SAMSUNG

ELECTRONICS

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TRAINING MANUAL

DVD-V90K/V65K/V62K/V19000K/V17000K,SV-DVD20

SAMSUNG

DVD-VCR COMBINATION

Chassis : Diva

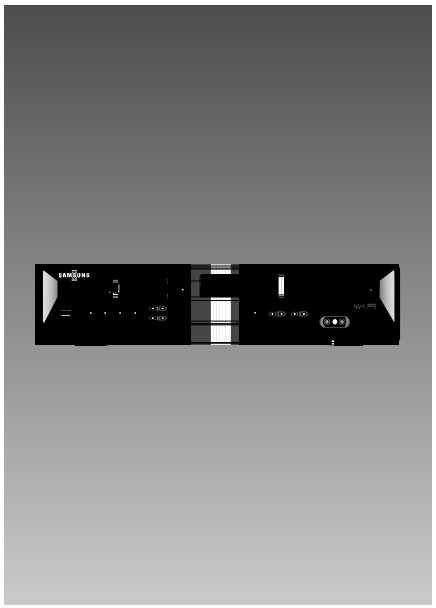
DVD-V90K/V65K/V62K

DVD-V17000K/V19000K

SV-DVD20

TRAINING Manual

DVD-VCR COMBINATION



CONTENTS

IMPORTANT SERVICE GUIDE

◆ MODE SWITCH (PROGRAM SWITCH) ASSEMBLY POINT

1) When installing the ass'y deck on the Main PCB, be sure to align the assembly point of mode switch.

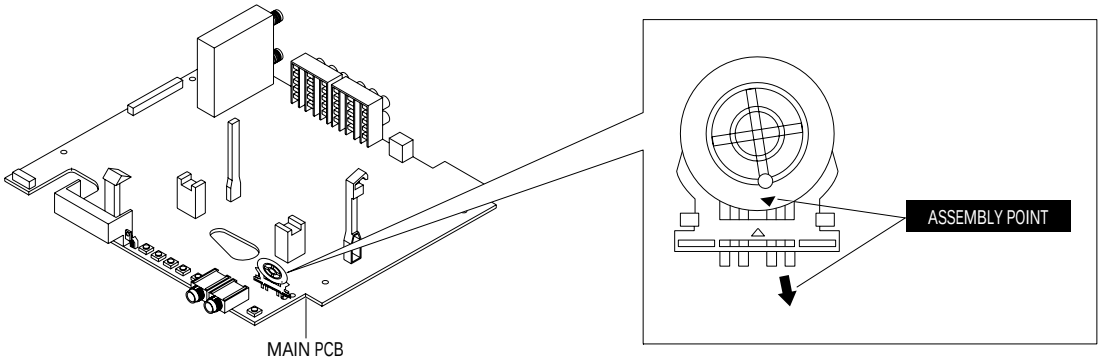


Fig. 1

◆ HOW TO EJECT THE CASSETTE TAPE
(If the tape is stuck in the unit)

1) Turn the Gear Worm ❶ clockwise in the direction of arrow with a screwdriver. (See Fig. 2)
(Other method ; Remove the screw of Motor Load Ass'y, Separate the Motor Load Ass'y)
2) When Slider S, T approach the unloading position, rotate holder Clutch counterclockwise after inserting screwdriver in the frame's bottom hole in order to wind the unwound tape. (Refer to Fig. 3)
(If you rotate Gear Worm ❶ continuously when tape is in state of unwinding, you may cause tape contamination by grease and tape damage. Be sure to wind the unwound tape in the state of set horizontally.)
3) Rotate Gear Worm ❶ clockwise using screwdriver again up to the state of eject mode and then pick out the tape. (Refer to Fig. 2)

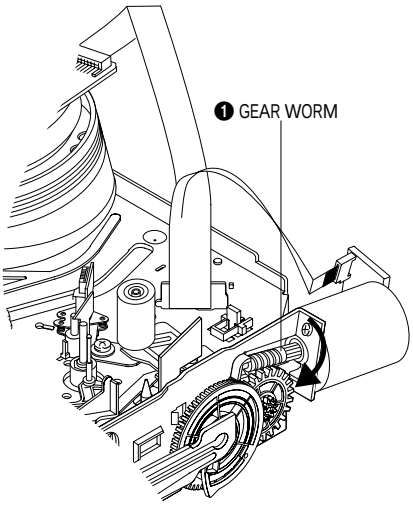


Fig. 2

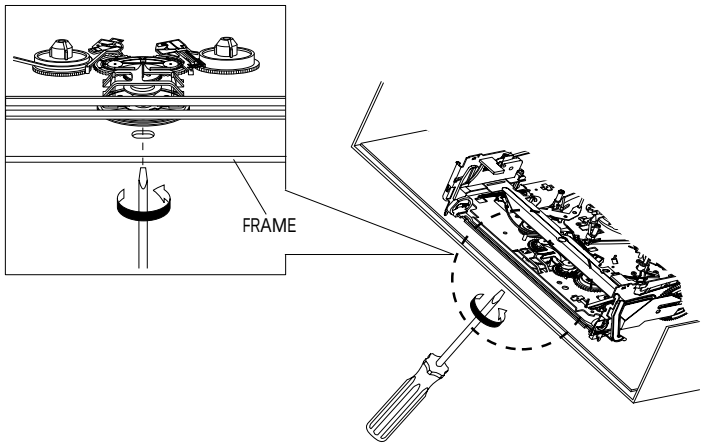


Fig. 3

1. Precautions

1-1 Safety Precautions

1) Before returning an instrument to the customer, always make a safety check of the entire instrument, including, but not limited to, the following items:

(1) Be sure that no built-in protective devices are defective or have been defeated during servicing. (1)Protective shields are provided to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience.
(2)When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fish papers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks. Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning.

