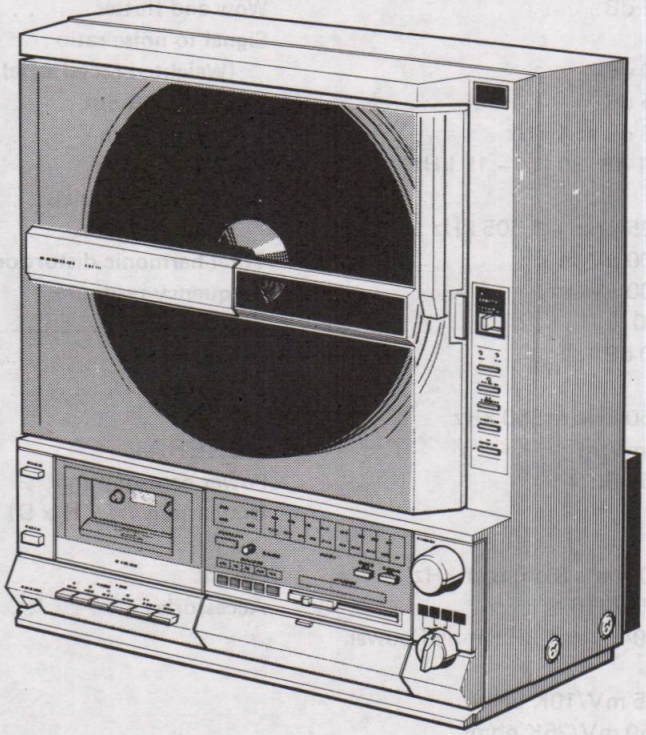
MITSUBISHI
AUDIO SYSTEMS

SERVICE MANUAL

VERTICAL MUSIC CENTER

MODEL X-7



MITSUBISHI ELECTRIC CORPORATION

SPECIFICATIONS

TUNER SECTION

FM section

Tuning range	87.5 MHz – 108 MHz
Usable sensitivity (IHF)	2.5 μV (13.2 dBf)
50 dB quieting sensitivity	
MONO	5.5 μV (20 dBf)
STEREO	55 μV (40 dBf)
Sensitivity (±40 kHz deviation)	
MONO (S/N = 26 dB)	1.8 μV
STEREO (S/N = 46 dB)	35 μV
Total Harmonic distortion	
MONO	0.5 %
STEREO	0.8 %
Image response ratio	45 dB
Signal to noise ratio (IHF)	
MONO	77 dB
STEREO	72 dB
Signal to noise ratio (DIN)	
MONO	70 dB
STEREO	65 dB
Stereo separation	35 dB at 1 kHz
Frequency response	±1 dB, 30 Hz – 15 kHz

MW section

Tuning range	525 kHz – 1,605 kHz
Usable sensitivity (IHF)	300 μV/m
Sensitivity (S/N = 26 dB)	600 μV/m
Total harmonic distortion	1.0 %
Image response ratio	30 dB

LW section

Tuning range	150 kHz – 350 kHz
Sensitivity (S/N = 26 dB)	1 mV/m
Image response ratio	35 dB

AMPLIFIER SECTION

Power output	20 watts 8 ohms, 1 kHz, 5 % THD
Total harmonic distortion	0.04 % at 1 kHz at half power
Input sensitivity/impedance	
MIC	1.5 mV/10K ohms
AUX	150 mV/25K ohms
Variable loudness control (VR MAX –30 dB)	
LOW	0 ~ +7 dB at 100 Hz
HIGH	+7 dB at 10 kHz

TURNTABLE SECTION

Type	Vertical linear tracking
Drive system	Belt drive
Motor	DC servo motor
Platter	30 cm (12") diameter, Aluminium diecast alloy
Platter speed	33-1/3, 45 rpm
Wow and flutter	0.08 % Wrms
Signal to noise ratio	55 dB (IEC-B), 65 dB (DIN-B)
Tonearm	
Type	Liner tracking, straight, static balance
Cartridge	Dual magnet type
Tracking force	2.0 gr.

CASSETTE DECK SECTION

Type	4-track, 2-channel stereo cassette deck
Tape speed	4.75 cm/sec (1-7/8 ips)
Head material	
REC/PB	Hard permalloy
ERASE	Ferrite
Wow and flutter	0.06 % Wrms
Signal to noise ratio (Weighted Metal tape)	
Dolby NR out	56 dB
Dolby NR in	66 dB
Crosstalk	
Between channels	35 dB
Between tracks	65 dB
Total harmonic distortion	1.0 %
Frequency response	
Normal	30 Hz – 15,000 Hz
Special	30 Hz – 16,000 Hz
Metal	30 Hz – 17,000 Hz

GENERAL

Power consumption	110W (IEC nominal)
Dimensions (W x H x D)	415 x 476 x 189 mm (16-3/8 x 18-3/4 x 7-7!616")
Weight	13.5 kg (29.8 lbs)
Accessories	T-shaped FM aerial Black sheets 17, 30 cm (For transparent or coloured records) AM loop aerial

- "Dolby" and double-D symbol are trademarks of Dolby Laboratories Licensing Corporation.
  Noise Reduction System manufactured under license from Dolby Laboratories Licensing Corporation.

DISASSEMBLING PROCEDURE

1. How to remove chassis unit

1) Remove knobs (TUNING, FUNCTION, VOLUME, TAPE SELECTOR, BASS, TREBLE, BALANCE, and remove cassette cover.
2) Remove four screws (1) (on both sides) in Fig. 1.
3) Pull chassis unit rearward to separate it from the main body. Disconnect lead wire from the player unit.

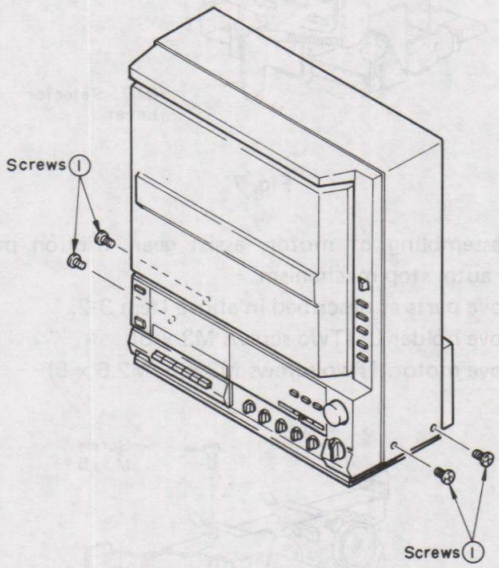


Fig. 1

2. How to remove cassette mechanism assembly

1) Remove chassis unit.
2) Remove counter belt on the counter side.
3) Disconnect lead wires (J410, 420) of mechanism assembly from PV board.
4) Remove five mechanism assembly fixing screws (2) (2-3 x 6).

Two of the five screws are used commonly to fix the EJECT knob.

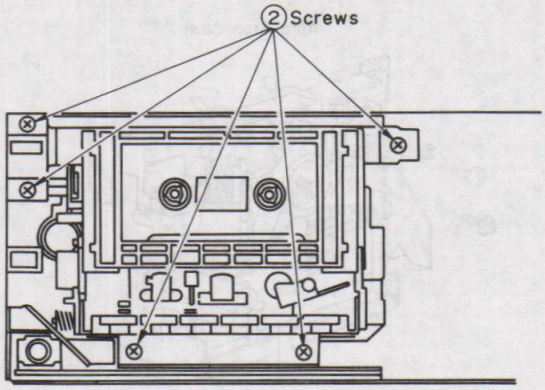


Fig. 2

3. How to disassemble principal parts of mechanism

* In the following description, the mechanism assembly has already been removed from the chassis unit.

3-1 Disassembling of head, pinch roller, reel rest, and play idler.

1) Remove cassette holder. (CS ring)

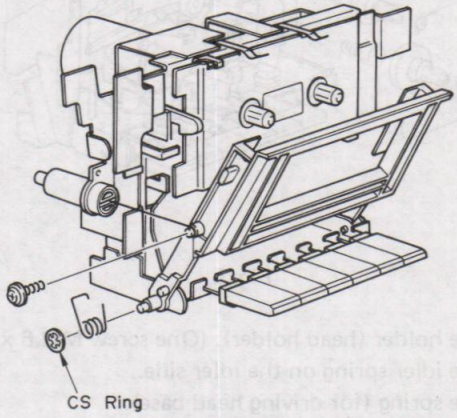


Fig. 3

2) Remove pinch roller/panel plate. (CS ring)

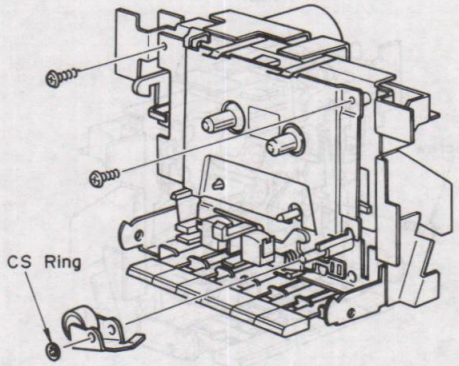


Fig. 4

3) Remove reel rest (FEED, TAKE-UP), (PS washer)

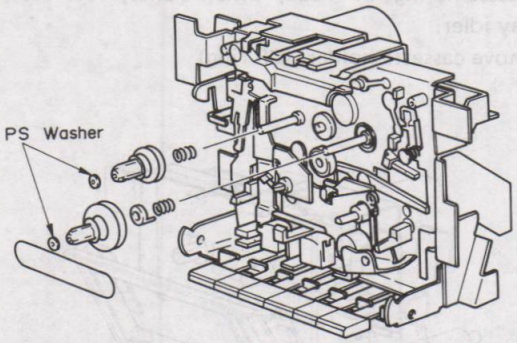


Fig. 5

4) Remove holder (head holder). (One screw M-2.6 x 10)
5) Remove idler spring on the idler side.
6) Remove spring (for driving head base).
7) Remove head base.
8) Remove idler (PLAY IDLER).

Note 1. Take care not to lose the one steel ball between holder and head base and the three steel balls between head base and chassis base.

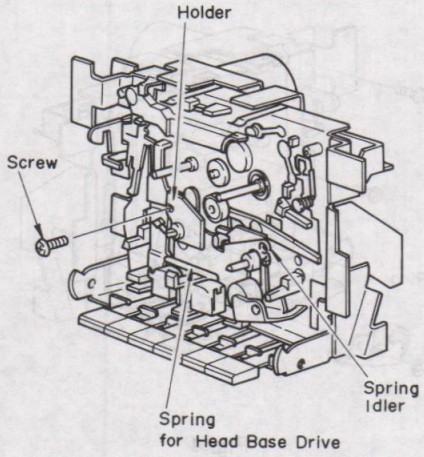


Fig. 6

3-2 Disassembling of flywheel and belt (MAIN, REEL, AUTO. STOP)

1) Remove the RECORD/PLAYBACK lever. (One screw M2.6 x 5)
2) Remove REEL belt and MAIN belt.
3) Remove flywheel. Remove AUTO. STOP belt at the same time.

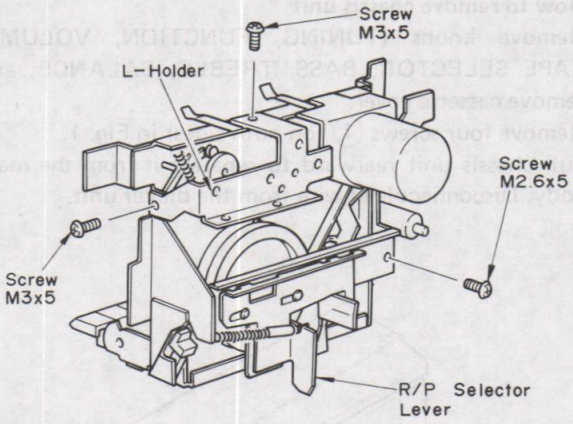


Fig. 7

3-3 Disassembling of motor, assist gear, friction pulley, and auto. stop mechanism

1) Remove parts as described in above Item 3-2.
2) Remove holder L. (Two screws M3 x 5)
3) Remove motor. (Two screws M3 x 5, M2.6 x 5)

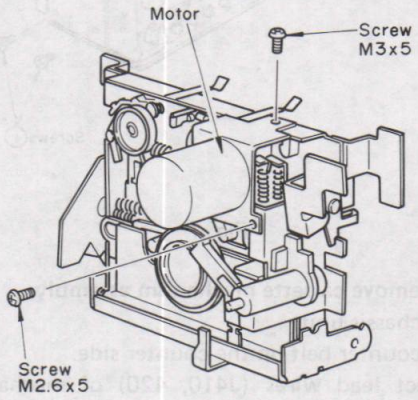


Fig. 8

4) Remove START lever. (E-ring 3ϕ, 1 pc)

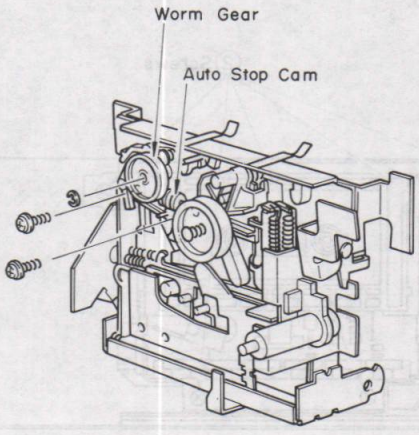


Fig. 9

5) Remove assist gear. (E-ring 3, 1 pc)
6) Remove friction pulley.
7) Remove worm gear. (E-ring 2, 1 pc)
8) Remove AUTO. STOP cam.

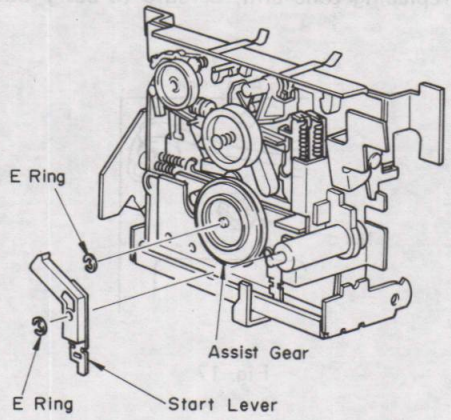


Fig. 10

4. How to remove dust cover

1) Pull two hinge shafts.
2) Remove two screws from cap mounting holder.
3) Remove hinge mounting screw from dust cover.
4) In this state, replace dust cover.

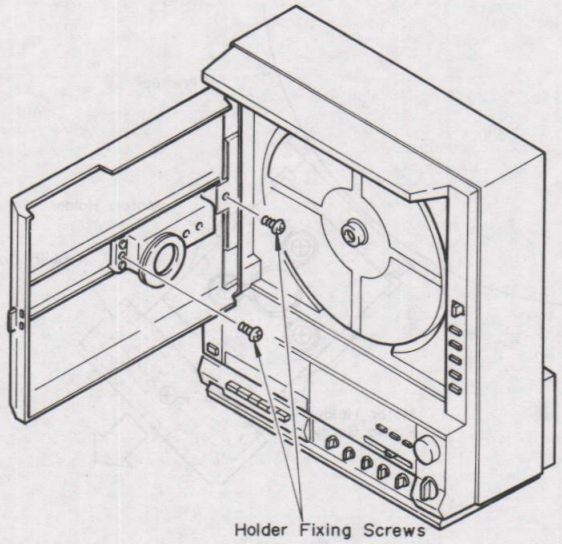


Fig. 11

5. How to remove turntable

1) Hold turn table on its circumference by hand and turn 45 adaptor in centre in clockwise direction.
2) Turntable holder, 45 adaptor, and spring are removed.
3) Remove back lid of the unit (by removing four fixing screws, T2-3 x 12) and hold turntable and flywheel by hand. Then turn turntable counterclockwise to remove it from shaft.

6. How to remove player unit

1) Remove four cover fixing screws (T1-3 x 10) below turntable.
2) Hold tone arm base with finger and move it towards centre shaft, and stop above where cover wad.

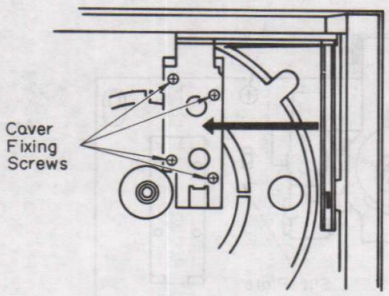


Fig. 12

3) Remove five player-unit fixing screws (A and B) in Fig. 13. Player unit can now be removed from cabinet main body.

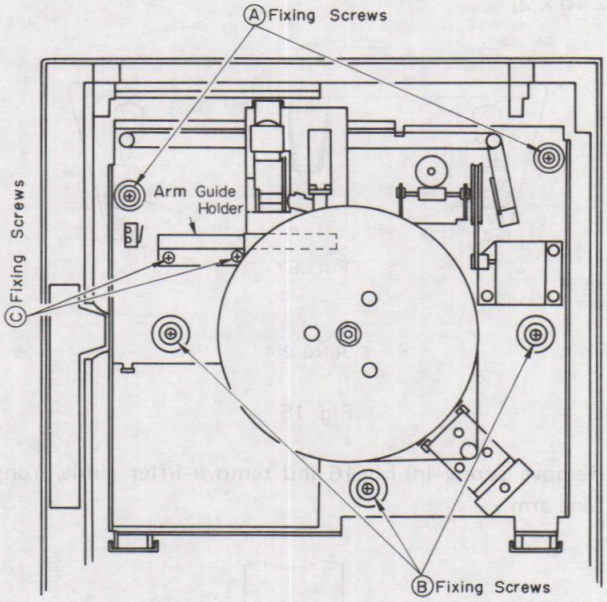


Fig. 13

7. How to remove tone arm

1) Remove player unit according to the procedure in Item 6.
2) Remove slit plate attached to arm base in Fig. 14.

