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CR-3, CR-3A, CR-3E, CR-30 S2

Nakamichi

Service Manual

Nakamichi

CR-3
CR-3A
CR-3E
CR-30

Discrete Head Cassette Deck

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1. GENERAL

1.1. Voltage Selector

Voltage selector is installed on the rear panel for Other version of the Nakamichi CR-3.
This voltage selector can select 110, 127, 220, or 240 V at customer's disposal.

1.2. Package Ass'y and Accessory Ass'y

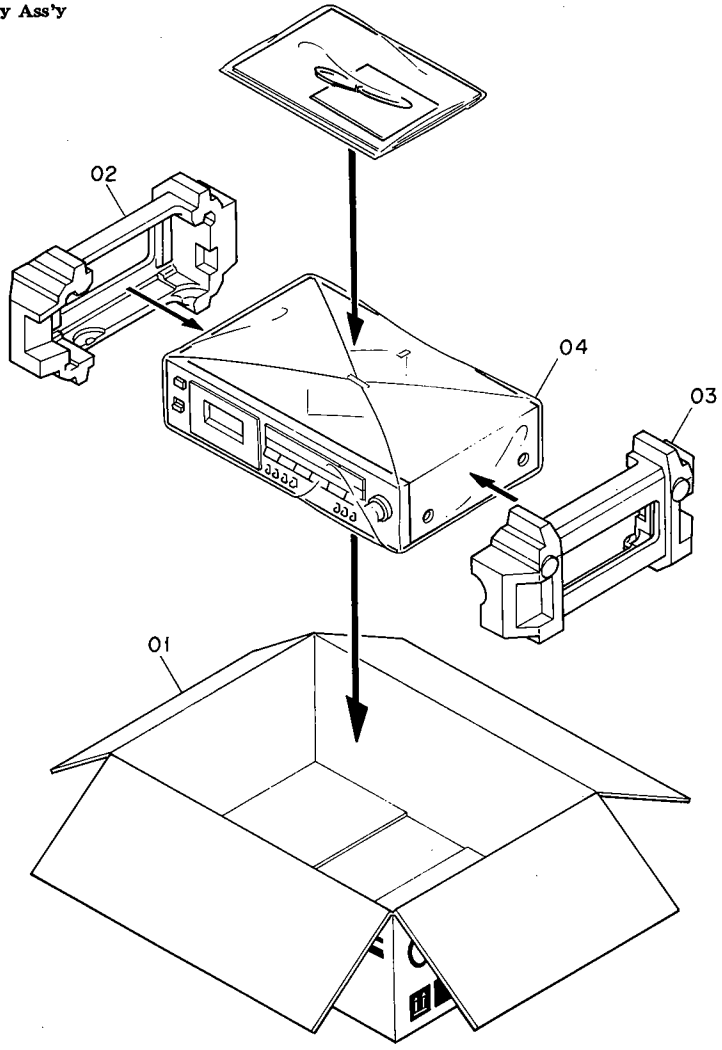


Fig. 1

Schematic Ref. No.	Part No.	Description	Q'ty
		Package Ass'y	
01	0F04065A	Carton Box (CR-3)	1
	0F04066A	Carton Box (CR-3A)	1
	0F04067A	Carton Box (CR-3E)	1
	0F04101A	Carton Box (CR-30)	1
02	0F04087C	Packing L	1
03	0F04088C	Packing R	1
04	0F03684A	Poly-Sheet S	1
—	0D04046A	Warranty Card (CR-30)	1
—	0D04047A	User's Pack (CR-30)	1
—	0M03457A	Voltage Label 240V (CR-3 (Australia) & CR-3E (UK))	2
—	0M05101A	Voltage Label (CR-3 (Saudi Arabia))	2
—	0M05085A	Point of Sale Label (CR-30)	1
—	0M05056A	Serial No. Label (CR-3, CR-3E & CR-30)	1
—	0M05069A	Serial No. Label (CR-3A)	2
—	0M05106A	UL Label (CR-3A)	1
—	0M05105A	LA Label (CR-3A)	1
—	0M05107A	Canada Label (CR-3A)	1
—	0M05108A	UL/Canada Label (CR-3A)	1
—	0M05102A	Shipping Label Los (CR-3A)	1
—	0M05103A	Shipping Label VAN (CR-3A)	1

Schematic Ref. No.	Part No.	Description	Q'ty
		Accessory Ass'y	
	0D03092B	Poly-Bag	1
	0D04449A	Important Notice (CR-3, CR-3E & CR-30)	1
	0D04810A	Important Notice (CR-3A)	1
	0D04766A	General Catalogue (CR-3A)	1
	0D04783B	Owner's Manual (English/ German/French)	1
	0D04784B	Owner's Manual (Japanese)	1
	0D04786B	Price Card (CR-30)	1
	0D04796A	Tape Catalogue (CR-3A)	1
	0D04795A	Tape Catalogue (CR-30)	1
	0D04797A	Warranty Card (CR-3A)	1
	0D04812A	Tape Supplement	1
	0M03844B	Power Cord Label (CR-3E (UK))	1
	DA04121A	Pin Cord Ass'y	1

2. REMOVAL PROCEDURES

2.1. Top Cover Ass'y and Bottom Cover Ass'y
Refer to Fig. 2.1.
(1) Loosen F01 and remove F02 (Top Cover Ass'y).
(2) Loosen F03 and remove F04 (Bottom Cover Ass'y).

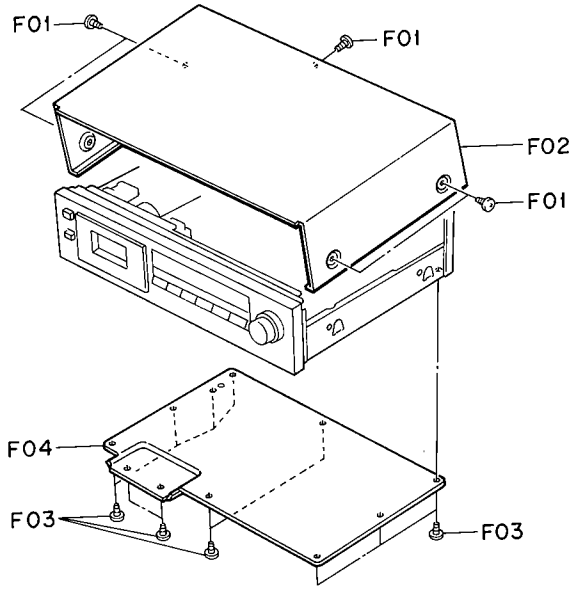


Fig. 2.1

2.2. Cassette Case Cover Ass'y
Refer to Fig. 2.2.
(1) Press F01 (Eject Button) to open F02 (Cassette Case Cover Ass'y).
(2) Pull F02 (Cassette Case Cover Ass'y) upward.

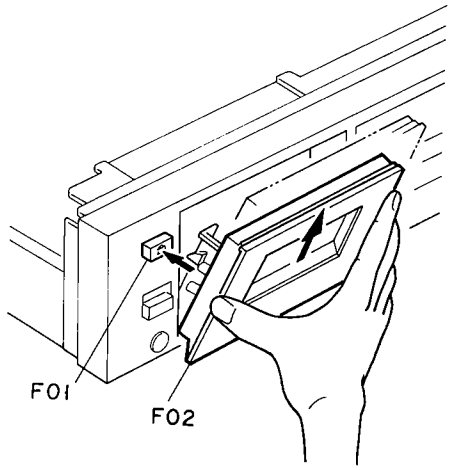


Fig. 2.2

2.3. Mechanism Ass'y
Refer to Fig. 2.3.
(1) Remove the Top Cover Ass'y and the Bottom Cover Ass'y referring to item 2.1.
(2) Remove the Cassette Case Cover Ass'y referring to item 2.2.
(3) Loosen F01, F02 and F03, remove F04, and disassemble F05 (Mechanism Ass'y).

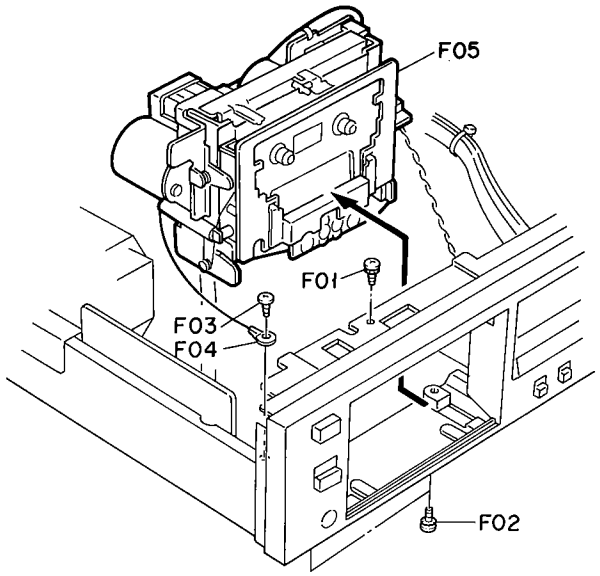


Fig. 2.3

2.4. Monitor Switch Joint
Refer to Fig. 2.4.
(1) Remove the Top Cover Ass'y and the Bottom Cover Ass'y referring to item 2.1.
(2) With pushing F01 (Monitor Switch Joint) in the direction of the arrow A, pull F01 (Monitor Switch Joint) in the direction of the arrow B to remov it.

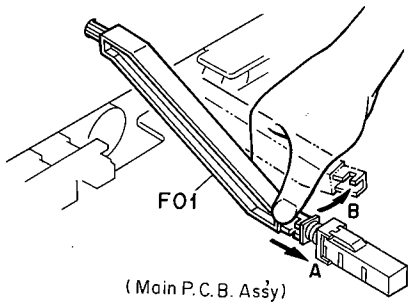


Fig. 2.4

2.5. Pin Jack P.C.B. Ass'y, Power Supply P.C.B. Ass'y, and Main P.C.B. Ass'y
Refer to Fig. 2.5.
(1) Remove the Top Cover Ass'y and the Bottom Cover Ass'y referring to item 2.1.
(2) Remove the Monitor Switch Joint referring to item 2.4.
(3) Loosen F01 and remove F02 (Pin Jack P.C.B. Ass'y).
(4) Loosen F03 and remove F04 (Power Supply P.C.B. Ass'y).
(5) Push F05 (Hole Plug) with the top of screwdriver to remove it.
(6) Loosen F06 and lift F07 (Main P.C.B. Ass'y).
Note: When installing the Main P.C.B. Ass'y, to facilitate installation, place the Main P.C.B. Ass'y so that the tops of switches on the Main P.C.B. Ass'y come in contact with the ends of push buttons as shown in Fig. 2.6.

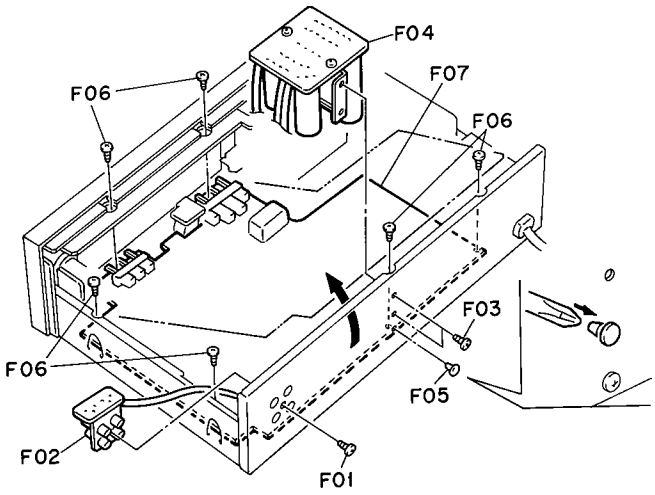


Fig. 2.5

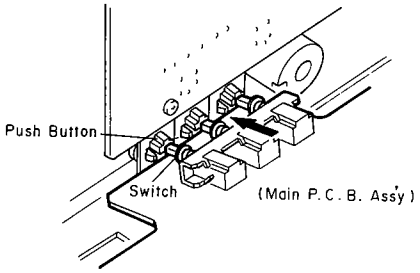


Fig. 2.6

2.6. Front Panel

Refer to Fig. 2.7.

(1) Remove the Top Cover Ass'y and the Bottom Cover Ass'y referring to item 2.1.
(2) Remove the Cassette Case Cover Ass'y referring to item 2.2.
(3) Pull out F01, F02 and F03, and loosen F04 and F05.
(4) With pushing claws by hand as shown in the figure, remove F06 (Front Panel).

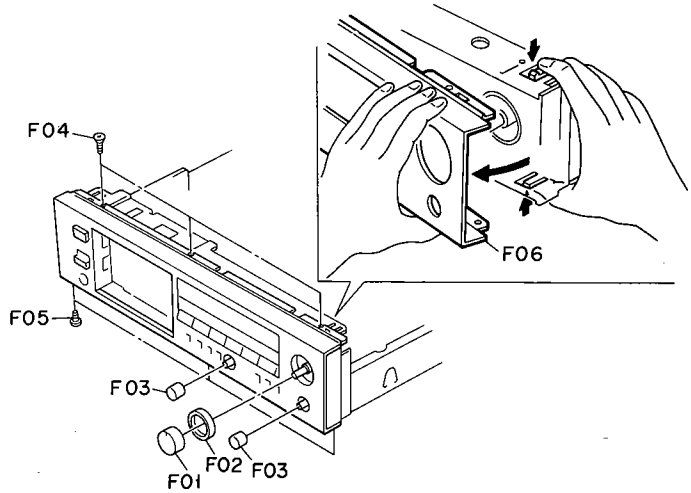


Fig. 2.7

2.7. Bias Tune Volume P.C.B. Ass'y

Refer to Fig. 2.8.

(1) Remove the Top Cover Ass'y and the Bottom Cover Ass'y referring to item 2.1.
(2) Remove the Monitor Switch Joint referring to item 2.4.
(3) Remove the Main P.C.B. Ass'y referring to item 2.5.
(4) Remove the Front Panel referring to item 2.6.
(5) Loosen F01 and F02 with a special nut driver or with pliers, and remove F03 (Bias Tune Volume P.C.B. Ass'y).

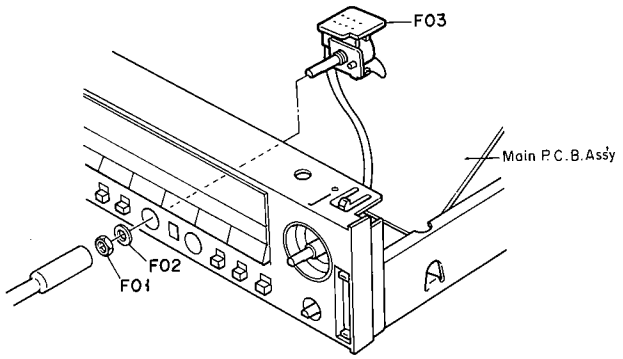


Fig. 2.8

2.8. Control P.C.B. Ass'y

Refer to Fig. 2.9.

(1) Remove the Top Cover Ass'y and the Bottom Cover Ass'y referring to item 2.1.
(2) Remove the Mechanism Ass'y referring to item 2.3.
(3) Remove the Monitor Switch Joint referring to item 2.4.
(4) Remove the Front Panel referring to item 2.6.
(5) Loosen F01 and F02 with a special nut driver or with pliers to set F03 (Bias Tune Volume P.C.B. Ass'y) free.
(6) With pushing F03 (Bias Tune Volume P.C.B. Ass'y) in the direction of the arrow, loosen F04, unhook F05, and remove F06 (Control P.C.B. Ass'y).

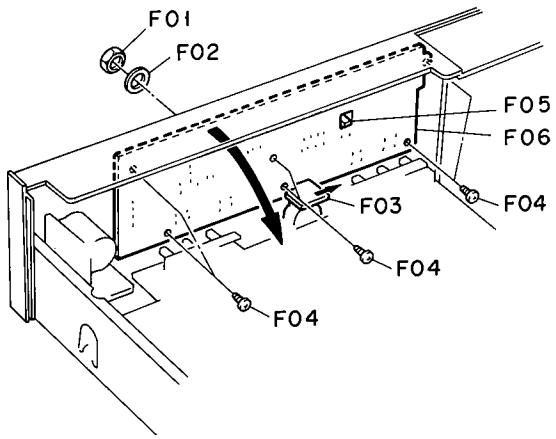


Fig. 2.9

2.9. Head Mount Base Ass'y

Refer to Fig. 2.10.

(1) Remove the Top Cover Ass'y and the Bottom Cover Ass'y referring to item 2.1.
(2) Remove the Mechanism Ass'y referring to item 2.3.
(3) Loosen F01 and remove F02 (Head Mounting Cover).
(4) Loosen F03, remove F04 and F05, straighten F06 (Wire Clamper), and lift F07 (Head Mount Base Ass'y).

Note: When mounting the Head Mount Base Ass'y, follow the next steps. Refer to Figs. 2.11.1 and 2.11.2.

(a) Insert the Plate Washer into the groove of the shaft by hand as shown in Fig. 2.11.1.
(b) Mount F07 (Head Mount Base Ass'y) and fasten F03. Then push the Plate Washer with a blade of screwdriver to set the Plate Washer free. Refer to Fig. 2.11.2.

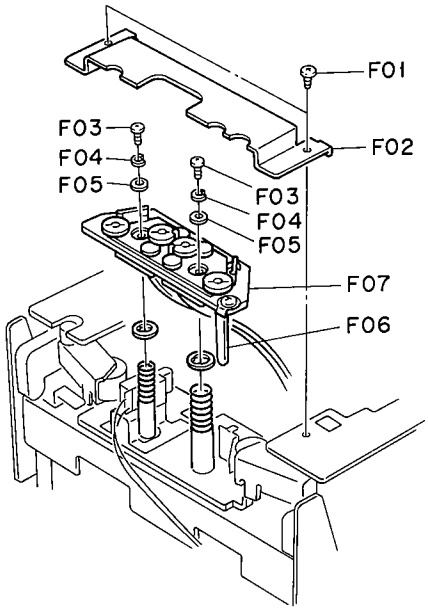


Fig. 2.10

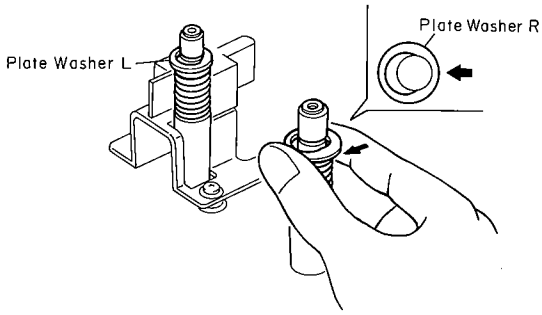


Fig. 2 11.1

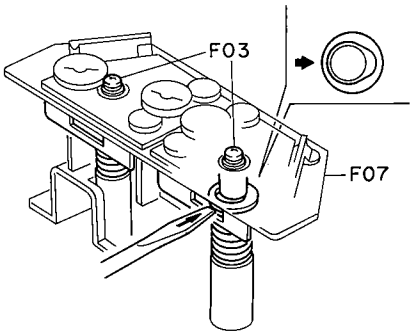


Fig. 2.11.2

2.10. Power Switch Joint

Refer to Fig. 2.12.

(1) Remove the Top Cover Ass'y referring to item 2.1.
(2) Pull F01 (Power Switch Joint) upward to remove it.

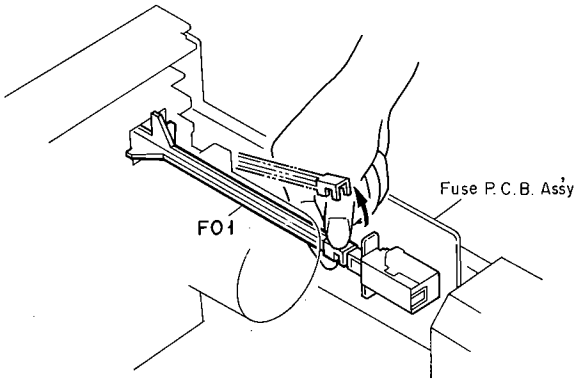


Fig. 2.12

3. TEST TAPES AND GAUGES

(1) 400 Hz Level Tape (DA09005B)
(2) 1 kHz Track Alignment B Tape (DA09087B)
(3) 10 kHz PB Frequency Response Tape (DA09003B)
(4) 15 kHz PB Frequency Response Tape (DA09002B)
(5) 20 kHz PB Frequency Response Tape (DA09001B)
(6) 15 kHz Azimuth Tape (DA09004B)
(7) 3 kHz Speed and Wow/Flutter Tape (DA09006C)
(8) Tape Travelling Cassette (DA09071A)
(9) Reference EXII Tape (DA09111A)
(10) Reference SX Tape (DA09110A)
(11) Reference ZX Tape (DA09109A)
(12) EH Tilt Check Gauge S (DA09088A)
(13) Stroke Check Gauge S (DA09090A)
(14) Tape Guide Height Check Gauge S (DA09091A)
(15) Tilt Check Gauge S (DA09039B)
(16) Torque Gauge FWD (DA09082A)

4. MECHANICAL ADJUSTMENTS

4.1. Record Head and Playback Head Tilt Adjustment

Remove the Cover Plate Ass'y by loosening two screws to gain access to the head block.

Refer to Fig. 4.1.

(1) Remove the pad lifter from the playback head.
(2) Load a Tilt Check Gauge S (DA09039B) in the cassette deck.
(3) Clip the grounding terminal of the Tilt Check Gauge with one end of the cord with clip, and the chassis of the cassette deck with the other end.
(4) Remove both of the Height Gears.
(5) Set the cassette deck in Play mode. Check to insure whether the Beacons Playback Head "Upper" or "Lower" and Record Head "Upper" or "Lower" are illuminating. In order not to give damages onto the head surfaces, push both of slide knobs of the Gauge to away from the heads, then return them to the original place to be in contact with record head and playback head surfaces after Play mode is securely locked.
(6) Beacon Playback Head "Lower" will light on when height adjustment screw (PH) turned counterclockwise but playback Head "Upper" when clockwise. Adjust so that both "Upper" and "Lower" will light on even when you move the slide knob away from the heads and then return it to the original place.
(7) Same procedures will apply to the Beacons Record Head "Upper" and "Lower", except for the height adjustment screw (RH).
(8) Set the cassette deck in Stop mode and fit both of the serrated Height Gears. Then set the cassette deck again in Play mode and insure all of the 4 Beacons are illuminating. If not, (4) through (7) will have to be repeated till satisfactory results are obtained.
(9) Mount the pad lifter on the playback head.

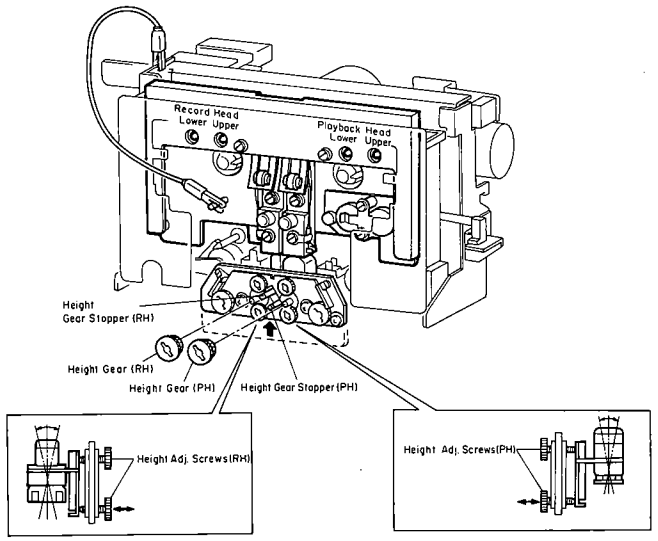


Fig. 4.1

4.2. Head Base Stroke Check

Remove the Cover Plate Ass'y.

