KENWOOD

SERVICE MANUAL

R-820



HIGH PERFORMANCE HF AMATEUR BAND RECEIVER

CONTENTS

R-820

SPECIFICATIONS 3
FEATURES 4
BLOCK DIAGRAM 5
GENERAL 6
CIRCUIT DESCRIPTION 7
FUNCTIONAL DESCRIPTION 9
MODIFICATION OF THE TS-820 11
PANEL CONTROLS 13
PARTS ALIGNMENT/PACKING 14
PARTS LIST 31
EXPLODED VIEW 44
DISASSEMBLY 45
TROUBLESHOOTING 47
LEVEL DIAGRAM 50
ADJUSTMENT 51
OPTION 58
SCHEMATIC DIAGRAM 59
CONNECTOR ALIGNMENT 60

SPECIFICATIONS

Frequency Range

160 meter band	1.8 ~ 2.0 MHz
80 meter band	3.5 ~ 4.0 MHz
40 meter band	7.0 ~ 7.5 MHz
20 meter band	14.0 ~ 14.5 MHz
15 meter band	21.0 ~ 21.5 MHz
10 meter band A	28.0 ~ 28.5 MHz
10 meter band B	28.5 ~ 29.0 MHz
10 meter band C	29.0 ~ 29.5 MHz
10 meter band D	29.5 ~ 30.0 MHz
119 meter band (WWV)/JJY	15.0 ~ 15.5 MHz
Shortwave band:	
49 meter band	5.9 ~ 6.4 MHz
31 meter band	9.4 ~ 9.9 MHz
25 meter band	11.5 ~ 12.0 MHz
16 meter band	17.7 ~ 18.2 MHz

Mode

SSB, CW, AM, RTTY

Receiver Sensitivity

SSB 0.25 μV (SW Band 0.5 μV) S + N/N 10 dB or more
AM 1.5 μV (SW Band 3 μV) S + N/N 10 dB or more

Image Ratio

Better than 80 dB (SW Band better than 50 dB)

IF Rejection

IF Frequency is 90 dB or more down from output signal (SW Band more than 40 dB)

Receiver Selectivity

CW (0.25) more than 250 Hz (−6 dB), less than 500 Hz (−6 dB) (*1)
CW (0.5) more than 500 Hz (−6 dB), less than 850 Hz (−60 dB) (*2)
SSB (2.4) more than 2.4 kHz (−6 dB), less than 3.9 kHz (−60 dB)
AM (6) more than 6 kHz (−6 dB), less than 12 kHz (−60 dB)

Variable Bandwidth

CW (0.5) 150 Hz ~ 500 Hz (−6 dB) fully variable (*3)
SSB (2.4) 600 Hz ~ 2.4 kHz (−6 dB) fully variable
AM (6) 4.3 kHz ~ 6 kHz (−6 dB) fully variable (*4)

*1 Installed optional filter-YG-455CN
*2 Installed optional filter-YG-455C
*3 Installed optional filter-YG-88C and YG-455C
*4 Installed optional filter-YG-88A

Notch Filter Attenuation

More than 50 dB

Frequency Stability

Within 100 Hz during any 30 minute period after warm up within ± 1 kHz during the first hour after 1 minute of warm up.

Antenna Impedance

50 ~ 75Ω (unbalanced)

AF Output

More than 1.5W (8Ω load, 10% distortion)

AF Load Impedance

4 ~ 16Ω for both speaker and headphone

Power Consumption

AC 120V, 30W
DC 13.8V, 1.6A

Power Supply

AC 100, 120, 220, 240V, 50/60 Hz
DC 12 ~ 15V

Semiconductors and Tubes

IC's	40
FET's	34
Transistors	89
Diodes	170
Tube	1

Dimensions

13-1/8" (W) × 6" (H) × 13-3/16" (D)
(Protection not included)

NOTE:

The circuit and ratings may change without notice due to development in technology.

FEATURES

1. **High Performance HF Amateur Band Receiver**
   The R-820 is KENWOOD's high performance communication receiver, designed to meet diversified demands in various operation modes in the HF band. A highly refined version of the TS-820's receiver section, the R-820 covers all HF amateur bands (1.8 MHz ~ 29.7 MHz) plus WWV and selected SW Bands, and operates in the CW, SSB, and AM modes.

2. **Full Transceiver Capability**
   In combination with a TS-820 series tranceiver, the R-820 can provide split frequency operation. Shared HET and VFO frequencies provide "full transceive" operation with identical transmitting and receiving frequency, as well as "VFO transceive" operation.

3. **Variable Bandwidth Tuning (VBT)**
   IF bandwidth is continuously front panel adjustable, making optimum IF bandwidth available for any operating condition. This feature is completely independent of the IF Shift.

4. **50 kHz Notch Filter**
   The notch circuit effectively nulls nearby interfering signals. The R-820 employs a fixed notch filter. The BFO and local oscillator are simultaneously varied so as to obtain equivalent changes in the notch frequency.

5. **Double Tuned RF Circuits for Improved Cross Modulation (2-Signal) Characteristics**
   Improved front end circuit elements and optimized level distribution have greatly enhanced intersignal performances such as intermodulation and overload characteristics. The introduction of double-tuned RF circuits provides increased selectivity and sensitivity.

6. **IF Shift to Cope with all Receiving Conditions**
   The IF Shift circuit, one of the highly evaluated features used in the TS-820 transceiver, has also been incorporated in the R-820, providing remarkable interference rejection performance, frequency response, and CW pitch control.

7. **Digital Display Provides Accurate Frequency Indication**
   The Digital frequency readout provides precise indication to the 100 Hz order, any band, any mode, including the shortwave bands.

8. **Superior Tuning Operation**
   The combination of analog and digital readouts provides maximum convenience and flexibility during operation.

9. **Four Shortwave Bands with an AM Filter**
   The R-820 also covers the popular HF broadcast bands of 49m, 31m, 25m, and 16m. It is supplied with a built-in 455 kHz AM filter; an 8.83 MHz AM filter (YG-88A) is available as an/option.

10. **Transmitter Signal Monitor**
    Transmitter output can be monitored with the R-820 for checking final sound quality. Monitor level is front panel adjustable.

11. **Optional IF Filters**
    Filters optionally available are: 8.83 MHz CW filter YG-88C, AM filter YG-88A, and 455 kHz CW filter YG-455C (pass band: 500 Hz) and YG-455CN (pass band: 250 Hz).

12. **Additional Filter Switching**
    Additional filters are appropriately selected by the MODE switch. Filter pass bands of 0.25 kHz, 0.5 kHz, 2.4 kHz, and 6 kHz can be selected by means of the Filter Switch.

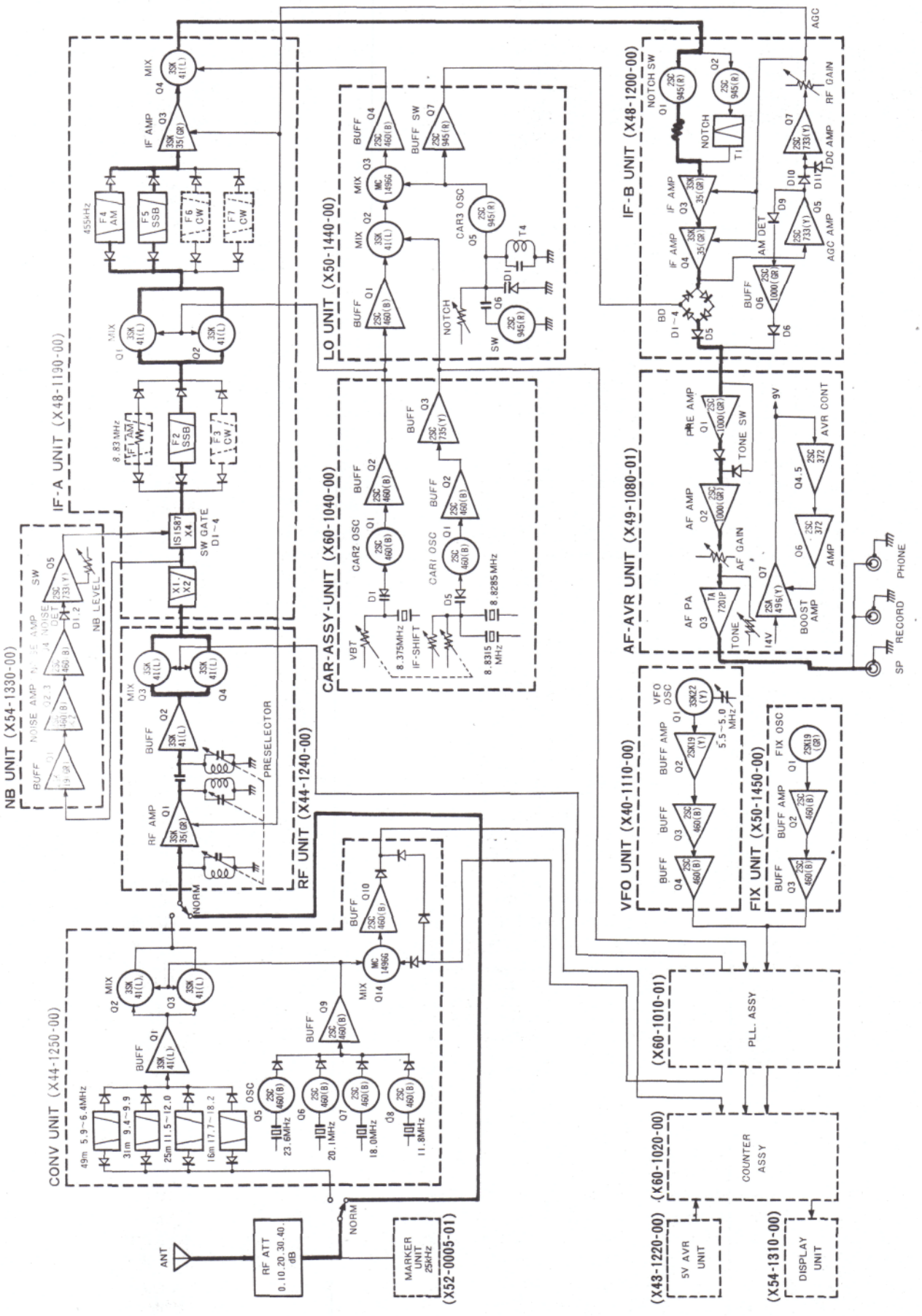
13. **Adjustable Noise Blanker Level and Audio Frequency Response**
    The balanced-gate noise blanker circuit is provided with a front panel noise threshold adjustment. This is especially useful when noise levels are relatively low. A front panel tone control for audio response shaping is also provided.

14. **10 dB-Stepped RF Attenuator (0 ~ 40 dB)**
    The 10 dB stepped attenuator provides up to 40 dB's RF attenuation making it possible to receive strong local signals or low band stations operating at night.

15. **S-Meter with dB/μV Scale**
    The S-meter is provided with a dB/μV scale which can be used for field intensity measurements in combination with the RF step attenuator.

16. **Full Accessory and Connecting Features**
    The R-820 receiver is complete with full accessory and connecting features such as: 25 kHz marker, display hold switch, transceive/separate selector, standby switch, FIXED channel oscillators, NOTCH, FIX, VFO, and RIT indicators, PHONE PATCH OUT jack, terminals for IF output a observation (50 kHz) and pan display connection (8.83 MHz), and a recording jack.

BLOCK DIAGRAM



GENERAL

The R-820 receiver is triple conversion superheterodyne for the amateur bands, and quadruple conversion superheterodyne through an additional 29.5 MHz intermediate frequency for the shortwave bands.

Full amateur band coverage consist of 1.8, 3.5, 7.0, 14.0, 21.0, 28.0, 28.5, 29.0, and 29.5 MHz bands along with 15 MHz WWV (JJY). Shortwave coverage consists of the 49m (5.9 ~ 6.4 MHz), 31m (9.4 ~ 9.9 MHz), 25m (11.5 ~ 12.0 MHz), and 16m (17.7 ~ 18.2 MHz) Bands.

Reception of CW, SSB, RTTY, and AM are all possible.

The 1st, 2nd, and 3rd intermediate frequencies are 8830 kHz, 455 kHz, and 50 kHz. The 1st IF stage uses crystal filters with pass bandwidths of 2.7 kHz (SSB; supplied), 6 kHz (AM; optional), and 0.5 kHz (CW; optional). The 2nd IF stage uses ceramic filters of 6 kHz (AM; supplied) and 2.7 kHz (SSB; supplied), and optional crystal filters of 0.5 kHz (CW) and 0.25 kHz (CW).

For enhanced selectivity, the R-820 features continuously-variable IF bandwidth, achieved by combining the 1st and 2nd IF filter responses, and the IF Shift feature.

A T notch filter is incorporated in the 3rd IF stage. Amateur frequencies can be read by both the dial and Digital frequency readouts. Shortwave frequency is read by the Digital display only. Performance is assured in the 1st and 2nd mixers and the converter by employing dual-gate MOS FETs. (Refer to Figure 1.)

RF circuits are also totaly of dual-gate MOS FET configuration for increased selectivity, signal-to-noise ratio, and AGC performance.

The R-820 receiver is capable of operating with the TS-820 transmitter as a complete transceiver.

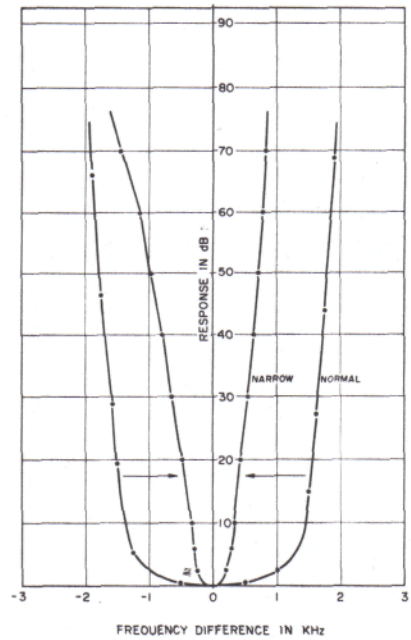


Fig. 1 SSB Filter Variable Bandwidth Characteristic

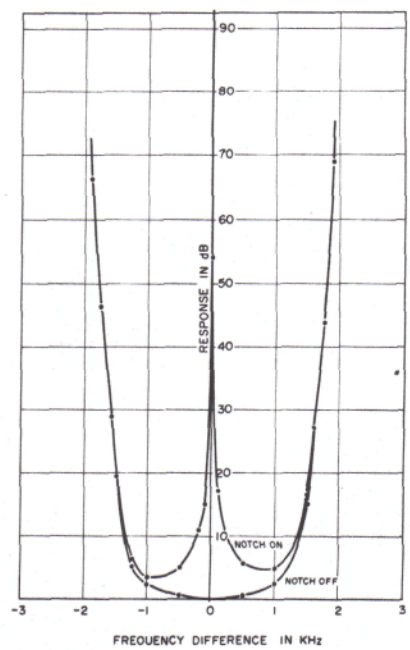


Fig. 2. T Notch Filter Attenuation Characteristic

CIRCUIT DESCRIPTION

***Coil Pack Unit (X44-1230-00)**

The Coil Pack Unit is the same basic design as that used in the TS-820 transceiver, excepting the RF section, which is double-tuned for higher selectivity.

***RF Unit (XX-1240-00)**

The RF Unit consists of an RF amplifier, 1st mixer, and block bias circuits, and assembles to the Coil Pack Unit.

***IF A Unit (X48-1190-00)**

The IF A Unit consists of an 8 pole crystal filter for 8830 kHz, filter and gate circuits for the noise blanker, 2nd mixer, ceramic and crystal filters for the 2nd IF at 455 kHz, 3rd mixer, S-meter amplifier, and filter preset switches.

The standard supplies filters pre a YG-88SW (8830 kHz) and CFJ455K3 (455 kHz) both for SSB, and CFR455H for AM. *Optional filters are the* YG-88A (AM) *and* YG-88C (CW) both for the 1st IF, and YG-455C (CW) and YG-455CN (CW) both for the 2nd IF.

***IF B Unit (X48-1200-00)**

The IF B Unit contains 3rd IF (50 kHz) circuits, consisting of the notch filter, notch filter switch circuit, product detector, AM detector, switching AM detector switching circuit, and AGC amplifier.

***NB Unit (X45-1330-00)**

The NB Unit consists of a noise amplifier for noise blanking.

***AF AVR Unit (X49-1080-01)**

The R-820's AF AVR Unit is identical to that of the TS-820 transceiver, and includes the audio power amplifier, 9V regulated power supply, FET bias supply, and RIT adjust circuits.

***PLL Ass'y Unit (X60-1010-01)**

The PLL Ass'y Unit consists of the PD (Phase Detector) Unit (X50-1340-01) and the VCO (Voltage Controlled Oscillator) Unit (X50-1330-00).

The R-820 has a front panel switch for turning the HET oscillator on and off; for transceiver operation, HET output accepted from the TS-820 forms the PLL loop.

The PD Unit has separate crystals for each band, two mixers, waveform shaping, and phase comparator. It generates control for the VCO, based on BFO output. It also provides a pure electronic IF Shift loop by using the incoming carrier signal.

The VCO Unit contains the voltage controlled oscillators for each band, buffer amplifier, and oscillator output shut-off circuit for loop unlock. Oscillation frequencies are controlled by voltage from the PD Unit. Band switching for both units is by electronic (diode) switches.

***CAR Ass'y Unit (X60-1040-00)**

The CAR Ass'y Unit consists of IF Shift and VBT control circuits, and a local for the 2nd mixer.

The CAR-1 Unit (X50-1480-00) has an oscillator for IF Shift, crystals for 8831.5 kHz (USB) and 8828.5 kHz (LSB), switch circuit, and VXO circuit. It also contains an oscillator frequency shift circuit for AM reception.

The CAR-2 Unit (X50-1460-00) consists of oscillators for the 2nd mixer and VBT, which is equipped with an 8375 kHz (NORM) crystal and VXO circuit.

***Local OSC Unit (X50-1440-00)**

The Local OSC Unit accepts signals from CAR-1 and 2 to produce a 455 kHz mixed output, and also produces a 505 kHz signal by mixing the 455 kHz mixed output with the 50 kHz NOTCH signal generated by its own oscillator. It also has 50 kHz signal generator. The 50 kHz signal is used as a BFO signal for the product detector, and the 505 kHz signal is used as a local signal for the 3rd mixer.

***FIX Unit (X50-1450-00)**

The FIX Unit consists of an oscillator for the 4 fixed channels, and a −6V power supply for block bias.

***Indicator Unit (X54-1180-00)**

This unit provides "VFO", "FIX", "RIT", and "NOTCH" indication. The VFO and FIX indicators also function during transceiver operation with the TS-820.

***VR ASS'y (X54-1340-00)**

The VR Ass'y has variable resistors for monitor level control, NB level control, and tone control.

***Switch Ass'y (X41-1130-00)**

During full transceive operation, the TRCV position activates the VFO and HET switching circuits.

***Relay Ass'y (X43-1190-01)**

The Relay Ass'y consists of a standby relay, low voltage DC power supply capacitors, and the 5-volt stabilized power supply for the PLL circuit. The standby relay switches block biases and VFO power during transceive operation.

***VFO Ass'y (X40-1110-00)**

The receiver's overall frequency stability depends on that of the VFO, since the PLL circuit is controlled by VFO output. VFO frequency is 5.0 MHz to 5.5 MHz.

***5V-AVR Ass'y (X43-1220-00)**

The 5V-AVR Ass'y supplies regulated 5V DC to the Counter ass'y.

***Marker Ass'y (X52-0005-01)**

The 100 kHz synchronizes output from Q1 is waveform shaped by diode D1, Q2 and Q3 multivibrator. The 25 kHz multivibrator output is amplified by Q4 and fed to the receiver input.

***Counter Ass'y (X60-1020-00)**

The Counter Ass'y consists of the Counter Mixer unit (X54-1150-00) and the Counter unit (X54-1160-00), both

CIRCUIT DESCRIPTION

contained in a rigid shielded case. The counter mixer synthesized operating frequency by mixing the PLL and carrier outputs; Counter unit output drives the external 6-digit fluorescent display tube.

***Converter Ass'y (X44-1250-00)**

Shortwave broadcasts are crystal converted to the 29.5 MHz intermediate frequency. Diode switching is employed for converter selection.

The Converter Ass'y also has a frequency converter for the Digital display, control circuits for HET/VFO switching, monitoring, frequency display erasure, and the low voltage rectifier circuit.

***Frequency Configuration for Triple Conversion**

The 1st, 2nd, and 3rd intermediate frequencies for the triple conversion system are 8830 kHz, 455 kHz, and 50 kHz. Unlike conventional receivers, the R-820 uses high-selectivity IF filters for each stage after the 1st mixer. Crystal converters are used for each of the shortwave bands.

Table 1

Mode	Freq. kHz
LSB	8828.5
USB	8831.5
CW	8831.5
RTTY	8828.5
AM	8830.0

Table 2

Band	HET MHz	VCO MHz
WWV/JJY	20.5	23.83 ~ 24.33
1.8	7.3	10.63 ~ 11.13
3.5	9.0	12.33 ~ 12.85
7	12.5	15.83 ~ 16.33
14	19.5	22.83 ~ 23.33
21	26.5	29.83 ~ 30.33
28	33.5	36.83 ~ 37.33
28.5	34.0	37.33 ~ 37.83
29	34.5	37.83 ~ 38.33
29.5	35.0	38.33 ~ 38.83

Table 3

Band	Receiving Freq. MHz	OSC MHz	VCO MHz	CVO MHz
49m	5.9~ 6.4	23.6	38.33~38.83	14.73~15.23
39	9.4~ 9.9	20.1	38.33~38.83	18.23~18.75
25	11.5~12.0	18.0	38.33~38.83	20.33~20.83
16	17.7~18.2	11.8	38.33~38.83	26.53~27.03

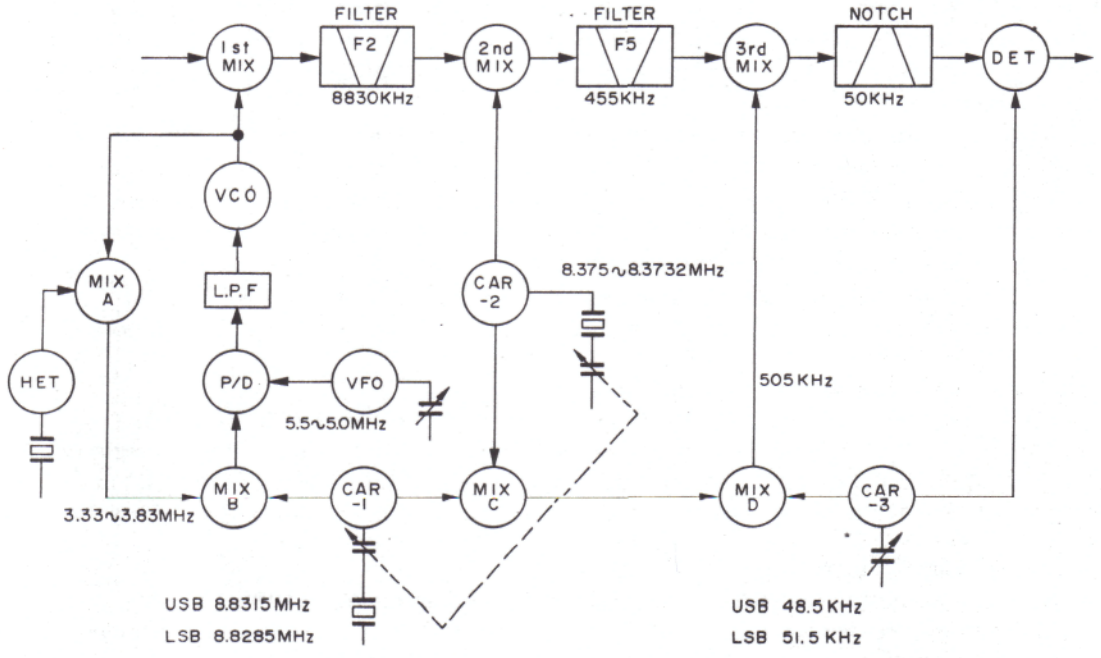


Fig. 3 Frequency Configuration

FUNCTIONAL DESCRIPTION

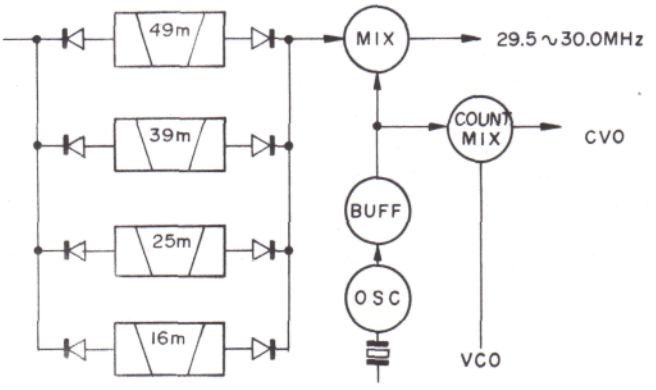


Fig. 4 Shortwave Band Converter

***VBT and IF Shift Features**

The VBT (Variable Bandwidth Tuning) continuously varies the IF filter pass band. The variable range for each IF filter is shown in Table 4.

Table 4

	F2 (kHz)	F5 (kHz)
Center Freq. Bandwidth Bandwidth (−6 dB)	8830 8828.65∼8831.35	455 453.65∼456.35

When a 14.0 MHz USB signal is received in the SSB mode, the VFO, CAR-1, and HET generate 5.5 MHz, 8.8315 MHz, and 19.5 MHz signals. Oscillation injection to the 1st mixer is 22.8315 MHz. Therefore, the SSB signal of 14.0015 MHz is converted by the 1st mixer into 8.830 MHz. This signal is further converted to 455 kHz by the 2nd mixer and to 50 kHz by the 3rd mixer. At this stage, variable bandwidth is controled by adjusting CAR-2 frequency VBT control. For simplified explanation, assume filters F2 and F5 pass bands normal CAR-1 and CAR-2 conditions are 2.7 kHz.

[Example-1]

Bandwidth ..... 1.7 kHz
IF shift ..... 0 kHz

Under the above conditions, the input frequency of 14.0 MHz provides:

CAR-2 ..... 8374.0 kHz (VBT control)
CAR-1 ..... 8831.0 kHz (IF shift control)

NOTE:

One half of the frequency variation provided by the VBT.

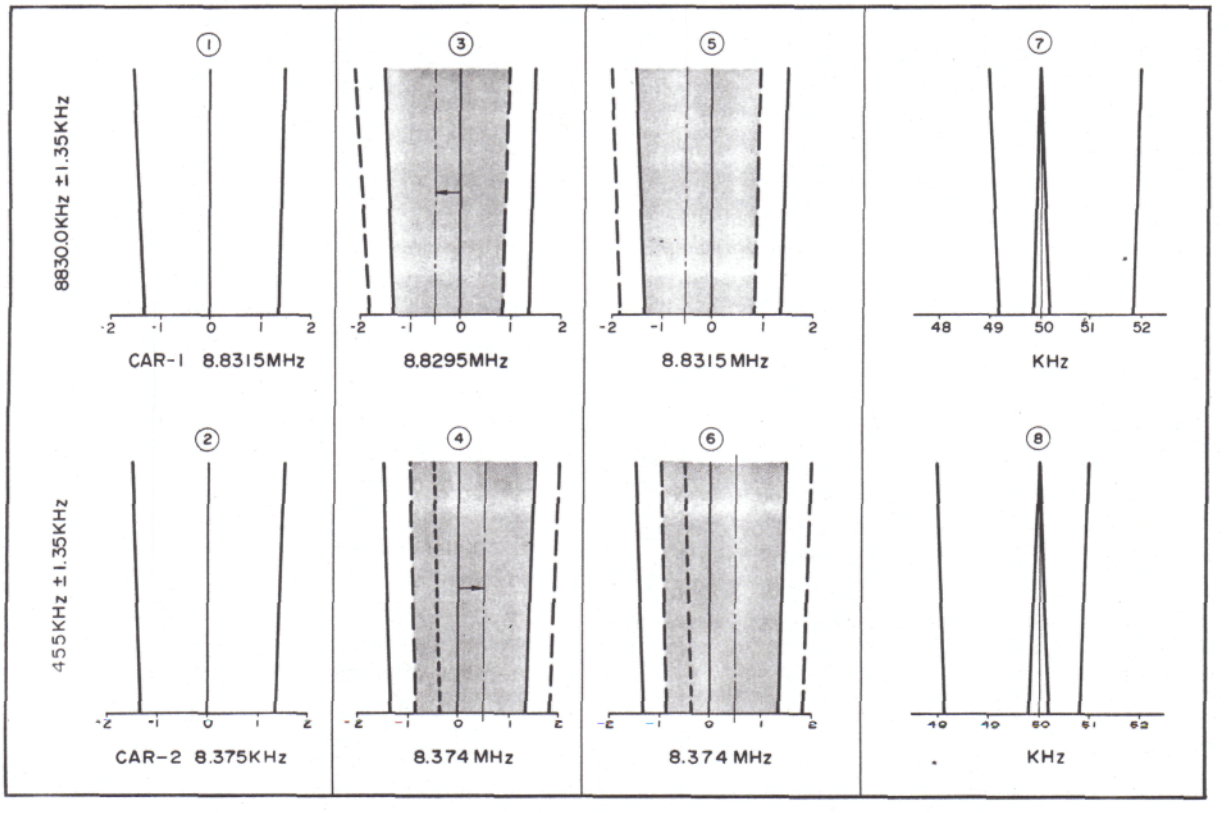


Fig. 5 Description of VBT·IF Shift

Circuit is obtained through CAR-1 manipulation. The 14 MHz USB signal actually covers a frequency of 14.0015 MHz ± 1.35 MHz. CAR-1 8829.5 kHz, provides for VCO at 22.8310 MHz.

Therefore, the 1st IF signal shifts by 500 Hz to become 8829.5 kHz ± 1.5 kHz. As previously mentioned the 1st IF filter passband width is 8.830 MHz ± 1.35 kHz. This means that the frequency component is reduced by 500 Hz as compared with the standard condition as illustrated in Figure 5-3. The 1st IF signal is then converted to the 2nd IF at 455 kHz ± 1.35 kHz as shown in Figure 5-4, and finally becomes 455.5 kHz ± 850 Hz with a bandwidth of 1.7 kHz. This is equivalent to an antenna input frequency of 14.0015 MHz ± 850 Hz. This also shows the IF Shift function is not activated.

[Example-2]

Bandwidth ..... 1.7 kHz
IF Shift ..... +500 Hz

Under these conditions, an incoming USB signal provides:

CAR-2 ..... 8374.0 kHz (VBT control)
CAR-1 ..... 8831.5 kHz (IF Shift control)

From example-1, let us determine in reverse the incoming signal frequency distribution by tracing up from the 2nd IF. It is known from example-1 that the 2nd IF center frequency is 455.5 kHz with its upper limit placed at 455.5 kHz + 850 Hz. This 2nd IF can be reverse converted to the 1st IF as 455.5 kHz + 8374 kHz = 88295 kHz with its lower limit placed at 8829.5 kHz − 850 Hz. Therefore, the signal components passing through the 1st and the 2nd IF filter are identical to those in example-1. However, the CAR-1 frequency of 8831.5 kHz for example-2, which is 8831.0 kHz in example-1, gives a VCO output of 22.8315 MHz. The 88.29.5 kHz frequency component converted from the 1st IF can further be converted to the incoming frequency of 14.002 MHz + 850 Hz. This is equivalent to a signal of 1.7 kHz bandwidth, shifted + 500 Hz.

As known from example-1 and 2, the VBT and IF Shift operate separately, permitting totally independent control of IF bandwidth and center frequency shifting.

***NOTCH Circuit configuration**

Despite frequency variations produced by the IF Shift, the 3rd IF center frequency remains constant, fixed at 50 kHz.

The 3rd IF center frequency can be varied by changing CAR-3 frequency. At this time, the pitch between the 3rd IF and the carrier frequency remains unchanged. A fixed 50 kHz notch filter is inserted into the 3rd IF circuit to eliminate interfering signals only.

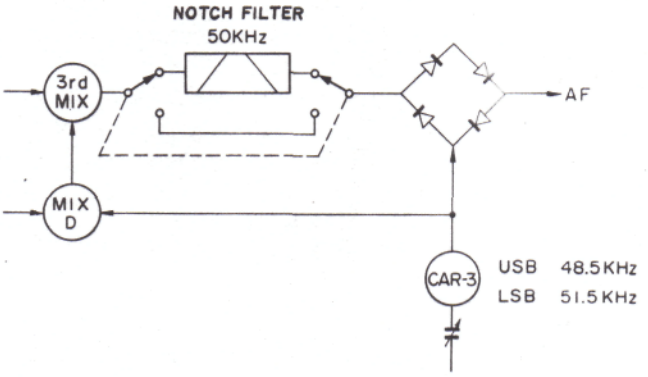


Fig. 6 T Notch Filter

***Monitor Circuit**

During transceiver operation, turning the MONITOR switch ON while transmitting turns Q12, on the Converter ass'y ON. This turns RL-2 OFF, shutting off incoming signals from the receiver antenna. Meanwhile, the R-820's antenna terminal is grounded through a resistor to minimize signal leakage. Also, the voltage applied to G2 of Q1 through Q4 on the RF ass'y is controlled to adjust FET gain. This reduces overall gain by more than 70 dB.

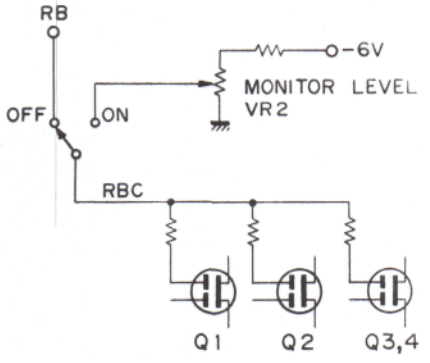


Fig. 7 Monitor Circuit

***NB LEVEL CONTROL Circuit**

The NB circuit for the R-820 receiver is quite similar to conventional circuits. In Figure 8, noise signals are voltage doubled by diodes D1 and D2. Q5 creates supplies driving signal for the NB switching gate.

Q5 emitter voltage is variable; thresh-old level can be controlled for weak signals.

The maximum (clockwise) NB LEVEL control position provides the maximum NB threshold level.

The range of emitter voltage variation is approx. 1.9V to 0.6V, and provides an NB level variation range of approx. 10 dB.

FUNCTIONAL DESCRIPTION/MODIFICATION OF THE TS-820

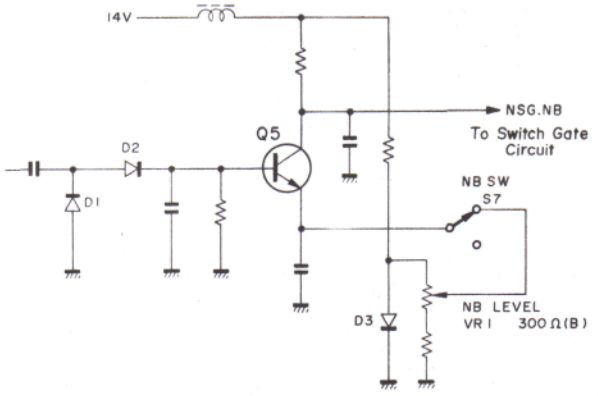


Fig. 8 NB Level Control Circuit

***TONE Circuit**

The Tone circuit shapes audio output high frequency response. The maximum (clockwise) position of the TONE control provides the flatest response, with maximum clarity.

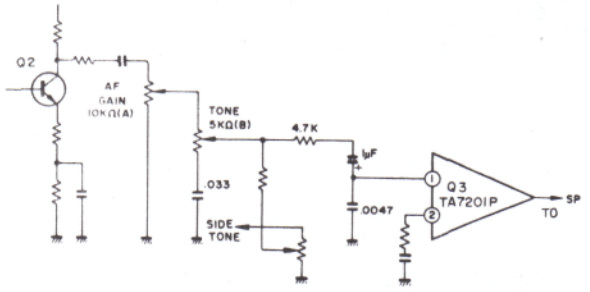


Fig. 9 Tone Circuit

TS-820 TRANSCEIVER MODIFICATION

This section describes modification to the TS-820 transceiver for operating with the R-820 receiver as a complete transceiver:

Modifications to the TS-820

1. Remove and insulate the coaxial cable from the IF Out jack. Connect the PLL Ass'y PD Unit (X50-1340-00) TP-4 to the IF Out jack by using the supplied 75Ω 1.5C-2V coaxial cable. Cable layout should be in accordance with Figure 11.

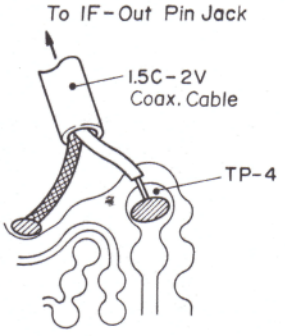


Fig. 10

2. Remove the lead from the common terminal on the stage and connect the two red wires to the common terminal. Connect the MODE-SW's common terminal for switching between the USB and LSB crystals with the EXT VFO socket pin ⑦.
3. Remove and insulate the lead from the EXT VFO socket pin ④.
4. Connect 2 capacitors (0.01μF) across pins ③ and ⑤ and ③ and ⑦ on the EXT VFO socket.
5. Connect pins ④ with ⑦ on the 9P-MT EXT VFO plug.
6. Insulate and secure all cables and leads removed from their original positions so they do not short.

Modification Procedure

1. Remove the PLL Ass'y from the transceiver by 4 screws, and disconnect all multiconnectors.
2. Remove the PD unit shield.
3. Remove the PD unit by 5 screws.

