



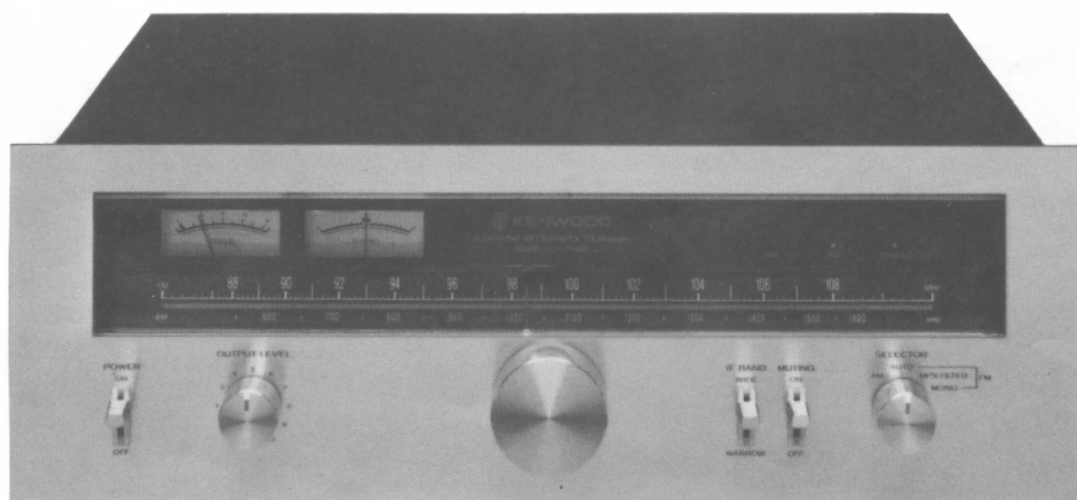
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**KENWOOD**

HI/FI STEREO COMPONENTS

# SERVICE MANUAL

**KT-7500  
(KT-7550)**



**AM-FM STEREO TUNER**

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Products for PX (U type) are provided with cabinet as photo.

### Note 1:

The products are subject to modification in components and circuits in different countries and regions. This is because each products must be used under the best condition.

This manual provides information of modification based on the standard to the U.S. for the convenience of ordering associated components and parts.

|                            |                |
|----------------------------|----------------|
| U.S.A. ....                | K              |
| Canada .....               | P              |
| PX .....                   | U              |
| Australia .....            | X              |
| Europe .....               | W              |
| England .....              | T              |
| Scandinavia .....          | L              |
| Other Areas .....          | M <sub>1</sub> |
| Audio Club (KT-7550) ..... | M <sub>2</sub> |

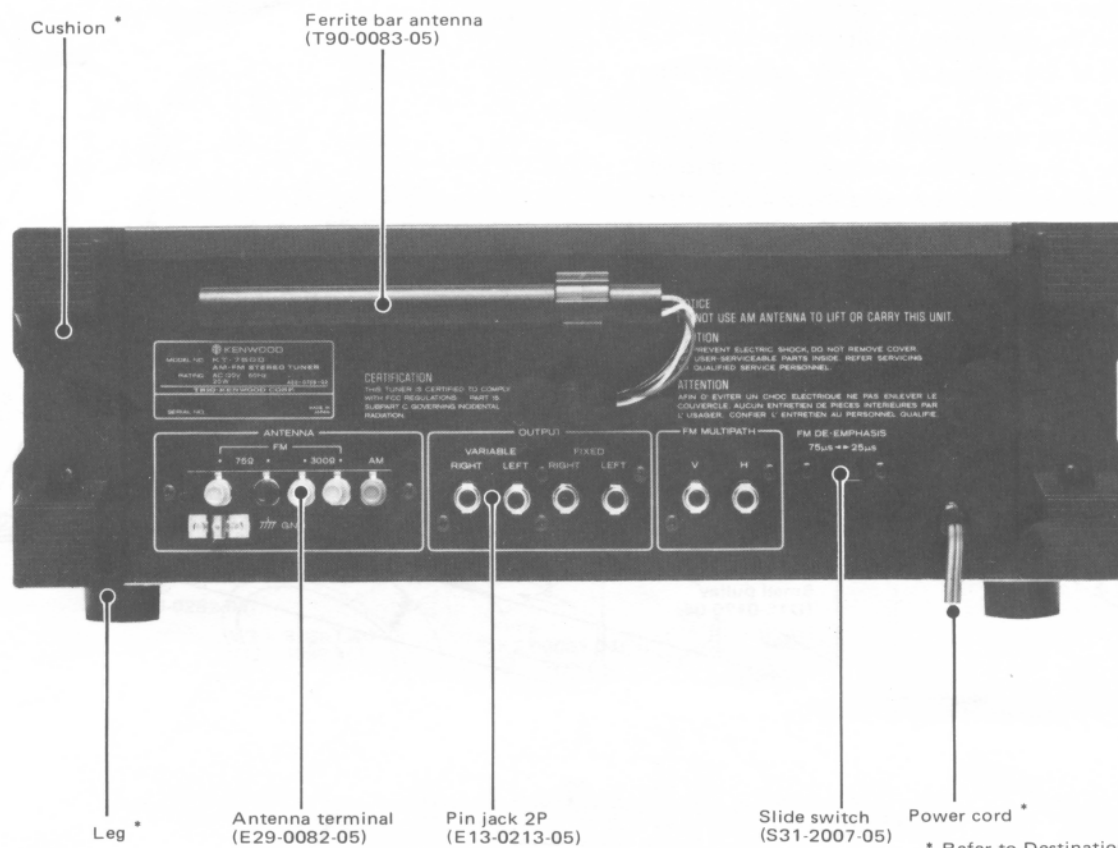
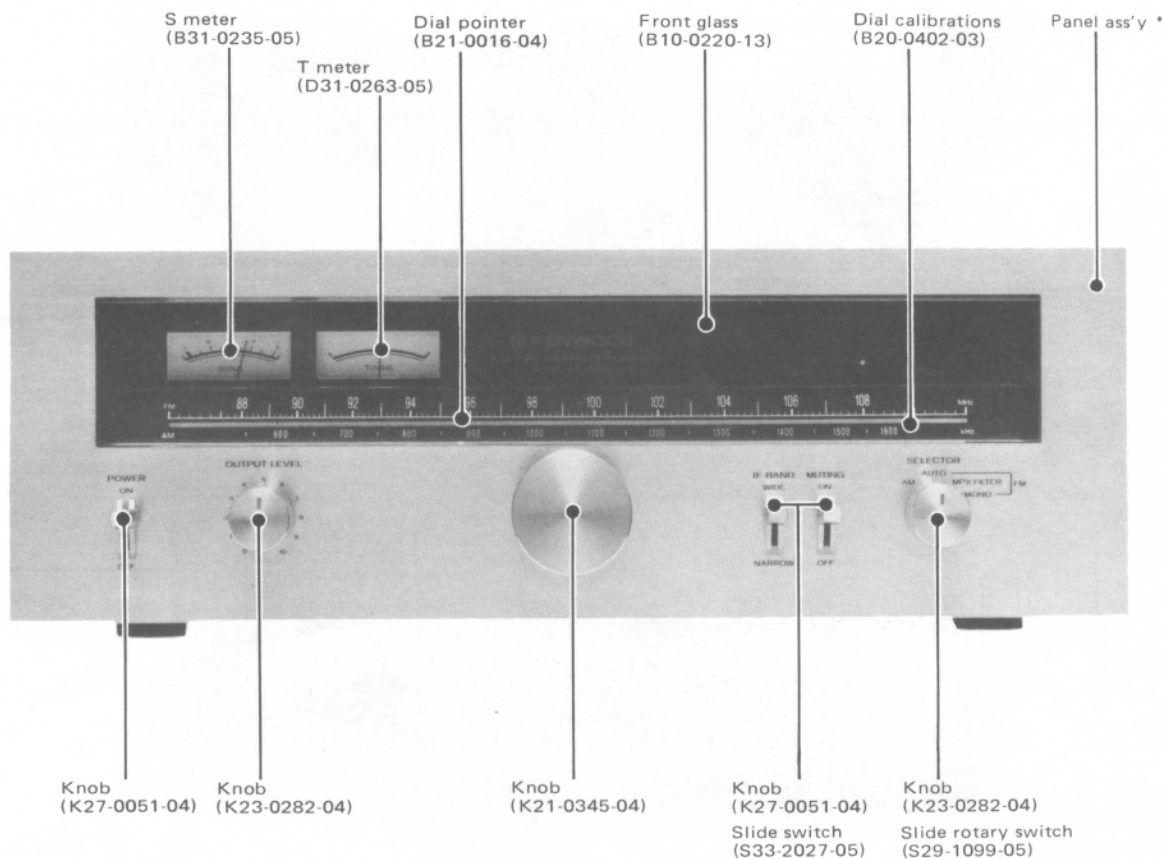
### Note 2:

Symbol ☆ in parts list means the new parts.

