FM/SW/MW/LW 33-BAND RADIO RECEIVER

CRF-330K

US Model
Canadian Model
E Model
AEP Model
UK Model

SUPPLEMENT

No. 2
February, 1978

File this supplement with the service manual.

CIRCUIT AND MECHANISM OPERATION

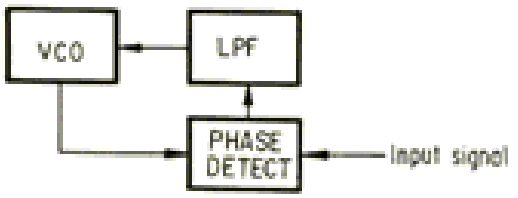
TABLE OF CONTENTS

SONY
SERVICE MANUAL

RADIO SECTION

1. PHASE–LOCKED LOOP

The phase-locked loop (PLL) is a type of frequency feedback circuit made up of a phase detector (PD), low-pass filter (LPF), and a voltage-controlled oscillator (VCO). The frequency of the VCO is synchrounized to the frequency of the input signal.

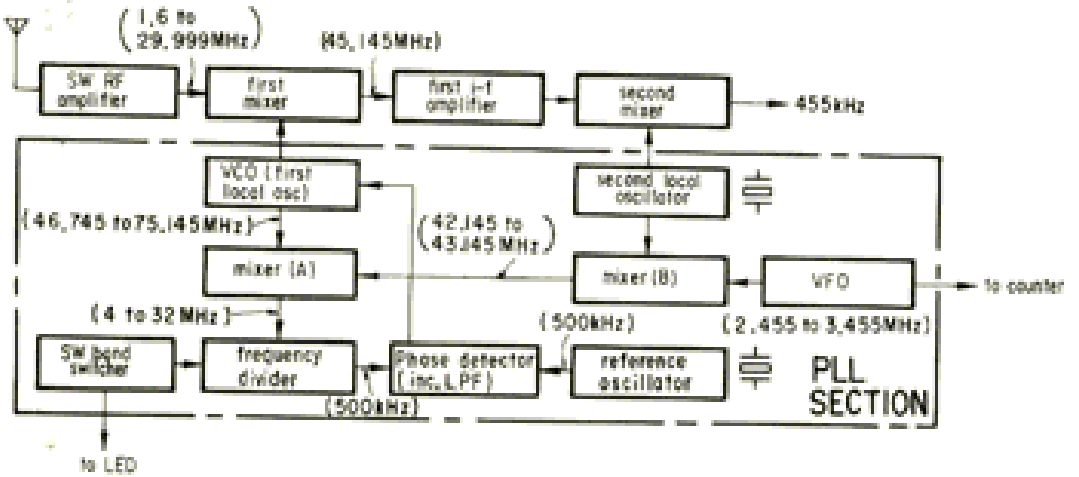


When there is no input signal, the VOC oscillates at its free-running frequency. When the input signal is received, the phase-detector compares the VCO oscillation frequency with the frequency of phase of the input signal. If they do not match, the phase detector detects the difference as a voltage signal. This voltage is changed into direct current by the LPF, and shifts the VCO frequency towards that of the input signal. When both frequencies are the same, the phase detector voltage becomes constant, thus synchronizing or locking the PLL. Under these conditions, the VCO oscillation output and the input signal will be of the same frequency with a constant phase difference.

2. THE PLL USED IN THIS RECEIVER

The PLL has been inserted in the short-wave local oscillator circuit to stabilize the oscillation frequency. As a result, the receiver is very stable.

If the output of the frequency divider is not at 500 kHz, the phase-detector generates and sends a voltage to the VCO, and controls the VCO frequency so that the frequency divider output will ultimately



In the above short-wave front-end block diagram, the signal received via the antenna is changed to a 45.145 MHz first i-f signal by the first mixer. After going through the i-f amplifier stage, it is converted to a 455 kHz second i-f signal at the second mixer.

In the PLL section, the output of the second local oscillator is mixed with the VFO output in the mixer (B). The mixer (B) output is equivalent to the input signal shown in the PLL diagram of section 1. It is mixed with the VCO output in the mixer (A). The mixer (A) output can be any frequency between 4 and 32 MHz, depending upon the frequency of the signal received. The output is then divided by the frequency divider, and compared with the 500 kHz signal of the reference oscillator at phase-detector. be at 500 kHz. Thus, the VCO frequency is controlled by three oscillators (second local oscillator, VFO, and reference oscillator). The second local oscillator and the reference oscillator are both extremely stable crystal oscillators. The VFO is a stable lower frequency oscillator.

The amount of frequency division is selected by the band selector switch. The initial division is by 2, and then by from 4 to 32. Therefore, the VCO frequencies can be changed in 1 MHz steps by changing the ratio of the frequency divider, and in smaller steps by changing the VFO frequency. The VFO frequency is changed by turning the SW tuning knob.

1) Changing of the VCO Coils

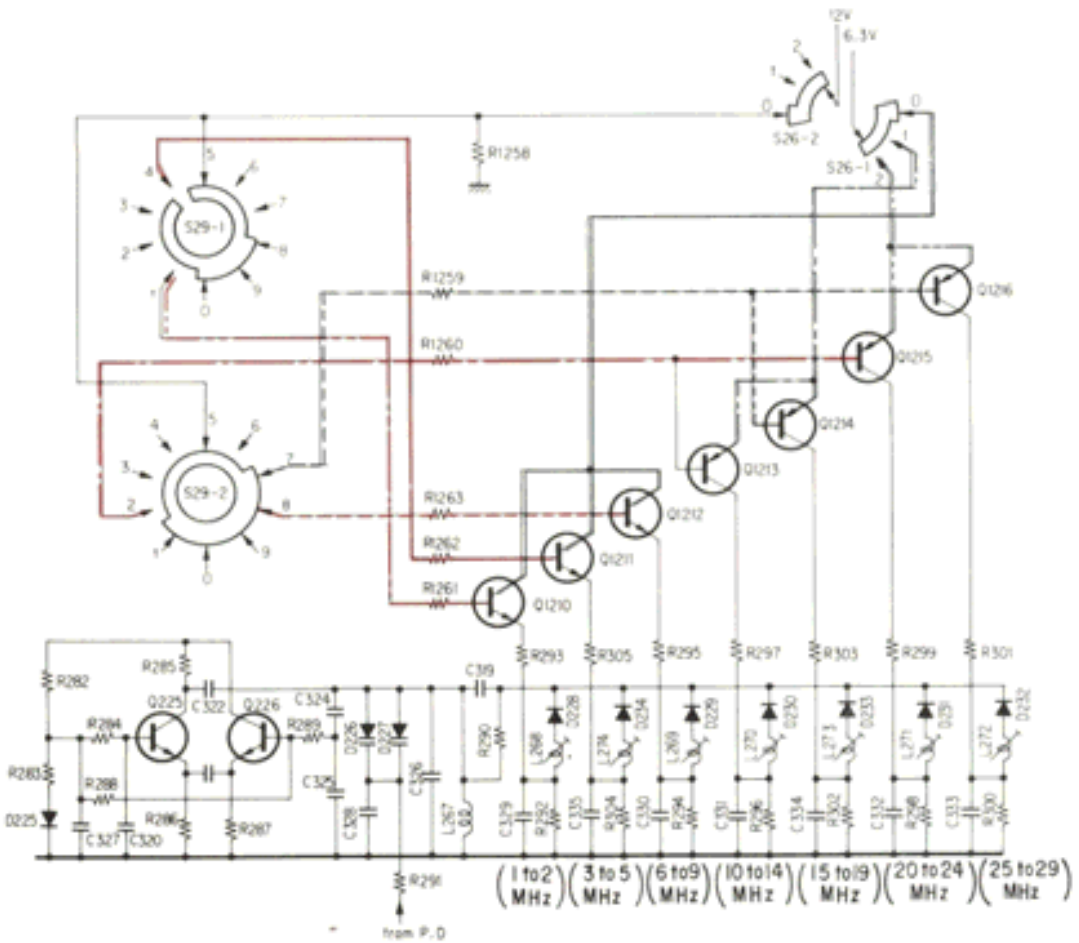
The VCO (voltage controlled oscillator) is equivalent to the local oscillator in the usual superheterodyne receiver. The difference between the VCO and the usual local oscillator lies in the tracking of the VCO, or more precisely, in the fact that the VCO frequency changes accurately according to the VFO frequency variations, and the divided VCO frequency is continually compared with the reference oscillator frequency so that the VCO is locked at a stable frequency. The VCO frequency is controlled via the variable capacitor diodes D226 and D227 in the diagram by the DC output from the phase detector (PD).

However, it is difficult to change the VCO frequency across the entire range by the variable capacitor diodes only. It is for this reason that, as shown in the diagram, a convenient division into 29 bands is made with switchable values of 'L' and the switching diodes D228 to D234. In the diagram, S26 is the switch for 10 MHz-interval band switching. It is turned progressively to the right (clockwise), in the order 0, 1, 2. S29 is the 1 MHz-interval switch, shown in position 9 in the diagram, from which it would be advanced successively to the right in the order 9, 0, 1 - - - - - - - - 8.

These two switches, S26 and S29, combine to give, for example, the 1 to 2 MHz band with Q1210 on. For the 1 to 2 MHz band, L268 enters the oscillator circuit as 'L'. In the same way, L274 gives the 3 to 5 MHz band, L269 gives the 6 to 9 MHz band, L270 the 10 to 14 MHz band, L273 the 15 to 19 MHz band, L271 the 20 to 24 MHz band, and L272 the 25 to 29 MHz band.

Note:

- B+ bus at 1 to 9 MHz band
- B+ bus at 10 to 19 MHz band
- B+ bus at 20 to 29 MHz band
- bias line path at 15 to 19 and 25 to 29 MHz bands
- bias line path at 10 to 14 and 20 to 24 MHz bands
- bias line path at 6 to 9 MHz band
- bias line path at 3 to 5 MHz band
- bias line path at 1 and 2 MHz bands

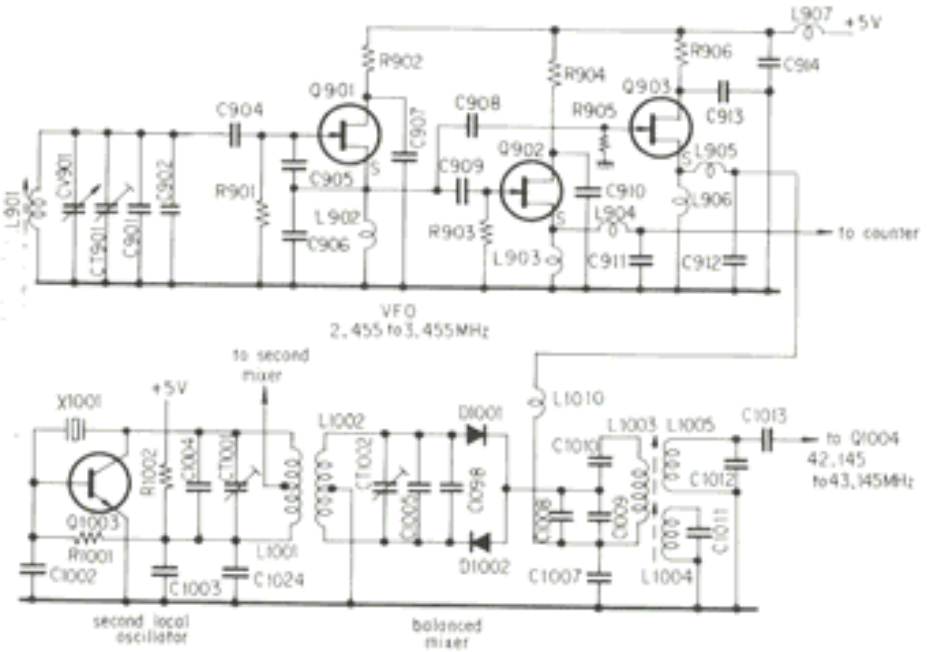


2) VFO

The stability of this set in short-wave reception is almost completely determined by the stability of the VFO. Of the three oscillators determining the stability of this set, the reference oscillator and the second local oscillator are fully stable crystal oscillators, and the VFO oscillator is at a low enough frequency (2.445 to 3.445 MHz) to permit highly stable circuit design. This is an advantageous characteristic feature of synthesizer receivers. The mixing of the VFO output and the output of the second local oscillator gives variable frequencies which are both high enough and stable enough for the purpose.

Again, by incorporating the output of the second local oscillator into the synthesizer loop, the instability in reception associated with second local oscillator drift is eliminated by the first and second mixers. Furthermore, the VFO frequency is measured by the counter, giving a display of all frequencies between the 1 MHz intervals.

As described above, the VFO block has been designed and selected with attention to detail for stability and precision. Repair and adjustment require special instrumentation and advanced techniques. Repairs should generally therefore be effected by block replacement.



3) Mixer (B) - - - - -D1001 and D1002

A part of the second local oscillator output (45.6 MHz) is mixed with the VFO output at D1001 and D1002 in order to boost the VFO frequency (2.455 to 3.455 MHz). The 2.455 to 3.455 MHz component of the mixer output is easily eliminated by the bandpass filter. Since 45.6 MHz is quite close to the frequency of the bandpass filter (42.145 to 43.145 MHz), the 45.6 MHz component leaks through the bandpass filter. In order to prevent the 45.6 MHz component from appearing at the output of the mixer, a balanced type mixer has been utilized. In a balanced type mixer, any frequency component of the signal inserted from the balanced side does not appear at the output side. Its operation can be thought of as a balanced type product detector.

4) Second Local Oscillator

The output of the second local oscillator is mixed with the first i-f signal at the second mixer and converted to the 455 kHz second i-f signal.

In this set, again, the output of the second local oscillator is incorporated into the synthesizer loop and applied to the first mixer. Therefore, the stability in reception associated with second local oscillator drift is cancelled by the first and second mixers.

5) Programmable Counter as Frequency Divider in PLL

A frequency divider can be composed of several counters. For example, in a decimal counter, then pulses input is converted to one pulse output. After all, the decimal counter operates as a 1/10 frequency divider. However, the division ratios required in this set are from 1/4 to 1/32. The two decimal counters including preset functions are installed for changing the division ratios, as shown in the diagram.

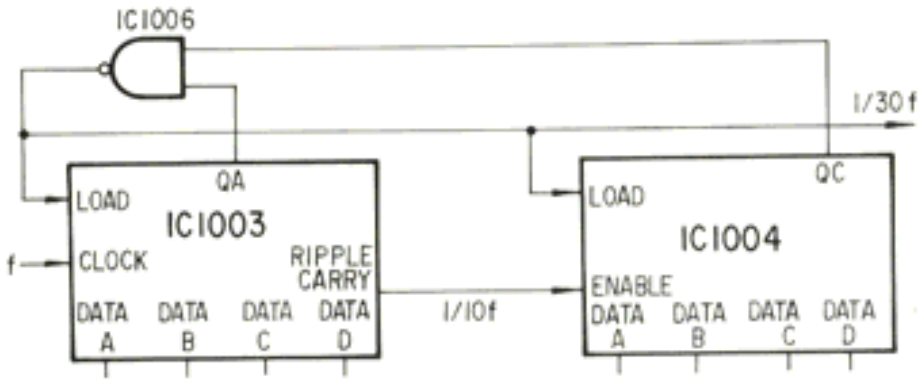
IC1003 and IC1004 are both programmable decimal counters and are capable of dividing up to 1/100. However, in this set, terminals C and D of IC1004 are grounded in order to obtain only a division of only 1/40. The output pulse of IC1006 is inputted at LOAD terminals of IC1003 and IC1004, and in so doing, the counters are reset. By this preset operation, the frequency divider circuit is actually capable of dividing up to 1/41.

The below table indicates the input and output combination of IC1003.

CLOCK input frequency	f	f	f	f	f
DATA A	0	1	0	0	0
DATA B	0	0	1	0	0
DATA C	0	0	0	1	0
DATA D	0	0	0	0	1
QA output frequency	0f (constantly LEVEL 1)	1/1 f	½ f	¼ f	1/8 f
RIPPLE CARRIER output frequency	1/10 f	1/10 f	1/10 f	1/10 f	1/10 f

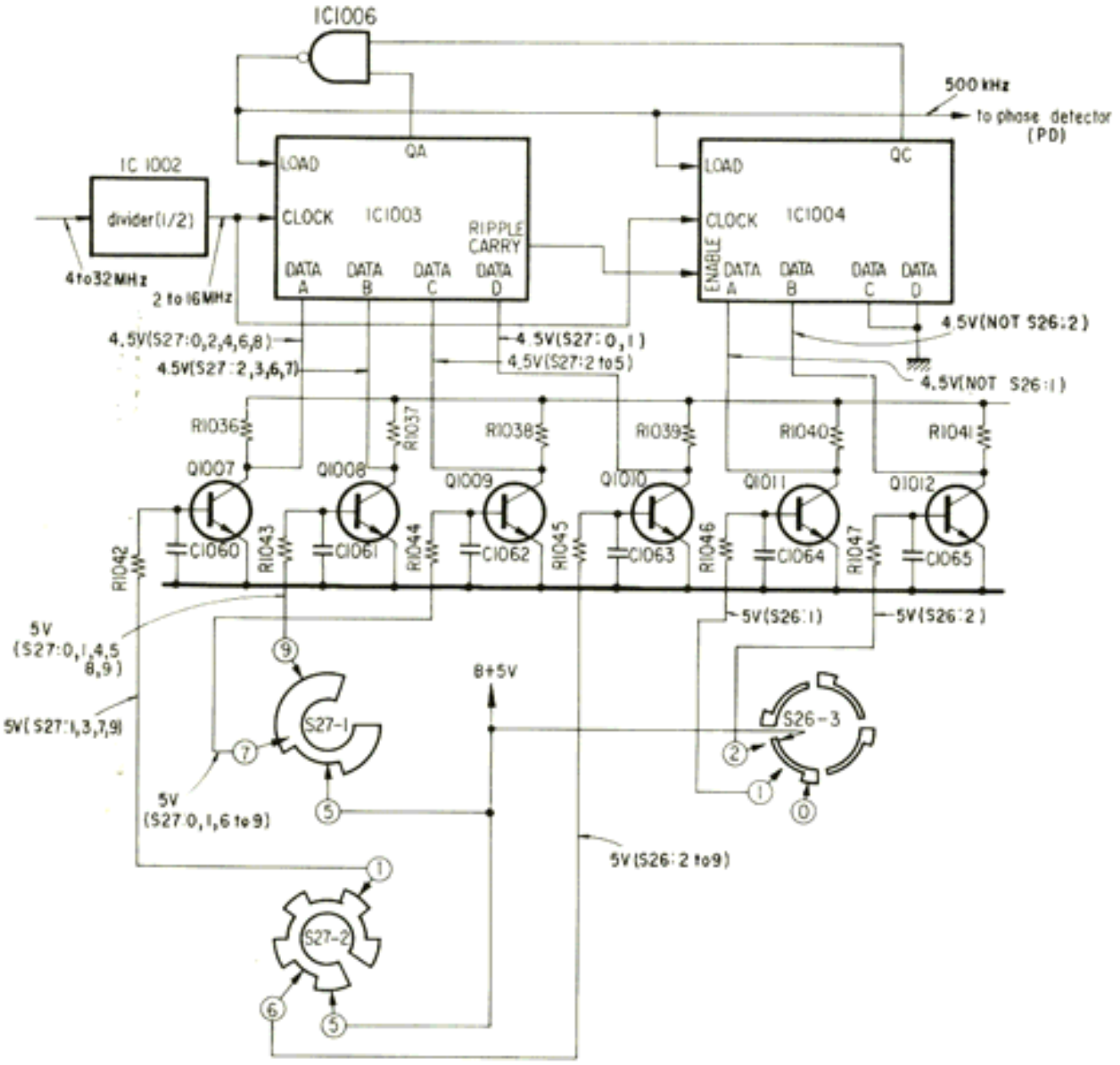
When the level of the DATA B is 1 and the levels of the DATA A, DATA C and DATA D are all 0, the CLOCK input frequency is divided by 2. The signal appears at the QA terminal. At this time, 8 has already been counted by IC1003 before the output signal from IC1002 enters the CLOCK terminal. In the same way, the division ratios change according to the levels of DATA terminals. Again, the RIPPLE CARRIER output frequency is always divided to 1/10 and inputted at the ENABLE terminal of IC1004. Thus, IC1004 counts 10, 20, 30 and 40.

The next diagram shows the frequency counter circuit, where 41 pulses are converted to one pulse. If division to 1/30 is required, preset the programmable counters to 11 by setting the DATA A levels of IC1003 and IC1004 to 1. This means that 11 has already been counted before inputting pulses at the CLOCK terminal of IC1003. Thus, when 30 pulses are inputted, this circuit counts 12 to 41 and one pulse appears as output. In other words, 30 pulses are converted to one pulse. Thus, the division to 1/30 is completed.



The below diagram shows the frequency divider circuit. The 4 to 32 MHz input is converted to a 2 to 16 MHz signal by IC1002. Again, the 2 to 16 MHz signal is converted to a 500 kHz signal, which is compared with the 500 kHz signal of the reference oscillator at PD, by IC1006, IC1003 and IC1004.

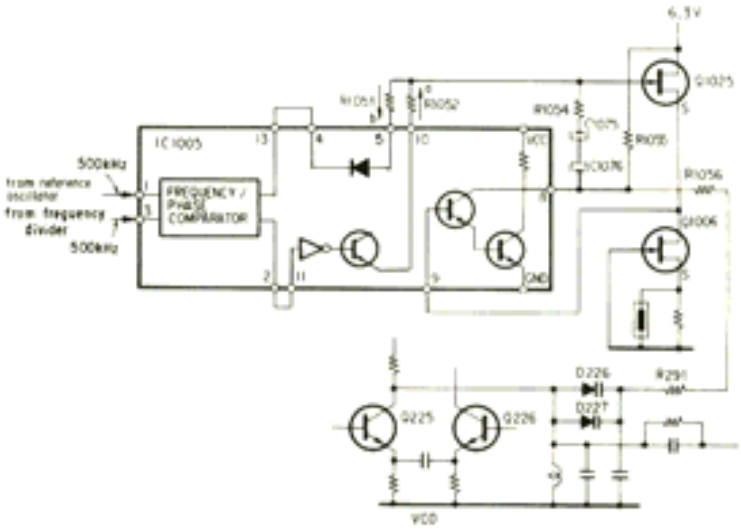
The output signal from IC1002 enters the CLOCK terminals of IC1003 and IC1004. The signal is not counted in IC1004, but synchronizes the counting in the two ICs. Q1007 to Q1012, S26-3, S27-1 and S27-2 constitute the control circuit for counter presetting.



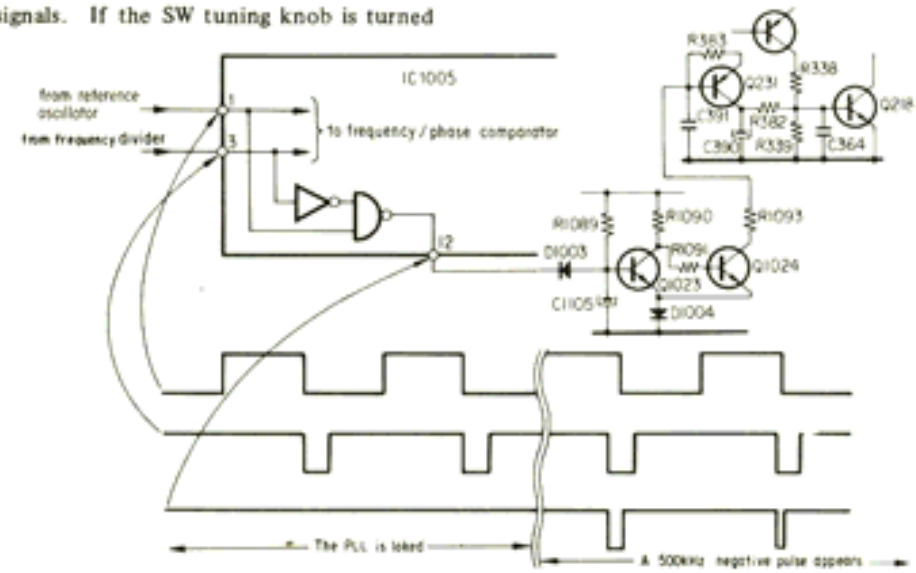
6) Phase Detector and Lowpass Filter

IC1005 is composed of a frequency/phase comparator and an integrator as shown below. When the output of the frequency divider is higher in frequency than the 500 kHz output of the reference oscillator, first the level at terminal 2 becomes 0 and then the level at terminal 10 becomes the high level. But, when it is lower, the level at terminal 13 becomes the low level and the level at terminal 8 becomes up to 6.3 V. Futhermore, the levels at both terminals 2 and 13 become the high levels, and the PLL is locked.

The signal from terminals 10 and 15 is integrated and amplified by the active lowpass filter. Next, this signal goes to the variable capacitance diodes D226 and D227, and controls the frequency of the VCO. When the PLL is locked, 1.75 V appears at terminal 8 in 1.6 MHz reception and 5 V appears in 29.999 MHz reception. Q1006 is a constant current load for Q1025.

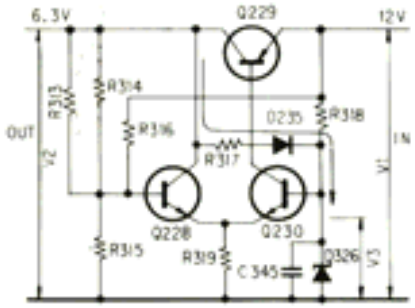


The next diagram shows that the duty factor of the signal from the reference oscillator is approx. 50%, and that of the divided to 1/4 signal from the frequency divider is 25%. When the PLL is locked, the level at terminal 12 is 1 as determined by the two input signals. If the SW tuning knob is turned during SW reception, the frequency of the signal from the frequency divider changes. Consequently, a 500 kHz negative pulse appears at terminal 12. This pulse is a trigger pulse for the muting operation of this set.



7) Regulator Circuit for VCO

If we assume that V2 has risen, the base voltage of Q228 will increase. This will increase the emitter current of Q228, and will raise the emitter voltage. At the same time, the emitter voltage of Q230 will increase and the emitter current will decrease, because the base voltage of Q230 is fixed by the zener diode D236. Therefore, the base current and collector current of Q229 will decrease, so that V2 will decrease a little and will be regulated. R316 is installed to prevent the influence of variation in V1 from affecting V2. Again, V3 is mainly applied via R317 and D235. However, with this alone, the regulator will not start to operate, and the start is effected by supplying an initial current to the base of Q230 via R318. D235 is inserted to prevent the initial current from flowing to the V2 side via R317.

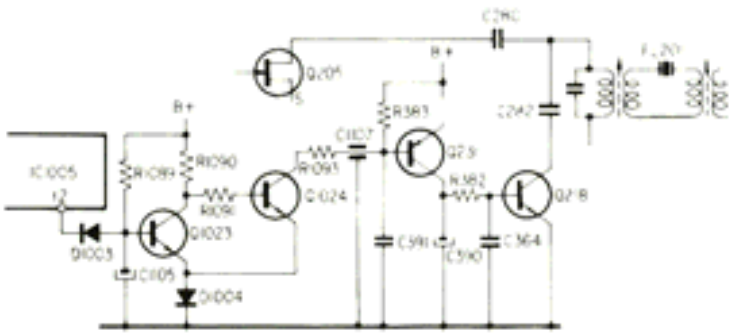


8) Muting Circuit Composed of Q1023, Q1024 and Q231.

When changing bands during SW reception, a small amount of time is required for the PLL to lock. Also, when the VCO frequency changes rapidly, noise will appear in the speaker. This muting circuit, composed of Q1023, Q1024 and Q231, is designed to mute the noise.

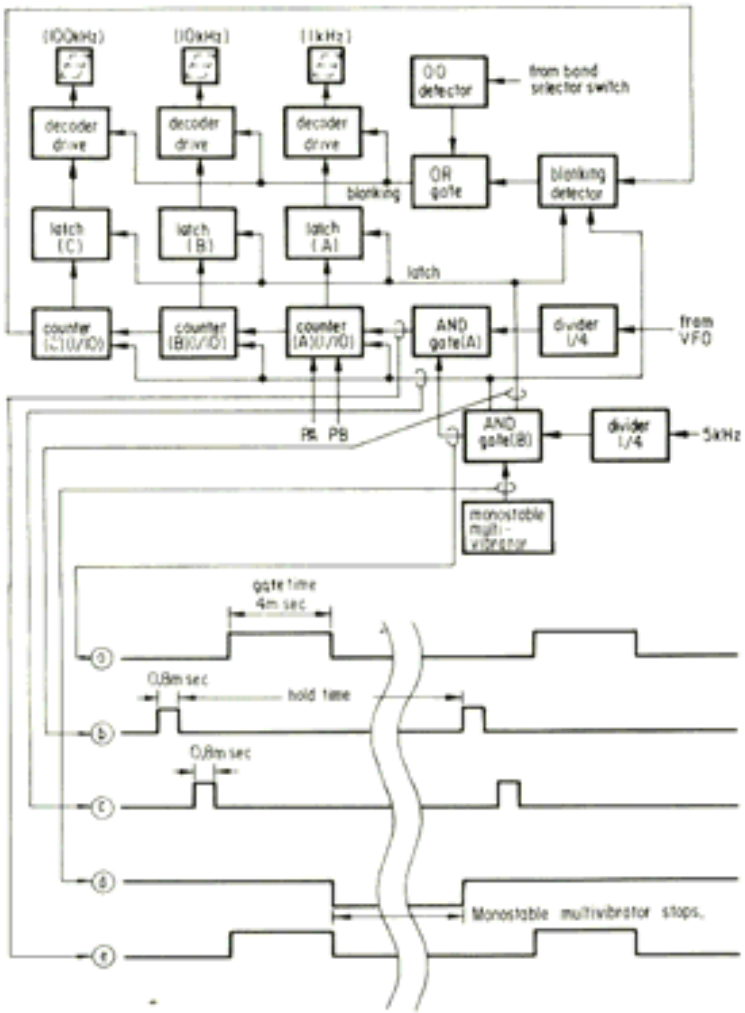
When the PLL is not locked, a 500 kHz negative pulse appears at terminal 12 of IC1005. This pulse is integrated at C1105, cutting off Q1023. Consequently, Q1024 comes on, and then Q231 comes on. Since the collector of Q231 is connected to the base of Q218 (noise blanker switch), Q218 comes on, and the i-f circuit is grounded. So long as it remains grounded, no sound will be heard from the speaker.

But once the PLL is locked, no further pulses will appear at terminal 12. Q1023 will then come on, and the muting operation will be terminated.



3. RECEIVED–SIGNAL FREQUENCY COUNTER

The display of frequencies between 1 MHz points is actually a display of counted VFO frequencies. The diagram shows a block diagram of the counter section. The input signals from the VFO are first divided to 1/4, and then passed onto the AND gate (A). The AND gate (A) is opened by the AND gate (B) for only 4 msec, since the VFO frequencies are divided by 4 and the displayed frequencies are in kHz, one cycle per msec. During this period, the VFO pulses which pass through the AND gate (A) are counted in the counters (A), (B) and (C). The AND gate (A) is closed after 4 msec, and the counters (A), (B) and (C) stop where they are. Pulse signals (b) from the AND gate (B) are then sent to the latches (A), (B) and (C), which in turn read off and memorize the values of the counters (A), (B) and (C). The counters are then restored to their original status by reset signals (c), ready to perform the next count. The decoders convert the binary numbers stored in the latches into decimal numbers for LED use, and then drive the LEDs via drive circuits. The latches maintain their status until the next latch pulse signals arrive. Consequently, the LED display is also maintained for the same length of time. As long as no signal from the monostable multivibrator is applied to the AND gate (B), the counters will again commence to count the next VFO signal after 4 msec. But since the pulses are counted once every 8 msec, even if the counter value varies a little, the LED display will change once every 8 msec, which is far too short to read frequencies. In order to prevent this, the AND gate (B) is switched off by the monostable multivibrator. The counters will then only count once every 100 msec.



Also incorporated in this set is a blanking circuit. Since reception is not possible when the SW BAND SELECTOR switch is at 00 with the VCO frequency outside the 3.455 to 2.455 MHz range, the frequency must not be displayed. Therefore, the 00 detector detects the 00 status of the SW BAND SELECTOR switch, and the blanking detector detects the counter status. These two outputs are passed through the OR gate, and extinguish the LEDs.

The below table shows the combination between the VFO frequencies and the received signal frequencies.

Received Signal	VFO Frequency	Low Three Figures of Received Signal Frequency (on SW Frequency Counter)
A3	3,455 kHz 3,454 kHz 2,456 kHz	000 kHz 001 kHz 999 kHz
USB	3,453.5 kHz 2,454.5 kHz	000 kHz 999 kHz
LSB, CW	3,456.5 kHz 2,457.6 kHz	000 kHz 999 kHz

When the VFO signal has a frequency down of 1 kHz, the received signal has a frequency up of 1 kHz. In A3 (AM mode) signal reception, when the low three figures of the VFO frequency are 455 kHz, that of the received signal frequency is 000 kHz. Therefore, at this time the counter is preset to 455 kHz. When the VFO frequency goes down, the received signal frequency goes up.

In the same way, the counter is preset to 454 kHz in USB signal reception and 456 kHz in LSB and CW signal reception. (0.5 of a kHz can not be counted.) In this set, then, the programmable down-counter is used to preset to 454, 455 and 456 kHz. The programmable down-counter is preset by the inputs via PA and PB as follows.

PA Level	PB Level	Presetting Frequency
low	low	454 kHz
high	low	455 kHz
low	high	456 kHz

1) IC1201

a) 1/2 IC1201

Gate of counter and ½ frequency divider. It has two operations as a T flip-flop.

If the input at terminal CD is used as a gate signal and keeps the terminal SD at 0 level, the level at the terminal CD becomes 0 and this circuit operates as a 1/2 frequency divider of a T flip-flop.

If the level at terminal CD becomes 1, the output at terminal Q becomes 0 and this operates as the counter gate of a RS flip-flop.

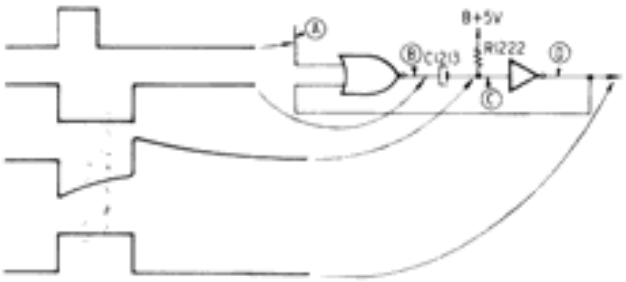
b) 2/2 IC1201

1/2 frequency divider of a T flip-flop with reset function.

2) IC1202

It consists of four NOR gates; two gates operate as an inverter. The other two gates operate as a monostable multivibrator as in the following figure.

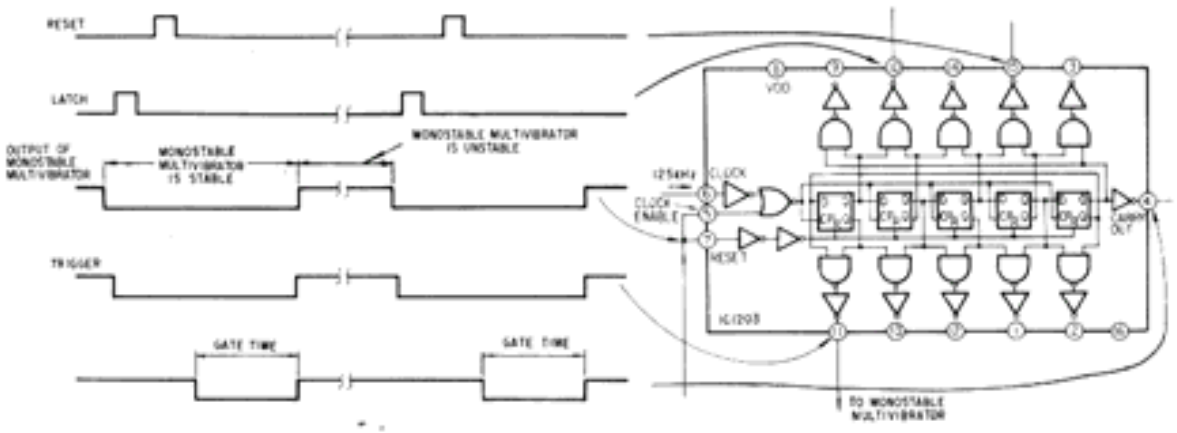
When a pulse is applied to Ⓐ, the voltage at Ⓑ and Ⓒ becomes low and the voltage at Ⓓ becomes high. But, the voltage at Ⓒ gradually increases to a high voltage according to the time constant determined by C1213 and R1222. Consequently the voltage at Ⓓ becomes low and the voltage at Ⓑ becomes high. At this time C1213 is discharged, so that the voltage at Ⓒ becomes too high and is gradually stabilized at 5V. This happens every time a pulse is applied to Ⓐ. For approx. 0.07 second, this monostable multivibrator is unstable and stops the IC1203 operation.



3) IC1203

This is a Johnson counter with five-stages which divides the 125 kHz clock pulse to 1/10 to make three pulses, such as gate, latch and reset.

The output of the monostable multivibrator is connected with the ENABLE terminal to control the 125 kHz clock-pulse. Again, the output of the monostable multivibrator is connected with the RESET terminal to keep each timing pulse in order. The output at terminal 11 is a trigger to make the monostable multivibrator of IC1202 unstable and stop the IC1203 operation as described in 2) IC1202.



4) IC1204

a) 1/2 IC1204

When the VFO output frequency becomes less than 2.456 MHz or more than 3.455 MHz, the MHz digits of the received signal frequency change, and the output of IC1207 activates IC1204 to send a blanking signal to the decoder drivers (IC1208 to IC1210). When the blanking signal is 1, only three dots appear on the kHz digits of the SW frequency counter.

b) 2/2 IC1204

A latch for storing the output of ½ IC1204. The latch is constituted by a D flip-flop. The latch pulse is applied to the CLOCK terminal. The R and S terminals are at 0 level.

5) IC1205 to IC1207

These constitute the ripple down-counter which can be preset. 455 is a preset value in DSB mode, 454 in USB mode, and 456 in LSB or CW mode. The 3.455 to 2.456 MHz of the VFO output is converted to the indication of 000 to 999 on the SW frequency counter.

6) IC1208 to IC1210

These constitute the latch, BCD-7 segments decoder and LED driver. These hold the output of the counter (IC1205, IC1206 or IC1207) every time a latch pulse arrives, and simultaneously convert BCD into the 7-segments indicated by the LED. The LED indication is eliminated by setting the B.1 input of the decoder to 0 level.

7) LED1201 to LED 1203

These are common cathode type LEDs. The LED lights when high-level voltage is applied to its anode. The segment showing a dot lights when a high voltage comes from the OR GATE composed of Q1208 and Q1209.

4. SW RF FILTER

1) Filter for External SW Antenna

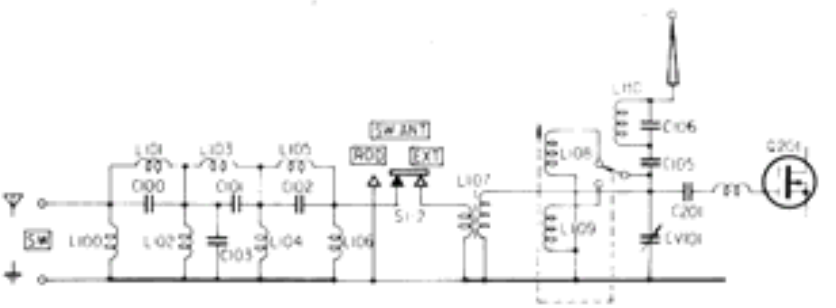
When an external antenna is used to boost the strength of a desired frequency range, the input of unwanted frequencies will also be increased. Many of the unwanted MW frequencies are especially strong, and if harmonics of MW frequencies are permitted to reach Q201 in the RF amplifier, they may interfere with SW reception. To prevent this, a sharp bandpass filter (low-cut filter) is included before the RF amplifier.

2) Antenna Tuning

The ANTENNA TUNING knob for adjusting the SW antenna circuit is a relatively new feature in radio equipment. This system is provided since it is difficult to obtain correct tracking between the antenna tank circuit and the local oscillator, and since in the usual wide-range bandpass type radio, optimum selectivity can not be obtained.

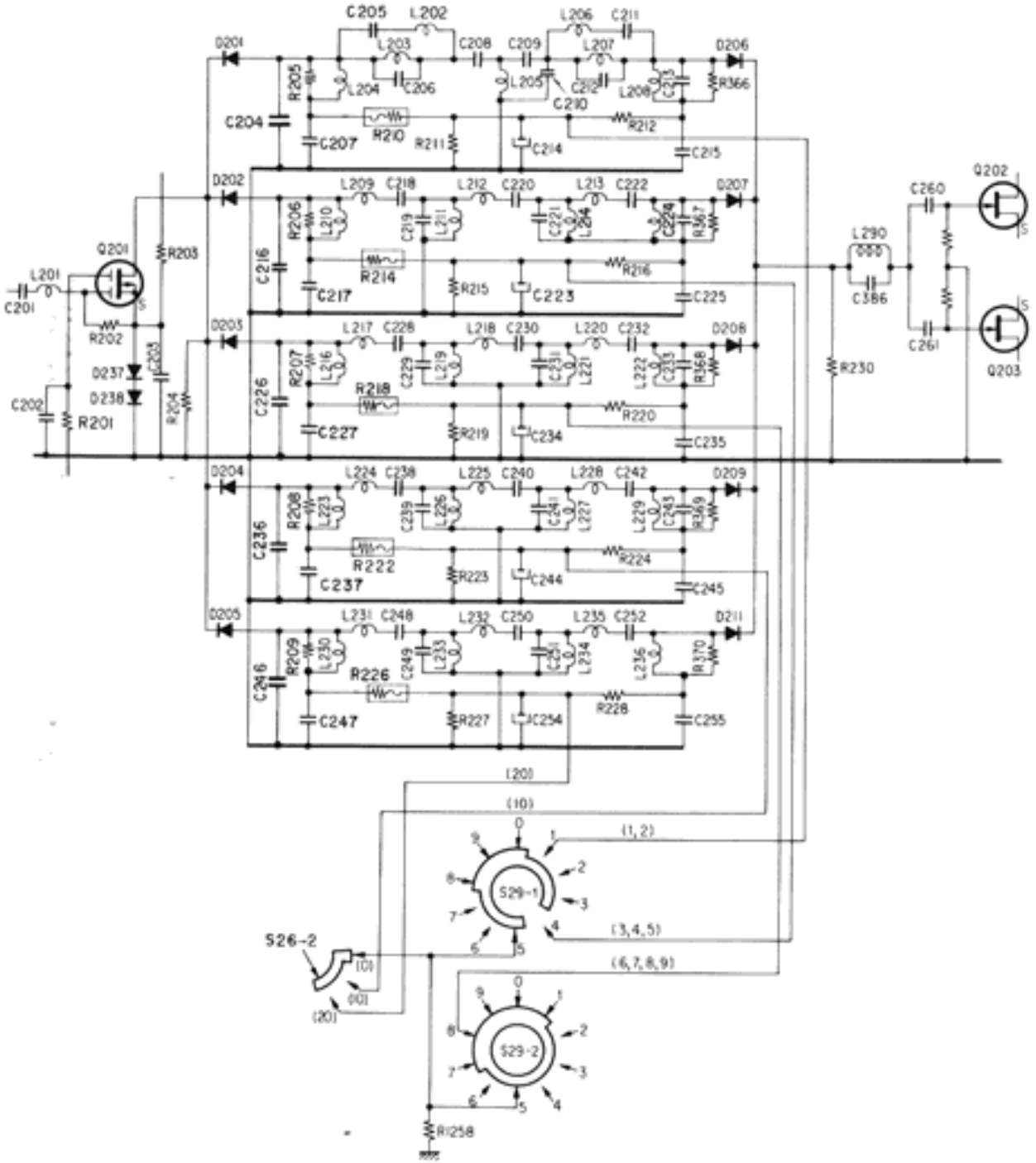
Also, since one coil can not cover the whole 1.6 to 30 MHz range, a coil switching at the 7 MHz position has been provided.

L110 and C106 in the telescopic antenna circuit constitute a trap for TV signals.



3) RF Filter Switching

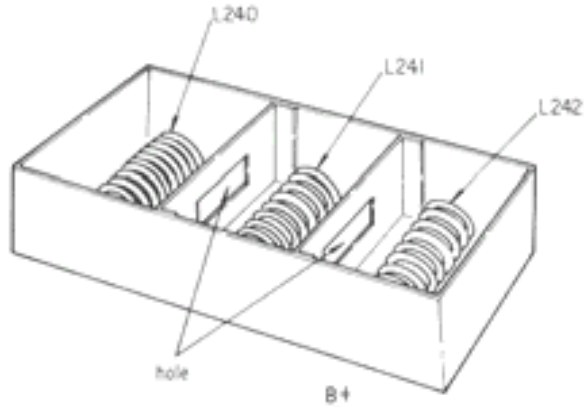
The SW RF filter in this set is of the bandpass type. However, the reception range is wide, extending from 1.6 to 30 MHz, so five sets of bandpass filters are selected for the appropriate reception bands. Switching is effected by the SW BAND SELECTOR switch, with a 12 V supply turning D201 to D211 on and off. S29-1 and S29-2 in the diagram is in the 9 MHz position, so it would be turned to the right (clockwise) successively to positions 0, 1, 2, etc. Again, S26-2 is in the 0 position, and would be turned similarly to positions 1, 2. It follows that D201 and D206 are on for 1 to 3 MHz, D202 and D207 are on for 3 to 6 MHz, D203 and D208 are on for 6 to 10 MHz, D204 and D209 are on for 10 to 20 MHz, and D205 and D211 are similarly on for 20 to 30 MHz, effecting the bandpass filter switching.

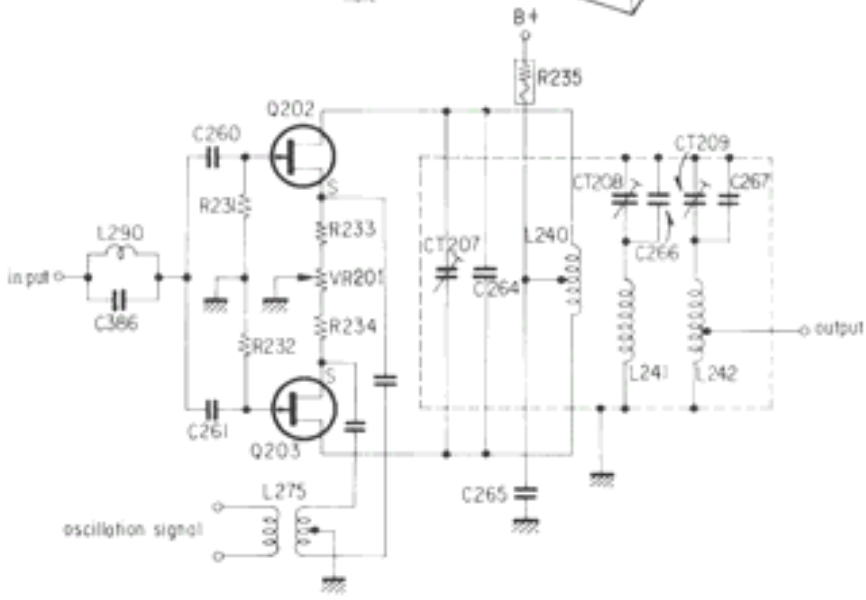


5. BALANCED TYPE SW FIRST MIXER

The input signal from the antenna is initially filtered by the antenna-tuning circuit, and then passes through the RF amplifier and a subsequent bandpass filter to remove unwanted frequency components of the input, the is fed to the first mixer. However, if any unwanted frequency component which is to be removed by the RF filter is present at high signal strength, it may be impossible for the RF filter alone to eliminate it, and it may be passed on to the input signal. If they do not match, the phase coincides with the frequency of the first i-f signal, the conventional single type mixer would pass on the unwanted frequency component and it would enter the first i-f circuit. In such a case, no subsequent circuit would be able to eliminate it, and it would persist as interference. In the balanced type mixer, however, the input signal does not appear in the same form at the output (it undergoes frequency conversion, and appears in the converted form).

Let us assume that the first i-f signal of 45.145MHz enters the input of the mixer shown in the diagram. This signal is in the same phase at both Q202 and Q203 gates, and also appears in the same phase at their drains. But it appears in the opposite phase at L240, so that it is cancelled out, and does not appear at the output. The VR201 between the sources of Q202 and Q203 is for adjustment to ensure that the two FETs operate with the same gain and cancel the signal out completely. However, the local oscillator signal is applied in the opposite phase to Q202 and Q203, so that the frequency-converted signal appears at the drains in the opposite phase. The signal level is doubled at L240, so that a higher-level i-f output signal appears at the output. Further, L240 to L242 are arranged as shown in the diagram, forming a triple-chain M-coupled filter, coupled through the holes in the shield case.





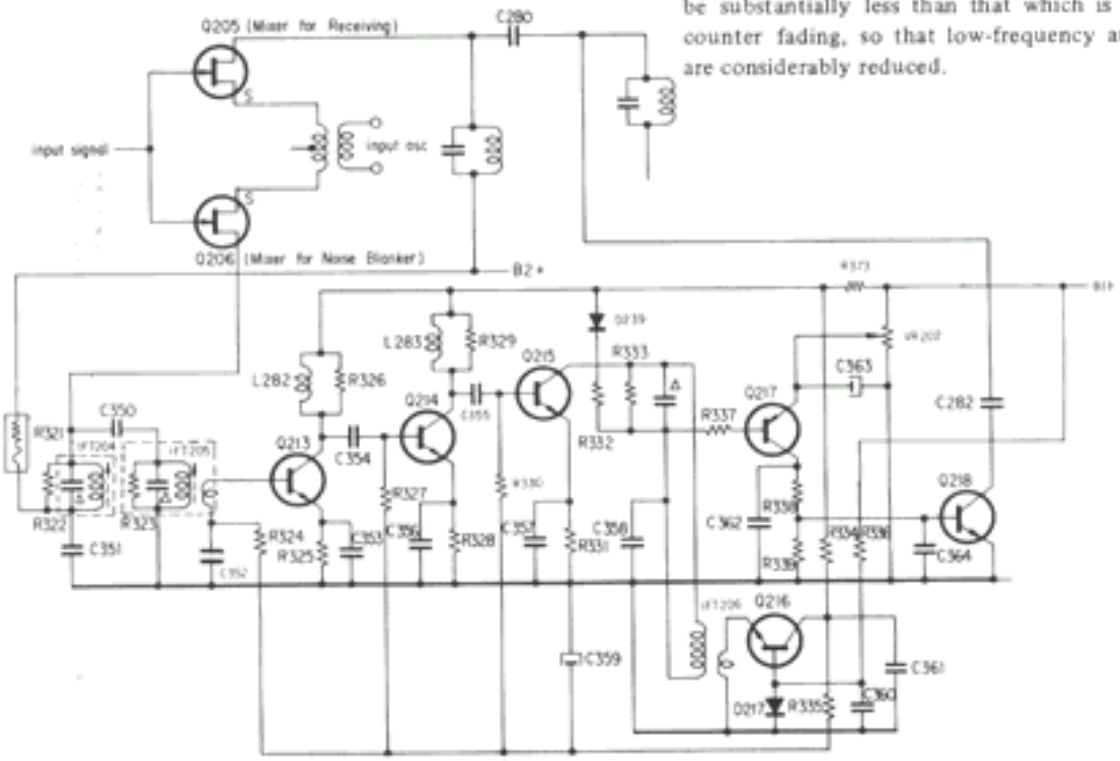
6. NOISE BLANKER

High-level pulse noise such as automobile ignition noise is both highly audible and extremely irritating. In order to remove this, a noise limiter is often used. To secure an even more effective removal of pulse noise, a noise blanker is used.

The diagram shows the noise blanker circuit. The i-f signal derived from the noise blanker mixer is adequately amplified by Q213, Q214 and Q215, and at the same time a powerful AGC is applied to level out the signal amplitudes. When no high-amplitude signal appears, Q217 is in the cut-off state, and no base current flows through Q218, so that the impedance of Q218 is high. When a pulsative (noise) signal appears, operation is as follows.

The AGC does not respond to the pulse signal. Therefore, the pulse is applied at a sufficiently high level to Q217, so that Q217 goes on. With Q217 on the pulse current also flows in the base of Q218, and Q218 goes on, and the i-f signal is passed to ground via C282 and Q218, so that the pulse noise portion is eliminated. The deleted section of the i-f signal is largely compensated for in the following tank circuit, detector, and the integrating circuit of the AF section, so that the effect is not obtrusive.

Q216 in the diagram is the AGC amplifier. Because of the common-base circuit, the base circuit has a constant voltage supply via D217. If a voltage higher than the base potential is applied to the emitter, Q216 rapidly cuts off, and powerful AGC is applied. Again, the AGC time constant is chosen to be substantially less than that which is required to counter fading, so that low-frequency audio signals are considerably reduced.




a) input signal


b) waveform after noise limiter


c) waveform after noise blanker

7. CIRCUITS FOR SSB AND CW RECEPTION

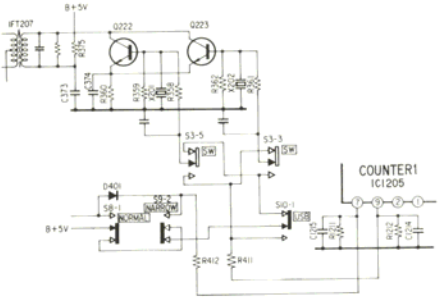
1) BFO

Two crystal oscillators, one for USB and the other for LSB, are used in the BFO of this set to ensure reception stability. These oscillators are switched by changing the biases of Q222 and Q223 with S10-1, S3-3 or S3-5 as required. In SW SSB reception, this set operates as a double superheterodyne receiver and in MW/LW SSB reception, as a single superheterodyne receiver. The SSB carrier waves are therefore reversed as necessary with S3-3 and S3-5. The oscillator frequency of Q222 is 453.5 kHz and that of Q223 is 456.5 kHz. The signal produced in this way is injected into the SSB detector as a carrier wave, but because this frequency is not 455 kHz, an accurate display of the frequency is not possible by VFO frequency counting as in AM mode. In order to obtain an accurate display of this frequency, 1.5 kHz must be added or substracted.

