

AM/FM STEREO TUNER  
**TX-8100**

KCU

〈ART-115-0〉

*Service Manual*



 **PIONEER**

# **SERVICE MANUAL**

STEREO TUNER

# **TX-8100**

**KUW, KCW, FW, FVZW**

**NOTE:**

MODEL TX-8100 COMES IN FOUR VERSIONS DISTINGUISHED AS FOLLOWS:

Round label on rear panel	Voltage	Type
KUW KCW FVZW FW	120V only 120V only 5-position selector 5-position selector	UL approved (U.S.A.) CSA approved (Canada) FTZ approved (West Germany) General export model

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**MISCELLANEOUS****Power Requirements**

KUW and KCW model .....	AC 120V 60Hz
FVZW and FW model .....	AC 110V, 120V, 130V, 220V and 240V (Switchable) 50/60Hz

**Power Consumption**

27W

**AC Outlet** .....

Unswitched 1

**Dimensions** .....430(W) x 138(H) x 345(D)mm  
16-15/16 x 5-7/16 x 13-9/16 in.**Weight Without Package** .....

7.9 kg, 17 lb 6oz

**With Package** .....

9.9 kg, 21 lb 12oz

**FURNISHED PARTS**

FM T-type Antenna .....	1
Connection Cord with Pin Plugs .....	1
Polishing Cloth .....	1
Operating Instructions .....	1
Fuse 0.5A { 5-line voltage } .....	1
Fuses 1.0A { model only } .....	2

**NOTE:**

Specifications and the design subject to possible modification without notice due to improvements.



## 2. FRONT PANEL FACILITIES

### POWER SWITCH

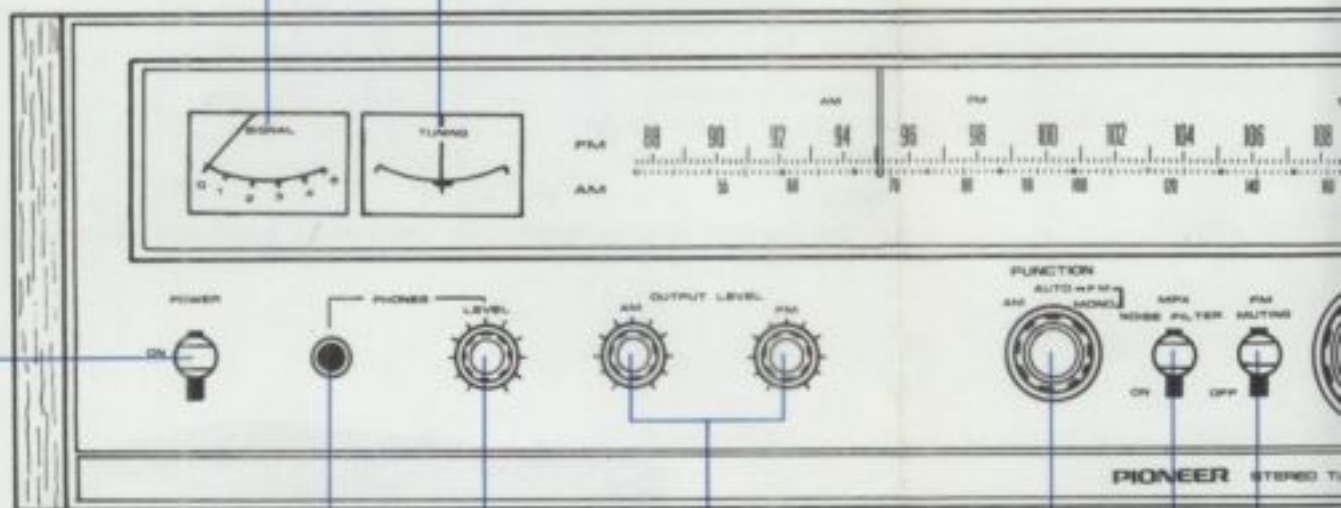
Move up to ON to power the set, down to turn it OFF.

### SIGNAL METER

Optimum AM or FM reception is obtained when the needle swings to the extreme right.

### TUNING METER

Works together with the SIGNAL meter during FM broadcast tuning to indicate precise station alignment (center position).



### HEADPHONE JACK

Accepts stereo headphones connection cord. Useful for listening without disturbing others.

### HEADPHONE OUTPUT LEVEL KNOB

Regulates the volume heard through the headphones.  
Turn to the right to increase the volume.

### FUNCTION SWITCH

Used to select the type of broadcast reception.

AM . . . . . For AM broadcast reception.

FM AUTO . . . For normal FM reception. Provides automatic switchover to stereo when a stereo signal is received.

FM MONO . . . For monophonic reception of both mono and stereo FM signals.

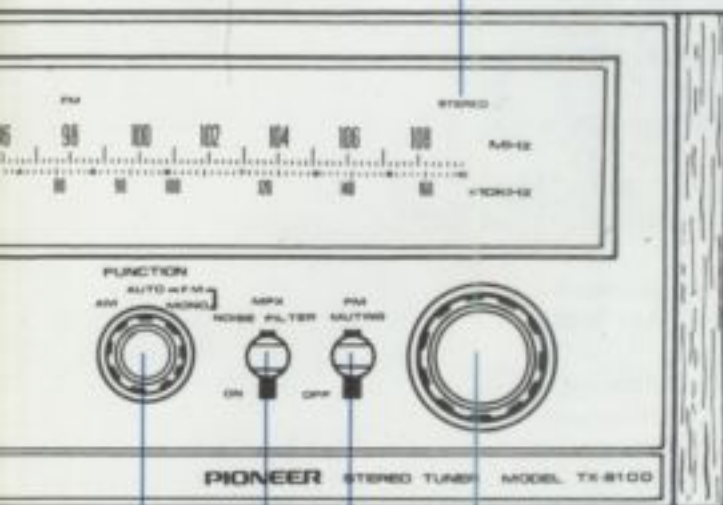
### AM AND FM OUTPUT LEVEL KNOBS

Control the volume of the signal from the OUTPUT (VARIABLE) terminals on the rear panel.

Separate controls for AM and FM signals. Turn to the right to increase the volume.

reception is obtained when the  
me right.

SIGNAL meter during FM broad-  
precise station alignment (center



### FM STEREO INDICATOR

When the FUNCTION switch is set to FM AUTO this lamp lights whenever an FM stereo broadcast is being received.

broadcast reception.

broadcast reception.

al FM reception. Provides auto-  
chover to stereo when a stereo  
received.

phonic reception of both mono  
FM signals.

### T LEVEL KNOBS

the signal from the OUTPUT  
n the rear panel.

l and FM signals. Turn to the  
ne.

### TUNING KNOB

Used to tune in both AM and FM stations.

### FM MUTING LEVER SWITCH

In keeping the lever upper (not moved down to OFF), the FM muting circuit cancels out noise on unused FM bands (inter-station noise), but it also rejects very weak, faint FM stations. To receive such a station, move the lever to OFF to turn off the FM muting circuit.

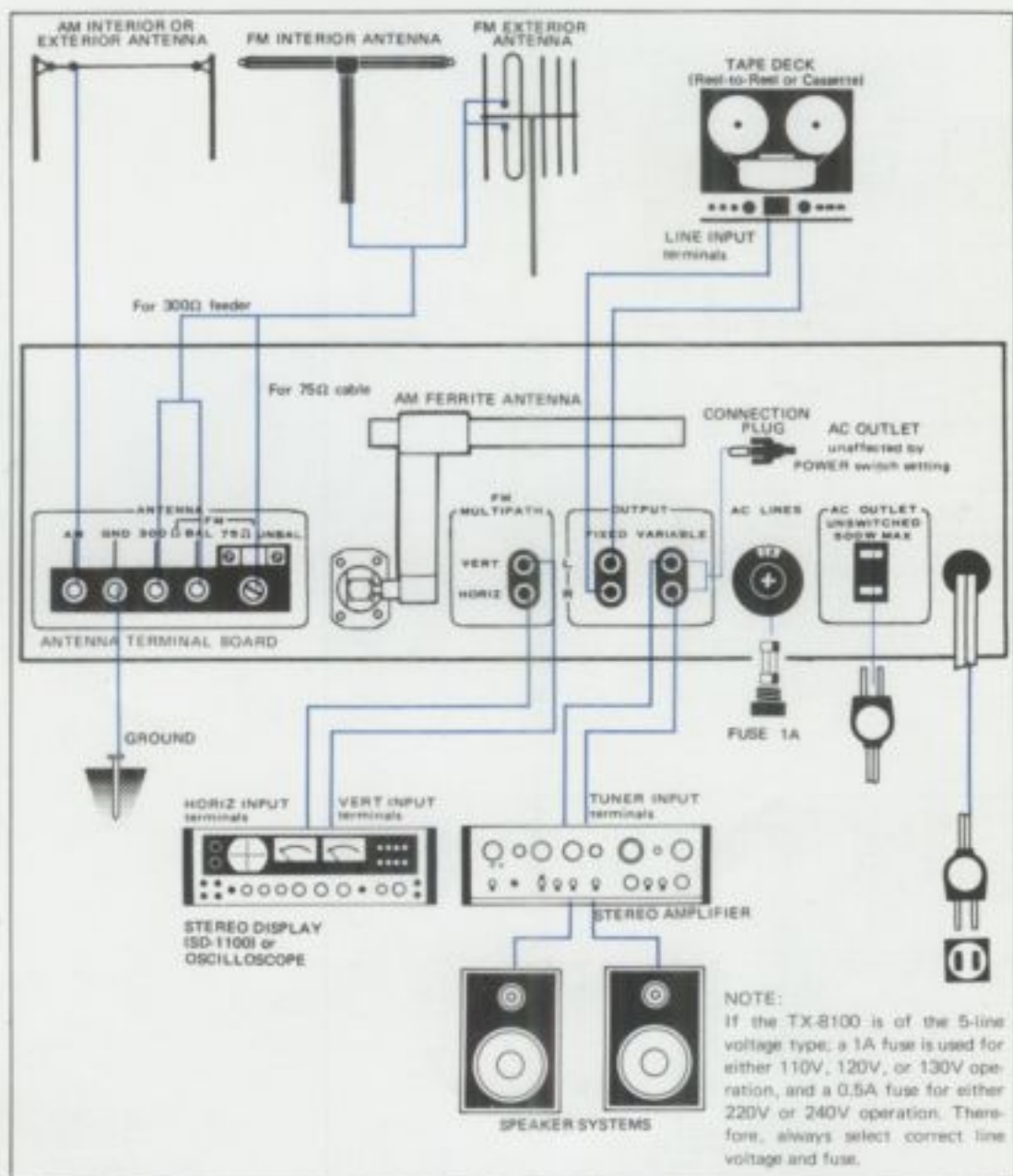
### MPX NOISE FILTER SWITCH

Switch on to cut high-frequency noise during FM stereo broadcast reception.



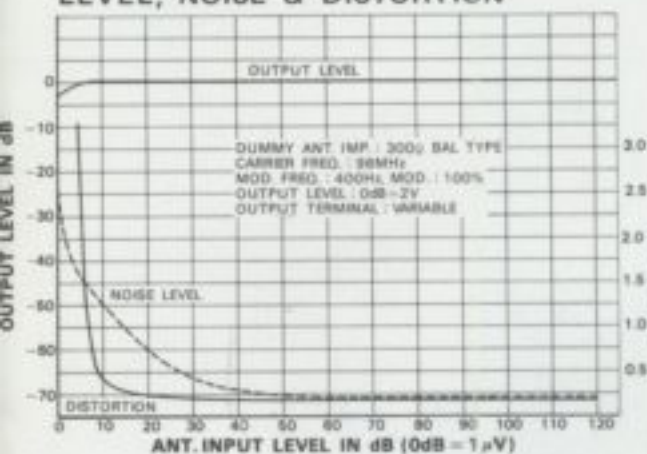


### 3. CONNECTION DIAGRAM

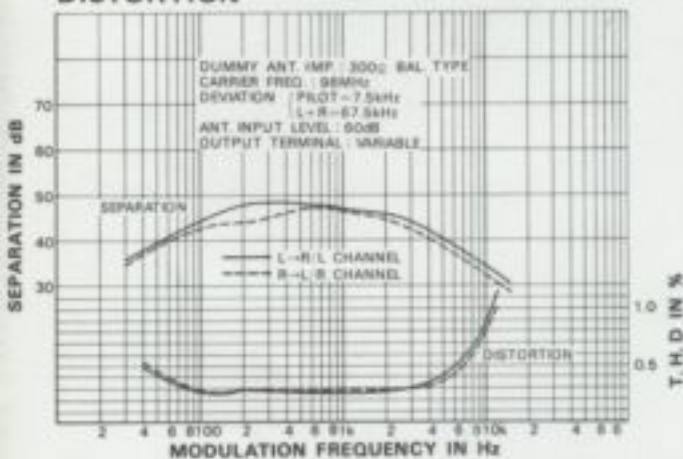


## 4. TUNER CHARACTERISTICS

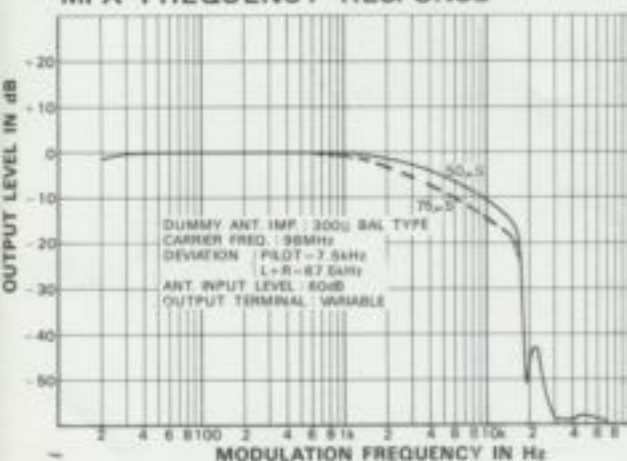
## ANTENNA INPUT LEVEL VS. OUTPUT LEVEL, NOISE &amp; DISTORTION



