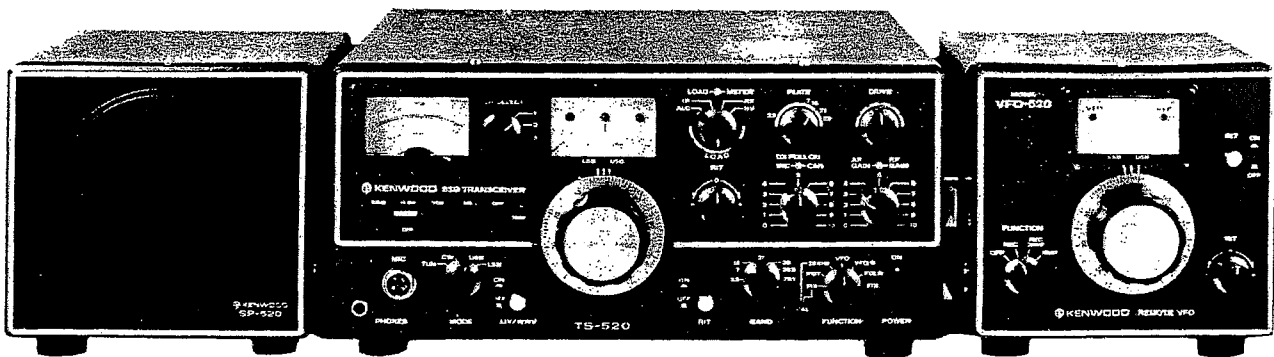


 **KENWOOD / TRIO**

SERVICE MANUAL

**Model TS-520
VFO-520
SP-520**

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SSB TRANSCEIVER

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EXTERNAL VIEW

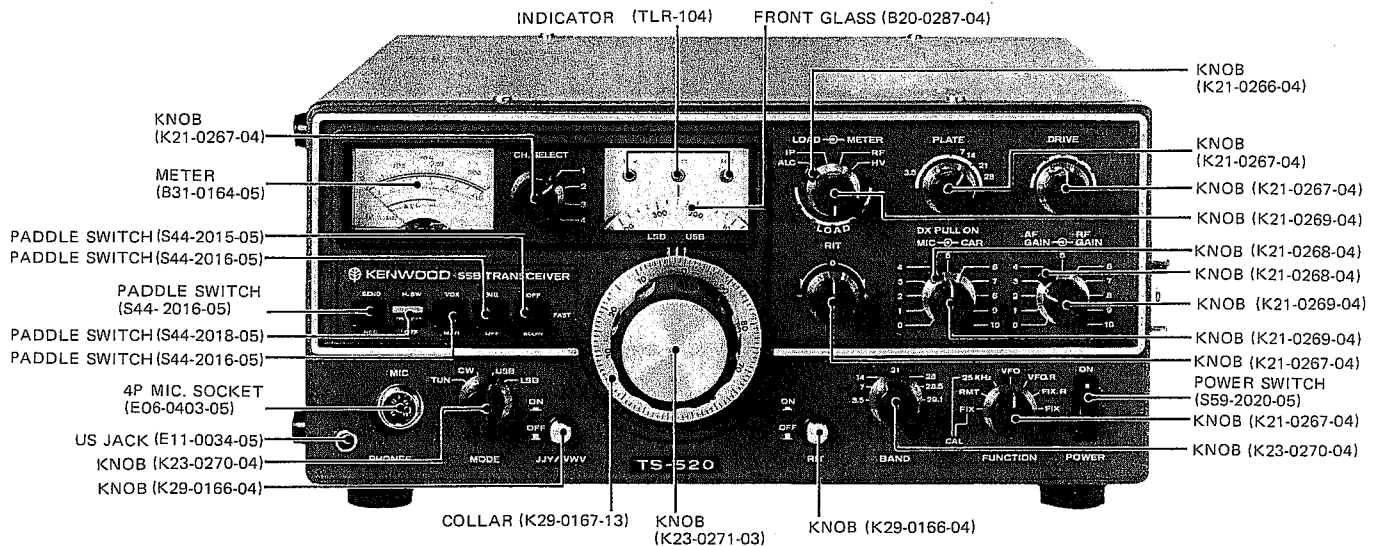


Figure 1. TS-520 FRONT PANEL PARTS

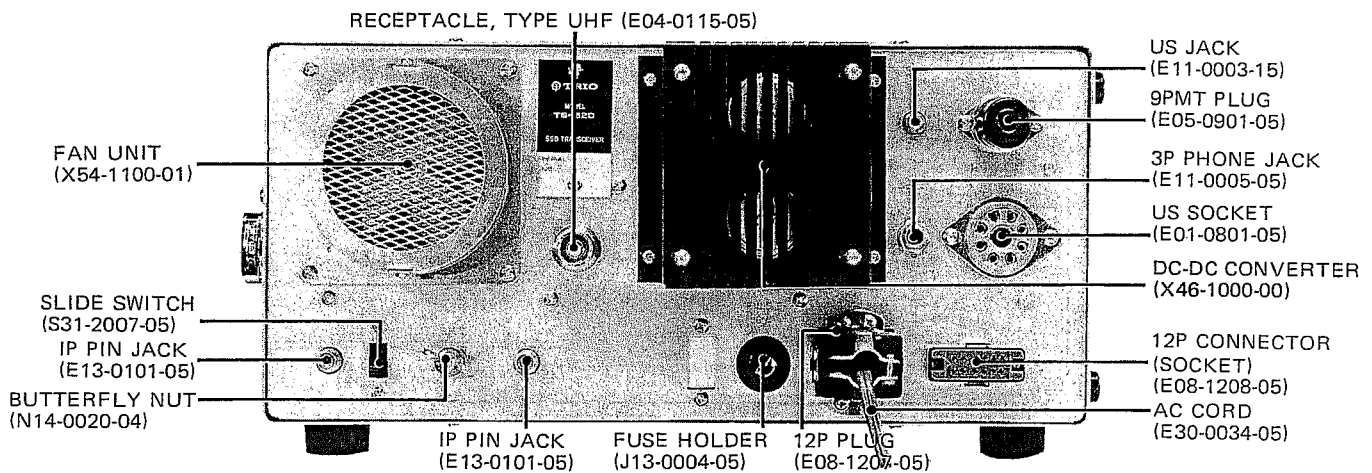


Figure 2. TS-520 REAR PANEL PARTS

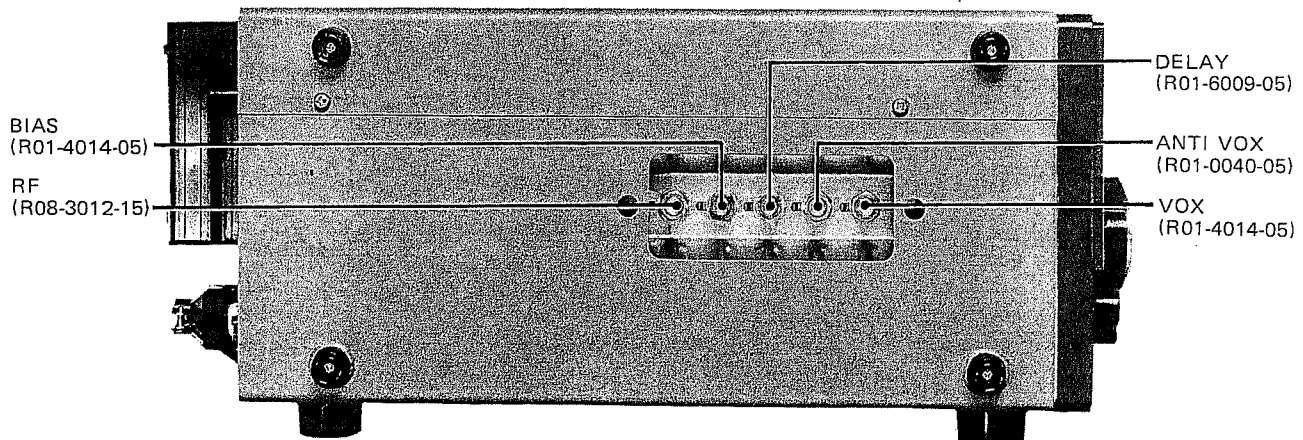


Figure 3. TS-520 SIDE CONTROLS

PARTS ALIGNMENT

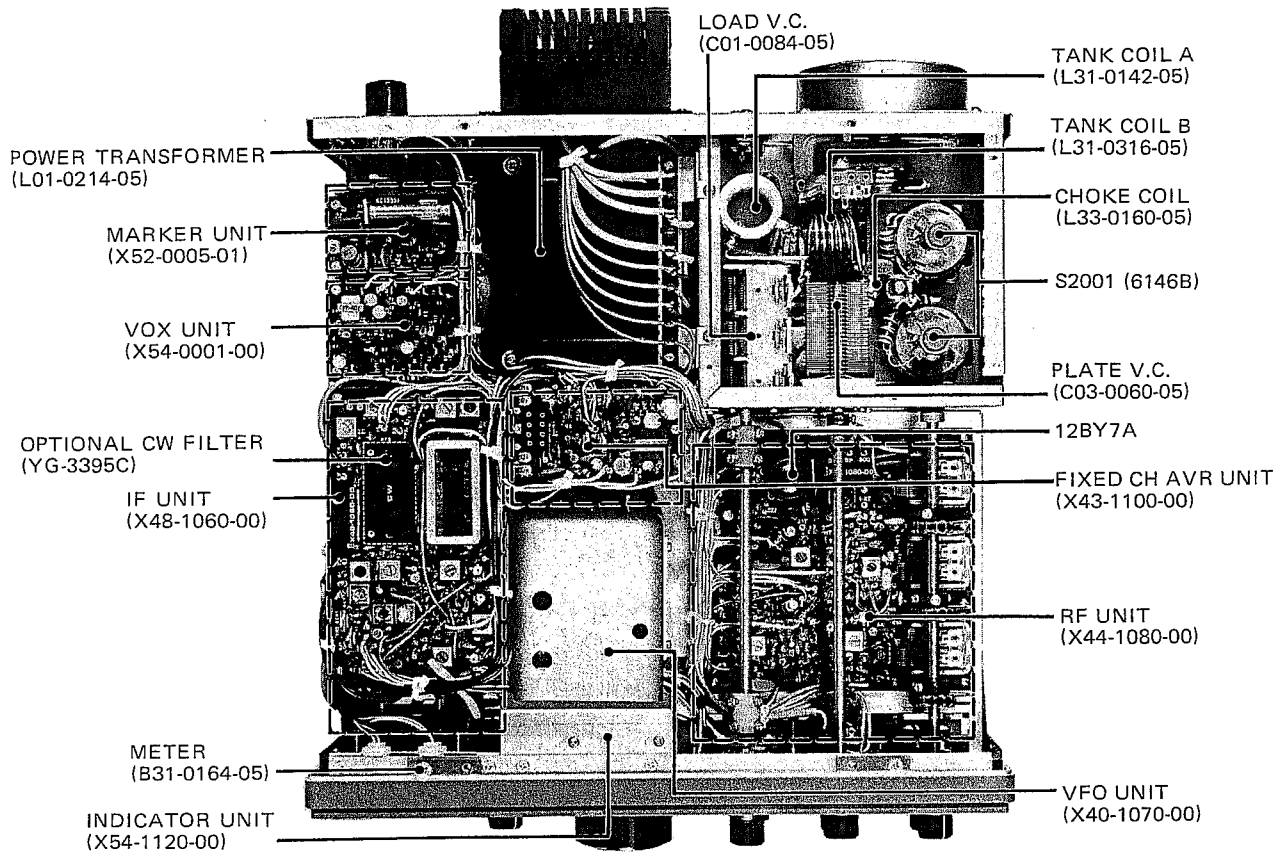


Figure 4. TS-520 TOP VIEW PARTS

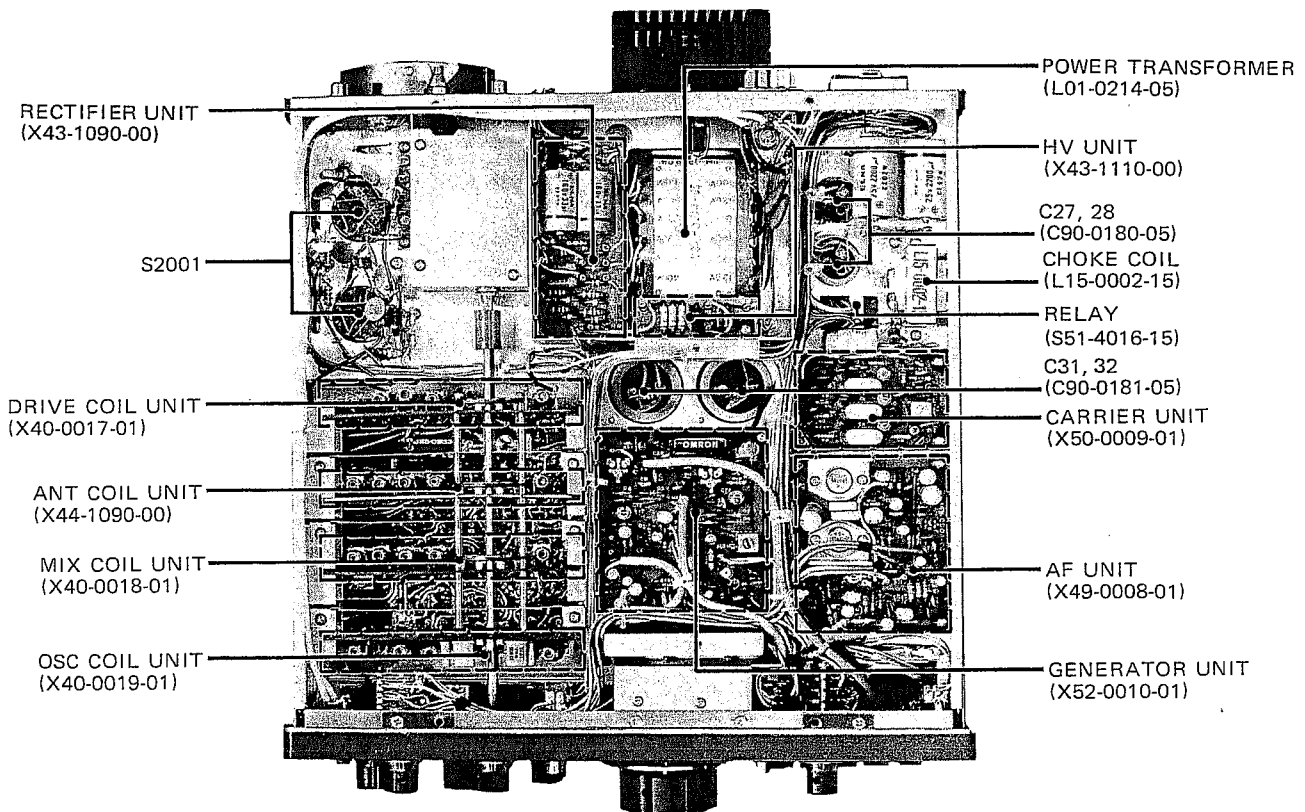


Figure 5. TS-520 BOTTOM VIEW PARTS

SECTION 1. INTRODUCTION

Kenwood's TS-520 is a solid-state, amateur band single side band transceiver which uses only three vacuum tubes in the exciter and final stages. The TS-520 incorporates many sophisticated and modern features which make it a very useful transceiver. The information included in this service manual is intended to complement the technical data supplied in the operator's manual. For example the operator's manual includes pictorial parts displays, voltage tables, operating instructions, a troubleshooting chart, and the block diagram. This service manual includes technical service procedures, a parts list, circuit board layouts and full schematics. Together, the two publications provide full technical information.

TS-520 was completely adjusted and inspected at the factory prior to shipment. The most common causes of service problems are shipping damage, improper operation, or component ageing. When shipping damage is the cause of trouble, check for loose connectors, disconnected wires, damaged or open circuits, or mechanical damage to relays, crystals, or other parts vulnerable to vibrations. When component ageing or improper operation is the cause of service problems, check for deteriorated or burned out parts. The troubleshooting table is useful for pin-pointing some problems.

Be certain to check in the operating manual for a detailed circuit description and the block diagram.

SECTION 2. TROUBLE-SHOOTING

The following table describes possible causes of different malfunctions which might occur when the transceiver is connected and operated as described in the operating

manual. When problems are caused by defective components, replace the part only with its exact replacement or a close equivalent.

2-1. RECEIVER SECTION

| SYMPTOM | CAUSE | REMEDY |
|--|---|---|
| 1. No power from power supply. | 1. Blown fuse. | Replace the fuse with a fuse of the same value. |
| | 2. Defective POWER switch. | Check and replace the switch. |
| | 3. Defective power cord. | Check and replace the power cord. |
| 2. Blown fuse. | 1. Defective transistors on the AUDIO board - Q3 and/or Q4. | Check and replace the transistors. |
| | 2. B + circuit shorted to chassis. | Locate and repair the short. |
| 3. No noise can be heard from the speaker. | 1. Defective speaker or disconnected speaker plug. | Check and replace or reattach the speaker. |
| | 2. Defective transistors on the AUDIO board - Q3 and/or Q4. | Check and replace the defective transistors. |
| | 3. PHONES or SPEAKER jack contacts are broken. | Check and replace the defective jack. |
| 4. Noise, but no signals, can be heard from the speaker. | 1. AF GAIN or RF GAIN controls are defective. | Check and replace the defective controls. |
| | 2. TC1 on the CARRIER board requires tuning. | See Section 3.26. |
| | 3. Defective diode switching on the CARRIER board. | Check and replace defective diodes. |
| | | Check the continuity of the MODE switch. |
| | 4. Output from the AVR board may be unregulated. | Check and repair the AVR board. |
| | 5. EXT VFO jumper plug is not inserted. | Be certain this jumpered plug is in the socket. |
| 6. FUNCTION switch is set to a fixed channel position. | Set the switch to the proper position. | |

| SYMPTOM | CAUSE | REMEDY |
|-------------------------------------|---|--|
| | 7. The coaxial VFO output cable is disconnected. | Reconnect the cable. |
| | 8. Defective transistor on the VFO board. | Check and repair the VFO board. |
| | 9. The coils on the OSC COIL board require tuning. | See Section 3-13. |
| | 10. A defective switch on the OSC COIL board. | Check and replace the switch wafer. |
| | 11. Q1 and/or Q2 on the RF board are defective. | Check and replace the defective transistors. |
| | 12. Q1, Q3, Q4 and/or Q9 on the IF board are defective. | Check and replace the defective transistors per Figure. |
| | 13. IF transformers T1, T2, T5, T6, and/or T9 may be misaligned or defective. | See Section 3-15. |
| | 14. Band pass filter requires alignment. | See Section 3-12. |
| | 15. Bias circuit on IF board not normal. | Check voltages at terminals RB, 14V and AGC. |
| | 16. Filter diode switch on IF board defective. | Check voltages and operation by Figure 14. |
| | 17. ANT or RF coils require alignment. | See Section 3-13. |
| | 18. Defective switch wafer in the RF section. | Check and replace the defective switch. |
| | 19. Disconnected coax on ANT board or at the 8.6 MHz trap. | Reconnect the coax. |
| | 20. Defective relay in the final section. | See Section 3-2. |
| | 21. Defective tuning capacitor. | Check the capacitor after disconnecting the leads at terminals MVC and DVC of the DRIVE board. |
| | 22. Defective Q4 and/or Q5 on the RF board. | Check the transistors per Figure. |
| | 23. Carrier unbalanced on GENERATOR board. | See Section 3-17. |
| 5. S-meter does not read correctly. | 1. Zero adjust VR1 on IF board requires calibration. | See Section 3-18. |
| | 2. S-meter sensitivity adjust, VR2 on the IF board, requires calibration. | See Section 3-18. |
| | 3. Defective AGC circuit (Q5 or Q6) on IF board. | Check the circuit and replace the defective transistors. |
| | 4. Open circuit at L4, L6, or terminal RFC of the IF board. | Repair as necessary. |
| | 5. Defective relay in final section. | Replace the relay. |
| 6. S-meter does not return to zero. | 1. Reference voltage for RF1 on the FIX. AVR board requires adjustment. | See Section 3-18. |
| | 2. Carrier requires balancing. | See Section 3-17. |
| 7. Calibrator inoperative. | 1. Defective FUNCTION switch at wafer S2-4 on MARKER board. | Check continuity at terminal 9. |

| SYMPTOM | CAUSE | REMEDY |
|---------|--|---|
| | 2. Coax cable disconnected from terminal MO on MARKER board. | Check the connection. |
| | 3. Open circuit L1 on the MARKER board. | Check and repair the circuit. |
| | 4. Defective Q1 on MARKER board. | Check and replace the defective transistor. |
| | 5. Defective crystal on the MAKER board. | Replace the crystal. |
| | 8. No WWV reception. | 1. Defective WWV switch, S9. |
| | 2. Coil T3 on RF board misaligned. | See Section 3-14. |
| | 3. Defective Q7 on the RF board. | Check and replace the defective transistor. |
| | 4. Defective or misaligned T5 on the RF board. | Check and replace the defective coil. |

2-2. TRANSMITTER SECTION

| SYMPTOM | CAUSE | REMEDY |
|--|--|---|
| 1. No output or low output. | 1. Defective final tubes. S2001 (6146A) | Replace the tubes. |
| | 2. Defective switch, S5, in final section. | Check and replace the defective switch. |
| | 3. Defective relay in final section. | Check and replace the defective relay. |
| | 4. Loading capacitor shorted. | Check the conduction of the capacitor and replace if defective. |
| | 5. Carrier, VFO, or heterodyne oscillator boards may be defective. | See Sections 3-13, 3-21, or 3-26. |
| | 6. Defective driver tube (12BY7A). | Replace the tube. |
| | 7. Defective relay RL1 on GENERATOR board. | Check the conduction of the coil and contacts. |
| | 8. Defective MODE switch wafer (S3-7) on GENERATOR board. | Check the continuity of the switch contacts. |
| | 9. Defective Q4 on the GENERATOR board. | Check and replace the transistor. |
| | 10. Defective MIC GAIN control. | Check and replace the defective control. |
| | 11. SG switch is off or defective. | Check the continuity of the rear panel SG switch. |
| 2. Output is normal but the meter shows no output. | 1. The RF VOLT control is improper adjusted. | Adjust the RF VOLT control. |
| | 2. Defective meter. | Check the meter and replace if necessary. |
| 3. No ALC meter reading. | 1. Q10 on RF board is defective. | Check and replace the transistor. |
| | 2. Insufficient drive. | See Section 2-2-1. |
| | 3. Shorted ALC circuit. | Trace the circuit and repair as necessary. |
| | 4. Defective RL1. | Check and replace the defective relay. |

| SYMPTOM | CAUSE | REMEDY |
|------------------------------------|--|---|
| 4. No HV meter reading. | 1. Defective components in power supply section. | Troubleshoot the power supply. |
| | 2. Defective or disconnected meter circuit. | Troubleshoot the meter circuit. |
| 5. Stand-by switch is inoperative. | 1. Microphone wired incorrectly. | Rewire the MIC plug. |
| | 2. Disconnected leads at terminal VS or SS on the VOX board. | Check the continuity of the leads. |
| | 3. Q8 or D8 on VOX board defective. | Check and replace the defective parts. |
| | 4. Defective stand-by switch. | Check and replace the defective switch. |

2-3. OTHER CIRCUITS

| SYMPTOM | CAUSE | REMEDY |
|--------------------------------------|---|--|
| 1. 9 volt supply is not regulated. | 1. Transistor or diode on AVR board defective. | Check and replace the defective part. |
| 2. The noise blanket is ineffective. | 1. NB board requires adjustment. | See Section 3-15. |
| | 2. NB switch defective. | Check and replace the defective switch. |
| | 3. Transistors Q1 through Q6 on the NB board are defective. | Check the voltages and replace the part. |
| | 4. Diodes D1 through D6 on NB board are defective. | Check the voltages and replace the defective part. |
| | 5. Disconnected or defective L1 or L2 on NB board. | Check the circuit. |

SECTION 3. MAINTENANCE AND ALIGNMENT

3-1. GENERAL INFORMATION

Refer to the operating manual for information on how to remove the transceiver's case.

CAUTION: DANGEROUS HIGH VOLTAGES ARE PRESENT WITHIN THE CASE OF THE TS-520 WHEN THE TRANSCEIVER IS TURNED ON. EXERCISE EXTREME CAUTION TO AVOID ELECTRIC SHOCK.

3-2. REPLACING THE RELAYS (See Figure 6.)

ANTENNA RELAY

RL2 is enclosed on the bottom of the final section. Remove the bottom of the TS-520's case and then remove the cover of the relay shield box as shown in Figure 6A.

The standard relay has large contacts and the coil is rated at 300 ohms. Be sure to replace the relay with an exact equivalent.

VOX RELAY:

RL1 is located below the VOX board, as shown in Figure 6B, next to the power transformer. Remove the top cover

of the transceiver and then remove the VOX board. Replace the relay with an exact equivalent.

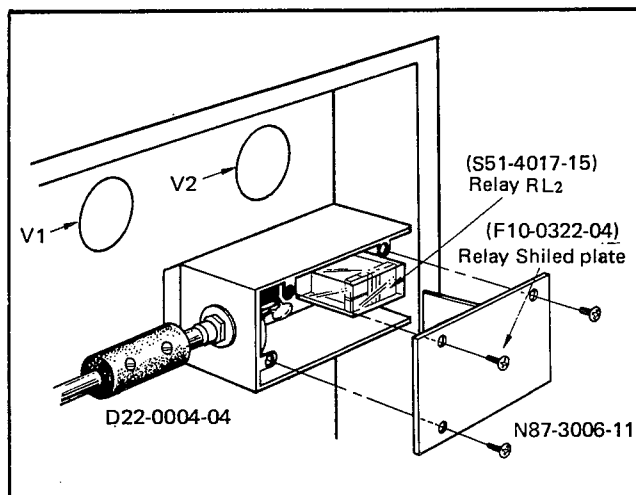


Figure 6A. Replacing the Antenna Relay.

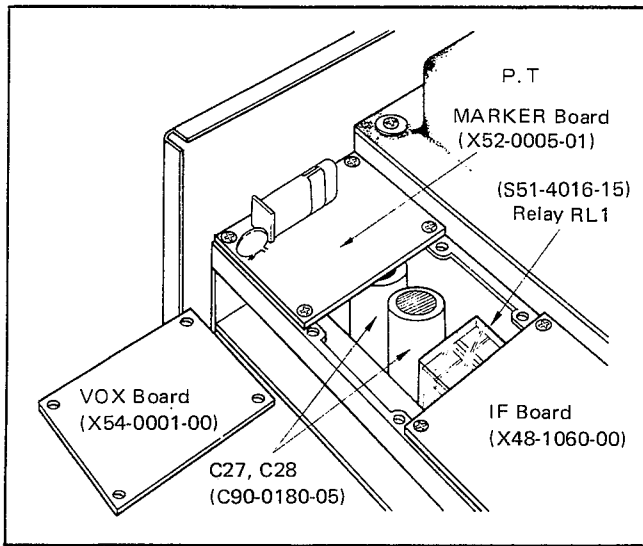


Figure 6B. Replacing the VOX Relay.