### Note 3:

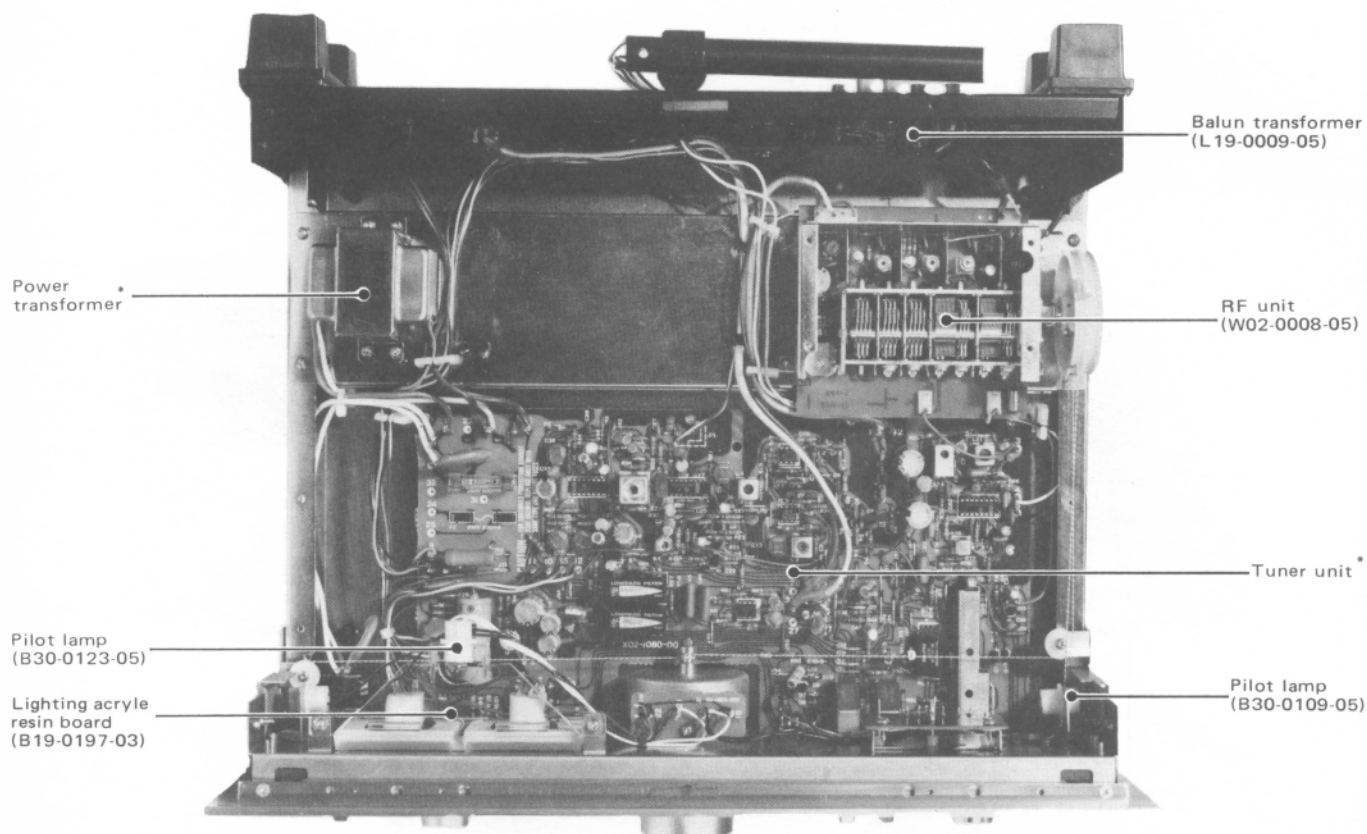
When repairing the RF unit (W02-0008-05), if replacement of FETs and transistors does not solve a trouble, replace the RF unit.

## EXTERNAL VIEW



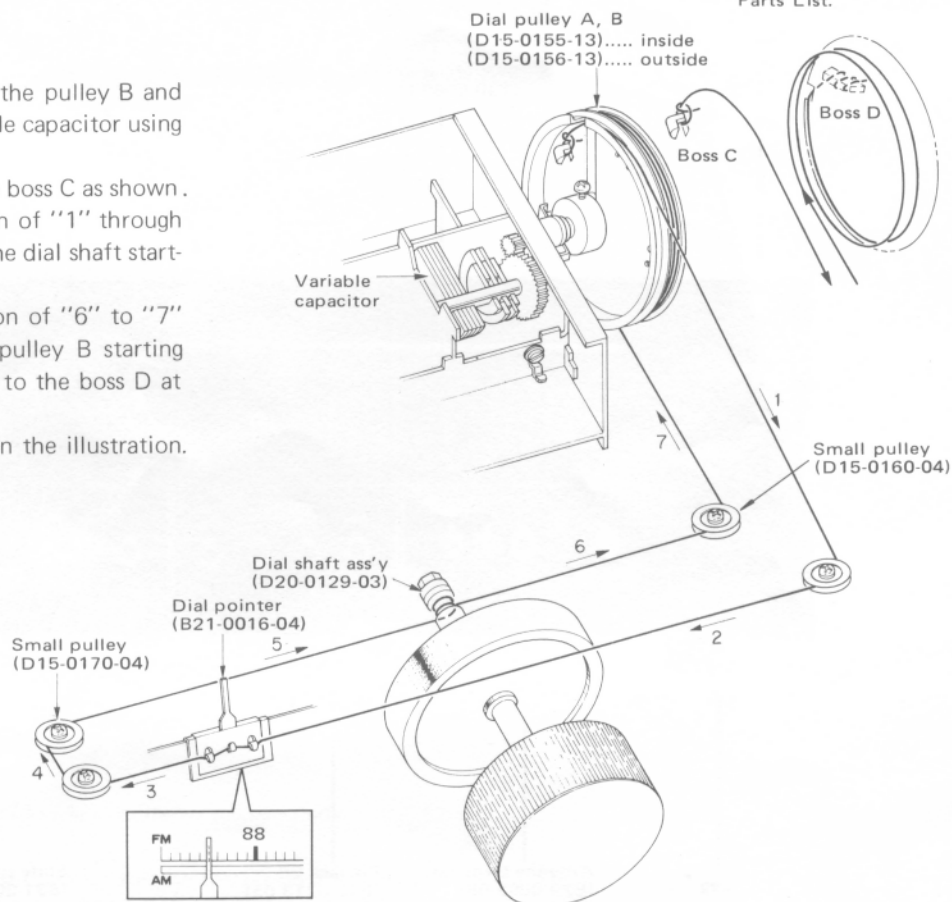
\* Refer to Destinations' Parts List.

## TOP VIEW/DIAL CORD STRINGING



### DIAL CORD STRINGING

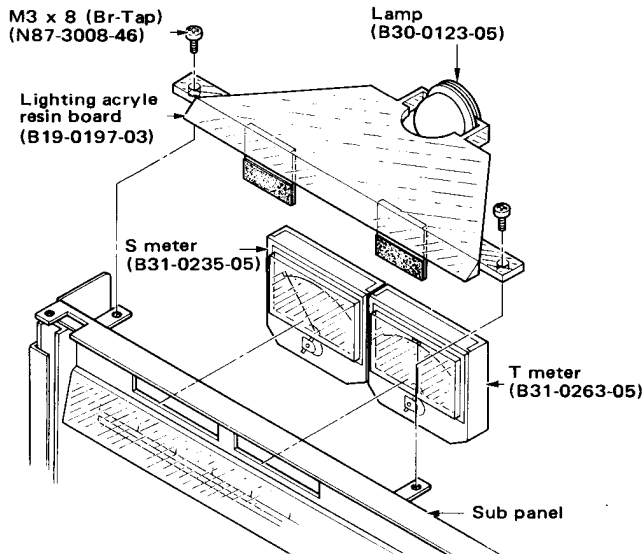
1. Fully close the variable capacitor.
2. Assemble the dial pulley A with the pulley B and fix them on the shaft of the variable capacitor using 2 screws.
3. Tie the end of the dial cord to the boss C as shown.
4. Dress the dial cord in the direction of "1" through "5" and wind it 3 turns around the dial shaft starting from its lower side.
5. Dress the dial cord in the direction of "6" to "7" and wind it 2 turns around the pulley B starting from its lower side. Then, fix it to the boss D at the rear side.
6. Mount the dial pointer as shown in the illustration.



## DISASSEMBLY

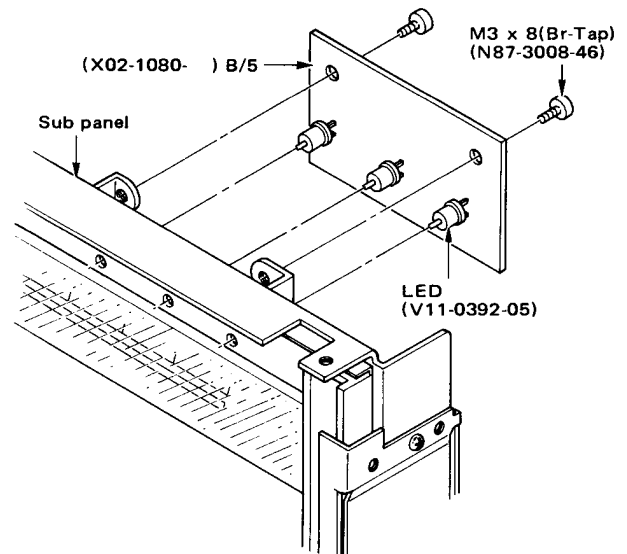
### METER

- ① Remove the case.
- ② Remove the two Br-Tap screws fixing the lighting acryle resin board to the sub panel.
- ③ Then, S meter or T meter can be replaced.