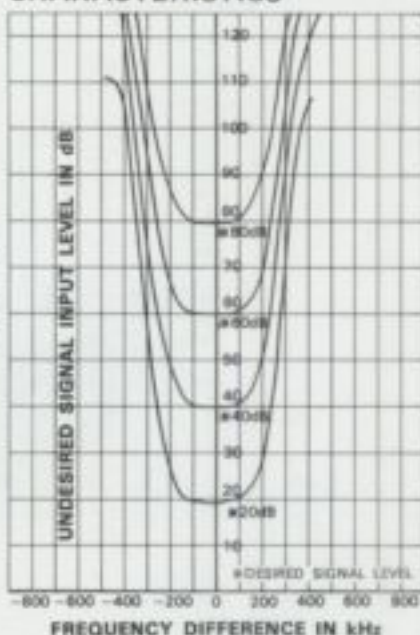
## MPX FREQUENCY VS. SEPARATION &amp; DISTORTION



## MPX FREQUENCY RESPONSE



## FM USABLE SELECTIVITY CHARACTERISTICS



DUMMY ANT. IMP. 300 $\Omega$  BAL TYPE  
CARRIER FREQ. 98MHz  
OUTPUT TERMINAL VARIABLE  
UNDESIRE-DESIRE SIGNAL  
OUTPUT RATIO - 30dB  
UNDESIRE SIGNAL 400Hz 100% MOD.

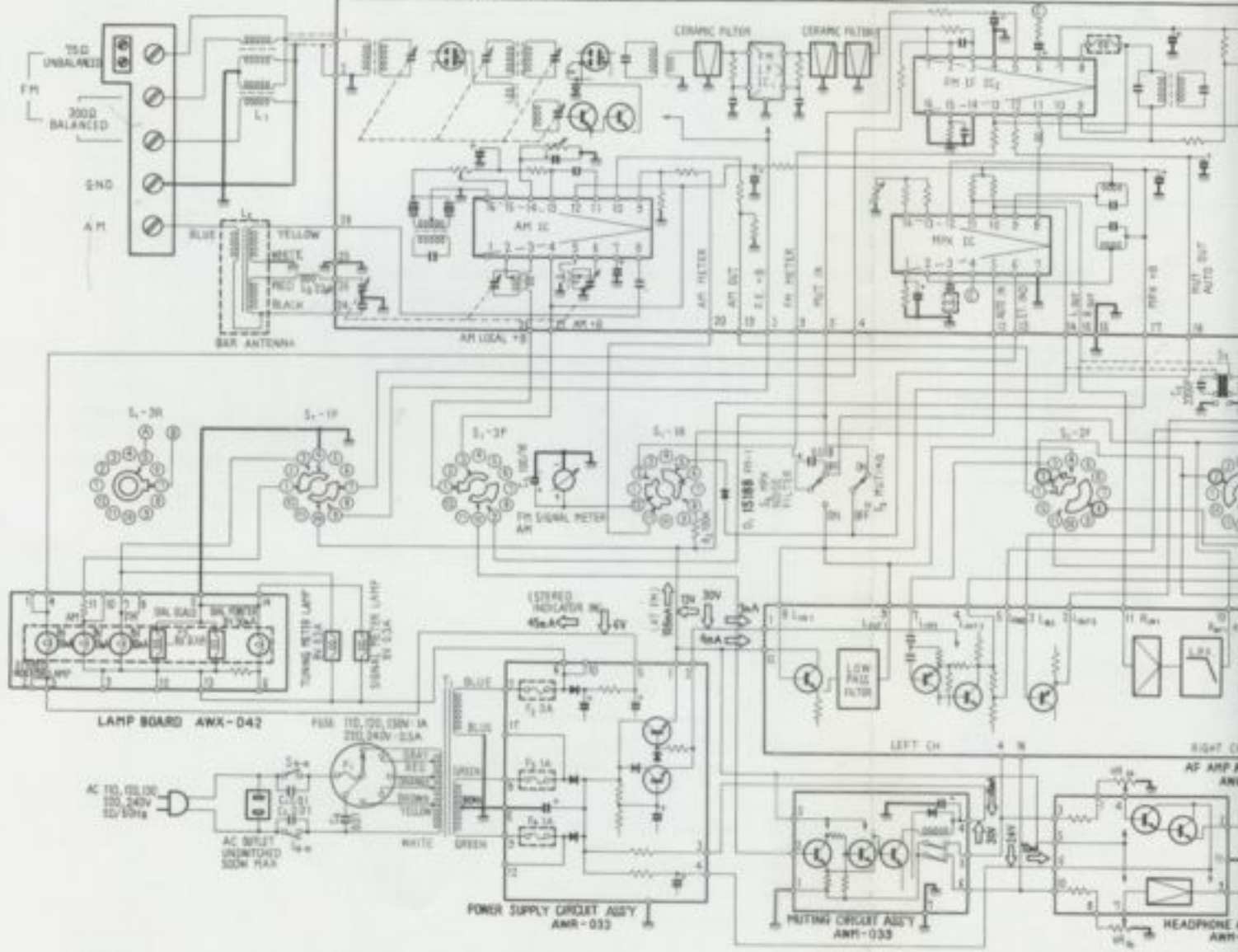
# 5. BLOCK DIAGRAM

**TX-8100**

NOTES:

Neither switch (S<sub>5</sub>) nor capacitors (C<sub>5</sub> & C<sub>6</sub>) are provided for FTZ-approved unit. No switch (S<sub>5</sub>) is provided for QOV unit, but capacitors (C<sub>5</sub> & C<sub>6</sub>) are provided.

TUNER ASSY AME-023



- SWITCHES**
- S<sub>1</sub> FUNCTION
  - 1. AM
  - 2. FM AUTO
  - 3. FM MONO
  - S<sub>2</sub> MPX NOISE FILTER SW
  - OFF → ON
  - S<sub>3</sub> TUNING SW
  - ON → OFF
  - S<sub>4</sub> POWER SW
  - ON → OFF
  - S<sub>5</sub> DE-EMPHASIS SW
  - 50μS → 75μS

**RESISTORS**  
IN OHM,  $\frac{1}{2}$ W, +5% TOLERANCE UNLESS OTHERWISE NOTED. K = KΩ M = MΩ

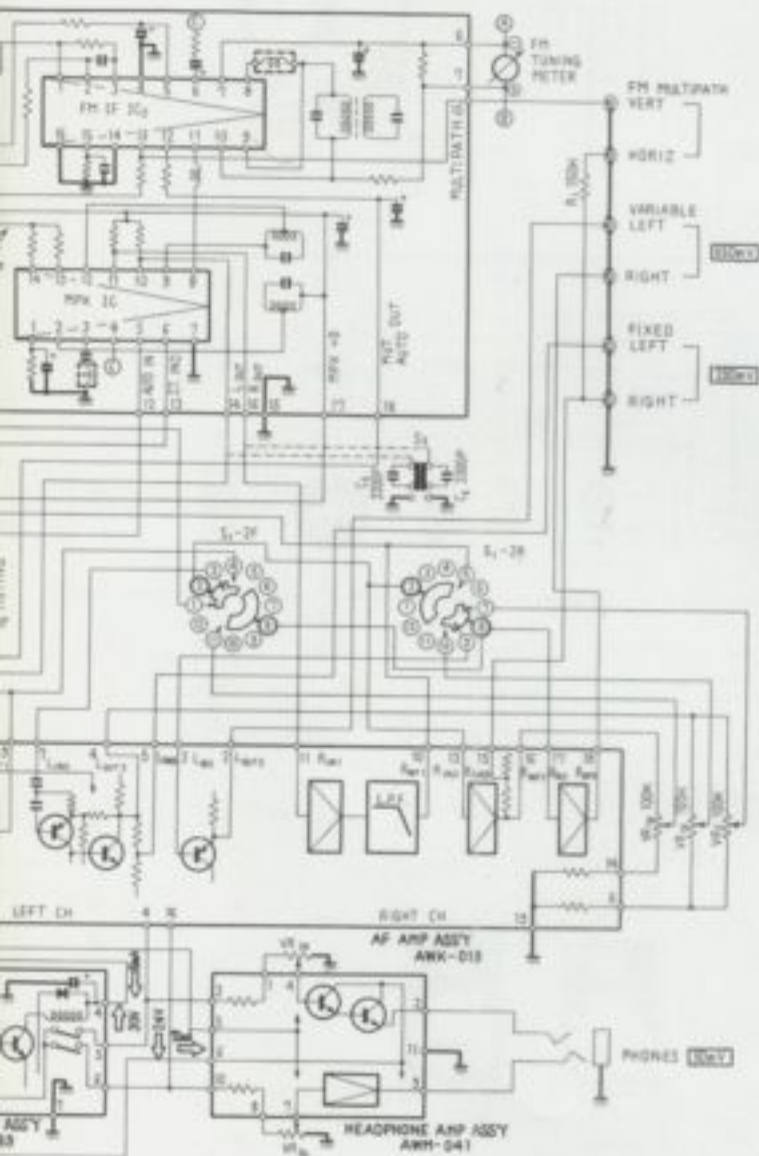
**CAPACITORS**  
IN  $\mu$ F UNLESS OTHERWISE NOTED. P = pF

→ mA / DC CURRENT AT NO INPUT SIGNAL.  
→ V / DC VOLTAGE AT NO INPUT SIGNAL.  
→ SIGNAL VOLTAGE AT 30% MOD.

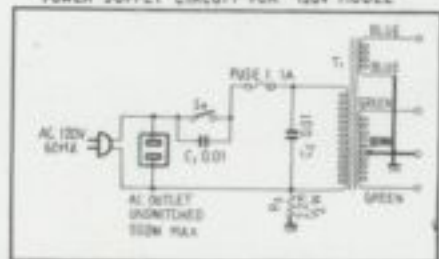
POWER I

AC 120V 50Hz

capacitors (C<sub>1</sub> & C<sub>2</sub>) are provided for FTZ-approved unit.  
 for 120V unit, but capacitors (C<sub>1</sub> & C<sub>2</sub>) are provided.



POWER SUPPLY CIRCUIT FOR 120V MODEL



CURRENT AT NO INPUT SIGNAL.  
 VOLTAGE AT NO INPUT SIGNAL.  
 VOLTAGE AT 30% MOD.



## 6. CIRCUIT ANALYSIS

### 6.1 FM FRONT END

The FM front end, equipped with a 4-ganged tuning capacitor in its single-stage RF amplifier, uses low-noise dual-gate MOS FET's for RF amplification and frequency conversion. These MOS FET's give high gain combined with low noise.

The antenna signal, after impedance matching in a balun, enters the tuner ass'y between terminals 1 (hot) and 2 (ground). After the desired frequency only has been selected in the tuning circuit (T1 and variable tuning capacitor), the signal enters the No. 1 gate of Q1 for RF amplification. Upon amplification in Q1, the signal passes through the tuning circuit made up of T2, T3 and the variable tuning capacitor and goes to gate No. 1 of Q2.

Q2 serves as mixer (frequency converter). The signal from the local oscillator is applied to gate No. 2 of Q2. The intermediate frequency — that is the difference between the frequencies at gates No. 1 and No. 2 of Q2 — is obtained at the secondary side of T5 (the drain load).

The local oscillator is basically a Colpitts circuit consisting of Q3; its load impedance has been increased to prevent waveform distortions, and a buffer amp has been provided between oscillator and mixer to prevent oscillator frequency instabilities caused by high antenna signal input to the front end.

### 6.2 FM IF AMPLIFIER SECTION

The FM IF amplifier contains three ceramic filters of two elements each for improved selectivity. One IC serves as a single-stage differential amplifier, while another IC combines the following functions: a 3-stage differential amplifier, quadrature detector, muting

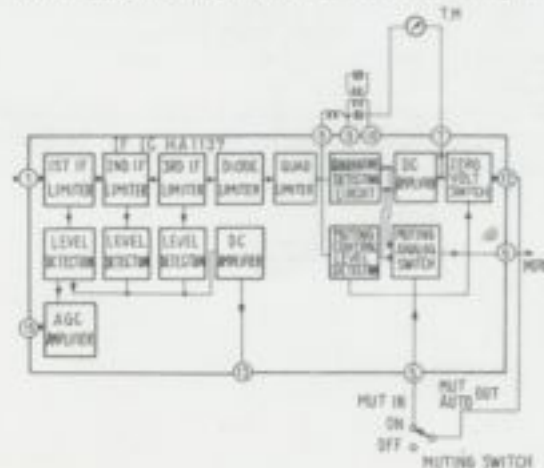


Fig. 1

circuit, tuning meter amp circuit, etc. (see IC block diagram, below). This design helps assure high limiting efficiency. From the front end, the signal passes through the following stages: ceramic filter F1, single stage differential amplifier IC Q5, ceramic filters F2 and F3, and the three differential amplifiers contained in IC Q6. In these circuits, the desired signal of the proper bandwidth is selected and amplified while limiting action suppresses AM components.