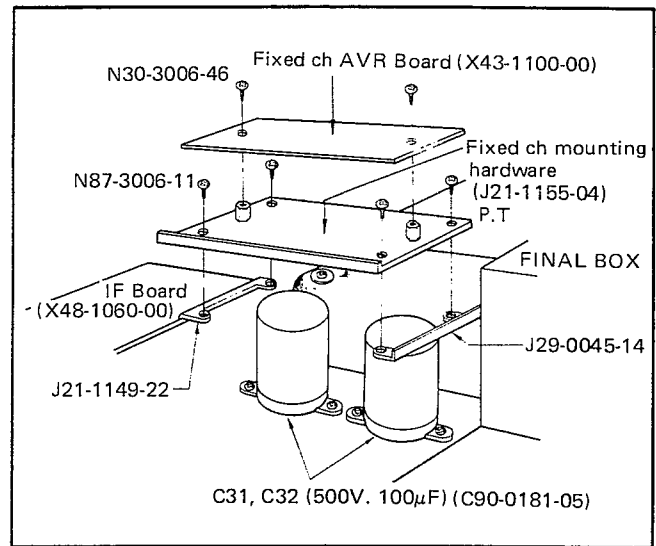


Figure 7A. Replacing C31 and C32

3-3. REPLACING THE ELECTROLYTIC POWER SUPPLY CAPACITORS

See Figure 7. C31 and C32 are reached by removing the TS-520's top cover and then the FIXCH-AVR board as shown in Figure 7A. C27 and C28 are reached by removing the transceiver's top case and then the MARKER and VOX boards as shown in Figure 7B.

3-4. DISASSEMBLY OF THE COIL PACK

When service is required on the RF board or on any of the coil boards the coil pack must be taken apart as shown in Figure 8. The assembly includes the RF board, the OSCILLATOR COIL board, the MIXER COIL board, the ANTENNA COIL board, and the DRIVER COIL board.

PURPOSE: To remove the RF section coil pack.

PROCEDURE:

1. Remove the top and bottom cover of the transceiver.
2. From the top, disconnect the lead between the square wrapping-terminal on the RF board and the COIL board to be removed.
3. Remove all of the front panel knobs and the front glass as shown in Figure 9.
4. Use a small hex nut driver to loosen the nuts at the front and/or back of the coil pack. The front nuts are reached through two holes in the front sub-panel on either side of the band switch. The front nuts must be loosened to remove the OSCILLATOR or MIXER COIL boards. The back nuts must be loosened to remove the ANTENNA or DRIVER coil boards.
5. The OSCILLATOR COIL board can be removed by pulling the screw bars towards the rear panel. For the other boards, pull the screw bars out towards the front panel.

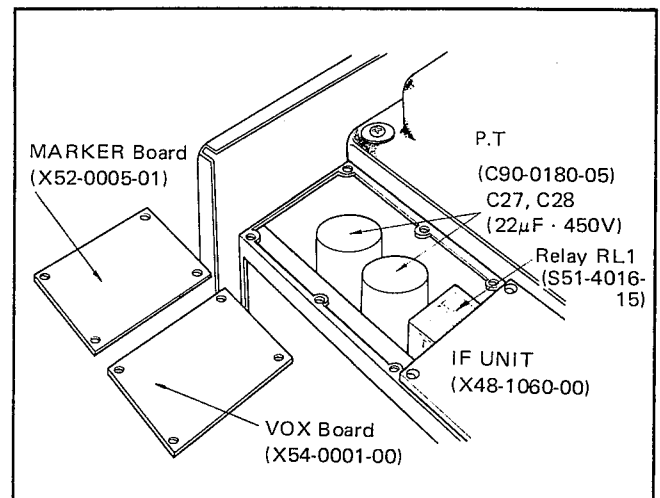


Figure 7B. Replacing C27 and C28

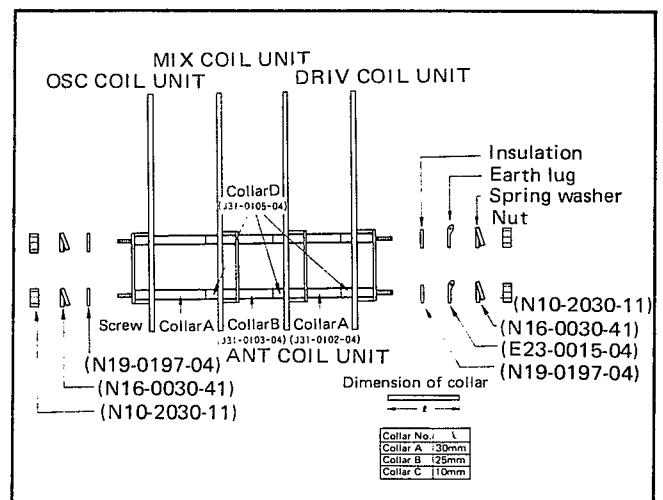


Figure 8. Coil Pack Assembly

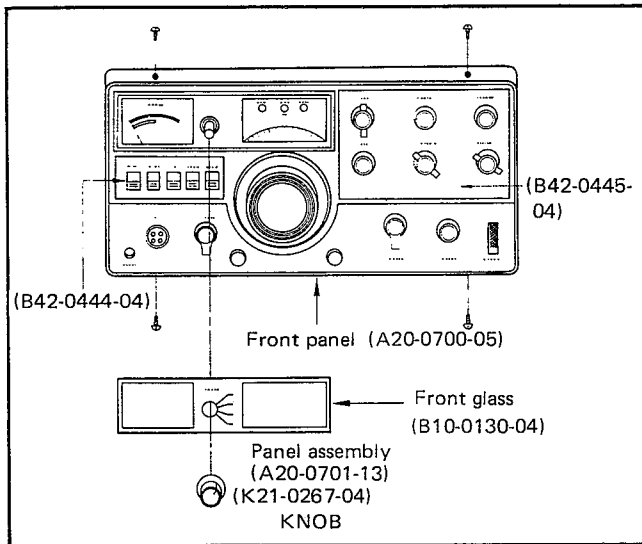


Figure 9. Removing the Front Panel

4. Unscrew the four countersunk screws (two on the top and two on the bottom) which hold the VFO to the front sub-panel (see Figure 10).
5. Gently lift and pull the VFO assembly from the chassis being very careful not to damage the sub-dial. Figure 11 shows the entire assembly.

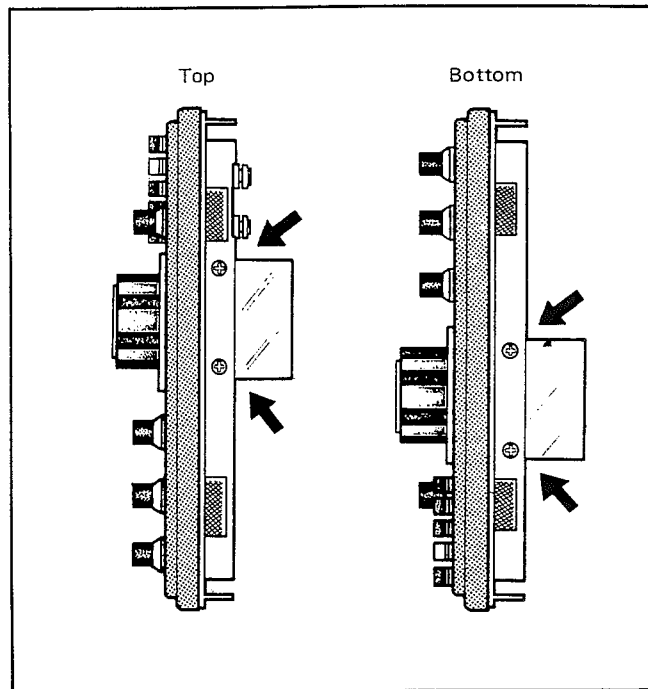


Figure 10. VFO Assembly Chassis Screws.

3-5. REMOVING THE VFO SECTION

PURPOSE: To remove the VFO assembly.

PROCEDURE:

1. Remove the front panel knobs, take off the transceiver's case, remove the front glass and pull off the front panel as shown in Figure 9.
2. Remove the FIXED CHANNEL-AVR board as shown in Figure 7A.
3. Unplug the VFO output coax and the 2-pin power plug from the rear of the VFO case.

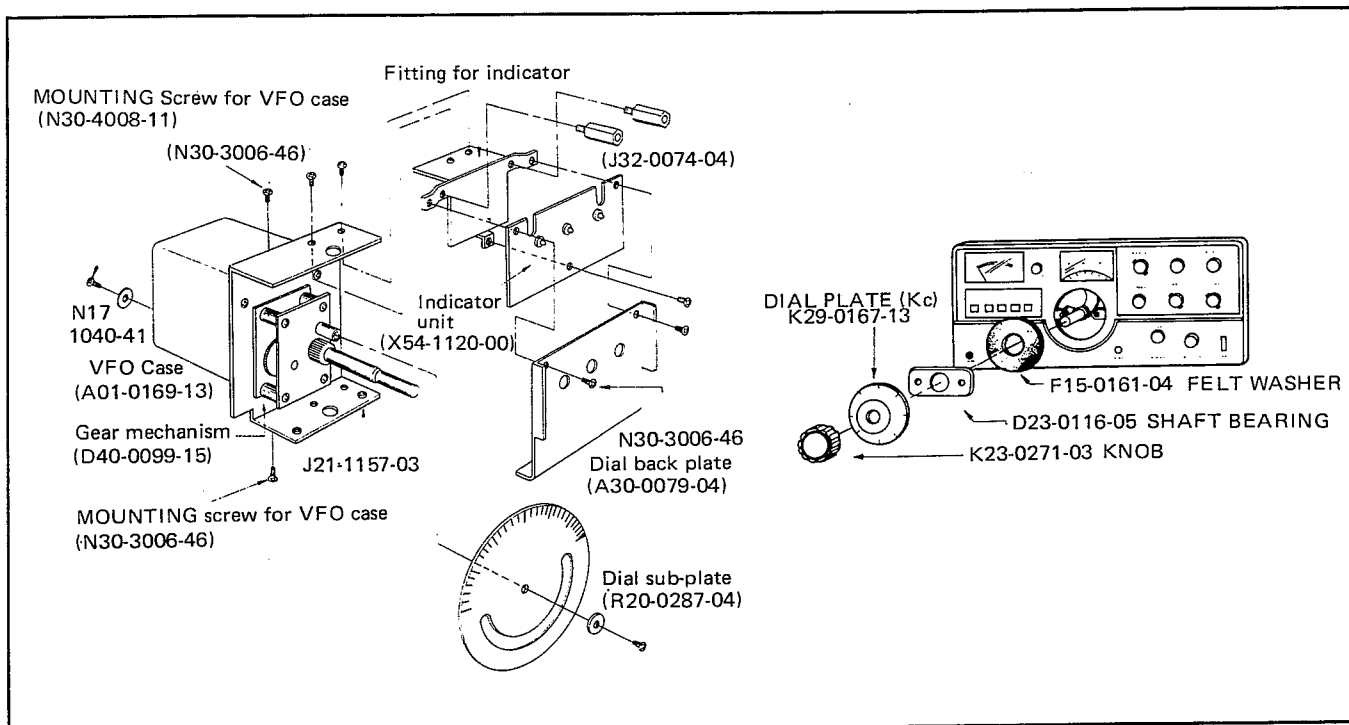


Figure 11. VFO Assembly

3-6. CHANGING THE PILOT LIGHTS

METER LIGHTS:

Remove the top cover of the transceiver. Remove the two countersunk screws holding the meter and light bracket to the top of the front sub-panel. Pull the meter back to gain access to the meter lights. Replace the light and refasten the bracket.

DIAL LIGHT:

Some early model TS-520's had no dial light. On later models the light can be replaced by removing the main tuning knob and the tuning dial. Reach in with long nose pliers to remove the bulb. After replacing the tuning dial, recalibrate the transceiver.

3-7. REPLACING THE METER

Remove the top cover of the transceiver. Remove the two countersunk screws holding the meter and light bracket to the top of the front sub-panel. Remove the six screws securing the IF board (behind the meter) and tilt the board up about 60° from its normal position. Lift the meter back and away being very careful not to scratch the meter face on the sub-panel.

3-8. CHANGING THE PADDLE SWITCHES

Remove the TS-520's case. Remove all the knobs from the front panel and then remove the front glass and front panel. Take out the meter, as described in Section 3-7. Pull the switch out towards the front of the transceiver while holding down the securing spring as shown in Figure 12.

Push in a new switch from the front. The switch will secure itself with a leaf spring. The paddle itself can be replaced by levering off the old paddle with a screwdriver. Then push on the new paddle.

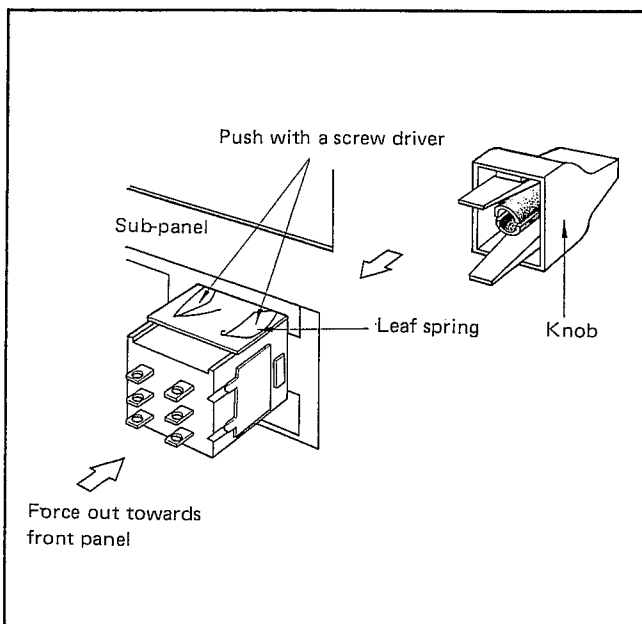


Figure 12. Replacing the Paddle Switches

3-9. LEVEL DIAGRAMS

RECEIVER SECTION:

Refer to Figure 13 for a level diagram of the receiver section to aid in service work. The following notes apply to that diagram.

NOTES:

1. Figure 13 shows a curve formed by plotting the signal generator output required for a constant audio output with a constant AF gain control setting. Set the AF gain control for a .63v/8 ohm audio output for a 0 db signal generator input at 14.175 MHz.
2. Measure the AF output at the ring detector on the GENERATOR board.
3. All voltage measurements are read from an RF VTVM.
4. To measure the output of the signal generator, connect a .01 mf, 500 volt capacitor between the signal generator and the voltmeter.

TRANSMITTER SECTION:

Refer to Figure 14 for a level diagram of the transmitter section. The following notes apply to the diagram.

NOTES:

1. The voltage measurements in Figure 14 are measured with an RF VTVM having an input capacitance of less than 3 pf.
2. All the voltages at and before the first grid of the final tubes are measured with the rear panel SG switch turned off.

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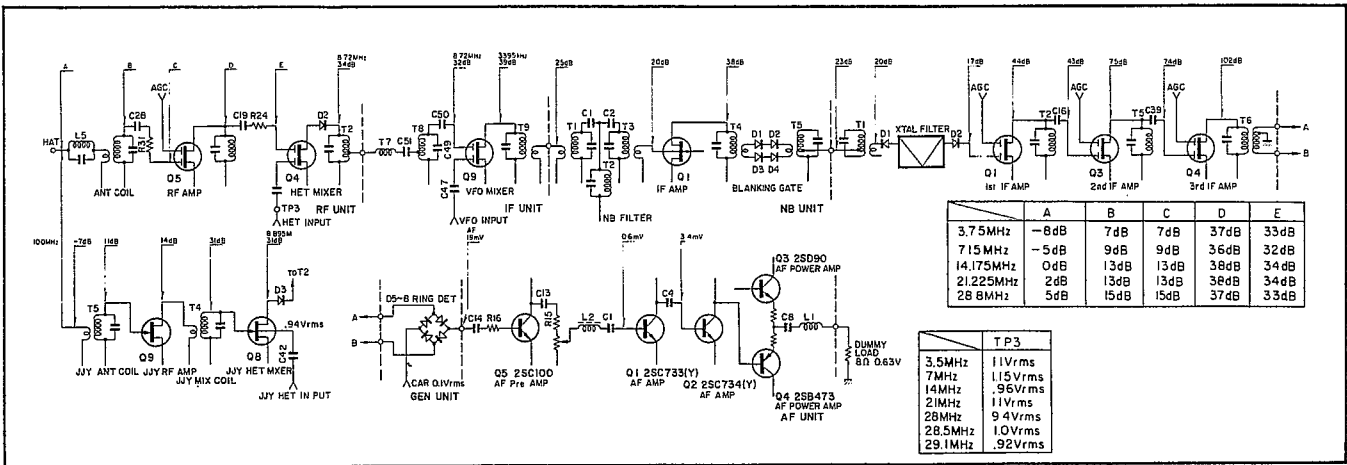


Figure 13. Receiver Section Level Diagram

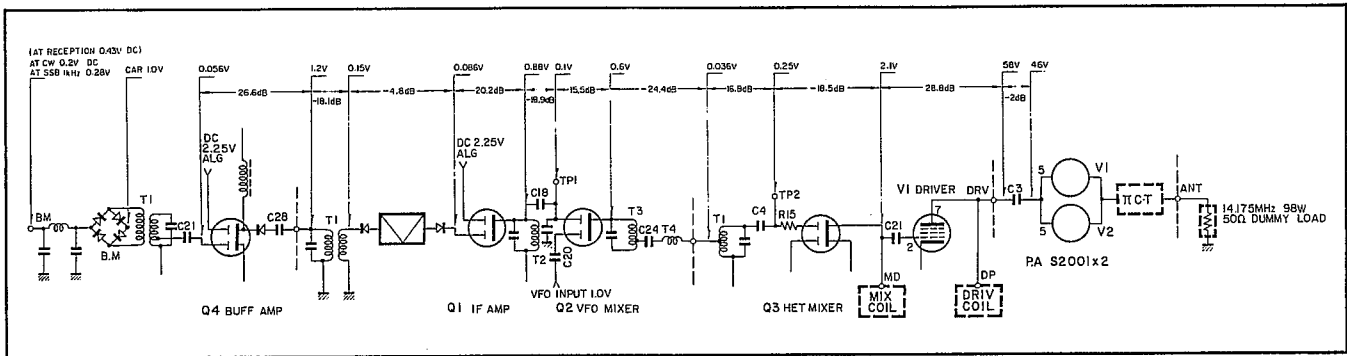


Figure 14. Transmitter Section Level Diagram

3-10. SERVICE INFORMATION

Be certain to see the operating manual for directions on removing the transceiver's case and information on the proper service position. Be certain that the air supply to the final tubes is not blocked.

INITIAL SWITCH SETTINGS:

| LOCATION | SWITCH | POSITION |
|--------------|-------------------|-----------------------------|
| Front Panel: | MODE Switch | USB |
| | FUNCTION Switch | FIX |
| | RF Gain Control | Maximum |
| | H. SW Switch | OFF |
| | VOX Switch | MAN |
| | AGC Switch | FAST |
| | NB Switch | OFF |
| | JJY/WWV Switch | OFF |
| | RIT Switch | OFF |
| | Standby Switch | REC |
| | POWER Switch | ON |
| Rear Panel: | SG Switch | OFF |
| | EXT. SPEAKER Jack | 8 ohm dummy load |
| | ANTENNA Connector | 200 watt, 50 ohm dummy load |

3-11. AVR ADJUSTMENT

PURPOSE: To adjust the output of the automatic voltage regulator board.

TEST EQUIPMENT: Voltmeter.

PROCEDURE: Connect the voltmeter to terminal 9 on the FIX. CH-AVR board. Adjust VR1 for a voltage reading of 9 volts ± 0.2 volts. Next connect the voltmeter to terminal RF1 on the FIX. CH-AVR board. Adjust VR3 for a meter reading of 3.3 volts ± 0.1 volt.

3-12. BAND PASS FILTER ADJUSTMENT

PURPOSE: To adjust the receive and transmit B.P.F.

TEST EQUIPMENT: A sweep signal generator (require frequencies at 8.295, 8.595, and 8.895 MHz), a B.P.F. wave detector (as shown in Figure 15), and an oscilloscope.

PROCEDURE: See Figure 16 for the test setup. After all of the connections described in Figure 16 have been made for the receiver adjustment, tune T2 on the RF board, and T7 and T8 on the IF board for the waveform shown in Figure 17.

Now make the connections for transmission as shown in Figure 16. Set the standby switch to SEND and adjust T3 and T4 on the IF board and T1 on the RF board for the waveform shown in Figure 17. Return the standby switch to REC.

NOTE: The FUNCTION switch is set to the FIX position to turn off the VFO. However if an accessory crystal is installed in the fixed channel oscillator, the waveform may be disturbed.

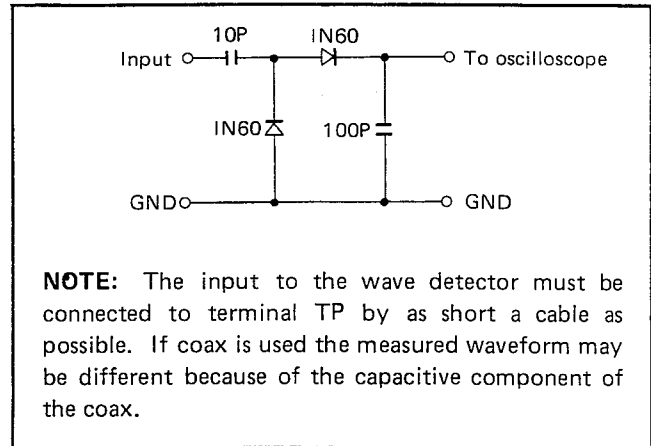


Figure 15. B.P.F. Wave Detector

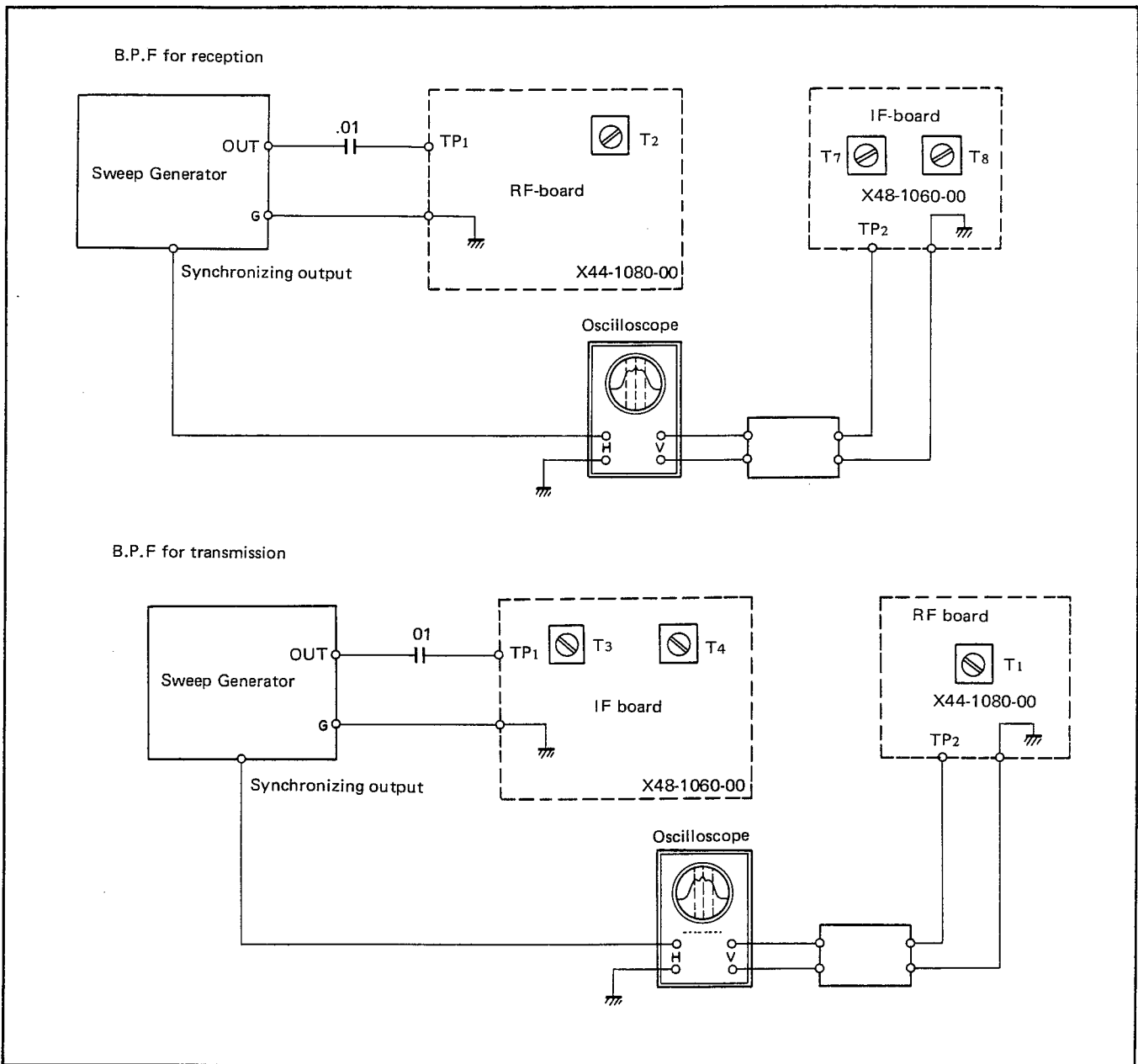


Figure 16. Band Pass Filter Test Circuit

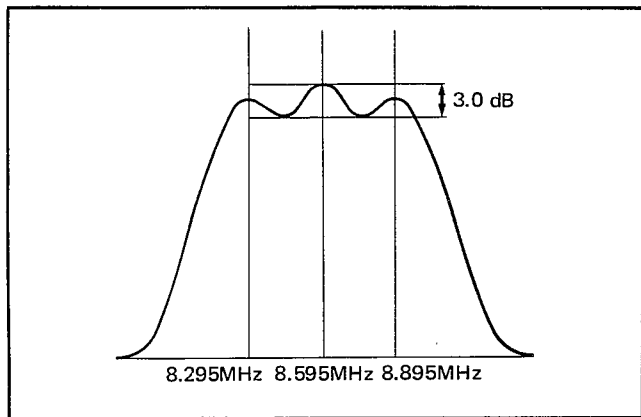


Figure 17. B.P.F. Waveform

3-12. CARRIER BOARD (X50-0009-01) ADJUSTMENT

PURPOSE: To adjust the output from the CARRIER board.

TEST EQUIPMENT: RF VTVM.

PROCEDURE: Connect the VTVM to terminal OUT on the CARRIER board. Set the FUNCTION switch to VFO and adjust T1 on the CARRIER board for a maximum voltage at the output.

NOTE: The carrier can not be adjusted when the FUNCTION switch is turned to CAL-FIX or CAL-RMT.

3-13. COIL PACK ALIGNMENT

PURPOSE: To align the OSCILLATOR, MIXER, ANTENNA, and DRIVER coils of the transceiver.

TEST EQUIPMENT: An RF VTVM and a signal generator.

PROCEDURE:

HETERODYNE OSCILLATOR COILS:

Connect the RF VTVM to terminal TP3 on the RF board. For the 3.5 MHz band adjust the 3.5 MHz oscillator coil for a maximum reading on the VTVM. Then turn the core counterclockwise for a voltage reading 1 db lower than the maximum. Repeat the same procedure for the 7, 14, 21, and 28.5 MHz bands.