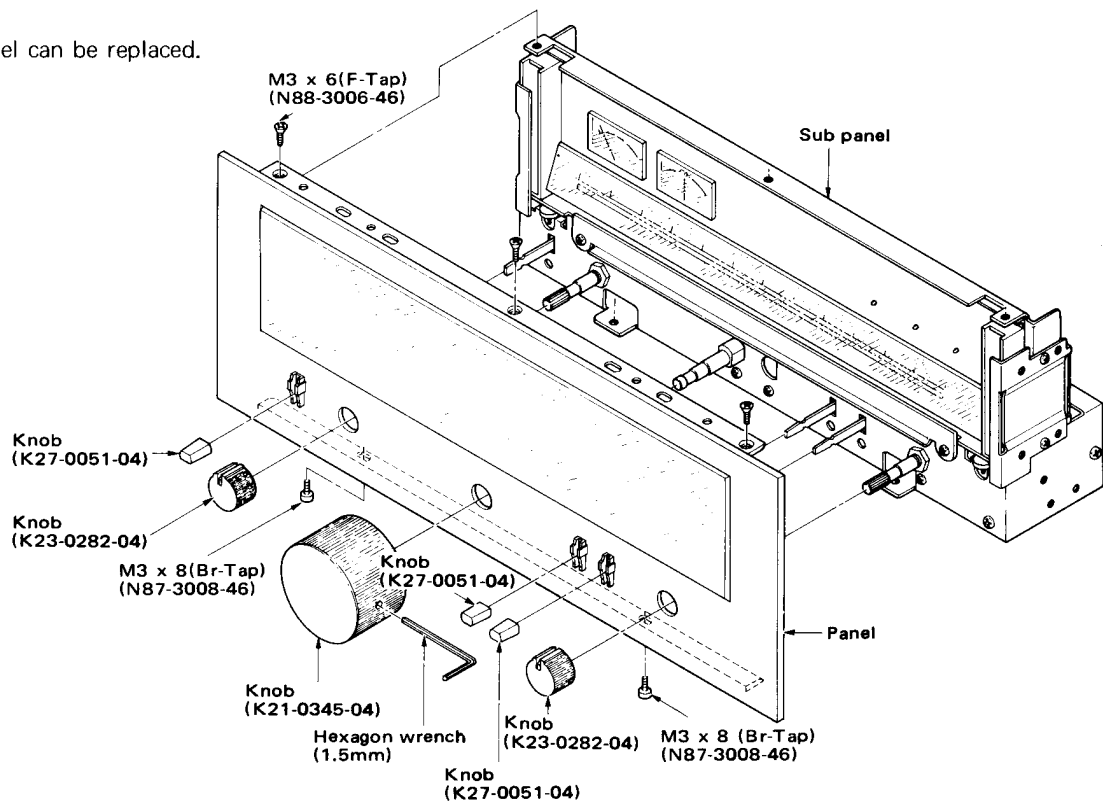
### LED

- ① Remove the case.
- ② Remove the two Br-Tap screws fixing the (X02-1080- ) B/5 to the sub panel.
- ③ Then, LEDs can be replaced.

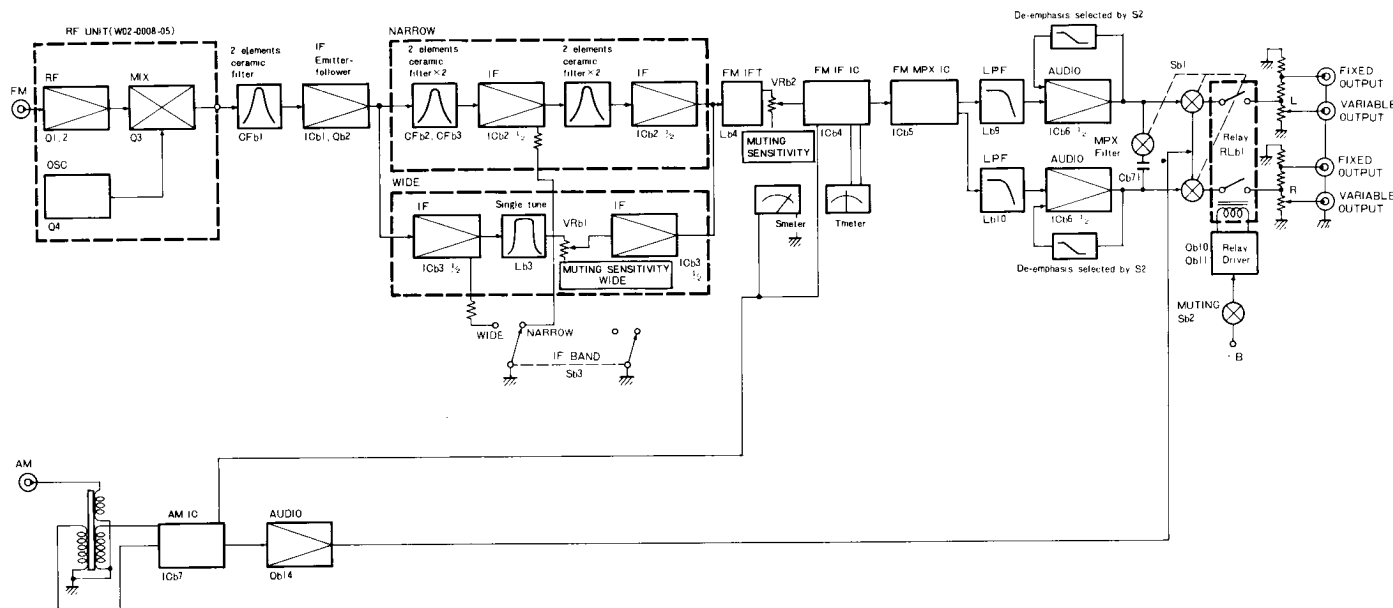


### PANEL

- ① Remove the case.
- ② Pull out the knobs. (For tuning knob, use a hexagon wrench.)
- ③ Remove the five screws, the two on the bottom and the three on the top, fixing the panel to the sub panel.
- ④ Then, the panel can be replaced.



## BLOCK DIAGRAM/CIRCUIT DESCRIPTION



### RF UNIT (W02-0008-05)

The RF unit is composed of an ANT circuit, a linear type 5-gang variable capacitor for FM, a 2-gang variable capacitor for AM, a single-double-single tune circuit, an OSC circuit and a mixer. A new MOS FET 3SK59 is used for the second RF amp and the mixer. The ANT coil T1 and the OSC coil use non-variable ones so that they can not be adjusted.

If replacement of FETs and transistors does not solve a trouble, replace the RF unit (W02-0008-05).

### FM IF CIRCUIT

The IF band is switchable in 2 steps, WIDE and NARROW. The WIDE stage uses a 2-elements ceramic filter and a single-tune IFT to assure 30 dB selectivity at a 400 kHz distance, which the NARROW stage uses the five 2-elements ceramic filters to assure 100 dB selectivity. Selection of WIDE and NARROW can be accomplished by varying the DC voltage supplied to ICb2 and ICb3.

VRb2 determines a total MUTING SENSITIVITY of the IF circuit. VRb1 determines a MUTING SENSITIVITY at the WIDE operation. Lb3 is used to adjust the T meter to its center position at the WIDE operation. The IF signal is discriminated by HA1137W.

### OPERATION OF HA1137W

HA1137W consists of the IF amps, a quadrature detector, a muting circuit and a meter circuit. The IF signal partly applied to the quadrature detector through the three IF amps. Also the IF signal is applied to the quadrature detector after lagging by a "90° ± Δφ phase shifter" Lb8. The audio output is derived from the terminal 6 by multiplying these signals each other.

The signal for the S meter is derived from the terminal 13. The signal for the T meter is derived from the terminal 7.

### FM MPX CIRCUIT

The FM MPX circuit uses PLL IC HA1196. The operation is almost the same as that of HA1156W. The HA-1196 is improved in the following points:

1. The terminal 12 for the FM muting operation is provided. However, this terminal is not used in the KT-7500.
2. A current booster is provided on the synchronizing detector to minimize distortion.
3. An amplifier is provided after the synchronizing detector.
4. The number of the terminals is 16, on the other hand, that of HA1156Ws' is 14.

### OPERATION OF HA1196

The stereo composite signal is fed to the terminal 2. It is applied to the synchronizing detector, PD-1 and PD-2 through the audio amplifier. When the control voltage is absent, VCO is set in a free run oscillating state at about 76 kHz. The output of VCO is divided into 19 kHz by the dividers DIV-1 and DIV-2, and its phase is compared with the phase of the 19 kHz pilot signal by PD-1. In practical application, a multiplier is used as a phase detector to produce an output proportional to the product of 2 input signals (19 kHz pilot signal and 19 kHz VCO). This output, after its unwanted component is removed by LPF, consisting of Cb35, Cb36 and Rb44, is amplified by the DC amplifier and is fed to VCO as a control voltage. With this voltage, VCO oscillates a signal 4 times the frequency of the pilot signal.

## CIRCUIT DESCRIPTION

The 38 kHz signals obtained by VCO is fed, as switching signals, to the synchronizing detector circuit through the stereo auto switch. Since the 38 kHz signals are the ideal square wave signals, they do not include even number harmonics and they will not produce a beat with SCA signal ( $67 \pm 7$  kHz), thus eliminating the need for SCA filter.

When a monaural signal or a weak stereo signal is received, the stereo auto switch makes the 38 kHz signals, which are balanced outputs, the same phase and stops the operation of the synchronizing detector. As a result, the demodulated audio signal turns monaural preventing the deterioration of SN ratio.

### Functions of stereo auto switch:

The output of DIV-1 is partly fed to DIV-3 and is divided into 19 kHz. It is then fed to the one side of the input of PD-2.

The 19 kHz signal of DIV-3 is phase locked by the 19 kHz pilot signal during stereo reception, so that a DC voltage proportional to the amplitude of the pilot signal is developed in the PD output.

In monaural broadcast, there is no pilot signal and therefore no voltage is developed. Also, in stereo broadcast, if the signal is weak, it does not reach the trigger level so the following functions are not effected.

The DC signal is fed to the trigger circuit through LPF, consisting of Rb41 ~ Rb43 and Cb34, and when its level is above the predetermined threshold, the stereo switch turns on to send the 38 kHz switching signals in anti phase with each other to the synchronizing detector and the stereo lamp lights.

The signal is demodulated to L and R signals by the synchronizing detector. And the SEPARATION is adjusted by VRb5 for NARROW or VRb6 for WIDE respectively to get the best characteristics.

