dbx

TYPE II

NOISE-REDUCTION SYSTEM

Model 224X-DS

Service Manual

CONTENTS

SPECIFICATIONS

• ELECTRICAL

Frequency response(40 Hz to 20 kHz).....	+/-0.5 dB
(35 Hz to 20 kHz).....	+0.5/-1 dB
(30 Hz to 20 kHz).....	+0.5/-2 dB
Total harmonic distortion	
(30 Hz to 100 Hz)....	0.5 %
(100 Hz to 20 kHz)....	0.1 %
Intermodulation distortion	0.2 % (IHF)
	0.2 % (SMPTE)
Dynamic range(below 1V).....	105 dB
Equivalent input noise	-88 dBV
Maximum input	6.5 Vrms
Maximum output	6.5 Vrms
Effective noise reduction	40 dB or more(depending on deck)
Unity gain(set at 200 mV).....	Adjustable from 20 mV to 2 V

o GENERAL

Dimensions(W x H x D).....	19"(17-1/8") x 1-31/32" x 8-3/4"
	483mm(435mm) x 50mm x 222mm
	(without rack mounting bracket)
Weight	5.95 lbs.
	2.7 kg.
Power consumption	13 W
Power requirement	100-120 V/220-240 V, 50/60 Hz

Notes : IHF IMD is measured with 19 kHz and 20 kHz mixed 1:1, output 1 V.
SMPTE IMD is measured with 60 Hz and 7 kHz mixed 4:1, output 1 V.

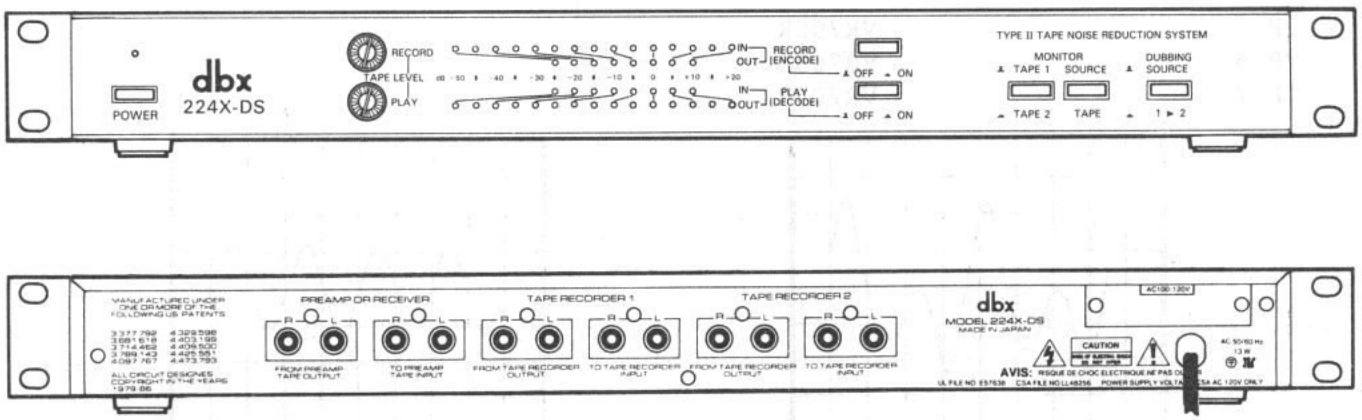
ADJUSTMENT PROCEDURE

BEFORE ADJUSTMENT

- Confirm that the voltage-selector switch is in the proper position.
- Inspect the unit to be tested and verify that all interconnect cables are properly installed.
- Allow a minimum of 10 minutes warm-up for the test equipments and the unit under test.

INSTRUMENTS REQUIRED

- Audio signal generator
- Oscilloscope
- Digital voltmeter
- Distortion meter
- VTVM (Vacuum tube voltmeter)
- Frequency counter
- Toneburst generator



• POWER SUPPLY TEST

1. Verify the following power-supply conditions:

	Probe location	Test condition	Tolerance
1	+12V	+12.0 V	+/-0.6 V
2	-12V	-12.0 V	+/-0.6 V

• LED TEST

1. Depress the power switch and verify that the POWER LED lights.

ADJUSTMENT PROCEDURE

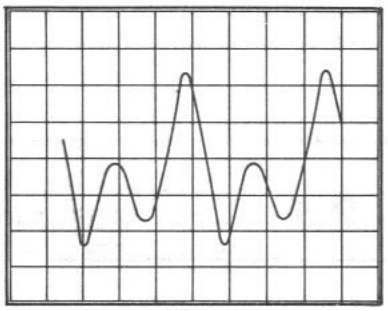
• RMS SYMMETRY ADJUSTMENT

1. Set the controls as follows:

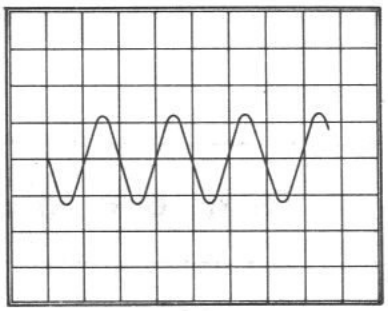
(RECORD/PLAY)	
RECORD	Off
PLAY	Off
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

2. Connect the signal generator to both L and R inputs desinated "TAPE RECORDER 1, FROM TAPE RECORDER OUTPUT" and apply a 100 Hz, -10 dBV(316 mV rms).
3. Connect the oscilloscope to TP 4, and set it to 2 mV/div and 50 ms/div.
4. Observe the output on the scope.
5. Adjust a potentiometer VR702L for the output becomes symmetrical and clear.
6. Repeat this procedure for equal peaks on the wave shape at the following test points and potentiometers .

TP 5	VR702R
TP 6	VR705L
TP 7	VR705R



Wrong



Right

• VCA SYMMETRY ADJUSTMENT

1. Set the controls as follows:

(RECORD/PLAY)	
RECORD	Off
PLAY	Off
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

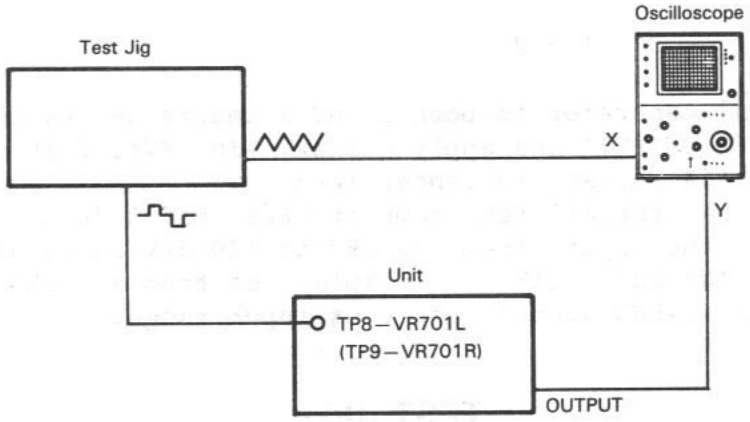
2. Mechanically center the calibration potentiometers VR701L, VR701R, VR704L, VR704R to the center of their angular rotation.

ADJUSTMENT PROCEDURE

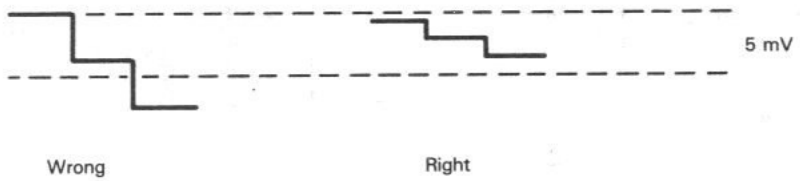
3. Connect the signal generator to both L and R inputs desinated "TAPE RECORDER 1, FROM TAPE RECORDER OUTPUT" and apply a 1kHz, -10 dBV(316 mV rms).

   (TAPE LEVEL - RECORD adjustment)

4. Adjust VR707 "TAPE LEVEL - RECORD" on the front panel to obtain a output of -10 dBV at L ch desinated "TAPE RECORDER 2 - TO TAPE RECORDER INPUT"
5. Adjust VR703 for R channel.
6. Connect the X-axis probe of the oscilloscope to the TEST JIG* (see page 6) triangle wave output terminal.



7. Connect the Y-axis of the oscilloscope to R ch output terminal desinated "PREAMP OR RECEIVER - TO PREAMP TAPE INPUT".
8. Apply a staircase wave shape output to TP 9.
9. Monitor the lissajous wave shape and adjust VR701R such that the output wave shape should be less than 5 mV.



10. Repeat this procedure for L ch, at test point TP 8 and VR701L.

    (TAPE LEVEL - PLAY adjustment)

11. Adjust VR709 "TAPE LEVEL - PLAY" on the front panel to obtain a output of -10 dBV at L ch desinated "TAPE RECORDER 2 - TO TAPE RECORDER INPUT"
12. Adjust VR706 for R channel.
13. Repeat paragraphs 6, 7, 8, 9 for testpoint TP 11 (TP 10 for L ch.) and VR704R (VR704L for L ch.)