The counter of this set is the 455 kHz preset (programmable) down-counter. Here, for USB, this presetting must be made to 454 kHz, and for LSB, it must be preset to 456 kHz, in order to obtain accurate frequency readings. (The counter does not read 0.5 kHz intervals, so the preset need only be made to the nearest 1 kHz.)

The switching of the preset down-counter operates as follows. During A3 reception, either S8 or S9 is depressed and S10 to S12 are not depressed, so that the current flows from the 5 V power supply to terminal 7 of IC1205 via S8-1 and then to either D401 or S9-2. This current gives the counter instruction, and the preset goes to 455 kHz.. In LSB mode, the current goes to terminal 9 of IC1205 via S8-1, S10-1 and R411, and gives the counter instruction for the 456 kHz preset. In USB mode, there is no instruction for the counter from this circuit, and the counter is preset to 454 kHz.

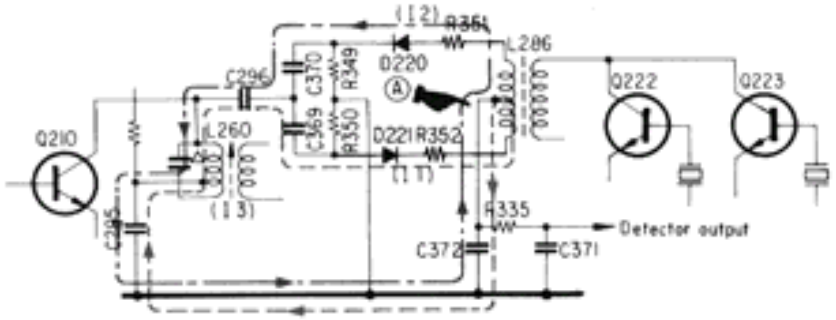
In CW mode, the BFO utilizes the LSB oscillator. The preset frequency is 456 kHz. Therefore, when the beat frequency is 1 kHz, accurate tuning is obtained. If the beat frequency is a little less than 1 kHz, the frequency indication will be more accurate. The beat frequency is usually 800 kHz. Under these conditions the set is not accurately tuned, but the frequency difference is allowable considering the i-f bandwidth.

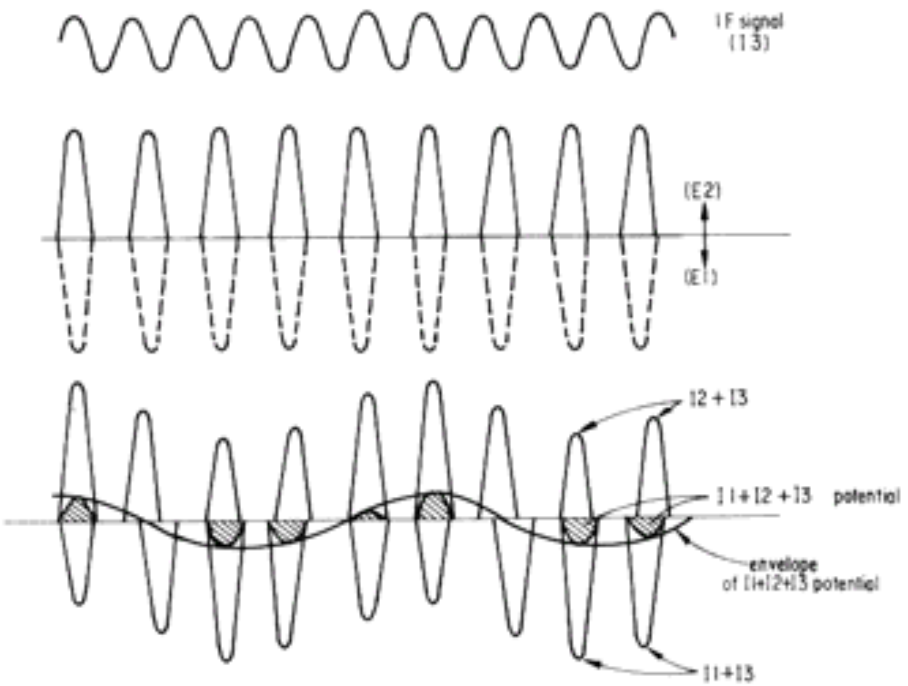


2) Product Detector

The oscillator output generated by Q222 or Q223 is applied to the secondary winding of L286, and induced currents I1 and I2 flow in the detector-side winding of L286. I1 and I2, under the action of D220 and D221, only flow for one half cycle of the sine wave. At this time the current develops a potential between the center tap Ⓐ of the primary winding of L286 (for deriving the detector output) and ground: I1 generates E1, and I2 generates E2. However, these potentials are of the same level but opposite polarity, so that when there is no i-f signal they cancel out and no potential is produced. When an i-f signal I3 (*Note) comes in, the beating between I1 and I3, and between I2 and I3, appears as a beat difference potential at tap Ⓐ. This potential is integrated via R335, C372 and C371 to result in an audio signal. This method of detection uses what is known as a balanced detector, where the currents I1 and I2 which flow through L260 cancel out, so that interference does not occur in i-f circuit.

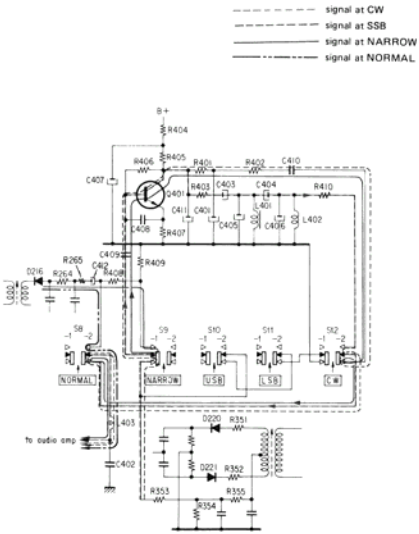
*Note: The I3 in the diagram is a part of the i-f signal when an SSB wave is being received, with continuous modulation by a signal frequency at the same level. In other words, this signal may be thought of as the same as the i-f signal when a CW signal is being received.





3) AF Amplifier Q401

Generally, the audio frequency range of a SSB transmission is not as wide as that of a DSB. After demodulation, the intelligibility of the sound is more important than its HiFi features. So during SSB reception, the detected output is amplified by the AF amplifier, and then cut on the low and high sides by a filter. Even in the NARROW position there are no real problems with the tonal quality. The demodulated frequency in the CW is normally constant. The width of the band produced is very narrow, a sharp filter with a peak around 800 kHz being used.

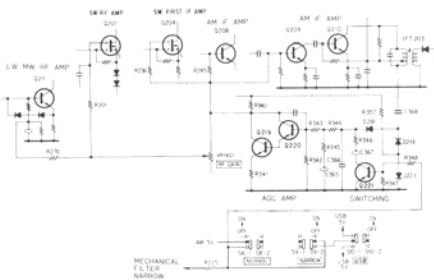


8. AGC CIRCUIT

In this set, the AGC time constant increases in the CW, LSB, USB and NARROW positions, but decreases in the NORMAL position. During reception of A3 with relatively high input levels in the NORMAL position, the faster AGC response time produces more stable and better sound output. In the SSB and CW modes, if the AGC time constant is low in the no-carrier portions the gain increases and a considerable amount of noise is heard from the speaker. Even during A3 reception, if the signal is weak, fading etc. produce sudden drops in level accompanied by considerable noise. And since the noise in weak signals is also a function of bandwidth, the NARROW position is most commonly used. Because of the reasons described above, the AGC time constant increases in the CW, LSB, USB and NARROW positions.

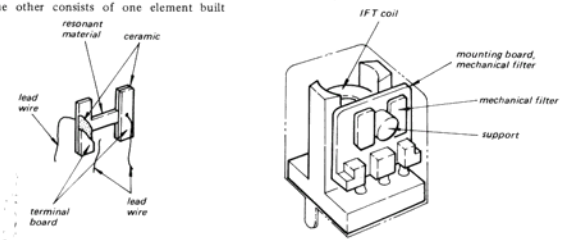
When the S8-1 (NORMAL) is switched off, Q221 is switched on as result of the bias signal sent to it from the 5 V power supply. Consequently, R346 and C367 inserted between the cathode of D218 and ground will increase the time constant.

The RF GAIN control differs from the conventional manual gain control. The AGC circuit in the i-f stage is alone responsible for changing the gain in the RF amplifier. The reason for this is that if the gain is decreased in the first input circuit, the later stages will operate in the same way as during normal reception. So even if the gain is lowered during reception of strong signals, the output level of the speaker will remain fairly constant, and intermodulation can be minimized. The AGC circuit is also effective in reducing fading, which the conventional manual gain control is not able to do. The adjustable range of the RF GAIN is 40 dB.

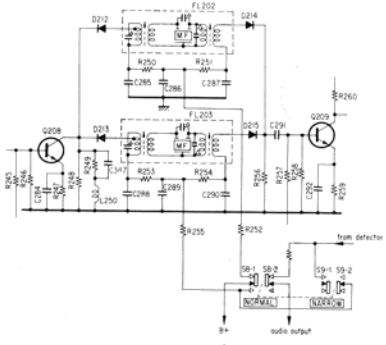


9. MECHANICAL FILTERS FL202 AND FL203

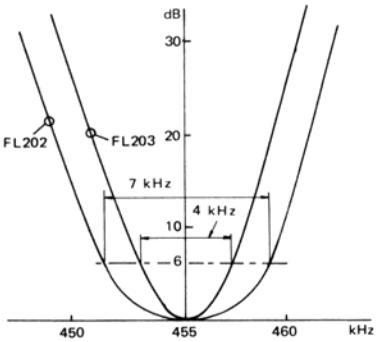
Mechanical filters have performance characteristics that make them useful as i-f filters, and for this reason they are widely used in communication equipment. In this set, mechanical filters of the type shown in the diagram (a) are used, with ceramic used to drive the resonant material. One of the mechanical filters consists of one element built into a drive-type IFT and the other consists of one element built into an output-type IFT. As shown in the diagram (b), two IFTs have been provided to enable switching between NARROW and NORMAL operation. This gives the receiver different bandwidths by switching the two mechanical filters. The bandwidths for 6 dB are 7 kHz for FL202 and 4 kHz for FL203 as shown in the diagram (c).



(a) Mechanical filter structure



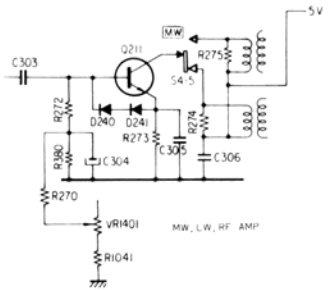
(b)



(c) Typical characteristic curve

10. Q211 IN MW AND LW RF AMPLIFIER

When an external antenna is connected, very strong signals are often passed into the RF amplifier stage. As a result, reverse currents may flow back from the base to the emitter in Q211, and break down the transistor. This is avoided by inserting diodes D240 and D241 between the base and emitter. Any reverse currents will then be by-passed by the diodes. These diodes also serve to prevent distortion due to amplitude limiting during the reception of strong signals.



11. POWER SUPPLY CIRCUIT

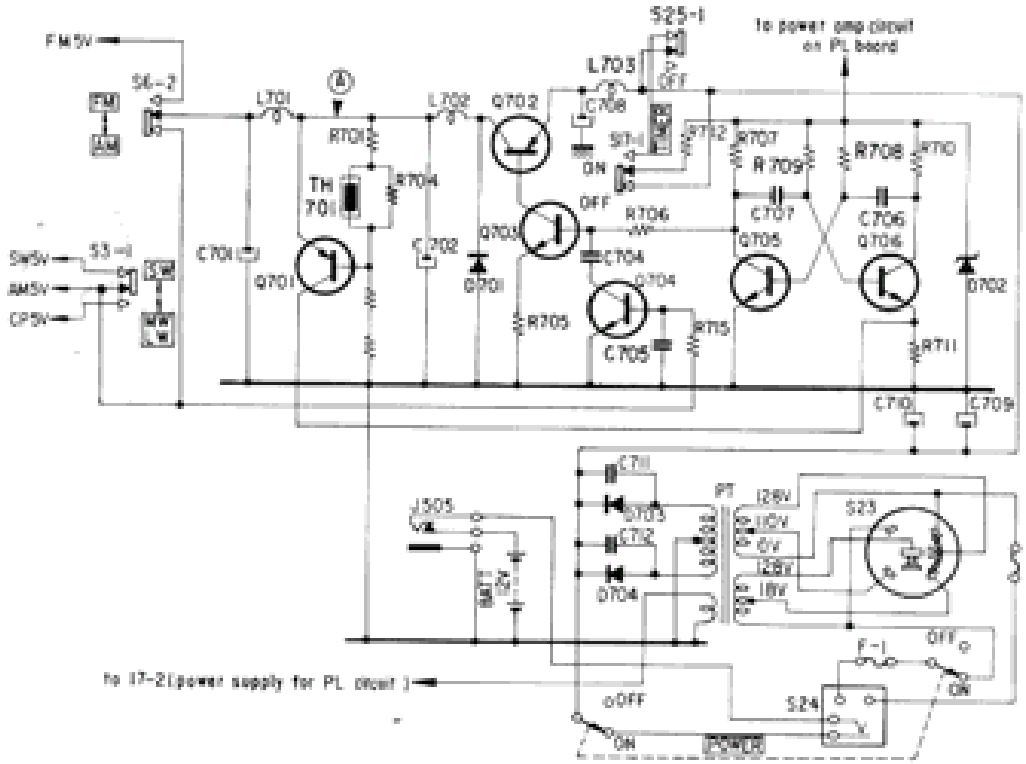
The regulator circuit in this set controls the output side voltage by changing the switching time of Q701. This is to reduce the power loss due to Q702.

Impedance control is used for the voltage regulation, and a 100 mA current is delivered. The primary voltage for this circuit is 12 V, and the secondary voltage is 5 V, so that the power consumed is (12−5) (V) x 100 (mA)=700 (mW), which is far from negligible.

Therefore, a switching control is provided for the regulator of this set. No current flows when Q702 is off, and when it is on, the impedance is extremely low, so that losses can be very significantly reduced. The conversion efficiency is 80%.

When the voltage at point Ⓐ slightly increases under the influence of load changes, the potential between the base and emitter of Q701 becomes large. This causes the collector current of Q701 to increase, with a corresponding increase in the emitter potential of Q706. Q705 and Q706 form a flip-flop, and generate square waves (approx. 2 kHz). Here, if the emitter potential of Q706 increases, the base potential also increases, decreasing the amount of discharge through C707. Therefore, the time for which Q706 is on is shortened. When Q706 is on, Q705 is off, causing Q703 and Q702 to be on. It follows that if the time that Q706 is on is reduced, the time that Q702 is on is also reduced, maintaining the secondary voltage at a constant level. On the other hand, when the secondary voltage drops, the emitter current of Q706 also drops, and the time for which Q706 is on becomes longer, so that Q702 is also on for a longer, time and the secondary voltage is maintained at the specified level. L702 is a smoothing choke coil. D701 is known as a catching diode, and it uses the starting current of L702 so that when Q702 is off, this diode passes a current through L702 which increases the efficiency of electrical supply utilization. The switching of Q702 acts with L701 and L705 to ensure that leakage of harmonics is prevented.

The waveform generated by the flip-flop oscillator is a high quality square wave. Square waves have inherently high levels of harmonics. It follows that if Q702 is driven in exactly the same way for LW and MW reception, the rod antenna will pick up the harmonic waves, resulting in interference. In order to prevent this, Q704 is put on during AM reception, a capacitor is inserted between the base of Q703 and ground, and the square waves are smoothed to prevent the generation of harmonics. However, for FM reception, the frequencies of reception are high, and the presence of such harmonics presents no problems. Under that condition, Q704 is set to off to increase the efficiency of the regulator.



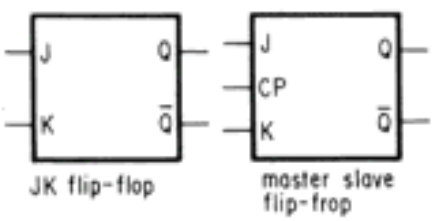
12. DIGITAL IC SYMBOLS AND OPERATIONS

1) Flip-Flop

The flip-flop circuits in this set have two logical conditions which are determined according to external instruction signals. They form a kind of memory circuit.

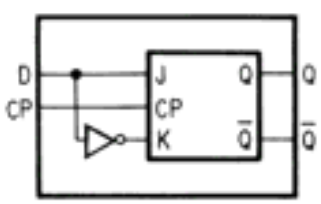
a) JK Flip-Flop

When the J input of the JK flip-flop is 1, the Q output is also 1, but when the K input is 1, Q becomes 0. And when the J and K inputs are of different polarities, the original status is reversed. The JK flip-flops shown below are called clocked JK flip-flop circuits because of the additional clock (CP) input terminal. With J and K inputs, the clocked JK flip-flop status does not change, but when clock inputs are received, the type of J and K inputs will determine the output. This principle is adopted in IC1002 where the CP signal is divided to 1/2 when the J and K inputs of the clocked JK (master-slave) flip-flop are both 1.



b) D Flip-Flop

In this kind of flip-flop, the J and K inputs are connected to each other via an inverter. The combined input terminal for J and K inputs is called the D input, and is capable of determining the status of outputs Q and $\bar{Q}$ during the input of CP signals.



This principle is employed when using CP inputs as strobes. When the CP input is 1, the D input appears at the output unchanged until the next CP (strobe) signal arrives. This kind of action is called "latch", and is used in IC1201 to IC1208. IC1201 and IC1204 use two D flip-flop circuits, and have SR terminals. The SR terminal becomes 0 level for operating as a D flip-flop.

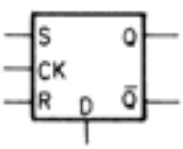
D	CP	t_{n-1} Q	t_n Q
1	⌐¯	0	1
1	⌐¯	1	1
0	⌐¯	0	0
0	⌐¯	1	0

The Q of the flip-flop output can be reversed every rise time of CP when grounding the $\bar{Q}$ and D terminals. This kind of flip-flop is called a T flip-flop.

c) RS Flip-Flop

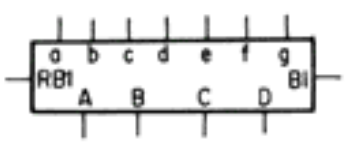
The RS flip-flop status is determined by the S (set) and R (reset) input signals. If either S or R input signal is 1, the status is maintained. But when the S input is 0, $\bar{Q}$ becomes 0, and Q becomes 1. The S input then reverts to 1, but the Q and $\bar{Q}$ states remain unchanged. On the other hand, when R input is 0, Q becomes 0, and $\bar{Q}$ becomes 1. When the R and S inputs are both 0 or 1, the output is not designated.

S	R	Q
1	0	1
0	1	0
0	0	NO CHANGE
1	1	NOT PERMISSIBLE



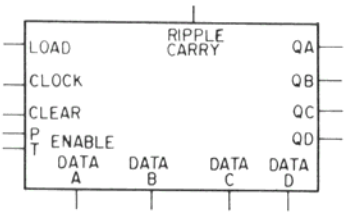
2) Decoder

The decoder converts the BCD code of the counter output into decimal notation for the LEDs. The terminals A to D shown below are for counter inputs, while a to g are the outputs for LED signals. BI is the blanking input for extinguishing the LEDs, while RBI is the ground connection for blanking when the counter is 0.



3) Programmable Counter

This counter can be preset via the inputs at the DATA A to DATA D. The counter is reset by inputting a pulse signal at the LOAD, but will not operate if there is no input at the ENABLE. The counter outputs appear at the QA to QD, with the output for digit increase at the RIPPLE CARRY.



4) AND Gate

An output of 1 only appears when both inputs are 1.

Note: 0 for L level and 1 for H level is referred to as positive logic, while 1 for L level and 0 for H level is called negative logic.

5) OR Gate

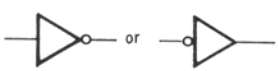
An output of 1 appears if either input is 1.

6) Buffer

Symbol for buffer amplifier.

7) Inverter

Symbol for phase inverter.



○ indicates phase inverting.

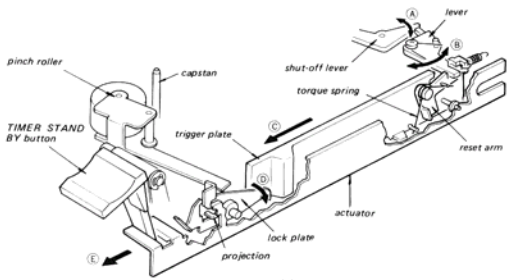
TAPE RECORDER SECTION

1. TIMER STAND-BY MECHANISM

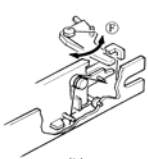
In this set, a TIMER STAND-BY mechanism is provided to operate the tape recorder automatically at the desired time. The mechanism also prevents the pinch roller and capstan from deforming from prolonged contact.

The diagram (a) shows the TIMER STAND-BY setting. At the desired time, the power supply works to rotate the motor, and then the shut-off lever moves to release the lock plate by the projection of the actuator assembly (Operation: Ⓐ to Ⓓ). At this time, the actuator assembly moves toward Ⓔ and sets the reset arm as shown in the diagram (c). After this, the lever continues to move as shown by Ⓖ, but has no influence on the actuator assembly.

If the TIMER STAND-BY mechanism is set when the lever is as shown in the diagram (b), the lever moves toward Ⓕ at the desired time. But after this, the mechanism operates as described above.



(a)

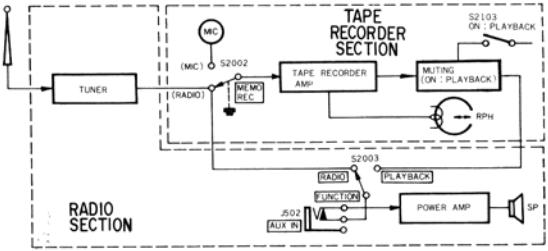


(b)

(c)

2. CONNECTION OF THE TAPE RECORDER AND RADIO

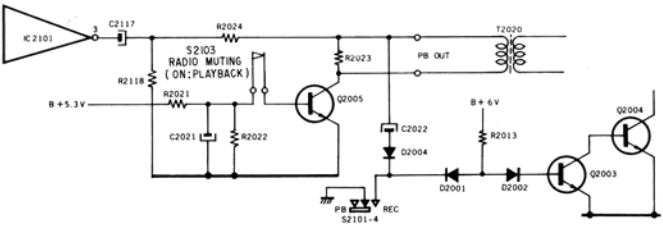
The block diagram is shown below. A signal from the microphone can be recorded only when S2002 is pressed. A signal from J502 can not be recorded.



3. RECORD MUTING

If a signal should appear at the speaker when recording through the microphone, howling would occur. To prevent this, the RECORD MUTING circuit is inserted in the output circuit.

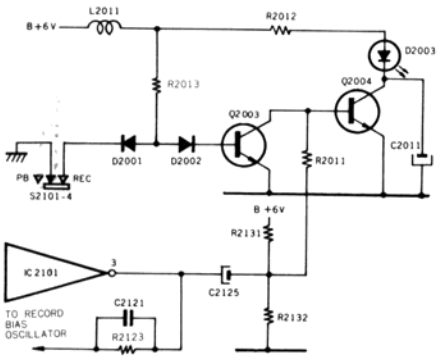
The diagram below shows the RECORD MUTING circuit. Except in playback mode, when S2103 becomes on, the output of IC2101 flows to the power amplifier through T2020. To complete the muting, the signal circuit is grounded via C2022, D2004 and S2101-4 in record mode.



4. LED AMPLIFIER

In record mode, a part of the IC2101 output goes to Q2004 via C2125 and R2011, and makes D2003 flicker to indicate recording. This is not necessary in playback mode, so the signal is muted as follows.

In playback mode, since the bias voltage is applied to Q2003 via R2103 and D2002, Q2003 is on. The base of Q2004 is grounded, so D2003 does not flicker. In record mode, since the bias circuit of Q2003 is grounded via D2001 and S2101-4, Q2003 is off. Therefore, Q2004 is biased for class B operation and flickers with the variations of the audio input signal.



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Sony Corporation

78B05104-1
Printed in Japan

K4XL's  BAMA

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FM/SW/MW/LW 33-BAND RADIO RECEIVER

CRF-330K

US Model
Serial No. 10201 and later

Canadian Model

E Model

AEP Model

SUPPLEMENT

This supplement updates the service manual to include the production changes in US model and to cover information for Canadian, E and AEP models.
File this supplement with the service manual.

No. 1
October, 1977

SONY
SERVICE MANUAL

1. MODEL IDENTIFICATION

– Specification Label –

USA, Canadian model

SONY WORLD ZONE MODEL NO. CRF-330K
FM/SW/MW/LW 33 BAND RADIO RECEIVER

FREQ RANGE:
FM1 76–90 MHz FM2 87.5–108 MHz LW 150–400 kHz
MW 530–1605 kHz SW 1.6–30.0 MHz (29 BANDS)
IF: FM 10.7 MHz SW 1st 45.145 MHz 2nd 455 kHz MW, LW 455 kHz
BATTERY SUPPLY:
1.5 V x 8 USE SIZE "D" STANDARD FLASHLIGHT
BATT OR EQUIVALENT

EXT DC POWER SUPPLY: 12 V 900 mA
AC POWER SUPPLY: 120 V 12.5 W 60 Hz
CLOCK: QUARTZ CLOCK CRYSTAL FREQ
32.768 kHz BATT SUPPLY
1.5 V x 1 USE SIZE "D" STANDARD FLASH-
LIGHT BATT OR EQUIVALENT

SERIAL NO.

CERTIFICATION: DESIGN CERTIFIED
AS COMPLYING WITH F.C.C. RULES
PART 15, IN EFFECT AS OF DATE
OF MANUFACTURE.

CAUTION
TO PREVENT ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONEL.

MADE IN JAPAN

ATTENTION
AFIN DE PREVENIR UN CHOC ELECTRIQUE NE PAS ENLEVER LE COUVERCLE. IL NE SE TROUVE A L'INTERIEOR AUDUNE PIECE POUVANT ETRE REPAREE PAR L'USAGER S'ADRESSER A UN REPARATEUR COMPETENT

AEP model

SONY WORLD ZONE MODEL NO. CRF-330K
FM/SW/MW/LW 33 BAND RADIO RECEIVER

FREQ RANGE: FM1 76–90 MHz FM2 87.5–108 MHz
LW 150–400 kHz MW 530–1605 kHz
SW 1.6–30.0 MHz (29 BANDS)
IF: FM 10.7 MHz SW 1st 45.145 MHz 2nd 455 kHz
MW, LW 455 kHz
BATTERY SUPPLY (1.5 V ⎓) x 8 USE SIZE "D" STANDARD
FLASHLIGHT BATT OR EQUIVALENT
EXT DC POWER SUPPLY: 12 V ⎓ 900 mA
AC POWER SUPPLY: 110, 120, 220, 240 V ~ 12.5 W 50/60 Hz
CLOCK: QUARTZ CLOCK CRYSTAL FREQ
32.768 kHz BATT SUPPLY
(1.5 V ⎓) x 1 USE SIZE "D" STANDARD
FLASHLIGHT BATT OR EQUIVALENT

SERIAL NO.

CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

MADE IN JAPAN

E model

SONY WORLD ZONE MODEL NO. CRF-330K
FM/SW/MW/LW 33 BAND RADIO RECEIVER

FREQ RANGE: FM1 76–90 MHz FM2 87.5–108 MHz
LW 150–400 kHz MW 530–1605 kHz
SW 1.6–30.0 MHz (29 BANDS)
IF: FM 10.7 MHz SW 1st 45.145 MHz 2nd 455 kHz
MW, LW 455 kHz
BATT SUPPLY: 1.5 V x 8 USE SIZE "D" STANDARD FLASH-
LIGHT BATT OR EQUIV
EXT DC POWER SUPPLY: 12 V 900 mA
AC POWER SUPPLY: 110, 120, 220, 240 V
12.5 W 50/60 Hz
CLOCK: QUARTZ CLOCK CRYSTAL FREQ:
32.768 kHz
BATT SUPPLY: 1.5 V x 1 USE SIZE "D" STANDARD FLASH-
LIGHT BATT OR EQUIV

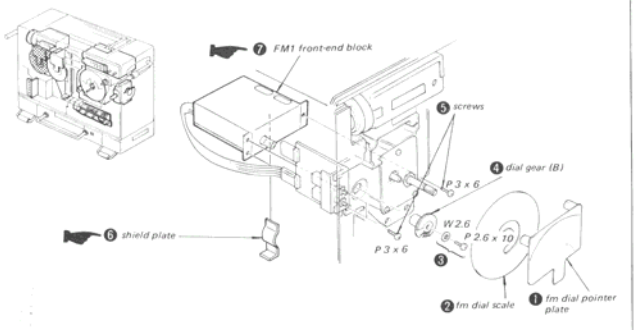
SERIAL NO.

MADE IN JAPAN

2. DISASSEMBLY

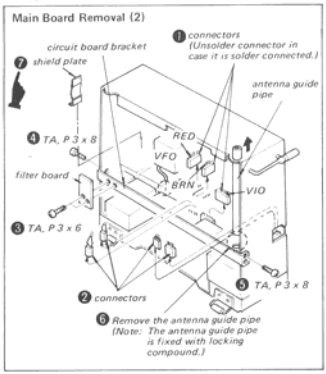
Page 18: changed portions

FM1 Front-end Block Removal



Page 28:

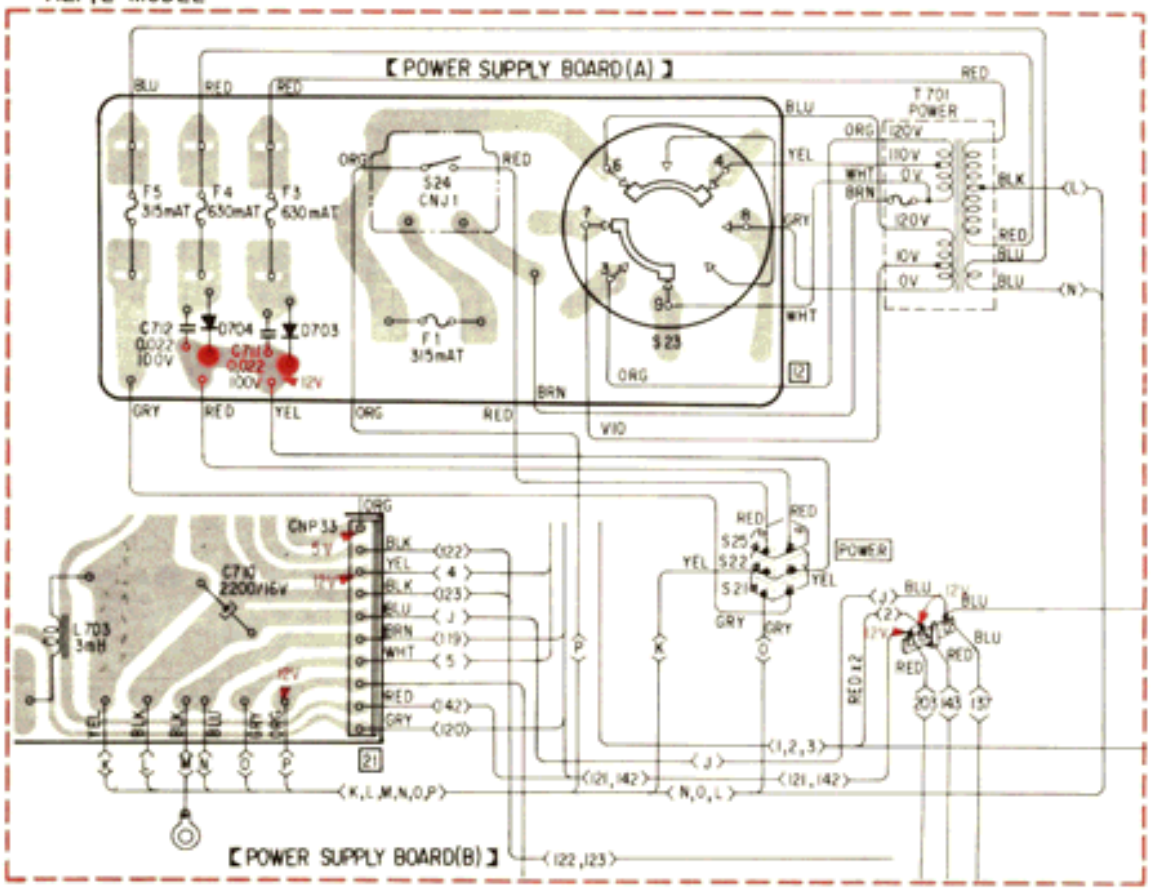
Main Board Removal (2)



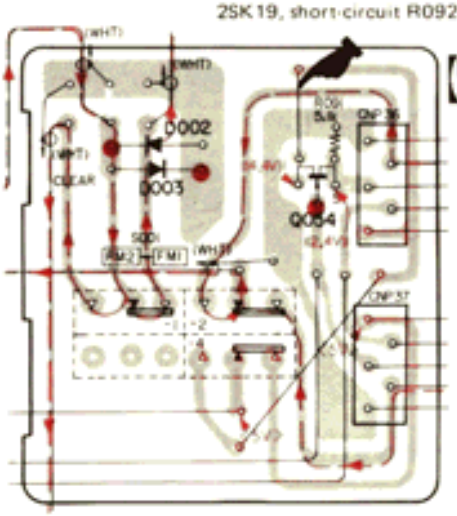
3. MOUNTING DIAGRAM

: changed portion

AEP, E MODEL



Note:
When replacing Q054 2SK23A with 2SK19, short-circuit R092 2 kΩ.

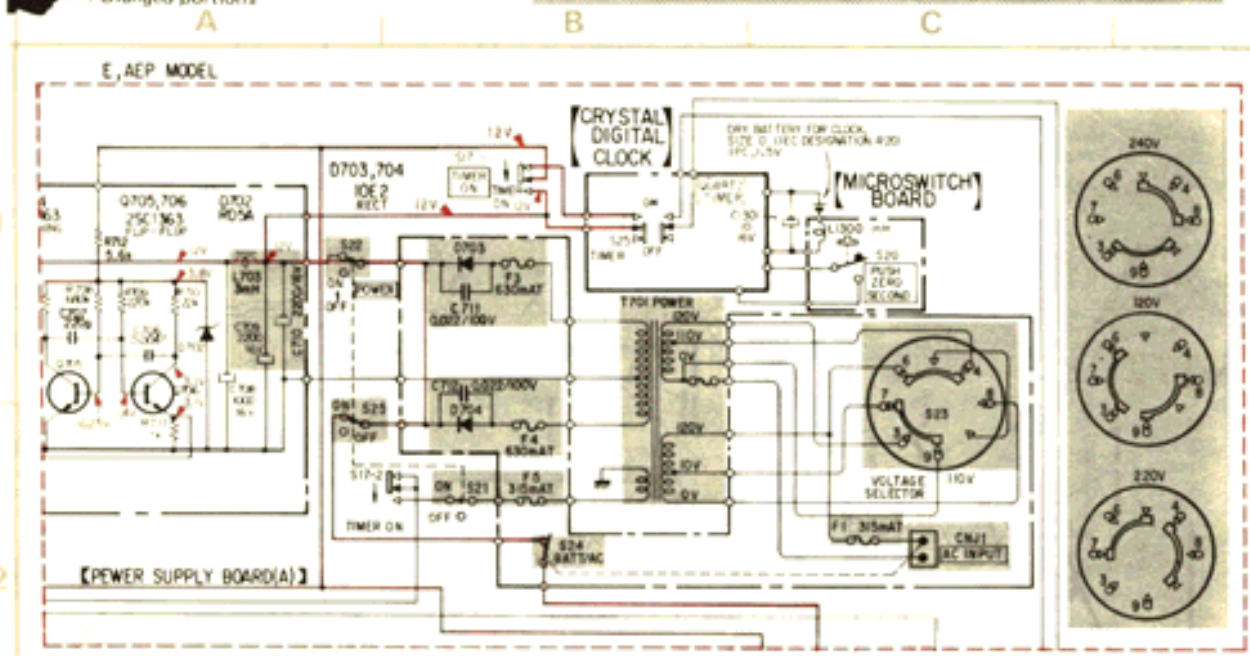


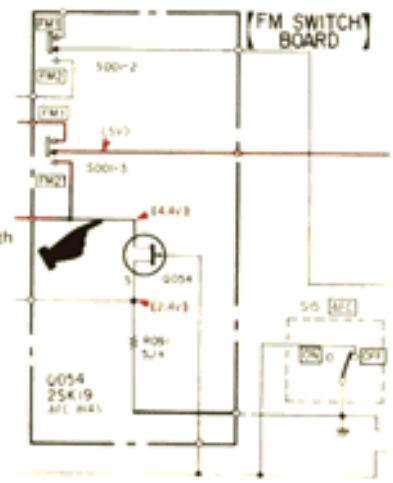
: B+ pattern

4. SCHEMATIC DIAGRAM

Note: The components identified by shading are critical for safety. Replace only with part number specified.

: changed portions

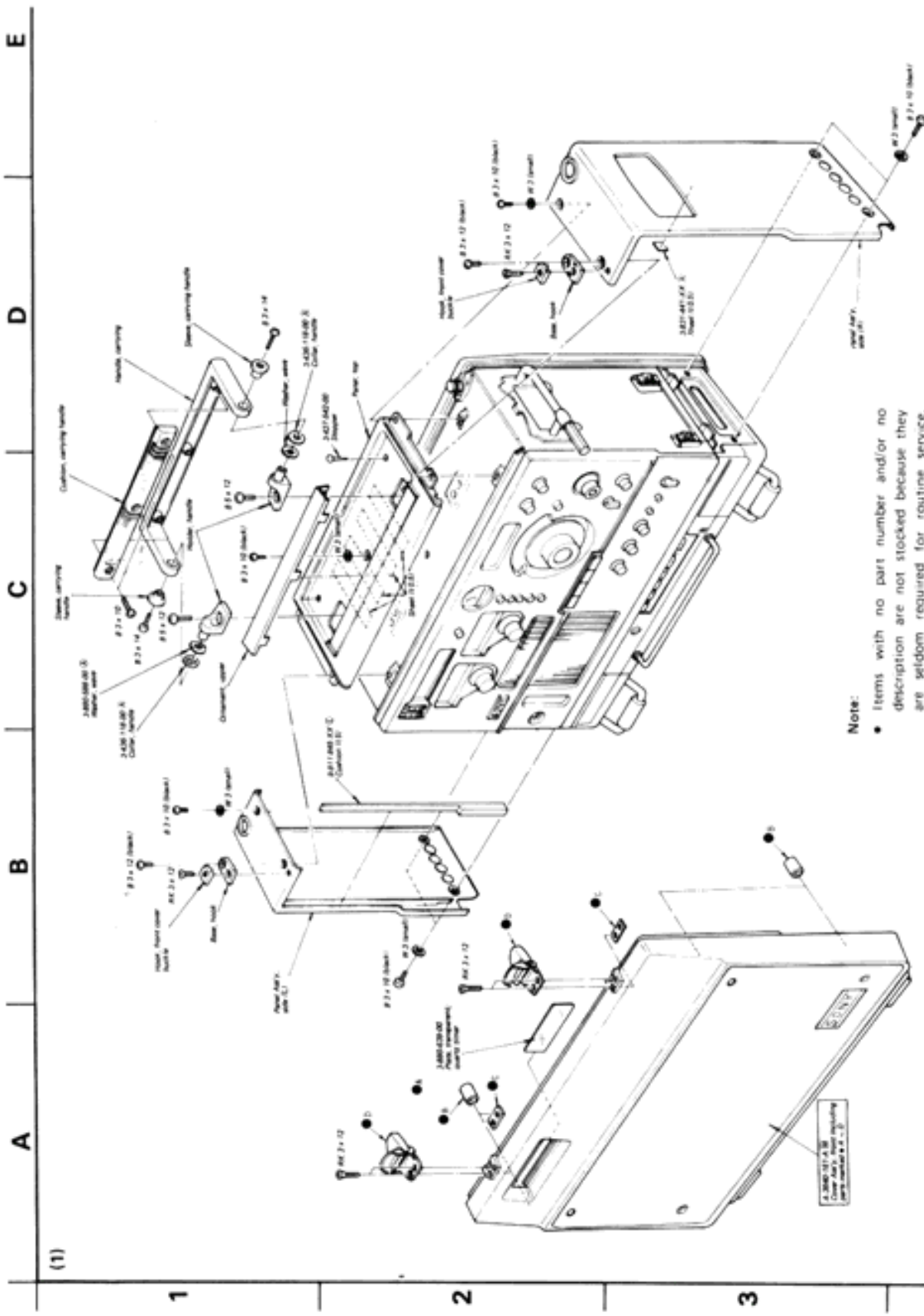




Note:
When replacing Q054 2SK23A with 2SK19, short-circuit R092 2 kΩ.

: B+ pattern

5. EXPLODED VIEWS

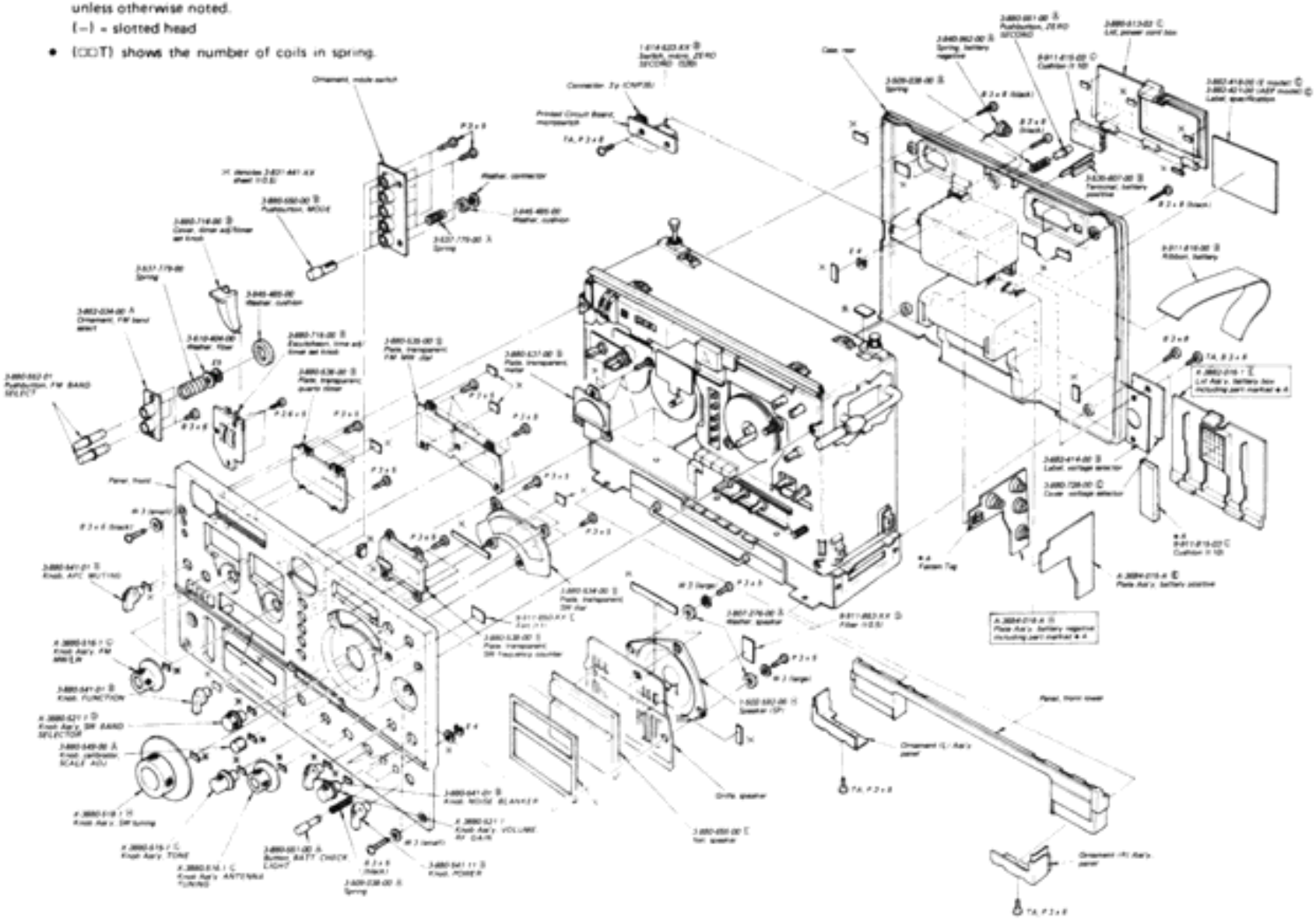


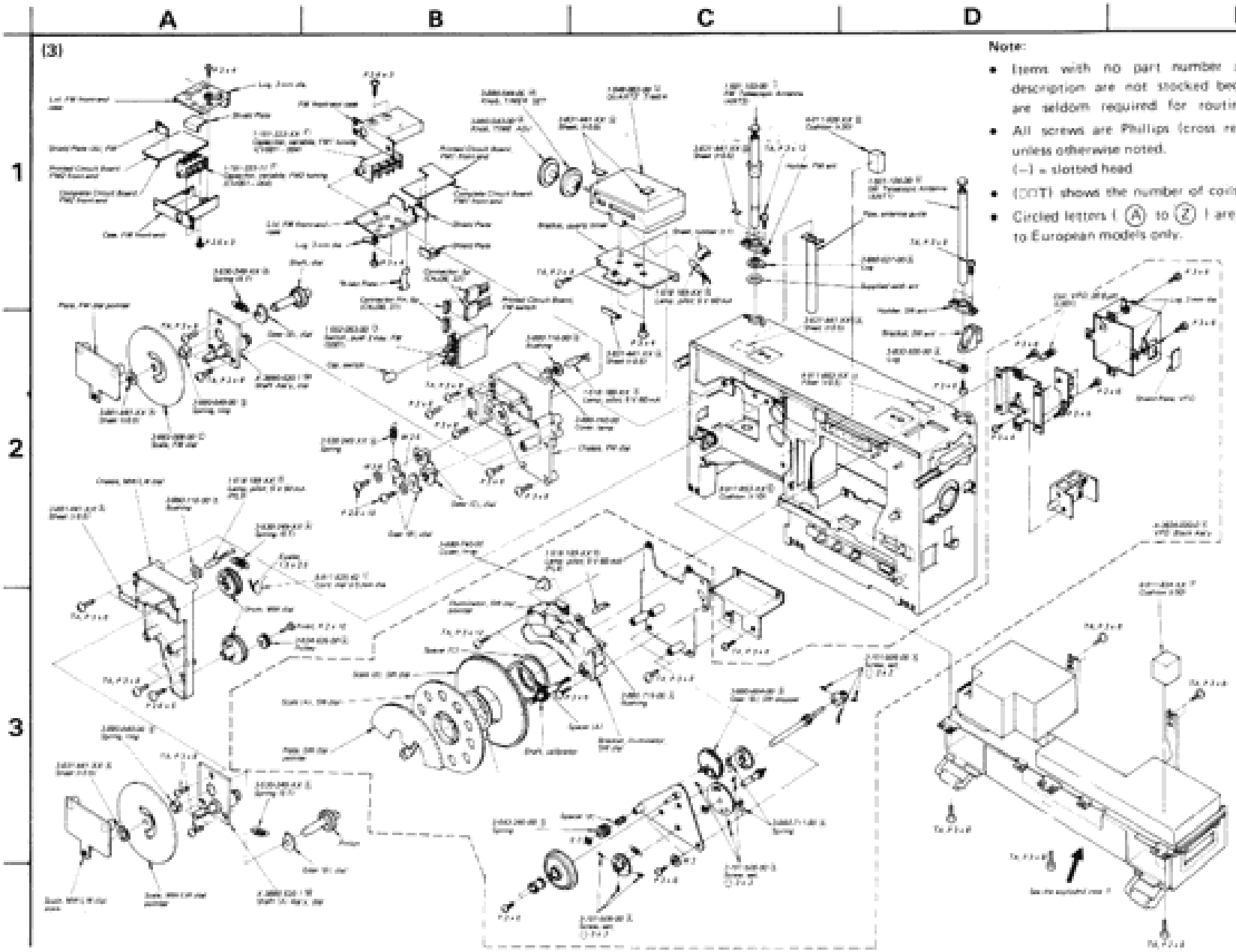
Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) – slotted head
- (□□T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

(2) **Note:**

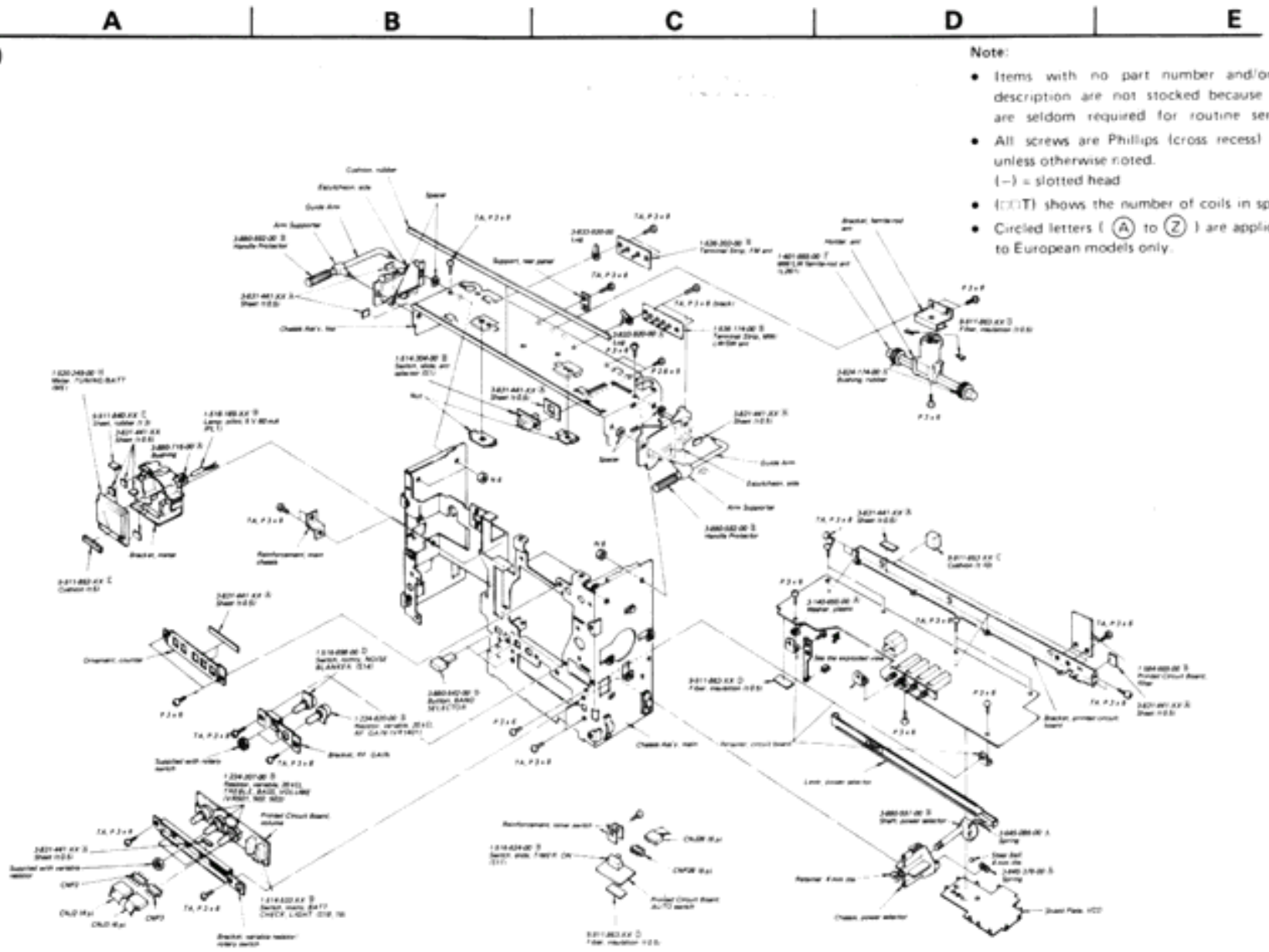
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.





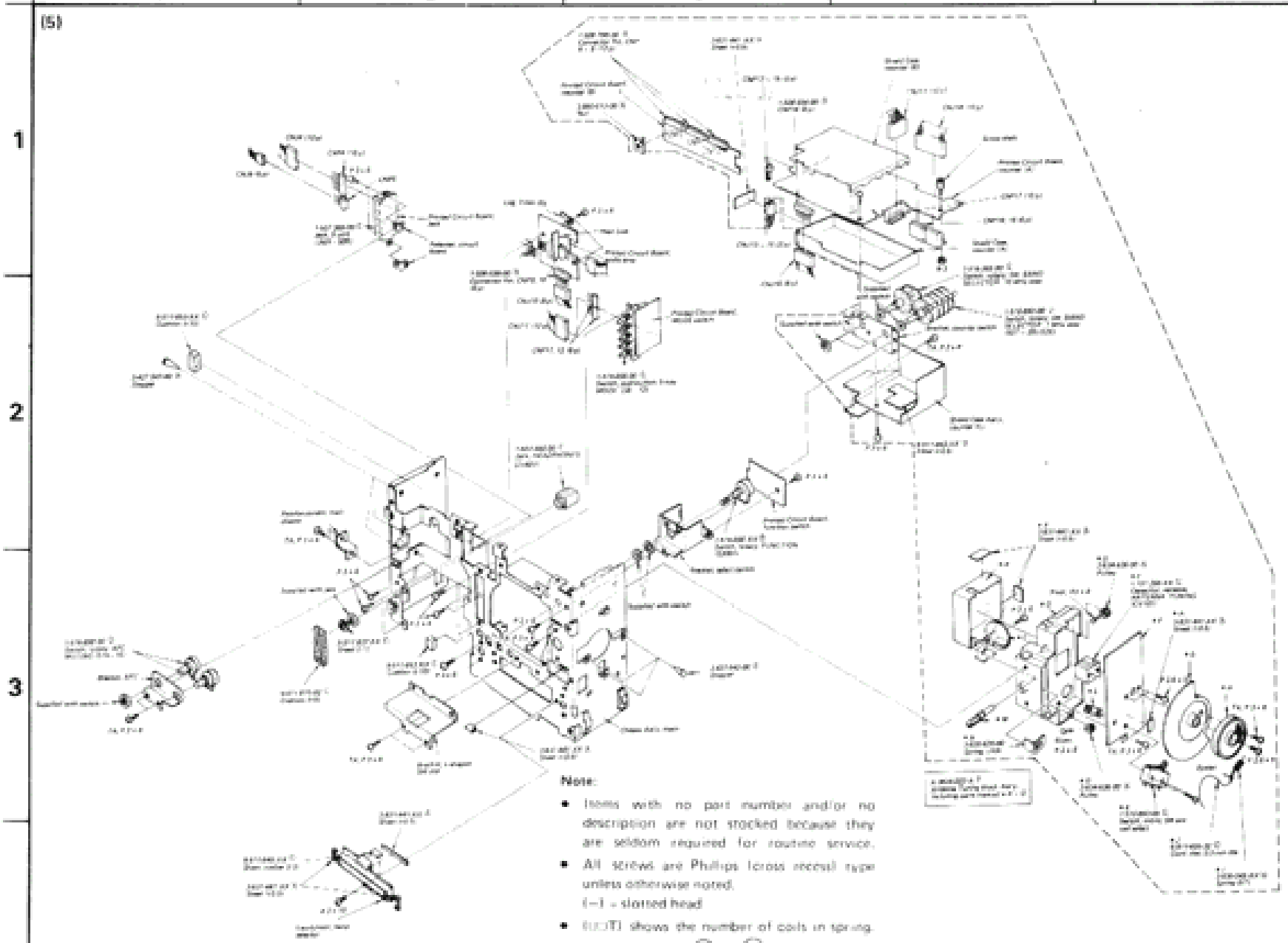
Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.