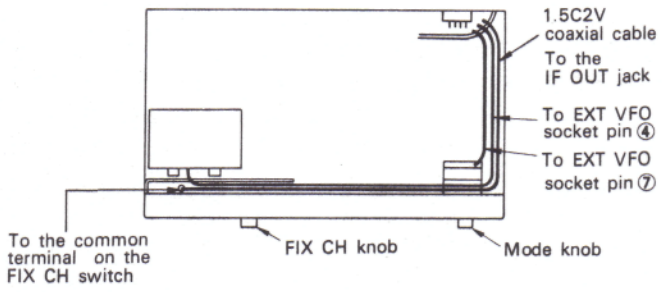


Fig. 11 Viewed from Bottom

4. Connect TP4 on the PD unit with the IF Out jack by using the supplied 75Ω 1.5C-2V coaxial cable, (Fig. 11).
5. On the MODE switch, reconnect the red lead to the terminal with the orange lead. Remove the jumper across the terminals for the red and orange leads. Connect the MODE switch terminal from which the red lead was removed with pin ⑦ on the EXT VFO socket. (Fig. 12).
6. Remove and insulate the lead from the EXT VFO socket pin ④ connect the common 9V terminal on the FIX CH switch with the EXT VFO socket pin ④ (Fig. 13).
7. Connect 2 capacitors (0.01μF) across pins ③ and ⑤ and ③ and ⑦ on the EXT VFO socket.
8. Connect pins 4 and 7 on the 9P-MT VFO plug.
9. When connecting a remote VFO, such as the VFO-820, remove and insulate the lead from pin 4 on one 9P-MT plug, and connect pin ④ with pin ⑦ on the transceiver-side plug. After modification, the Remote VFO lamps won't light.

ANTI-VOX MODIFICATION

This section describes the modification procedure to supply Anti-VOX during fully transceiver operation of the R-820 receiver and TS-820 transceiver.

Modification Procedure

1. Connect two 100Ω 1/4W resistors to the terminal strip as in Fig. 14, and secure the terminal strip by the Digital Unit mounting screw.
2. Remove the green wire from the Audio-AVR unit to the PHONE jack and reconnect it to the two 100Ω resistors common connection. Connect the PHONE jack to either of the 100Ω resistors.
3. Remove the green and white/red leads from the PHONE PATCH OUT terminal, connect them together and insulate.
4. Connect the PHONE PATCH OUT terminal to the remaining 100Ω resistor.

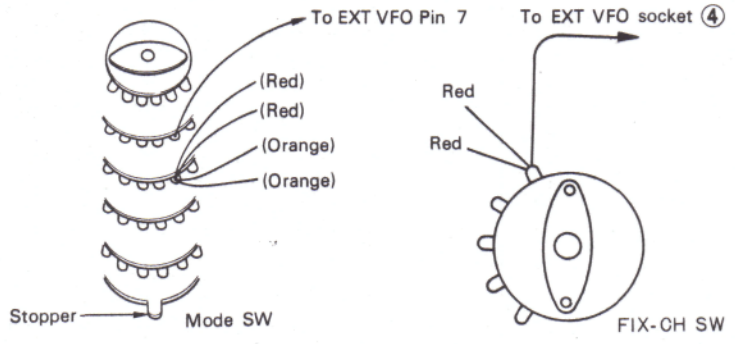


Fig. 12

Fig. 13

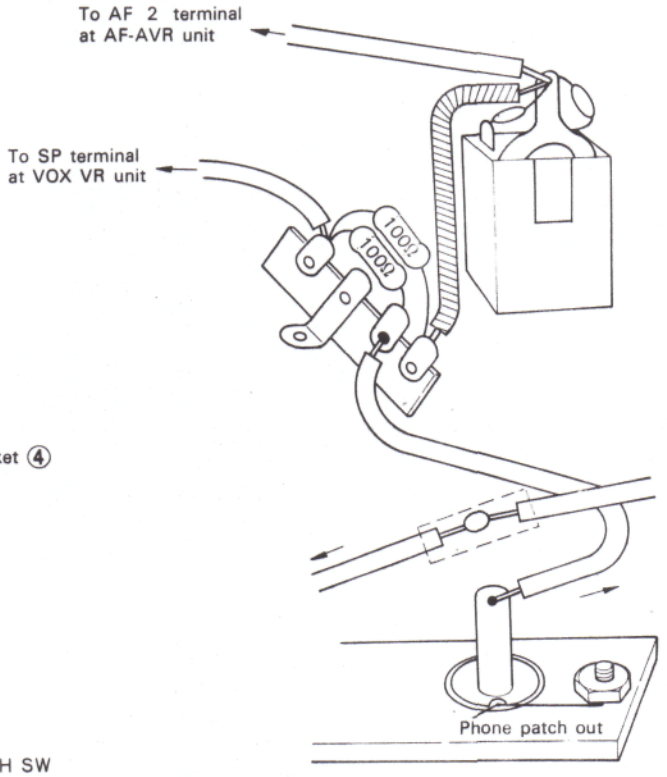
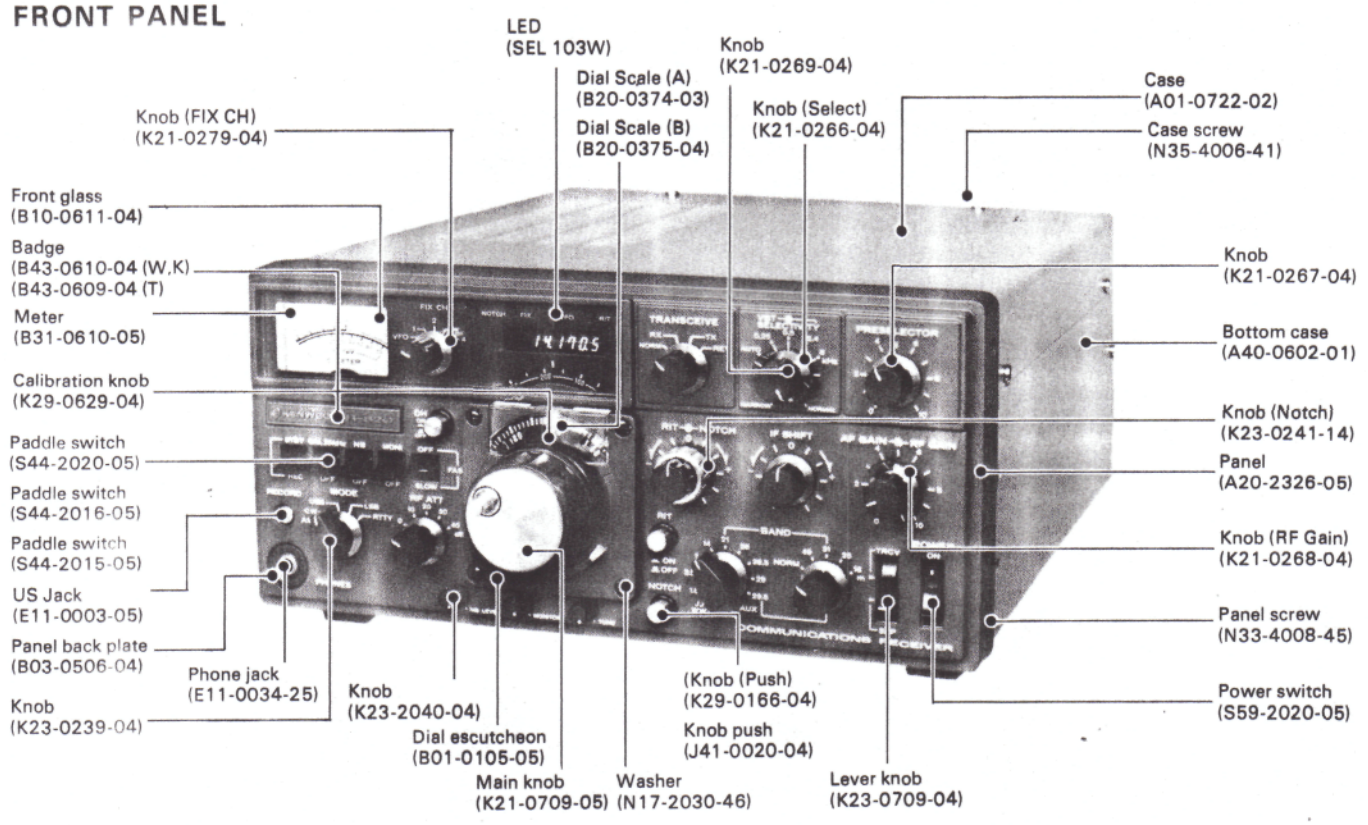


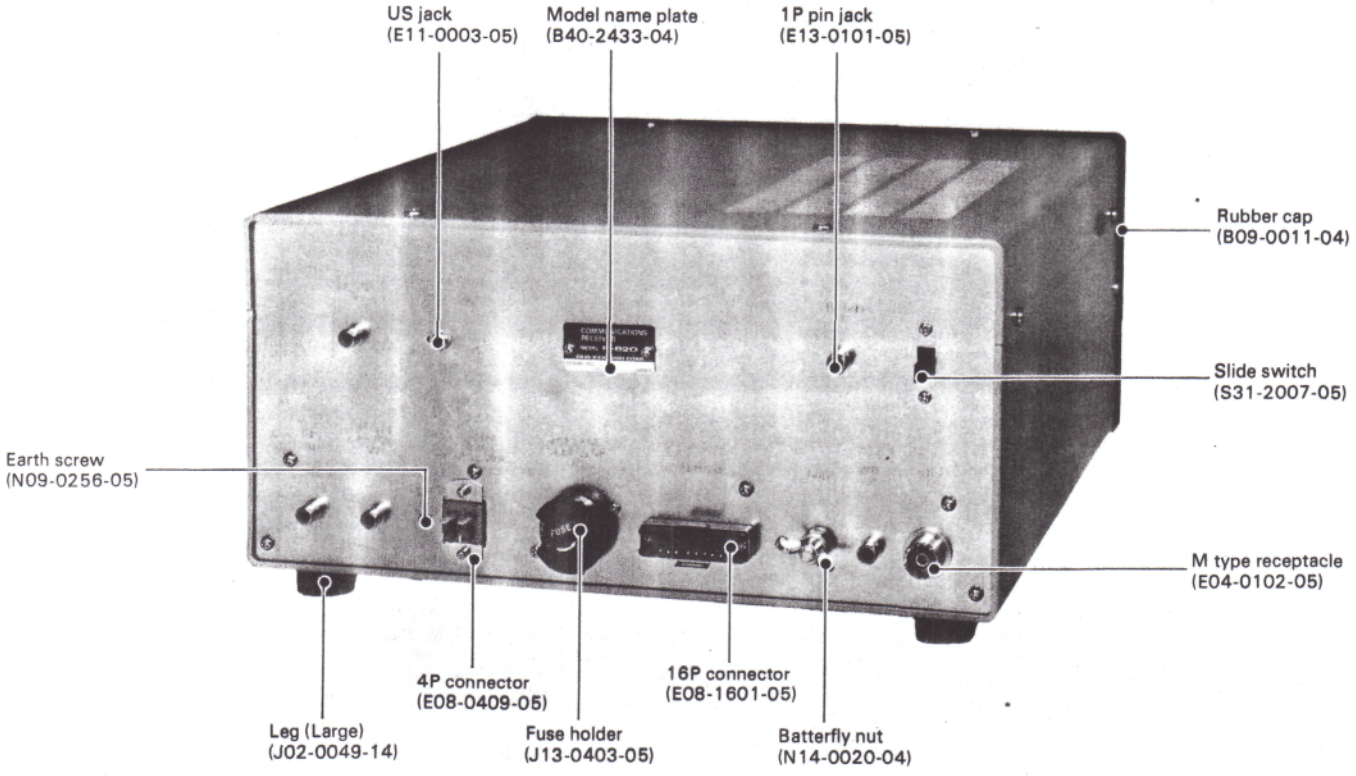
Fig. 14

PANEL CONTROLS

FRONT PANEL

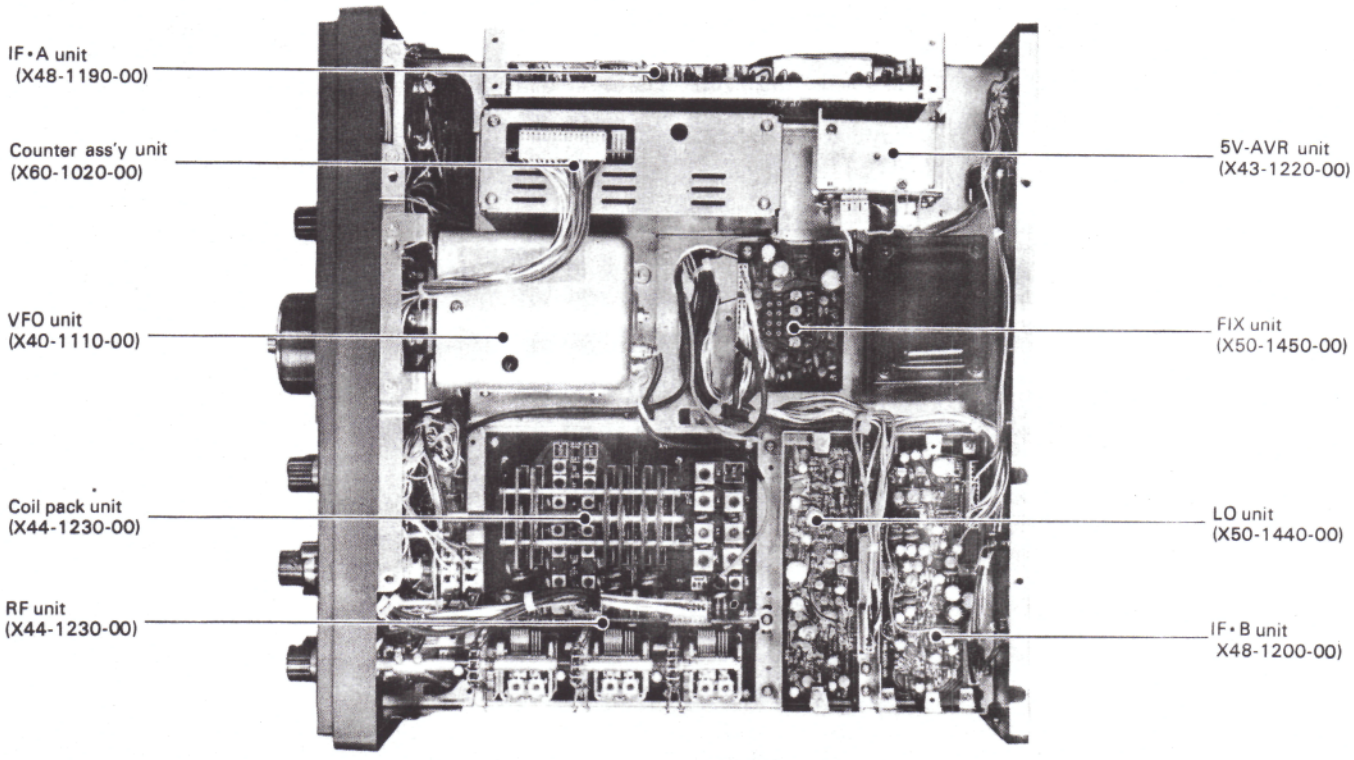


REAR PANEL

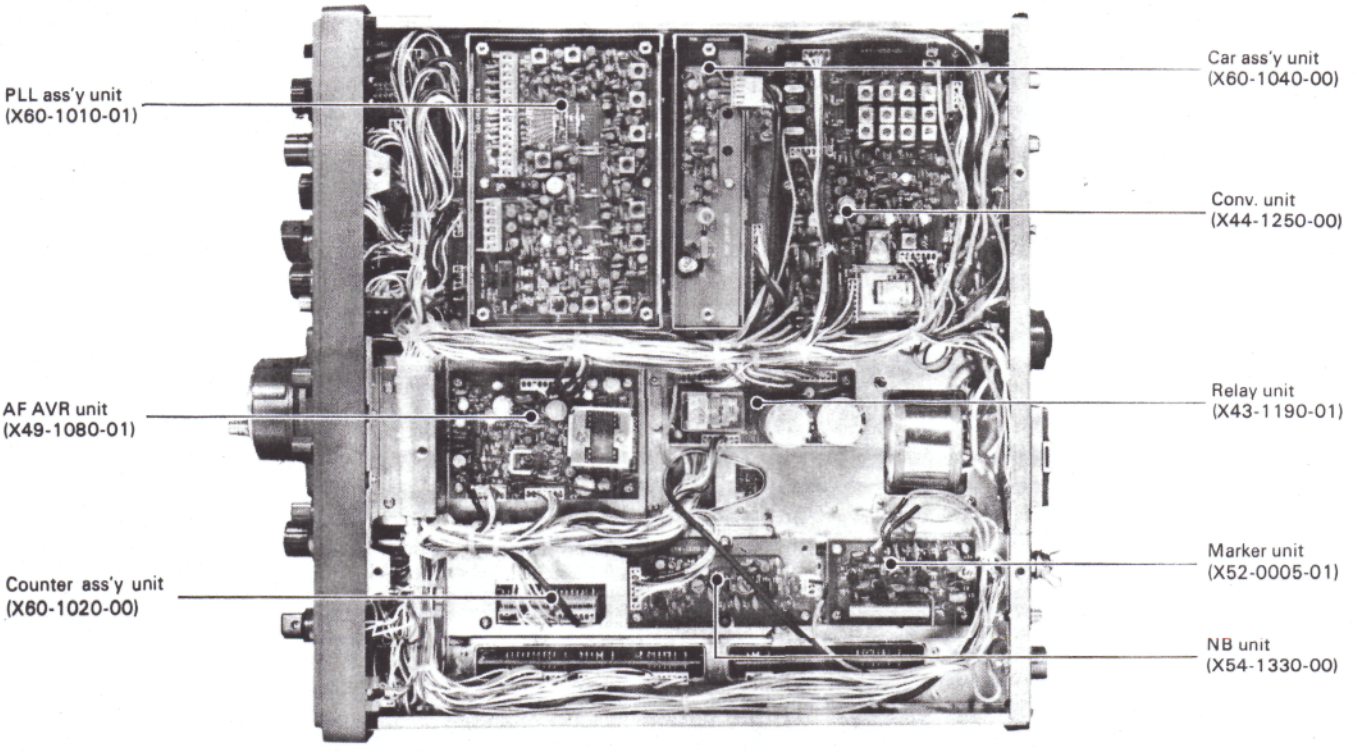


PARTS ALIGNMENT

VIEWED FROM TOP

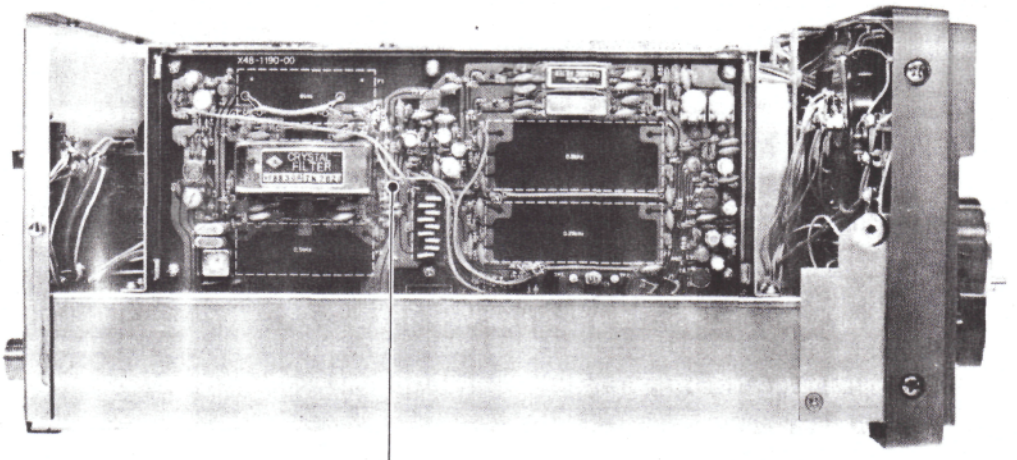


VIEWED FROM BOTTOM



PARTS ALIGNMENT/PACKING

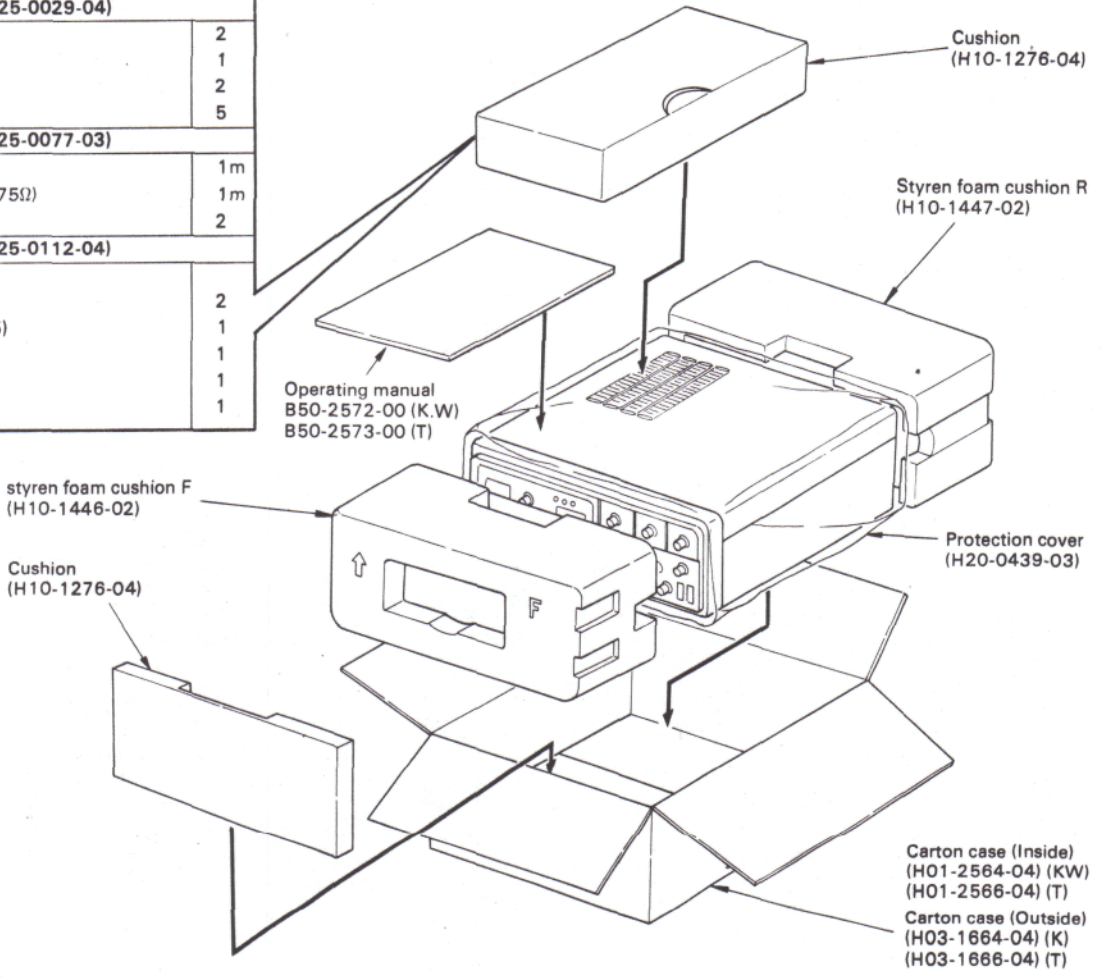
VIEWED FROM COMPONENT SIDE (IF•A Unit)



IF•A Unit (X48-1190-00)

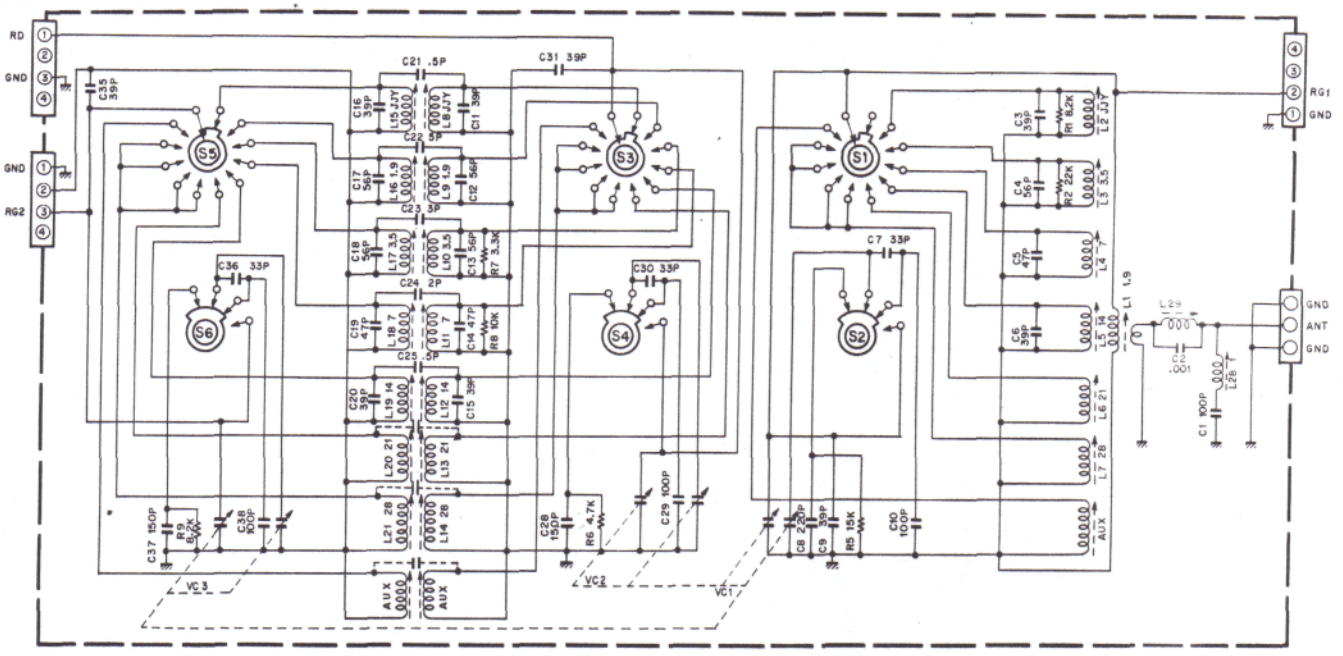
PACKING

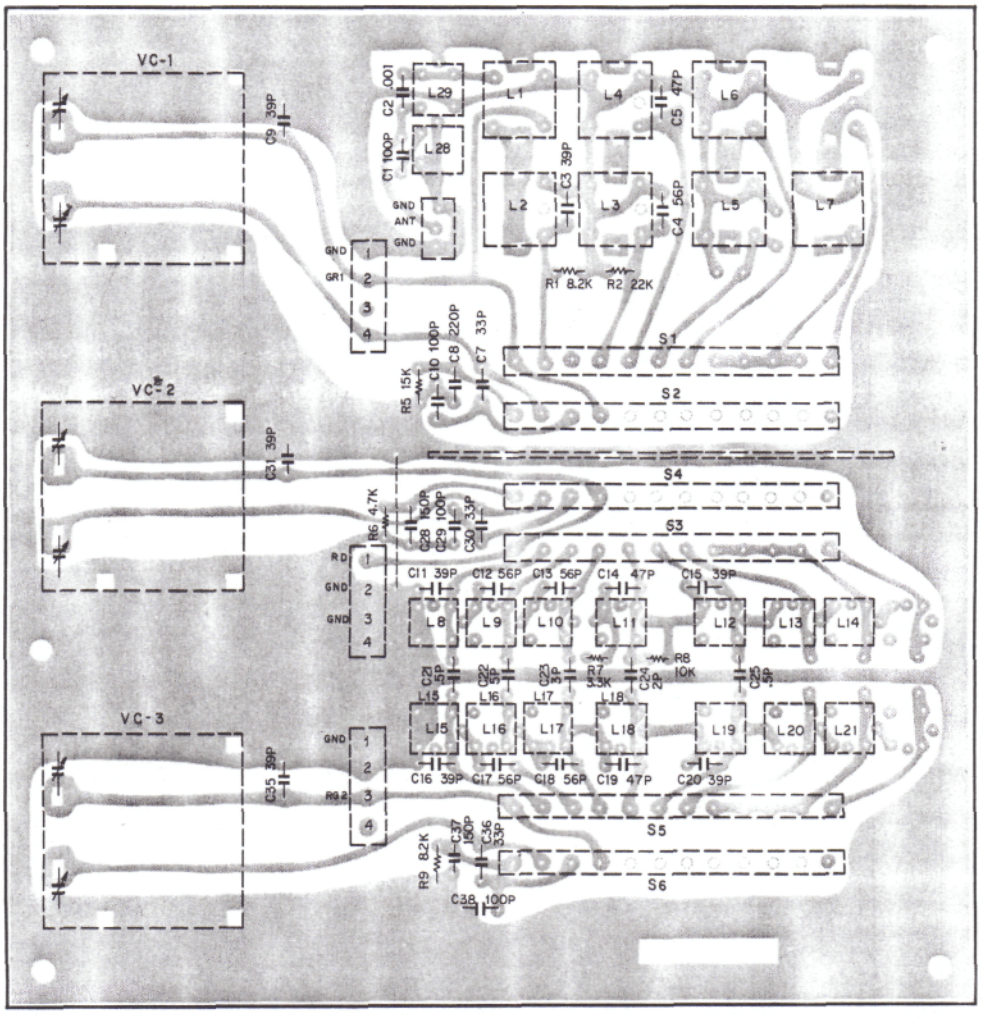
Description	Q'ty
Accessory bag A (H25-0029-04)	
Fuse (F05-1023-05)	2
Phone plug (E12-0001-05)	1
Screw (N30-4012-46)	2
1P pin plug (E14-0101-05)	5
Accessory bag B (H25-0077-03)	
White/red wire	1m
Coax cable 1.5C-2V (slipped 75Ω)	1m
Ceramic (0.01μF)	2
Accessory bag C (H25-0112-04)	
Accessory bag A, B	
Leg (Large) (J02-0049-14)	2
Counter calbe (E31-0039-05)	1
Cable (HET) (E30-1616-05)	1
Cable (ANT) (E30-1617-05)	1
Cable (GND) (E30-1619-05)	1



CIRCUIT DIAGRAM/PC BOARD

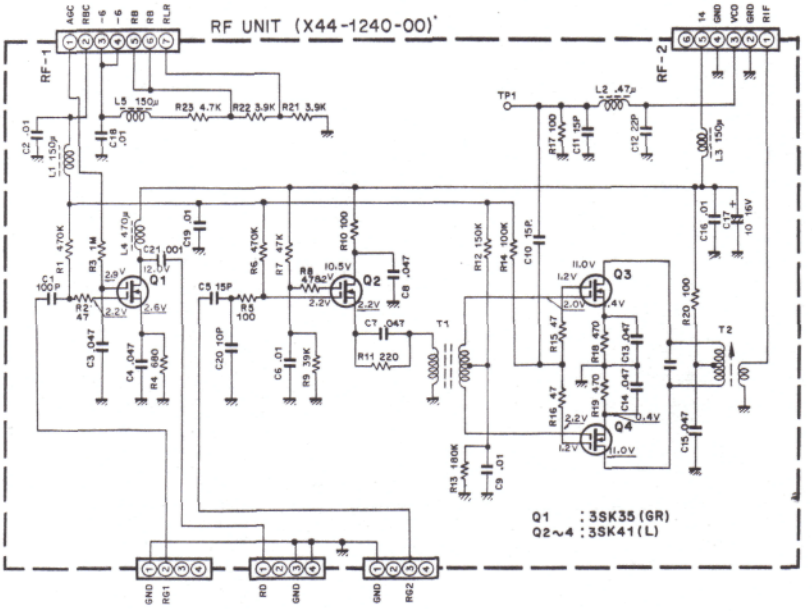
■ COIL PACK UNIT (X44-1230-00)

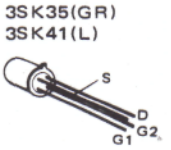


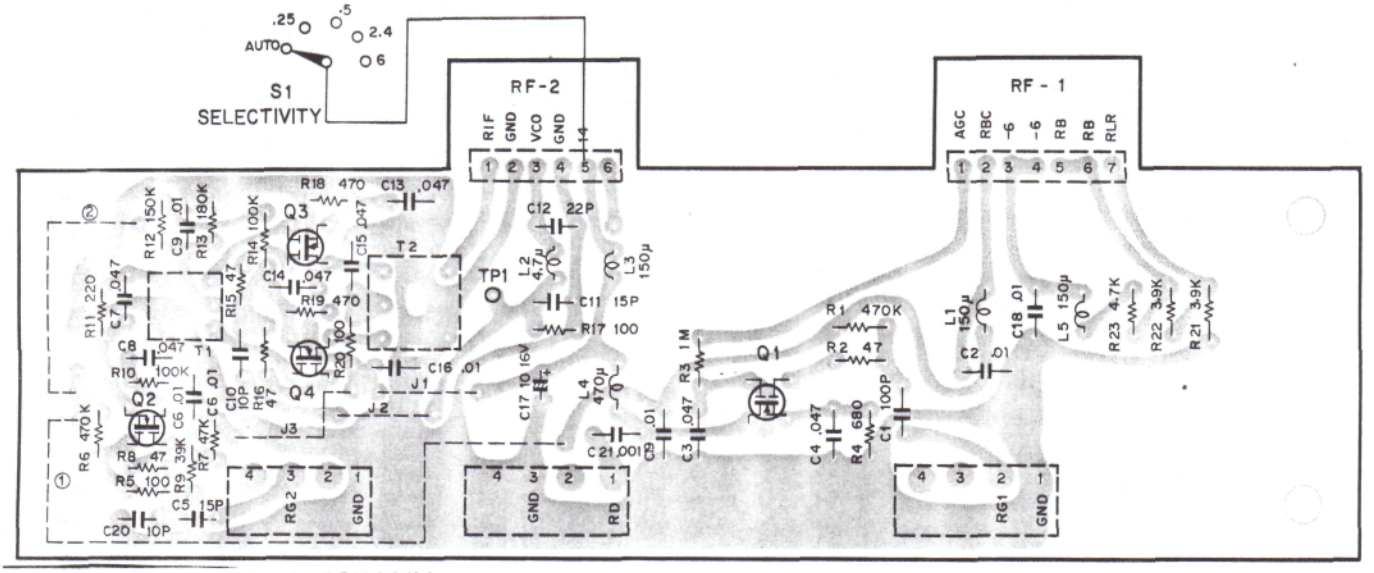


CIRCUIT DIAGRAM/PC BOARD

■ RF UNIT (X44-1240-00)

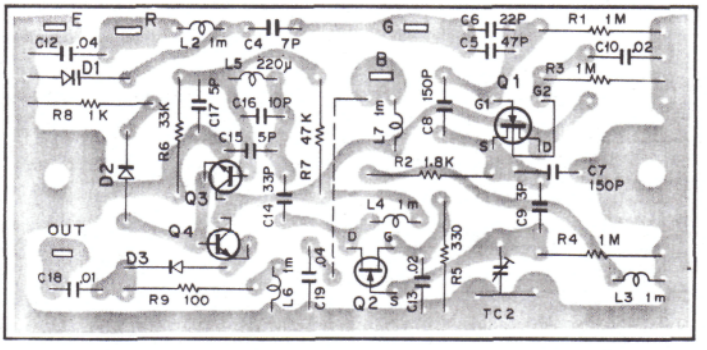


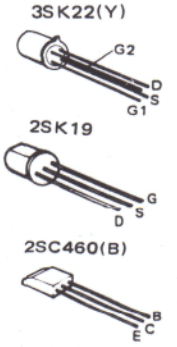




Q1: 3SK35(GR), Q2~4: 3SK41(L)

■ VFO UNIT (X44-1110-00)