ADJUSTMENT PROCEDURE

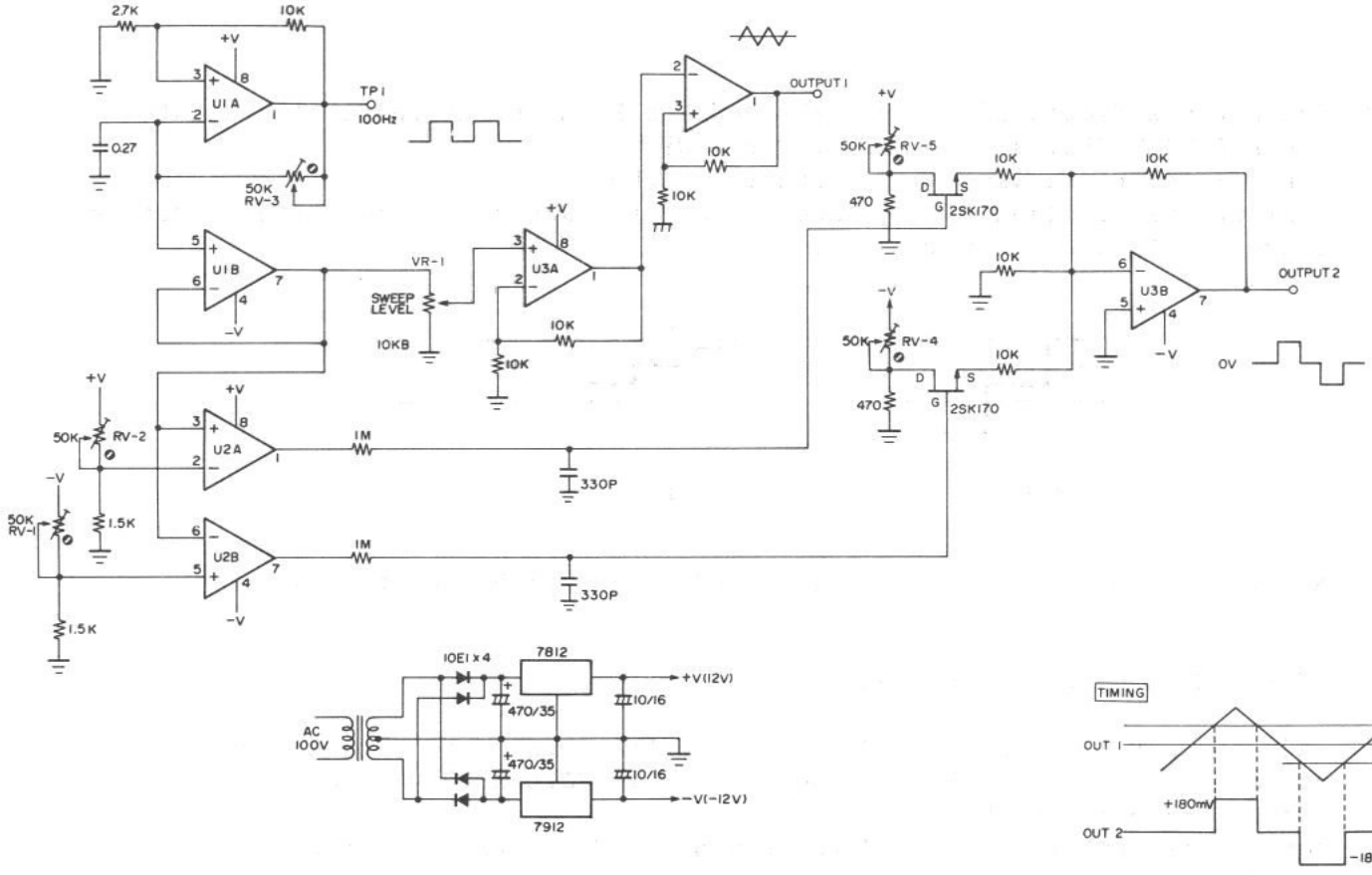
• LED DISPLAY ADJUSTMENT

1. Set the controls as follows:

(RECORD/PLAY)	
RECORD	Off
PLAY	Off
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

2. Connect the signal generator to both L and R inputs desinated "TAPE RECORDER 1, FROM TAPE RECORDER OUTPUT" and apply a 1kHz, -10 dBV(316 mV rms).
3. Adjust VR 01 for 4.5 Vdc at its center lead.
4. Adjust VR 02 so that the all four rows of LEDs read 0 dB.
5. Vary the level of the input from -60 dBV to +20 dBV in 10 dB steps and verify that the "RECORD IN" and "PLAY OUT" displays go from all LEDs off to all LEDs on in 10 dB steps (2-LED steps) over this input range.

TEST JIG



PERFORMANCE TESTS

• TRACKING TEST

1. Set the controls as follows:

(RECORD/PLAY)	
RECORD	Off
PLAY	Off
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

2. Connect the signal generator to both L and R inputs desinated "FROM PREAMP TAPE OUTPUT" and apply a 1kHz, -10 dBV(316 mV rms).
3. Adjust the "TAPE LEVEL - RECORD" control on the front panel such that the output voltage at the L ch and R ch "TO PREAMP TAPE INPUT" is exactly -10 dBV.
4. Verify the following levels;

INPUT LEVEL (dBV)	OUTPUT LEVEL (dBV)
0	-1 to +1
-10	-10
-20	-21 to -19
-30	-31 to -29
-40	-41 to -39
-50	-51 to -49
-60	-61 to -59

• FREQUENCY RESPONSE TEST

1. Set the controls as follows:

(RECORD/PLAY)	
RECORD	On
PLAY	On
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

2. With a 0 dBV(1.0V rms) sinewave to both "FROM PREAMP TAPE OUTPUT" input jacks and verify that the outputs at the "TO TAPE RECORDER 1 - TO TAPE RECORDER INPUT" jack is as shown for the following frequencies:

FREQUENCY (Hz)	OUTPUT LEVEL (dBV)
20	+3.2 to +5.2
100	-0.5 to +1.5
1k	0
10k	-4.0 to -2.0
20k	+2.5 to +4.5

3. With a 0 dBV sinewave to both "TAPE RECORDER 1 - FROM TAPE RECORDER OUTPUT" input jacks and verify that the outputs at the "TO PREAMP TAPE INPUT" jack is as shwon for the following frequencies:

FREQUENCY (Hz)	OUTPUT LEVEL (dBV)
20	-17.0 to -15.0
100	-1.5 to +0.5
1k	0
10k	+5.5 to +7.5
20k	-7.5 to -5.5

• THD TEST

1. Set the controls as follows:

(RECORD/PLAY)	
RECORD	Off
PLAY	Off
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

2. Apply a -10 dBV(316 mV rms) sinewave to "FROM PREAMP TAPE OUTPUT" input jacks at the following frequencies.
3. At the "TO PREAMP TAPE INPUT" jacks, measure the total harmonic distortion and verify that it does not exceed the following limit.

FREQUENCY (Hz)	DISTORTION LIMIT
100 (2nd H.D)	below 0.1 %
1k	below 0.1 %
10k (3rd H.D)	below 0.1 %

PERFORMANCE TESTS

• MAXIMUM OUTPUT LEVEL TEST

1. Set the controls as follows:

(RECORD/PLAY)	
RECORD	Off
PLAY	Off
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

2. Apply a 1 kHz sinewave to "FROM PREAMP TAPE OUTPUT" and measure the output voltage at "TO PREAMP TAPE INPUT".
3. Verify that the output voltage is greater than approximately +16 dBV(6.5 V rms) at 1% THD.

• NOISE TEST

1. Set the controls as the above.
2. Terminate the "FROM PREAMP TAPE OUTPUT" and "FROM TAPE RECORDER OUTPUT" inputs with 1 K-ohm resistor in parallel with 1000 pF to ground.
3. Verify that the noise level is less than -88 dBV.(with DIN audio filter)