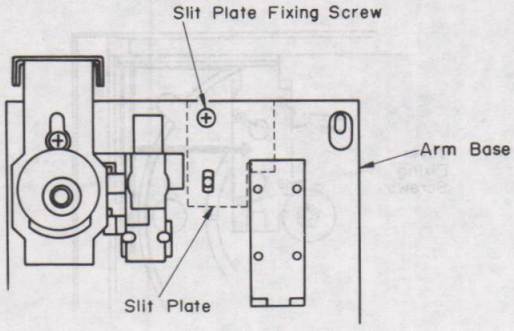


Fig. 14

3) Remove dial thread from pulley and remove fixing screws (C) in Fig. 15.
4) Remove pulley attached to arm base in Fig. D. (E-ring 2.4ϕ x 2)

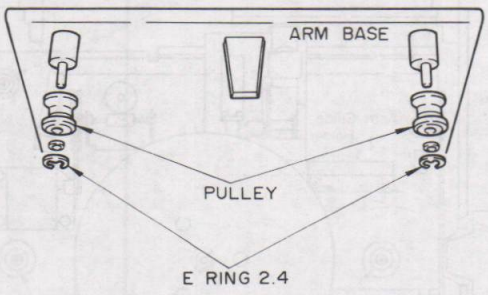


Fig. 15

5) Remove screw in Fig.16 and remove lifter guide from tone arm.

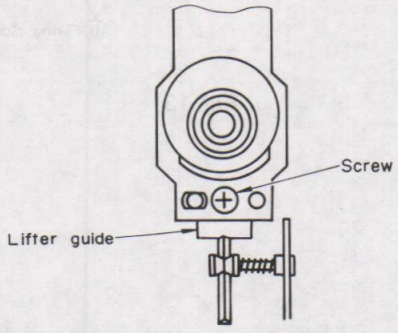


Fig. 16

6) Remove tone arm fixing nut in Fig.17 and disassemble tone arm from tone base.
7) Disconnect output lead wire of tone arm from PC board.
8) In this state, replace tone arm.
9) After replacing tone arm, be sure to carry out adjustment.

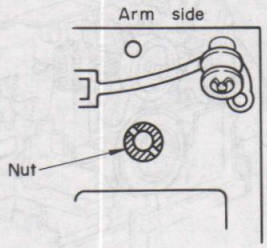


Fig. 17

8. How to remove main motor

1) Remove back lid of the unit.
2) Remove main belt from motor pulley.
3) Remove one motor holder mounting screw (M3 x 25).
4) Pull motor holder in a direction shown by arrow in Fig. 18.
5) Disconnect connector J9 from logic board.
6) In this state, replace motor.
7) Reverse the above procedure to mount motor holder.

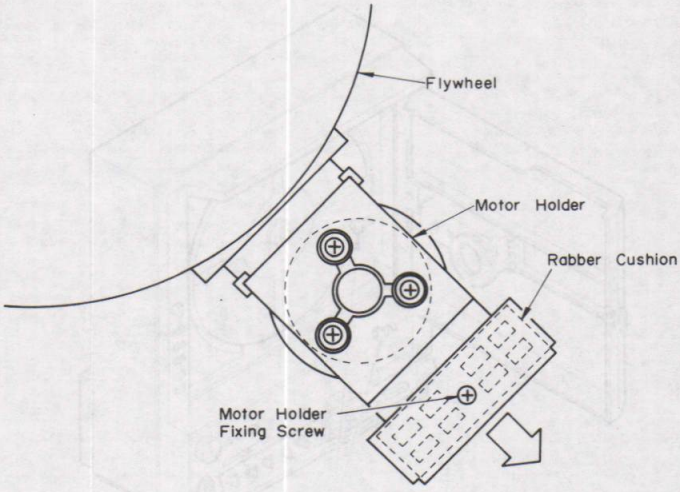


Fig. 18

9 How to remove tuner unit

* Tuner unit can be replaced without removing the chassis unit.

1) Pull out TUNING knob.
2) Remove four tuner unit fixing screw (1) (T2-3 x 10) from chassis unit rear panel in Fig.
3) Pull tuner unit toward yourself and disconnect connector J202 from the tuner board. The tuner unit can be disassembled.

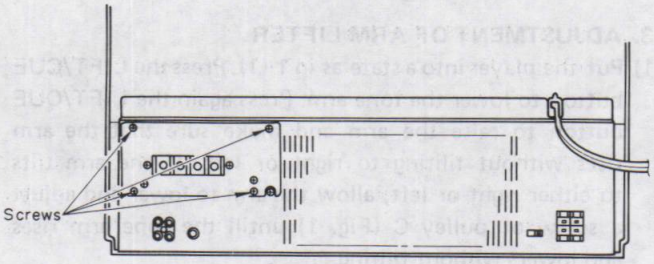


Fig. 19

10. How to replace power IC

1) Remove chassis unit according to the procedure in Item 1.
2) Remove tuner unit according to the procedure in Item 9.
3) Remove three screws (1) (T1-3 x 12), two screws (2) (T2-3 x 8), and six screws (3) (T2-3 x 10) in the rear panel.
4) Disconnect lead wire of transformer from PC board.
5) In this state, remove rear panel.
6) Remove screw fixing power IC to radiation panel.
7) Remove two shield plate fixing screws on both sides in the rear of chassis unit.
8) Remove soldering of power IC and take out.

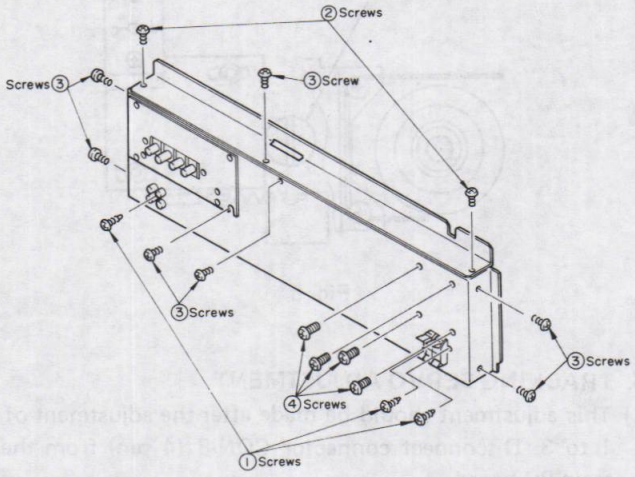


Fig. 20

ADJUSTMENT PROCEDURE

TURNTABLE Section

- Before adjustment, remove the back lid from main body and place the player horizontally.

1. STYLUS HEIGHT ADJUSTMENT

1) Remove the main turntable belt and the horizontal motor belt. With no record, lift the tone arm base with the finger and move it to the centre of turntable. Press the actuator of REST switch to put the switch into the ON state. (See Fig. 1)

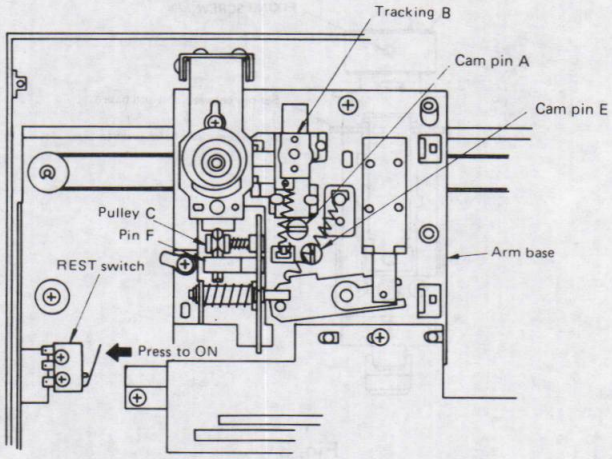


Fig. 1

2) With the tone arm up, unlock and turn the cam pin E till the tip of stylus is 8 ± 1mm above the turntable. In this case, the main body cover is open. (See Fig. 2)
3) After adjustment, lock the eccentric pin E with screw and replace the belt removed previously.

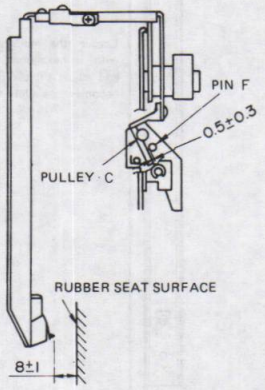


Fig. 2

2. VERTICAL ADJUSTMENT OF TONE ARM

1) With unit in state of Item 1-(1), allow a thread with small weight to hang from a top surface of set along the tone arm. Put a pin between the arm base and tone arm and set the stylus pressure of tone arm at Og. (See Figs. 3 and 4)
2) Loosen the main weight fixing hexagon screw (M3 X 4) with a 1.5 mm hexagonal screwdriver and adjust the main weight till the perpendicularly hung thread becomes parallel to the tone arm.
   After adjustment, tighten hexagon screw of main weight.

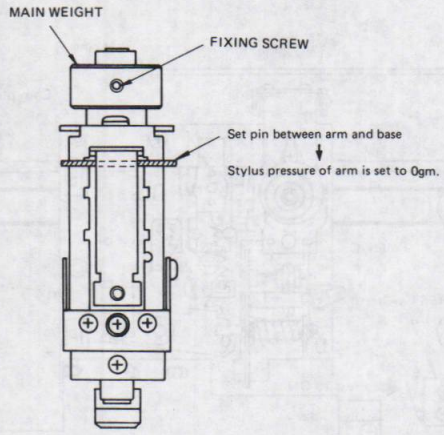


Fig. 3

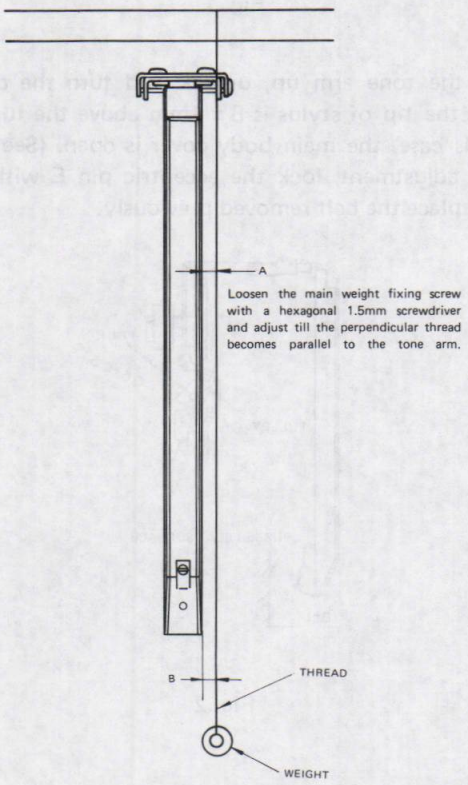


Fig. 4

3. ADJUSTMENT OF ARM LIFTER

1) Put the player into a state as in 1 (1). Press the LIFT/CUE button to lower the tone arm. Press again the LIFT/CUE button to raise the arm and make sure that the arm rises without tiliting to right or left. If the arm tilts to either right or left, allow the arm to lower and adjust a screw of pulley C (Fig. 1) untill the tone arm rises and lowers without tiliting.

4. ARM LIFT TIMING.

Note: This adjustment should be made with the player detached from the cabinet main body.

1) Put the player into a state of 1 (1). With the tone arm raised, turn the pin F to adjust the clearance between the pulley C and pin F (shown in Fig. 1) to 0.5 ± 0.3 mm.

5. ADJUSTING THE LEAD-IN POSITION

1) Remove the back of player while keeping other components in the actual operation state.
2) Adjust the cam pin G (Fig. 5) so that the stylus lowers correctly in the lead in grooves along the periphery of record (a 12" disc) placed on the turntable when the START button is pressed. Also check 7" operation.

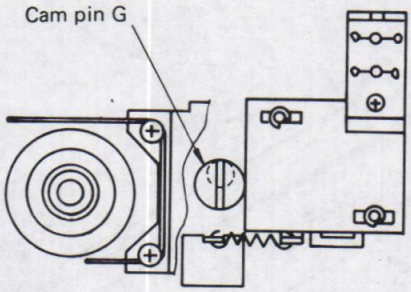


Fig. 5

6. TRACKING SERVO ADJUSTMENT

1) This adjustment should be made after the adjustment of 1 to 3. Disconnect connector CON-8 (4 pin) from the main PC board.
2) The removed connector CON-8 is wired as shown in Fig. 6. Press pin 1 with a standard screwdriver and pull out the brown wire.

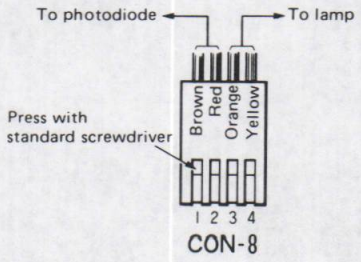


Fig. 6

Adjustment of Recording System

1. Bias frequency

1) Setting . . . . . Connect a frequency counter to Pin 1 (L) or Pin 3 (R) and Pin 2 (GND) of the jack J120.
2) Location . . . . . OSC unit.
3) Procedure . . . . . Adjust OSC unit till the frequency counter reads 85 KHz ± 0.1 KHz.

Note: Adjust with BEAT CANCEL switch in "N" position.

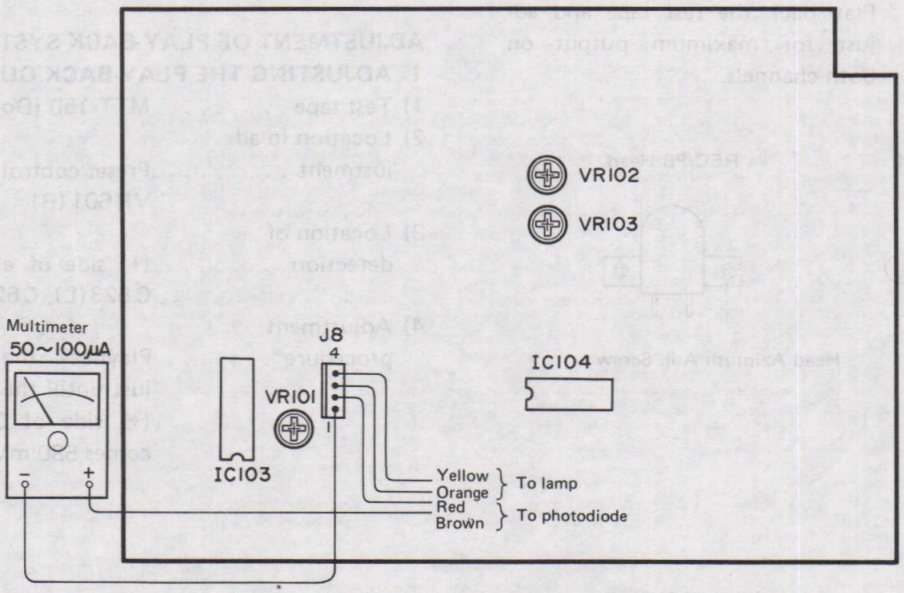
2. Adjustment of recording current

1) Setting . . . . . With the deck in recording mode, apply a signal of 400Hz, -10 dB. Adjust the RECORD LEVEL control to obtain a -7 dB signal at the output terminal, then lower the input level by 30 dB.
2) Test tape . . . . . AC512 special.
3) Location . . . . . Semi-fixed resistor, VR541 (L), VR641 (L).
4) Procedure . . . . . Adjust, so that the output level during recording and playback of 400 Hz signal becomes equal to that during monitoring.

3. Adjustment of bias current

1) Setting . . . . . Same as in Item 2 above.
2) Test tape . . . . . AC512 special.
3) Location . . . . . Semi-fixed resistor VR561 (L), VR661 (R).
4) Procedure . . . . . Adjust, so that the level difference between 8 KHz and 400 Hz is within ± 0.5 dB during recording and playback of 400 Hz and 8 KHz signals.

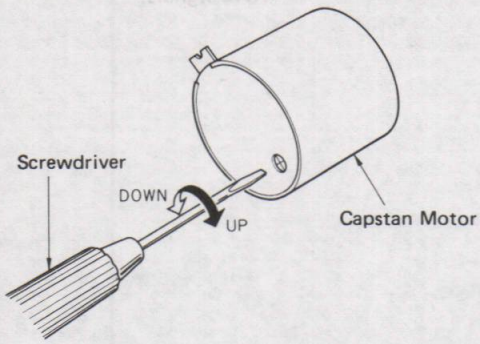
ADJUSTMENT LOCATION DIAGRAM



TAPE DECK MECHANISM Section

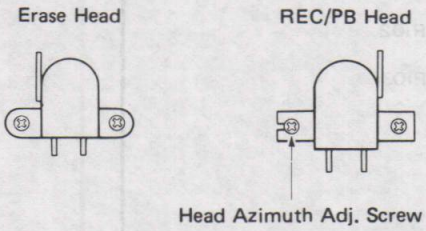
1. ADJUSTING THE TAPE SPEED

1) Setting – Connect a frequency counter to the output terminal.
2) Test tape – MTT-111 (3 kHz)
3) Adjustment procedure – Play back the test tape, and insert a standard screwdriver into the motor adjusting hole and adjust till the frequency counter indicates 3000 $^{+10}_{-0}$ Hz.



2. ADJUSTING THE HEAD ANGLE

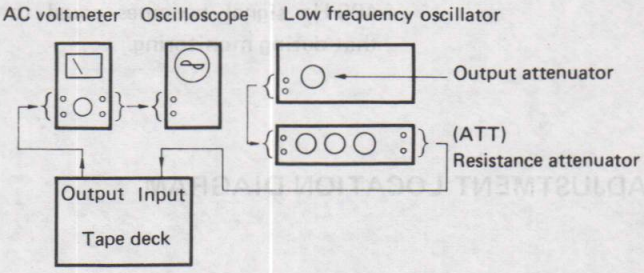
1) Setting . . . . . Set the PLAY-BACK OUTPUT LEVEL ADJUSTMENT preset control VR102 (L), VR202 (R) to the max. level.
2) Test tape . . . . . MTT-215C (10k/315Hz, –10 dB, NORMAL)
3) Location of adjustment . . . . . Head angle adjusting screw
4) Adjustment procedure . . . . . Play back the test tape and adjust for maximum output on both channels.



TAPE DECK ELECTRICAL Section

MEASURING INSTRUMENTS AND TEST TAPES

1. Low-frequency oscillator . . . . . 20 Hz – 20 kHz
2. Variable resistance attenuator . . . . . 0 – 90 dB, 0.1 or 0.5 dB step
3. AC voltmeter . . . . . Measuring range of 20 Hz – 200 kHz or more, input impedance more than 100 kΩ, and –60 dB or more
4. Frequency counter
5. Oscilloscope
6. Test tape
   - MTT-111 (3 kHz)
   - MTT-215C (10K/315 Hz, –10dB, NORMAL)
   - MTT-150 (400Hz dolby level)
   - AC-512 (blank)
7. How to connect the instruments.
   1) Connect a load resistance 22 kΩ, then the AC voltmeter and oscilloscope to the output terminal of deck.
   2) To adjust the recording system, connect the low-frequency oscillator and resistance attenuator to the input terminal of deck.