Refer to Fig. 4.2.

Note: Before you conduct this adjustment, afjust with a "Tilt Check Gauge S" to insure freedom from tilt on the playback head and record head.

(1) Load a Stroke Check Gauge S (DA09090A) in the cassette deck.
(2) Move Record Head Indicator and Playback Head Indicator to the direction of arrow mark "A" with your finger tip and then set the cassette deck in Play mode.
Then slowly release the Indicators and insure whether each of the Indicators is in contact with record and playback heads.
(3) Check to insure whether the line "P" on the Playback Head Indicator meets the central line on the Indicator Plate.
(4) Check to insure whether the line "P" on the Playback Head Indicator locates between the 2 lines on the Record Head Indicator, thus check can be made on record head stroke.

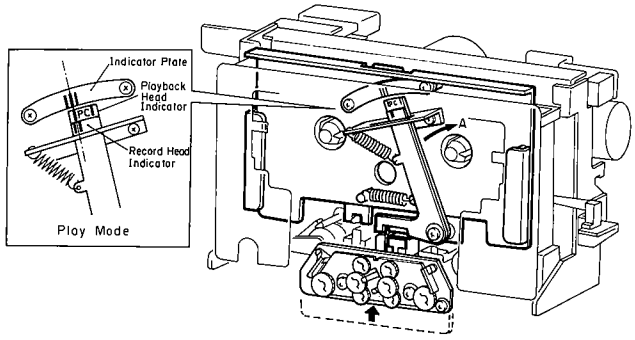


Fig. 4.2

4.3. Erase Head Stroke Adjustment and Tape Guide Height Check

Remove the Cover Plate Ass'y and the Head Mount Base Ass'y.

Refer to Fig. 4.3.

(1) **Erase Head Stroke Adjustment**
(a) Load a Tape Guide Height Check Gauge S (DA09091A) in the cassette deck.
(b) Set the cassette deck in Play mode, thus check can be made on erase head stroke through the EH Stroke Indicator.
(c) Check to insure whether the erase head surface is aligned with red line on the EH Stroke Indicator. If not, adjust the erase head stroke by loosening screw A that assembles erase head with erase head plate.
(d) After completion of adjustment, screw A shall be locked with lock tight paint.

(2) **Supply Tape Guide Height Adjustment**
(a) Load a Tape Guide Height Check Gauge S (DA09091A) in the cassette deck.
(b) Set the cassette deck in Play mode.
(c) Slide the Supply Tape Guide Check Bar down against the supply tape guide, and check to insure that the Supply Tape Guide Check Bar is accepted by the supply tape guide. If not, adjust the supply tape guide height by turning screw B.

(3) **Take-up Tape Guide Height Check**
(a) Load a Tape Guide Height Check Gauge S (DA09091A) in the cassette deck.
(b) Set the cassette deck in Play mode.
(c) Slide the Take-up Tape Guide Check Bar down against the take-up tape guide, and check to insure that the Take-up Tape Guide Check Bar is accepted by the take-up tape guide.

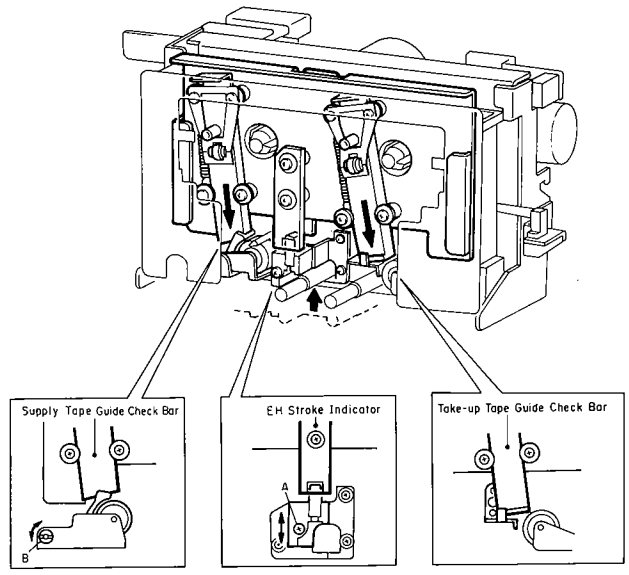


Fig. 4.3

4.4. Erase Head Height and Tilt Adjustment

Refer to Fig. 4.4.

(1) Remove th Cassette Case Cover Ass'y, Cover Plate Ass'y, and Head Mount Base Ass'y.
(2) Load an EH Tilt Check Gauge S (DA09088A) in the cassette deck.
(3) Set the cassette deck in Stop mode.
(4) Check to insure whether one of the 3 Beacons is illuminating. Look down the mirror and slowly turn the Screw "Height" counterclockwise (or clockwise) so that the two horizontal lines on the mirror will become superposed on the line (in different color) of the erase head, and check to insure whether the first Beacon is illuminating.
(5) Turn Screw "Tilt" counterclockwise (or clockwise) to light on the second Beacon. Excessive turning will cause the first Beacon to light off. Adjustments of Screw "Tilt" will therefore be conducted till both of the first and the second Beacons illuminate.
(6) Turn Screw "Azimuth" counterclockwise (or clockwise) to light on the third Beacon. Excessive turning will cause either the first or the second Beacon to light off, and therefore adjust Screw "Azimuth" until all of the 3 Beacons illuminate.
(7) Check to insure whether the horizontal line on the mirror corresponds to that on the erase head. If not, (4) through (7) will have to be repeated till satisfactory results are obtained.
(8) After completion of adjustment, 3 pcs. of screws shall be locked with lock tight paint.

Note: Before use of this gauge, check to insure freedom from dust or dirts, or overflow in the groove of the erase head surface.

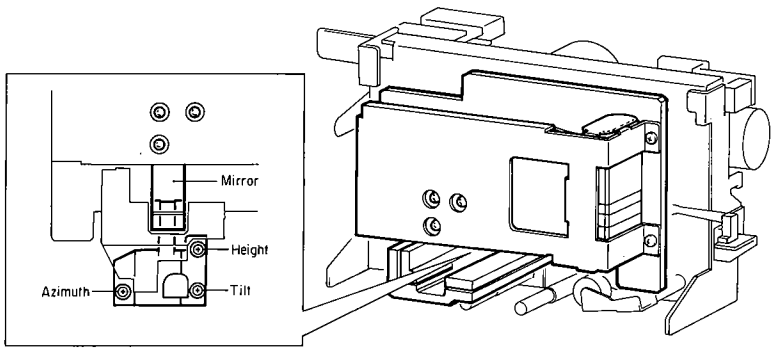


Fig. 4.4

4.5. Playback Head and Record Head Height Adjustment and Azimuth Alignment

Refer to Fig. 4.5.

(1) Playback Head Height Adjustment and Azimuth Alignment

(a) Set the Monitor switch to Tape and connect an AC voltmeter to the Output Jacks.
(b) Load a 1 kHz Track Alignment B Tape (DA09087B) and set the cassette deck in Play mode.
(c) Turn the PH Height Gear until the outputs of both channels become minimum.
(d) Load a 15 kHz Azimuth Tape (DA09004B) and set the cassette deck in Play mode.
(e) Turn the PH Azimuth Alignment Screw until the outputs of both channels become maximum.
(f) Repeat above steps (b) through (e) two or three times to obtain optimum performance.

(2) Record Head Height Adjustment and Azimuth Alignment

(a) Set the cassette deck in Stop mode.
(b) Set the Monitor switch to Tape, Eq. switch to 70 μs and Tape Selector switch to ZX.
(c) Load a reference ZX tape and connect an AC voltmeter to Output Jacks.
(d) Feed in 400 Hz (0 dB) to the Input Jacks.
(e) Set the cassette deck in Record and Play mode and turn the RH Height Gear until the outputs of both channels become maximum.
(f) Feed in 15 kHz (—20 dB) to the Input Jacks and turn the RH Azimuth Alignment Screw until the outputs of both channels become maximum.
(g) Repeat (d) to (f) two or three times to obtain optimum performance.

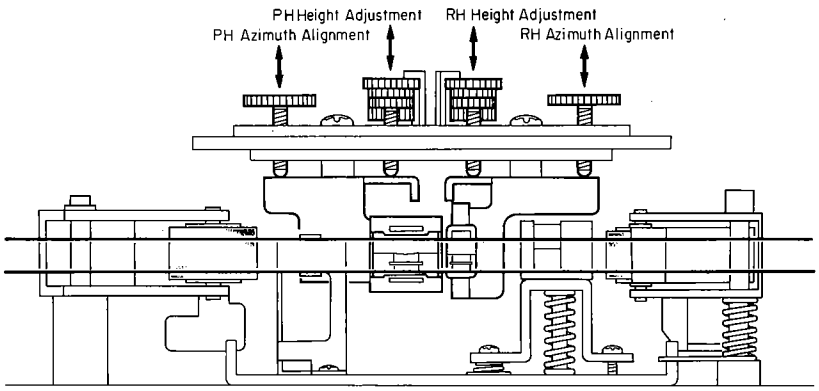


Fig. 4.5

4.6. Pressure Adjustment of Take-up Pressure Roller

Refer to Fig. 4.6.

(1) Set the cassette deck in Play mode.
(2) Measure the torque of the Take-up Pressure Roller and check whether the torque is in a range of 320 ±50 g-cm.
(3) If torque is out of the range, correct it by changing the installation point of the Pressure Roller Spring.

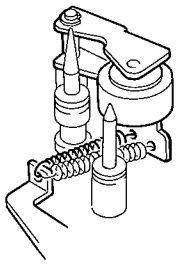


Fig. 4.6

4.7. Tape Travelling Check

Load and play back a Tape Travelling Cassette and check the following:

(1) Tape is in contact with heads sufficiently.
(2) Tape waving is small on the heads and pressure rollers.
(3) Tape is free from waving or slippage from the tape guides.

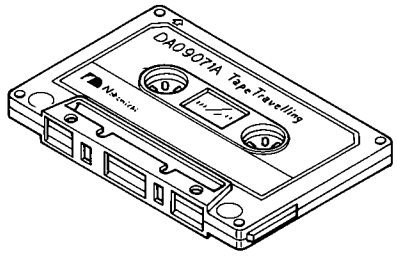


Fig. 4.7

4.8. Eject Damper Adjustment

Refer to Fig. 4.8. Load a cassette tape, and with opening the Cassette Case by pressing the Eject button and closing it by hand, adjust the speed of damper action by the Adjustment Screw.

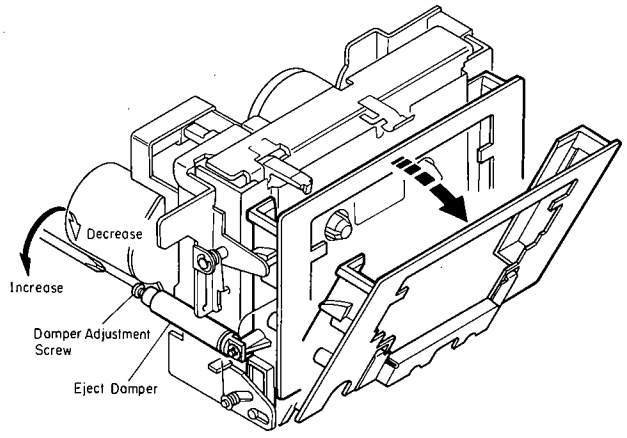


Fig. 4.8

4.9. Reel Motor Speed Adjustment in Play Mode

(1) To warm-up the cassette deck, load a C-60 cassette tape and set the cassette deck in Play mode.
(2) After more than four minutes, load a Torque Gauge FWD (DA09082A) and set the cassette deck in Play mode.
(3) Adjust VR601 on the Main P.C.B. Ass'y to obtain exactly 50 g-cm on the torque gauge.

4.10. Tape Speed Adjustment

Refer to Fig. 4.9.

(1) Connect a frequency counter to the Output Jacks.
(2) Load a 3 kHz Speed and Wow/Flutter Tape (DA09006C) and play it back.
(3) Adjust the Tape Speed Adjustment Volume incorporated in the Capstan Motor to obtain 3,000 Hz on the frequency counter.
    CCW: Motor drives slowly.
    CW: Motor drives fast.

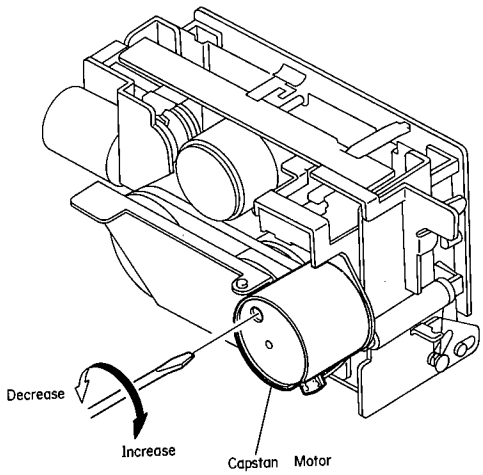


Fig. 4.9

4.11. Lubrication

The tape transport is of a lubrication-free type mechanism. When the following parts are replaced, apply the specified lubricant.

(1) Molykote (R) Grease (X5-6020)
    Cam Motor Pulley
    Thrust portion on the Capstan Shaft
(2) FLOIL GB-TS-1
    Washer between Reel Hub Ass'y and Back Tension Spring
(3) Diamond Oil (EP-56)
    Reel Hub Shaft
(4) Anderol 456
    Capstan Shaft

Note: We suggest that you use the above specified lubricant or equivalent type.
The company dealing in the above lubricant is as follows:
(a) Molykote (R) Grease (X5-6020)
Dowcorning Co., Ltd., 1-15-1 Nishishinbashi, Minato-ku, Tokyo, Japan
(b) FLOIL GB-TS-1
Kanto Chemicals Co., Ltd., 2-7 Kanda Sakuma-cho, Chiyoda-ku, Tokyo, Japan
(c) Diamond Oil (EP-56)
Mitsubishi Oil Co., Ltd., 1-2-4 Toranomon, Minato-ku, Tokyo, Japan
(d) Anderol 456
Toyo Kokusai Oil Co., Ltd., 3-3-5 Hatchobori, Chuo-ku, Tokyo, Japan

5. PARTS LOCATION FOR ELECTRICAL ADJUSTMENT

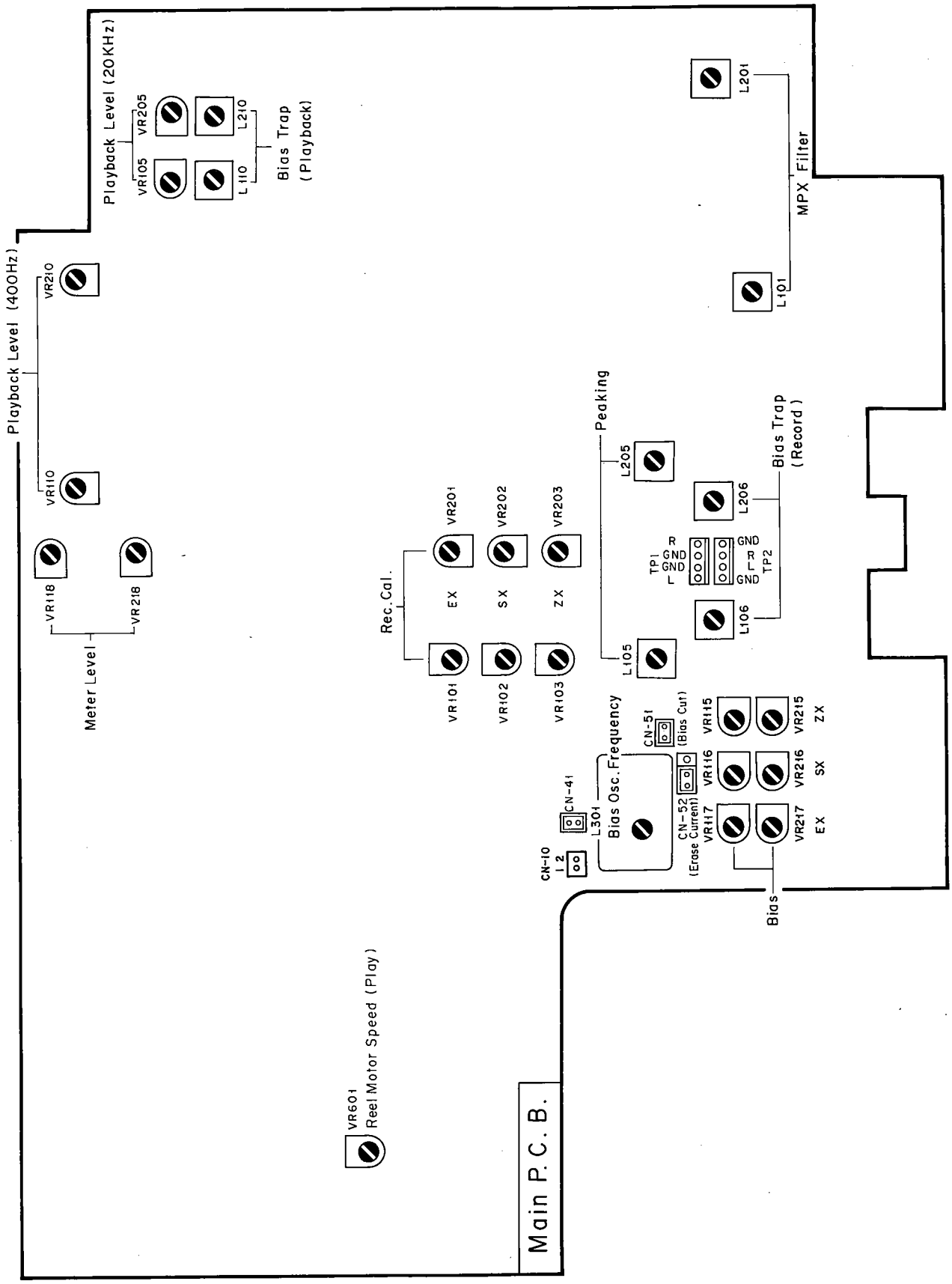
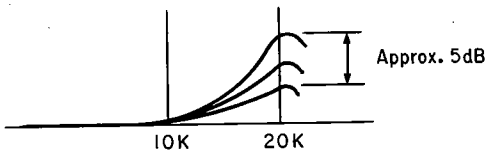
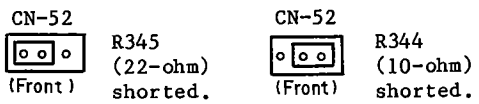


Fig. 5

6. ELECTRICAL ADJUSTMENTS

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUST-MENT	REMARKS
1	Preliminary Step			**Output Level - Max.** Balance - Center **Bias Tune - Center** Monitor - Tape Eq. - 70 µs Tape - ZX MPX Filter - OFF Dolby NR - OFF		Set the CR-3/3A/3E/30 as shown in MODE.
2	Reel Motor Speed Adjustment (Play)	Torque Guage FWD (DA09082A)		Playback	Main VR601	Adjust VR601 to obtain 50 g-cm on the Torque Gauge.
3	Tape speed Adjustment	3 kHz Speed and Wow/ Flutter Tape (DA09006C)	Frequency Counter to Output Jacks	Playback Monitor - Tape Eq. - 120 µs	Tape Speed Adj. Volume (Capstan Motor)	Adjust the volume incorporated in the Capstan Motor Ass'y to obtain 3 kHz ± 15 Hz on the frequency counter.
4	Meter Level Calibration	400 Hz to Input Jacks	AC Volt-meter to Output Jacks	Monitor - Source	Main P.C.B. VR118 VR218	1. Feed in 400 Hz and adjust the Input Level control to obtain 500 mV -2 dB on the AC voltmeter. 2. Adjust VR118 (VR218) so that the 0 dB segment on the level meter starts illuminating.
5	MPX Filter Adjustment	19 kHz ±100 Hz to Input Jacks	AC Volt-meter to Output Jacks	Monitor - Source MPX - OFF/ON	Main P.C.B. L101 L201	1. Adjust the Input Level control to obtain 500 mV (0 dB) on the AC voltmeter. 2. Set the MPX Filter switch to ON and adjust L101 (L201) to obtain minimum reading on the AC voltmeter. (The minimum reading will be less than -30 dB.)
6	Playback Head Track Alignment	1 kHz Track Alignment Tape (DA09087A)	AC Volt-meter to Output Jacks	Playback Monitor - Type Eq. - 70 µs Dolby NR - OFF	PH Height Gear	Adjust the PH Height Gear to obtain the minimum readings on the AC voltmeter for both channels. Refer to "Playback Head Height Adjustment" in item 4.5.
7	Playback Head Azimuth Alignment	15 kHz Azimuth Tape (DA09004B)	AC Volt-meter to Output Jacks	Same as above	Playback Head Azimuth Alignment Screw	Adjust the Playback Head Azimuth Alignment Screw to obtain maximum readings on the AC voltmeter for both channels. Refer to "Playback Head Height Adjustment and Azimuth Alignment" in item 4.5. Note: Repeat Steps 6 and 7 two or three times to obtain optimum performance.

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUST-MENT	REMARKS
8	Playback Level Calibration	400Hz Level Tape (DA09005B)	AC Voltmeter to Output Jacks	Playback Monitor - Type Eq. - 70 μs Dolby NR - OFF	Main P.C.B. VR110 VR210	Adjust VR110 (VR210) to obtain 500 mV on the AC voltmeter.
9	Playback Frequency Response Adjustment	400Hz Level Tape (DA09005B) 10 kHz PB Frequency Response Tape (DA09003B) 15 kHz PB Frequency Response Tape (DA09002B) 20 kHz PB Frequency Response Tape (DA09001B)	AC Voltmeter to Output Jacks	Same as above	Main P.C.B. VR105 VR205	1. Load a 400 Hz level tape, play it back, and read the playback level on the AC voltmeter. 2. Load 10 kHz, 15 kHz and 20 kHz PB frequency response tapes and adjust the playback head azimuth to obtain maximum levels on the AC voltmeter with each tape. Check that the playback levels are as follows with respect to the level for 400 Hz level tape. 10 kHz: -20 dB -2 dB to +2 dB 15 kHz: -20 dB -2 dB to +3 dB 20 kHz: -20 dB -2 dB to +4 dB If the levels are out of the ranges, play back the 20 kHz PB frequency response tape and adjust VR105 (VR205) to obtain -20 dB +1.0 dB. VR105 (VR205) compensates the playback frequency response at 20 kHz as shown below:  3. Conduct Step 7 "Playback Head Azimuth Alignment".
10	Bias Oscillation Frequency and Erase Current Adjustment	None	AC Voltmeter across the additional 0.1 ohm resistor and Frequency Counter between terminals 1 and 2 of CN-10 on Main P.C.B.	Record, Playback Monitor - Source Tape - ZX Eq. - 70 μs Dolby NR - OFF	Main P.C.B. L301 R344 R345	1. Connect an additional 0.1 ohm resistor in seies to the Erase Head and connect the AC voltmeter across the resistor. 2. Record and playback a reference ZX tape. 3. Adjust L301 to obtain 105 kHz on the frequency counter. 4. Check the erase current by the AC voltmeter. Erase current will be within the range of 310 mA to 400 mA (typically approx. 350 mA). If erase current is less than 310 mA, plug the 2P-receptacle into CN-52 as shown below to short-circuit either R344 or R345.  5. After completion of the erase current adjustment, re-check the bias oscillation frequency. 6. Remove the additional 0.1 ohm resistor.