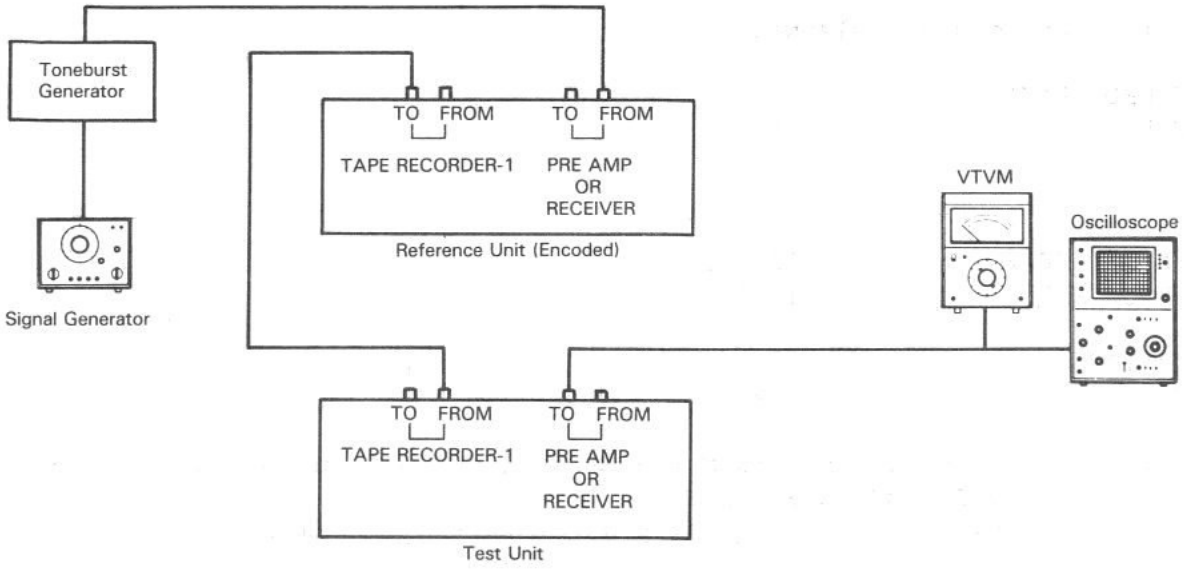
• TONEBURST TEST

1. Set the controls as follows:

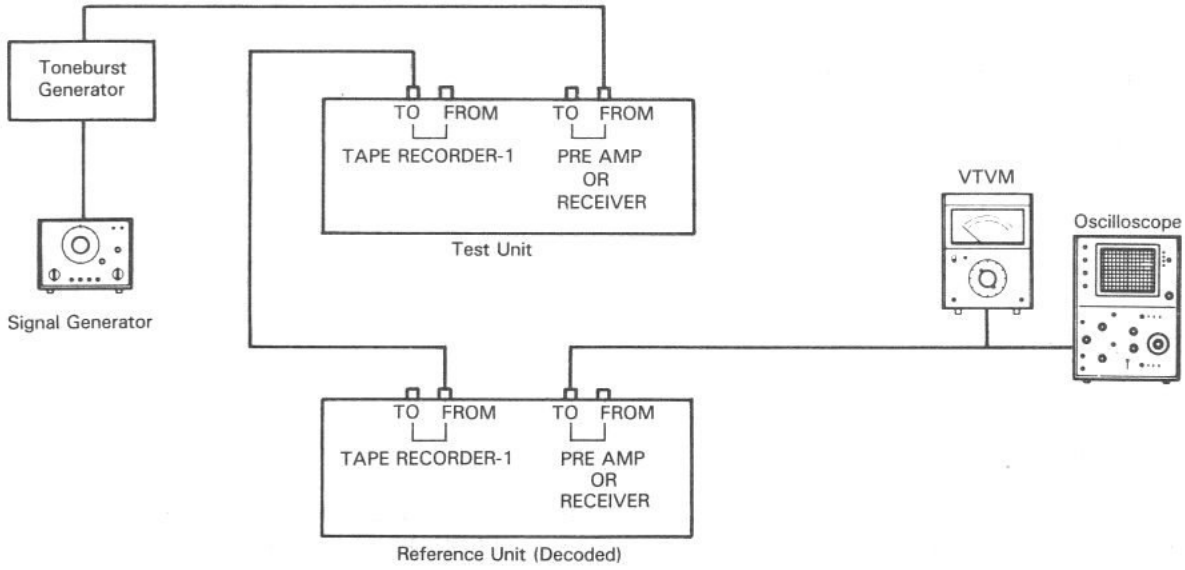
(RECORD/PLAY)	
RECORD	On
PLAY	On
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

2. Connect the signal generator to the toneburst generator, and connect the toneburst generator output to L and R ch. "FROM PREAMP TAPE OUTPUT" input jacks of the reference unit encoded.
3. Connect the output of the reference unit encoded to both "FROM TAPE RECORDER OUTPUT" jacks of the unit under test.

PERFORMANCE TESTS



4. Apply a toneburst of 50 cycles of burst(approx. 50-ms) and 500 cycles off(approx. 500-ms) of at least 40 dB attenuation at 1 kHz.
5. Observe the output wave shape at the "TO PREAMP TAPE INPUT" jacks of the unit under test.
6. Verify that there is no more than 20 % overshoot on the first cycle and no overshoot for the remaining cycles, including the end of the wave shape.
7. Replace the cable connecting the output of the toneburst generator to L and R ch. "FROM PREAMP TAPE OUTPUT" input jacks of the unit under test.
8. Connect the "TAPE RECORDER 1 - TO TAPE RECORDER INPUT" of the unit under test to "FROM RECORDER 1 - FROM TAPE RECORDER OUTPUT" of the reference unit decoded.



9. Verify that the wave shape at "TO PREAMP TAPE INPUT" output of the reference decoder has no more than 20 % overshoot on the first cycle and on the remaining cycles.