The block diagram for IC Q6 is given in Fig. 1. After passing through the limiter circuits, the signal enters the quadrature detector. The composite AF signal obtained there, after passing through the muting circuit, is taken out at pin No. 6 of the IC.

Muting is done in two stages, one of which is effected here. Please note that part of the muting control voltage is also used in the MPX IC as a trigger voltage for the automatic stereo/mono switching.

### 6.3 FM MPX DECODER

The FM MPX decoder circuitry is contained in a single IC (Q7) and consists of the following stages: audio amp, 19kHz pilot signal amp, frequency doubler, 38kHz amp, time switching circuit, automatic stereo/mono switching circuit,

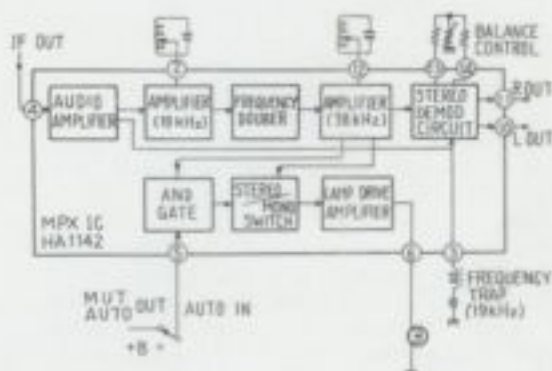


Fig. 2

circuit, etc. The block diagram of this IC is given in Fig. 2. Because of the "double balanced type differential demodulator," good channel separation can be obtained over a wide bandwidth while carrier leak and distortions can be reduced.

From the FM IF section, the signal enters through pin 4 of the IC, is amplified in the AF amplifier and is then split into two routes: pilot signal, main (L+R) and sub (L-R) signal paths. The main and sub signal portions, after passing through a 19kHz trap circuit, go to the demodulator section. The 19kHz pilot signal, after selection and amplification, goes to the frequency doubler where the 38kHz switching signal is generated.

This switching signal is used in the decoder for time-switching of the main and sub signals, whereby the L and R audio signals of the stereo program are obtained. These are taken out from pins 14 (L) and 16 (R) of the circuit assembly. One portion of the switching signal is supplied to the automatic stereo/mono switchover circuit. This functions by switching on-off an AND gate in the IC by means of a DC voltage obtained from the IF section and by the level of the 38kHz switching signal. The stereo indicator lamp is also turned on and off by a circuit in the IC which functions together with the stereo/mono switching.

## 6.4 AM SECTION

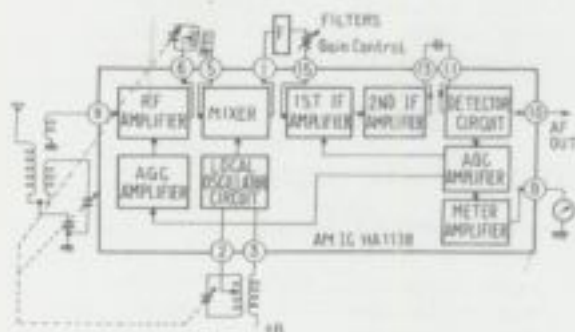


Fig. 3

The AM circuitry has been combined into a single IC. Its block diagram is given in Fig. 3, and it features a single-stage RF amplifier.

The antenna signal, after selection by antenna coil and variable tuning capacitor, enters pin 8 of the IC and is then amplified.

Thereafter, the desired signal is again selected by RF tuning coil and tuning capacitor; it then goes to the frequency converter (mixer) stage. There, it is mixed with the frequency obtained from the local oscillator, and the resulting intermediate frequency is obtained as output. After passing through filter F4 between IC pins 1 and 15, where unwanted RF and other frequency components are eliminated, the signal then enters the 2-stage IF amplifier. After amplification, the signal undergoes AM detection and, after passing through the FUNCTION switch, enters the AF amplifier.

A portion of the detected signal also serves for the AGC feedback and as power source for the signal strength meter.

## 6.5 AF SECTION

Q1 in the AF amp assembly operates as an emitter-follower, functioning as a buffer amp for the purpose of effecting the special FM low pass filter.

Q3 and Q5 form a direct coupled amplifier which raises the load impedance as seen from the low pass filter in FM mode and as seen from the detector circuit in AM mode, thereby preventing any rise in harmonic distortion. Output from Q5 is split into two portions: one passes through the OUTPUT LEVEL CONTROL, the FUNCTION switch and the emitter-follower of Q7 into the VARIABLE OUTPUT jacks; the other undergoes voltage division and goes to the FIXED OUTPUT jacks.

The low-cut filter connected to the base of Q3 eliminates the minimal ultra-low frequency switching noise that is generated when the muting circuit is activated.

## 6.6 MUTING CIRCUIT

The necessary control voltage for the muting circuit is applied to the two terminals of the muting circuit assembly together with the muting circuit contained in IC Q6. Q1 and Q2 of the muting circuit assembly operate as a Schmitt circuit - at 0V input voltage, Q1 is OFF, Q2 is ON and Q3 is OFF. The load on Q3 is given by the coil of the reed relay; when current flows through Q3, the relay contacts close. The relay functions as a link between signal path and ground.

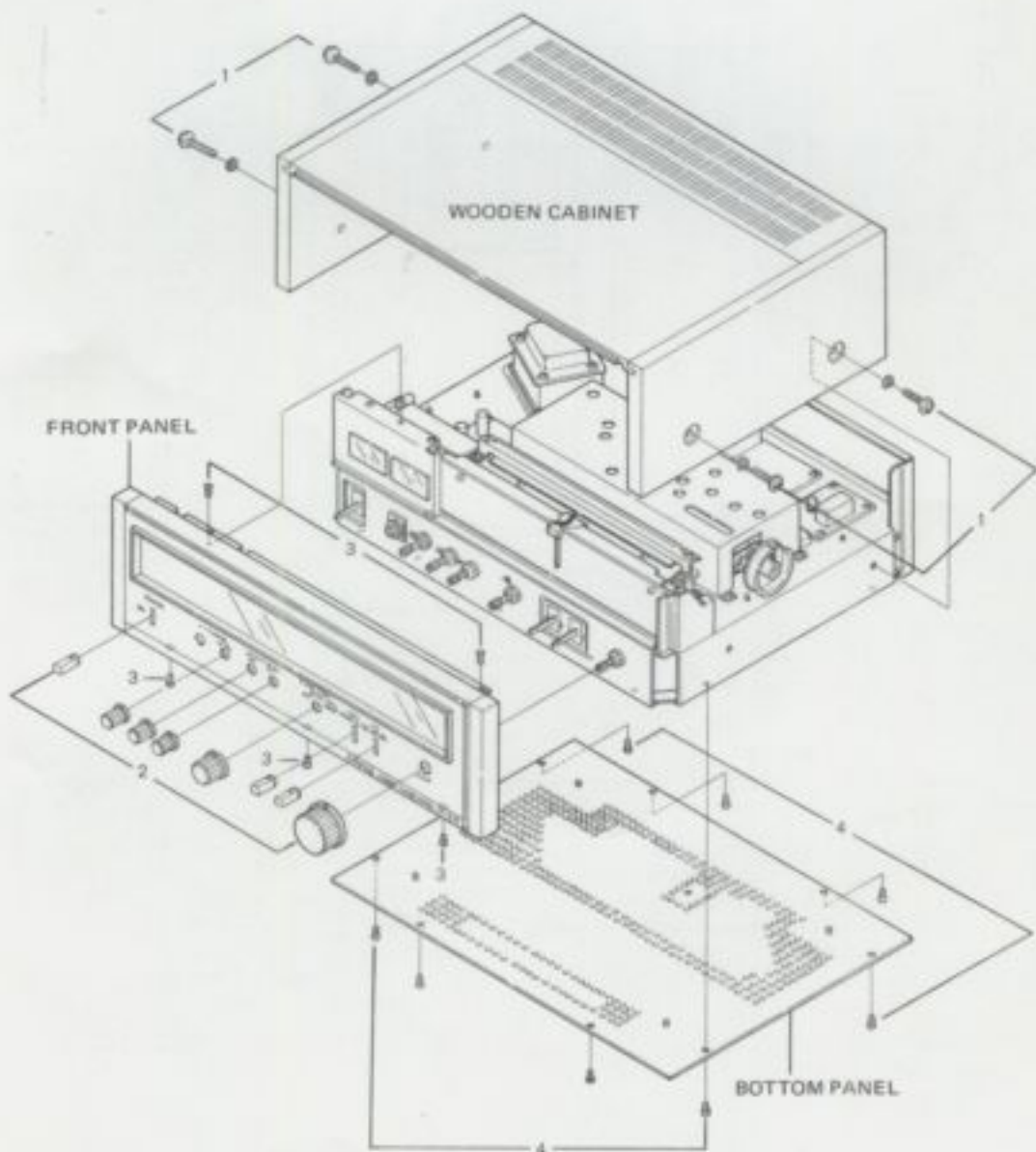
When Q3 is OFF, no current flows through the relay, and connection to ground is interrupted. The trigger level for the muting circuit in the IC is somewhat different from that of the above-mentioned function. When the muting is inactivated, a signal appears at the output terminal.

As the tuner is detuned from an FM station, the muting circuit in the IC functions, attenuating the output signal level as some extent. At the same time, a positive potential appears at the No. 2 pin of the muting circuit assembly. As soon as this positive voltage exceeds the  $V_{BE}$  of the transistor, Q1 is turned ON, Q2 OFF, and Q3 ON, current flows through the relay coil, the relay contacts close, the signal path is grounded and no signal can appear at the output.

This dual action prevents or at least reduces the switching noise generated by triggering of the muting function.

## 7. DISASSEMBLY

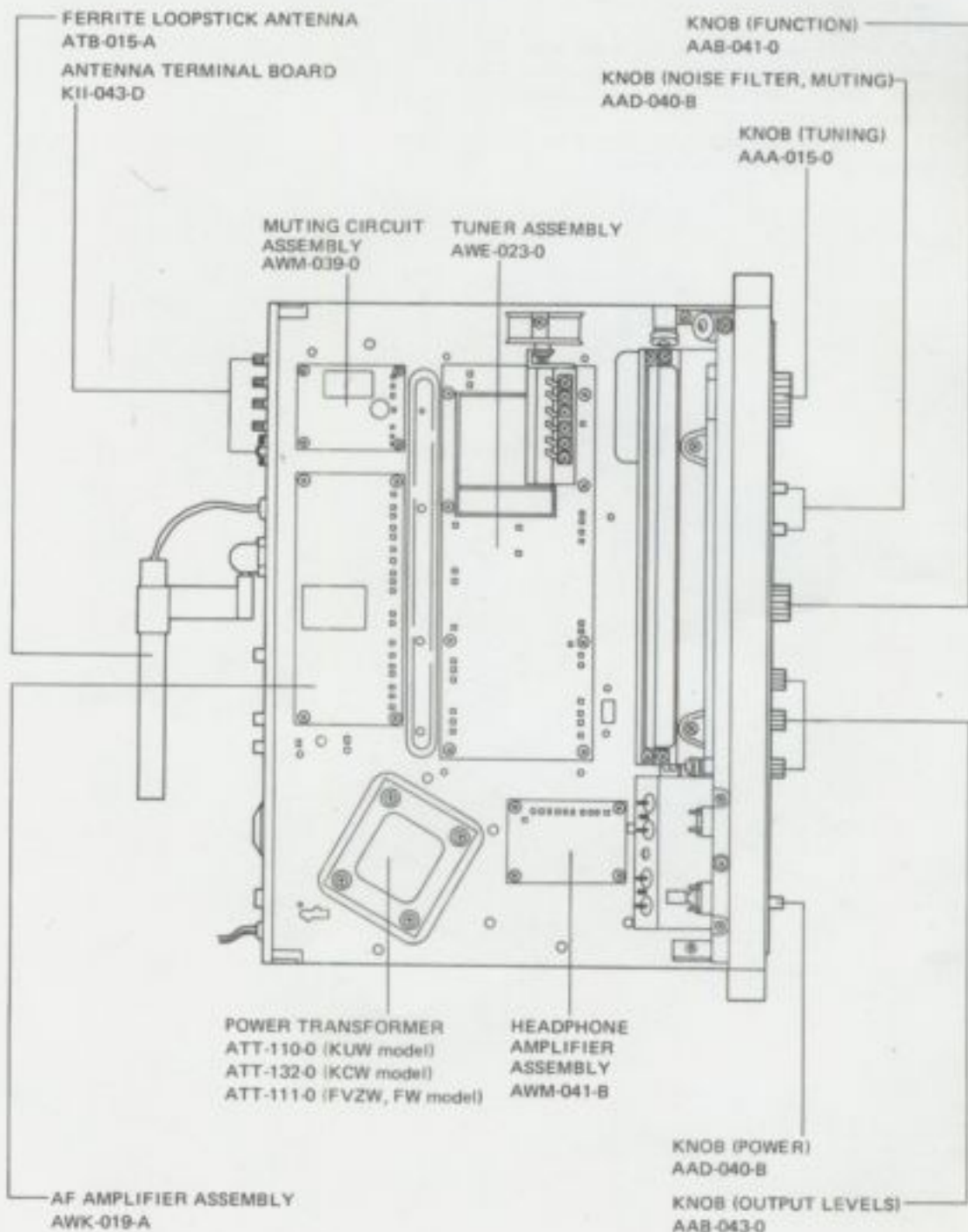
1. To remove the wooden cabinet, first remove the two screws holding each side, then lift the back of the wooden cabinet upward.
2. Pull off all knobs.
3. Remove the two screws in the upper edge and the three screws in the lower edge of the front panel. Then pull the panel gently forward.
4. To remove the bottom panel, first remove the eight screws holding it in place.