## PLL LOOP RESPONSE CONTROL CIRCUIT

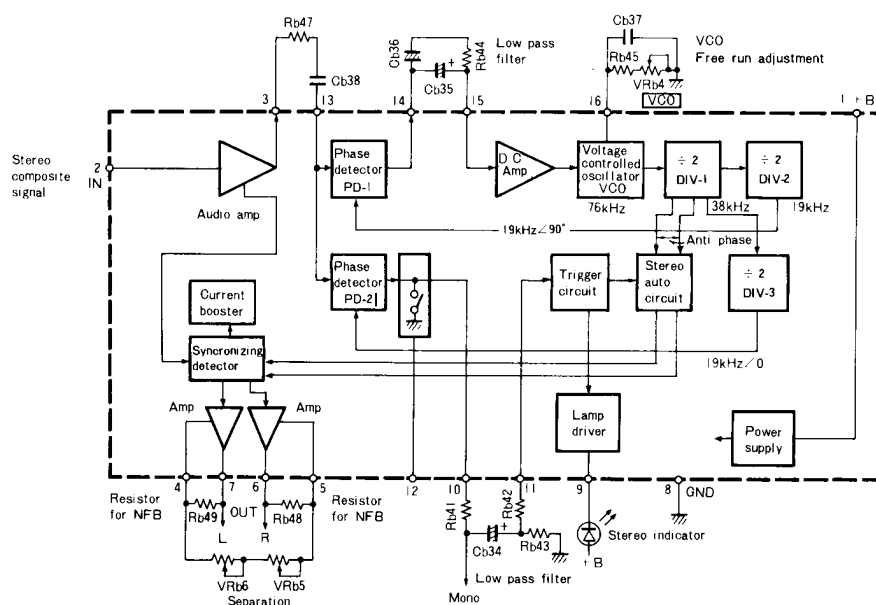
This set is provided with a PLL loop response control circuit which was primarily developed for the KT-8300 and the model 600T by KENWOOD's original design techniques. The stereo demodulator circuit making use of PLL may often suffer from beat distortion. There would be no problem if output of the phase detector PD-1 contains the DC component only. However, it actually contains various frequency spectrums (of AC components) which give rise to FM modulation of VCO and badly affect the 38kHz sub-carrier. The signals switched by the 38kHz sub-carrier in unstable phase arrangements often interfere with the audio component of (L + R) and the DSB component of (L - R), thus resulting in beating trouble and unclear sound reproduction. Such a phenomenon is called beat distortion. In order to remove such difficulties, the following method is adopted for the KT-8300 and the model 600T.

### 1. Method for KT-8300 and model 600T

The attenuation rate of the low-pass filter (equivalent to Cb35, Cb36, and Rb44 in the block diagram of HA-1196) is increased to cut off the AC component. However, this will simultaneously narrow the capture range of PLL and locking may be impossible at the pilot signal. Therefore the input level is raised before locking, and is returned to the original level after locking.

### 2. Method of KT-7500

In the above case the input level itself is not changed, and instead the level of audio amplifier output to be fed to the PD-1 is controlled by Qb7. In other words, if stereo broadcast is received, the lamp is lit and the terminal 9 of ICb5 is put at the ground potential. The



HA1196 BLOCK DIAGRAM

## CIRCUIT DESCRIPTION

base potential of Qb7 is about 0.6V and Qb7 is thus turned on. As a result Rb52 is connected to the audio amplifier output as a load, thus lowering the input level of the PD-1. This effect is the same as when the filter effect of the low-pass filter is increased. In this way the circuit is improved against beat distortion. The lamp sensitivity is higher than usual because of adoption of Rb41 ~ 43.

### MUTING CIRCUIT

Relay RLb1 of the muting circuit is operated when Qb-10 and Qb11 are turned on, while it is released when they are turned off.

#### 1. Prevention of shock noise when POWER switch is ON

The circuit is designed so that rectified voltage at Db12 can be raised slowly when the POWER switch is turned on. Therefore, it takes several seconds to make Qb10 and Qb11 turned on (Rb94, Cb74 and Rb92, Cb72).

#### 2. Prevention of shock noise when POWER switch is OFF

Since anode potential of Db11 is higher than cathodes potential of Db11 after the POWER switch has been turned off, Db11 is turned on and discharge occurs quickly at a time constant which is dependent on Cb75 and Rb95. Therefore, Qb10 and Qb11 are turned off instantaneously.

#### 3. Prevention of shock noise when IF band is switched over

In the middle of IF band switching over, both contacts of Sb3-b are isolated from ground potential. Thus Qb9 is turned on and Qb10 and Qb11 are turned off. In the NARROW or WIDE setting, Qb9 is turned off and Qb10 and Qb11 are turned on since base potential of Qb9 is lowered to ground potential by Db7 or Db8.

#### 4. Prevention of noise during AM $\rightleftharpoons$ FM switching over

Since Sb1 is a short-type switch, both contacts are simultaneously connected in the middle of switching over. At that time Qb12 and Qb13 are simultaneously biased by Sb1-b and are turned on. Qb10 and Qb11 are turned off. In the AM or FM setting, Qb12 and Qb13 are not biased simultaneously and thus Qb10 and Qb11 are not turned off.

#### 5. FM muting

When the muting switch Sb2 is turned on, the collector bias of Qb10 is not fixed. When the terminal 12 of ICb4 is at zero volt (while tuned at a sufficient input level), Qb6 is OFF, Qb5 is ON, Qb4

is ON, and Qb3 is OFF. As a result collector potential of Qb3 is high and +B is supplied to the collector of Qb10 to turn it on. When DC voltage appears at the terminal 12 of ICb4 (detuning), Qb6 is ON, Qb4 is OFF, and Qb3 is ON. As a result collector potential of Qb3 is lowered to zero volt and +B is removed from the collector Qb10, thus turning it off. Qb5 is used to make up an AND condition in conjunction with the condition of the S meter (the terminal 13 of ICb4) and that of tuning (the terminal 12 of ICb4). In the AM setting, +B of AM is supplied to the collector of Qb10 which is therefore turned on. Since the build-up time for +B is short in the FM setting (Rb81 and Cb87), there is no occurrence of shock noise at time of switching over from AM to FM.

### DIODE FUNCTIONS

**Db1:** Stops the operation of HA1137W in AM setting and prevents a reverse flow of +B from FM circuit to AM circuit.

**Db2:** Stops the operation of VCO in AM setting by use of +B and prevents a reverse flow of +B from FM circuit to AM circuit.

**Db3:** Prevents a reverse flow from AM circuit to FM circuit.

**Db4:** Improves the build-up characteristic of +B to be supplied to Qb12 and Qb13 (to avoid influence of Cb87 and Rb81).

**Db5:** Prevents a reverse flow of +B.

**Db6:** Prevents a reverse flow of +B from FM circuit to AM circuit.

**Db7, 8:** Prevents a reverse flow from NARROW circuit to WIDE circuit.

**Db9:** Reduces a build-down time of +B.

**Db10:** Used for compensation of Db7 and Db8.

**Db11:** Reduces a build-down time of +B.

**Db12:** Used for +B rectification for Qb10.

**Db13~16:** Used for  $\pm B$  rectification.

**Db17:** Stabilizes 14V of +B.

**Db18:** Stabilizes 14V of -B.

**Db22:** Used for forced monaural operation at time of detuning.

**Db23:** Prevents AM radiation.

**Db24:** Used for tuning for muting and improvement of response characteristic at time of detuning.

### AM CIRCUIT

The AM circuit uses IC HA1197. The RF signal from the bar antenna is fed to the terminal 2 of ICb7 and derived from the terminal 12 of ICb7. The AM signal is amplified by Qb14 and fed to ICb6. The S meter output is taken out of the terminal 15 of ICb7.