PERFORMANCE TESTS

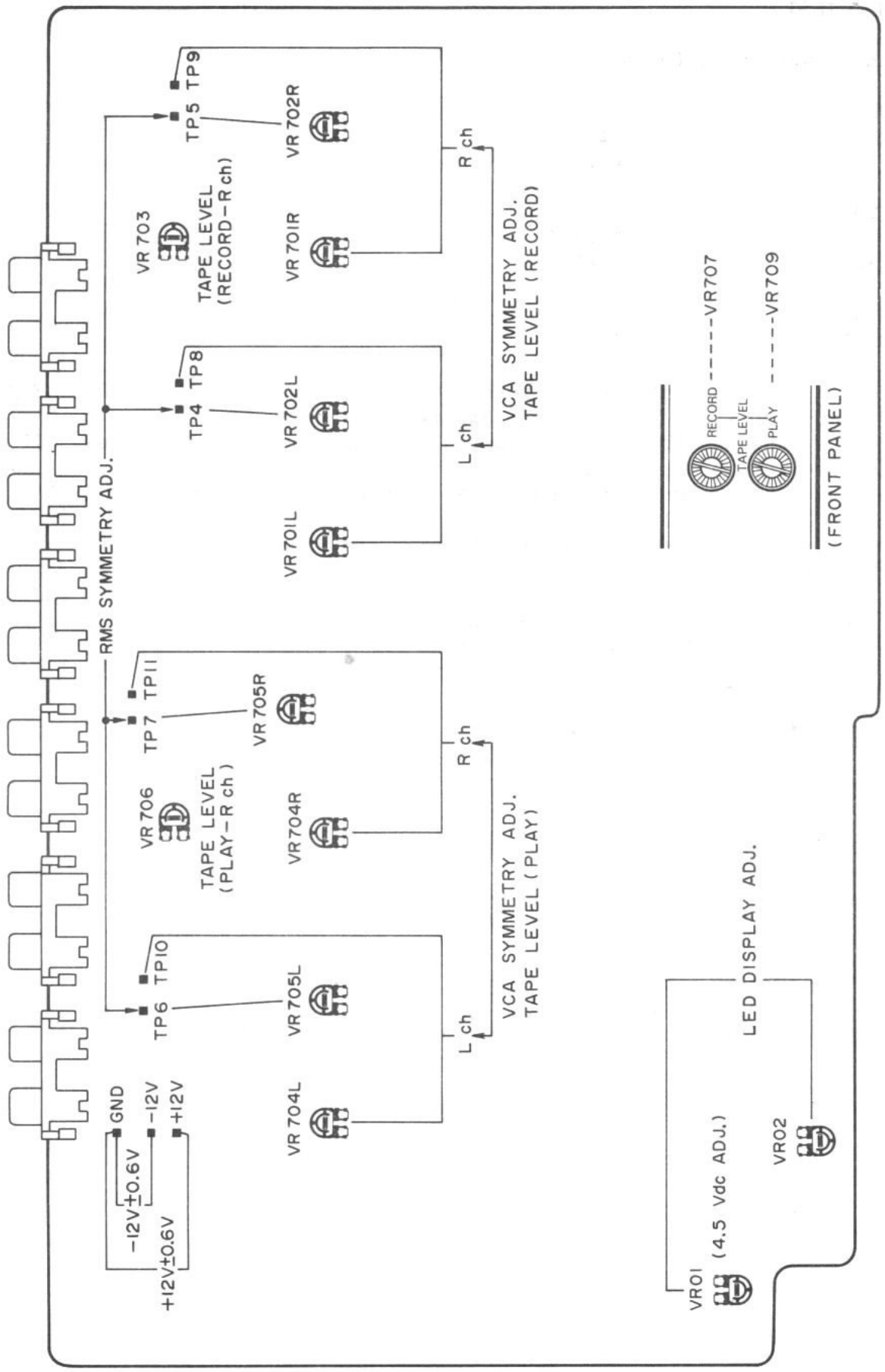
• LED DISPLAY TEST

1. Set the controls as follows:

(RECORD/PLAY)	
RECORD	Off
PLAY	Off
(MONITOR)	
TAPE 1/TAPE 2	TAPE 1
SOURCE/TAPE	TAPE
(DUBBING)	
SOURCE/1 > 2	1 > 2

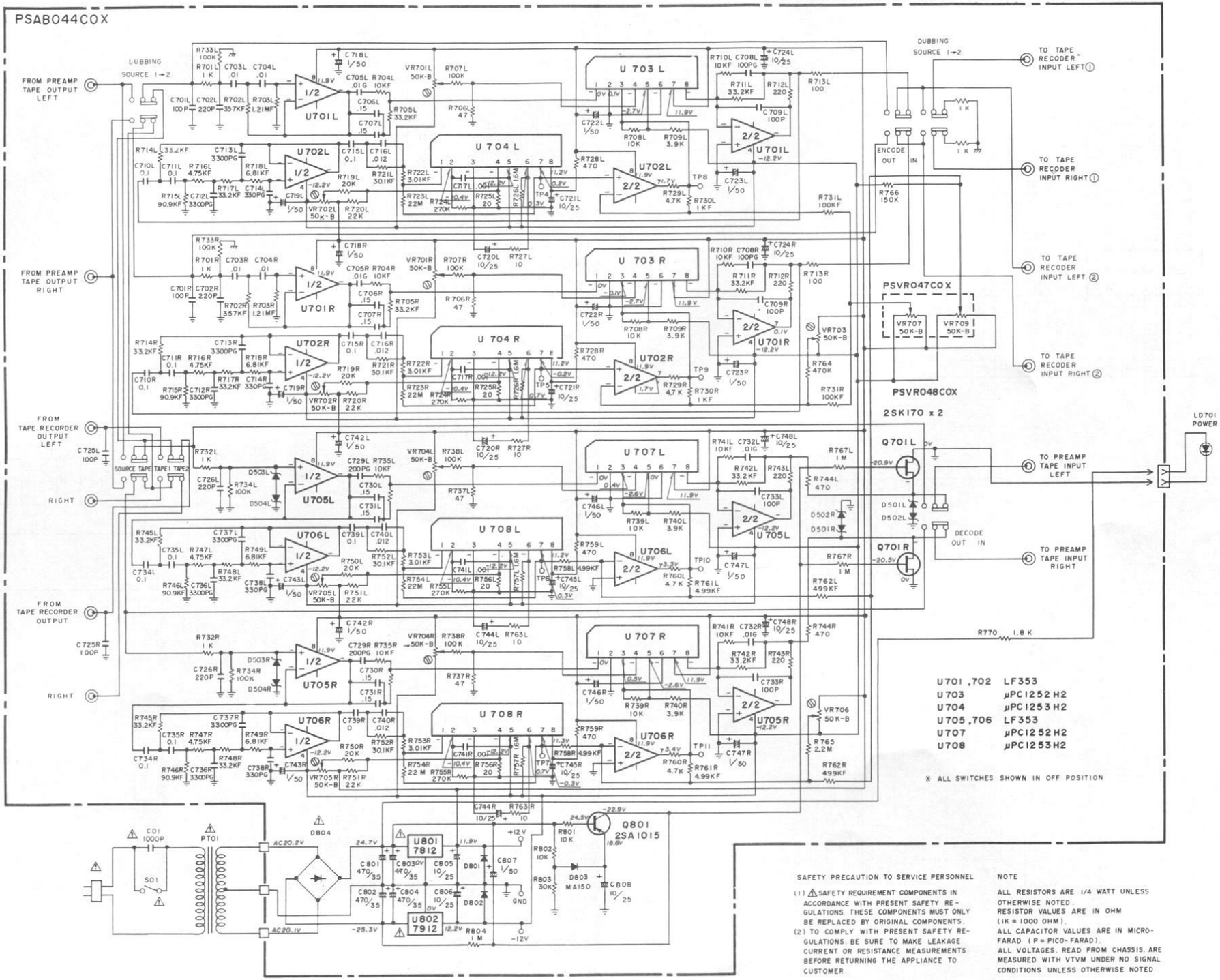
2. Connect the signal generator to both L and R inputs desinated "FROM PREAMP TAPE OUTPUT" and apply a 1 kHz, -10 dBV(316 mV rms).
3. Verify that the two rows of "RECORD (ENCODE)" LEDs now read 0 dB even if the "RECORD" switch is depressed.
4. Replace the cable connecting the signal generator output to "TAPE RECORDER 1 - FROM TAPE RECORDER OUTPUT".
5. Verify that the two rows of "PLAY (DECODE)" LEDs read 0 dB even if the "PLAY" switch is depressed.
6. Vary the level of the input from -60 dBV to +20 dBV in 10 dB steps and verify that the "RECORD IN" and "PLAY OUT" displays go from all LEDs off to all LEDs on in 10 dB steps (2-LED steps) over this input range.

ADJUSTMENT POINTS



SCHEMATIC DIAGRAM

NOTE: This is a stadard circuit but is subject to change without notice.



SAFETY PRECAUTION TO SERVICE PERSONNEL

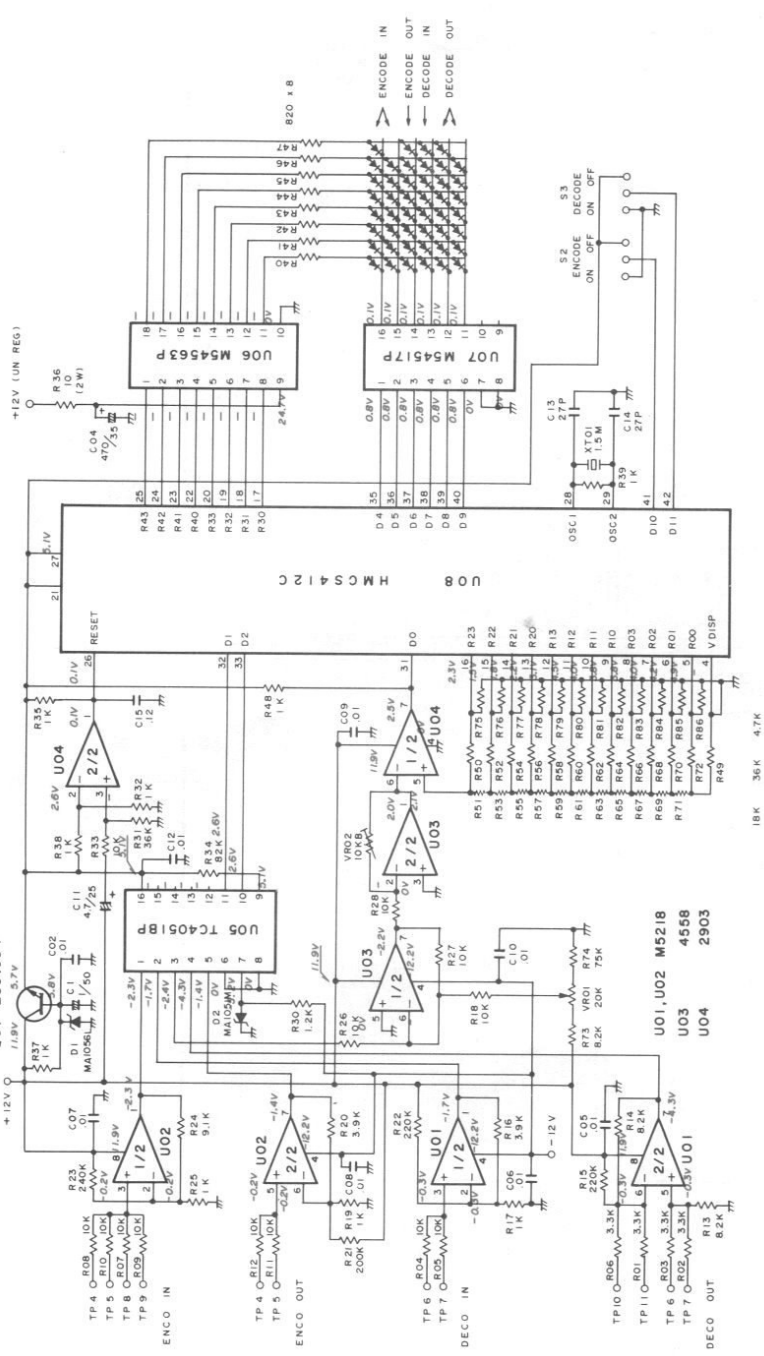
(1) ⚠ SAFETY REQUIREMENT COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL COMPONENTS.

(2) TO COMPLY WITH PRESENT SAFETY REGULATIONS. BE SURE TO MAKE LEAKAGE CURRENT OR RESISTANCE MEASUREMENTS BEFORE RETURNING THE APPLIANCE TO CUSTOMER.