ANTENNA AND MIXER COILS:

Set the FUNCTION switch to VFO, remove the VTVM, and connect the signal generator to the ANTENNA connector. Turn the DRIVE control to the 12 o'clock position. Table 1 below describes the adjustment order and frequencies for this alignment. Receive the signal generator output at the designated frequency and carefully adjust the appropriate ANTENNA then MIXER coil for a maximum S-meter reading. The signal generator output should start at 60 db and be reduced as the circuit sensitivity increases.

NOTE: The coil cores are fragile. Tune them carefully from straight above. Be certain to tune the correct coil for each band.

DRIVER COILS:

Turn the H.SW switch to ON, turn the MODE switch to CW, set the METER switch to ALC, adjust the CAR control

to maximum, and set the standby switch to SEND. The SG switch should be OFF whenever the signal generator is connected to the transceiver. Adjust each coil, in the order of and at the frequencies described in Table 1, for maximum ALC deflection. Reduce the CAR control as necessary.

TABLE 1. ANTENNA, MIXER, and DRIVER Coil Adjustment

| ORDER | BAND | FREQUENCY |
|-------|------|------------|
| 1 | 3.5 | 3.750 MHz |
| 2 | 28.5 | 28.800 MHz |
| 3 | 21.0 | 21.225 MHz |
| 4 | 14.0 | 14.175 MHz |
| 5 | 7.0 | 7.150 MHz |

3-14. WWV CIRCUIT ALIGNMENT

PURPOSE: To align the WWV circuit for maximum sensitivity.

TEST EQUIPMENT: Signal Generator.

PROCEDURE: Insert a 10 MHz, 60 db signal into the ANTENNA connector and push the WWV switch on. Set the main tuning dial to zero to receive the signal. Adjust coils T4 and T5 on the RF board for a maximum S-meter reading. Reduce the signal input as necessary. Adjust coil T3 for a maximum S-meter reading and then turn the core 1/4 turn counterclockwise.

3-15. IF TRANSFORMER ADJUSTMENT

PURPOSE: IF board and NB board alignment.

TEST EQUIPMENT: A signal generator and a voltmeter.

PROCEDURE: Insert a 40 db signal into the transceiver and receive it on USB at 14.175 MHz. Tune IF transformers T2, T5, T6, and T9 on the IF board (X48-1060-00) for a maximum S-meter reading. Then adjust IF transformers T1, T2, and T3 on the NB board (X54-1080-10) for a maximum S-meter reading. Figure 19 shows the coil locations.

Disconnect the coax from terminal OUT on the NB board and insert a 47 pf capacitor (as shown in Figure 18). Adjust T1 on the IF board and T4 and T5 on the NB board alternately for a maximum S-meter reading. Remove the capacitor and reconnect the coax.

NOTE: Always repeat the adjustments several times because the coils affect each other.

Set the signal generator to 60 db and connect a voltmeter to the collector of Q6 on the NB board. Adjust NB IF coils T6 and T7 to minimize the voltage at the collector of Q6.

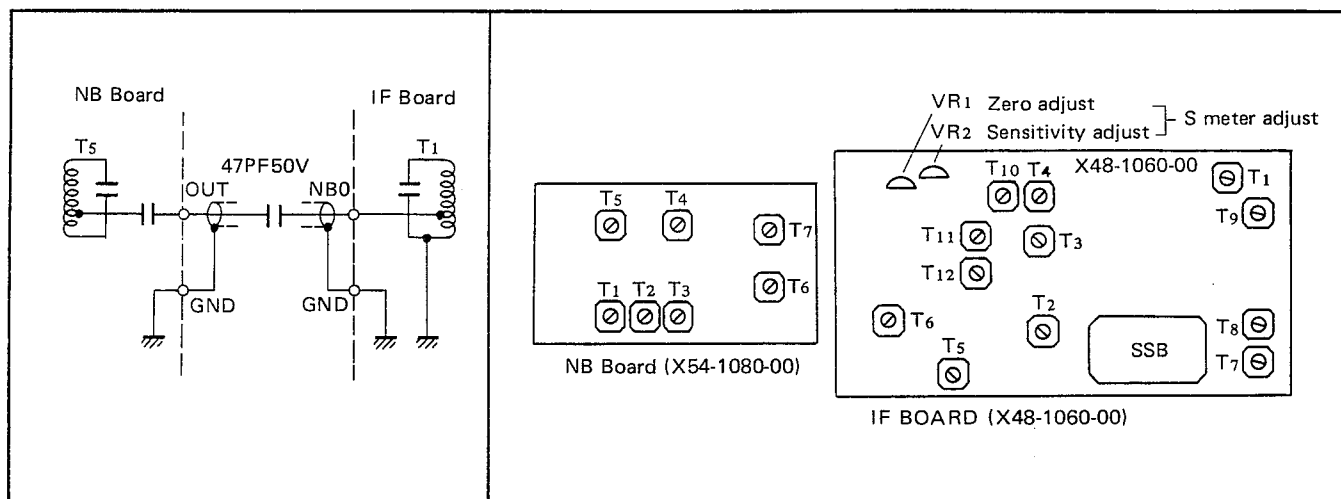


Figure 18. IF Transformer Test Circuit

Figure 19. IF Transformer Adjustment Diagram

3-16. TRAP COIL ADJUSTMENT

PURPOSE: To align the trap coils.

TEST EQUIPMENT: Signal generator, an AF VTVM, and an 8 ohm dummy load.

PROCEDURE: Set the BAND switch to 7 MHz and insert an 8.895 MHz signal (70 db) at the ANTENNA connector. Tune the receiver to 7.0 MHz and adjust L11 on the RF board (X44-1080-00) for a minimum S-meter reading. Set the signal generator to 8.395 MHz and tune the receiver to 7.5 MHz. Adjust L5 on the RF board to minimize the S-meter reading.

Turn the BAND switch to 3.5, turn the receiver to 3.7 MHz and adjust the DRIVE control for maximum sensitivity. Connect an AF VTVM and an 8 ohm dummy load to the EXT. SPEAKER jack of the TS-520. Insert a 3.736 MHz signal from the signal generator to the ANTENNA connector, tune it in on the VFO, and adjust trap coil L2 on the RF board for a minimum voltage reading on the AF VTVM.

3-17. CARRIER BALANCE

PURPOSE: To adjust the carrier balance.

TEST EQUIPMENT: A Signal generator, an 8 ohm dummy load, and an AF VTVM.

PROCEDURE: Tune the TS-520 to receive the signal generator input (20 db) at 14.175 MHz and adjust the DRIVE control for maximum sensitivity. Connect the AF VTVM and an 8 ohm dummy load to the EXT. SPEAKER jack. Adjust TC2 and VR3 (on the GENERATOR board) alternately for maximum voltage on the AF VTVM.

3-18. S-METER ADJUSTMENT

PURPOSE: To adjust the S-meter zero and sensitivity.

TEST EQUIPMENT: Signal generator.

PROCEDURE: Turn the RF gain control fully clockwise, receive the signal generator input at 14.175 MHz (40 db), and tune the DRIVE control for maximum sensitivity.

With no signal, adjust VR1 on the IF board (X48-1060-00) to zero the S-meter. Then with a 40 db signal to the ANTENNA connector at 14.175 MHz, adjust VR2 on the IF board for an S9 meter reading.

3-19. RIT ADJUSTMENT

PURPOSE: To adjust the RIT zero to the VFO frequency.

TEST EQUIPMENT: None required.

PROCEDURE: Set the RIT control to zero and push the RIT switch on. Turn the FUNCTION switch to CAL-25 KHz and receive a calibrator signal at any frequency. Adjust the VFO to receive the calibrator signal as a 1000 Hz tone.

Push the RIT switch off and adjust VR2 on the FIXED CH.-AVR board (X43-1100-00) for the same 1000 Hz tone established with the RIT on. Switch the RIT on and off several times to be certain that the two tones are identical.

3-20. CALIBRATOR FREQUENCY ADJUSTMENT

PURPOSE: To adjust the frequency of the built-in crystal calibrating circuit.

TEST EQUIPMENT: A frequency counter (or alternately use WWV as a frequency standard).

PROCEDURE: Connect a frequency counter to terminal MO of the MARKER board. Set the FUNCTION switch to CAL-25 KHz and adjust TC1 on the MARKER board for a frequency counter reading of an even 25 KHz (± 2 Hz). Alternately, connect an antenna to the transceiver and receive WWV at 10 MHz. Set the FUNCTION switch to CAL-25 KHz to turn on the calibrator. Adjust TC1, as above, to bring the calibrator; and WWV into a single beat note.

3-21. VFO ADJUSTMENT

PURPOSE: To adjust the frequency and output of the VFO circuit.

TEST EQUIPMENT: An RF VTVM and a frequency counter.

PROCEDURE: Set the FUNCTION switch to VFO and connect a frequency counter to terminal VFO on the IF board (X48-1060-00). With the VFO tuned to zero the frequency counter should read 5.5 MHz. If the frequency is not correct, adjust TC1 (inside the VFO section) as shown in Figure 20 for a correct frequency output. Tune the VFO to the 600 marking and check that the frequency counter shows 4.9 MHz. If the frequency is incorrect, adjust L1 in the VFO section for a proper frequency. Repeat the adjustment of TC1 and L1 alternately several times to insure proper operation.

To adjust the VFO output, set the VFO to 300, connect an RF VTVM to terminal V on the IF board, and adjust TC2 in the VFO section for a 0.9 volt reading.

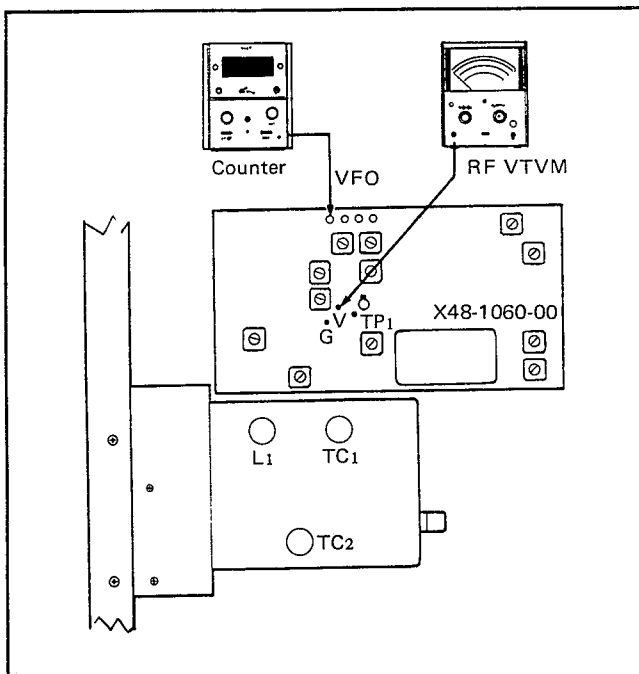


Figure 20. VFO Adjustment Diagram.

3-22. BIAS ADJUSTMENT

See the operating manual for instructions on setting the bias current to 60 ma. The bias requires readjustment if the AC line voltage is changed.

3-23. GENERATOR BOARD IF TRANSFORMER ADJUSTMENT

PURPOSE: To adjust the IF transformers on the GENERATOR board.

TEST EQUIPMENT: A 100 watt dummy load.

PROCEDURE: Slide the SG switch to off, turn the MODE switch to CW, set the METER switch to ALC, and

turn the CAR control fully clockwise. Tune the transmitter section at 14.175 MHz into the dummy load. The DRIVE control should be about 12 o'clock. Set the standby switch to SEND and adjust T1 on the GENERATOR board for a maximum ALC meter reading. Reduce the CAR control as necessary.

3-24. RF METER ADJUSTMENT

PURPOSE: To align the RF output meter reading and to verify the RF output level.

TEST EQUIPMENT: A 200 watt, 50 ohm RF dummy load, and a 200 watt, 3-30 MHz accurate RF wattmeter.

PROCEDURE: Tune the TS-520 for operation at 14.175 MHz into a dummy load through a wattmeter with the SG switch on. Set the meter switch to ALC and the CAR control to about 12 o'clock. With the MODE switch at TUN, transmit at 14.175 MHz and adjust the DRIVE control for a maximum ALC meter reading. Turn the METER switch to IP and tune the PLATE control to minimize the meter reading. Set the MODE switch to CW, turn the METER switch to RF, and tune the PLATE and LOAD controls alternately for maximum output power as indicated on the wattmeter. After the transceiver is tuned, adjust the side panel RF VOLT control for an RF meter reading of about 200 ma (on the IP scale). The RF meter position does not have a separate scale. Return the standby switch to REC.

Tune the TS-520 now for maximum CW output with the SG switch on. Check the power output at 3.75 MHz, 7.15 MHz, 14.175 MHz, 21.225 MHz, 28.3 MHz, 28.8 MHz, and 29.4 MHz. Verify with the wattmeter on each band that the output power meets specifications.

3-25. FINAL SECTION NEUTRALIZATION

PURPOSE: The TS-520 does not require matched final tubes, however when new finals are installed in the transceiver the final section must be reneutralized.

TEST EQUIPMENT: An RF VTVM and a dummy load.

PROCEDURE: Tune the TS-520 for maximum output on CW at 21.3 MHz with the SG switch on. Set the standby switch to REC and slide the SG switch off. Connect the RF VTVM to the ANTENNA connector along with the dummy load, and flip the standby switch to SEND. With an insulated tuning tool, tune TC1 in the final section for a minimum reading on the VTVM.

3-26. BALANCED MODULATOR AND CARRIER ADJUSTMENT

PURPOSE: To adjust the balanced modulator and the carrier.

TEST EQUIPMENT: An RF wattmeter, an AF VTVM, an AF signal generator, an RF VTVM, and a frequency counter, and a dummy load.

PROCEDURE: Tune the TS-520 for maximum CW output at 14.175 MHz through the wattmeter into a dummy load. Set the MODE switch to LSB, connect an RF VTVM to the ANTENNA connector and adjust TC1 and VR2 alternately

on the GENERATOR board for a minimum reading on the RF VTVM. Switch the MODE switch to USB and readjust TC1 and VR2 for an RF VTVM reading equal to the reading for LSB.

Disconnect the RF VTVM, set the MODE switch to LSB, and insert a 1500 Hz (5 mv) signal at the MIC connector. Adjust the MIC control for an output power of 50 watts. Switch the AF input to 400 Hz and, if necessary, adjust TC3 (on the CARRIER board) for an output power within 5 watts of the output for 1500 Hz. Switch the AF input to 2600 Hz and, if necessary, adjust TC3 for an output power within 5 watts of the output power for 1500 Hz.

Turn off the rear panel SG switch and connect a frequency counter to terminal OUT on the CARRIER board and set

the MODE switch to CW. Set the standby switch to SEND and adjust TC1 on the CARRIER board to obtain an oscillator frequency of 3.395 MHz.

3-27. SIDETONE OUTPUT ADJUSTMENT

PURPOSE: To adjust the volume of the CW sidetone output to the speaker.

TEST EQUIPMENT: An AF VTVM and a telegraph key.

PROCEDURE: Slide the SG switch off and connect the key to the TS-520. Set the MODE switch to CW and the AF gain control to about 12 o'clock. Connect the AF VTVM to the EXT. SPEAKER jack, key the transceiver, and adjust VR2 on the AF board for a reading of about 50 mW (0.63 V/8 ohms).

PARTS LIST

■ PARTS LIST OF TS-520 (Y54-1110-00)

| Circuit No. | Parts No. | Description |
|---------------------------|--------------|--|
| CAPACITOR | | |
| VC1 | C03-0060-05 | Variable capacitor (A) (FINAL) |
| VC2 | C01-0084-05 | Variable capacitor (B) (LOAD) |
| TC1 | C03-0002-05 | Neutralizing trimmer |
| C3 | CC45CH2H101J | Ceramic 100pF ±5% |
| C4 | CK45E2H102P | Ceramic 0.001μF +100% -0% |
| C7 | CK45F2H103P | Ceramic 0.01μF +100% -0% |
| C8 ~ 13 | CK45F1E403Z | Ceramic 0.04μF +80% -20% |
| C14 | CK45E2H103P | Ceramic 0.01μF +100% -0% |
| C15 | C90-0186-05 | Ceramic 1000pF ±10% |
| C16 | C90-0187-05 | Ceramic 4700pF +100% -0% |
| C17 | C45SL2H330J | Ceramic 33pF ±5% |
| C18 | C90-0185-05 | Ceramic 68pF ±5% |
| C19 | C90-0184-05 | Ceramic 47pF ±5% |
| C20 | CC45SL2H271J | Ceramic 270pF ±5% |
| C21 | CM91D3A681J | Mica 680pF ±5% |
| C22 ~ 26 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| C27, 28 | C90-0180-05 | Electrolytic block 22μF 45WV |
| C29, 30 | CK45E2H103P | Ceramic 0.01μF +100% -0% |
| C31, 32 | C90-0181-05 | Electrolytic block 100μF 500WV |
| C33, 34 | CE02W1E222 | Electrolytic 2200μF 25WV |
| C35, 36 | CK45F1E403Z | Ceramic 0.04μF +80% -20% |
| C37 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| C38 | C90-0187-05 | Ceramic 4700pF +100% -0% |
| C39 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| C40 | C90-0187-05 | Ceramic 4700pF +100% -0% |
| C41 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| C42 | CE04W1C471 | Electrolytic 470μF 16WV |
| C43, 44 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| RESISTOR | | |
| R1 | PD14BY2E103J | Carbon 10kΩ ±5% 1/4W |
| R2 | PD05GF2H101K | Carbon 100Ω ±10% 1/4W |
| R3, 4 | RC05GF3A100J | Carbon 10Ω ±5% 1W |
| R5 | PD14BY2E332J | Carbon 3.3kΩ ±5% 1/4W |
| R6 | RC05GF2H101K | Carbon 10kΩ ±10% 1/2W |
| R7 | RC05GF3A103K | Carbon 10kΩ ±10% 1W |
| R8 | PD14BY2E102J | Carbon 1kΩ ±5% 1/4W |
| R9 | RC05GF2H560J | Carbon 56Ω ±5% 1/2W |
| R10, 11 | RC05GF2H474J | Carbon 470kΩ ±5% 1/2W |
| R13 | PD14BY2E332J | Carbon 3.3kΩ ±5% 1/4W |
| R14 | PD14BY2E101J | Carbon 100Ω ±5% 1/4W |
| R15 | RC05GF2H474J | Carbon 470kΩ ±5% 1/2W |
| R16, 17 | PD14BY2E104J | Carbon 100kΩ ±5% 1/4W |
| VR1, 2 | R08-3013-05 | Potentiometer (MIC, CAR 10K(A) 10K(B)) |
| VR3 | R08-3012-15 | Potentiometer (RF10K(B)) |
| VR4 | R01-4014-05 | Potentiometer (BIS 50K(B)) |
| VR5 | R08-3012-05 | Potentiometer (AF 10K(A)) |
| VR6 | R01-4014-05 | Potentiometer (VOX, 50K(B)) |
| VR7 | R01-0040-05 | Potentiometer (AVX 300(B)) |
| VR8 | R01-6009-05 | Potentiometer (DELAY 250K(B)) |
| VR9 | R03-2004-05 | Potentiometer (RIT 5K(B)) |
| VR10 | R01-3014-05 | Potentiometer (RF, METER 10kΩM (B)) |
| TUBE/SEMICONDUCTOR | | |
| D3 | | Diode 1N60 |
| D4, 5 | | Diode V06B |
| D6 | | Zener diode WZ-061 |
| D7, 8 | | Diode 1S1555 |
| V1, 2 | | Vacuum-tube S2001 |

| Circuit No. | Parts No. | Description |
|----------------------|-------------|--|
| MISCELLANEOUS | | |
| — | A01-0211-02 | Case |
| — | A10-0370-01 | Chassis |
| — | A20-0699-05 | Main chassis |
| — | A20-0700-13 | Panel ass'y (England) |
| — | A20-0730-13 | Panel ass'y (U.S.A., Europe) |
| — | A22-0135-12 | Sub panel |
| — | A23-0429-02 | Rear panel |
| — | A40-0120-11 | Bottom plate |
| — | B05-0201-04 | Speaker net |
| — | B10-0130-04 | Front grass |
| — | B20-0287-04 | Dial board |
| — | B30-0079-05 | Pilot lamp (12V, 40mA) x 4 |
| — | B31-0164-05 | Meter |
| — | B40-0889-04 | Name plate (U.S.A., Europe) |
| — | B40-0890-04 | Name plate (England) |
| — | B41-0189-04 | Voltage plate (120 ~ 240V) (U.S.A., England) |
| — | B41-0190-04 | Voltage plate (120 ~ 220V) (Europe) |
| — | B42-0009-04 | Passed sticker (Europe, England) |
| — | B42-0444-14 | Switch name plate (England) |
| — | B42-0445-04 | Panel name plate |
| — | B42-0446-04 | Name plate of adjustment |
| — | B42-0447-04 | VR name plate of adjustment |
| — | B42-0451-04 | Fixed channel plate |
| — | B42-0452-04 | DC terminal plate |
| — | B42-0474-14 | Switch name plate (U.S.A., Europe) |
| — | B42-0287-04 | Caution sticker (HIGH VOLTAGE) |
| — | B43-0200-04 | Badge (TS-520) |
| — | B46-0047-00 | Warranty card (U.S.A.) |
| — | B50-1101-00 | Operating manual (U.S.A.) |
| — | B50-1102-00 | Operating manual (Europe) |
| — | B50-1107-00 | Operating manual (England) |
| — | B58-0181-00 | Transmitter caution plate |
| — | D13-0032-04 | Sprocket |
| — | D16-0033-04 | Chain ass'y |
| — | D21-0324-05 | Band shaft |
| — | D21-0326-04 | Shaft (A) DRIVE |
| — | D21-0327-04 | Shaft (B) PLATE |
| — | D21-0328-04 | Shaft (C) LOAD |
| — | D22-0004-04 | Shaft coupling |
| — | D22-0005-04 | Shaft coupling |
| — | D22-0011-05 | Shaft coupling |
| — | D23-0048-04 | Bearing (metal) |
| — | D23-0061-04 | Bearing (mold) |
| — | D23-0115-05 | Ball bearing |
| — | D23-0116-05 | Ball bearing ass'y |
| — | D32-0018-04 | Shaft stopper |
| — | D32-0051-04 | Shaft stopper |
| — | E01-0801-05 | US socket |
| — | E01-0903-05 | 9P, MT socket |
| — | E03-0301-05 | 3P plug (Europe) |
| — | E04-0115-05 | Receptacle, type-M |
| — | E05-0901-05 | 9P, MT plug |
| — | E06-0403-05 | 14P mike socket |
| — | E07-0403-05 | 14P mike plug |
| — | E08-0204-05 | 2P jack |
| — | E08-1202-05 | 12P jack |
| — | E08-1207-05 | 12P plug |
| — | E08-1208-05 | 12P connector (Socket) |
| — | E09-0204-05 | 2P plug |

| Circuit No. | Parts No. | Description | Circuit No. | Parts No. | Description |
|-------------|-------------|--|-------------|-------------|---------------------------------|
| — | E11-0003-15 | US jack | — | J21-1202-04 | Speaker mounting hardware ass'y |
| — | E110005-05 | 3P phone jack | — | J29-0045-14 | VR mounting reinforcement |
| — | E11-0034-05 | US jack | — | J32-0074-04 | Hexagonal boss x 8 |
| — | E12-0001-05 | Phone plug | — | J32-0081-04 | Hexagonal boss x 4 |
| — | E13-0101-05 | 1P pin jack | — | J32-0127-04 | Hexagonal boss |
| — | E14-0101-05 | 1P pin plug | — | J32-0182-04 | Hexagonal boss x 4 |
| — | E14-0801-05 | US plug | — | J32-0183-04 | Hexagonal boss |
| — | E20-0512-05 | 5P terminal strips | — | J32-1030-14 | Round boss |
| — | E20-0513-05 | 5P terminal strips | — | J41-0020-04 | Knob bushing |
| — | E20-1003-05 | 10P terminal strips | — | J41-0024-15 | Cord bushing |
| — | E22-0206-05 | Lug board | — | J59-0001-05 | Grommet |
| — | E22-0207-05 | Lug board | — | J59-0002-05 | Plunger |
| — | E22-0214-05 | Lug board | — | J61-0018-05 | Beaded band |
| — | E22-0405-04 | Lug board | — | J61-0019-05 | Wire wrapping band |
| — | E22-0603-04 | Lug board | — | J61-0036-05 | Free-up belt |
| — | E23-0016-04 | Lug board | — | K01-0049-05 | Knob |
| — | E23-0037-04 | Shaft grounding hardware | — | K21-0266-04 | Knob |
| — | E30-0181-05 | AC cord (U.S.A.) | — | K21-0267-04 | Knob x 5 |
| — | E30-0214-05 | Co-axial cable ass'y | — | K21-0268-04 | Knob x 2 |
| — | E90-0004-15 | Plate cap x 2 | — | K21-0269-04 | Knob x 3 |
| — | F05-2032-05 | Fuse (20A) | — | K23-0270-04 | Knob x 2 |
| — | F05-4022-05 | Fuse (4A) | — | K23-0271-03 | Knob |
| — | F05-6021-05 | Fuse (6A) | — | K29-0166-04 | Knob x 2 |
| — | F07-0315-13 | Final cover | — | K29-0167-23 | Knob wafer |
| — | F10-0321-04 | Coil pack shield plate | — | L01-0214-05 | Power transformer |
| — | F10-0322-04 | Relay shield plat | — | L15-0002-15 | Choke coil |
| — | F11-0186-13 | Final shield case | L3 | L33-0098-05 | Ferri-inductor |
| — | F15-0161-04 | Shading plate | L4 | L33-0101-05 | Ferri-inductor |
| — | F19-0134-04 | Side cover | L5 | L33-0032-05 | Choke coil |
| — | G11-0008-04 | Cushion | L6 | L33-0160-05 | Final choke |
| — | G11-0044-04 | Cushion | L7 | L31-0316-05 | Final coil (B) |
| — | H01-1014-04 | Carton case (Inside) (England) | L8 | L31-0142-05 | Final coil (A) |
| — | H01-1042-04 | Carton case (Inside) (U.S.A., Europe) | L9 | L33-0032-05 | Choke coil |
| — | H03-0283-04 | Carton case (Outside) (U.S.A., Europe) | L10 | L33-0101-05 | Ferri-inductor |
| — | H03-0304-04 | Carton case (Outside) (England) | L11 | L33-0110-05 | Ferri-inductor |
| — | H10-0570-04 | Retainer | L12 | L33-0098-05 | Ferri-inductor |
| — | H10-0931-02 | Polystyrene foamed fixture | Ps1, 3 | L33-0010-05 | Parasitic suppressor |
| — | H10-0932-02 | Polystyrene foamed fixture | Ps3, 4 | L39-0046-04 | Parasitic suppressor |
| — | H10-0934-04 | Protection board | S1 | S06-1006-05 | Rotary switch (METER) |
| — | H10-0964-04 | Retainer | S2 | S01-4017-05 | Rotary switch (FUNCTION) |
| — | H20-0371-04 | Protection cover | S3 | S04-5016-05 | Rotary switch (MODE) |
| — | J02-0049-14 | Leg (big) | S4 | S29-1006-05 | Rotary switch (CH SELECT) |
| — | J02-0022-05 | Leg (small) | S5 | S10-1101-05 | Rotary switch (FINAL) |
| — | J13-0004-05 | Fuse holder | S7 | S31-2007-05 | Slide switch |
| — | J13-0037-05 | Fuse holder (DC cord) | — | S40-2023-05 | Push switch (RIT, WWV) |
| — | J19-0006-04 | Switch stopper | S10 | S44-2018-05 | Paddle switch |
| — | J19-0360-04 | Coupling holder | S11,13,14 | S44-2016-05 | Paddle switch |
| — | J21-0392-04 | Lead holder | S15 | S44-2015-05 | Paddle switch |
| — | J21-0468-05 | Angle (tank coil) | S16 | S59-2020-05 | See-saw switch (POWER) |
| — | J21-0934-14 | Handle holder | S17 | S59-2017-65 | See-saw switch (VOLTAGE SELECT) |
| — | J21-1142-04 | Meter mounting | RL1 | S51-4016-15 | Relay |
| — | J21-1143-04 | VR mounting | RL2 | S51-4017-15 | Relay (FINAL) |
| — | J21-1144-04 | Speaker mounting | — | W01-0005-04 | Adjusting ber |
| — | J21-1145-04 | Lamp stopper | — | X40-0017-01 | DRIVE coil unit |
| — | J21-1146-04 | Coil pack fixture | — | X40-0018-01 | MIX coil unit |
| — | J21-1148-04 | VC mounting fixture | — | X40-0019-01 | OSC coil unit |
| — | J21-1149-22 | IF board holding fixture | — | X40-1070-00 | VFO unit |
| — | J21-1150-04 | Indicator mounting fixture | — | X43-1090-00 | Rectifier unit |
| — | J21-1151-04 | Terminal strip retainer | — | X43-1100-00 | Fixed-channel, AVR unit |
| — | J21-1155-04 | Fixed-channel mounting fixture | | | |

| Circuit No. | Parts No. | Description |
|-------------|-------------|----------------------|
| — | X43-1110-00 | HV unit |
| — | X44-1080-00 | RF unit |
| — | X44-1090-00 | ANT coil unit |
| — | X46-1000-00 | DC-DC converter unit |
| — | X48-1060-00 | IF unit |
| — | X49-0008-01 | AF unit |
| — | X50-0009-01 | Carrier unit |
| — | X52-0005-01 | Marker unit |
| — | X52-0010-01 | Generator unit |
| — | X54-0001-00 | VOX unit |
| — | X54-1080-10 | NB unit |
| — | X54-1100-01 | FAN unit |
| — | X54-1120-00 | Indicator unit |

| Circuit No. | Parts No. | Description |
|----------------------|-------------|--------------------------------|
| L7 | L33-0025-05 | Choke coil |
| MISCELLANEOUS | | |
| S3-1 | S29-1005-05 | Rotary wafer |
| S3-2 | S29-1005-05 | Rotary wafer |
| X1 | L77-0141-05 | Crystal oscillator (12,395MHz) |
| X2 | L77-0142-05 | Crystal oscillator (15,895MHz) |
| X3 | L77-0143-05 | Crystal oscillator (22,895MHz) |
| X4 | L77-0144-05 | Crystal oscillator (29,895MHz) |
| X5 | L77-0145-05 | Crystal oscillator (36,895MHz) |
| X6 | L77-0146-15 | Crystal oscillator (37,395MHz) |
| X7 | L77-0147-05 | Crystal oscillator (37,995MHz) |