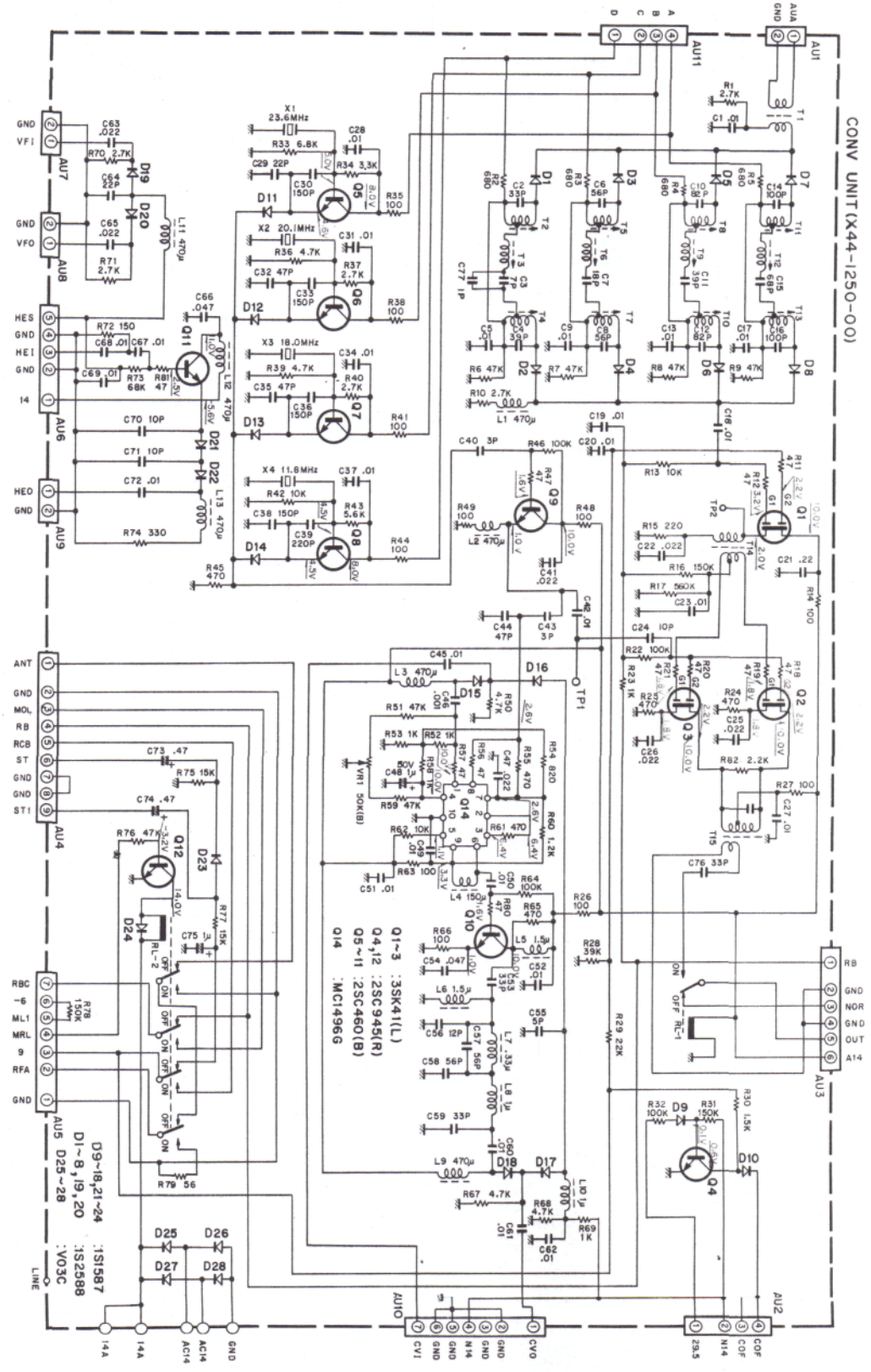




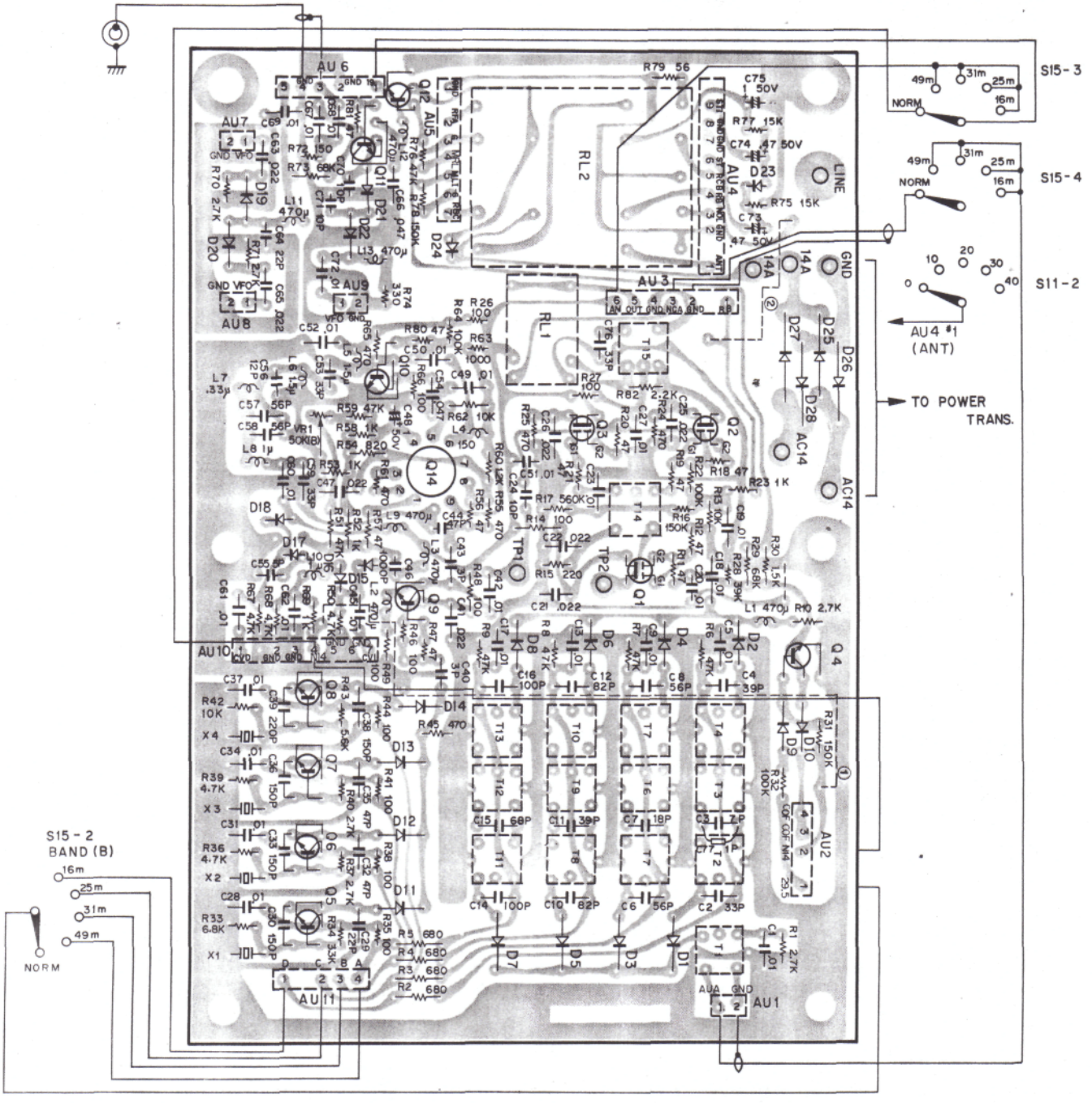
Q1: 3SK22(Y), Q2: 2SK19(Y), Q3, 4: 2SC460(B),
D1: SD111, D2, 3: 1N60

CIRCUIT DIAGRAM/PC BOARD

■ CONVERTER UNIT (X44-1250-00)

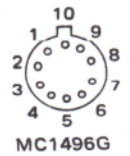


CIRCUIT DIAGRAM/PC BOARD



Q1~3: 3SK41(L), Q4, 12: 2SC945(R), Q5~11: 2SC460(B), Q14: MC1496G

Bottom View



MC1496G

2SC945(R)



3SK41(L)

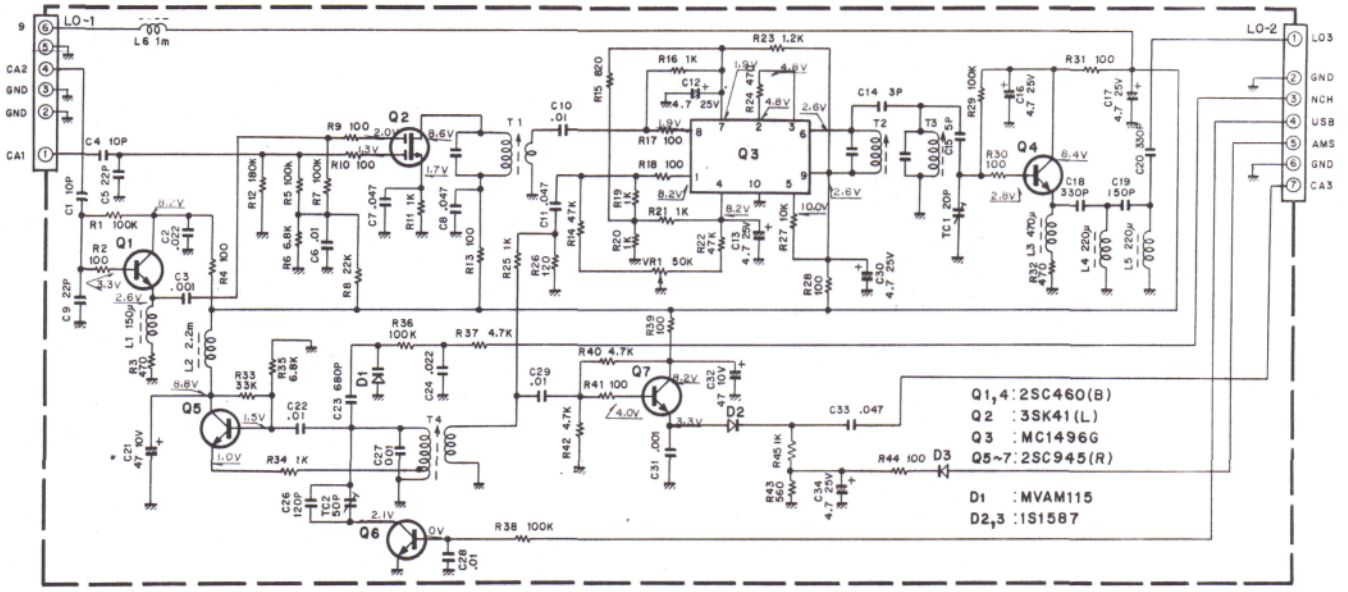


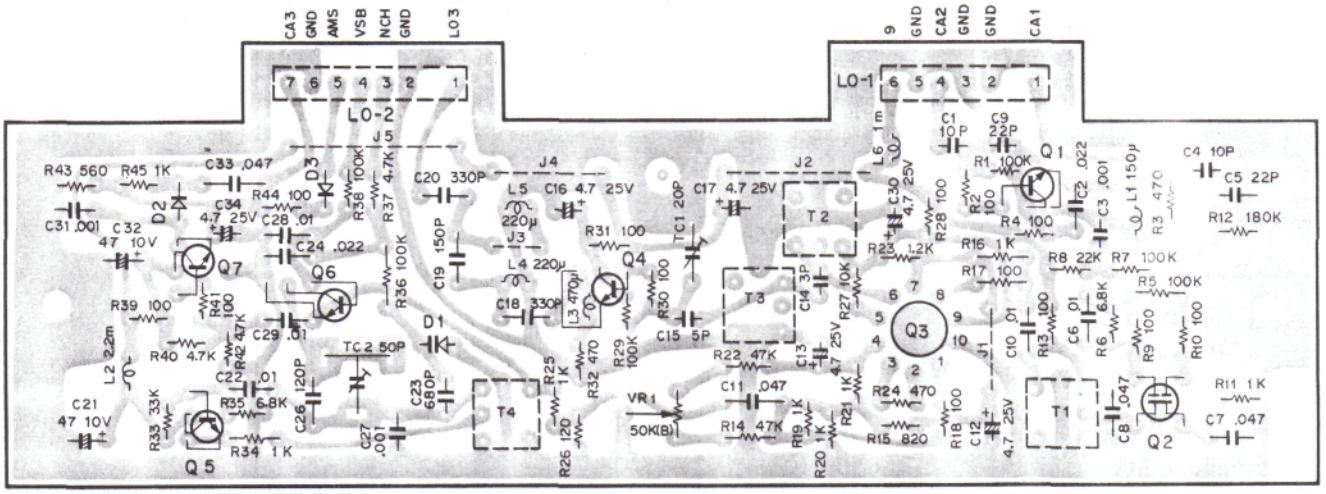
2SC460(B)



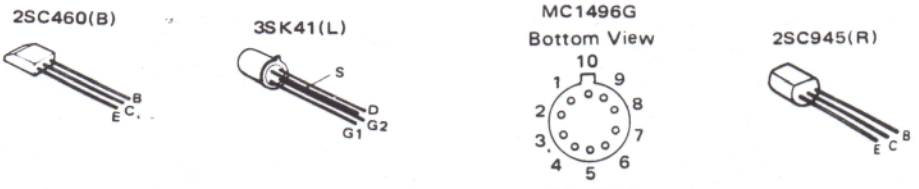
CIRCUIT DIAGRAM/PC BOARD

■ LOCAL OSCILLATOR UNIT (X50-1440-00)



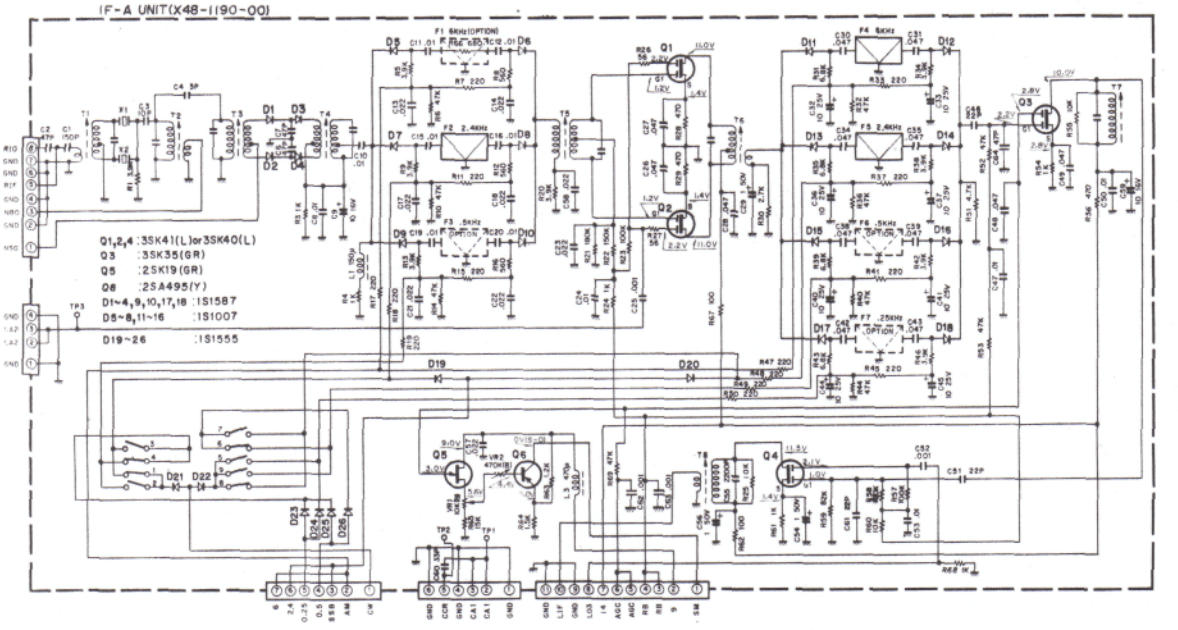


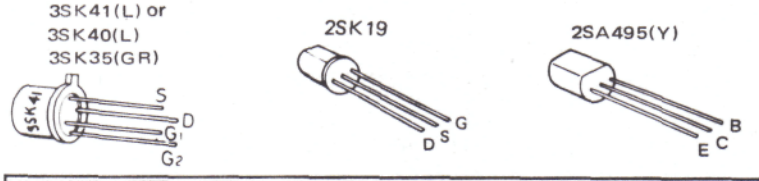
Q1, 4: 2SC460(B), Q2: 3SK41(L), Q3: MC1496G, Q5~7: 2SC945(R), D1: MVAM115
D2, 3: 1S1587

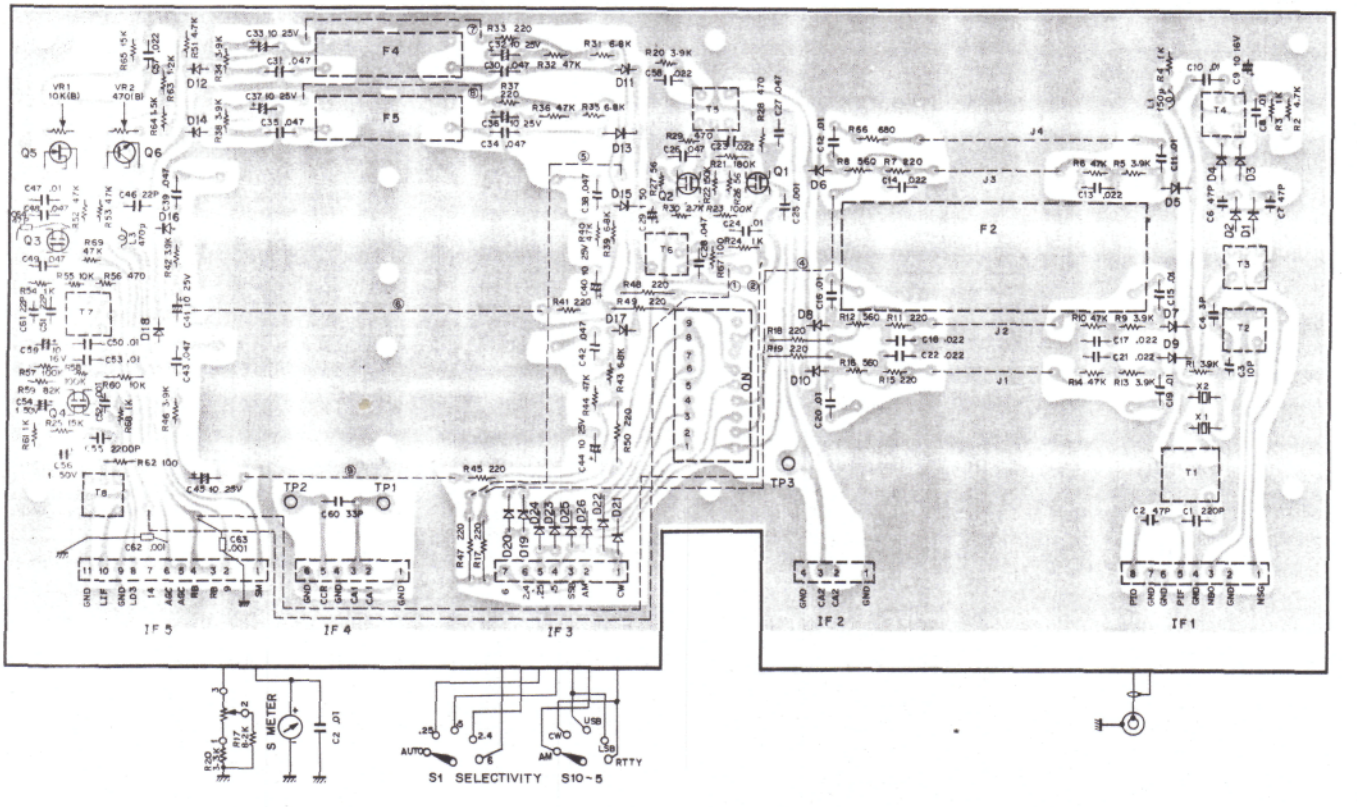


CIRCUIT DIAGRAM/PC BOARD

■ IF•A UNIT (X48-1190-00)



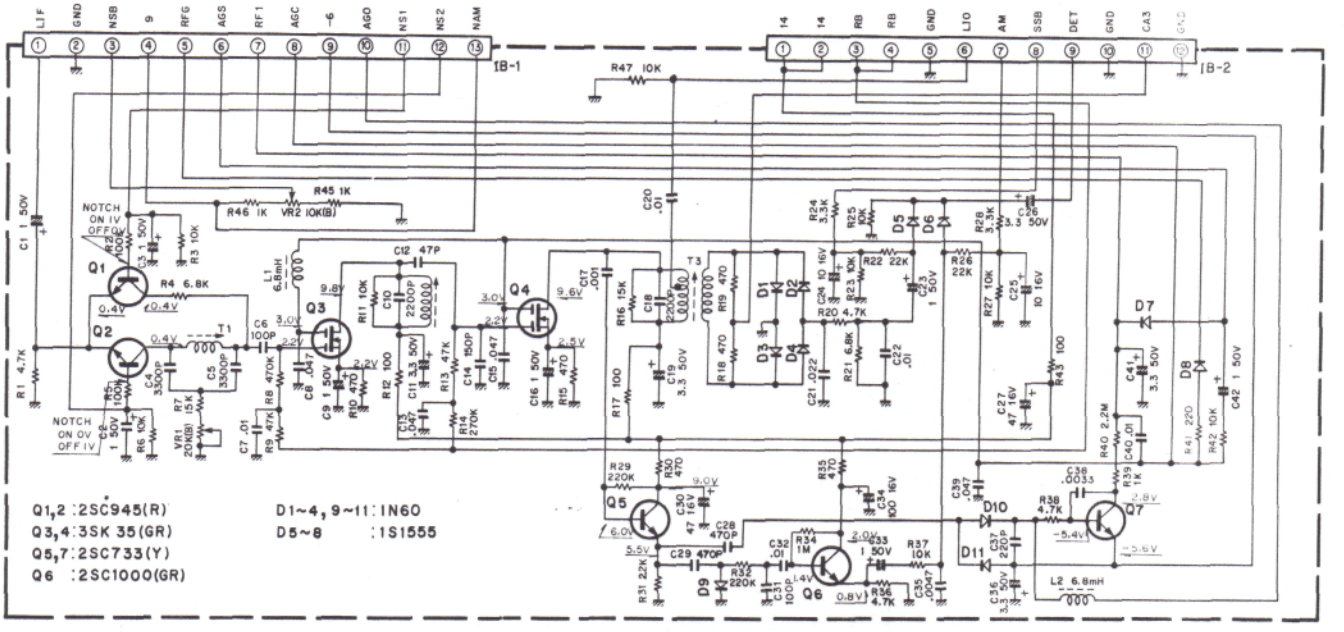


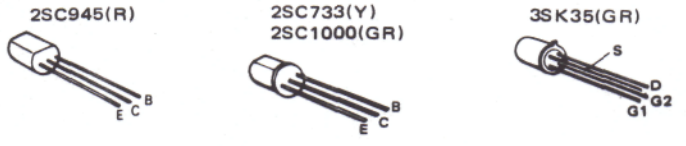


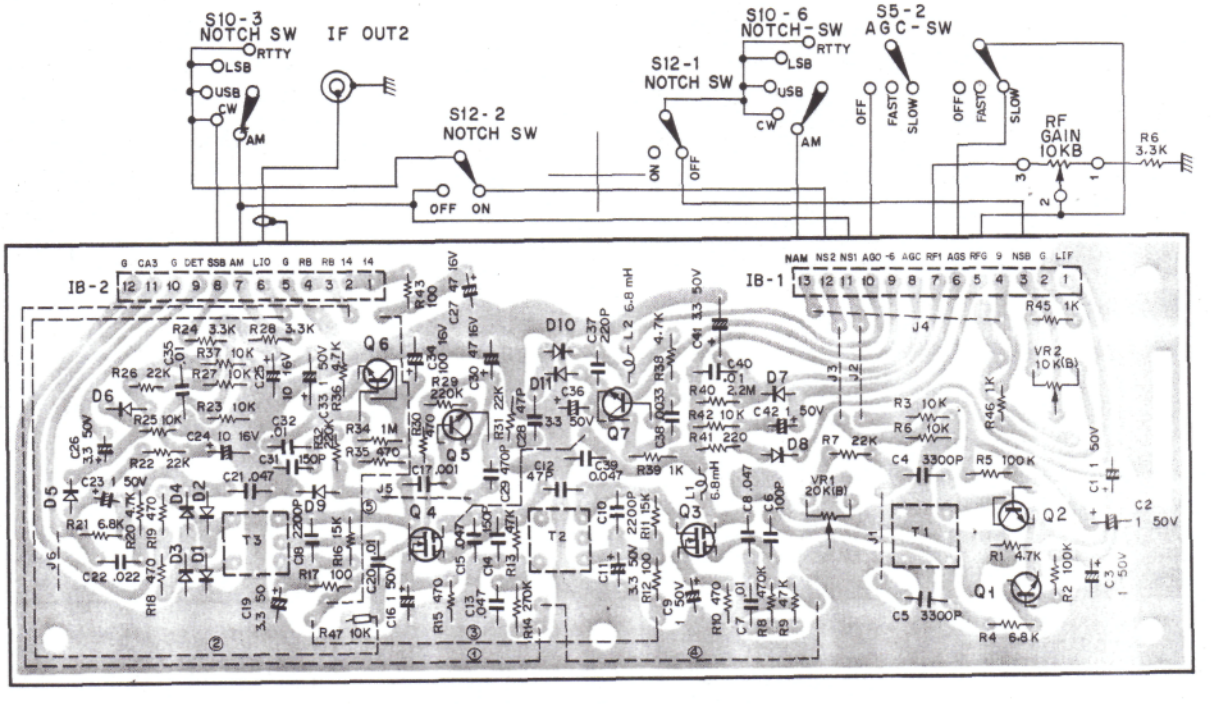
Q1, 2, 4: 3SK40 (L) or 3SK41(L), Q3: 3SK35(GR), Q5: 2SK19(GR), Q6: 2SA495(Y)
D1~4, 9, 10, 17, 18: 1S1587, D5~8, 11~16: 1S1007, D19~26: 1S1555

CIRCUIT DIAGRAM/PC BOARD

■ IF·B UNIT (X48-1200-00)



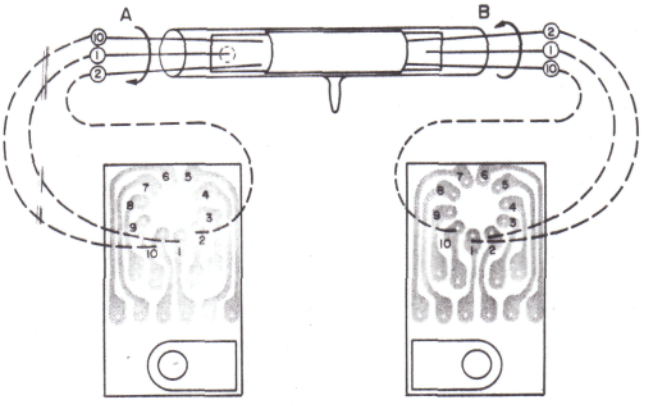


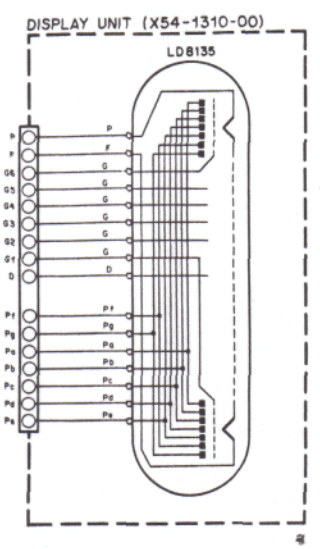


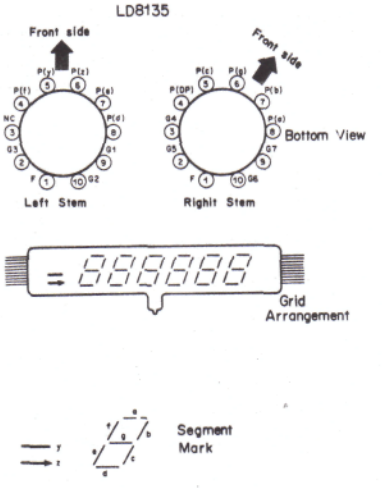
Q1, 2: 2SC945(R), Q3, 4: 3SK35(GR), Q5, 7: 2SC733(Y), Q6: 2SC1000(GR)
D1~4, 9~11: 1N60, D5~8: 1S1555

CIRCUIT DIAGRAM/PC BOARD

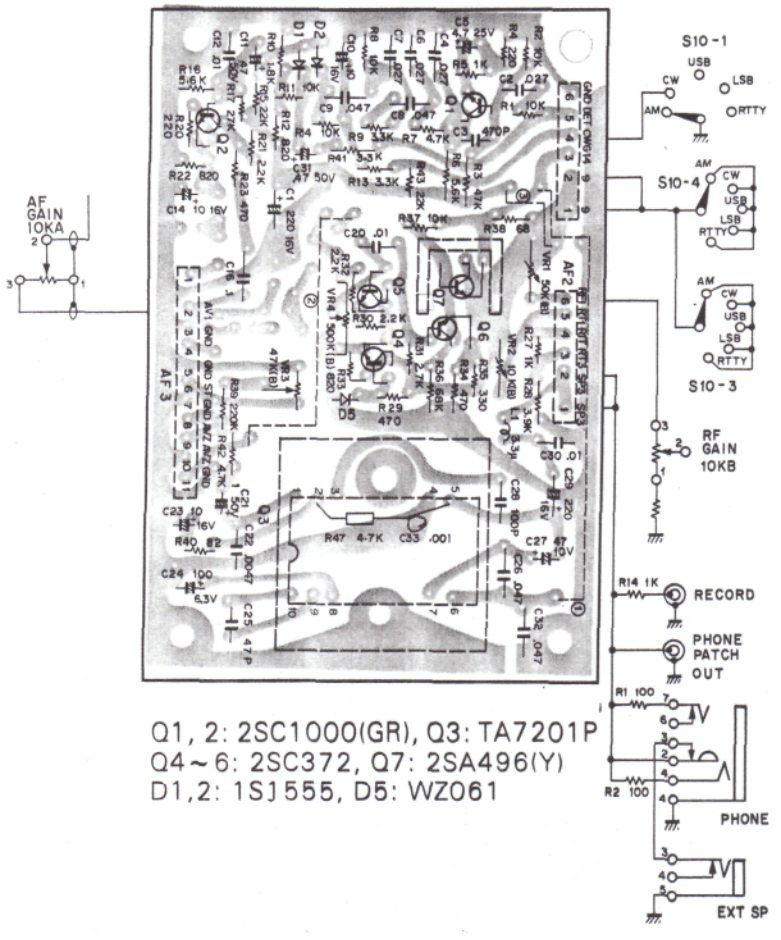
■ DISPLAY UNIT





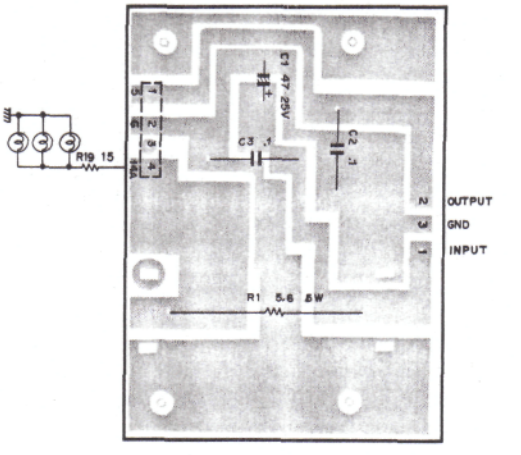


■ AF AVR UNIT (X49-1080-00)

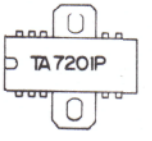


Q1, 2: 2SC1000(GR), Q3: TA7201P
Q4~6: 2SC372, Q7: 2SA496(Y)
D1,2: 1SJ555, D5: WZ061

■ 5V AVR UNIT (X43-1220-00)



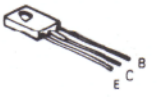
TA7201P



2SC1000(GR)
2SC372

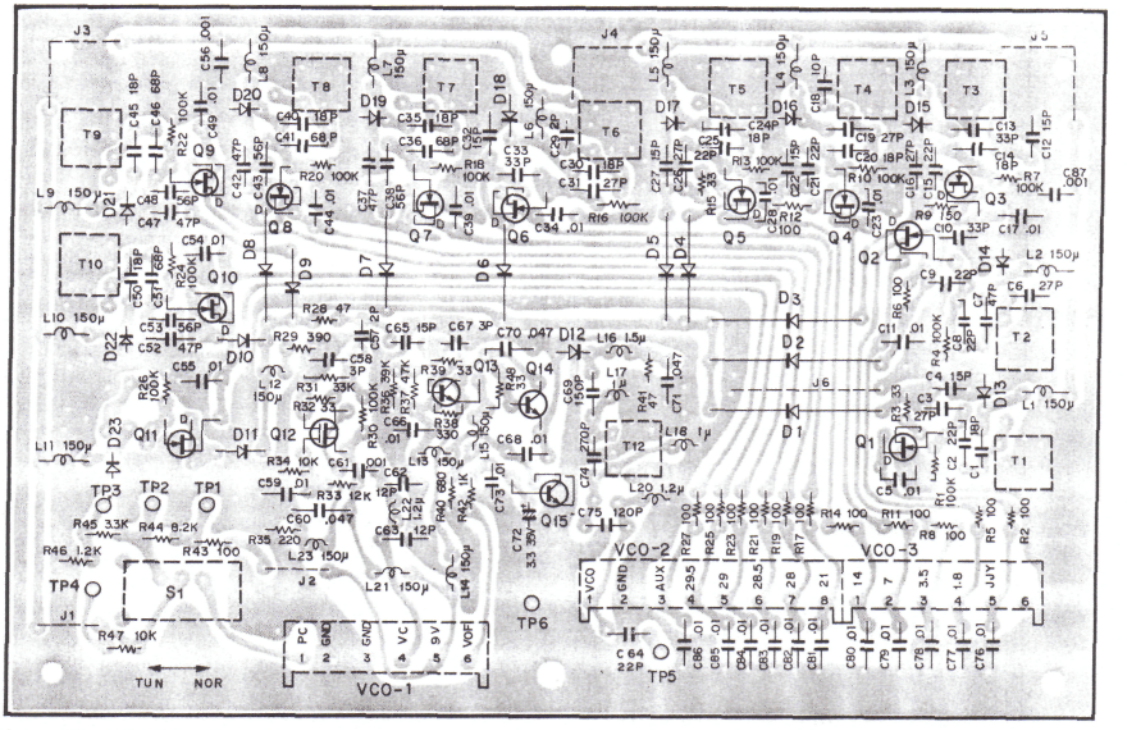


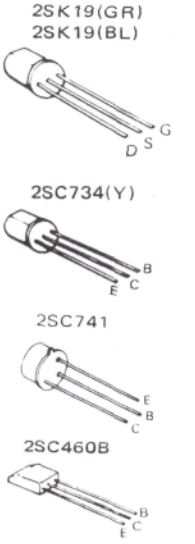
2SA496(Y)



CIRCUIT DIAGRAM/PC BOARD

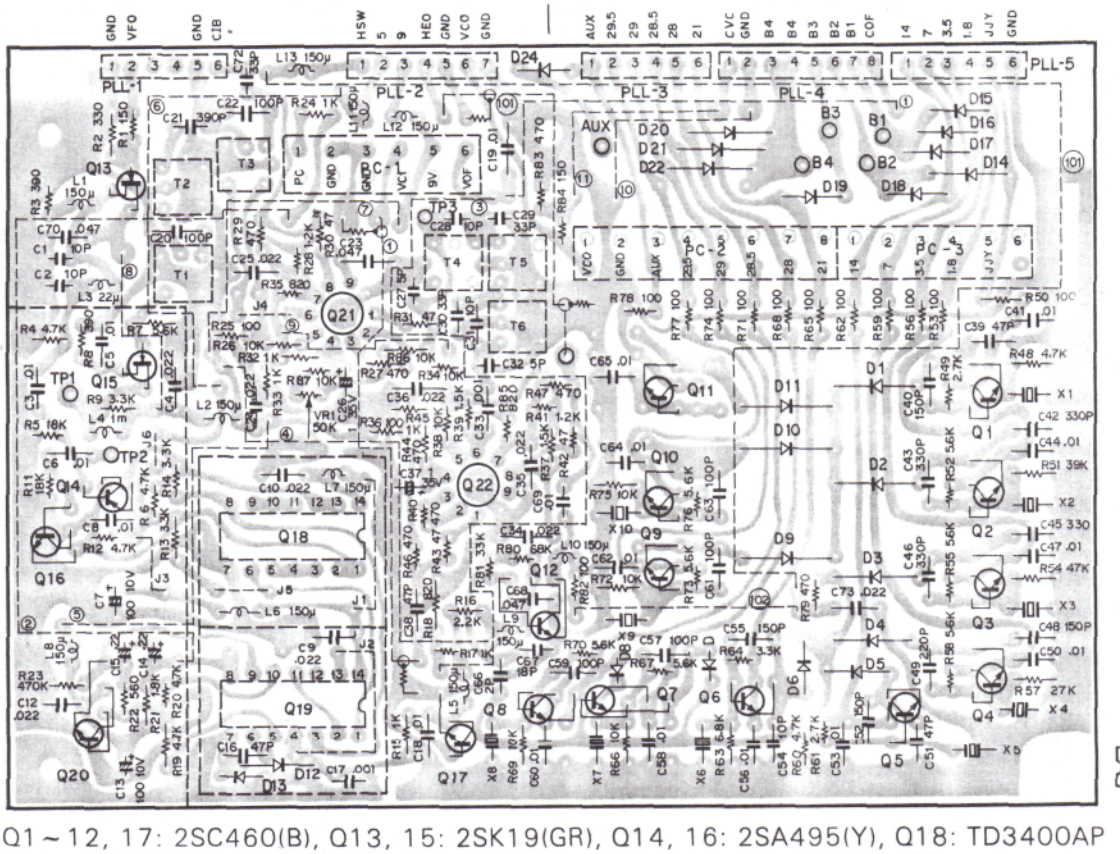
■ VCO UNIT (X50-1330-00)

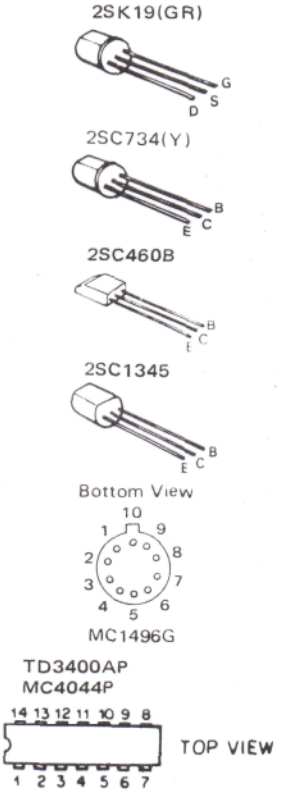




Q1 ~ 6: 2SK19(GR), Q7 ~ 11: 2SK19(BL), Q12: 3SK41(L), Q13: 2SC460(B), Q15: 2SC734(Y)
Q14: 2SC741, D1 ~ 12: 1S2588, D13 ~ 23: 1S1658-(3)

■ PD UNIT (X50-1340-00)