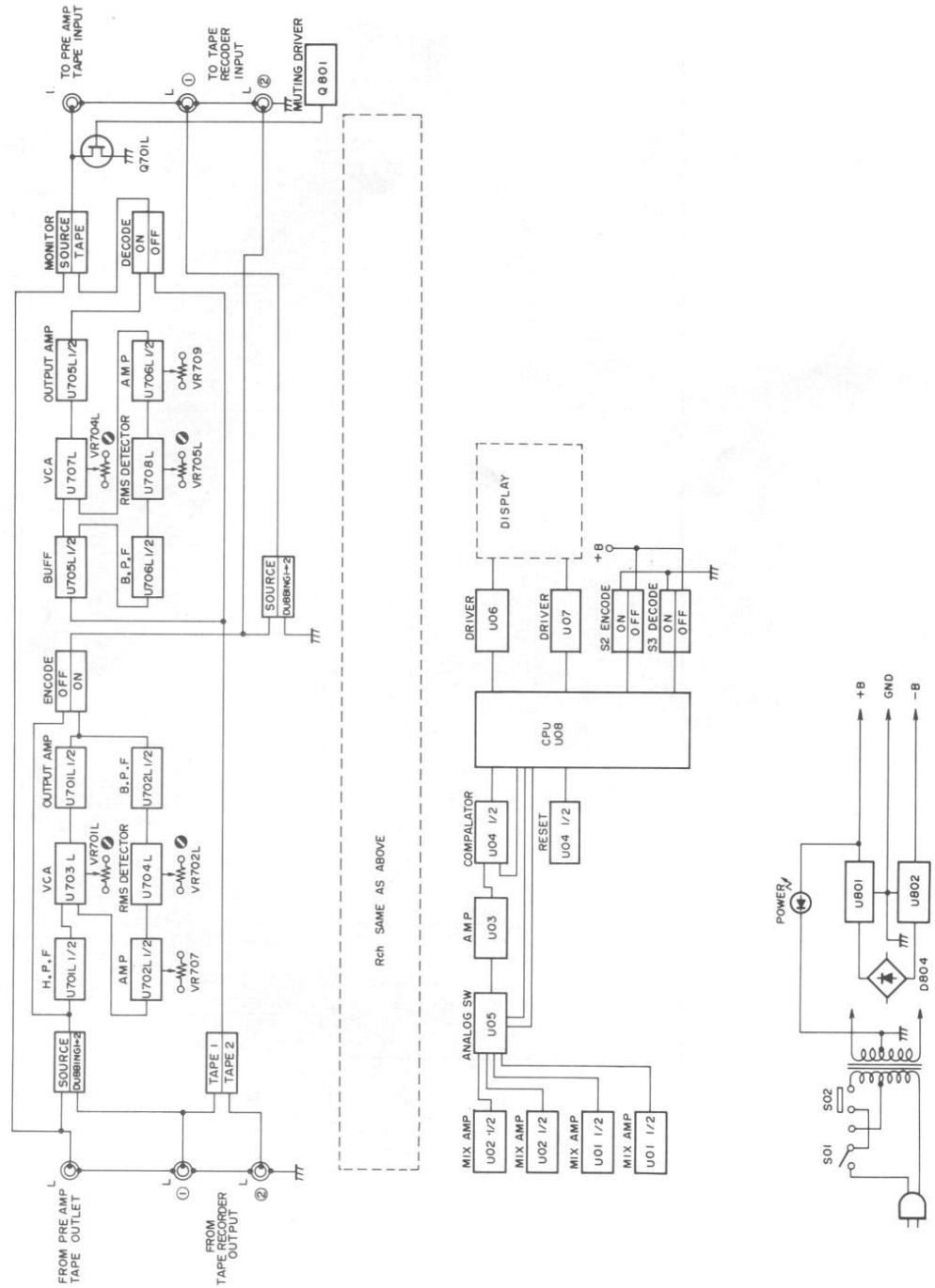
NOTE

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE NOTED.
RESISTOR VALUES ARE IN OHM (1K = 1000 OHM).
ALL CAPACITOR VALUES ARE IN MICRO-FARAD (P = PICO-FARAD).
ALL VOLTAGES, READ FROM CHASSIS, ARE MEASURED WITH VTVM UNDER NO SIGNAL CONDITIONS UNLESS OTHERWISE NOTED.

SCHEMATIC DIAGRAM

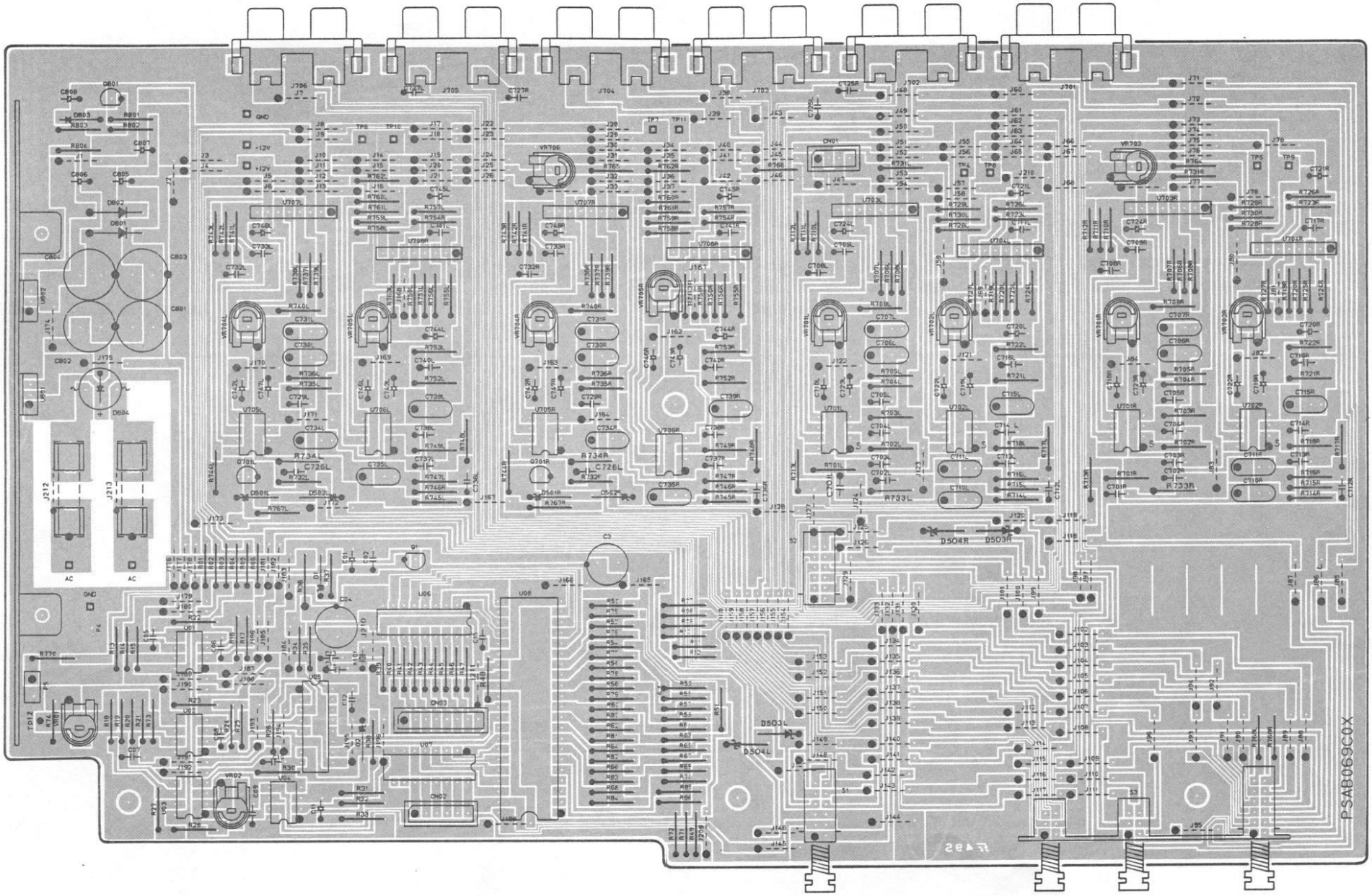


BLOCK DIAGRAM



WIRING BOARD LAYOUT (1)

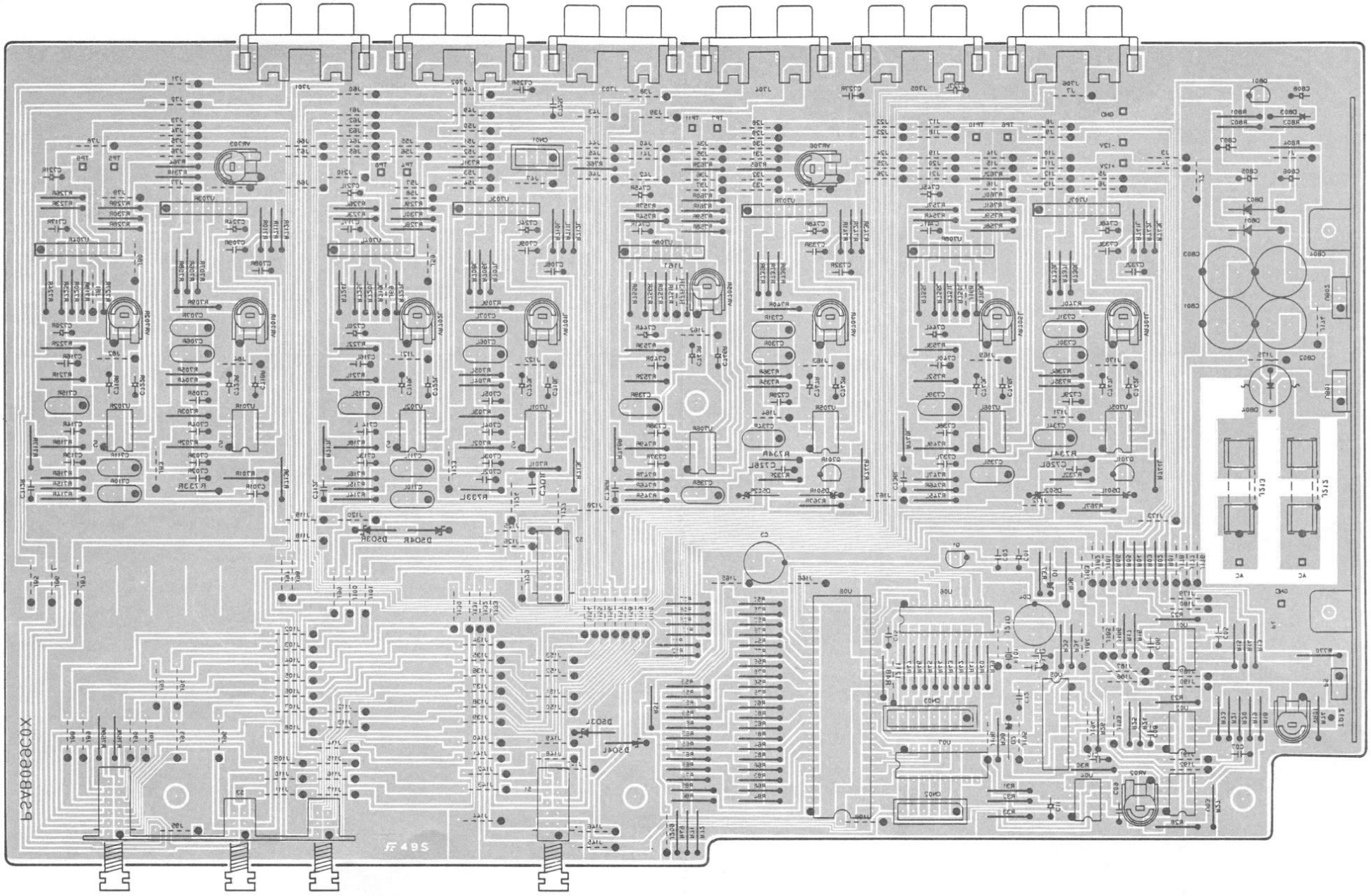
Component Side View



APSAB069AH

WIRING BOARD LAYOUT (2)