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUST-MENT	REMARKS
11	Record Amplifier Equalizer Adjustment	23 kHz (-20 dB) to Input Jacks	AC Voltmeter between L and GND (R and GND) of TP2 on Main P.C.B.	Record, Playback Monitor - Source Tape - ZX Eq. - 70 µs Dolby NR - OFF	Main P.C.B. L105 L205	1. Remove the 2P-receptacle from CN-51 to stop the bias oscillation. 2. Adjust L105 (L205) to obtain approx. 16 dB at 23 kHz on the AC voltmeter. 3. Plug the 2P-receptacle into CN-51.
12	Bias Trap Adjustment (Record Amp.)	Remove input signals	AC Voltmeter between L and GND (R and GND) of TP1 on Main P.C.B.	Same as above	Main P.C.B. L106 L206	Adjust L106 (L206) to obtain minimum reading on the AC voltmeter.
13	Record Head Height Adjustment	400 Hz (0 dB) to Input Jacks	AC Voltmeter to Output Jacks	Record, Playback Monitor - Tape Tape - SX Eq. - 70 µs Dolby NR - OFF	RH Height Gear	1. Load a reference SX tape, and record and play it back. 2. Adjust the RH Height Gear to obtain maximum readings for both channels on the AC voltmeter. Refer to "Record Head Height Adjustment and Azimuth Alignment" in item 4.5
14	Record Head Azimuth Alignment	15 kHz (-20 dB) to Input Jacks	AC Voltmeter to Output Jacks	Same as above	Record Head Azimuth Alignment Screw	Adjust the Record Head Azimuth Alignment Screw to obtain maximum readings for both channels on the AC voltmeter. Refer to "Record Head Height Adjustment and Azimuth Alignment in item 4.5. Note: Repeat Steps 13 and 14 two or three times to obtain optimum performance.
15	Record Level Calibration and Recording Bias Current Adjustment	400 Hz (0 dB), 15 kHz (-20 dB) and 10 kHz/20 kHz (-20 dB) to Input Jacks	AC Voltmeter to Output Jacks	Record, Playback Monitor - Source/Tape Tape - ZX/SX/EX Eq. - 70 µs (ZX/SX) 120 µs (EX) Dolby NR - OFF/B/C	Main P.C.B. (Level) ZX:VR103 VR203 SX:VR102 VR202 EX:VR101 VR201 (Bias) ZX:VR115 VR215 SX:VR116 VR216 EX:VR117 VR217	Adjustment should be made in the order of ZX, SX and EX. 1. Set the Monitor switch to Source. 2. Feed in 400 Hz, and set the Input Level control to obtain 0 dB (500 mV) on the AC voltmeter. 3. Set the Monitor switch to tape. 4. Load a reference ZX tape, reference SX tape and reference EXII tape. 5. Set Record Cal. VR103 (VR203) for ZX, VR102 (VR202) for SX and VR101 (VR201) for EXII tape to their center position. 6. Adjust Bias VR115 (VR215) for ZX, VR116 (VR216) for SX and VR117 (VR217) for EXII tape to obtain maximum reading on the AC voltmeter. 7. Feed in 15 kHz (-20 dB) and adjust Bias VR115 (VR215), VR116 (VR216) and VR117 (VR217) to obtain the same readings as source monitor levels on the AC voltmeter. (to be continued)

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUST-MENT	REMARKS
						8. Feed in 400 Hz (0 dB) and adjust Record Cal. VR103 (VR203), VR102 (VR202) and VR101 (VR201) to obtain 0 dB (500 mV) on the AC voltmeter. 9. Repeat above 7 and 8 two or three times to obtain optimum performance. 10. Feed in 10 kHz and 20 kHz (-20 dB), record and play them back, and check whether the playback levels are within the following ranges. With Dolby NR OFF: -20 dB ±3 dB Level difference between Dolby NR OFF and B: ±2 dB Level difference between Dolby NR OFF and C: ±3 dB 11. Check that the total harmonic distortion is less than 0.9% for ZX tape and 1.0% for SX and EXII tapes. If satisfactory results are not obtained, re-adjust VR105 (VR205) referring to Step 9 "Playback Frequency Response Adjustment" and repeat above steps.
16	Overall Frequency Response Adjustment	400 Hz (0 dB) and 20 Hz to 20 kHz (-20 dB) to Input Jacks	AC Volt-meter to Output Jacks	Record, Playback Monitor - Source/ Tape Tape - ZX/SX/EX Eq. - 70 µs (ZX/SX) 120 µs (EX) Dolby NR - OFF	Main P.C.B. L105 L205	1. Set the Monitor switch to Source. 2. Feed in 400 Hz and adjust the Input Level control to obtain -20 dB on the AC voltmeter. 3. Set the Monitor switch to Tape. 4. Feed in 20 Hz to 20 kHz (-20 dB) and check to insure whether the output levels are within -20 dB ±3 dB. 5. If above is not sufficient, adjust L105 (L205) to obtain approx. -20 dB at 20 kHz. 6. Conduct step 15 "Record Level Calibration and Recording Bias Current Adjustment". 7. If above is not sufficient, precise re-adjustment of step 9 "Playback Frequency Response", replacement of Playback Head or Record Head, check on item 4.7 "Tape Travelling Check" will be required.

7. MECHANISM ASS'Y AND PARTS LIST

7.1. Synthesis

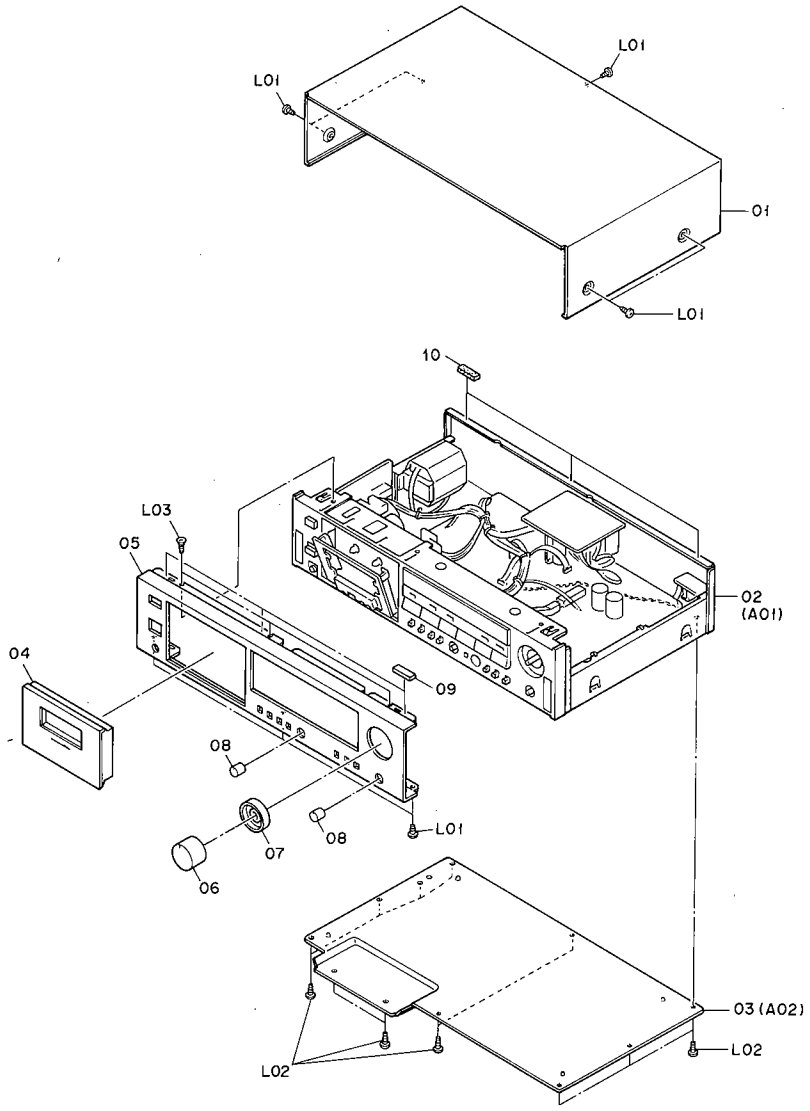


Fig. 7.1

Schematic Ref. No.	Part No.	Description	Q'ty
7.1. Synthesis			
		Synthesis Serial No.: A13201001 -	
01	0H05111A	Top Cover	1
02	JA04300A	Chassis Ass'y (CR-3 (Australia))	1
	JA04299A	Chassis Ass'y (CR-3 (Other))	1
	JA04302A	Chassis Ass'y (CR-3 (Saudi Arabia))	1
	JA04303A	Chassis Ass'y (CR-3A (U.S.A.))	1
	JA04297A	Chassis Ass'y (CR-3A (Canada))	1
	JA04301A	Chassis Ass'y (CR-3E (Europe))	1
	JA04296A	Chassis Ass'y (CR-3E (UK))	1
	JA04298A	Chassis Ass'y (CR-30)	1
03	JA04319A	Bottom Cover Ass'y (CR-3 & CR-3E)	1
	JA04329A	Bottom Cover Ass'y (CR-3A)	1
	JA04340A	Bottom Cover Ass'y (CR-30)	1
04	HA05312A	Cassette Case Cover Ass'y	1
05	0H05142B	Front Panel (CR-3)	1
	0H05140B	Front Panel (CR-3A)	1
	0H05141B	Front Panel (CR-3E)	1
	0H05143B	Front Panel (CR-30)	1
06	HA05340A	Rec. Volume Knob Ass'y	1
07	HA05338A	Rec. Balance Knob Ass'y	1
08	HA05339A	Bias Volume Knob Ass'y	2
09	0J05453A	Top Cover Cushion	3
10	0J05407A	Top Cover Sheet	3
L01	0E03433A	BT 3x6 ⊕ Binding Projected (Black Chromate)	8
L02	0E00868A	BT 3x8 ⊕ Binding	11
L03	0E03054A	BT 3x8 ⊕ Countersunk	3
—	0M03797A	Voltage Seal 240V (CR-3E (UK))	1
—	0M03844B	Power Cord Label (CR-3E (UK))	1
—	0M05148A	Production Date Seal (CR-3A)	1
—	0M04381A	EP Approval Label (CR-3E Europe))	1
—	0M04811A	Voltage Caution Sheet (CR-3 (Other & Saudi Arabia))	1
—	0M05065A	Pass Label	1
—	0M05067A	CSA Approval Label (CR-3A (Canada))	1
—	0M05068A	LA Label (CR-3A (U.S.A.))	1
—	0M05056A	Serial No. Seal (CR-3, CR-3E & CR-30)	1
—	0M05069A	Serial No. Seal (CR-3A)	1
—	0M05115A	Amp. Number Seal	1
—	0M05111A	F Mark Approval Seal (CR-3E (Europe))	1
—	MA01001A	F. Code Label Ass'y (CR-3, CR-3E & CR-30)	1

7.2. Chassis Ass'y (A01)

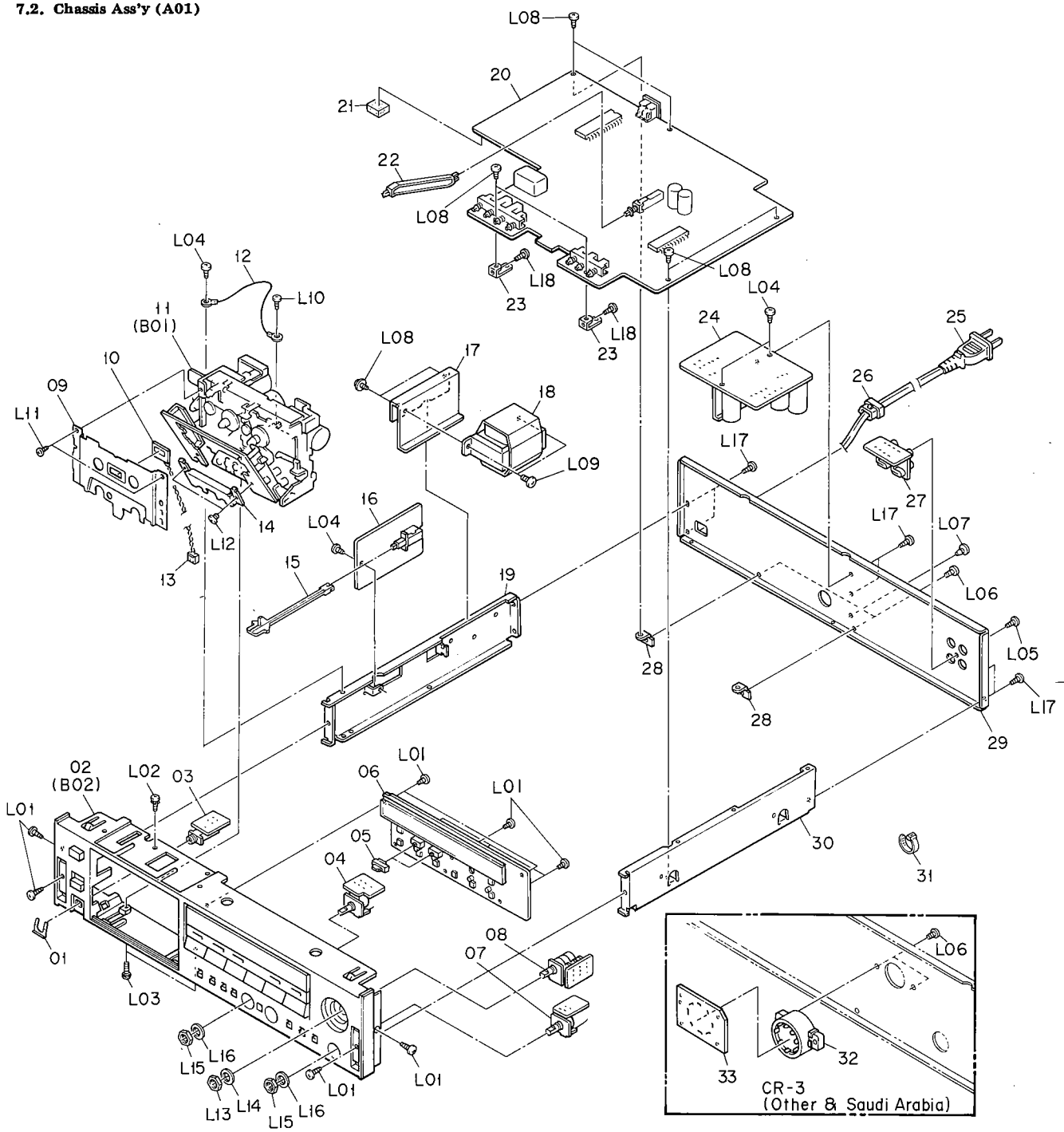


Fig. 7.2

Schematic Ref. No.	Part No.	Description	Q'ty
7.2. Chassis Ass'y (A01)			
A01	JA04300A	Chassis Ass'y (Australia))	1
	JA04299A	Chassis Ass'y (CR-3 (Other))	1
	JA04302A	Chassis Ass'y (CR-3 (Saudi Arabia))	1
	JA04303A	Chassis Ass'y (CR-3A (U.S.A.))	1
	JA04297A	Chassis Ass'y (CR-3A (Canada))	1
	JA04301A	Chassis Ass'y (CR-3E (Europe))	1
	JA04296A	Chassis Ass'y (CR-3E (UK))	1
	JA04298A	Chassis Ass'y (CR-30) Serial No.: A13201001 -	1
01	0J05427A	Mount Plate	1
02	HA05306A	Front Escutchen Ass'y	1
03	BA06929A	Headphone P.C.B. Ass'y	1
04	BA06928A	Bias Tune Volume P.C.B. Ass'y	1
05	0H05095A	Slide Button	2
06	BA06932A	Control P.C.B. Ass'y	1
07	BA06927A	Output Volume P.C.B. Ass'y	1
08	BA06926A	Input Volume P.C.B. Ass'y	1
09	0H05166A	Cover Plate	1
10	0B12580A	LED P. Green SLF-7250	1
11	CA08885A	Mechanism Ass'y	1
12	0B80150A	GND Wire Ass'y	1
13	0B83132A	2P Connector	1
14	0H04415C	Head Mounting Cover	1
15	0J05402A	Power Switch Joint	1
16	BA06935A	Fuse P.C.B. Ass'y (CR-3 & CR-3E)	1
	BA06934A	Fuse P.C.B. Ass'y (CR-3A)	1
	BA06936A	Fuse P.C.B. Ass'y (CR-30)	1
17	0J05417C	Transformer Holder	1
18	0B50100A	Power Transformer (CR-3 (Australia) & CR-3E)	
	0B50101A	Power Transformer (CR-3 (Other & Saudi Arabia))	1
	0B50099A	Power Transformer (CR-3A)	1
	0B50102A	Power Transformer (CR-30)	1
19	0J05392A	Side Chassis L	1
20	BA06915A	Main P.C.B. Ass'y	1
21	0J05451A	P.C.B. Cushion	1
22	0J05403A	Monitor Switch Joint	1
23	0J05394A	P.C.B. Holder Front	2
24	BA06931A	Power Supply P.C.B. Ass'y	1
25	0B05241A	Power Cord (CR-3 (Australia))	1
	0B08533A	Power Cord (CR-3 (Other & Saudi Arabia))	1
	0B08504A	Power Cord (CR-3A)	1
	0B08093U	Power Cord (CR-3E (Europe))	1
	0B08348A	Power Cord (CR-3E (UK))	1
	0B08219B	Power Cord (CR-30)	1
26	0B90280A	Cord Bushing (CR-3 (Australia), CR-3A & CR-3E)	1
	0B90283A	Cord Bushing (CR-3 (Other & Saudi Arabia) & CR-30)	1
27	BA06930A	Pin Jack P.C.B. Ass'y	1
28	0J05395A	P.C.B. Holder Rear	2
29	0H05119A	Rear Panel (CR-3 (Australia))	1
	0H05121A	Rear Panel (CR-3 (Other & Saudi Arabia))	1
	0H05117B	Rear Panel (CR-3A)	1
	0H05118A	Rear Panel (CR-3E)	1
	0H05120A	Rear Panel (CR-30)	1
30	0J05393A	Side Chassis R	1
31	0B08515A	Insu-lock SKB80	18
32	0B81771A	Voltage Selector (CR-3 (Other & Saudi Arabia))	1
33	0B60503A	Voltage Selector P.C.B. (CR-3 (Other & Saudi Arabia))	1
L01	0E00868A	BT3x8 ⊕ Binding	10
L02	0E03212A	BT2.6x6 ⊕ Binding with Toothed Lock Washer	1
L03	0E03435A	M2.6x6 ⊕ Binding with Toothed Lock Washer	2
L04	0E00857A	BT3x6 ⊕ Binding	4
L05	0E00921A	BT3x8 ⊕ Binding (Black Chromate)	1
L06	0E00985A	M3x6 ⊕ Binding (Black Chromate) (CR-3 (Australia), CR-3A, CR-3E & CR-30)	2
	0E00985A	M3x6 ⊕ Binding (Black Chromate) (CR-3 (Other & Saudi Arabia))	4
L07	0J05108A	Hole Plug No.9	1
L08	0E03432A	BT3x6 ⊕ Tapping (Black Chromate)	8
L09	0E03438A	BT4x6 ⊕ Binding	2
L10	0E00859A	BT2.6x6 ⊕ Binding	1
L11	0E03437A	FT2.5x3.5 ⊕ Pan (Black Chromate)	2
L12	0E03202A	M2.6x3 ⊕ Binding (Black Chromate)	2
L13	0E03375A	Nut Hex. M9	1
L14	0E03376A	Washer 9mm	1
L15	0E03382A	Nut Hex. M7	2
L16	0E03383A	Washer 7mm	2
L17	0E03433A	BT3x6 ⊕ Binding Projected (Black Chromate))	6
L18	0E00846A	BT3x8 ⊕ Pan	2
—	0M04075C	Fuse Caution (CR-3A)	1
7.3. Bottom Cover Ass'y (A02)			
A02	JA04319A	Bottom Cover Ass'y (CR-3 & CR-3E)	1
	JA04329A	Bottom Cover Ass'y (CR-3A)	1
	JA04340A	Bottom Cover Ass'y (CR-30) Serial No.: A13201001 -	1
01	0J05401A	Bottom Cover	1
02	0J05420A	Leg N (CR-3, CR-3A & CR-3E)	4
	HA05357A	Leg Ass'y (CR-30)	4
03	0M04377B	Caution Label (CR-3A)	1
L01	0E00888A	BT3x12 ⊕ Binding	4
—	0J05461A	Leg Felt N (CR-3, CR-3A & CR-3E)	4