Note:

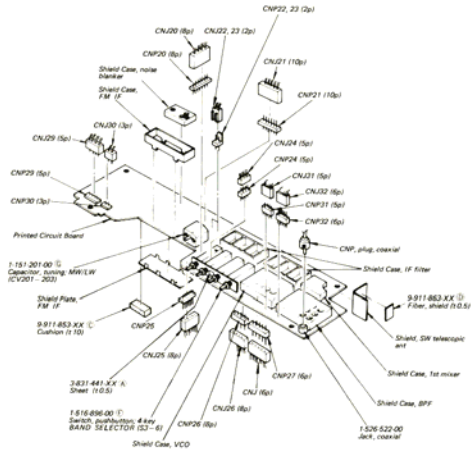
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.



Note:

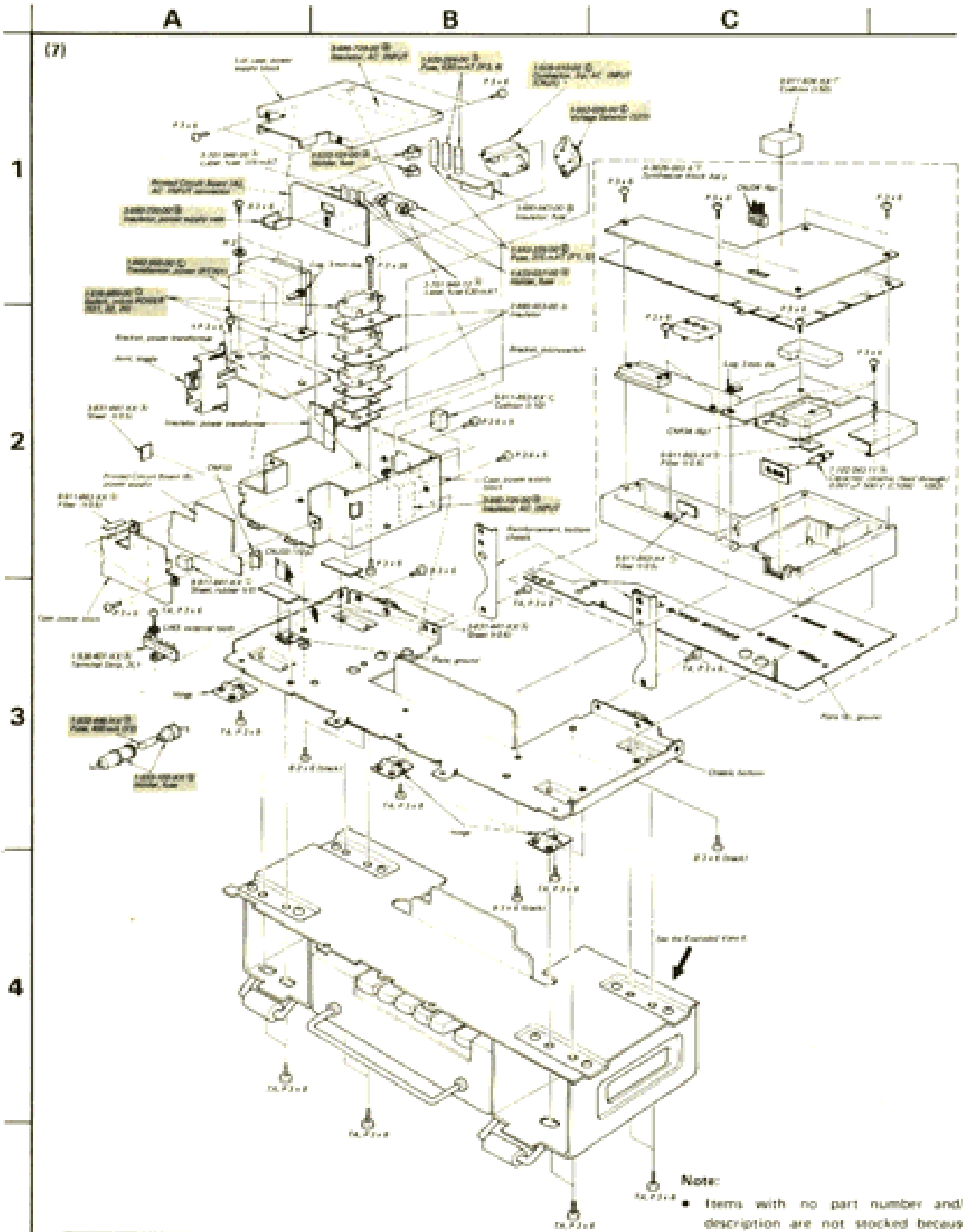
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) - slotted head
- (0.0T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

(6)



Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) – slotted head
- [□□T] shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.



Note: The components identified by shading are critical for safety. Replace only with part number specified.

Note:

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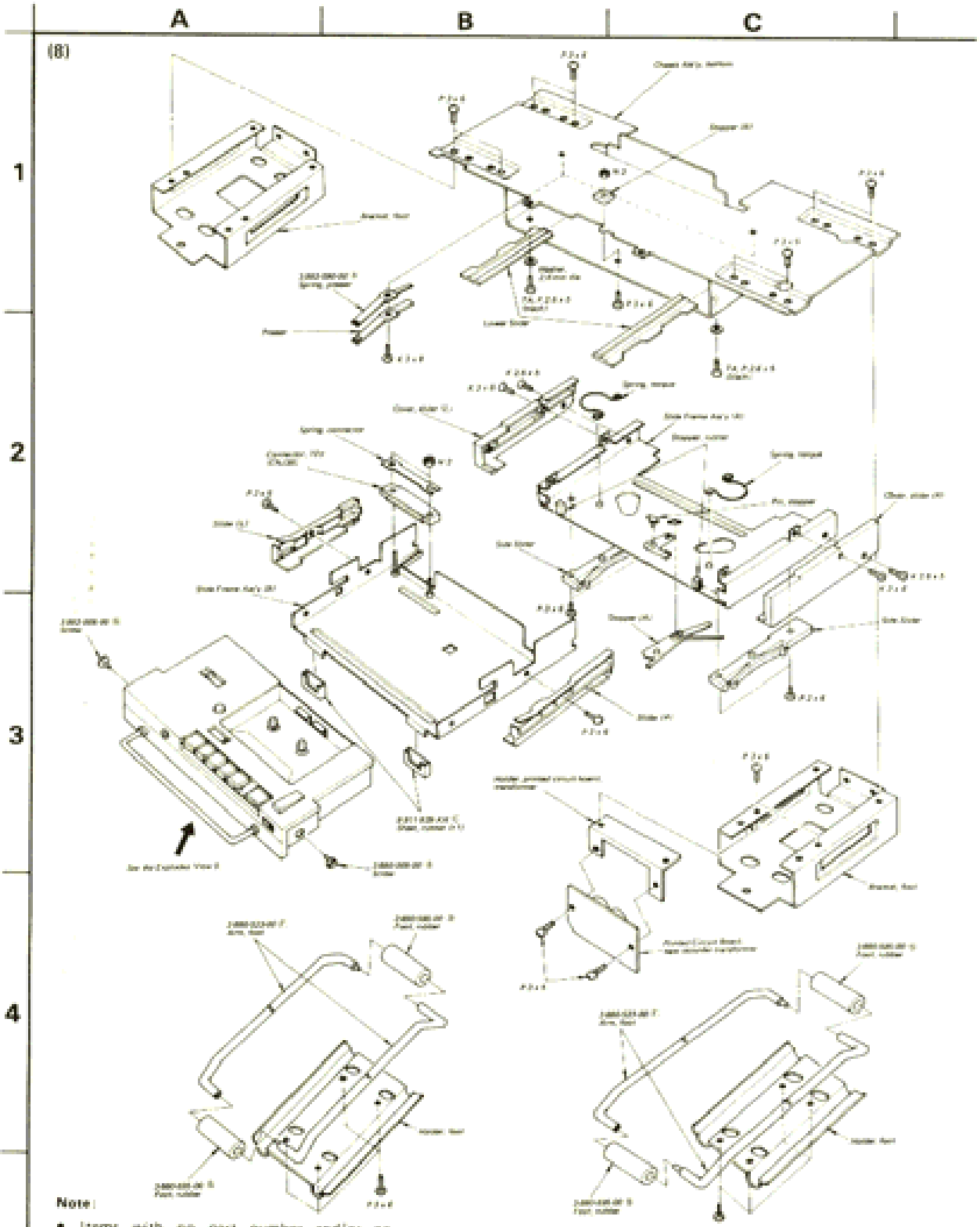
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.



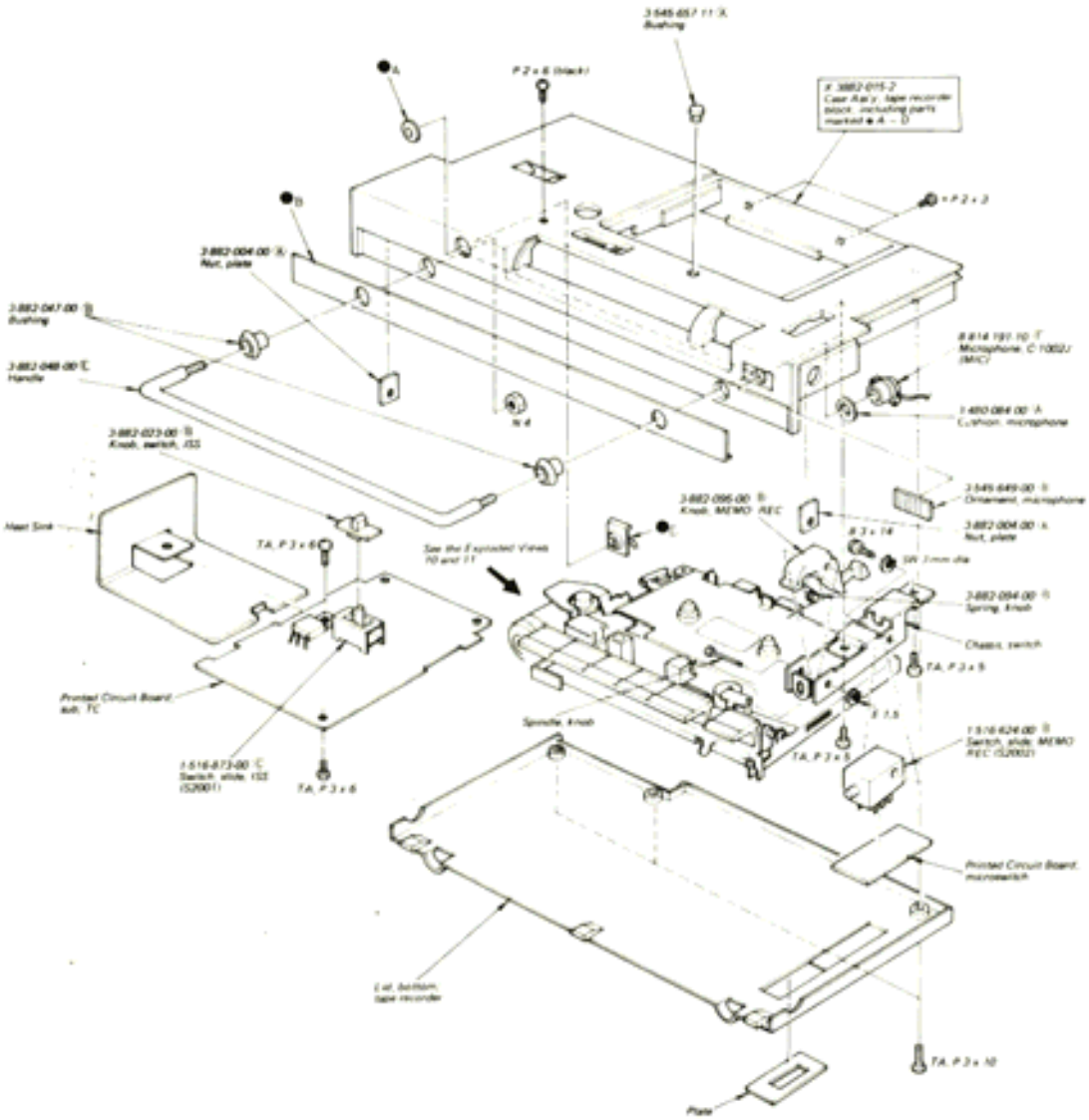
Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Philips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

A B C

1 2 3 4 5

(9)



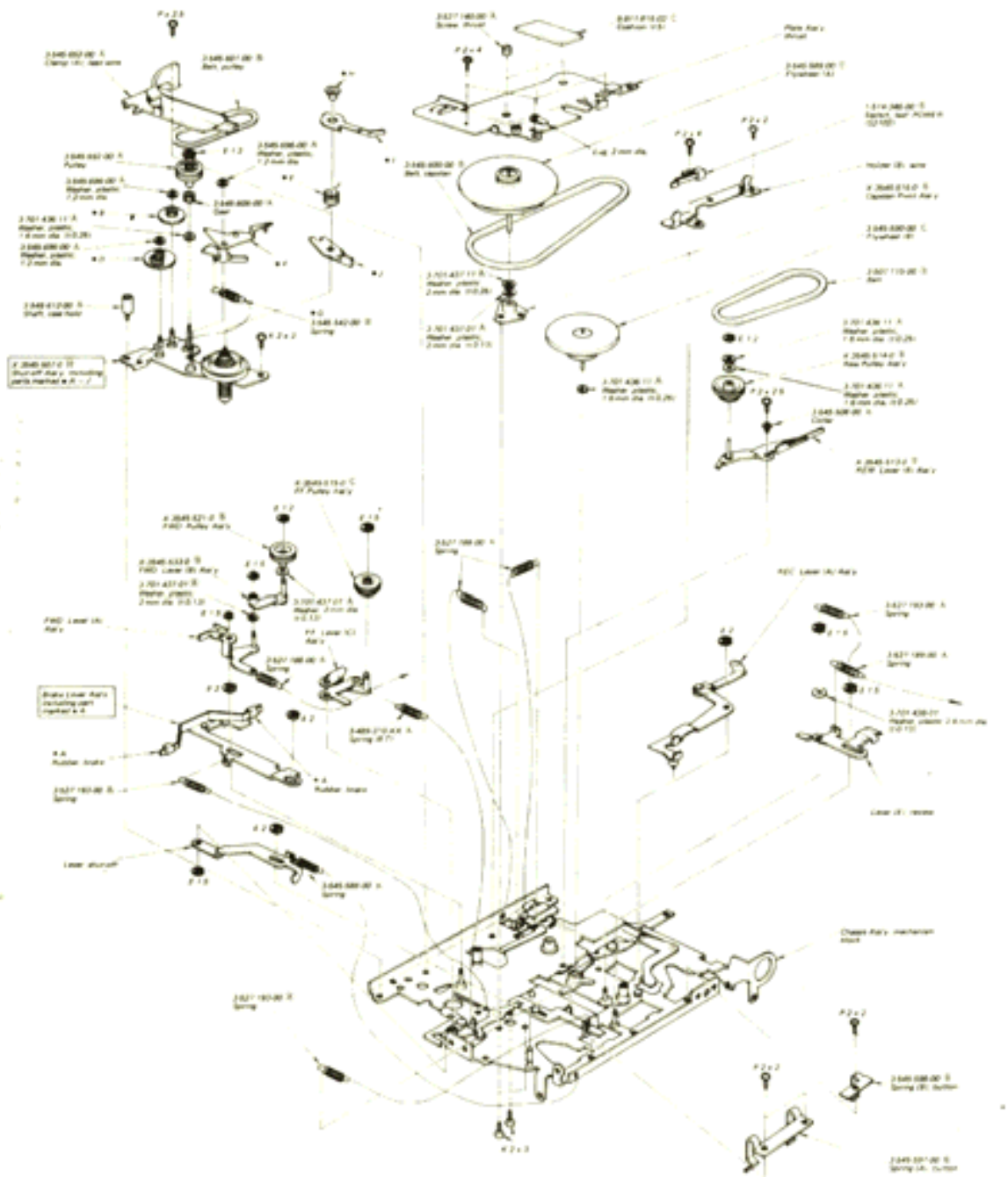
Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

A B C

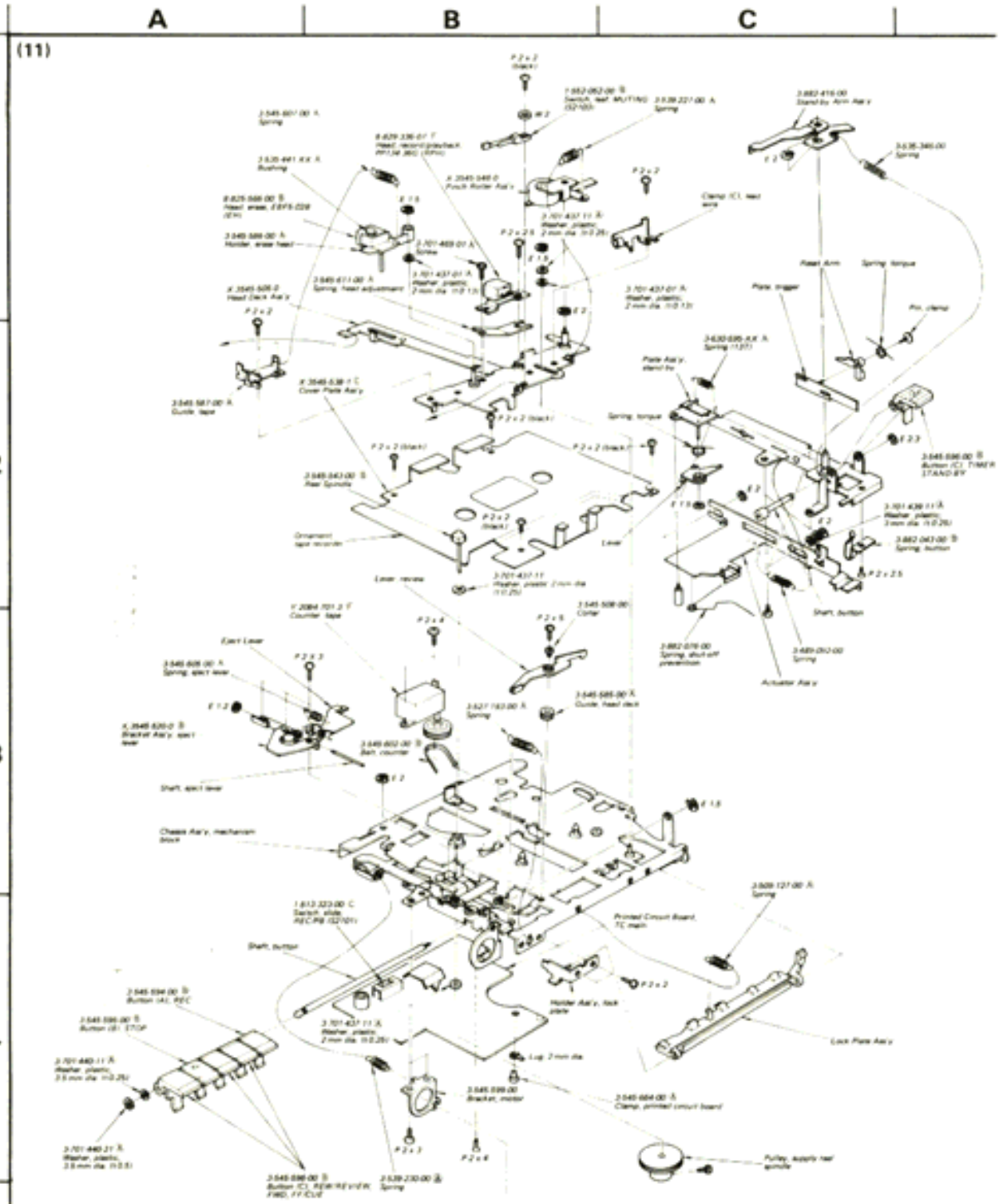
(10)

1 2 3 4 5



Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Philips (cross recess) type unless otherwise noted.
  (−) = slotted head
- [□T] shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.



Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (EIT) shows the number of coils in spring.
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

6. ELECTRICAL PARTS LIST

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	Part No.	Description
		SEMICONDUCTORS
		Transistors
⇒ Q001	Ⓒ	2SK42-1
⇒ Q002	Ⓒ	2SK23A-840
Q003	Ⓑ	2SC710
⇒ Q051	Ⓒ	2SK42-1
⇒ Q052	Ⓒ	2SK23A-840
Q053	Ⓑ	2SC710
⇒ Q054	Ⓑ	2SK23A-860 (US model: Serial No. up to 10200)
	Ⓑ	2SK19-BL (US model serial No. 10201 and later, AEP, E model)
Q201	Ⓔ	3SK37
⇒ Q202, 203	Ⓑ	2SK23A-840
Q204	Ⓔ	3SK37
⇒ Q205, 206	Ⓒ	2SK23A-840
Q207 – 209	Ⓑ	2SC710
⇒ Q210, 211	Ⓑ	2SC710-14
⇒ Q212	Ⓑ	2SC710-15
Q213 – 215	Ⓑ	2SC710
⇒ Q216	Ⓑ	2SC634A
⇒ Q217	Ⓒ	2SA678
⇒ Q218 – 221	Ⓑ	2SC634A
⇒ Q222	Ⓑ	2SC710-14
Q223	Ⓑ	2SC710
⇒ Q224	Ⓒ	2SK42-1
⇒ Q225, 226	Ⓒ	2SC1129
Q227	Ⓕ	3SK37
⇒ Q228	Ⓑ	2SA634A
⇒ Q229	Ⓒ	2SA684
⇒ Q230	Ⓑ	2SC634A
⇒ Q231	Ⓒ	2SA678
Q401	Ⓑ	2SC632A
⇒ Q501	Ⓑ	2SC634A
⇒ Q601	Ⓑ	2SC634A
⇒ Q602, 603	Ⓒ	2SC1429-□5
⇒ Q604	Ⓑ	2SC634A
Q701	Ⓒ	2SA678
⇒ Q702	Ⓒ	2SA684
⇒ Q703 – 706	Ⓑ	2SC634A
Q801 – 803	Ⓑ	2SC710-14
⇒ Q804	Ⓑ	2SC634A
⇒ Q805, 806	Ⓑ	2SC1364
⇒ Q901,	Ⓒ	2SK42-1
⇒ Q902, 903	Ⓔ	2SK23A-824
Q1001, 1002	Ⓔ	3SK37
Q1003, 1004	Ⓑ	2SC710
⇒ Q1006	Ⓒ	2SK23A-825
⇒ Q1007 – 1012	Ⓑ	2SC634A
Q1013 – 1018	Ⓑ	2SC710
Q1019, 1020	Ⓒ	2SC641K
Q1021, 1022	Ⓑ	2SC710
⇒ Q1023, 1024	Ⓑ	2SC634A
Q1025, 1201	Ⓣ	2SK23A-824
Q1202, 1203	Ⓑ	2SC710
⇒ Q1204 – 1212	Ⓑ	2SC1364
⇒ Q1213 – 1216	Ⓒ	2SA678
⇒ Q2001	Ⓓ	2SC1016
⇒ Q2002 – 2005	Ⓑ	2SC634A
⇒ Q2101, 2102	Ⓑ	2SC632A
⇒ Q2103, 2104	Ⓑ	2SC634A
⇒ Q2105	Ⓒ	2SA678
⇒ Q2106, 2107	Ⓑ	2SC634A
Q2108	Ⓑ	2SC1474
		ICs
⇒ IC801, 802	Ⓓ	CX075B
IC1001	Ⓓ	TA7060P
⇒ IC1002	Ⓗ	SN74S113DC
IC1003, 1004	Ⓙ	SN74162N
⇒ IC1005	Ⓚ	μPC1008C
IC1006	Ⓔ	HD74LS00P
IC1007	Ⓓ	TA7060P
IC1201	Ⓚ	34013PC
IC1202	Ⓓ	MSM5505
IC1203	Ⓚ	MSM55H1
IC1204	Ⓕ	MSM530
IC1205 – 1207	Ⓚ	MSM5503
IC1208 – 1210	Ⓗ	MSM561
IC2101	Ⓕ	CX170
⇒ IC2102	Ⓗ	BX295A

⇒: Due to standardization, interchangeable replacements may be substituted for parts specified in the diagrams.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	Part No.	Description
		Diodes
D001, 051		Ⓑ 1S2687S-2
D201 – 209, D211 – 215		Ⓑ 1S1555
D216		Ⓑ 1T23S
D217 – 219		Ⓑ 1S1555
D220, 221		Ⓑ 1T23S
D223, 225		Ⓑ 1S1555
D226, 227		Ⓒ 1T18-0
D228 – 234		Ⓑ 1S2222
D235		Ⓑ 1T261
D236		Ⓑ RD6A
D237 – 241, D401		Ⓑ 1S1555
D601, 602		Ⓑ VD1120
D701		Ⓑ 2SB324
D702		Ⓑ RD5A
D703, 704		Ⓑ 10E2
D801, 802		Ⓑ 1T261
D803 – 807		Ⓑ 1S1555
D1001, 1002		Ⓑ 1T261
D1003, 1004, D1201 – 1204		Ⓑ 1S1555
D2001, 2002		Ⓑ 1S1555
D2003		Ⓒ TLR109 (LED)
D2004, D2101 – 2105		Ⓑ 1S1555
		Thermistors
Th701	1-800-071-XX	Ⓐ S-300
Th1001	1-800-198-XX	Ⓐ S-1K
Th1002	1-800-194-00	Ⓐ S-90
Th2101	1-800-198-00	Ⓐ S-1K
		COILS
L001	1-425-909-00	Ⓑ FM Antenna
L002	1-425-910-00	Ⓑ FM RF
L003	1-425-909-00	Ⓑ FM Antenna
L004	1-405-750-00	Ⓑ FM Osc
L051	1-425-929-00	Ⓑ Coil
L052	1-425-930-00	Ⓑ Coil
L053	1-425-929-00	Ⓑ Coil
L054	1-405-527-21	Ⓑ FM Osc
L201	1-407-178-XX	Ⓐ Microinductor, 1 µH
L210, 215	1-407-741-00	Ⓑ Microinductor, 18 µH
L224	1-407-864-00	Ⓑ RF BPF
L225	1-407-865-00	Ⓑ RF BPF
L228	1-407-864-00	Ⓑ RF BPF
L231	1-407-862-00	Ⓑ RF BPF
L232	1-407-863-00	Ⓑ RF BPF
L235	1-407-862-00	Ⓑ RF BPF
L261	1-401-665-00	Ⓕ MW/LW Ferrite-rod Antenna
L262	1-425-911-00	Ⓑ MW RF
L263	1-425-444-00	Ⓑ LW RF
L264	1-405-717-00	Ⓑ MW Osc
L265	1-405-716-00	Ⓑ LW Osc
L266	1-417-053-00	Ⓓ VCO Matching Transformer
L267	1-407-178-XX	Ⓐ Microinductor, 1 µH
L268	1-433-184-00	Ⓑ VCO (1)
L269	1-433-185-00	Ⓑ VCO (3)
L270	1-433-188-00	Ⓑ VCO (4)
L271	1-433-189-00	Ⓑ VCO (6)
L272	1-433-190-00	Ⓑ VCO (7)
L273	1-433-186-00	Ⓑ VCO (5)
L274	1-433-187-00	Ⓑ VCO (2)
L275	1-425-912-00	Ⓑ Mixing
L282, 283	1-407-661-XX	Ⓐ Microinductor, 470 µH
L287, 288	1-407-157-XX	Ⓐ Microinductor, 10 µH
L289	1-407-661-XX	Ⓐ Microinductor, 470 µH
L290	1-407-178-XX	Ⓐ Microinductor, 1 µH
L401 – 403	1-407-883-00	Ⓒ Microinductor, 100 mH
L701	1-407-857-00	Ⓓ Choke, 3 mH
L702	1-407-884-00	Ⓗ Choke, 6 mH
L703	1-407-857-00	Ⓓ Choke, 3 mH
L804	1-407-169-XX	Ⓐ Microinductor, 100 µH
L1010	1-407-178-XX	Ⓐ Microinductor, 1 µH
L1016	1-407-169-XX	Ⓐ Microinductor, 100 µH

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	Part No.	Description
L1021 – 1023	1-407-856-00	Ⓒ Choke, 1 mH
L1025, 1026	1-407-169-XX	Ⓐ Microinductor, 100 µH
L1201, 1202	1-407-856-00	Ⓒ Choke, 1 mH
L1203	1-407-175-XX	Ⓐ Microinductor, 330 µH
L2011	1-407-175-XX	Ⓐ Microinductor, 330 µH
L2031	1-407-206-XX	Ⓑ Microinductor, 10 mH

TRANSFORMERS

T1	1-433-105-00	Ⓑ Osc
T601	1-423-140-11	Ⓒ Input
FL201	1-403-165-00	Ⓒ Ceramic Filter
FL202A	1-403-888-11	Ⓔ Mechanical Filter
FL202B	1-403-888-21	
FL203A	1-404-024-11	Ⓕ Mechanical Filter
FL203B	1-404-024-21	Ⓑ
IFT001, 051	1-404-031-00	Ⓑ FM IFT
IFT202	1-404-023-00	Ⓑ AM IFT
IFT203	1-403-152-00	Ⓑ AM IFT
IFT204 – 206	1-404-023-00	Ⓑ AM IFT
IFT207	1-459-153-00	Ⓑ BFO
IFT801	1-403-959-00	Ⓑ FM Discriminator
IFT802	1-403-953-00	Ⓑ FM Discriminator
IFT803	1-403-243-00	Ⓑ FM IFT

CAPACITORS

All capacitors are in µF and ceramic unless otherwise noted.
50WV or less are not indicated except for electrolytics.
pF = µµF, elect = electrolytic

Ref. No.	Part No.	Description		
C001	1-102-956-11	Ⓐ 15 p		
C002	1-161-013-11	Ⓐ 0.01		(boundary layer)
C003, 004	1-102-960-11	Ⓐ 24 p		
C005	1-161-013-11	Ⓐ 0.01		(boundary layer)
C006	1-102-972-11	Ⓐ 91 p		
C009	1-161-013-11	Ⓐ 0.01		(boundary layer)
C011	1-102-870-11	Ⓐ 8 p		
C012	1-102-947-11	Ⓐ 10 p		
C013	1-102-870-11	Ⓐ 8 p		
C014	1-161-013-11	Ⓐ 0.01		(boundary layer)
C015	1-127-019-11	Ⓑ 0.1	16 V	solid aluminum
C016	1-121-651-11	Ⓐ 10	16 V	elect
C051	1-102-949-11	Ⓐ 12 p		
C052	1-161-013-11	Ⓐ 0.01		(boundary layer)
C053, 054	1-102-953-11	Ⓐ 18 p		
C055	1-161-013-11	Ⓐ 0.01		(boundary layer)
C056	1-102-972-11	Ⓐ 91 p		
C059	1-161-013-11	Ⓐ 0.01		(boundary layer)
C061	1-102-858-11	Ⓐ 10 p		
C062	1-102-944-11	Ⓐ 7 p		
C063	1-102-663-11	Ⓐ 8 p		
C065	1-127-019-11	Ⓑ 0.1	16 V	solid aluminum
C066	1-121-651-11	Ⓐ 10	16 V	elect
C067	1-101-978-11	Ⓐ 10 p		
C100	1-103-733-11	Ⓐ 0.0022	50 V	polystyrol
C101	1-103-729-11	Ⓐ 0.0015	50 V	polystyrol
C102	1-103-728-11	Ⓐ 0.0013	50 V	polystyrol
C103	1-107-082-11	Ⓐ 75 p		silvered mica
C105	1-101-882-11	Ⓐ 51 p		
C106	1-102-946-11	Ⓐ 9 p		
C107	1-102-975-11	Ⓐ 100 p		
C201 – 203	1-101-118-11	Ⓐ 0.01		
C204	1-101-361-11	Ⓐ 150 p		
C205	1-107-082-11	Ⓐ 75 p		silvered mica
C206	1-107-068-11	Ⓐ 20 p		silvered mica
C207 – 209	1-161-013-11	Ⓐ 0.01		(boundary layer)
C210	1-102-979-11	Ⓐ 240 p		
C211	1-107-081-11	Ⓐ 68 p		silvered mica
C212	1-107-102-11	Ⓐ 5 p		silvered mica
C213	1-101-367-11	Ⓐ 160 p		silvered mica
C214	1-121-651-11	Ⓐ 10	16 V	elect
C215	1-161-013-11	Ⓐ 0.01		(boundary layer)
C216	1-107-079-11	Ⓐ 56 p		silvered mica
C217	1-161-013-11	Ⓐ 0.01		(boundary layer)
C218	1-107-075-11	Ⓐ 39 p		silvered mica

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	Part No.	Description		
C219	1-107-086-11 Ⓐ	110 p		silvered mica
C220	1-107-072-11 Ⓐ	30 p		silvered mica
C221	1-107-086-11 Ⓐ	110 p		silvered mica
C222	1-107-075-11 Ⓐ	39 p		silvered mica
C223	1-121-651-11 Ⓐ	10	16 V	elect
C224	1-107-078-11 Ⓐ	51 p		silvered mica
C225	1-161-013-11 Ⓐ	0.01		(boundary layer)
C226	1-107-074-11 Ⓐ	36 p		silvered mica
C227	1-161-013-11 Ⓐ	0.01		(boundary layer)
C228	1-107-067-11 Ⓐ	18 p		silvered mica
C229	1-107-081-11 Ⓐ	68 p		silvered mica
C230	1-107-066-11 Ⓐ	16 p		silvered mica
C231	1-107-081-11 Ⓐ	68 p		silvered mica
C232	1-107-067-11 Ⓐ	18 p		silvered mica
C233	1-107-071-11 Ⓐ	27 p		silvered mica
C234	1-121-651-11 Ⓐ	10	16 V	elect
C235	1-161-013-11 Ⓐ	0.01		(boundary layer)
C236	1-102-507-11 Ⓐ	9 p		
C237	1-161-013-11 Ⓐ	0.01		(boundary layer)
C238	1-102-511-11 Ⓐ	13 p		
C239	1-102-516-11 Ⓐ	27 p		
C240	1-102-510-11 Ⓐ	12 p		
C241	1-102-516-11 Ⓐ	27 p		
C242	1-102-511-11 Ⓐ	13 p		
C243	1-102-501-11 Ⓐ	1 p		
C244	1-121-651-11 Ⓐ	10	16 V	elect
C245	1-161-013-11 Ⓐ	0.01		(boundary layer)
C246	1-102-505-11 Ⓐ	6 p		
C247	1-161-013-11 Ⓐ	0.01		(boundary layer)
C248	1-102-864-11 Ⓐ	5 p		
C249	1-102-514-11 Ⓐ	22 p		
C250	1-102-504-11 Ⓐ	4 p		
C251	1-102-514-11 Ⓐ	22 p		
C252	1-102-864-11 Ⓐ	5 p		
C254	1-121-651-11 Ⓐ	10	16 V	elect
C255	1-161-013-11 Ⓐ	0.01		(boundary layer)
C264	1-107-077-11 Ⓐ	47 p		silvered mica
C265	1-102-125-11 Ⓐ	0.0047		
C266	1-107-079-11 Ⓐ	56 p		silvered mica

Ref. No.	Part No.	Description		
C267	1-107-078-11 Ⓐ	51 p		silvered mica
C268	1-102-074-11 Ⓐ	0.001		
C272	1-107-078-11 Ⓐ	51 p		silvered mica
C273, 274	1-107-079-11 Ⓐ	56 p		silvered mica
C276	1-107-233-11 Ⓐ	430 p		silvered mica
C277	1-102-125-11 Ⓐ	0.0047		
C278	1-107-078-11 Ⓐ	51 p		silvered mica
C280	1-102-944-11 Ⓐ	7 p		
C281 - 290	1-101-924-11 Ⓐ	0.022		
C284	1-108-239-12 Ⓐ	0.01		mylar
C294	1-108-242-12 Ⓐ	0.022		mylar
C295	1-101-924-11 Ⓐ	0.022		
C296	1-107-079-11 Ⓐ	56 p		silvered mica
C297, 298	1-108-239-12 Ⓐ	0.01		mylar
C299	1-107-235-11 Ⓐ	510 p		silvered mica
C302	1-108-563-12 Ⓑ	0.0022		mylar
C303	1-101-924-11 Ⓐ	0.022		
C304	1-121-391-11 Ⓐ	1	50 V	elect
C305, 306	1-108-244-12 Ⓐ	0.033		mylar
C307	1-102-942-11 Ⓐ	5 p		
C308	1-102-949-11 Ⓐ	12 p		
C309	1-102-679-11 Ⓐ	120 p		
C310	1-103-714-11 Ⓐ	360 p	50 V	polystyrol
C312	1-102-964-11 Ⓐ	36 p		
C313, 314	1-102-947-11 Ⓐ	10 p		
C315	1-108-242-12 Ⓐ	0.022		mylar
C318	1-121-414-11 Ⓐ	100	6.3 V	elect
C319	1-102-125-11 Ⓐ	0.0047		
C321	1-102-504-11 Ⓐ	4 p		
C322	1-102-751-11 Ⓐ	22 p		
C323	1-102-526-11 Ⓐ	75 p		
C324	1-101-999-11 Ⓐ	10 p		
C325	1-102-755-11 Ⓐ	43 p		
C326	1-102-743-11 Ⓐ	3 p		
C328	1-102-112-11 Ⓐ	330 p		
C329 - 335	1-102-125-11 Ⓐ	0.0047		
C337	1-102-505-11 Ⓐ	6 p		
C338	1-102-074-11 Ⓐ	0.001		
C340	1-102-074-11 Ⓐ	0.001		

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only

Ref. No.	Part No.	Description		
C341	1-121-413-11 Ⓐ	100	6.3 V	elect
C345	1-101-924-11 Ⓐ	0.022		
C346	1-107-235-11 Ⓐ	510 p		silvered mica
C350	1-107-071-11 Ⓐ	27 p		silvered mica
C351	1-101-924-11 Ⓐ	0.022		
C353	1-108-242-12 Ⓐ	0.022		mylar
C356, 357	1-108-242-12 Ⓐ	0.022		mylar
C358	1-101-924-11 Ⓐ	0.022		
C359	1-121-651-11 Ⓐ	10	16 V	elect
C360, 361	1-101-924-11 Ⓐ	0.022		
C362	1-102-832-11 Ⓐ	330 p		
C363	1-121-651-11 Ⓐ	10	16 V	elect
C364	1-102-114-11 Ⓐ	470 p		
C365	1-127-022-11 Ⓐ	0.47	16 V	solid aluminum
C367	1-127-023-11 Ⓑ	1	10 V	solid aluminum
C368	1-107-102-11 Ⓑ	5 p		silvered mica
C371	1-108-239-12 Ⓐ	0.01		mylar
C372	1-108-242-12 Ⓐ	0.022		mylar
C373	1-101-924-11 Ⓐ	0.022		
C374	1-107-085-11 Ⓐ	100 p		silvered mica
C377	1-123-070-11 Ⓒ	2200	16 V	elect
C378	1-121-943-11 Ⓑ	1000	10 V	elect
C380	1-108-234-12 Ⓐ	0.0047		mylar
C383, 384	1-101-924-11 Ⓐ	0.022		
C385	1-102-934-11 Ⓐ	1 p		
C386	1-102-935-11 Ⓐ	2 p		
C387	1-161-013-11 Ⓐ	0.01		(boundary layer)
C390	1-127-023-11 Ⓑ	1	10 V	solid aluminum
C401	1-127-018-11 Ⓑ	0.047	10 V	solid aluminum
C402	1-108-244-12 Ⓐ	0.033		mylar
C403	1-121-951-11 Ⓐ	0.47	50 V	elect
C404	1-127-019-11 Ⓑ	0.1	10 V	solid aluminum
C405	1-127-022-11 Ⓑ	0.47	10 V	solid aluminum
C406	1-127-020-11 Ⓑ	0.22	10 V	solid aluminum
C407	1-121-415-11 Ⓑ	100	16 V	elect
C408	1-102-099-11 Ⓐ	0.0015		
C409	1-108-244-12 Ⓐ	0.033		mylar
C410	1-161-015-11 Ⓐ	0.015		(boundary layer)
C411	1-161-021-11 Ⓐ	0.47		(boundary layer)
C412	1-127-019-11 Ⓑ	0.1	10 V	solid aluminum
C501	1-127-377-11 Ⓑ	0.22	16 V	solid aluminum
C502	1-101-918-11 Ⓐ	0.001		
C504	1-121-415-11 Ⓑ	100	16 V	elect
C505	1-127-377-11 Ⓑ	0.22	16 V	solid aluminum
C506	1-127-018-11 Ⓑ	0.0047	10 V	solid aluminum
C507	1-127-378-11 Ⓑ	0.68	10 V	solid aluminum
C509	1-127-378-11 Ⓑ	0.68	10 V	solid aluminum
C601	1-121-415-11 Ⓑ	100	16 V	elect
C602	1-127-377-11 Ⓑ	0.22	16 V	solid aluminum
C603	1-102-975-11 Ⓐ	100 p		
C604	1-102-074-11 Ⓐ	0.001		
C605	1-121-479-11 Ⓐ	22	16 V	elect
C606	1-161-015-11 Ⓐ	0.015		(boundary layer)
C607	1-161-019-11 Ⓐ	0.033		(boundary layer)
C608, 609	1-121-521-11 Ⓑ	330	16 V	elect
C610	1-127-203-11 Ⓑ	0.33	16 V	solid aluminum
C611, 612	1-121-939-11 Ⓑ	470	16 V	elect
C613	1-102-123-11 Ⓐ	0.0033		
C614	1-102-119-11 Ⓐ	0.0015		
C701	1-123-078-11 Ⓑ	2200	6.3 V	elect
C702	1-121-944-11 Ⓕ	1000	16 V	elect
C704	1-108-232-12 Ⓐ	0.0033		mylar
C705	1-101-923-11 Ⓐ	0.01		
C706	1-108-234-12 Ⓐ	0.0047		mylar
C707	1-107-093-11 Ⓐ	220 p		silvered mica
C708	1-121-944-11 Ⓕ	1000	16 V	elect
C709, 710	**1-121-660-11 Ⓑ**	**2200**	**16 V**	**elect**
C711, 712	1-108-381-12 Ⓐ	0.022	100 V	mylar
C805	1-121-413-11 Ⓐ	100	6.3 V	elect
C810	1-101-924-11 Ⓐ	0.022		
C812	1-102-964-11 Ⓐ	36 p		
C813	1-101-924-11 Ⓐ	0.022		
C814	1-108-234-12 Ⓐ	0.0047		mylar
C815	1-121-651-11 Ⓐ	10	16 V	elect
C816	1-108-228-12 Ⓐ	0.0015		

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*		
C817	1-127-022-11 Ⓑ	0.47	16 V	solid aluminum
C819	1-102-962-11 Ⓐ	30 p		
C823	1-102-940-11 Ⓐ	3 p		
C824	1-131-196-11 Ⓑ	2.2	20 V	tantalum
C825	1-102-940-11 Ⓐ	3 p		
C829	1-127-019-11 Ⓐ	0.1	16 V	solid aluminum
C832	1-101-924-11 Ⓐ	0.022		
C835	1-121-982-11 Ⓐ	470	6.3 V	elect
C836	1-121-426-11 Ⓑ	470	16 V	elect
C901	1-102-648-11 Ⓐ	43 p		
C902	1-102-672-11 Ⓐ	24 p		
C904	1-107-068-11 Ⓐ	20 p		silvered mica
C905	1-107-089-11 Ⓐ	150 p		silvered mica
C906	1-107-092-11 Ⓐ	200 p		silvered mica
C907	1-108-279-12 Ⓐ	0.015		mylar
C908	1-107-099-11 Ⓐ	2 p		silvered mica
C909	1-107-098-11 Ⓐ	1 p		silvered mica
C910	1-108-279-12 Ⓐ	0.015		mylar
C911	1-107-071-11 Ⓐ	27 p		silvered mica
C912	1-107-085-11 Ⓐ	100 p		silvered mica
C913, 914	1-108-279-12 Ⓐ	0.015		mylar
C1002	1-102-953-11 Ⓐ	18 p		
C1004, 1005	1-107-087-11 Ⓐ	120 p		silvered mica
C1007 – 1009	1-107-097-11 Ⓐ	330 p		silvered mica
C1010 – 1012	1-107-087-11 Ⓐ	120 p		silvered mica
C1013	1-102-949-11 Ⓐ	12 p		
C1016, 1017	1-107-087-11 Ⓐ	120 p		silvered mica
C1018	1-102-949-11 Ⓐ	12 p		
C1021, 1022	1-107-087-11 Ⓐ	120 p		silvered mica
C1024	1-161-013-XX Ⓐ	0.01		(boundary layer)
C1025, 1026	1-101-923-11 Ⓐ	0.01		
C1028	1-101-923-11 Ⓐ	0.01		
C1029	1-101-924-11 Ⓐ	0.022		
C1030	1-102-506-11 Ⓐ	7 p		
C1031	1-102-503-11 Ⓐ	3 p		
C1032	1-102-512-11 Ⓐ	16 p		

Ref. No.	*Part No.*	*Description*		
C1033	1-102-503-11 Ⓐ	3 p		
C1034	1-102-505-11 Ⓐ	6 p		
C1035 – 1037	1-101-923-11 Ⓐ	0.01		
C1038, 1039	1-101-924-11 Ⓐ	0.022		
C1040	1-102-864-11 Ⓐ	5 p		
C1041	1-102-951-11 Ⓐ	15 p		
C1042	1-102-504-11 Ⓐ	4 p		
C1043	1-102-948-11 Ⓐ	11 p		
C1044	1-102-943-11 Ⓐ	6 p		
C1045	1-102-949-11 Ⓐ	12 p		
C1046	1-102-503-11 Ⓐ	3 p		
C1047	1-161-013-11 Ⓐ	0.01		(boundary layer)
C1049	1-101-924-11 Ⓐ	0.022		
C1055	1-101-923-11 Ⓐ	0.01		
C1059	1-102-121-11 Ⓐ	0.0022		
C1060 – 1065	1-101-923-11 Ⓐ	0.01		
C1066	1-102-977-11 Ⓐ	200 p		
C1067	1-102-973-11 Ⓐ	100 p		
C1068	1-161-021-11 Ⓐ	0.0047		(boundary layer)
C1069	1-107-070-11 Ⓐ	24 p		silvered mica
C1070	1-102-409-11 Ⓒ	30 p		
C1071, 1072	1-102-121-11 Ⓐ	0.0022		
C1073	1-121-413-11 Ⓐ	100	6.3 V	elect
C1074	1-121-352-11 Ⓐ	47	10 V	elect
C1075, 1076	1-131-236-11 Ⓑ	1	25 V	tantalum
C1077	1-102-121-11 Ⓐ	0.0022		
C1078	1-101-880-11 Ⓐ	47 p		
C1079, 1080	1-107-093-11 Ⓐ	220 p		silvered mica
C1081	1-102-963-11 Ⓐ	33 p		
C1082, 1083	1-103-714-11 Ⓐ	360 p		polystyrol
C1084	1-102-963-11 Ⓐ	33 p		
C1085, 1086	1-108-555-12 Ⓑ	0.001		mylar
C1090 – 1092	1-102-043-11 Ⓐ	0.001	500 V	feed-through
C1094	1-121-391-11 Ⓐ	1	50 V	elect
C1095	1-101-880-11 Ⓐ	47 p		

Note: Circled letters (Ⓐ to Ⓙ) are applicable to European models only.

Ref. No.	Part No.	Description		
C1096, 1097	1-121-414-11 Ⓐ	100	10 V	elect
C1098	1-107-061-11 Ⓐ	10 p		silvered mica
C1099	1-161-013-11 Ⓐ	0.01		(boundary layer)
C1100, 1101	1-102-961-11 Ⓐ	27 p		
C1102	1-102-977-11 Ⓐ	200 p		
C1103	1-101-923-11 Ⓐ	0.01		
C1104	1-101-924-11 Ⓐ	0.022		
C1105	1-127-019-11 Ⓑ	0.1	10 V	solid aluminum
C1106	1-101-919-11 Ⓐ	0.0022		
C1107	1-102-043-11 Ⓐ	0.001	500 V	feed-through
C1108	1-102-934-11 Ⓐ	1 p		
C1201	1-121-424-11 Ⓑ	470	6.3 V	elect
C1203	1-131-193-11 Ⓑ	10	10 V	tantalum
C1207	1-131-392-11 Ⓑ	33	3.15 V	tantalum
C1210	1-101-890-11 Ⓐ	75 p		
C1211, 1212	1-108-563-12 Ⓑ	0.0022		mylar
C1213	1-127-019-11 Ⓑ	0.1	10 V	solid aluminum
C1301	1-121-651-11 Ⓐ	10	16 V	elect
C2001	1-121-963-11 Ⓑ	33	25 V	elect
C2021	1-121-352-11 Ⓐ	47	10 V	elect
C2022	1-121-726-11 Ⓐ	0.47	50 V	elect
C2031	1-108-575-12 Ⓑ	0.0068		mylar
C2051	1-108-234-12 Ⓐ	0.0047		mylar
C2052	1-108-227-12 Ⓐ	0.001		mylar
C2110	1-131-387-11 Ⓑ	47	6.3 V	tantalum
C2101	1-131-169-11 Ⓑ	0.47	10 V	tantalum
C2102	1-131-202-11 Ⓑ	1.5	20 V	tantalum
C2103	1-131-380-11 Ⓑ	33	10 V	tantalum
C2104	1-105-669-12 Ⓐ	0.0047		mylar
C2105	1-161-190-11 Ⓐ	0.001		(boundary layer)
C2106	1-105-669-12 Ⓐ	0.0047		mylar
C2108	1-107-123-11 Ⓐ	47 p		silvered mica
C2109	1-131-170-11 Ⓑ	3.3	10 V	tantalum
C2111	1-131-173-11 Ⓒ	33	10 V	tantalum
C2112	1-131-202-11 Ⓑ	1.5	20 V	tantalum
C2113	1-161-190-11 Ⓐ	0.001		(boundary layer)
C2114	1-131-380-11 Ⓑ	33	10 V	tantalum
C2115	1-131-387-11 Ⓑ	47	6.3 V	tantalum

Ref. No.	Part No.	Description		
C2116	1-131-375-11 Ⓑ	4.7	10 V	tantalum
C2117	1-121-419-11 Ⓑ	220	6.3 V	elect
C2118	1-131-368-11 Ⓑ	3.3	16 V	tantalum
C2119	1-131-177-11 Ⓒ	100	3 V	tantalum
C2120	1-131-244-11 Ⓑ	1	6.3 V	tantalum
C2121	1-105-673-12 Ⓐ	0.01		mylar
C2122	1-105-789-12 Ⓑ	0.033		mylar
C2123	1-105-669-12 Ⓐ	0.0047		mylar
C2124	1-131-375-11 Ⓑ	4.7	10 V	tantalum
C2125	1-131-170-11 Ⓑ	3.3	10 V	tantalum
C2126	1-121-420-11 Ⓑ	220	10 V	elect
C2127	1-131-395-11 Ⓑ	100	3 V	tantalum
C2128	1-131-377-11 Ⓑ	33	10 V	tantalum
C2129	1-161-190-11 Ⓐ	0.001		(boundary layer)
C2132	1-161-190-11 Ⓐ	0.001		(boundary layer)
C2133	1-131-368-11 Ⓑ	3.3	16 V	tantalum
C2134	1-108-249-12 Ⓐ	0.068		mylar
	1-161-001-11 Ⓐ	0.001		(boundary layer)
CT1001 - 1003	1-141-171-11 Ⓑ	Trimmer		
CT201 - 206	1-141-171-XX Ⓑ	Trimmer		
CT207	1-141-138-XX Ⓗ	Trimmer		
CT208	1-141-174-00 Ⓗ	Trimmer		
CT209 - 212	1-141-138-XX Ⓗ	Trimmer		
CT901	1-141-175-00 Ⓓ	Trimmer		
CV001 - 004	1-151-223-XX Ⓘ	Tuning		
CV051 - 054	1-151-223-11 Ⓘ	Tuning		
CV101	1-151-266-XX Ⓘ	Tuning		
CV201 - 203	1-151-201-00 Ⓒ	Tuning		

RESISTORS

All resistors are in ohms. Common ¼ W carbon resistors are omitted. Check schematic diagram for values.