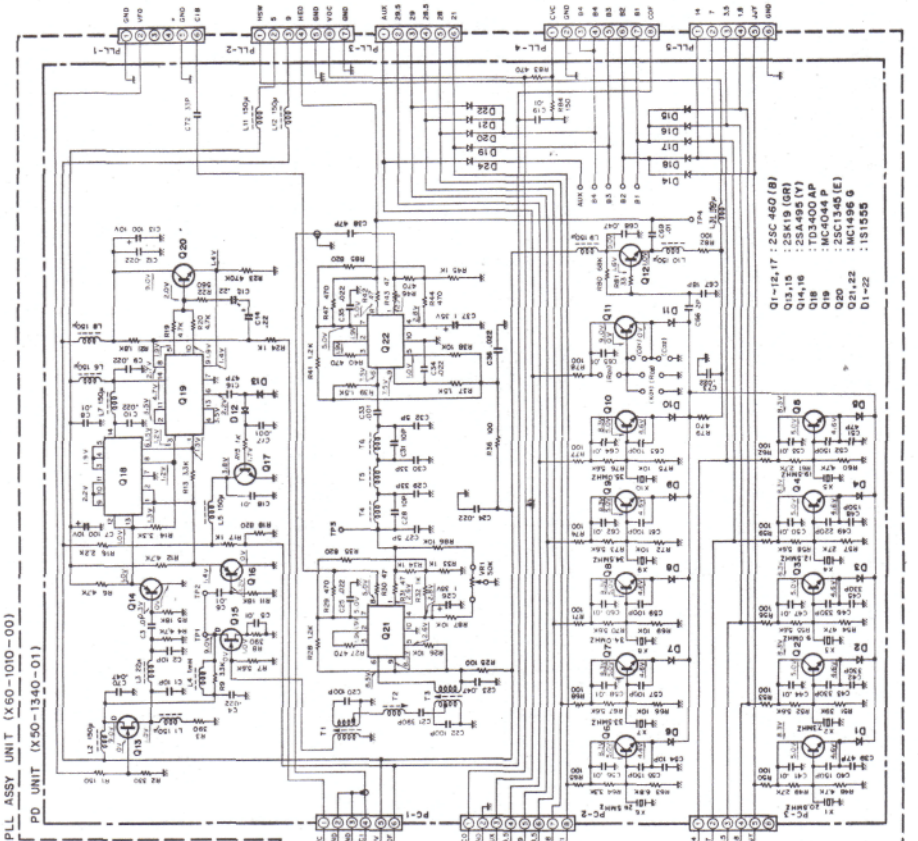




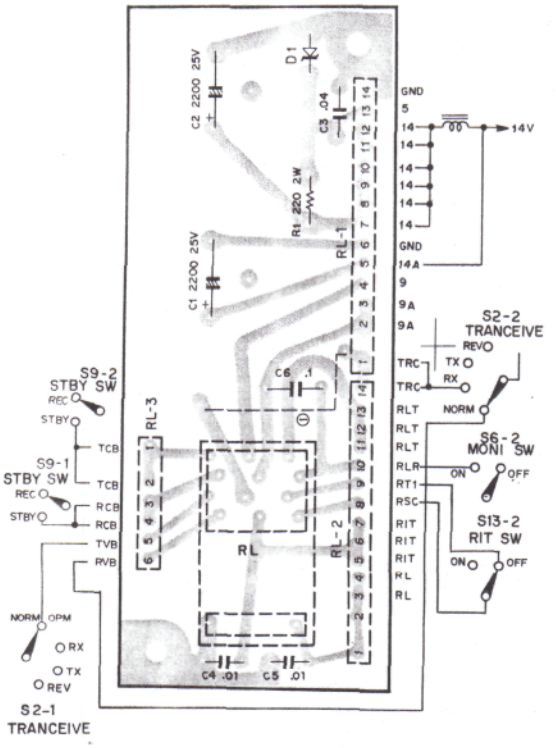
Q1 ~ 12, 17: 2SC460(B), Q13, 15: 2SK19(GR), Q14, 16: 2SA495(Y), Q18: TD3400AP
Q19: MC4044P, Q20: 2SC1345(E), Q21, 22: MC1496G, D1 ~ 22: 1S1555

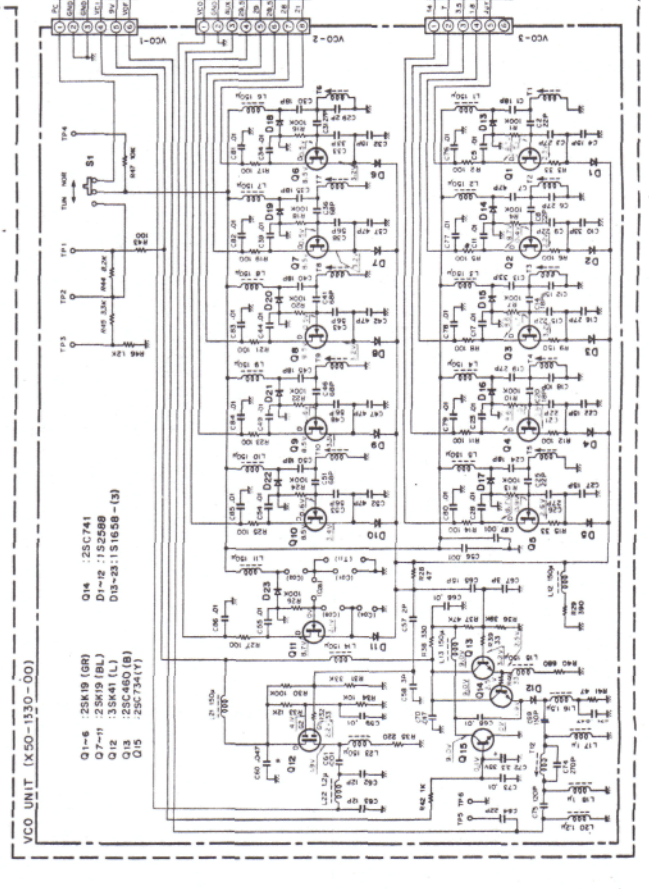
CIRCUIT DIAGRAM/PC BOARD

■ PLL ASS'Y UNIT (X60-1010-01)



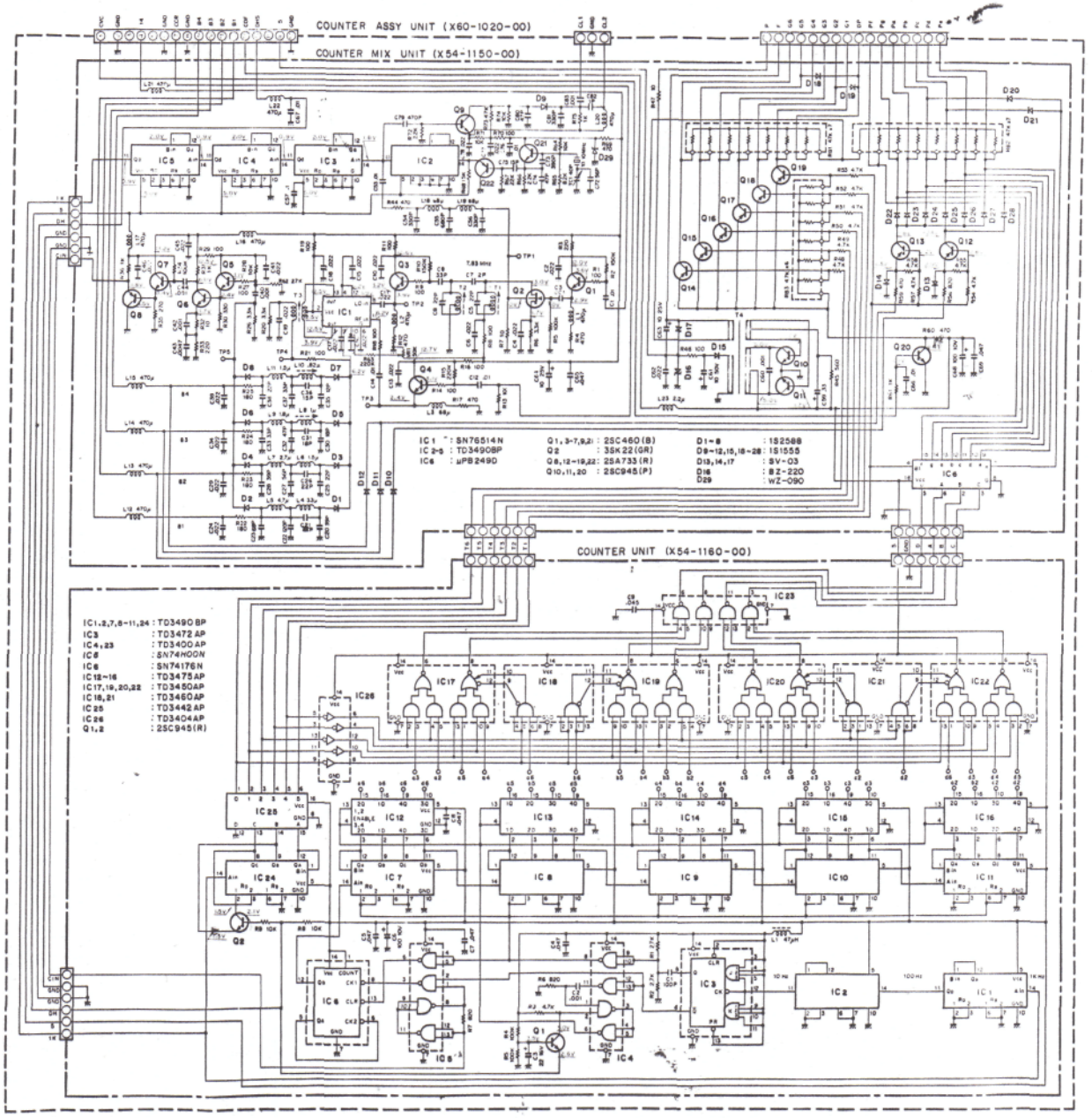
■ RELAY UNIT (X43-1190-00)



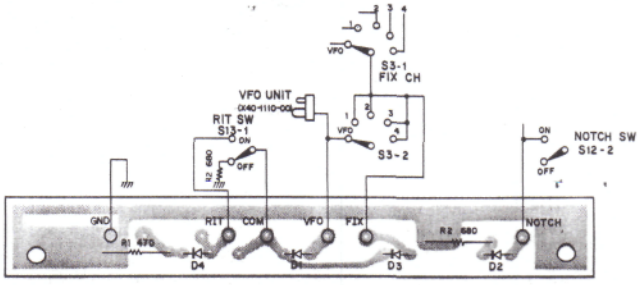


CIRCUIT DIAGRAM/PC BOARD

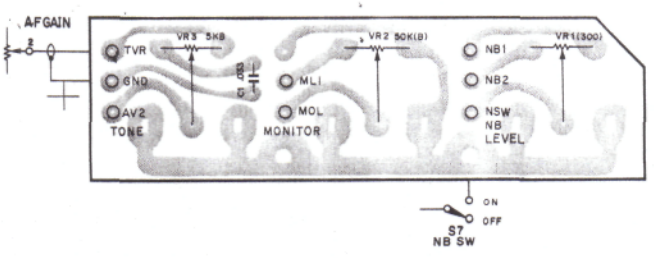
■ COUNTER ASS'Y UNIT (X60-1020-00)



■ INDICATOR UNIT (X54-1180-00)

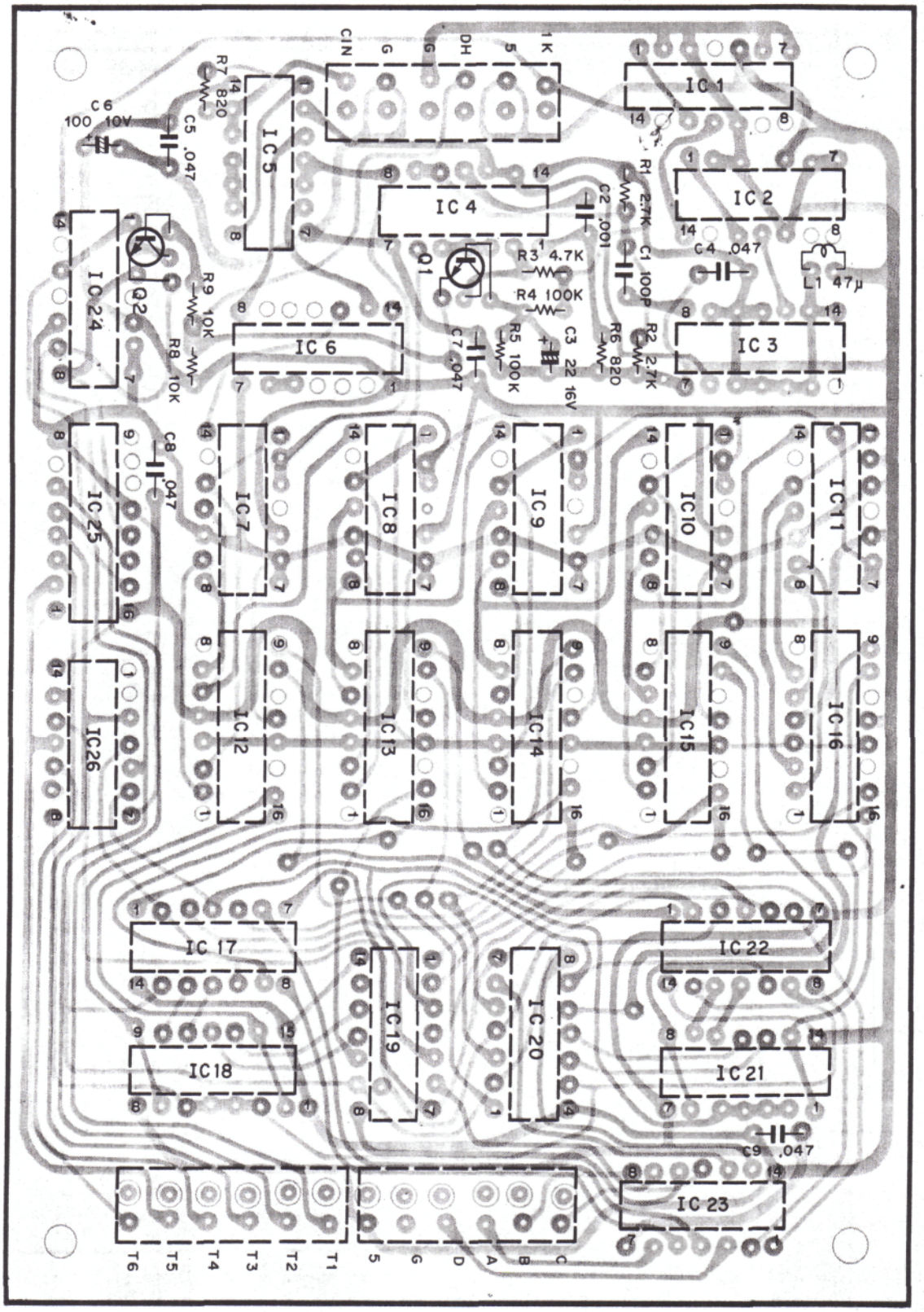


■ VR UNIT (X54-1340-00)



CIRCUIT DIAGRAM/PC BOARD

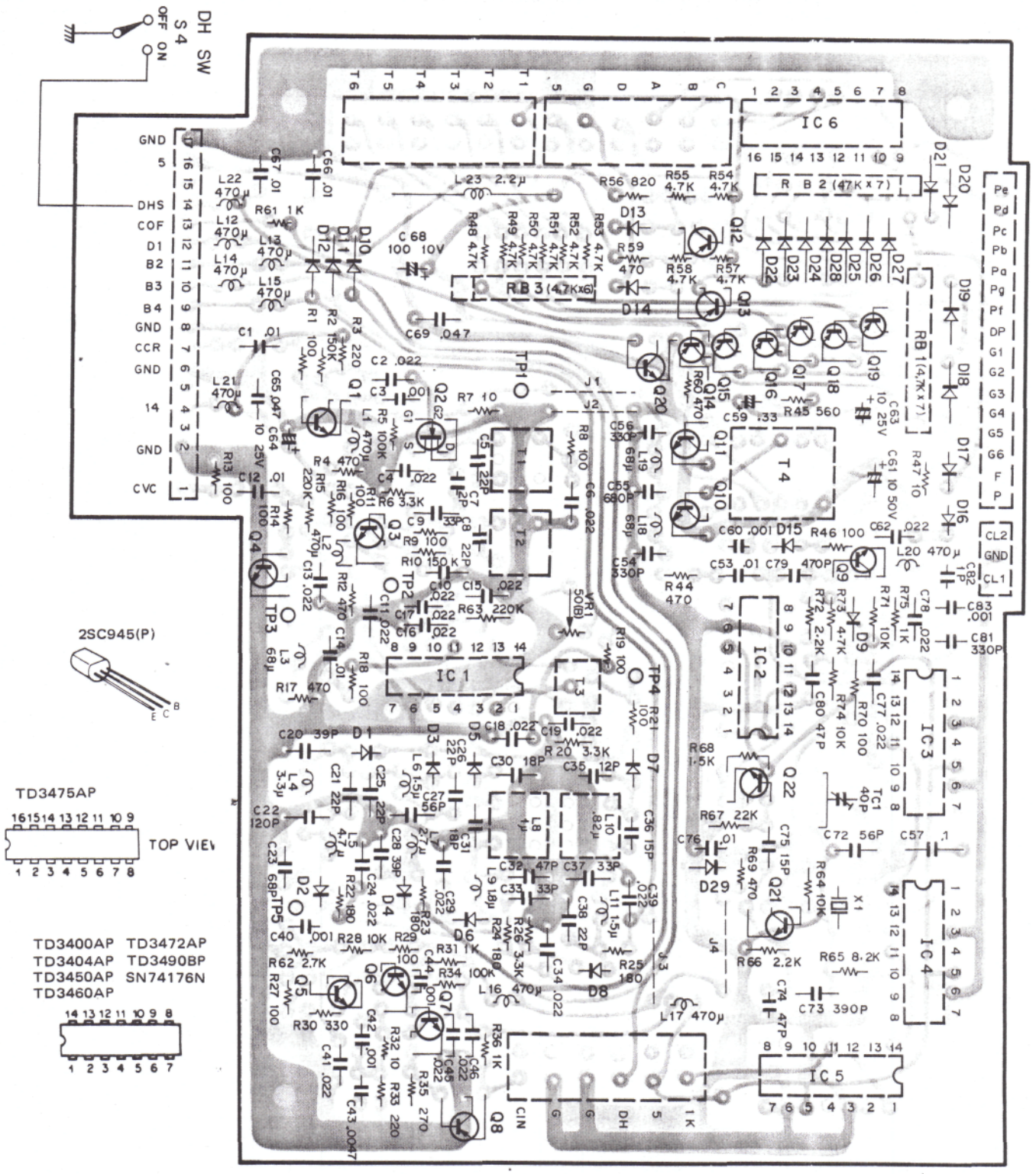
■ COUNTER UNIT (X54-1160-00)



IC1, 2, 7, 8~11, 24: TD3490BP, IC3: TD3472AP, IC4, 23: TD3400AP, IC5: SN74H00N
IC6: SN74176N, IC12~16: TD3475AP, IC17, 19, 20, 22: TD3450AP, IC18, 21: TD3460AP
IC25: TD3442AP, IC26: TD3404AP, Q1, 2: 2SC945(R)

CIRCUIT DIAGRAM/PC BOARD

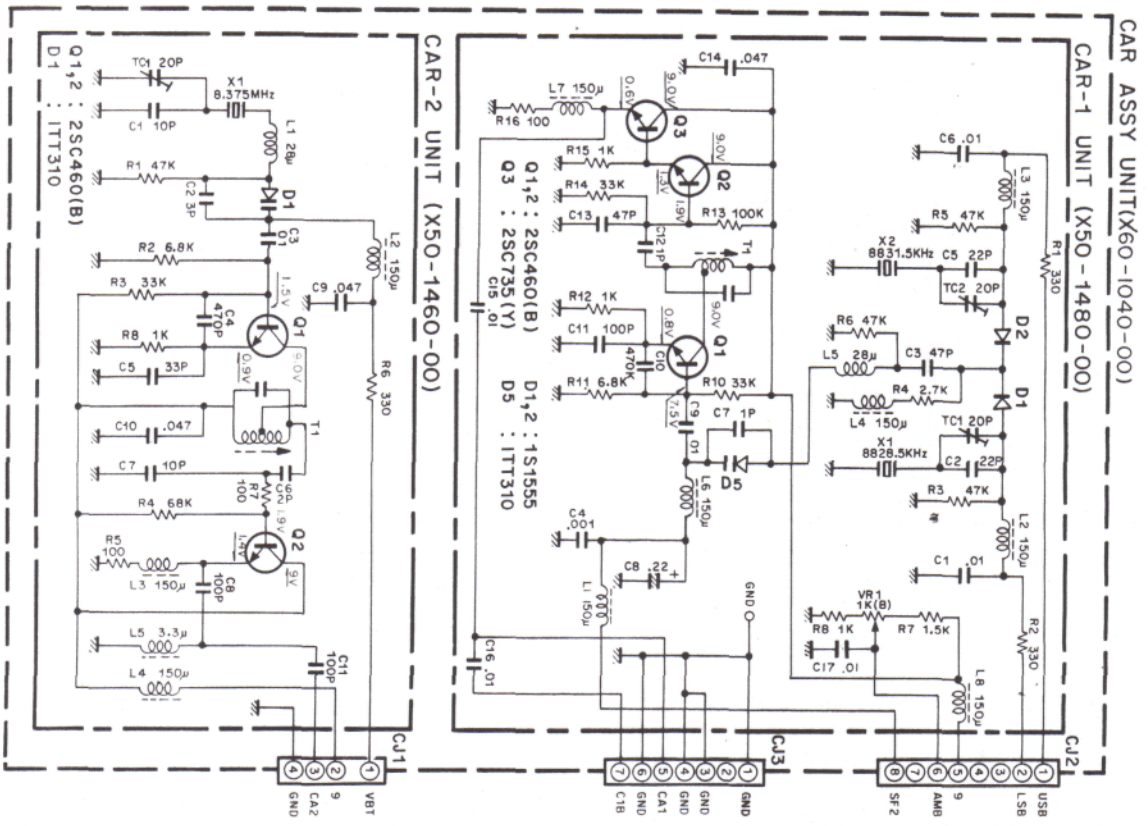
■ COUNTER MIXER UNIT (X54-1150-00)



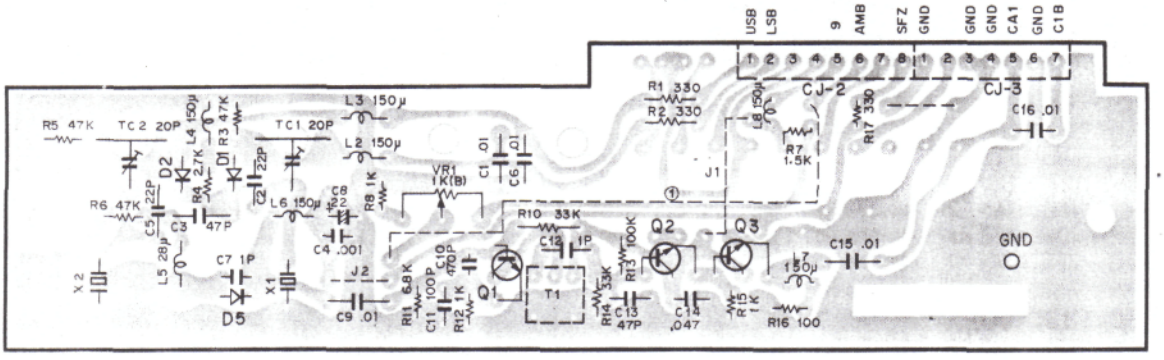
IC1: SN76514N. IC2~5: TD3490BP. IC6: μPB249D. Q1, 3~7, 9, 21: 2SC460(B)
Q2: 3SK22(GR), Q8, 12~19, 22: 2SA733(R), Q10, 11, 20: 2SC945(P), D1~8: 1S2588
D9~12, 15, 18~28: 1S1555, D13, 14, 17: SV-03, D16: BZ-220, D29: WZ-090

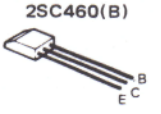
CIRCUIT DIAGRAM/PC BOARD

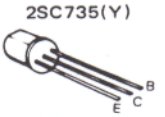
■ CAR ASS'Y UNIT (X60-1040-00)



■ CAR-1 UNIT (X50-1480-00)

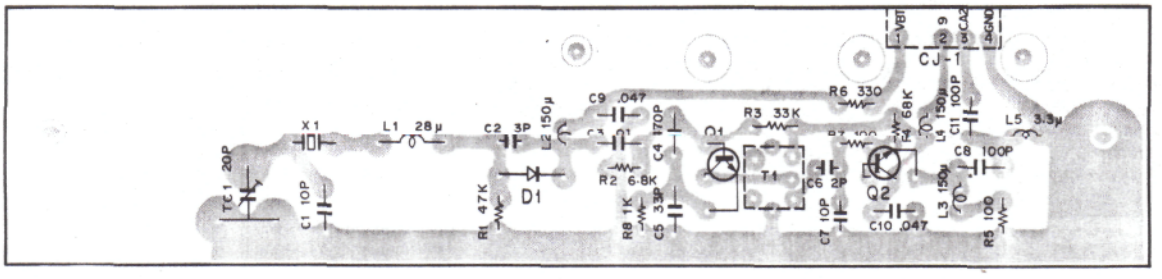


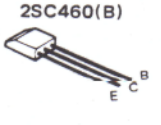




Q1, 2: 2SC460(B), Q3: 2SC735(Y), D1, 2: 1S1555, D5: ITT310

■ CAR-2 UNIT (X60-1040-00)

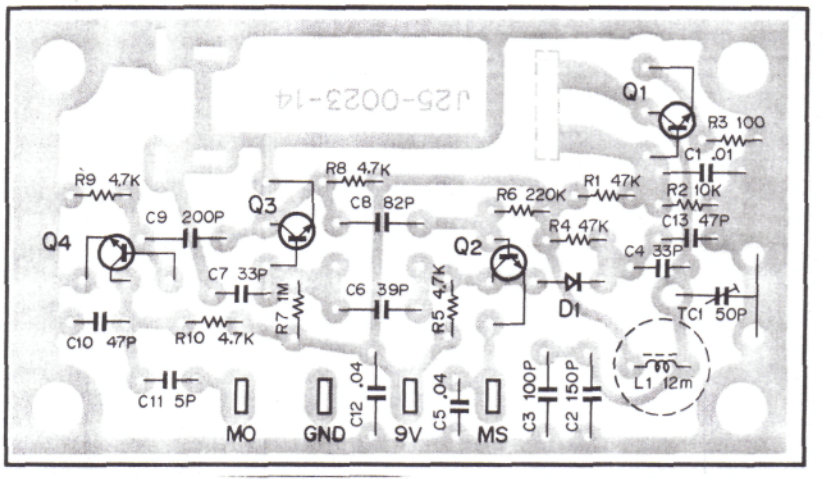


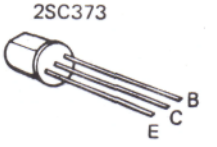


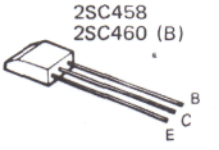
Q1, 2: 2SC460(B), D1: ITT310

CIRCUIT DIAGRAM/PC BOARD

■ MARKER UNIT (X52-0005-00)

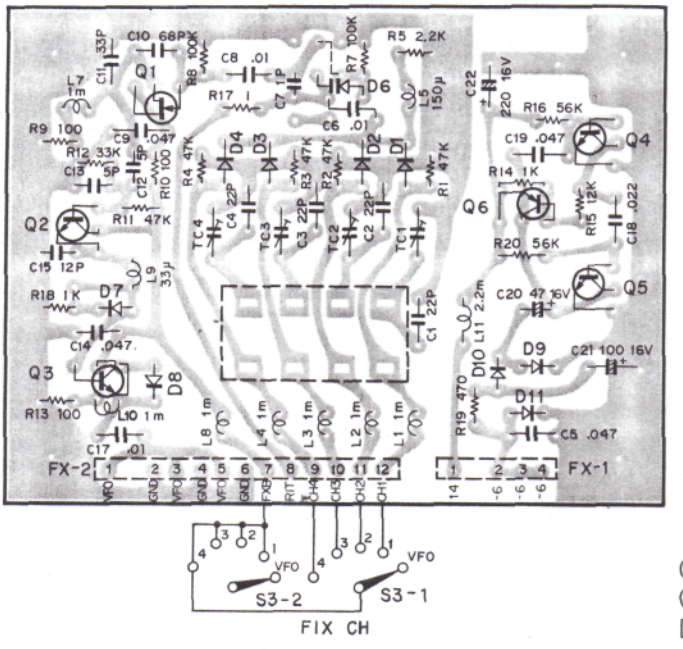


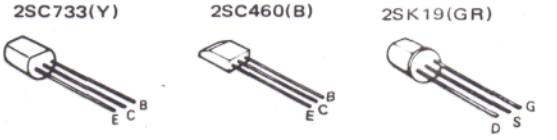




Q1, 4:2SC373 or 2SC458 (B), Q2, 3:2SC373, D1:1N60

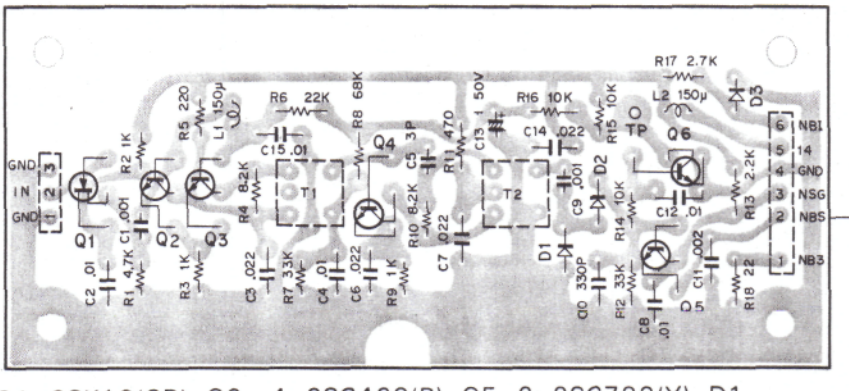
■ FIX UNIT (X50-1450-00)

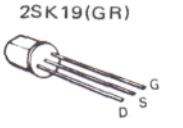


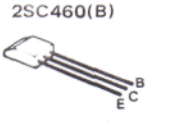


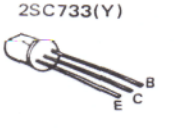
Q1: 2SK19(GR), Q2, 3: 2SC460(B), Q4, 5: 2SC945(R)
Q6: 2SA733(R), D1~4: 1S1587, D6: ITT310, D7, 8: 1N60
D9, 10: 1S1555, D11: XZ060

■ NB UNIT (X50-1330-00)









Q1: 2SK19(GR), Q2~4: 2SC460(B), Q5, 6: 2SC733(Y), D1, 2: 1N60, D3: MV-13

PARTS LIST

GENERAL

☆ : New parts

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C1	C90-0145-05	Metalized polyester 0.01μF AC250V	
C2	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
		RESISTOR	
R1,2	RC05GF2H101J	Solid 100Ω ±5% 1/2W	
R3～21	RD14BB2E○○○J	Carbon ○○○Ω* ±5% 1/4W	
		*Refer to schematic diagram.	
R19	RC05GF2H150J	Solid 15Ω ±5% 1/2W	
		SEMICONDUCTOR	
D1		Diode 1S1555	
		POTENTIOMETER	
—	R08-3012-15	RF 10kΩ (B), AF 10kΩ (A)	☆
—	R08-3401-05	VBT10kΩ (F), × 2	☆
—	R08-9402-05	IF-SHIFT 10kΩ (F), 1kΩ (F)	☆
—	R21-9401-05	NOTCH 10kΩ (F), RIT 5kΩ (B)	☆
		SWITCH	
S1	S01-1407-05	Rotary switch SELECTIVITY	☆
S2	S01-1408-05	Rotary switch TRANSCEIVE	☆
S3	S01-1037-05	Rotary switch FIX CH	
S4	S40-2077-05	Push switch DH	
S5	S44-2015-05	Paddle switch AGC	
S6	S44-2016-05	Paddle switch MONITOR	
S7,8	S44-2020-05	Paddle switch NB, CAL25kHz	
S9	S44-2016-05	Paddle switch STBY	
S10	S01-5010-05	Rotary switch MODE	
S11	S01-3402-05	Rotary switch ATT	☆
S12,13	S40-2077-05	Push switch NOTCH, RIT	
S14	S01-1409-05	Rotary switch BAND (A)	☆
S15	S01-1015-15	Rotary switch BAND (B)	
S16	S59-2020-05	Seesaw POWER	
S17	S31-2007-05	Slide switch TRCV-SEP	
		MISCELLANEOUS	
—	A01-0722-02	Case	☆
—	A20-2326-05	Panel	☆
—	A22-0713-12	Sub-panel	☆
—	A40-0602-01	Bottom plate	☆
—	B01-0105-05	Dial escutcheon	
—	B09-0011-04	Rubber cap × 2	
—	B10-0611-04	Front glass	☆
—	B10-0196-24	Front glass (indicating plate)	☆
—	B10-0197-03	Front glass (dial)	
—	B20-0373-04	*Dial scale (sub-dial)*	
—	B20-0374-04	Dial scale A (outside)	
—	B20-0375-04	Dial scale B (inside)	
—	B30-0806-05	Pilot lamp × 3, 12V 40 mA	
—	B31-0610-05	Meter	☆
—	B40-2433-04	Model name plate	☆
—	B42-1637-04	Adjustment indication sticker (A) (case)	☆
—	B42-1639-04	Adjustment indication sticker (B) (bottom plate)	☆
—	B43-0609-04	Badge (T)	☆
—	B43-0610-04	Badge (Kenwood) (W)(K)	☆

Ref. No.	Parts No.	Description	Re-marks
—	B46-0058-00	Warranty card K	
—	B50-2572-00	Operation manual (K.W)	☆
—	B50-2573-06	Operation manual (T)	☆
—	D13-0402-03	Sprocket × 2 (BAND SW)	
—	D16-0401-04	Chain ass'y	
—	D21-0803-05	Band shaft	☆
—	D21-0414-24	Shaft (B) (Preselector)	
—	D22-0401-14	Shaft coupling (Preselector)	
—	D22-0403-05	Universal joint VBT	☆
—	D23-0702-04	Ball retainer	
—	D32-0051-04	Shaft stopper 3 × 10	
—	D32-0064-04	Shaft stopper × 3 (Set screw)	
—	D32-0075-04	Switch stopper	
—	E04-0102-05	M type receptacle	
—	E05-0116-05	M type plug	
—	E08-0409-05	4P connector (socket)	
—	E08-1601-15	16P consent	
—	E09-0204-05	2P consent plug (VFO)	
—	E11-0034-25	US jack (PHONES)	
—	E11-0003-15	US jack × 2 (EXT-SP, REC)	
—	E12-0001-05	Phone plug (SP)	
—	E13-0101-05	1P pin jack × 5	
—	E14-0101-05	1P plug × 5	
—	E22-0207-05	Lug plate × 3 (101B)	
—	E22-0415-05	Lug plate (201B)	
—	E23-0088-04	Antenna earth lug	
—	E30-1616-05	Cable (HET)	☆
—	E30-1617-05	*Cable (ANT)*	☆
—	E30-1619-05	Cable (GND)	☆
—	E31-0039-05	Counter cable (for adjustment)	
—	F05-1023-05	Fuse × 3 1A	
—	F15-0601-04	Shading plate × 2 (panel, sub-panel)	
—	G01-0801-04	Spring for GND (band, RF)	
—	G11-0044-04	Cushion (relay)	
—	H01-2564-04	Carton case (inside) (K)(W)	☆
—	H01-2566-04	Carton case (inside) (T)	☆
—	H03-1664-04	Carton case (outside) (K)	☆
—	H03-1666-04	Carton case (outside) (T)	☆
—	H10-1276-04	Cushion	
—	H10-1446-02	Styren foam cushion (F)	
—	H10-1447-02	Styren foam cushion (R)	
—	H12-0427-04	Cushion	
—	H20-0439-03	Protection cover	
—	H25-0029-04	Polyetylene bag	
—	H25-0077-03	Polyetylene bag	
—	H25-0112-04	Polyetylene bag	
—	J02-0049-14	Leg (large) × 6	
—	J13-0403-05	Fuse holder with power source selector	☆
—	J19-1301-04	Diode holder × 4	
—	21-0392-04	Lead wire holder × 3	
—	J21-2564-04	Knob fittings	☆
—	J32-0218-04	Hex-boss × 12 (bush, AF VR)	
—	J32-0221-04	Hex-boss × 2 (5V, AVR)	
—	J32-1030-14	Round boss × 2	
—	J32-0222-04	Boss for dial scale A	
—	J32-0223-14	Boss for dial scale B	
—	J41-0020-04	Knob bushing × 3	
—	J61-0019-05	Vinyle tie × 15	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
—	K21-0266-04	Knob double (in) 6φ	
—	K21-0267-04	Knob × 5	
—	K21-0268-04	Knob double (in) 8φ	
—	K21-0269-04	Knob double (out) × 3	
—	K21-0279-04	Knob (FIX)	
—	K21-0709-03	Main knob	
—	K23-0239-04	Knob × 2 (BAND, MODE)	
—	K23-0240-04	Knob × 3 (ADJ)	
—	K23-0241-14	Knob (NOTCH)	
—	K23-0709-04	Lever switch (TRCV-SEP)	☆
—	K29-0166-04	Knob × 3 (push)	
—	K29-0269-04	Knob (calibration)	
—	L01-8014-05	Power transformer	☆
—	L15-0002-15	Choke coil (low frequency)	
—	X40-1110-00	VFO unit	
—	X41-1130-00	Switch unit	☆
—	X43-1190-01	Relay unit	☆
—	X43-1220-00	5V-AVR unit	
—	X44-1230-00	Coil pack unit	☆
—	X44-1240-00	RF unit	☆
—	X44-1250-00	CONV. unit	☆
—	X48-1190-00	IF-A unit	☆
—	X48-1200-00	IF-B unit	☆
—	x49-1080-01	AF-AVR unit	☆
—	X50-1440-00	Local oscillator unit	☆
—	X50-1450-00	FIX unit	☆
—	X52-0005-01	Marker unit	
—	X54-1310-00	Display unit	
—	X54-1180-00	Indicator unit	
—	X54-1330-00	NB unit	☆
—	X54-1340-00	VR unit	☆
—	X60-1010-01	PLL ASS'Y unit	☆
—	X60-1020-00	Counter ass'y unit	
—	X60-1040-00	CAR-ASS'Y unit	☆
—	X42-1040-00	AC cord ass'y	
—	X42-1130-00	Tranceive cable	☆

VFO UNIT (X40-1110-00)

Ref. No.	Parts No.	Description	Remarks
C1	CC45PG1H470J	Ceramic 47pF ±5%	
C2,3	CC45LG1H150J	Ceramic 15pF ±5%	
C4	CC45SG1H070D	Ceramic 7pF ±0.5pF	
C5	CC45LG1H470J	Ceramic 47pF ±5%	
C6	CC45LG1H220J	Ceramic 22pF ±5%	
C7,8	CM93F2A151J	Super mica 150pF ±5%	
C9	CC45CH1H030D	Ceramic 3pF ±0.5pF	
C10	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C11,12	CK45F1H473Z	Ceramic 0.047μF +80,−20%	
C13	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C14	CC45SL1H330J	Ceramic 33pF ±5%	
C15	CC45SL1H050D	Ceramic 5pF ±0.5pF	
C16	CC45SL1H100D	Ceramic 10pF ±0.5pF	
C17	CC45SL1H050D	Ceramic 5pF ±0.5pF	
C18	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C19	CK451H473Z	Ceramic 0.047μF +80,−20%	
C20	CC45CG1H100D	Ceramic 10pF ±0.5pF	