7.3. Bottom Cover Ass'y (A02)

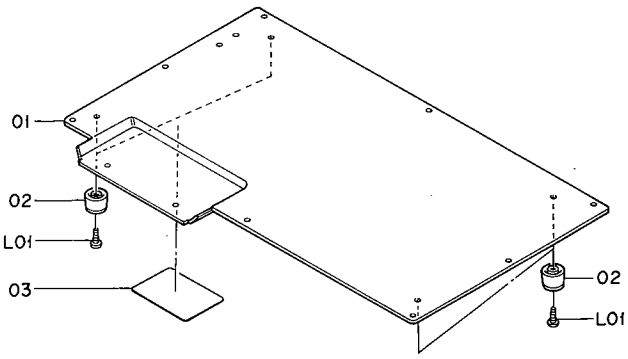


Fig. 7.3

Schematic Ref. No.	Part No.	Description	Q'ty
7.4. Mechanism Ass'y (B01)			
B01	CA08885A	Mechanism Ass'y Serial No.: A13201001 -	1
01	0C80021A	Eject Lever	1
02	0C82720A	Eject Lever Spring	1
03	CA80006A	Pneumatic Damper Ass'y	1
04	0C80019B	Eject Spring	1
05	0C82723A	Cassette Case Holder L	1
06	0C80617A	Back Tension Arm Spring	1
07	0C80618A	Back Tension Arm Collar	1
08	0C80619A	Back Tension Arm	1
09	0C80620A	Back Tension Arm Pulley	1
10	0C80621A	Back Tension Arm Belt	1
11	0C80013A	Lock Lever Spring	1
12	0C80014A	Lock Lever Collar	1
13	0C80015B	Lock Lever	1
14	CA80366A	Supply Pressure Roller Arm Ass'y	1
15	0C81420A	Supply Pressure Roller Arm Spring	1
16	0C81422A	Supply Pressur Roller Arm Track Spring	1
17	CA80726A	Supply Reel Hub Ass'y	1
18	0C80612A	Spring Holder	2
19	0C80614A	Supply Reel Hub Spring	1
20	CA80200A	Cassette Case Ass'y	1
21	0C08762A	Head Hight Adjustment Gear	2
22	0C08761A	Head Hight Adjustment Screw	4
23	0C08763A	Azimuth Alignment Screw	2
24	0C80605A	Wire Clamper	1
25	CA08637A	Head Mount Base Sub Ass'y	1
26	CA08659A	R-3L Record Head Ass'y	1
27	0C08776A	Head Plate Spring (L)	1
28	CA80731A	4P Connector	1
29	0C80003A	Head Base Hold Plate	1
30	0C80004A	Steel Ball 3mm	1
31	GA02201A	E-4F Erase Head	1
32	CA80733A	2P Connector	1
33	0C08768A	E.H. Hold Plate	1
34	0C08889A	E.H. Hold Plate Tapering Spring	2
35	0C08886A	E.H. Hold Plate Spring	1
36	0C80007A	Steel Ball 2mm	3
37	CA08658B	P2H-3L Playback Head Ass'y	1
38	0C08775A	Head Plate Spring (R)	1
39	CA80732A	4P Connector	1
40	0C08771A	Tape Guide Plate	1
41	CA80365A	Head Base Sub Ass'y	1
42	0C82711A	Head Base Spring	1
43	CA80725A	Take-up Reel Hub Ass'y	1
44	0C80613A	Take-up Reel Hub Spring	1
45	CA80368A	Take-up Pressure Roller Arm Ass'y	1
46	0C81423A	Take-up Pressure Arm Spring	1
47	0C80610A	Cassette Case Spring	1
48	0C80622A	Switch Hold Plate	1
49	0C80623A	Switch Plate	2
50	0C80624A	Switch Collar A	2
51	0C80626A	Leaf Switch	1
52	0C80625A	Switch Collar B	2
53	0C80017B	Record Protector Lever	1
54	CA80736A	Mechanism Chassis	1
55	0C80022B	Cassette Hold Spring	1
56	CA80011A	Shut-off P.C.B. Ass'y	1
57	CA80204A	Brake Ass'y	1
58	0C80628A	Brake Spring B	1
59	0C80630A	Brake Arm Collar	1
60	0C80629A	Brake Arm	1
61	0C82724A	Reel Motor Holder	1
62	CA80735A	9P Connector	1
63	CA80730A	Reel Motor Ass'y	1
64	0C81417A	Cam Gear B	1
65	0C81418A	Control Motor Holder	1
66	0C81416A	Thrust Spring B	1
67	0C80027A	Mode Switch	3
68	0C81415A	Warm Thrust Bush	1
69	CA80007A	Control Motor Ass'y	1
70	0C80010D	Cassette Case Holder R	1
71	0C80012A	Eject Sensor Switch	1
72	0C82701A	Supply Capstan Flange	1
73	0C80029A	Back Tesion Spring	2
74	0C82699A	Supply Flywheel	1
75	0C82702A	Capstan Belt	1
76	0C82714A	Flywheel Holder	1
77	0C82726A	Floating Rubber	3
78	CA80729A	Capstan Motor Ass'y	1
79	0C82700A	Take-up Capstan Flange	1
80	0C82698A	Take-up Flywheel	1
81	0C82718A	Thrust plate	2
82	0C80037A	Insu-Lock	3
83	CA80734A	5P Connector	1
L01	0E00181A	E-Ring 3mm	3
L02	0E03235A	Plastic Washer 2x5x0.25	1
L03	0E03052A	CS Stopper Ring 2.4mm	2
L04	0E03236A	M2x5 ⊕Pan (3A)	3
L05	0E03229A	FT2.5x6 ⊕Pan	8
L06	0E03043A	FT2.5x10 ⊕Pan	2
L07	0E03225A	Washer 1.8x3.8x0.5	2
L08	0E03226A	Washer 2.1x4.5x0.1	3
L09	0C81421A	Supply Pressure Roller Arm Adjustment	1
L10	0C82725A	M2.6x9 ⊕Pan with Washer	3
L11	0E03049A	Washer 1.8x3.2x0.5	2
L12	0E00976A	M2x5 ⊕Binding	5
L13	0E00025A	Spring Washer 2mm	2
L14	0E00117A	Washer 2x4.3x0.4	5
L15	0E00866A	M2.6x4 ⊕Binding	1
L16	0C08774A	Plate Washer L	1
L17	0C08773A	Plate Washer R	1
L18	0E03228A	FT3x4 ⊕Pan	1
L19	0E03232A	M1.7x7 ⊕Pan	1
L20	0E03222A	Washer 1.8x3.8x0.3	1
L21	0E00691A	M2x3 ⊕Pan	2
L22	0E00222A	E-Ring 2mm	1
L23	0E03035A	M2x3.2 ⊕Truss	3
L24	0E03227A	Washer 2.7x5x0.5	1
L25	0E03231A	M2x30 ⊕Pan	2
L26	0E03041A	FT2.5x4 ⊕Pan	2
L27	0E03233A	Wahser 2.6x8x1	1
L28	0E03230A	ST2.6x12 ⊕Pan	1
L29	0C82717A	Capstan Washer T	1
L30	0E03237A	Nut Hex. M2.6	1
L31	0E03045A	M2.6x3 ⊕Binding	2
L32	0E00694A	Nut Hex. M2	1
L33	0E03234A	M2x3 ⊕Pan	2
L34	0E03044A	FT2.5x20 ⊕Pan	1
L35	0C82716A	Capstan Washer S	1
L36	0E03042A	FT2.5x5 ⊕Pan	9
L37	0E00912A	Washer 2.6x4.7x0.25 (Poly)	2

7.4. Mechanism Ass'y (B01)

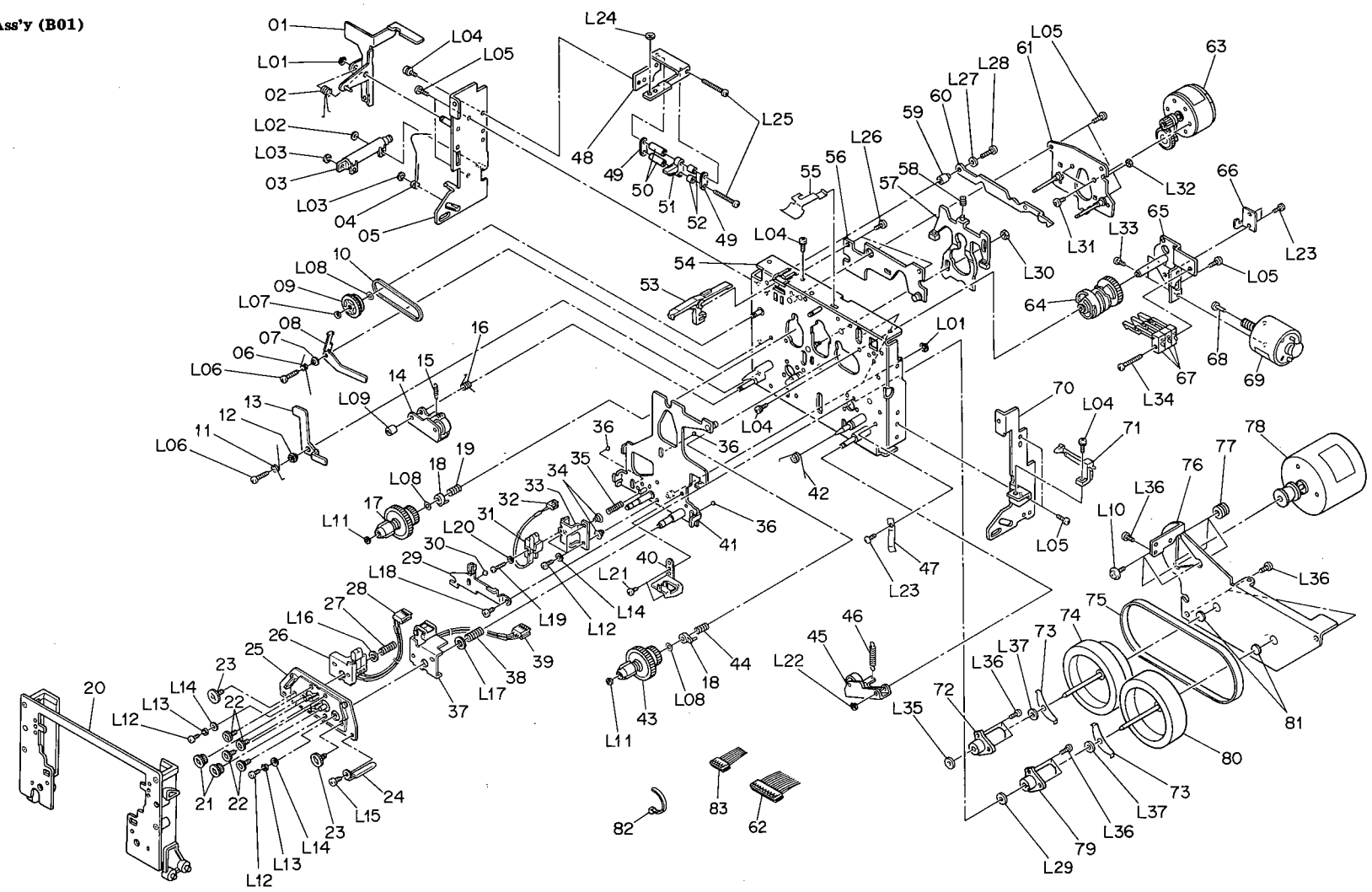


Fig. 7.4

7.5. Front Escutcheon Ass'y (B02)

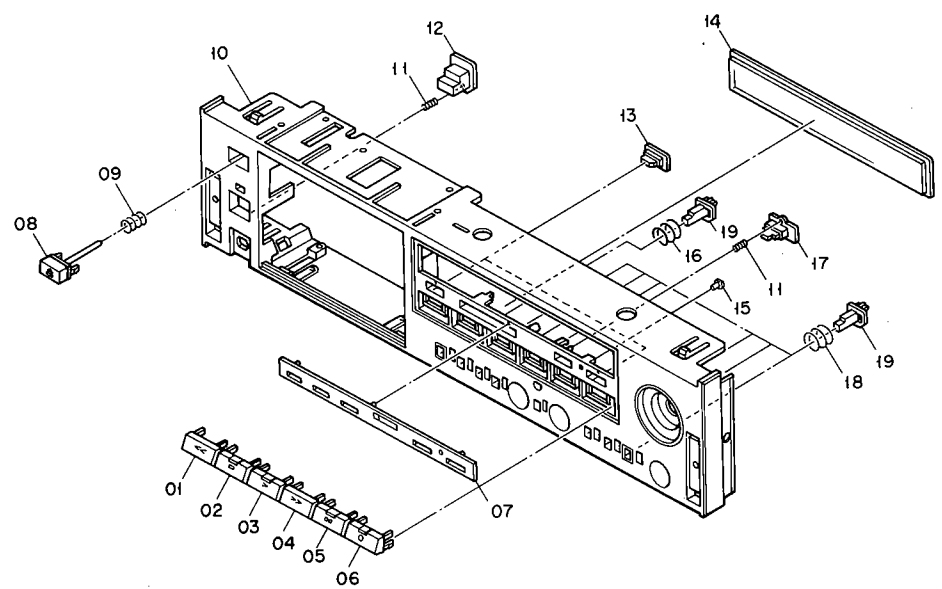
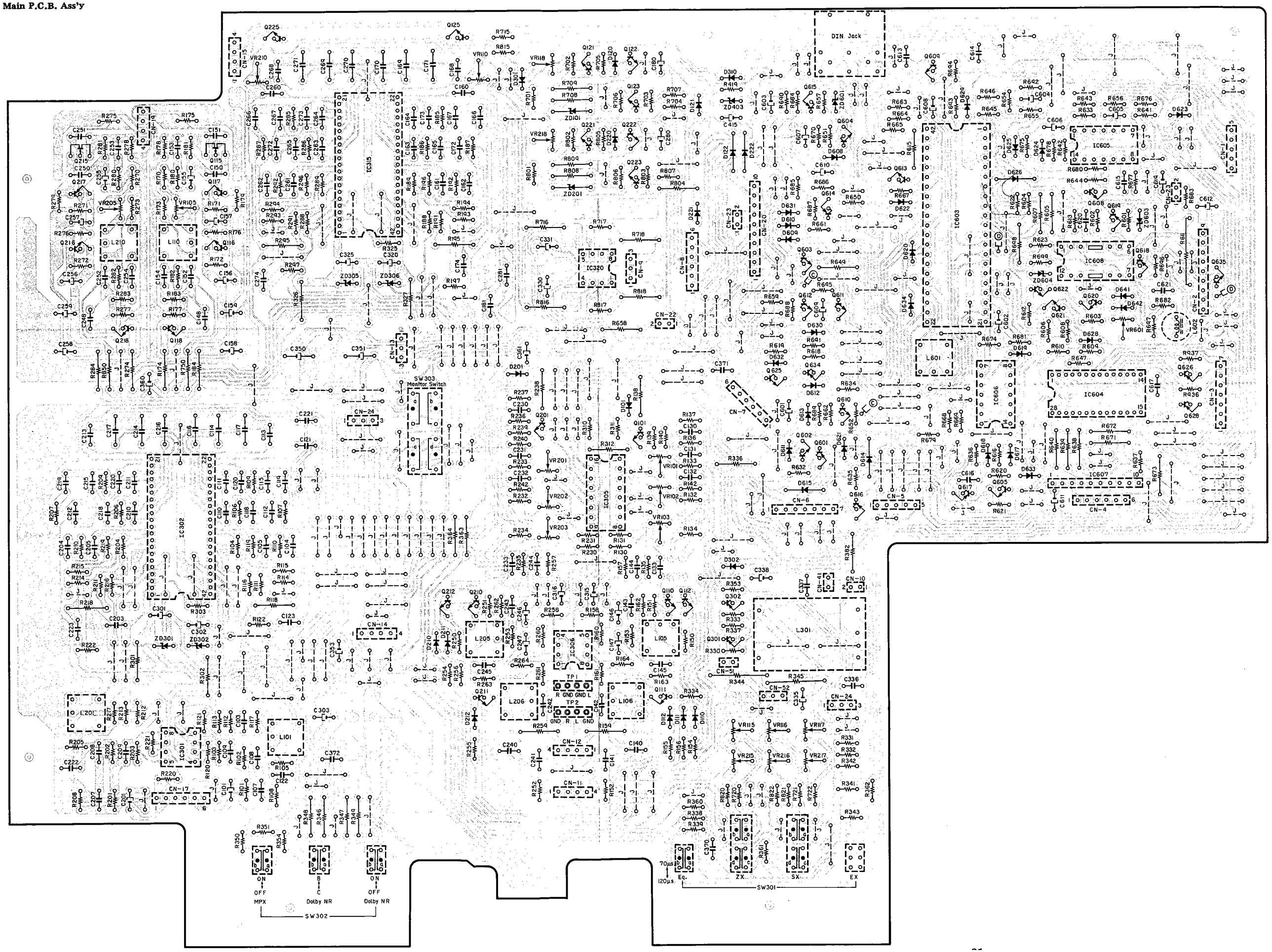


Fig. 7.5

Schematic Ref. No.	Part No.	Description	Q'ty
7.5. Front Escutcheon Ass'y (B02)			
B02	**HA05306A**	**Front Escutcheon Ass'y** **Serial No.: A13201001 -**	**1**
01	0H05126A	Rewind Button	1
02	HA05359A	Stop Button Ass'y	1
03	HA05343A	Play Button Ass'y	1
04	0H05129A	F.F. Button	1
05	HA05361A	Pause Button Ass'y	1
06	HA05360A	Rec. Button Ass'y	1
07	0H05098B	Function Plate	1
08	HA05344A	Eject Button Ass'y	1
09	0J05404A	Eject Knob Spring	1
10	0H05122B	Front Escutcheon	1
11	0J05405A	Power Switch Knob Spring	2
12	0H05125B	Power Switch Knob	1
13	0H05094A	Function Button	2
14	0H05101A	Display Lens	1
15	0H05103A	LED Lens B	1
16	0J05452B	EX Switch Spring	1
17	0H05096A	Counter Button	1
18	0J05406A	Push Switch Button Spring	6
19	0H05097A	Push Button	7
—	0J05458A	LED Lens Adhesive Tape	2
—	0J05459A	F. Plate Adhesive Tape	2