R210, 214 R218, 222 R226	1-212-879-11 Ⓐ	82	fusible
R235, 239 R244, 321	1-212-881-11 Ⓐ	100	fusible

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	Part No.	Description		
R363	**1-212-857-11**	**Ⓐ 10**		**fusible**
R501	1-206-475-11	Ⓐ 33	2 W	metal-oxide
R511	1-244-837-11	Ⓐ 33	½ W	carbon
R610	**1-212-869-11**	**Ⓐ 33**	**½ W**	**fusible**
R618, 619	1-207-459-11	Ⓐ 0.47	½ W	wirewound
R620	**1-212-857-11**	**Ⓐ 10**		**fusible**
R836	**1-212-869-11**	**Ⓐ 33**		**fusible**
R1267	**1-212-941-11**	**Ⓐ 2**	**½ W**	**fusible**
R2005	1-212-857-11	Ⓐ 10		fusible
R2101, 2102	1-209-878-11	Ⓐ 1.8 k	1/16 W	carbon
R2103	1-209-781-11	Ⓐ 10	1/16 W	carbon
R2108	1-210-381-11	Ⓐ 33	1/16 W	carbon
R2112	1-209-768-11	Ⓐ 2.2 k	1/16 W	carbon
R2113	1-210-113-11	Ⓐ 18 k	1/16 W	carbon
R2114	1-210-371-11	Ⓐ 1.6 k	1/16 W	carbon
R2115	1-210-363-11	Ⓐ 270	1/16 W	carbon
R2116	1-210-381-11	Ⓐ 33 k	1/16 W	carbon
R2119	1-210-363-11	Ⓐ 270	1/16 W	carbon
R2121	1-209-768-11	Ⓐ 2.2 k	1/16 W	carbon
R2122	1-209-113-11	Ⓐ 18 k	1/16 W	carbon
R2123	1-209-774-11	Ⓐ 5.1 k	1/16 W	carbon
R2124	1-209-770-11	Ⓐ 2.7 k	1/16 W	carbon
R2125	1-210-388-11	Ⓐ 68 k	1/16 W	carbon
R2126	1-210-392-11	Ⓐ 75	1/16 W	carbon
R2127	1-210-101-11	Ⓐ 51	1/16 W	carbon
R2128	1-210-846-11	Ⓐ 33	1/16 W	carbon
R2129	1-209-770-11	Ⓐ 2.7 k	1/16 W	carbon
R2130	1-209-774-11	Ⓐ 5.1 k	1/16 W	carbon
R2131	1-210-111-11	Ⓐ 12 k	1/16 W	carbon
R2132	1-209-781-11	Ⓐ 10 k	1/16 W	carbon
R2135, 2136	1-210-371-11	Ⓐ 1.6 k	1/16 W	carbon
R2137	1-210-102-11	Ⓐ 150	1/16 W	carbon
R2142		1.2 k	1/16 W	carbon
R2144	1-210-105-11	Ⓐ 560	1/16 W	carbon
VR201	1-224-642-XX	Ⓑ 1 k, adjustable; first mixer balance		
VR202	1-224-644-XX	Ⓑ 4.7 k, adjustable; blank level		
VR501 – 503	1-224-207-00	Ⓑ 20 k, variable; TREBLE, BASS, VOLUME		

Ref. No.	Part No.	Description
VR1001	1-224-649-XX	Ⓑ 200 k, adjustable; SW spurious beat
VR1401	1-224-820-00	Ⓗ 20 k, variable; RF GAIN

SWITCHES

S1	1-514-304-00	Ⓑ Slide, antenna selector
S2	1-516-893-00	Ⓔ Micro, SW antenna coil select
S3 – 6	1-516-896-00	Ⓕ Pushbutton, 4-key; BAND SELECTOR
S8 – 12	1-516-895-00	Ⓖ Pushbutton, 5-key; MODE
S14 – 16	1-516-898-00	Ⓓ Rotary, NOISE BLANKER, AFC, MUTING
S17	1-516-624-00	Ⓑ Slide, TIMER ON
S18 – 20	1-514-533-XX	Ⓑ Micro, BATT CHECK, LIGHT, ZERO SECOND
S21, 22	**1-516-889-00**	**Ⓓ Micro, POWER**
S23	**1-552-026-00**	**Ⓔ Voltage Selector**
S25	**1-516-889-00**	**Ⓔ Micro, POWER**
S26	1-516-965-00	Ⓕ Rotary, SW BAND SELECTOR
S27 – 29	1-516-892-00	Ⓘ Rotary, SW BAND SELECTOR
S001	1-552-053-00	Ⓓ Pushbutton, 2-key, FM
S2001	1-516-873-00	Ⓒ Slide, ISS
S2002	1-516-624-00	Ⓑ Slide, MEMO REC
S2003	1-516-898-XX	Ⓓ Rotary, FUNCTION
S2101	1-513-323-00	Ⓒ Slide; REC/PB
S2102	1-514-346-00	Ⓑ Leaf, POWER
S2103	1-552-052-00	Ⓑ Leaf, MUTING

JACKS

J501 – 505	1-507-369-00	Ⓘ Jack, 5-unit; earphone, AUX IN
J1401	1-507-440-00	Ⓒ Jack, HEADPHONES

FUSES

F1	**1-552-235-00**	**Ⓔ 315 mAT**
F2	**1-532-448-XX**	**Ⓑ 400 mA**
F3, 4	**1-532-284-00**	**Ⓓ 630 mAT**
F5	**1-552-235-00**	**Ⓔ 315 mAT**

MISCELLANEOUS

ANT1	1-501-104-00	Ⓗ SW Telescopic Antenna
ANT2	1-501-103-00	Ⓘ FM Telescopic Antenna

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*
CF801 – 803	1-527-184-XX	Ⓑ Filter, ceramic (10.7 MHz)
CNJ1	**1-509-510-00**	**Ⓒ Connector, 2-p; AC IN, including S24**
CNJ38	1-507-302-00	Ⓒ Connector, 10 p
CNP5	1-508-743-00	Ⓑ Connector Pin
CNP6 – 8	1-508-795-00	Ⓑ Connector Pin, 12 p
CNP9, 10	1-508-699-00	Ⓑ Connector Pin, 8 p
CNP16	1-508-694-00	Ⓑ Connector Pin, 8 p
CNP28	1-508-698-00	Ⓑ Connector, 6 p
CR801	1-231-202-00	Ⓑ Encapsulated Component
EH	8-825-566-00	Ⓑ Head, erase; EBE5-02B
M	8-834-221-00	Ⓛ Motor, D-221F
ME	1-520-249-00	Ⓗ Meter, TUNING/BATT
MIC	8-814-191-10	Ⓕ Microphone, C-1002J
PL1	1-518-138-XX	Ⓑ Lamp, pilot; 5 V 60 mA; meter, timer
PL2, 3	1-518-189-XX	Ⓑ Lamp, pilot; 5 V 60 mA; meter, timer
PL4 – 5	1-518-138-XX	Ⓑ Lamp, pilot; 5 V 60 mA; meter, timer
PT701	**1-442-950-00**	**Ⓛ Transformer, power**
RPH	8-829-336-07	Ⓕ Head, record/playback; PP134-36G
SP	1-502-592-00	Ⓗ Speaker
X201	1-527-270-00	Ⓘ Crystal
X202	1-527-271-00	Ⓘ Crystal
X1002	1-527-269-00	Ⓚ Crystal

Ref. No.	*Part No.*	*Description*
	1-407-856-00	Ⓒ Choke Coil, power
	1-423-230-00	Ⓗ Transformer, output
	1-526-522-00	Ⓑ Jack, coaxial connector
	1-533-037-00	**Ⓐ Holder, fuse**
	1-533-102-00	**Ⓑ Holder, fuse**
	1-533-131-00	**Ⓐ Holder, fuse**
	1-536-174-00	Ⓑ Terminal Strip, MW/LW/SW antenna
	1-536-203-00	Ⓑ Terminal Strip, FM antenna
	1-536-401-XX	Ⓐ Terminal Strip, 2L1
	1-548-082-00	Ⓤ QUARTZ TIMER

ACCESSORIES & PACKING MATERIALS

Part No.	*Description*
1-504-059-00	Ⓒ Earphone, EM-20H
1-534-840-00	**Ⓕ Cord, power; DK-38 (AEP model)**
1-551-235-00	**Ⓔ Cord, power; DK-51 (E model)**
3-701-632-00	Ⓐ Bag, plastic
3-880-697-00	Ⓐ Bag, plastic
3-882-401-00	Ⓒ Cushion, protection
3-882-410-00	Ⓗ Carton
3-993-063-14	Ⓑ Book, SHORT WAVE GUIDE
3-995-763-11	Ⓘ Manual, instruction

Note: The components identified by shading are critical for safety. Replace only with part number specified.

1/4 WATT CARBON RESISTORS

Ω	Part No.	Ω	Part No.	Ω	Part No.	Ω	Part No.	Ω	Part No.	Ω	Part No.	Ω	Part No.
1.0	1 244 601 11	10	1 244 625 11	100	1 244 649 11	1.0k	1 244 673 11	10k	1 244 697 11	100k	1 244 721 11	1.0M	1 244 745 11
1.1	1 244 602 11	11	1 244 626 11	110	1 244 650 11	1.1k	1 244 674 11	11k	1 244 698 11	110k	1 244 722 11	1.1M	1 244 746 11
1.2	1 244 603 11	12	1 244 627 11	120	1 244 651 11	1.2k	1 244 675 11	12k	1 244 699 11	120k	1 244 723 11	1.2M	1 244 747 11
1.3	1 244 604 11	13	1 244 628 11	130	1 244 652 11	1.3k	1 244 676 11	13k	1 244 700 11	130k	1 244 724 11	1.3M	1 244 748 11
1.5	1 244 605 11	15	1 244 629 11	150	1 244 653 11	1.5k	1 244 677 11	15k	1 244 701 11	150k	1 244 725 11	1.5M	1 244 749 11
1.6	1 244 606 11	16	1 244 630 11	160	1 244 654 11	1.6k	1 244 678 11	16k	1 244 702 11	160k	1 244 726 11	1.6M	1 244 750 11
1.8	1 244 607 11	18	1 244 631 11	180	1 244 655 11	1.8k	1 244 679 11	18k	1 244 703 11	180k	1 244 727 11	1.8M	1 244 751 11
2.0	1 244 608 11	20	1 244 632 11	200	1 244 656 11	2.0k	1 244 680 11	20k	1 244 704 11	200k	1 244 728 11	2.0M	1 244 752 11
2.2	1 244 609 11	22	1 244 633 11	220	1 244 657 11	2.2k	1 244 681 11	22k	1 244 705 11	220k	1 244 729 11	2.2M	1 244 753 11
2.4	1 244 610 11	24	1 244 634 11	240	1 244 658 11	2.4k	1 244 682 11	24k	1 244 706 11	240k	1 244 730 11	2.4M	1 244 754 11
2.7	1 244 611 11	27	1 244 635 11	270	1 244 659 11	2.7k	1 244 683 11	27k	1 244 707 11	270k	1 244 731 11	2.7M	1 244 755 11
3.0	1 244 612 11	30	1 244 636 11	300	1 244 660 11	3.0k	1 244 684 11	30k	1 244 708 11	300k	1 244 732 11	3.0M	1 244 756 11
3.3	1 244 613 11	33	1 244 637 11	330	1 244 661 11	3.3k	1 244 685 11	33k	1 244 709 11	330k	1 244 733 11	3.3M	1 244 757 11
3.6	1 244 614 11	36	1 244 638 11	360	1 244 662 11	3.6k	1 244 686 11	36k	1 244 710 11	360k	1 244 734 11	3.6M	1 244 758 11
3.9	1 244 615 11	39	1 244 639 11	390	1 244 663 11	3.9k	1 244 687 11	39k	1 244 711 11	390k	1 244 735 11	3.9M	1 244 759 11
4.3	1 244 616 11	43	1 244 640 11	430	1 244 664 11	4.3k	1 244 688 11	43k	1 244 712 11	430k	1 244 736 11	4.3M	1 244 760 11
4.7	1 244 617 11	47	1 244 641 11	470	1 244 665 11	4.7k	1 244 689 11	47k	1 244 713 11	470k	1 244 737 11	4.7M	1 244 761 11
5.1	1 244 618 11	51	1 244 642 11	510	1 244 666 11	5.1k	1 244 690 11	51k	1 244 714 11	510k	1 244 738 11	5.1M	1 244 762 11
5.6	1 244 619 11	56	1 244 643 11	560	1 244 667 11	5.6k	1 244 691 11	56k	1 244 715 11	560k	1 244 739 11		
6.2	1 244 620 11	62	1 244 644 11	620	1 244 668 11	6.2k	1 244 692 11	62k	1 244 716 11	620k	1 244 740 11		
6.8	1 244 621 11	68	1 244 645 11	680	1 244 669 11	6.8k	1 244 693 11	68k	1 244 717 11	680k	1 244 741 11		
7.5	1 244 622 11	75	1 244 646 11	750	1 244 670 11	7.5k	1 244 694 11	75k	1 244 718 11	750k	1 244 742 11		
8.2	1 244 623 11	82	1 244 647 11	820	1 244 671 11	8.2k	1 244 695 11	82k	1 244 719 11	820k	1 244 743 11		
9.1	1 244 624 11	91	1 244 648 11	910	1 244 672 11	9.1k	1 244 696 11	91k	1 244 720 11	910k	1 244 744 11		

9-950-367-81

Sony Corporation

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Printed in Japan

K4XL's  BAMA

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CRF-330K

US Model
Canadian Model
E Model
AEP Model

FM/SW/MW/LW 33-BAND RADIO RECEIVER

SPECIFICATIONS

GENERAL

Power Requirements:
Radio, Recorder: 120 V ac (adjustable to 100, 220, or 240 V)
12 V dc, eight size-D (IEC designation R20) batteries
12 V car battery with Sony Car Battery Cord DCC-9 (optional)

Clock: 1.5 V dc, one size-D battery

Power Consumption: SW: 10 W ac, FM/MW/LW: 6.5 W ac, in radio operation
SW: 12.5 W ac, FM/MW/LW: 9 W ac, in radio and recorder operation

Speaker: 12 cm (4 3/4 inches)

Clock: QUARTZ clock

Input: AUX IN (mini jack) 1
Maximum sensitivity 4.4 mV (−45 dB) at 50 mW output
Imput impedance 5 kΩ

Outputs: Earphone (mini jack) 1
For 8 Ω earphone
HEADPHONES (phone jack) 1
For 8 Ω headphones
Recording (mini jack) 1
Output level 0.8 mV (−60 dB)
Output impedance 1 kΩ

Control Jack: TIMER OUT (mini jack) 1

Dimensions: Approx. 451 (w) x 349 (h) x 207 (d) mm
17 3/4 (w) x 13 3/4 (h) x 8 1/8 (d) inches
(including projecting parts and controls with the recorder retracted to the set)

Weight: Approx. 15.4 kg, 33 lb 15 oz
(including batteries)

RADIO SECTION

Frequency Range:
FM_2: 87.5 – 108 MHz (3.43 – 2.78 m)
FM_1: 76 – 90 MHz (3.95 – 3.33 m)
SW: 1.6 – 30 MHz (187 – 10 m)
MW: 530 – 1,605 kHz (566 – 187 m)
LW: 150 – 400 kHz (2,000 – 750 m)

Intermediate Frequency:
FM: 10.7 MHz
SW-1st: 45.145 MHz
SW-2nd: 455 kHz
MW/LW: 455 kHz

Sensitivity:
FM: 1.8 μV (5 dB), S/N = 30 dB
SW: 0.7 μV (−3 dB), S/N = 6 dB, at 10 MHz
MW: 32 μV/m (30 dB/m), S/N = 6 dB, built-in ferrite-rod antenna
LW: 57 μV/m (35 dB/m), S/N = 6 dB, built-in ferrite-rod antenna

– continued on next page –

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

SONY®

SERVICE MANUAL

Image Rejection:
FM_2: 65 dB, at 108 MHz
FM_1: 65 dB, at 90 MHz
SW-1st: 90 dB
SW-2nd: 65 dB, at 10 MHz
MW: 55 dB, at 1,605 kHz
LW: 80 dB, at 360 kHz

Selectivity:
FM: Better than 70 dB
(± 400 kHz off resonance)
SW/MW/LW:
–60 dB at NORMAL
(± 8 kHz off resonance)
–60 dB at NARROW
(± 6 kHz off resonance)

Antennas:
FM: Telescopic antenna, external antenna terminals (75 ohms)
SW: Telescopic antenna, external antenna terminals (50 – 75 ohms)
MW/LW:
Built-in ferrite-rod antenna, external antenna terminals (high impedance)

TAPE RECORDER SECTION

Recording System: 2-track 1-channel monaural

Fast Winding Time: Approx. 1 min. 50 sec. with Sony Cassette C-60

Frequency Response: 90 – 10,000 Hz

SECTION 1
OUTLINE

1-1. TAPE RECORDER TIMER STAND BY MECHANISM

This set is equipped with a TIMER STAND BY mechanism in the tape recorder section for an automatic recording during absence of the operator. This mechanism is intended to prevent the pinch roller and recording tape from deforming when the pinch roller is left pressed against the capstan and does not rotate for a long time in the stand-by mode.

Fig. 1 shows the mechanism condition when TIMER STAND BY is set up. In this condition and when the power supply is applied by TIMER, the motor starts to rotate and the shut-off lever moves in the direction Ⓐ . Accordingly, the lever moves in the direction Ⓑ and it pushes the trigger plate in the direction Ⓒ . The trigger plate's protrusion now pushes the lock plate in the direction Ⓓ and the lock plate releases the actuator which is locked at position ●. Now the actuator moves in the direction Ⓔ and the reset arm positions as shown in Fig. 2. In this, condition, the lever moves in the direction Ⓑ′, but it does not afect to the actuator.

If TIMER STAND BY is set up when the lever positioned as shown in Fig. 3, the lever once moves in the direction Ⓑ″ after the time set by TIMER SET, and the lever locks the reset arm and releases the STAND BY condition.

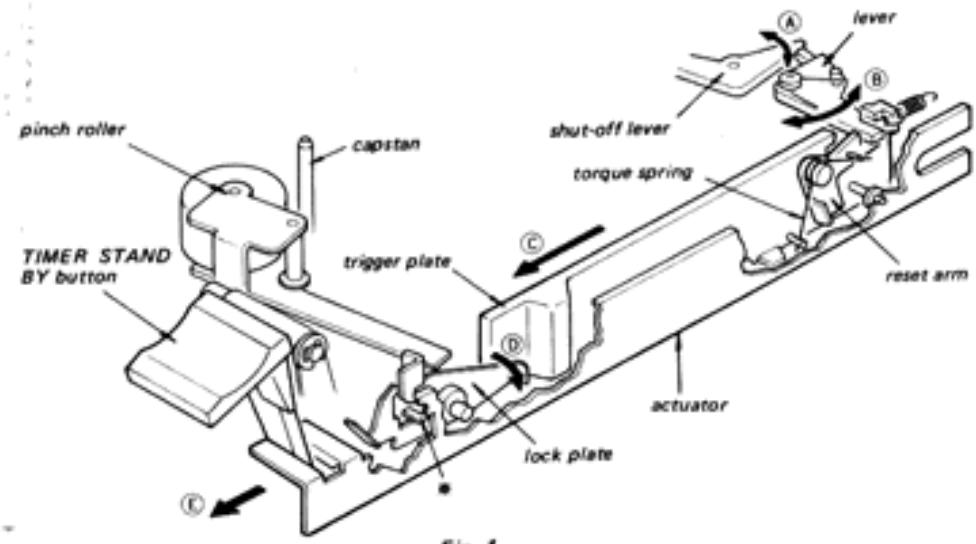


Fig. 1.

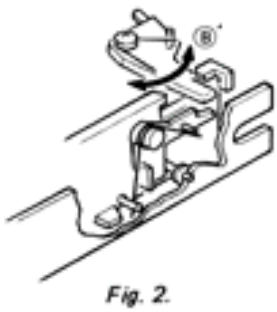


Fig. 2.

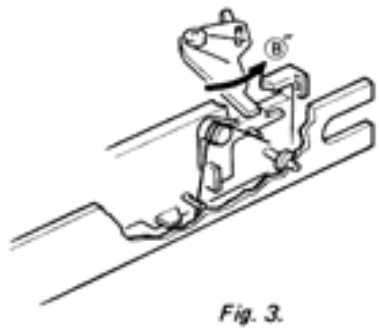


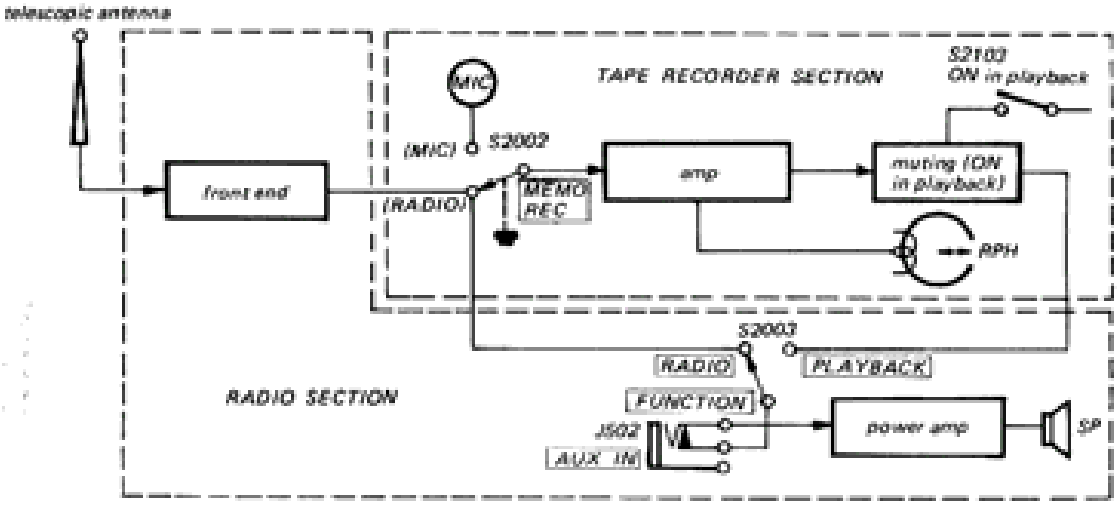
Fig. 3.

1-2. CIRCUIT DESCRIPTION

1) CONNECTION OF TAPE RECORDER AND RADIO

This set is a combination of CRF-320 radio receiver and a cassette tape recorder. With the tape recorder provision, receiving signals can easily be recorded. This set also provides a STAND BY facility combined with a timer clock, and recordings during absence of the operator can be made with ease.

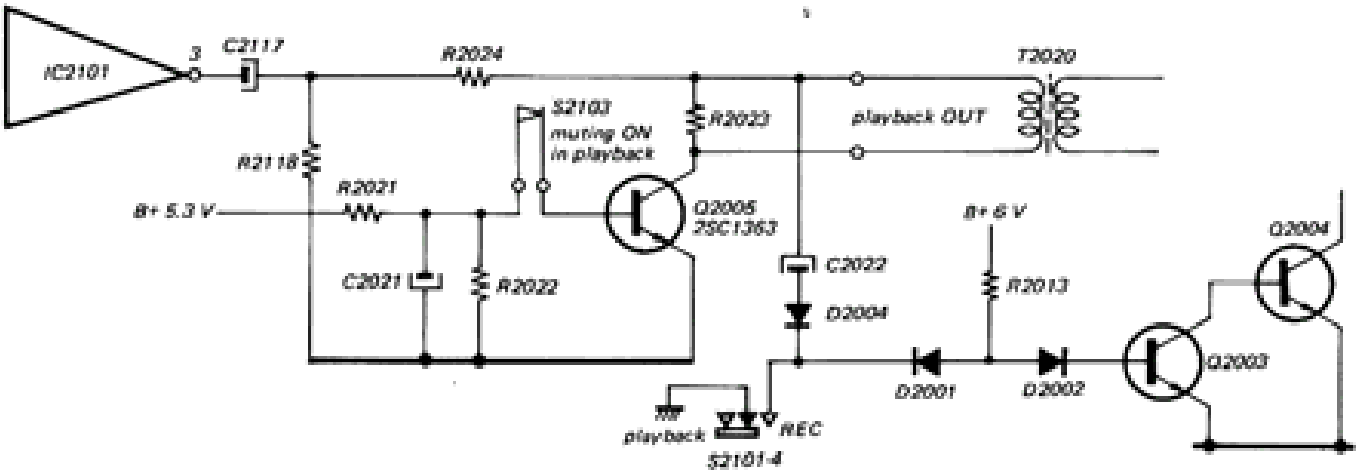
The following diagram shows a simplified signal flow. The recording from the built-in microphone can only be made when MEMO REC switch button is pressed in MIC position. And recording from AUX IN jack J502 cannot be made.



2) RECORD MUTING CIRCUIT

A muting circuit is provided in the output circuit of the tape recorder in the record mode to prevent a hawling from occuring during a record with microphone. The following diagram is the muting circuit of the tape recorder. Except in the playback mode, the muting switch S2103 is in the off position and Q2005 is also in the off state. Accordingly, no signal flows in the transformer T2020 and the output circuit is muted.

When the muting switch S2103 turns on in the playback mode, the output signal from IC2101 flows in the transformer T2020 and the signal passes to the power amplifier of the radio section. To ensure the muting operation in the record mode, the signal line is grounded through C2022, D2004 and S2101-4.

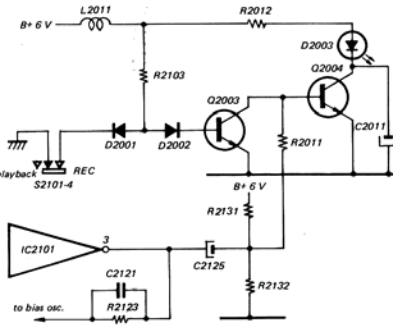


3) LED AMPLIFIER CIRCUIT

In the record mode, a part of the output signal from IC2101 goes through C2125 and R2011 to Q2004. Q2004 amplifies the signal, and the collector current of Q2004 turns D2003 (REC INDICATOR) on and the record mode is visually identified.

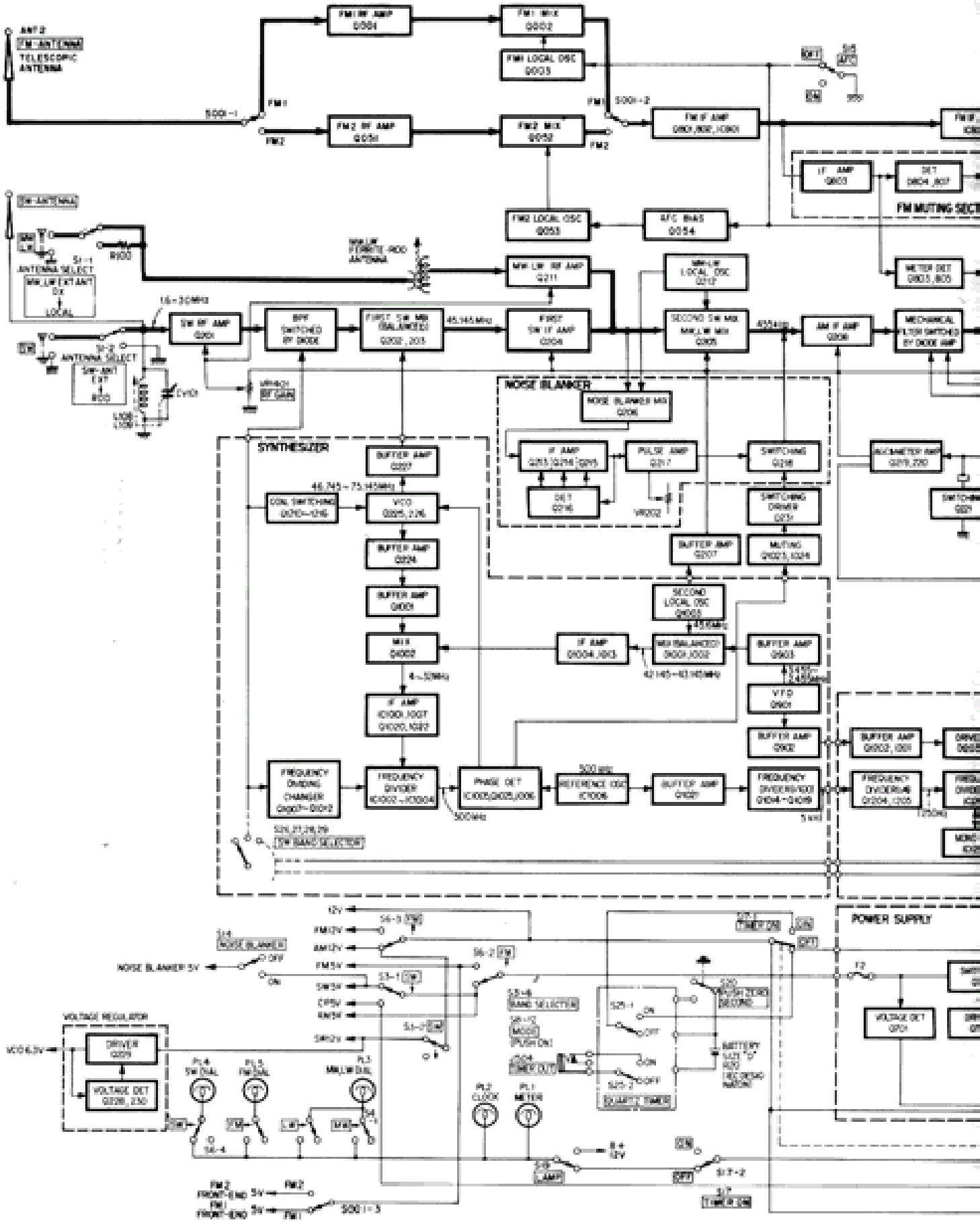
In the playback mode, this LED amplifier is muted because of unnecessity of the LED indication. In the playback mode, the bias is applied to Q2003 through R2103 and D2002 to turn on Q2003. Accordingly, the base of Q2004 is grounded and D2003 turns off.

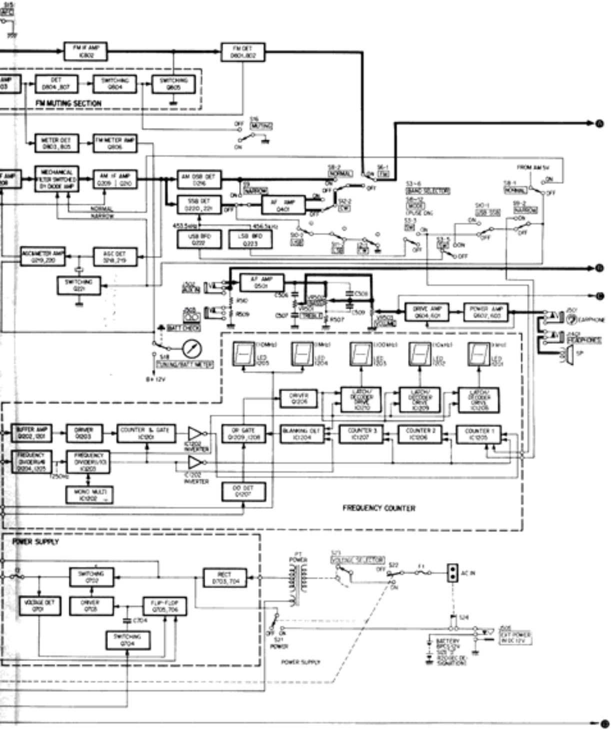
In the record mode, the bias circuit of Q2003 is routed to the ground through D2001 and S2101-4, and Q2003 turns off. Consequently, Q2004 turns on. Q2004 is operating in class B, and D2003 lights up only when audio signals are applied to the base of Q2004 to indicate the record mode.



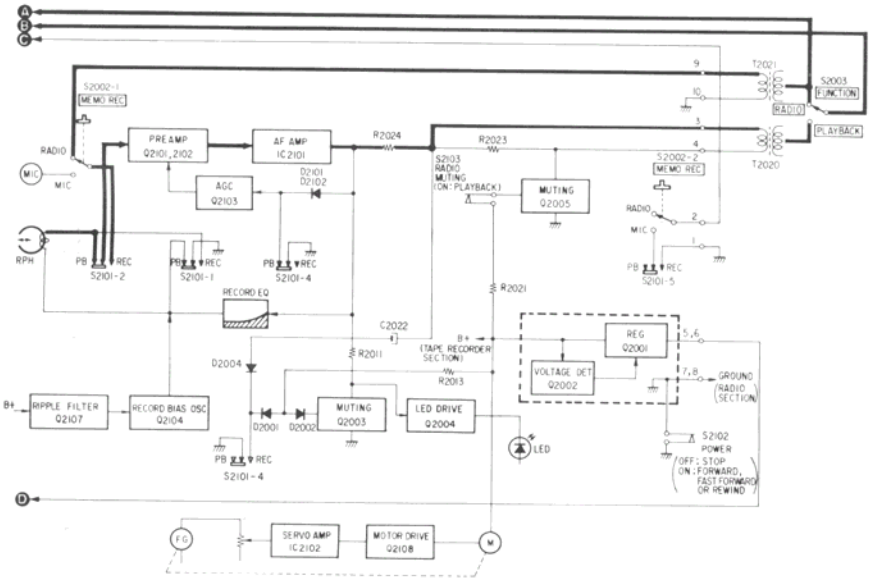
1-2. BLOCK DIAGRAM

1) Radio Section



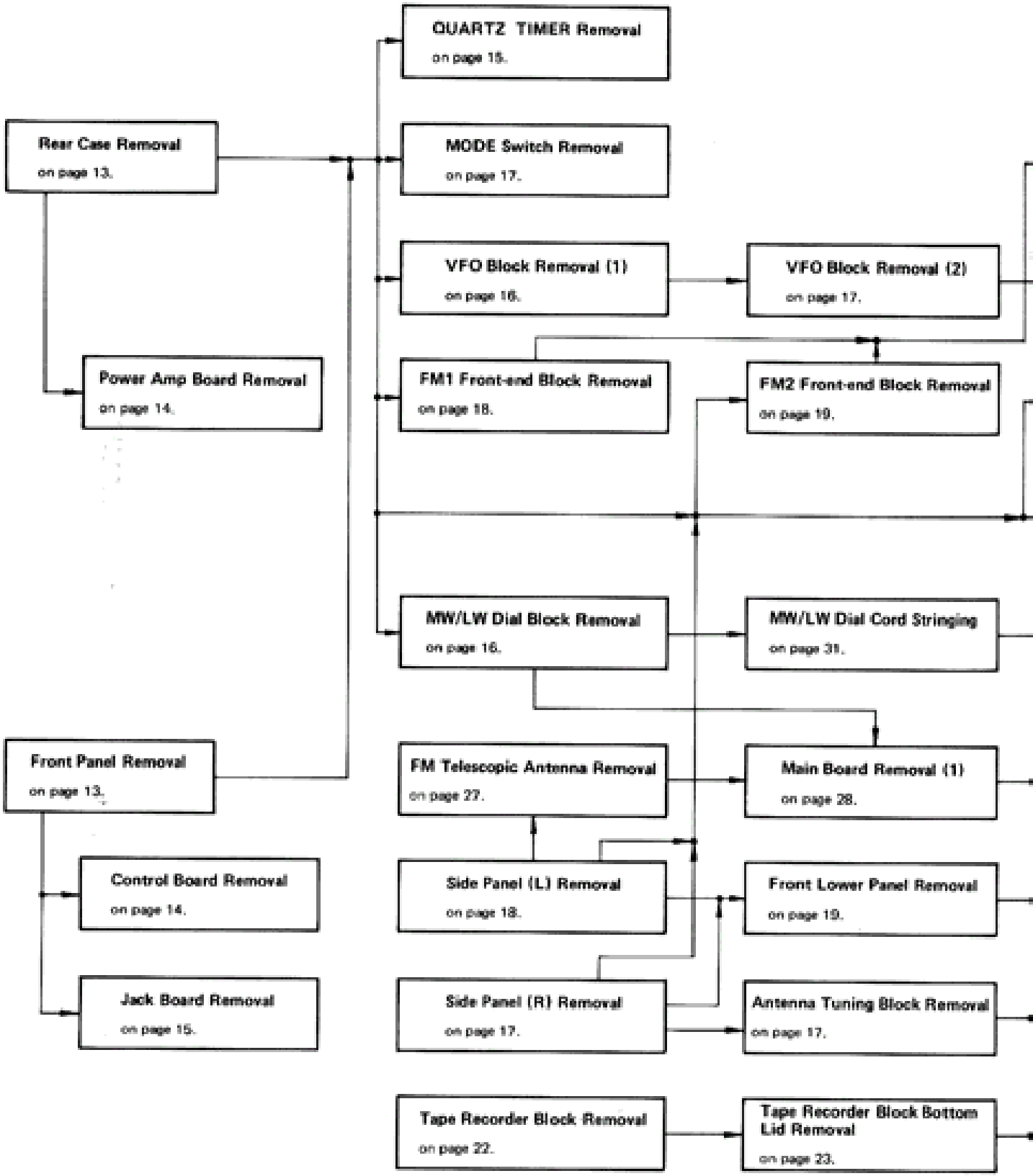

FM IF AMP IC802
FM DET D801, 802
FM MUTING SECTION
METER DET
FM METER AMP Q806
MECHANICAL FILTER SWITCHED BY DIODE AMP
AM IF AMP
AM DSB DET
SSB DET
AF AMP Q401
USB BFO Q222
LSB BFO Q223
AGC/METER AMP
AGC DET
SWITCHING Q221
AF AMP Q501
DRIVE AMP
POWER AMP
EARPHONE
HEADPHONES
SP
TUNING/BATT METER
B+ 12V
BUFFER AMP
DRIVER Q1203
COUNTER & GATE IC1201
IC1202 INVERTER
OR GATE
BLANKING DET IC1204
COUNTER 3 IC1207
COUNTER 2 IC1206
COUNTER 1 IC1205
DRIVER Q1206
FREQUENCY DIVIDER
MONO MULTI IC1202
DO DET Q1207
FREQUENCY COUNTER
POWER SUPPLY
SWITCHING Q702
RECT D703, 704
VOLTAGE DET Q701
DRIVER Q703
FLIP-FLOP Q705, 706
SWITCHING Q704
VOLTAGE SELECTOR
AC IN
EXT POWER
BATTERY

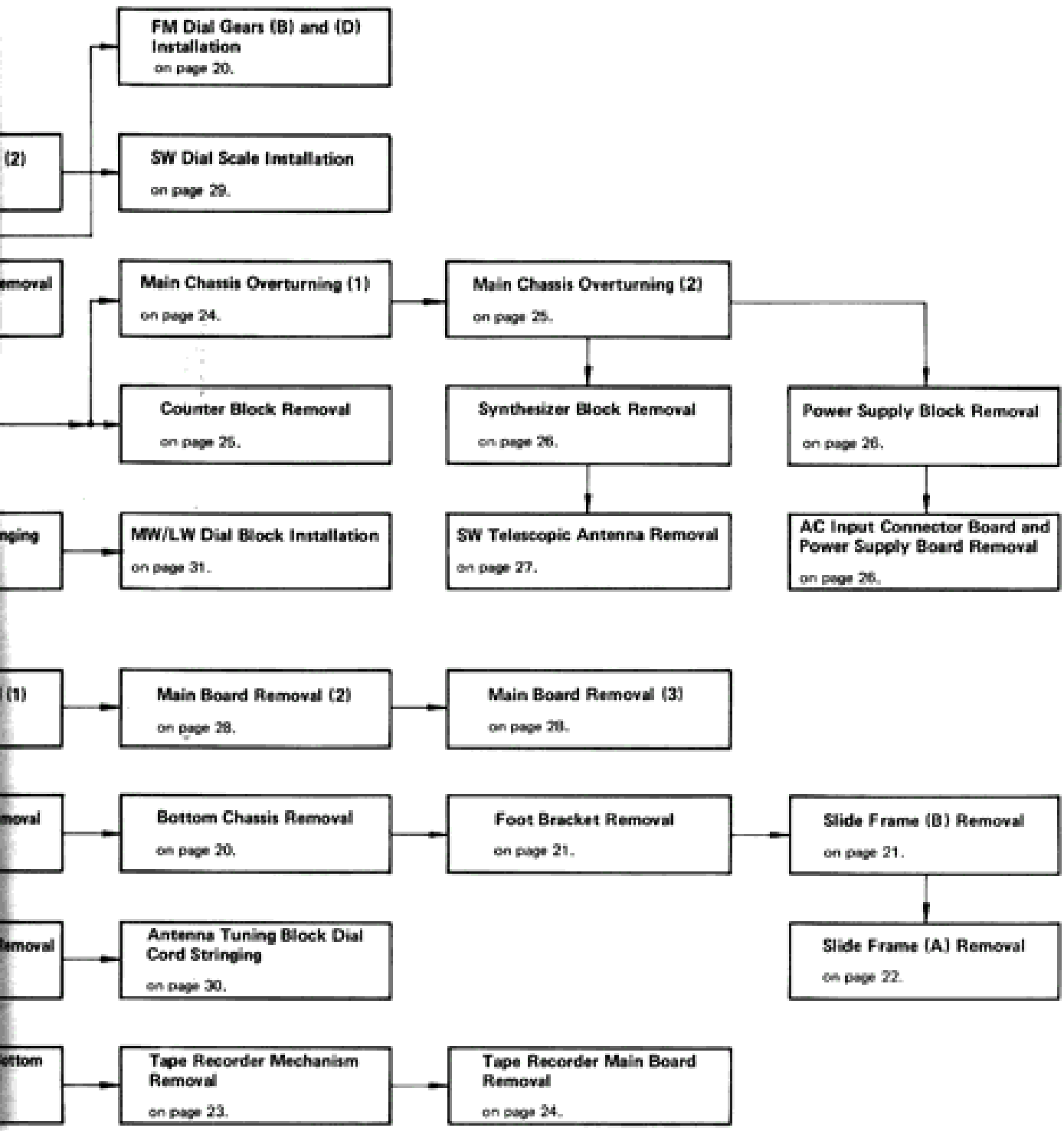
2) Tape Recorder Section



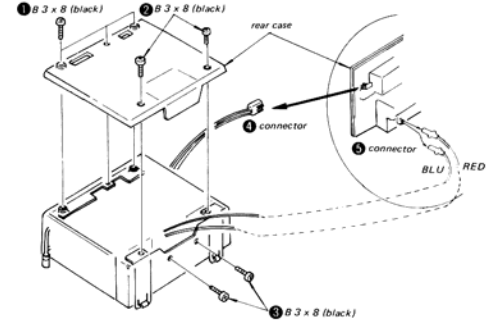
SECTION 2
DISASSEMBLY

2-1. DISASSEMBLY FLOW CHART

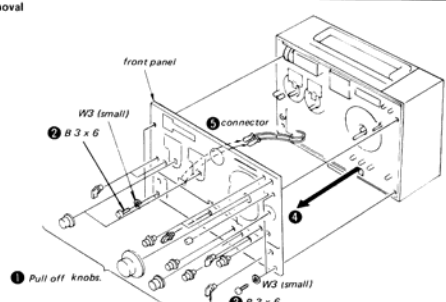



FM Dial Gears (B) and (D) Installation
on page 20.
SW Dial Scale Installation
on page 29.
Main Chassis Overturning (1)
on page 24.
Main Chassis Overturning (2)
on page 25.
Counter Block Removal
on page 25.
Synthesizer Block Removal
on page 26.
Power Supply Block Removal
on page 26.
MW/LW Dial Block Installation
on page 31.
SW Telescopic Antenna Removal
on page 27.
AC Input Connector Board and Power Supply Board Removal
on page 26.
Main Board Removal (2)
on page 28.
Main Board Removal (3)
on page 28.
Bottom Chassis Removal
on page 20.
Foot Bracket Removal
on page 21.
Slide Frame (B) Removal
on page 21.
Antenna Tuning Block Dial Cord Stringing
on page 30.
Slide Frame (A) Removal
on page 22.
Tape Recorder Mechanism Removal
on page 23.
Tape Recorder Main Board Removal
on page 24.

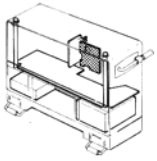
Rear Case Removal

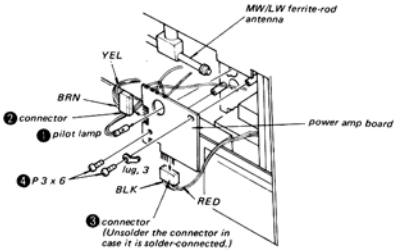


Front Panel Removal

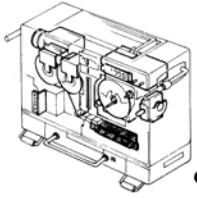


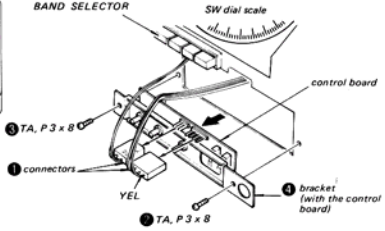
Power Amp Board Removal



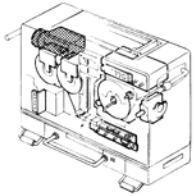


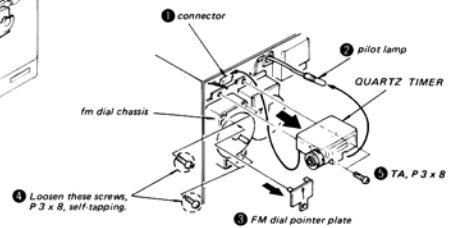
Control Board Removal



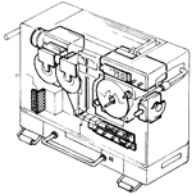


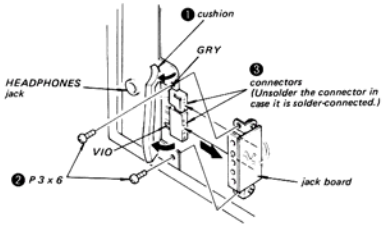
QUARTZ TIMER Removal



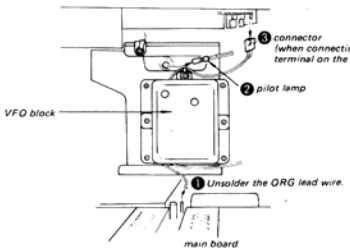


Jack Board Removal



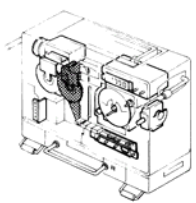


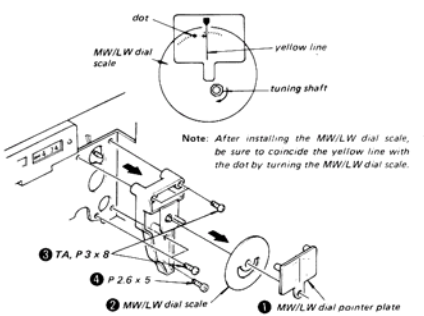
VFO Block Removal (1)



Main Board Removal
on page 28.

MW/LW Dial Block Removal

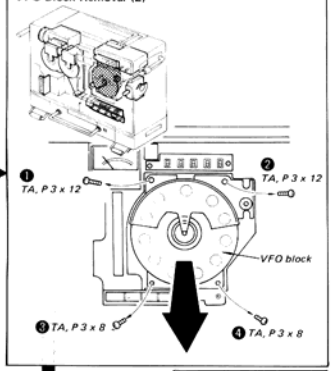




Note: *After installing the MW/LW dial scale, be sure to coincide the yellow line with the dot by turning the MW/LW dial scale.*

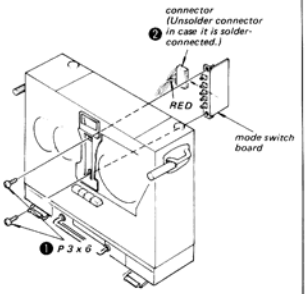
MW/LW Dial Cord Stringing
on page 31.

VFO Block Removal (2)

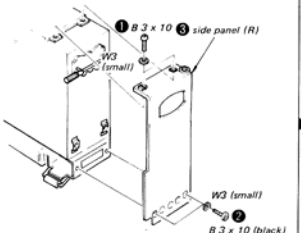


SW Dial Scale Installation on page 29.

MODE Switch Board Removal

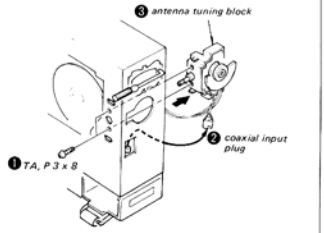


Side Panel (R) Removal



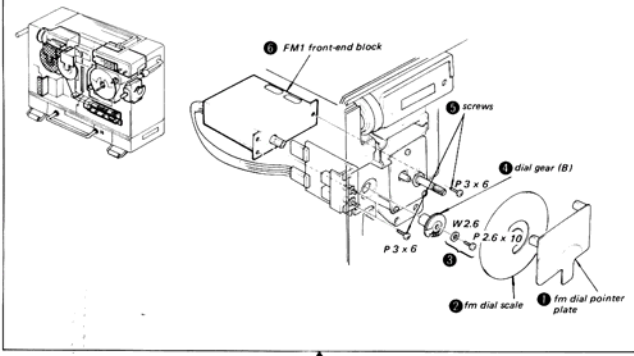
Main Chassis Overturning (1) on page 24.

Antenna Tuning Block Removal



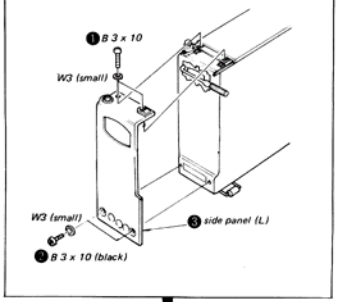
Antenna Tuning Block Dial Cord Stringing on page 30.

FM1 Front-end Block Removal



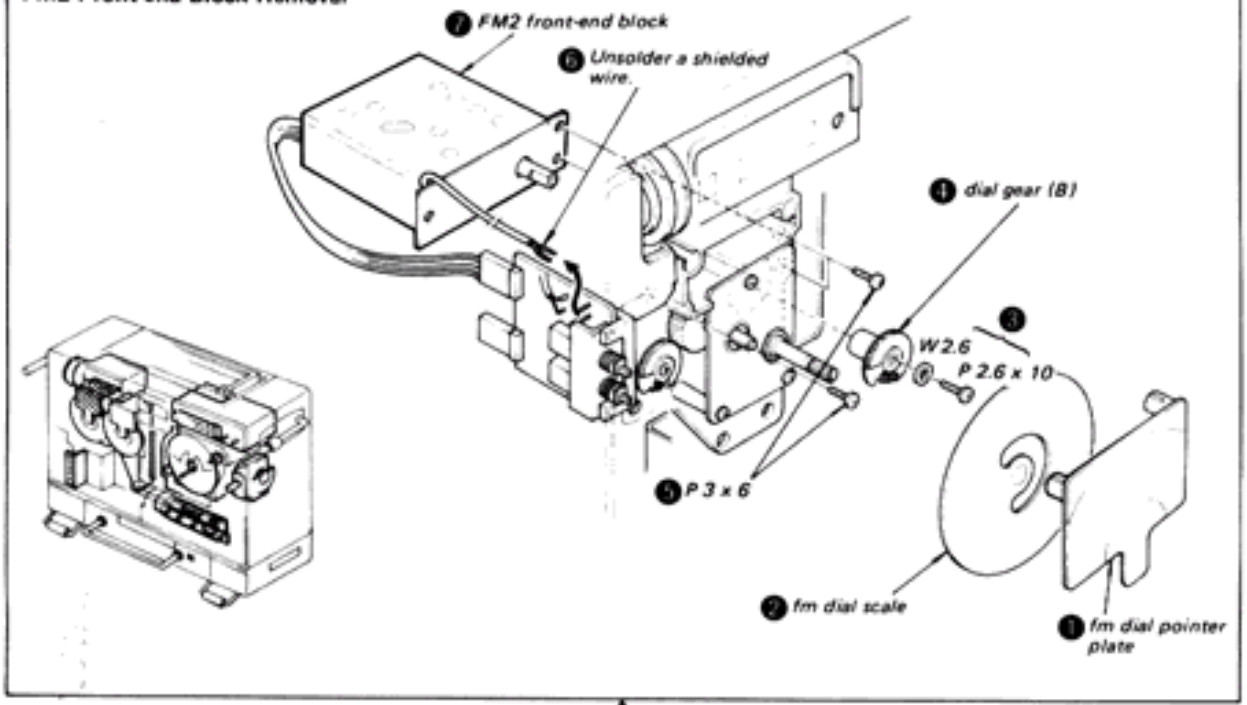
FM Telescopic Antenna Removal
on page 27.

Side Panel (L) Removal

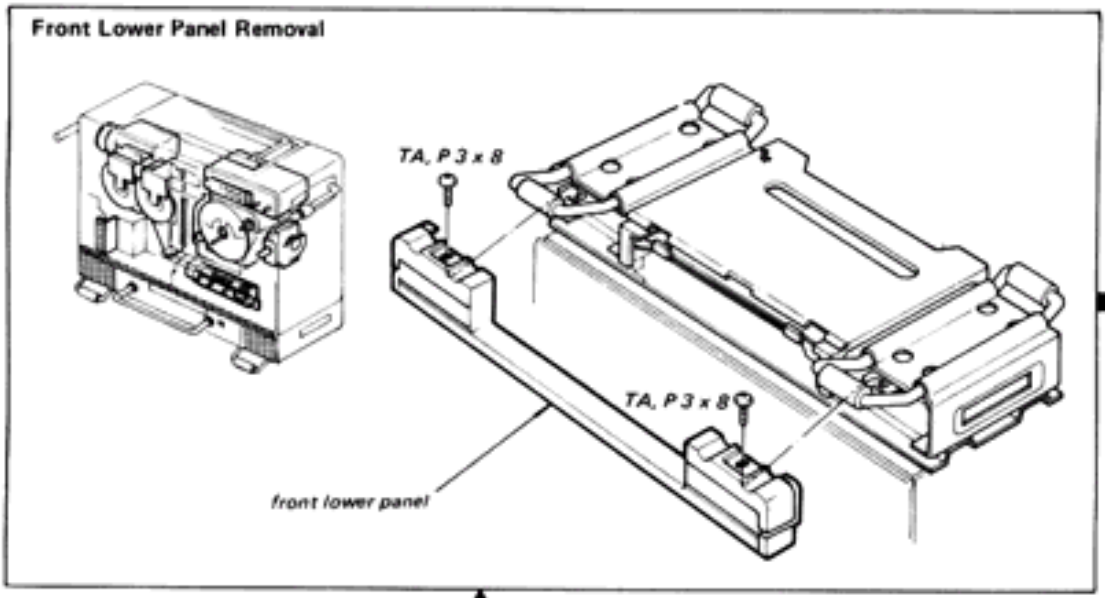


Side Panel (R) Removal
on page 17.