Foil Side View



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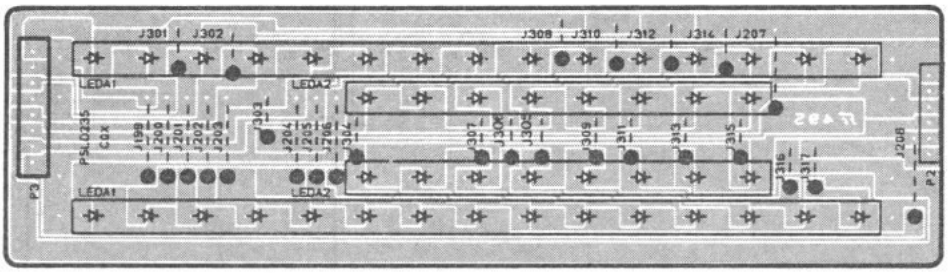
WIRING BOARD LAYOUT (3)

Component Side View



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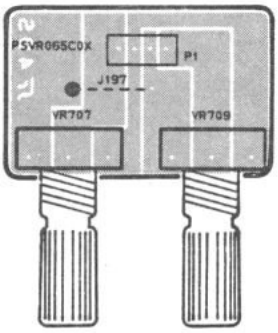

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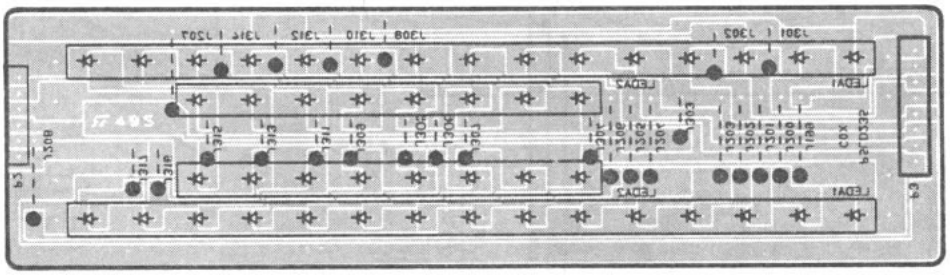
Foil Side View



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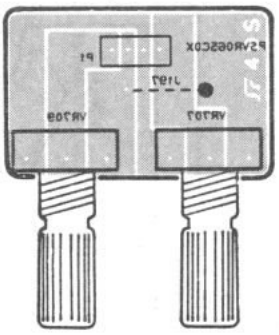

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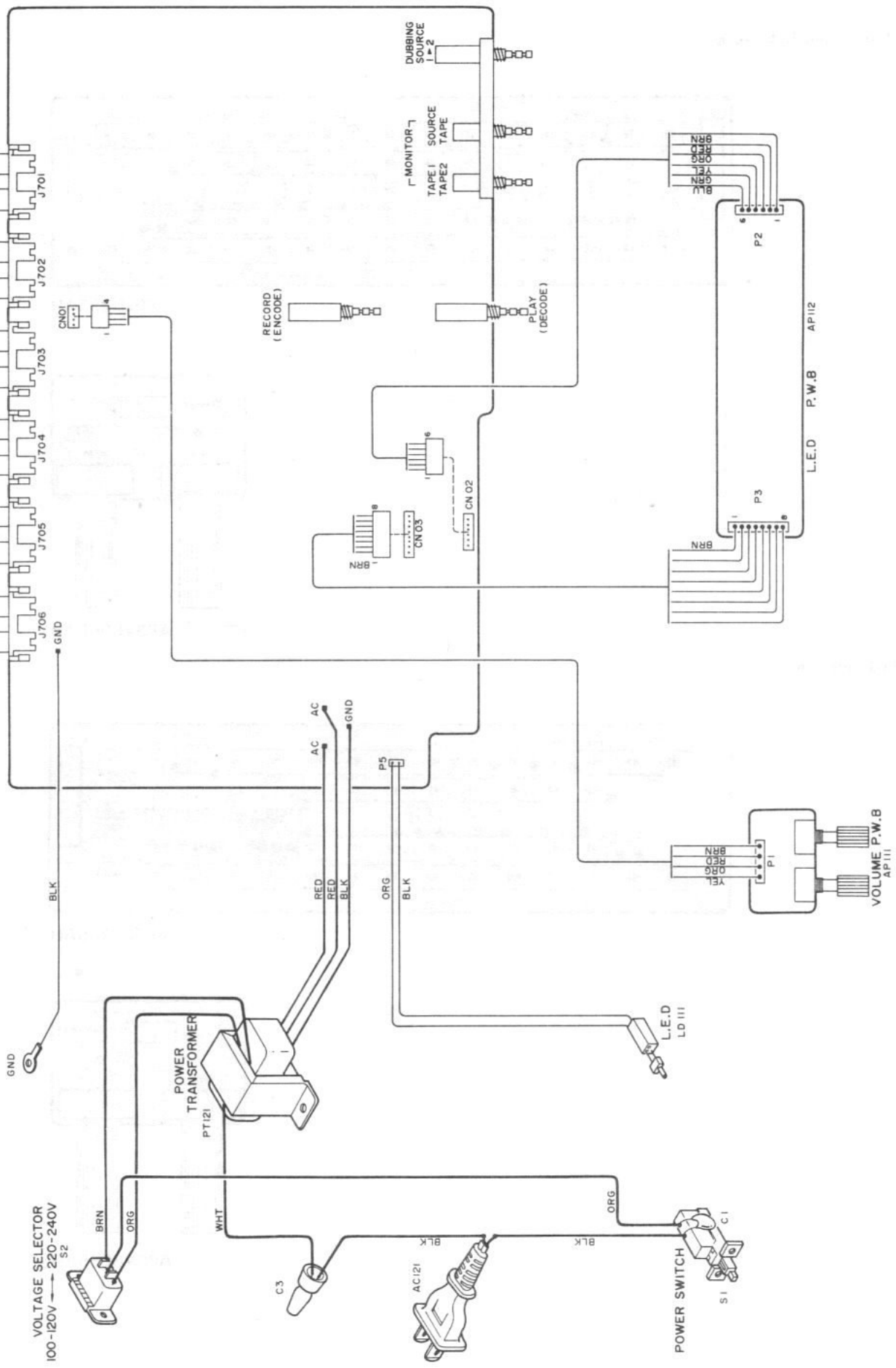
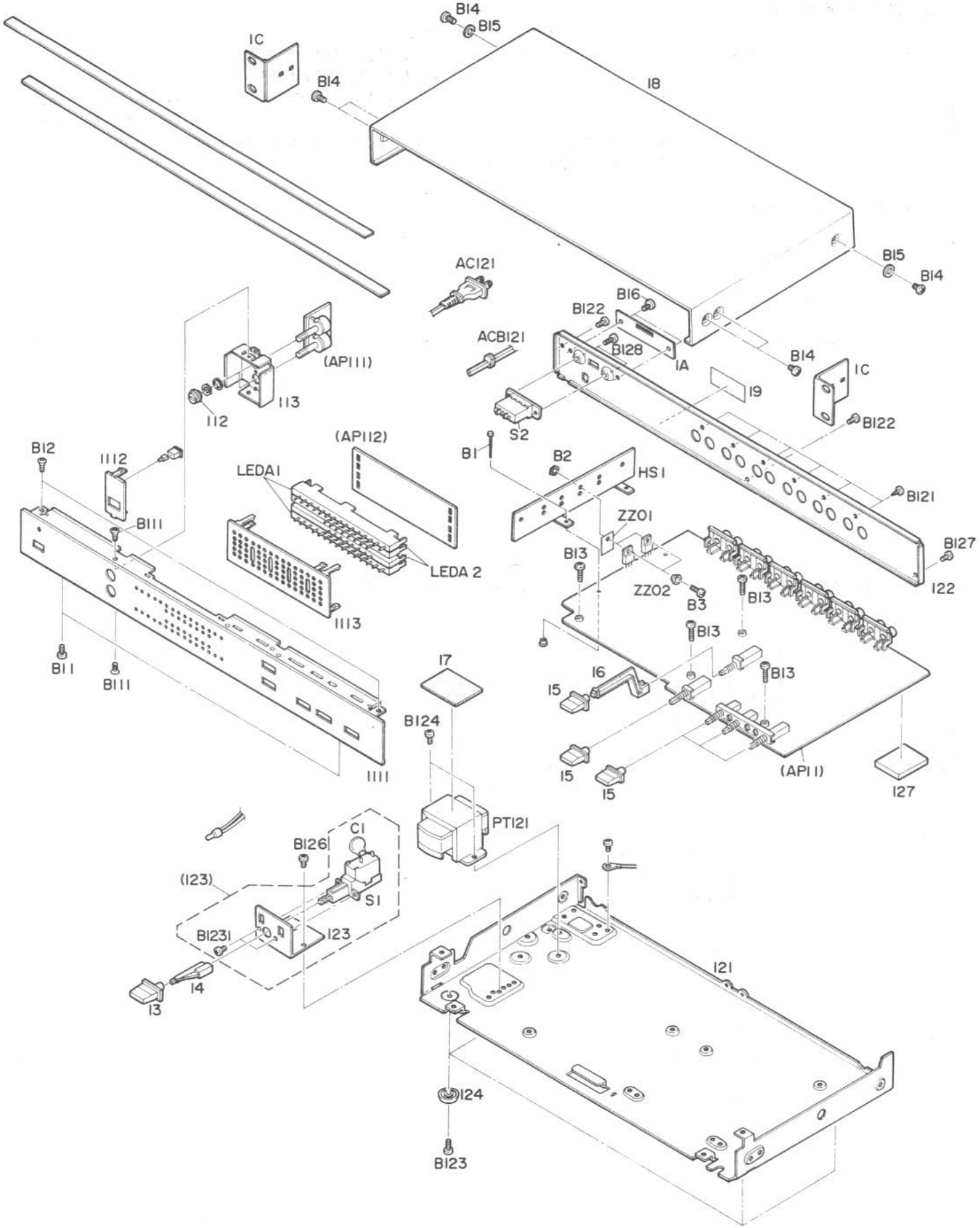
WIRING LAYOUT