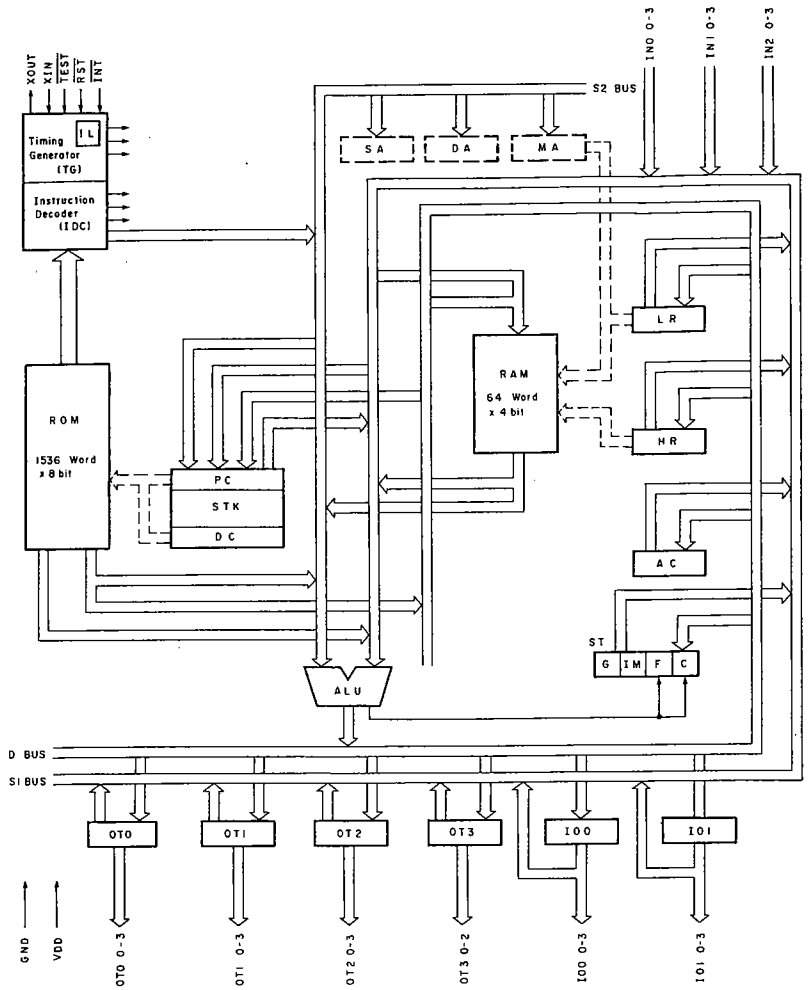
8.10. Main P.C.B. Ass'y

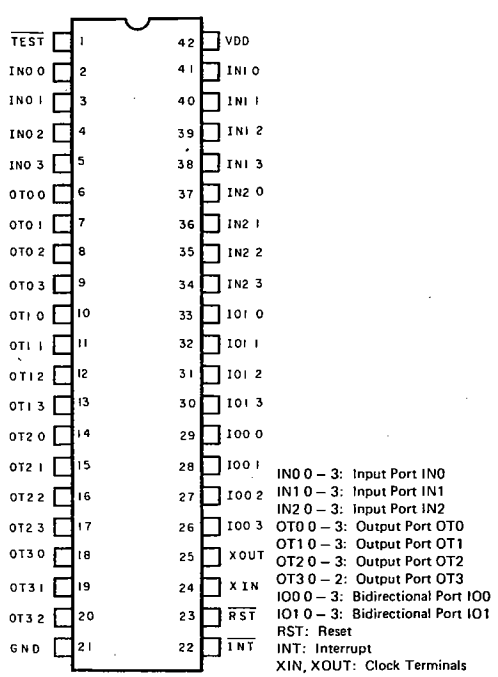


Schematic Ref. No.	Part No.	Description
8.10. Main P.C.B Ass'y		
	BA06915A	**Main P.C.B. Ass'y**
	— PB Eq. Amp. —	
Q115	0B10213A	FET 2SK371 (GR)
Q116	0B06142A	TR 2SC2240 (BL)
Q117	0B10050A	TR 2SA970 (BL)
Q118	0B10033A	TR 2SC1740S
Q215	0B10213A	FET 2SK371 (GR)
Q216	0B06142A	TR 2SC2240 (BL)
Q217	0B10050A	TR 2SA970 (BL)
Q218	0B10033A	TR 2SC1740S
L110	0B51261A	Trap Unit
L210	0B51261A	Trap Unit
VR105	0B32124A	Semi VR 1K
VR205	0B32124A	Semi VR 1K
R170	0B09661A	RK 220 1/6W J
R171	0B09673A	RK 680 1/6W J
R172	0B09697A	RK 6.8K 1/6W J
R173	0B09709A	RK 22K 1/6W J
R174	0B01888A	RK 10K 1/4W J
R175	0B09725A	RK 100K 1/6W J
R176	0B09721A	RK 68K 1/6W J
R177	0B09749A	RK 1M 1/6W J
R178	0B22085A	RM 54.9 1/6W F
R179	0B22274A	RM 2.61K 1/6W F
R180	0B22313A	RM 5.49K 1/6W F
R181	0B22472A	RM 140K 1/6W F
R182	0B22329A	RM 7.50K 1/6W F
R183	0B22344A	RM 10.2K 1/6W F
R184	0B24146A	RF 62 1/4W J
R270	0B09661A	RK 220 1/6W J
R271	0B09673A	RK 680 1/6W J
R272	0B09697A	RK 6.8K 1/6W J
R273	0B09709A	RK 22K 1/6W J
R274	0B01888A	RK 10K 1/4W J
R275	0B09725A	RK 100K 1/6W J
R276	0B09721A	RK 68K 1/6W J
R277	0B09749A	RK 1M 1/6W J
R278	0B22085A	RM 54.9 1/6W F
R279	0B22274A	RM 2.61K 1/6W F
R280	0B22313A	RM 5.49K 1/6W F
R281	0B22472A	RM 140K 1/6W F
R282	0B22329A	RM 7.50K 1/6W F
R283	0B22344A	RM 10.2K 1/6W F
R284	0B24146A	RF 62 1/4W J
R750	0B24146A	RF 62 1/4W J
R850	0B24146A	RF 62 1/4W J
C148	0B41402A	CPP 470P 50V J
C150	0B09812A	CC 2P 50V C
C151	0B41390A	CPP 150P 50V J
C152	0B41239A	CPP 3900P 100V J
C153	0B09405A	CPP 0.022μ 100V J
C154	0B41245A	CPP 6800P 100V J
C155	0B09833A	CE 4.7μ 25V (LN)
C156	0B05899A	CE 220μ 10V
C157	0B05841A	CE 330μ 10V
C158,159	0B40081A	CE 470μ 16V
C248	0B41402A	CPP 470P 50V J
C250	0B09812A	CC 2P 50V C
C251	0B41390A	CPP 150P 50V J
C252	0B41239A	CPP 3900P 100V J
C253	0B09405A	CPP 0.022μ 100V J
C254	0B41245A	CPP 6800P 100V J
C255	0B09833A	CE 4.7μ 25V (LN)
C256	0B05899A	CE 220μ 10V
C257	0B05841A	CE 330μ 10V
C258,259	0B40081A	CE 470μ 16V
C360	0B09147A	CE 3.3μ 50V (LN)
CN19	0B81761A	4P-T Post
	— Decoder —	
IC315	0B11363A	IC CX20188
ZD305,306	0B12168A	ZD 10V RD10JS-T1B2
VR110	0B32058A	Semi VR 2.2K
VR210	0B32058A	Semi VR 2.2K
R185	0B09673A	RK 680 1/6W J
R186	0B09698A	RK 7.5K 1/6W J
R187	0B09700A	RK 9.1K 1/6W J
R188	0B09725A	RK 100K 1/6W J
R189	0B09749A	RK 1M 1/6W J
R191	0B22229A	RM 1.00K 1/6W F
R192	0B22201A	RM 562 1/6W F
R193	0B22285A	RM 3.24K 1/6W F
R194	0B22294A	RM 3.83K 1/6W F
R195	0B09547A	RM 2.21K 1/4W F
R196	0B22380A	RM 22.1K 1/6W F
R197	0B09717A	RK 47K 1/6W J
R285	0B09673A	RK 680 1/6W J
R286	0B09698A	RK 7.5K 1/6W J
R287	0B09700A	RK 9.1K 1/6W J
R288	0B09725A	RK 100K 1/6W J
R289	0B09749A	RK 1M 1/6W J
R291	0B22229A	RM 1.00K 1/6W F
R292	0B22201A	RM 562 1/6W F
R293	0B22285A	RM 3.24K 1/6W F
R294	0B22294A	RM 3.83K 1/6W F
R295	0B09547A	RM 2.21K 1/4W F
R296	0B22380A	RM 22.1K 1/6W F
R297	0B09717A	RK 47K 1/6W J
R325	0B22469A	RM 130K 1/6W F
R326,327	0B24146A	RF 62 1/4W J
C160	0B41386A	CPP 100P 50V J
C161,162	0B41133A	CPP 2200P 100V G
C163	0B41139A	CPP 3900P 100V G
C164	0B41143A	CPP 5600P 100V G
C165,166	0B09187A	CE 1μ 50V (BP)
C167	0B05813A	CML 0.056μ 50V J
C168	0B05682A	CML 0.068μ 50V J
C169	0B09870A	CMM 0.15μ 50V J
C170	0B09872A	CMM 0.22μ 50V J
C171	0B09876A	CMM 0.47μ 50V J
C172	0B05557A	CML 0.015μ 50V J
C173	0B05681A	CML 0.01μ 50V J
C174	0B40473A	CE 10μ 16V (BP)
C260	0B41386A	CPP 100P 50V J
C261,262	0B41133A	CPP 2200P 100V G
C263	0B41139A	CPP 3900P 100V G
C264	0B41143A	CPP 5600P 100V G
C265,266	0B09187A	CE 1μ 50V (BP)
C267	0B05813A	CML 0.056μ 50V J
C268	0B05682A	CML 0.068μ 50V J
C269	0B09870A	CMM 0.15μ 50V J
C270	0B09872A	CMM 0.22μ 50V J
C271	0B09876A	CMM 0.47μ 50V J
C272	0B05557A	CML 0.015μ 50V J
C273	0B05681A	CML 0.01μ 50V J
C274	0B40473A	CE 10μ 16V (BP)
C320	0B01391A	CE 220μ 25V
C325	0B01391A	CE 220μ 25V
	— Encoder —	
IC301	0B11005A	IC NJM072DE
IC302	0B11363A	IC CX20188
L101	0B51262A	L-C Block BLU (MPX)
L201	0B51262A	L-C Block BLU (MPX)
ZD301,302	0B12168A	ZD 10V RD10JS-T1B2
R101,102	0B09717A	RK 47K 1/6W J
R103	0B09709A	RK 22K 1/6W J
R104	0B09749A	RK 1M 1/6W J
R105	0B09725A	RK 100K 1/6W J
R106	0B09698A	RK 7.5K 1/6W J
R107	0B09700A	RK 9.1K 1/6W J
R108	0B09749A	RK 1M 1/6W J
R109	0B09673A	RK 680 1/6W J
R110	0B22201A	RM 562 1/6W F
R111	0B22229A	RM 1.00K 1/6W F
R112,113	0B22275A	RM 2.67K 1/6W F
R114	0B22285A	RM 3.24K 1/6W F
R115	0B22294A	RM 3.83K 1/6W F
R116,117	0B22315A	RM 5.62K 1/6W F
R118	0B09523A	RM 13.7K 1/4W F
R119	0B22380A	RM 22.1K 1/6W F
R120,121	0B09677A	RK 1K 1/6W J
R122	0B09733A	RK 220K 1/6W J
R201,202	0B09717A	RK 47K 1/6W J
R203	0B09709A	RK 22K 1/6W J
R204	0B09749A	RK 1M 1/6W J
R205	0B09725A	RK 100K 1/6W J
R206	0B09698A	RK 7.5K 1/6W J
R207	0B09700A	RK 9.1K 1/6W J
R208	0B09749A	RK 1M 1/6W J
R209	0B09673A	RK 680 1/6W J
R210	0B22201A	RM 562 1/6W F
R211	0B22229A	RM 1.00K 1/6W F
R212,213	0B22275A	RM 2.67K 1/6W F
R214	0B22285A	RM 3.24K 1/6W F
R215	0B22294A	RM 3.83K 1/6W F
R216,217	0B22315A	RM 5.62K 1/6W F
R218	0B09523A	RM 13.7K 1/4W F
R219	0B22380A	RM 22.1K 1/6W F
R220,221	0B09677A	RK 1K 1/6W J
R222	0B09733A	RK 220K 1/6W J
R301,302	0B24146A	RF 62 1/4W J
R303	0B22469A	RM 130K 1/6W F
C101	0B09148A	CE 10μ 25V (LN)
C103	0B09404A	CPP 1000P 100V J
C104,105	0B41133A	CPP 2200P 100V G
C107,108	0B09792A	CC 33P 50V J
C109	0B09393A	CC 68P 50V J
C110	0B41139A	CPP 3900P 100V G
C111	0B41143A	CPP 5600P 100V G
C112	0B05557A	CML 0.015μ 50V J
C113	0B05682A	CML 0.068μ 50V J
C114	0B09870A	CMM 0.15μ 50V J
C115	0B05813A	CML 0.056μ 50V J
C116	0B09872A	CMM 0.22μ 50V J
C117	0B09876A	CMM 0.47μ 50V J
C118,119	0B09187A	CE 1μ 50V (BP)
C120	0B05681A	CML 0.01μ 50V J
C121	0B40473A	CE 10μ 16V (BP)
C122	0B41388A	CPP 120P 50V J
C123	0B40473A	CE 10μ 16V (BP)
C201	0B09148A	CE 10μ 25V (LN)
C203	0B09404A	CPP 1000P 100V J
C204,205	0B41133A	CPP 2200P 100V G
C207,208	0B09792A	CC 33P 50V J
C209	0B09393A	CC 68P 50V J
C210	0B41139A	CPP 3900P 100V G
C211	0B41143A	CPP 5600P 100V G
C212	0B05557A	CML 0.015μ 50V J
C213	0B05682A	CML 0.068μ 50V J
C214	0B09870A	CMM 0.15μ 50V J
C215	0B05813A	CML 0.056μ 50V J
C216	0B09872A	CMM 0.22μ 50V J
C217	0B09876A	CMM 0.47μ 50V J
C218,219	0B09187A	CE 1μ 50V (BP)
C220	0B05681A	CML 0.01μ 50V J
C221	0B40473A	CE 10μ 16V (BP)
C222	0B41388A	CPP 120P 50V J
C223	0B40473A	CE 10μ 16V (BP)
C301,302	0B01391A	CE 220μ 25V
C303	0B01674A	CE 10μ 25V
	— Rec. Level —	
IC305	0B11027A	IC TC9145P
Q101	0B10033A	TR 2SC1740S
Q201	0B10033A	TR 2SC1740S
D101	0B06398A	SiD 1SS176
D201	0B06398A	SiD 1SS176
VR101,102	0B32127A	Semi VR 10K
VR103	0B32128A	Semi VR 20K
VR201,202	0B32127A	Semi VR 10K
VR203	0B32128A	Semi VR 20K
R130	0B09689A	RK 3.3K 1/6W J
R131	0B09693A	RK 4.7K 1/6W J
R132	0B09697A	RK 6.8K 1/6W J
R133,134	0B09701A	RK 10K 1/6W J
R135	0B09701A	RK 10K 1/6W J
R136	0B09705A	RK 15K 1/6W J
R137	0B09711A	RK 27K 1/6W J
R138	0B05615A	RK 22K 1/4W J
R139	0B09749A	RK 1M 1/6W J
R140	0B22326A	RM 6.98K 1/6W F
R142	0B09709A	RK 22K 1/6W J
R230	0B09689A	RK 3.3K 1/6W J
R231	0B09693A	RK 4.7K 1/6W J
R232	0B09697A	RK 6.8K 1/6W J
R233,234	0B09701A	RK 10K 1/6W J
R235	0B09701A	RK 10K 1/6W J
R236	0B09705A	RK 15K 1/6W J
R237	0B09711A	RK 27K 1/6W J
R238	0B05615A	RK 22K 1/4W J
R239	0B09749A	RK 1M 1/6W J
R240	0B22326A	RM 6.98K 1/6W F
R242	0B09709A	RK 22K 1/6W J
R310,311	0B09693A	RK 4.7K 1/6W J
R312	0B01888A	RK 10K 1/4W J
C130	0B09322A	CPP 330P 100V J
C131	0B09591A	CPP 0.01μ 100V J
C132	0B05659A	CML 5600P 50V J
C133	0B05687A	CML 1200P 50V J
C230	0B09322A	CPP 330P 100V J
C231	0B09591A	CPP 0.01μ 100V J
C232	0B05659A	CML 5600P 50V J
C233	0B05687A	CML 1200P 50V J
C361	0B01863A	CE 3.3μ 50V
	— Rec. Amp. —	
IC306	0B06387A	IC 2043DD
Q110	0B06299A	TR 2SC2878
Q111	0B06299A	TR 2SC2878
Q112	0B10033A	TR 2SC1740S
Q210	0B06299A	TR 2SC2878
Q211	0B06299A	TR 2SC2878
Q212	0B10033A	TR 2SC1740S
D110,111	0B06398A	SiD 1SS176
D112	0B06398A	SiD 1SS176
D210,211	0B06398A	SiD 1SS176
D212	0B06398A	SiD 1SS176
L105	0B51260A	L-C Block 42-5025
L106	0B51258A	Trap Coil 1.05mH
L205	0B51260A	L-C Block 42-5025
L206	0B51258A	Trap Coil 1.05mH
R150	0B09681A	RK 1.5K 1/6W J
R151	0B09675A	RK 820 1/6W J
R152	0B09693A	RK 4.7K 1/6W J
R153	0B09703A	RK 12K 1/6W J
R154,155	0B09701A	RK 10K 1/6W J
R156	0B09709A	RK 22K 1/6W J
R157	0B09713A	RK 33K 1/6W J
R158	0B09733A	RK 220K 1/6W J
R159	0B05936A	RK 10 1/4W J
R160	0B22229A	RM 1.00K 1/6W F
R161	0B22248A	RM 1.54K 1/6W F
R162	0B22296A	RM 3.92K 1/6W F
R163	0B22431A	RM 59.0K 1/6W F
R164	0B09733A	RK 220K 1/6W J
R250	0B09681A	RK 1.5K 1/6W J
R251	0B09675A	RK 820 1/6W J
R252	0B09693A	RK 4.7K 1/6W J
R253	0B09703A	RK 12K 1/6W J
R254,255	0B09701A	RK 10K 1/6W J
R256	0B09709A	RK 22K 1/6W J
R257	0B09713A	RK 33K 1/6W J
R258	0B09733A	RK 220K 1/6W J
R259	0B05936A	RK 10 1/4W J
R260	0B22229A	RM 1.00K 1/6W F
R261	0B22248A	RM 1.54K 1/6W F
R262	0B22296A	RM 3.92K 1/6W F
R263	0B22431A	RM 59.0K 1/6W F
R264	0B09733A	RK 220K 1/6W J
C140	0B09322A	CPP 330P 100V J
C141	0B09270A	CPP 470P 100V J
C142	0B09834A	CPP 2200P 100V J
C143	0B05687A	CML 1200P 50V J
C144	0B09828A	CPP 8200P 100V J
C145	0B05685A	CML 0.082μ 50V J
C146	0B09814A	CE 1μ 50V (LN)
C147	0B40154A	CE 47μ 16V (LN)
C240	0B09322A	CPP 330P 100V J
C241	0B09270A	CPP 470P 100V J
C242	0B09834A	CPP 2200P 100V J
C243	0B05687A	CML 1200P 50V J
C244	0B09828A	CPP 8200P 100V J
C245	0B05685A	CML 0.082μ 50V J
C246	0B09814A	CE 1μ 50V (LN)
C247	0B40154A	CE 47μ 16V (LN)
C315,316	0B40154A	CE 47μ 16V (LN)
CN12	0B81761A	4P-T Post
TP1,2	0B81761A	4P-T Post
	— Meter Amp. —	
Q121	0B06142A	TR 2SC2240 (BL)
Q122,123	0B10033A	TR 2SC1740S
Q221	0B06142A	TR 2SC2240 (BL)
Q222,223	0B10033A	TR 2SC1740S
ZD101	0B06230A	ZD 5.1V RD5.1EB2
ZD201	0B06230A	ZD 5.1V RD5.1EB2
D120,121	0B06398A	SiD 1SS176
D122	0B12584A	SiD 1N4148
D220,221	0B06398A	SiD 1SS176
D222	0B12584A	SiD 1N4148
D301	0B06398A	SiD 1SS176
VR118	0B32130A	Semi VR 100K
VR218	0B32130A	Semi VR 100K
R701	0B09709A	RK 22K 1/6W J
R702	0B09705A	RK 15K 1/6W J
R703,704	0B09719A	RK 56K 1/6W J
R705,706	0B09725A	RK 100K 1/6W J
R707	0B09725A	RK 100K 1/6W J
R708	0B05692A	RK 68K 1/4W J
R709	0B05776A	RK 1M 1/4W J
R801	0B09709A	RK 22K 1/6W J
R802	0B09705A	RK 15K 1/6W J
R803	0B09719A	RK 56K 1/6W J
R804	0B05508A	RK 56K 1/4W J
R805,806	0B09725A	RK 100K 1/6W J
R807	0B09725A	RK 100K 1/6W J
R808	0B05692A	RK 68K 1/4W J
R809	0B05776A	RK 1M 1/4W J
C180	0B09148A	CE 10μ 25V (LN)
C181	0B01780A	CML 0.1μ 50V J
C280	0B09148A	CE 10μ 25V (LN)
C281	0B01780A	CML 0.1μ 50V J
CN8	0B81763A	6P-T Post
	— Headphone Amp. —	
IC320	0B06370A	IC 4556D
Q125	0B06299A	TR 2SC2878
Q225	0B06299A	TR 2SC2878
D310	0B06398A	SiD 1SS176
R715	0B09693A	RK 4.7K 1/6W J
R716	0B01889A	RK 100K 1/4W J
R717	0B09725A	RK 100K 1/6W J
R718	0B09543A	RF 12 1/4W J
R815	0B09693A	RK 4.7K 1/6W J
R816	0B01889A	RK 100K 1/4W J
R817	0B09725A	RK 100K 1/6W J
R818	0B09543A	RF 12 1/4W J
C330,331	0B01403A	CE 47μ 16V
CN9	0B81011A	Dip Mate 3P
	— Bias Osc. —	
Q301	0B06202A	TR 2SA562TM (Y)
Q302	0B10029A	TR 2SA933S
D302	0B06398A	SiD 1SS176
L301	0B51256A	Bias Osc. B01-JF
VR115	0B32127A	Semi VR 10K
VR116	0B32128A	Semi VR 20K
VR117	0B32129A	Semi VR 50K
VR215	0B32127A	Semi VR 10K
VR216	0B32128A	Semi VR 20K
VR217	0B32129A	Semi VR 50K
R330	0B09669A	RK 470 1/6W J
R331,332	0B09693A	RK 4.7K 1/6W J
R333,334	0B09701A	RK 10K 1/6W J
R336	0B05622A	RK 2.2K 1/4W J
R337	0B09721A	RK 68K 1/6W J
R338,339	0B09725A	RK 100K 1/6W J
R341,342	0B09733A	RK 220K 1/6W J
R343	0B09733A	RK 220K 1/6W J
R344	0B09837A	RF 10 1W J
R345	0B09831A	RF 22 1W J
R353	0B09717A	RK 47K 1/6W J
R360	0B09711A	RK 27K 1/6W J
R361,362	0B09725A	RK 100K 1/6W J
R720	0B09653A	RK 100 1/6W J
R721	0B09697A	RK 6.8K 1/6W J
R722	0B09705A	RK 15K 1/6W J
R820	0B09653A	RK 100 1/6W J
R821	0B09697A	RK 6.8K 1/6W J
R822	0B09705A	RK 15K 1/6W J
C335	0B01403A	CE 47μ 16V
C336	0B41255A	CPP 0.018μ 100V J
C337	0B05550A	CML 1000P 50V J
C338	0B09148A	CE 10μ 25V (LN)
C370,371	0B01780A	CML 0.1μ 50V J
CN10	0B81759A	2P-T Post
CN41	0B81774A	Header 2P
CN51	0B81774A	Header 2P
CN52	0B81775A	Header 3P
	0B81773A	Receptacle 2P (3)
	— Switch —	
R346,347	0B05794A	RK 680 1/4W J
R348,349	0B01888A	RK 10K 1/4W J
R350,351	0B09709A	RK 22K 1/6W J
R354	0B09701A	RK 10K 1/6W J
R363,364	0B01888A	RK 10K 1/4W J
R382	0B09673A	RK 680 1/6W J
C350,351	0B40083A	CE 2200μ 16V
C353	0B01409A	CE 47μ 25V
C372	0B01780A	CML 0.1μ 50V J
SW301	0B70114A	Push Switch SPUJ42
SW302	0B70113A	Push Switch SPUJ32
SW303	0B70115A	Push Switch SPUL19
	— Logic —	
IC603	0B11020A	IC TMP4315BP-1814
IC604	0B06368A	IC LM6416E-106
IC605	0B06317A	IC μPD4030BC
IC606	0B06214A	IC μPD4071BC
IC607	0B11369A	IC TA64
IC608	0B11368A	IC LB1649
Q601	0B10003A	TR 2SA1345
Q602,603	0B10007A	TR 2SC3399
Q604	0B10007A	TR 2SC3399
Q605	0B06299A	TR 2SC2878
Q608,609	0B10033A	TR 2SC1740S
Q610,611	0B10033A	TR 2SC1740S
Q612,613	0B10033A	TR 2SC1740S
Q614,615	0B10029A	TR 2SA933S
Q616,617	0B10029A	TR 2SA933S
Q618,619	0B06013A	TR 2SA733 (P,Q)
Q620,621	0B01872A	TR 2SC945L (P,Q)
Q622	0B01872A	TR 2SC945L (P,Q)
Q625	0B10033A	TR 2SC1740S
Q626	0B10029A	TR 2SA933S
Q628	0B10029A	TR 2SA933S
Q634	0B10097A	TR 2SA952 (K,L)
Q635	0B06066A	TR 2SD471 (L,M)
ZD403	0B12179A	ZD 15V RD15JS-T1B1
ZD601	0B12168A	ZD 10V RD10JS-T1B2
ZD603	0B12150A	ZD 5.6V RD5.6JS-T1B2
ZD604	0B12153A	ZD 6.2V RD6.2JS-T1B2
D608,609	0B06398A	SiD 1SS176
D610,611	0B06398A	SiD 1SS176
D612,613	0B06398A	SiD 1SS176
D614,615	0B12584A	SiD 1N4148
D617,618	0B06398A	SiD 1SS176
D619,620	0B06398A	SiD 1SS176
D621,622	0B06398A	SiD 1SS176
D623,624	0B06398A	SiD 1SS176
D625	0B06398A	SiD 1SS176
D626	0B12584A	SiD 1N4148
D628,629	0B06398A	SiD 1SS176
D630,631	0B06398A	SiD 1SS176
D632,633	0B06398A	SiD 1SS176
D634	0B06398A	SiD 1SS176
D641,642	0B06398A	SiD 1SS176
L601	0B51263A	L-C Block BLK
L602	0B24150A	Coil Resistor 5
VR601	0B32056A	Semi VR 470
R419	0B09669A	RK 470 1/6W J
R601	0B09677A	RK 1K 1/6W J
R602,603	0B09677A	RK 1K 1/6W J
R604	0B09717A	RK 47K 1/6W J
R605	0B05641A	RK 47K 1/4W J
R606	0B09717A	RK 47K 1/6W J
R607	0B05641A	RK 47K 1/4W J
R608,609	0B09717A	RK 47K 1/6W J
R610	0B09729A	RK 150K 1/6W J
R611	0B24147A	RF 15 2W J
R612	0B09677A	RK 1K 1/6W J
R613	0B09717A	RK 47K 1/6W J
R615	0B05641A	RK 47K 1/4W J
R616	0B09693A	RK 4.7K 1/6W J
R618,619	0B09701A	RK 10K 1/6W J
R620	0B09701A	RK 10K 1/6W J
R621	0B09693A	RK 4.7K 1/6W J
R622	0B09717A	RK 47K 1/6W J
R623	0B09677A	RK 1K 1/6W J
R632	0B09701A	RK 10K 1/6W J
R633	0B09677A	RK 1K 1/6W J
R634,635	0B09693A	RK 4.7K 1/6W J
R636	0B09693A	RK 4.7K 1/6W J
R637	0B09671A	RK 560 1/6W J
R638,639	0B05575A	RK 560 1/4W J
R640	0B05575A	RK 560 1/4W J
R641	0B09687A	RK 2.7K 1/6W J
R642,643	0B09701A	RK 10K 1/6W J
R644,645	0B09701A	RK 10K 1/6W J
R646,647	0B09701A	RK 10K 1/6W J
R649	0B01888A	RK 10K 1/4W J
R650,651	0B09701A	RK 10K 1/6W J
R652	0B09701A	RK 10K 1/6W J
R654,655	0B09725A	RK 100K 1/6W J
R656,657	0B09725A	RK 100K 1/6W J
R658	0B05576A	RK 470 1/4W J
R659	0B09725A	RK 100K 1/6W J
R661	0B09713A	RK 33K 1/6W J
R662	0B09713A	RK 33K 1/6W J
R663,664	0B09717A	RK 47K 1/6W J
R665	0B09717A	RK 47K 1/6W J
R667,668	0B09717A	RK 47K 1/6W J
R669,670	0B09717A	RK 47K 1/6W J
R671,672	0B05625A	RK 220K 1/4W J
R673	0B05625A	RK 220K 1/4W J
R674	0B09733A	RK 220K 1/6W J
R675,676	0B09737A	RK 330K 1/6W J
R677,678	0B09737A	RK 330K 1/6W J
R679	0B09701A	RK 10K 1/6W J
R680	0B09749A	RK 1M 1/6W J
R681	0B09735A	RK 270K 1/6W J
R682	0B09611A	RK 1.8 1/6W J
R683	0B09623A	RF 5.6 1/2W J
R684	0B09669A	RK 470 1/6W J
R685	0B09689A	RK 3.3K 1/6W J
R686	0B09697A	RK 6.8K 1/6W J
R687	0B09689A	RK 3.3K 1/6W J
R688	0B09707A	RK 18K 1/6W J
R689	0B09719A	RK 56K 1/6W J
R690	0B09721A	RK 68K 1/6W J
R691	0B09681A	RK 1.5K 1/6W J
R692,693	0B09713A	RK 33K 1/6W J
R694	0B09713A	RK 33K 1/6W J
R695	0B09695A	RK 5.6K 1/6W J
R696,697	0B09670A	RK 510 1/6W J
R698	0B01857A	RK 1K 1/6W J
R699	0B09677A	RK 1K 1/6W J
R936,937	0B09701A	RK 10K 1/6W J
C415	0B01403A	CE 47μ 16V
C601,602	0B09223A	CE 1μ 50V
C603	0B09223A	CE 1μ 50V
C604	0B09327A	CE 0.33μ 50V
C605	0B09222A	CE 0.47μ 50V
C606	0B09332A	CE 2.2μ 50V
C607	0B09148A	CE 10μ 25V
C608,609	0B09150A	CE 33μ 25V
C610	0B01412A	CE 10μ 16V
C611	0B05841A	CE 330μ 10V
C612	0B40079A	CE 220μ 10V
C613,614	0B09286A	CC 470P 50V J
C615	0B09290A	CC 0.01μ 50V J
C616	0B05557A	CML 0.015μ 50V J
C617	0B05892A	CC 100P 50V J
C619	0B01403A	CE 47μ 16V
C620,621	0B01780A	CML 0.1μ 50V J
CN1	0B81762A	5P-T Post
CN2	0B81766A	9P-T Post
CN3	0B81764A	7P-T Post
CN4	0B81763A	6P-T Post
CN5	0B81762A	5P-T Post
CN6	0B81764A	7P-T Post
CN7	0B81763A	6P-T Post
CN22	0B81759A	2P-T Post
	0B81754A	DIN Socket
	— Miscellaneous —	
	0B60469A	Main P.C.B
CN9	0B83118A	3P Connector
CN11	0B83119A	4P Connector
CN13	0B83129A	3P Ribbon C
CN14	0B82267A	4P Ribbon C
CN15	0B82149A	4P Ribbon C
CN16	0B83121A	3P Connector
CN17	0B83130A	6P Ribbon C
CN18	0B83120A	4P Connector
CN20	0B83165A	5P Ribbon C
CN23	0B82116B	2P Ribbon C
CN24	0B82193A	3P Ribbon C
CJ	0B82065C	PD Connector V90
DJ	0B82062B	PD Connector V120