## DESTINATIONS' PARTS LIST

☆ : New parts

| Ref. No. | U.S.A. (K)  | Canada (P)  | PX (U)      | Australia (X) | Europe (W)     | Scandinavia (L) | England (T)    | Other Area (M.) | Audio Club (M.) | Description                    |
|----------|-------------|-------------|-------------|---------------|----------------|-----------------|----------------|-----------------|-----------------|--------------------------------|
| C1       | C91-0001-05 | C91-0025-05 | C91-0023-05 | C91-0023-05   | CK45E3D-103PMU | CK45E3D-103PMU  | CK45E3D-103PMU | C91-0023-05     | C91-0023-05     | Ceramic capacitor 0.01μF       |
| C2       | —           | —           | —           | —             | CK45E3D-103PMU | CK45E3D-103PMU  | CK45E3D-103PMU | —               | —               | Ceramic capacitor 0.01μF       |
| —        | A01-0310-03 | A01-0310-03 | A03-0225-01 | A01-0310-03   | A01-0310-03    | A01-0310-03     | A01-0310-03    | A01-0310-03     | A01-0310-03     | Case ☆                         |
| —        | A20-1122-03 | A20-1122-03 | A20-1122-03 | A20-1122-03   | A20-1122-03    | A20-1122-03     | A20-1122-03    | A20-1122-03     | A20-1173-03     | Panel assembly ☆               |
| —        | A30-0122-03 | A30-0122-03 | A30-0122-03 | A30-0122-03   | A30-0122-03    | A30-0122-03     | A30-0123-03    | A30-0122-03     | A30-0124-03     | Dial back board ☆              |
| —        | B46-0061-10 | B46-0055-20 | B46-0051-00 | —             | —              | —               | B46-0060-10    | —               | —               | Warranty card                  |
| —        | —           | —           | B46-0062-10 | —             | —              | —               | —              | —               | —               | Warranty card                  |
| —        | B50-1599-00 | B50-1639-00 | B50-1599-00 | B50-1599-00   | B50-1599-00    | B50-1599-00     | B50-1600-00    | B50-1599-00     | B50-1640-00     | Instruction manual ☆           |
| —        | —           | —           | B59-0018-00 | —             | —              | —               | —              | —               | —               | Kenwood service stations' list |
| —        | —           | —           | D32-0075-04 | D32-0075-04   | D32-0075-04    | —               | —              | D32-0075-04     | D32-0075-04     | Switch stopper                 |
| —        | E30-0181-05 | E30-0181-05 | E30-0545-05 | E30-0185-05   | E30-0459-05    | E30-0292-05     | 040-0306-05    | E30-0545-05     | E30-0459-05     | Power cord                     |
| —        | G11-0071-03 | G11-0071-03 | —           | G11-0071-03   | G11-0071-03    | G11-0071-03     | G11-0071-03    | G11-0071-03     | G11-0071-03     | Cushion x 2                    |
| —        | H01-1708-04 | H01-1710-04 | H01-1712-04 | H01-1708-04   | H01-1708-04    | H01-1708-04     | H01-1709-04    | H01-1708-04     | H01-1711-04     | Carton case ☆                  |
| —        | H10-1486-02 | H10-1486-02 | —           | H10-1486-02   | H10-1486-02    | H10-1486-02     | H10-1486-02    | H10-1486-02     | H10-1486-02     | Polystyrene foamed fixture (L) |
| —        | H10-1487-02 | H10-1487-02 | —           | H10-1487-02   | H10-1487-02    | H10-1487-02     | H10-1487-02    | H10-1487-02     | H10-1487-02     | Polystyrene foamed fixture (R) |
| —        | —           | —           | H10-1491-02 | —             | —              | —               | —              | —               | —               | Polystyrene foamed fixture x 2 |
| —        | H20-0444-04 | H20-0444-04 | H20-0394-04 | H20-0444-04   | H20-0444-04    | H20-0444-04     | H20-0444-04    | H20-0416-04     | H20-0444-04     | Polyethylene cover             |
| —        | —           | —           | —           | —             | —              | —               | —              | H40-0004-04     | —               | Anti-rust paper                |
| —        | J02-0088-05 | J02-0089-05 | J02-0049-14 | J02-0089-05   | J02-0089-05    | J02-0089-05     | J02-0089-05    | J02-0089-05     | J02-0089-05     | Leg x 4                        |
| —        | J41-0034-05 | J41-0034-05 | J41-0034-05 | J41-0024-15   | J41-0033-05    | J41-0033-05     | J41-0024-15    | J41-0034-05     | J41-0033-05     | Power cord bushing             |
| —        | L01-1271-05 | L01-1271-05 | L01-1275-05 | L01-1275-05   | L01-1275-05    | L01-1277-05     | L01-1277-05    | L01-1275-05     | L01-1275-05     | Power transformer ☆            |
| S1       | S33-1005-05 | S33-1005-05 | S33-1004-05 | S33-1004-05   | S33-2028-05    | S33-2028-05     | S33-2028-05    | S33-1004-05     | S33-1004-05     | Power switch                   |
| —        | —           | —           | S31-2001-05 | S31-2001-05   | S31-2001-05    | —               | —              | S31-2001-05     | S31-2001-05     | Slide switch                   |
| —        | X02-1080-11 | X02-1081-01 | X02-1080-81 | X02-1080-71   | X02-1080-61    | X02-1080-51     | X02-1080-51    | X02-1080-81     | X02-1080-22     | Tuner unit ☆                   |

## PARTS LIST

Symbol ☆ : New parts

| Ref. No.             | Parts No.   | Description                          | Re-<br>marks |
|----------------------|-------------|--------------------------------------|--------------|
| <b>MISCELLANEOUS</b> |             |                                      |              |
| —                    | B07-0205-04 | Escutcheon for the lever switch x 3  | ☆            |
| —                    | B10-0220-13 | Front glass                          |              |
| —                    | B19-0197-03 | Lighting acryl resin board           |              |
| —                    | B20-0402-03 | Dial calibrations                    |              |
| —                    | B21-0016-04 | Dial pointer                         |              |
| —                    | B30-0109-05 | Pilot lamp x 2                       |              |
| —                    | B30-0123-05 | Pilot lamp                           |              |
| —                    | B31-0235-05 | S meter                              |              |
| —                    | B31-0263-05 | T meter                              |              |
| —                    | D15-0155-13 | Dial pulley (A)                      |              |
| —                    | D15-0156-13 | Dial pulley (B)                      | ☆            |
| —                    | D15-0160-04 | Small pulley                         |              |
| —                    | D15-0170-04 | Small pulley x 3                     |              |
| —                    | D20-0129-03 | Dial shaft assembly                  |              |
| —                    | E29-0082-05 | Antenna terminal                     |              |
| —                    | E30-0505-05 | Audio cord                           |              |
| —                    | G01-0314-04 | Dial spring                          |              |
| —                    | H25-0048-03 | Polyethylene bag (110 x 250mm)       |              |
| —                    | H25-0078-00 | Instruction bag                      |              |
| —                    | J19-0507-05 | Antenna holder                       | ☆            |
| —                    | J19-0510-04 | Dial calibrations holder x 2         |              |
| —                    | J90-0083-04 | Dial pointer rail                    |              |
| —                    | K21-0345-04 | Knob (TUNING)                        |              |
| —                    | K23-0282-04 | Knob x 2 (OUTPUT, SELECTOR)          |              |
| —                    | K27-0051-04 | Knob x 3<br>(POWER, IF BAND, MUTING) |              |
| —                    | L19-0009-05 | Balun transformer                    |              |
| S2                   | S31-2007-05 | Slide switch (De-emphasis)           |              |
| —                    | T90-0083-05 | Ferrite bar antenna                  |              |
| —                    | T90-0202-05 | FM indoor antenna                    |              |
| —                    | W02-0008-05 | RF unit                              | ☆            |

### TUNER (X02-1080- )

| Ref. No.          | Parts No.      | Description                | Re-<br>marks |
|-------------------|----------------|----------------------------|--------------|
| <b>CAPACITOR</b>  |                |                            |              |
| Cb2~6, 8<br>10~13 | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  | ☆            |
| Cb14, 15          | CE04W1C471EL   | Electrolytic 470μF 16WV    |              |
| Cb16~18           | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| Cb19              | CC45SL1H101K   | Ceramic 100pF ±10%         |              |
| Cb20              | CK45F1H473Z    | Ceramic 0.047μF +80%, -20% |              |
| Cb21              | CK45B1H561M    | Ceramic 560pF ±20%         |              |
| Cb22              | CK45F1H473Z    | Ceramic 0.047μF +80%, -20% |              |
| Cb23              | CE04W1E100EL   | Electrolytic 10μF 25WV     |              |
| Cb24              | CE04AW1V2R2MEL | Electrolytic 2.2μF 35WV    |              |
| Cb25              | CE04AW1HR33MEL | Electrolytic 0.33μF 50WV   |              |
| Cb26              | CE04W1E4R7EL   | Electrolytic 4.7μF 25WV    |              |
| Cb27              | CK45B1H561M    | Ceramic 560pF ±20%         |              |
| Cb28              | CC45SL1H330K   | Ceramic 33pF ±10%          |              |
| Cb29              | CC45SL1H101K   | Ceramic 100pF ±10%         |              |
| Cb30              | CE04W1H010EL   | Electrolytic 1μF 50WV      |              |
| Cb31              | CE04W1A470EL   | Electrolytic 47μF 10WV     |              |
| Cb32              | CC45SL1H330K   | Ceramic 33pF ±10%          |              |
| Cb33              | CE04W1E4R7EL   | Electrolytic 4.7μF 25WV    |              |
| Cb34              | CE04AW1HR33MEL | Electrolytic 0.33μF 50WV   |              |
| Cb35              | CE04AW1V2R2MEL | Electrolytic 2.2μF 35WV    |              |