FM2 Front-end Block Removal



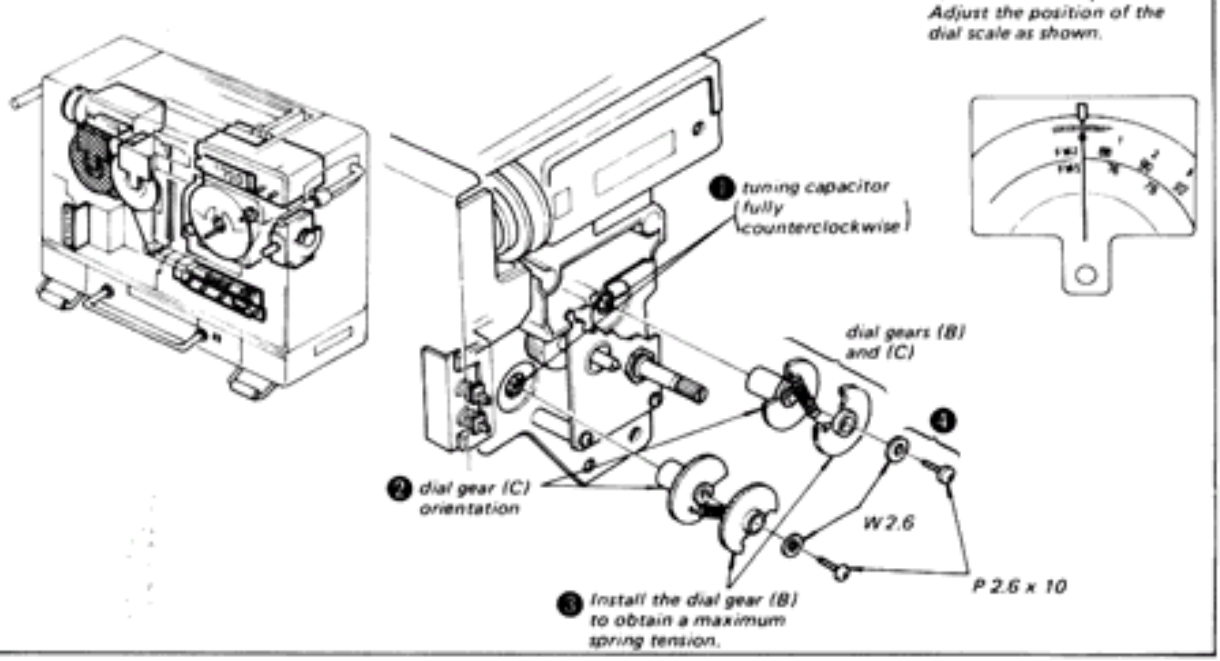
Front Lower Panel Removal



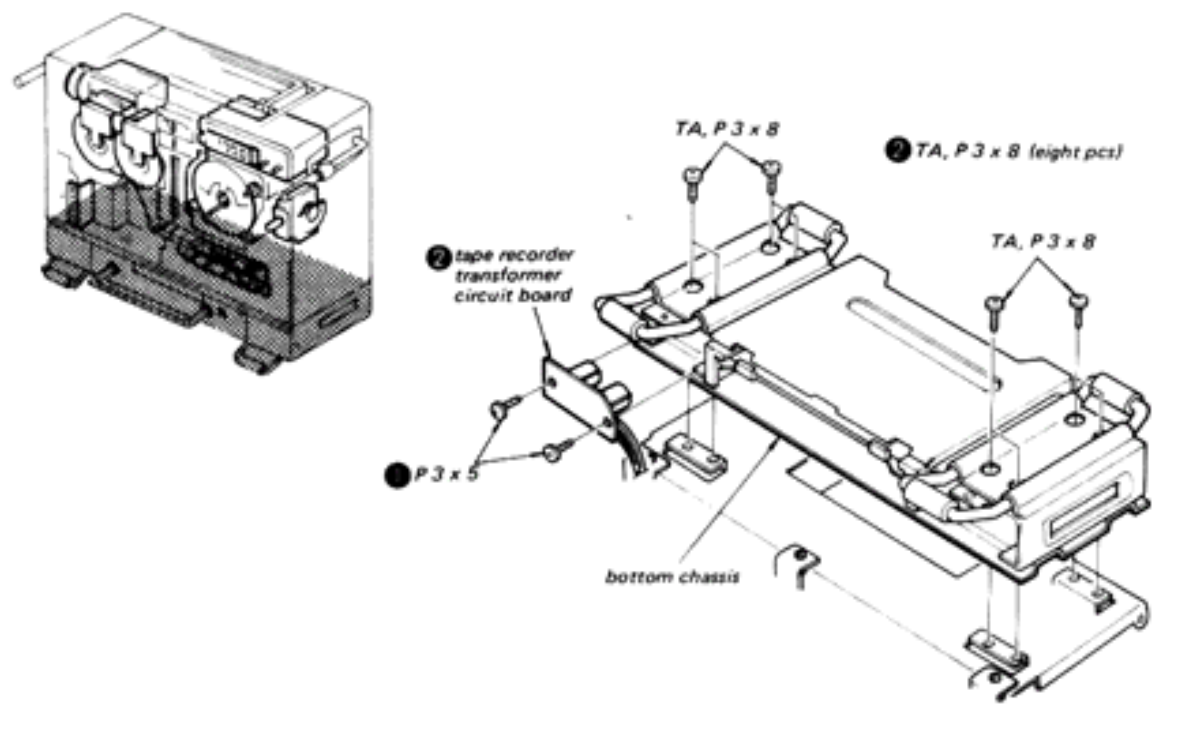
Main Chassis Overturning (1)
on page 24.

Counter Block Removal
on page 25.

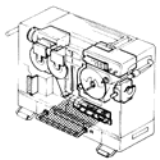
FM Dial Gears (B) and (D) Installation

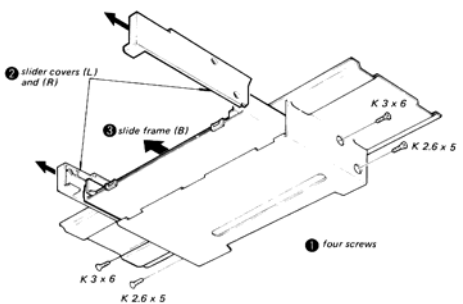


Bottom Chassis Removal

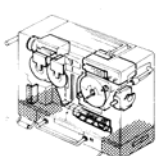


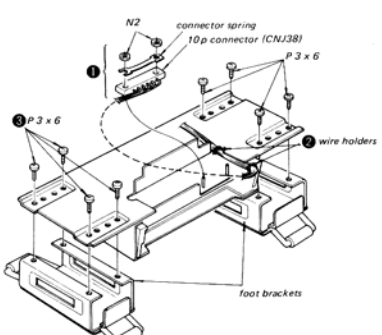
Slide Frame (B) Removal



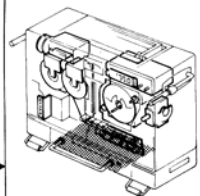


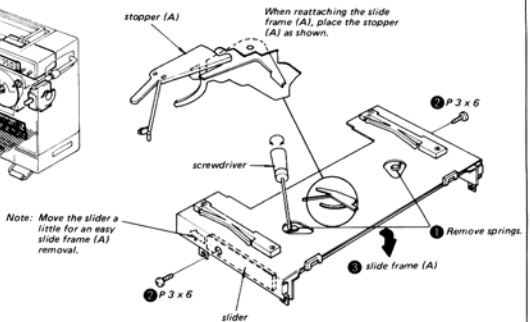
Foot Bracket Removal



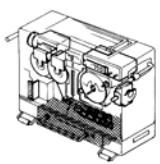


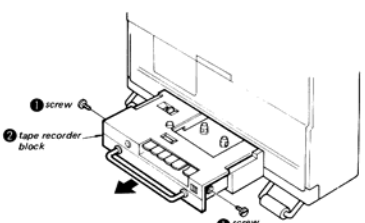
Slide Frame (A) Removal



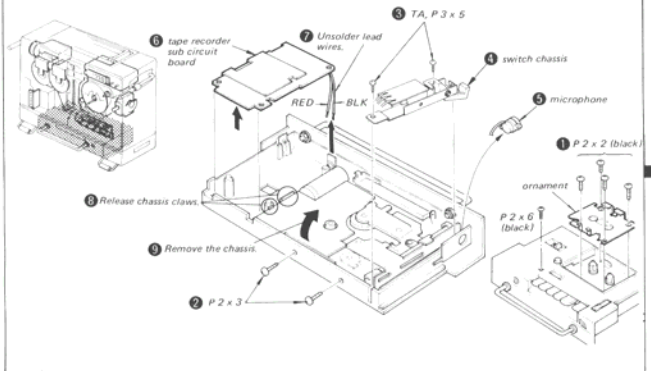


Tape Recorder Block Removal

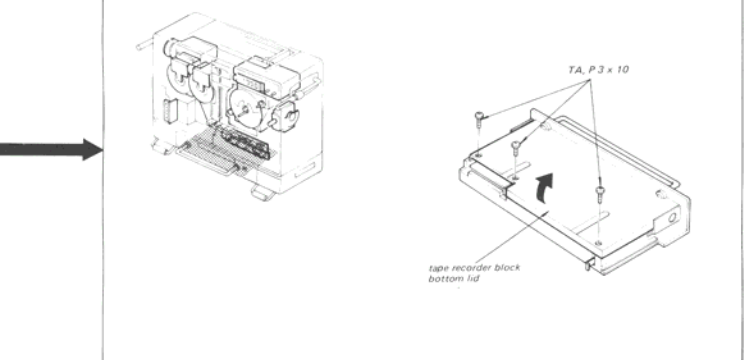




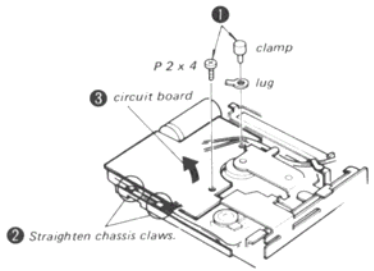
Tape Recorder Mechanism Removal



Tape Recorder Block Bottom Lid Removal

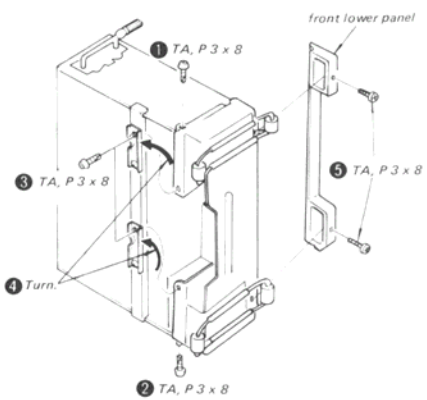


Tape Recorder Main Board Removal

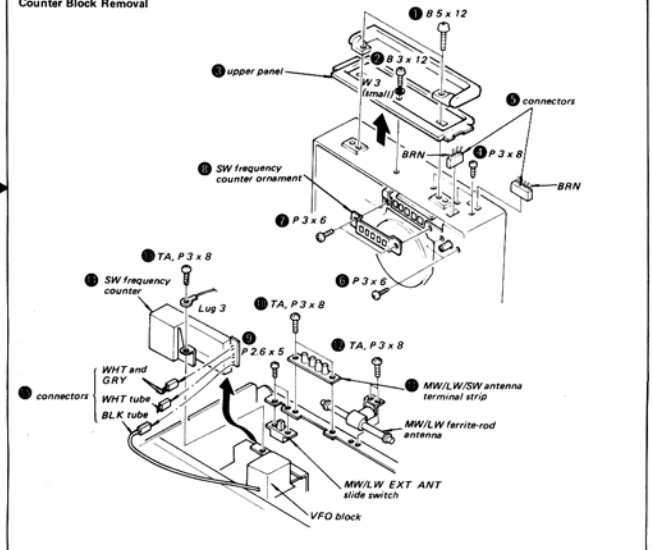


- Rear Case Removal
  on page 13.
- Front Panel Removal
  on page 13.
- Side Panel (R) Removal
  on page 17.
- Side Panel (L) Removal
  on page 18.

Main Chassis Overturning (1)

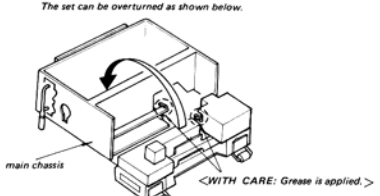


Counter Block Removal

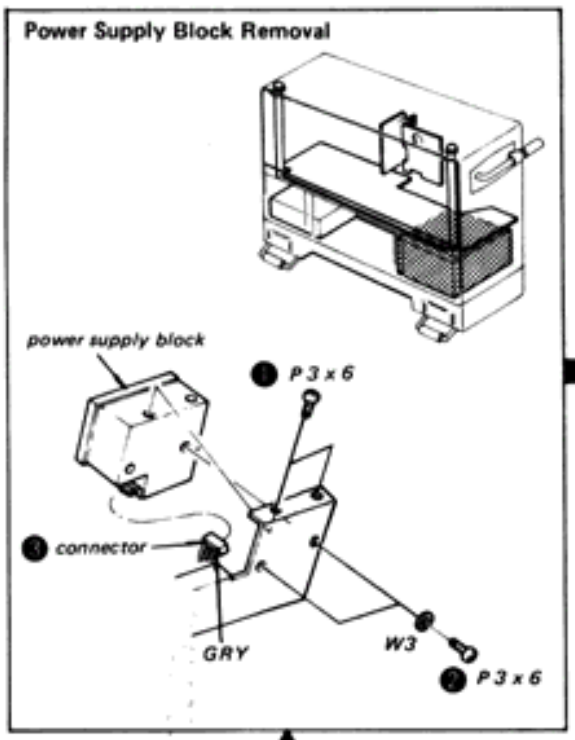


Main Chassis Overturning (2)

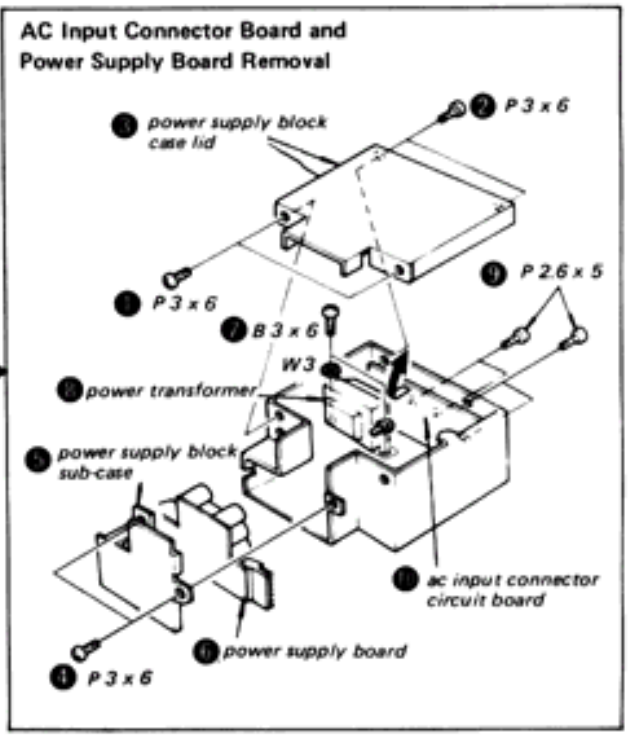
The set can be overturned as shown below.



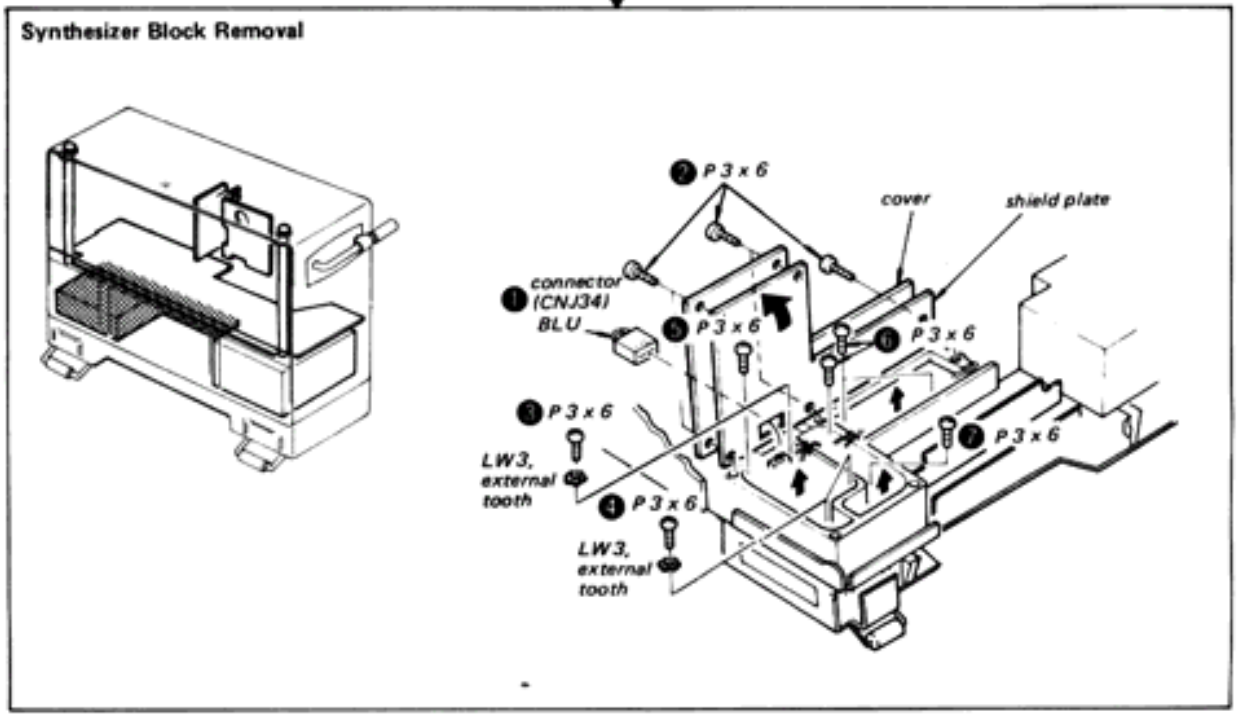
Power Supply Block Removal



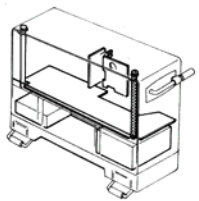
AC Input Connector Board and Power Supply Board Removal

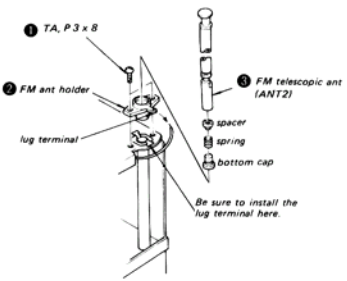


Synthesizer Block Removal



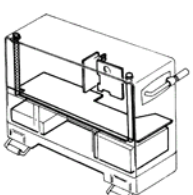
FM Telescopic Antenna Removal

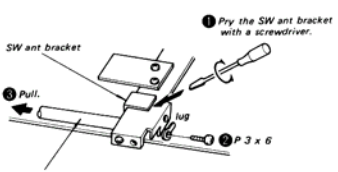




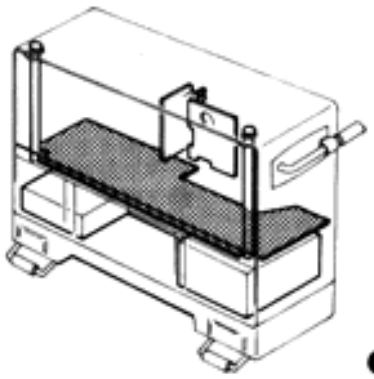
Side Panel (L) Removal
on page 18.

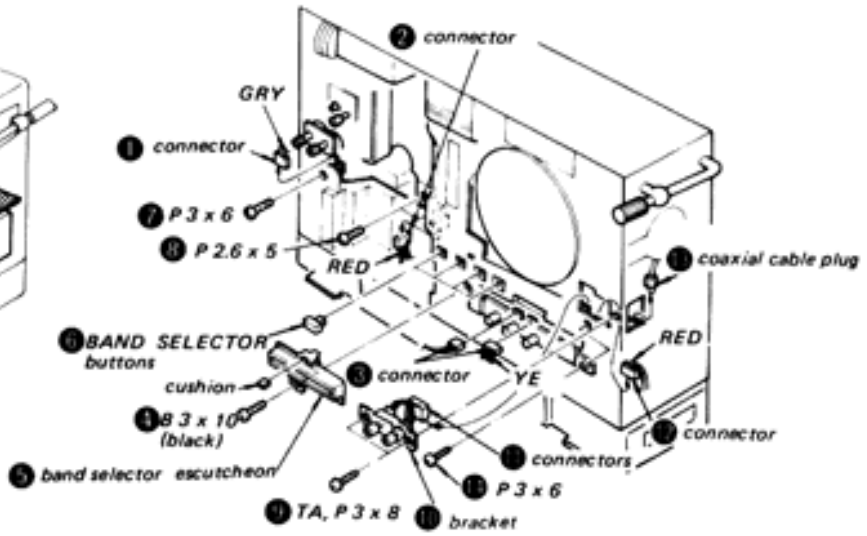
SW Telescopic Antenna Removal





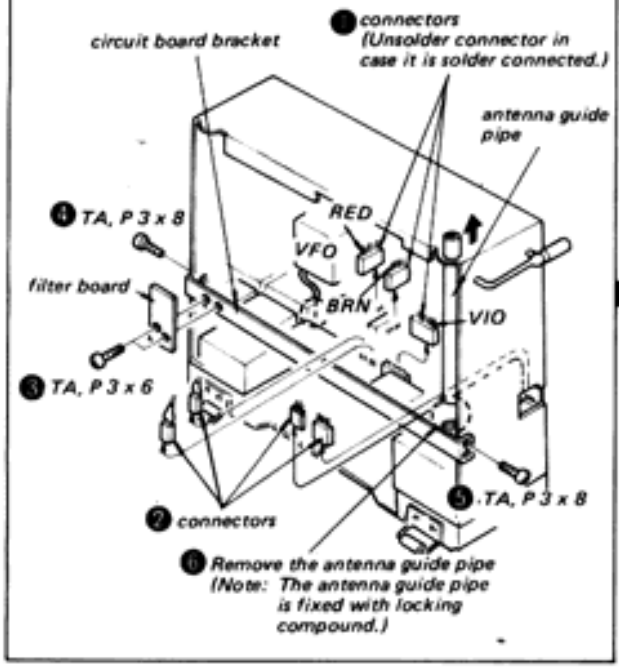
Main Board Removal (1)



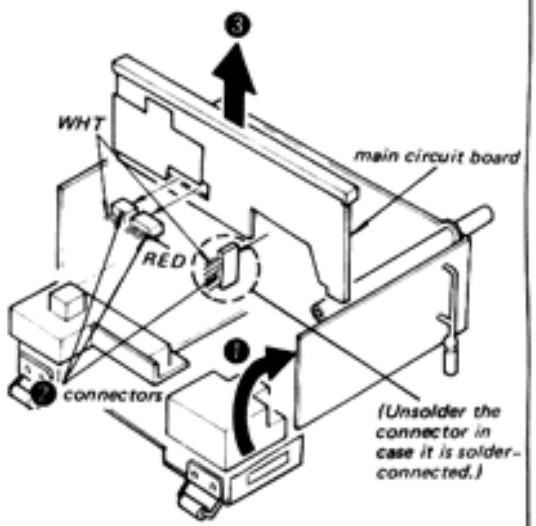


MW/LW Dial Block Removal
on page 16.

Main Board Removal (2)

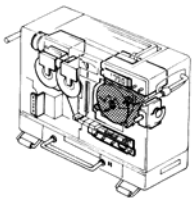


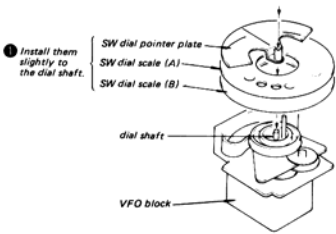
Main Board Removal (3)



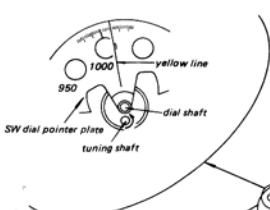
VFO Block Removal (2)
on page 17.

SW Dial Scale Installation

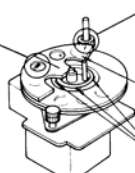




❸ *Turn the tuning shaft fully counterclockwise. Install the two kinds of dial scale and dial pointer plate so that the yellow line on the dial pointer plate points to "1010".*



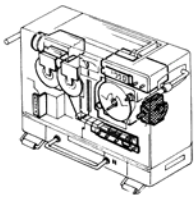
❷ *After turning the calibrator shaft fully clockwise, gear the SW dial pointer plate into the calibrator shaft on line mark.*



❹ *Secure four grooves with a suitable locking compound.*

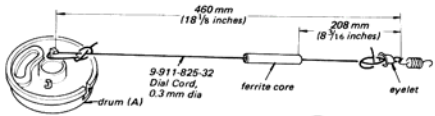
Antenna Tuning Block Removal
on page 17.

Antenna Tuning Block Dial Cord Stringing

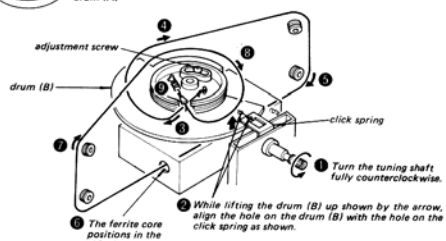


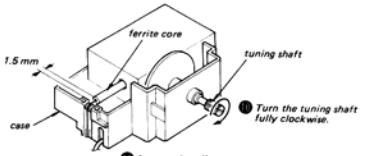
1. Dial Cord Preparation

- ○ *Crimp the eyelet.*
- ○ *Secure the ties, eyelet and ferrite core with a suitable locking compound.*



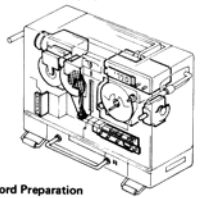
2. Dial Cord Stringing





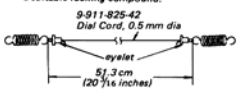
MW/LW Dial Block Removal
on page 16.

MW/LW Dial Cord Stringing

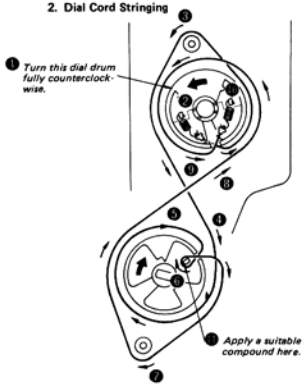


1. Dial Cord Preparation

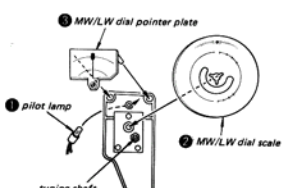
- Crimp the eyelets.
- Secure the dial cord and eyelets with a suitable locking compound.



2. Dial Cord Stringing



MW/LW Dial Block Installation



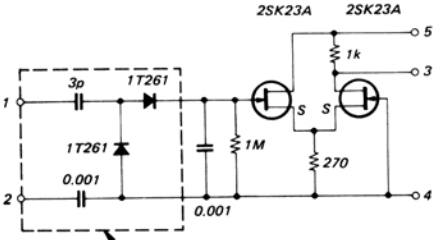
4 Turn the tuning shaft fully clockwise and then coincide the yellow line with the dot by turning the MW/LW dial scale.

SECTION 3
ADJUSTMENTS

3-1. RADIO SECTION

Test Equipment Required:

- FM rf signal generator
- AM rf signal generator
- FM sweep generator
- AM sweep generator
- marker generator
- frequency counter
  (100 MHz, resolution ± 1 Hz)
- ac/dc VTVM
- rf VTVM
- oscilloscope
- detector (shown below)



- **Note:** 1. Adjustments to the VFO can not be made by using generally available test equipment. When trouble is encountered to the VFO, replace the VFO Block.
  Part No.: **A-3624-020-B**

  2. Overturn the main chassis before the adjustments. Refer to pages 24 and 25.

3-1. +5 V VOLTAGE ADJUSTMENT

Setting:

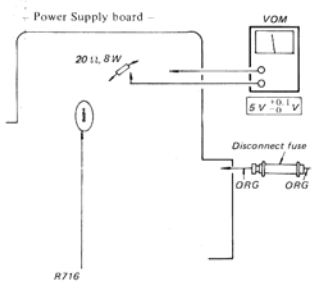
BAND SELECTOR switch: SW

Procedure:

1. Disconnect the fuse F2.
2. Install a 20 Ω, 8 W resistor on the conductor side as shown.
3. Adjust the value of R716 to obtain the specified voltage. Perform this adjustment on the conductor side.

Note: When the patterns are heated by a soldering iron, thermistor warms up. Cool off the components and circuit board at a time in selecting resistor.

4. Install the selected resistor on the component side.
5. Remove 20 Ω, 8 W resistor and reconnect the fuse.



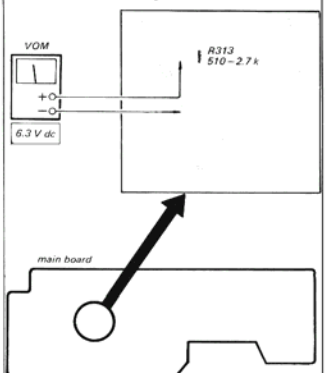
3-2. VCO POWER SUPPLY VOLTAGE ADJUSTMENT

Setting:

BAND SELECTOR switch: SW

Procedure:

Adjust the value of R313 (510 Ω – 2.7 kΩ) for the indicated VOM reading.

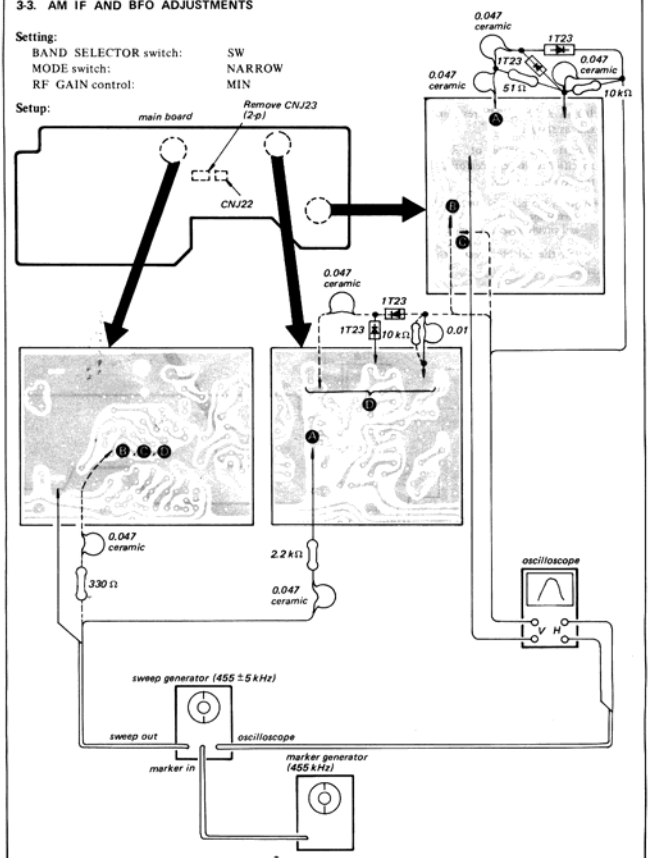


3-3. AM IF AND BFO ADJUSTMENTS

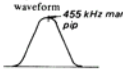
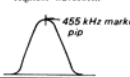
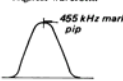
Setting:

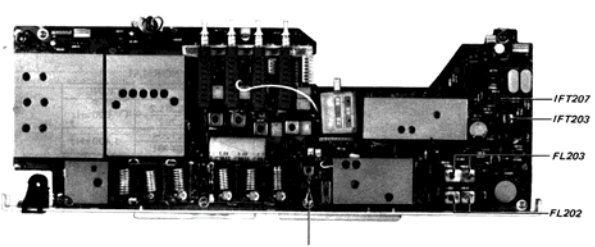
BAND SELECTOR switch:	SW
MODE switch:	NARROW
RF GAIN control:	MIN

Setup:



Procedure:

Adjust	Obtain
FL203 (Connect oscilloscope and sweep out to Ⓐ.) (MODE switch: NORMAL) FL202 (MODE switch: NARROW)	Highest and widest waveform 
IFT202, IFT203 (Connect oscilloscope and sweep out to Ⓑ.) (MODE switch: NORMAL)	Highest waveform 
IFT207 (MODE switch: LSB Connect oscilloscope to Ⓒ.) Check: MODE switch: USB	A beat spike on the above waveform. Set the core at the center of rotation in which a spike appears on the waveform. Beat spike should move to the opposite slope and stays stably.
IFT202 (Connect oscilloscope and sweep out to Ⓓ.) (MODE switch: NARROW)	Highest waveform 



3-4. LW/MW FREQUENCY COVERAGE AND TRACKING ADJUSTMENTS

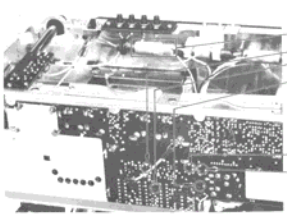
Setup:

Adjust for maximum VOM reading.

A) LW

Setting:

BAND SELECTOR switch:	LW
MODE switch:	NORMAL
VOLUME control:	MAX
TONE controls:	MAX
RF GAIN control:	MAX/NORMAL



LW TRACKING	
L261-1	200 kHz
L263	
CT203	380 kHz
CT202	

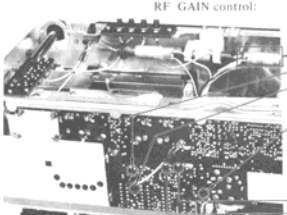
Fix L261-1 with wax after the adjustment.

LW FREQUENCY COVERAGE
L265 (146 kHz)
CT205 (407 kHz)

B) MW

Setting:

BAND SELECT switch:	MW
MODE switch:	NORMAL
VOLUME control:	MAX
TONE controls:	MAX
RF GAIN control:	MAX/NORMAL



MW TRACKING	
L261-2	620 kHz
L262	
CT204	1,400 kHz
CT201	

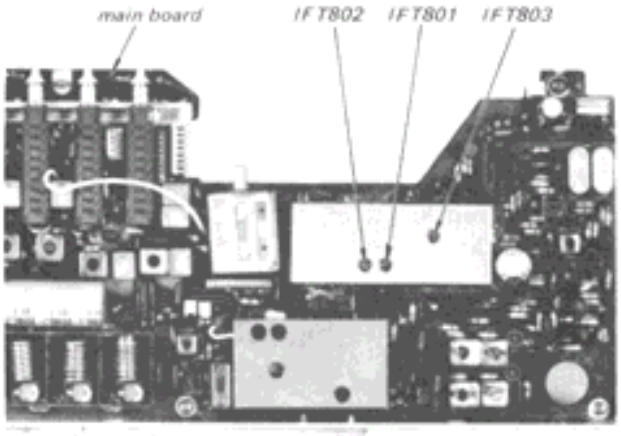
Fix L261-2 with wax after the adjustment.

MW FREQUENCY COVERAGE
L264 (520 kHz)
CT206 (1,680 kHz)

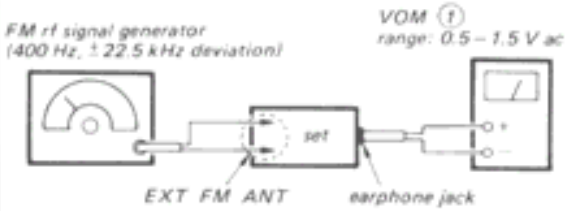
3-5. FM IF ALIGNMENT

Setting:

BAND SELECTOR switch:	FM
VOLUME control:	MAX
TONE controls:	MAX
MUTING switch:	OFF
AFC switch:	OFF



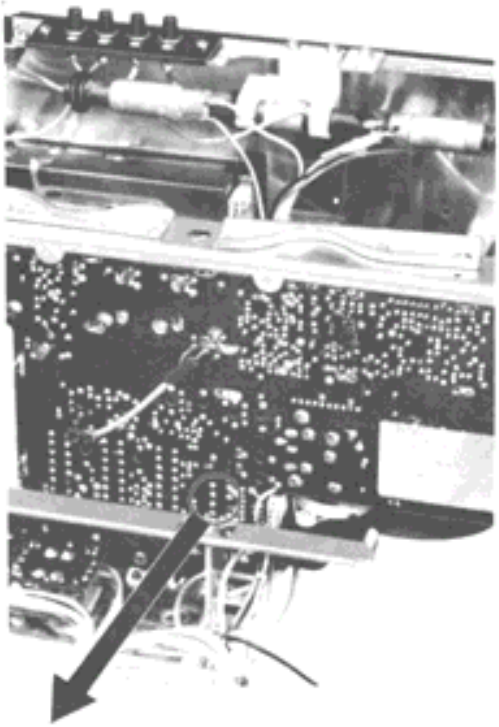
Setup:

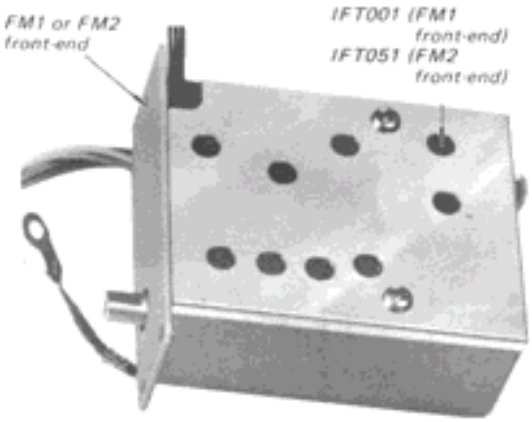


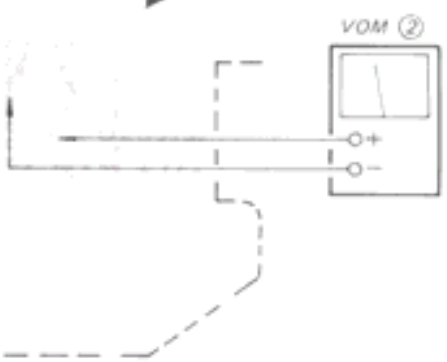
Procedure:

Remove the FM front-ends (Refer to pages 18 and 19.).

Signal Generator Frequency	Adjust	Obtain
10.7 MHz	IFT001 IFT051 IFT801 IFT802	Maximum VOM ① reading.
10.7 MHz	IFT802	0 V VOM ② reading.
FM1: 75.0 – 91.5 MHz FM2: 86.5 – 109.5 MHz (Tune the receiver in.)	IFT803	Maximum TUNING meter reading.





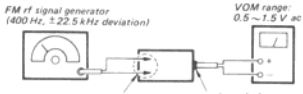


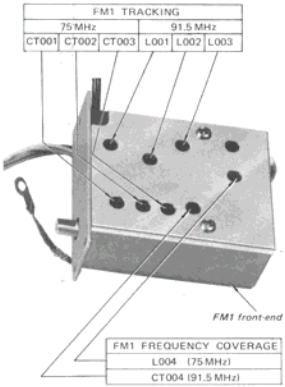
3-6. FM1 FREQUENCY COVERAGE AND TRACKING ADJUSTMENTS

Setting:

BAND SELECTOR switch:	FM1
VOLUME control:	MAX
TONE controls	MAX
MUTING switch:	OFF
AFC switch:	OFF

Setup:





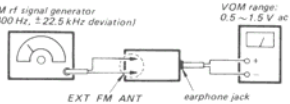
FM1 FREQUENCY COVERAGE	
L004	(75 MHz)
CT004	(91.5 MHz)

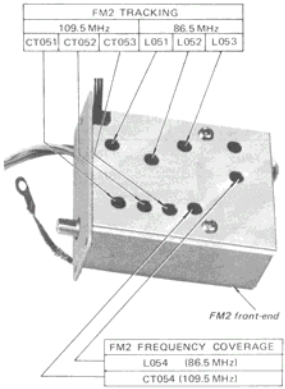
3-7. FM2 FREQUENCY COVERAGE AND TRACKING ADJUSTMENTS

Setting:

BAND SELECTOR switch:	FM2
VOLUME control:	MAX
TONE controls	MAX
MUTING switch:	OFF
AFC switch:	OFF

Setup:





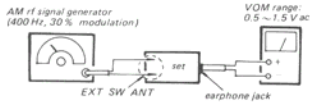
FM2 FREQUENCY COVERAGE	
L054	(86.5 MHz)
CT054	(109.5 MHz)

3-8. SW 1st IF ADJUSTMENT

Setting:

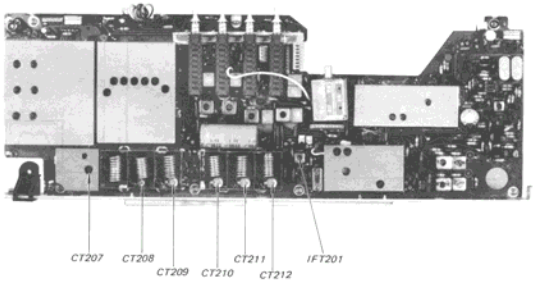
BAND SELECTOR switch:	SW
MODE switch:	NORMAL
VOLUME control:	center of rotation
TONE control:	center of rotation
NOISE BLANKER switch:	OFF

Setup:



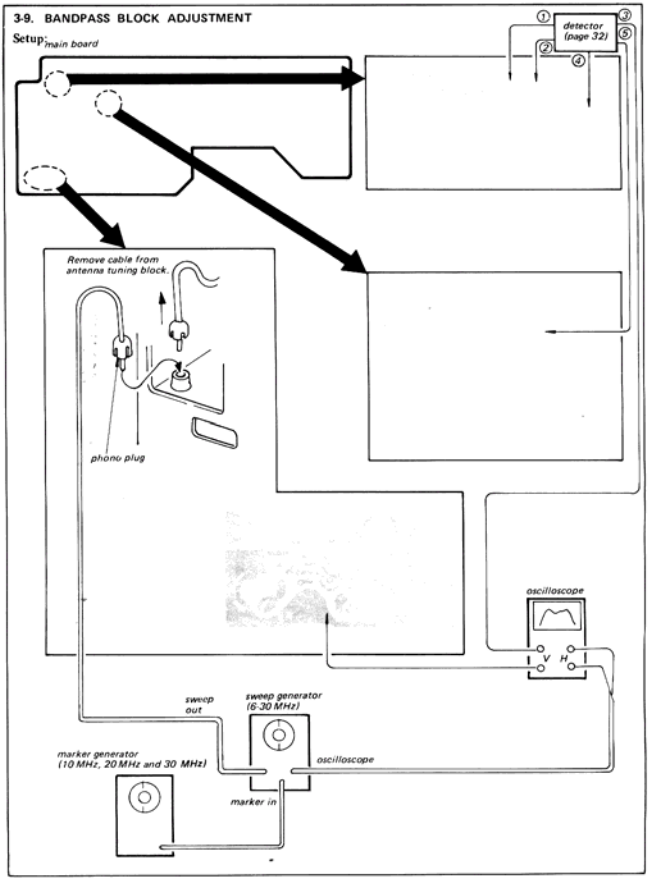
Procedure:

1. Set the AM rf signal generator to an appropriate frequency between 1.6 MHz and 30 MHz.
2. Tune the set in to the frequency set in step 1.
3. Adjust CTs207, 208, 209, 210, 211 and 212, and IFT201 for maximum VOM reading.



3-9. BANDPASS BLOCK ADJUSTMENT

Setup: *main board*

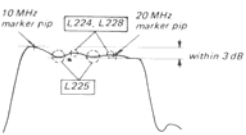


Setting:

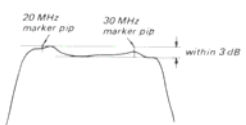
BAND SELECTOR switch:	SW
VOLUME control:	center of rotation
TONE controls:	center of rotation
Marker Generator Frequencies:	10, 20 and 30 MHz

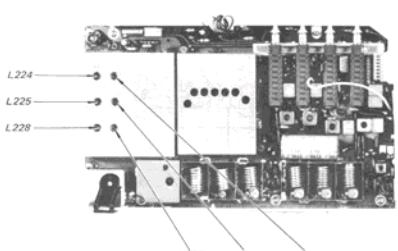
Procedure:

1. SW BAND SELECTOR switch: 10 MHz
   Sweep Generator Frequency: 6-30 MHz
2. Adjust L224, 225 and 228 to obtain a waveform shown below.



3. SW BAND SELECTOR switch: 20 MHz
   Sweep Generator Frequency: 15-35 MHz
4. Adjust L231, 232 and 235 to obtain a waveform shown below.





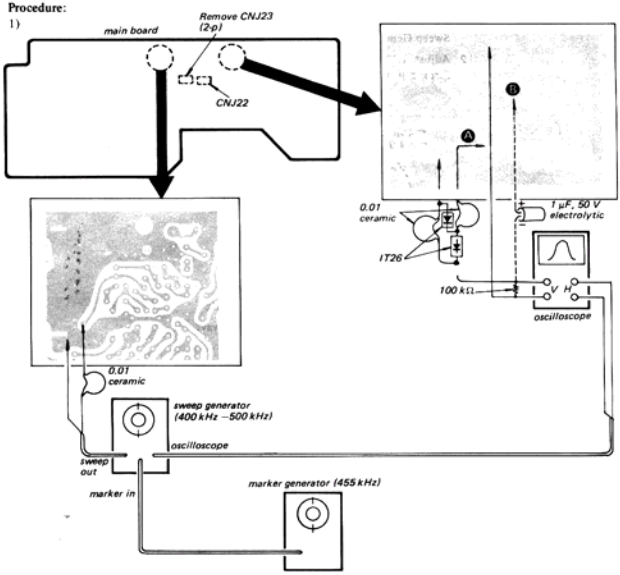
3-10. NOISE BLANKER ADJUSTMENT

Setting:

BAND SELECTOR switch: SW
NOISE BLANKER switch: ON

Procedure:

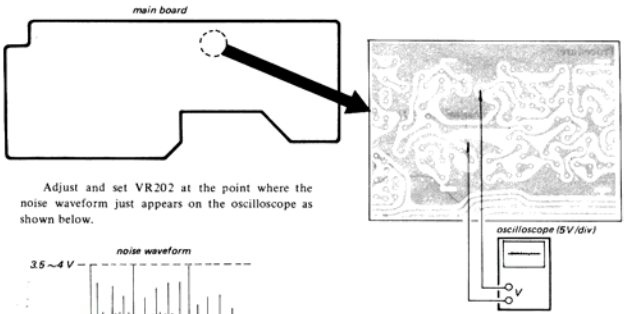
1)



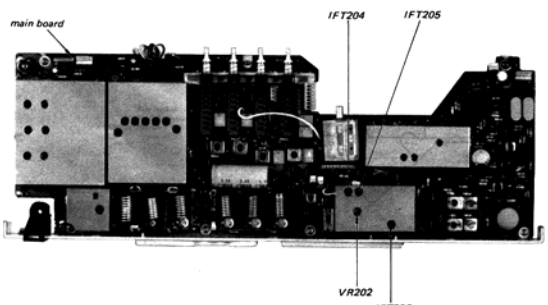
RF GAIN control: MIN

Adjust	Obtain
IFT204 IFT205 (Connect oscilloscope to A.)	Highest waveform 455 kHz marker pip about 20 kHz
IFT206 (Connect oscilloscope to B.)	

2) RF GAIN control: MAX/NORMAL



Adjust and set VR202 at the point where the noise waveform just appears on the oscilloscope as shown below.



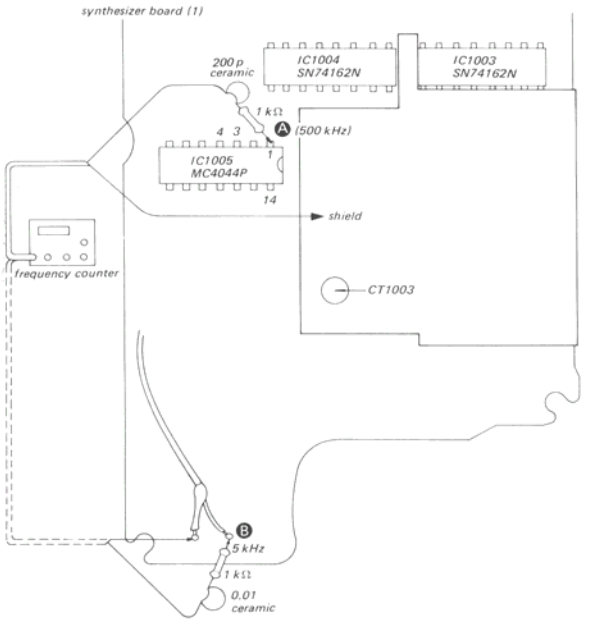
3-11. 500 kHz REFERENCE OSCILLATOR ADJUSTMENT

Setting:

BAND SELECTOR switch: SW

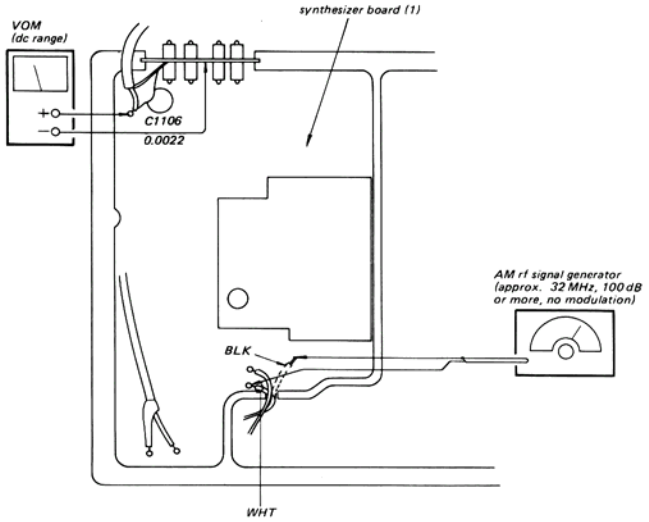
Procedure:

1)



Adjust	Connect Frequency Counter to	Frequency Counter Reading
CT1003	A	500,000 Hz ± 1Hz
(Check)	B	5,000 Hz

2) SW BAND SELECTOR switch: 29 MHz
Unsolder a white wire.



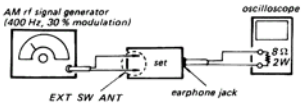
Adjust AM Rf Signal Generator Frequency	VOM Reading
around 32 MHz	0.7 V
below the frequency obtained above	6.3 V

3-12. SW 1st MIXER BALANCE ADJUSTMENT

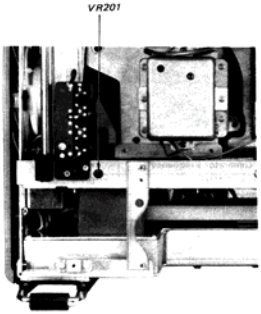
Setting:

BAND SELECTOR switch:	SW
SW BAND SELECTOR switch:	22 MHz
VOLUME control:	center of rotation
TONE controls:	center of rotation
MODE switch:	AM NORMAL

Setup:



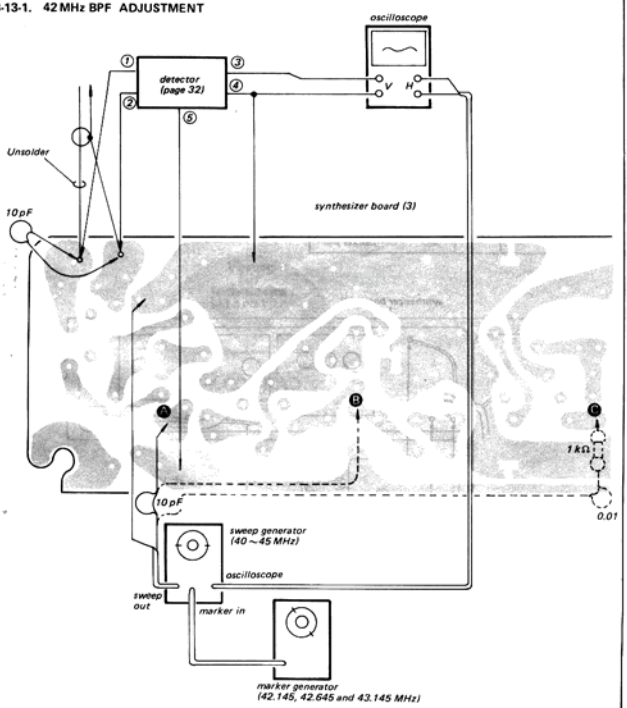
AM Rf Signal Generator Frequency	Tune the Set to	Adjust
22.57 MHz 70 dB	around 22.8 MHz to obtain a maximum waveform	VR201 to obtain a minimum waveform



3-13. SYNTHESIZER SECTION ADJUSTMENTS

Setting:
BAND SELECTOR switch: SW

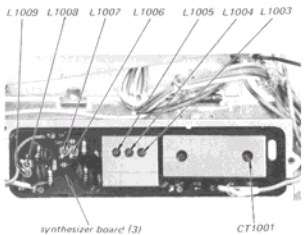
3-13-1. 42 MHz BPF ADJUSTMENT

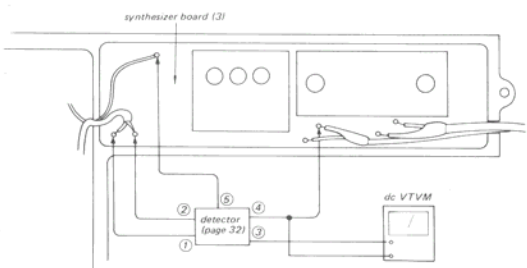


Procedure:

1. Turn CT1001 and stop the oscillation of 45.6 MHz. The 45.6 MHz pip disappears from the waveform on the oscilloscope.
2. Turn the cores of L1003 through L1006 counterclockwise until they place on top of the coils.
3.

Connect Sweep Out to	Adjust	Obtain
Ⓐ	L1008 L1009	Maximum double-humped waveform 42.645 MHz marker pip
Ⓑ	L1006 L1007	
Ⓒ	L1003 L1004 L1005	
Ⓒ (Reduce sweep out level)	L1003 through L1009 (fine adjust)	Symmetrical waveform within 3 dB 42.145 MHz marker pip 43.145 MHz marker pip





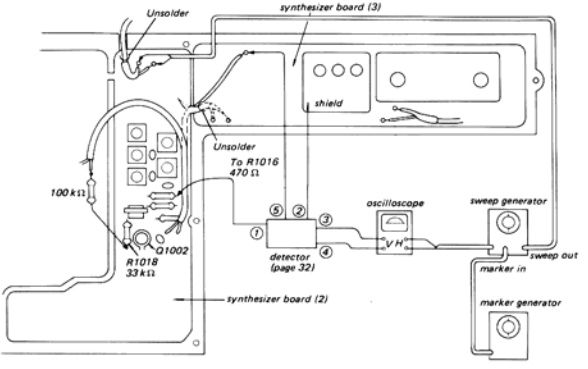
4. Turn the tuning dial throughout the range and confirm that the VTVM reading variation is within 3 dB. If not, perform steps 1 through 3.
5. Turn CT1001 and oscillate 45.6 MHz. 45.6 MHz pip appears on the waveform again.