ADJUSTMENT OF PLAY-BACK SYSTEM

1. ADJUSTING THE PLAY-BACK OUTPUT LEVEL

1) Test tape . . . . . MTT-150 (Dolby level)
2) Location fo adjustment . . . . . Preset control VR 501 (L), VR 601 (R)
3) Location of detection . . . . . (+) side of electrolytic capacitor C 523 (L), C 623 (R)
4) Adjustment procedure . . . . . Playback the test tape and adjust untill the output level on the (+) side of C 523 and C 623 becomes 580 mV ± 0.25 dB.

3) Insert the connector CON-8 again into the main PC board.
4) Connect the (–) lead of a MItimeter to pin 1 (main body side) of connector CON-8 and connect the (+) side of tester to the brown lead wire disconnected from pin 1. See Fig. 7.
5) Put the player into a state as in 1 (1). With the tone arm raised, adjust the cam pin A of Fig. 1 till the meter indicates 10 ± 1 μA.

6) Allow the tone arm to lower from the state in above (5), and make sure that the meter indication is within ± 1 μA of the value obtained with the tone arm raised.
7) Connect a voltmeter between PIN 1 and GND of main PV board and adjust the preset resistor VR 101 till the voltmeter indicates 3.5V.

7. SERVO MOTOR SPEED ADJUSTMENT

1) Place a test record on the turntable and connect a frequency counter to the output terminal of player via an amplifier.
2) Remove the back of player and adjust the player speed to 33 rpm.
3) Play back 3 KHz of test record and adjust the preset resistor VR 103 for 3020Hz.
4) Set the player speed to 45 rpm. Play back as in the case of above (3) and adjust the preset resistor VR 102 till the counter indicates 4070Hz.

ADJUSTMENT LOCATION DIAGRAM

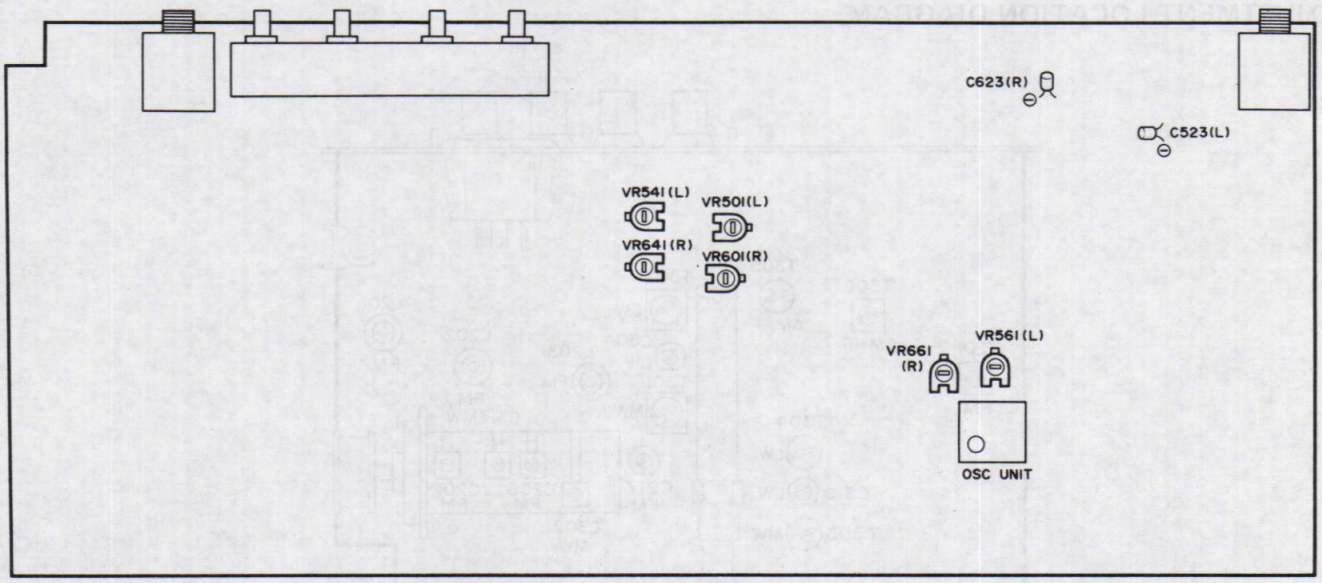


Fig. 7

ADJUSTMENT OF TUNER

- **Measuring instruments**
* AM signal oscillator (AM-SG)
* Stereo modulator
* Frequency counter
* AM loop antenna
* FM signal oscillator (FM-SG)
* Oscilloscope
* AC voltmeter

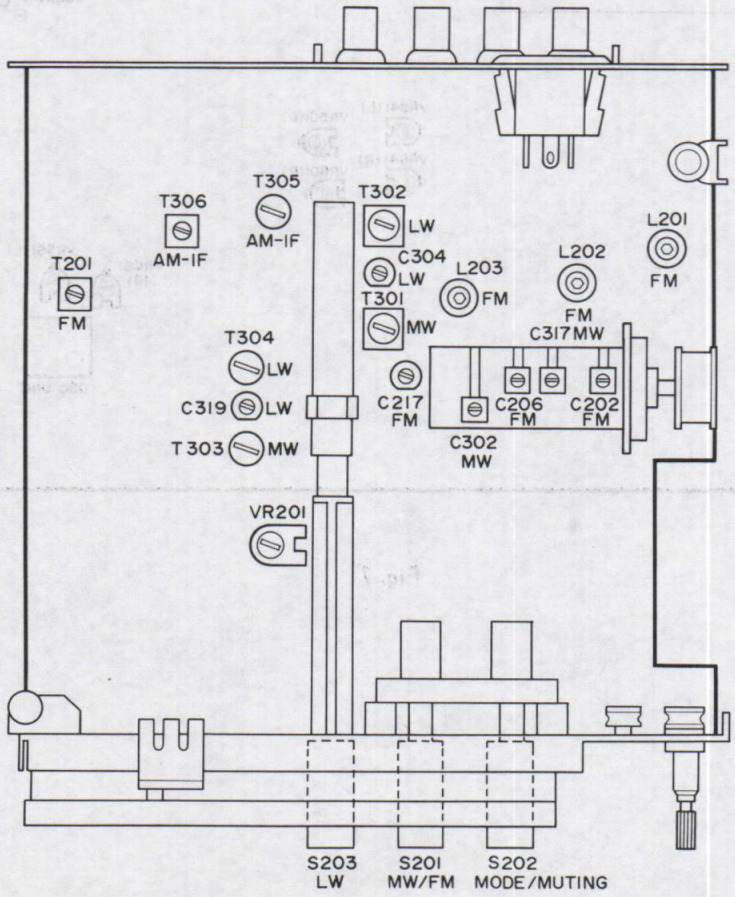
1. FM-RF Adjustment

1) Connect the output of FM-SG to an antenna terminal. Take the output from a pin 2 of IC202 and connect it to the AC voltmeter.
2) Set the frequency of SG to 87.4 MHz. Tune the pointer of the set to the lowest frequency. Adjust the local oscillator coil L203 so that 87.4 MHz can be received from SG. Adjust so that the AC voltmeter registers the maximum reading.
3) Set the SG frequency to 108.3 MHz. Tune the pointer of the set to the highest frequency. Adjust the trimmer capacitor C217 so that 108.3 MHz can be received from SG. Adjust so that the AC voltmeter registers the maximum reading.
4) Set the frequency to 88 MHz. Tune the set so that 88 MHz can be received from SG. Adjust tuning coils of L201 and L202 so that the AC voltmeter registers the maximum reading.
5) Set the SG frequency to 108 MHz. Tune the set so that 108 MHz can be received from SG. Adjust trimmer capacitors of C202 and C206 so that the AC voltmeter registers the maximum reading.
6) Repeat steps 2) through 5).

2. FM·IF, MPX Adjustment

1) Connect the DC voltmeter to pins 7 and 10 of IC201. Put the set in a state of not receiving a signal. Adjust T201 so that the voltmeter reads 0 ± 50 mV.
2) Set the SG frequency to 98 MHz. The output should be 66 dB, 1 KHz monoral 100% modulation. Tune the set so that 98 MHz can be received from SG. Connect a distortion factor meter to terminals 1 and 2 of J202. Make sure that the distortion factor is below 1%. If the distortion factor exceeds 1%, adjust T201 again.

ADJUSTMENT LOCATION DIAGRAM



3) In the state of above 2), set the modulation to 0%. Connect the frequency counter to a test point TP 1 of IC202. Adjust a semi-solid resistor VR201 so that the frequency counter reads 19 KHz ± 50 Hz.

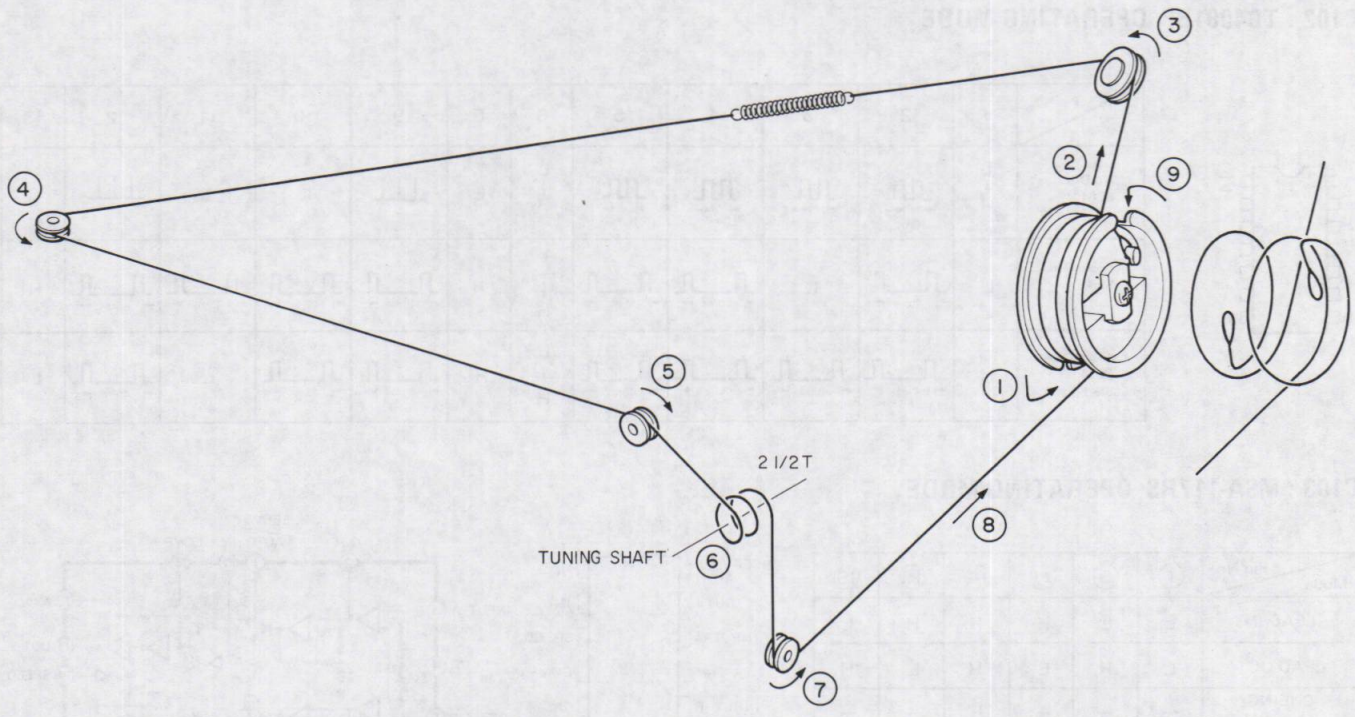
3. AM Adjustment

1) Connect the output of AM-SG to a loop antenna. Connect the loop antenna attached to the main body to the AM antenna terminal, take the output from pin 12 of IC201, and connect it to the AC voltmeter.
2) Set the AM-SG frequency to 520 KHz. Tune pointer to the lowest frequency. Adjust the local oscillator transformer so that 520 KHz can be received from AM-SG.
3) Set the AM-SG frequency to 1650 KHz. Tune pointer to the highest frequency. Adjust the local oscillator trimmer C317 so that 1650 KHz can be received from AM-SG.
4) Set the AM-SG frequency to 600 KHz. Tune the set so that 600 KHz can be received from AM-SG. Adjust the tuning transformer T301 so that the AC voltmeter registers the maximum reading.
5) Set the AM-SG frequency to 1400 KHz. Tune the set so that 1400 KHz can be received from AM-SG. Adjust the trimmer capacitor C302 so that the AC voltmeter registers the maximum reading.
6) Repeat steps 2) through 5) several times.

4. Adjustment of LW

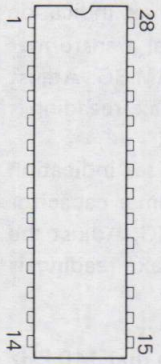
1) Obtain a state as in the adjustment of MW.
2) Set AM-SG frequency at 140 kHz. Tune set indication to the lowest frequency. Adjust the local transformer T304 till 140 kHz can be received from AM-SG. Adjust the tuning transformer T302 so that the max. reeading is obtained on an AC voltmeter.
3) Set AM-SG frequency to 360 kHz. Tune set indication to the highest frequency. Adjust the trimmer capacitor C319 till 360 kHz is received from AM-SG. Adjust the trimmer capacitor C304 so that the max. reading is obtained on an AC voltmeter.
4) Repeat steps 2) and 3) several times.
5) Set AM-SG frequency to 140 kHz. Tune so that 140 kHz can be received from AM-SG. Adjust IF transformers T305 and T306 so that the max. reading is obtained on an AC voltmeter.

DIAL CORD STRINGING



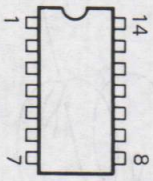
INTERNAL DIAGRAMS AND PINOUT OF INTEGRATED CIRCUITS TURNTABLE Section

IC101 : 1320SL OPERATING MODE



Pin No.	2	3	5	6	7	8	14	15	16	17	21	22	23	26	27	28
Arm Rest Position (Power ON)	L	H	L	L	15ms	15ms	H	L	H	L	15ms		15ms	L	L	L
Disk Side S203 III CUE (Arm : Down)	L	H	L	45ms	45ms	10ms 45ms	H	H	H	H	45ms	45ms	45ms	L	H	L
S204 Start : Push Arm : Inward	L	H	45ms	L	45ms	10ms 45ms	L	H	H	L	45ms		45ms	L	H	L
S204 ON Start Arm : Lowering (Lead-In)	H	H	L	L	45ms	10ms 45ms	H	H	H	H		45ms	45ms	L	H	L
S202 Stop(Play) Arm : Rising	H→L	H	L	L	45ms	10ms 45ms	H	H	H	H→L	45ms		45ms	L	H	L
S202 Stop Arm : Outward (Lead-Out)	L	H	L	L	15ms	15ms	H	L	H	L		15ms	15ms	L	H	L
Arm Lift S204 Pushing	L	H	20ms	L	20ms	20ms	L	H	L	L	20ms	20ms	20ms	L	H	L
Arm Lift S202 Pushing	L	H	L	L	20ms	20ms	H	L	L	L	20ms	20ms	20ms	L	H	L
Auto-End Detection	L	H	L	L	10ms 45ms	45ms	H	H	H	H→L		45ms	45ms	L	H	L

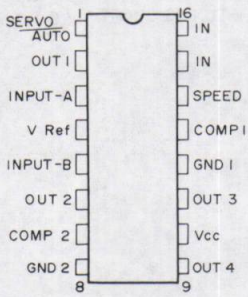
IC102 : TC4081BP OPERATING MODE

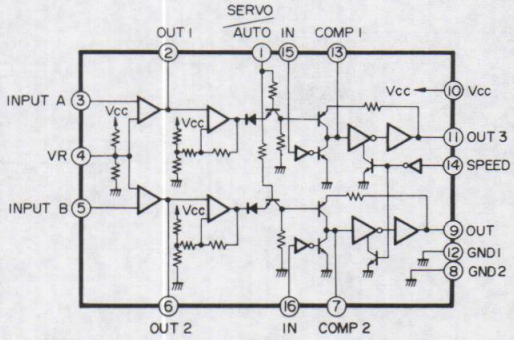


Pin No. / Actual	1	2	3	4	5	6	8	9	10	11	12	13
No Disk S204	L→H 17 Groove	10ms	10ms	10ms	10ms	L→H	L		L	L		L
30cm Disk S204 Start	L	45ms	L	45ms	45ms	L→H	H	45ms	45ms	45ms	45ms	H
17cm Disk S204 Start	H 17 Groove	45ms	45ms	45ms	45ms	L→H	H	45ms	45ms	L	45ms	L

IC103 : MSA-117RS OPERATING MODE

Mode \ Pin No.	①	⑨	⑪	⑭	⑮	⑯
LEAD-IN	L	L	H	H	H	L
LEAD-OUT	L	H	L	H	L	H
CUEING (Arm up)	—	—	—	L	—	—
Tracking Servo activiated	H	L	L	H	L	L

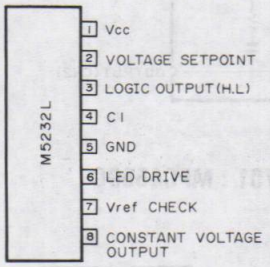




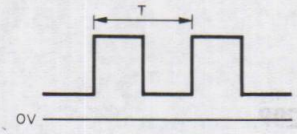
IC104 : TC4081BP OPERATING MODE

Pin No. / Actual	1	2	3	4	5	6	8	9	10	11	12	13
Rest Position (Power ON) Cover : Close	L	15ms	L	L	15ms	L	L	15ms	L	15ms	15ms	H
Rest Position (Power ON) Cover : Open	L	15ms	L	L	15ms	L	H	15ms	15ms	15ms	15ms	H
S203 ▮ Cue (Rest Position)	H	45ms	45ms	L	45ms	L	L	45ms	L	45ms	45ms	H
S204 ◁ Start	L	45ms	L	45ms	45ms	H	L	45ms	L	L	45ms	L
S202 ▷ Stop	L	45ms	L	L	45ms	L	H	45ms	45ms	L	45ms	L