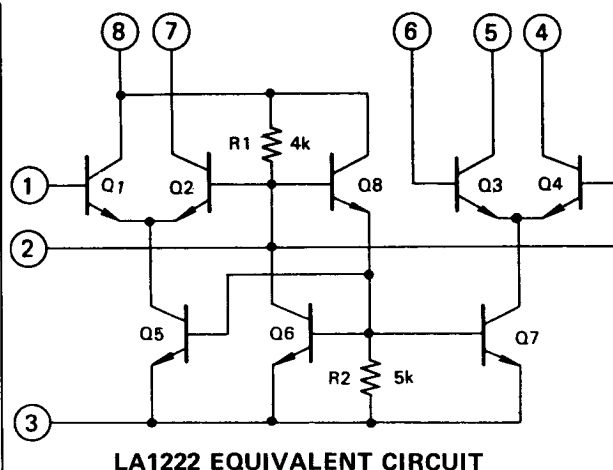
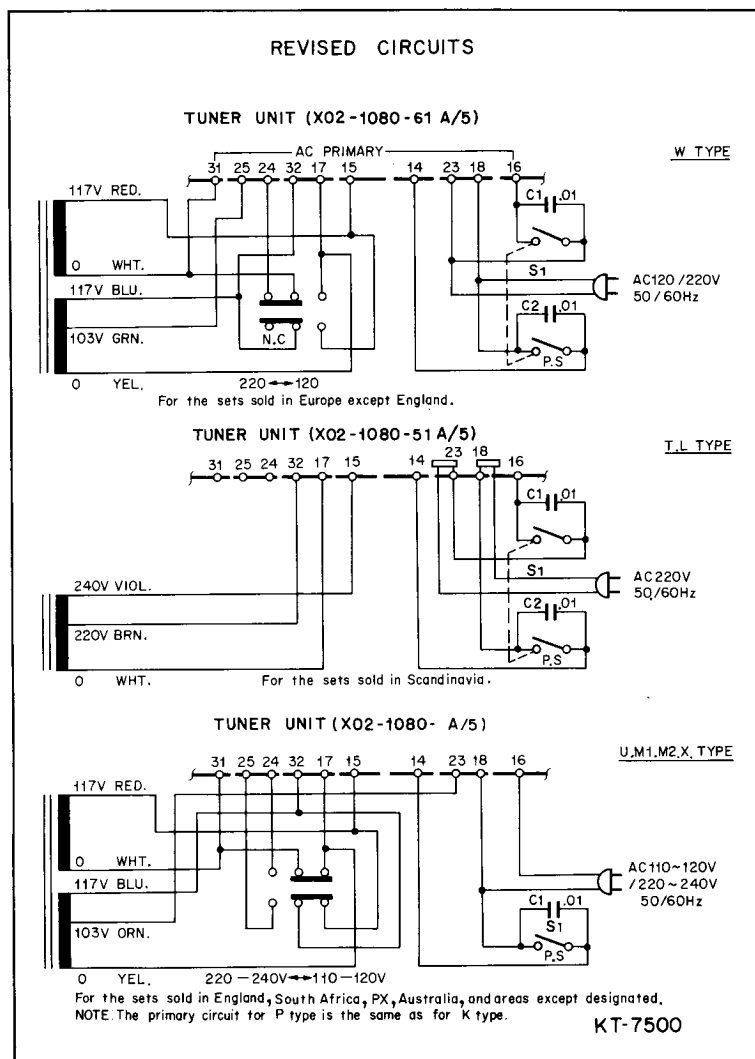
| Ref. No. | Parts No.      | Description                          | Re-<br>marks |
|----------|----------------|--------------------------------------|--------------|
| Cb36     | CE04AW1V3R3MEL | Electrolytic 3.3μF 35WV              | ☆            |
| Cb37     | CQ09FS1H361J   | Polystyrene 360pF ±5%                |              |
| Cb38     | CQ93M1H473M    | Mylar 0.047μF ±20%                   |              |
| Cb39     | CC45SL1H470K   | Ceramic 47pF ±10%                    |              |
| Cb40     | CE04W1C221EL   | Electrolytic 220μF 16WV              |              |
| Cb41, 42 | CE04AW1E4R7MEL | Electrolytic 4.7μF 25WV              |              |
| Cb43     | CE04AW1H010MEL | Electrolytic 1μF 50WV                |              |
| Cb44     | CE04W1A221EL   | Electrolytic 220μF 10WV              |              |
| Cb45, 46 | CQ93M1H154M    | Mylar 0.15μF ±20%                    |              |
| Cb47, 48 | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-11)  |              |
|          | CQ09FS1H152J   | Polystyrene 1500pF ±5%<br>(-1080-22) |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-51)  |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-61)  |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-71)  |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-81)  |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1081-01)  |              |
| Cb49, 50 | CE04W1A470EL   | Electrolytic 47μF 10WV               |              |
| Cb51     | CC45UJ1H180K   | Ceramic 18pF ±10%                    |              |
| Cb52     | CQ09FS1H361J   | Polystyrene 360pF ±5%                |              |
| Cb53     | CQ93M1H103M    | Mylar 0.01μF ±20%                    |              |
| Cb54     | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%            |              |
| Cb55     | CQ93M1H102M    | Mylar 0.001μF ±20%                   |              |
| Cb56     | CK45F1H473Z    | Ceramic 0.047μF +80%, -20%           |              |
| Cb57     | CE04W1E100     | Electrolytic 10μF 25WV               |              |
| Cb58, 59 | CC45SL1H100K   | Ceramic 10pF ±10%                    |              |
| Cb60     | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%            |              |
| Cb61     | CC45SL1H470K   | Ceramic 47pF ±10%                    |              |
| Cb62     | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%            |              |
| Cb63, 64 | CE04W1E4R7EL   | Electrolytic 4.7μF 25WV              |              |
| Cb65     | CQ93M1H102M    | Mylar 0.001μF ±20%                   |              |
| Cb66     | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%            |              |
| Cb67     | CE04W1C470EL   | Electrolytic 47μF 16WV               |              |
| Cb68     | CQ93M1H472M    | Mylar 0.0047μF ±20%                  |              |
| Cb69     | CQ93M1H104M    | Mylar 0.1μF ±20%                     |              |
| Cb70     | CE04W1H010EL   | Electrolytic 1μF 50WV                |              |
| Cb71     | CQ93M1H223M    | Mylar 0.022μF ±20%                   |              |
| Cb72     | CE04AW1V2R2MEL | Electrolytic 2.2μF 35WV              |              |
| Cb73     | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%            |              |
| Cb74, 75 | CE04AW1E4R7MEL | Electrolytic 4.7μF 25WV              |              |
| Cb76     | CK45E2H103P    | Ceramic 0.01μF +100%, -0%            |              |
| Cb77     | CK45B1H561M    | Ceramic 560pF ±20%                   |              |
| Cb78     | CE04W1C221EL   | Electrolytic 220μF 16WV              |              |
| Cb79     | CE04W1E221EL   | Electrolytic 220μF 25WV              |              |
| Cb80     | CE02W1E102EL   | Electrolytic 1000μF 25WV             |              |
| Cb81     | CE04W1C101EL   | Electrolytic 100μF 16WV              |              |
| Cb82     | CE04W1E101EL   | Electrolytic 100μF 25WV              |              |
| Cb83, 84 | CK45E2H103P    | Ceramic 0.01μF +100%, -0%            |              |
| Cb85     | CK45B1H561M    | Ceramic 560pF ±20%                   |              |
| Cb86     | C91-0023-05    | Ceramic 0.01μF 250WV                 |              |
| Cb87     | CE04W1H010EL   | Electrolytic 1μF 50WV                |              |
| Cb88     | CK45B1H561M    | Ceramic 560pF ±20%                   |              |
| Cb89, 90 | CQ09FS1H152J   | Polystyrene 1500pF ±5%<br>(-1080-11) |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-22)  |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-51)  |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-61)  |              |
|          | CQ09FS1H751J   | Polystyrene 750pF ±5%<br>(-1080-71)  |              |
|          | CQ09FS1H152J   | Polystyrene 1500pF ±5%<br>(-1080-81) |              |
|          | CQ09FS1H152J   | Polystyrene 1500pF ±5%<br>(-1081-01) |              |

## PARTS LIST

| Ref. No.                    | Parts No.      | Description                         | Re-<br>marks |
|-----------------------------|----------------|-------------------------------------|--------------|
| <b>RESISTOR</b>             |                |                                     |              |
| Rb6, 12, 18                 | RD14GY2E101JMA | Carbon 100Ω ±5% 1/4W                |              |
| Rb20, 34                    | RD14GY2E220JMA | Carbon 22Ω ±5% 1/4W                 |              |
| Rb53, 69                    | RD14GY2E101JMA | Carbon 100Ω ±5% 1/4W                |              |
| Rb75                        | RD14GY2E220JMA | Carbon 22Ω ±5% 1/4W                 |              |
| Rb103                       | RS14GB3F270J   | Metal film 27Ω ±5% 3W               |              |
| Rb107                       | RC05GF2H225K   | Carbon 2.2MΩ ±10% (-1080-11)        |              |
|                             | RC05GF2H225K   | Carbon 2.2MΩ ±10% (-1081-01)        |              |
| <b>SEMICONDUCTOR</b>        |                |                                     |              |
| Qb2                         | V03-0098-05    | Transistor 2SC535 (B) or 2SC381 (O) |              |
| Qb3~6                       | V03-0270-05    | Transistor 2SC945 (R) or (Q)        |              |
|                             | V03-9991-05    | or 2SC828 (P) or (Q)                |              |
| Qb7                         | V01-0084-05    | Transistor 2SA733 (R) or (Q)        |              |
| Qb8                         | V03-1983-00    | Transistor 2SC1983                  |              |
| Qb9~15                      | V03-0270-05    | Transistor 2SC945 (R) or (Q)        |              |
|                             | V03-9991-05    | or 2SC828 (P) or (Q)                |              |
| ICb1                        | V30-0087-05    | I C TA7060P                         |              |
| ICb2, 3                     | V30-0215-05    | I C LA1222                          |              |
| ICb4                        | V30-0133-05    | I C HA1137W                         |              |
| ICb5                        | V30-0155-05    | I C HA1196                          |              |
| ICb6                        | V30-0217-05    | I C NJM4558D(A) or (B)              |              |
| ICb7                        | V30-0196-05    | I C HA1197                          |              |
| Db1~11                      | V11-0076-05    | Diode 1S1555 or 1S2076              |              |
| Db12~16                     | V11-0295-05    | Diode W06B                          |              |
| Db17, 18                    | V11-0254-05    | Zener diode YZ-140                  |              |
| Db19~21                     | V11-0392-05    | LED GD-4-203CD                      |              |
| Db22                        | V11-0076-05    | Diode 1S1555 or 1S2076              |              |
| Db23                        | V11-0051-05    | Diode 1N60                          |              |
| Db24                        | V11-0076-05    | Diode 1S1555 or 1S2076              |              |
| <b>COIL/INDUCTOR/FILTER</b> |                |                                     |              |
| Lb3                         | L30-0258-05    | FM coil                             |              |
| Lb4                         | L30-0297-05    | FM coil                             | ☆            |
| Lb5, 6                      | L40-1092-03    | Ferri-inductor 1μH                  |              |
| Lb7                         | L40-1805-62    | Ferri-inductor 18μH                 |              |
| Lb8                         | L30-0205-05    | FM coil                             |              |
| Lb9, 10                     | L79-0027-05    | Low pass filter                     |              |
| Lb11                        | L32-0181-05    | AM coil                             |              |
| Lb12                        | L40-1021-03    | Ferri-inductor 1mH                  |              |
| Lb13                        | L30-0284-05    | AM coil                             |              |
| Lb14                        | L40-1092-03    | Ferri-inductor 1μH                  |              |
| CFb1~5                      | L72-0050-05    | Ceramic filter                      | ☆            |
| CFb6                        | L72-0036-05    | Ceramic filter                      |              |
| <b>POTENTIOMETER</b>        |                |                                     |              |
| VRb1                        | R12-1029-05    | Semi-fixed resistor 1kΩ             |              |
| VRb2                        | R12-0502-05    | MUTING SENSITIVITY(WIDE)            |              |
| VRb3                        | R12-4019-05    | Semi-fixed resistor 100Ω            |              |
| VRb4                        | R12-3041-05    | MUTING SENSITIVITY                  |              |
| VRb5, 6                     | R12-5026-05    | Semi-fixed resistor 50kΩ            |              |
| VRb7                        | R06-2008-05    | S METER                             |              |
|                             |                | Semi-fixed resistor 10kΩ VCO        |              |
|                             |                | Semi-fixed resistor 220kΩ           |              |
|                             |                | SEPARATION                          |              |
|                             |                | Variable resistor 5kΩ x 2           |              |
|                             |                | OUTPUT LEVEL                        |              |
| <b>SWITCH/RELAY</b>         |                |                                     |              |
| Sb1                         | S29-1099-05    | Slide type rotary switch            |              |
| Sb2, 3                      | S33-2027-05    | SELECTOR                            |              |
| RLb1                        | S51-2034-05    | Lever switch MUTING, IF BAND        |              |
|                             |                | Reed relay                          |              |