3-13-2. 46-76 MHz BPF ADJUSTMENT

Setting:

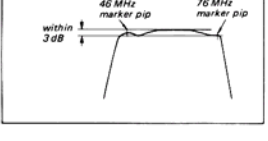
BAND SELECTOR switch: SW

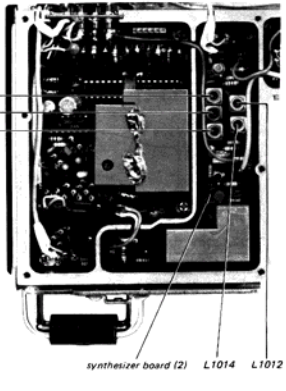
Setup:



Procedure:

Adjust	Obtain
L1012 L1014 (ORG)	Maximum amplitude at 76 MHz.
L1013 (RED)	Maximum amplitude at 46 MHz.
L1011 L1015 (BLU)	Same amplitude at 46 MHz and 76 MHz.
Repeat all the above adjustment.	



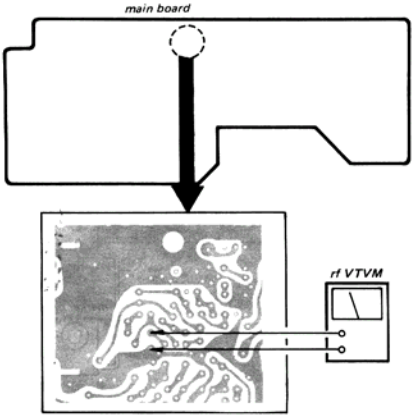


3-13-3. SW 2nd LOCAL OSCILLATOR ADJUSTMENT

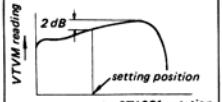
Setting:

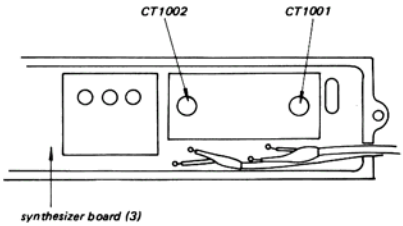
BAND SELECTOR switch: SW

Setup:



Procedure:

Adjust	Obtain
CT1001	Setting position. 
CT1002	Minimum VTVM reading.

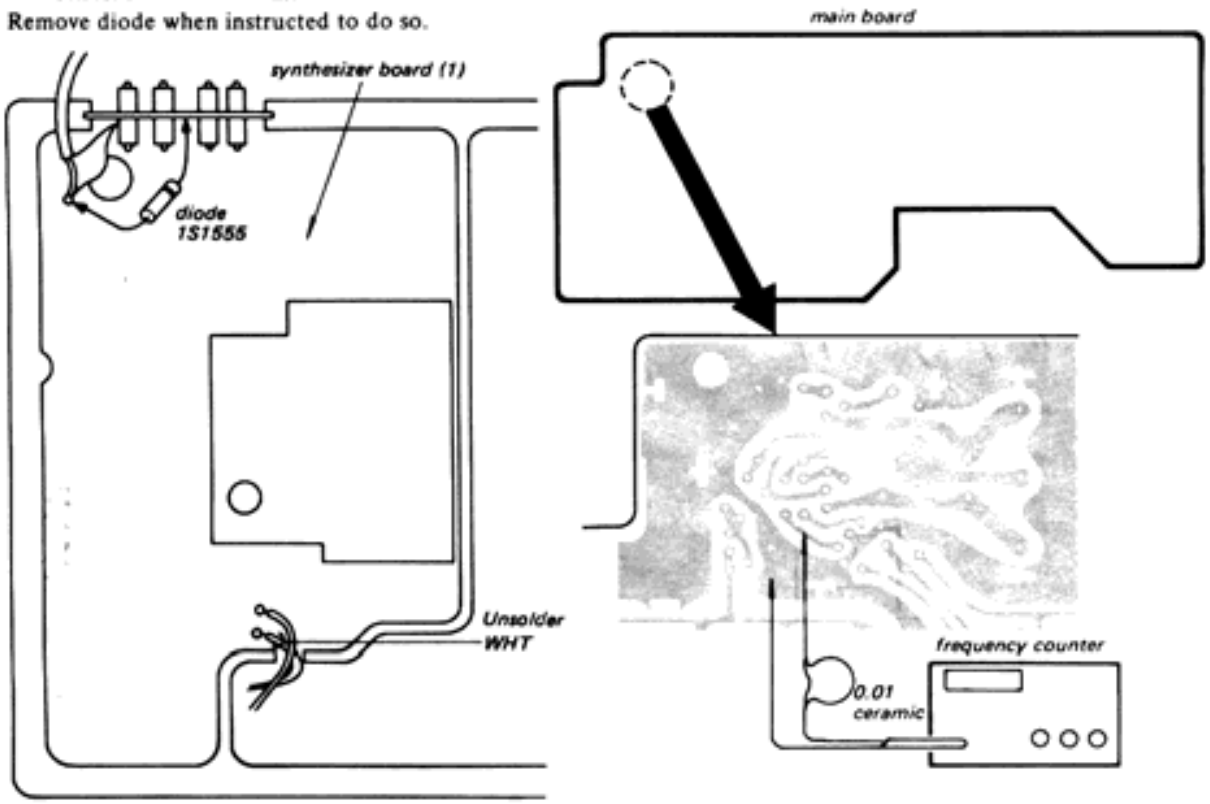


3-13-4. VCO ADJUSTMENT

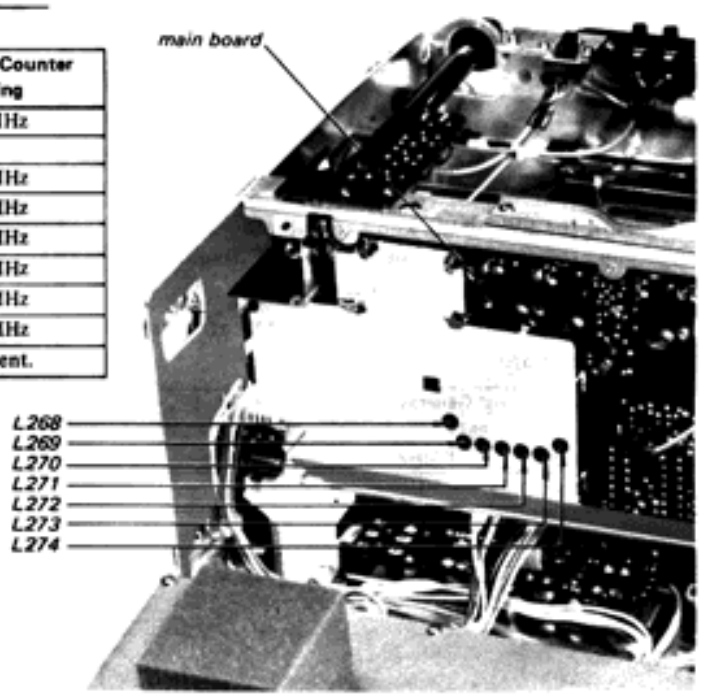
Setting:

BAND SELECTOR switch: SW

Unsolder white wire and install a diode as shown.
Remove diode when instructed to do so.



Step	SW BAND SELECTOR	Adjust	Frequency Counter Reading
1	2 MHz	L268	44.0 MHz
2	Remove diode 1S1555.		
3	3 MHz	L274	52.3 MHz
4	6 MHz	L269	56.1 MHz
5	10 MHz	L270	61.6 MHz
6	15 MHz	L273	66.4 MHz
7	20 MHz	L271	71.7 MHz
8	25 MHz	L272	76.8 MHz
9	Fix all coils with wax after the adjustment.		

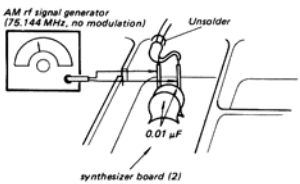


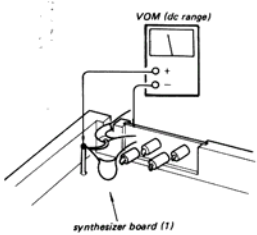
3-13-5. SYNTHESIZER SECTION CHECKOUT

Setting:

BAND SELECTOR switch: SW
SW BAND SELECTOR switch: 29 MHz

Setup:





Procedure:

1. Turn the SW tuning knob and obtain a 29 MHz 999 kHz indication on the digital frequency indicator on the front panel.
2. Fine adjust the frequency of AM rf signal generator around 75.14 MHz.

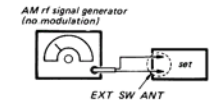
AM Rf Signal Generator Frequency		VOM Indication
above	75.144 MHz	0.7 V
below	75.144 MHz	6.3 V

3-13-6. SW SPURIOUS BEAT ADJUSTMENT

Setting:

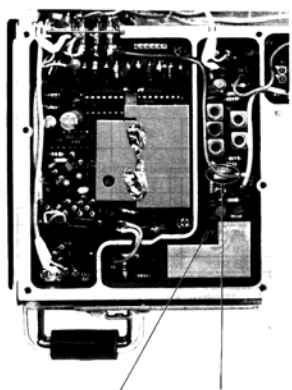
BAND SELECTOR switch: SW
SW BAND SELECTOR switch: 29 MHz
VOLUME control: MAX
TONE controls: MAX
RF GAIN control: MAX/NORMAL

Setup:



Procedure:

AM Rf Signal Generator Frequency	Adjust
approximately 29.352 MHz or 29.852 MHz	VR1001 for a minimum beat note



3-2. TAPE RECORDER SECTION

PRECAUTION

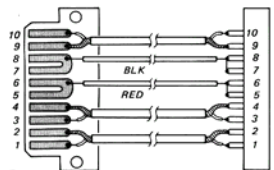
1. Clean the following parts with a denatured-alcohol-moistened swab:

record/playback head	pinch roller
erase head	rubber belts
capstan	idlers

2. Demagnetize the record/playback head with a head demagnetizer. (Do not bring the head demagnetizer close to the erase head.)
3. Do not use a magnetized screwdriver for the adjustments.
4. After the adjustments, apply a suitable locking compound to the parts adjusted.
5. The adjustments should be performed with the rated power supply voltage unless otherwise noted.

Preparation of Extension Cable

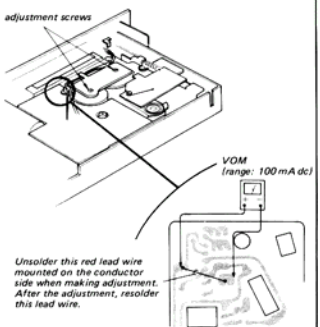
Make an extension cable as shown below and connect it between the radio and tape recorder sections.



Flywheel Thrust Play Adjustment

Procedure:

1. Mode: playback



2. Turn the adjustment screws counterclockwise until the screw tip is detached from the flywheel shafts.
3. Gradually turn either of the adjustment screws clockwise to the position where the motor current suddenly increases.
4. Then, turn the screw counterclockwise about ¼ turn from the position obtained in step 3.
5. Perform steps 3 and 4 for the another adjustment screw.
6. After the adjustment, apply a suitable locking compound to the screws.

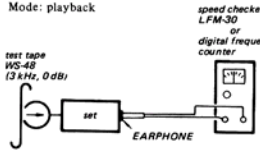
Tape Speed Adjustment

Setting:

VOLUME control: mechanical mid

Procedure:

Mode: playback

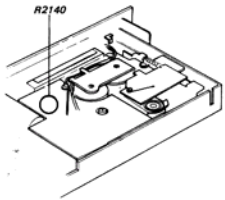


Specification:

Speed Checker	Digital Frequency Counter
−0.5 ∔ −1.5%	2985 — 2955 Hz

Adjustment Location:

– record/playback board –



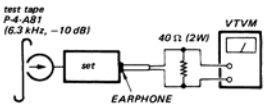
Record/playback Head Azimuth Adjustment

Setting:

VOLUME control: mechanical mid

Procedure:

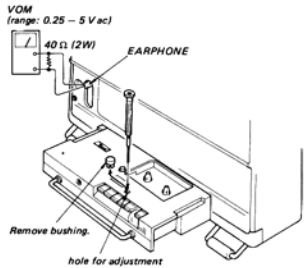
1. Mode: playback



2. Turn the adjustment screw for the highest VTVM reading.

Note: Several peaks may appear, take the highest.

Adjustment Location:

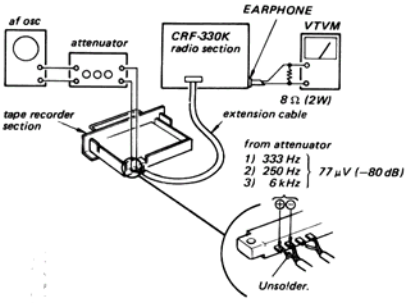


Record Bias Adjustment

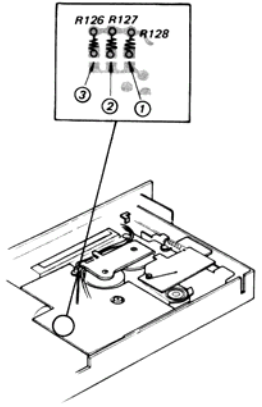
Setting:

TONE controls: mechanical mid

Procedure:



Adjustment Location:
– record/playback board –



1. FUNCTION: RADIO
   Mode: record
2. Mode: playback
   Playback 333 Hz. Adjust VOLUME control for 0.25 V (–10 dB) VTVM reading.
3. Repeating the above steps, adjust as follows:

Playback	Adjust pattern connection	Level difference
250 Hz 6 kHz	①,②,③	within 18 dB

Pattern connection	6 kHz VTVM reading
①	down ↑ ↓ up
②	
③	

4. If necessary, repeat above steps.

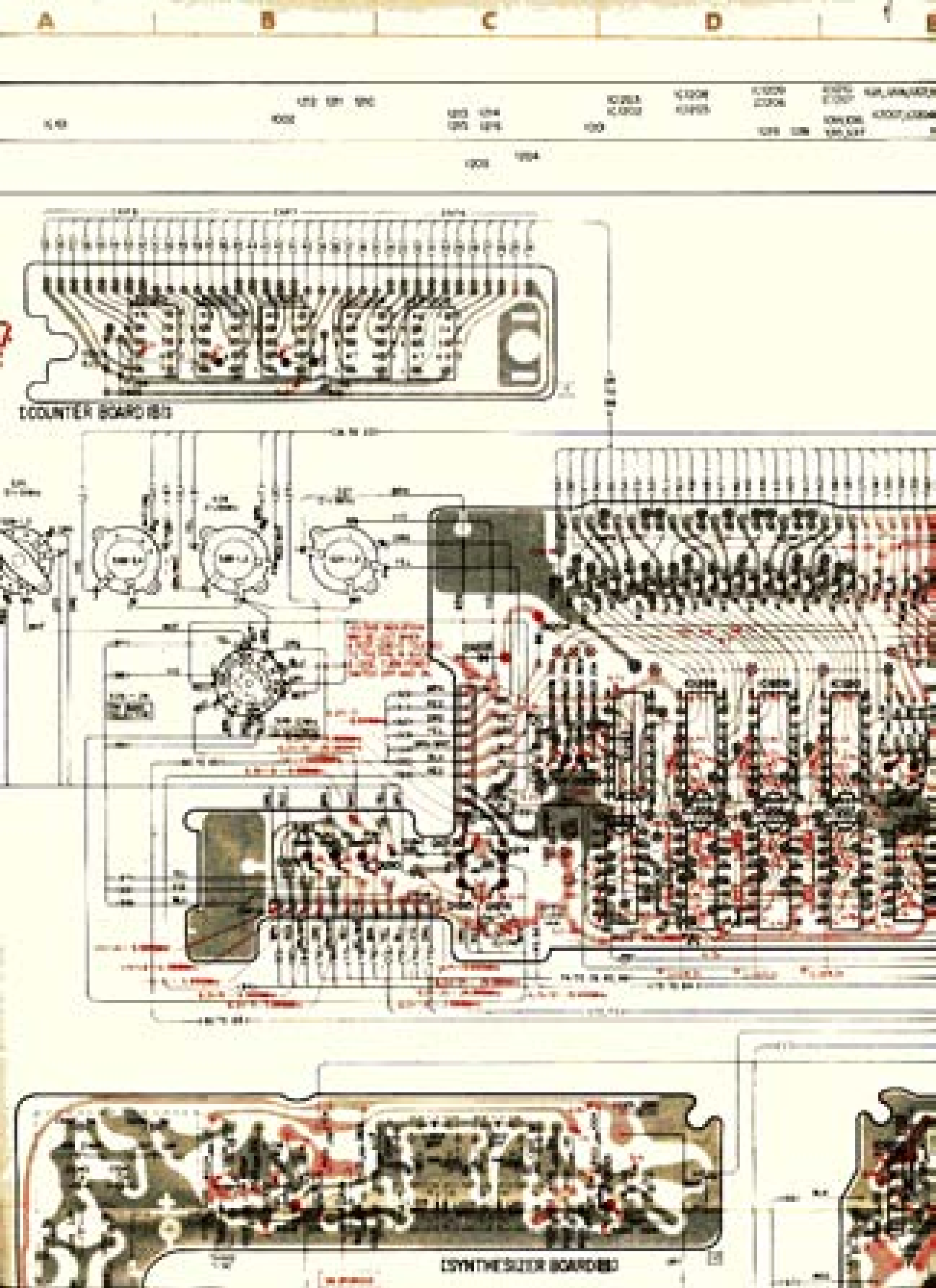
MEMO

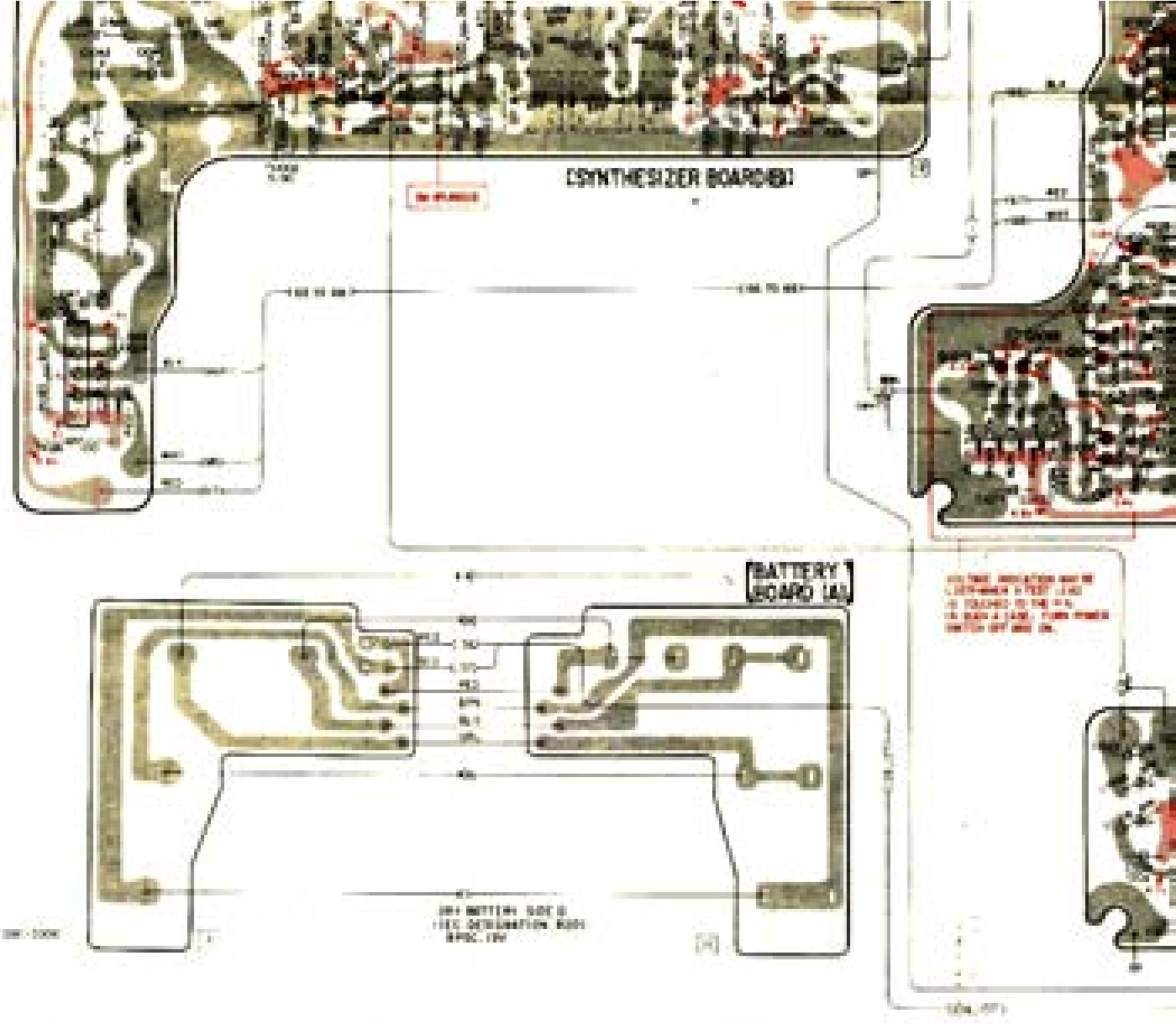
4-1. MOUNTING DIAGRAM – Rad
– Conductor Side –

SECTION 4
DIAGRAMS

4-1. MOUNTING DIAGRAM – Radio Section –

– Conductor Side –


A
B
C
D
COUNTER BOARD (B3)
SYNTHESIZER BOARD (B2)



A

Q005, 201 } 2SA49
Q204, 501 }

Q201, 204, 227 } 2SA37
Q1001, 1002 }

Q002, 203 }
Q052, 502 } : 2SA233A-840
Q205, 206
Q054: 2SK23A-660
Q902, 903 : 2SK23A-834
Q1025, 1291 :
Q1026: 2SK23A-825

B

Q212: 2SC710-53
Q003, 053, 207 – 209
Q213, 214, 1003, 1004
Q1003 – 1018, 1021
Q1022, 1292, 1303 } C : 2SC710

Q210, 211, 222
Q801 – 803 : 2SC710-54

Q1023, 1024: 2SC536A

Q215, 218 – 221, 225, 230
Q501, 503, 504, 703 – 706 : 2SC634A
Q1027 – 1212 (2SC1363)
Q804, 806, 1294 – 1213: 2SC1364

D

Q217, 231, 701 } 2SA676
Q1213 – 1216 }

Q225, 226: 2SC1139

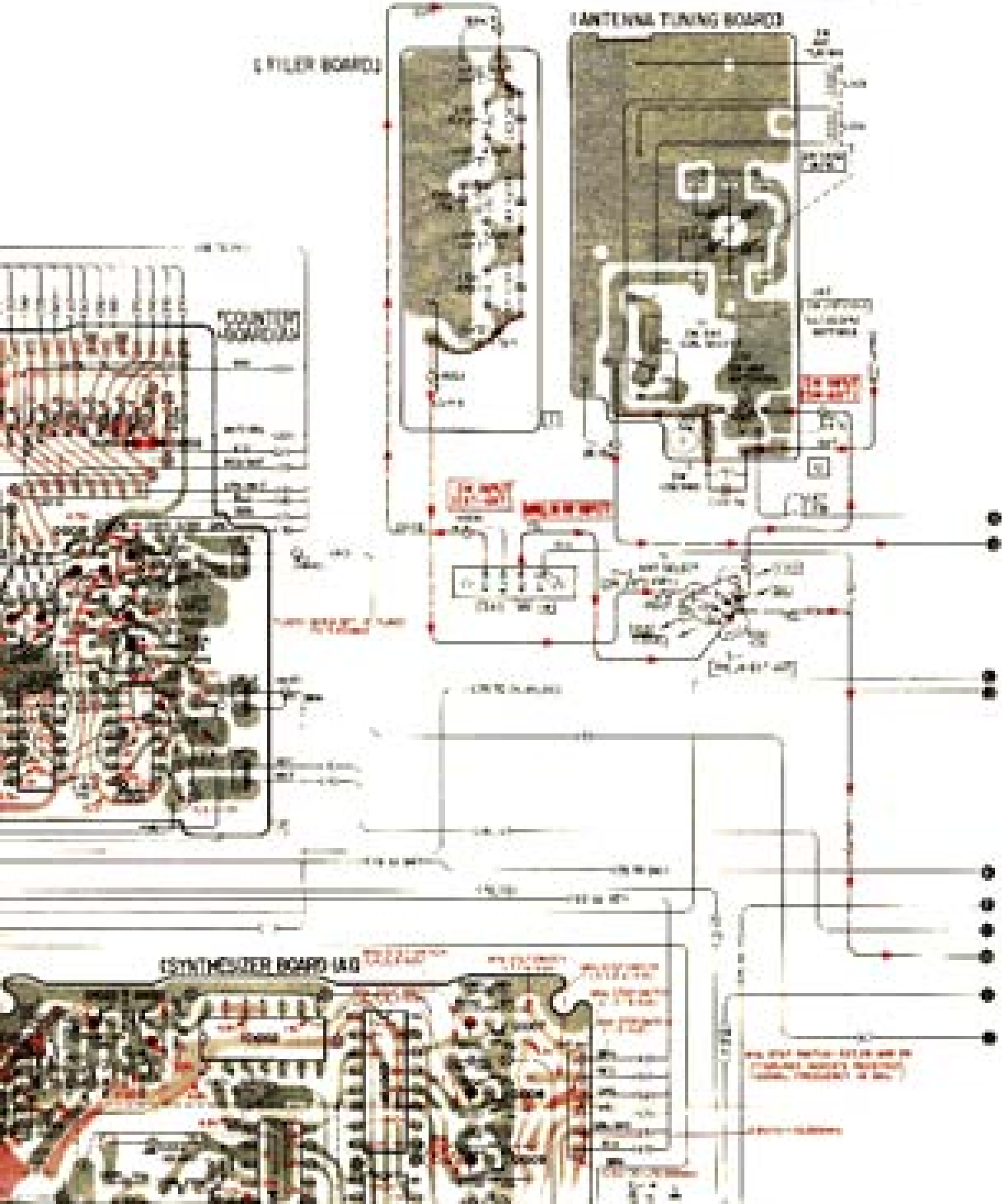
Q226, 702: 2SA684

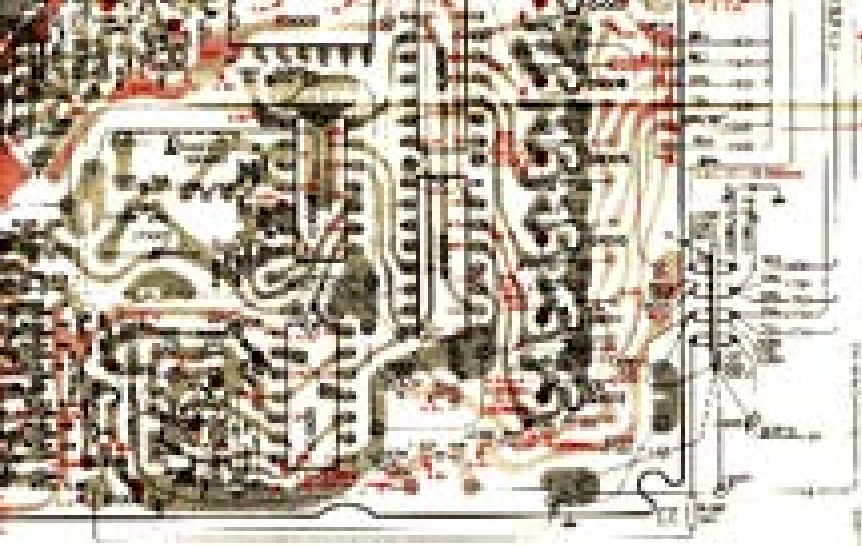
Q401: 2SC633A
Q1023, 1024: 2SC63

Q402, 803: 2SC1426

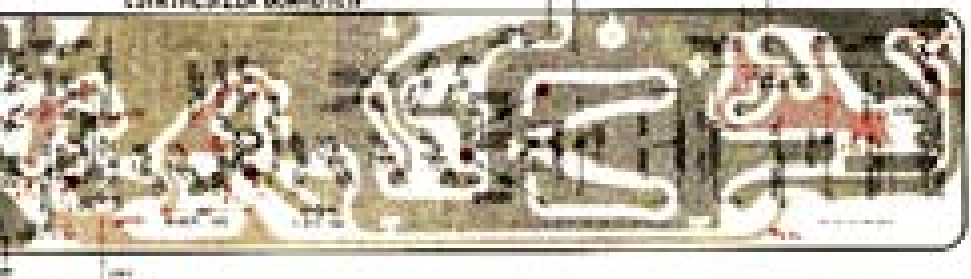
Q1019, 1020: 2SC64

E F G H





SYNTHESIZER BOARD (C.T.)

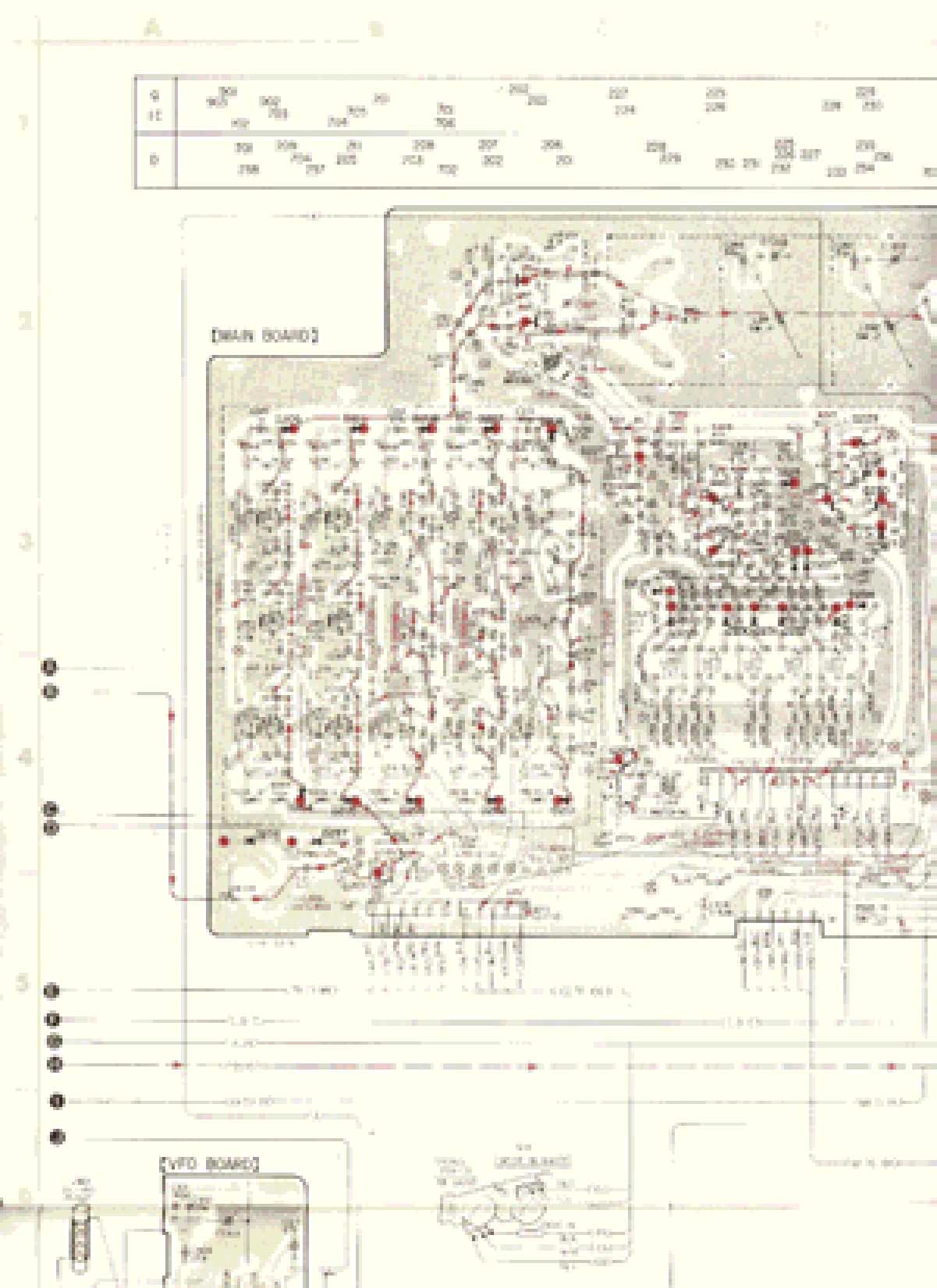


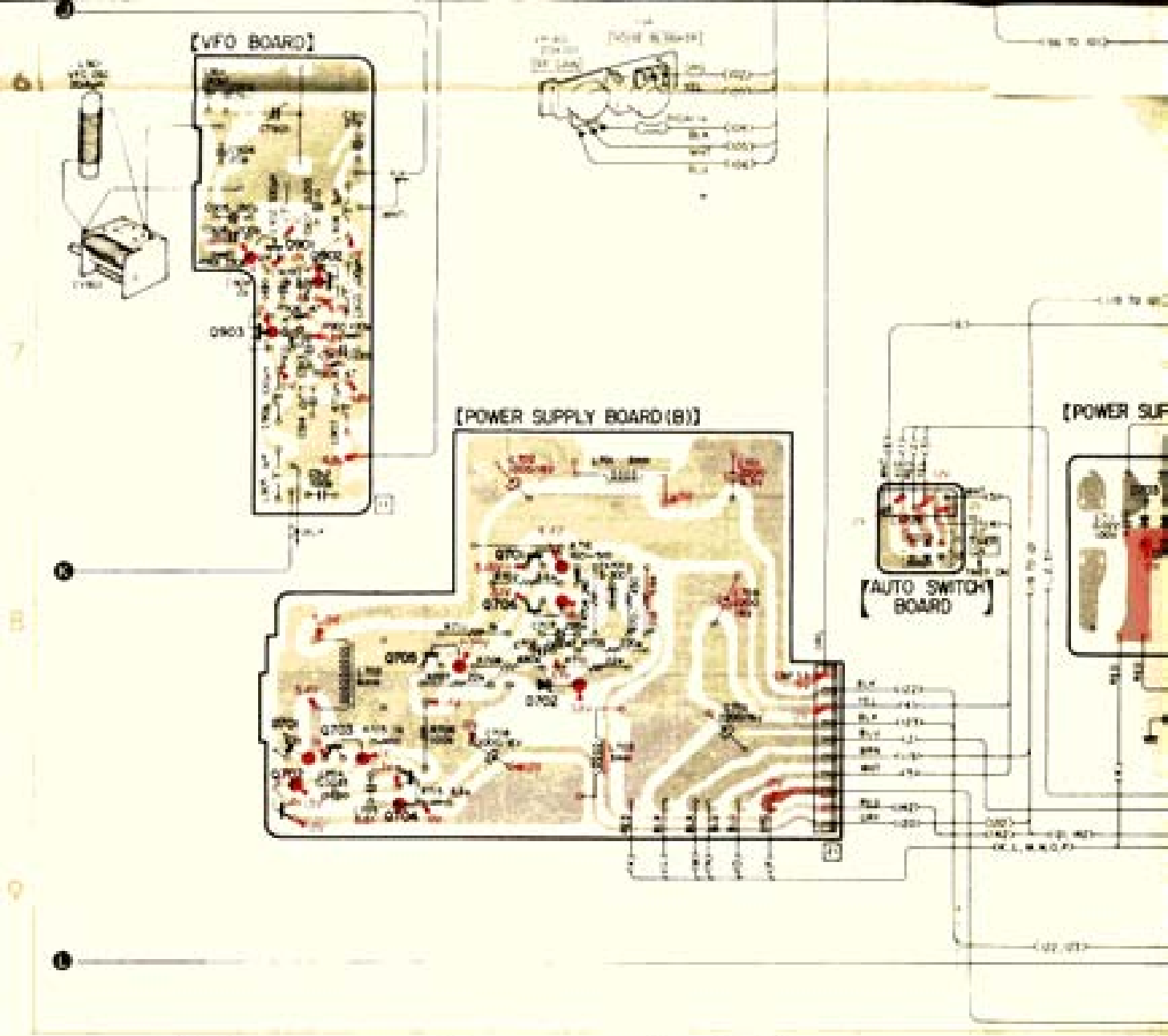
E

F

G

H

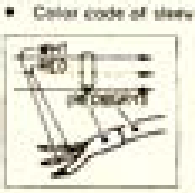

[MAIN BOARD]
[VFO BOARD]



A

Note:

- All capacitors are in μF unless otherwise noted. pF = μμF. 50WV or less are not indicated except for electrolytics.
- All resistors are in ohms, ¼W unless otherwise noted. kΩ = 1000Ω, MΩ = 1000kΩ
- : fusible resistor.
- : internal component.
- : panel designation.
- : adjustment for repair.
- Transistor base-emitter voltages are measured on the 2.5V range.
- Transistor is used for Q701.
- Color code of sleeving over the end of the jacket



- : B+ pattern
- : signal path

component side pattern

through hole

B

C

- : B+ bus.
- : B+ bus when S3 (BAND SELECTOR SW) is on.
- : B+ bus at 3.501 MHz.
- Voltages are DC with respect to ground unless otherwise noted.
- Readings are taken under SW detuned conditions with a VOM (20 kΩ/V), setting VR501 (TREBLE) to minimum position, VR502 (BASS) to minimum position and VR503 (VOLUME) to mechanical mid position.

< > : FM1 ..... S15 (AFC): ON, S16 (MUTING): OFF, tuning dial: minimum frequency

[ ] : FM2 ..... S15 (AFC): ON, S16 (MUTING): OFF, tuning dial: minimum frequency

< > : FM ..... S15 (AFC): OFF, S16 (MUTING): ON, tuning dial: minimum frequency

[ ] : LW ..... VR1401 (RF GAIN): MAX/NORMAL, MODE: NORMAL, tuning dial: minimum frequency

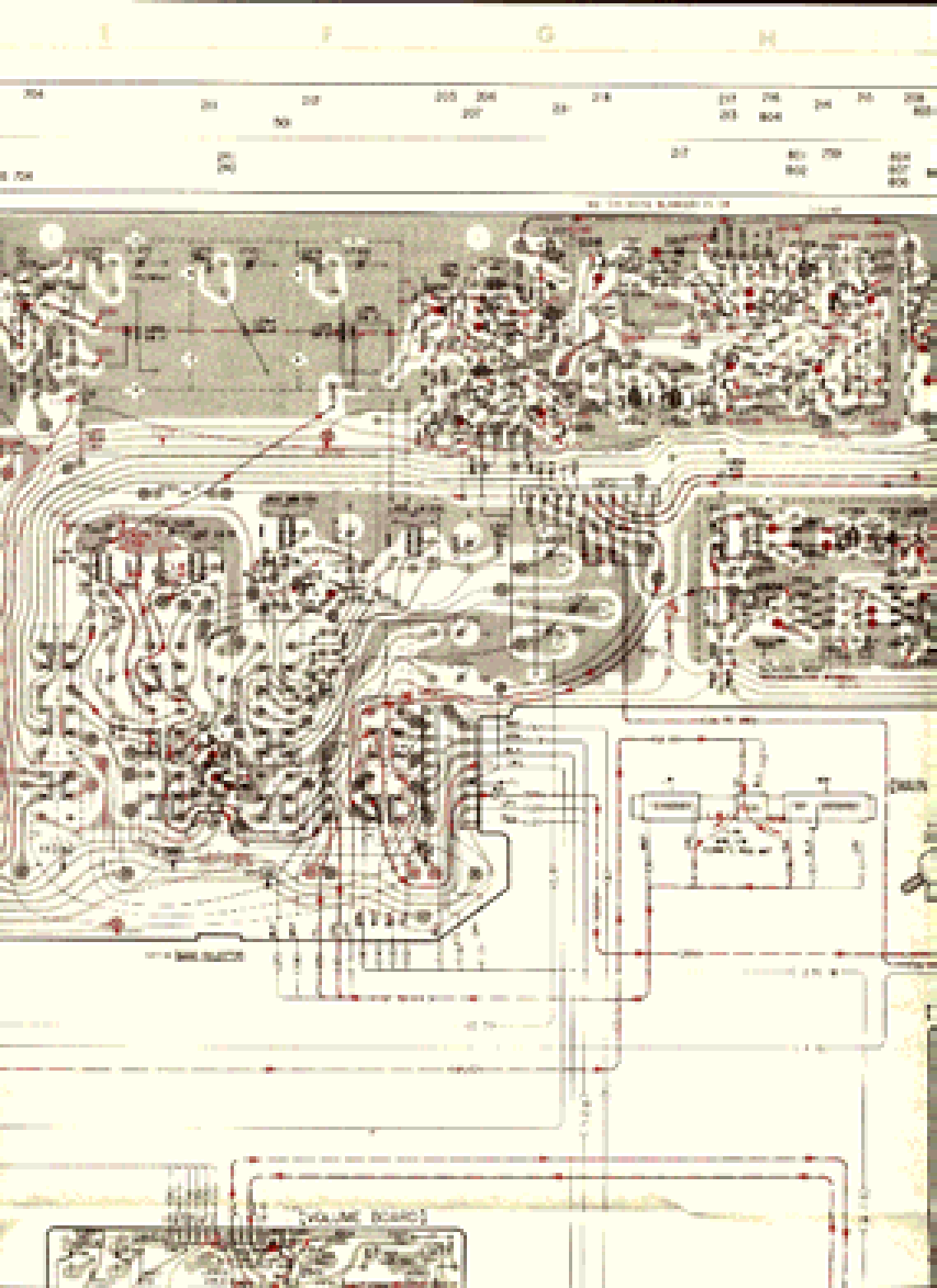
[ ] : MW ..... VR1401 (RF GAIN): MAX/NORMAL, MODE: NORMAL, tuning dial: minimum frequency

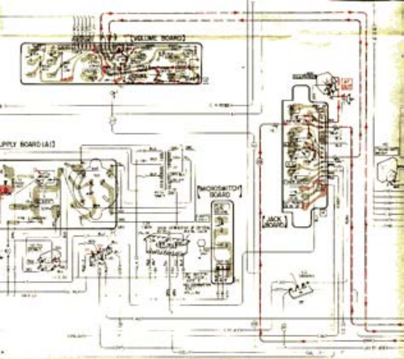
D

/G M
/G M
/USB
/LSB
/SSB

/CW
/NB
/MH

* * 1 Re
(be


VOLUME BOARD



MAX ...... VR1401 (RF GAIN) MAX/NORMAL
MIN ...... VR1401 (RF GAIN) MIN
...... S10 (MAIN, LSB-USB): ON
...... S11 (MODE, LSB-USB): ON
...... S10 (MODE, LSB-USB) or S11 (MODE, LSB-USB): ON
...... S12 (CW): ON
...... S14 (NOISE BLANKER): ON
MHz ...... When 1 MHz signal is received.

Relations of the LED indication (decimal value) and BCD (binary-coded decimal) value are as follows.

LED indication	BCD code A	B	C	D
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

0 : low level
1 : high level

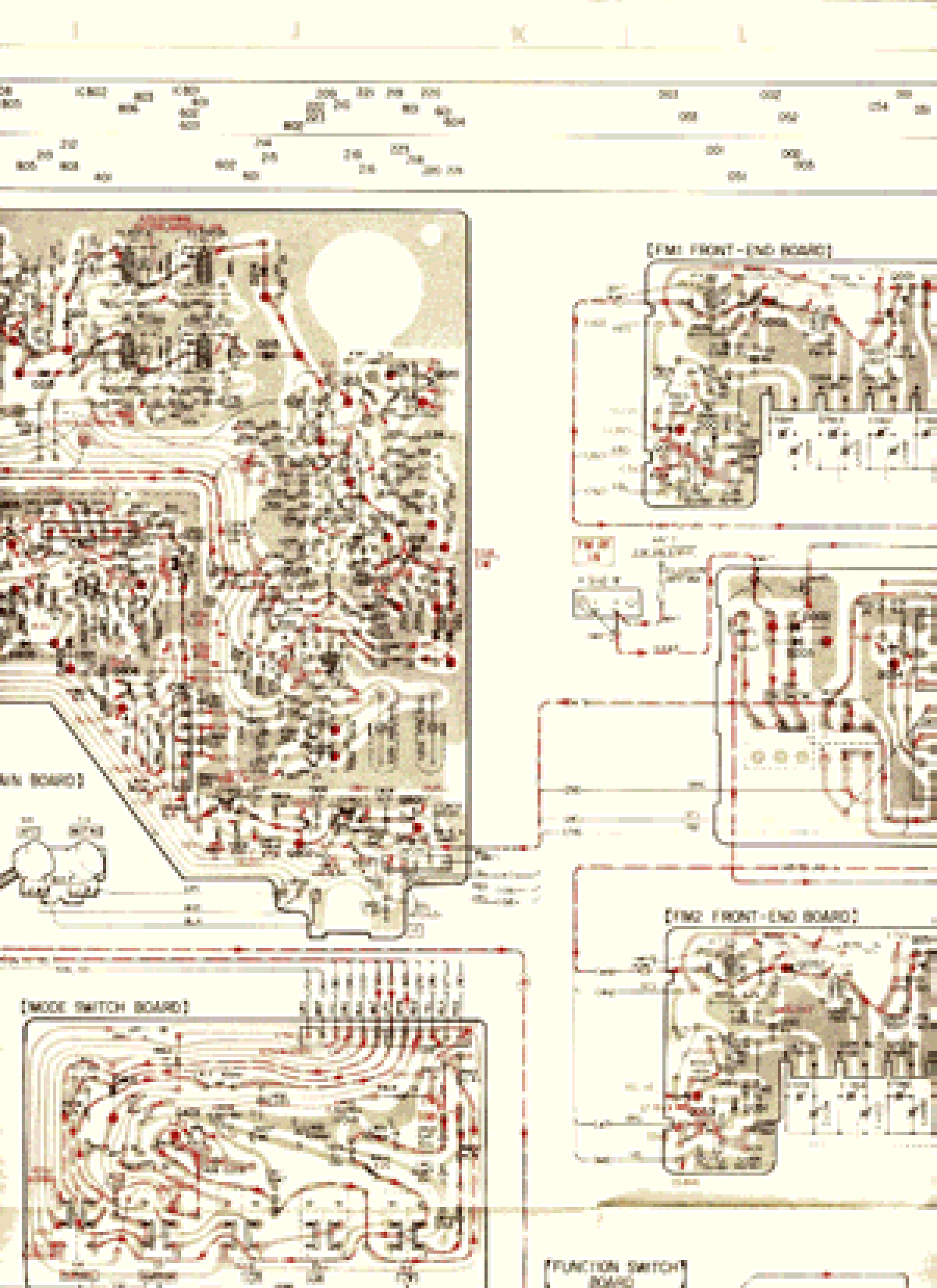
**1 Relation of the LED indication (decimal value) and inputs to the LED are as follows.