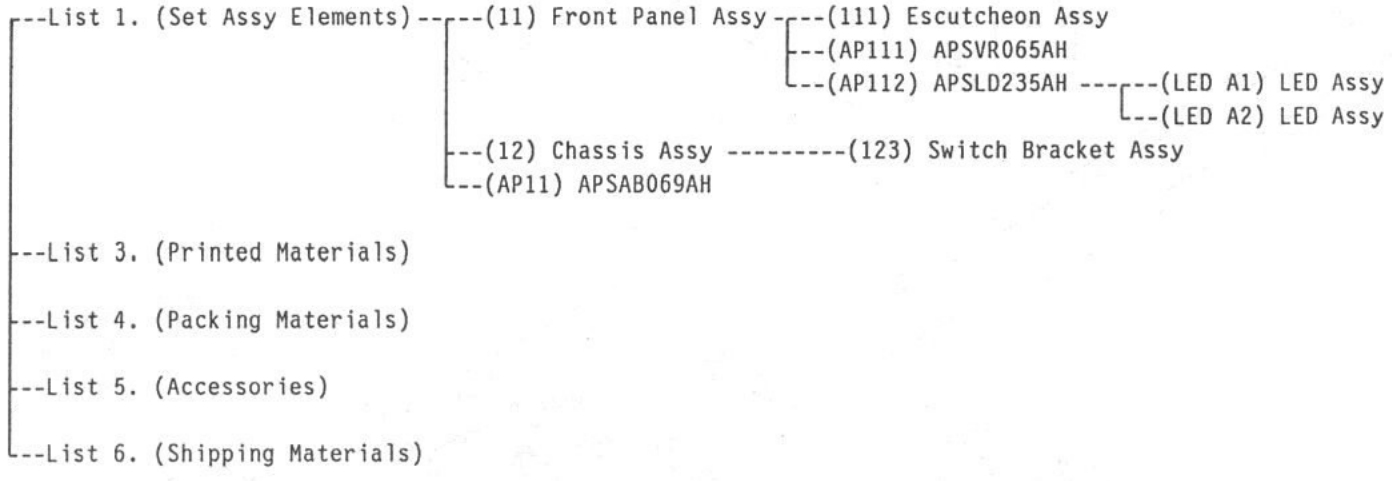


EXPLODED VIEW



REPLACEMENT PARTS LIST

Table of Part Structure



LIST 1. SET ASSY ELEMENTS

Numbers with ( ) listed in Ref.No. has exploded details.

Ref.No.	MFR's Part No.	Description	Remarks
(11)	AY224DS*01	Front Panel Assy	
(12)	AY224DS*02	Chassis Assy	
(AP11)	APSAB069AH	P.W.Board Assy	
1A	MS625AA002	Switch Cover	
1C	ML543AA003	Rack Mount Adaptor	
13,15	NBR1255258	Push Knob	
14	VK321SB001	Joint	
16	VQ611SB008	Joint Switch	
17	VS547XB001	Power Transfomer Sheet	
18	MU985SX001	Cover	
19	VVL511GE30	Serial No. Plate	
B11,16	BTPB3005ZB	Bind T.T Screw M3 x 5	
B12	BTPS3006TZ	Flat T.T Screw M3 x 6	
B13	BSPB3012NZ	Bind Head Screw M3 x 12	
B14	BSPB4010NB	Bind Head Screw M4 x 10	
B15	BWU40855SB	IT.Lock Washer M4 x 8.5 x 0.5	

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REPLACEMENT PARTS LIST

11. Front Panel Assy

Numbers with ( ) listed in Ref.No. has exploded details.

Ref.No.	MFR's Part No.	Description	Remarks
(111)	AM224XDS01	Escutcheon Assy	
(AP111)	APSVR065AH	P.W.Board Assy	
(AP112)	APSLD235AH	P.W.Board Assy	
112	VN276SB036	Flat Rotary Knob	
113	MU542SD001	Volume Bracket	
114	VS741SB001	PCB Holder	
B111	BTPS3006TZ	Flat T.T Screw M3 x 6	
LD111	QLBLN222RN	LED (red) LN222RP	

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12. Chassis Assy

Numbers with ( ) listed in Ref.No. has exploded details.

Ref.No.	MFR's Part No.	Description	Remarks
121	MU984SL001	Chassis	
122	MB951SL008	Rear Panel	
(123)	AY1BXDS*03	Switch Bracket Assy	
124	NBR9227577	Foot Assy	
AC121	ACAC029ULA	AC Cord Assy	
ACB121	VM270NB001	Bushing	
B121	BTPW3008AB	Bras.Tap Screw M3 x 8	
B122	BTPB3005TB	Bind T.T Screw M3 x 5	
B123,124,126,128	BTPB3005TZ	Bind T.T Screw M3 x 5	
B127	BTPL3006TB	Round Head Wood Screw M3 x 6	
B129	BWM30705SN	Flat L Washer M3 x 7 x 0.5	
PT121	TPL41A001K	Power Transformer	
S2	SS010226AJ	Slide Switch	

1/1

111. Escutcheon Assy

Ref.No.	MFR's Part No.	Description	Remarks
1111	ME95EAA051	Escutcheon	
1112	VF132SB004	Button Guide	
1113	VF122SB004	Button Guide	

1/1

REPLACEMENT PARTS LIST

123. Switch Bracket Assy

Ref.No.	MFR's Part No.	Description	Remarks
1231	ML544SD004	Switch Bracket	
B1231	BTPB3005TZ	Bind T.T Screw M3 x 5	
C1	CKDU102KBM	Ceramic 1000 pF 125V +/-10%	
C2	WUA322EEXX	Hi-Wrap Wire	
S1	SP01AAW07A	Push Switch	

1/1

AP11. P.W.Board Assy (APSAB069AH)

Ref.No.	MFR's Part No.	Description	Remarks
	PSAB069C0X	P.W.Board (without parts)	
B1	BRU3280XAJ	Thin Head Rivet M3.2 x 8.0	
B2	BNHCL30NSZ	Hexa Nut M3	
B3	BSPP3008NZ	Pan Head Screw M3 x 8	
C01,718L/R,719L/R 722L/R,723L/R 742L/R,743L/R 746L/R,747L/R 807	CEVG010ALX	Electrolytic 1 uF 50V	
C02,05,06,07,08 09,10,12,703L/R 704L/R	CQ4B103JTH	Film 0.01 uF 50V +/-5%	
C04,801,802,803 804	CEAF471ALX	Electrolytic 470 uF 35V	
C11	CEVE4R7ALX	Electrolytic 4.7 uF 25V	
C13,14	CCGB270J0T	Ceramic 27 pF 50V +/-5%	
C15	CQ4B124JTH	Film 0.12 uF 50V +/-5%	
C701L/R,709L/R 725L/R,727L/R 733L/R	CCGB101J0T	Ceramic 100 pF 50V +/-5%	
C702L/R,726L/R	CCGB221K0T	Ceramic 220 pF 50V +/-10%	
C705L/R,732L/R	CQPC103GEH	Film 0.01 uF 100V	
C706L/R,707L/R 730L/R,731L/R	CQ4B154JTH	Film 0.15 uF 50V +/-5%	
C708L/R	CQSC101GEF	Film 100 pF 100V	
C710L/R,711L/R 715L/R,734L/R 735L/R,739L/R	CQ4B104JTH	Film 0.1 uF 50V +/-5%	
C712L/R,713L/R 736L/R,737L/R	CQSC332GEF	Film 3300 pF 100V	
C714L/R,738L/R	CQSC331GEF	Film 330 pF 100V	

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REPLACEMENT PARTS LIST

Ref.No.	MFR's Part No.	Description	Remarks
C716L/R,740L/R	CQ4B123JTH	Film 0.012 uF 50V +/-5%	
C717L/R,741L/R	CKGB102KBT	Ceramic 1000 pF 50V +/-10%	
C720L/R,744L/R	CSVE100KLN	Tantalum 10 uF 25V +/-10%	
C721L/R,724L/R 745L/R,748L/R 805,806,808	CEVE100ALX	Electrolytic 10 uF 25V	
C729L/R	CQSC201GEF	Film 200 pF 100V	
CN01	YJF04S043Z	Junction Jack	
CN02	YJF06S035Z	Junction Jack	
CN03	YJF0BS028Z	Junction Jack	
D1	QDZ1056L#N	Diode (zener) MA1056L	
D2	QDZ1051M#N	Diode (zener) MA1051M	
D501L/R,502L/R 503L/R,504L/R	QDZ1120M#N	Diode (zener) MA1120M	
D801,802	QDSN4003AZ	Diode IN4003	
D803	QDSMA150XN	Diode MA150	
D804	QDSW02MXXG	Diode W02M	
HS1	MS736AD001	Heat Sink	
J701,702,703 704,705,706	YJP02S033Z	Pin Jack (2P)	
P4	ACZZ460ULA	Earth Wire Assy	
P5	ACCNL73ULA	Connection Cord Assy	
Q1	QTC1384XGN	Transistor 2SC1384 (R,S)	
Q701L/R	QTK0364XTT	Transistor 2SK364 (BL,GR)	
Q801	QTA1015XTT	Transistor 2SA1015 (Y,GR)	
R01,02,03,06	RD25PJ332X	Carbon 1/4W 3.3K ohm +/-5%	
R04,05,07,08,09 10,11,12,18,26 27,28,33,708L/R 739L/R,801,802	RD25PJ103X	Carbon 1/4W 10K ohm +/-5%	
R13,14,73	RD25PJ822X	Carbon 1/4W 8.2K ohm +/-5%	
R15,22	RD25PJ224X	Carbon 1/4W 220K ohm +/-5%	
R16,20,709L/R 740L/R	RD25PJ392X	Carbon 1/4W 3.9K ohm +/-5%	
R17,19,25,32,35 37,38,48,701L/R 732L/R,768L/R	RD25PJ102X	Carbon 1/4W 1K ohm +/-5%	
R21	RD25PJ204X	Carbon 1/4W 200K ohm +/-5%	
R23	RD25PJ244X	Carbon 1/4W 240K ohm +/-5%	
R24	RD25PJ912X	Carbon 1/4W 9.1K ohm +/-5%	
R30	RD25PJ122X	Carbon 1/4W 1.2K ohm +/-5%	
R31,49,50,52,54 56,58,60,62,64 66,68,70,72	RD25PJ363X	Carbon 1/4W 36K ohm +/-5%	
R34	RD25PJ823X	Carbon 1/4W 82K ohm +/-5%	