Ref. No.	Parts No.	Description	Remarks
R1～11	RD14BB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W *Refer to schematic diagram.	
Q1	V09-0020-05	FET 3SK22(Y)	
Q2	V09-0011-05	FET 2SK19(Y)	
Q3,4	V03-0079-05	Transistor 2SC460(B)	
D1	V11-0053-05	Diode SD111	
D2,3	V11-0051-05	Diode 1N60	
VC	C01-0169-05	Variable condenser	
TC1	C03-0001-05	Variable capacitor (small size)	
TC2	C05-0013-15	Ceramic trimmer	
L1	L32-0098-05	Oscillator coil	
L2～4	L40-1021-03	Ferri inductor 1mH	
L5	L40-2201-03	Ferri inductor 22μH	
L5,7	L40-1021-03	Ferri inductor 1 mH	
—	A01-0169-23	VFO case	
—	B42-0010-04	Indication tape	
—	D22-0011-05	Shaft coupling	
—	D40-0205-05	Dial mechanism	
—	E08-0204-05	2P consent	
—	E13-0101-05	1P pin jack	
—	E22-0207-05	Lug plate	
—	E23-0021-04	Terminal × 5	
—	G03-0009-04	Spring	

SWITCH UNIT (X41-1130-00)

Ref. No.	Parts No.	Description	Remarks
—	E40-0526-05	U type pin wafer	
—	E40-0626-05	U type pin wafer	
—	S33-6401-05	Lever switch	☆

RELAY UNIT (X43-1190-00)

Ref. No.	Parts No.	Description	Remarks
C1,2	C90-0325-05	Electrolytic 2200μF 25WV	☆
C3	CK45F1H473Z	Ceramic 0.047μF +80,−20%	
C4,5	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C6	CQ92M1H104K	Mylar 0.1μF ±10%	
D1	V11-0418-05	Zener diode BZ-052	
R1	RS14AB3D221J	Metal film 220Ω ±5%	
—	E40-0613-05	Mini connector	
—	E40-1413-05	Mini connector	
—	S51-4031-05	Relay	☆

PARTS LIST

5V-AVR UNIT (X43-1220-00)

Ref. No.	Parts No.	Description	Remarks
C1	CQ93M1H104K	Mylar 0.1μF ±10%	
C2	CE04W1E470	Electrolytic 47μF 25WV	
C3	CQ93M1H104K	Mylar 0.1μF ±10%	
R1	RW98A3H5R6K	Cement resistor 5.6Ω ±10% 5WV	
Q1	V30-1029-36	IC μPC14305H	☆
—	E40-0413-05	Mini connector	

COIL PACK UNIT (X44-1230-00)

Ref. No.	Parts No.	Description	Remarks
C1	CC45RH1H101J	Ceramic 100pF ±5%	
C2	CQ09S1H102J	Styrene 1999pF ±5%	
C3	CC45RH1H390J	Ceramic 39pF ±5%	
C4	CC45RH1H560J	Ceramic 56pF ±5%	
C5	CC45RH1H470J	Ceramic 47pF ±5%	
C6	CC45RH1H390J	Ceramic 39pF ±5%	
C7	CC45RH1H330J	Ceramic 33pF ±5%	
C8	CC45RH1H221J	Ceramic 220pF ±5%	
C9	CC45RH1H390J	Ceramic 39pF ±5%	
C10	CC45RH1H101J	Ceramic 100pF ±5%	
C11	CC45RH1H390J	Ceramic 39pF ±5%	
C12,13	CC45RH1H560J	Ceramic 56pF ±5%	
C14	CC45RH1H470J	Ceramic 47pF ±5%	
C15,16	CC45RH1H390J	Ceramic 39pF ±5%	
C17,18	CC45RH1H560J	Ceramic 56pF ±5%	
C19	CC45RH1H470J	Ceramic 47pF ±5%	
C20	CC45RH1H390J	Ceramic 39pF ±5%	
C21	CC45RH1H0R5C	Ceramic 0.5pF ±0.25pF	
C22	CC45RH1H050D	Ceramic 5pF ±0.5pF	
C23	CC45RH1H030C	Ceramic 3pF ±0.25pF	
C24	CC45RH1H020C	Ceramic 2pF ±0.25pF	
C25	CC45RH1H0R5C	Ceramic 0.5pF ±0.25pF	
C26,27	VACANT		
C28	CC45RH1H151J	Ceramic 150pF ±5%	
C29	CC45RH1H101J	Ceramic 100pF ±5%	
C30	CC45RH1H330J	Ceramic 33pF ±5%	
C31	CC45RH1H390J	Ceramic 33pF ±5%	
C32～34	VACANT		
C35	CC45RH1H390J	Ceramic 39pF ±5%	
C36	CC45RH1H330J	Ceramic 33pF ±5%	
C37	CC45RH1H151J	Ceramic 150pF ±5%	
C38	CC45RH1H101J	Ceramic 100pF ±5%	
R1～9	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
R3,4	VACANT		
VC1～3	C01-0127-15	Variable capacitor	
L1	L34-0542-05	Tuning coil 1.9 MHz, ANT	
L2	L34-0545-05	Tuning coil JJY, ANT	
L3	L34-0543-05	Tuning coil 3.5 MHz, ANT	
L4	34-0544-05	Tuning coil 7 MHz, ANT	
L5	L34-0545-05	Tuning coil 14 MHz, ANT	
L6	L34-0546-15	Tuning coil 21 MHz, ANT	
L7	L34-0547-15	Tuning coil 28 MHz, ANT	
L8	L34-0679-05	Tuning coil JJY	☆
L9	L34-0651-05	Tuning coil 1.9 MHz	☆
L10	L34-0652-05	Tuning coil 3.5 MHz	☆
L11	L34-0653-05	Tuning coil 7 MHz	☆
L12	L34-0654-05	Tuning coil 14 MHz	☆
L13	L34-0655-05	Tuning coil 21 MHz	☆
L14	L34-0656-05	Tuning coil 28 MHz	☆
L15	L34-0679-05	Tuning coil JJY	☆
L16	L34-0651-05	Tuning coil 1.9 MHz	☆
L17	L34-0652-05	Tuning coil 3.5 MHz	☆
L18	L34-0653-05	Tuning coil 7 MHz	☆
L19	L34-0654-05	Tuning coil 14 MHz	☆
L20	L34-0655-05	Tuning coil 21 MHz	☆
L21	L34-0656-05	Tuning coil 28 MHz	☆
L22～27	VACANT		
L28	L34-0559-05	Trap coil	
L29	L34-0558-05	Trap coil	
—	D13-0032-03	Sprocket	
—	D13-0401-04	Sprocket × 3	
—	D16-0021-04	Chain ass'y × 3	
—	D21-0805-04	Shaft	☆
—	E40-0401-05	Connector	
—	E40-0315-05	Mini connector	
—	S29-6401-05	*Rotary wafer ass'y*	☆

RF UNIT (X44-1240-00)

Ref. No.	Parts No.	Description	Remarks
C1	CC45SL1H101J	Ceramic 100pF ±5%	
C2	CK45F1H102Z	Ceramic 0.01μF +80,−20%	
C3,4	C90-0262-05	Ceramic 0.04μF ±10%	
C5	CC45RH1H150J	Ceramic 15pF ±5%	
C6	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C7,8	C90-0262-05	Ceramic 0.047μF ±10%	
C9	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C10	CC45SL1H100D	Ceramic 10pF ±0.5pF	
C11	CC45SL1H150J	Ceramic 15pF ±5%	
C12	CC45SL1H220J	Ceramic 22pF ±5%	
C13～15	C90-0262-05	Ceramic 0.047μF ±10%	
C16	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C17	CE04W1C100	Electrolytic 10μF 16WV	
C18,19	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C20	CC45RH1H100D	Ceramic 10pF ±0.5pF	
R1～22	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W *Refer to schematic diagram.	
Q1	V09-1002-26	FET 3SK35 (T) (GR)	
Q2～4	V09-0057-05	FET 3SK41 (L)	
L1	L40-1511-03	Ferri inductor 150μF	
L2	L40-4782-02	Ferri inductor 0.47μH	
L3	L40-1511-03	Ferri inductor 150μH	
L4	L40-4711-03	Ferri inductor 470μH	
L5	L40-1511-03	Ferri inductor 150μH	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
T1	L34-0524-05	Transformer (wide range)	
T2	L34-0527-05	Tuning coil	
—	E23-0047-04	Terminal (square)	
—	E40-0406-05	Connector × 3	

CONVERTER UNIT (X44-1250-00)

Ref. No.	Parts No.	Description	Re-marks
C1	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C2	CC45RH1H330J	Ceramic 33pF ±5%	
C3	CC45RH1H070D	Ceramic 7pF ±0.5pF	
C4	CC45RH1H390J	Ceramic 39pF ±5%	
C5	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C6	CC45RH1H560J	Ceramic 56pF ±5%	
C7	CC45RH1H180J	Ceramic 18pF ±5%	
C8	CC45RH1H560J	Ceramic 56pF ±5%	
C9	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C10	CC45RH1H820J	Ceramic 82pF ±5%	
C11	CC45RH1H390J	Ceramic 39pF ±5%	
C12	CC45RH1H820J	Ceramic 82pF ±5%	
C13	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C14	CC45R1H101J	Ceramic 100pF ±5%	
C15	CC45RH1H680J	Ceramic 68pF ±5%	
C16	CC45RH1H101J	Ceramic 100pF ±5%	
C27～20	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
1,22	C90-0254-05	Ceramic 0.022μF	
3	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C24	CC45SL1H100D	Ceramic 10pF ±0.5pF	
C25,26	C90-0254-05	Ceramic 0.022μF	
C27,28	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C29	CC45SL1H220J	Ceramic 22pF ±5%	
C30	CC45SL1H151J	Ceramic 150pF ±5%	
C31	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C32	CC45SL1H470J	Ceramic 47pF ±5%	
C33	CC45SL1H151J	Ceramic 150pF ±5%	
C34	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C35	CC45SL1H470J	Ceramic 47pF ±5%	
C36	CC45SL1H151J	Ceramic 150pF ±5%	
C37	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C38	CC45SL1H151J	Ceramic 150pF ±5%	
C39	CC45SL1H221J	Ceramic 220pF ±5%	
C40	CC45SL1H030C	Ceramic 3pF ±0.25pF	
C41	C90-0254-05	Ceramic 0.022μF	
C42	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C43	CC45SL1H030C	Ceramic 3pF ±0.25pF	
C44	CC45SL1H470J	Ceramic 47pF ±5%	
C45	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C46	CK45B1H102K	Ceramic 1000pF ±10%	
C47	C90-0254-05	Ceramic 0.022μF	
C48	CE04W1H010	Electrolytic 1μF 50WV	
C49～52	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C53	CC45SL1H330J	Ceramic 33pF ±5%	
C54	C90-0262-05	Ceramic 0.047μF	
C55	CC45SL1H050D	Ceramic 5pF ±0.5pF	
C56	CC45SL1H120J	Ceramic 12pF ±5%	
C57,58	CC45SL1H560J	Ceramic 56pF ±5%	
	CC45SL1H330J	Ceramic 33pF ±5%	
C60～62	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C63	C90-0254-05	Ceramic 0.022μF	
C64	CC45SL1H220J	Ceramic 22pF ±5%	
C65	C90-0254-05	Ceramic 0.022μF	
C66	C90-0262-05	Ceramic 0.047μF	
C67～69	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C70,71	CC45SL1H200D	Ceramic 10pF ±0.5pF	
C72	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C73,74	CE04W1HR47	Electrolytic 0.47μF 50WV	
C75	CE04W1H010	Electrolytic 1μF 50WV	
C76	CC45RH1H330J	Ceramic 33pF ±5%	
C77	CC45RH1H010C	Ceramic 1pF ±0.25pF	
R1～82	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
Q1～3	V09-0057-05	FET 3SK41 (L)	
Q4	V03-0270-05	Transistor 2SC945 (R)	
Q5～11	V03-0079-05	Transistor 2SC460 (B)	
Q12	V03-0270-05	Transistor 2SC945 (R)	
Q13	VACANT		
Q14	V30-0174-05	IC MC1496G	
D1～18	V11-0370-05	Diode 1S1587	
D19,20	V11-0414-05	Diode 1S2588	
D21～24	V11-0370-05	Diode 1S1587	
D25～28	V11-0290-05	Diode V03C	
VR1	R12-4021-05	Potentiometer 50kΩ (B)	
L1	L40-4711-03	Ferri inductor 470μH	
L2	L40-1511-03	Ferri inductor 150μH	
L3	L40-4711-03	Ferri inductor 470μH	
L4	L40-1511-03	Ferri inductor 150μH	
L5,6	L40-1592-02	Ferri inductor 1.5μH	
L7	L40-3382-01	Ferri inductor 0.33μH	
L8	L40-1091-03	Ferri inductor 1μH	
L9～12	L40-4711-03	Ferri inductor 470μH	
T1	L34-0662-05	Transformer (wide range)	
T2	L34-0660-05	BPF coil 16m (17.7 MHz)	☆
T3	L34-0676-05	BPF coil 16m (17.7 MHz)	☆
T4	L34-0660-05	BPF coil 16m (17.7 MHz)	☆
T5	L34-0659-05	BPF coil 25m (11.5 MHz)	☆
T6	L34-0673-05	BPF coil 49.25m (5.9 MHz)	☆
T7	L34-0659-05	BPF coil 25m (11.5 MHz)	☆
T8	L34-0658-05	BPF coil 31m (9.4 MHz)	☆
T9	L34-0674-05	BPF coil 31m (9.4 MHz)	☆
T10	L34-0658-05	BPF coil 31m (9.4 MHz)	☆
T11	L34-0657-05	BPF coil 49m (5.9 MHz)	☆
T12	L34-0673-05	BPF coil 49.25m (5.9 MHz)	☆
T13	L34-0657-05	BPF coil 49m (5.9 MHz)	☆
T14	L34-0524-05	Transformer (wide range)	
T15	L34-0663-15	Tuning coil 29.5 MHz (installed capacitor)	☆
RL-1	S51-1404-05	Relay	
RL-2	S51-4401-05	Relay	☆
X1	L77-0800-05	Crystal quartz HC-18/u (23.6 MHz)	☆
X2	L77-0799-05	Crystal quartz HC-18/u (20.1 MHz)	☆
X3	L77-0798-05	Crystal quartz HC-18/u (18.0 MHz)	☆
X4	L77-0797-05	Crystal quartz HC-18/u (11.8 MHz)	☆
AU1	E40-0215-05	Mini connector 2P	
AU2	E40-0413-05	Mini connector 4P pole	
AU3	E40-0613-05	Mini connector 6P pole	
AU4	E40-0913-05	Mini connector 9P pole	
AU5	E40-0713-05	Mini connector 7P pole	

PARTS LIST

Ref. No.	Parts No.	Description		Remarks
AU6	E40-0513-05	Mini connector	5P pole	
AU7～9	E40-0215-05	Mini connector	2P	
AU10	E40-0713-05	Mini connector	7P pole	
AU11	E40-0413-05	Mini connector	4P pole	
—	E23-0047-04	Terminal (square) × 8		

IF-A UNIT (X48-1190-00)

Ref. No.	Parts No.	Description			Remarks
C1	CC45SL1H221J	Ceramic	220pF	±5%	
C2	CC45SL1H470J	Ceramic	47pF	±5%	
C3	CC45SL1H100D	Ceramic	10pF	±0.5pF	
C4	CC45SL1H030C	Ceramic	3pF	±0.25pF	
C5	VACANT				
C6,7	CC45SL1H470J	Ceramic	47pF	±5%	
C8	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C9	CE04W1C100	Electrolytic	10μF	16WV	
C10～12	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C13,14	C90-0254-05	Ceramic	0.022μF		
C15,16	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C17,18	C90-0254-05	Ceramic	0.022μF		
C19,20	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C21～23	C90-0254-05	Ceramic	0.022μF		
C24	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C25	CK45B1H102K	Ceramic	1000pF	±10%	
C25～28	C90-0262-05	Ceramic	0.047μF		
C29	CE04W1H010	Electrolytic	1μF	50WV	
C30,31	C90-0262-05	Ceramic	0.047μF		
C32,33	CS15E1E100M	Tantalum	10μF	25WV	
C34,35	C90-0262-05	Ceramic	0.047μF		
C36,37	CS15E1E100M	Tantalum	10μF	25WV	
C38,39	C90-0262-05	Ceramic	0.047μF		
C40,41	CS15E1E100M	Tantalum	10μF	25WV	
C42,43	C90-0262-05	Ceramic	0.047μF		
C44,45	CS15E1E100M	Tantalum	10μF	25WV	
C46	CC45SL1H220J	Ceramic	22pF	±5%	
C47	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C48,49	C90-0262-05	Ceramic	0.047μF		
C50	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C51	CC45SL1H220J	Ceramic	22pF	±5%	
C52	CK45B1H102K	Ceramic	1000pF	±10%	
C53	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C54	CE04W1H010	Electrolytic	1μF	50WV	
C55	CQ09S1H222J	Styrene	2200pF	±5%	
C56	CE04W1H010	Electrolytic	1μF	50WV	
C57,58	C90-0254-05	Ceramic	0.022μF		
C59	CE04W1C100	Electrolytic	10μF	16WV	
C60	CC45SL1H330J	Ceramic	33pF	±5%	
C61	CC45SL1H220J	Ceramic	22pF	±5%	
C62,63	CK45B1H102K	Ceramic	1000pF	±10%	
C64	CC45SL1H470J	Ceramic	47pF	±5%	
R1～69	RD14CB2E○○○J	Carbon resistor	○○○Ω*	±5% 1/4W	
		*Refer to schematic diagram.			
R17～19	RD14BB2E221J	Carbon resistor	220Ω	±5% 1/4W	
R47～50	RD14BB2E221J	Carbon resistor	220Ω	±5% 1/4W	

Ref. No.	Parts No.	Description		Remarks
Q1,2	V09-0057-05	FET	3SK41 (L)	
Q3	V09-1002-26	FET	3SK35 (T) (GR)	
Q4	V09-0057-05	FET	3SK41 (L)	
Q5	V09-0012-05	FET	2SK19 (GR)	
Q6	V01-0037-05	Transistor	2SA495 (Y)	
D1～4	V11-0370-05	Diode	1S1587	
D5～8	V11-4160-66	Diode	1S1007	
D9,10	V11-0370-05	Diode	1S1587	
D11～16	V11-4160-66	Diode	1S1007	
D17,18	V11-0370-05	Diode	1S1587	
D19～26	V11-0076-05	Diode	1S1555	
VR1	R12-3045-05	Potentiometer 10kΩ (B)		☆
VR2	R12-6401-05	Potentiometer 470kΩ (B)		☆
L1	L40-1511-03	Ferri inductor	150μH	
L2	VACANT			
L3	L40-4711-03	Ferri inductor	470μH	
T1	L34-05	Tuning coil	(8.83 MHz)	
T2	L34-0536-05	Tuning coil	(8.83 MHz)	
T3	L34-0537-05	Tuning coil	(8.83 MHz)	
T4	L34-0538-05	Tuning coil	(8.83 MHz)	
T5	L34-0678-05	Tuning coil	(8.83 MHz)	☆
T6	L34-0664-05	Tuning coil	(455 kHz)	☆
T7	L34-0540-05	Tuning coil	(455 kHz)	
T8	L34-0665-05	Tuning coil	(50 kHz)	☆
F2	L71-0204-05	Crystal quartz filter	SSB (8.83 MHz)	☆
F4	L72-0307-05	Ceramic filter	AM (455 kHz)	☆
F5	L72-0308-05	Ceramic filter	SSB (455 kHz)	☆
X1	L77-0499-05	Crystal quartz	NB filter	
X2	L77-0500-05	Crystal quartz	NB filter	
—	S59-9401-05	DIP switch (9 circuits)		☆
—	E23-0046-04	Terminal × 3 (square)		
—	E40-0414-05	Mini connector		
—	E40-0614-05	Mini connector		
—	E40-0614-05	Mini connector		
—	E40-0714-05	Mini connector		
—	E40-0814-05	Mini connector		
—	E40-1114-05	Mini connector		

IF-B UNIT (X48-1200-00)

Ref. No.	Parts No.	Description			Remarks
C1～3	CE04W1H010	Electrolytic	1μF	50WV	
C4,5	CQ09S1H332J	Styrene	330pF	±5%	
C6	CC45SL1H101J	Ceramic	100pF	±5%	
C7	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C8	C90-0262-05	Ceramic	0.047μF		
C9	CE04W1H010	Electrolytic	1μF	50WV	
C10	CQ09S1H222J	Styrene	2200pF	±5%	
C11	CE04W1H3R3	Electrolytic	3.3μF	50WV	
C12	CC45SL1H470J	Ceramic	47pF	±5%	
C13	C90-0262-05	Ceramic	0.047μF		
C14	CC45SL1H151J	Ceramic	150pF	±5%	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
C15	C90-0262-05	Ceramic 0.047μF	
C16	CE04W1H010	Electrolytic 1μF 50WV	
C17	CK45B1H102K	Ceramic 1000pF ±10%	
C18	CQ09SH1H222J	Styrene 2200pF ±5%	
C19	CE04W1H3R3	Electrolytic 3.3μF 50WV	
C20	CQ92M1H103K	Mylar 0.01μF ±10%	
C21	C90-0262-05	Ceramic 0.047μF	
C22	CQ92M1H223K	Mylar 0.022μF ±10%	
C23	CE04W1H010	Electrolytic 1μF 50WV	
C24,25	CE04W1C100	Electrolytic 10μF 16WV	
C26	CE04W1H3R3	Electrolytic 3.3μF 50WV	
C27	CE04W1C470	Electrolytic 47μF 16WV	
C28	CC45SL1H470J	Ceramic 47pF ±5%	
C29	CK45B1H471K	Ceramic 470pF ±10%	
C30	CE04W1C470	Electrolytic 47μF 16WV	
C31	CC45SL1H151J	Ceramic 150pF ±5%	
C32	CQ92M1H103K	Mylar 0.01μF ±10%	
C33	CE04W1H010	Electrolytic 1μF 50WV	
C34	CE04W1C101	Electrolytic 100μF 16WV	
C35	CQ92M1H103K	Mylar 0.01μF ±10%	
C36	CE04W1H3R3	Electrolytic 3.3μF 50WV	
C37	CC45SL1H221J	Ceramic 220pF ±5%	
C38	CQ92M1H332K	Mylar 3300pF ±10%	
C39	C90-0262-05	Ceramic 0.047μF	
C40	CQ92M1H103K	Mylar 0.01μF ±10%	
C41	CE04W1H3R3	Electrolytic 3.3μF 50WV	
C42	CE04W1H010	Electrolytic 1μF 50WV	
R1～46	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W *Refer to schematic diagram.	
R40	RC05GF2H225J	Solid resistor 2.2MΩ ±5% 1/2W	
R47	RD14BB2E103J	Carbon resistor 10kΩ ±5% 1/4W	
Q1,2	V03-0270-05	Transistor 2SC945 (R)	
Q3,4	V09-1002-26	FET 3SK35 (T) (GR)	
Q5	V03-0183-05	Transistor 2SC733 (Y)	
Q6	V03-0355-05	Transistor 2SC1000 (GR)	
Q7	V03-0183-05	Transistor 2SC733 (Y)	
D1～4	V11-0051-05	Diode 1N60	
D5～8	V11-0076-05	Diode 1S1555	
D9～11	V11-0051-05	Diode 1N60	
VR1	R12-3403-05	Potentiometer 20kΩ (B)	☆
VR2	R12-3045-05	Potentiometer 10kΩ (B)	
L1,2	L40-6825-03	Ferri inductor 6.8mH	
T1	L34-0666-05	Tuning coil (NOTCH)	☆
T2	L34-0667-05	Tuning coil (IF)	☆
T3	L34-0668-05	Tuning coil (DET)	☆
—	E40-1211-05	Mini connector	
—	E40-1311-05	Mini connector	

AF-AVR UNIT (X49-1080-00)

Ref. No.	Parts No.	Description	Re-marks
C1	CE04W1C221	Electrolytic 220μF 16WV	
C2	CQ92M1H273K	Mylar 0.027μF ±10%	
C3	CK45B1H471K	Ceramic 470pF ±10%	
C4	CQ92M1H273K	Mylar 0.027μF ±10%	
C5	CE04W1E4R7	Electrolytic 4.7μF 25WV	
C6,7	CQ92M1H273K	Mylar 0.027μF ±10%	
C8,9	CQ92M1H473K	Mylar 0.047μF ±10%	
C10	CE04W1C100	Electrolytic 10μF 16WV	
C11	CE04W1HR47	Electrolytic 0.47μF 50WV	
C12	CQ92M1H103K	Mylar 0.01μF ±10%	
C13,14	CE04W1C100	Electrolytic 10μF 16WV	
C15	CK45F1H1037	Ceramic 0.01μF +80,−20%	
C16	CQ92M1H104K	Mylar 0.1μF ±10%	
C17	CE04W1H010	Electrolytic 0.1μF ±10%	
C18	CC45SL1H101J	Ceramic 100pF ±5%	
C19	VACANT		
C20	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C21	CE04W1H010	Electrolytic 1μF 50WV	
C22	CQ92M1H472K	Mylar 4700pF ±10%	
C23	CE04W1C100	Electrolytic 10μF 16WV	
C24	CE04W0J101	Electrolytic 100μF 6.3WV	
C25	CC45SL1H470J	Ceramic 47pF ±5%	
C26	CQ92M1H473K	Mylar 0.047μF ±10%	
C27	CE04W1A470	Electrolytic 47μF 10WV	
C28	CC45SL1H101J	Ceramic 100pF ±5%	
C29	CE04W1C221	Electrolytic 220μF 16WV	
C30	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C31	CE04W1H473	Electrolytic 0.47μF 50WV	
C32	CQ92M1H473K	Mylar 0.047μF ±10%	
C33	CK47B2H102K	Ceramic 1000pF ±10%	
R1～46	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W *Refer to schematic diagram.	
R38	RS14AB3A680J	Metal film resistor 68Ω ±5% 1W	
R47	RD14BB2E472J	Carbon resistor 4.7kΩ ±5% 1/4W	
Q1,2	V03-0355-05	Transistor 2SC1000 (GR)	
Q3	V30-0172-05	IC TA7201P	
Q4～6	V03-0099-05	Transistor 2SC372	
Q7	V01-0113-05	Transistor 2SA496 (Y)	
D1,2	V11-0076-05	Diode 1S1555	
D3,4	V11-0051-05	Diode 1N60	
D5	V11-0243-05	Zener diode WZ-061	
VR1	R12-4020-05	Potentiometer 50kΩ	
VR2	R12-3036-05	Potentiometer 10kΩ	
VR3	R12-3004-05	Potentiometer 47kΩ (solid)	
VR4	R12-0042-05	Potentiometer 590Ω	
L1	L40-3391-03	Ferri inductor 3.3μH	
AF1,2	E40-0613-05	Mini connector	
AF3	E40-1113-05	Mini connector	

PARTS LIST

VCO UNIT (X50-1330-00)

Ref. No.	Parts No.	Description			Remarks
C1	CC45TH1H180J	Ceramic	18pF	±5%	
C2	CC45TH1H220J	Ceramic	22pF	±5%	
C3	CC45TH1H270J	Ceramic	27pF	±5%	
C4	CC45TH1H150J	Ceramic	15pF	±5%	
C5	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C6	CC45RH1H270J	Ceramic	27pF	±5%	
C7	CC45TH1H470J	Ceramic	47pF	±5%	
C8,9	CC45RH1H220J	Ceramic	22pF	±5%	
C10	CC45RH1H330J	Ceramic	33pF	±5%	
C11	CK45F1H103	Ceramic	0.01μF	+80,−20%	
C12	CC45RH1H150J	Ceramic	15pF	±5%	
C13	CC45TH1H330J	Ceramic	33pF	±5%	
C14	CC45RH1H180S	Ceramic	18pF	±5%	
C15	CC45RH1H220J	Ceramic	22pF	±5%	
C16	CC45RH1H270J	Ceramic	27pF	±5%	
C17	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C18	CC45RH1H100D	Ceramic	10pF	±0.5pF	
C19	CC45TH1H180J	Ceramic	27pF	±5%	
C20	CC45SH1H180J	Ceramic	18pF	±5%	
C21	CC45SH1H220J	Ceramic	22pF	±5%	
C22	CC45SH1H150J	Ceramic	15pF	±5%	
C23	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C24	CC45TH1H180J	Ceramic	18pF	±5%	
C25	CC45TH1H220J	Ceramic	22pF	±5%	
C26	CC45TH1H270J	Ceramic	27pF	±5%	
C27	CC45TH1H150J	Ceramic	15pF	±5%	
C28	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C29	CC45RH1H020C	Ceramic	2pF	±0.25pF	
C30	CC45TH1H180J	Ceramic	18pF	±5%	
C31	CC45RH1H270J	Ceramic	27pF	±5%	
C32	CC45RH1H150J	Ceramic	15pF	±5%	
C33	CC45RH1H330J	Ceramic	33pF	±5%	
C34	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C35	CC45TH1H180J	Ceramic	18pF	±5%	
C36	CC45SH1H680J	Ceramic	68pF	±5%	
C37	CC45SH1H470J	Ceramic	47pF	±5%	
C38	CC45SH1H560J	Ceramic	56pF	±5%	
C39	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C40	CC45TH1H180J	Ceramic	18pF	±5%	
C41	CC45SH1H680J	Ceramic	68pF	±5%	
C42	CC45SH1H470J	Ceramic	47pF	±5%	
C43	CC45SH1H560J	Ceramic	56pF	±5%	
C44	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C45	CC45TH1H180J	Ceramic	18pF	±5%	
C46	CC45SH1H680J	Ceramic	68pF	±5%	
C47	CC45SH1H470J	Ceramic	47pF	±5%	
C48	CC45SH1H560J	Ceramic	56pF	±5%	
C49	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C50	CC45TH1H180J	Ceramic	18pF	±5%	
C51	CC45SH1H680J	Ceramic	68pF	±5%	
C52	CC45SH1H470J	Ceramic	47pF	±5%	
C53	CC45SH1H560J	Ceramic	56pF	±5%	
C54,55	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C56	CK45D1H102M	Ceramic	1000pF	±20%	
C57	CC45CH1H020C	Ceramic	2pF	±0.25pF	
C58	CC45CH1H030C	Ceramic	3pF	±0.25pF	
C59	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C60	C90-0262-05	Ceramic	0.047μF		
C61	CK45D1H102M	Ceramic	1000pF	±20%	
C62,63	CC45SL1H120J	Ceramic	12pF	±5%	
C64	CC45SL1H220J	Ceramic	22pF	±5%	
C65	CC45CH1H150J	Ceramic	15pF	±5%	
C66	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C67	CC45CH1H030C	Ceramic	3pF	±0.25pF	
C68	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C69	CC45SL1H120J	Ceramic	12pF	±5%	
C70,71	C90-0262-05	Ceramic	0.047μF		
C72	CS15E1A3R3M	Tantalum	3.3μF	10WV	
C73	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C74	CC45SL1H271J	Ceramic	270pF	±5%	
C75	CC45SL1H121J	Ceramic	120pF	±5%	
C76～86	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
R1～48	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W *Refer to schematic diagram.			
Q1～6	V09-0012-05	FET	2SK19 (GR)		
Q7～11	V09-0013-05	FET	2SK19 (BL)		
Q12	V09-0057-05	FET	3SK41 (L)		
Q13	V03-0079-05	Transistor	2SC460 (B)		
Q14	V03-0283-05	Transistor	2SC741		
Q15	V03-0126-05	Transistor	2SC734 (Y)		
D1～12	V11-0414-05	Diode	1S2588		☆
D13～23	V11-0464-05	Diode	1S1658-3		☆
S1	S31-1005-05	Slide switch			☆
L1～12	L40-1511-03	Ferri inductor	150μH		
L16	L40-1592-02	Ferri inductor	1.5μH		
L17,18	L40-1092-02	Ferri inductor	1.0μH		
L19	VACANT				
L20	L40-1292-02	Ferri inductor	1.2μF		
L21	L40-1511-03	Ferri inductor	150μH		
L22	L40-1292-02	Ferri inductor	1.2μH		
L23	L40-1511-03	ferri inductor	150μH		
T1	L32-0199-05	Oscillator coil	15 MHz		☆
T2,3	L32-0193-05	Oscillator coil	1.8 MHz, 3.5 MHz		☆
T4	L32-0195-05	Oscillator coil	7 MHz		☆
T5	L32-0196-05	Oscillator coil	14 MHz		☆
T6	L32-0197-05	Oscillator coil	21 MHz		☆
T7～10	L32-0198-05	Oscillator coil	28 MHz		☆
T11	VACANT				
T12	L34-0529-05	Trap coil	8.83 MHz		☆
—	E23-0046-04	Terminal (square)			
—	E40-0607-05	Connector × 2			
—	E40-0807-05	Connector × 2			

PD UNIT (X50-1340-01)

Ref. No.	Parts No.	Description			Remarks
C1,2	CC45SL1H100D	Ceramic	10pF	±0.5pF	
C3	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C4	CK45F1H223Z	Ceramic	0.022μF	+80,−20%	
C5,6	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C7	CE04W1A101	Electrolytic	100μF	10WV	
C8	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C9,10	CK45F1H223Z	Ceramic	0.022μF	+80,−20%	
C11	VACANT				
C12	CK45F1H223Z	Ceramic	0.022μF	+80,−20%	

PARTS LIST

Ref. No.	Parts No.	Description			Remarks
C13	CE04W1A101	Electrolytic	100μF	10WV	
C14,15	CS15E1VR22M	Tantalum	0.22μF		
C16	CC45SL1H470J	Ceramic	47pF	±5%	
C17	CK45D1H102M	Ceramic	1000pF	±20%	
C18,19	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C20	CC45RH1H101J	Ceramic	100pF	±5%	
C21	CQ09S1H391J	Styrene	390pF	±5%	
C22	CC45RH1H101J	Ceramic	100pF	±5%	
C23	C90-0262-05	Ceramic	0.047μF		
C24,25	CK45F1H223Z	Ceramic	0.022μF	+80,−20%	
C26	CS15E1V010M	Tantalum	1μF		
C27	CC45SL1H050C	Ceramic	5pF	±0.25pF	
C28	CC45SL1H100D	Ceramic	10pF	±0.5pF	
C29,30	CC45SL1H330J	Ceramic	33pF	±5%	
C31	CC45SL1H100D	Ceramic	10pF	±0.5pF	
C32	CC45SL1H050C	Ceramic	5pF	±0.25pF	
C33	CK45D1H102M	Ceramic	1000pF	±20%	
C34～36	CK45F1H223Z	Ceramic	0.022μF	+80,−20%	
C37	CS15E1V010M	Tantalum	1μF		
C38	CC45SL1H470J	Ceramic	47pF	±5%	
C39	CC45CH1H470J	Ceramic	47pF	±5%	
C40	CC45SL1H151J	Ceramic	150pF	±5%	
C41	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C42,43	CC45SL1H331J	Ceramic	330pF	±5%	
C44	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C45,46	CC45SL1H331J	Ceramic	330pF	±5%	
C47	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C48	CC45SL1H151J	Ceramic	150pF	±5%	
C49	CC45SL1H221J	Ceramic	220pF	±5%	
C50	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C51	CC45CH1H470J	Ceramic	47pF	±5%	
C52	CC45SL1H151J	Ceramic	150pF	±5%	
C53	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C54	CC45CH1H100D	Ceramic	10pF	±0.5pF	
C55	CC45SL1H151J	Ceramic	150pF	±5%	
C56	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C57	CC45FH1H101J	Ceramic	100pF	±5%	
C58	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C59	CC45CH1H101J	Ceramic	100pF	±5%	
C60	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C61	CC45CH1H101J	Ceramic	100pF	±5%	
C62	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C62	CC45CH1H101J	Ceramic	100pF	±5%	
C64,65	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C66	CC45SL1H020C	Ceramic	2pF	±0.25pF	
C67	CC45SL1H180J	Ceramic	18pF	±5%	
C68	C90-0262-05	Ceramic	0.047μF		
C69	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C70	C90-0262-05	Ceramic	0.047μF		
C71	VACANT				
C72	CC45SL1H330J	Ceramic	33pF	±5%	
C73	CK45F1H223Z	Ceramic	0.022μF	+80,−20%	
R1～87	RD14CB2E○○○J	Carbon resistor	○○○Ω*	±5% 1/4W	
Q1～12	V03-0079-05	Transistor	2SC460 (B)		
Q13	V09-0012-05	FET	2SK19 (GR)		
Q14	V01-0037-05	Transistor	2SA495 (Y)		
Q15	V09-0012-05	FET	2SK19 (GR)		
Q16	V01-0037-05	Transistor	2SA495 (Y)		
Q17	V03-0079-05	Transistor	2SC460 (B)		
Q18	V30-0132-05	IC	TD3400AP		
Q19	V30-0173-05	IC	MC4044P		☆
Q20	V03-0271-05	Transistor	2SC1345 (E)		
Q21,22	V30-0174-05	IC	MC1496G		☆
D1～24	V11-0076-05	Diode	1S1555		
VR1	R12-4021-05	Potentiometer	50Ω (B)		☆
L1,2	L40-1511-04	Ferri inductor	150μH		
L3	L40-2201-03	Ferri inductor	22μH		
L4	L40-1021-03	Ferri inductor	1mH		
L5～13	L40-1511-03	Ferri inductor	150μH		
T1	L34-0518-05	BPF coil			☆
T2	L34-0519-05	BPF coil			☆
T3	L34-0518-05	BPF coil			☆
T4	L34-0520-05	LPF coil			☆
T5	L34-0521-05	LPF coil			☆
T6	L34-0520-05	LPF coil			☆
X1	L77-0497-05	Crystal quartz	(20.5 MHz)		☆
X2	L77-0488-05	Crystal quartz	(7.3 MHz)		☆
X3	L77-0489-05	Crystal quartz	(9.0 MHz)		☆
X4	L77-0490-05	Crystal quartz	(12.5 MHz)		☆
X5	L77-0491-05	Crystal quartz	(19.5 MHz)		☆
X6	L77-0492-05	Crystal quartz	(26.5 MHz)		☆
X7	L77-0493-05	Crystal quartz	(33.5 MHz)		☆
X8	L77-0494-05	Crystal quartz	(34.0 MHz)		☆
X9	L77-0495-05	Crystal quartz	(34.5 MHz)		☆
X10	L77-0496-05	Crystal quartz	(35.0 MHz)		☆
—	E40-0607-05	Connector			
—	E40-0807-05	Connector			
—	E40-0626-05	U type pin wafer			
—	E40-0826-05	U type pin wafer			
—	E40-0726-05	U type pin wafer			
—	E26-0046-04	Terminal (square)			