IC105 : M5232L

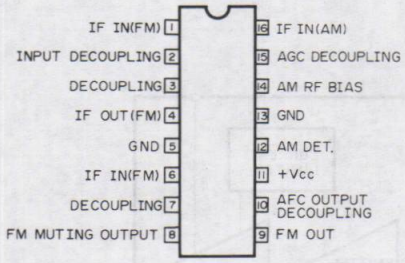


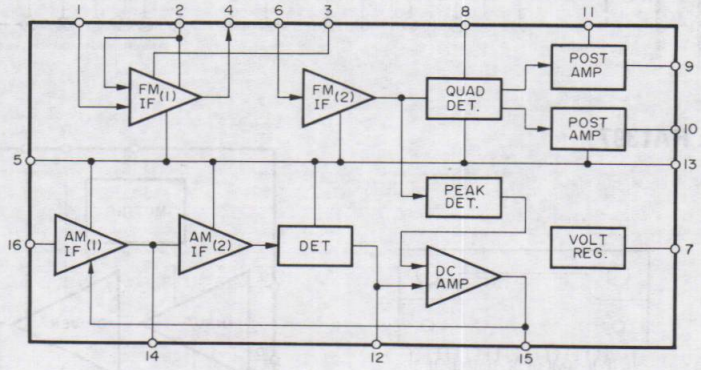
	Vcc	S1	S2	S3	S4
Icc	9V	OFF	OFF	OFF	—
V2	9V	ON	ON	OFF	b
V1	9V	ON	ON	OFF	a
V3	9V	ON	ON	OFF	c
V6	6V	ON	OFF	ON	d
f	6V	ON	ON	OFF	c