9. SCHEMATIC DIAGRAM

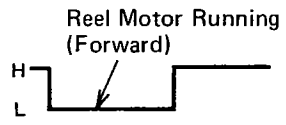
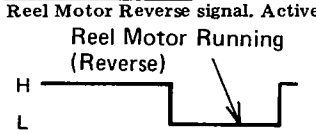
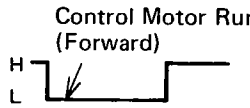
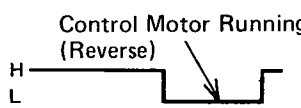
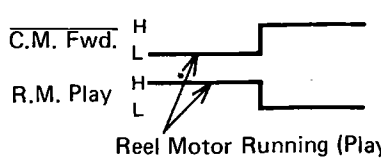
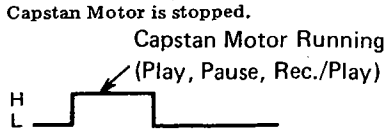
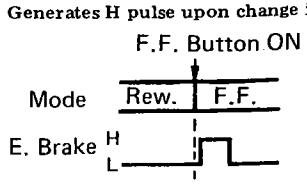
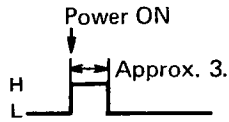
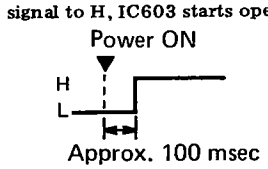
9.1. IC Block Diagrams

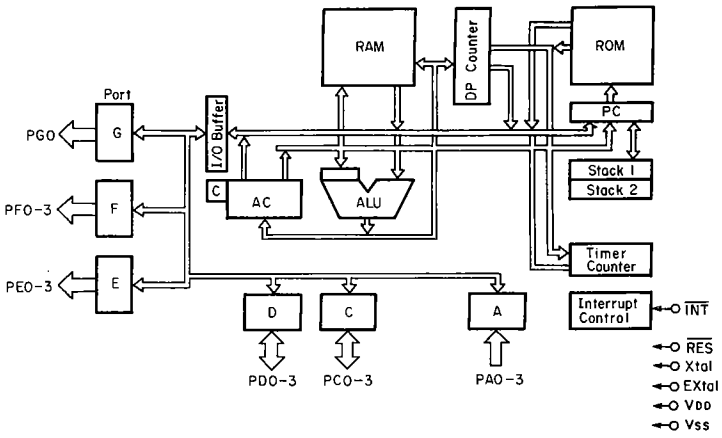




IN0 0 – 3: Input Port IN0
IN1 0 – 3: Input Port IN1
IN2 0 – 3: Input Port IN2
OT0 0 – 3: Output Port OT0
OT1 0 – 3: Output Port OT1
OT2 0 – 3: Output Port OT2
OT3 0 – 2: Output Port OT3
IO0 0 – 3: Bidirectional Port IO0
IO1 0 – 3: Bidirectional Port IO1
RST: Reset
INT: Interrupt
XIN, XOUT: Clock Terminals

IC603 (TMP4315BP-1814)

Pin No.	Signal Name	In/ Out	Function
1	Test	—	Not used.
2	Cam (0)	In	Mechanism position detecting signals.
3	Cam (1)	In	Mechanism mode can be sensed according to states of Cam (0), Cam (1) and Cam (2).
4	Cam (2)	In	
5	$\overline{\text{Eject}}$	In	$\overline{\text{Eject}}$ signal. Active L. Used to detect whether the Cassette Case is open. When it is open, this signal is L. In this condition, the CR-3 is in Stop mode and no pushbutton operation is enabled.
6	$\overline{\text{R.M. Fwd.}}$	Out	$\overline{\text{Reel Motor Forward}}$ signal. Active L. 
7	$\overline{\text{R.M. Rev.}}$	Out	$\overline{\text{Reel Motor Reverse}}$ signal. Active L. 
8	$\overline{\text{C.M. Fwd.}}$	Out	$\overline{\text{Control Motor Forward}}$ signal. Active L. 
9	$\overline{\text{C.M. Rev.}}$	Out	$\overline{\text{Control Motor Reverse}}$ signal. Active L. 
10	R.M. Play	Out	Reel Motor Play signal. Active H. In Play mode, $\overline{\text{C.M. Fwd.}}$ becomes L, and R.M. Play becomes H. 
11	Capstan M	Out	Capstan Motor Run signal. Active H. In Play, Pause, or Rec./Play mode, Capstan M is H and Capstan Motor runs. In other modes, Capstan M is L, so Capstan Motor is stopped. 
12	E. Brake	Out	Electric Brake signal. Active H. Generates H pulse upon change in mode. 
13	Source Mute	Out	Source Mute signal. Active H. Issues H pulse for 3.3 sec after power is turned ON. Used for timer recording circuit. 
14	Line Mute	Out	Line Output Mute signal. Active H. Stays at L only in Play or Rec./Play mode. Deactivates mute of line outputs.
15	Rec. Mute	Out	Record Mute signal. Active H. Stays at L only in Rec./Play mode. Releases record mute.
16	$\overline{\text{Rew. Mode}}$	Out	$\overline{\text{Rewind Mode}}$ signal. Active L.
17	$\overline{\text{F.F. Mode}}$	Out	$\overline{\text{F.F. Mode}}$ signal. Active L.
18	$\overline{\text{Pause Mode}}$	Out	$\overline{\text{Pause Mode}}$ signal. Active L. Used for lighting of Pause lamp.
19	$\overline{\text{Play Mode}}$	Out	$\overline{\text{Play Mode}}$ signal. Active L. Used for lighting of Play lamp.
20	$\overline{\text{Rec. Mode}}$	Out	$\overline{\text{Record Mode}}$ signal. Active L. Used for lighting of Record lamp.
21	Vss	In	GND.
22	$\overline{\text{INT}}$	In	$\overline{\text{Interrupt}}$ signal. Active L. Allows input of shut-off pulse train. Detects tape running, i.e., rotation of Take-up Reel Hub.
23	$\overline{\text{Reset}}$	In	$\overline{\text{Reset}}$ signal. Active L. Held at L for approx. 100 msec after power is turned ON. Upon change of this signal to H, IC603 starts operation. 
24	EXtal	In	External circuit for clock oscillation.
25	Xtal	In	Oscillating frequency = 550 kHz.
26	$\overline{\text{Rec.}}$	—	Not used.
27	AMS	—	Not used.
28	$\overline{\text{Zero}}$	In	Not used.
29	Memory	In	Memory Switch ON signal. Active H. Held at H when Memory switch is set to ON. (With this switch set to ON, tape will stop automatically when the tape counter indication "000" is reached during rewind or fast-forward.)
30	$\overline{\text{A. Rew.}}$	In	$\overline{\text{Auto Rewind}}$ and $\overline{\text{Auto Play}}$ signals. Active L. These signals are L when Timer switch is set to OFF and, at the same time, Auto Repeat swtich is set to ON. (With these signals set to L, auto repeat function is performed and the playback/rewind cycle is continuously repeated between the tape end and the tape start. Furthermore, if Memory switch is set to ON, the playback/rewind cycle is continuously repeated between the tape end and the tape counter indication "000".)
31	$\overline{\text{A. Play}}$	In	
32	$\overline{\text{T. Rec.}}$	In	$\overline{\text{Timer Recording}}$ signal. Active L. When power is turned ON with Timer switch in Record position, becomes L for approx. 3.3 sec, causing unattended recording to start.
33	$\overline{\text{T. Play}}$	In	$\overline{\text{Timer Play}}$ signal. Active L. Held at L upon setting of Timer switch to the Play position.
34	$\overline{\text{K. Pause}}$	In	Pause button input terminal. Becomes L upon push of Pause button.
35	$\overline{\text{K. Rec.}}$	In	Record button input terminal. Becomes L upon push of Record button.
36	$\overline{\text{R. Mute}}$	—	Not used.
37	SEA	—	Not used.
38	$\overline{\text{K. Play}}$	In	Play button input terminal. Becomes L upon push of Play button.
39	$\overline{\text{K. F.F.}}$	In	F.F. button input terminal. Becomes L upon push of F.F. button.
40	$\overline{\text{K. Rew.}}$	In	Rewind button input terminal. Becomes L upon push of Rewind button.
41	$\overline{\text{K. Stop}}$	In	Stop signal input terminal. At L, stops all operations.
42	VDD	In	+5 V.



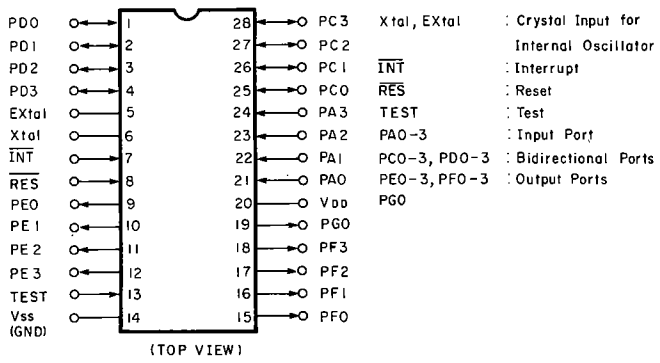
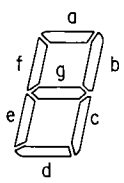


Fig. 9.1.2 4-Bit Micro-processor LM6416E-106

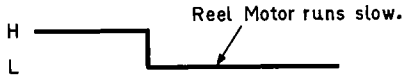
IC604 (LM6416E-106)

Pin No.	Signal Name	In/ Out	Function
1	CLR	In	Reset button input terminal. Upon push of Reset button, Reset signal becomes L and counter is cleared to "0000".
2	K. Play	In	Play button input terminal. Becomes L upon push of Play button.
3	K. F.F.	In	F.F. button input terminal. Becomes L upon push of F.F. button.
4	K. Rew.	In	Rewind button input terminal. Becomes L upon push of Rewind button.
5	EXtal	In	Terminals for clock oscillation. RC circuit is
6	Xtal	In	connected.
7	INT	In	Interrupt signal. Active L. Shut-off pulse train is input. Input pulse train is counted for tape counter display.
8	Reset	In	Reset signal. Active L. Held at L for approx. 100 msec after power is turned ON.
9	f		Display segment drive signals.
10	b	Out	Segment lights at L.
11	a		
12	d		

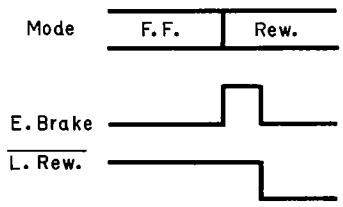


13	Test	In	Not used.
14	Vss	In	GND.
15	g		Display segment drive signals.
16	a	Out	Segment lights at L.
17	c		
18	D4	Out	The 4th (rightmost) digit select signal. Active L.

Pin No.	Signal Name	In/ Out	Function
19	Motor Slow	Out	Motor Slow signal. Active L. When Motor Slow signal is L, reel motor speed is reduced.



20	V_{DD}	In	+5 V
21	L. Rew.	In	LED Rewind signal. Active L. When mode is changed to Rewind, L. Rew. signal becomes L after H period of E. Brake signal ended.



22	L. F.F.	In	LED F.F. signal. Active L. Timing is similar to L. Rew. signal.
23	L. Stop	In	LED Stop signal. Active L. Timing is similar to L. Rew. signal.
24	Memory Stop	In	Memory Stop switch input terminal of Memory Stop/Auto Repeat switch. Memory Stop signal is L when Memory Stop is selected.
25	Memory Play	In	Not used.
26	D3		The 3rd, 2nd, and 1st (leftmost) digit select
27	D2	Out	signals. Active L.
28	D1		

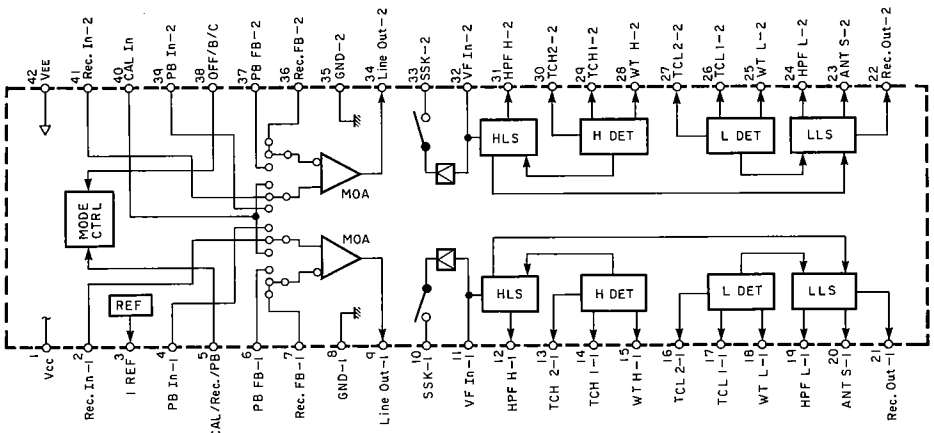


Fig. 9.1.3 Dolby NR IC CX20188

IC302/IC315 (CX20188)

Pin No.	Signal Name	Function
1	Vcc	Positive power supply input terminal.
2,41	Rec. In	Record signal input terminal.
3	I Ref.	Reference current input terminal.
4,39	PB In	PB signal input terminal.
5	CAL/Rec./ PB	Calibration/Recording/Playback select terminal.
6,37	PB FB	Playback signal feedback terminal.
7,36	Rec. FB	Record signal feedback terminal.
8,35	GND	GND terminal.
9,34	Line Out	Line signal (decoded signal) output terminal.
10,33	SSK	Spectral skewing switch terminal.
11,32	VF In	Encode circuit input terminal.
12,31	HPF H	HLS high-pass filter terminal.
13,30	TCH 2	HLS detector time constant determination terminal 2.
14,29	TCH 1	HLS detector time constant determination terminal 1.
15,28	WT H	HLS weighting terminal.
16,27	TCL 2	LLS detector time constant determination terminal 2.
17,26	TCL 1	LLS detector time constant determination terminal 1.
18,25	WT L	LLS weighting terminal.
19,24	HPF L	LLS high-pass filter terminal.
20,23	ANT S	Anti-saturation terminal.
21,22	Rec. Out	Record signal (encoded signal) output terminal.
38	OFF/B/C	Dolby NR OFF/B-type/C-type select terminal.
40	CAL In	Calibration input terminal. Not used.
42	V_{EE}	Negative power supply input terminal.

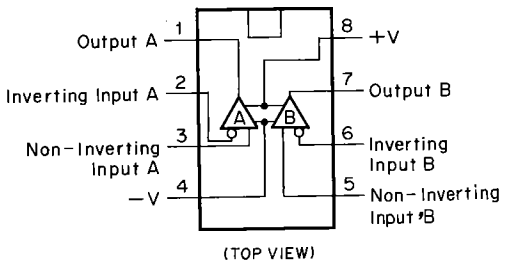


Fig. 9.1.4 Operational Amp. IC 4556D, 4560D, 2043DD, 2403D, 072DE

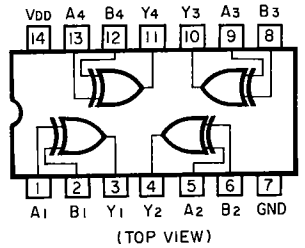


Fig. 9.1.6 Exclusive OR Gate C-MOS IC μPD4030BC

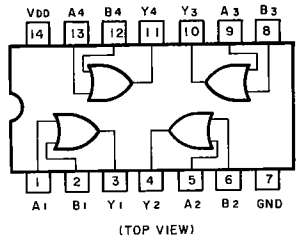


Fig. 9.1.5 OR Gate C-MOS IC μPD4071BC

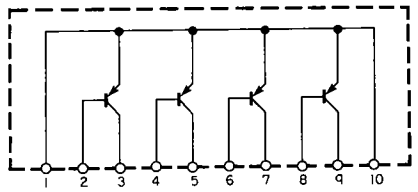
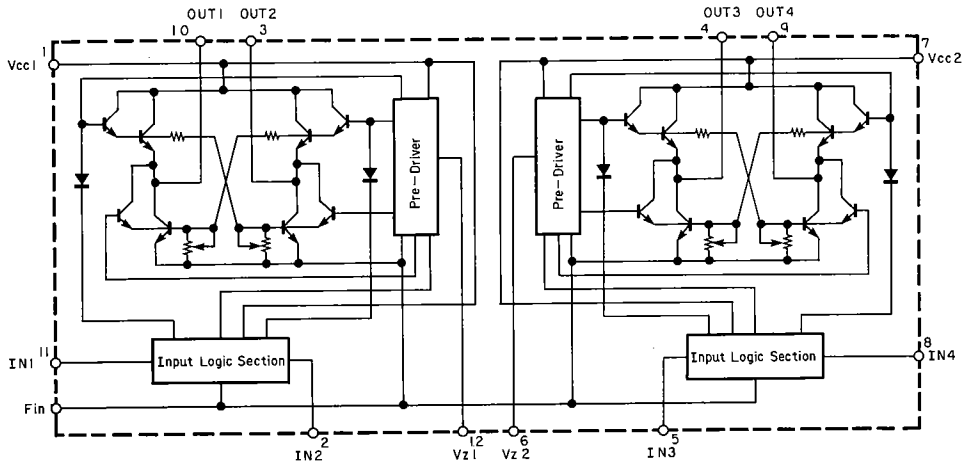


Fig. 9.1.7 Transistor Array TA64



INPUT IN1/3	IN2/4	OUTPUT OUT1/3	OUT2/4	OPERATION
0	0	0	0	Braking
1	0	1	0	Forward (Reverse)
0	1	0	1	Reverse (Forward)
1	1	0	0	Braking

Fig. 9.1.8 Motor Driver IC LB1649

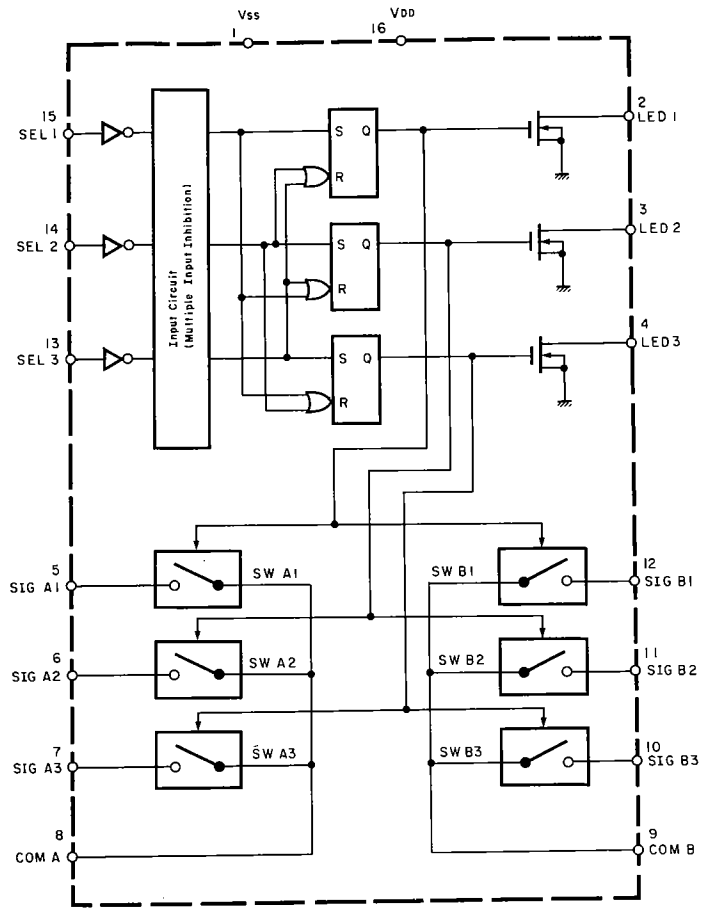


Fig. 9.1.9 Analog Switch Selector TC9145P

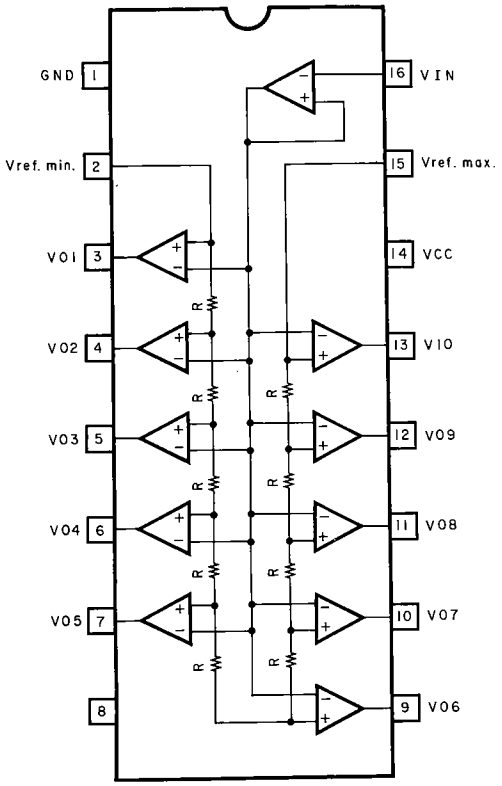
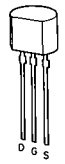
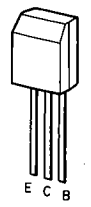


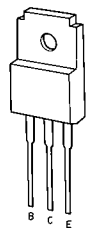
Fig. 9.1.10 Level Meter Driver TA7612AP



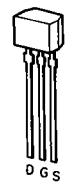
2SA562TM
2SA733
2SA933
2SA952
2SA970
2SA1345
2SC945
2SC1740
2SC2240
2SC2878
2SC3399



2SD471



2SB1015
2SD1406



2SK371

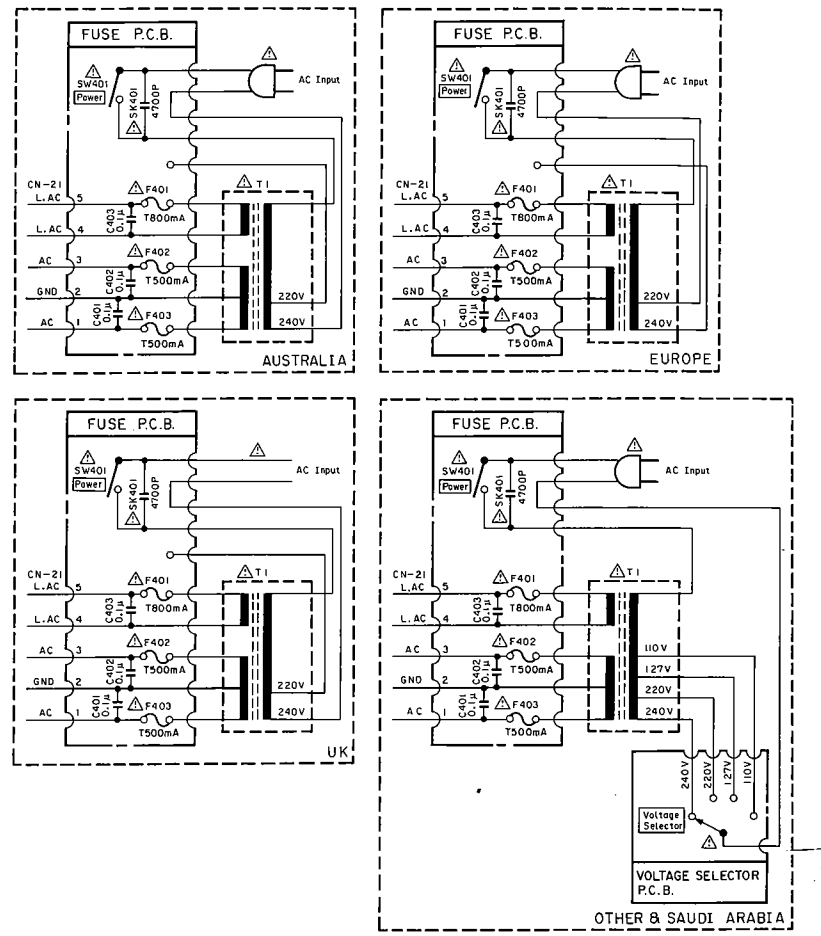


Fig. 9.2.1

WARNING:

Parts marked with the symbol ⚠ have critical characteristics.
Use ONLY replacement parts recommended by the manufacturer.
It is recommended that the unit be operated from a suitable DC supply or batteries during initial check-out procedures.