■ PARTS LIST OF DRIVER COIL PACK (X40-0017-01)

| Circuit No. | Parts No. | Description |
|----------------------|-----------------|---------------------------|
| CAPACITOR | | |
| C1 | CC45CH2H100J | Ceramic 10pF ±5% |
| C2 | CC45CH2H330J | Ceramic 33pF ±5% |
| C3 | CM93D2H151J(DM) | Mica 150pF ±5% |
| C4 | CC45CH2H330J | Ceramic 33pF ±5% |
| C5, 6 | CK45E2H103P | Ceramic 0.01μF +100% -0% |
| RESISTOR | | |
| R1, 2 | PD14BY2E151J | Carbon 150Ω ±5% 1/4W |
| COIL | | |
| L1 | L31-0031-04 | Tuning coil (3.5 MHz) (A) |
| L2 | L31-0032-04 | Tuning coil (7 MHz) |
| L3 | L31-0033-04 | Tuning coil (14 MHz) |
| L4 | L31-0034-04 | Tuning coil (21 MHz) |
| L5 | L31-0209-04 | Tuning coil |
| L6 | L33-0097-05 | Ferri-inductor |
| MISCELLANEOUS | | |
| S1-1,1-2 | S29-1052-05 | Rotary wafer |

■ PARTS LIST OF MIX COIL UNIT (X40-0018-01)

| Circuit No. | Parts No. | Description |
|----------------------|--------------|--------------------------|
| CAPACITOR | | |
| C1 | CC45CH1H220J | Ceramic 22pF ±5% |
| C2 | CC45CH1H330J | Ceramic 33pF ±5% |
| C3 | CC45CH1H151J | Ceramic 150pF ±5% |
| C4 | CC45CH1H330J | Ceramic 33pF ±5% |
| C5, 6 | CK45E1H103P | Ceramic 0.01μF +100% -0% |
| COIL | | |
| L1 | L31-0036-04 | Tuning coil (3.5MHz) (B) |
| L2 | L31-0032-04 | Tuning coil (7MHz) |
| L3 | L31-0033-04 | Tuning coil (14MHz) |
| L4 | L31-0034-04 | Tuning (21MHz) |
| L5 | L31-0209-04 | Tuning (28MHz) |
| L6 | L33-0095-05 | Ferri-inductor |
| MISCELLANEOUS | | |
| S2-1, 2-2 | S29-1052-05 | Rotary wafer |

■ PARTS LIST OF OSC COIL UNIT (X40-0019-00)

| Circuit No. | Parts No. | Description |
|------------------|--------------|-----------------------------|
| CAPACITOR | | |
| C1 | CC45CH1H121J | Ceramic 120pF ±5% |
| C2 | CC45CH1H680J | Ceramic 68pF ±5% |
| C3 | CC45CH1H560J | Ceramic 56pF ±5% |
| C4 | CC45CH1H100J | Ceramic 10pF ±5% |
| C5 ~ 7 | CK94YG1E403Z | Ceramic 0.04μF +80% -20% |
| RESISTOR | | |
| R1 | PD14BY2E102J | Carbon 1kΩ ±5% 1/4W |
| COIL | | |
| L1, 2 | L31-0032-04 | Oscillator coil (3.5, 7MHz) |
| L3 | L31-0033-04 | Oscillator coil (14MHz) |
| L4 | L32-0011-04 | Oscillator coil (21MHz) |
| L5a,b | L32-0138-15 | Oscillator coil (28MHz(A)) |
| L6 | L32-0012-04 | Oscillator coil (28MHz(B)) |

■ PARTS LIST OF VFO UNIT (X40-1070-00)

| Circuit No. | Parts No. | Description |
|------------------|-----------------|-----------------------------|
| CAPACITOR | | |
| C1 | CC45PG1H470J | Ceramic 470pF ±5% |
| C2,3 | CC45LG1H150J | Ceramic 15pF ±5% |
| C3 | CC45CG1H150J | Ceramic 15pF ±5% Adjustment |
| C3 | CC45PG1H150J | Ceramic 15pF ±5% Adjustment |
| C4 | CC45SG1H070J | Ceramic 7pF ±5% |
| C5 | CC45LG1H470J | Ceramic 47pF ±5% |
| C6 | CC45LG1H220J | Ceramic 22pF ±5% |
| C7,8 | CM93F2A151J(DM) | Mica 150pF ±5% |
| C9 | CC45CH1H030D | Ceramic 3pF ±0.5pF |
| C10 | CK45F1H203Z | Ceramic 0.02μF +80% -20% |
| C11,12 | CK45F1E403Z | Ceramic 0.04μF +80% -20% |

| Circuit No. | Parts No. | Description |
|----------------------|--------------|--|
| C13 | CK45F1H203Z | Ceramic 0.02 μ F +80% -20% |
| C14 | CC45SL1H330J | Ceramic 33pF \pm 5% |
| C15 | CC45SL1H050J | Ceramic 5pF \pm 0.5pF |
| C16 | CC45SL1H100D | Ceramic 10pF \pm 0.5pF |
| C17 | CC45SL1H050J | Ceramic 5pF \pm 0.5pF |
| C18 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C19 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C20 | CC45CG1H100D | Ceramic 10pF \pm 0.5pF |
| - | C01-0001-25 | Variable capacitor |
| TC1 | C03-0001-05 | Variable capacitor |
| TC2 | C05-0013-15 | Ceramic trimmer |
| RESISTOR | | |
| R1 | PD14BY2E274J | Carbon 270k Ω \pm 5% 1/4W |
| R2 | PD14BY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R3, 4 | PD14BY2E105J | Carbon 1 M Ω \pm 5% 1/4W |
| R5 | PD14BY2E331J | Carbon 330 Ω \pm 5% 1/4W |
| R6 | PD14BY2E333J | Carbon 33k Ω \pm 5% 1/4W |
| R7 | PD14BY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R8 | PD14BY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R9 | PD14BY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| SEMICONDUCTOR | | |
| Q1 | | FET 3SK22(Y) |
| Q2 | | FET 2SK19(Y) |
| Q3, 4 | | Transistor 2SC460 (B) |
| D1 | | Diode SD111 |
| D1, 2 | | Diode 1N60 |
| MISCELLANEOUS | | |
| - | A01-0169-13 | VFO case |
| - | B42-0010-04 | Name plate |
| - | D22-0011-05 | Shaft coupling |
| - | D40-0099-25 | Gear mechanism |
| - | E13-0101-05 | 1P pin jack |
| - | E08-0204-05 | 2P receptacle |
| - | E22-0207-05 | Lug board |
| - | E23-0021-04 | Terminal |
| - | F07-0231-14 | VFO cover |
| - | F10-0249-04 | VFO shield plate |
| - | F11-0010-04 | VFO box |
| - | J21-1157-03 | VFO variable capacitor mounting hardware |
| - | J21-0895-03 | VFO mounting hardware |
| L1 | L32-0098-05 | Oscillating coil |
| L2 ~ 4 | L33-0104-05 | Ferri-inductor |
| L5 | L33-0091-05 | Ferri-inductor |
| L6, 7 | L33-0104-05 | Ferri-inductor |

■ PARTS LIST OF FIXED-CHANNEL AVR UNIT (X43-1100-00)

| Circuit No. | Parts No. | Description |
|------------------|--------------|------------------------|
| CAPACITOR | | |
| C1 | CC45SL1H151J | Ceramic 150pF \pm 5% |

| Circuit No. | Parts No. | Description |
|----------------------|----------------|------------------------------------|
| C2 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C3 | CC45CH1H820J | Ceramic 82pF \pm 5% |
| C4 | CC45CH1H100J | Ceramic 10pF \pm 5% |
| C5 | CC45CH1H330J | Ceramic 33pF \pm 5% |
| C6 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C7 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C8 | CE04W1C100(RL) | Electrolytic 10 μ F 16WV |
| C9 | CE04W1C470(RL) | Electrolytic 47 μ F 16WV |
| C10 | CE04W1HR47(RL) | Electrolytic 0.47 μ F 50WV |
| C11 | CE04W1C101(RL) | Electrolytic 100 μ F 16WV |
| C12 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| RESISTOR | | |
| R1 | PD14CY2E222J | Carbon 2.2k Ω \pm 5% 1/4W |
| R2 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R3 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R4 | PD14CY2E333J | Carbon 33k Ω \pm 5% 1/4W |
| R5 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R6 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R7 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R8 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R9 | PD14CY2E683J | Carbon 68k Ω \pm 5% 1/4W |
| R10 | PD14CY2E331J | Carbon 330 Ω \pm 5% 1/4W |
| R11 | PD14CY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| R12 | PD14CY2E821J | Carbon 820 Ω \pm 5% 1/4W |
| R13 | PD14CY2E222J | Carbon 2.2k Ω \pm 5% 1/4W |
| R14 | PD14CY2E272J | Carbon 2.7k Ω \pm 5% 1/4W |
| R15 | PD14CY2E222J | Carbon 2.2k Ω \pm 5% 1/4W |
| R16 | PD14CY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| R17 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R18 | PD14CY2E392J | Carbon 3.9k Ω \pm 5% 1/4W |
| R19 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R20 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R21 | PD14CY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| R22 | PD14CY2E151J | Carbon 150 Ω \pm 5% 1/4W |
| SEMICONDUCTOR | | |
| Q1 ~ 3 | | Transistor 2SC460 (B) |
| Q4 | | Transistor 2SA606 (L) |
| Q5 ~ 7 | | Transistor 2SC372 |
| Q8 | | Transistor 2SC735 (Y) |
| D1, 2 | | Diode 1N60 |
| D3 | | Zener diode WZ-061 |
| D4 ~ 7 | | Diode 1S1555 |
| D8 | | Zener diode WZ-061 |
| MISCELLANEOUS | | |
| - | E18-0401-05 | Crystal socket |
| - | E23-0047-04 | Terminal |
| L1 | L33-0089-05 | Ferri-inductor |
| L2 ~ 4 | L33-0104-05 | Ferri-inductor |
| T1 | L12-0013-05 | Oscillating transformer |
| VR1 | R12-0042-05 | Trimmer potentiometer |
| VR2 | R12-3036-05 | Trimmer potentiometer |
| VR3 | R12-4020-05 | Trimmer potentiometer |
| TC1 ~ 4 | C05-0030-15 | Ceramic trimmer 20pF |
| TC5 | C05-0015-15 | Ceramic trimmer 40pF |

■ PARTS LIST OF RECTIFIER UNIT (X43-1090-00)

| Circuit No. | Parts No. | Description |
|------------------|--------------|--------------------------------------|
| CAPACITOR | | |
| C1, 2 | CE02W2C330 | Electrolytic tubler 33 μ F 160WV |
| RESISTOR | | |
| D1 ~ 6 | | Diode (V08J) |
| D7 | | Diode (V06E) |
| D8 ~ 11 | | Diode (V06B) |
| R1 ~ 4 | RC05GF2H474J | Carbon 470k Ω \pm 5% 1/2W |
| R5, 6 | RN14AB3D471J | Metal film 470 Ω \pm 5% 2W |
| R7 | RC05FG2H102J | Carbon 1k Ω \pm 5% 1/2W |
| R8 | RC05FG2H104 | Carbon 100k Ω \pm 5% 1/2W |

■ PARTS LIST OF HV UNIT (X43-1110-00)

| Circuit No. | Parts No. | Description |
|------------------|--------------|------------------------------------|
| CAPACITOR | | |
| C1 | CK45E2H103P | Ceramic 0.01 μ F +100% -0% |
| RESISTOR | | |
| R1 | RC05GF2H104J | Carbon 100k Ω \pm 5% 1/2W |
| R2 ~ 4 | PD14BY2H684J | Carbon 680k Ω \pm 5% 1/2W |
| R5, 6 | RC05GF2H563J | Carbon 56k Ω \pm 5% 1/2W |

■ PARTS LIST OF RF UNIT (X44-1080-00)

| Circuit No. | Parts No. | Description |
|------------------|----------------|---------------------------------|
| CAPACITOR | | |
| C1 | CE04W1H010(RL) | Electrolytic 1 μ F 50W |
| C2 | CE04W1HR47(RL) | Electrolytic 0.47 μ F 50WV |
| C3 | CC45CH1H101J | Ceramic 100pF \pm 5% |
| C4 | CC45SL1H101J | Ceramic 100pF \pm 5% |
| C5 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C6 | CC45CH1H030D | Ceramic 3pF \pm 0.5pF |
| C7 | CC45SL1H330J | Ceramic 33pF \pm 5% |
| C8, 9 | CK45D1H102M | Ceramic 0.001 μ F \pm 20% |
| C10, 11 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C12 | CM93D2H561J | Mica 560pF \pm 5% |
| C13 | CC45CH1H050D | Ceramic 5pF \pm 0.5pF |
| C14 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C15 | CC45CH1H050D | Ceramic 5pF \pm 0.5pF |
| C16 | CC45CH1H101J | Ceramic 100pF \pm 5% |
| C17, 18 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C19 | CC45SL1H220J | Ceramic 22pF \pm 5% |
| C20 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C21 | CC45SL2H151J | Ceramic 150pF \pm 5% |
| C22 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C23, 24 | CK45D1H102M | Ceramic 0.001 μ F \pm 20% |
| C25 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C26 | CC45CH1H100D | Ceramic 10pF \pm 0.5pF |
| C27 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C28 | CC45SL1H101J | Ceramic 100pF \pm 5% |
| C29 ~ 31 | CK45E2H103P | Ceramic 0.01 μ F +100% -0% |
| C32, 33 | CM93D2H561J | Mica 560pF \pm 5% |
| C34 | CK45B1H102K | Ceramic 0.001 μ F \pm 10% |
| C35 | CK45F1E403Z | Ceramic 0.04 μ F +80% -20% |
| C36 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |

| Circuit No. | Parts No. | Description |
|-----------------|--------------|--|
| C37 | CK45E2H103P | Ceramic 0.01 μ F +100% -0% |
| C38 | C90-0156-05 | Metalized polyester film 0.047 μ F 250WV |
| C39 | CK45E2H103P | Ceramic 0.01 μ F +100% -0% |
| C40 | CC45SL1H330J | Ceramic 33pF \pm 5% |
| C41 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C42 | CC45CH1H020D | Ceramic 2pF \pm 0.5pF |
| C43 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C44 ~ 46 | CK45F1F403Z | Ceramic 0.04 μ F +80% -20% |
| C48 | C90-0154-05 | Metalized polyester film 0.22 μ F 250WV |
| C49 | CK45D1H102M | Ceramic 0.001 μ F \pm 20% |
| C50 | CQ93M1H473K | Electrolytic mylar 0.047 μ F \pm 10% |
| C51 | CC45CH1H101J | Ceramic 100pF \pm 5% |
| C52 | CK45E2H103P | Ceramic 0.01 μ F +100% -0% |
| C53 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C54 | CC45CH1H101J | Ceramic 100pF \pm 5% |
| C55 | CC45CH1H050D | Ceramic 5pF \pm 0.5pF |
| VC1 ~ 3 | C01-0127-05 | Variable capacitor |
| RESISTOR | | |
| R1 | PD14CY2E274J | Carbon 270k Ω \pm 5% 1/4W |
| R2 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R3 | RC05GF2H225J | Carbon 2.2M Ω \pm 5% 1/2W |
| R4 | PC14CY2E333J | Carbon 33k Ω \pm 5% 1/4W |
| R5 | PD14CY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| R6 | PD14CY2E333J | Carbon 33k Ω \pm 5% 1/4W |
| R7 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R8 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R9 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R10 | PD14CY2E104J | Carbon 100k Ω \pm 5% 1/4W |
| R11 | PD14CY2E474J | Carbon 470k Ω \pm 5% 1/4W |
| R12 | PD14CY2E124J | Carbon 120k Ω \pm 5% 1/4W |
| R13 | PD14CY2E274J | Carbon 270k Ω \pm 5% 1/4W |
| R14 | PD14CY2E104J | Carbon 100k Ω \pm 5% 1/4W |
| R15, 16 | PD14CY2E560J | Carbon 56 Ω \pm 5% 1/4W |
| R17 | PD14CY2E181J | Carbon 180 Ω \pm 5% 1/4W |
| R18, 19 | PD14CY2E682J | Carbon 6.8k Ω \pm 5% 1/4W |
| R20 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R21 | PD14CY2E271J | Carbon 270 Ω \pm 5% 1/4W |
| R22 | PD14CY2E184J | Carbon 180k Ω \pm 5% 1/4W |
| R23 | PD14CY2E104J | Carbon 100k Ω \pm 5% 1/4W |
| R24, 25 | PD14CY2E560J | Carbon 56 Ω \pm 5% 1/4W |
| R26 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R27, 28 | PD14CY2E104J | Carbon 100k Ω \pm 5% 1/4W |
| R29 | PD14CY2E561J | Carbon 560 Ω \pm 5% 1/4W |
| R30 | PD14CY2E182J | Carbon 1.8k Ω \pm 5% 1/4W |
| R31 | PD14CY2E560J | Carbon 56 Ω \pm 5% 1/4W |
| R32 | PD14CY2E105J | Carbon 1 M Ω \pm 5% 1/4W |
| R33 | RC05GF2H820J | Carbon 82 Ω \pm 5% 1/2W |
| R34, 35 | RC05GF2H330J | Carbon 33 Ω \pm 5% 1/2W |
| R35 | RC05GF2H330J | Carbon 33 Ω \pm 5% 1/2W |
| R36 | PD14CY2E474J | Carbon 470k Ω \pm 5% 1/4W |
| R37, 28 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R39, 40 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R41 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R42, 43 | PD14CY2E392J | Carbon 3.9k Ω \pm 5% 1/4W |
| R44 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R45 | PD14CY2E392J | Carbon 3.9k Ω \pm 5% 1/4W |
| R46 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R47 | PD14CY2E392J | Carbon 3.9k Ω \pm 5% 1/4W |
| R48 | PD14CY2E682J | Carbon 6.8k Ω \pm 5% 1/4W |
| R49 | PD14CY2E563J | Carbon 56k Ω \pm 5% 1/4W |
| R50 | PD14CY2E104J | Carbon 100k Ω \pm 5% 1/4W |

| Circuit No. | Parts No. | Description |
|-------------|--------------|-----------------------|
| R51 | PD14CY2E153J | Carbon 15kΩ ±5% 1/4W |
| R52 | PD14CY2E683J | Carbon 68kΩ ±5% 1/4W |
| R53 | PD14CY2E123J | Carbon 12kΩ ±5% 1/4W |
| R54 | PD14CY2E473J | Carbon 47kΩ ±5% 1/4W |
| R55 | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W |
| R56 | PD14CY2E273J | Carbon 27kΩ ±5% 1/4W |
| R57 | PD14CY2E822J | Carbon 8.2kΩ ±5% 1/4W |
| R59 | PD14CY2E333J | Carbon 33kΩ ±5% 1/4W |
| R60 | PD14CY2E104J | Carbon 100kΩ ±5% 1/4W |
| R61 | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W |
| R62 | PD14CY2E471J | Carbon 470Ω ±5% 1/4W |
| R63 | PD14CY2E104J | Carbon 100kΩ ±5% 1/4W |
| R64 | PD14CY2E332J | Carbon 3.3kΩ ±5% 1/4W |
| R65~67 | PD14CY2E101J | Carbon 100Ω ±5% 1/4W |
| R68 | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W |
| R69 | PD14CY2E331J | Carbon 330Ω ±5% 1/4W |
| R70 | RC05GF2H823J | Carbon 82kΩ ±5% 1/2W |
| R71 | RC05GF2H392J | Carbon 3.9kΩ ±5% 1/2W |
| R72 | PD14BY2B563J | Carbon 56kΩ ±5% 1/8W |

SEMICONDUCTOR

| | | |
|-------|-------------|-----------|
| Q1 | FET | 2SK19(GR) |
| Q2 | Transistor | 2SC460(B) |
| Q3 | FET | 3SK41(L) |
| Q4 | FET | 3SK35(GR) |
| Q5 | FET | 3SK35(Y) |
| Q6 | Transistor | 2SC733(Y) |
| Q7 | Transistor | 2SC535(A) |
| Q8 | FET | 3SK22(GR) |
| Q9 | FET | 2SK19(GR) |
| Q10 | Transistor | 2SC856 |
| Q11 | FET | 3SK35(GR) |
| D1 | Zener diode | WZ-090 |
| D2~4 | Diode | 1S73A |
| D5, 6 | Diode | V06B |
| D7, 8 | Zener diode | WZ-090 |
| D9 | Diode | 1S1555 |

MISCELLANEOUS

| | | |
|-------|-------------|------------------------|
| - | D13-0032-03 | Sprocket x 3 |
| - | D16-0033-04 | Chain ass'y x 2 |
| - | E06-0406-05 | FET socket x 4 |
| - | E10-1902-05 | Vacuum-tube socket |
| - | E23-0046-04 | Terminal |
| - | E23-0047-04 | Terminal |
| - | F11-0020-05 | Shield case |
| T1, 2 | L30-0008-05 | B.P.F. coil |
| T3 | L32-0165-05 | OSC coil |
| T4, 5 | L31-0317-05 | Tuning coil |
| L1 | L33-0104-05 | Ferri-inductor |
| L2 | L31-0012-05 | Trap coil (12,395 MHz) |
| L3 | L33-0104-05 | Ferri-inductor |
| L4 | L33-0098-05 | Ferri-inductor |
| L5 | L31-0010-05 | Trap coil (8.6 MHz) |
| L6 | L33-0098-05 | Ferri-inductor |
| L7 | L33-0074-05 | Heater choke |
| L8 | L33-0104-05 | Ferri-inductor |
| L10 | L33-0131-05 | Ferri-inductor |
| L11 | L31-0011-05 | Trap coil (8.6 MHz) |
| X1 | L77-0013-35 | Crystal oscillator |

■ PARTS LIST OF ANT COIL UNIT (X44-1090-00)

| Circuit No. | Parts No. | Description |
|----------------------|--------------|---------------------|
| V1 | | Vacuum-tube 12BY7A |
| CAPACITOR | | |
| C1 | CC45CH1H270J | Ceramic 27pF ±5% |
| C2 | CC45CH1H151J | Ceramic 150pF ±5% |
| C3 | CC45CH1H330J | Ceramic 33pF ±5% |
| C4 | CC45CH1H220J | Ceramic 22pF ±5% |
| COIL | | |
| L1 | L31-0031-04 | Tuning coil 3.5 MHz |
| L2 | L31-0032-04 | Tuning coil 7 MHz |
| L3 | L31-0033-04 | Tuning coil 14 MHz |
| L4 | L31-0034-04 | Tuning coil 21 MHz |
| L5 | L31-0209-04 | Tuning coil 28 MHz |
| MISCELLANEOUS | | |
| - | E23-0015-04 | Grounding lug |
| - | J31-0102-04 | Collar A |
| - | J31-0103-04 | Collar B |
| - | J31-0105-04 | Collar D |
| - | J32-0184-04 | Screw rod |
| - | S29-1052-05 | Rotary wafer |

■ PARTS LIST OF DC-DC CONVERTER UNIT (X46-1000-00)

| Circuit No. | Parts No. | Description |
|----------------------|-------------|-------------------------|
| CAPACITOR | | |
| C1 | CE02W1E221 | Electrolytic 220μF 25WV |
| SEMICONDUCTOR | | |
| Q1, 2 | | Transistor 2N4049 |
| R1 | R92-0121-05 | Cement 2.4Ω 5W |
| R2 | R92-0120-05 | Cement 220Ω 2W |
| MISCELLANEOUS | | |
| - | E20-0510-05 | 5P terminal strips |
| - | F01-0170-04 | Heat sink (A) |
| - | F01-0171-04 | Heat sink (B) |
| - | F11-0195-04 | Heat sink cover |