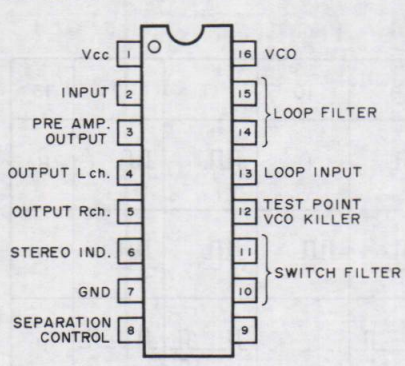
TUNER Section

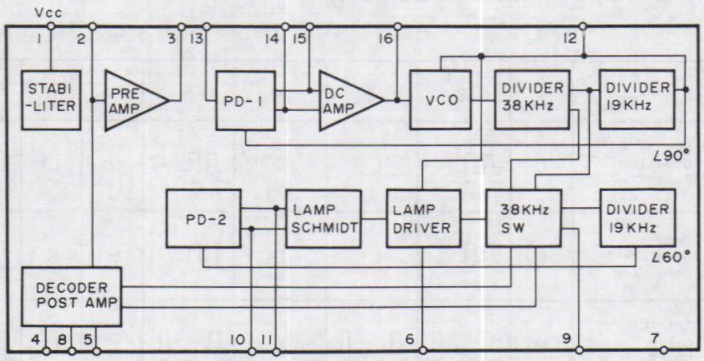
IC201 : HA12413





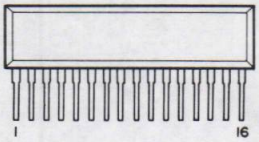
IC202 : KB4424A

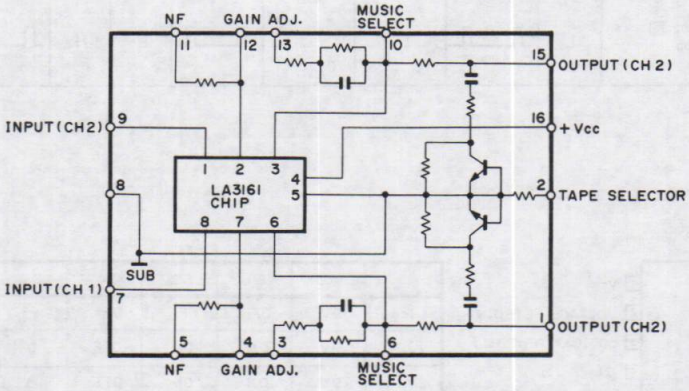




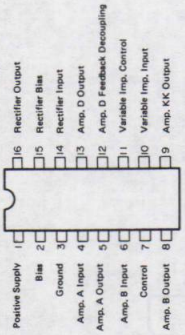
TAPE DECK Section

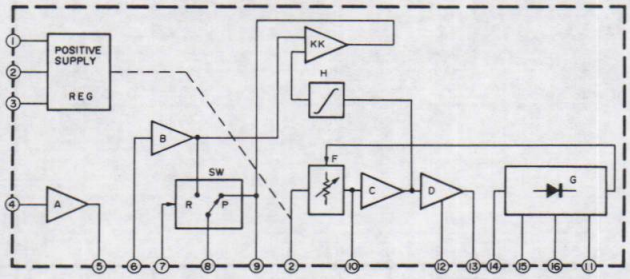
IC501 : STK3161



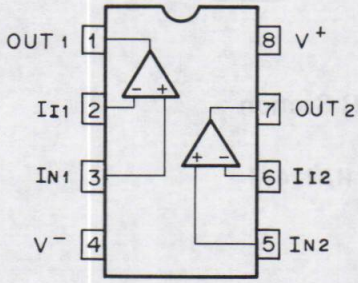


IC502 : TA7629P

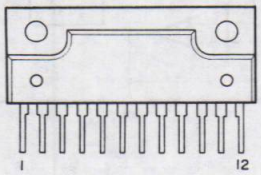


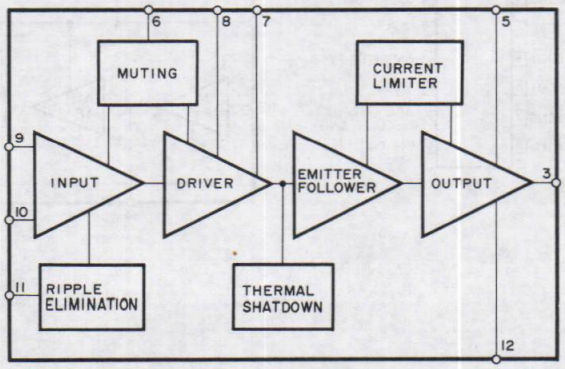


IC701 : MPC4559C



IC721/821 : HA1397

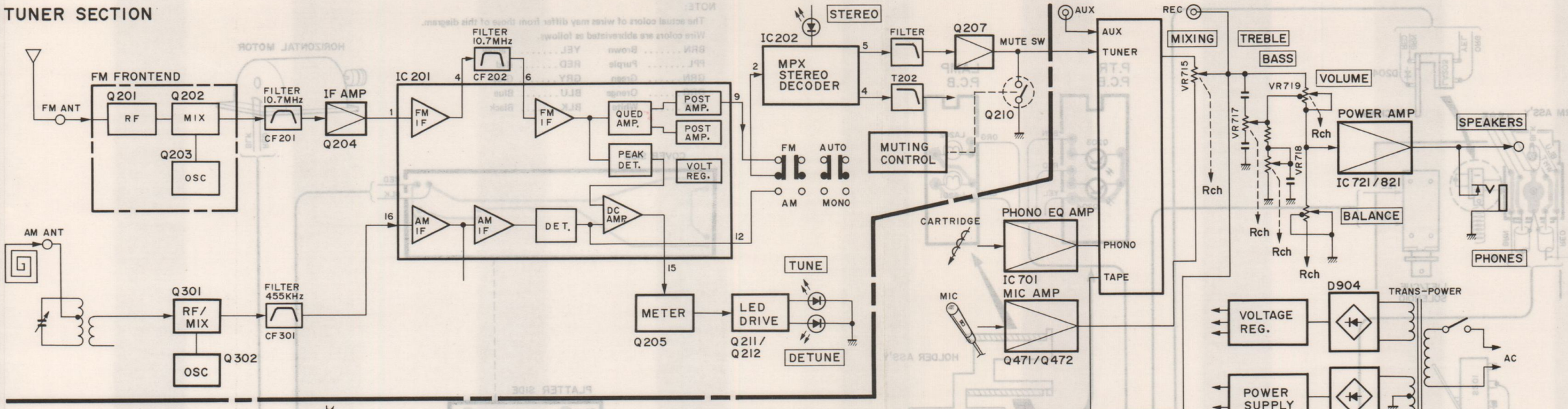




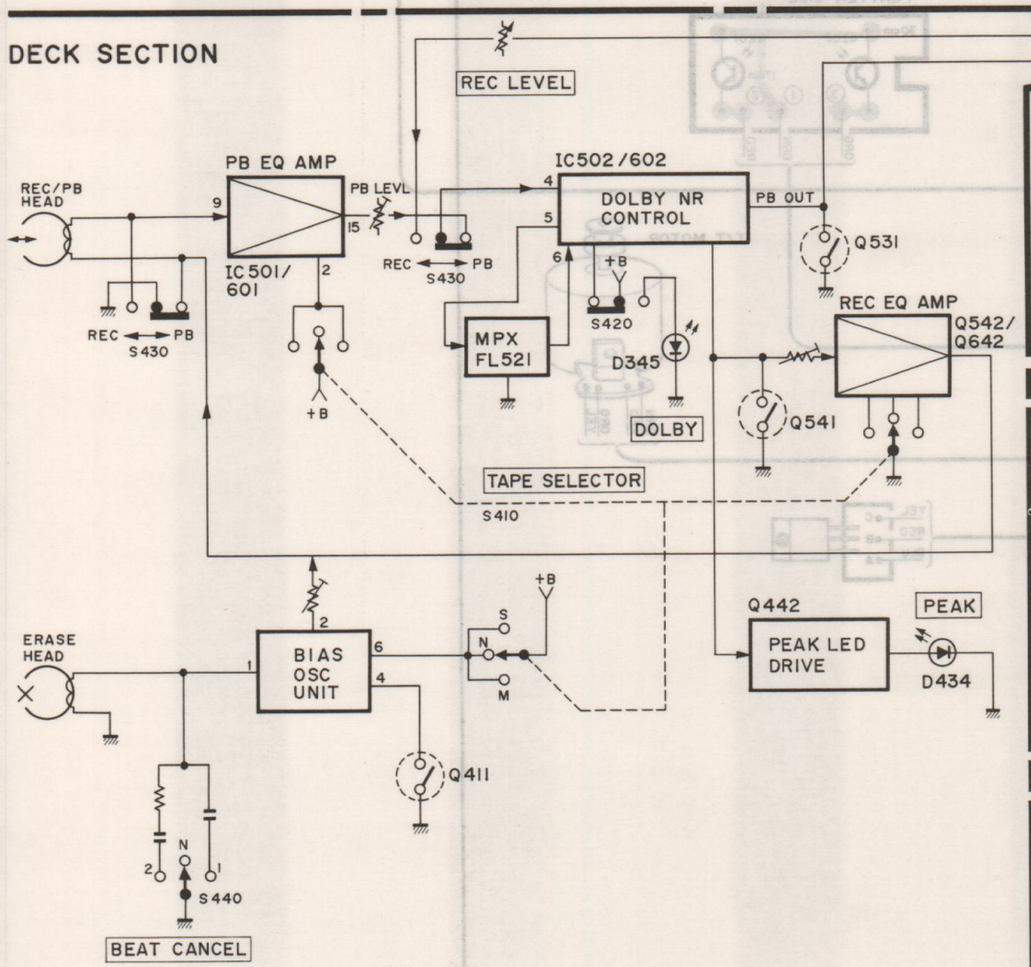
X-7 X-7

BLOCK DIAGRAM

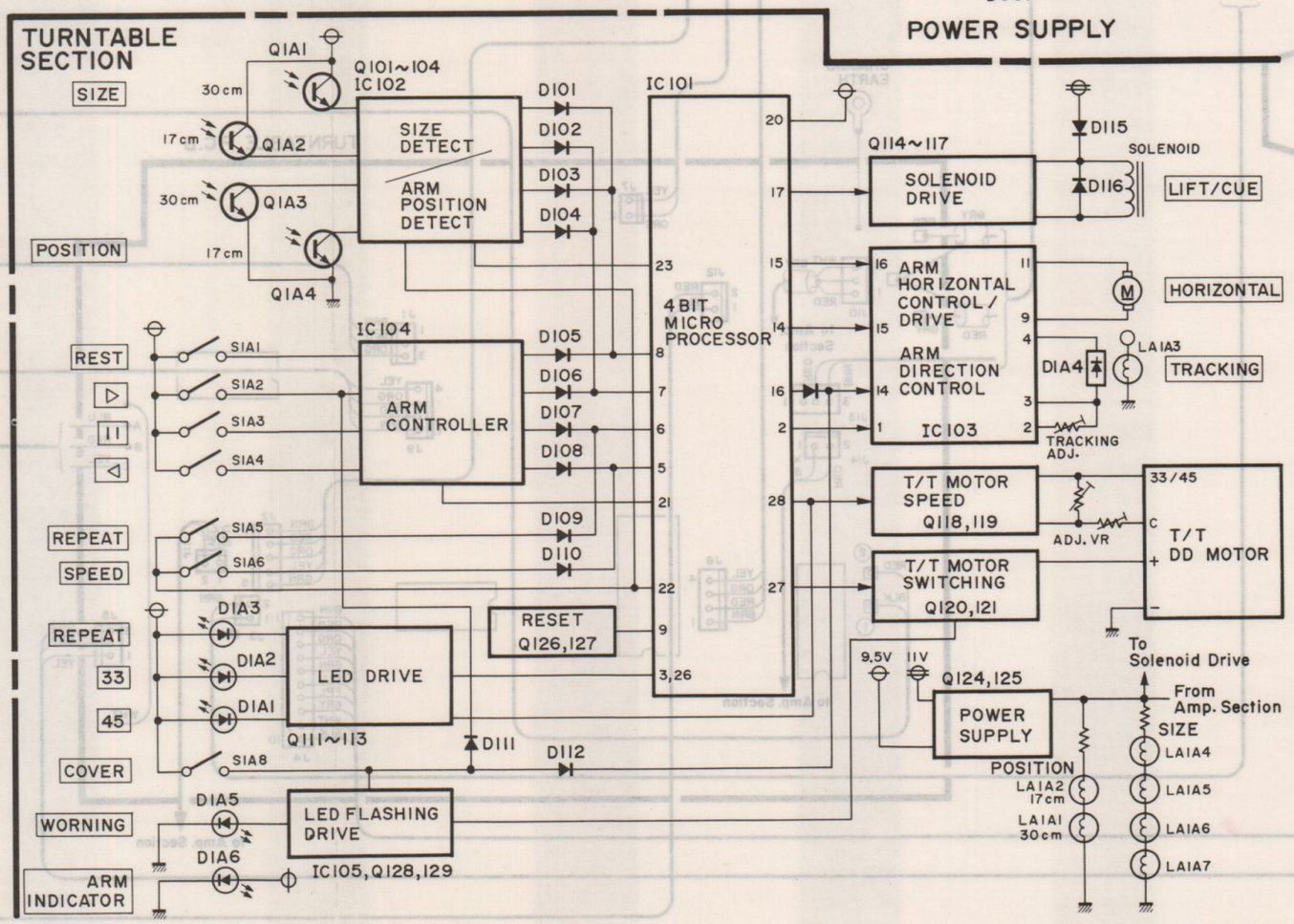
TUNER SECTION



DECK SECTION



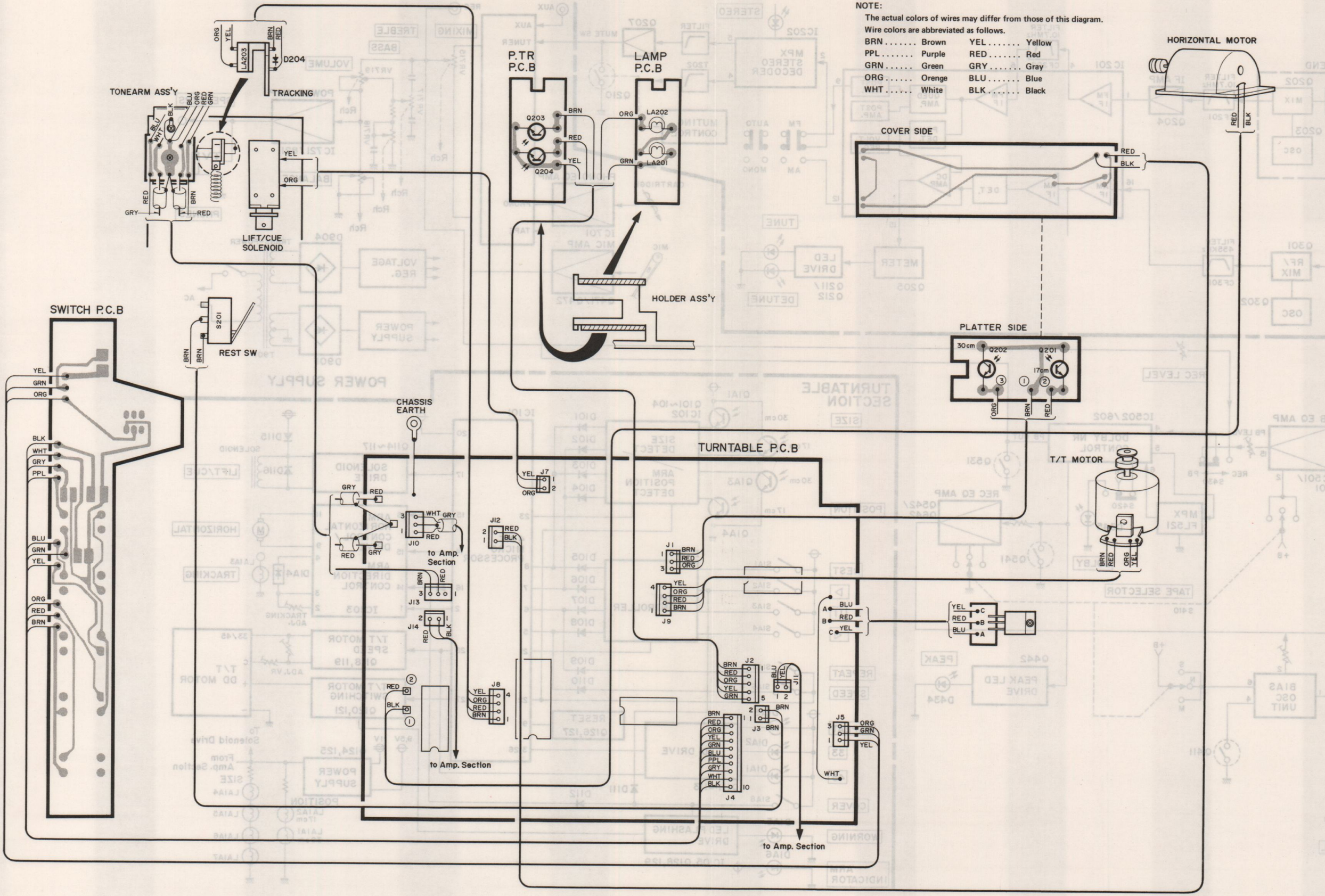
TURNTABLE SECTION



WIRING DIAGRAM . . . . TURNTABLE Section

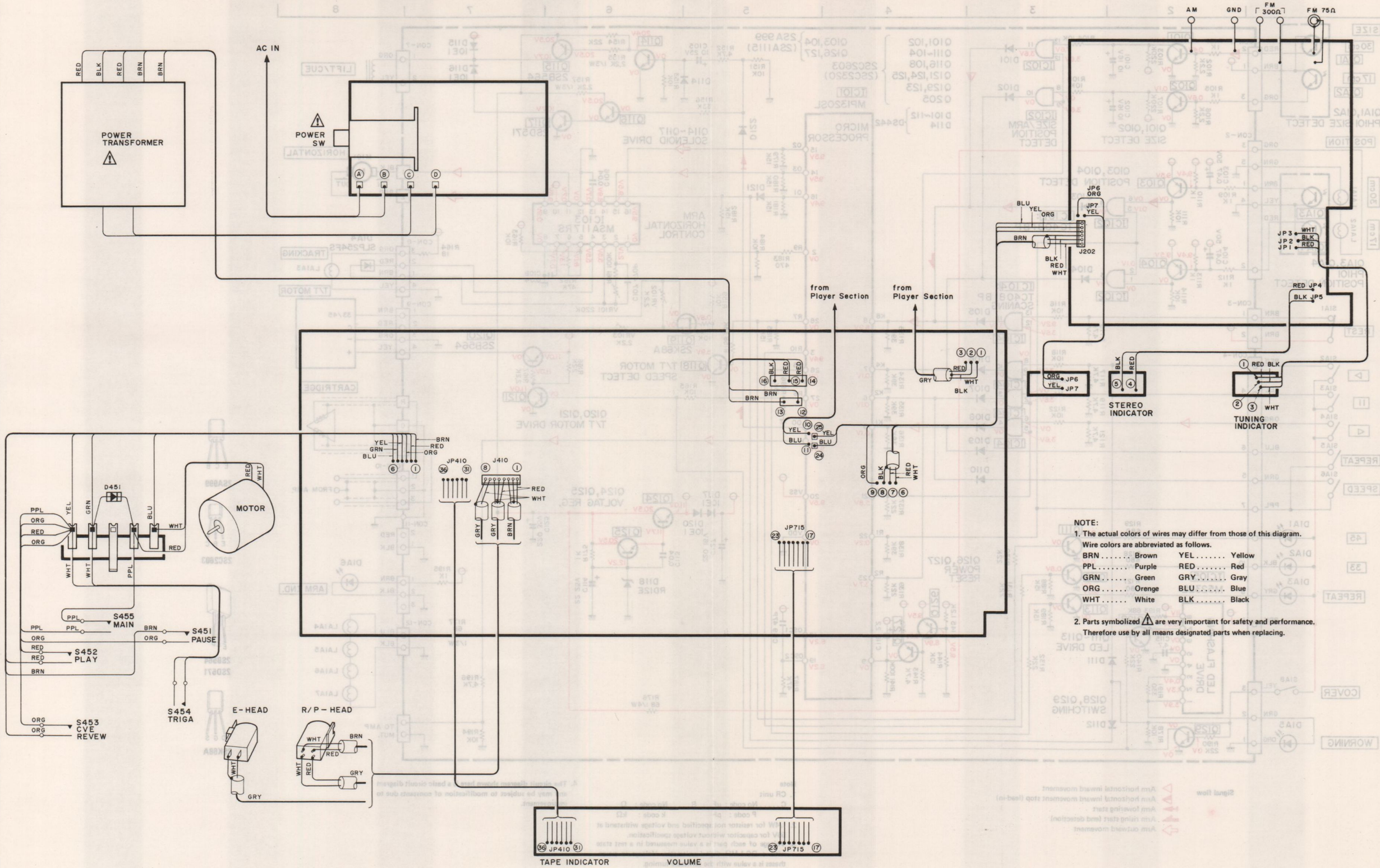
NOTE:
The actual colors of wires may differ from those of this diagram.
Wire colors are abbreviated as follows.

BRN	Brown	YEL	Yellow
PPL	Purple	RED	Red
GRN	Green	GRY	Gray
ORG	Orenge	BLU	Blue
WHT	White	BLK	Black



X-7	X-7

TAPE DECK, AMP, TUNER Section



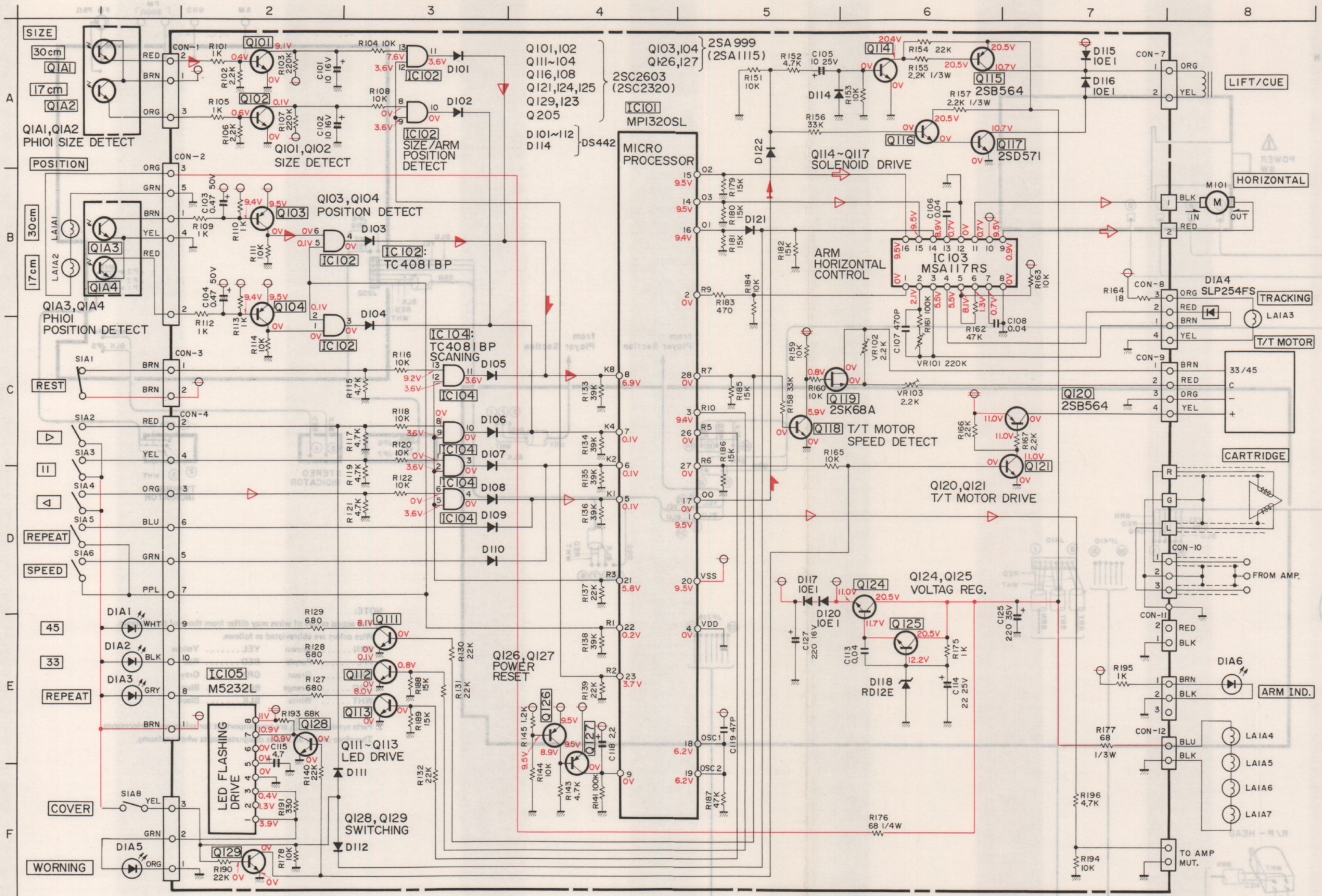
NOTE:

1. The actual colors of wires may differ from those of this diagram.
   Wire colors are abbreviated as follows.

BRN	Brown	YEL	Yellow
PPL	Purple	RED	Red
GRN	Green	GRY	Gray
ORG	Orenge	BLU	Blue
WHT	White	BLK	Black

2. Parts symbolized ⚠ are very important for safety and performance.
   Therefore use by all means designated parts when replacing.

SCHEMATIC DIAGRAM . . . . TURNTABLE Section

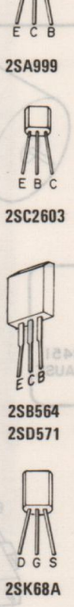


Signal flow

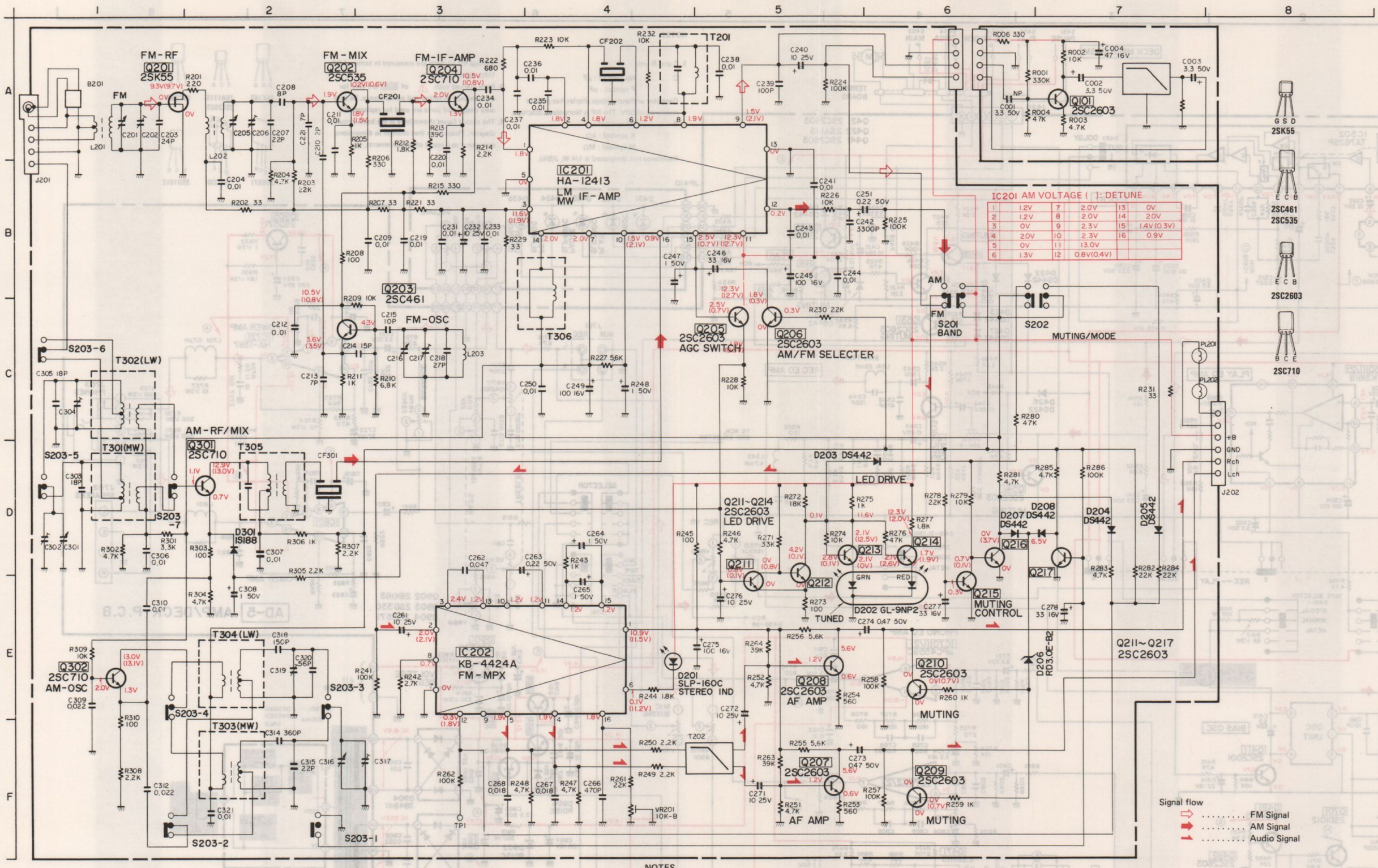
- Arm horizontal inward movement
- Arm horizontal inward movement stop (lead-in)
- Arm lowering start
- Arm rising start (end detection)
- Arm outward movement

Note

1. CR unit
   C . . . . . No code : μF R . . . . . No code : Ω
   P code : pF k code : kΩ
2. 1/4W for resistor not specified and voltage withstand at 50V for capacitor without voltage specification.
3. Voltage of each part is a value measured in a rest state with a DC 1 MΩ digital voltmeter. Voltage in parantheses is a value with the turntable turning.
4. **The circuit diagram shown here is a basic circuit diagram and may be subject to modification of constants due to improvement.**



TUNER Section

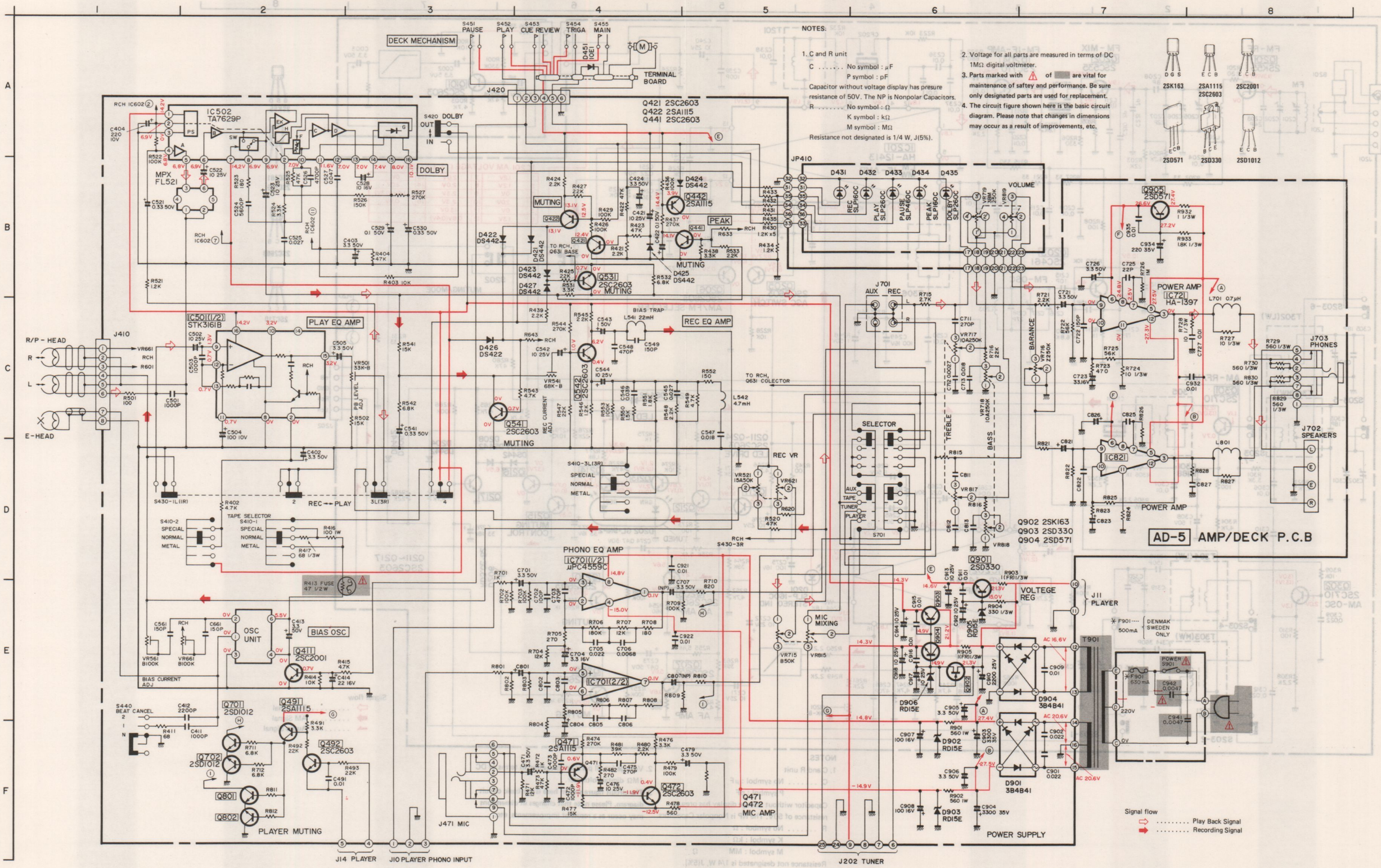


IC201 AM VOLTAGE ( ): DETUNE					
1	1.2V	7	2.0V	13	0V
2	1.2V	8	2.0V	14	2.0V
3	0V	9	2.3V	15	1.4V (0.3V)
4	2.0V	10	2.3V	16	0.9V
5	0V	11	13.0V		
6	1.3V	12	0.8V (0.4V)		

NOTES.