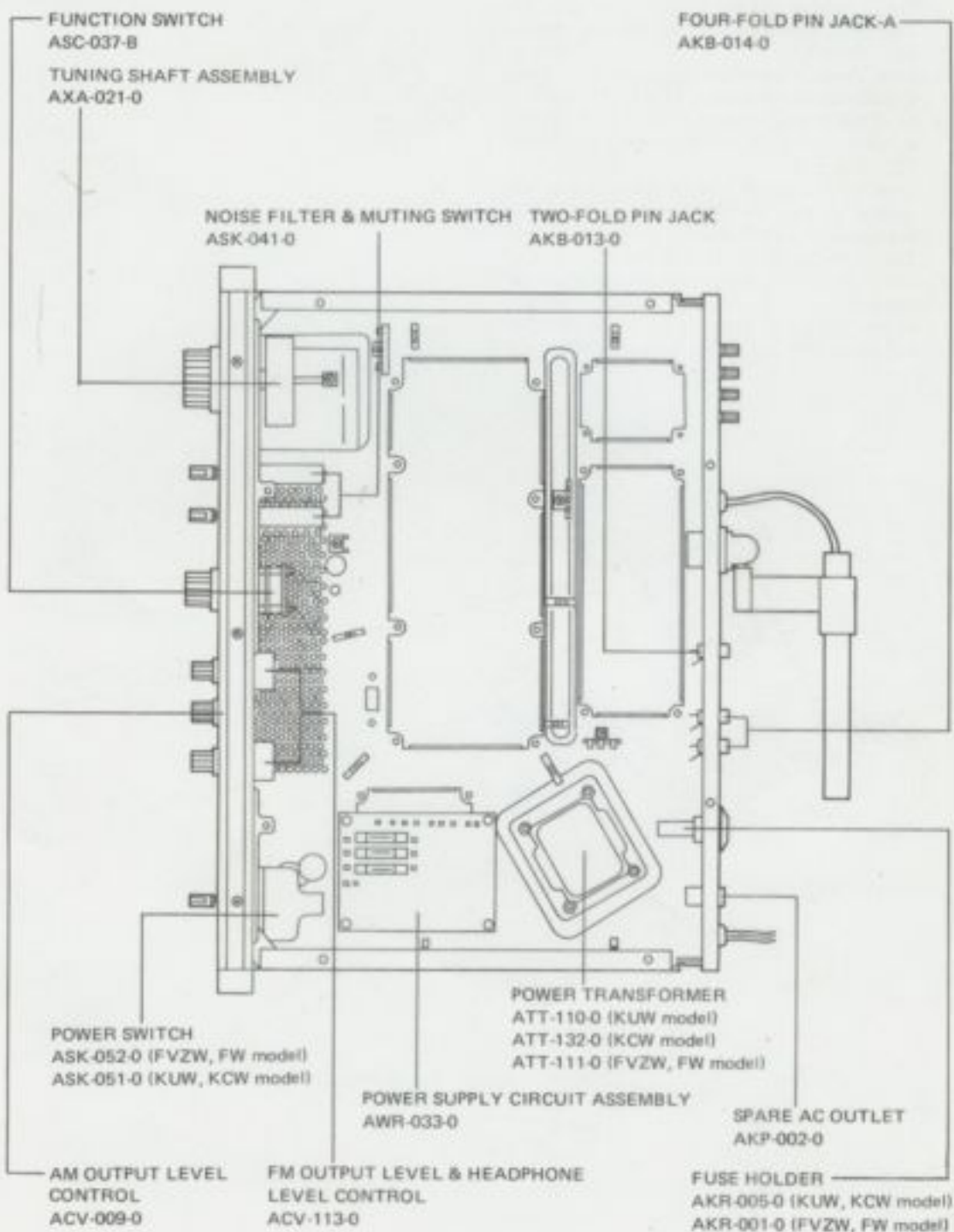
## 8. PARTS LOCATION

### 8.1 TOP VIEW



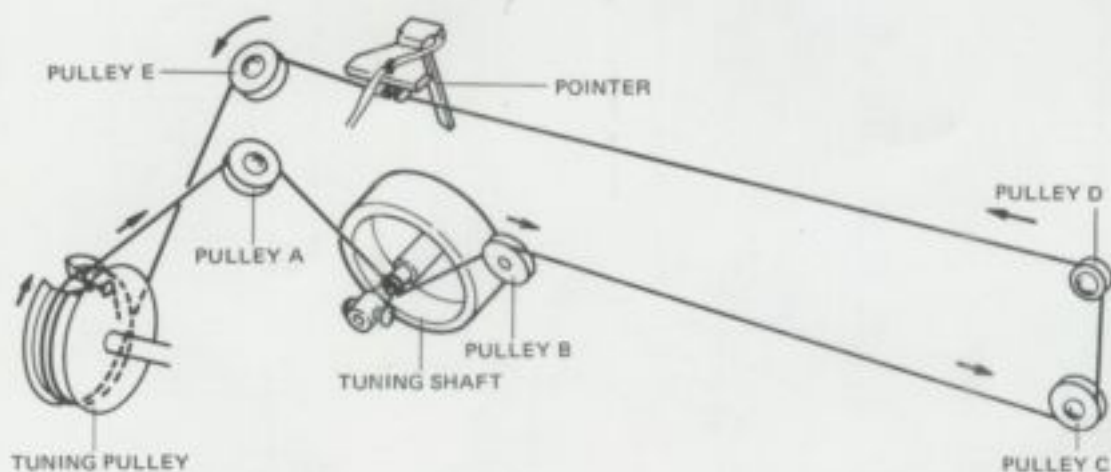


## 8.2 BOTTOM VIEW



## 9. DIAL STRINGING

1. Turn the tuning capacitor so that its plates protrude as much as possible.
2. Tie one end of the string to the spring on the TUNING pulley (attached to the tuning capacitor).
3. Lead the string around pulley A, then wind it three turns around the TUNING shaft.
4. Lead the string around pulleys B, C, D and E, then wind it 1-1/2 turns around the TUNING pulley.
5. Now tie the other end of the string to the spring on the TUNING pulley. Turn the tuning shaft and check for proper function. Then trim the ends of the string.
6. Turn the tuning shaft until the plates of the variable are all the way in. Move the pointer to the right-end starting point on the dial and fasten it to the string in that position.



## 10. ALIGNMENT PROCEDURE

### 10.1 REQUIRED MEASURING INSTRUMENTS

- FM Signal generator
- MPX signal generator
- AM signal generator
- Millivolt meter
- Distortion meter

### 10.2 AM ALIGNMENT

1. Set AM signal generator at 400Hz 30% modulation. Connect to AM antenna terminal via 1k-ohm dummy resistor.
2. Connect oscilloscope and millivolt meter in parallel to unit's VARIABLE OUTPUT terminals.
3. Tune signal generator and unit to 600kHz. Set signal generator output level at approx. 30dB.
4. Adjust T9 and T10 on tuner assembly and core of ferrite bar antenna for maximum output level reading.
5. Now tune unit and signal generator to 1,400kHz.
6. Adjust TC5, TC6 and TC7 on tuner assembly for maximum output level reading.
7. Repeat steps 3 thru 6 several times to obtain maximum readings at both frequencies.

### 10.3 FM ALIGNMENT

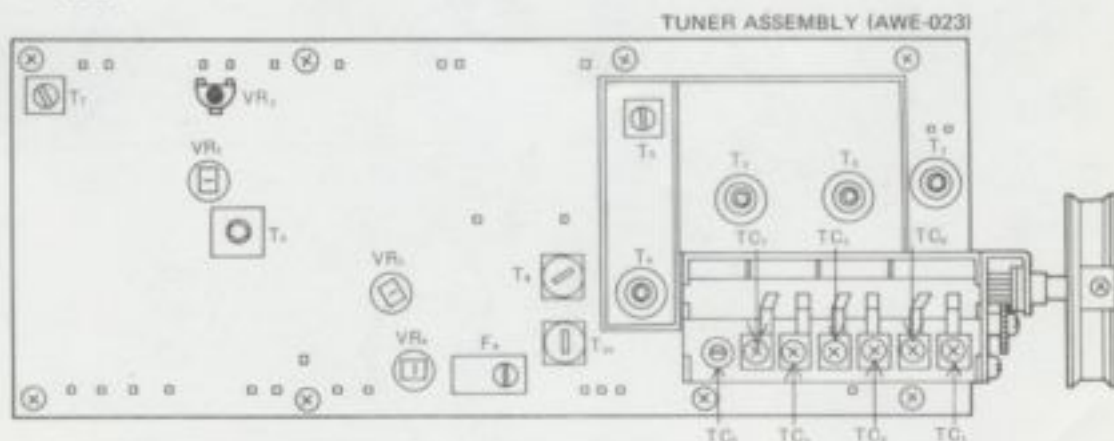
#### Tracking Adjustment

1. Set FM signal generator at 400Hz 100% modulation. Connect to unit's FM antenna terminals via 300-ohm balanced dummy antenna.
2. Connect oscilloscope, millivolt meter and distortion meter in parallel to VARIABLE OUTPUT terminal.
3. Set the signal generator output level to 8 ~ 10dB.

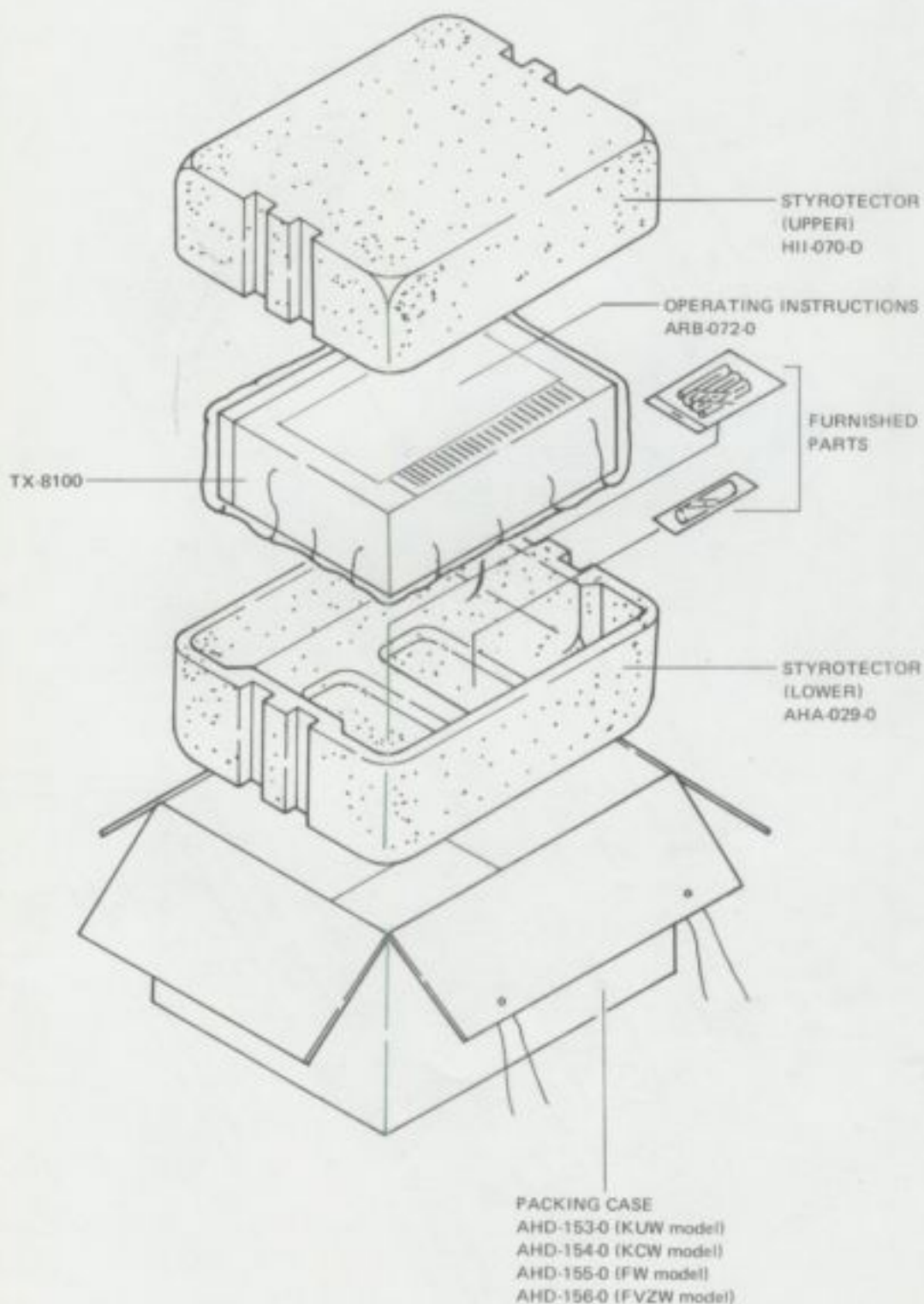
- KCW and KUV model:  
Set the signal generator and set dials to 90MHz.
  - FW and FVZW model:  
Set the signal generator dial to 87.4MHz, and set dial to lower end (o left side).
4. Adjust T1, T2, T3 and T4 cores for maximum output level reading.
  5. Now, tune unit and signal generator to 106MHz.
  6. Adjust TC4, TC1, TC2 and TC3 to obtain maximum output level reading.
  7. Repeat steps 3 thru 6 several times for maximum level readings at both frequencies.
  8. Then adjust core of T5 for maximum output level reading.
  9. Detune so that only interstation noise is received.  
Adjust primary (bottom) core of T6 so that tuning meter is centered.
  10. Tune unit and signal generator to 98MHz. Set signal generator level at 60dB. Tune precisely, observing tuning meter.
  11. Adjust secondary (upper) core of T6 on tuner assembly to obtain minimum reading on distortion meter.