■ PARTS LIST OF IF UNIT (X48-1060-00)

| Circuit No. | Parts No. | Description |
|------------------|--------------|--------------------------|
| CAPACITOR | | |
| C1 | CC45SL1H330J | Ceramic 33pF ±5% |
| C2 | CQ92M1H473K | Mylar 0.047μF ±10% |
| C3 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| C4 | CQ92M1H473K | Mylar 0.047μF ±10% |
| C5 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| C6 | CQ92M1H473K | Mylar 0.047μF ±10% |
| C7, 8 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |
| C9 | CQ92M1H473K | Mylar 0.047μF ±10% |
| C10 | CK45F1H103Z | Ceramic 0.01μF +80% -20% |

| Circuit No. | Parts No. | Description |
|-------------|----------------|---------------------------------|
| C11 | CK45D1H102M | Ceramic 0.001 μ F \pm 20% |
| C12 | CC45SL1H220J | Ceramic 22pF \pm 5% |
| C13 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C14 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C15 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C16 | CC45SL1H101J | Ceramic 100pF \pm 5% |
| C17 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C18 | CC45SL1H050D | Ceramic 5pF \pm 0.5pF |
| C19 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C20 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C21 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C22 | CC45CH1H121J | Ceramic 120pF \pm 5% |
| C23 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C24 | CC45CH1H330J | Ceramic 33pF \pm 5% |
| C25 | CC45SL1H151J | Ceramic 150pF \pm 5% |
| C27 | CE04W1H010(RL) | Electrolytic 1 μ F 50WV |
| C28 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C29 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C30 | CK45D1H102M | Ceramic 0.001 μ F \pm 20% |
| C31 | CC45SL1H221J | Ceramic 220pF \pm 5% |
| C32 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C33 | CC45SL1H470J | Ceramic 47pF \pm 5% |
| C34 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C35 | CC45SL1H100D | Ceramic 10pF \pm 0.5pF |
| C36 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C37 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C38 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C39 | CC45SL1H101J | Ceramic 100pF \pm 5% |
| C40 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C41, 42 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C43, 44 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C45, 46 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C47, 48 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C49 | CC45CH1H101J | Ceramic 100pF \pm 5% |
| C50 | CC45SL1H101J | Ceramic 100pF \pm 5% |
| C51 | CC45CH1H330J | Ceramic 33pF \pm 5% |
| C53 | CQ92M1H473K | Mylar 0.047 μ F \pm 10% |
| C54 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| C55, 56 | CC45SL1H101J | Ceramic 100pF \pm 5% |
| C57, 58 | CC45SL1H331J | Ceramic 330pF \pm 5% |
| C59, 60 | CC45SL1H330J | Ceramic 33pF \pm 5% |

RESISTOR

| | | |
|-----|--------------|------------------------------------|
| R1 | PD14CY2E222J | Carbon 2.2k Ω \pm 5% 1/4W |
| R2 | PD14CY2E221J | Carbon 220 Ω \pm 5% 1/4W |
| R3 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R4 | PD14CY2E221J | Carbon 220 Ω \pm 5% 1/4W |
| R5 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R6 | PD14CY2E223J | Carbon 22k Ω \pm 5% 1/4W |
| R7 | PD14CY2E221J | Carbon 220 Ω \pm 5% 1/4W |
| R8 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R9 | PD14CY2E221J | Carbon 220 Ω \pm 5% 1/4W |
| R10 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R11 | PD14CY2E223J | Carbon 22k Ω \pm 5% 1/4W |
| R12 | PD14CY2E222J | Carbon 2.2 Ω \pm 5% 1/4W |
| R13 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R14 | PD14CY2E123J | Carbon 12k Ω \pm 5% 1/4W |
| R15 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R16 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R17 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R18 | PD14CY2E474J | Carbon 470k Ω \pm 5% 1/4W |
| R19 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R20 | PD14CY2E822J | Carbon 8.2k Ω \pm 5% 1/4W |
| R21 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R22 | PD14CY2E224J | Carbon 220k Ω \pm 5% 1/4W |

| Circuit No. | Parts No. | Description |
|-------------|--------------|------------------------------------|
| R23 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R24 | PD14CY2E332J | Carbon 3.3k Ω \pm 5% 1/4W |
| R25, 26 | PD14CY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| R27 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R28 | RC05GF2H225J | Carbon 2.2M Ω \pm 5% 1/2W |
| R29 | PD14CY2E222J | Carbon 2.2k Ω \pm 5% 1/4W |
| R30 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R31 | PD14CY2E224J | Carbon 220k Ω \pm 5% 1/4W |
| R32 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R33 | PD14CY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| R34 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R35 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R36 | PD14CY2E101J | Carbon 100 Ω \pm 5% 1/4W |
| R37 | PD14CY2E473J | Carbon 47k Ω \pm 5% 1/4W |
| R38 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R39 | PD14BY2B471J | Carbon 470 Ω \pm 5% 1/8W |
| R40 | PD14CY2E821J | Carbon 820 Ω \pm 5% 1/4W |
| R41 | PD14CY2E273J | Carbon 27k Ω \pm 5% 1/4W |
| R42 | PD14CY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R43, 44 | PD14CY2E104J | Carbon 100k Ω \pm 5% 1/4W |
| R45 | PD14CY2E103J | Carbon 10k Ω \pm 5% 1/4W |
| R46 | PD14CY2E152J | Carbon 1.5k Ω \pm 5% 1/4W |
| R47 | PD14CY2E104J | Carbon 100k Ω \pm 5% 1/4W |
| R48 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R49 | PD14CY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| R50 | PD14CY2E331J | Carbon 330 Ω \pm 5% 1/4W |
| R51 | PD14CY2E472J | Carbon 4.7k Ω \pm 5% 1/4W |
| R52 | PD14CY2E561J | Carbon 560 Ω \pm 5% 1/4W |

SEMICONDUCTOR

| | | |
|--------|--|----------------------|
| D1 ~ 4 | | Diode 1S73A |
| D5, 6 | | Diode 1N60 |
| D7 | | Diode 1S1555 |
| D9, 10 | | Diode 1S1555 |
| D11 | | Diode WZ-090 |
| Q1 | | FET 3SK35(GR) |
| Q2 | | FET 3SK41(L) |
| Q3,4 | | FET 3SK35(GR) |
| Q5,6 | | Transistor 2SC733(Y) |
| Q7 | | FET 2SK19(GR) |
| Q8 | | Transistor 2SA495(Y) |
| Q9 | | FET 3SK35(GR) |

COIL

| | | |
|--------|-------------|--------------------|
| T1 | L30-0263-05 | IFT |
| T2 | L30-0010-05 | IFT |
| T3 | L30-0008-05 | B.P.F. coil |
| T4 | L30-0009-05 | B.P.F. coil |
| T5 | L30-0010-05 | IFT |
| T6 | L30-0021-05 | IFT |
| T7 | L30-0009-05 | B.P.F. coil |
| T8 | L30-0008-05 | B.P.F. coil |
| T9 | L30-0010-05 | IFT |
| T10 | L31-0284-05 | Filter coil (BLU) |
| T11 | L31-0252-05 | Filter coil (GRN) |
| T12 | L31-0251-05 | Filter coil (WHT) |
| L1 ~ 6 | L33-0104-05 | Ferri-inductor |
| XF1 | L71-0018-05 | Crystal oscillator |

MISCELLANEOUS

| | | |
|-----|-------------|-------------------------------|
| VR1 | R12-3025-05 | Trimmer potentiometer 10k(B) |
| VR2 | R12-7013-05 | Trimmer potentiometer 500k(B) |

■ PARTS LIST AF UNIT (X49-0008-01)

| Circuit No | Parts No. | Description | | |
|----------------------|----------------|--------------|----------------|---------------|
| CAPACITOR | | | | |
| C1 | CE04W1H010(RL) | Electrolytic | 1 μ F | 50WV |
| C2 | CE04W0J101(RL) | Electrolytic | 100 μ F | 6.3WV |
| C3 | CE04W1C101(RL) | Electrolytic | 100 μ F | 16WV |
| C4 | CE04W1E100(RL) | Electrolytic | 10 μ F | 25WV |
| C5 | CQ93M1H472K | Mylar | 0.0047 μ F | \pm 10% |
| C6 | CE04W0F470(RL) | Electrolytic | 47 μ F | 3.15WV |
| C7 | CE04W1C330(RL) | Electrolytic | 33 μ F | 16WV |
| C8 | CE04W1C221(RL) | Electrolytic | 220 μ F | 16WV |
| C9 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| C10 | CC94SL1H101K | Ceramic | 100pF | \pm 10% |
| C11 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| C12 | CE04W1H010(RL) | Electrolytic | 1 μ F | 50WV |
| C13 | CQ92M1H473K | Mylar | 0.047 μ F | \pm 10% |
| C14 | CE04W1HR47 | Electrolytic | 0.47 μ F | 50WV |
| C15 | CQ92M1H103K | Mylar | 0.01 μ F | \pm 10% |
| C16, 17 | CE04W1E100(RL) | Electrolytic | 10 μ F | 25WV |
| C18 | CK45B1H331K | Ceramic | 330pF | \pm 10% |
| C19 | CE04W1E100(RL) | Electrolytic | 10 μ F | 25WV |
| C20 | CE04W1E3R3(RL) | Electrolytic | 3.3 μ F | 25WV |
| C21 | CE04W1E100(RL) | Electrolytic | 10 μ F | 25WV |
| C22 ~ 25 | CQ93M1H123K | Mylar | 0.012 μ F | \pm 10% |
| C26 | CK45F1E203Z | Ceramic | 0.02 μ F | +80% -20% |
| C27, 28 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| RESISTOR | | | | |
| R1 | PD14BY2E223J | Carbon | 22k Ω | \pm 5% 1/4W |
| R2 | PD14BY2E103J | Carbon | 10k Ω | \pm 5% 1/4W |
| R3 | PD14BY2E102J | Carbon | 1k Ω | \pm 5% 1/4W |
| R4 | PD14CY2E471J | Carbon | 470 Ω | \pm 5% 1/4W |
| R5 | PD14BY2E102J | Carbon | 1k Ω | \pm 5% 1/4W |
| R6 | PD14BY2E152J | Carbon | 1.5k Ω | \pm 5% 1/4W |
| R7 | PD14BY2E221J | Carbon | 220 Ω | \pm 5% 1/4W |
| R8 | PD14BY2E471J | Carbon | 470 Ω | \pm 5% 1/4W |
| R9 | PD14BY2E330J | Carbon | 33 Ω | \pm 5% 1/4W |
| R10 | PD14BY2E103J | Carbon | 10k Ω | \pm 5% 1/4W |
| R11, 12 | R92-0041-25 | Metal plate | 0.47 Ω | \pm 10% 1W |
| R13 | PD14BY2E682J | Carbon | 6.8k Ω | \pm 5% 1/4W |
| R14 | PD14CY2E473J | Carbon | 47k Ω | \pm 5% 1/4W |
| R15 | PD14BY2E682J | Carbon | 6.8k Ω | \pm 5% 1/4W |
| R16 | PD14BY2E332J | Carbon | 3.3k Ω | \pm 5% 1/4W |
| R17 | PD14CY2E273J | Carbon | 27k Ω | \pm 5% 1/4W |
| R18 | PD14BY2E562J | Carbon | 5.6k Ω | \pm 5% 1/4W |
| R19 | PD14BY2E221J | Carbon | 220 Ω | \pm 5% 1/4W |
| R20 | PD14BY2E392J | Carbon | 3.9k Ω | \pm 5% 1/4W |
| R21 | PD14BY2E222J | Carbon | 2.2k Ω | \pm 5% 1/4W |
| R22 | PD14BY2E821J | Carbon | 820 Ω | \pm 5% 1/4W |
| R23 | PD14BY2E102J | Carbon | 1k Ω | \pm 5% 1/4W |
| R24 | PD14CY2E562J | Carbon | 5.6k Ω | \pm 5% 1/4W |
| R25 | PD14CY2E474J | Carbon | 470k Ω | \pm 5% 1/4W |
| R26 | PD14CY2E104J | Carbon | 100k Ω | \pm 5% 1/4W |
| R27 | PD14BY2E223J | Carbon | 22k Ω | \pm 5% 1/4W |
| R28 | PD14BY2E224J | Carbon | 220k Ω | \pm 5% 1/4W |
| R29 | PD14BY2E104J | Carbon | 100k Ω | \pm 5% 1/4W |
| R30 | PD14BY2E332J | Carbon | 3.3k Ω | \pm 5% 1/4W |
| R31 | PD14BY2E103J | Carbon | 10k Ω | \pm 5% 1/4W |
| R32 ~ 34 | PD14CY2E103J | Carbon | 10k Ω | \pm 5% 1/4W |
| R35 | PD14BY2E105J | Carbon | 1M Ω | \pm 5% 1/4W |
| R36 | PD14BY2E224J | Carbon | 220k Ω | \pm 5% 1/4W |
| R37 | PD14CY2E222J | Carbon | 2.2k Ω | \pm 5% 1/4W |
| R38 | PD14CY2E120J | Carbon | 12 Ω | \pm 5% 1/4W |
| SEMICONDUCTOR | | | | |
| D1, 2 | | Diode | 1N60 | |
| D3 | | Diode | 1S1555 | |

| Circuit No. | Parts No. | Description | |
|----------------------|-------------|-----------------------|---------------|
| D4 | | Zener diode | WZ130 |
| D5 | | Diode | V06B |
| Q1 | | Transistor | 2SC733(Y) |
| Q2 | | Transistor | 2SC734(Y) |
| Q3 | | Transistor | 2SD90(O) red |
| Q4 | | Transistor | 2SB473(C.D.N) |
| Q5 | | Transistor | 2SC1000(GR) |
| Q6 | | Transistor | 2SC733(Y) |
| MISCELLANEOUS | | | |
| — | F01-0074-24 | Heat sink x 2 | |
| L | | | |
| L1 | L33-0032-05 | Choke coil | |
| — | L33-0088-05 | Ferri-inductor | |
| VR1 | R12-4015-05 | Trimmer potentiometer | |

■ PARTS LISTS OF CARRIER UNIT (X50-009-01)

| Circuit No. | Parts No. | Description | | |
|----------------------|--------------|--------------------|---------------|---------------|
| CAPACITOR | | | | |
| C1 | CK94YG1E102Z | Ceramic | 0.001 μ F | +80% -20% |
| C2 | CC45CH1H220J | Ceramic | 22pF | \pm 5% |
| C3 | CK94YG1E102Z | Ceramic | 0.001 μ F | +80% -20% |
| C4 | CC45CH1H220J | Ceramic | 22pF | \pm 5% |
| C5 | CK94YG1E102Z | Ceramic | 0.001 μ F | +80% -20% |
| C6 | CC45CH1H220J | Ceramic | 22pF | \pm 5% |
| C7 | CK94YG1E102Z | Ceramic | 0.001 μ F | +80% -20% |
| C8 | CK94YX1H471K | Ceramic | 470pF | \pm 10% |
| C9 | CC94TH1H221J | Ceramic | 220pF | \pm 5% |
| C10 | CC94SL1H101K | Ceramic | 100pF | \pm 10% |
| C11 | CC45CH1H100J | Ceramic | 10pF | \pm 5% |
| C12 | CK94YG1E403Z | Ceramic | 0.04 μ F | +80% -20% |
| C13 | CC45CH1H220J | Ceramic | 22pF | \pm 5% |
| C14 | CK94YG1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| RESISTOR | | | | |
| R1 ~ 4 | PD14BY2E682J | Carbon | 6.8k Ω | \pm 5% 1/4W |
| R5 | PD14BY2E333J | Carbon | 33k Ω | \pm 5% 1/4W |
| R6 | PD14BY2E682J | Carbon | 6.8k Ω | \pm 5% 1/4W |
| R7 | PD14BY2E102J | Carbon | 1k Ω | \pm 5% 1/4W |
| R8 | PD14BY2E683J | Carbon | 68k Ω | \pm 5% 1/4W |
| R9 | PD14BY2E101J | Carbon | 100 Ω | \pm 5% 1/4W |
| SEMICONDUCTOR | | | | |
| D1 ~ 4 | | Diode | 1S1555 | |
| Q1, 2 | | Transistor | 2SC460(B) | |
| MISCELLANEOUS | | | | |
| L1 ~ 6 | L33-0104-05 | Ferri-inductor | | |
| T1 | L32-0003-05 | Oscillating coil | | |
| TC1 ~ 3 | C05-0013-15 | Ceramic trimmer | | |
| X1 | L77-0123-05 | Crystal oscillator | | |
| X2 | L77-0122-05 | Crystal oscillator | | |
| X3 | L77-0120-05 | Crystal oscillator | | |

■ PARTS LIST OF MARKER UNIT (X52-0005-01)

| Circuit No. | Parts No. | Description | | |
|----------------------|--------------|---------------------------------|---------------|---------------|
| CAPACITOR | | | | |
| C1 | CQ93M1H103K | Mylar | 0.01 μ F | \pm 10% |
| C2 | CC45CH1H151J | Ceramic | 150pF | \pm 5% |
| C3 | CC94TH2H101J | Ceramic | 100pF | \pm 5% |
| C4 | CC45CH1H330J | Ceramic | 33pF | \pm 5% |
| C5 | CK94YG1E403Z | Ceramic | 0.04 μ F | +80% -20% |
| C6 | CC45CH1H390J | Ceramic | 39pF | \pm 5% |
| C7 | CC45CH1H330J | Ceramic | 33pF | \pm 5% |
| C8 | CC45CH1H820J | Ceramic | 82pF | \pm 5% |
| C9 | CC45CH1H201J | Ceramic | 200pF | \pm 10% |
| C10 | CC94SL1H470K | Ceramic | 47pF | \pm 10% |
| C11 | CC94SL2H050D | Ceramic | 5pF | \pm 0.5pF |
| C12 | CK94YG1E403Z | Ceramic | 0.04 μ F | +80% -20% |
| C13 | CC45CH1H470J | Ceramic | 47pF | \pm 5% |
| RESISTOR | | | | |
| R1 | PD14CY2E473J | Carbon | 47k Ω | \pm 5% 1/4W |
| R2 | PD14CY2E103J | Carbon | 10k Ω | \pm 5% 1/4W |
| R3 | PD14CY2E101J | Carbon | 100 Ω | \pm 5% 1/4W |
| R4 | PD14CY2E473J | Carbon | 47k Ω | \pm 5% 1/4W |
| R5 | PD14CY2E472J | Carbon | 4.7k Ω | \pm 5% 1/4W |
| R6 | PD14CY2E224J | Carbon | 220k Ω | \pm 5% 1/4W |
| R7 | RC05GF2H105J | Carbon | 1M Ω | \pm 5% 1/2W |
| R8 ~ 10 | PD14CY2E472J | Carbon | 4.7k Ω | \pm 5% 1/4W |
| SEMICONDUCTOR | | | | |
| Q1 | | Transistor 2SC373 or 2SC458 (B) | | |
| Q2, 3 | | Transistor 2SC373 | | |
| Q4 | | Transistor 2SC373 or 2SC458 (B) | | |
| D1 | | Diode | 1N60 | |
| L1 | L33-0118-05 | Ferri-inductor | | |
| X1 | L77-0009-05 | Crystal oscillator | | |
| - | J19-0013-04 | Crystal oscillator holder | | |
| - | C05-0029-15 | Ceramic trimmer | | |

■ PARTS LIST OF GENERATOR UNIT (X52-0010-01)

| Circuit No. | Parts No. | Description | | |
|------------------|----------------|--------------|---------------|-----------|
| CAPACITOR | | | | |
| C1, 2 | CC94SL1H101K | Ceramic | 100pF | \pm 10% |
| C3 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| C4 | CE04W1E4R7 | Electrolytic | 4.7 μ F | 25WV |
| C5 | CE04W1H010 | Electrolytic | 1 μ F | 50WV |
| C6 | CK45F1E502Z | Ceramic | 0.005 μ F | +80% -20% |
| C7 | CE04W1C470(RL) | Electrolytic | 47 μ F | 16WV |
| C8 | CQ92M1H473K | Mylar | 0.047 μ F | \pm 10% |
| C9 | CE04W1H010 | Electrolytic | 1 μ F | 50WV |
| C10 | CE04W1E100 | Electrolytic | 10 μ F | 25WV |
| C11 | CE04W1E4R7 | Electrolytic | 4.7 μ F | 25WV |
| C12 | CE04W1E3R3 | Electrolytic | 3.3 μ F | 25WV |
| C13, 14 | CK45F1E102Z | Ceramic | 0.001 μ F | +80% -20% |
| C15 | CC94SL1H220K | Ceramic | 22pF | \pm 10% |
| C16 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| C17 | CQ92M1H473K | Mylar | 0.047 μ F | \pm 10% |
| C18 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |

| Circuit No. | Parts No. | Description | | |
|----------------------|----------------|--|---------------|---------------|
| C19 | CC94SL1H220K | Ceramic | 22pF | \pm 10% |
| C20 | CE04W1C470(RL) | Electrolytic | 47 μ F | 16WV |
| C21 | CC94SL1H101K | Ceramic | 100pF | \pm 10% |
| C22 | CE04W1E3R3 | Electrolytic | 3.3 μ F | 25WV |
| C23 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| C24 | CQ92M1H473K | Mylar | 0.047 μ F | \pm 10% |
| C25 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| C26 | CC94SL1H271K | Ceramic | 270pF | \pm 10% |
| C29 | CK45F1E403Z | Ceramic | 0.04 μ F | +80% -20% |
| RESISTOR | | | | |
| R1 | PD14BY2E332J | Carbon | 3.3k Ω | \pm 5% 1/4W |
| R2 | PD14BY2E473J | Carbon | 47k Ω | \pm 5% 1/4W |
| R3 | PD14BY2E101J | Carbon | 100 Ω | \pm 5% 1/4W |
| R4 | PD14BY2E222J | Carbon | 2.2k Ω | \pm 5% 1/4W |
| R5 | PD14BY2E123J | Carbon | 12k Ω | \pm 5% 1/4W |
| R6 | PD14BY2E102J | Carbon | 1k Ω | \pm 5% 1/4W |
| R7, 8 | PD14BY2E223J | Carbon | 22k Ω | \pm 5% 1/4W |
| R9 | PD14BY2E154J | Carbon | 150k Ω | \pm 5% 1/4W |
| R10 | PD14BY2E221J | Carbon | 220 Ω | \pm 5% 1/4W |
| R11 | PD14BY2E102J | Carbon | 1k Ω | \pm 5% 1/4W |
| R12 | PD14BY2E821J | Carbon | 820 Ω | \pm 5% 1/4W |
| R13, 14 | PD14BY2E221J | Carbon | 220 Ω | \pm 5% 1/4W |
| R15 | PD14BY2E331J | Carbon | 330 Ω | \pm 5% 1/4W |
| R16 | PD14BY2E474J | Carbon | 470k Ω | \pm 5% 1/4W |
| R17 | PD14CY2E221J | Carbon | 220 Ω | \pm 5% 1/4W |
| R18 | PD14CY2E681J | Carbon | 680 Ω | \pm 5% 1/4W |
| R20 | PD14BY2E472J | Carbon | 4.7k Ω | \pm 5% 1/4W |
| R21 | PD14BY2E183J | Carbon | 18k Ω | \pm 5% 1/4W |
| R22 | PD14CY2E474J | Carbon | 470k Ω | \pm 5% 1/4W |
| R23 | PD14CY2E152J | Carbon | 1.5k Ω | \pm 5% 1/4W |
| R24 | PD14CY2E102J | Carbon | 1k Ω | \pm 5% 1/4W |
| SEMICONDUCTOR | | | | |
| D1 ~ 8 | | Diode 1N60 | | |
| D9 ~ 11 | | Diode 1S1555 | | |
| Q1 | | FET 2SK24E | | |
| Q2, 3 | | Transistor 2SC733Y | | |
| Q4 | | FET 3SK35GR | | |
| COIL | | | | |
| L1 | L33-0104-05 | Ferri-inductor | | |
| L3 | L33-0101-05 | Ferri-inductor | | |
| T1 | L30-0021-05 | Balanced modulator coil (3.395 MHz) | | |
| MISCELLANEOUS | | | | |
| RL1 | S51-1002-05 | Reed relay | | |
| TC1, 2 | C05-0015-15 | Ceramic trimmer | | |
| VR2 | R12-0054-05 | Trimmer potentiometer 100 Ω (B) | | |
| VR3 | R12-1012-05 | Trimmer potentiometer 1k Ω (B) | | |

■ PARTS LIST OF VOX UNIT (X54-0001-00)

| Circuit No. | Parts No. | Description | | |
|------------------|--------------|--------------|--------------|-----------|
| CAPACITOR | | | | |
| C1 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% |
| C2 | CE04W0F470 | Electrolytic | 47 μ F | 3.15WV |
| C3 | CK94YG1E403Z | Ceramic | 0.04 μ F | +80% -20% |

| Circuit No. | Parts No. | Description | | | |
|----------------------|--------------|-------------------|----------------|-----------|------|
| C4 | CK94YG1E203Z | Ceramic | 0.02 μ F | +80% -20% | |
| C5 | CE04W1H3R3 | Electrolytic | 3.3 μ F | 50WV | |
| C6 | CE04W1H010 | Electrolytic | 1 μ F | 50WV | |
| C7 | CK94YY1H472M | Ceramic | 0.0047 μ F | \pm 20% | |
| C8 | CK94YG1E403Z | Ceramic | 0.04 μ F | +80% -20% | |
| C9, 10 | CE04W1H3R3 | Electrolytic | 3.3 μ F | 50WV | |
| C24 | CC45SL1H331K | Ceramic | 330pF | \pm 10% | |
| C25 | CK45F1E103Z | Ceramic | 0.01 μ F | +80% -20% | |
| RESISTOR | | | | | |
| R1 | PD14CY2E104J | Carbon | 100k Ω | \pm 5% | 1/4W |
| R2 | PD14CY2E223J | Carbon | 22k Ω | \pm 5% | 1/4W |
| R3 | PD14CY2E334J | Carbon | 330k Ω | \pm 5% | 1/4W |
| R4 | PD14CY2E472J | Carbon | 4.7k Ω | \pm 5% | 1/4W |
| R5 | PD14CY2E334J | Carbon | 330k Ω | \pm 5% | 1/4W |
| R6 | PD14CY2E563J | Carbon | 56k Ω | \pm 5% | 1/4W |
| R7 | PD14CY2E562J | Carbon | 5.6k Ω | \pm 5% | 1/4W |
| R8 | PD14CY2E102J | Carbon | 1k Ω | \pm 5% | 1/4W |
| R9 | PD14CY2E222J | Carbon | 2.2k Ω | \pm 5% | 1/4W |
| R10 | PD14CY2E102J | Carbon | 1k Ω | \pm 5% | 1/4W |
| R11 | PD14CY2E103J | Carbon | 10k Ω | \pm 5% | 1/4W |
| R12 | PD14CY2E153J | Carbon | 15k Ω | \pm 5% | 1/4W |
| R13, 14 | PD14CY2E472J | Carbon | 4.7k Ω | \pm 5% | 1/4W |
| R15 | PD14CY2E471J | Carbon | 470 Ω | \pm 5% | 1/4W |
| R16 | PD14CY2E4R7J | Carbon | 4.7 Ω | \pm 5% | 1/4W |
| R17 | PD14CY2E473J | Carbon | 47k Ω | \pm 5% | 1/4W |
| R18 | PD14BY2B102J | Carbon | 1k Ω | \pm 5% | 1/8W |
| SEMICONDUCTOR | | | | | |
| D1 ~ 4 | | Diode | 1N60 | | |
| D5 | | Diode | S-1.5-Q1 | | |
| D6 ~ 8 | | Diode | 1N60 | | |
| Q1 ~ 4 | | Transistor | 2SC373 | | |
| Q5 | | Transistor | 2SA562-Y | | |
| Q6, 7 | | Transistor | 2SC373 | | |
| Q8 | | Transistor | 2SA562-Y | | |
| MISCELLANEOUS | | | | | |
| T1 | L13-0001-05 | Input transformer | | | |