1. C and R unit
   C ..... No symbol : μF
   P symbol : pF
   Capacitor without voltage display has presure resistance of 50V. The NP is Nonpolar Capacitors.
   R ..... No symbol : Ω
   K symbol : kΩ
   M symbol : MM Ω
   Resistance not designated is 1/4 W, J(5%).
2. Voltage for all parts are measured in terms of DC 1MΩ digital voltmeter.
3. **The circuit figure shown here is the basic circuit diagram. Please note that changes in dimensions may occur as a result of improvements, etc.**

TAPE DECK, AMP Section



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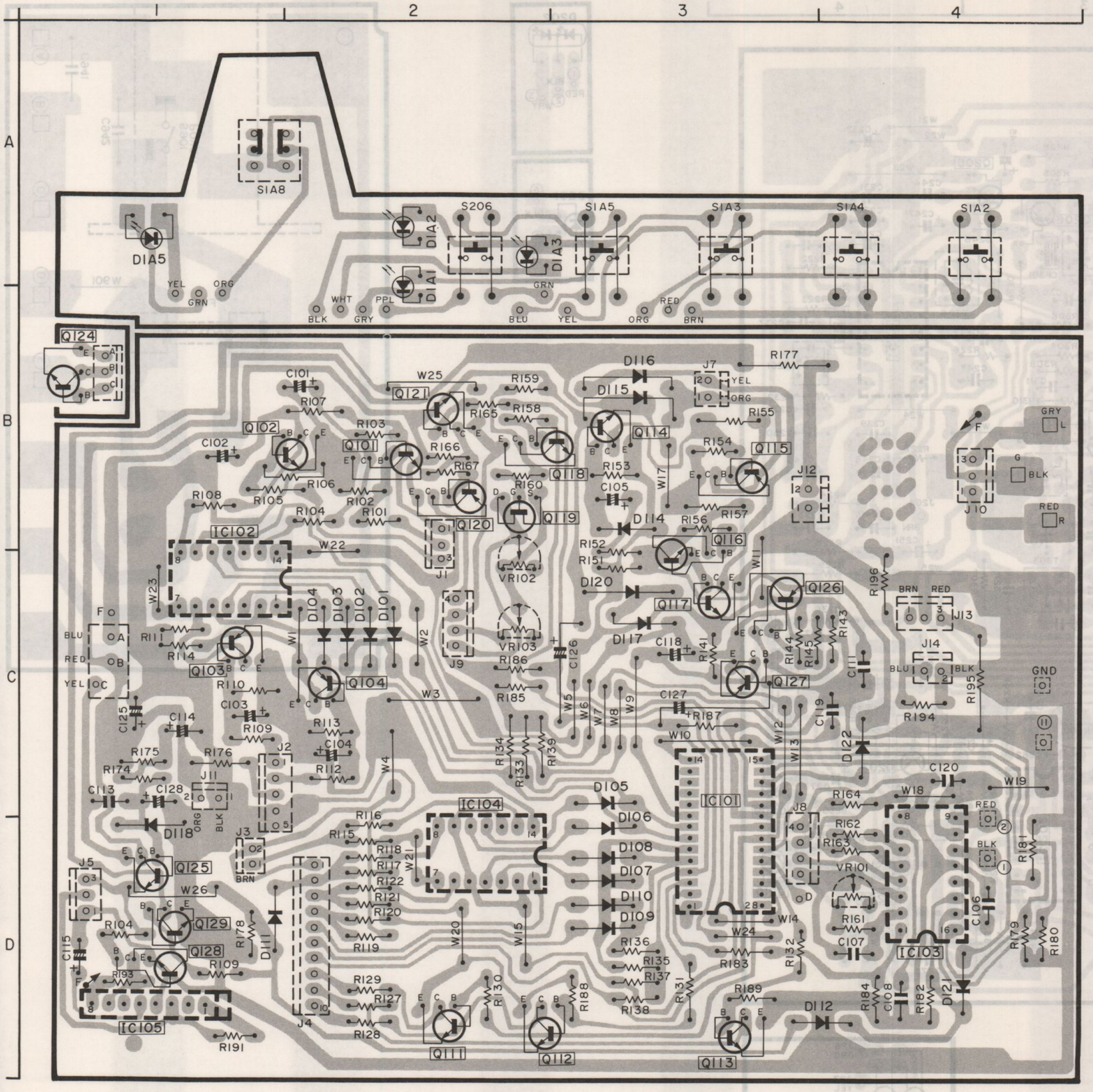
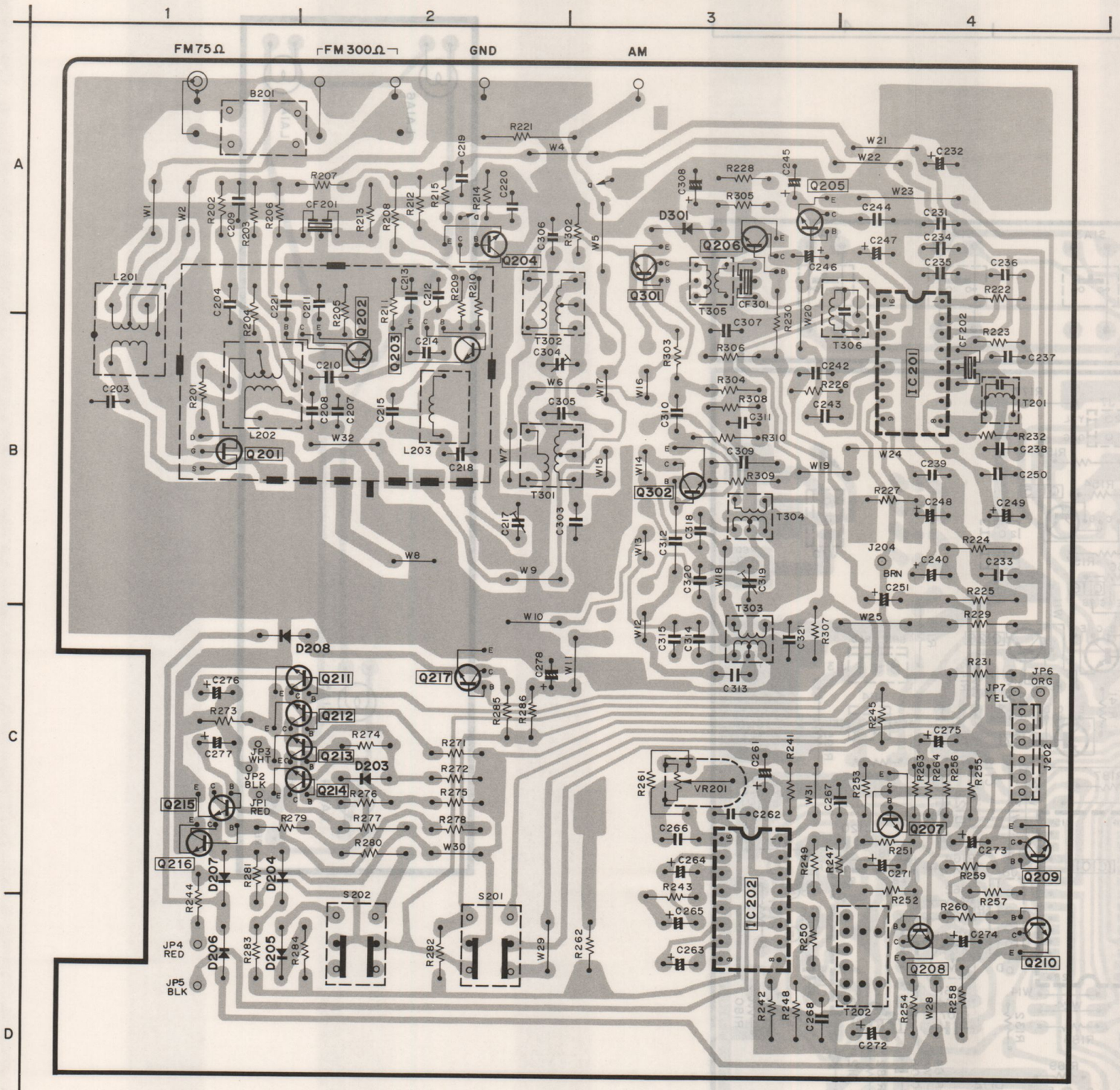
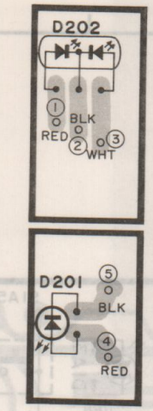
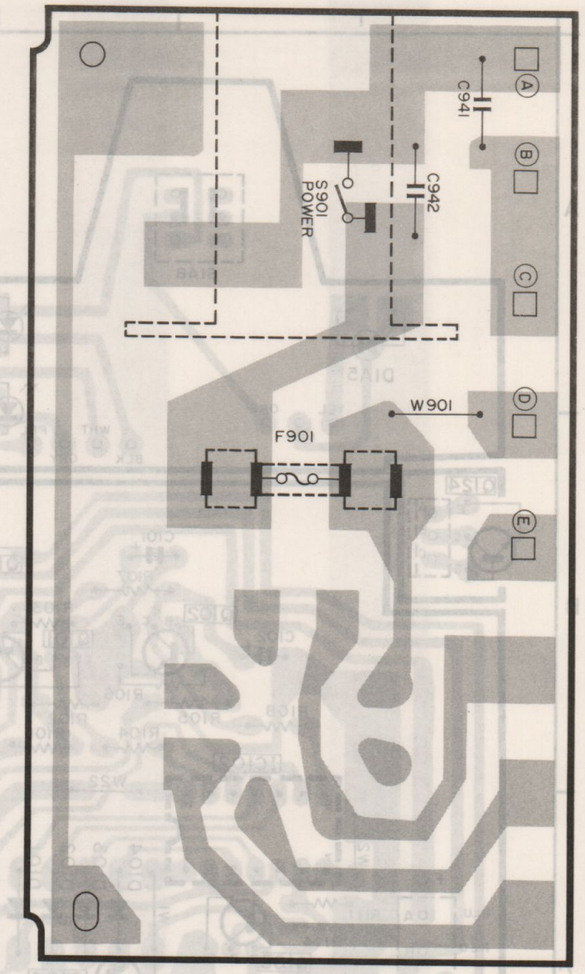
PRINTED CIRCUIT BOARD . . . . TURNTABLE Section

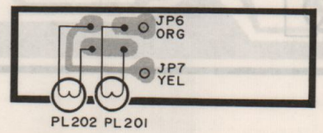


TUNER Section









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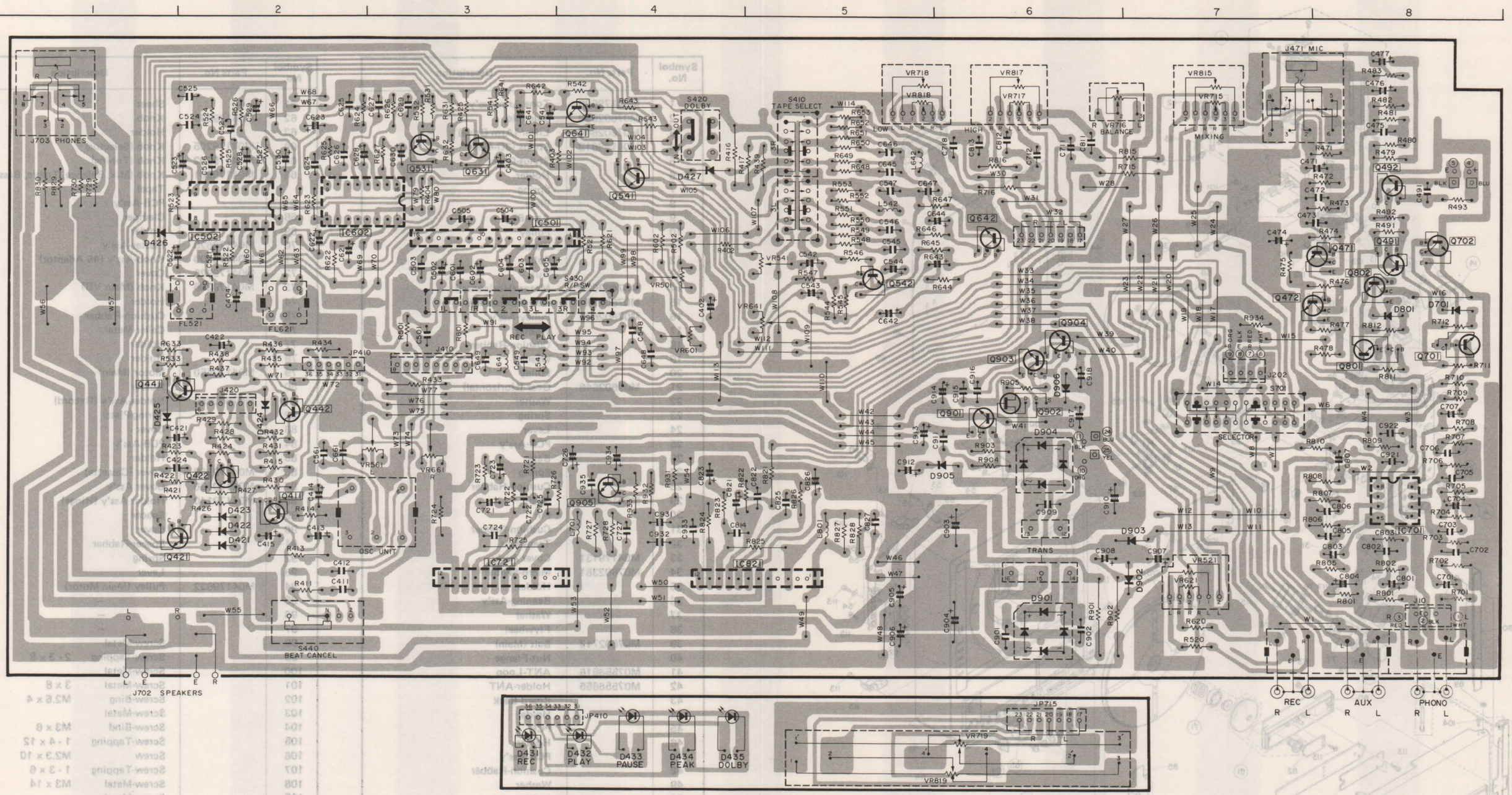
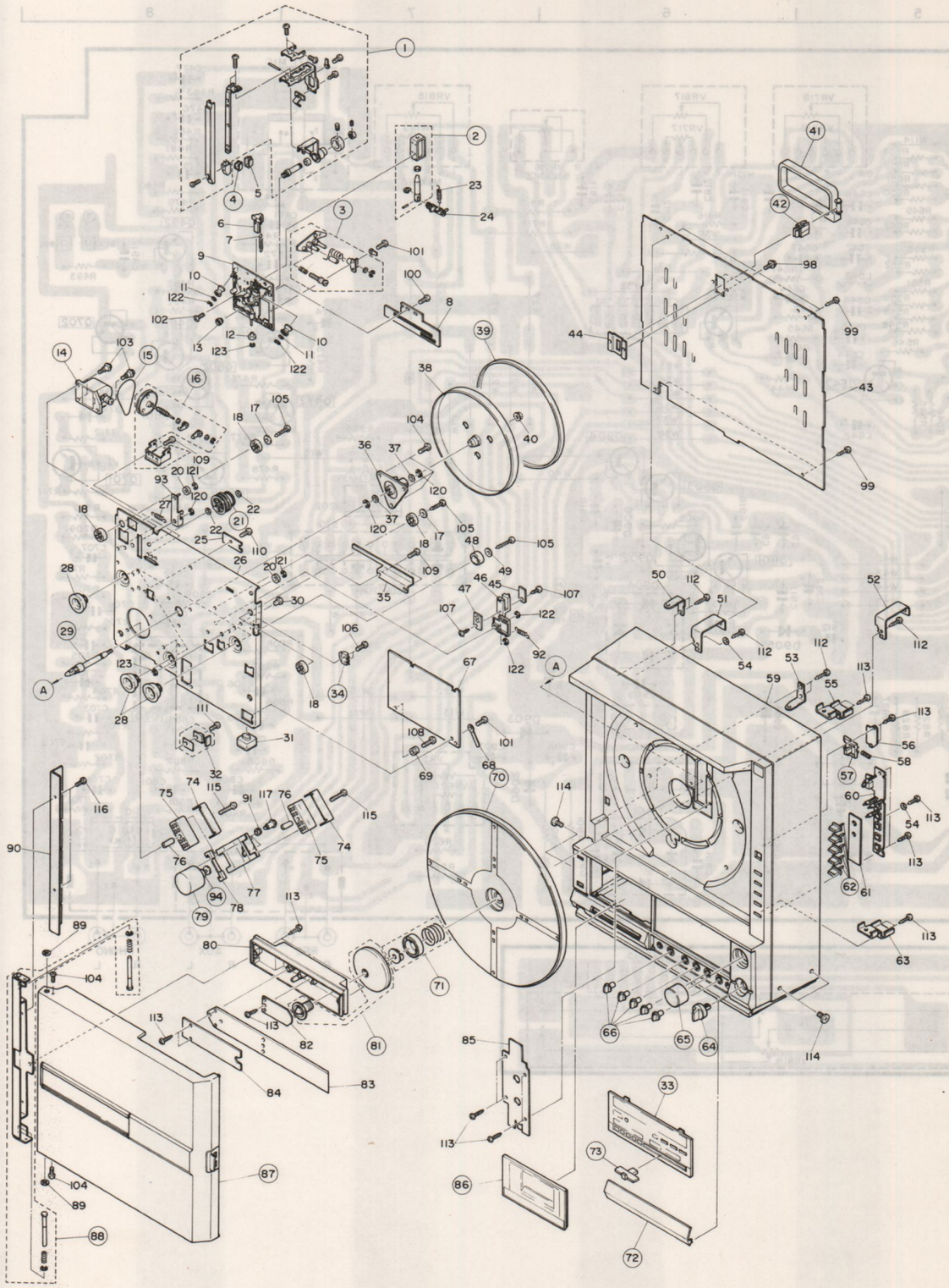
TAPE DECK, AMP Section



