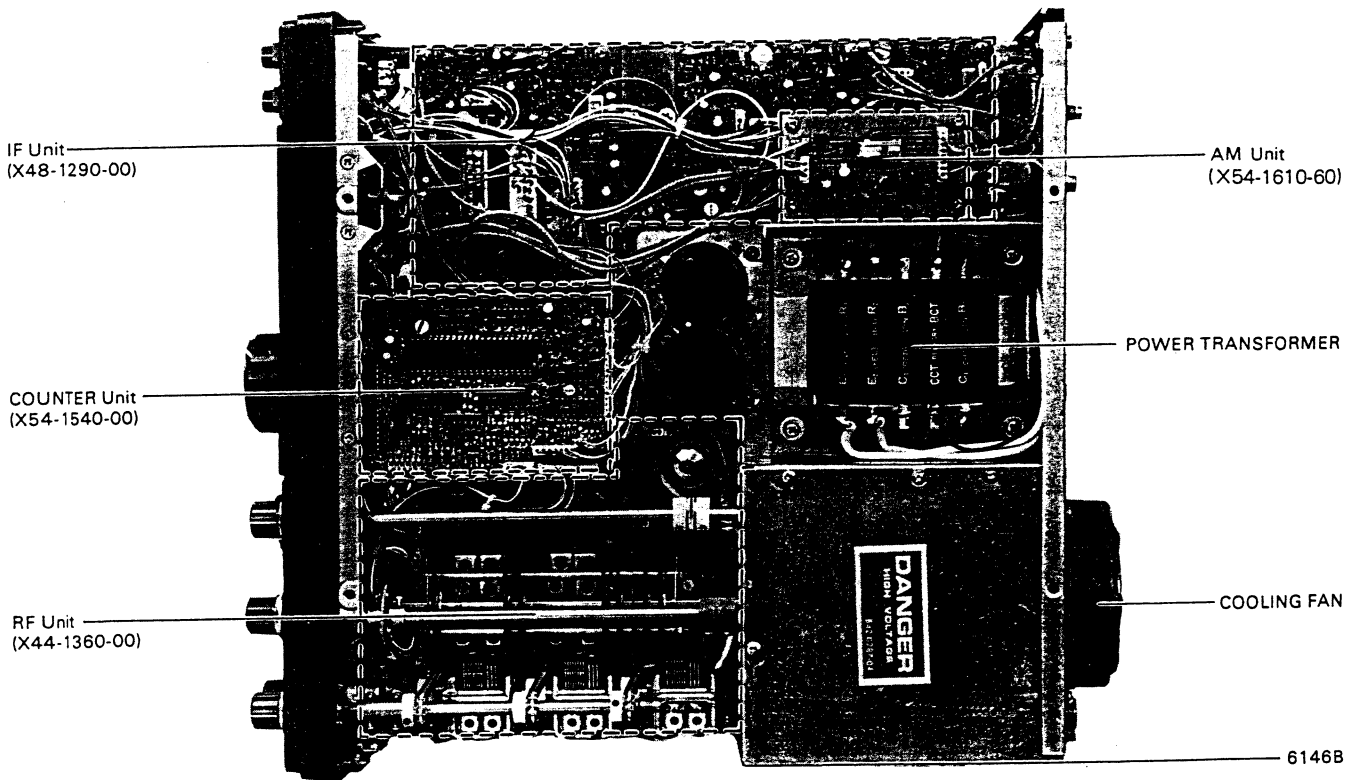
VFO UNIT (X40-1170-00)