■ PARTS LISTS OF NB UNIT (X54-1080-10)

| Circuit No. | Parts No. | Description | | | |
|------------------|----------------|--------------|---------------|-------------|--|
| CAPACITOR | | | | | |
| C1, 2 | CC45SL1H020D | Ceramic | 2pF | \pm 0.5pF | |
| C3 | CK45F1H203Z | Ceramic | 0.02 μ F | +80% -20% | |
| C4 | CK45F1H103Z | Ceramic | 0.01 μ F | +80% -20% | |
| C5, 6 | CC45SL1H101J | Ceramic | 100pF | \pm 5% | |
| C7 | CE04W1E100(RL) | Electrolytic | 10 μ F | 25WV | |
| C8, 9 | CK45F1H103Z | Ceramic | 0.01 μ F | +80% -20% | |
| C10, 11 | CK45F1H203Z | Ceramic | 0.02 μ F | +80% -20% | |
| C12 | CK45D1H102M | Ceramic | 0.001 μ F | \pm 20% | |
| C13, 14 | CK45F1H103Z | Ceramic | 0.01 μ F | +80% -20% | |
| C15 | CE04W1H010(RL) | Electrolytic | 1 μ F | 50WV | |
| C16 | CK45F1H203Z | Ceramic | 0.02 μ F | +80% -20% | |
| C17 | CK45F1H103Z | Ceramic | 0.01 μ F | +80% -20% | |
| C18 | CK45D1H102M | Ceramic | 0.001 μ F | \pm 20% | |
| C19 | CC45SL1H331J | Ceramic | 330pF | \pm 5% | |
| C20 | CK45F1H103Z | Ceramic | 0.01 μ F | +80% -20% | |
| C21 | CK45F1E403Z | Ceramic | 0.04 μ F | +80% -20% | |
| C22 | CK45F1H203Z | Ceramic | 0.02 μ F | +80% -20% | |
| C23, 24 | CK45F1H103Z | Ceramic | 0.01 μ F | +80% -20% | |

| Circuit No. | Parts No. | Description | | | |
|----------------------|--------------|----------------|---------------|----------|------|
| RESISTOR | | | | | |
| R1 | PD14CY2E151J | Carbon | 150 Ω | \pm 5% | 1/4W |
| R2 | PD14CY2E221J | Carbon | 220 Ω | \pm 5% | 1/4W |
| R3 | PD14CY2E102J | Carbon | 1k Ω | \pm 5% | 1/4W |
| R4 | PD14CY2E472J | Carbon | 4.7k Ω | \pm 5% | 1/4W |
| R5 | PD14CY2E102J | Carbon | 1k Ω | \pm 5% | 1/4W |
| R6 | PD14CY2E472J | Carbon | 4.7k Ω | \pm 5% | 1/4W |
| R7 | PD14CY2E682J | Carbon | 6.8k Ω | \pm 5% | 1/4W |
| R8 | PD14CY2E221J | Carbon | 220 Ω | \pm 5% | 1/4W |
| R9 | PD14CY2E223J | Carbon | 22k Ω | \pm 5% | 1/4W |
| R10 | PD14CY2E333J | Carbon | 33k Ω | \pm 5% | 1/4W |
| R11 | PD14CY2E683J | Carbon | 68k Ω | \pm 5% | 1/4W |
| R12 | PD14CY2E102J | Carbon | 1k Ω | \pm 5% | 1/4W |
| R13 | PD14CY2E471J | Carbon | 470 Ω | \pm 5% | 1/4W |
| R14, 15 | PD14CY2E103J | Carbon | 10k Ω | \pm 5% | 1/4W |
| R16 | PD14CY2E333J | Carbon | 33k Ω | \pm 5% | 1/4W |
| R17 | PD14CY2E103J | Carbon | 10k Ω | \pm 5% | 1/4W |
| R18 | PD14CY2E222J | Carbon | 2.2k Ω | \pm 5% | 1/4W |
| SEMICONDUCTOR | | | | | |
| Q1 | | FET | 3SK22(GR) | | |
| Q2 | | FET | 2SK19(GR) | | |
| Q3 | | IC | TA7045M(R) | | |
| Q4 | | Transistor | 2SC460B | | |
| Q5, 6 | | Transistor | 2SC733(Y) | | |
| D1 ~ 4 | | Diode | 1S73A | | |
| D5, 6 | | Diode | 1N60 | | |
| D7 | | Varistor | MV-13 | | |
| COIL | | | | | |
| T1 ~ 3 | L30-0010-05 | IFT | 3395KHz | | |
| T4 | L31-0286-05 | NB coil (A) | 3395KHz | | |
| T5 | L31-0287-05 | NB coil (B) | 3395KHz | | |
| T6 | L30-0010-05 | IFT | 3395KHz | | |
| T7 | L30-0021-05 | IFT | 3395KHz | | |
| L1, 2 | L33-0104-05 | Ferri-inductor | | | |

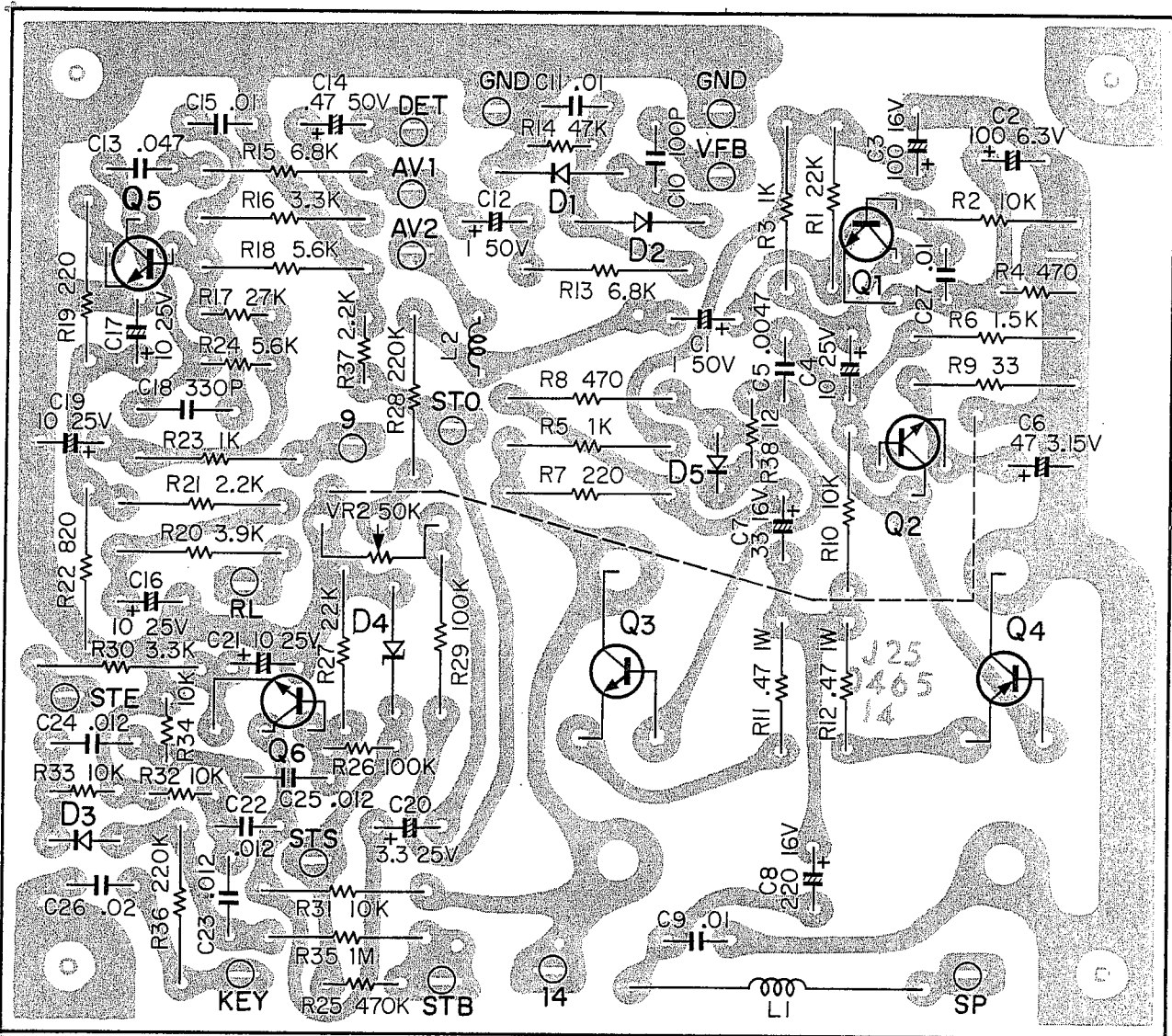
■ PARTS LISTS OF FAN UNIT (X54-1100-01)

| Circuit No. | Parts No. | Description | | | |
|----------------------|-------------|------------------------------|--|--|--|
| MISCELLANEOUS | | | | | |
| - | E22-0207-05 | Lug board x 2 | | | |
| - | - | | | | |
| - | F07-0316-04 | Fan cover | | | |
| - | F09-0020-05 | Fan 75 ϕ | | | |
| - | - | | | | |
| - | J21-1153=-4 | Fan motor mounting hardware | | | |
| - | J32-0117-04 | Hexagon boss | | | |
| - | - | | | | |
| - | L33-0025-05 | Heater choke (1 μ H) x 2 | | | |
| - | - | | | | |
| - | T40-0012-05 | Motor 100V | | | |

■ PARTS LISTS OF INDICATOR UNIT
(X54-1120-00)

| Circuit No. | Parts No. | Description |
|----------------------|--------------|-----------------------------|
| RESISTOR | | |
| R1 | PD14BY2E681J | Carbon 680Ω ±5% 1/4W |
| R2 | PD14BY2E471J | Carbon 470Ω ±5% 1/4W |
| R3 | PD14BY2E681J | Carbon 680Ω ±5% 1/4W |
| SEMICONDUCTOR | | |
| D1 ~ 3 | | LED TLR-104 |
| MISCELLANEOUS | | |
| - | A30-0079-14 | Dial back board |
| - | E23-0046-04 | Terminal |
| - | J21-1150-14 | Indicator mounting hardware |
| - | J32-0074-04 | Hexagon boss x 2 |

PC BOARD



Q1,6:2SC733(Y) Q2:2SC734(Y) Q3:2SD90(O) Q4:2SB473(C.D.N) Q5:2SC1000(GR)
 D1,2:1N60 D3:1S1555 D4:WZ-130 D5:V06B

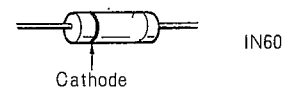
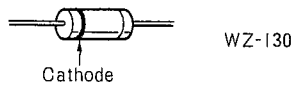
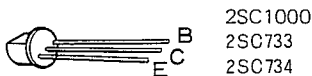
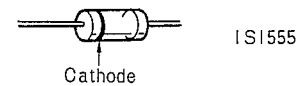
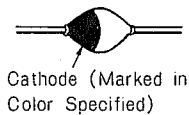
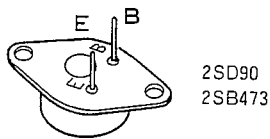


Figure 21. AF Board (X49-0008-01) Diagram

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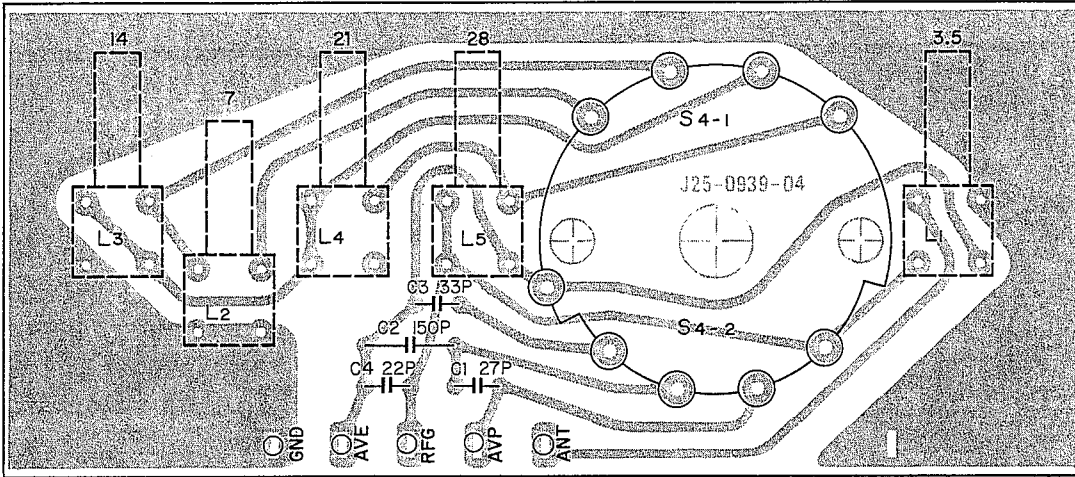
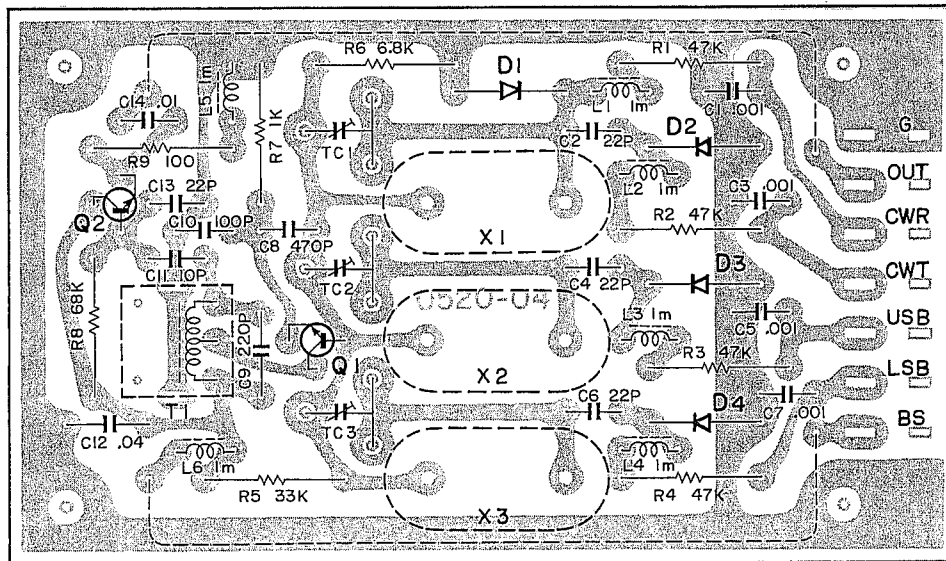


Figure 22. ANTENNA COIL Board (X44-1090-00) Diagram



Q1,2 : 2SC460 (B), D1~4 : 1S1555

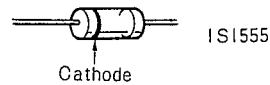
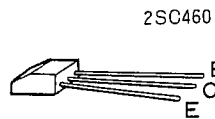


Figure 23. CARRIER Board (X50-0009-01) Diagram

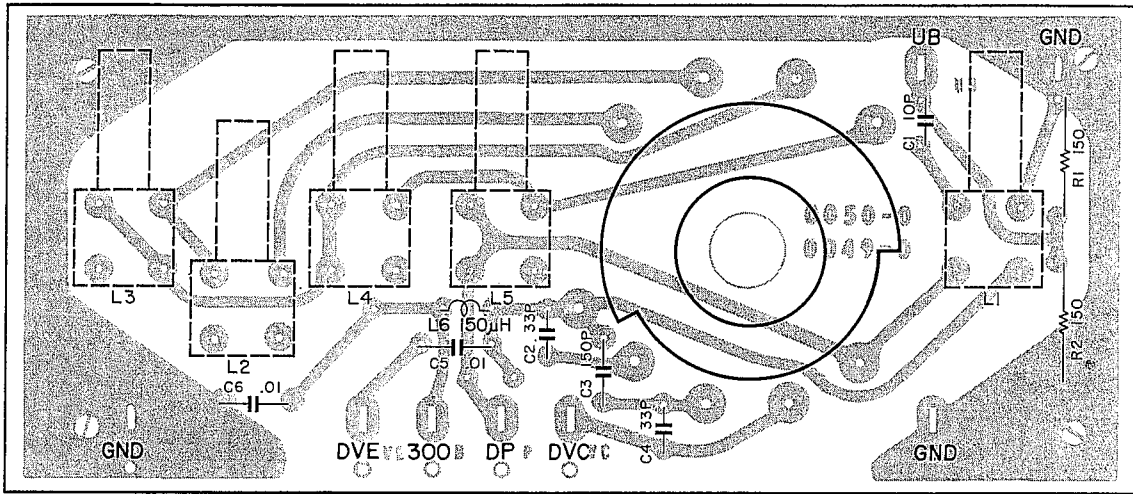
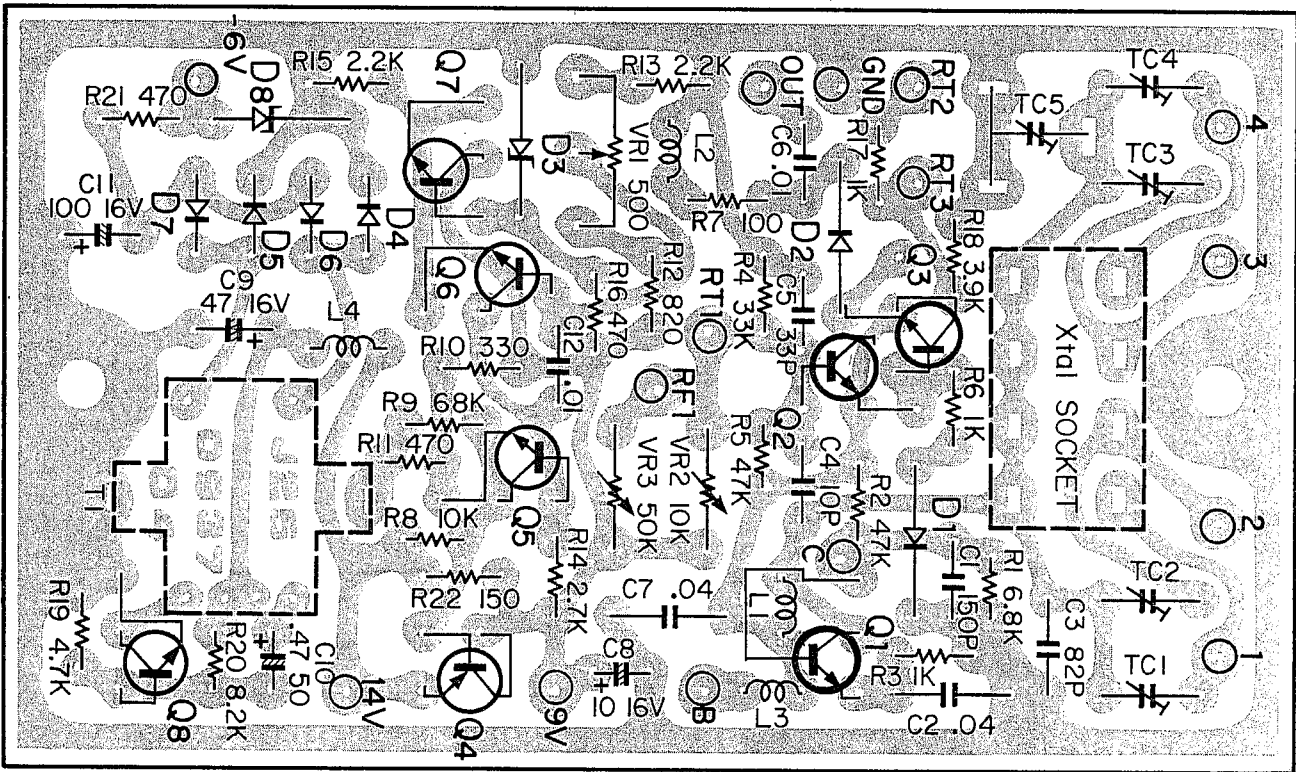


Figure 24. DRIVER COIL Board (X40-0017-01) Diagram



Q1~3:2SC460(B) Q4:2SA606(L) Q5~7:2SC372 Q8:2SC735(Y)
 D1,2:1N60 D3,8:WZ-061 D4~7:1S1555

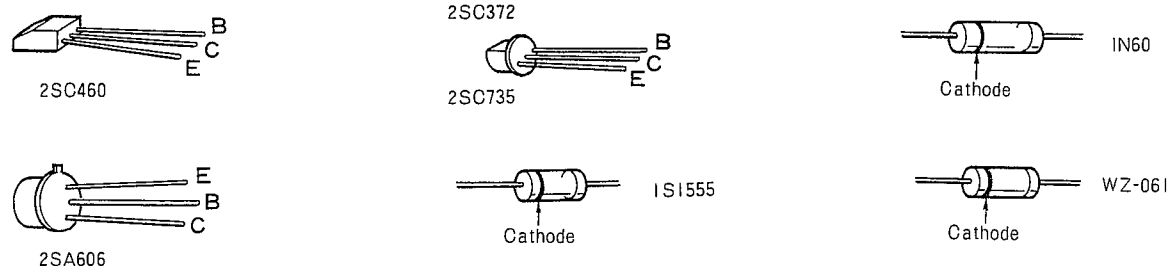
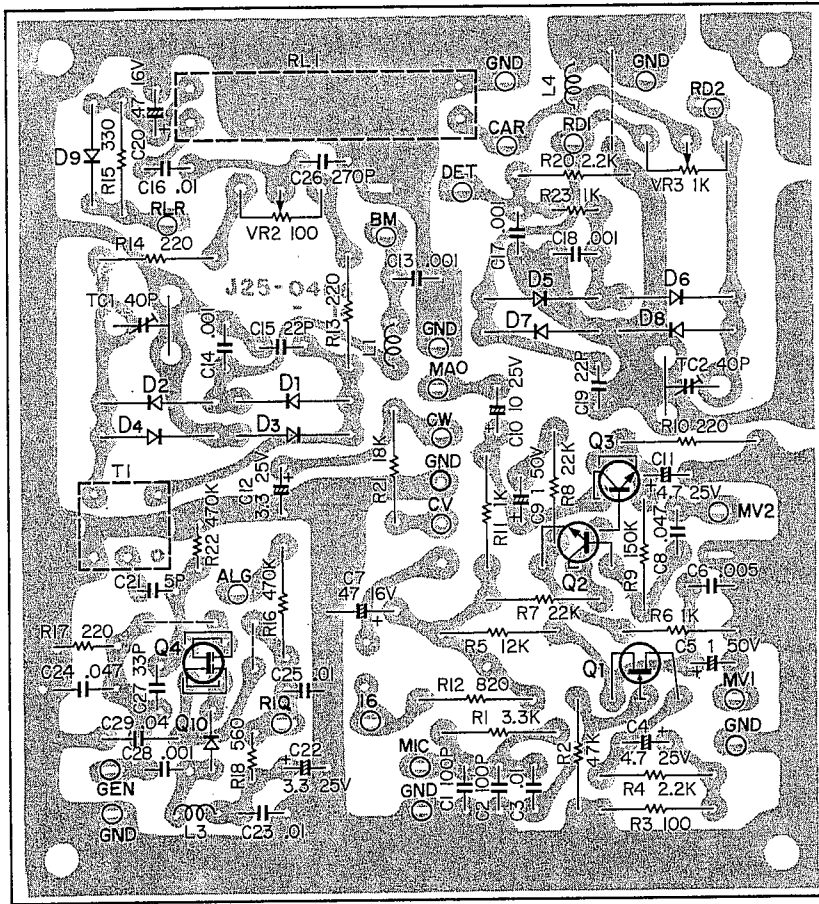


Figure 25. FIXED CHANNEL-AVR Board (X43-1100-00) Diagram



Q1:2SK24(E) Q2,3:2SC733(Y) Q4:3SK35(GR) D1~D9:1N60 D10:1S1555

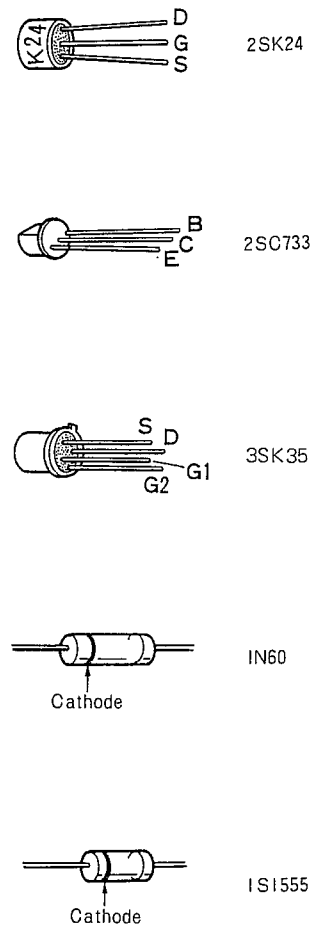


Figure 26. GENERATOR Board (X52-0010-01) Diagram

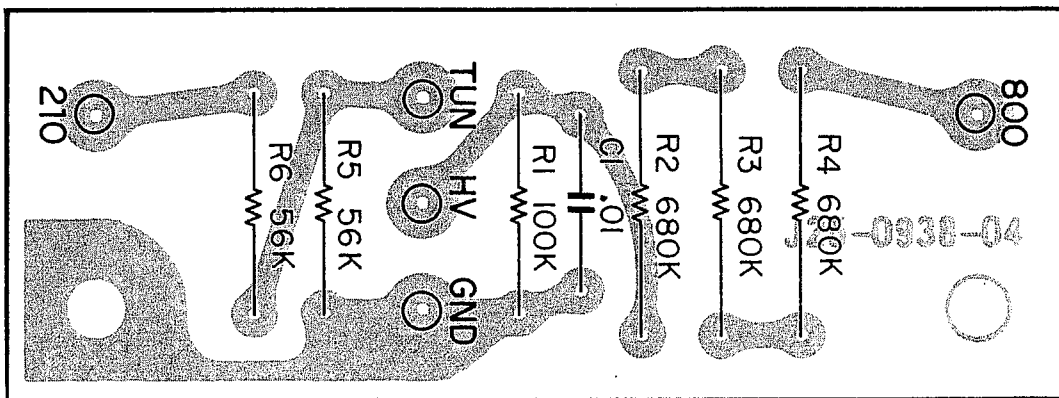
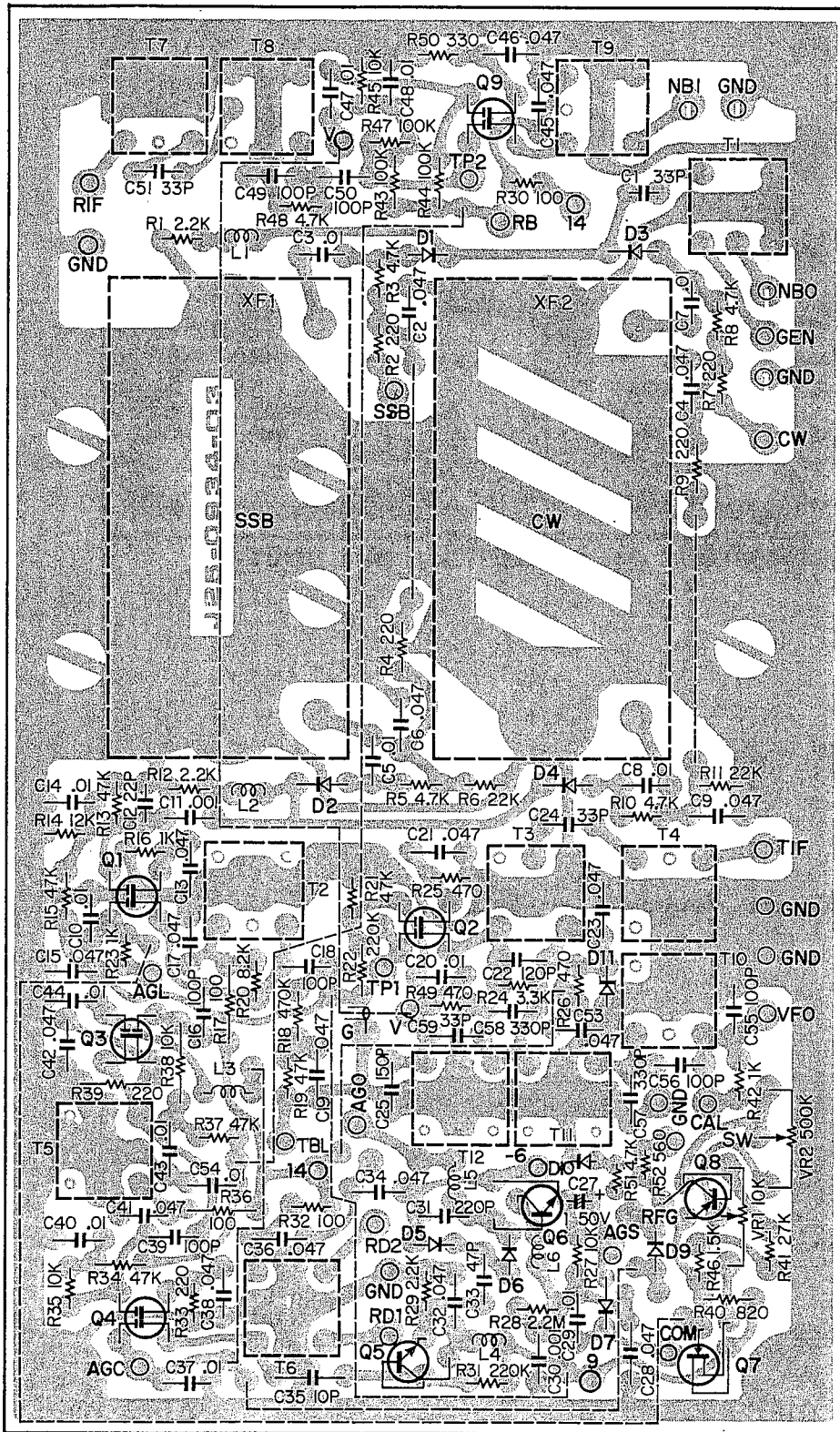
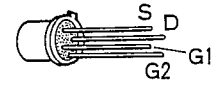