TURNTABLE MECHANISM EXPLODED VIEW



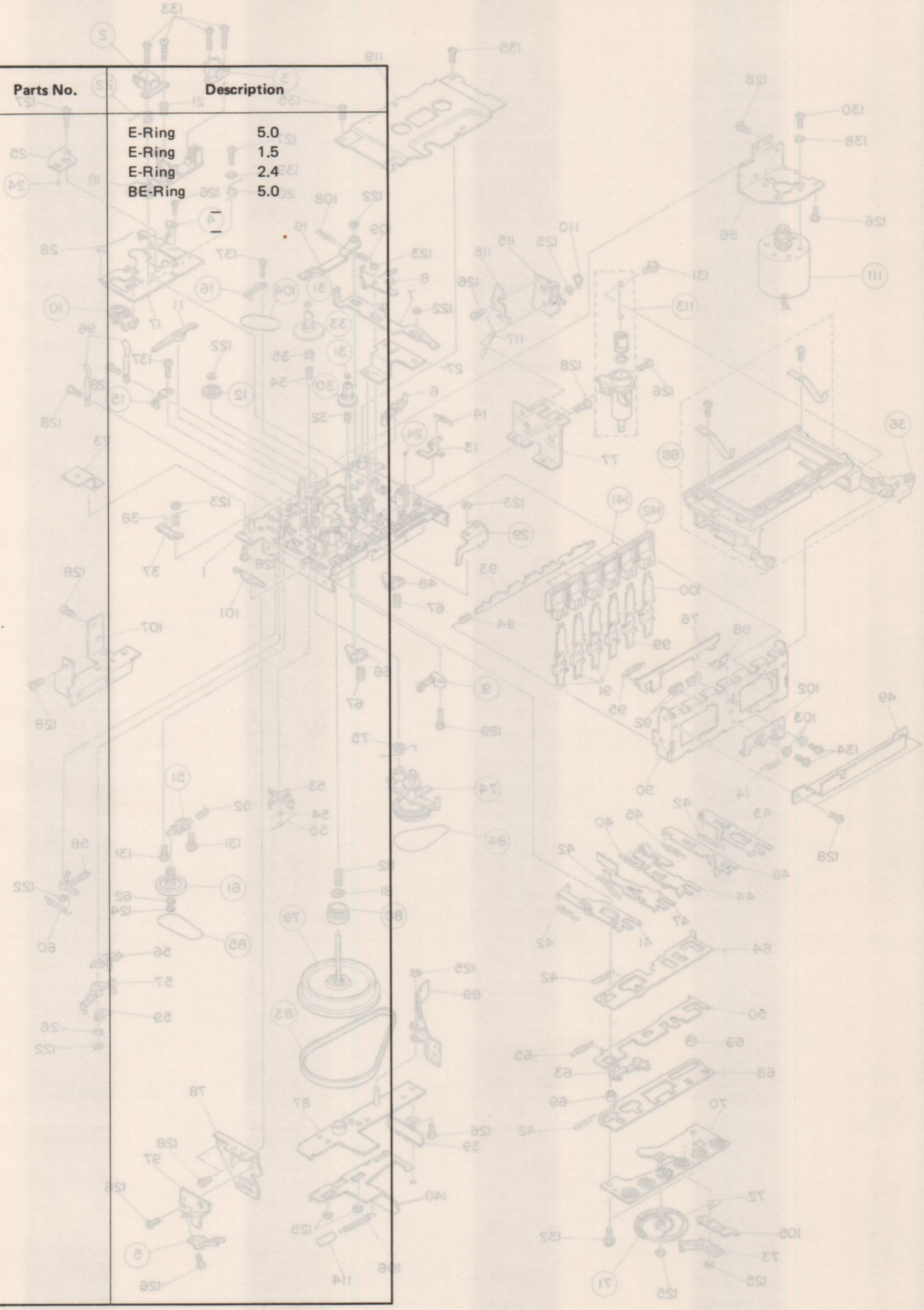
TURNTABLE MECHANISM PARTS LIST

Symbol No.	Parts No.	Description
1	M04179600	Tone Arm Ass'y
2	M07602530	Solenoid
3	M07602640	Lifter (Arm Drive)
4	M04168612	Stylus (3D-47M)
5		Stylus-Cover
6		Holder
7		Spring
8		Plate
9		Arm-Base
10		Pulley
11		Washer
12		Pulley
13		Nut
14	M07469639	Motor (Horizontal)
15	M07602714	Belt (Horizontal)
16	M07602645	Pulley-Ass'y
17		Washer
18		Cushion-Rabber
19		Washer
20		Pulley
21	M07602646	Gear (Horizontal)
22		Washer
23		Spring
24		Lever
25		PCB-Ass'y
26		Base
27		Spring
28		Cushion-Rabber
29	M04179625	Shaft
30		Pin
31		Cushion-Rabber
32		Transistor
33	M04179131	Cover Ass'y
34	M07602381	Micro-Switch
35		Holder
36		Beaning-Ass'y
37		Washer
38		Flywheel
39	M07602713	Belt (Main)
40		Nut-Flange
41	M07556516	ANT-Loop
42	M07556655	Holder-ANT
43		Board-Back
44		Holder
45		PCB
46		Holder
47		PCB-Ass'y
48		Cushion-Rabber
49		Washer
50		Holder
51		Holder
52		Holder
53		Holder
54		Washer
55		Holder
56		Plate
57	M04179204	Knob
58		Spring
59		Cabinet
60		PCB-Ass'y (SW)

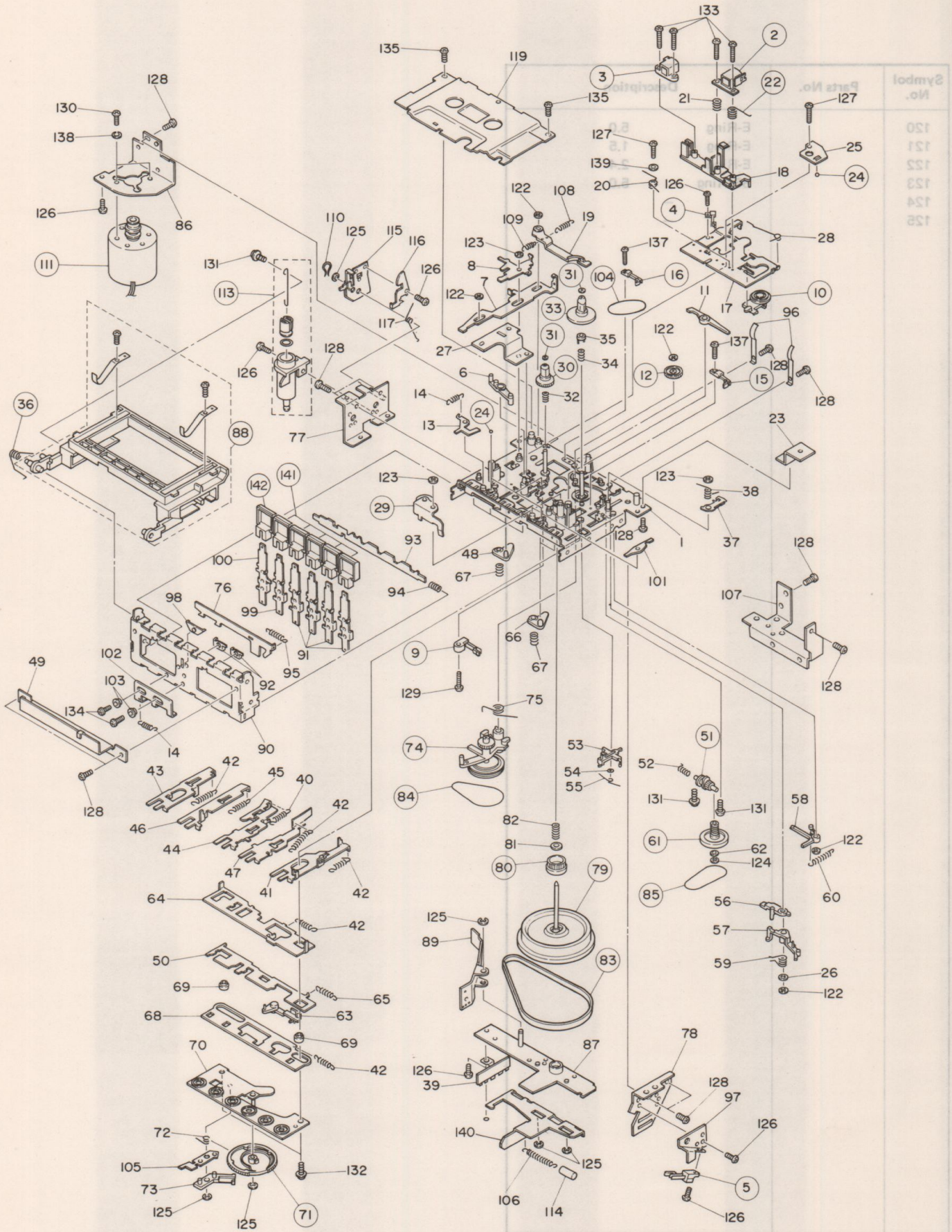
Symbol No.	Parts No.	Description	
61		Sheet	
62	M04179203	Knob	
63		Holder	
64	M04179205	Knob (Selector)	
65	M04179202	Knob (Tuning)	
66	M04179201	Knob (Mix, Balance, Treble, Bass, Tape)	
67		PCB-Ass'y	
68		Clamper	
69		Holder	
70	M04179620	Platter-Ass'y	
71	M04179200	Knob-Ass'y (45 Adaptor)	
72	M04179925	Cover	
73	M04179206	Knob (Main VR)	
74		Holder	
75		Cushion-Rabber	
76		Caller-Metal	
77		Holder	
78		Holder	
79	M04172550	Motor (Main)	
80		Holder	
81	M07602656	Holder-Ass'y (Record)	
82		Spring-Plate	
83		Cover	
84		PCB-Ass'y	
85		Holder	
86	M04179132	Cover (Cassette)	
87	M04179130	Cover Ass'y	
88	M04179140	Holder Ass'y (Hinge)	
89		Spacer	
90		Cover	
91		Spacer-Rabber	
92		Spring	
93		Lever	
94	M04179632	Pulley (Main Motor)	
95		—	
96		—	
97		—	
98		Screw-Metal	
99		Screw-Tapping	2 - 3 x 8
100		Screw-Metal	
101		Screw-Metal	3 x 8
102		Screw-Bing	M2.6 x 4
103		Screw-Metal	
104		Screw-Bind	M3 x 6
105		Screw-Tapping	1 - 4 x 12
106		Screw	M2.3 x 10
107		Screw-Tapping	1 - 3 x 6
108		Screw-Metal	M3 x 14
109		Screw-Metal	
110		Screw-Tapping	
111		Screw-PC	M3 x 6
112		Screw-Tapping	1 - 3 x 14
113		Screw-Tapping	1 - 3 x 12
114		Bolt	M6 x 8
115		Screw-Bind	M3 x 25
116		Screw-Metal	
117		Screw-Metal	
118		—	
119		—	

TAPE DECK MECHANISM EXPLODED VIEW

Symbol No.	Parts No.	Description	
120		E-Ring	5.0
121		E-Ring	1.5
122		E-Ring	2.4
123		BE-Ring	5.0
124		—	
125		—	



TAPE DECK MECHANISM EXPLODED VIEW

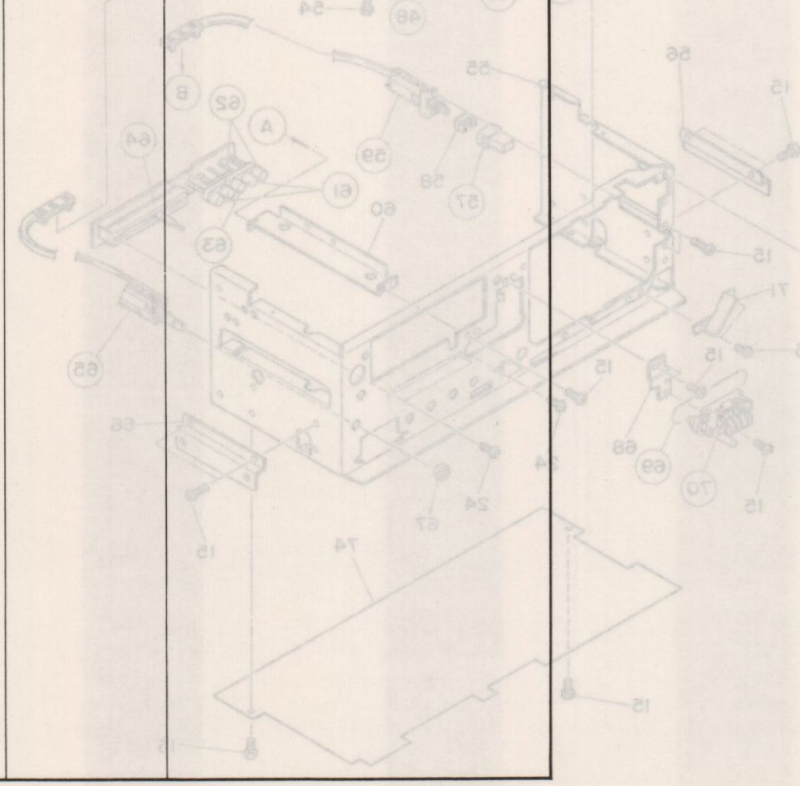


TAPE DECK MECHANISM PARTS LIST

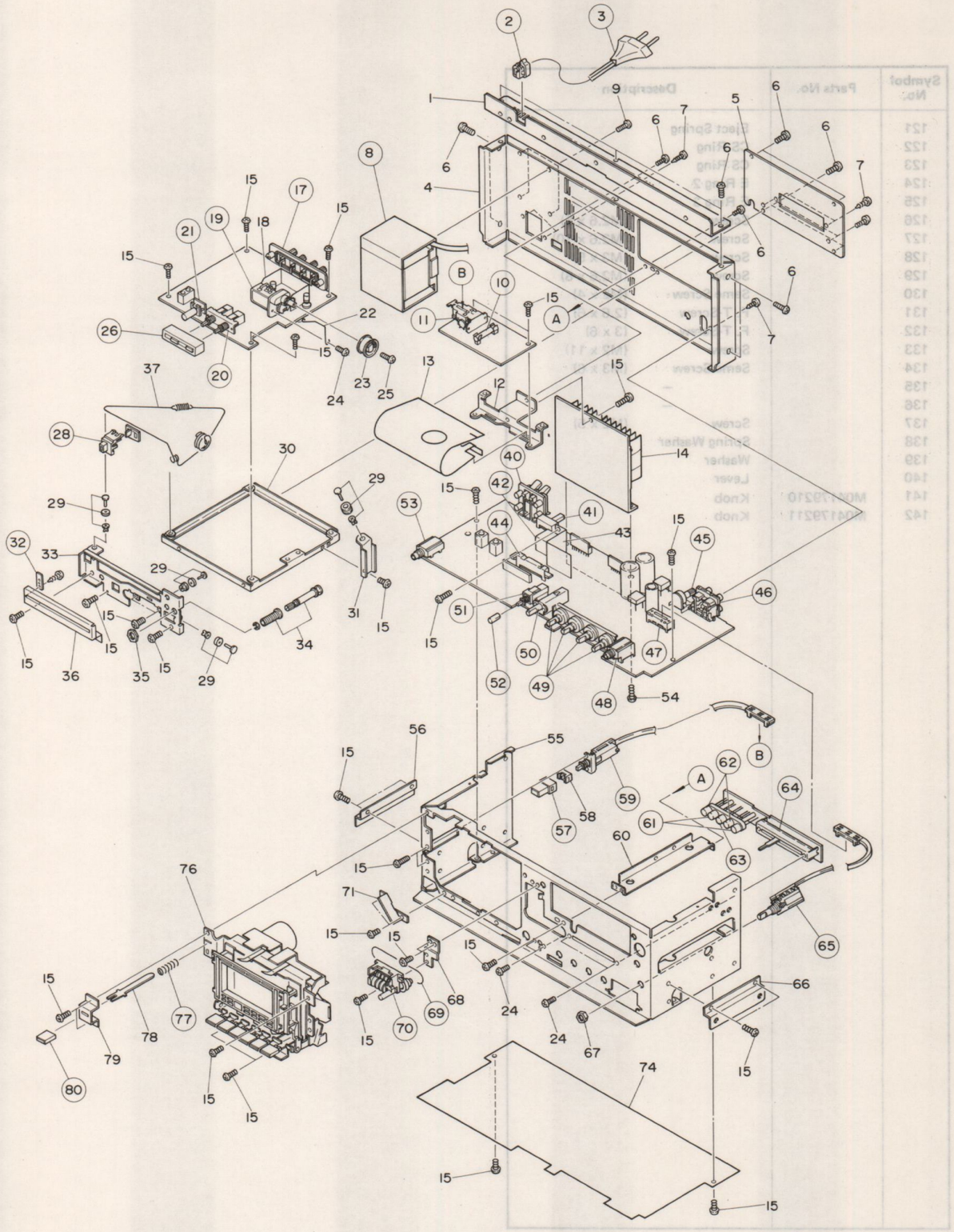
Symbol No.	Parts No.	Description
1		Chassis Ass'y
2	M04172520	R/P Head
3	M04172524	Erase Head
4	M04179375	Leaf Switch (Cue/Rev)
5	M05230377	Leaf Switch (Triga)
6		Cue Lever
7		Rec Inter Plart
8		Stop Sub Plart
9	M05230376	Leaf Switch (Play)
10	M05230722	Idler Ass'y
11		Pause Arm
12	M05230732	Idler Gear
13		Protecter
14		Spring
15	M05230378	Leaf switch (Pause)
16	M05230378	Leaf switch (Main)
17		Head Base
18		Head Stand
19		Switch Arm
20		Spring
21		Spring
22	M04179760	Pinch Spring
23		Holder
24		Steel Ball
25		Ball Holder
26		Washer
27		Holder
28		Spring
29	M04179720	Pinch Arm Ass'y
30	M04179700	Supply Reel
31	M04179780	Washer
32		Spring
33	M04179701	Take-up Reel Ass'y
34		Spring
35		Clutch Plate
36		Spring (Eject)
37		Lock Plate
38		Spring
39		Terminal
40		Spring
41		PAUSE Plate
42		Spring
43		REC Plate
44		REW Plate
45		Spring
46		PLAY Plate
47		FF Plate
48		Select Arm
49		Holder
50		Lock Plate
51	M04179735	AS Cam Ass'y
52		Spring
53		Senser
54		Washer
55		Spring
56		Senser Arm A
57		Senser Arm B
58		Senser Arm C
59		Spring
60		Spring