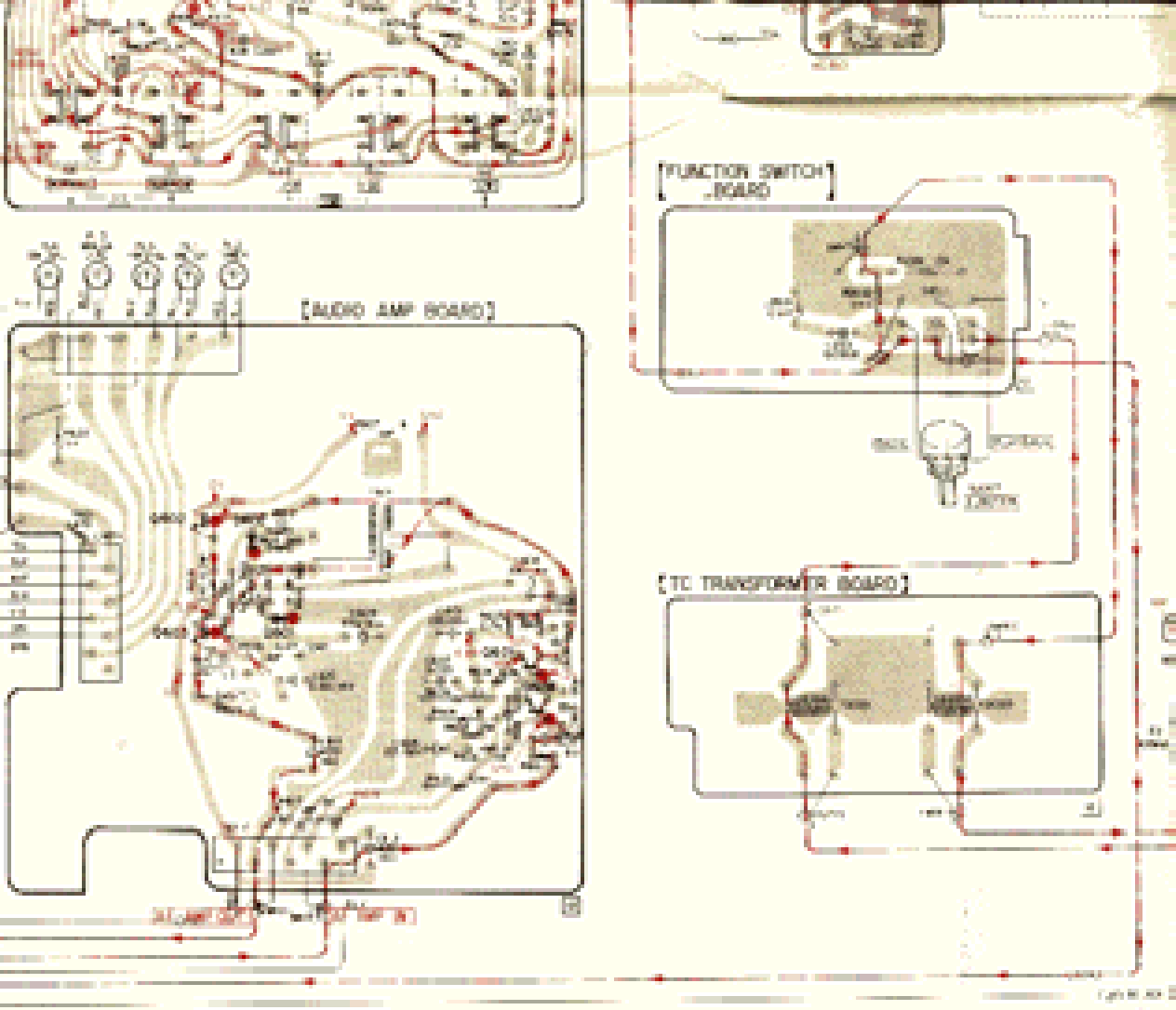
LED indication	LED input terminal a	b	c	d	e	f	g
0	1	1	1	1	1	1	0
1	0	1	1	0	0	0	0
2	1	1	0	1	1	0	1
3	1	1	1	1	0	0	1
4	0	1	1	0	0	1	1
5	1	0	1	1	0	1	1
6	0	0	1	1	1	1	1
7	1	1	1	0	0	0	0
8	1	1	1	1	1	1	1
9	1	1	1	1	0	1	1

0 : low level
1 : high level

**3 0: 0 V
1: 4.5 V

SW BAND	[illegible]	[illegible]
1 MHz BAND	1	1
2	0	1
3	1	0
4	0	0
5	1	1
6	0	1
7	1	0
8	0	0
9	1	0
10	0	0
11	1	1
12	0	1
13	1	0
14	0	0
15	1	1
16	0	1
17	1	0

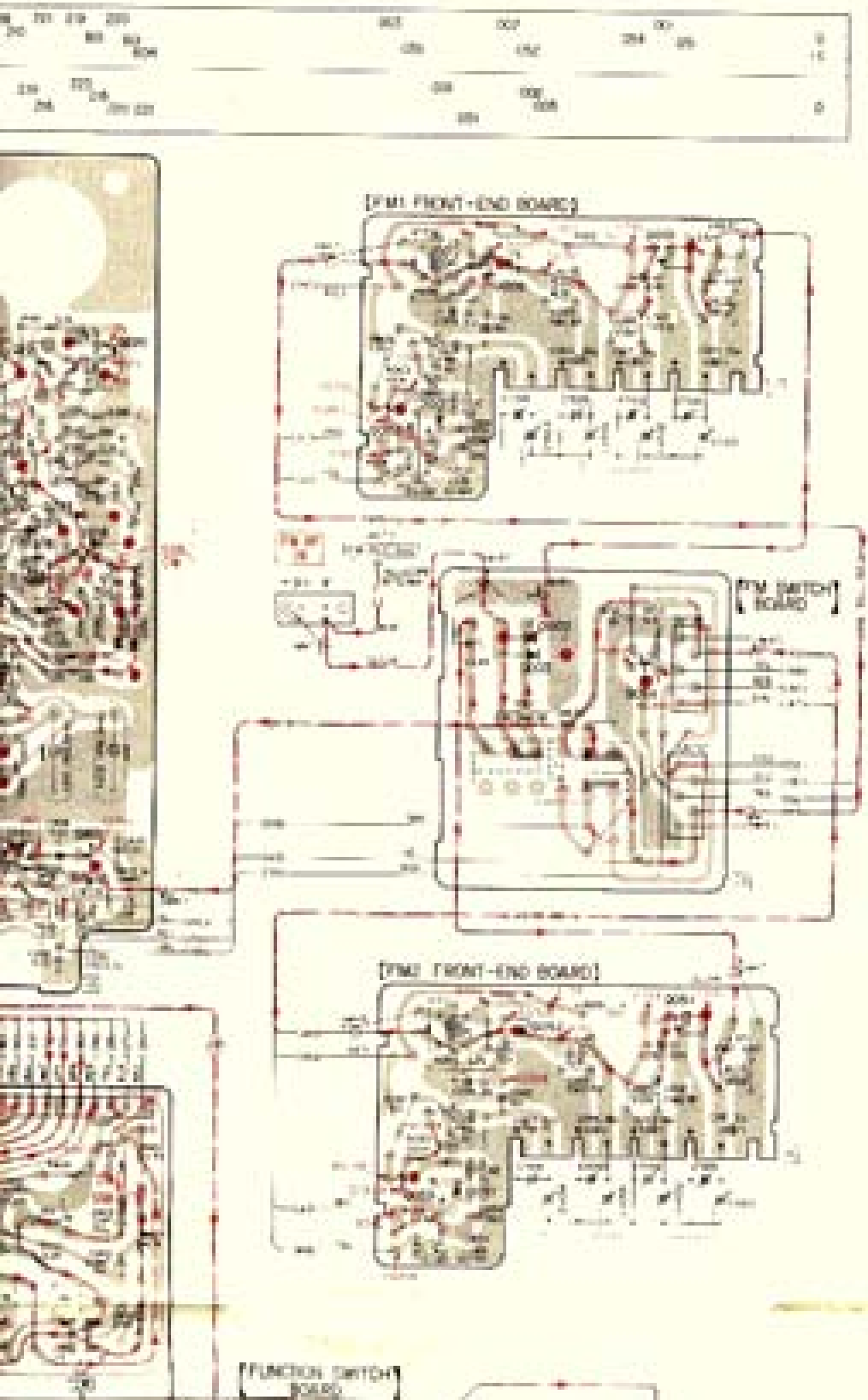

[FM1 FRONT-END BOARD]
[FM2 FRONT-END BOARD]
[MODE SWITCH BOARD]
[FUNCTION SWITCH BOARD]

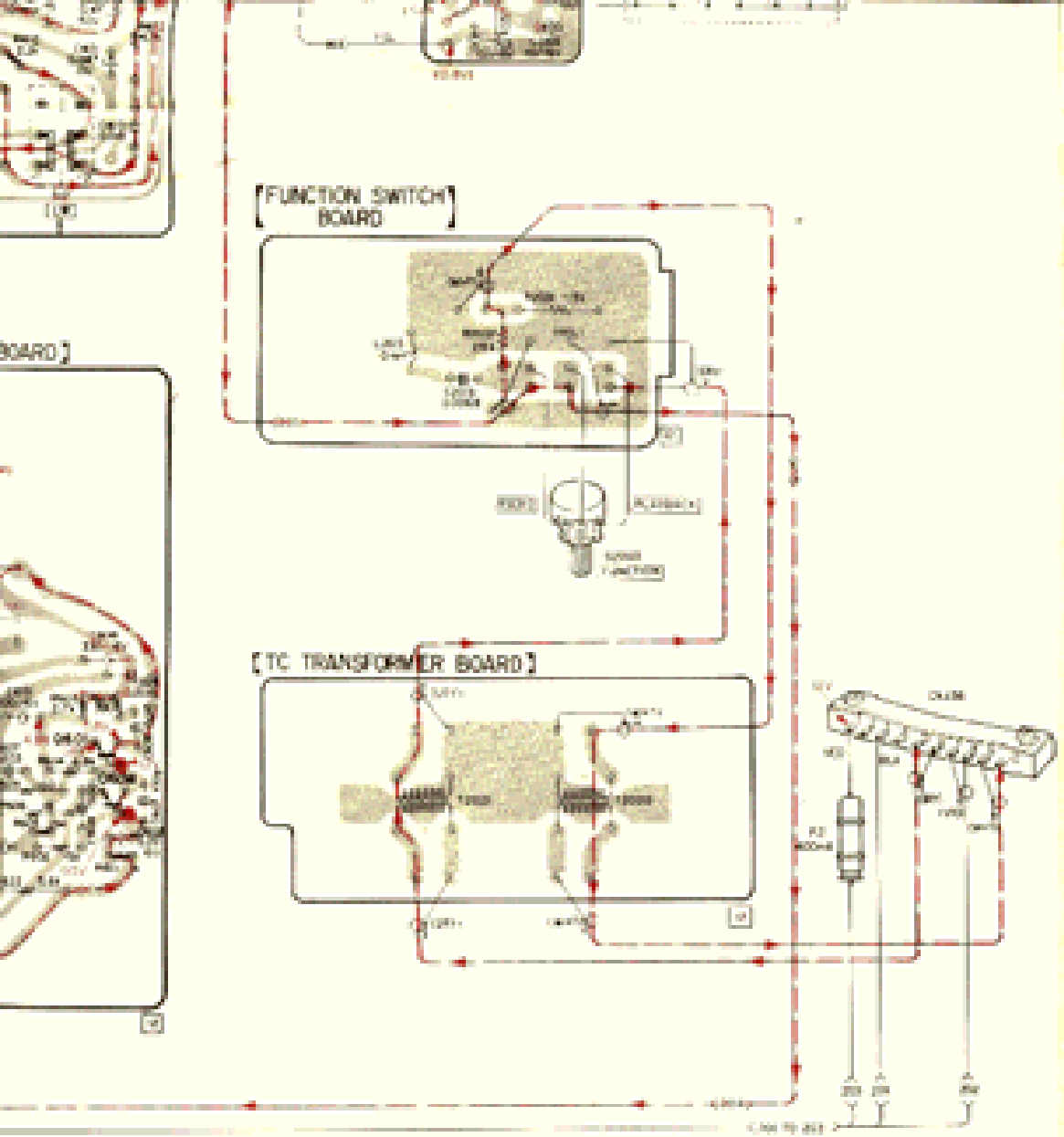


SW BAND	IC TERMINAL					
	IC1000				IC1006	
	⑦	⑧	⑨	⑩	⑫	⑬
10 MHz BAND	0	0	0	0	0	1
19	1	0	0	0	1	0
20	0	0	0	1	1	0
21	1	1	0	1	1	0
22	0	1	1	0	1	0
23	1	0	1	0	1	0
24	0	0	1	0	1	0
25	1	0	0	0	1	0
26	0	1	0	0	1	0
27	1	0	0	0	1	0
28	0	0	0	0	1	0
29	1	0	0	1	0	0

Ref. No.	Switch	Position
S001	KEY ANT GND	TEST
S1-1	ANT SELECT MW, LW & EXT ANT	LW/ANT
S1-2	ANT SELECT SW ANT ROD EXT	ROD
S2	SW ANT COIL SELECT L100 L101	L100
S3-1 ~ S4	BAND SELECTOR, SW	Q4
S4-1 ~ S4	BAND SELECTOR, MW	Q4
S5-1 ~ S6	BAND SELECTOR, LW	ON
S6-1 S4	BAND SELECTOR, FM	OFF
S8	MODE, NORMAL	ON
S9	MODE, NARROW	ON
S10	MODE, USB/SSB	OFF
S11	MODE, LSB/SSB	OFF
S12	MODE, CW	OFF
S14	NOISE BLANKER	ON
S15	AFC	OFF
S16	MUTING	OFF
S17	TIMER ON	OFF
S18	BATT CHECK	OFF
S19	LIGHT	ON
S20	ZERO SECOND	OFF

Ref. No.
S21
S22
S23
S24
S25
S26
S27 ~ S29
S2000


[FM1 FRONT-END BOARD]
[FM SWITCH BOARD]
[FM2 FRONT-END BOARD]
[FUNCTION SWITCH BOARD]



TERMINAL	IC1004			
	①	②	③	④
0	0	0	0	1
0	0	1	1	0
0	1	1	1	0
1	0	1	1	0
1	0	1	1	0
1	0	1	1	0
1	0	1	1	0
0	0	1	1	0
0	0	1	1	0
0	0	1	1	0
0	0	1	1	0
0	1	0	0	0

* Switch

Ref. No.	Switch	Position
S001	FM FM1 – FM2	FM1
S1-1	ANT SELECT SW, LW-EXT ANT	LOCAL
S1-2	ANT SELECT SW-ANT ROD-EXT	ROD
S2	SW ANT COIL SELECT L108 L109	L108
S3-1 – 3-6	BAND SELECTOR, SW	ON
S4-1 – 4-6	BAND SELECTOR, MW	OFF
S5-1 – 5-6	BAND SELECTOR, LW	OFF
S6-1 – 6-6	BAND SELECTOR, FM	OFF
S8	MODE, NORMAL	ON
S9	MODE, NARROW	OFF
S10	MODE, USB-SSB	OFF
S11	MODE, LSB-SSB	OFF
S12	MODE, CW	OFF
S14	NOISE BLANKER	OFF
S15	AFC	OFF
S16	MUTING	OFF
S17	TIMER ON	OFF
S18	BATT CHECK	OFF
S19	LIGHT	OFF
S20	ZERO SECOND	OFF

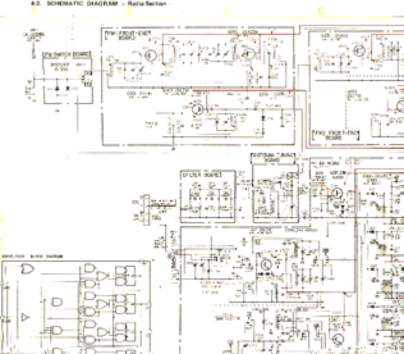
Ref. No.	Switch	Position
S21	POWER	OFF
S22	OFF-ON-TIMER ON	OFF
S23	VOLTAGE SELECT	100 V
S24	BATT/AC	BATT
S25	QUARTZ TIMER	OFF
S26	SW BAND SELECTOR 10 MHz STEP 0 – 10 MHz – 20	0
S27 to 29	SW BAND SELECTOR 1 MHz STEP 0 – 1MHz – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9	9
S3003	FUNCTION RADIO/PLAYBACK	RADIO

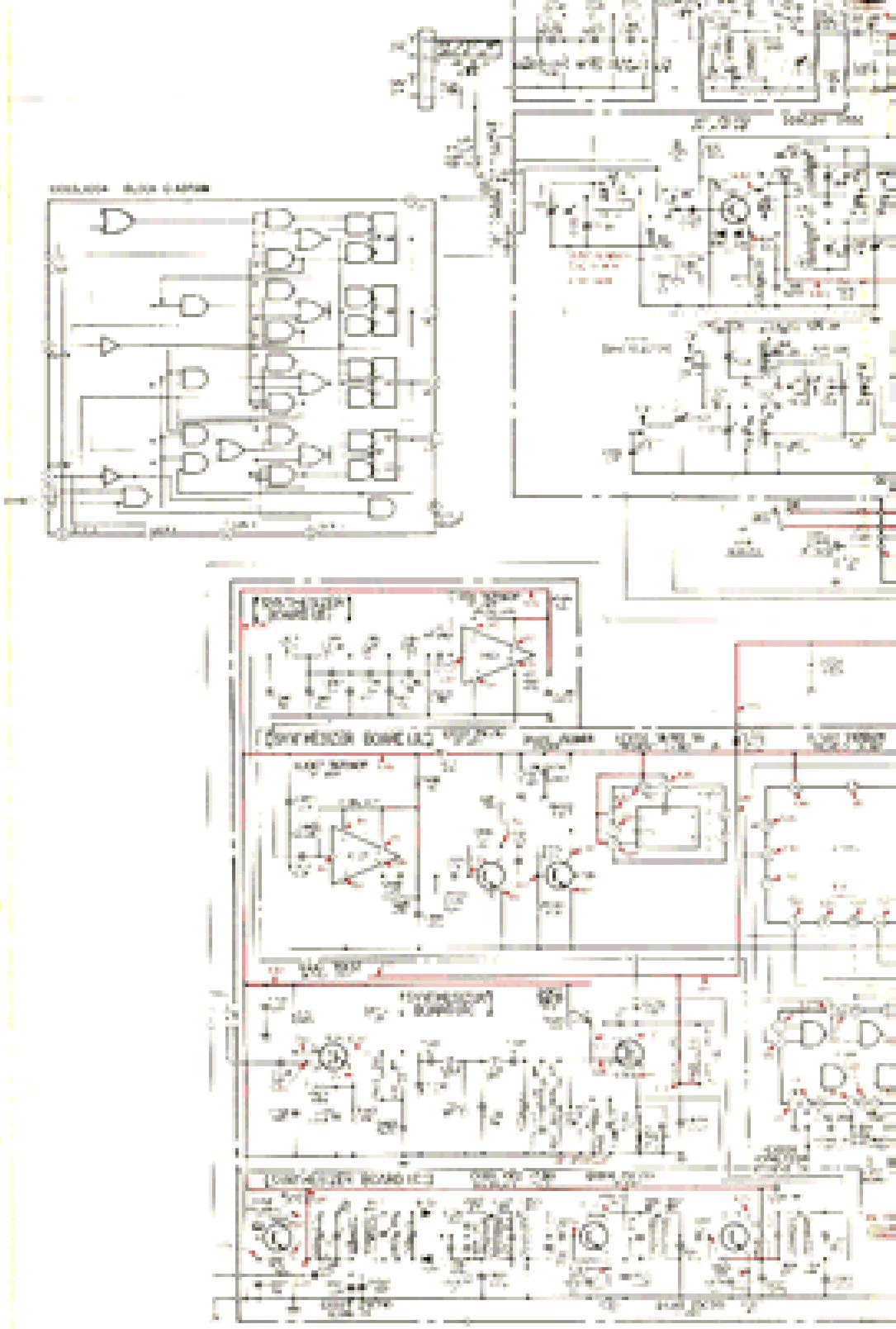
Note:

- All capacitors are in µF unless otherwise noted. pF: µµF 50WV or less are not indicated except for electrolytics.
- All resistors are in ohms, 1/4W unless otherwise noted. kΩ = 1000Ω, MΩ = 1000kΩ
- : fusible resistor.
- : internal component.
- : panel designation.
- : adjustment for repair.
- Transistor... voltages are measured...
- ... is used for ...
- Color code of drawing ...

- : B+ pattern
- : signal path

4-2. SCHEMATIC DIAGRAM – Radio Section –





...ces are in μF unless otherwise noted. pF : μμF
...ltages are not indicated except for electrolytics.
...rs are in ohms, 1/4 W unless otherwise noted.
...kΩ, MΩ = 1000kΩ
...sible resistor.
...ternal component.
...and designation.
...ljustment for repair.
...parentheses voltages are measured on the 2.5 V

...is used for D701.
...e of pleasing over the end of the jacket.

- ▒▒▒▒ : B+ pattern
- —▸— : signal path

component side pattern

through hole

- ——— : B+ bus.
  - – – – : B+ bus when S3 (BAND SELECTOR, SW) is on.
  - —·—·— : B+ bus at 21.01 MHz.
- Voltages are DC with respect to ground unless otherwise noted.
- Readings are taken under SW detuned conditions with a VOM (20kΩ/V), setting VR301 (TREBLE) to minimum position, VR307 (BASS) to maximum position and VR900 (VOLUME) to mechanical mid position.
  - < > : FM1 .... S15 (AFC): ON, S16 (MUTING): OFF, tuning dial: minimum frequency
  - [ ] : FM2 .... S15 (AFC): ON, S16 (MUTING): OFF, tuning dial: minimum frequency
  - < > : FM .... S15 (AFC): OFF, S16 (MUTING): ON, tuning dial: minimum frequency
  - ( ) : LW .... VR1401 (RF GAIN): MAX/NORMAL, MODE: NORMAL, tuning dial: minimum frequency
  - ( ) : MW .... VR1401 (RF GAIN): MAX/NORMAL, MODE: NORMAL, tuning dial: minimum frequency

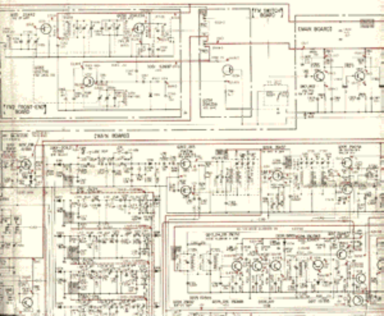
/G MAX: .... VR1401 (RF GAIN): MA...
/G MIN: .... VR1401 (RF GAIN): MI...
/USB: .... S10 (MODE, USB-SSB): ...
/LSB: .... S11 (MODE, LSB-SSB): ...
/SSB: .... S10 (MODE, USB-SSB) ... LSB-SSB): ON
/CW: .... S12 (CW): ON
/NB: .... S14 (NOISE BLANKER...
/1 MHz: .... When 1 MHz signal is ...

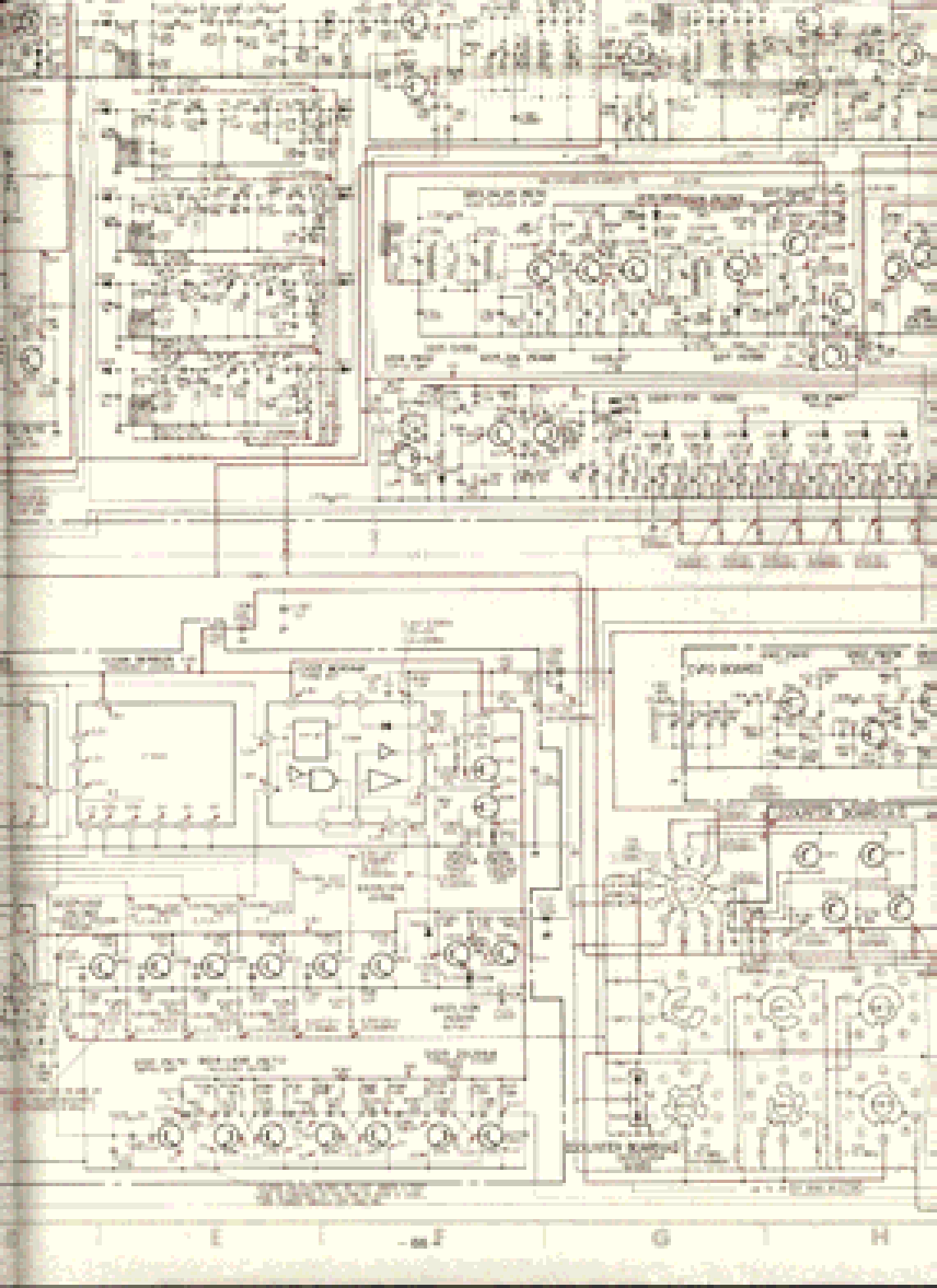
**1 Relations of the LED indication (decimal ...) (binary-coded decimal) value are as follows...

LED Indication	BCD code A	B	C	D
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

0 : low level
1 : high level

D E F G H





K/NORMAL
ON
ST) MODE,
ON
ified.
etual and BCD

* \#2 Relation of the LED indication (decimal value) and inputs to the LED are as follows:

LED indication	LED Input Terminal a	b	c	d	e	f	g
0	1	1	1	1	1	1	0
1	0	1	1	0	0	0	0
2	1	1	0	1	1	0	1
3	1	1	1	1	0	0	1
4	0	1	1	0	0	1	1
5	1	0	1	1	0	1	1
6	0	0	1	1	1	1	1
7	1	1	1	0	0	0	0
8	1	1	1	1	1	1	1
9	1	1	1	1	0	1	1

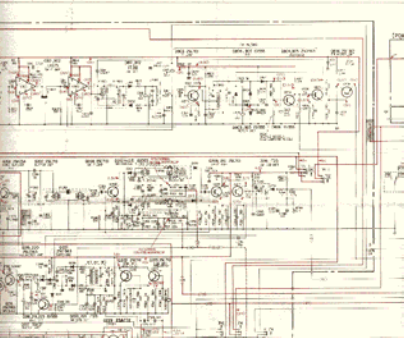
0 : low level
1 : high level

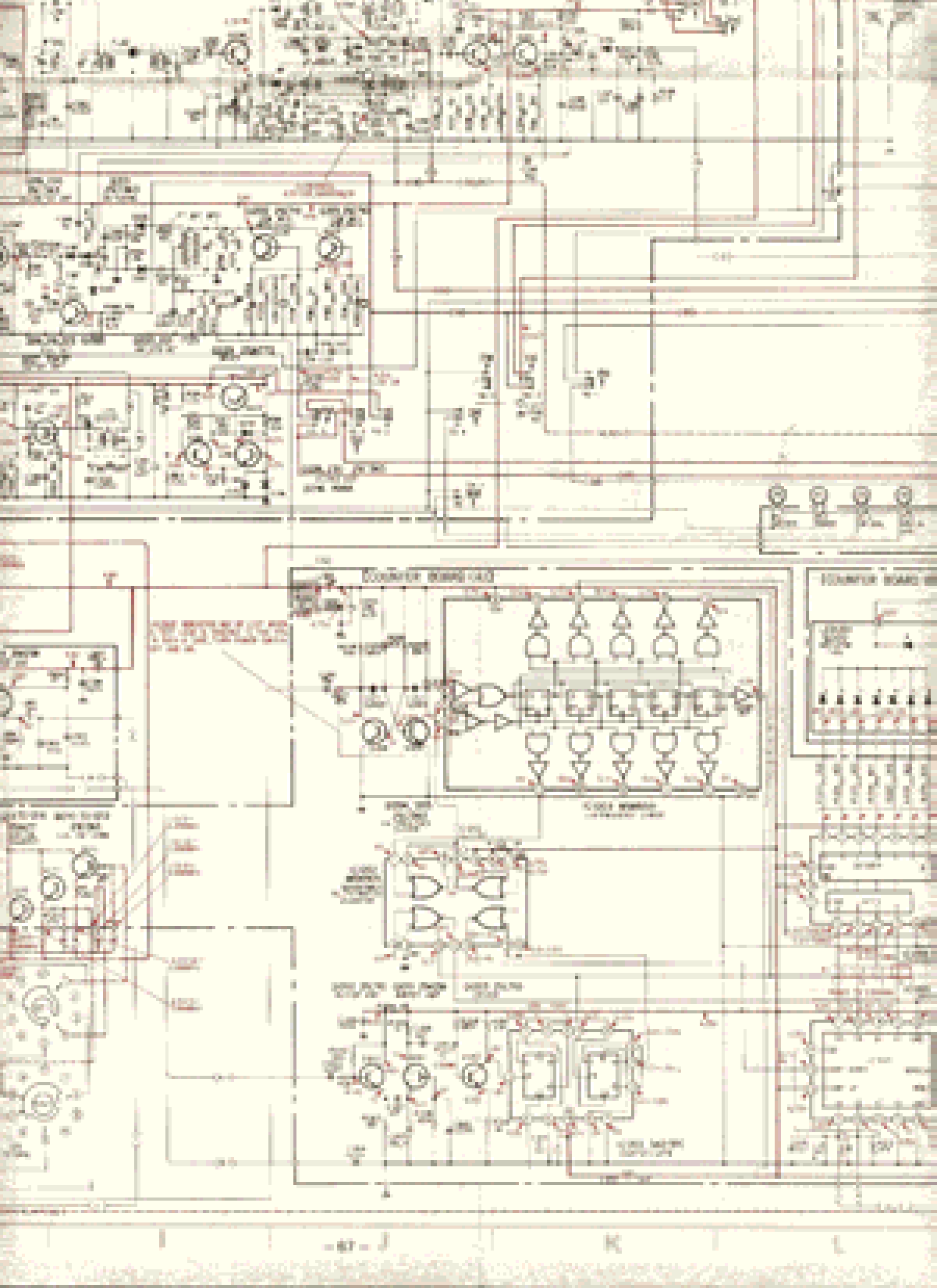
* \#3 0 : 0 V
1 : 4.5 V

SW BAND	IC TERMINAL IC1003 [illegible]	IC1003 [illegible]	IC1003 [illegible]	IC1003 [illegible]	IC1004 [illegible]	IC1004 [illegible]
1 MHz BAND	1	1	1	0	1	1
2	0	1	1	0	1	1
3	1	0	1	0	1	1
4	0	0	1	0	1	1
5	1	1	0	0	1	1
6	0	1	0	0	1	1
7	1	0	0	0	1	1
8	0	0	0	0	1	1
9	1	0	0	1	0	1
10	0	0	0	1	0	1
11	1	1	1	0	0	1
12	0	1	1	0	0	1
13	1	0	1	0	0	1
14	0	0	1	0	0	1
15	1	1	0	0	0	1
16	0	1	0	0	0	1
17	1	0	0	0	0	1

SW BAND
18 MHz BAND
19
20
21
22
23
24
25
26
27
28
29

I J K L




COUNTER BOARD (A2)
COUNTER BOARD (B)
I
J
K
L

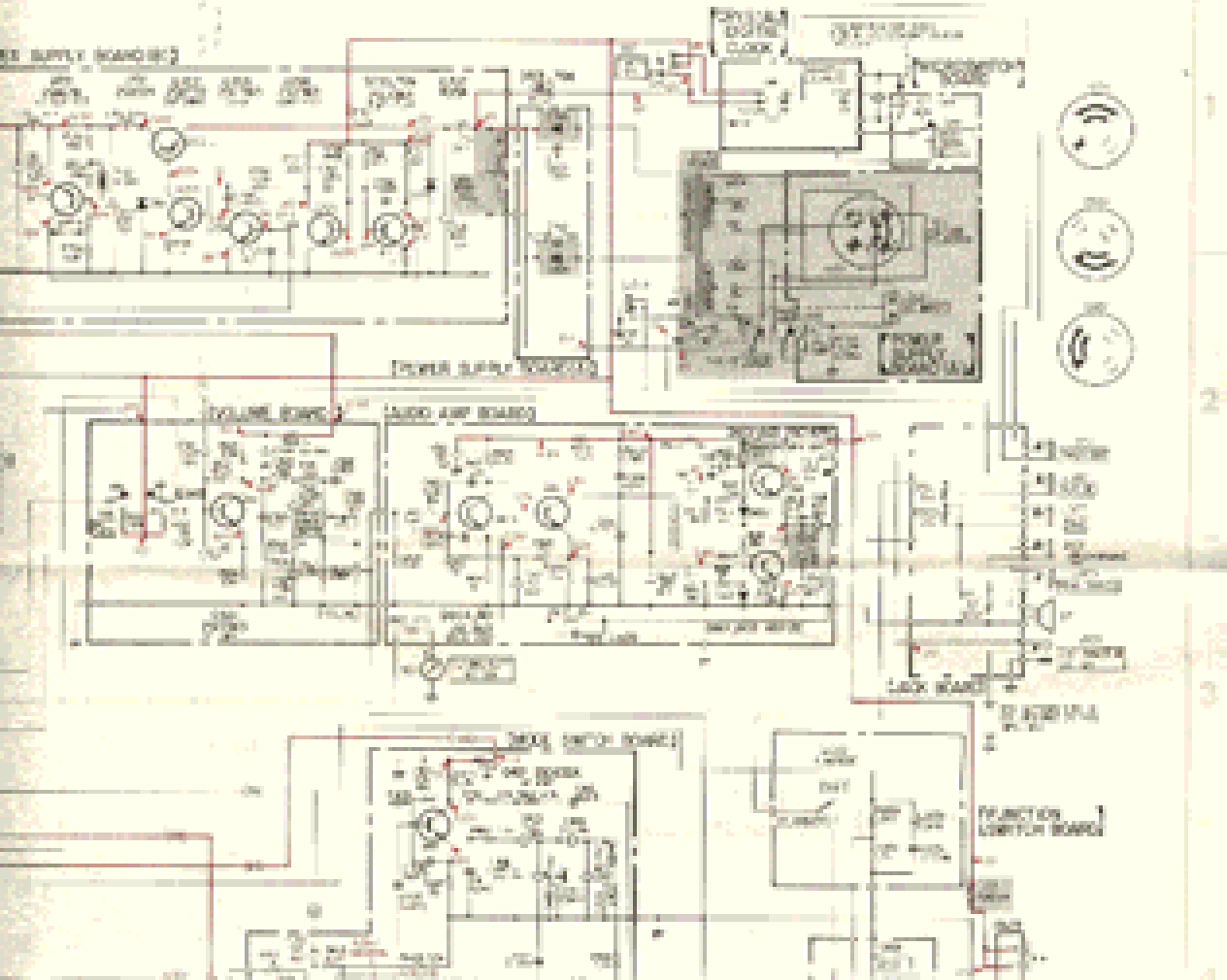
IC TERMINAL

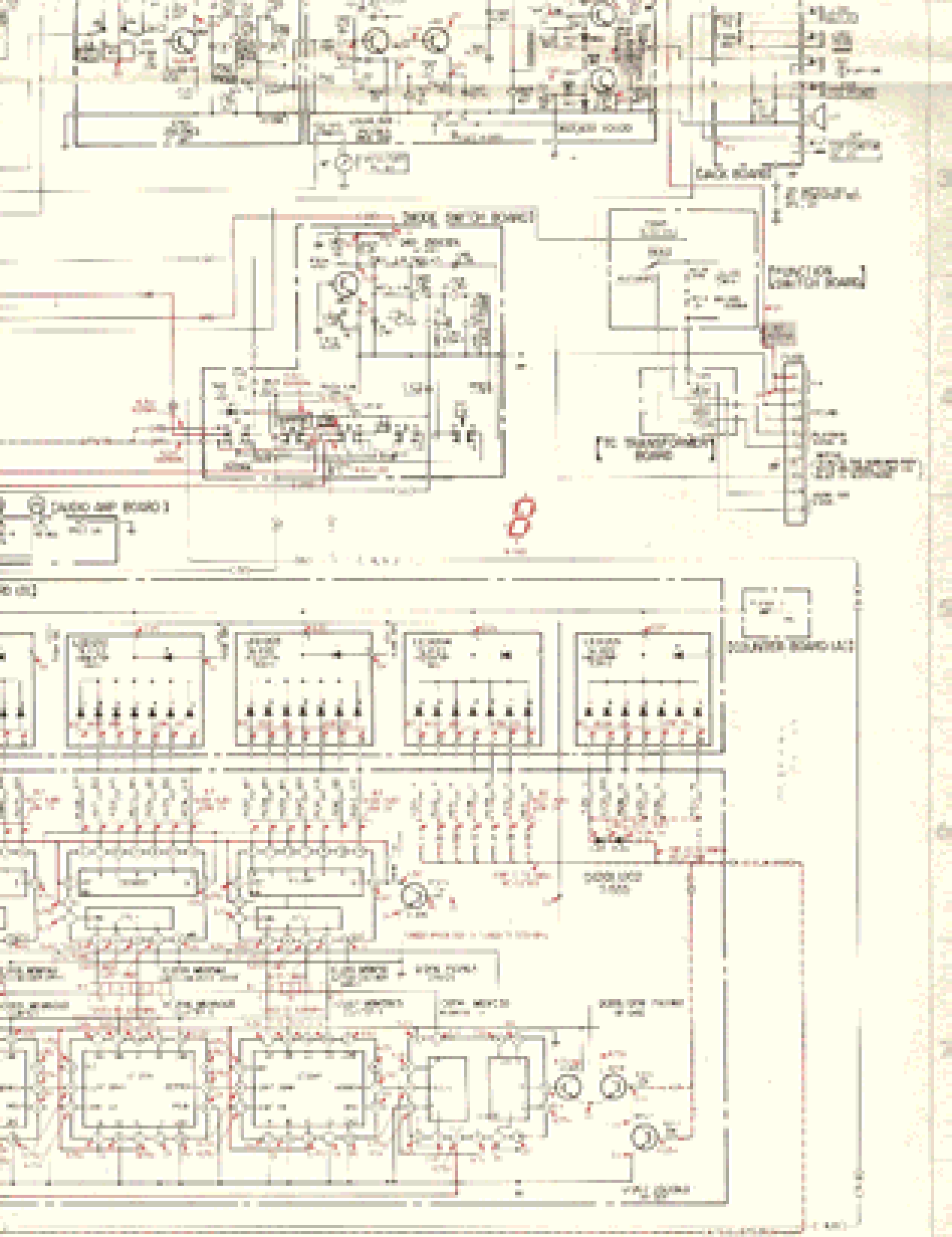
	IC1002				IC1004	
	②	③	⑤	⑥	①	④
	0	0	0	0	0	1
	1	0	0	0	1	0
	0	0	0	1	1	0
	1	1	1	0	1	0
	0	1	1	0	1	0
	1	0	1	0	1	0
	0	0	1	0	1	0
	1	1	0	0	1	0
	0	1	0	0	1	0
	1	0	0	0	1	0
	0	0	0	0	1	0
	1	0	0	1	0	0

Switch

Ref. No.	Switch	Position
S001	FM FM1 – FM2	FM1
S1-1	ANT SELECT SW, LW-EXT ANT	LOCAL
S1-2	ANT SELECT SW ANT HOD-EXT	ROD
S2	SW ANT COIL SELECT L108, L109	L108
S31 – 34	BAND SELECTOR, SW	ON
S41 – 44	BAND SELECTOR, MW	OFF
S51 – 54	BAND SELECTOR, LW	OFF
S61 – 64	BAND SELECTOR, FM	OFF
S8	MODE, NORMAL	ON
S9	MODE, NARROW	OFF
S10	MODE, USB-SSB	OFF
S11	MODE, LSB-SSB	OFF
S12	MODE, CW	OFF
S14	NOISE BLANKER	OFF
S15	AFC	OFF
S16	MUTING	OFF
S17	TIMER ON	OFF
S18	BATT CHECK	OFF
S19	LIGHT	OFF
S20	ZERO SECOND	OFF

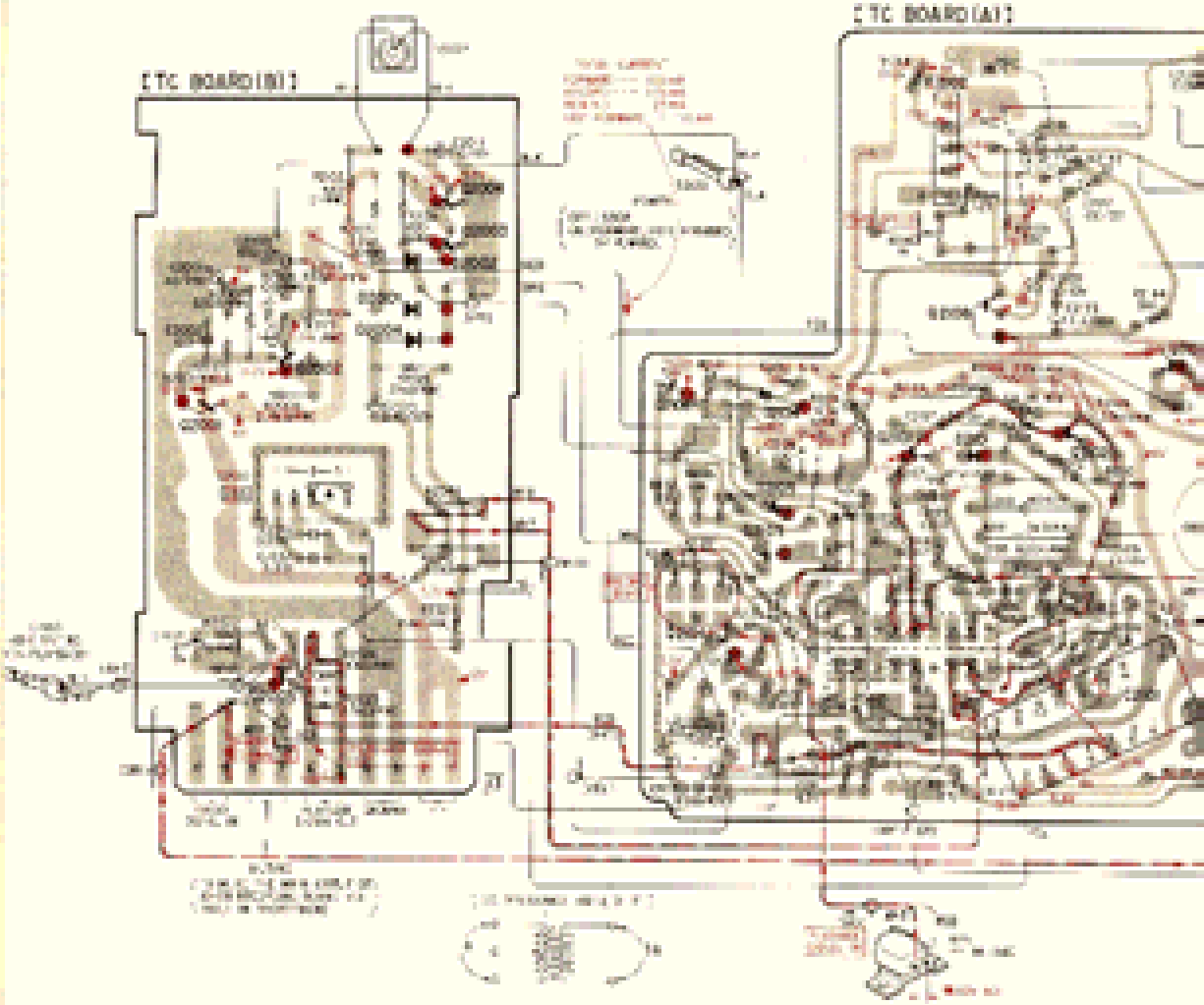
Ref. No.	Switch	Position
S21	POWER	OFF
S22	OFF-ON/TIMER ON	OFF
S23	VOLTAGE SELECT	13.8V
S24	BATT/AC	BATT
S25	QUARTZ TIMER	OFF
S26	SW BAND SELECTOR 10MHz STEP 0 = 10MHz – 20	0
S27 to 29	SW BAND SELECTOR 1MHz STEP 0 – 1MHz – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9	9
S2900	FUNCTION RADIO-PLAYBACK	RADIO





4-3. MOUNTING DIAGRAM – Tape Recorder Section –

– Conductor Side –



Q	2001	2002 2003	2004 2005
D			

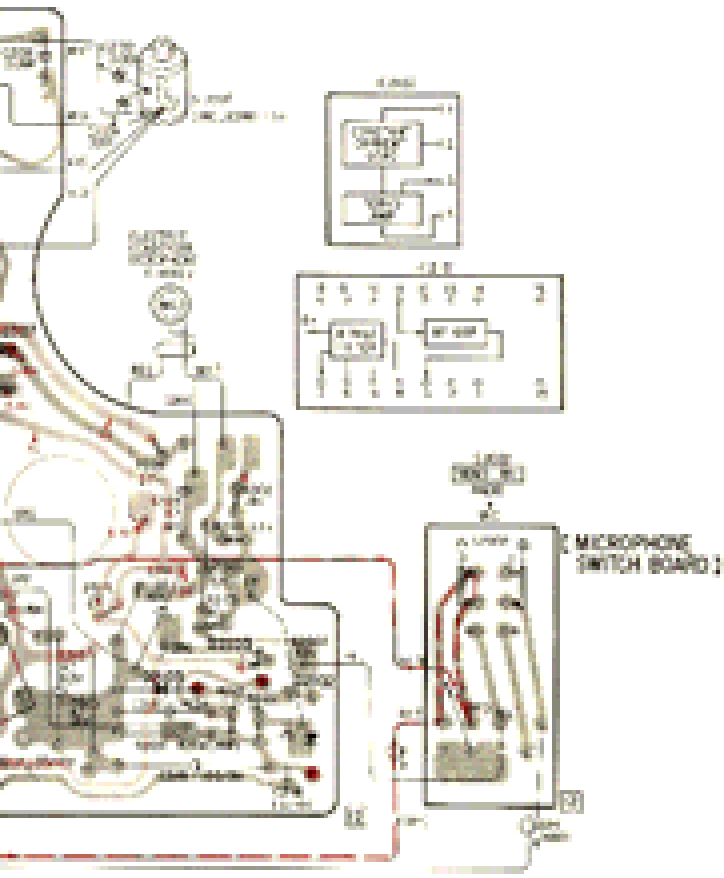
Q	2004	2104	2105	2101	2102	2107
D		2104	2105	2101		

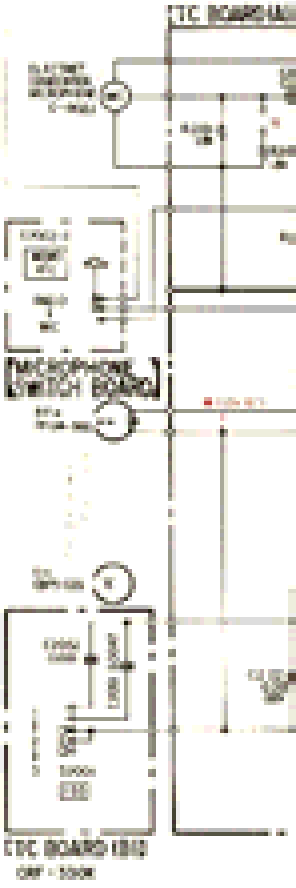
Q2001 : 2SD1981

Q2002 – 2005 : 2SC634A (2SC1383)

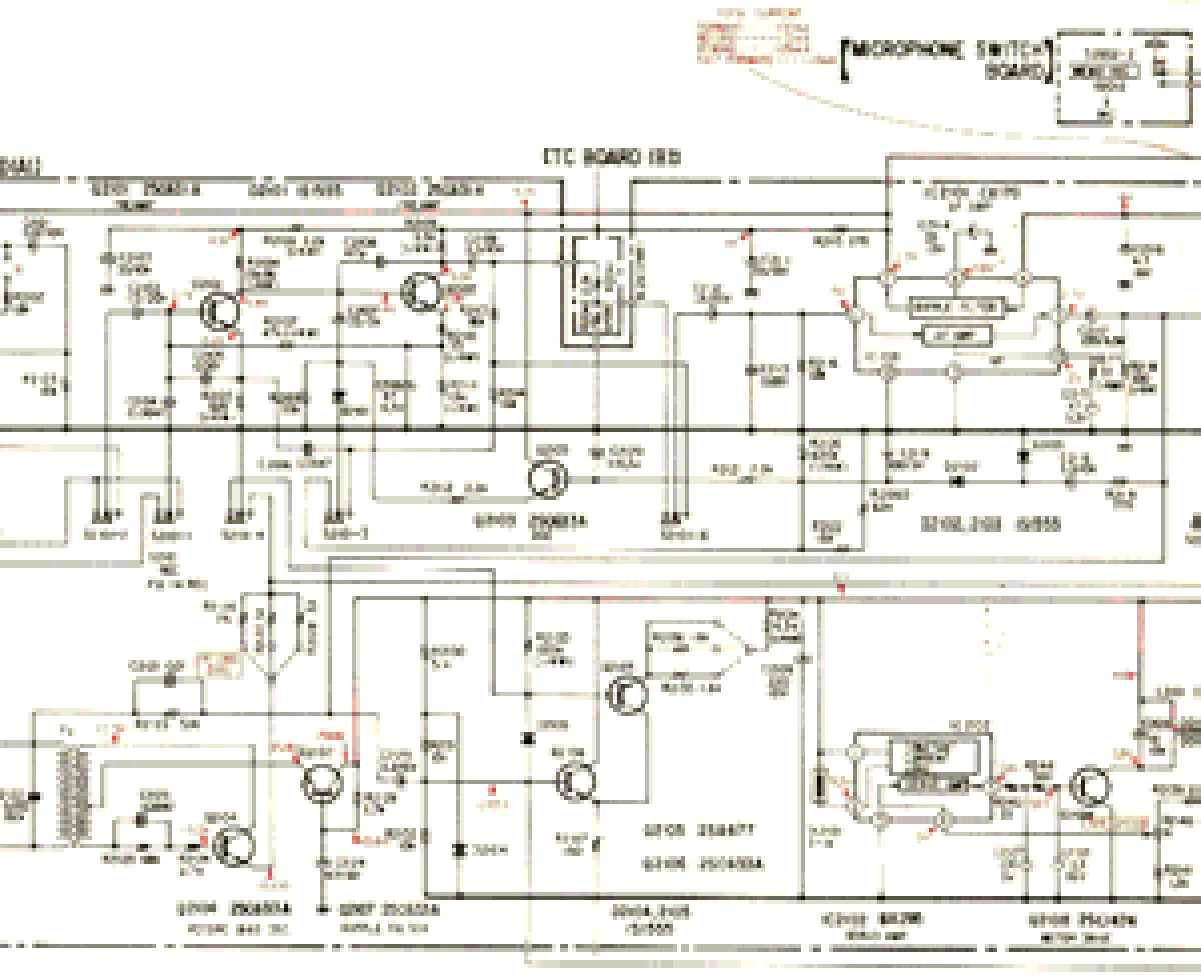
Q2101, 2103 : 2SC633A
Q2102, 2104 : 2SC634A
Q2106, 2107 : 2SC634A

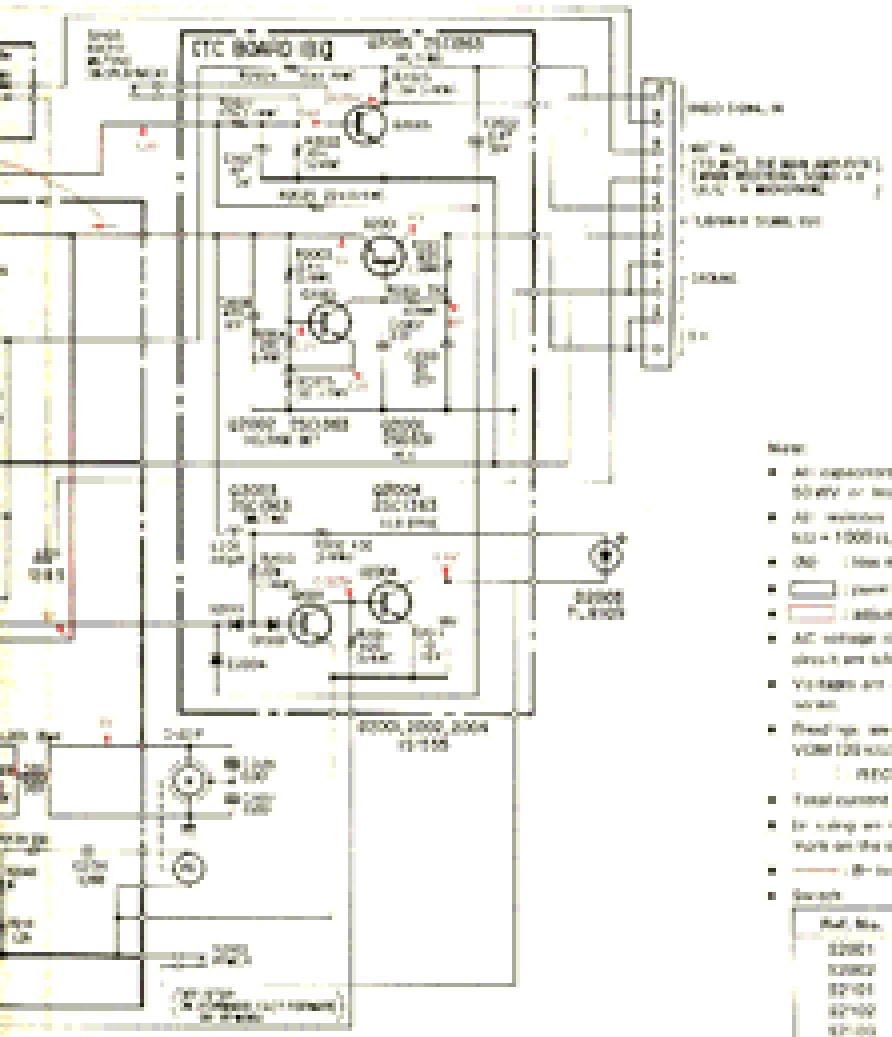
Q2106 : 2SA678


MICROPHONE
SWITCH BOARD


MICROPHONE
SWITCH BOARD

B C D E





Note:

- All capacitors are in μF unless otherwise noted. pF = μμF. 50 WV or less are not indicated except for electrolytics.
- All resistors are in ohms, 1/4W unless otherwise noted. kΩ = 1000Ω, MΩ = 1000kΩ.
- (M) : Mass metal resistor.
- : panel designation.
- : adjustment for repair.
- AC voltage readings indicated by ( ) in the tape recorder circuit are taken with a VTVM.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken under no signal conditions with a VOM (20 kΩ/V).

  PLAYBACK < > RECORD
- Total current is measured with no cassette inserted.
- In using an electronic condenser microphone with a coil built on the side of the case, connect R2103 shown by ( ).
- : B+ line.
- Switch

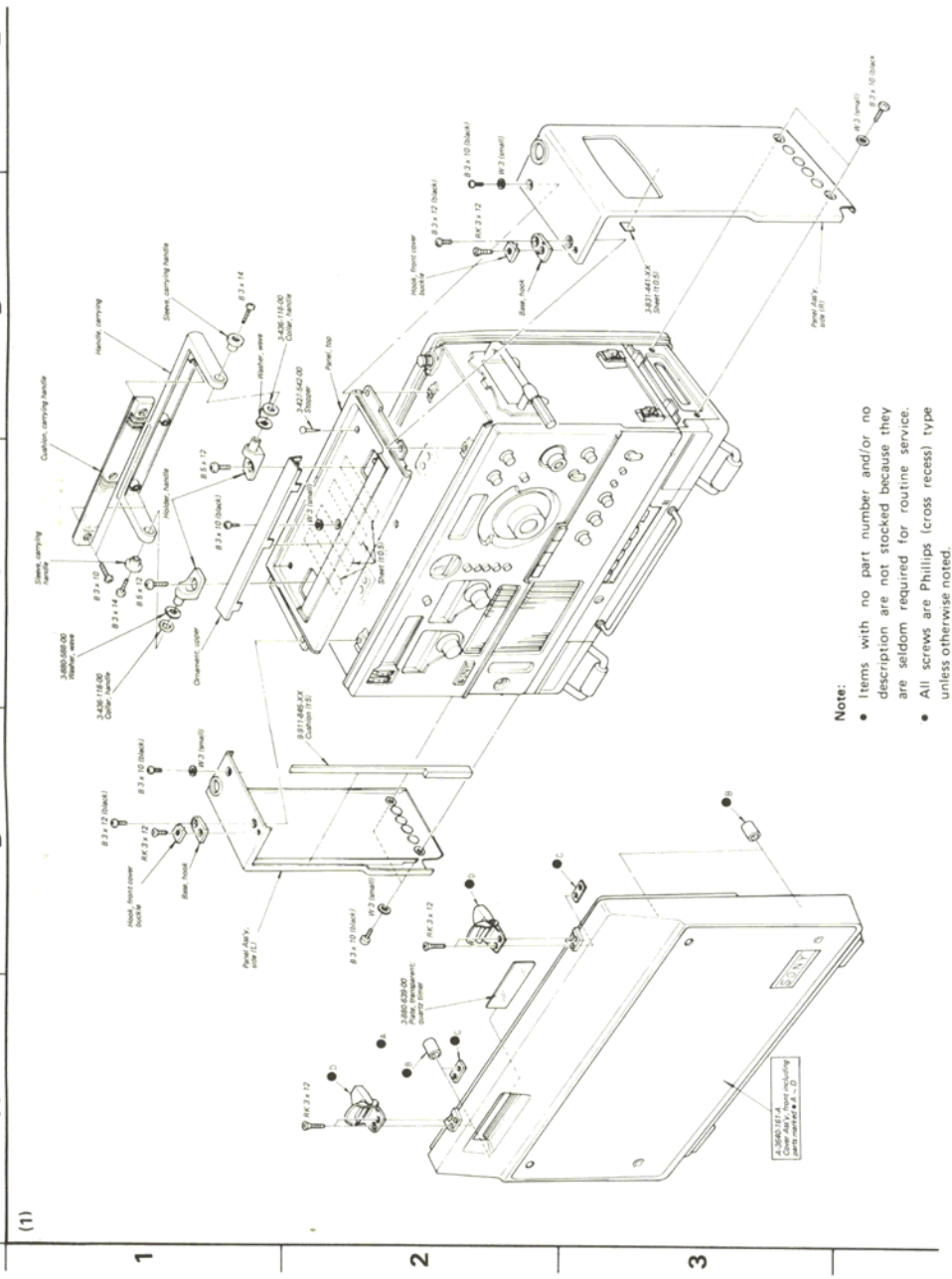
Ref. No.	Switch	Position
S2901	KEY	3
S2902	VHMO INPUT	RADIO
S2101	REC/PB	PB
S2102	POWER	OFF
S2103	RADIO MUTING	ON

Note:

- Color code of resistor over the end of the jacket.