REPLACEMENT PARTS LIST

Ref.No.	MFR's Part No.	Description	Remarks
R36	RX2ATJ100B	Metal-oxide 2W 10 ohm +/-5%	
R39,767L/R,804	RD25PJ105X	Carbon 1/4W 1M ohm +/-5%	
R40,41,42,43,44 45,46,47	RD25PJ821X	Carbon 1/4W 820 ohm +/-5%	
R51,53,55,57,59 61,63,65,67,69,71	RD25PJ183X	Carbon 1/4W 18K ohm +/-5%	
R74	RD25PJ753X	Carbon 1/4W 75K ohm +/-5%	
R75,76,77,78,79,80 81,82,83,84,85,86 729L/R,760L/R	RD25PJ472X	Carbon 1/4W 4.7K ohm +/-5%	
R702L/R	RQBPF3573X	Metal-oxide 1/4W 357K ohm +/-1%	
R703L/R	RQBPF1214X	Metal-oxide 1/4W 1.21M ohm +/-1%	
R704L/R,710L/R 735L/R,741L/R	RQBPF1002X	Metal-oxide 1/4W 10K ohm +/-1%	
R705L/R,711L/R 714L/R,717L/R 736L/R,742L/R 745L/R,748L/R	RQBPF3322X	Metal-oxide 1/4W 33.2K ohm +/-1%	
R706L/R,737L/R	RD25PJ470X	Carbon 1/4W 47 ohm +/-5%	
R707L/R,733L/R 734L/R,738L/R	RD25PJ104X	Carbon 1/4W 100K ohm +/-5%	
R712L/R,743L/R	RD25PJ221X	Carbon 1/4W 220 ohm +/-5%	
R713L/R	RD25PJ101X	Carbon 1/4W 100 ohm +/-5%	
R715L/R,746L/R	RQBPF9092X	Metal-oxide 1/4W 90.9K ohm +/-1%	
R716L/R,747L/R	RQBPF4751X	Metal-oxide 1/4W 4.75K ohm +/-1%	
R718L/R,749L/R	RQBPF6811X	Metal-oxide 1/4W 6.81K ohm +/-1%	
R719L/R,750L/R	RD25PJ203X	Carbon 1/4W 20K ohm +/-5%	
R720L/R,751L/R	RD25PJ223X	Carbon 1/4W 22K ohm +/-5%	
R721L/R,752L/R	RQBPF3012X	Metal-oxide 1/4W 30.1K ohm +/-1%	
R722L/R,753L/R	RQBPF3011X	Metal-oxide 1/4W 3.01K ohm +/-1%	
R723L/R,754L/R	RGQCPJ226X	Metal-oxide 1/4W 22M ohm +/-5%	
R724L/R,755L/R	RD25PJ274X	Carbon 1/4W 270K ohm +/-5%	
R725L/R,756L/R	RD25PJ200X	Carbon 1/4W 20 ohm +/-5%	
R726L/R,757L/R	RQBCF1654X	Metal-oxide 1/4W 1.65M ohm +/-1%	
R727L/R,763L/R	RD25PJ100X	Carbon 1/4W 10 ohm +/-5%	
R728L/R,744L/R 759L/R	RD25PJ471X	Carbon 1/4W 470 ohm +/-5%	
R730L/R	RQBPF1001X	Metal-oxide 1/4W 1K ohm +/-1%	
R731L/R	RQBPF1003X	Metal-oxide 1/4W 100K ohm +/-1%	
R758L/R,761L/R	RQBPF4991X	Metal-oxide 1/4W 4.99K ohm +/-1%	
R762L/R	RQBPF4993X	Metal-oxide 1/4W 499K ohm +/-1%	
R764	RD25PJ474X	Carbon 1/4W 470K ohm +/-5%	
R765	RD25PJ225X	Carbon 1/4W 2.2M ohm +/-5%	
R766	RD25PJ154X	Carbon 1/4W 150K ohm +/-5%	
R770	RD25PJ272X	Carbon 1/4W 2.7K ohm +/-5%	
R771L/R,772L/R	RQBCF1824X	Metal-oxide 1/4W 1.82M ohm +/-1%	
R803	RD25PJ303X	Carbon 1/4W 30K ohm +/-5%	
S01,02	SP01AAXB1A	Push Switch	
S03	SP03YAX11A	Push Switch	

REPLACEMENT PARTS LIST

Ref.No.	MFR's Part No.	Description	Remarks
U01,02,03	QQM04558A&	IC 4558	
U04	QQM02903AJ	IC JRC2903	
U05	QQ004051DE	IC M4051BP	
U06	QQM54563AE	IC M54563P	
U07	QQM54517PE	IC M54517P	
U08	QQ000412CB	IC HMCS412C	
U701L/R,702L/R	QQM0353NYL	IC LF353N	
U703L/R,707L/R	QQM01252AA	IC uPC1252H2	
U704L/R,708L/R	QQM01253AA	IC uPC1253H2	
U705L/R,706L/R	QQM00353NL	IC LF353N	
U801	QQM07812CJ	IC NJM7812A	
U802	QQM07912BJ	IC NJM7912A	
VR01	RP1NB203#1	Potentiometer 20K ohm-B	
VR02	RP1NB103#1	Potentiometer 10K ohm-B	
VR701L/R,702L/R 703,704L/R 705L/R,706	ERP63H50301*02	Potentiometer 50K ohm-B	New Part Code
XT01	ECX15000201*01	Ceramic (OSC) 1.50 MHz	New Part Code
ZZ01	VS223RH002	Silicon Sheet	
ZZ02	VF164DN003	Bushing	
ZZ03	NBR2666116	Collar Bushing	
ZZ04	NBR2675136	Collar Bushing	
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AP111. P.W.Board Assy (APSVR065AH)

Ref.No.	MFR's Part No.	Description	Remarks
	PSVR065C0X	P.W.Board (without parts)	
P1	ACCNAC3ULA	Connector Cord Assy	
VR707,709	RVNA503B17	Rotary Volume 50K ohm-B	
			1/1

REPLACEMENT PARTS LIST

AP112. P.W.Board Assy (APSLD235AH)

Numbers with ( ) listed in Ref.No. has exploded details.

Ref.No.	MFR's Part No.	Description	Remarks
	PSLD235C0X	P.W.Board (without parts)	
(LED A1)	AXLD008GEA	LED Assy	
(LED A2)	AXLD009GEA	LED Assy	
P2	ACCNAC4ULA	Connection Cord Assy	
P3	ACCNAC5ULA	Connection Cord Assy	
			1/1

LED A1. LED Assy

Ref.No.	MFR's Part No.	Description	Remarks
	QLBLN222RN	LED (red) LN222RP	
	QLBLN322GN	LED (green) LN322GP	
	QLBLN422YN	LED (orange) LN422YP	
	VB721SW002	LED Case	
			1/1

LED A2. LED Assy

Ref.No.	MFR's Part No.	Description	Remarks
	QLBLN222RN	LED (red) LN222RP	
	QLBLN322GN	LED (green) LN322GP	
	QLBLN422YN	LED (orange) LN422YP	
	VB721SW002	LED Case	
			1/1

LIST 3. PRINTED MATERIALS

Ref.No.	MFR's Part No.	Description	Remarks
31	KT224DSPXX	Owner's Manual	
32	KW000341AX	Warranty Card	
35	KF243400E4	Polyethylene Bag	
			1/1

REPLACEMENT PARTS LIST

LIST 4. PACKING MATERIALS

Ref.No.	MFR's Part No.	Description	Remarks
41	KP224DS*01	Inner Carton	
42	KS224DS*01	Outer Carton	
43	KN1BX3**03	Partitioner L	
44	KN1BX3**04	Partitioner R	
45	KF604200E2	Polyethylene Bag No2	
49	KN1BXDS*01	Pad A	
			1/1

LIST 5. ACCESSORIES

Ref.No.	MFR's Part No.	Description	Remarks
51	ACSP023GEA	Stereo Audio Cable	
			1/1

LIST 6. SHIPPING MATERIALS

Ref.No.	MFR's Part No.	Description	Remarks
61	KM224DSP01	Master Carton	
			1/1

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