Symbol No.	Parts No.	Description
61	M04179730	Worm
62		Washer
63		Stop Lever
64		Lock Plate
65		Spring
66		Select Arm
67		Spring
68		Slede Plate
69		Collar
70		Holder Plate Ass'y
71	M04179731	Assist Gear
72		Spring
73		Start Lever A
74	M04179768	Tension Ass'y
75		Spring
76		Lock Plate
77		Side Plate
78		Side Plate
79	M05230756	Flyweel
80	M05230730	FM Gear
81		Washer
82		Spring
83	M05230714	Belt (Main)
84	M05230716	Belt (Reel)
85	M05230715	Belt (AS)
86		Motor Bracket
87		Holder Ass'y
88	M04179148	Cassette Case
89		Rec Lever
90		Button Holder
91		Button Lever
92		Inter Plate
93		Cam Plate
94		Spring
95		Spring
96		Cassette Holder (Spring)
97		SW Plate
98		Inter Plate
99		Button Lever
100		Button Lever
101		Release Lever
102		Rec Plate
103		Collar
104	M04179714	Belt (Counter)
105		Start Plate B
106		Spring
107		Holder
108		Spring
109		Spring
110		Spring
111	M04179550	Motor Ass'y
112		Spring
113	M04179679	Damper Ass'y
114		Tube
115		Eject Ass'y
116		Eject Plate
117		Spring
118		Star Plate
119		Plate
120		—

Symbol No.	Parts No.	Description	
121		Eject Spring	
122		CS Ring	
123		CS Ring	
124		E Ring 2	
125		E Ring 3	
126		Screw	(M2.6 x 5)
127		Screw	(M2.6 x 10)
128		Screw	(M3 x 5)
129		Screw	(M2.6 x 8)
130		Seme Screw	(M2 x 4)
131		F. T-Screw	(2.6 x 6)
132		F. T-Screw	(3 x 6)
133		Screw	(M2 x 11)
134		Seme Screw	(M3 x 6)
135		—	
136		—	
137		Screw	(M2 x 5)
138		Spring Washer	
139		Washer	
140		Lever	
141	M04179210	Knob	
142	M04179211	Knob	



MAIN CHASSIS EXPLODED VIEW



MAIN CHASSIS PARTS LIST

Symbol No.	Parts No.	Description
1		Cover
2	M07602060	Clamper
3	M05209700	Power-Cord
4		Panel-Back
5		Panel-Back
6		Screw 3 x 8
7		T-Screw 1 - 3 x 10
8	M04178500	Trans-Power
9		T-Screw 2 - 4 x 10
10	M04177450	Fuse 1.5A
11	M04179358	SW-Push
12		Holder
13		Spacer-PL
14		Radiator-Ass'y
15		Screw 3 x 6
16		–
17	M04172480	Terminal-Board (Antenna)
18		Shield
19	M04179420	VC-Air
20	M04179359	SW-Push (AM/FM)
21		Lamp
22		Spring
23		Drum
24		Screw-B M3 x 6
25		Screw-B M2.6 x 5
26	M04178200	Knob-Ass'y (AM/FM)
27		–
28	M04177250	Pointer
29		Pulley
30		Holder
31		Holder
32	M04179565	Lamp
33		Panel-Front
34		Tuning-Shaft
35		Nut M10
36		Dial
37		Dial-Cord-Ass'y
38		–
39		–
40	M07573480	Terminal-Board (Speaker)
41	M05225360	SW-Slide (Beat Cancel)
42	M05249435	OSC-Unit
43		Shield
44	M05225360	SW-Slide (Rec/Play)
45	M04179402	VR-W-A50K-30 (Rec VR)
46	M07573480	Terminal-Board
47	M04179366	SW-Rotary (Selector)
48	M04179475	Jack (Mic)
49	M04179400	VR-STD-4 (Bass, Treble, Balance, Mix)
50	M04179367	SW-Rotary (Tape Select)
51	M04179357	SW-Push (Dolby)
52	M04179207	Knob (Dolby)
53	M07607475	Jack (Phones)
54		Screw-Metal 3 x 8
55		Panel-Front
56		Holder-Z
57	M04179208	Knob (Power)
58		Clamper
59	M04179356	SW-Push (Power)
60		Holder

Symbol No.	Parts No.	Description
61	M05240320	LE-Diode (GRN) (Play, Dolby)
62	M04179320	LE-Diode (RED) (Rec, Peak)
63	M04179321	LE-Diode (ORG) (Pause)
64	M04179401	VR-Slide (Volume)
65	M04179365	SW-Rotary
66		Holder-Z
67		Nut M9
68		Holder
69	M04179713	Belt (Counter)
70	M04179710	Counter
71		Holder
72		–
73		–
74		Shield
75		–
76		Mechanism-Ass'y
77	M04177762	Spring-W
78		Link
79		Holder
80	M04179209	Knob (Eject)

PARTS LIST . . . . TURNTABLE Section

Symbol No.	Part No.	Description
		Diodes
D1A1	M04179324	SLP146B
D1A2	M04179324	SLP146B
D1A3	M04179324	SLP146B
D1A4	M07297320	SP254FS
D1A5	M04179324	SLP146B
D1A6	M04179325	202C
D101	M07556320	DS442
D102	M07556320	DS442
D103	M07556320	DS442
D104	M07556320	DS442
D105	M07556320	DS442
D106	M07556320	DS442
D107	M07556320	DS442
D108	M07556320	DS442
D109	M07556320	DS442
D110	M07556320	DS442
D111	M07556320	DS442
D112	M07556320	DS442
D114	M07556320	DS442
D115	M07228321	10E1
D116	M07228321	10E1
D117	M07228321	10E1
D118	M05232328	RD12E
D120	M07228321	10E1
D121	M07556320	DS442
D122	M07556320	DS442
		ICs
IC101	M07602311	MP1320SL
IC102	M07602310	TC4081BP
IC103	M07527344	MSA117RS
IC104	M07602310	TC4081BP
IC105	M04179311	M5232L
		Transistors
Q1A1	M07137303	PH101
Q1A2	M07137303	PH101
Q1A3	M07137303	PH101
Q1A4	M07137303	PH101
Q101	M07390303	2SC2603
Q102	M07390303	2SC2603
Q103	M07390304	2SA1115
Q104	M07390304	2SA1115
Q111	M07390303	2SC2603
Q112	M07390303	2SC2603
Q113	M07390303	2SC2603
Q114	M07390303	2SC2603
Q115	M05147312	2SB564
Q116	M07390303	2SC2603
Q117	M07228303	2SD571
Q118	M07390303	2SC2603
Q119	M07139304	2SK68A
Q120	M05147312	2SB564
Q121	M07390303	2SC2603

Symbol-No.	Part No.	Description
Q124	M07151310	2SD330
Q125	M07390303	2SC2603
Q126	M07390304	2SA1115
Q127	M07390304	2SA1115
Q128	M07390303	2SC2603
Q129	M07390303	2SC2603
		Electrical Parts
LA1A1	M07374251	LAMP
LA1A1	M07374251	LAMP
LA1A3	M07374251	LAMP
LA1A4	M07297250	LAMP
LA1A5	M07297250	LAMP
LA1A6	M07297250	LAMP
LA1A7	M07297250	LAMP
S1A1	M07445660	SW-PUSH
S1A2	M07445660	SW-PUSH
S1A3	M07445660	SW-PUSH
S1A4	M07445660	SW-PUSH
S1A5	M07445660	SW-PUSH
S1A6	M07445660	SW-PUSH
S1A8	M04179354	SW-PUSH
VR101	M05104360	VR-SEMI-B220K
VR102	M04139436	VR-SEMI-B2.2K
VR103	M04139436	VR-SEMI-B2.2K

TUNER Section

Symbol No.	Part No.	Description
		Description
D201	M04179320	SLP-160C
D202	M04179323	GL-9NP2
D203	M07556320	DS442
D204	M07556320	DS442
D205	M07556320	DS442
D206	M05225320	RD3.0E-B2
D207	M07556320	DS442
D208	M07556320	DS442
D301	M05142320	1S188AM
		ICs
IC201	M05199343	HA-12413
IC202	M04179310	KB-4424A
		Transistors
Q101	M07390303	2SC2603
Q201	M07152303	2SK55
Q202	M04070303	2SC535
Q203	M04066313	2SC461
Q204	M04070304	2SC710
Q205	M07390303	2SC2603
Q206	M07390303	2SC2603
Q207	M07390303	2SC2603
Q208	M07390303	2SC2603
Q209	M07390303	2SC2603
Q210	M07390303	2SC2603
Q211	M07390303	2SC2603
Q212	M07390303	2SC2603
Q213	M07390303	2SC2603
Q214	M07390303	2SC2603
Q215	M07390303	2SC2603
Q216	M07390303	2SC2603
Q217	M07390303	2SC2603
Q301	M04070304	2SC710
Q302	M04070304	2SC710
		Electrical Parts
CF201	M07532445	CERAMIC-FILTER
CF202	M07532445	CERAMIC-FILTER
CF301	M07566445	CERAMIC-FILTER
J201	M04167576	TERMINAL-BOARD
L201	M04179511	COIL-ANT
L202	M04179512	COIL-RF
L203	M04179513	COIL—OSC
PL201	M04179565	LAMP
PL202	M04179565	LAMP
S201	M04179359	SW-PUSH (FM/AM)
S202	M04179359	SW-PUSH (MUTING/MONO)
S203	M04178356	SW-PUSH (MW/LW)
T001	M07632445	FILTER
T201	M04179502	TRANS-IF
T202	M04179445	FILTER

Symbol No.	Part No.	Description
T302	M04178510	COIL-ANT
T303	M04179515	COIL-OSC
T304	M04178511	COIL-OSC
T305	M07566502	TRANS-IF
T306	M04179503	TRANS-IF
VR201	M04179412	VR-SEMI-B10K

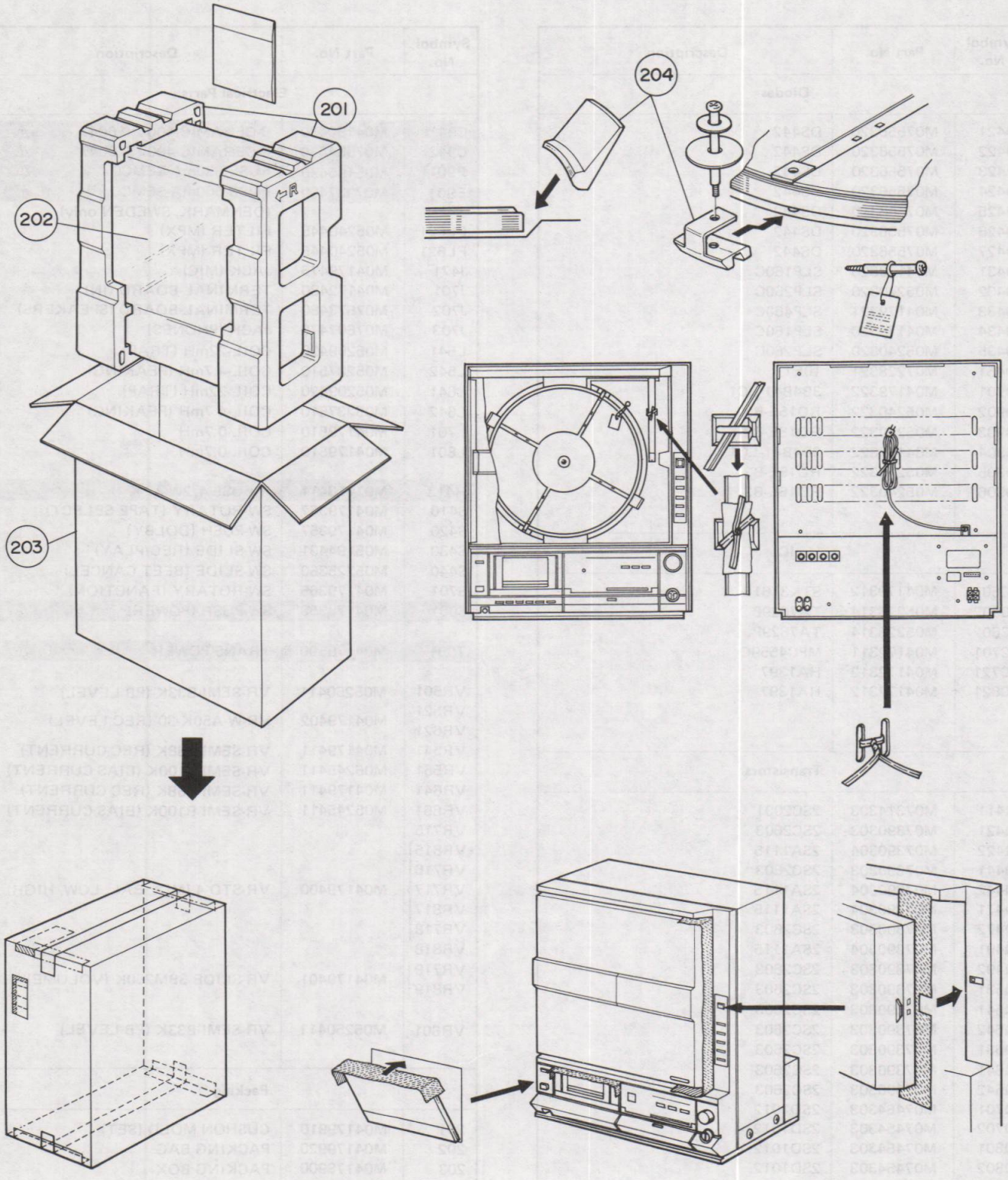
TAPE DECK, AMP Section

NOTE: ⚠ and ▭ marks components on Parts list have special chracteristics to keep safety performance of this unit. When replacing any of these parts, be sure to use only specified parts.

Symbol No.	Part No.	Description
		Diodes
D421	M07556320	DS442
D422	M07556320	DS442
D423	M07556320	DS442
D424	M07556320	DS442
D425	M07556320	DS442
D426	M07556320	DS442
D427	M07556320	DS442
D431	M04179320	SLP160C
D432	M05240320	SLP260C
D433	M04179321	SLP460C
D434	M04179320	SLP160C
D435	M05240320	SLP260C
D451	M07228321	10E1
D901	M04179322	3B4B41-LC1
D902	M05240322	RD15E-B2
D903	M05240322	RD15E-B2
D904	M04179322	3B4B41-LC1
D905	M05240322	RD15E-B2
D906	M05240322	RD15E-B2
		ICs
IC501	M04179312	STK3161B
IC502	M05225314	TA7629P
IC602	M05225314	TA7629P
IC701	M04172311	MPC4559C
IC721	M04172312	HA1397
IC821	M04172312	HA1397
		Transistors
Q411	M07314303	2SC2001
Q421	M07390303	2SC2603
Q422	M07390304	2SA1115
Q441	M07390303	2SC2603
Q442	M07390304	2SA1115
Q471	M07390304	2SA1115
Q472	M07390303	2SC2603
Q491	M07390304	2SA1115
Q492	M07390303	2SC2603
Q531	M07390303	2SC2603
Q541	M07390303	2SC2603
Q542	M07390303	2SC2603
Q631	M07390303	2SC2603
Q641	M07390303	2SC2603
Q642	M07390303	2SC2603
Q701	M07454303	2SD1012
Q702	M07454303	2SD1012
Q801	M07454303	2SD1012
Q802	M07454303	2SD1012
Q901	M07061304	2SD330
Q902	M04179300	2SK163
Q903	M07061304	2SD330
Q904	M07228303	2SD571
Q905	M07228303	2SD571

Symbol No.	Part No.	Description
		Electrical Parts
C941	M04180430	C-CERAMIC-400V 0.0047 ⚠
C942	M07554430	C-CERAMIC-400V 0.0047 ⚠
F901	M05195490	FUSE 630mA-SEMCO ⚠
F901	M07337490	FUSE 500mA-SEMCO ⚠ (DENMARK, SWEDEN only)
FL521	M05240445	FILTER (MPX)
FL621	M05240445	FILTER (MPX)
J471	M04179475	JACK (MIC)
J701	M04172480	TERMINAL-BOARD (IN)
J702	M07573480	TERMINAL-BOARD (SPEAKERS)
J703	M07607475	JACK (PHONES)
L541	M05209420	COIL-22mH (TRAP)
L542	M05237510	COIL-4.7mH (PEAKING)
L641	M05209420	COIL-22mH (TRAP)
L642	M05237510	COIL-4.7mH (PEAKING)
L701	M04179510	COIL-0.7mH
L801	M04179510	COIL-0.7mH
R413	M07113411	R-FUSE 1/2W 47-K ⚠
S410	M04179367	SW-ROTARY (TAPE SELECT)
S420	M04179357	SW-PUSH (DOLBY)
S430	M05194431	SW-SLIDE (REC/PLAY)
S440	M05225360	SW-SLIDE (BEET CANCEL)
S701	M04179365	SW-ROTARY (FANCTION)
S901	M04178358	SW-PUSH (POWER) ⚠
T901	M04178500	TRANS-POWER ⚠
VR501	M05250411	VR-SEMI-B33K (PB LEVEL)
VR521 VR621	M04179402	VR-W-A50K-30 (REC LEVEL)
VR541	M04179411	VR-SEMI-B68K (REC CURRENT)
VR561	M05245411	VR-SEMI-B100K (BIAS CURRENT)
VR641	M04179411	VR-SEMI-B68K (REC CURRENT)
VR661	M05245411	VR-SEMI-B100K (BIAS CURRENT)
VR715 VR815 VR716 VR717 VR817 VR718 VR818	M04179400	VR-STD-4 (MIX, BAL, LOW, HIGH)
VR719 VR819	M04179401	VR-SLIDE-3BM250K (VOLUME)
VR601	M05250411	VR-SEMI-B33K (PB LEVEL)
		Packing
201	M04179910	CUSHON MOLD (SET)
202	M04179920	PACKING BAG
203	M04178900	PACKING BOX
204	M04179911	CUSHION (PLATTER)
	M04178940	INSTRUCTION BOOKLET
	M04178945	CARD (GUARANTEE)
	M04057540	ANTENNA (FM)

PACKING INSTRUCTIONS



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HEAD OFFICE: MITSUBISHI DENKI BLDG., MARUNOUCHI, TOKYO 100. TELEX: J24532 CABLE: MELCO TOKYO

X-7 EU
SM-2074
Printed in Japan