#### FM MPX Alignment

1. Adjust MPX signal generator to obtain main signal modulation of 1kHz, 67.5kHz frequency deviation, and pilot signal modulation of 19kHz, 7.5kHz frequency, deviation. Set output level at 60dB.
2. Set signal generator for modulation of L (left) channel only. Adjust core of T7 to obtain maximum output level reading.
3. Now, adjust core of T5 to obtain minimum distortion reading.
4. Then set signal generator for modulation of L (later R) and pilot. Adjust VR1 to obtain maximum channel separation.

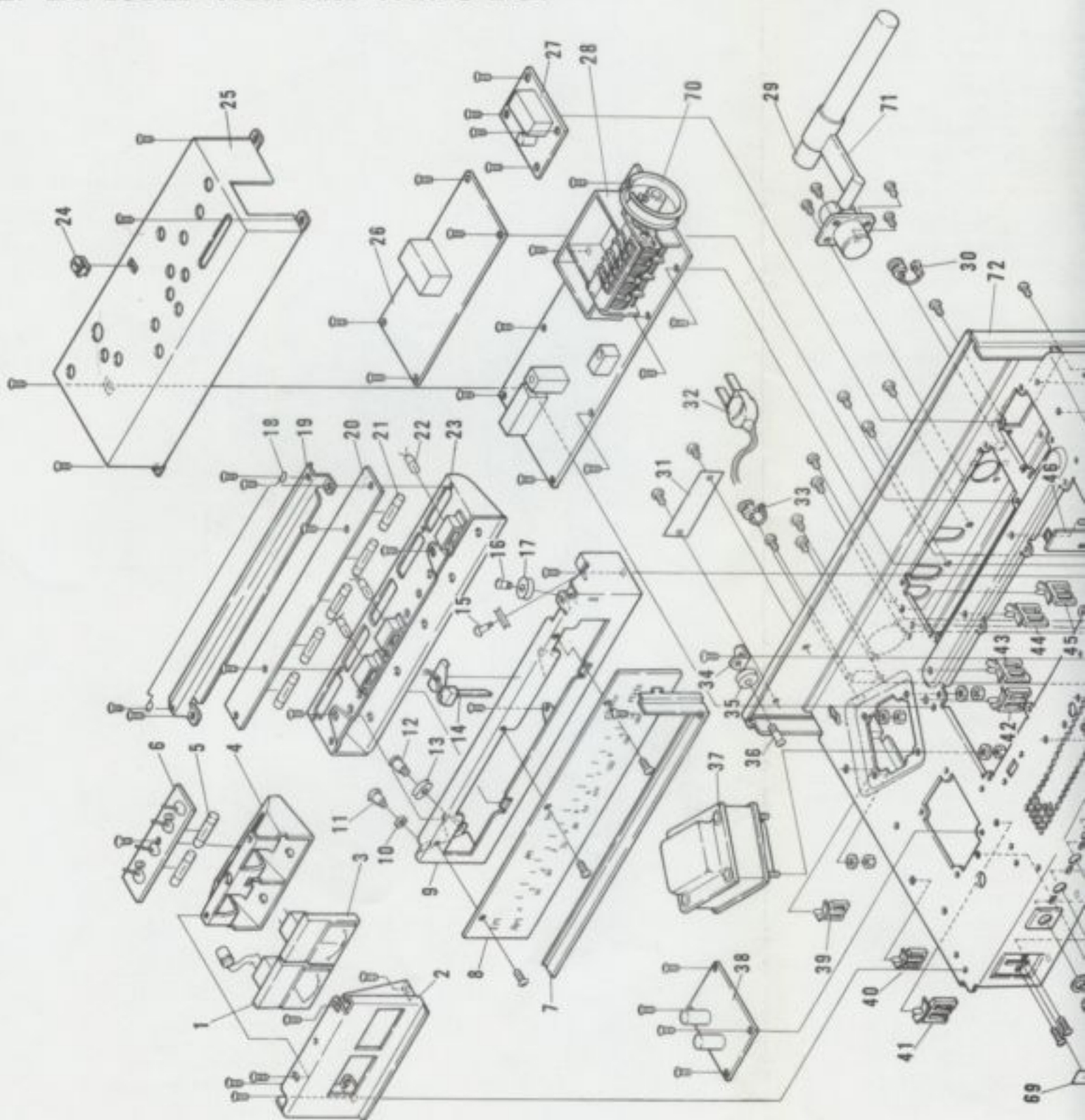


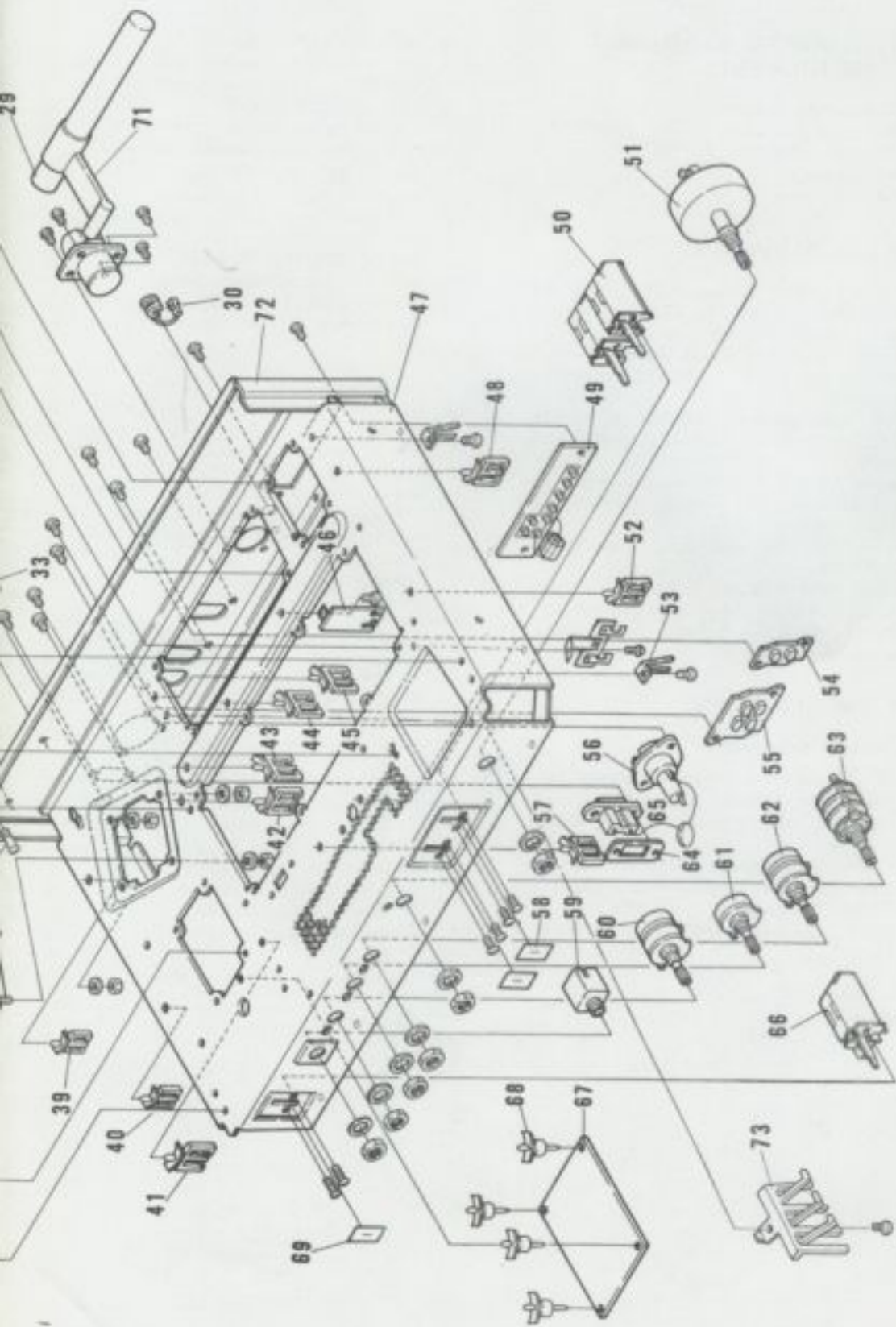
## 11. PACKING METHOD AND PART NUMBERS





## 12. EXPLODED VIEW AND PARTS LIST





## NOTICE:

Any parts asterisked(\*) are subject to being not supplied.

## PARTS LIST

Key No.	Description	Part No.	
1	Signal meter	AAW-015-0	
2*	Meter-held metal	ANF-106-C	
3	Tuning meter	AAW-016-A	
4*	Lamp box-B	ANH-127-C	
5	Pilot lamp (tuning and signal meter)	AEL-015-0	
6	Pilot lamp socket holder	ANF-107-0	
7*	Dial scale holder	ANG-075-0	
8	Dial scale	AAG-045-0	
9*	Sub panel	AND-051-C	
10*	Pulley	AEC-006-0	
11*	Pulley's shaft	M49-025-E	
12*	Pulley's shaft	M49-025-E	
13*	Pulley	AEC-006-0	
14	Dial pointer	AAF-025-0	
15*	Pulley's shaft	M49-025-E	
16*	Pulley's shaft	M49-025-E	
17*	Pulley	AEC-006-0	
18*	Wire holder	ANK-035-0	
19*	P.C. board cover	ANK-034-0	
20	Lamp board assembly	AWX-042-0	
21	Pilot lamp (dial scale)	E22-032-0	
22	Pilot lamp (program indicator)	AEL-007-0	
23*	Lamp box-A	ANH-126-0	
24*	Wire holder	AEC-089-0	
25*	Shield cover	ANH-137-B	
26	AF amplifier assembly	AWK-019-A	
27	Muting circuit assembly	AWM-039-0	
28	Tuner assembly	AWE-023-0	
29	Ferrite loopstick antenna	ATB-015-A	
30	AC cord stopper	AEC-079-0	
31*	Model name plate	AAL-138-0	KUW, KCW model
	Model name plate	AAL-139-0	FVZW, FW model
32	AC power cord	ADG-003-0	KUW, KCW model
	AC power cord	ADG-004-0	FVZW, FW model
33	AC cord stopper	AEC-079-0	
34*	Pulley held metal	ANG-076-A	
35*	Pulley	AEC-006-0	
36*	Pulley's shaft	M49-025-E	
37	Power transformer	ATT-110-0	KUW model
	Power transformer	ATT-132-0	KCW model
	Power transformer	ATT-111-0	FVZW, FW model
38	Headphone amplifier assembly	AWM-041-B	
39*	Wire clip (A)	AEC-004-0	
40*	Wire clip (A)	AEC-004-0	
41*	Wire clip (B)	AEC-005-0	
42*	Wire clip (B)	AEC-005-0	
43*	Wire clip (B)	AEC-005-0	
44*	Wire clip (B)	AEC-005-0	
45*	Wire clip (B)	AEC-005-0	

Key No.	Description	Part No.	
46*	Wire holder	M46-139-0	
47*	Chassis	ANA-037-C	
48*	Wire clip (A)	AEC-004-0	
49	Antenna terminal board	K11-043-D	
50	Muting and noise filter switches	AKS-041-0	
51	Tuning shaft assembly	AXA-021-0	
52*	Wire clip (A)	AEC-004-0	
53	2P lug terminal strip	K13-048-0	
54	Two-fold pin jack (RCA type)	AKB-013-0	
55	Four-fold pin jack-A (RCA type)	AKB-014-0	
56	Fuse holder	AKR-005-0	KUW, KCW model
	Fuse holder (with line voltage switch)	AKR-001-0	FVZW, FW model
57*	Wire clip (A)	AEL-004-0	
58*	Shading plate	AED-018-0	
59	Headphone jack	K72-026-0	
60	Potentiometer dual (Headphone level)	ACV-113-0	
61	Potentiometer (AM output level)	ACV-009-0	
62	Potentiometer dual (FM output level)	ACV-113-0	
63	Function switch	ASC-037-B	
64	AC outlet-held metal	M49-127-A	
65	Spare AC outlet	AKP-002-0	
66	Power switch	ASK-051-0	KUW, KCW model
	Power switch	ASK-052-0	FVZW, FW model
67	Power supply circuit assembly	AWR-033-0	
68*	P.C. board holder	AEB-019-0	
69*	Shading plate	AED-018-0	
70	Tuning pulley assembly	AXA-015-A	
71	Ferrite antenna holder assembly	W72-092-C	
72*	Rear panel	ANC-078-0	
73*	4P ground terminal	K13-047-0	







- CAPACITORS: IN  $\mu\text{F}$  UNLESS OTHERWISE NOTED p: pF.
- RESISTORS: IN  $\Omega$ ,  $\%W$  UNLESS OTHERWISE NOTED k: k $\Omega$ , M: M $\Omega$ .