| Ref. No.             | Parts No.   | Description                | Re-<br>marks |
|----------------------|-------------|----------------------------|--------------|
| <b>MISCELLANEOUS</b> |             |                            |              |
| —                    | E13-0213-05 | Pin jack                   |              |
| F1                   | F05-5011-05 | Fuse 500 mA (-1080-11)     |              |
|                      | F05-5013-05 | Fuse 500 mA (-1080-22)     |              |
|                      | F05-2014-05 | Fuse 200 mA (-1080-51)     |              |
|                      | F05-5015-05 | Fuse 500 mA (-1080-61)     |              |
|                      | F05-5013-05 | Fuse 500 mA (-1080-71)     |              |
|                      | F05-5013-05 | Fuse 500 mA (-1080-81)     |              |
| F2                   | F05-5011-05 | Fuse 500 mA (-1081-01)     |              |
|                      | F05-2012-05 | Fuse 200 mA (-1080-22)     |              |
|                      | F05-2014-05 | Fuse 200 mA (-1080-61)     |              |
|                      | F05-2012-05 | Fuse 200 mA (-1080-71)     |              |
|                      | F05-2012-05 | Fuse 200 mA (-1080-81)     |              |
| —                    | J13-0052-05 | Fuse holder x 2 (-1080-11) |              |
| —                    | J13-0052-05 | Fuse holder x 4 (-1080-22) |              |
| —                    | J13-0052-05 | Fuse holder x 2 (-1080-51) |              |
| —                    | J13-0052-05 | Fuse holder x 4 (-1080-61) |              |
| —                    | J13-0052-05 | Fuse holder x 4 (-1080-71) |              |
| —                    | J13-0052-05 | Fuse holder x 4 (-1080-81) |              |
| —                    | J13-0052-05 | Fuse holder x 2 (-1081-01) |              |

## PRIMARY CIRCUIT/TEST EQUIPMENTS AND SPECIFICATIONS



### TEST EQUIPMENTS AND SPECIFICATIONS

#### STANDARD SIGNAL GENERATOR (RF-SG)

|                             |                                                             |
|-----------------------------|-------------------------------------------------------------|
| <b>Ranges</b>               | 90 MHz~108 MHz (FM)<br>500 kHz~1600 kHz (AM)                |
| <b>Modulation Frequency</b> | 1 kHz, 400 Hz or external input<br>(Input level 2V or less) |
| <b>Deviation (FM)</b>       | 0~75 kHz (FM)                                               |
| <b>Modulation (AM)</b>      | 0~30%                                                       |
| <b>Output</b>               | 100 mV or more                                              |
| <b>Distortion</b>           | 0.5% or less                                                |

#### SOLID STATE VOLT METER (SSVM)

|                           |                          |
|---------------------------|--------------------------|
| <b>Ranges</b>             | 0.3 mV~300V (full scale) |
| <b>Frequency Response</b> | 5 Hz~500 kHz             |
| <b>Impedance</b>          | 1 MΩ or more             |

#### OSCILLOSCOPE (SCOPE)

|                    |              |
|--------------------|--------------|
| <b>Ranges</b>      | DC~10 MHz    |
| <b>Sensitivity</b> | 20 mV/cm     |
| <b>Impedance</b>   | 1 MΩ or more |

#### MULTIPLEX SIGNAL GENERATOR (MPX-SG)

|                             |                                                      |
|-----------------------------|------------------------------------------------------|
| <b>Modulation Frequency</b> | 1 kHz or external input<br>(Input level: 5V or less) |
| <b>Separation</b>           | 60 dB or more                                        |
| <b>S/N</b>                  | 85 dB or more                                        |

#### DISTORTION METER

|                    |                         |
|--------------------|-------------------------|
| <b>Ranges</b>      | 0.1%~0.03% (full scale) |
| <b>Sensitivity</b> | 100 mV or more          |

#### FREQUENCY COUNTER (COUNTER)

|                           |               |
|---------------------------|---------------|
| <b>Frequency Response</b> | 10 Hz~1 MHz   |
| <b>Sensitivity</b>        | 50 mV or more |
| <b>Impedance</b>          | 1 MΩ or more  |

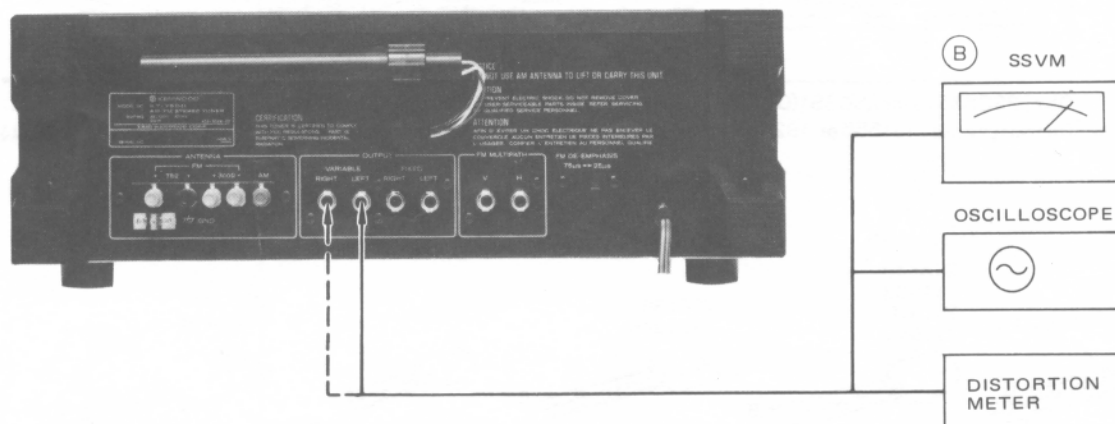
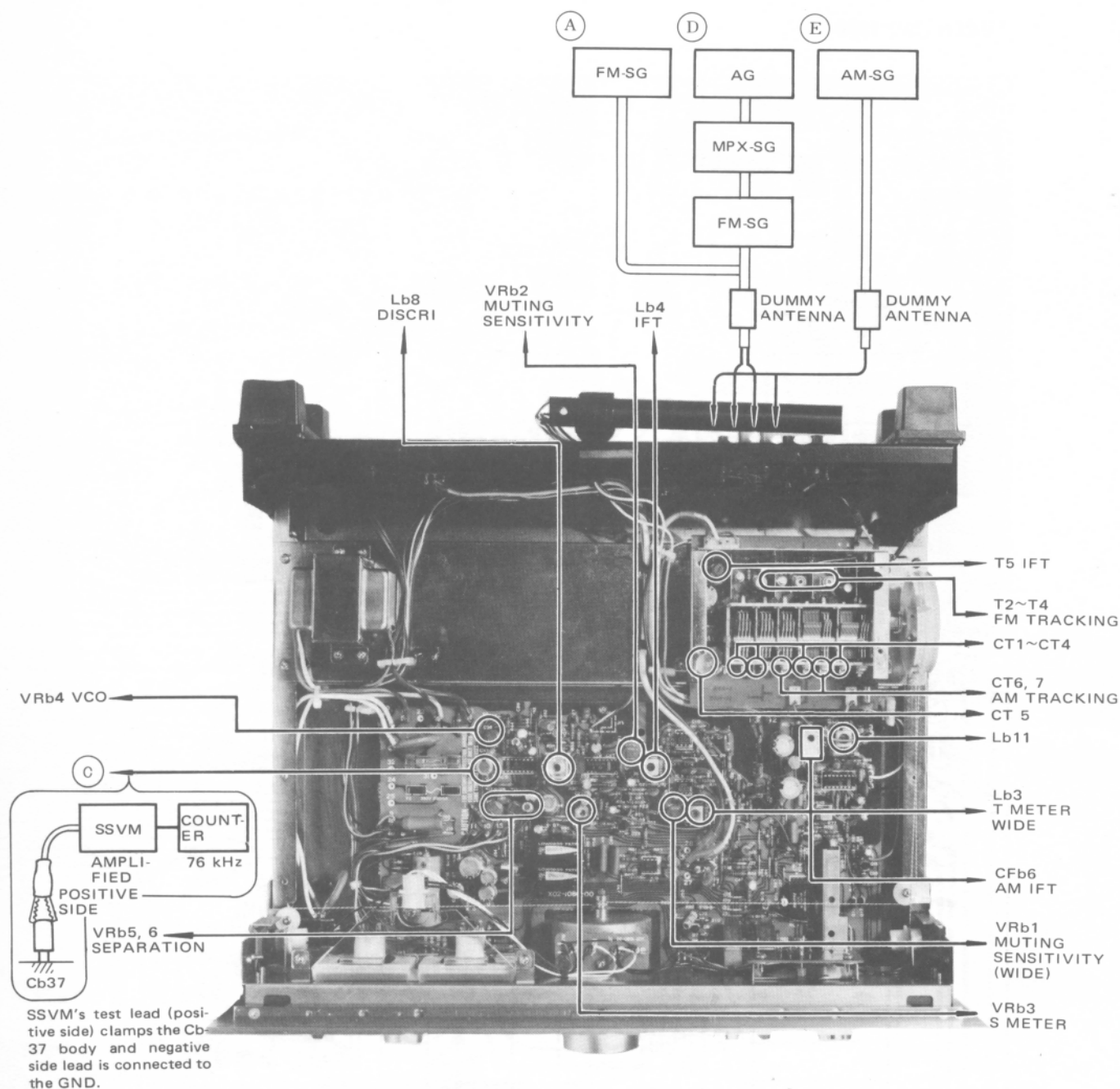
#### AUDIO SIGNAL GENERATOR (AG)

|                   |               |
|-------------------|---------------|
| <b>Ranges</b>     | 5 Hz~500 kHz  |
| <b>Waveform</b>   | Sine wave     |
| <b>Output</b>     | 10V r.m.s.    |
| <b>Distortion</b> | 0.01% or less |