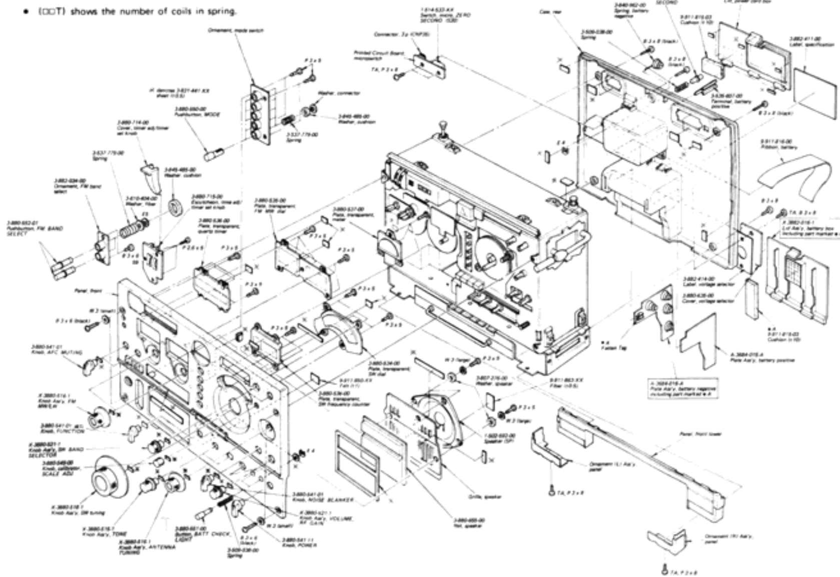
- : Bias current
- : signal path

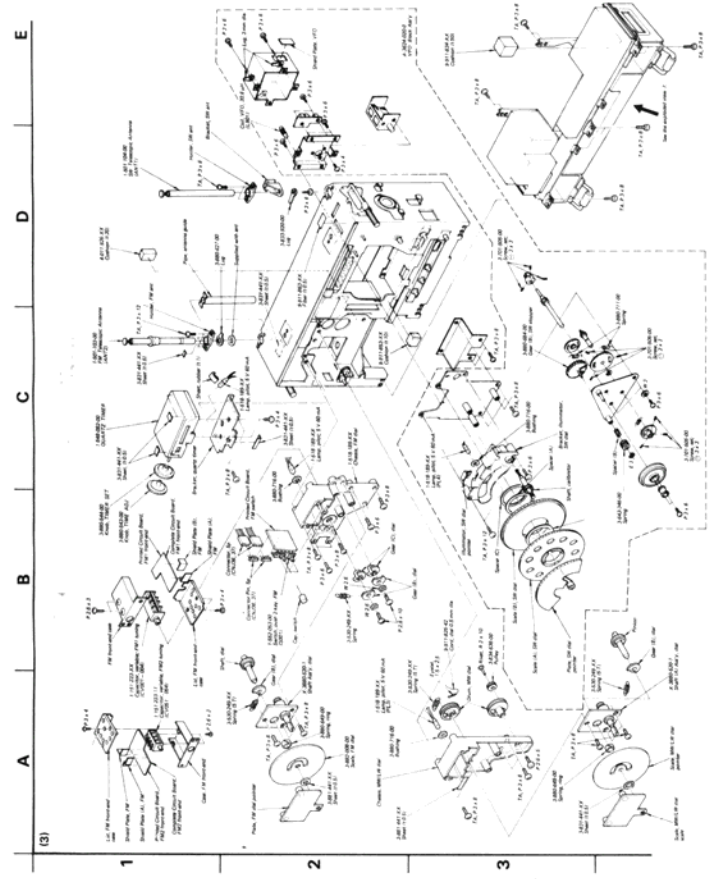
SECTION 5
EXPLODED VIEWS



(2) **Note:**

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (−) = slotted head
- (□□T) shows the number of coils in spring.

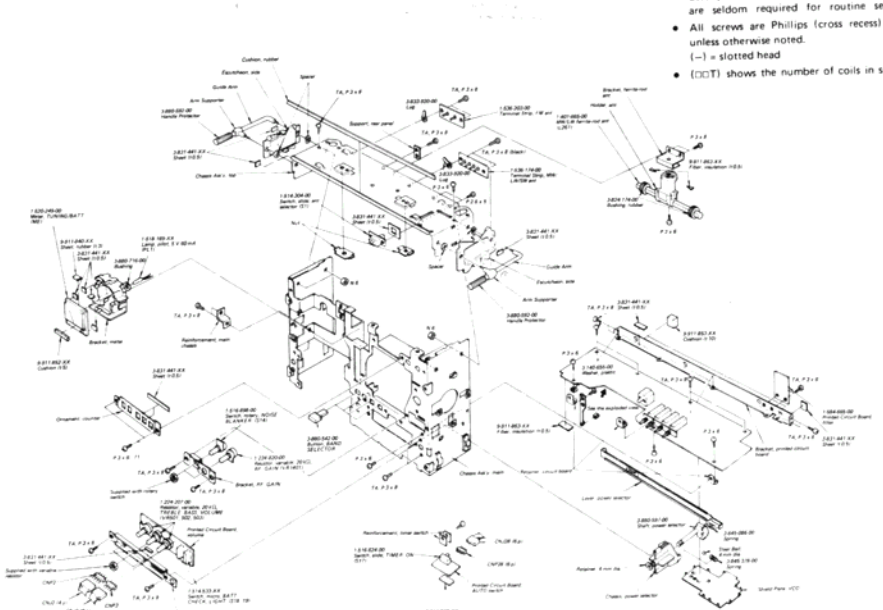


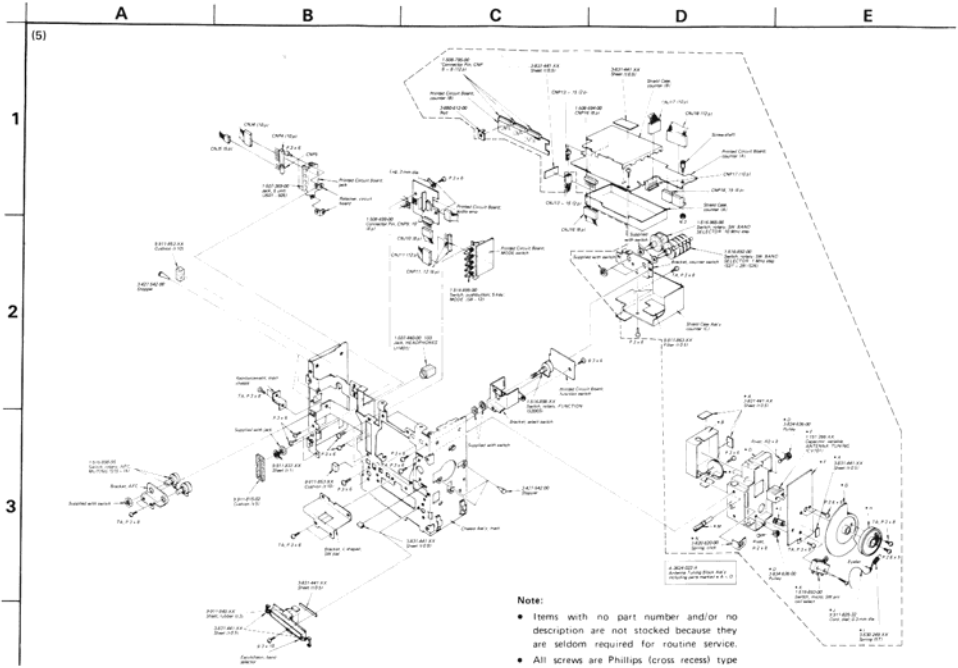

A
B
C
D
E
1
2
3
(3)

(4)

Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (—) = slotted head
- (□□T) shows the number of coils in spring.




A
B
C
D
E
(5)
1
2
3
Note:
• Items with no part number and/or no description are not stocked because they are seldom required for routine service.
• All screws are Phillips (cross recess) type unless otherwise noted.
(–) = slotted head
• (□□T) shows the number of coils in spring.

A B C

(6)

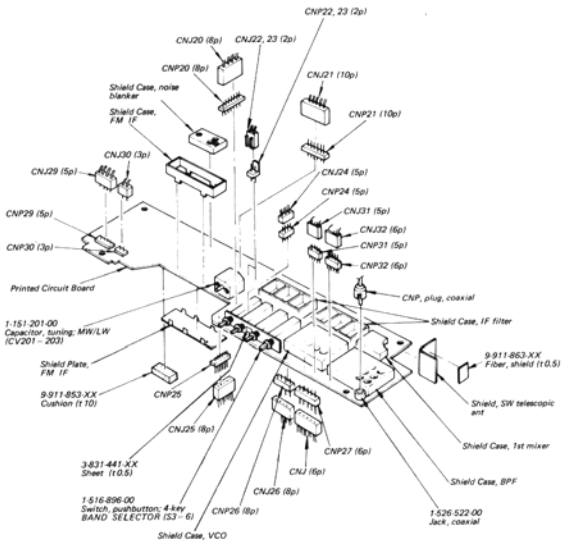
1

2

3

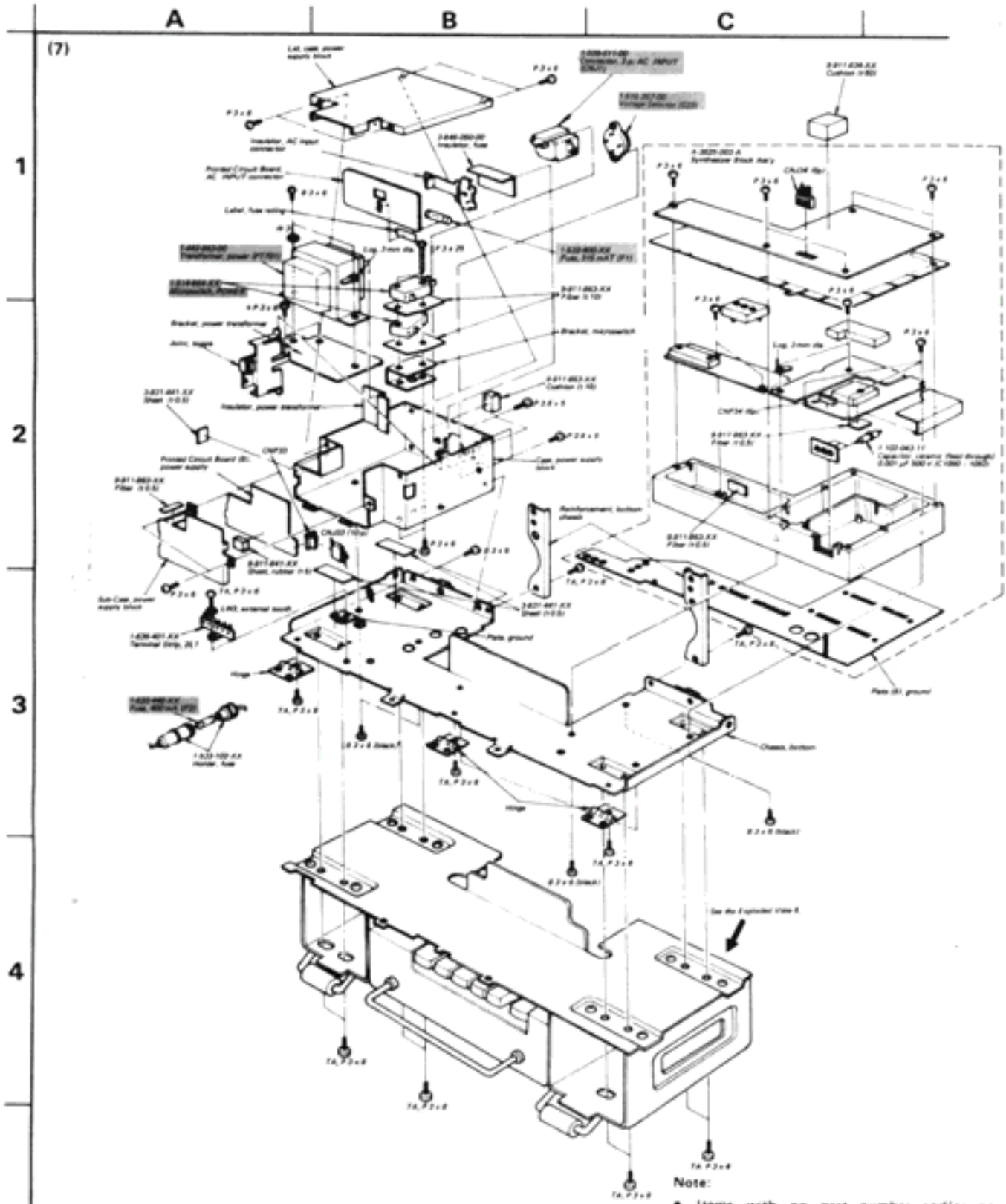
4

5



Note:

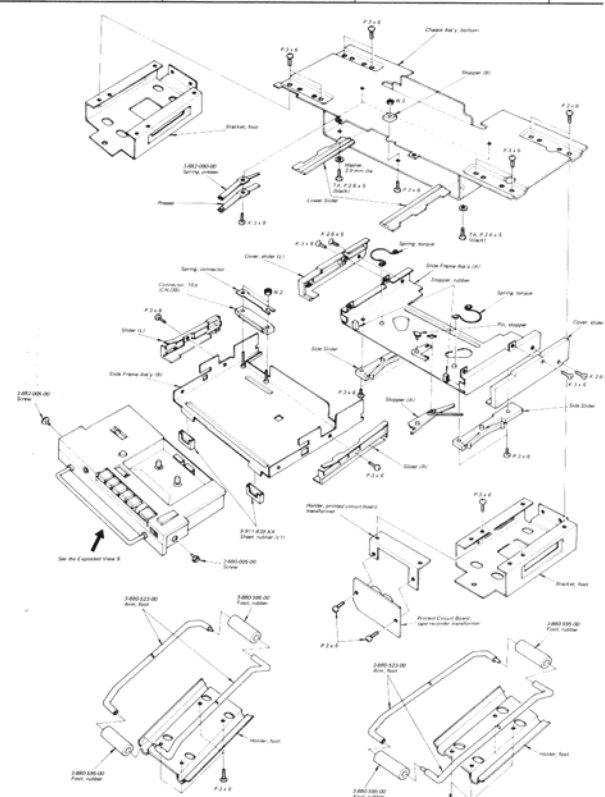
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring.



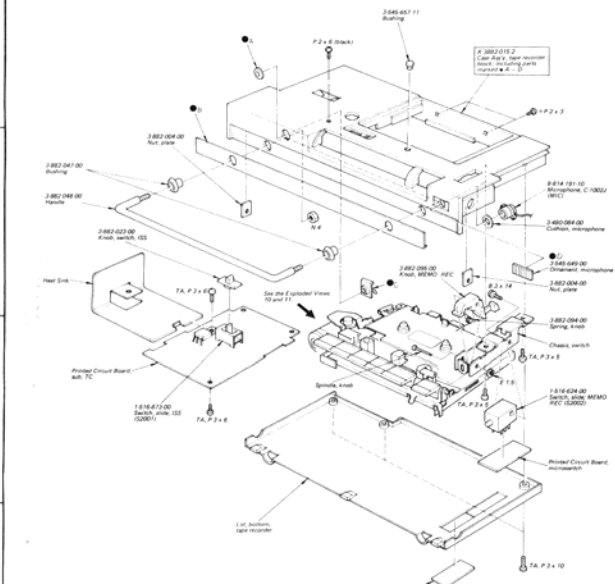
Note: The components identified by shading are critical for safety. Replace only with part number specified.

Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (−) = slotted head
- (□□T) shows the number of coils in spring.


A
B
C
(8)
1
2
3
4
5
Chassis Ass'y, bottom
Stopper (B)
Bracket, foot
Spring, pressor
Pressor
Lower Slider
Spring, torque
Cover, slider (L)
Spring, connector
Slider (L)
Slide Frame Ass'y (A)
Stopper rubber
Pin, stopper
Cover, slider (R)
Side Slider
Slide Frame Ass'y (B)
Stopper (A)
Screw
Slider (R)
See the Exploded View 9
Holder, printed circuit board, transformer
Printed Circuit Board
Tape recorder transformer
Arm, foot
Foot, rubber
Holder, foot
Note:
Items with no part number and/or no description are not stocked because they are seldom required for routine service.
All screws are Phillips (cross recess) type unless otherwise noted.
(−) = slotted head
(□□T) shows the number of coils in spring.

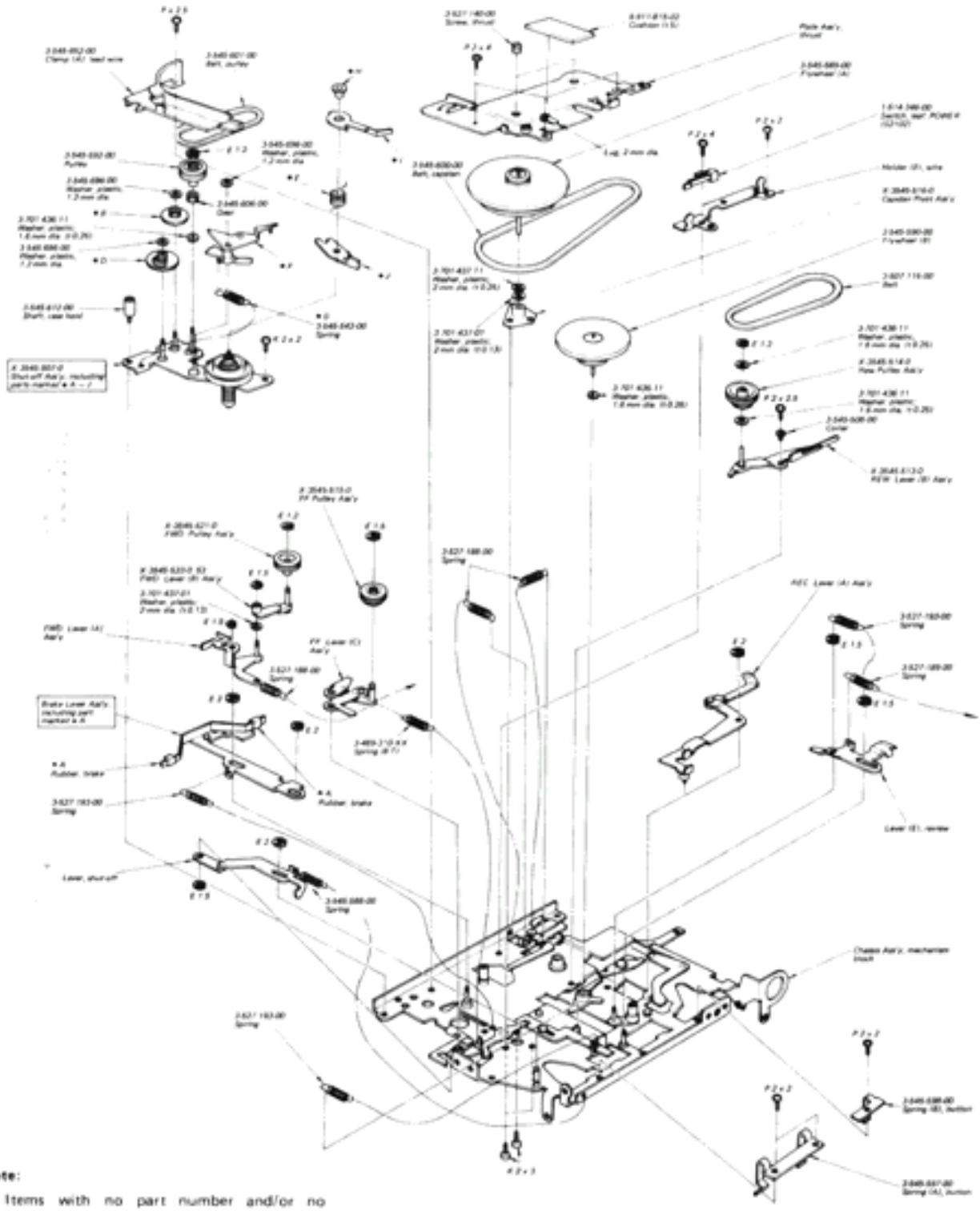
(9)



Note:

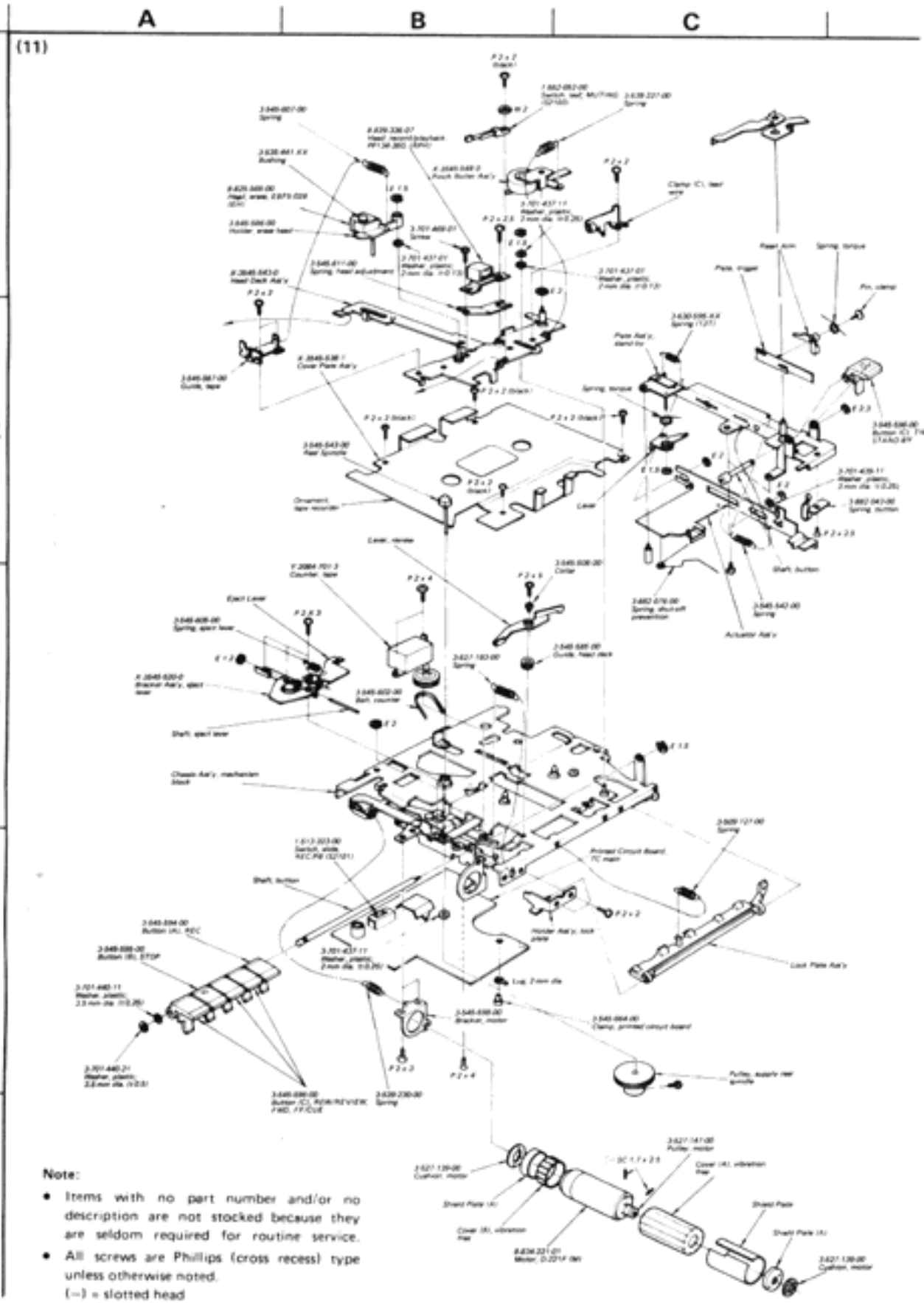
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (—) = slotted head
- (□□T) shows the number of coils in spring.

(10)



Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (−) = slotted head
- (□T) shows the number of coils in spring.



Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (–) = slotted head
- (□□T) shows the number of coils in spring

SECTION 6

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
		SEMICONDUCTORS
		Transistors
Q001		2SK42-1
Q002		2SK23A-840
Q003		2SC710
Q051		2SK42-1
Q052		2SK23A-840
Q053		2SC710
Q054		2SK23A-860
Q201		3SK37
Q202, 203		2SK23A-840
Q204		3SK37
Q205, 206		2SK23A-840
Q207 – 209		2SC710
Q210, 211		2SC710-14
Q212		2SC710-15
Q213, 214		2SC710
Q216		2SC634A
Q217		2SA678
Q218 – 221		2SC634A
Q222		2SC710-14
Q223		2SC710
Q224		2SK42-1
Q225, 226		2SC1129
Q227		3SK37
Q228		2SA634A
Q229		2SA684
Q230		2SC634A
Q231		2SA678
Q401		2SC632A
Q501		2SC634A
Q601		2SC634A
Q602, 603		2SC1429-□5
Q604		2SC634A
Q701		2SA678
Q702		2SA684
Q703 – 706		2SC634A
Q801 – 803		2SC710-14
Q804		2SC634A
Q805, 806		2SC1364
Q901, Q902, 903		2SK42-1 2SK23A-824
Q1001, 1002		3SK37
Q1003, 1004		2SC710
Q1006		2SK23A-825
Q1007 – 1012		2SC634A
Q1013 – 1018		2SC710
Q1019, 1020		2SC641K
Q1021, 1022		2SC710
Q1023, 1024		2SC634A
Q1025, 1201		2SK23A-824
Q1202, 1203		2SC710
Q1204 – 1212		2SC1364
Q1213 – 1216		2SA678
Q2001		2SD1061
Q2002 – 2005		2SC634A
Q2101, 2102		2SC632A
Q2103, 2104		2SC634A
Q2105		2SA678
Q2106, 2107		2SC634A
Q2108		2SC1474
		ICs
IC801, 802		CX075B
IC1001		TA7060P
IC1002		SN74S113DC
IC1003, 1004		SN74162N
IC1005		μPC1008C
IC1006		HD74LS00P
IC1007		TA7060P
IC1201		34013PC
IC1202		MSM505
IC1203		MSM551H
IC1204		MSM530
IC1205 – 1207		MSM5503
IC1208 – 1210		MSM561
IC2101		CX170
IC2102		BX295A

Ref. No.	Part No.	Description
		Diodes
D001, 051		1S2687S-2
D201 – 209		1S1555
D211 – 215		
D216		1T23S
D217 – 219		1S1555
D220, 221		1T23S
D223, 225		1S1555
D226, 227		1T18-0
D228 – 234		1S2222
D235		1T261
D236		RD6A
D237 – 241		1S1555
D401		
D601, 602		VD1120
D701		2SB324
D702		RD5A
D703, 704		10E2
D801, 802		1T261
D803 – 807		1S1555
D1001, 1002		1T261
D1003, 1004		1S1555
D1201 – 1204		
D2001, 2002		1S1555
D2003		TLR109 (LED)
D2004		1S1555
D2101 – 2105		
		Thermistor
Th701	1-800-071-XX	S-300
Th1001	1-800-198-XX	S-1K
Th1002	1-800-194-00	S-90
Th2101	1-800-198-00	S-1K
		COILS
L001	1-425-909-00	FM Antenna
L002	1-425-910-00	FM RF
L003	1-425-909-00	FM Antenna
L004	1-405-750-00	FM Osc

Ref. No.	Part No.	Description
L051	1-425-929-00	Coil
L052	1-425-930-00	Coil
L053	1-425-929-00	Coil
L054	1-405-527-21	FM Osc
L201	1-407-178-XX	Microinductor, 1 µH
L210, 215	1-407-741-00	Microinductor, 18 µH
L224	1-407-864-00	RF BPF
L225	1-407-865-00	RF BPF
L228	1-407-864-00	RF BPF
L231	1-407-862-00	RF BPF
L232	1-407-863-00	RF BPF
L235	1-407-862-00	RF BPF
L261	1-401-665-00	MW/LW Ferrite-rod Antenna
L262	1-425-911-00	MW RF
L263	1-425-444-00	LW RF
L264	1-405-717-00	MW Osc
L265	1-405-716-00	LW Osc
L266	1-417-053-00	VCO Matching Transformer
L267	1-407-178-XX	Microinductor, 1 µH
L268	1-433-184-00	VCO (1)
L269	1-433-185-00	VCO (3)
L270	1-433-188-00	VCO (4)
L271	1-433-189-00	VCO (6)
L272	1-433-190-00	VCO (7)
L273	1-433-186-00	VCO (5)
L274	1-433-187-00	VCO (2)
L275	1-425-912-00	Mixing
L282, 283	1-407-661-XX	Microinductor, 470 µH
L287, 288	1-407-157-XX	Microinductor, 10 µH
L289	1-407-661-XX	Microinductor, 470 µH
L290	1-407-178-XX	Microinductor, 1 µH
L401 – 403	1-407-883-00	Microinductor, 100 mH
L701	1-407-857-00	Choke, 3 mH
L702	1-407-884-00	Choke, 6 mH
L703	1-407-857-00	Choke, 3 mH
L804	1-407-169-XX	Microinductor, 100 µH
L1010	1-407-178-XX	Microinductor, 1 µH
L1016	1-407-169-XX	Microinductor, 100 µH

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Ref. No.	Part No.	Description
L1021 – 1023	1-407-856-00	Choke, 1 mH
L1025, 1026	1-407-169-XX	Microinductor, 100 μH
L1201, 1202	1-407-856-00	Choke, 1 mH
L1203	1-407-175-XX	Microinductor, 330 μH
L2011	1-407-175-XX	Microinductor, 330 μH
L2031	1-407-206-XX	Microinductor, 10 mH

TRANSFORMERS

T1	1-433-105-00	Osc
T601	1-423-140-11	Input
FL201	1-403-165-00	Ceramic Filter
FL202A	1-403-888-11	Mechanical Filter
FL202B	1-403-888-21	Mechanical Filter
FL203A	1-404-024-11	Mechanical Filter
FL203B	1-404-024-21	Mechanical Filter
IFT001, 051	1-404-031-00	FM IFT
IFT202	1-404-023-00	AM IFT
IFT203	1-403-152-00	AM IFT
IFT204 – 206	1-404-023-00	AM IFT
IFT207	1-459-153-00	BFO
IFT801	1-403-959-00	FM Discriminator
IFT802	1-403-953-00	FM Discriminator
IFT803	1-403-243-00	FM IFT

CAPACITORS

All capacitors are in μF and ceramic unless otherwise noted.
50WV or less are not indicated except for electrolytics.
pF = μμF, elect = electrolytic

Ref. No.	Part No.	Description		
C001	1-102-956-11	15 p		
C002	1-161-013-11	0.01		(boundary layer)
C003, 004	1-102-960-11	24 p		
C005	1-161-013-11	0.01		(boundary layer)
C006	1-102-972-11	91 p		
C009	1-161-013-11	0.01		(boundary layer)
C011	1-102-870-11	8 p		
C012	1-102-947-11	10 p		
C013	1-102-870-11	8 p		
C014	1-161-013-11	0.01		(boundary layer)
C015	1-127-019-11	0.1	16 V	solid aluminum
C016	1-121-651-11	10	16 V	elect
C051	1-102-949-11	12 p		
C052	1-161-013-11	0.01		(boundary layer)
C053, 054	1-102-953-11	18 p		
C055	1-161-013-11	0.01		(boundary layer)
C056	1-102-972-11	91 p		
C059	1-161-013-11	0.01		(boundary layer)
C061	1-102-858-11	10 p		
C062	1-102-944-11	7 p		
C063	1-102-663-11	8 p		
C065	1-127-019-11	0.1	16 V	solid aluminum
C066	1-121-651-11	10	16 V	elect
C067	1-101-978-11	10 p		
C100	1-103-733-11	0.0022	50 V	polystyrol
C101	1-103-729-11	0.0015	50 V	polystyrol
C102	1-103-728-11	0.0013	50 V	polystyrol
C103	1-107-082-11	75 p		silvered mica
C105	1-101-882-11	51 p		
C106	1-102-946-11	9 p		
C107	1-102-975-11	100 p		
C201 – 203	1-101-118-11	0.01		
C204	1-101-361-11	150 p		
C205	1-107-082-11	75 p		silvered mica
				silvered mica
C206	1-107-068-11	20 p		silvered mica
C207 – 209	1-161-013-11	0.01		(boundary layer)
C210	1-102-979-11	240 p		
C211	1-107-081-11	68 p		silvered mica
C212	1-107-102-11	5 p		silvered mica
C213	1-101-367-11	160 p		silvered mica
C214	1-121-651-11	10	16 V	elect
C215	1-161-013-11	0.01		(boundary layer)
C216	1-107-079-11	56 p		silvered mica
C217	1-161-013-11	0.01		(boundary layer)
C218	1-107-075-11	39 p		silvered mica

Ref. No.	Part No.	Description		
C219	1-107-086-11	110 p		silvered mica
C220	1-107-072-11	30 p		silvered mica
C221	1-107-086-11	110 p		silvered mica
C222	1-107-075-11	39 p		silvered mica
C223	1-121-651-11	10	16 V	elect
C224	1-107-078-11	51 p		silvered mica
C225	1-161-013-11	0.01		(boundary layer)
C226	1-107-074-11	36 p		silvered mica
C227	1-161-013-11	0.01		(boundary layer)
C228	1-107-067-11	18 p		silvered mica
C229	1-107-081-11	68 p		silvered mica
C230	1-107-066-11	16 p		silvered mica
C231	1-107-081-11	68 p		silvered mica
C232	1-107-067-11	18 p		silvered mica
C233	1-107-071-11	27 p		silvered mica
C234	1-121-651-11	10	16 V	elect
C235	1-161-013-11	0.01		(boundary layer)
C236	1-102-507-11	9 p		
C237	1-161-013-11	0.01		(boundary layer)
C238	1-102-511-11	13 p		
C239	1-102-516-11	27 p		
C240	1-102-510-11	12 p		
C241	1-102-516-11	27 p		
C242	1-102-511-11	13 p		
C243	1-102-501-11	1 p		
C244	1-121-651-11	10	16 V	elect
C245	1-161-013-11	0.01		(boundary layer)
C246	1-102-505-11	6 p		
C247	1-161-013-11	0.01		(boundary layer)
C248	1-102-864-11	5 p		
C249	1-102-514-11	22 p		
C250	1-102-504-11	4 p		
C251	1-102-514-11	22 p		
C252	1-102-864-11	5 p		
C254	1-121-651-11	10	16 V	elect
C255	1-161-013-11	0.01		(boundary layer)
C264	1-107-077-11	47 p		silvered mica
C265	1-102-125-11	0.0047		
C266	1-107-079-11	56 p		silvered mica

Ref. No.	Part No.	Description		
C267	1-107-078-11	51 p		silvered mica
C268	1-102-074-11	0.001		
C272	1-107-078-11	51 p		silvered mica
C273, 274	1-107-079-11	56 p		silvered mica
C276	1-107-233-11	430 p		silvered mica
C277	1-102-125-11	0.0047		
C278	1-107-078-11	51 p		silvered mica
C280	1-102-944-11	7 p		
C281 – 290	1-101-924-11	0.022		
C284	1-108-239-12	0.01		mylar
C294	1-108-242-12	0.022		mylar
C295	1-101-924-11	0.022		
C296	1-107-079-11	56 p		silvered mica
C297, 298	1-108-239-12	0.01		mylar
C299	1-107-235-11	510 p		silvered mica
C302	1-108-563-12	0.0022		mylar
C303	1-101-924-11	0.022		
C304	1-121-391-11	1	50 V	elect
C305, 306	1-108-244-12	0.033		mylar
C307	1-102-942-11	5 p		
C308	1-102-949-11	12 p		
C309	1-102-679-11	120 p		
C310	1-103-714-11	360 p	50 V	polystyrol
C312	1-102-964-11	36 p		
C313, 314	1-102-947-11	10 p		
C315	1-108-242-12	0.022		mylar
C318	1-121-414-11	100	6.3 V	elect
C319	1-102-125-11	0.0047		
C321	1-102-504-11	4 p		
C322	1-102-751-11	22 p		
C323	1-102-526-11	75 p		
C324	1-101-999-11	10 p		
C325	1-102-755-11	43 p		
C326	1-102-743-11	3 p		
C328	1-102-112-11	330 p		
C329 – 335	1-102-125-11	0.0047		
C337	1-102-505-11	6 p		
C338	1-102-074-11	0.001		
C340	1-102-074-11	0.001		

Ref. No.	Part No.	Description		
C341	1-121-413-11	100	6.3 V	elect
C345	1-101-924-11	0.022		
C346	1-107-235-11	510 p		silvered mica
C350	1-107-071-11	27 p		silvered mica
C351	1-101-924-11	0.022		
C353	1-108-242-12	0.022		mylar
C356, 357	1-108-242-12	0.022		mylar
C358	1-101-924-11	0.022		
C359	1-121-651-11	10	16 V	elect
C360, 361	1-101-924-11	0.022		
C362	1-102-832-11	330 p		
C363	1-121-651-11	10	16 V	elect
C364	1-102-114-11	470 p		
C365	1-127-022-11	0.47	16 V	solid aluminum
C367	1-127-023-11	1	10 V	solid aluminum
C368	1-107-102-11	5 p		silvered mica
C371	1-108-239-12	0.01		mylar
C372	1-108-242-12	0.022		mylar
C373	1-101-924-11	0.022		
C374	1-107-085-11	100 p		silvered mica
C377	1-123-070-11	2200	16 V	elect
C378	1-121-943-11	1000	10 V	elect
C380	1-108-234-12	0.0047		mylar
C383, 384	1-101-924-11	0.022		
C385	1-102-934-11	1 p		
C386	1-102-935-11	2 p		
C387	1-161-013-11	0.01		(boundary layer)
C390	1-127-023-11	1	10 V	solid aluminum
C401	1-127-018-11	0.047	10 V	solid aluminum
C402	1-108-244-12	0.033		mylar
C403	1-121-951-11	0.47	50 V	elect
C404	1-127-019-11	0.1	10 V	solid aluminum
C405	1-127-022-11	0.47	10 V	solid aluminum
C406	1-127-020-11	0.22	10 V	solid aluminum
C407	1-121-415-11	100	16 V	elect
C408	1-102-099-11	0.0015		
C409	1-108-244-12	0.033		mylar
C410	1-161-015-11	0.015		(boundary layer)

Ref. No.	Part No.	Description		
C411	1-161-021-11	0.47		(boundary layer)
C412	1-127-019-11	0.1	10 V	solid aluminum
C501	1-127-377-11	0.22	16 V	solid aluminum
C502	1-101-918-11	0.001		
C504	1-121-415-11	100	16 V	elect
C505	1-127-377-11	0.22	16 V	solid aluminum
C506	1-127-018-11	0.0047	10 V	solid aluminum
C507	1-127-378-11	0.68	10 V	solid aluminum
C509	1-127-378-11	0.68	10 V	solid aluminum
C601	1-121-415-11	100	16 V	elect
C602	1-127-377-11	0.22	16 V	solid aluminum
C603	1-102-975-11	100 p		
C604	1-102-074-11	0.001		
C605	1-121-479-11	22	16 V	elect
C606	1-161-015-11	0.015		(boundary layer)
C607	1-161-019-11	0.033		(boundary layer)
C608, 609	1-121-521-11	330	16 V	elect
C610	1-127-203-11	0.33	16 V	solid aluminum
C611, 612	1-121-939-11	470	16 V	elect
C613	1-102-123-11	0.0033		
C614	1-102-119-11	0.0015		
C701	1-123-078-11	2200	6.3 V	elect
C702	1-121-944-11	1000	16 V	elect
C704	1-108-232-12	0.0033		mylar
C705	1-101-923-11	0.01		
C706	1-108-234-12	0.0047		mylar
C707	1-107-093-11	220 p		silvered mica
C708	1-121-944-11	1000	16 V	elect
C709, 710	1-121-660-11	2200	16 V	elect
C711, 712	1-108-381-12	0.022	100 V	mylar
C805	1-121-413-11	100	6.3 V	elect
C810	1-101-924-11	0.022		
C812	1-102-964-11	36 p		
C813	1-101-924-11	0.022		
C814	1-108-234-12	0.0047		mylar
C815	1-121-651-11	10	16 V	elect
C816	1-108-228-12	0.0015		

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Ref. No.	Part No.	Description		
C817	1-127-022-11	0.47	16 V	solid aluminum
C819	1-102-962-11	30 p		
C823	1-102-940-11	3 p		
C824	1-131-196-11	2.2	20 V	tantalum
C825	1-102-940-11	3 p		
C829	1-127-019-11	0.1	16 V	solid aluminum
C832	1-101-924-11	0.022		
C835	1-121-982-11	470	6.3 V	elect
C836	1-121-426-11	470	16 V	elect
C901	1-102-648-11	43 p		
C902	1-102-672-11	24 p		
C904	1-107-068-11	20 p		silvered mica
C905	1-107-089-11	150 p		silvered mica
C906	1-107-092-11	200 p		silvered mica
C907	1-108-279-12	0.015		mylar
C908	1-107-099-11	2 p		silvered mica
C909	1-107-098-11	1 p		silvered mica
C910	1-108-279-12	0.015		mylar
C911	1-107-071-11	27 p		silvered mica
C912	1-107-085-11	100 p		silvered mica
C913, 914	1-108-279-12	0.015		mylar
C1002	1-102-953-11	18 p		
C1004, 1005	1-107-087-11	120 p		silvered mica
C1007 – 1009	1-107-097-11	330 p		silvered mica
C1010 – 1012	1-107-087-11	120 p		silvered mica
C1013	1-102-949-11	12 p		
C1016, 1017	1-107-087-11	120 p		silvered mica
C1018	1-102-949-11	12 p		
C1021, 1022	1-107-087-11	120 p		silvered mica
C1024	1-161-013-XX	0.01		(boundary layer)
C1025, 1026	1-101-923-11	0.01		
C1028	1-101-923-11	0.01		
C1029	1-101-924-11	0.022		
C1030	1-102-506-11	7 p		
C1031	1-102-503-11	3 p		
C1032	1-102-512-11	16 p		

Ref. No.	Part No.	Description		
C1033	1-102-503-11	3 p		
C1034	1-102-505-11	6 p		
C1035 – 1037	1-101-923-11	0.01		
C1038, 1039	1-101-924-11	0.022		
C1040	1-102-864-11	5 p		
C1041	1-102-951-11	15 p		
C1042	1-102-504-11	4 p		
C1043	1-102-948-11	11 p		
C1044	1-102-943-11	6 p		
C1045	1-102-949-11	12 p		
C1046	1-102-503-11	3 p		
C1047	1-161-013-11	0.01		(boundary layer)
C1049	1-101-924-11	0.022		
C1055	1-101-923-11	0.01		
C1059	1-102-121-11	0.0022		
C1060 – 1065	1-101-923-11	0.01		
C1066	1-102-977-11	200 p		
C1067	1-102-973-11	100 p		
C1068	1-161-021-11	0.0047		(boundary layer)
C1069	1-107-070-11	24 p		silvered mica
C1070	1-102-409-11	30 p		
C1071, 1072	1-102-121-11	0.0022		
C1073	1-121-413-11	100	6.3 V	elect
C1074	1-121-352-11	47	10 V	elect
C1075, 1076	1-131-236-11	1	25 V	tantalum
C1077	1-102-121-11	0.0022		
C1078	1-101-880-11	47 p		
C1079, 1080	1-107-093-11	220 p		silvered mica
C1081	1-102-963-11	33 p		
C1082, 1083	1-103-714-11	360 p		polystyrol
C1084	1-102-963-11	33 p		
C1085, 1086	1-108-555-12	0.001		mylar
C1090 – 1092	1-102-043-11	0.001	500 V	feed-through
C1094	1-121-391-11	1	50 V	elect
C1095	1-101-880-11	47 p		

Ref. No.	Part No.	Description		
C1096, 1097	1-121-414-11	100	10 V	elect
C1098	1-107-061-11	10 p		silvered mica
C1099	1-161-013-11	0.01		(boundary layer)
C1100, 1101	1-102-961-11	27 p		
C1102	1-102-977-11	200 p		
C1103	1-101-923-11	0.01		
C1104	1-101-924-11	0.022		
C1105	1-127-019-11	0.1	10 V	solid aluminum
C1106	1-101-919-11	0.0022		
C1107	1-102-043-11	0.001	500 V	feed-through
C1108	1-102-934-11	1 p		
C1201	1-121-424-11	470	6.3 V	elect
C1203	1-131-193-11	10	10 V	tantalum
C1207	1-131-392-11	33	3.15 V	tantalum
C1210	1-101-890-11	75 p		
C1211, 1212	1-108-563-12	0.0022		mylar
C1213	1-127-019-11	0.1	10 V	solid aluminum
C1301	1-121-651-11	10	16 V	elect
C2001	1-121-963-11	33	25 V	elect
C2021	1-121-352-11	47	10 V	elect
C2022	1-121-726-11	0.47	50 V	elect
C2031	1-108-575-12	0.0068		mylar
C2051	1-108-234-12	0.0047		mylar
C2052	1-108-227-12	0.001		mylar
C2110	1-131-387-11	47	6.3 V	tantalum
C2101	1-131-169-11	0.47	10 V	tantalum
C2102	1-131-202-11	1.5	20 V	tantalum
C2103	1-131-380-11	33	10 V	tantalum
C2104	1-105-669-12	0.0047		mylar
C2105	1-161-190-11	0.001		(boundary layer)
C2106	1-105-669-12	0.0047		mylar
C2108	1-107-123-11	47 p		silvered mica
C2109	1-131-170-11	3.3	10 V	tantalum
C2111	1-131-173-11	33	10 V	tantalum
C2112	1-131-202-11	1.5	20 V	tantalum
C2113	1-161-190-11	0.001		(boundary layer)
C2114	1-131-380-11	33	10 V	tantalum
C2115	1-131-387-11	47	6.3 V	tantalum

Ref. No.	Part No.	Description		
C2116	1-131-375-11	4.7	10 V	tantalum
C2117	1-121-419-11	220	6.3 V	elect
C2118	1-131-368-11	3.3	16 V	tantalum
C2119	1-131-177-11	100	3 V	tantalum
C2120	1-131-244-11	1	6.3 V	tantalum
C2121	1-105-673-12	0.01		mylar
C2122	1-105-719-12	0.033		mylar
C2123	1-105-669-12	0.0047		mylar
C2124	1-131-375-11	4.7	10 V	tantalum
C2125	1-131-170-11	3.3	10 V	tantalum
C2126	1-121-420-11	220	10 V	elect
C2127	1-131-395-11	100	3 V	tantalum
C2128	1-131-377-11	33	10 V	tantalum
C2129	1-161-190-11	0.001		(boundary layer)
C2132	1-161-190-11	0.001		(boundary layer)
C2133	1-131-368-11	3.3	16 V	tantalum
C2134	1-108-249-12	0.068		mylar
	1-161-001-11	0.001		(boundary layer)
CT1001 – 1003	1-141-171-11	Trimmer		
CT201 – 206	1-141-171-XX	Trimmer		
CT207	1-141-138-XX	Trimmer		
CT208	1-141-174-00	Trimmer		
CT209 – 212	1-141-138-XX	Trimmer		
CT901	1-141-175-00	Trimmer		
CV001 – 004	1-151-223-XX	Tuning		
CV051 – 054	1-151-223-11	Tuning		
CV101	1-151-266-XX	Tuning		
CV201 – 203	1-151-201-00	Tuning		

RESISTORS

All resistors are in ohms. Common ¼ W carbon resistors are omitted. Check schematic diagram for values.

R210, 214 R218, 222 R226	1-212-879-11	82	fusible
R235, 239 R244, 321	1-212-881-11	100	fusible

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Ref. No.	Part No.	Description		
R363	1-212-857-11	10		fusible
R501	1-206-475-11	33	2 W	metal-oxide
R511	1-244-837-11	33	½ W	carbon
R610	1-212-869-11	33	½ W	fusible
R618, 619	1-207-459-11	0.47	½ W	wirewound
R620	1-212-857-11	10		fusible
R714	1-202-723-11	2.2 M	½ W	composition
R836	1-212-869-11	33		fusible
R1267	1-212-941-11	2	½ W	fusible
R2005	1-212-857-11	10		fusible
R2101, 2102	1-209-878-11	1.8 k	1/16 W	carbon
R2103	1-209-781-11	10	1/16 W	carbon
R2108	1-210-381-11	33	1/16 W	carbon
R2112	1-209-768-11	2.2 k	1/16 W	carbon
R2113	1-210-113-11	18 k	1/16 W	carbon
R2114	1-210-371-11	1.6 k	1/16 W	carbon
R2115	1-210-363-11	270	1/16 W	carbon
R2116	1-210-381-11	33 k	1/16 W	carbon
R2119	1-210-363-11	270	1/16 W	carbon
R2121	1-209-768-11	2.2 k	1/16 W	carbon
R2122	1-209-113-11	18 k	1/16 W	carbon
R2123	1-209-774-11	5.1 k	1/16 W	carbon
R2124	1-209-770-11	2.7 k	1/16 W	carbon
R2125	1-210-388-11	68 k	1/16 W	carbon
R2126	1-210-392-11	75	1/16 W	carbon
R2127	1-210-101-11	51	1/16 W	carbon
R2128	1-210-846-11	33	1/16 W	carbon
R2129	1-209-770-11	2.7 k	1/16 W	carbon
R2130	1-209-774-11	5.1 k	1/16 W	carbon
R2131	1-210-111-11	12 k	1/16 W	carbon
R2132	1-209-781-11	10 k	1/16 W	carbon
R2135, 2136	1-210-371-11	1.6 k	1/16 W	carbon
R2137	1-210-102-11	150	1/16 W	carbon
R2142		1.2 k	1/16 W	carbon
R2144	1-210-105-11	560	1/16 W	carbon
VR201	1-224-642-XX	1 k, adjustable; first mixer balance		
VR202	1-224-644-XX	4.7 k, adjustable; blank level		
VR501 503	1-224-207-00	20 k, variable; TREBLE, BASS, VOLUME		

Ref. No.	Part No.	Description
VR1001	1-224-649-XX	200 k, adjustable; SW spurious beat
VR1401	1-224-820-00	20 k, variable; RF GAIN

SWITCHES

S1	1-514-304-00	Slide, antenna selector
S2	1-516-893-00	Micro, SW antenna coil select
S3 – 6	1-516-896-00	Pushbutton, 4-key; BAND SELECTOR
S8 – 12	1-516-895-00	Pushbutton, 5-key; MODE
S14 – 16	1-516-898-00	Rotary, NOISE BLANKER, AFC, MUTING
S17	1-516-624-00	Slide, TIMER ON
S18 – 20	1-514-533-XX	Micro, BATT CHECK, LIGHT, ZERO SECOND
S21, 22	1-514-864-XX	Micro, POWER
S23	1-516-267-00	Voltage Select
S26	1-516-965-00	Rotary, SW BAND SELECTOR
S27 – 29	1-516-892-00	Rotary, SW BAND SELECTOR
S001	1-552-053-00	Pushbutton, 2-key, FM
S2001	1-516-873-00	Slide, ISS
S2002	1-516-624-00	Slide, MEMO REC
S2003	1-516-898-XX	Rotary, FUNCTION
S2101	1-513-323-00	Slide, REC/PB
S2102	1-514-346-00	Leaf, POWER
S2103	1-552-052-00	Leaf, MUTING

JACKS

J501 – 505	1-507-369-00	Jack, 5-unit; earphone, AUX IN
J1401	1-507-440-00	Jack, HEADPHONES

FUSES

F1	1-532-400-XX	315 mA
F2	1-532-448-XX	400 mA

MISCELLANEOUS

ANT1	1-501-104-00	SW Telescopic Antenna
ANT2	1-501-103-00	FM Telescopic Antenna

Note: The components identified by shading are critical for safety. Replace only with part number specified.

Ref. No.	Part No.	Description
CF801 – 803	1-527-184-XX	Filter, ceramic (10.7 MHz)
CNJ1	1-509-511-00	Connector, 2-p, AC IN; including S24
CNJ38	1-507-302-00	Connector, 10 p
CNP5	1-508-743-00	Connector Pin
CNP6 – 8	1-508-795-00	Connector Pin, 12 p
CNP9, 10	1-508-699-00	Connector Pin, 8 p
CNP16	1-508-694-00	Connector Pin, 8 p
CNP28	1-508-698-00	Connector, 6 p
CR801	1-231-202-00	Encapsulated Component
EH	8-825-566-00	Head, erase; EBF5-02B
M	8-834-221-00	Motor, D-221F
ME	1-520-249-00	Meter, TUNING/BATT
MIC	8-814-191-10	Microphone, C-1002J
PL1	1-518-138-XX	Lamp, pilot; 5 V 60 mA; meter, timer
PL2, 3	1-518-189-XX	Lamp, pilot; 5 V 60 mA; meter, timer
PL4 – 5	1-518-138-XX	Lamp, pilot; 5 V 60 mA; meter, timer
PT701	1-442-863-00	Transformer, power
RPH	8-829-336-07	Head, record/playback; PP134-36G
SP	1-502-592-00	Speaker
X201	1-527-270-00	Crystal
X202	1-527-271-00	Crystal
X1002	1-527-269-00	Crystal

Ref. No.	Part No.	Description
	1-407-856-00	Choke Coil, power
	1-423-230-00	Transformer, output
	1-526-522-00	Jack, coaxial connector
	1-533-102-00	Holder, fuse
	1-536-174-00	Terminal Strip, MW/LW/SW antenna
	1-536-203-00	Terminal Strip, FM antenna
	1-536-401-XX	Terminal Strip, 2L1
	1-548-082-00	QUARTZ TIMER

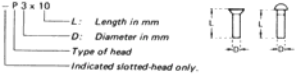
ACCESSORIES & PACKING MATERIALS

Part No.	Description
1-504-059-00	Earphone, EM-20H
1-534-867-00	Cord, power; DK-35 (US model)
1-551-002-XX	Cord, power; (Canadian model)
3-701-632-00	Bag, plastic
3-793-956-31	Card, warranty (Canadian model)
3-880-697-00	Bag, plastic
3-882-401-00	Cushion, protection
3-882-410-00	Carton
3-993-063-14	Book, SHORT WAVE GUIDE
3-995-735-21	Manual, instruction
3-995-763-21	Manual, instruction

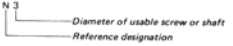
Note: The components identified by shading are critical for safety. Replace only with part number specified.

HARDWARE NOMENCLATURE

Screw:



Nut, Washer, Retaining ring:



Reference Designation	Shape	Description	Remarks
		SCREWS	
P		pan-head screw	binding-head (B) screw for replacement
PWH		pan-head screw with washer face	binding-head (B) screw and flat washer for replacement
PS PSP		pan-head screw with spring washer	binding-head (B) screw and spring washer for replacement
PSW PSPW		pan-head screw with spring and flat washers	binding-head (B) screw and spring and flat washers for replacement
R		round-head screw	binding-head (B) screw for replacement
K		flat-countersunk-head screw	
RK		oval-countersunk-head screw	
B		binding-head screw	
T		truss-head screw	binding-head (B) screw for replacement
F		flat-fillister-head screw	
RF		fillister-head screw	
BV		braizer-head screw	

Reference Designation	Shape	Description	Remarks
		SELF-TAPPING SCREWS	
TA		self-tapping screw	ex: TA, P 3 x 10
PTP		pan-head self-tapping screw	binding-head self-tapping (TA, B) screw for replacement
PTPWH		pan-head self-tapping screw with washer face	binding-head self tapping (TA, B) screw and flat washer for replacement
PTTWH		pan-head thread-rolling screw with washer face	binding-head (B) screw and flat washer for replacement
		SET SCREWS	
SC		set screw	
SC		hexagon-socket set screw	ex: SC 2.6 x 4, hexagon socket
		NUT	
N		nut	
		WASHERS	
W		flat washer	
SW		spring washer	
LW		internal-tooth lock washer	ex: LW3, internal
LW		external-tooth lock washer	ex: LW3, external
		RETAINING RINGS	
E		retaining ring	
G		grip-type retaining ring	

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