## Miscellaneous Parts

### CAPACITORS

Symbol	Description	Part No.	
C1	Ceramic 0.01 150V	ACG-002-0	KUW, KCW model
	Ceramic 0.01 DC1.4kV	C43-003-0	
C2	Metallized mylar 0.01 800V	ACE-002-0	FVZW, FW model
	Ceramic 0.01 150V	ACG-003-0	
C3	Ceramic 0.01 DC1.4kV	C43-003-0	KUW model
	Electrolytic 100 10V	CEA 101P 10	
C4	Mylar 0.018 50V	CGMA 183K 50	KCW model
C5	Mylar 0.0033 50V	CGMA 332J 50	
C6	Mylar 0.0033 50V	CGMA 332J 50	FVZW, FW model
C7	Ceramic 0.01 DC1.4kV	C43-003-0	

### RESISTORS AND POTENTIOMETERS

Symbol	Description	Part No.	
R1	Carbon film 150k	RD%PS 154J	KUW, KCW model
R2	Carbon film 100k	RD%PS 104J	
R3	Carbon film 2.2M $\%W$	RD%PS 225J	
VR1	Potentiometer (dual) 100k-B2	ACV-113-0	
VR2	Potentiometer 100k-B2	ACV-009-0	
VR3	Potentiometer (dual) 100k-B2	ACV-113-0	

### SWITCHES

Symbol	Description	Part No.	
S1	Function (rotary type)	ASC-037-B	KUW, KCW model
S2	MPX Noise filter (lever type)	ASK-041-0	
S3	Muting (lever type)	ASK-041-0	
S4	Power (lever type)	ASK-051-0	
S5	Power (lever type)	ASK-052-0	
	De-emphasis (slide type)	S41-022-A	FVZW, FW model

### COILS AND TRANSFORMER

Symbol	Description	Part No.	
L1	Balun	T22-025-A	
L2	Ferrite loopstick antenna	ATB-015-A	
L3	RF choke coil	T24-028-A	
T1	Power transformer	ATT-110-0	KUW model
	Power transformer	ATT-132-0	
	Power transformer	ATT-111-0	

### SEMICONDUCTOR

Symbol	Description	Part No.	
D1	Diode 1S188 FM-1		

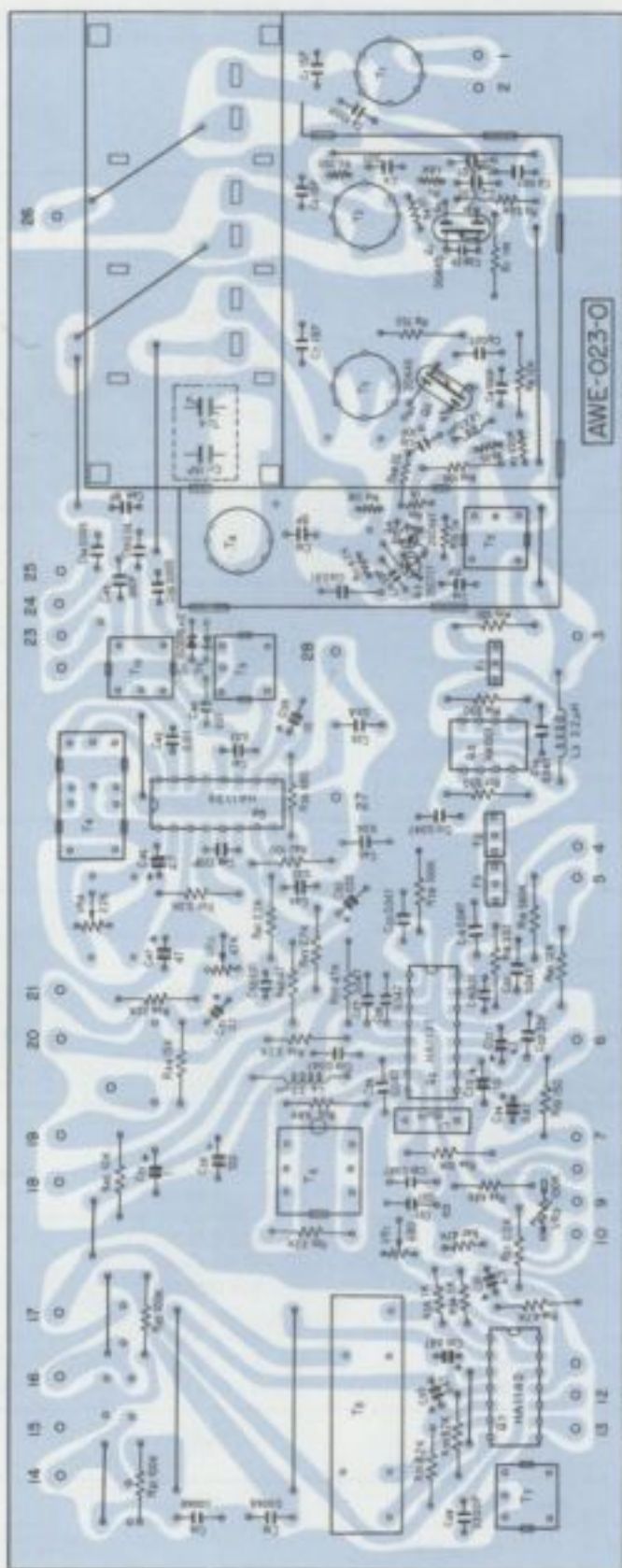
## OTHERS

Symbol	Description	Part No.	
	Front panel ass'y	ANB-188-A	
	Foot ass'y	AEC-083-A	
	Wooden cabinet	AMM-022-A	
	Knob (TUNING)	AAA-015-0	
	Knob (FUNCTION)	AAB-041-0	
	Knob (OUTPUT and HEADPHONE LEVEL)	AAB-043-0	
	Knob (MPX NOISE FILTER, MUTING, POWER)	AAD-040-B	
F1	Fuse 1A (AC power)	E21-033-0	KUW model
	Fuse 1A (AC power)	E21-034-A	KCW model
	Fuse 0.5A (AC power)	AEK-016-0	FVZW, FW model
F2	Fuse 3A (protection)	E21-021-0	KUW model
	Fuse 3A (protection)	AEK-008-0	KCW model
	Fuse 3A (protection)	E21-036-A	FVZW, FW model
F3	Fuse 1A (protection)	E21-033-0	KUW model
	Fuse 1A (protection)	AEK-022-0	KCW model
	Fuse 1A (protection)	E21-034-A	FVZW, FW model
F4	Fuse 1A (protection)	E21-033-0	KUW model
	Fuse 1A (protection)	AEK-022-0	KCW model
	Fuse 1A (protection)	E21-034-A	FVZW, FW model
F5	Fuse 1.2A (protection)	AEK-019-0	KCW model
	Screw to fix wooden cabinet	ABA-010-A	
	Packing case	AHD-153-0	KUW model
	Packing case	AHD-154-0	KCW model
	Packing case	AHD-155-0	FW model
	Packing case	AHD-156-0	FVZW model
	Styrotector (upper)	AHA-029-0	
	Styrotector (lower)	H11-070-D	
	Polishing cloth	E33-009-B	
	Operating instructions	ARB-072-0	
	Connection cord	ADE-005-0	
	Vinyl bag	E32-034-0	
	Fuse 1A (AC power)	E21-034-A	FVZW, FW model
	FM T-type antenna	D52-013-0	
	Pilot lamp socket	AKK-002-0	





Foil Side



Tuner Assembly

## Parts List of Tuner Assembly (AWE-023-0)

## CAPACITORS

Symbol	Description			Part No.
C1	Ceramic	15p	50V	CCDSH 150K 50
C2	Ceramic	0.01	50V	CKDYF 103Z 50
C3	Ceramic	100p	50V	CCDSL 101K 50
C4	Ceramic	0.01	50V	CKDYF 103Z 50
C5	Ceramic	0.01	50V	CKDYF 103Z 50
C6	Ceramic	18p	50V	CCDSH180K 50
C7	Ceramic	18p	50V	CCDSH 180K 50
C8	Ceramic	100p	50V	CCDSL 101K 50
C9	Ceramic	0.01	50V	CKDYF 103Z 50
C10	Ceramic	33p	50V	CCDCH 330K 50
C11	Ceramic	15p	50V	CCDLH 150K 50
C12	Ceramic	8p	50V	CCDLH 080F 50
C13	Ceramic	0.01	50V	CKDYB 103K 50
C14	Ceramic	15p	50V	CCDCH 150K 50
C15	Ceramic	10p	50V	CCDSL 100F 50
C16	Ceramic	0.047	25V	CKDBC 473Z 25
C17	Ceramic	0.047	25V	CKDBC 473Z 25
C18	Ceramic	0.047	25V	CKDBC 473Z 25
C19	Ceramic	0.01	50V	CKDYF 103Z 50
C20	Ceramic	0.047	25V	CKDBC 473Z 25
C21	Electrolytic	4.7	25V	CEA 4R7P 25
C22	Ceramic	33p	50V	CCDSL 330K 50
C23	Electrolytic	10	16V	CEA 100P 16
C24	Electrolytic	0.47	50V	CEA R47P 50
C25	Ceramic	0.047	25V	CKDBC 473Z 25
C26	Ceramic	0.047	25V	CKDBC 473Z 25
C27	Ceramic	0.047	25V	CKDBC 473Z 25
C28	Ceramic	0.047	25V	CKDBC 473Z 25
C29	Ceramic	0.047	25V	CKDBC473Z 25
C30	Ceramic	0.047	25V	CKDBC 473Z 25
C31	Electrolytic	1	50V	CEA 010P 50
C32	Electrolytic	0.47	50V	CEA R47P 50
C33	Electrolytic	0.47	50V	CEA R47P 50
C34	Mylar	0.0068	50V	QOMA 682J 50
C35	Mylar	0.0068	50V	QOMA 682J 50
C36	Electrolytic	100	16V	CEA 101P 16
C37	Electrolytic	4.7	25V	CEA 4R7P 25
C38	Styrol	0.0033	50V	C15-011-A
C39	Electrolytic	10	16V	CEA 100P 16
C40	Ceramic	0.01	50V	CKDYF 103Z 50
C41	Ceramic	0.01	50V	CKDYF 103Z 50
C42	Mylar	0.01	50V	QOMA 103K 50
C43	Styrol	300p	50V	QOSA 301J 50
C44	Ceramic	8p	50V	CCDXL 080F 50
C45	Ceramic	0.04	50V	CKDYF 403Z 50

Symbol	Description	Part No.
C46	Electrolytic 4.7 25V	CEA 4R7P 25
C47	Electrolytic 47 6V	CEA 470P 6
C48	Ceramic 220p 50V	CCDSL 221K 50
C49	Mylar 0.01 50V	QOMA 103K 50
C50	Mylar 0.01 50V	QOMA 103K 50
C51	Electrolytic 0.1 25V	CSSA 0R1M 25
C52	Electrolytic 220 16V	CEA 221P 16
C53	Ceramic 0.04 50V	CKDYF 403Z 50
C54	Ceramic 0.005 50V	CKDYF 502Z 50
C55	Ceramic 0.04 50V	CKDYF 403Z 50
C56	Ceramic 0.005 50V	CKDYF 502Z 50
C57	Ceramic 0.01 50V	CKDYF 103Z 50
C58	Ceramic 2p 50V	CCDSL 020C 50
VC	Tuning capacitor	ACK-006-0
TC4	Ceramic trimmer	C43-007-A

## RESISTORS

Symbol	Description	Part No.
R1	Carbon film 1M	RD%PS 105J
R2	Carbon film 1.8k	RD%VS 182J
R3	Carbon film 5.6k	RD%PS 562J
R4	Carbon film 27	RD%VS 270J
R5	Carbon film 150	RD%VS 151J
R6	Carbon film 12k	RD%PS 123J
R7	Carbon film 220k	RD%VS 224J
R8	Carbon film 150	RD%PS151J
R9	Carbon film 22	RD%VS 220J
R10	Carbon film 100	RD%PS 101J
R11	Carbon film 4.7k	RD%VS 472J
R12	Carbon film 10k	RD%VS 103J
R13	Carbon film 1k	RD%VS 102J
R14	Carbon film 1k	RD%VS 102J
R15	Carbon film 100	RD%PS 101J
R16	Carbon film 330	RD%PS 331J
R17	Carbon film 330	RD%PS 331J
R18	Carbon film 330	RD%PS 331J
R19	Carbon film 560k	RD%PS 564J
R20	Carbon film 12k	RD%PS 123J
R21	Carbon film 2.2k	RD%PS 222J
R22	Carbon film 150	RD%PS 151J
R23	Carbon film 5.6k	RD%PS 562J
R24	Carbon film 10k	RD%PS 103J
R25	Carbon film 2.2k	RD%PS 222J
R26	Carbon film 2.2k	RD%PS 222J
R27	Carbon film 47k	RD%PS 473J
R28	Carbon film 100k	RD%PS 104J
R29	Carbon film 68k	RD%PS 683J
R30	Carbon film 8.2k	RD%PS 822J