LOCAL OSC UNIT (X50-1440-00)

Ref. No.	Parts No.	Description			Remarks
C1	CC45SL1H100D	Ceramic	10pF	±0.5pF	
C2	C90-0254-05	Ceramic	0.022μF	±10%	
C3	CK45B1H102K	Ceramic	1000pF	±10%	
C4	CC45SL1H100D	Ceramic	10pF	±0.5pF	
C5	CC45SL1H220J	Ceramic	22pF	±5%	
C6	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C7,8	C90-0262-05	Ceramic	0.47μF	±10%	
C9	CC45SL1H220J	Ceramic	22pF	±5%	
C10	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C11	CQ92M1H473K	Mylar	0.047μF	±10%	
C12,13	CE04W1E4R7	Electrolytic	4.7μF	25WV	
C14	CC45SL1H030C	Ceramic	3pF	±0.25pF	
C15	CC45SL1H050D	Ceramic	5pF	±0.5pF	
C16,17	CE04W1E4R7	Electrolytic	4.7μF	25WV	
C18	CC45SL1H331J	Ceramic	330pF	±5%	
C19	CC45SL1H151J	Ceramic	150pF	±5%	
C20	CC45SL1H331J	Ceramic	330pF	±5%	
C21	CE04W1A470	Electrolytic	47μF	10WV	
C22	CQ92M1H103K	Mylar	0.01μF	±10%	
C23	CQ09S1H681J	Styrene	680pF	±5%	
C24	CQ92M1H223K	Mylar	0.022μF	±10%	

PARTS LIST

Ref. No.	Parts No.	Description			Remarks
C25	VACANT				
C26	CC45SL1H121J	Ceramic	120pF	±5%	
C27	CQ09S1H102J	Styrene	1000pF	±5%	
C28	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C29	CQ92M1H103K	Mylar	0.01μF	±10%	
C30	CE04W1E4R7	Electrolytic	4.7μF	25WV	
C31	CK45B1H102K	Ceramic	1000pF	±10%	
C32	CE04W1A470	Electrolytic	47μF	10WV	
C33	CQ92M1H473K	Mylar	0.047	±10%	
C34	CE04W1E4R7	Electrolytic	4.7μF	25WV	
R1～45	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W			
Q1	V03-0079-05	Transistor	2SC460 (B)		
Q2	V09-0057-05	FET	3SK41 (L)		
Q3	V30-0174-05	IC	MC1496G		
Q4	V03-0079-05	Transistor	2SC460 (B)		
Q5～7	V03-0270-05	Transistor	2SC945 (R)		
D1	V11-6263-36	Diode	MVAM115		☆
D2,3	V11-0370-05	Diode	1S1587		
VR1	R12-4503-05	Potentiometer 50kΩ			
TC1	C05-0030-15	Ceramic trimmer		20pF	
TC2	C05-0029-05	Ceramic trimmer		50pF	
L1	L40-1511-03	Ferri inductor		150μH	
L2	L40-2225-04	Ferri inductor		2.2mH	
L3	L40-4711-03	Ferri inductor		470μF	
L4,5	L40-2211-03	Ferri inductor		220μH	
L6	L40-1021-03	Ferri inductor		1mH	
T1～3	L34-0540-05	Tuning coil		(455 kHz)	☆
T4	L32-0605-05	Oscillator coil		(50 kHz)	☆
LO-1	E40-0613-05	Mini connector			
LO-2	E40-0713-05	Mini connector			

FIX UNIT (X50-1450-00)

Ref. No.	Parts No.	Description			Remarks
C1～4	CC45SL1H050D	Ceramic	5pF	±0.5pF	
C5	C90-0262-05	Ceramic	0.047μF	±10%	
C6	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C7	CC45SL1H010C	Ceramic	1pF	±0.25pF	
C8	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C9	C90-0262-05	Ceramic	0.047μF	±10%	
C10	CC45SL1680J	Ceramic	68pF	±5%	
C11	CC45SL1H330J	Ceramic	33pF	±5%	
C12,13	CC45SL1H050D	Ceramic	5pF	±0.5pF	
C14	C90-0262-05	Ceramic	0.047μF	±10%	
C15	CC45SL1H120J	Ceramic	12pF	±5%	
C16	VACANT				
C17	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C18	CQ92M1H223K	Mylar	0.022μF	±10%	
C19	CQ92M1H473K	Mylar	0.047μF	±10%	
C20	CE04W1C470	Electrolytic	47μF	16WV	
C21	CE04W1C101	Electrolytic	100μF	16WV	
C22	CE04W1C221	Electrolytic	220μF	16WV	

Ref. No.	Parts No.	Description			Remarks
R1～20	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W			
R6	VACANT				
Q1	V09-0012-05	FET	2SK19 (GR)		
Q2,3	V03-0079-05	Transistor	2SC460 (B)		
Q4,5	V03-0270-05	Transistor	2SC945 (R)		
Q6	V01-0084-05	Transistor	2SA733 (R)		
D1～4	V11-0370-05	Diode	1S1587		
D5	VACANT				
D6	V11-0432-05	Varicap diode		1TT310	
D7,8	V11-0051-05	Diode		1N60	
D9,10	V11-0076-05	Diode		1S1555	
D11	V11-4101-20	Zener diode		XZ060	
TC1～4	C05-0030-15	Ceramic trimmer		20 pF	
L1～4	L40-1021-03	Ferri inductor		1mH	
L5	L40-1511-03	Ferri inductor		150μH	
L6	VACANT				
L7,8	L40-1021-03	Ferri inductor		1mH	
L9	L40-3301-03	Ferri inductor		33μH	
L10	L40-1021-03	Ferri inductor		1mH	
L11	L40-2225-05	Ferri inductor		2.2mH	
FX-1	E40-0413-05	Mini connector			
FX-2	E40-1213-05	Mini connector			
—	E18-0401-05	Crystal quartz socket HC-25/u × 4			
—	J31-0502-04	PC board plate color × 4			
—	J42-0404-05	PC board bush × 4			

CAR-2 UNIT (X50-1460-00)

Ref. No.	Parts No.	Description			Remarks
C1	CC45UJ1H100D	Ceramic	10pF	±0.5pF	
C2	CC45UJ1H030C	Ceramic	3pF	±0.25pF	
C3	CK45F1H103Z	Ceramic	0.01μF	+80,−20%	
C4	CK45B1H471K	Ceramic	470pF	±10%	
C5	CC45SL1H330J	Ceramic	33pF	±5%	
C6	CC45SL1H020C	Ceramic	2pF	±0.25pF	
C7	CC45SL1H100D	Ceramic	10pF	±0.5pF	
C8	CC45SL1H101J	Ceramic	100pF	±5%	
C9,10	C90-0262-05	Ceramic	0.047μF		
C11	CC45SL1H101J	Ceramic	100pF	±5%	
R1～8	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W			
Q1,2	V03-0079-05	Transistor	2SC460B		
D1	V11-0432-05	Diode	1TT310		
TC1	C05-0013-15	Ceramic trimmer		20pF	
L1	L33-0266-05	Choke coil			
L2～4	L40-1511-03	Ferri inductor		150μF	
L5	L40-3391-03	Ferri inductor		3.3μH	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
T1	L32-0201-05	Oscillator coil	
X1	L77-0801-05	Crystal quartz (8.375 MHz)	☆
—	E40-0414-05	Mini connector	

CAR-1 UNIT (X50-1480-00)

Ref. No.	Parts No.	Description	Remarks
C1	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C2	CC45UJ1H220J	Ceramic 22pF ±5%	
C3	CC45UJ1H470J	Ceramic 47pF ±5%	
C4	CK45B1H102K	Ceramic 1000pF ±10%	
C5	CC45UJ1H220J	Ceramic 22pF ±5%	
C6	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C7	CC45U1H010C	Ceramic 1pF ±0.25pF	
C8	CS15E1VR22M	Tantalum 0.22μF ±20%	
C9	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C10	CK45B1H471K	Ceramic 470pF ±10%	
C11	CC45CH1H101J	Ceramic 100pF ±5%	
C12	CC45SL1H010C	Ceramic 1pF ±0.25pF	
C13	CC45SL1H470J	Ceramic 47pF ±5%	
C14	C90-0262-05	Ceramic 0.047μF	
C15,16	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
R1～17	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
Q1,2	V03-0079-05	Transistor 2SC460 (B)	
Q3	V03-0241-05	Transistor 2SC735 (Y)	
D1,2	V11-0076-05	Diode 1S1555	
D3,4	VACANT		
D5	V11-0432-05	Diode 1TT310	
VR1	R12-1012-05	Potentiometer 1kΩ (B)	
TC1,2	C05-0049-05	Trimmer 20pF	
L1	VACANT		
L2～4	L40-1511-03	Ferri inductor 150μH	
L5	L33-0266-05	Ferri inductor 28μH	
L6～8	L40-1511-03	Ferri inductor 150μH	
T1	L32-0201-05	Oscillator coil	
X1	L77-0486-05	Crystal quartz for LSB (8828.5 kHz)	
X2	L77-0485-05	Crystal quartz for USB (8831.5 kHz)	
CJ2	E40-0826-05	U type pin wafer	
CJ3	E40-0726-05	U type in wafer	
—	E23-0046-04	Terminal (square)	

MARKER UNIT (X52-0005-01)

Ref. No.	Parts No.	Description	Remarks
C1	CQ93M1H103K	Mylar 0.01μF ±10%	
C2	CC45CH1H151J	Ceramic 150pF ±5%	
C3	CC45TH1H101J	Ceramic 100pF ±5%	
C4	CC45CH1H330J	Ceramic 33pF ±5%	
C5	CK45F1H473Z	Ceramic 0.047μF +80,−20%	
C6	CC45CH1H390J	Ceramic 39pF ±5%	
C7	CC45CH1H330J	Ceramic 33pF ±5%	
C8	CC45SL1H101J	Ceramic 100pF ±5%	
C9	CC45SL1H221K	Ceramic 220pF ±10%	
C10	CC45SL1H470K	Ceramic 47pF ±10%	
C11	CC45SL2H050D	Ceramic 5pF ±0.5pF	
C12	CK45F1H473Z	Ceramic 0.047μF +80,−20%	
C13	CC45CH1H470J	Ceramic 47pF ±5%	
R1～10	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
Q1	V03-0042-05	Transistor 2SC373 or 2SC458 (B)	
Q2,3	V03-0042-05	Transistor 2SC373	
Q4	V03-0042-05	Transistor 2SC373 or 2SC458 (B)	
D1	V11-0051-05	Diode 1N60	
TC1	C05-0029-15	Ceramic trimmer 50pF	
L1	L40-1235-05	Ferri inductor 12mH	
X1	L77-0009-05	Crystal quartz HC-13/u (100 kHz)	

COUNTER MIXER UNIT (X54-1150-00)

Ref. No.	Parts No.	Description	Remarks
C1	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C2	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C3	CK45B1H102K	Ceramic 1000pF ±10%	
C4	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C5	CC45RH1H220J	Ceramic 22pF ±5%	
C6	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C7	CC45CH1H020C	Ceramic 2pF ±0.25pF	
C8	CC45RH1H220J	Ceramic 22pF ±5%	
C9	CC45CH1H330J	Ceramic 33pF ±5%	
C10,11	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C12	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C13	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C14	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C15～19	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C20	CC45CH1H390J	Ceramic 39pF ±5%	
C21	CC45-CH1H220J	Ceramic 22pF ±5%	
C22	CC45SL1H121J	Ceramic 120pF ±5%	
C23	CC45SL1H680J	Ceramic 68pF ±5%	
C24	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C25,26	CC45CH1H220J	Ceramic 22pF ±5%	
C27	CC45SL1H560J	Ceramic 56pF ±5%	
C28	CC45CH1H390J	Ceramic 39pF ±5%	
C29	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C30,31	CC45CH1H180J	Ceramic 18pF ±5%	
C32	CC45CH1H470J	Ceramic 47pF ±5%	
C33	CC45CH1H330J	Ceramic 33pF ±5%	
C34	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C35	CC45CH1H120J	Ceramic 12pF ±5%	
C36	CC45CH1H150J	Ceramic 15pF ±5%	
C37	CC45CH1H330J	Ceramic 33pF ±5%	
C38	CC45CH1H220J	Ceramic 22pF ±5%	
C39	CK45F1H223Z	Ceramic 0.022μF +80,−20%	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
C40	CK45B1H102K	Ceramic 1000pF ±10%	
C41	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C42	CK45B1H102K	Ceramic 1000pF ±10%	
C43	CQ92M1H472K	Mylar 4700pF ±10%	
C44	CK45B1H102K	Ceramic 1000pF ±10%	
C45,46	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C47～52	VACANT		
53	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C54	CK45B1H331K	Ceramic 330μF ±10%	
C55	CK45B1H681K	Ceramic 680pF ±10%	
C56	CK45B1H331K	Ceramic 330pF ±10%	
C57	CQ92M1H104K	Mylar 0.1μF ±10%	
C58	VACANT		
C59	CS15E1VR33M	Tantalum 0.33μF ±20%	
C60	CK45B1H331K	Ceramic 330pF ±10%	
C61	CE04W1H100	Electrolytic 10μF 50WV	
C62	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C63,64	CE04W1E100	Electrolytic 10μF 25WV	
C65	C90-0262-05	Ceramic 0.047μF ±10%	
C66,67	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C68	CE04W1A101	Electrolytic 100μF 10WV	
C69	C90-0262-05	Ceramic 0.047μF ±10%	
C70,71	VACANT		
C72	CC45CH1H560J	Ceramic 56pF ±5%	
C73	CC45SL1H391J	Ceramic 390pF ±5%	
C74	CC45CH1H470J	Ceramic 47pF ±5%	
C75	CC45CH1H150J	Ceramic 15pF ±5%	
C76	C90-0262-05	Ceramic 0.047μF ±10%	
C77,78	CK45F1H223Z	Ceramic 0.022μF +80,−20%	
C79	CK45B1H471K	Ceramic 470pF ±10%	
C80	CC45SL1H470J	Ceramic 47pF ±5%	
C81	CK45B1H331K	Ceramic 330pF ±10%	
C82	CC45CH1H010C	Ceramic 1pF ±0.25pF	
C83	CK45B1H102K	Ceramic 1000pF ±10%	
R1～75	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
R34	RD14BB2E333J	Carbon resistor 33kΩ ±5% 1/4W	
R76	RD14BB2E153J	Carbon resistor 15kΩ ±5% 1/4W	
RB1,2	R90-0112-05	Resistor 47kΩ×7	
RB3	R90-0113-05	Resistor 4.7kΩ×6	
Q1	V03-0079-05	Transistor 2SC460 (B)	
Q2	V09-0023-05	FET 3SK22 (GR)	
Q3～7	V03-0079-05	Transistor 2SC460 (B)	
Q8	V01-0084-05	Transistor 2SA733 (R)	
Q9	V03-0079-05	Transistor 2SC460 (B)	
Q10,11	V03-0405-05	Transistor 2SC945 (P)	
Q12～19	V01-0084-05	Transistor 2SA733 (R)	
Q20	V03-0405-05	Transistor 2SC945 (P)	
Q21	V03-0079-05	Transistor 2SC460 (B)	
Q22	V01-0084-05	Transistor 2SA733 (R)	
IC1	V30-0153-05	IC SN76514N	
IC2～5	V30-0151	IC TD3490BP	
IC6	V30-0170-05	IC μPB249D	
D1～8	V11-0414-05	Diode 1S2588	
D9～12	V11-0076-05	Diode 1S1555	
D13,14	V21-0007-05	Varistor SV-03	
D15	V11-0076-05	Diode 1S1555	
D16	V11-0428-05	Zener diode BZ-220	
D17	V21-0007-05	Varistor SV-03	
D18～28	V11-0076-05	Diode 1S1555	
D29	V11-0240-05	Zener diode WZ-090	
VR1	R12-4021-05	Potentiometer 50kΩ (B)	
TC1	C05-0032-05	Ceramic trimmer	
L1,2	L40-4711-03	Ferri inductor 470μH	
L3	L40-6801-03	Ferri inductor 68μH	
L4	L40-3391-03	Ferri inductor 3.3μH	
L5	L40-4791-02	Ferri inductor 4.7μH	
L6	L40-1592-02	Ferri inductor 1.5μH	
L7	L40-2792-02	Ferri inductor 2.7μH	
L8	L34-0523-05	Tuning coil 1μH	
L9	L40-1892-02	Ferri inductor 1.8μH	
L10	L34-0526-05	Tuning coil 0.82μH	
L11	L40-1592-02	Ferri inductor 1.5μH	
L12～17	L40-4711-03	Ferri inductor 470μH	
L18,19	L40-6801-03	Ferri inductor 68μH	
L20～22	L40-4711-03	Ferri inductor 470μH	
L23	L33-0601-05	Chock coil 2.2μH	
T1,2	L34-0522-05	Tuning coil 7.83 MHz	
T3	L34-0524-05	Transformer (BM output)	
T4	L19-0020-05	OSC transformer (DC-DC converter)	
X1	L77-0482-05	Crystal quartz HC-18/4 (10 MHz)	
—	E23-0046-04	Terminal (square)	
—	E40-0607-05	Connector×3	
—	E40-1714-05	Mini connector	
—	E40-0327-05	U type pin	
—	E40-0826-05	U type pin×2	

COUNTER UNIT (X54-1160-00)

Ref. No.	Parts No.	Description	Re-marks
C1	CC45CH1H101J	Ceramic 100pF ±5%	
C2	CK45B1H102K	Ceramic 1000pF ±10%	
C3	CE04W1C220	Electrolytic 22μF 16WV	
C4,5	C90-0262-05	Ceramic 0.047μF ±10%	
C6	CE04W1A101	Electrolytic 100μF 10WV	
C7～9	C90-0262-05	Ceramic 0.047μF ±10%	
R1～9	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
Q1,2	V03-0270-05	Transistor 2SC945 (R)	
IC1,2	V30-0151-05	IC TD3490BP	
IC3	V30-0131-05	IC TD3472AP	
IC4	V30-0132-05	IC TD3400AP	
IC5	V30-0169-05	IC SN74H00N	
IC6	V30-0168-05	IC SN74176N	
IC7～11	V30-0151-05	IC TD3490BP	
IC12～16	V30-0167-05	IC TD3475AP	
IC17	V30-0165-05	IC TD3450AP	
IC18	V30-0166-05	IC TD3460AP	
IC19,20	V30-0165-05	IC TD3450AP	
IC21	V30-0166-05	IC TD3460AP	
IC22	V30-0165-05	IC TD3450AP	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
IC23	V30-0132-05	IC TD3400AP	
IC24	V30-0151-05	IC TD3490BP	
IC25	V30-0164-05	IC TD3442AP	
IC26	V30-0163-05	IC TD3404AP	
L1	L40-4701-03	Ferri inductor 47μH	
—	E40-0607-05	Connector × 3	

INDICATOR UNIT (X54-1180-00)

Ref. No.	Parts No.	Description	Remarks
R1～4	PD14BB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
D1～4	V11-0430-05	LED SEL-103W	
—	E23-0046-04	Terminal (square) × 6	

DISPLAY UNIT (X54-1310-00)

Ref. No.	Parts No.	Description	Remarks
—	G13-0107-04	Protect sponge	
—	J19-0485-04	Indicating tube stopper	
—	J21-2559-04	Indicating tube stopper	
—	V11-1262-36	Indicating tube LD8135	

NB UNIT (X54-1330-00)

Ref. No.	Parts No.	Description	Remarks
C1	CK45B1H102K	Ceramic 1000pF ±10%	
C2	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C3	C90-0254-05	Ceramic 0.022μF	
C4	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C5	CC45SL1H039C	Ceramic 3pF ±0.25pF	
C6,7	C90-0254-05	Ceramic 0.022μF	
C8	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C9	CK45B1H102K	Ceramic 1000pF ±10%	
C10	CC45SL1H331J	Ceramic 330pF ±5%	
C11	C90-0254-05	Ceramic 0.022μF	
C12	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
C13	CE04W1H010	Electrolytic 1μF 50WV	
C14	C90-0254-05	Ceramic 0.022μF	
C15	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
R1～18	RD14CB2E○○○J	Carbon resistor ○○○Ω* ±5% 1/4W	
Q1	V09-0012-05	FET 2SK19 (GR)	
Q2	V03-0079-05	Transistor 2SC460 (B)	
Q5,6	V03-0183-05	Transistor 2SC733 (Y)	
D1,2	V11-0051-05	Diode 1N60	
D3	V21-0004-05	Varistor MV-13	

Ref. No.	Parts No.	Description	Remarks
L1,2	L40-1511-03	Ferri inductor 150μH	
T1	L34-0535-05	Tuning coil	
T2	L34-0536-05	Tuning coil	
—	E23-0047-04	Terminal (square)	
—	E40-0315-05	Mini connector	
—	E40-0613-05	Mini connector	

VR UNIT (X54-1340-00)

Ref. No.	Parts No.	Description	Remarks
C1	CQ92M1H333K	Mylar 0.033μF ±10%	
VR1	R01-0043-05	Variable resistor 300Ω (B)	
VR2	R01-4025-05	Variable resistor 50kΩ (B)	
VR3	R01-2403-05	Variable resistor 5kΩ (B)	☆
—	E23-0046-04	Terminal (square) × 8	

PLL ASS'Y UNIT (X60-1010-01)

Ref. No.	Parts No.	Description	Remarks
—	E40-0625-05	Chassis mount wafer × 2	
—	E40-0825-05	Chassis mount wafer × 2	
—	J32-0216-04	Hex. boss × 4	☆
—	J32-0217-04	Hex. boss × 5	☆
—	J32-0218-04	Hex. boss × 6	☆
—	X50-1330-00	VCO unit	☆
—	X50-1340-01	PD unit	☆

COUNTER ASS'Y UNIT (X60-1020-00)

Ref. No.	Parts No.	Description	Remarks
—	E40-0625-05	Chassis mount wafer	
—	E40-1225-05	Chassis mount wafer	
—	X54-1150-00	Counter mixer unit	
—	X54-1160-00	Counter unit	

CAR ASS'Y UNIT (X60-1040-00)

Ref. No.	Parts No.	Description	Remarks
—	J32-0216-04	Hex. boss × 2	
—	J32-0217-04	Hex. boss × 3	
—	J32-0218-04	Hex. boss × 3	
—	X50-1480-00	CAR-1 unit	☆
—	X50-1450-00	CAR-2 unit	☆

PARTS LIST/EXPLODED VIEW

AC CORD ASS'Y (X42-1040-00)

Ref. No.	Parts No.	Description	Re-marks
—	E09-0426-05	AC cord (with plug)	
—	E30-0545-05	4P plug (square)	
—	J41-0006-00	Cord bushing	

TRANCEIVE CABLE ASS'Y (X42-1130-00)

Ref. No.	Parts No.	Description	Re-marks
—	E05-0901-05	9P plug	
—	E09-1601-05	16P connector plug	
—	E33-1056-00	Wire kit	

1. Removing the front panel

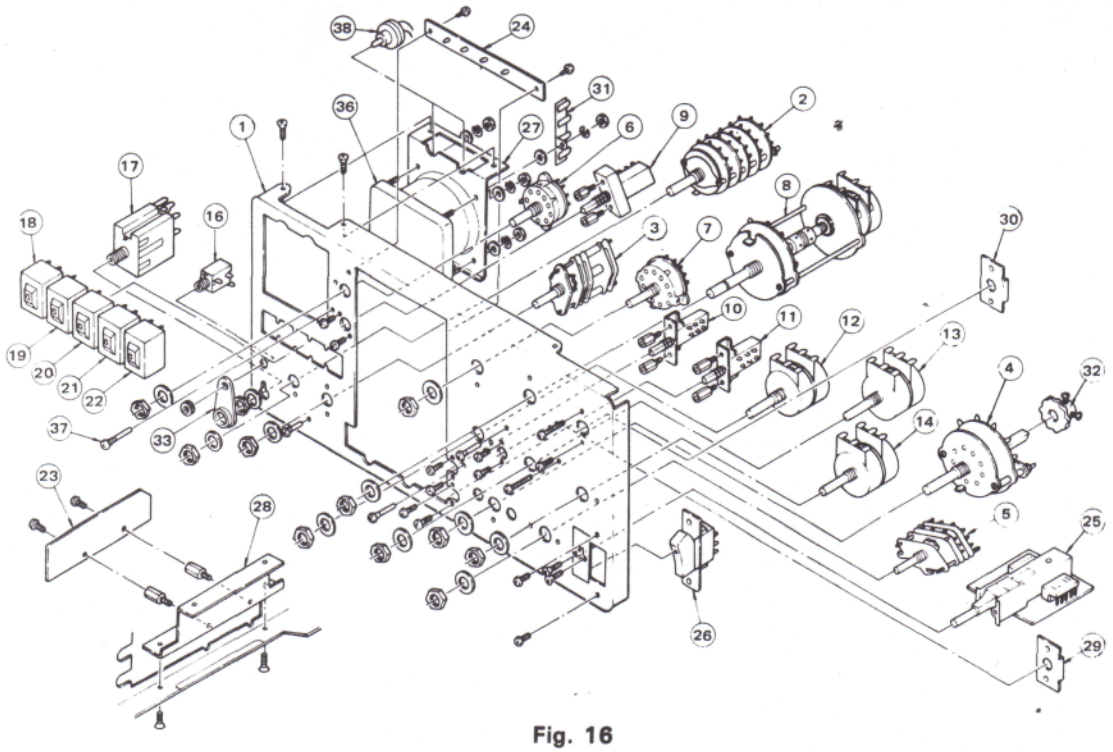


Fig. 16

No.	Description	Parts No.	Remarks	No.	Description	Parts No.	Remarks
1	Sub-panel	A22-0713-02		20	Paddle switch (c)	S44-2020-05	NB
2	Rotary switch (A)	S01-5010-05	MODE	21	Paddle switch (d)	S44-2016-05	MONI
3	Rotary switch (B)	S01-3402-05	RF ATT	22	Paddle switch (E)	S44-2015-05	AGC
4	Rotary switch (C)	S01-1409-05	BAND (A)	23	VR unit	X54-1340-00	
5	Rotary switch (D)	S01-1015-15	BAND (B)	24	Indicator unit	X54-1180-00	
6	Rotary switch (E)	S01-1037-05	FIX CH	25	Switch unit	X41-1130-00	
7	Rotary switch (F)	S01-1408-05	TRANSCEIVE	26	Seesaw switchz	S59-2020-05	POWER
8	Rotary switch (G)	S01-1407-05	SELECTIVITY	27	Meter stopper		
9	Push switch (A)	S40-2077-05	DH	28	VRO stopper		
10	Psu switch (B)	S40-2077-05	RIT	29	Shaft stopper		
11	Push switch (C)	S40-2077-05	NOTCH	30	Shaft stopper		
12	Potentiometer (A)	R21-9401-05	RIT, NOTCH	31	Lug plate	E22-0415-05	
13	Potentiometer (B)	R08-9402-05	IF SHIFT	32	Sprocket	D13-0402-03	
14	Potentiometer (C)	R08-3012-15	AF, RF GAIN	33	Panel buck plate	B03-0506-04	
16	US jack (A)	E11-0003-15	RECORD	36	Meter	B31-0610-05	
17	US jack (B)	E11-0034-05	PHONE	37	Screw (GND)	N09-0256-05	
18	Paddle switch (A)	S44-2016-05	STBY	38	Pilot lamp	B30-0806-05	
19	Paddle switch (B)	S44-2020-05	CAL 25 kHz				

EXPLODED VIEW

2. Removing the rear panel

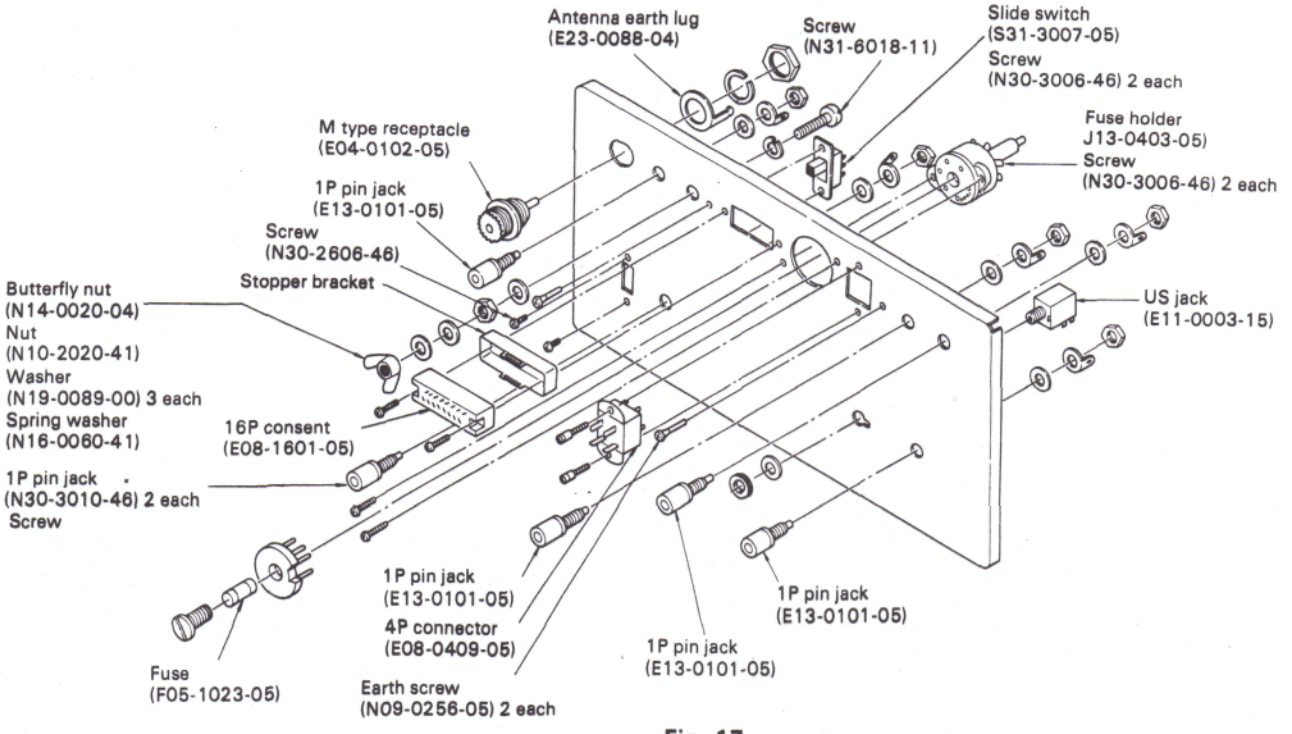
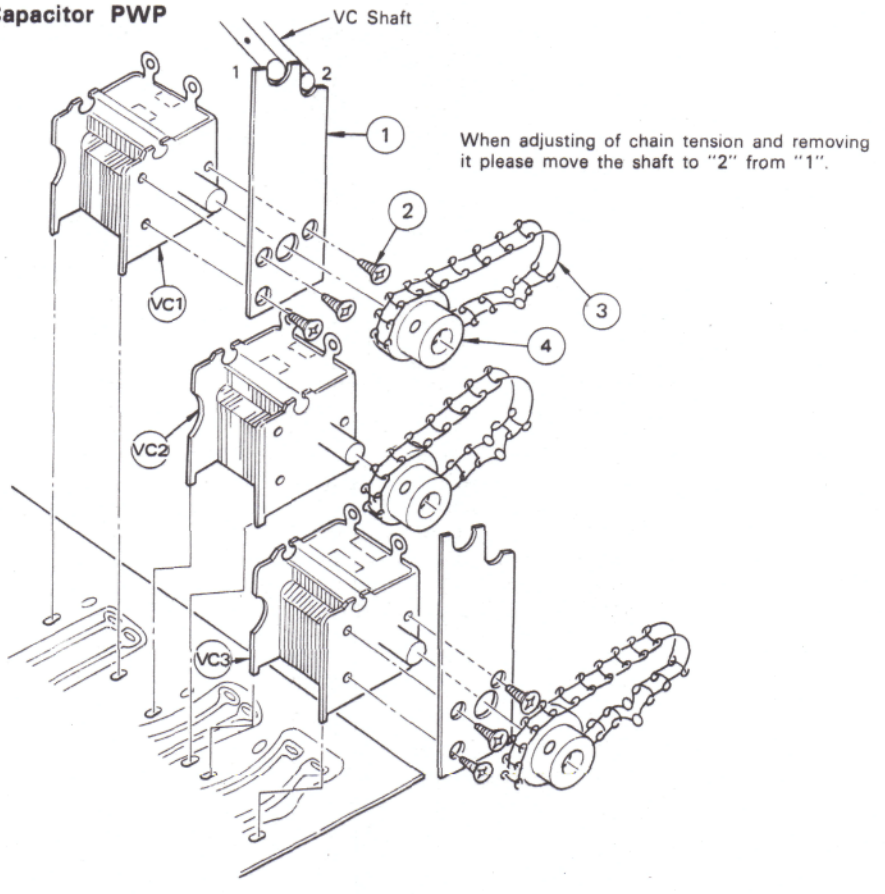


Fig. 17

3. Removing the coilpack (Variable Capacitor PWP Mechanism)



No.	Parts No.	Remarks
1	J19-1309-04	VC prop.
2	N32-3004-46	Screw
3	D16-0021-04	Chain ass'y
4	D13-0032-03	Sprocket

Fig. 18

4. Removing the VFO

1) Remove the top and the bottom covers from the unit.
2) Remove the VFO output cable and 2P plug from the rear of the VFO unit.
3) Remove the VFO knob, dial escutcheon, and 4 mounting screws to the sub-chassis.
4) Withdraw the VFO unit from the receiver. Exercise care not to scratch the sub dial.

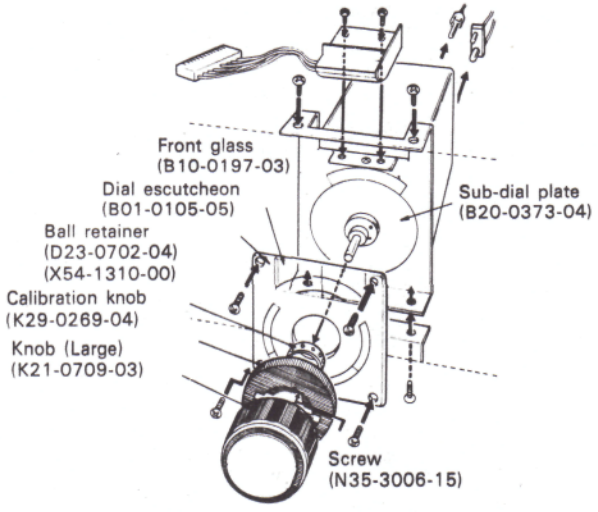


Fig. 19 Removing the VFO

5. Checking Procedure for the Counter Ass'y

1) For the mounting produce of the Counter Ass'y see "Fig. 19".
2) Option mounting produce, when checking each voltage, attach the printed circuit board, as shown in Fig. 20.

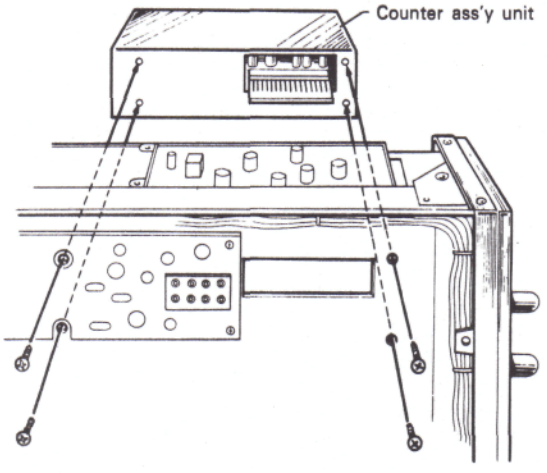


Fig. 20

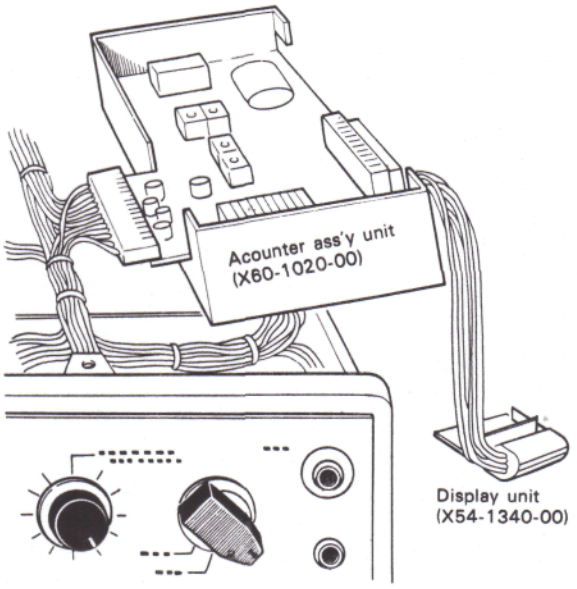


Fig. 21

6. Removing the VR Ass'y

1) Remove the upper and lower receiver cases.
2) Remove the panel per item 1.
3) Remove the NB LEVEL, MONITOR, and TONE controls.

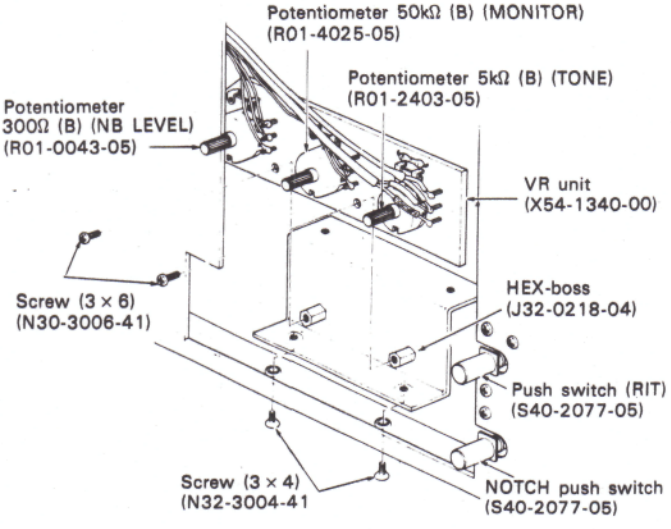


Fig. 22 Removing the VR Unit

DISASSEMBLY

7. Meter removal

1) Remove the upper and lower receiver cases.
2) Remove the two screws which secure the meter mount to the sub-panel.
3) For V and S types, removal should be in accordance with Fig. 19.