Figure 27. HV Board (X43-1110-00) Diagram



3SK41
3SK35



2SA495

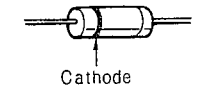


2SC733

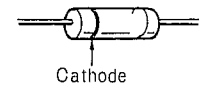
2SK19



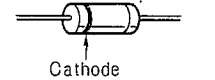
1S93A



1N60

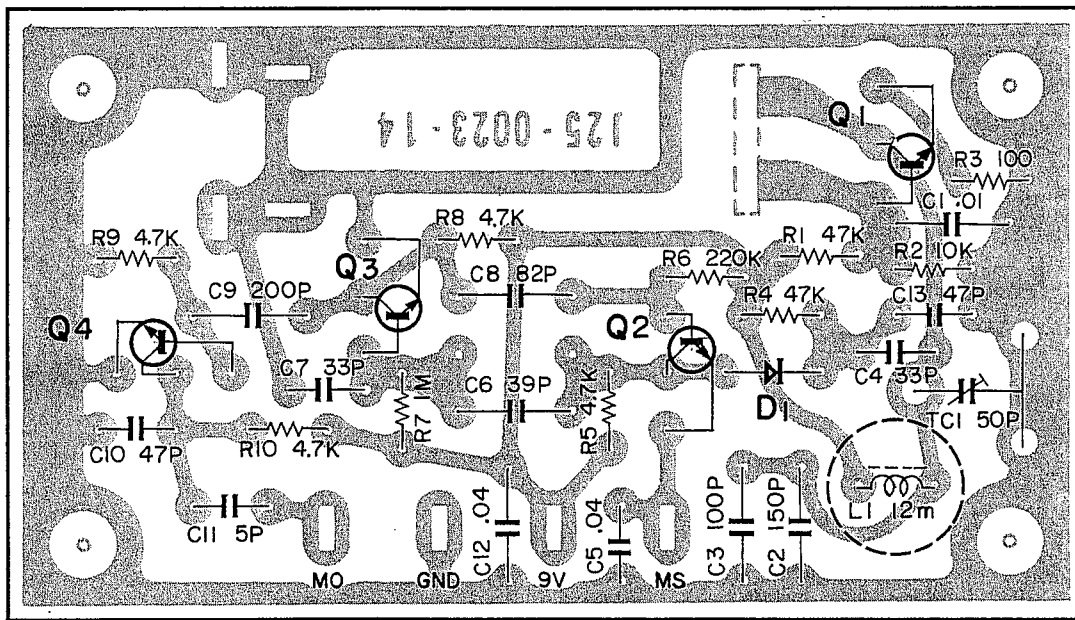


WZ-090



Q1,3,4,9:3SK35(GR) Q2:3SK41(L) Q5,6:2SC733(Y) Q7:2SK19(GR) Q8:2SA495(Y)
D1~4:1S73A D5,6:1N60 D7,9,10:1S1555 D11:WZ-090

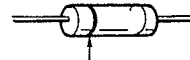
Figure 28. IF Board (X48-1060-00) Diagram



Q1, 4 : 2SC373 or 2SC458 (B), Q2, 3 : 2SC373, D1 : 1N60



2SC373



1N60

Cathode

Figure 29. MARKER Board (X52-0005-01) Diagram

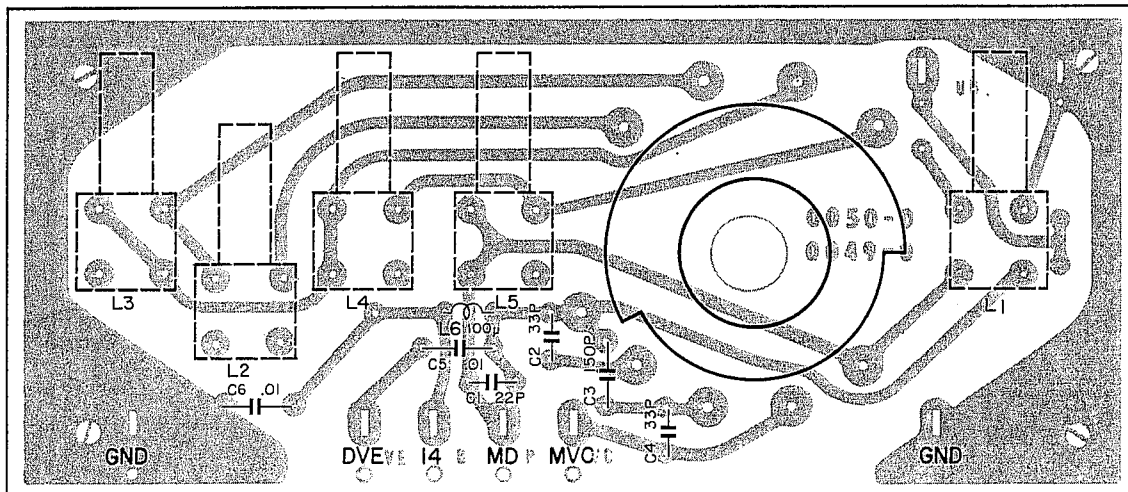
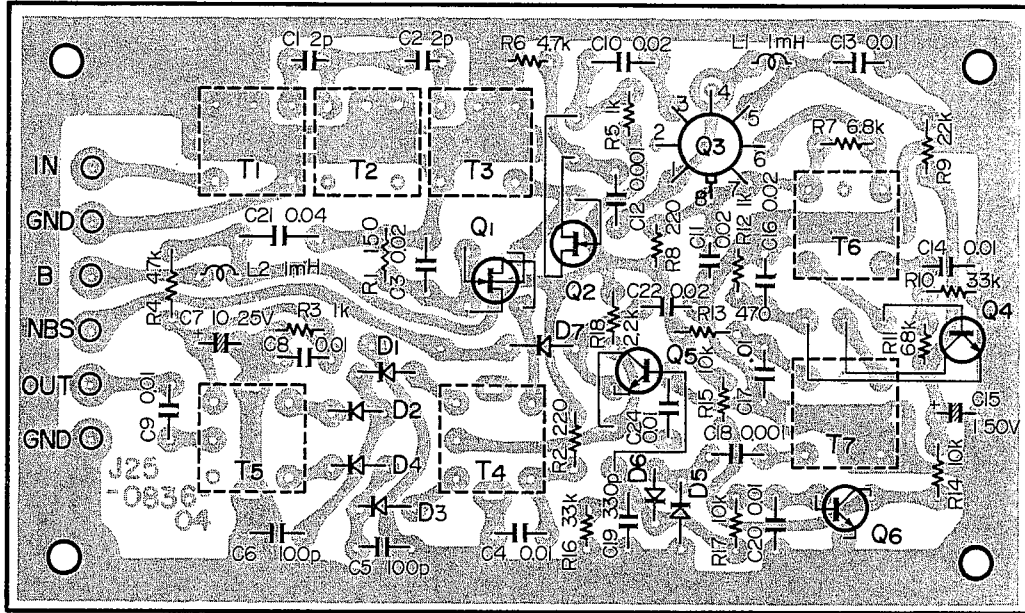
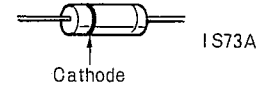
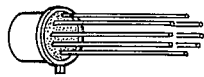
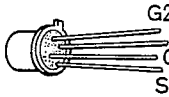


Figure 30. MIXER COIL Board (X40-0018-01) Diagram

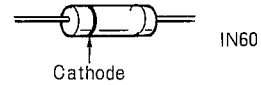
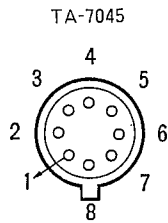
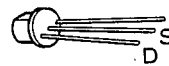


D1~4 : 1S73A D5,6 : 1N60 D7 : MV-13 Q1 : 3SK22(GR)
 Q2 : 2SK19 (GR) Q3 : TA7045M (R) Q4 : 2SC460 B Q5,6 : 2SC733 (Y)

3SK22



2SK19



2SC733



Figure 31. NB BOARD (X54-1080-10) Board

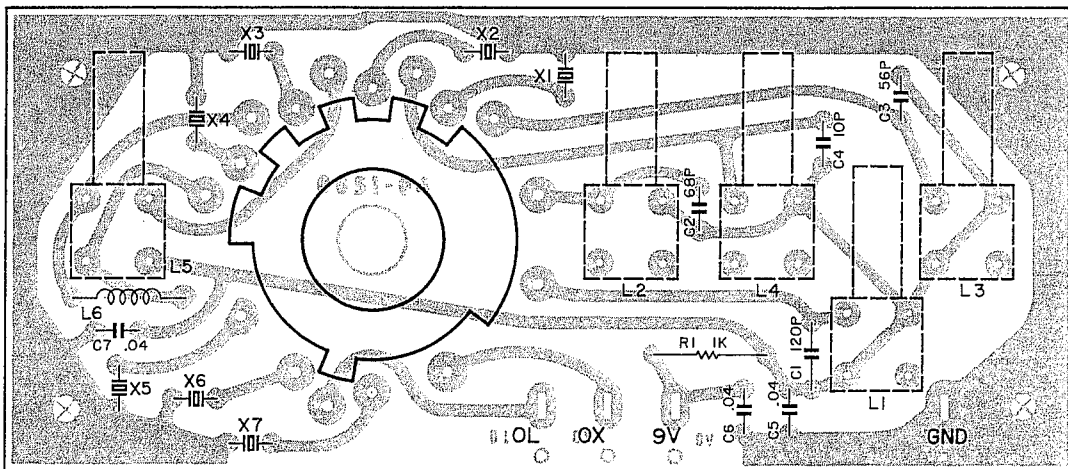
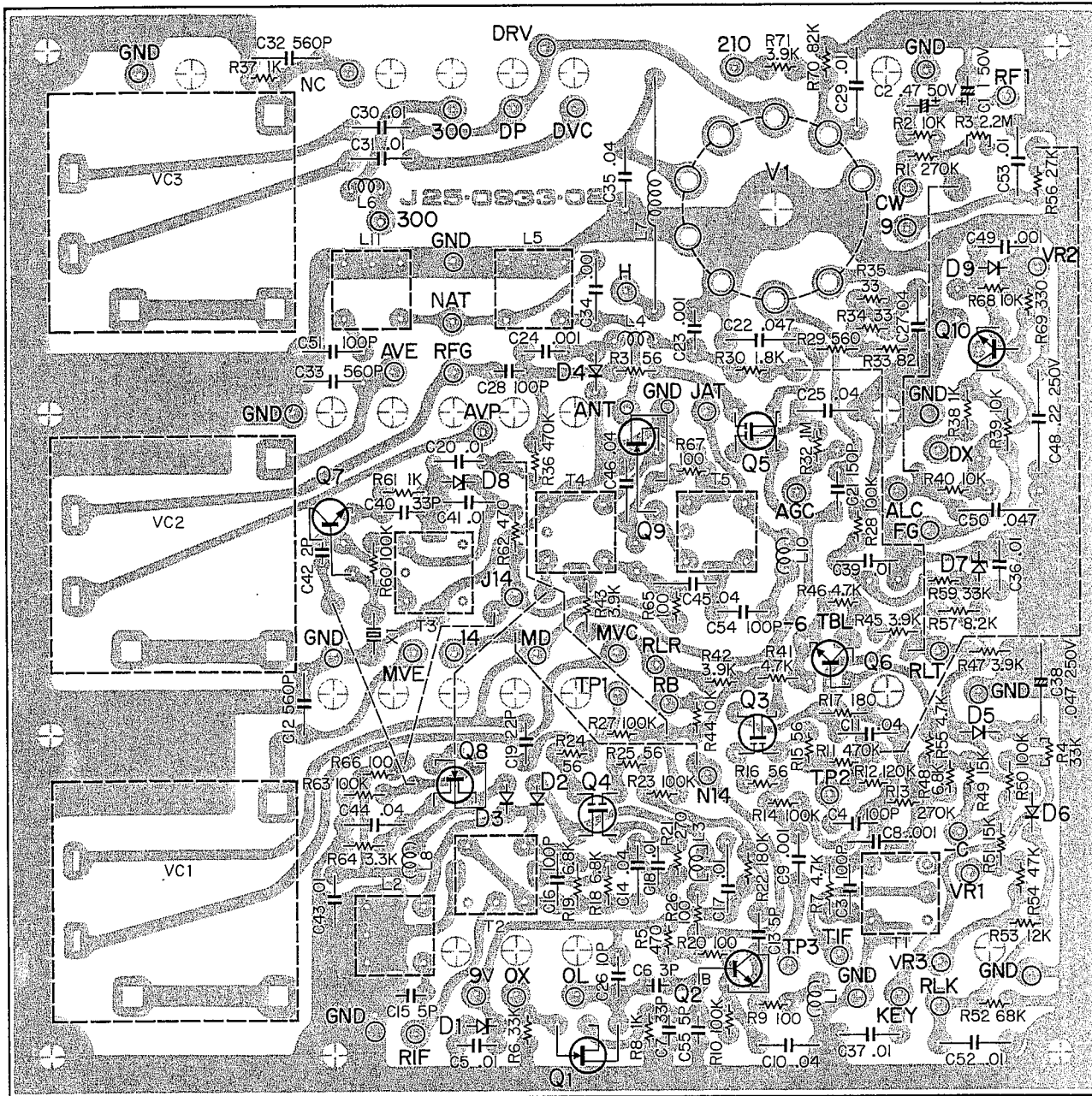


Figure 32. OSCILLATOR COIL Board (X40-0019-01) Diagram



Q1,9:2SK19(GR) Q2:2SC460(B) Q3:3SK41(L) Q4:3SK35(GR) Q5:3SK35(Y) Q6:2SC733(Y) Q7:2SC535(A)
 Q8:3SK22(GR) Q10:2SC856 V1:12BY7A D1,7,8:WZ-090 D2~4:1S73A D5,6:V06B D9:1S1555

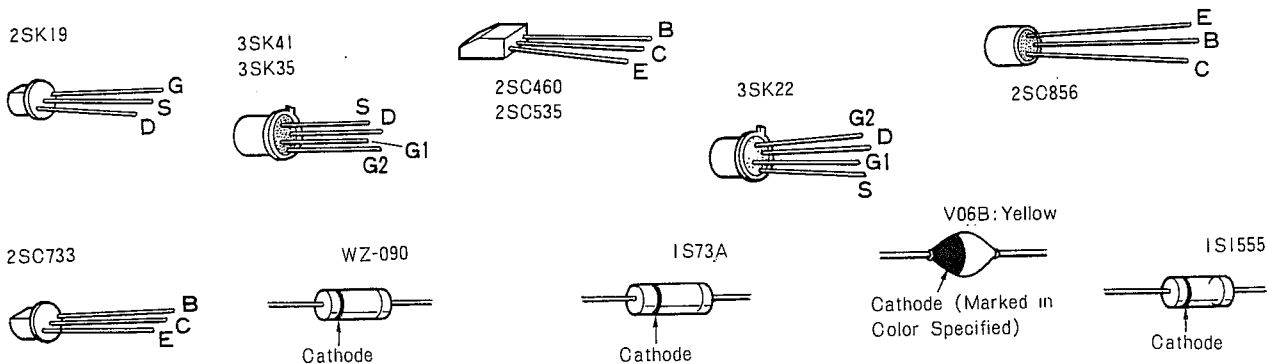
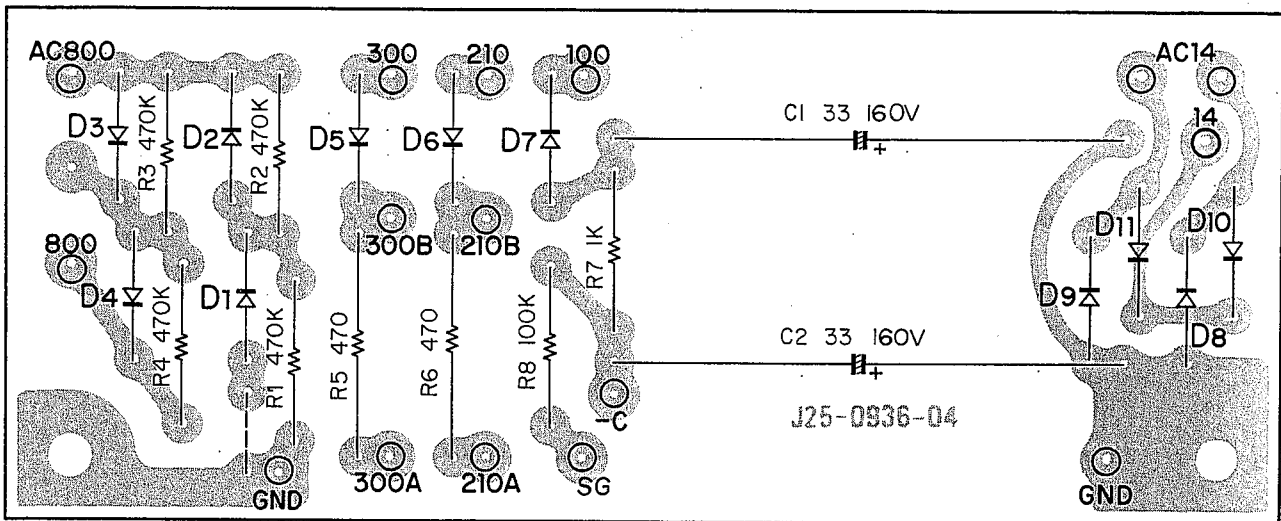
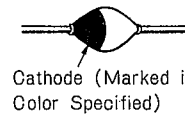


Figure 33. RF Board (X44-1080-00) Diagram

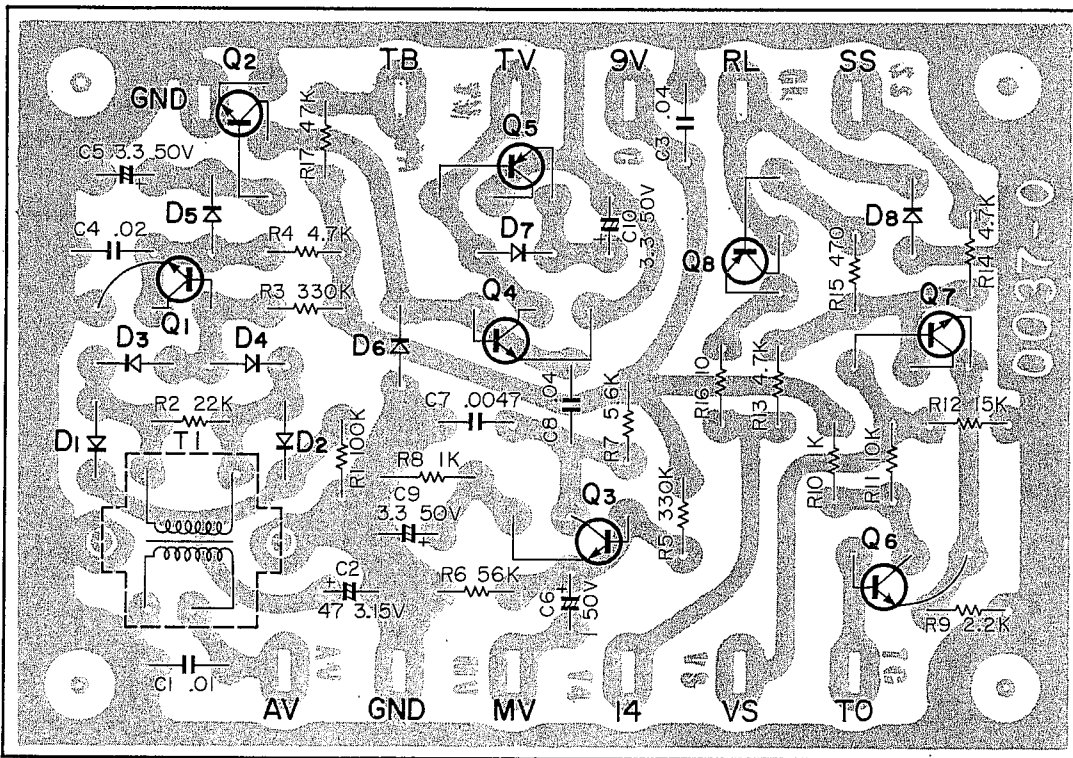


D1~6:V08J D7:V06E D8~11:V06B



V06B: Yellow
V08J: Green
V06E: Red

Figure 34. RECTIFIER Board (X43-1090-00) Diagram



Q1~4, 6, 7: 2SC373, Q5, 8: 2SA562(Y) D1~4, 6~8: IN60, D5: S-1.5-01

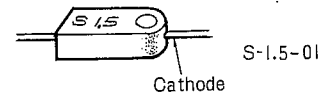
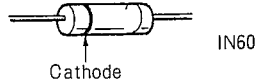
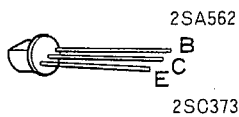
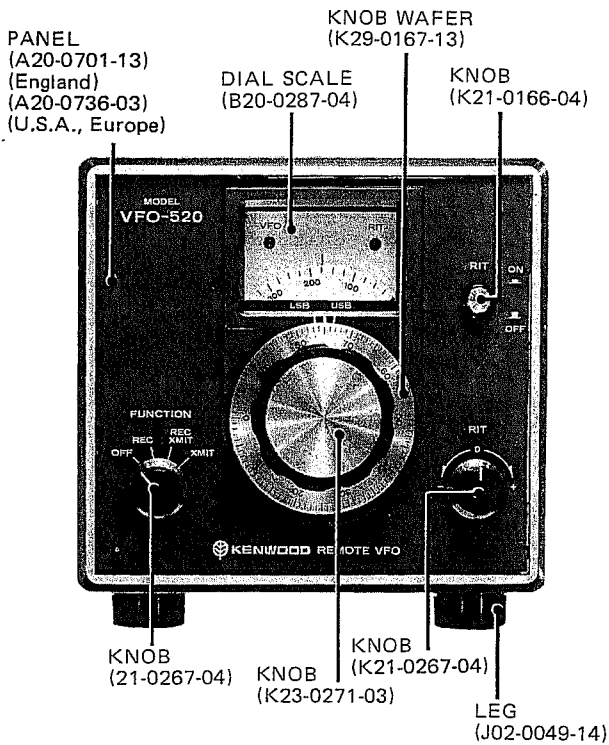


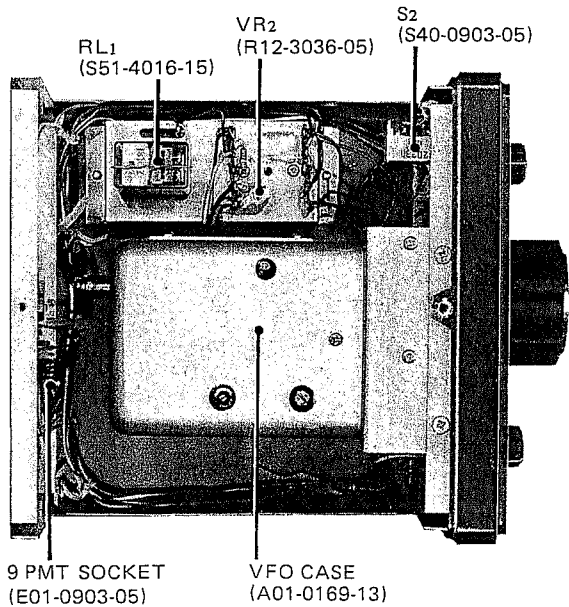
Figure 35. VOX Board (X54-0001-00) Diagram

VFO-520

EXTERNAL VIEW



TOP VIEW PARTS



SPECIFICATION

FREQUENCY RANGE:

| | |
|---------------|---------------------|
| 80 meter band | 3.5 to 4.0 MHz. |
| 40 meter band | 7.0 to 7.5 MHz. |
| 20 meter band | 14.0 to 14.5 MHz. |
| 15 meter band | 21.0 to 21.5 MHz. |
| 10 meter band | A 28.0 to 28.5 MHz. |
| | B 28.5 to 29.1 MHz. |
| | C 29.1 to 29.7 MHz. |

OSCILLATION FREQUENCY:

4.9 to 5.5 MHz.

OSCILLATION CIRCUIT:

VFO: Clapp Oscillator.

OUTPUT VOLTAGE:

1 volt \pm 3 db (across a 470 ohm load).

FREQUENCY STABILITY:

Within \pm 100 Hz per 30 minutes after 3 minutes of warm-up

SOLID STATE COMPLEMENT:

2 transistors.
 2 FET's
 6 diodes.