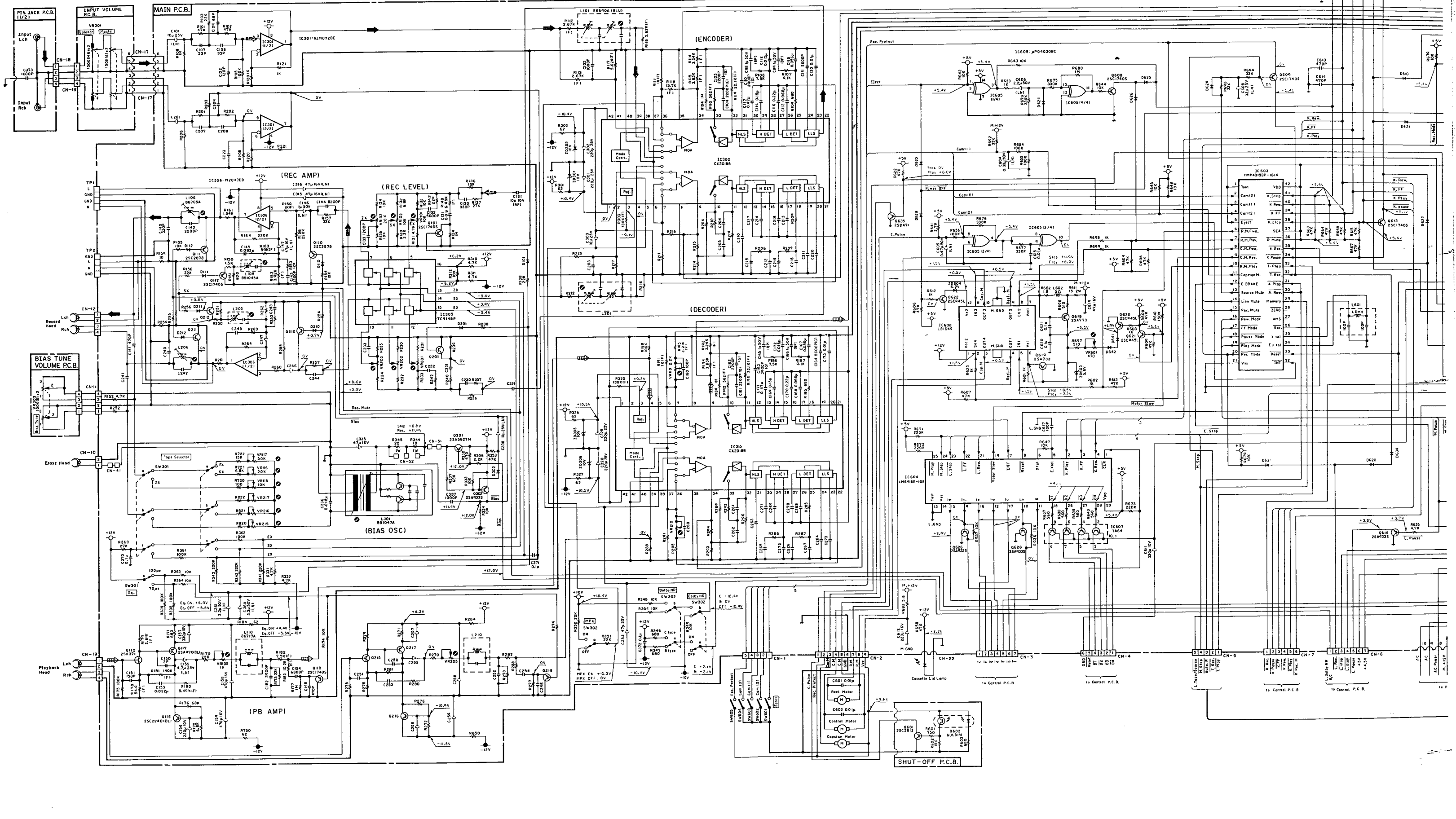
CAUTION:

Before returning the unit to the customer, make sure you make either (1) a leakage current check or (2) a line to chassis resistance check. If the leakage current exceeds 0.5 milliamp, or if the resistance from chassis to either side of the power cord is less than 240 k ohms, the unit is defective.
WARNING — DO NOT return the unit to the customer until the problem is located and corrected.

Notes:

1. Diode is 1SS53, 1S1555, or 1SS176 unless otherwise specified.
2. 2SA733, 2SA608SP, 2SA1048 and 2SA1175 are interchangeable with each other.
3. 2SC945, 2SC536SP, 2SC2458 and 2SC2785 are interchangeable with each other.
4. Voltage measuring condition:
   - Stop mode (with no input signal) unless otherwise specified.
   - Tape: SX position, Eq.: 70 μs
   - Monitor Switch: Tape
   - Timer Switch: OFF
   - Memory Stop/Auto Repeat Switch: OFF
   - MPX Switch: OFF
   - Dolby NR Switch: OFF
   - Play mode: Cassette with no tape played back.

9.2. Schematic Diagram



CONTROL P.C.B.

LED P.C.B.

POWER SUPPLY P.C.B.

FUSE P.C.B.

PIN JACK P.C.B.

OUTPUT VOLUME P.C.B.

HEADPHONE P.C.B.

SHUT-OFF P.C.B.

(METER AMP)

(HEADPHONE AMP)

IC603 TMP47C89P-1814

IC606 :JPM6030BE

IC604 :M54616P-106

IC605 :M54616P-104

IC601 :TA7613P

IC602 :NJM2402D

IC607 :TA7613P

IC608 :LB1641

IC609 :LB1640

IC610 :LB1640

IC611 :LB1640

IC612 :LB1640

IC613 :LB1640

IC614 :LB1640

IC615 :LB1640

IC616 :LB1640

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IC947 :LB1640

IC948 :LB1640

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IC983 :LB1640

IC984 :LB1640

IC985 :LB1640

IC986 :LB1640

IC987 :LB1640

IC988 :LB1640

IC989 :LB1640

IC990 :LB1640

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IC992 :LB1640

IC993 :LB1640

IC994 :LB1640

IC995 :LB1640

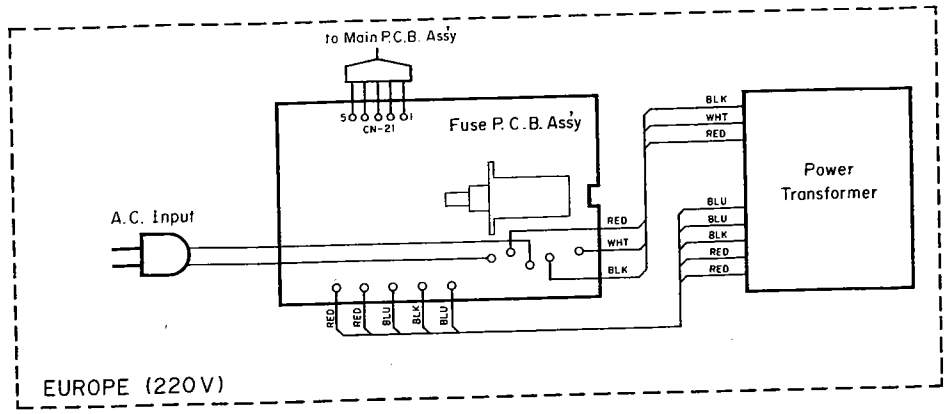
IC996 :LB1640

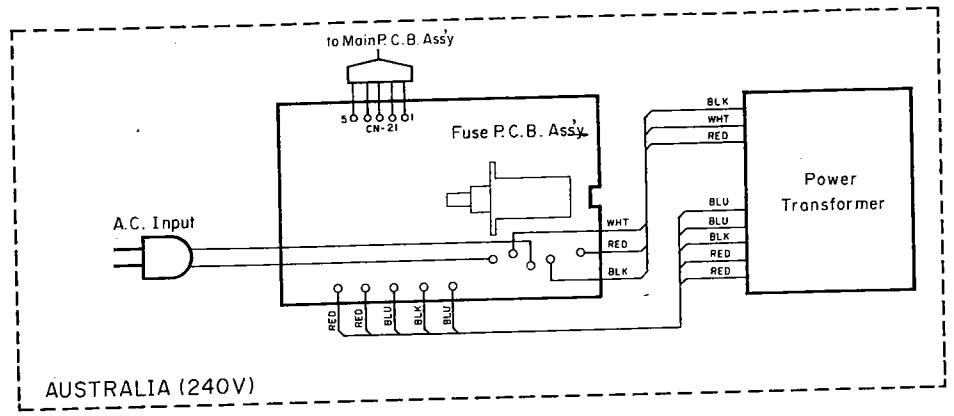
IC997 :LB1640

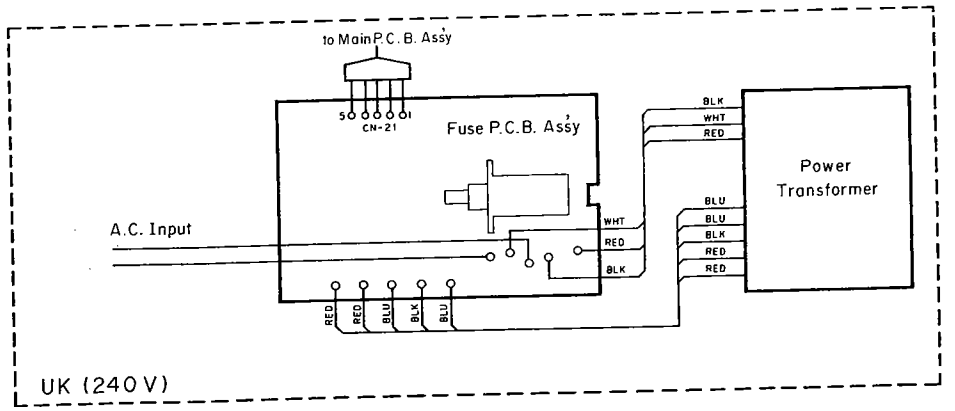
IC998 :LB1640

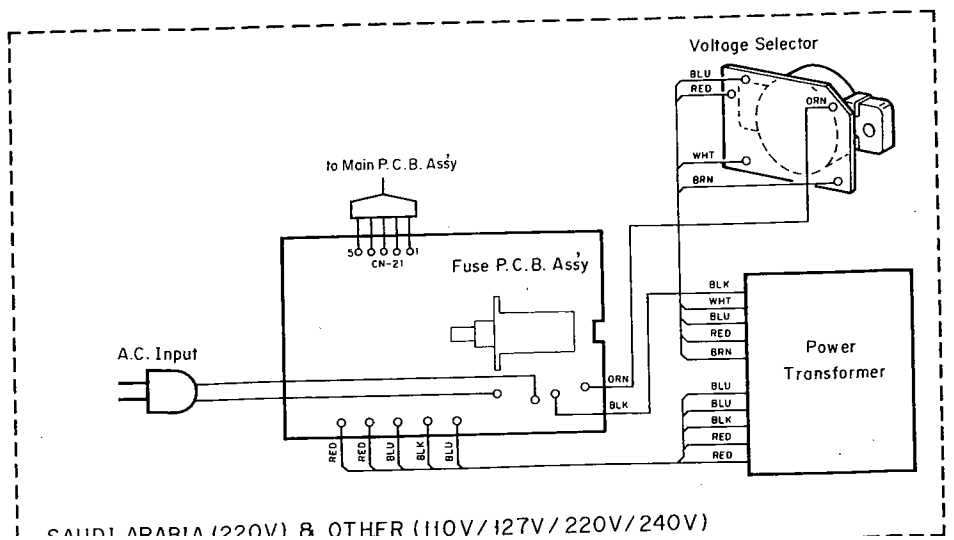
IC999 :LB1640

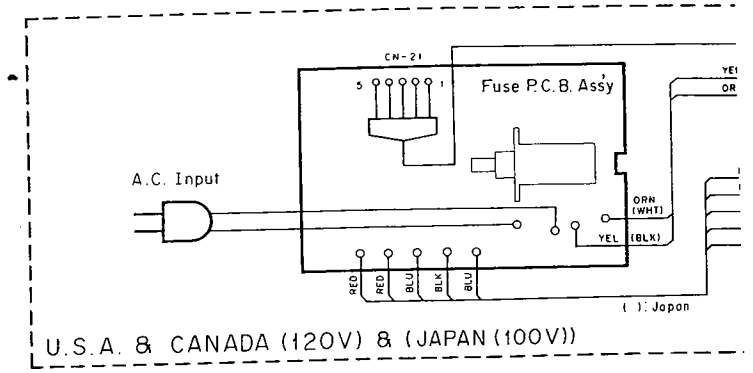
10. WIRING DIAGRAM

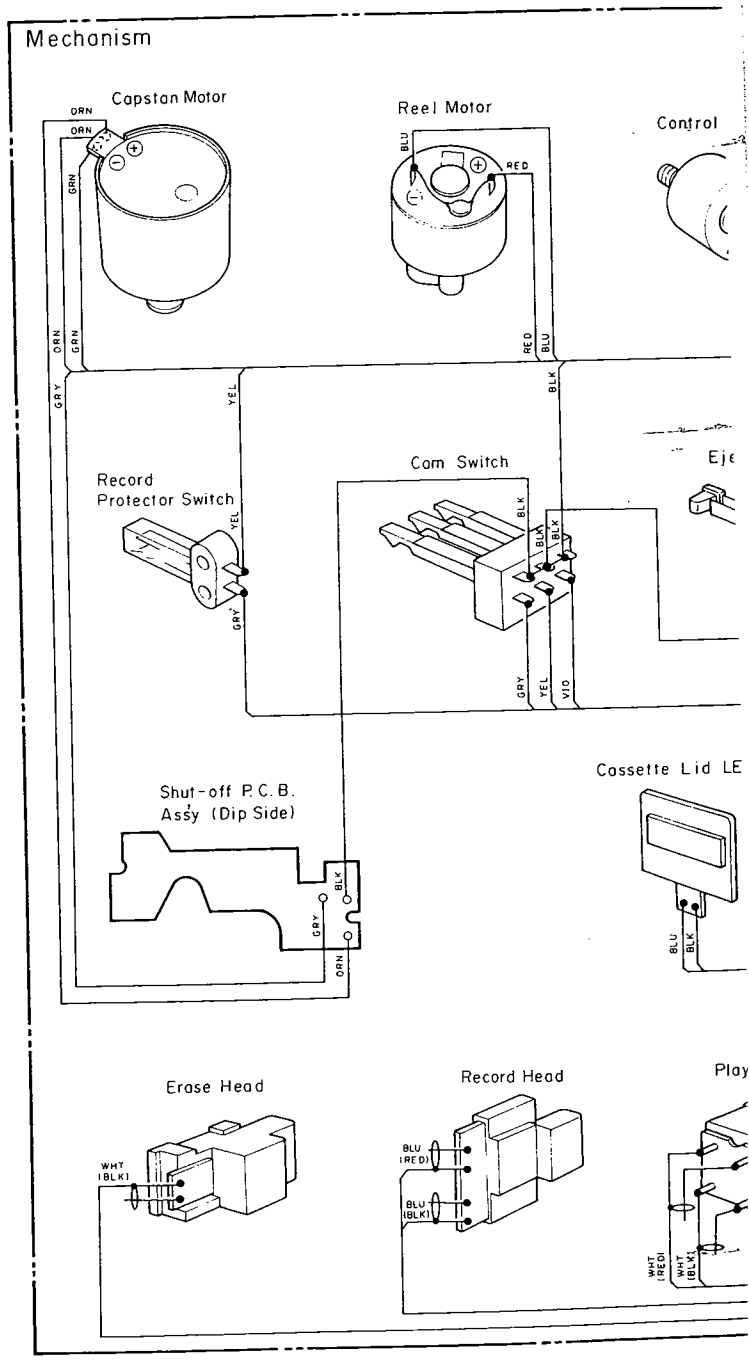










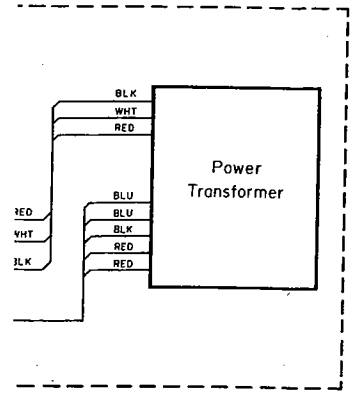


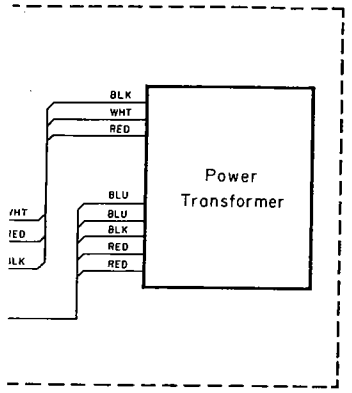
Notes: 1. Table of wire colors

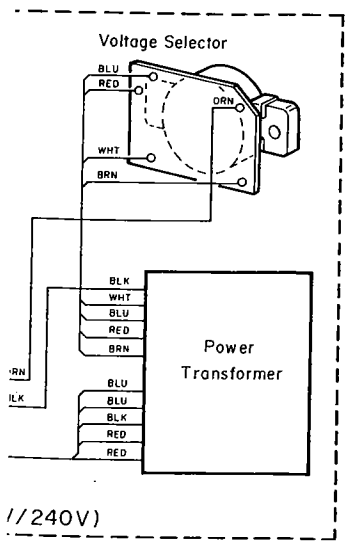
BRN	— Brown	BLU	— Blue
RED	— Red	VIO	— Violet
ORN	— Orange	GRY	— Gray
YEL	— Yellow	WHT	— White
GRN	— Green	BLK	— Black

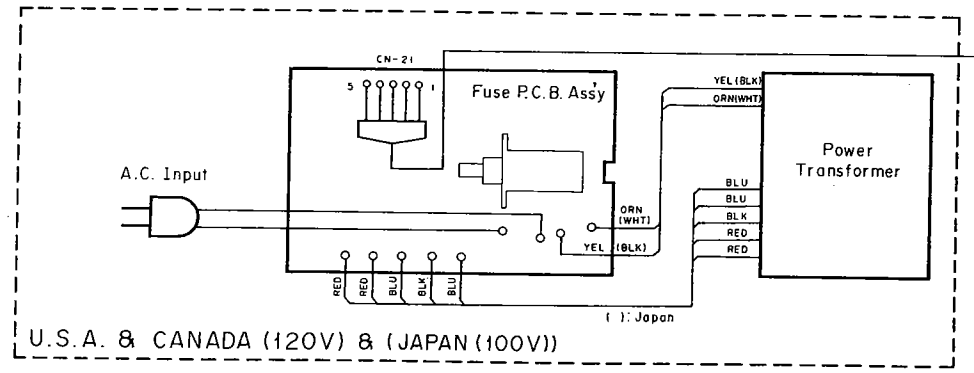
2. Component side view of the P.C.B. is illustrated unless otherwise specified.
3. Wire tube color is shown in ( ).

Fig.