8. Paddle switch replacement

1) Remove the knobs and dial plate from the front panel per item 1.
2) Remove the mter per item 7.
3) Pull the switch out towards the front of the transceiverr while holding down the securing leaf spring as shown in Fig. 23.
4) Push in a new switch from the front. The switch will secure itself by the leaf spring. The paddle itself can be replaced by levering off the old paddle with a screwdriver. Then push on the new paddle.

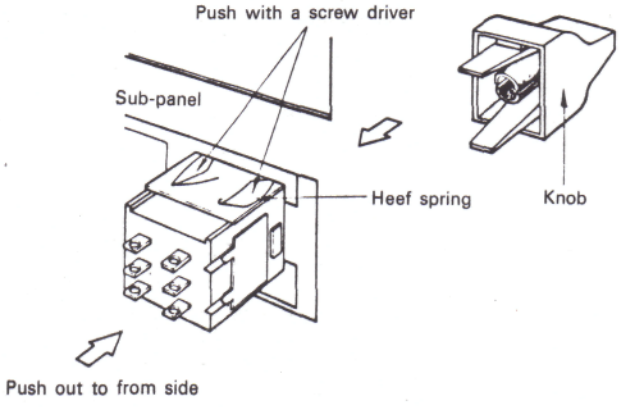


Fig. 23

9. Mini-connector of replacement

1) To remove leads from the mini-connector, depress the terminal clip by using a thin screw driver, then pull out the lead.
2) When soldering on a new terminal clip, use care not to heat damage the terminal spring.
Soldering should be limited within the area shown in Fig. 24.

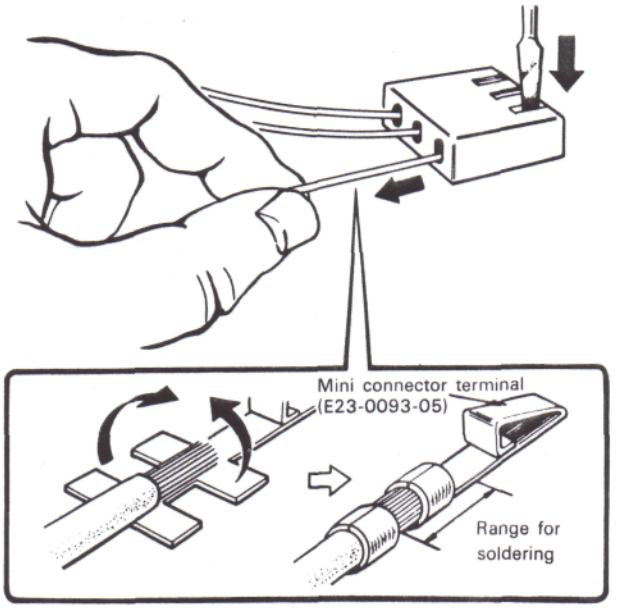
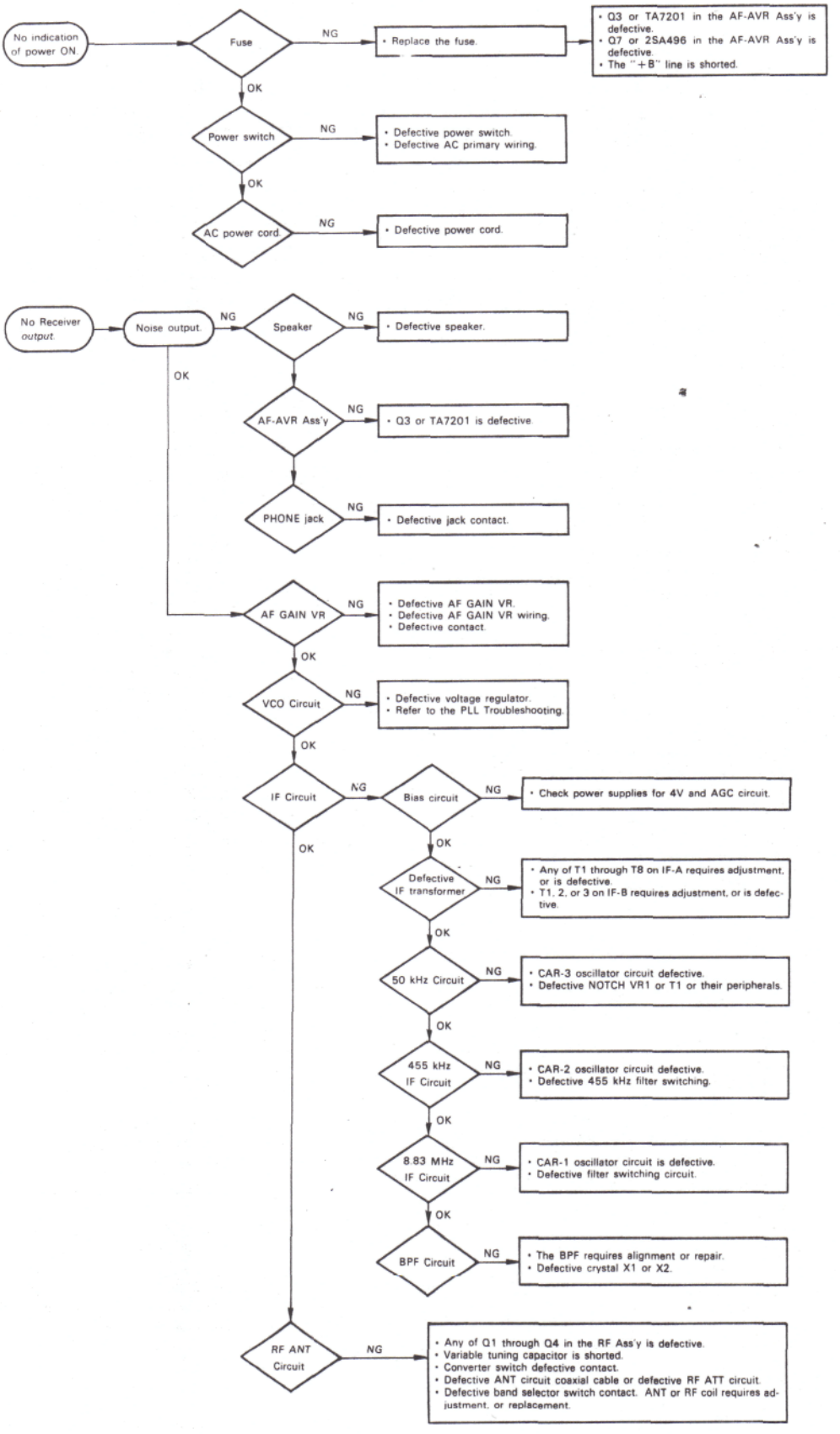


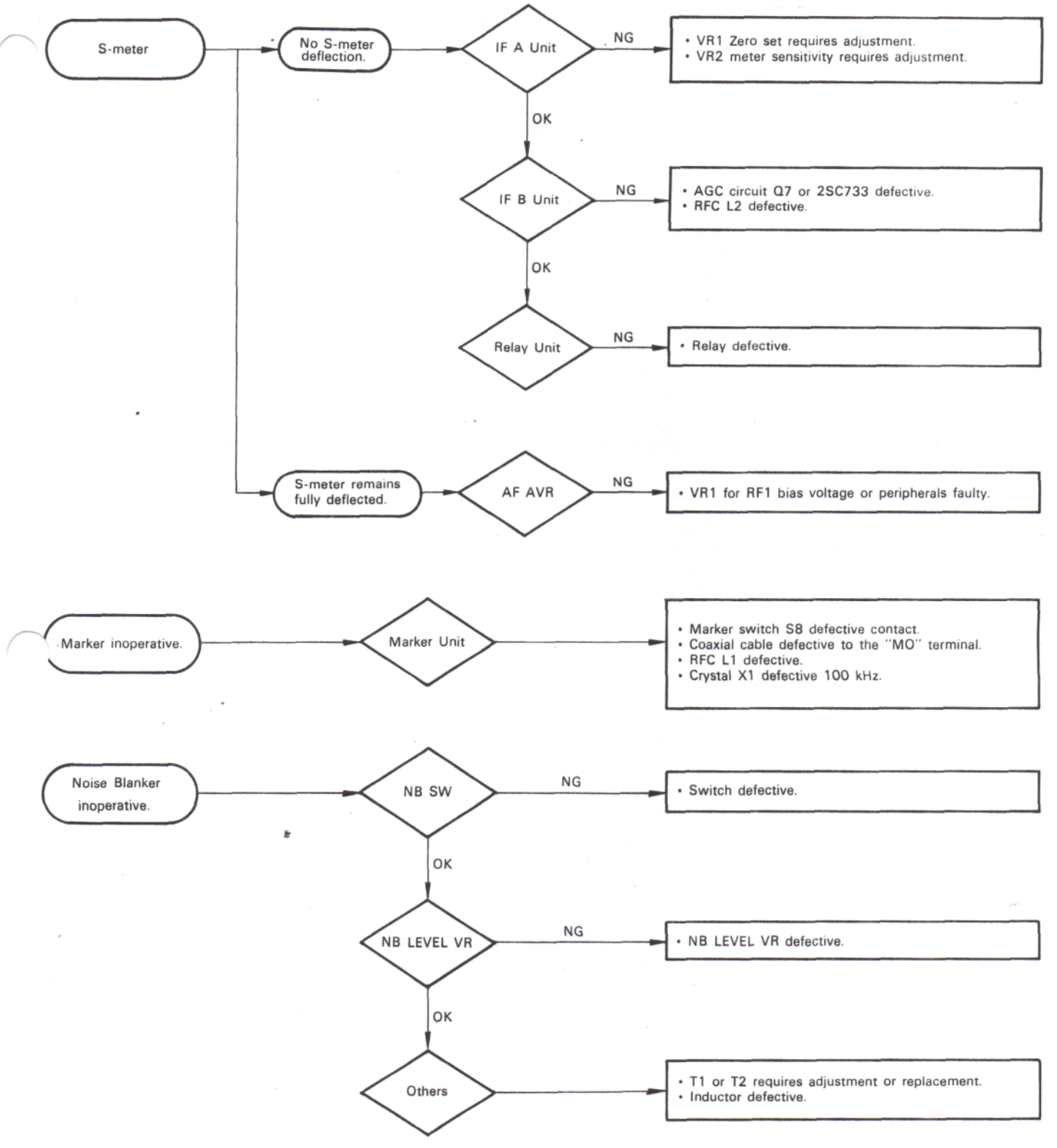
Fig. 24

TROUBLESHOOTING

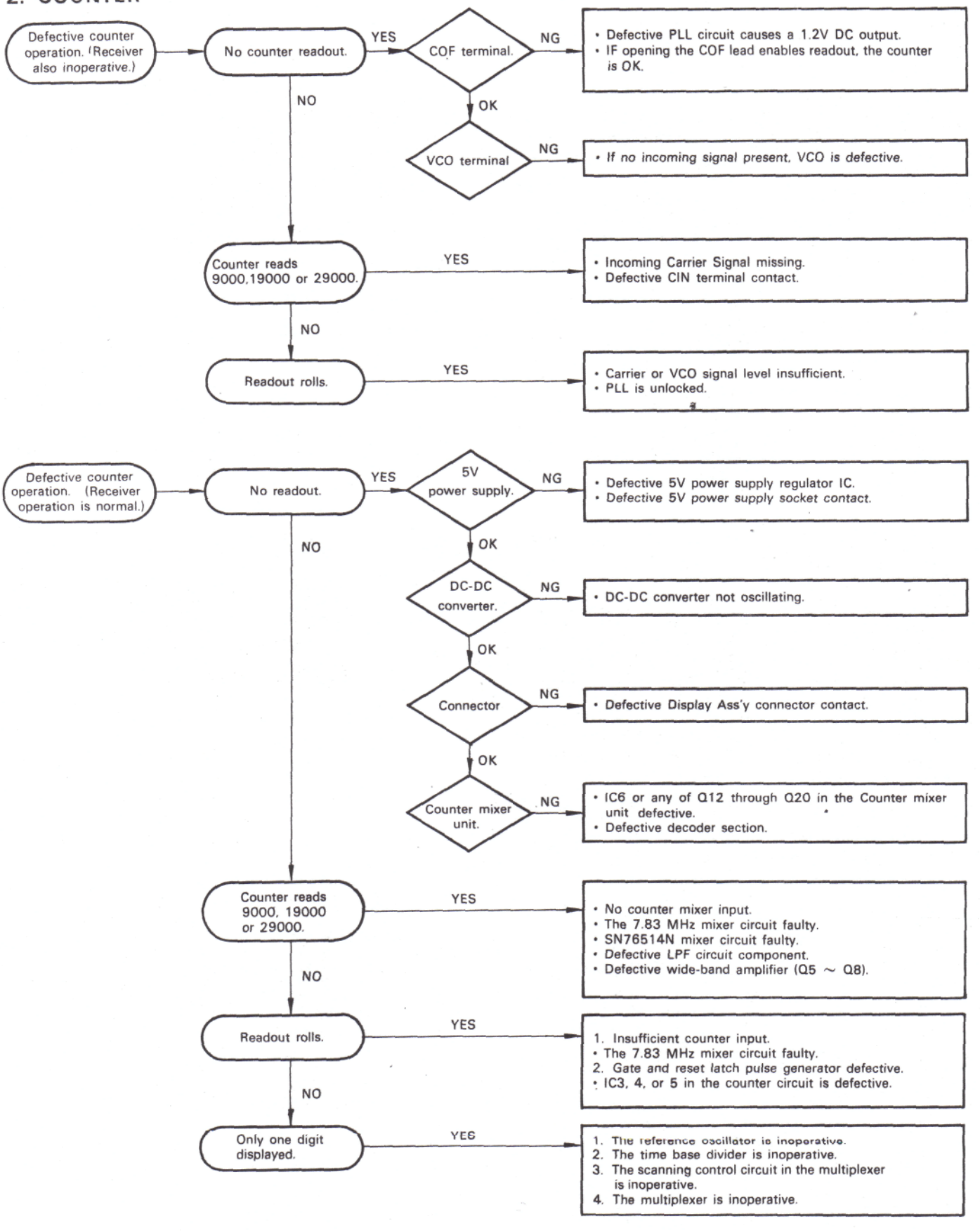
1. RECEIVER SYSTEM



TROUBLESHOOTING

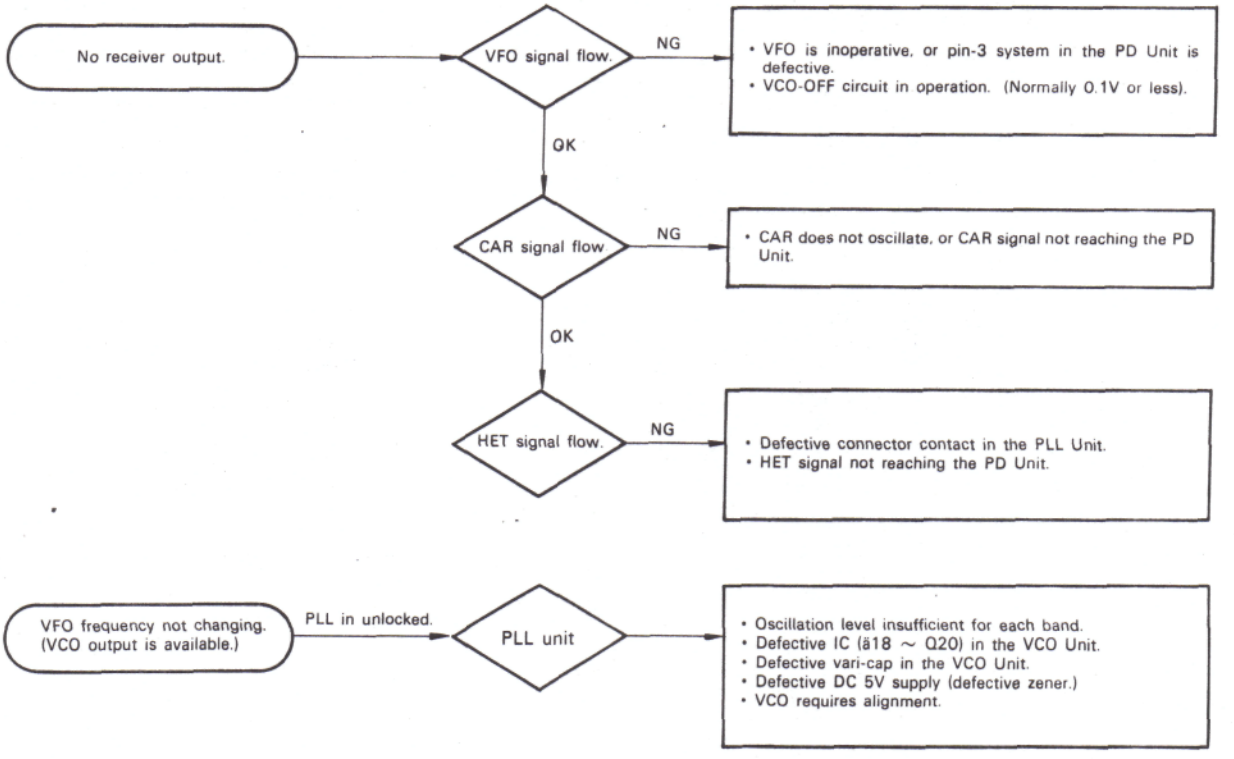


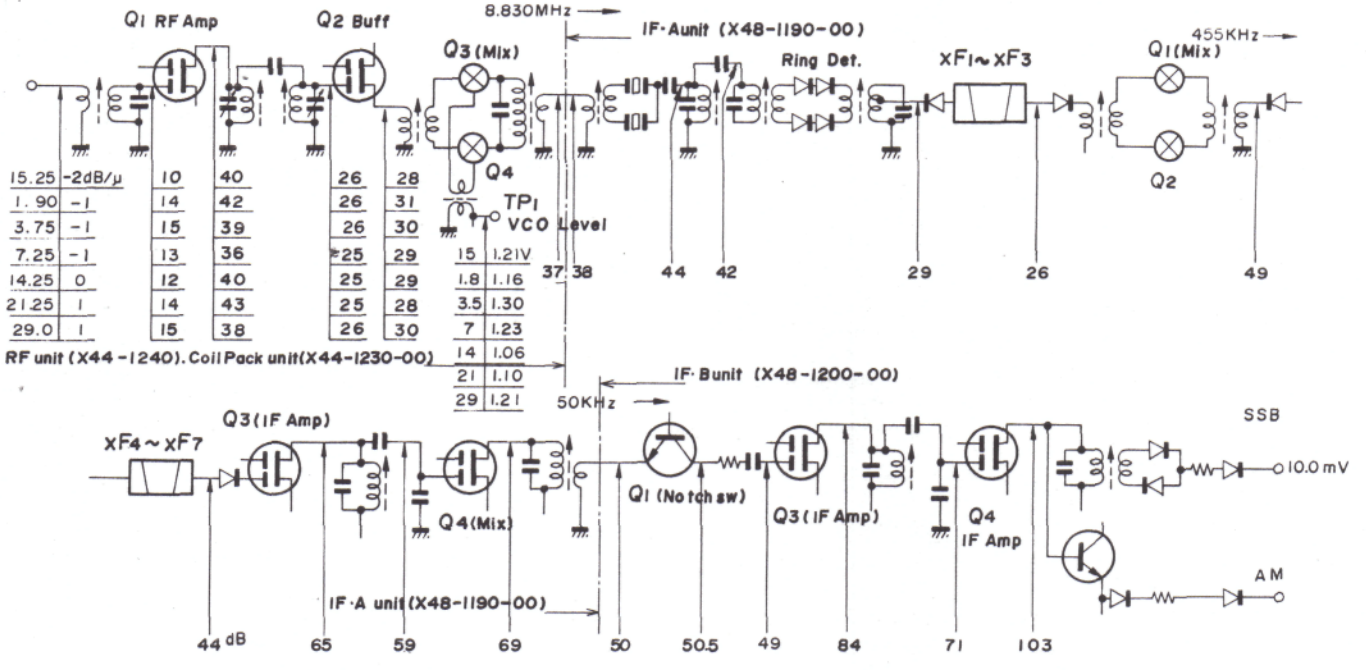
2. COUNTER


Defective counter operation. (Receiver also inoperative.)
No counter readout.
YES
COF terminal.
NG
• Defective PLL circuit causes a 1.2V DC output.
• IF opening the COF lead enables readout, the counter is OK.
NO
OK
VCO terminal
NG
• If no incoming signal present, VCO is defective.
Counter reads 9000,19000 or 29000.
YES
• Incoming Carrier Signal missing.
• Defective CIN terminal contact.
NO
Readout rolls.
YES
• Carrier or VCO signal level insufficient.
• PLL is unlocked.
Defective counter operation. (Receiver operation is normal.)
No readout.
YES
5V power supply.
NG
• Defective 5V power supply regulator IC.
• Defective 5V power supply socket contact.
NO
OK
DC-DC converter.
NG
• DC-DC converter not oscillating.
OK
Connector
NG
• Defective Display Ass'y connector contact.
OK
Counter mixer unit.
NG
• IC6 or any of Q12 through Q20 in the Counter mixer unit defective.
• Defective decoder section.
Counter reads 9000, 19000 or 29000.
YES
• No counter mixer input.
• The 7.83 MHz mixer circuit faulty.
• SN76514N mixer circuit faulty.
• Defective LPF circuit component.
• Defective wide-band amplifier (Q5 ~ Q8).
NO
Readout rolls.
YES
1. Insufficient counter input.
• The 7.83 MHz mixer circuit faulty.
2. Gate and reset latch pulse generator defective.
• IC3, 4, or 5 in the counter circuit is defective.
NO
Only one digit displayed.
YES
1. The reference oscillator is inoperative.
2. The time base divider is inoperative.
3. The scanning control circuit in the multiplexer is inoperative.
4. The multiplexer is inoperative.

TROUBLESHOOTING/LEVEL DIAGRAM

3. PLL SYSTEM





NOTES:

1) The above figure 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 0.63V/8Ω (50 mW) audio output for a 0 dB signal generator input at 14.250 MHz.
2) Measure the AF output at the ring detector on the IF B unit (X48-1200-00).
3) All voltage measurement are read from on RF VTVM.
4) To measure the output of signal generator, contact a 0.01μF 500WV capacitor between the signal generator and the check point.

ADJUSTMENT

TEST EQUIPMENT FOR ADJUSTMENT

1. Voltmeter

1) Input impedance:
   Not less than 1 MΩ.
2) Voltage ranges:
   1.5V to 1000V, AC and DC.

NOTE:
A high precision multimeter is permissible, but won't provide accurate reading for high-impedance circuit measurement.

2. RF Voltmeter

1) Input impedance:
   Not less than 1 MΩ with input capacitance not more than 20pF.
2) Voltage range:
   10mV through 300V full scale.
3) Frequency response:
   Not less than 20 MHz.

NOTE:
For adjustments requiring less precision, detector output may be checked with a voltmeter or miltimeter.

3. AF Voltmeter

1) Frequency response:
   50 Hz ~ 10 kHz
2) Input impedance:
   Not less than 1 MΩ.
3) Voltage range:
   10 mV ~ 30V full scale.

2. AF dummy load

1) Impedance:
   8Ω non-inductive.
2) Power capacitor:
   Not less than 3 watts.

5. Oscilloscope

High sensitivity with external sync in.

6. Sweep generator

1) Center frequency:
   8.83 MHz.
2) Frequency deviation:
   Max. +5 kHz.
3) Output voltage:
   Not less than 0.1V.
4) Sweep rate:
   Not less than 0.5 sec/cm.
5) Marker provision recommended.

7. SSG (Standard Signal Generator)

1) Output frequency range:
   1.8 MHz ~ 30 MHz.
2) Output level:
   0 dB/μV. −120 dB/μV.

NOTE:
1) The SSG mut be stable output frequency and minimum frequency modulation component.
2) 0 dB = 1 μV
   Z = 50Ω
   Open Circuit Voltage

8. Frequency counter

1) Minimum input voltage:
   50 mV.
2) Frequency response:
   Not less than 40 MHz.

9. Noise generator

1) Noise component must be similar to automobile ignition noise, containing harmonics to above 30 MHz.
2) Output level should be adjustable.

PRELIMINARY SETTING

1. Prior to adjustment, remove the top and bottom covers from the unit and place it on its side.

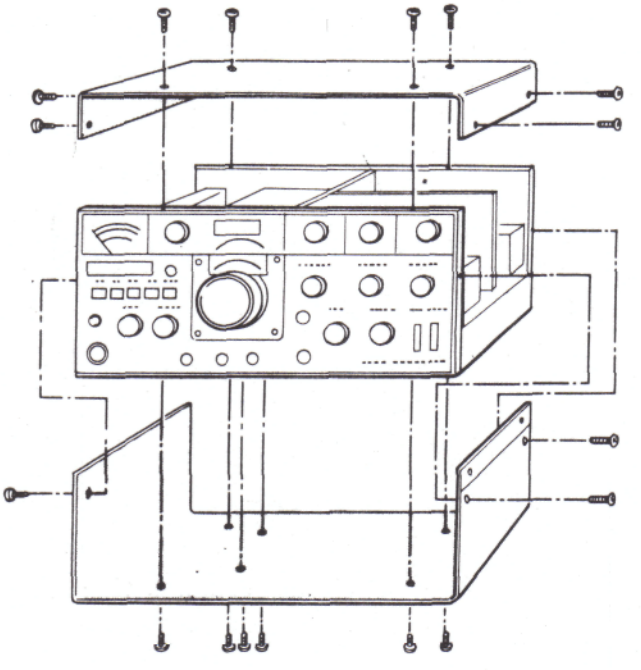


Fig. 26

ADJUSTMENT

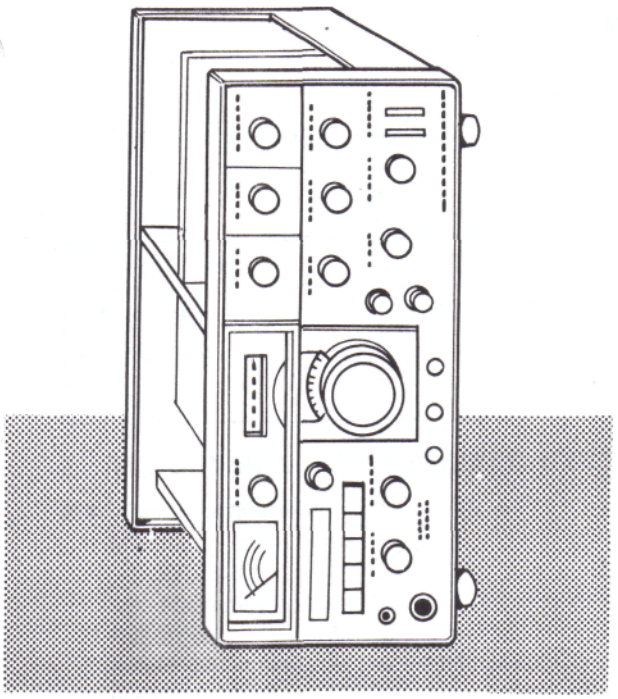


Fig. 27

2. Unless otherwise specified, set the front and rear panel controls as follows:

1) Front panel

Table 5

STBY	REC
CAL 25 kHz	OFF
NB	OFF
MONI	OFF
AGC	OFF
MODE	USB
RF ATT	0 dB
DH	OFF
FIX	VFO
NB LEVEL	FULL CLOCKWISE (CW)
MONITOR	FULL CLOCKWISE (CW)
TONE	FULL CLOCKWISE (CW)
RIT SW	OFF
NOTCH SW	OFF
BAND	1.8 NORM
TRCV SEP	SEP
NOTCH VR	CENTERED
RIT VR	CENTERED
IF SHIFT	CENTERED
AF GAIN	COUNTERCLOCK-WISE (CCW)
VBT	NORMAL
SELECTIVITY	AUTO
PRESELECTOR	CENTERED

2) Rear Panel

Table 6

FULL VFO	FULL

1. POWER SUPPLY ADJUSTMENT

1-1. 9V DC line adjustment

1) Measuring instrument: Voltmeter.

2) Adjustment

Connect voltmeter between the AF-AVR 9V terminal and Ass'y (X49-1080-00) and chassis ground, and adjust VR4 on the AF-AVR Ass'y for 9.0 volts. (Refer to Fig. 28 and P-connector terminal callouts.)

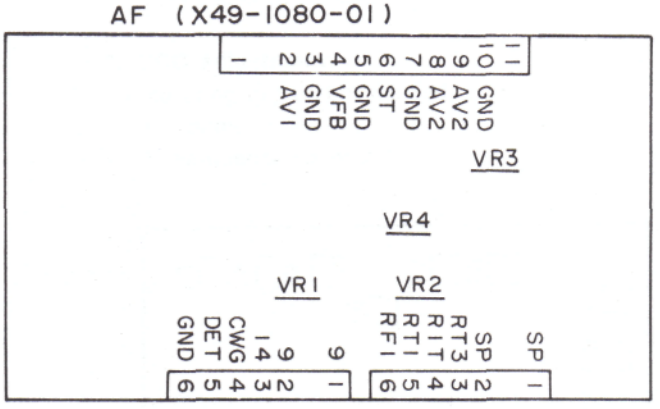


Fig. 28

1-2. RF-1 (3.5V) adjustment

1) Measuring instruments

1. RF Voltmeter.
2. Frequency Counter.

2) Adjustment

Before adjustment, set the IF Shift control to its center (detent) position.

1-3. Check points for voltage

1) 14V terminal.

AF (X49-1080-00) RL (X43-1190-01)
Conv. (X60-1020-00) IF•A (X48-1190-00)
RF (X44-1240-00) IF•B (X48-1200-00)
Fix (X50-1450-00)

2) 5V terminal.

PLL (X60-1010-01) RL (X43-1190-01)
Conv. (X60-1020-00)

3) 6V terminal.

RF (X44-1240-00) Fix (X50-1450-00)
IF•B (X48-1200-00)

4) Control voltage for RF unit (X44-1240-00)

Table 7

STBY-REC, SW	REC	STBY
RB terminal	+2.2V	−3.5V
RLR terminal	+9.0V	−1.7V
RBC terminal	+2.2V	−3.5V

2. ADJUSTMENT OF RECEIVER SECTION

2-1. Carrier adjustment

1) Measuring instruments
   1. RF VTVM.
   2. Frequency counter.
2) Adjustment
   Before adjustment, set the IF-Shift control to its center position.

1. Connect the RF voltmeter to the IF-A Ass'y (X48-1190-00), CA1 or TP1 terminal and adjust T1 on the CAR-1 Ass'y to obtain 100 mV ± 1 dB. Then adjust T1 on the CAR-2 Ass'y to obtain 1V ± 1 dB at the IF-A Ass'y CA1 or TP3 terminal.
2. Connect the frequency counter to the IF-A Ass'y CA1 or TP1 terminal, and adjust frequencies per Fig. 29.

Table 8

MODE SW	Adjustment point	Setting freq.
AM	CAR-1 unit VR1	8.8300 MHz
CW	CAR-1 unit TC2	8.8315 MHz
USB	CAR-1 unit TC2	8.8315 MHz
LSB	CAR-1 unit TC1	8.8285 MHz
RTTY	CAR-1 unit TC1	8.8285 MHz

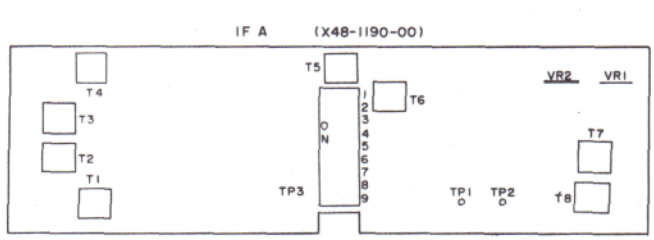


Fig. 29

After completing adjustments, return the VBT control to NORMAL (CW) position, and check that the IF-Shift control changes frequency over ± 1.5 kHz.

3. With the VBT control still at NORMAL (CW), and the IF-Shift control set at its center (Detent) position, connect the frequency counter to the IF-A Ass'y CA2 or TP3, and adjust TC-1 on the CAR-2 Ass'y to obtain 8.375 MHz. Then turn the VBT control through its range to check that the frequency changes more than −2.3 kHz.

2-2. VCO adjustment

1) Measuring instrument needed.
   1. Voltmeter.
   2. Frequency counter.

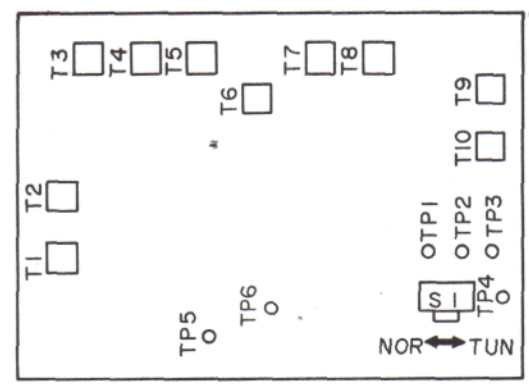


Fig. 30

2) Adjustment
   1. Connect the voltmeter to the VCO Ass'y (X54-1330-00) TP4. Check that the slide switch in the VCO is set to the NORM position.
   2. Set the VFO dial to "250", and adjust T1 through T10 to obtain a voltmeter reading of 2.9V to 3.5V for each band.

NOTES:

1) When the VFO dial is turned from "0" to "500", the voltmeter reading must reflect this change.
2) For 21 MHz and above, two different tuning points may give a reading of 3.2V. The "Correct" tuning point is with deeper core position. An incorrect tuning point won't give voltage change when the VFO dial is turned.
3) To check VCO frequencies, set the slide switch S1 on the VCO Unit to the TUN position, and connect a frequency counter across TP5 and TP6 (GND). First check frequencies with TP1 and TP2 bridged to each other (NORMAL), and then with TP1 and TP2 opened and TP2 and TP3 shorted to each other. The frequency differences between these two cases must range within the following frequency ranges, per Table 9.

Table 9

BAND	COIL	Setting freq.	Bandwidth
WWV/JJY	T1	24.08 MHz	More than ±550 kHz
1.8	T2	10.88 MHz	More than ±400 kHz
3.5	T3	12.58 MHz	More than ±400 kHz
7.0	T4	16.08 MHz	More than ±500 kHz
14.0	T5	23.08 MHz	More than ±650 kHz
21.0	T6	30.08 MHz	More than ±650 kHz
28.0	T7	37.08 MHz	More than ±650 kHz
28.5	T8	37.58 MHz	More than ±650 kHz
29.0	T9	38.08 MHz	More than ±650 kHz
29.5	T10	38.58 MHz	More than ±650 kHz
AUX	T11	X+8.83 MHz	More than ±500 kHz

2-3. IF amplifier adjustment

1) Instruments:
   1. SSG (or 25 kHz Marker).
   2. AF Voltmeter.
   3. AF dummy load.
2) Adjustment
   1. Connect SSG output to the receiver antenna terminal.
      Set the SSG to 1.9 MHz, 40 dB output.
   2. Adjust the following coil(s) for maximum AF voltmeter reading.

* Coil pack unit: L1, L12, and L16
* RF unit: T2
* IF A unit: T1 ~ T8
* IF B unit: T2, and T3

NOTE:
After completing this adjustment, make sure to carry out the S-meter adjustment described in 2-10.

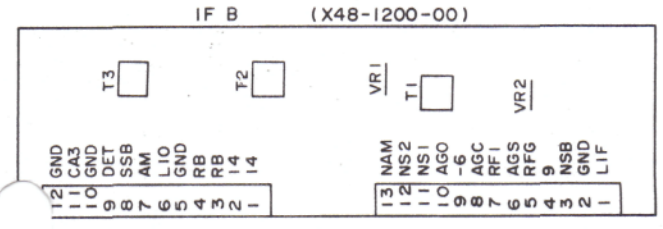


Fig. 31 IF B Unit

2-4. Coil pack adjustment

1) Instruments:
   Same as item 2-3, IF Amplifier Adjustment.
2) Adjustment
   1. Adjust SSG output to 40 dB, and connect to the receiver antenna terminal. Center the PRESELECTOR control. Adjust the coil Pack Unit per Table 10, for maximum AF output. SSG output should be reduced as sensitivity increases.

Table 10

BAND	VFO scale	SSG freq	Adjustment coil
WWV/JJY	250	15.25 MHz	L1, L8, L15
1.8	100	1.90 MHz	L2, L9, L16
3.5	250	3.75 MHz	L3, L10, L17
7.0	250	7.25	L4, L11, L18
14.0	250	14.25	L5, L12, L19
21.0	250	21.25	L6, L13, L20
29.0	0	29.00	L7, L14, L21
29.5~49m	250	6.15 MHz	Conv. unit T15.

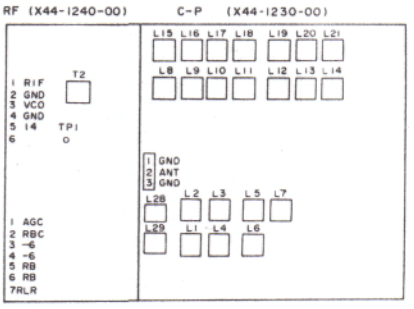


Fig. 32 RF Unit and Coil Pack

2-5. IF trap adjustment

1) Instruments:
   Same as item 2-3, IF Amplifier Adjustment.
2) Adjustment
   1. Adjust SSG output to 8.830 MHz, 100 dB, and connect to the receiver antenna terminal. Set the BAND switch to 7 MHz, and the VFO to "250".
   2. Adjust L28 and L29 on the coil pack alternately to obtain minimum S-meter and audio reading.

2-6. Noise blanker circuit adjustment

1) Instruments:
   1. Voltmeter.
   2. Noise generator.
   3. Oscilloscope.

2) Adjustment

* Initial adjustment.

Receive the 25 kHz marker signal, and adjust T1 and T2 on the NB Unit (X48-1150-00) to obtain minimum voltage at the TP terminal, with the NB switch turned ON.

* Full adjustment.

1. After completing initial adjustment, connect the noise generator to the receiver antenna terminal and adjust the Preselector for maximum receiver noise output.
   Ideal S-meter reading at this time will be between 5 and 7.
2. With NB ON, connect the oscilloscope probe to D13 cathode, on the IF Unit.
   Adjust T1 on the IF Unit, and T2 on the RF Unit for the waveform shown in Fig. 33b.