Symbol	Description	Part No.
R31	Carbon film 8.2	RD%PS 822J
R32	Carbon film 100k	RD%PS 104J
R33	Carbon film 100k	RD%PS 104J
R34	Carbon film 1k	RD%VS 102J
R35	Carbon film 1k	RD%VS 102J
R36	Carbon film 4.7k	RD%PS 472J
R37	Carbon film 3.3k	RD%PS 332J
R38	Carbon film 22k	RD%PS 223J
R39	Carbon film 680	RD%PS 681J
R40	Carbon film 47	RD%PS 470J
R41	Carbon film 2.2k	RD%PS 222J
R42	Carbon film 100	RD%PS 101J
R43	Carbon film 2.7k	RD%PS 272J
R44	Carbon film 15k	RD%PS 153J
R45	Carbon film 10k	RD%PS 103J
R46		
R47	Carbon film 47k	RD%VS 473J
R48	Carbon film 22	RD%PS 220J
VR1	Semi-fixed 680-B	ACP-013-0
VR2	Semi-fixed 100k-B	ACP-021-0
VR3	Semi-fixed 47k-B	C92-048-0
VR4	Semi-fixed 2.2k-B	ACP-001-0

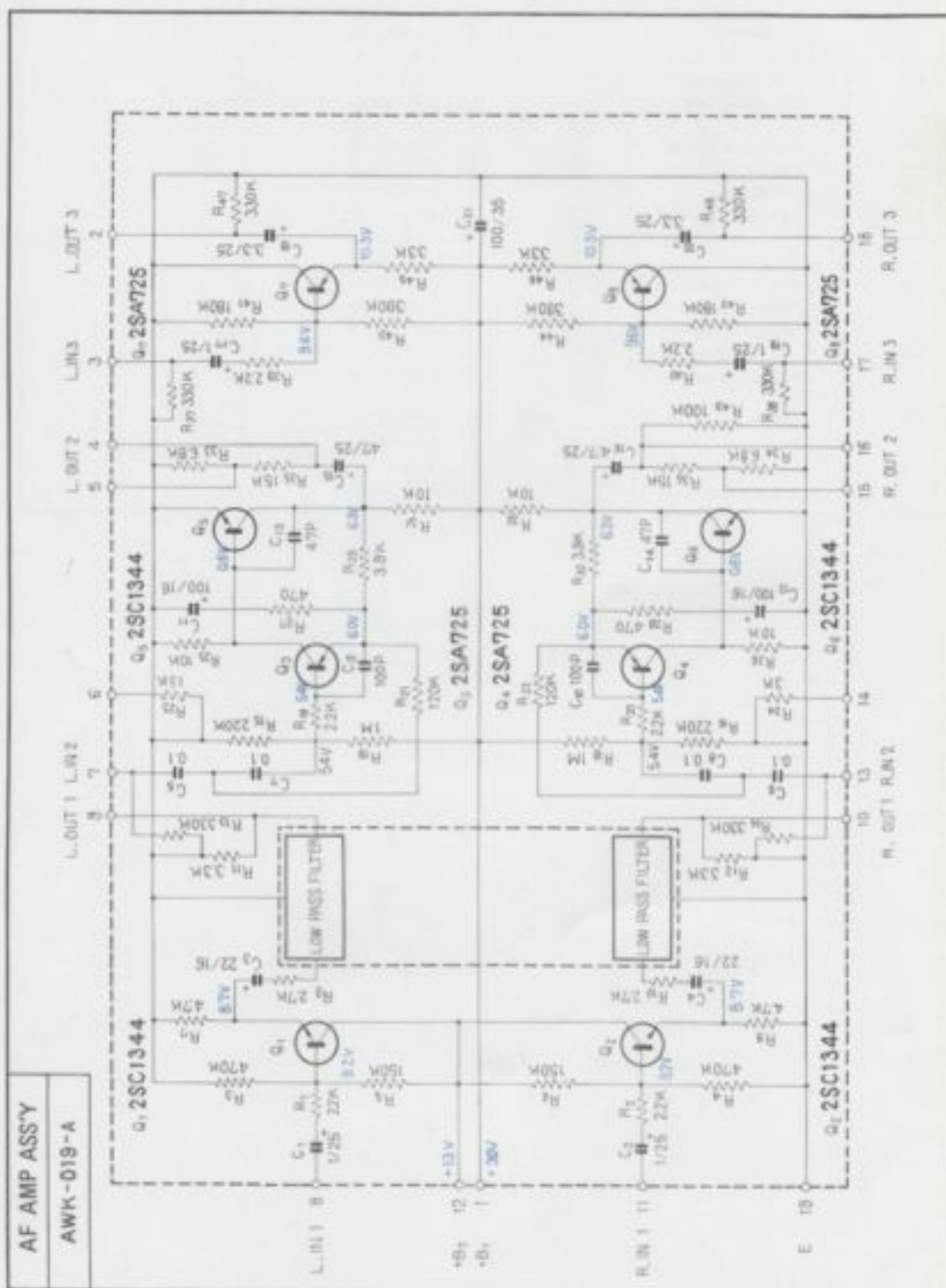
#### SEMICONDUCTORS

Symbol	Description	Part No.
Q1	FET 3SK45-B	
Q2	FET 3SK45-B	
Q3	Transistor 2SC717	
Q4	Transistor 2SC461-B	
Q5	IC HA1201	
Q6	IC HA1137	
Q7	IC HA1142	
Q8	IC HA1138	
D1	Diode 1S2076	
D2	Diode 1S2076	

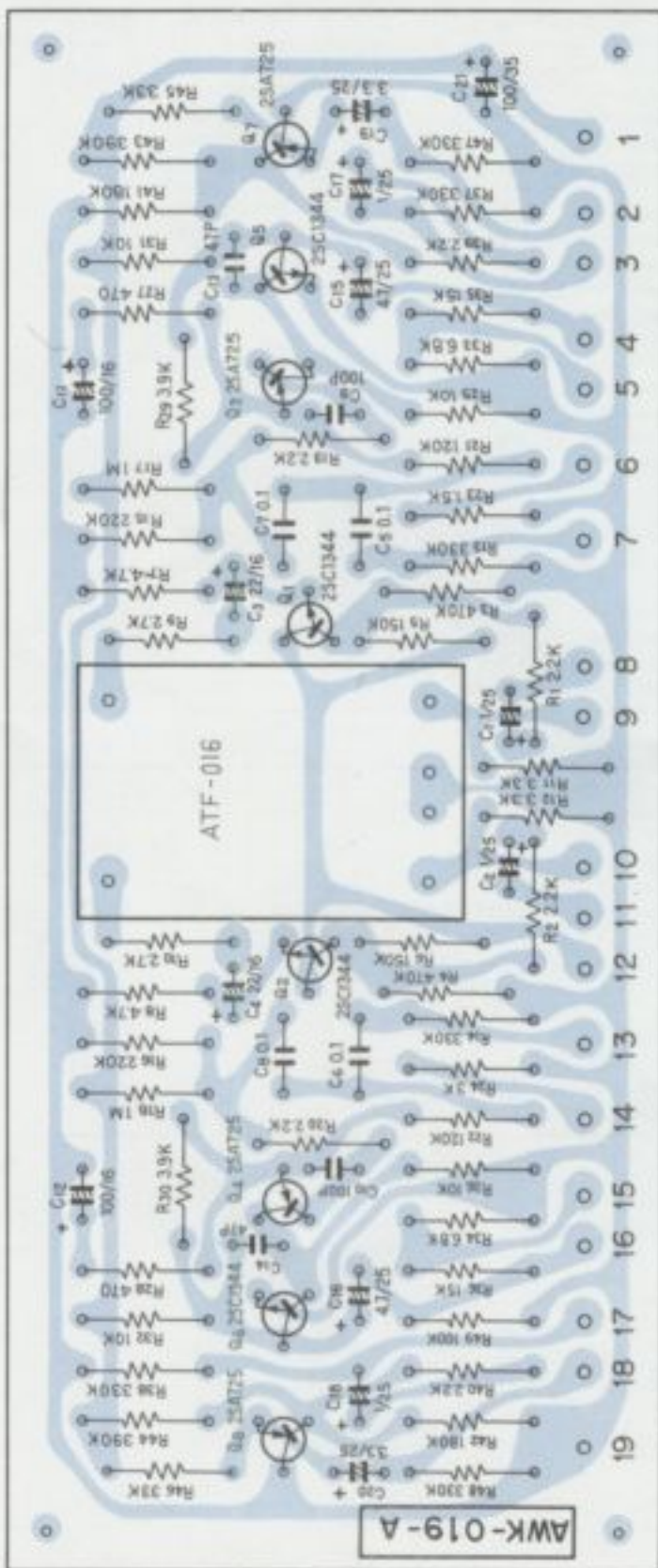
## COILS, TRANSFORMERS AND FILTERS

Symbol	Description	Part No.	
L1	Choke coil	ATH-007-0	
L2	RF choke coil	T24-028-A	
L3	RF choke coil	T24-028-A	
L4	RF choke coil	T24-028-A	
T1	FM antenna coil	ATC-021-0	
T2	FM RF coil	ATC-015-0	
T3	FM RF coil	ATC-016-0	
T4	FM oscillator coil	ATC-022-0	
T5	FM matching transformer	ATE-008-0	
T6	FM IF transformer	T73-035-A	
T7	19kHz transformer	T75-023-B	
T8	MPX transformer	ATM-011-0	
T9	AM RF coil	ATB-014-0	
T10	AM oscillator coil	ATB-013-0	
F1	FM ceramic filter	ATF-013-B	
F2	FM ceramic filter	ATF-013-B	
F3	FM ceramic filter	ATF-013-B	
F4	AM ceramic filter	ATF-009-0	

### 13.3 AF AMPLIFIER ASSEMBLY (AWK-019-A)



Foil Side





## Parts List of AF Amplifier Assembly (AWK-019-A)

## CAPACITORS

Symbol	Description			Part No.
C1	Electrolytic	1	25V	CSSA 010X 25
C2	Electrolytic	1	25V	CSSA 010X 25
C3	Electrolytic	22	16V	CEA 220P 16
C4	Electrolytic	22	16V	CEA 220P 16
C5	Mylar	0.1	50V	QOMA 104K 50
C6	Mylar	0.1	50V	QOMA 104K 50
C7	Mylar	0.1	50V	QOMA 104K 50
C8	Mylar	0.1	50V	QOMA 104K 50
C9	Ceramic	100p	50V	CCDSL 101K 50
C10	Ceramic	100p	50V	CCDSL 101K 50
C11	Electrolytic	100	16V	CEA 101P 16
C12	Electrolytic	100	16V	CEA 101P 16
C13	Ceramic	47p	50V	CCDSL 470K 50
C14	Ceramic	47p	50V	CCDSL 470K 50
C15	Electrolytic	4.7	25V	CSSA 4R7X 25
C16	Electrolytic	4.7	25V	CSSA 4R7X 25
C17	Electrolytic	1	25V	CSSA 010X 25
C18	Electrolytic	1	25V	CSSA 010X 25
C19	Electrolytic	3.3	25V	CSSA 3R3X 25
C20	Electrolytic	3.3	25V	CSSA 3R3X 25
C21	Electrolytic	100	35V	CEA 101P 35

## RESISTORS

Symbol	Description			Part No.
R1	Carbon film	2.2k		RD%PS 222J
R2	Carbon film	2.2k		RD%PS 222J
R3	Carbon film	470k		RD%PS 474J
R4	Carbon film	470k		RD%PS 474J
R5	Carbon film	150k		RD%PS 154J
R6	Carbon film	150k		RD%PS 154J
R7	Carbon film	4.7k		RD%PS 472J
R8	Carbon film	4.7k		RD%PS 472J
R9	Carbon film	2.7k		RD%PS 272J
R10	Carbon film	2.7k		RD%PS 272J
R11	Carbon film	3.3k		RD%PS 332J
R12	Carbon film	3.3k		RD%PS 332J
R13	Carbon film	330k		RD%PS 334J
R14	Carbon film	330k		RD%PS 334J
R15	Carbon film	220k		RD%PS 224J
R16	Carbon film	220k		RD%PS 224J
R17	Carbon film	1M		RD%PS 105J
R18	Carbon film	1M		RD%PS 105J
R19	Carbon film	2.2k		RD%PS 222J
R20	Carbon film	2.2k		RD%PS 222J

Symbol	Description	Part No.
R21	Carbon film 120k	RD%PS 124J
R22	Carbon film 120k	RD%PS 124J
R23	Carbon film 1.5k	RD%PS 152J
R24	Carbon film 3k	RD%PS 302J
R25	Carbon film 10k	RD%PS 103J
R26	Carbon film 10k	RD%PS 103J
R27	Carbon film 470	RD%PS 471J
R28	Carbon film 470	RD%PS 471J
R29	Carbon film 3.9k	RD%PS 392J
R30	Carbon film 3.9k	RD%PS 392J
R31	Carbon film 10k	RD%PS 103J
R32	Carbon film 10k	RD%PS 103J
R33	Carbon film 6.8k	RD%PS 682J
R34	Carbon film 6.8k	RD%PS 682J
R35	Carbon film 15k	RD%PS 153J
R36	Carbon film 15k	RD%PS 153J
R37	Carbon film 330k	RD%PS 334J
R38	Carbon film 330k	RD%PS 334J
R39	Carbon film 2.2k	RD%PS 222J
R40	Carbon film 2.2k	RD%PS 222J
R41	Carbon film 180k	RD%PS 184J
R42	Carbon film 180k	RD%PS 184J
R43	Carbon film 390k	RD%PS 394J
R44	Carbon film 390k	RD%PS 394J
R45	Carbon film 33k	RD%PS 333J
R46	Carbon film 33k	RD%PS 333J
R47	Carbon film 330k	RD%PS 334J
R48	Carbon film 330k	RD%PS 334J
R49	Carbon film 100k	RD%PS 104J