**Notes:**

- \* 1. As for the specifications of Test Equipments, see page 12.
- \* 2. RF-SG is set the lowest response possible on oscilloscope.
- \* 3. TRACKING has been properly adjusted at the factory, so there is no necessity for readjusting. When repairing the RF unit (W02-0008-05), if replacement of FETs and transistors does not solve a trouble, replace the RF unit.
- \* 4. The output level of RF-SG is made a loss by the dummy antenna. The loss is different from the dummy antenna, so you should take into consideration the value of the loss applicable to your case.
- \* 5. 0 dB = 1  $\mu$ V

| NO.                                                                 | ALIGNMENT             | TEST EQUIPMENT |                                                                                            | TUNER SETTING                | OUTPUT INDICATOR | ADJUSTMENT                     | REMARKS                                                                                                   |
|---------------------------------------------------------------------|-----------------------|----------------|--------------------------------------------------------------------------------------------|------------------------------|------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------|
|                                                                     |                       | CONNECTION     | SETTING                                                                                    |                              |                  |                                |                                                                                                           |
| FM SECTION VRb1 and VRb2 are in its mechanical center at the start. |                       |                |                                                                                            |                              |                  |                                |                                                                                                           |
| 1                                                                   | IF                    | Ⓐ              | 95 MHz<br>1 kHz (Mod)<br>75 kHz (Dev)                                                      | 95 MHz<br>NARROW             | Ⓑ                | Lb4<br>T5                      | Maximum deflection<br>and minimum distortion.                                                             |
| 2a                                                                  |                       | —              | —                                                                                          | —<br>NARROW                  | T meter          | Lb8<br>(Bottom)                | Make the pointer<br>position in the center<br>of the meter.                                               |
| 2b                                                                  |                       | —              | —                                                                                          | —<br>WIDE                    | T meter          | Lb3                            | Make the pointer<br>position in the center<br>of the meter.                                               |
| 3                                                                   |                       | Ⓐ              | 95 MHz<br>1 kHz (Mod)<br>75 kHz (Dev)                                                      | 95 MHz<br>NARROW             | Ⓑ                | Lb8<br>(Top)                   | Maximum deflection<br>and minimum distortion.                                                             |
| 4                                                                   | TRACKING * 3          | Ⓐ              | 90 MHz<br>1 kHz (Mod)<br>75 kHz (Dev)                                                      | 90 MHz<br>NARROW or<br>WIDE  | Ⓑ                | T2~T4                          | Maximum deflection                                                                                        |
| 5                                                                   |                       |                | 106 MHz (Dev)<br>1 kHz (Mod)<br>75 kHz (Dev)                                               | 106 MHz<br>NARROW or<br>WIDE |                  | CT1~CT5                        |                                                                                                           |
| 6a                                                                  | MUTING<br>SENSITIVITY | Ⓐ              | 95 MHz<br>16 dB (5μV) * 4<br>1 kHz (Mod)<br>75 kHz (Dev)                                   | 95 MHz<br>NARROW             | Ⓑ                | VRb2                           | Set the semi-fixed<br>resistor so that MUT-<br>ING will operate<br>under the 16 dB(5μV)<br>antenna input. |
| 6b                                                                  |                       | Ⓐ              | — ditto —                                                                                  | 95 MHz<br>WIDE               | Ⓑ                | VRb1                           | — ditto —                                                                                                 |
| 7                                                                   | S METER               | Ⓐ              | 95 MHz 10 dB * 4<br>0 (Dev)                                                                | 95 MHz<br>NARROW             | S meter          | VRb3                           | Make the pointer<br>indication "5" digit.                                                                 |
| 8                                                                   | VCO                   | Ⓐ              | 95 MHz 60 dB<br>0 (Dev)                                                                    | 95 MHz<br>NARROW             | Ⓒ                | VRb4                           | Counter indicates 76<br>kHz                                                                               |
| 9a                                                                  | SEPARA-<br>TION       | Ⓓ              | FM-MPX:<br>SELECTOR<br>L or R<br>1 kHz (Mod)<br>FM-SG:<br>95 MHz, 60 dB<br>68.25 kHz (Dev) | 95 MHz<br>NARROW             | Ⓑ                | VRb5                           | Minimum cross-talk<br>(Maximum separa-<br>tion)                                                           |
| 9b                                                                  |                       | Ⓓ              | — ditto —                                                                                  | 95 MHz<br>WIDE               | Ⓑ                | VRb6                           | — ditto —<br>Don't move the VRb5.                                                                         |
| AM SECTION                                                          |                       |                |                                                                                            |                              |                  |                                |                                                                                                           |
| 1                                                                   | IF                    | Ⓔ              | 1000 kHz<br>400 Hz,<br>30% (Mod)                                                           | 1000 kHz                     | Ⓑ                | CFb6                           | Maximum deflection                                                                                        |
| 2                                                                   | TRACKING              | Ⓔ              | 600 kHz<br>400 Hz,<br>30% (Mod)                                                            | 600 kHz                      | Ⓑ                | Lb11<br>Ferrite bar<br>antenna | — ditto —                                                                                                 |
| 3                                                                   |                       |                | 1400 kHz<br>400 Hz,<br>30% (Mod)                                                           | 1400 kHz                     | Ⓑ                | CT6~7                          |                                                                                                           |



## SPECIFICATIONS

## FM TUNER SECTION (I.H.F.)

|                               |                                        |                  |
|-------------------------------|----------------------------------------|------------------|
| Usable Sensitivity            | 9.8 dBf                                | (1.7 $\mu$ V)    |
| 50 dB Quieting Sensitivity    |                                        |                  |
| (Mono)                        | 14.1 dBf                               | (2.8 $\mu$ V)    |
| (Stereo)                      | 36.1 dBf                               | (35 $\mu$ V)     |
| Signal to Noise Ratio         |                                        |                  |
| (Mono)                        | 75 dB                                  |                  |
| (Stereo)                      | 70 dB                                  |                  |
| Total Harmonic Distortion     | at WIDE                                | at NARROW        |
| Mono at 100 Hz                | 0.08%                                  | 0.1%             |
| 1,000 Hz                      | 0.08%                                  | 0.2%             |
| 6,000 Hz                      | 0.08%                                  | 0.3%             |
| 15,000 Hz                     | 0.15%                                  | 0.15%            |
| Stereo at 100 Hz              | 0.13%                                  | 0.4%             |
| 1,000 Hz                      | 0.1%                                   | 0.3%             |
| 6,000 Hz                      | 0.1%                                   | 0.3%             |
| 15,000 Hz                     | 0.5%                                   | 1.5%             |
| Capture Ratio                 | 1.0 dB                                 | 2.0 dB           |
| Alternate Channel Selectivity | 30 dB                                  | 100 dB (400 kHz) |
|                               |                                        | 60 dB (300 kHz)  |
| Stereo Separation             |                                        |                  |
| at 1,000 Hz                   | 50 dB                                  | 45 dB            |
| at 50 to 1,000 Hz             | 43 dB                                  | 38 dB            |
| at 15,000 Hz                  | 40 dB                                  | 30 dB            |
| Frequency Response            | 20 Hz to 15,000 Hz +0.2 dB -1.5 dB     |                  |
| Spurious Response Ratio       | 110 dB                                 |                  |
| Image Response Ratio          | 105 dB                                 |                  |
| IF Response Ratio             | 110 dB                                 |                  |
| AM Suppression Ratio          | 60 dB                                  |                  |
| Sub Carrier Product Ratio     | 65 dB                                  |                  |
| Antenna Impedance             | 300 ohms balanced & 75 ohms unbalanced |                  |
| FM Frequency Range            | 88 MHz to 108 MHz                      |                  |
| Output Level                  |                                        |                  |
| at 400 Hz 100% Mod Fixed      | 0.75V,                                 | 1.2 kohms        |
| Variable                      | 0~1.5V,                                | 1.2 kohms        |
| Multipath Output Vertical     | 0.2V,                                  | 5 kohms          |
| Horizontal                    | 0.3V,                                  | 5 kohms          |
| FM DET. Out                   | 0.3V,                                  | 5 kohms          |

## AM TUNER SECTION

|                           |            |
|---------------------------|------------|
| Usable Sensitivity        | 14 $\mu$ V |
| Signal to Noise Ratio     | 50 dB      |
| Total Harmonic Distortion | 0.5%       |
| Image Rejection           | 60 dB      |
| Selectivity               | 35 dB      |
| Output Level              | 0.15V      |
| Fixed                     |            |
| Variable                  | 0~0.3V     |

## GENERAL

|                   |                                                                                 |
|-------------------|---------------------------------------------------------------------------------|
| Power Requirement | 60 Hz 120V (U.S.A. and Canada model) or<br>50~60 Hz 110~120/220~240V switchable |
| Power Consumption | 20 watts                                                                        |
| Dimensions        | W 16-15/16" (430 mm)<br>H 5-7/8" (149 mm)<br>D 14-27/32" (377 mm)               |
| Weight (Net)      | 16.8 lbs. (7.6 kg)                                                              |
| (Gross)           | 19.4 lbs. (8.8 kg)                                                              |

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