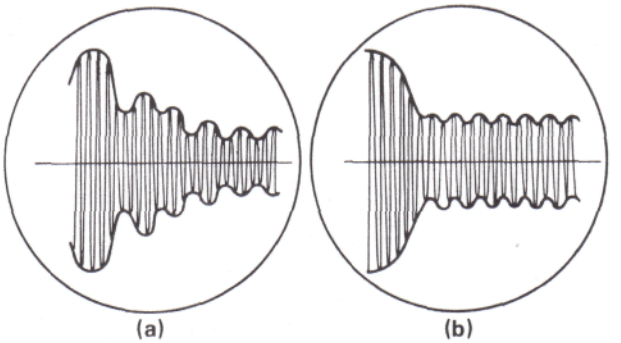


Fig. 33 Adjustment of Noise Blanker

3. Fine adjust T1 and T2 on the NB Unit and T3 on the IF A Unit within 1/4 turn for minimum receiver noise output, while using care to maintain waveform as shown in Fig. 33b.
4. Turn the RF ATT ON, and repeat fine adjustments. The Noise Blanker must be effective against noise below S-meter threshold.
5. Final check that receive gain is not greatly reduced.

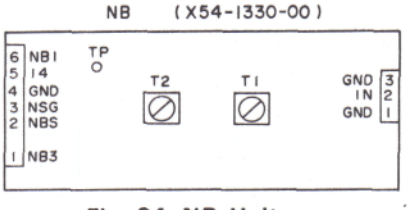


Fig. 34 NB Unit

2-7. NOTCH adjustment

1) Instruments:
   1. AF voltmeter.
   2. Frequency counter.
   3. AF dummy load.

2) Adjustment
   1. Center the NOTCH control, and connect the frequency counter to the CA3 terminal, on the Local OSC Unit. Adjust the Local OSC Unit per Table 11.

Table 11

MODE	NOTCH SW	Adj point	Adj freq.
LSB	ON	T4	51.5 kHz
USB	ON	TC2	48.5 kHz
—	OFF	IF•B unit VR2	51.5 kHz

   2. Turn the NOTCH and AGC OFF, and receive the 25 kHz Marker signal. Connect the frequency counter to the IF2 OUT jack on the receiver rear, and adjust the VFO for a 50,000 kHz counter reading.
   3. Turn the NOTCH switch ON, and adjust T1 on the IF B Unit for a 50,000 kHz counter reading.
   4. Adjust VR1 (NULL) on the IF B Unit for minimum AF voltmeter reading.
   5. Repeat this procedure 3 or 4 times, or until no further improvement is noted.

2-8. Frequency response (Carrier Point) adjustment

1) Instruments:
   1. SSG (or Marker).
   2. Frequency counter.

2) Adjustment
   1. Set the controls as follows:
      SELECTIVITY control: 0.5
      IF SHIFT control: Centered
      VBT control: NORMAL
      DIP switches 1, 3, 6 and 8 on the IF A Unit: ON.
      Jumper D15 and D16 (The 455 kHz filter is bypassed.)
   2. Receive any frequency from the SSG or marker, and note the S-meter reading with FAST AGC.
   3. Set the MODE switch to LSB. While reading the 25 kHz Marker AF output with the frequency counter, adjust TC-1 on the CAR-1 Unit for the same S-meter reading at both the 200 Hz and 2800 Hz beat points. Then set the MODE switch to USB, and adjust TC-2 on the CAR-1 Unit, again for the same S-meter reading at 200 Hz and 2800 Hz.

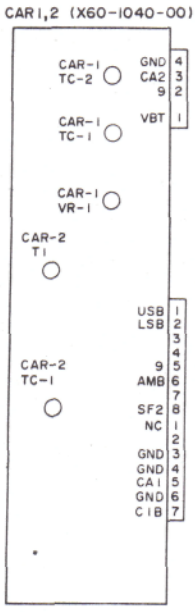


Fig. 35

4. Turn DIP switches 1, 4, 6, and 8 on the IF A Unit ON, and remove the jumper connecting D15 to D16. Set SELECTIVITY to the AUTO position, and adjust TC-1 on the CAR-2 Unit for equal S-meter reading at 200 Hz beat output when the MODE is switched between LSB and USB.
5. AM CAR adjustment
   Connect the frequency counter to CA1 or TP1 on the IF A Unit, and set the MODE switch to AM. Adjust VR-1 on the CAR-1 unit for an 8,8300 MHz counter reading.

2-9. CONV BAND adjustment

1) Instruments:
   1. Oscilloscope.
   2. Sweep generator.
   3. Detector.

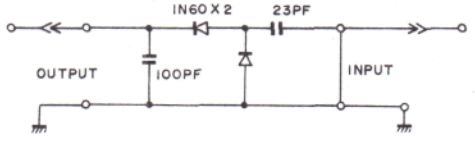


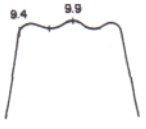
Fig. 36

2) Adjustment
   1. Set the sweep generator and marker output, and make the following adjustments for each SW BAND.

a) 29.5 — 49m
Adjust T11, T12, and T13.



b) 29.5 — 31m
Adjust T8, T9, and T10.



c) 29.5 — 25m
Adjust T5, T6, and T7.



d) 29.5 — 16m
T2, T3, and T4.



Fig. 37

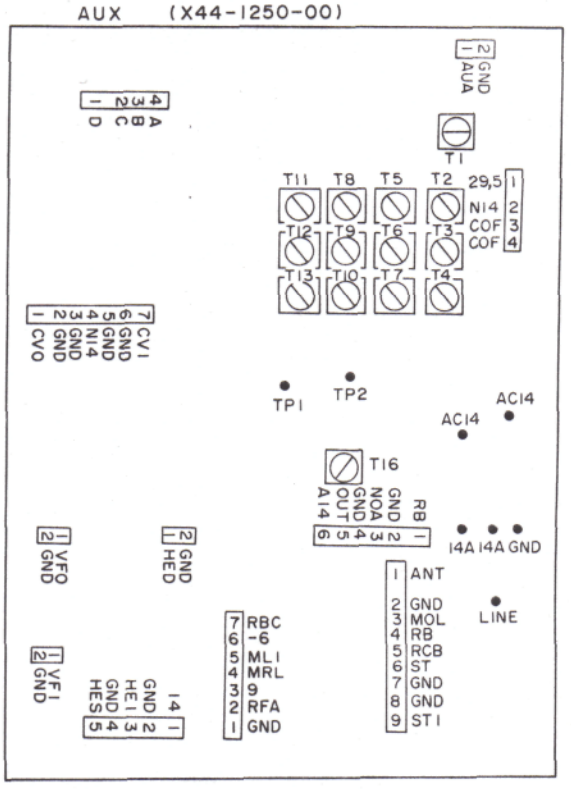


Fig. 38 CONV. Unit

2-10. S-meter adjustment

1) Instrument SSG:
2) Adjustment
   1. After RF and IF alignment, zero the S-meter by adjusting VR1 on the IF A Unit with no input signal.
   2. Adjust SSG output for 0 dB and connect to the receiver antenna terminal. On the IF A Unit, adjust T7 counterclockwise for S-meter start at 0 dB.
   3. Increase SSG output to 40 dB, and adjust VR2 on the IF A Unit for an "S9" S-meter reading.

2-11. RIT adjustment

1) Instrument 25 kHz marker.
2) Adjustment
   1. Set the RIT control exactly at "0" and turn the RIT switch ON.
   2. Turn the VFO to the marker for a 1 kHz beat.
   3. Turn the RIT switch OFF, and adjust VR2 on the AF AVR Unit (X49-1080-01) for no frequency change when the RIT switch is turned ON and OFF.

ADJUSTMENT

2-12. Marker frequency adjustment

1) Instrument:
   Frequency counter.
2) Adjustment
   1. Connect the frequency counter to Q4 collector on the Marker Unit (X52-005-01), and open the MS terminal ground.
   2. Turn the CA1 25 kHz switch ON, and adjust TC-1 on the Marker Unit for a 100.000 Hz ± 1 Hz counter reading.

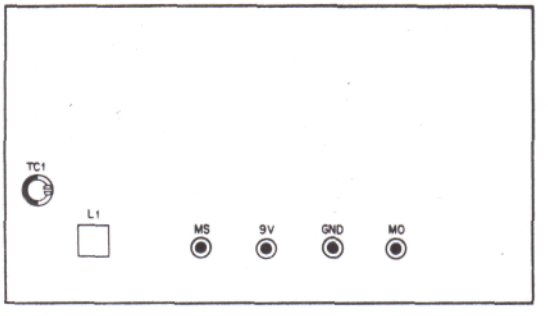


Fig. 39

2-13. VFO adjustment

1) Instruments:
   1. RF voltmeter.
   2. Frequency counter.
2) Adjustment
   * Oscillator frequency adjustment
     Set the FIX CH switch to the VFO position.
     Connect the frequency counter to the VFO terminal (1) on the FIX Unit (X50-1450-00). Tune the VFO to "0" and check that oscillator frequency is 5.50 MHz. Then turn the VFO to "500", and check that oscillator frequency is 5.00 MHz. If 5.50 MHz requires calibration, adjust TC1 in the VFO Unit. If the 5.00 MHz setting requires calibration, adjust L1. Since these adjustments interact, repeat the procedure several times, or until no improvement is noted.
   * Output voltage adjustment
     Set the VFO dial to "250". Connect the RF voltmeter to the VFO terminal (1) on the FIX Unit, and adjust TC2 in the VFO Unit for 0.8V output.

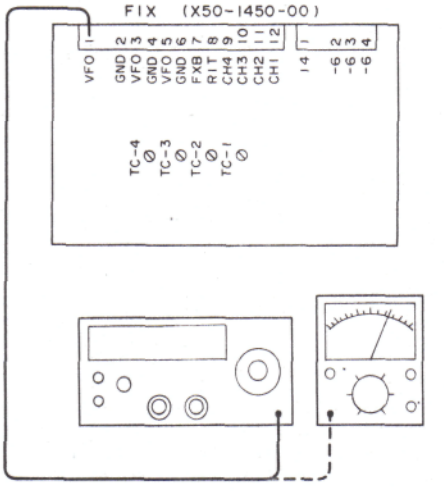


Fig. 40 FIX Unit

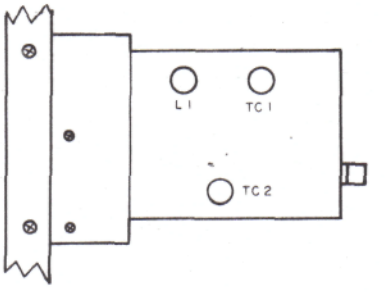


Fig. 41 VFO Unit

3. COUNTER ADJUSTMENT

3-1. Counter reference oscillator frequency adjustment

Simplified adjustment

1) Measuring instrument
   Frequency counter and calibration cable.

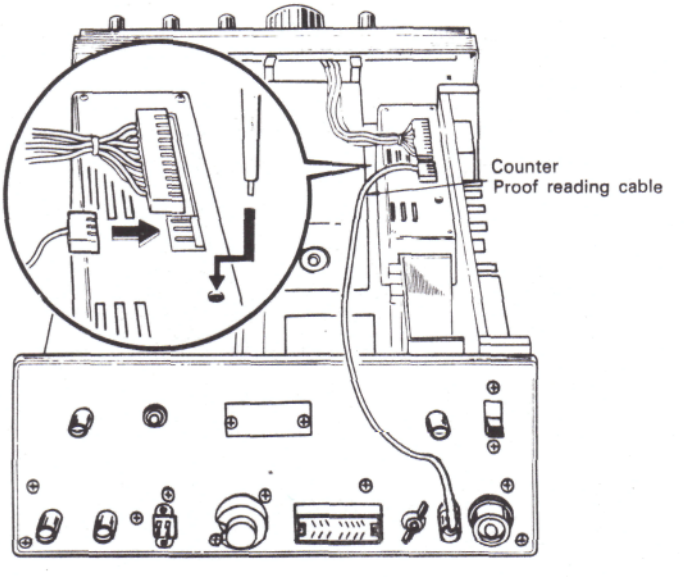


Fig. 42

2) Adjustment
   1. Turn the BAND selector to the JJY/WWV position. Connect an antenna to the antenna terminal on the receiver, and tune the 15 MHz JJY/WWV signal for Zero Beat.
   2. Connect the counter calibration cable between the ANT-2 terminal on the receiver rear, and the 3P terminal on top of the Counter Unit.
      Adjust TC1 on top of the Counter Unit for a zero beat against WWV/JJY.

NOTES:

1) Zero-beat can be judged from the speaker output. For greater accuracy, read the S-meter. As zero-beat is approached, the S-meter pointer be seen to will oscillate at a frequency of 1 to 3 Hz. At exact zero-beat, the meter pointer will cease oscillation.
2) The TC1, adjustment covers a frequency range of approximately ±400 Hz. For a rough adjustment, zero beat 15 MHz JJY/WWV and set TC1 for a counter reading of 14,999.9 to 15,000.0.

Complete adjustment

1) Instrument:
   Frequency counter.

2) Adjustment
   1. On the Counter Unit (X60-1020-00), short CL2 to G terminals and connect the frequency counter across CL1 and G terminals.
   2. Adjust TC1 on the Counter Mixer Unit for a 1 MHz ± 5 Hz frequency counter reading.

Counter Mixer

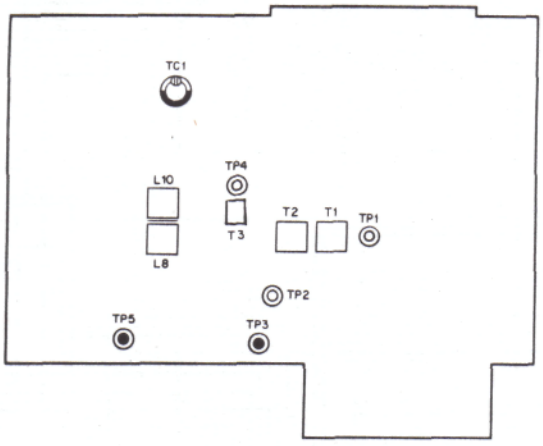


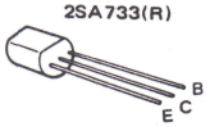
Fig. 43 Counter Mixer Unit

'TIONAL FILTER

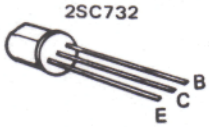
	Crystal filter (AM) YG-88A	Crystal filter (CW) YG-455C	Crystal filter (CW) YG-455CN
Center frequency	8830 kHz	455.7 kHz	455.7 kHz
Pass bandwidth	More than ±3 kHz (−6 dB)	More than ±250 Hz (−6 dB)	More than ±125 Hz (−6 dB)
Attenuation bandwidth	Less than ±6 kHz (−60 dB)	Less than ±425 kHz (−60 dB)	Less than ±250 Hz (−60 dB)
Guaranteed attenuation	More than80 dB	More than 80 dB	More than 80 dB
Loss	Less than 6 dB	Less than 6 dB	Less than 6 dB
Impedances	470Ω/5pF	2 kΩ/15pF	2 kΩ/15pF
Elements	8 elements	8 elements	8 elements

Signal — — — — OSC Control Circuit ——— Common P

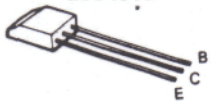
2SC458(B)
2SC945(R)
2SA733(R)



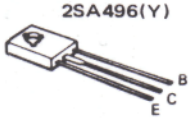
2SC373
2SC735(Y)
2SC1000(GR)
2SC732



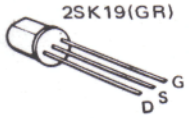
2SC460B



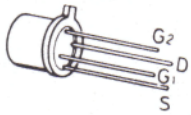
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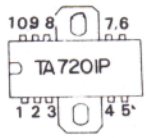
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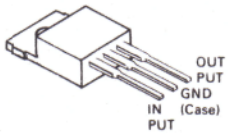
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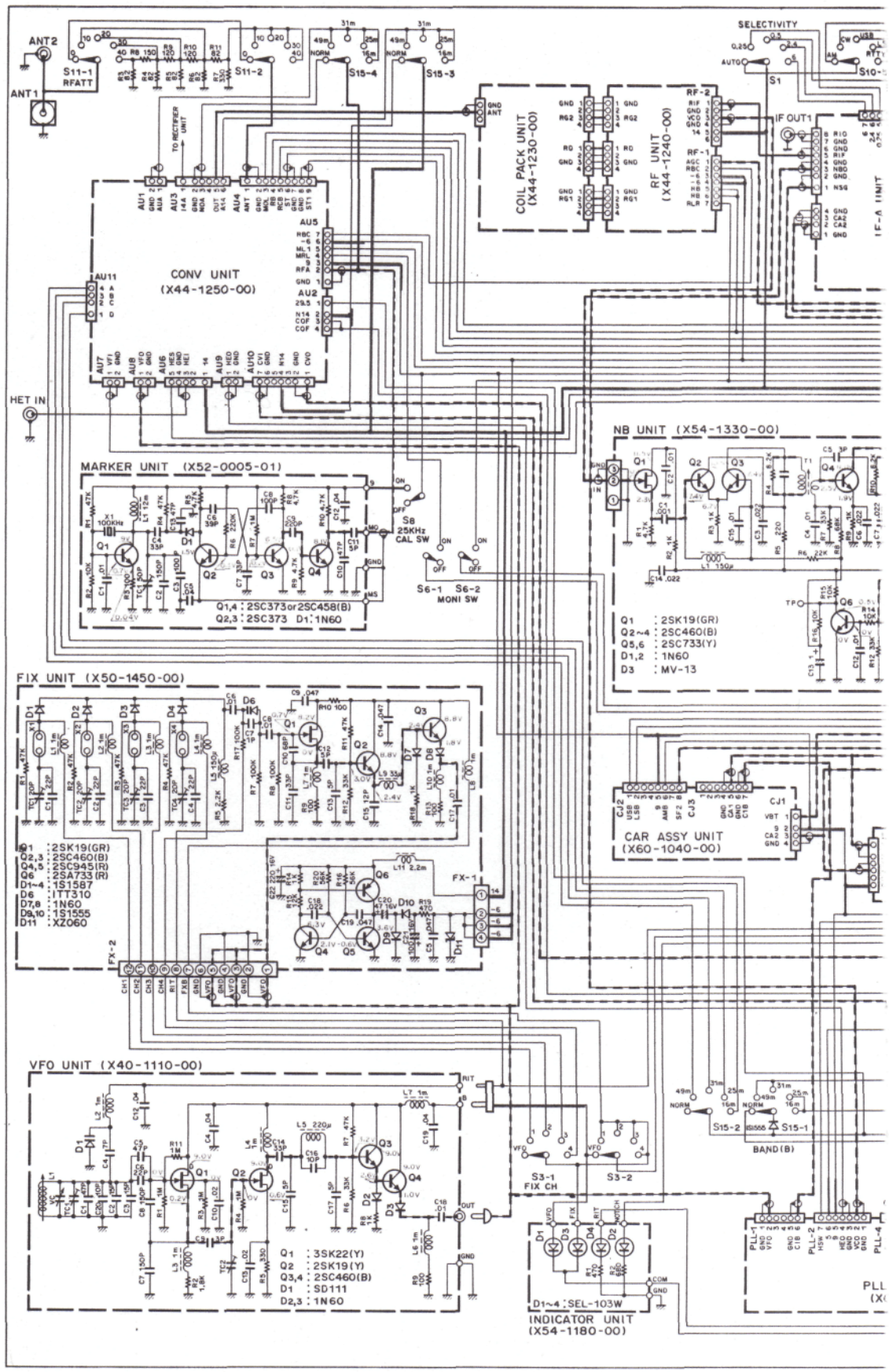


TA7201P



μPC14305H

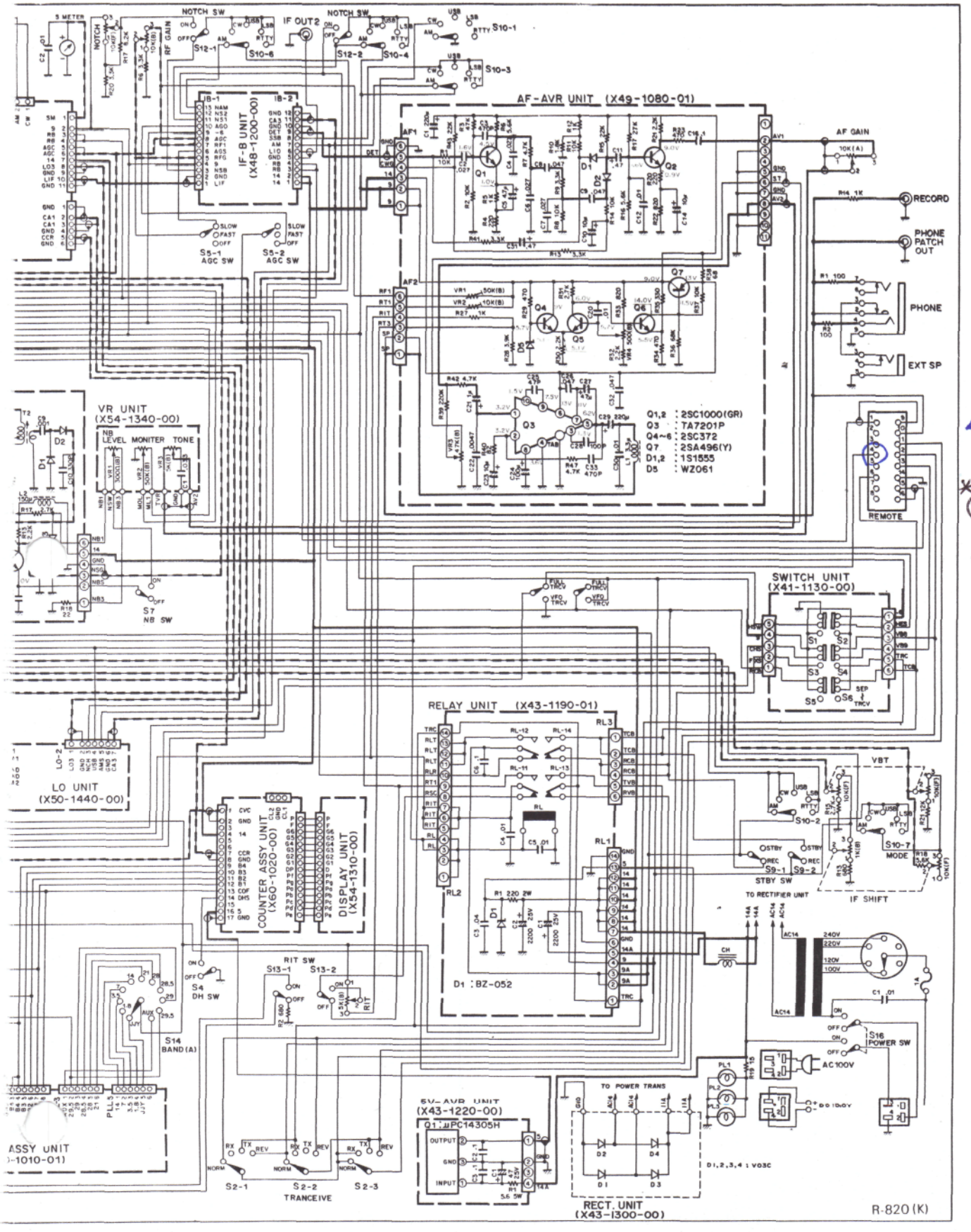




DIAGRAM

...ource

■ The circuit and ratings may change without notice due to development in technology.



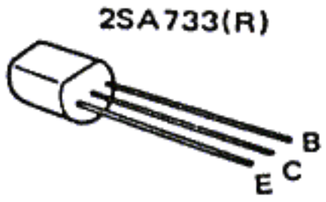
4=MUTE +12VDC TO ACT.
*(PIN 5 ON TS820 REMOTE UFO PLUG)

A

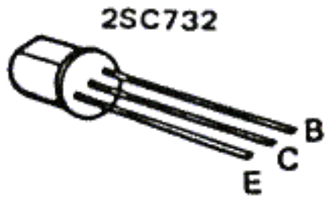
SCHEMA

Signal ——— OSC Control Circuit - - - - - - - Common ———

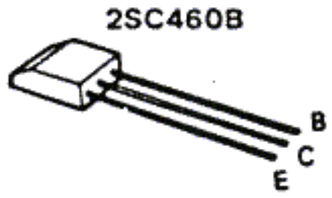
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2SC945(R)
2SA733(R)



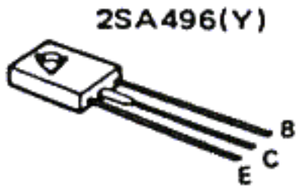
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2SC735(Y)
2SC1000(GR)
2SC732



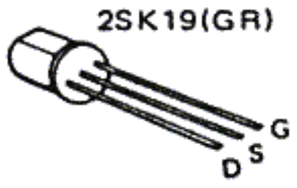
2SC460B



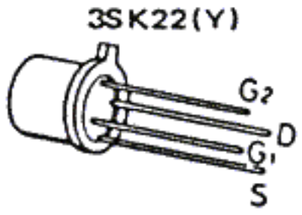
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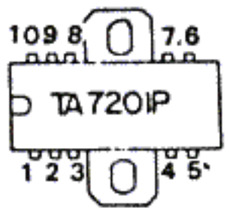
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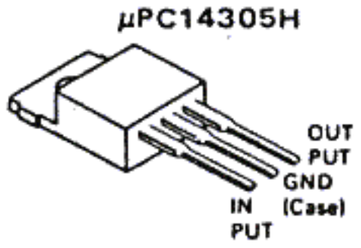
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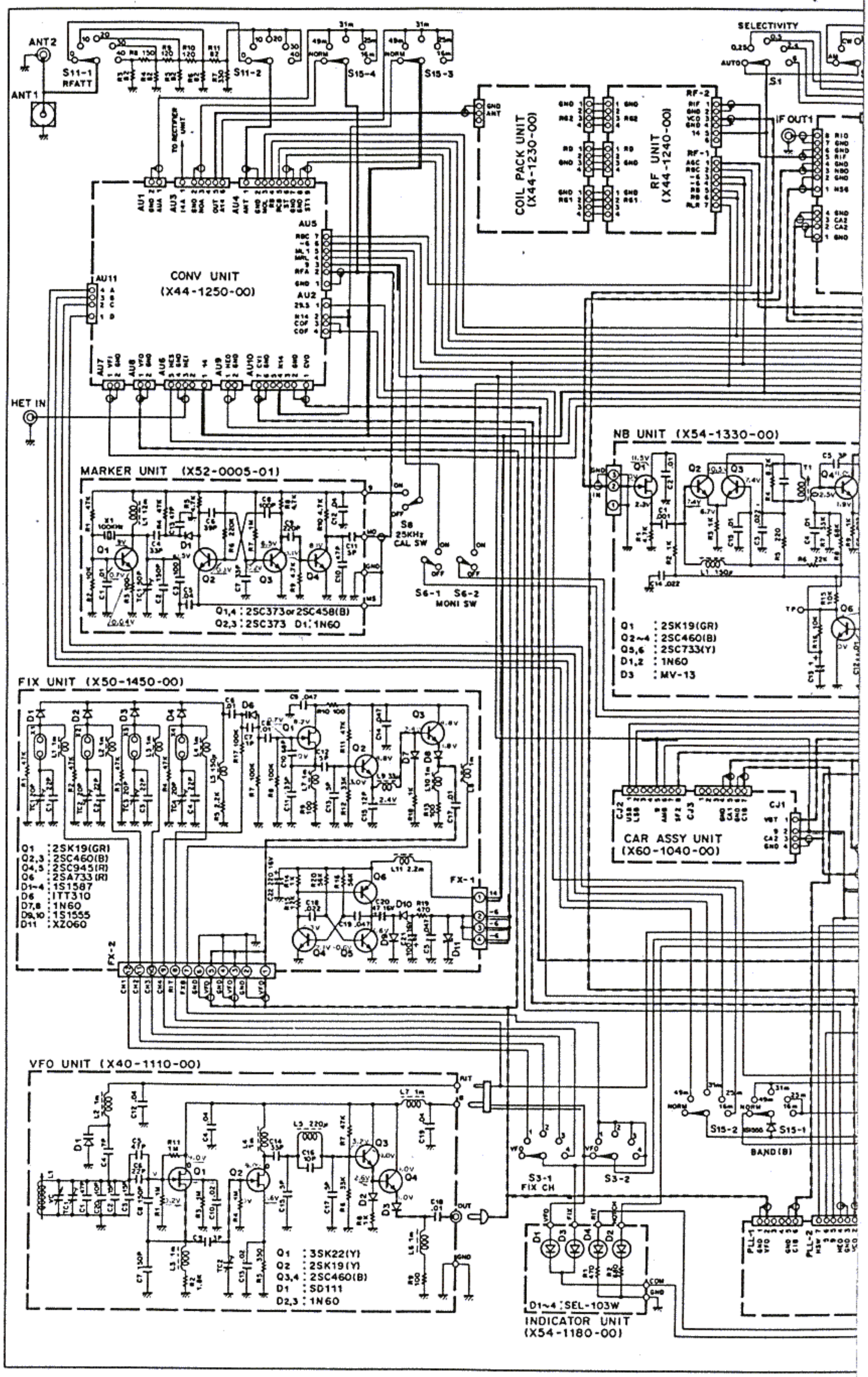


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μPC14305H



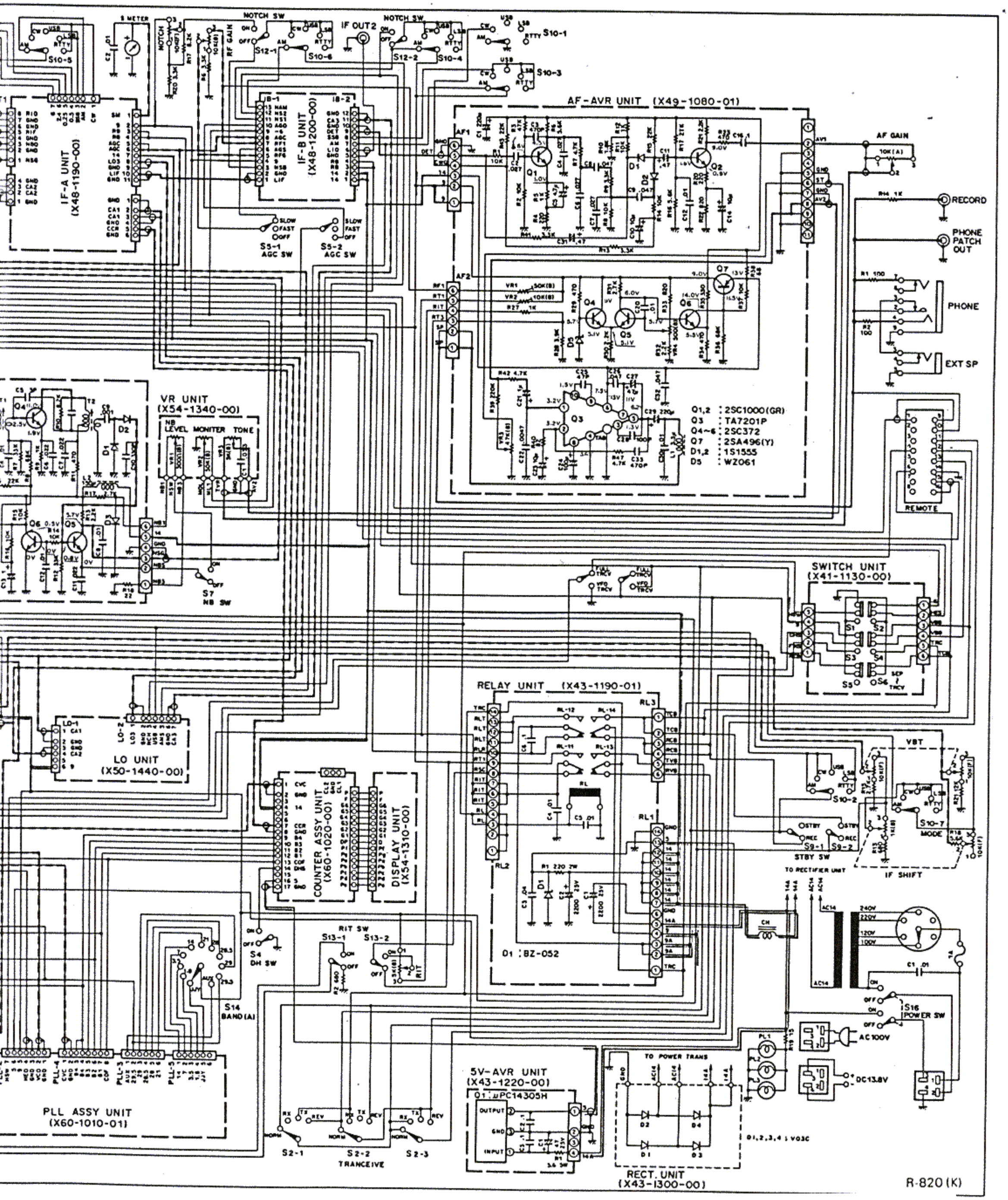


A

EMATIC DIAGRAM

ommon Power Source

■ The circuit and ratings may change without notice due to development in technology.

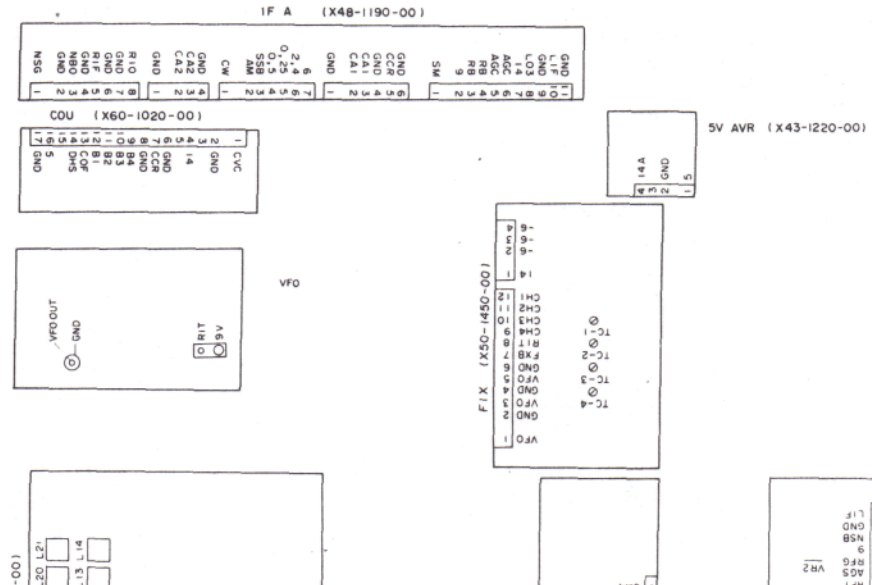


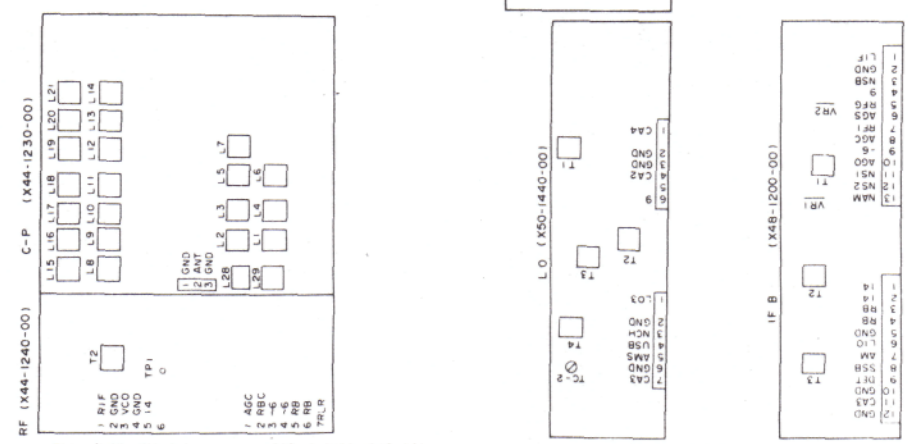
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CONNECTOR ALIGNMENT

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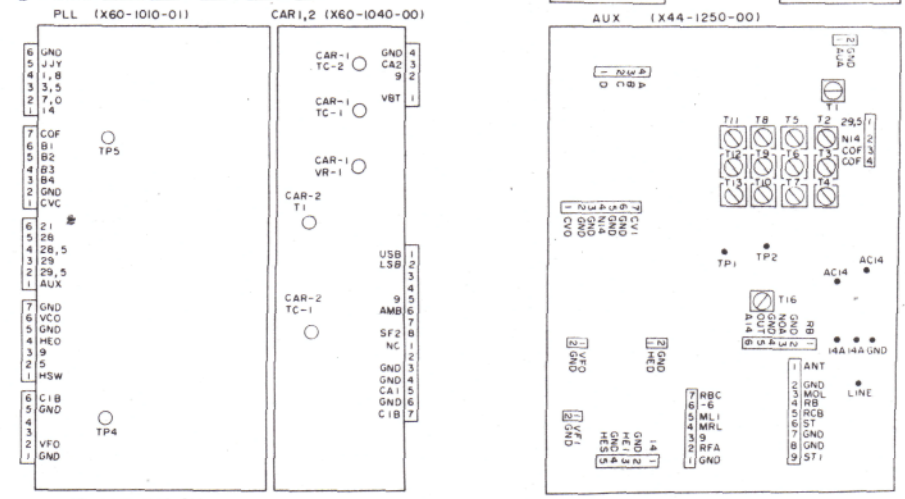
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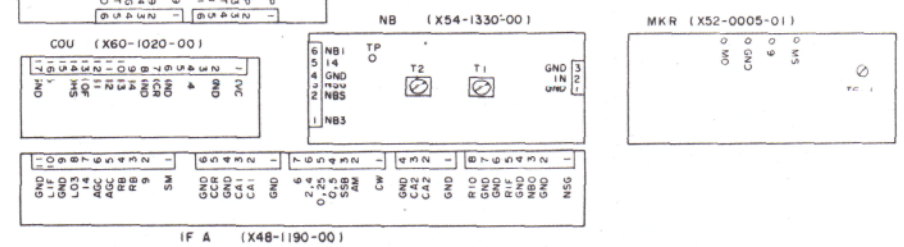




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