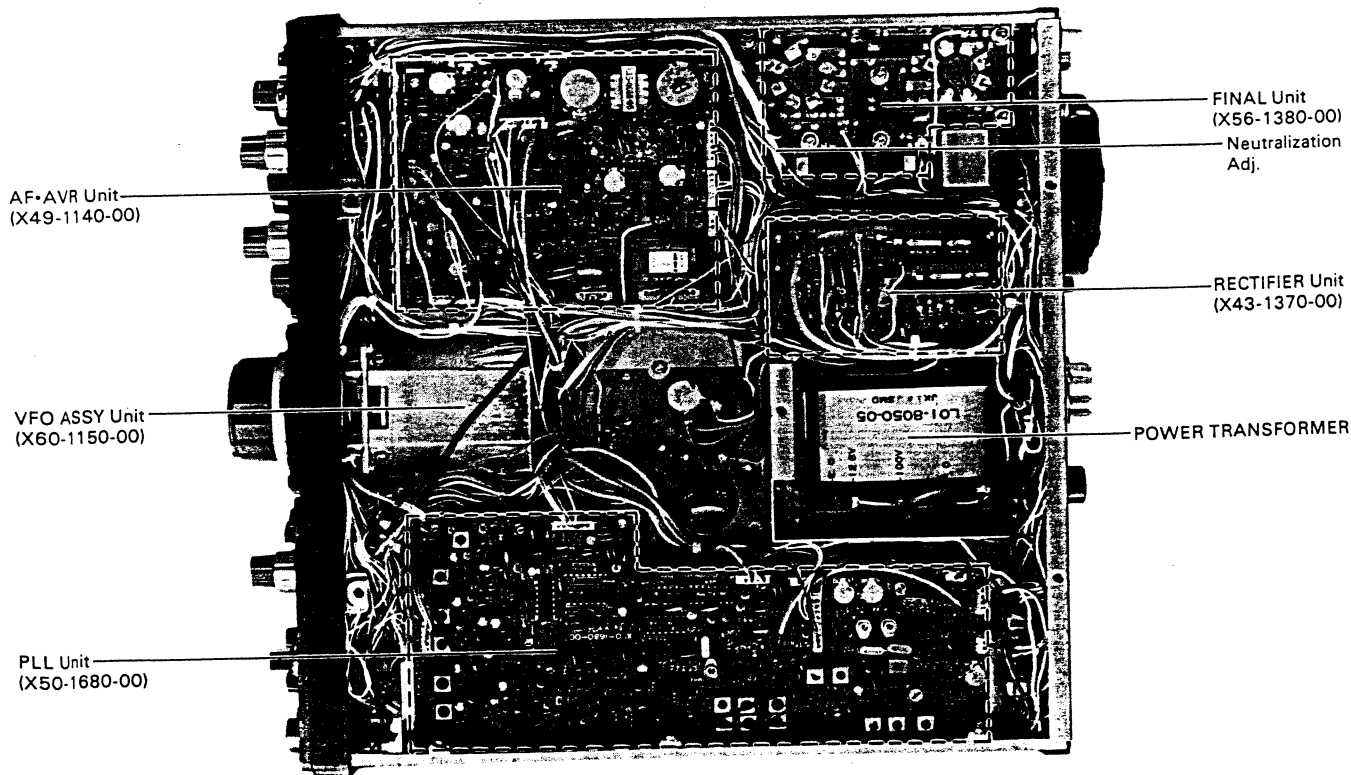
D1 : 1S2588
D2 ; 1SV53A
D3 ; 2SC1959(Y)

- O1,3-8,11,12 : 2SC945(Q)
- O2,3 : 2SC2240(IG)
- O4 : 2S8015(Y)
- O5 : 2SK30A(O)
- O6 : 2SK1815(IG)
- O7 : 2SC1955(K)
- O8 : 2SK19(IG)
- O9 : 2SC465(B)
- O10,34 : 2SK30A(IG)
- O11,2 : 4-10,13 : 1S1555S
- O12 : 1W2-090
- D1,7,21 : 1N60
- D2 : MV-13
- D3 : MV-15
- D4 : 1S19,20
- D5 : 1S2588
- D6 : 1S1555
- D7 : XZ-080

INTERNAL VIEW



Top View



Bottom View

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