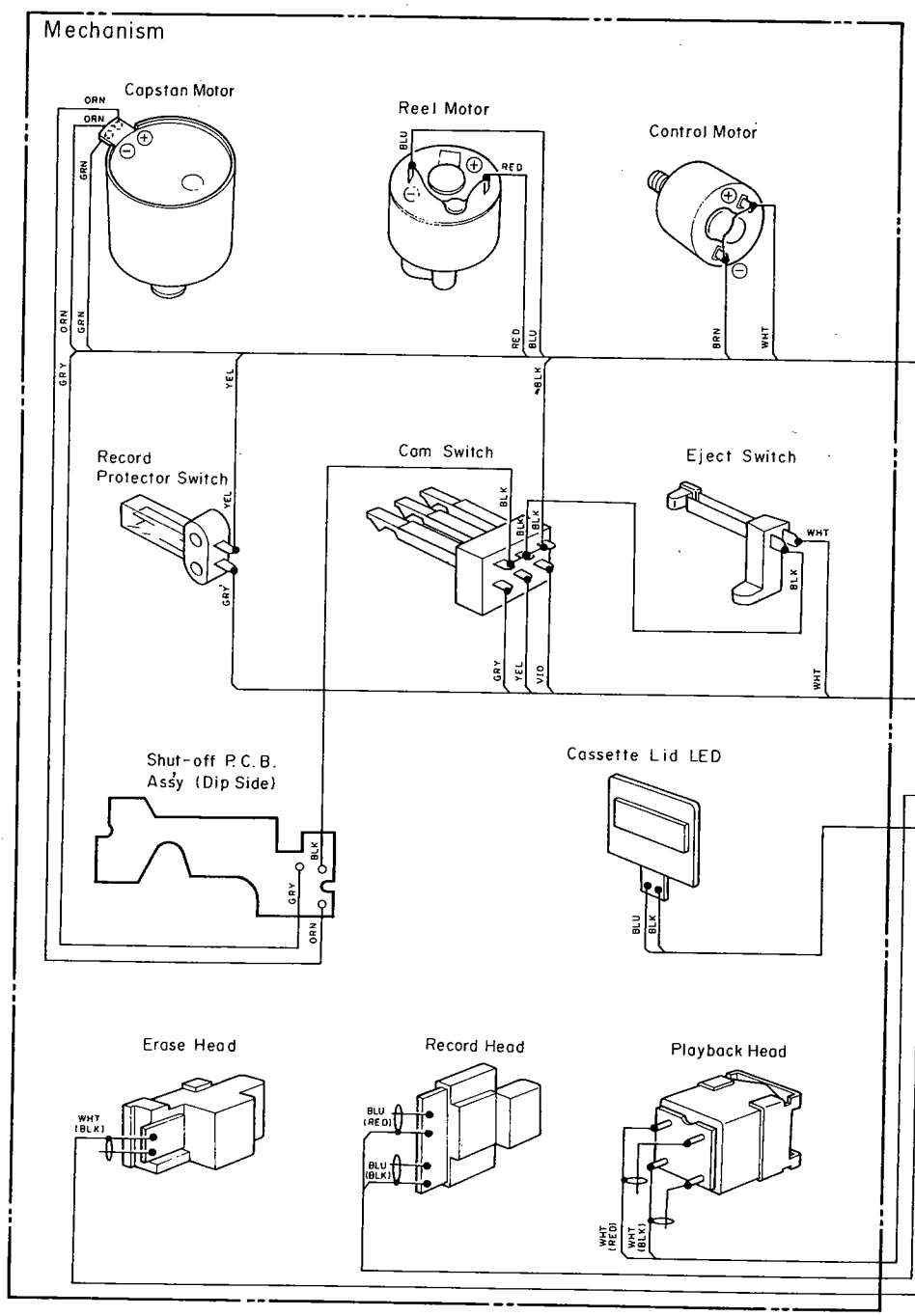


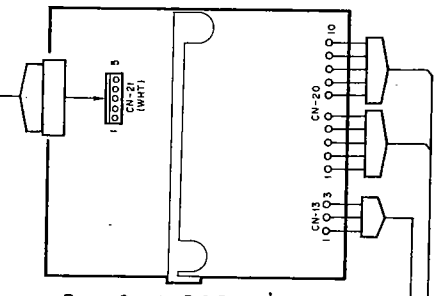


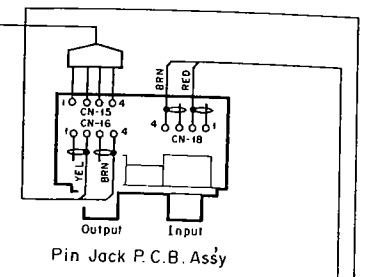


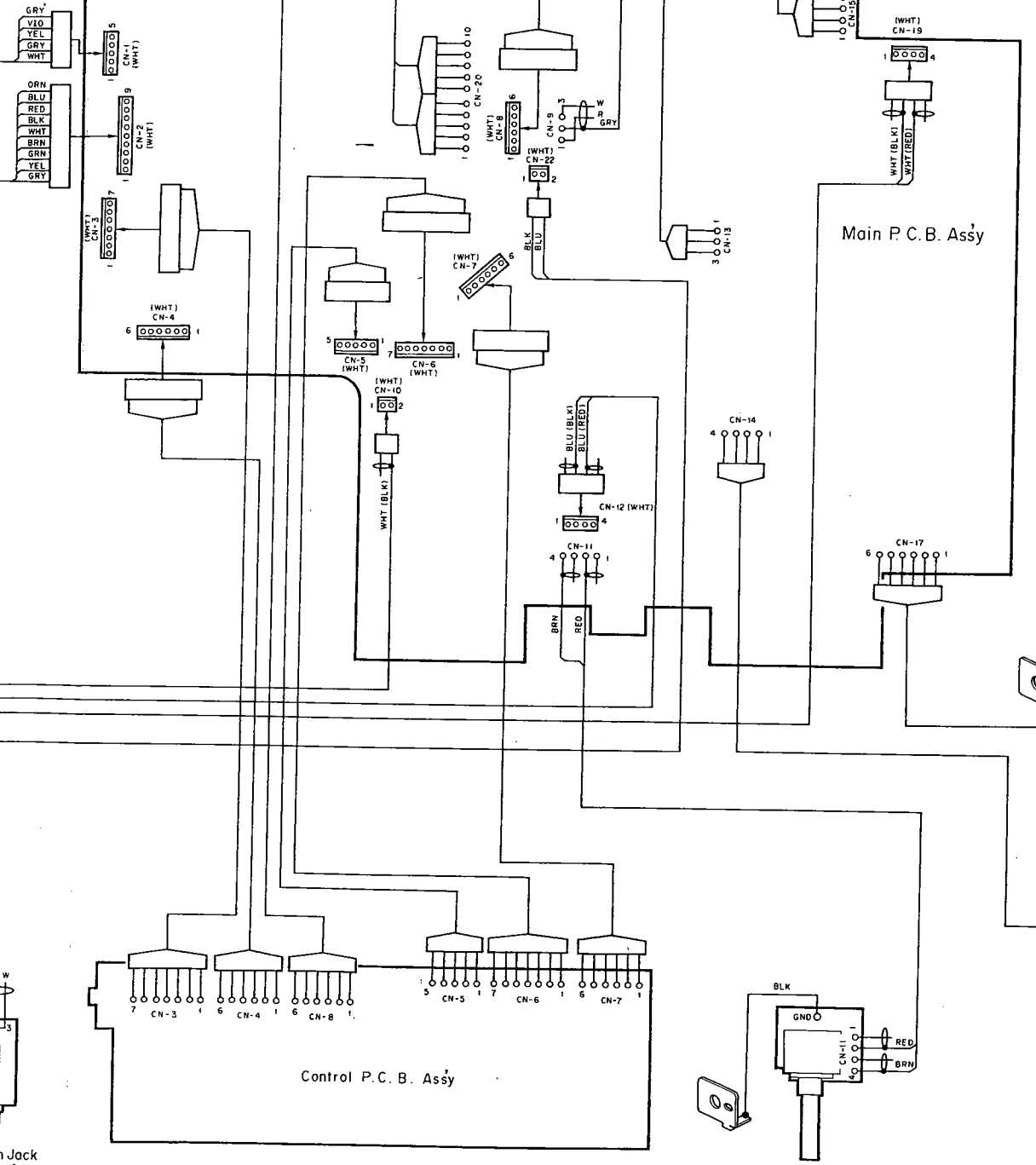


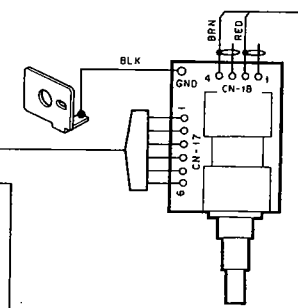
U.S.A. & CANADA (120V) & (JAPAN (100V))

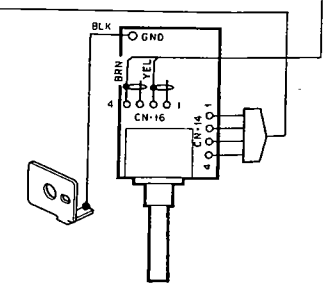


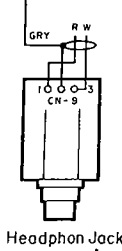












11. BLOCK DIAGRAMS

11.1. Amplifier Section

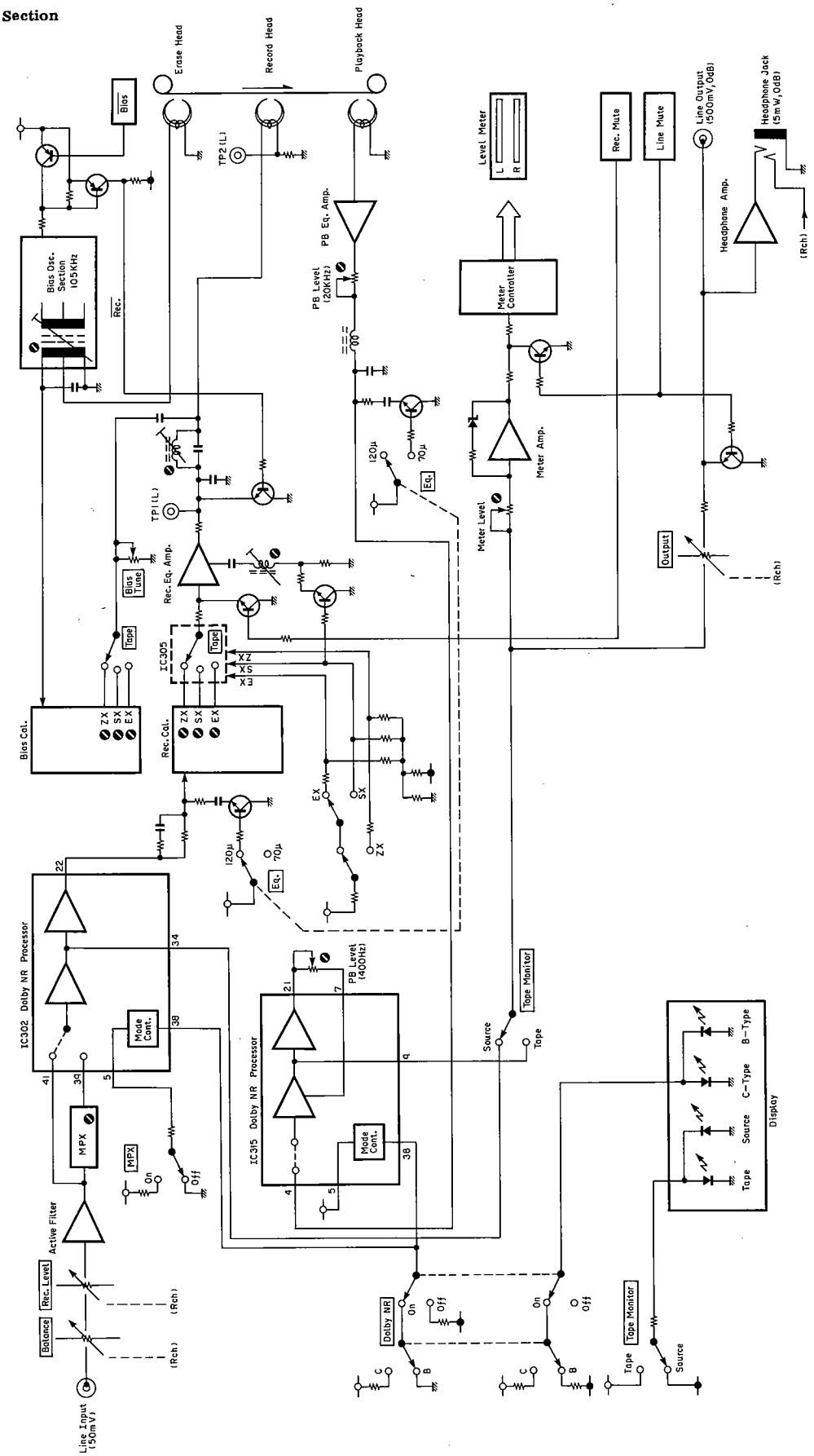


Fig. 11.1

11.2. Mechanism Control Section

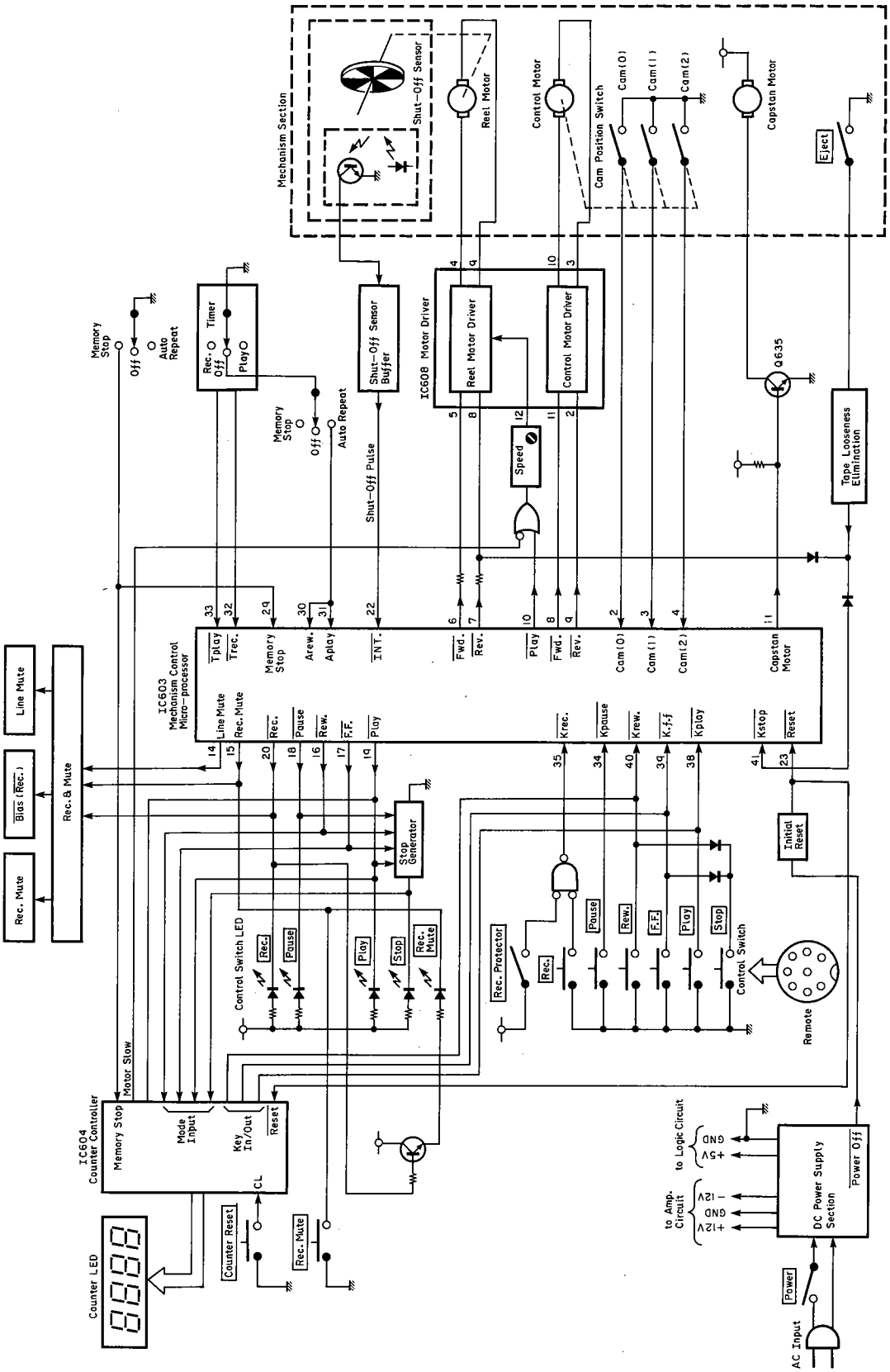


Fig. 11.2

12. TIMING CHARTS AND EQ. AMP. FREQUENCY RESPONSE

12.1. Timing Charts

(1) Overall Timing Charts

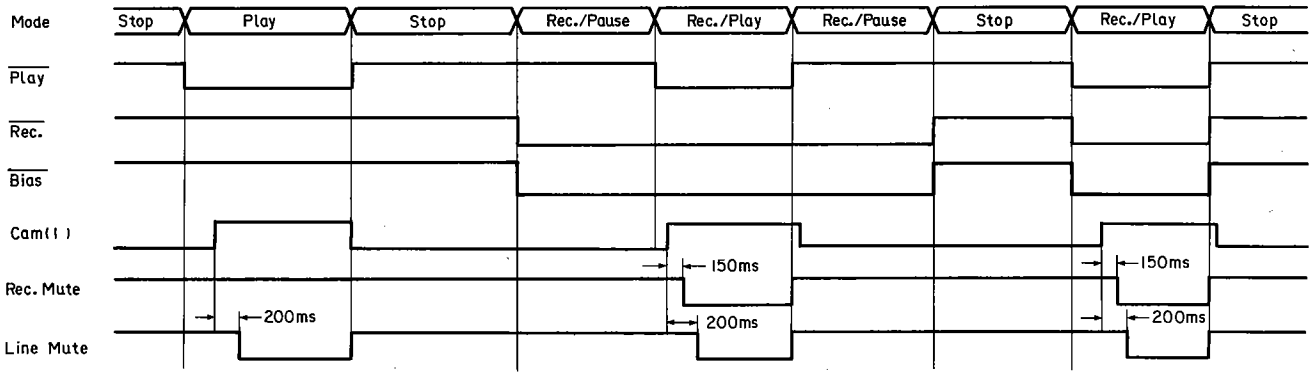


Fig. 12.1.1

(2) Mechanism Control Timing Charts

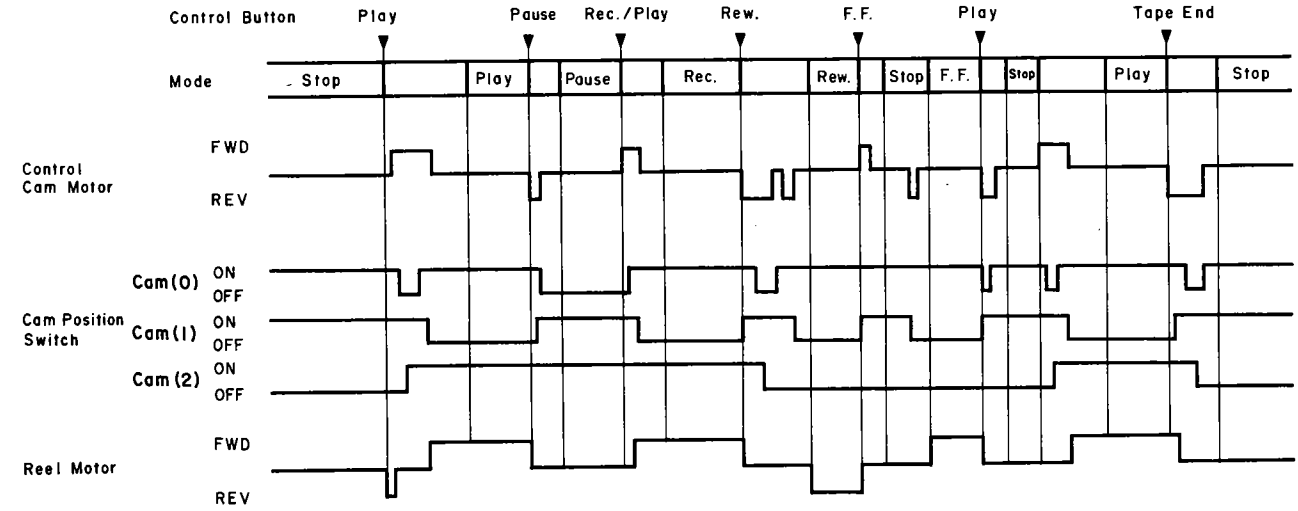


Fig. 12.1.2

12.2. Eq. Amp. Frequency Response

(1) Playback Frequency Response

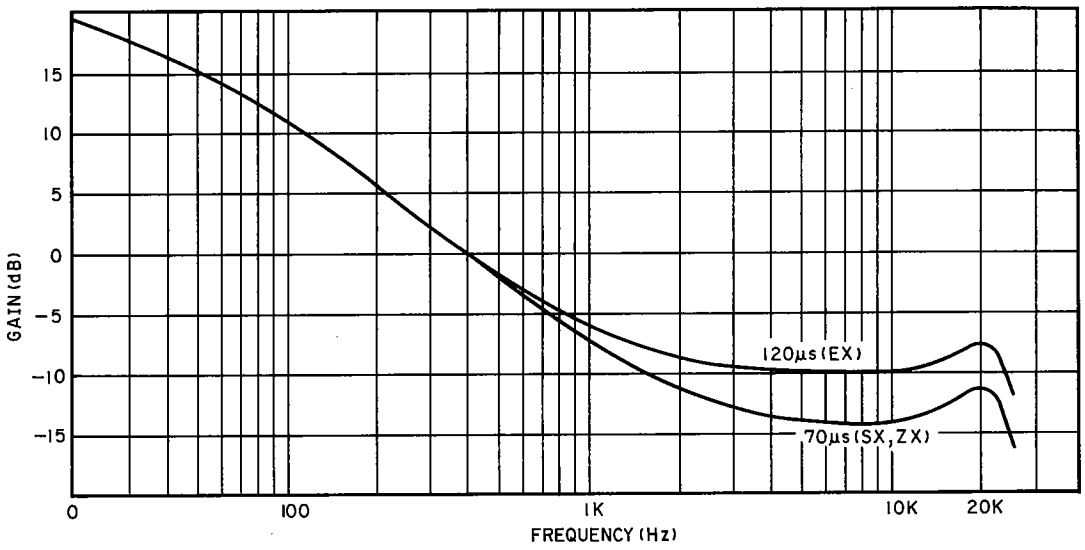


Fig. 12.2.1

(2) Record Current Frequency Response

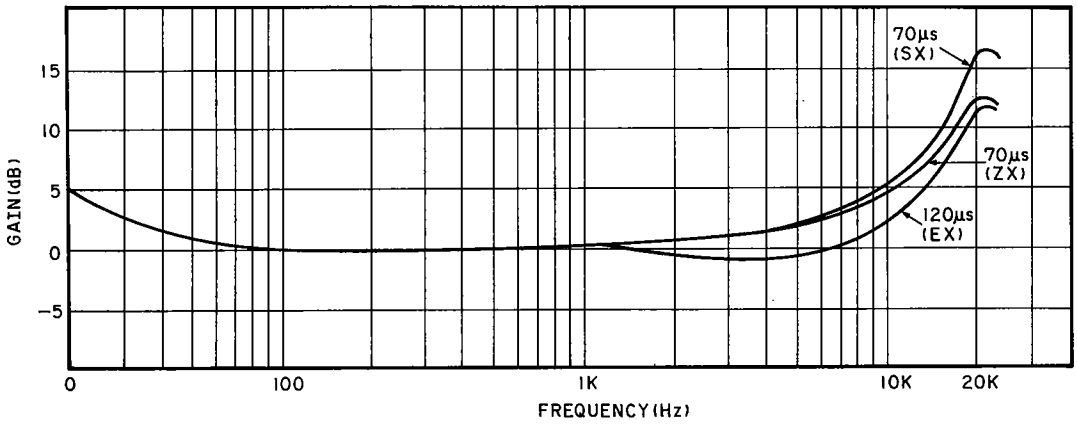


Fig. 12.2.2

13. SPECIFICATIONS

Track Configuration	4 tracks/2-channel stereo
Heads	3 (erase head x 1, record head x 1, playback head x 1)
Motors	<Tape Transport> DC Servo motor (capstan drive) x 1 DC motor (reel drive) x 1 <Mechanism> DC motor (cam drive) x 1
Power Source	120, 220, 240 or 110/127/220/240 V AC, 50/60 Hz (According to country of sale)
Power Consumption	35 W max.
Tape Speed	1-7/8 ips (4.8 cm/sec.) ±0.5%
Wow and Flutter	Less than ±0.06% WTD Peak Less than 0.035% WTD RMS
Frequency Response	20 Hz—20,000 Hz ±3 dB (recording level —20 dB, ZX [Type IV], SX [Type II], EXII [Type I] tape)
Signal to Noise Ratio	**Dolby C-Type NR on** <70 μs, ZX [Type IV] tape> Better than 72 dB (400 Hz, 3% THD, IHF A-WTD RMS) **Dolby B-Type NR on** <70 μs, ZX [Type IV] tape> Better than 66 dB (400 Hz, 3% THD, IHF A-WTD RMS)
Total Harmonic Distortion	Less than 0.9% (400 Hz, 0 dB, ZX [Type IV] tape) Less than 1.0% (400 Hz, 0 dB SX [Type II], EXII [Type I] tape)
Erasure	Better than 60 dB (100 Hz, +10 dB)
Separation	Better than 37 dB (1 kHz, 0 dB)
Crosstalk	Better than 60 dB (1 kHz, 0 dB)
Bias Frequency	105 kHz
Input (Line)	50 mV/30k ohms
Output (Line)	0.5 V (400 Hz, 0 dB, output level control at max.) 2.2k ohms
(Headphones)	5 mW into 8 ohms (400 Hz, 0 dB, output level control at max.)
Fast-Wind Time	Approx. 80 seconds (with C-60 cassette)
Dimensions	430 (W) x 100 (H) x 265 (D) mm 16-15/16 (W) x 3-15/16 (H) x 10-7/16 (D) inches
Approximate Weight	5.8 kg, 12 lbs. 13 oz

- Specifications and design are subject to change for further improvement without notice.
- Noise Reduction System manufactured under license from Dolby Laboratories Licensing Corporation.
- The word "DOLBY" and the Double-D-Symbol are trademarks of Dolby Laboratories Licensing Corporation.

Service Manual

Nakamichi
CR-3, CR-3A, CR-3E, CR-30

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