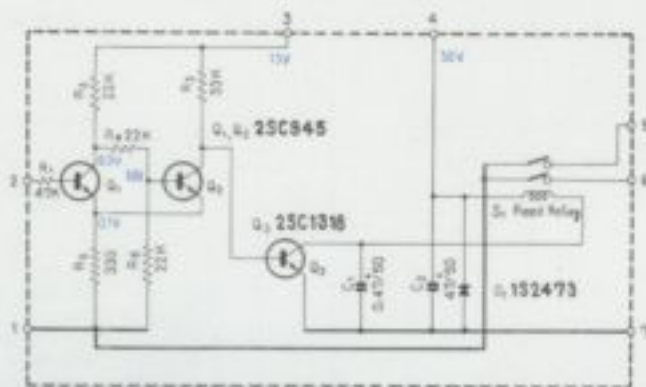
#### SEMICONDUCTORS

Symbol	Description	Part No.
Q1	Transistor 25C1344-E or D	
Q2	Transistor 25C1344-E or D	
Q3	Transistor 25A725-G or F	
Q4	Transistor 25A725-G or F	
Q5	Transistor 25C1344-E or D	
Q6	Transistor 25C1344-E or D	
Q7	Transistor 25A725-G or F	
Q8	Transistor 25A725-G or F	

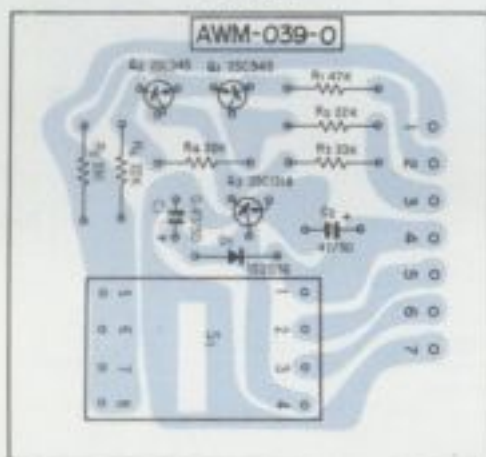
#### OTHER

Symbol	Description	Part No.
	Low-pass filter	ATF-016-0

## 13.4 MUTING CIRCUIT ASSEMBLY (AWM-039-0)



Foil Side



## CAPACITORS AND RESISTORS

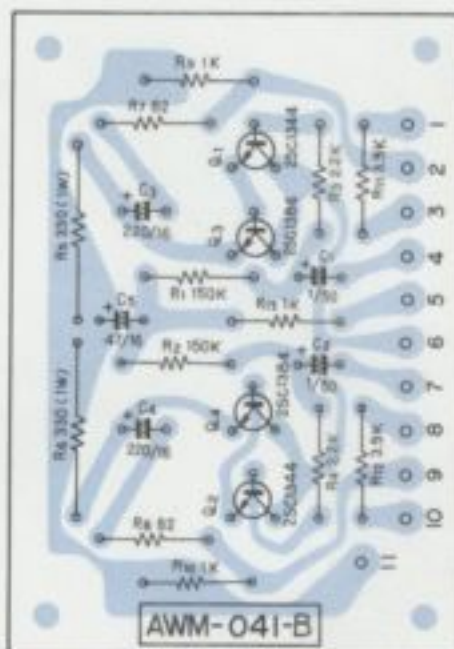
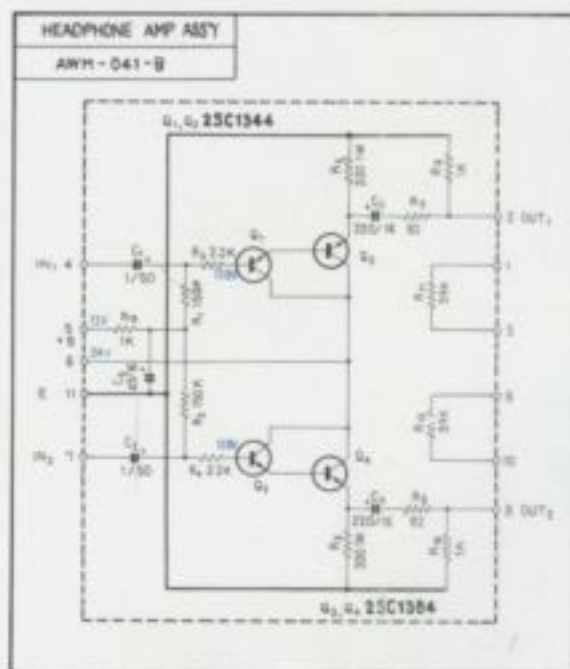
Symbol	Description	Part No.
C1	Electrolytic 0.47 50V	CEA R47P 50
C2	Electrolytic 47 50V	CEA 470P 50
R1	Carbon film 47k	RD%PS 473J
R2	Carbon film 22k	RD%PS 223J
R3	Carbon film 33k	RD%PS 333J
R4	Carbon film 22k	RD%PS 223J
R5	Carbon film 330	RD%PS 331J
R6	Carbon film 22k	RD%PS 223J

## SEMICONDUCTORS AND OTHER

Symbol	Description	Part No.
Q1	Transistor 2SC945-Q or R	
Q2	Transistor 2SC945-Q or R	
Q3	Transistor 2SC1318-R or S	
D1	Diode 1S2473	
S1	Reed relay	ASR-004-0

### 13.5 HEADPHONE AMPLIFIER ASSEMBLY (AWM-041-B)

Foil Side

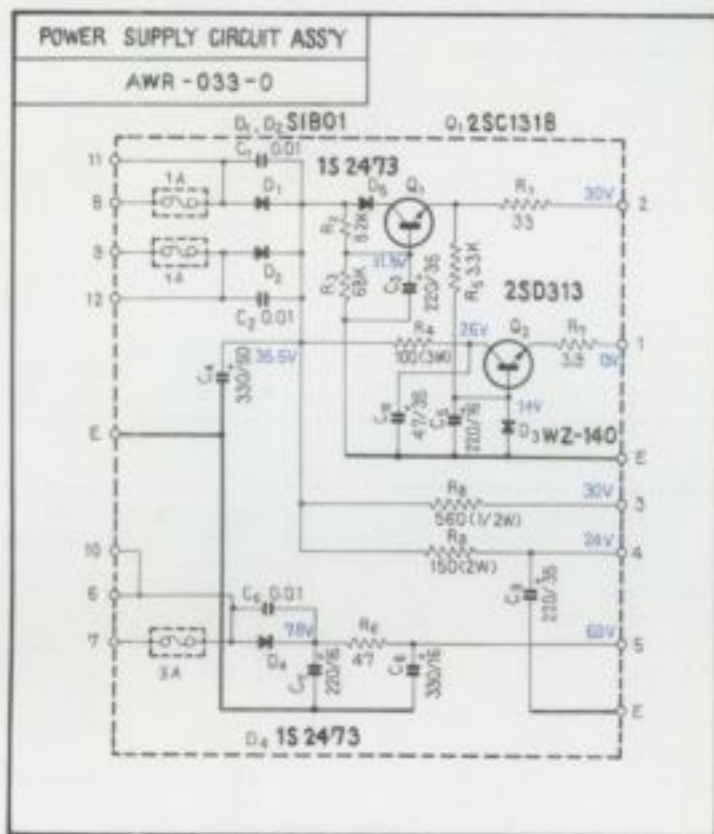


#### CAPACITORS, RESISTORS AND SEMICONDUCTORS

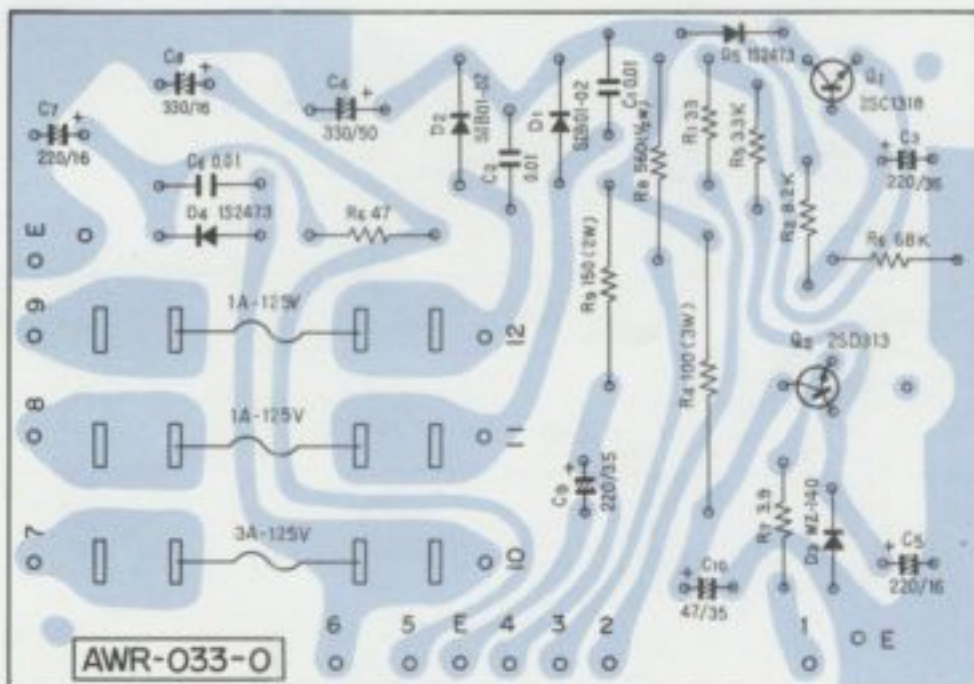
Symbol	Description	Part No.
C1	Electrolytic 1 50V	CEA 010P 50
C2	Electrolytic 1 50V	CEA 010P 50
C3	Electrolytic 220 16V	CEA 221P 16
C4	Electrolytic 220 16V	CEA 221P 16
C5	Electrolytic 47 16V	CEA 470P 16
R1	Carbon film 150k	RD%PS 154J
R2	Carbon film 150k	RD%PS 154J
R3	Carbon film 2.2k	RD%PS 222J
R4	Carbon film 2.2k	RD%PS 222J
R5	Metal oxide 330 1W	RS1P 331K
R6	Metal oxide 330 1W	RS1P 331K
R7	Carbon film 82	RD%PS 820J
R8	Carbon film 82	RD%PS 820J
R9	Carbon film 1k	RD%PS 102J
R10	Carbon film 1k	RD%PS 102J
R11	Carbon film 3.9k	RD%PS 392J
R12	Carbon film 3.9k	RD%PS 392J
R13	Carbon film 1k	RD%PS 102J
Q1	Transistor 25C1344-E or D (or 25C1312-C, F)	
Q2	Transistor 25C1344-E or D (or 25C1312-C, F)	
Q3	Transistor 25C1384-Q or R	
Q4	Transistor 25C1384-Q or R	



13.6 POWER SUPPLY CIRCUIT ASSEMBLY (AWR-033-0)



Foil Side



## Parts List of Power Supply Circuit Assembly (AWR-033-0)

### CAPACITORS

Symbol	Description	Part No.
C1	Ceramic 0.01 150V	ACG-002-0
C2	Ceramic 0.01 150V	ACG-002-0
C3	Electrolytic 220 35V	CEA 221P 35
C4	Electrolytic 330 50V	CEA 331P 50
C5	Electrolytic 220 16V	CEA 221P 16
C6	Ceramic 0.01 150V	ACG-002-0
C7	Electrolytic 220 16V	CEA 221P 16
C8	Electrolytic 330 16V	CEA 331P 16
C9	Electrolytic 220 35V	CEA 221P 35
C10	Electrolytic 47 35V	CEA 470P 35

### RESISTORS

Symbol	Description	Part No.
R1	Carbon film 330	RD%PS 330J
R2	Carbon film 8.2k	RD%PS 822J
R3	Carbon film 68k	RD%PS 683J
R4	Metal oxide 100 3W	RS3P 101K
R5	Carbon film 3.3k	RD%PS 332J
R6	Carbon film 47	RD%PS 470J
R7	Carbon film 3.9	RD%PS 3R9J
R8	Carbon film 560 1/2W	RD%PS 561J
R9	Metal oxide 150 2W	RS2P 151K

### SEMICONDUCTORS

Symbol	Description	Part No.
Q1	Transistor 2SC1318-Q or R	
Q2	Transistor 2SD313-D or E	
D1	Diode 1S1801-02	
D2	Diode 1S1801-02	
D3	Zener diode WZ-140	
D4	Diode 1S2473	
D5	Diode 1S2473	

### OTHERS

Symbol	Description	Part No.
	Heat sink	ANE-117-0
	Fuse holder for circuit board	K91-005-0

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