POWER REQUIREMENTS:

The VFO-520 receives power from the TS-520.
 12.6 VAC, 80 ma. 12.6 VDC, 40 ma. 9.0 VDC, 25 ma.

DIMENSIONS:

6.5" wide x 5.9" high x 7.5" (excluding feet).

WEIGHT:

6.6 lbs. (shipping weight 8.36 lbs.)

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VFO-520

■ PARTS LISTS OF VFO-520 (Y57-1020-00)

| Circuit No. | Parts No. | Description |
|----------------------|--------------|---------------------------------------|
| CAPACITOR | | |
| C2 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% |
| RESISTOR | | |
| R1 | PD14BY2E102J | Carbon 1k Ω \pm 5% 1/4W |
| R2 | PD14BY2E392J | Carbon 3.9k Ω \pm 5% 1/4W |
| SEMICONDUCTOR | | |
| D2 | | Diode V06B |
| MISCELLANEOUS | | |
| - | A01-0212-13 | Case (A) |
| - | A01-0213-03 | Case (B) |
| - | A20-0701-13 | Panel (England) |
| - | A20-0736-03 | Panel (U.S.A., Europe) |
| - | A22-0136-23 | Sub panel |
| - | A23-0430-03 | Rear panel |
| - | B01-0078-23 | Escutcheon |
| - | B10-0131-04 | Front glass |
| - | B20-0287-14 | Dial scale |
| PL1, 2 | B30-0079-05 | Pilot lamp (12V 40mA) |
| - | B40-0855-04 | Name plate (serial) |
| - | B42-0009-04 | Passed sticker (Europe, England) |
| - | B46-0047-00 | WARRANTY card (U.S.A.) |
| - | B50-1108-00 | Operating manual (U.S.A., Europe) |
| - | B50-1109-00 | Operating manual (England) |
| - | D23-0115-05 | Ball bearing |
| - | D23-0116-05 | Ball bearing ass'y |
| J1 | E01-0903-05 | 9P MT socket |
| - | E05-0904-05 | 9P MT plug |
| - | E09-0204-05 | 2P plug |
| - | E14-0101-05 | 1P plug |
| - | E22-0405-04 | Lug board |
| - | F15-0161-04 | Shading plate |
| - | H01-1015-04 | Carton case (Inside) (England) |
| - | H01-1044-04 | Carton case (Inside) (U.S.A., Europe) |
| - | H03-0285-04 | Carton case (Outside)(U.S.A., Europe) |
| - | H03-0303-04 | Carton case (Outside) (England) |
| - | H10-0933-03 | Polystyrene foamed fixture |
| - | H10-0935-04 | Protection Board |
| - | H10-0968-03 | Polystyrene foamed fixture |
| - | H20-0372-04 | Protection cover |
| - | H25-0002-04 | Accessory bag |
| - | H25-0029-04 | Accessory bag |
| - | H25-0078-00 | Instruction bag |

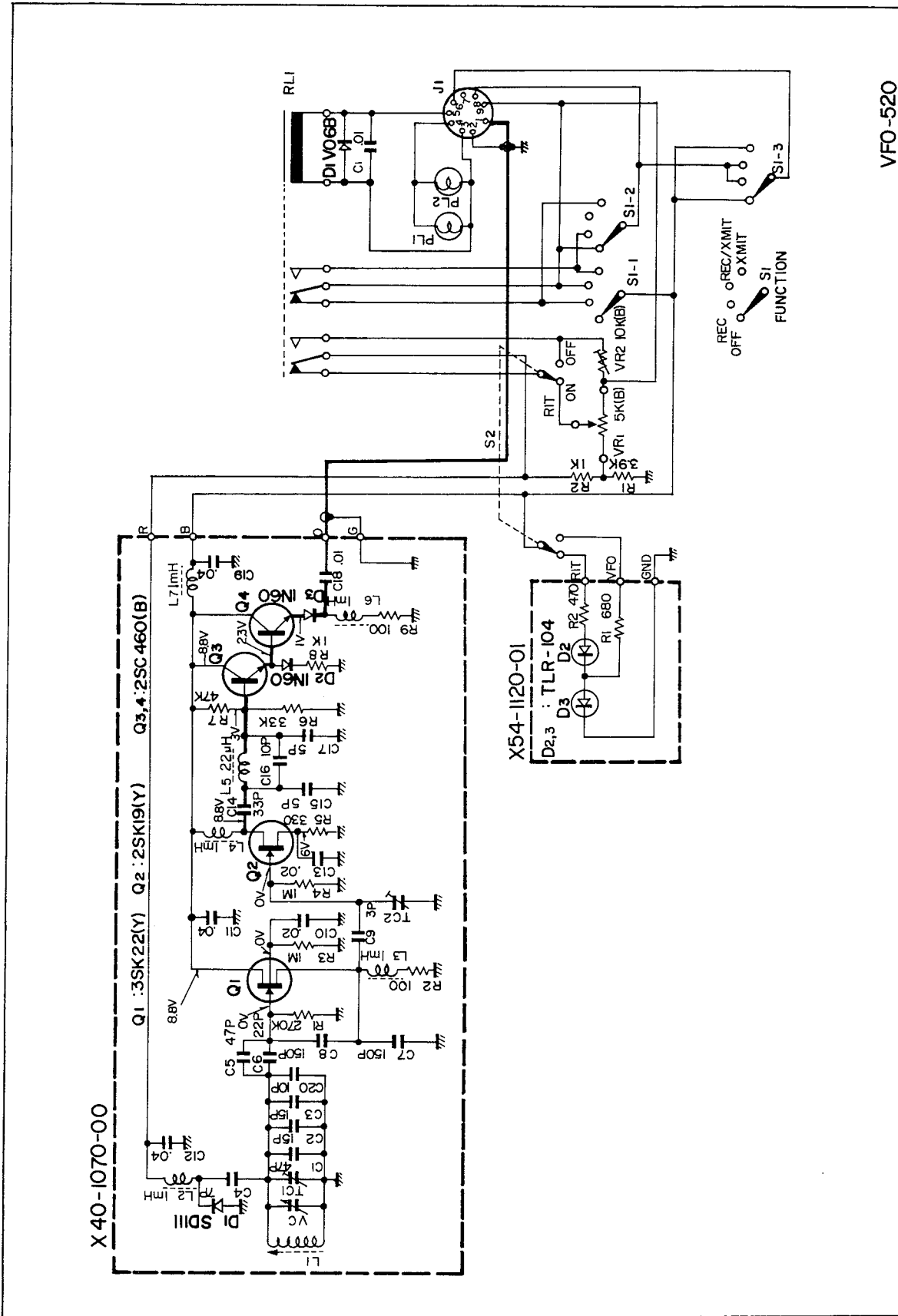
| Circuit No. | Parts No. | Description |
|-------------|-------------|------------------------------------|
| - | J01-0025-04 | Sub let |
| - | J02-0049-14 | Leg x 4 |
| - | J19-0360-04 | Coupling clamp |
| - | J21-1145-04 | Pilot lamp |
| - | J21-1147-04 | Coupling mounting hardware |
| - | J21-1152-04 | Relay mounting hardware |
| - | J32-1030-14 | Round boss x 2 |
| - | J32-0185-04 | Hexagonal boss x 2 |
| - | J41-0020-04 | Knob bushing |
| - | J61-0019-05 | Cable wrapping band |
| - | K21-0267-04 | Knob (RIT) x 2 |
| - | K23-0271-03 | Knob (MAIN) |
| - | K29-0166-04 | Knob (Push) |
| - | K29-0167-23 | Knob wafer |
| VR1 | R03-2020-05 | Variable resistor 5k Ω (B) |
| VR2 | R12-3036-05 | Variable resistor 10k Ω (B) |
| S1 | S10-1102-05 | Rotary switch (FUNCTION) |
| S2 | S40-2023-05 | Push switch (RIT) |
| RL1 | S51-4016-15 | Relay |
| - | X40-1070-00 | VFO unit |
| - | X54-1120-01 | Indicator unit |

■ PARTS LIST OF INDICATOR UNIT (X54-1120-01)

| Circuit No. | Parts No. | Description |
|-------------|--------------|-----------------------------------|
| - | E23-0046-04 | Terminal |
| R1 | PD14BY2E681J | Carbon 680 Ω \pm 5% 1/4W |
| R2 | PD14BY2E471J | Carbon 470 Ω \pm 5% 1/4W |
| D2.3 | | LED (TLR-104) |

VFO-520

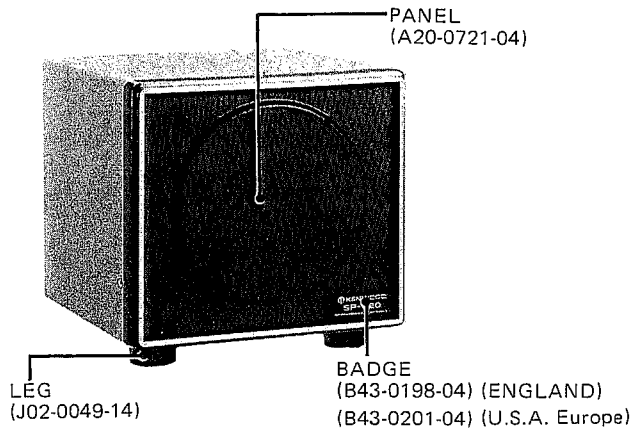
■ SCHEMATIC DIAGRAM



VFO-520

SP-520

EXTERNAL VIEW



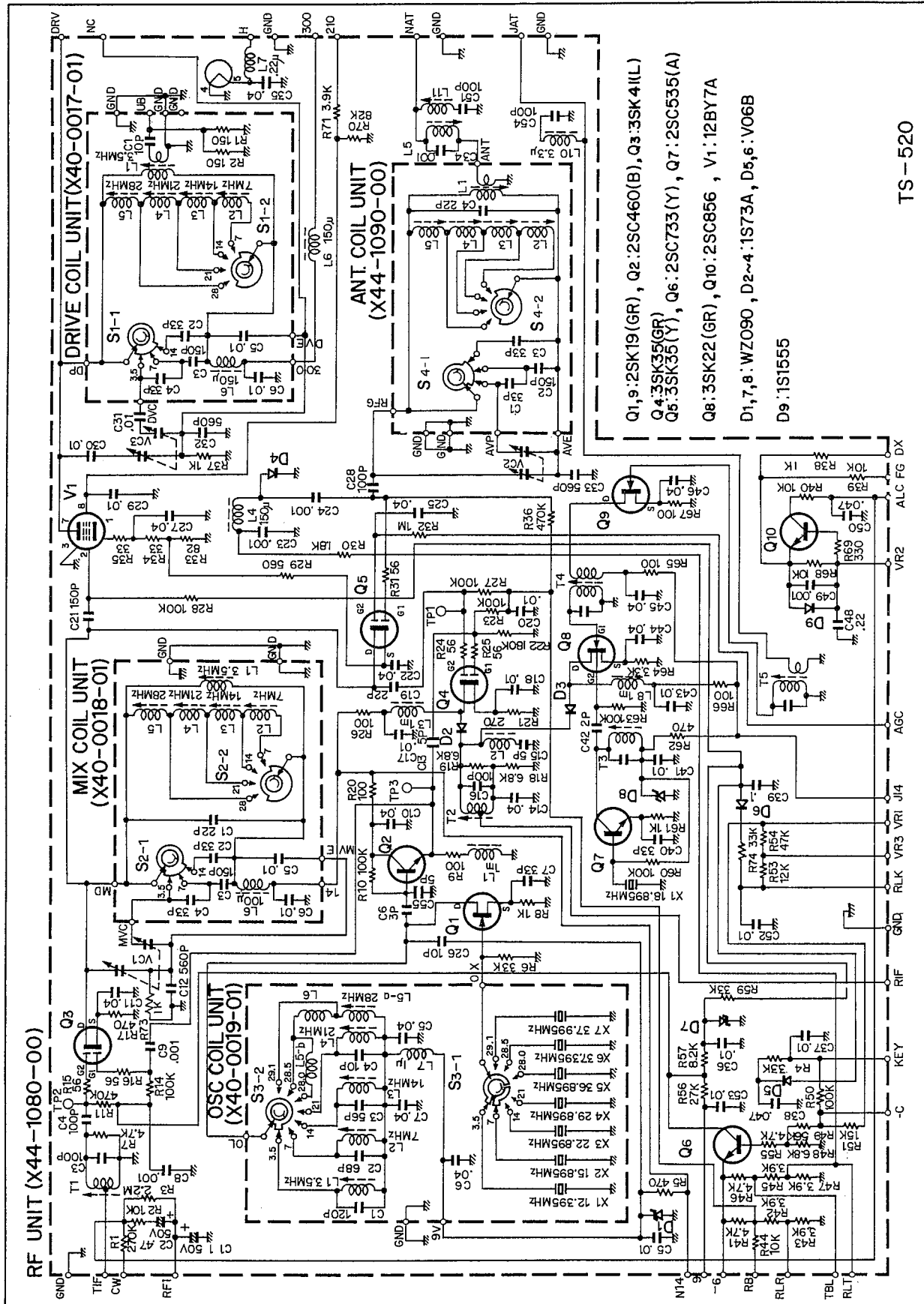
SPECIFICATION

| | |
|--------------------|---|
| Speaker size | 4.75" |
| Maximum input | 2 watts |
| Impedance | 8 ohms |
| Frequency response | 100 Hz to 5 kHz |
| Dimensions | 6.5" wide x 6.0" high x 7.5" deep (excluding feet) |
| Weight | 3.0 lbs. 5.28 lbs. (shipping weight) |

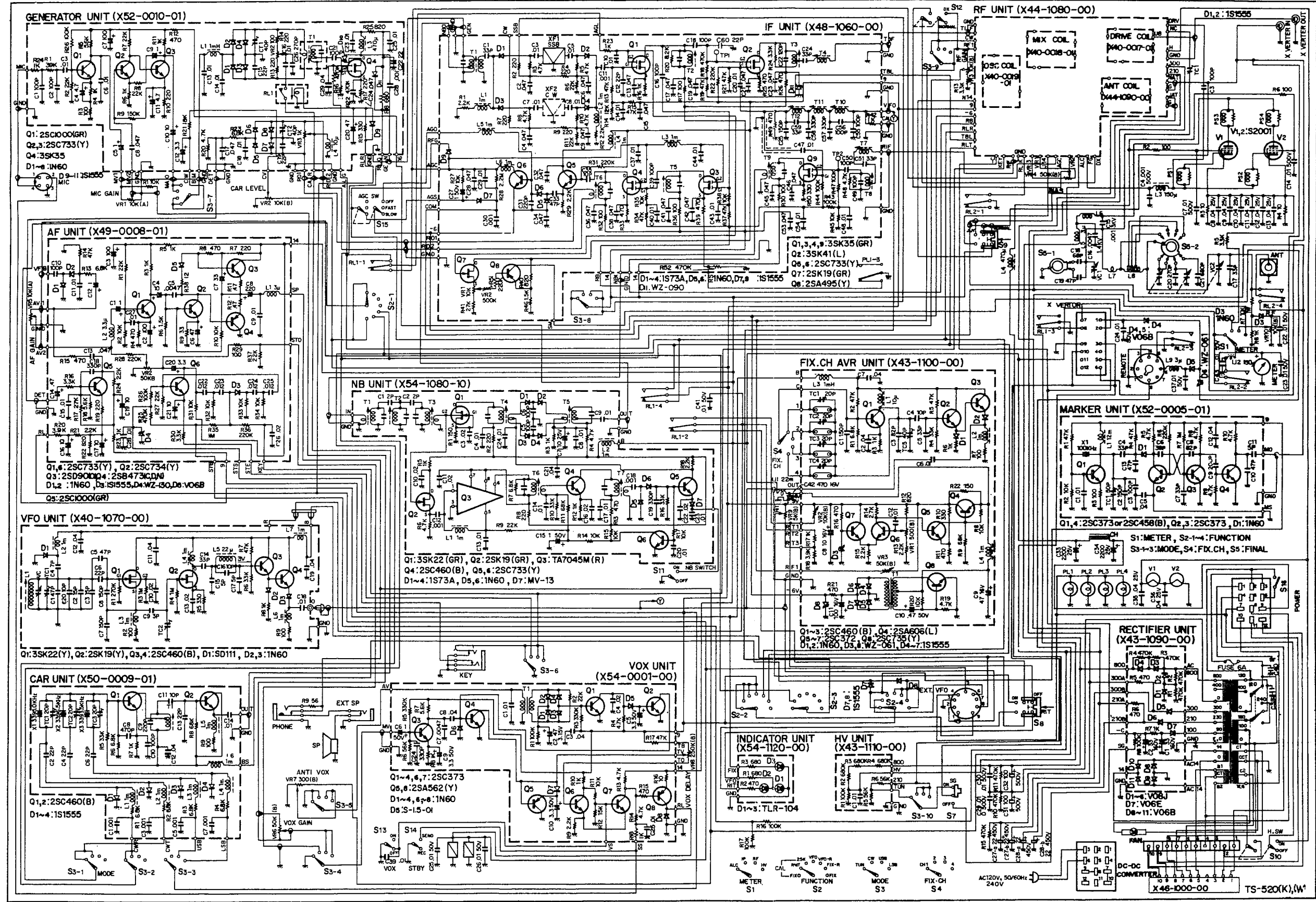
PARTS LISTS OF SP-520 (Y59-1000-00)

| Circuit No. | Parts No. | Description |
|----------------------|-------------|--|
| MISCELLANEOUS | | |
| — | A01-0221-12 | Case |
| — | A20-0721-04 | Panel |
| — | A22-0142-13 | Sub panel |
| — | A47-0007-04 | Rear plate |
| — | B01-0078-23 | Escutcheon |
| — | B05-0205-04 | Speaker net |
| — | B43-0198-04 | Badge (England) |
| — | B43-0201-04 | Badge (U.S.A., Europe) |
| — | B42-0009-04 | Passed sticker |
| — | B50-1111-00 | Operating manual (U.S.A., Europe) |
| — | B50-1120-00 | Operating manual (England) |
| — | E12-0001-05 | Phone plug |
| — | E20-0208-04 | Terminal strips |
| — | E29-0005-04 | Y lug x 2 |
| — | H01-1032-14 | Carton case (Inside) (England) |
| — | H01-1068-04 | Carton case (Inside) (U.S.A., Europe) |
| — | H03-0301-04 | Carton case (Outside) (England) |
| — | H03-0302-04 | Carton case (Outside) (U.S.A., Europe) |
| — | H10-0933-03 | Polystyrene foamed fixture |
| — | H10-0935-04 | Protection board |
| — | H10-0968-03 | Polystyrene foamed fixture |
| — | H20-0372-04 | Protection cover |
| — | H25-0016-00 | Accessory bag |
| — | J01-0025-04 | Sub leg |
| — | J02-0049-14 | Leg x 2 |
| — | J32-1030-14 | Round boss x 2 |
| — | T06-0011-05 | Speaker |

SCHEMATIC DIAGRAM(RF UNIT)

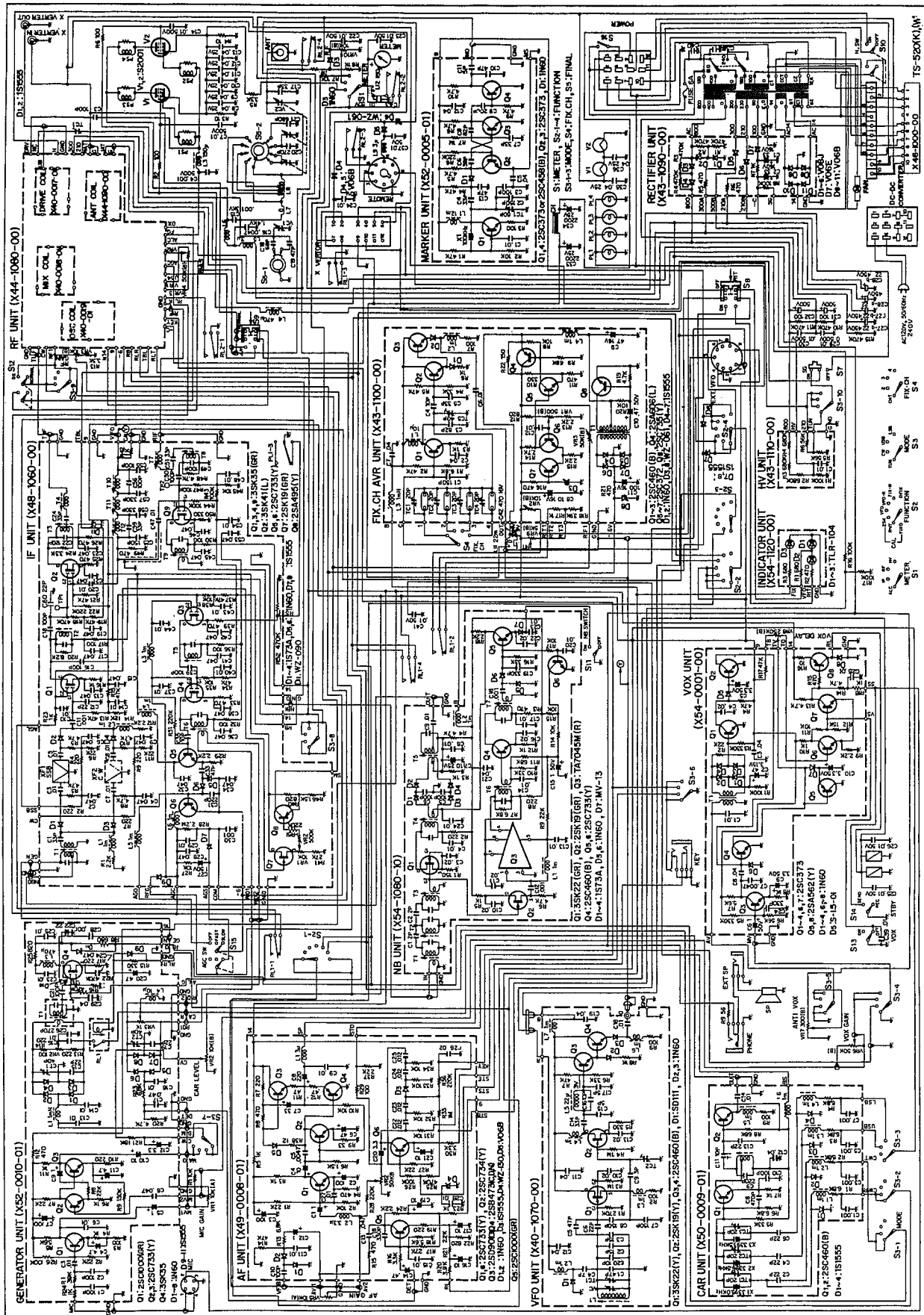


TS-520



SCHEMATIC DIAGRAM (TS-520)

SCHEMATIC DIAGRAM (TS-520)

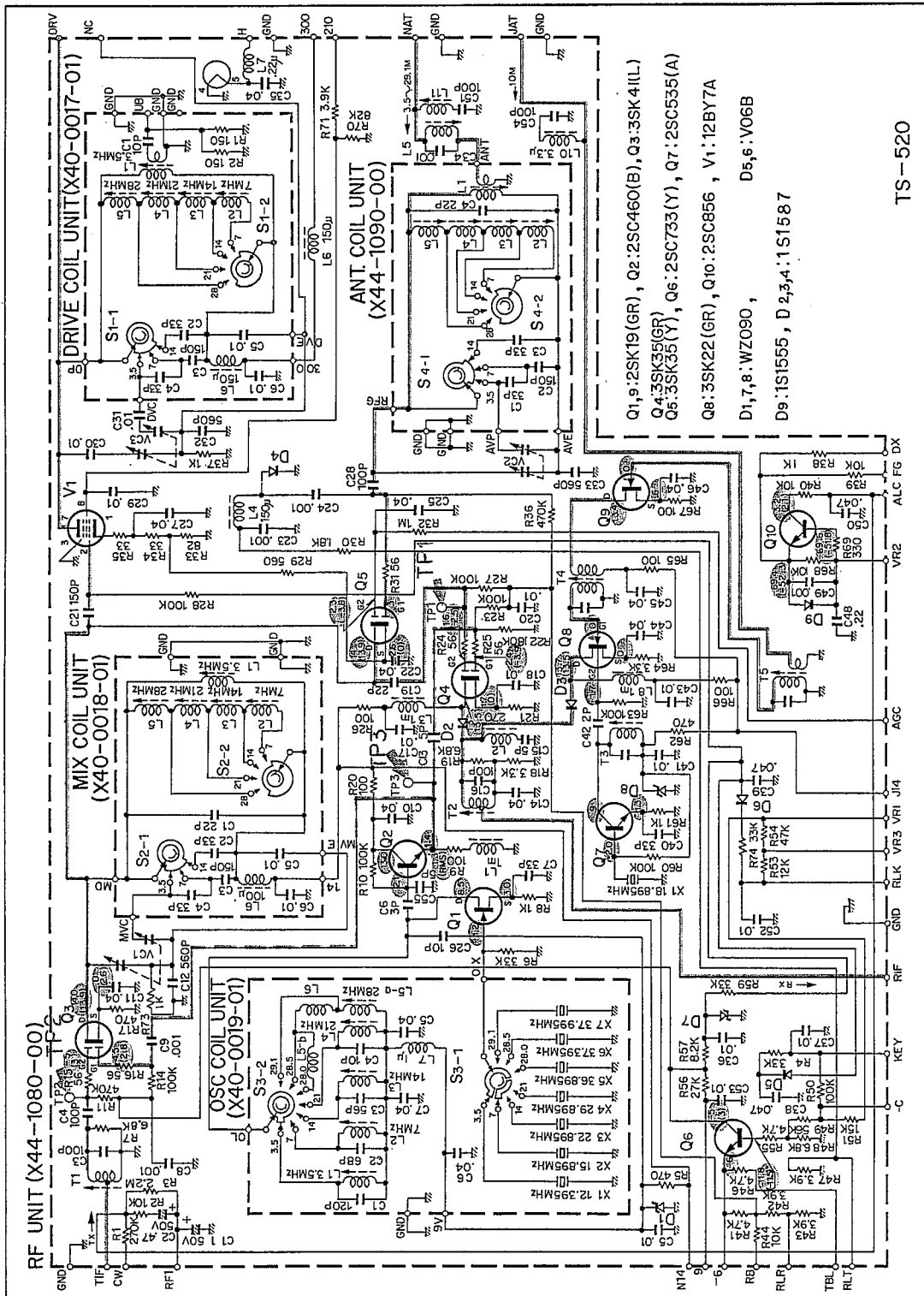


SCHEMATIC DIAGRAM (RF UNIT)

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- * ——— Signal flow
- * - - - - - Control, OSC, Common flow
- * ——— +800 V, +14 V, +9 V DC line
- * TP mark shows TEST POINT
- * The voltage is indicated as reception level
(transmission level)



Q1,9: 2SK19 (GR), Q2: 2SC460 (B), Q3: 3SK41 (L)
 Q4: 3SK35 (GR)
 Q5: 3SK35 (Y), Q6: 2SC733 (Y), Q7: 2SC535 (A)
 Q8: 3SK22 (GR), Q10: 2SC856, V1: 12BY7A
 D1,7,8: WZ090, D5,6: V06B
 D9: 1S1555, D2,3,4: 1S1587

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