(2) Be sure that there are no cabinet openings through which adults or children might be able to insert their fingers and contact a hazardous voltage. Such openings include, but are not limited to, excessively wide cabinet ventilation slots, and an improperly fitted and/or incorrectly secured cabinet back cover.

(3) Leakage Current Hot Check-With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards institute (ANSI) C101.1 Leakage Current for Appliances and Underwriters Laboratories (UL) 1270 (40.7). With the instrument's AC switch first in the ON position and then in the OFF position, measure from a known earth ground (metal water pipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle brackets, metal cabinets, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis.
Any current measured must not exceed 0.5mA. Reverse the instrument power cord plug in the outlet and repeat the test. See Fig. 1-1.
Any measurements not within the limits specified herein indicate a potential shock hazard that must be eliminated before returning the instrument to the customer.

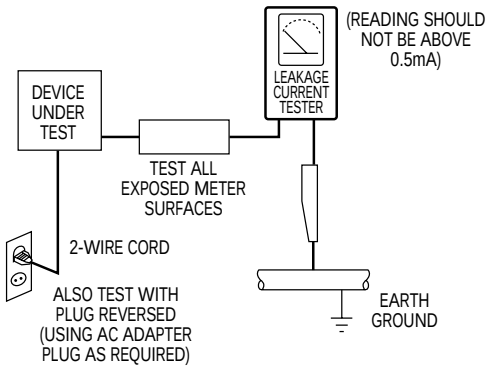


Fig. 1-1 AC Leakage Test

(4) Insulation Resistance Test Cold Check-(1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug. (2) Turn on the power switch of the instrument. (3) Measure the resistance with an ohmmeter between the jumpered AC plug and all exposed metallic cabinet parts on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. When an exposed metallic part has a return path to the chassis, the reading should be between 1 and 5.2 megohm. When there is no return path to the chassis, the reading must be infinite. If the reading is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer. See Fig. 1-2.

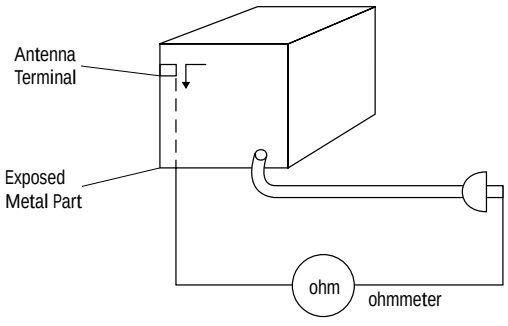


Fig. 1-2 Insulation Resistance Test

2) Read and comply with all caution and safety related notes on or inside the cabinet, or on the chassis.

3) Design Alteration Warning-Do not alter or add to the mechanical or electrical design of this instrument. Design alterations and additions, including but not limited to, circuit modifications and the addition of items such as auxiliary audio output connections, might alter the safety characteristics of this instrument and create a hazard to the user. Any design alterations or additions will make you, the servicer, responsible for personal injury or property damage resulting therefrom.

4) Observe original lead dress. Take extra care to assure correct lead dress in the following areas:
(1) near sharp edges, (2) near thermally hot parts (be sure that leads and components do not touch thermally hot parts), (3) the AC supply, (4) high voltage, and (5) antenna wiring. Always inspect in all areas for pinched, out-of-place, or frayed wiring, Do not change spacing between a component and the printed-circuit board. Check the AC power cord for damage.

5) Components, parts, and/or wiring that appear to have overheated or that are otherwise damaged should be replaced with components, parts and/ or wiring that meet original specifications.
Additionally, determine the cause of overheating and/or damage and, if necessary, take corrective action to remove any potential safety hazard.

6) Product Safety Notice-Some electrical and mechanical parts have special safety-related characteristics which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by shading, an (⚠)or a (⚠)on schematics and parts lists. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire and/or other hazards. Product safety is under review continuously and new instructions are issued whenever appropriate.

1-2 Servicing Precautions

CAUTION : Before servicing units covered by this service manual and its supplements, read and follow the Safety Precautions section of this manual.

Note : If unforseen circumstances create conflict between the following servicing precautions and any of the safety precautions, always follow the safety precautions. Remember: Safety First.

1-2-1 General Servicing Precautions

(1) a. Always unplug the instrument's AC power cord from the AC power source before (1) re-moving or reinstalling any component, circuit board, module or any other instrument assembly, (2) disconnecting any instrument electrical plug or other electrical connection, (3) connecting a test substitute in parallel with an electrolytic capacitor in the instrument.

b. Do not defeat any plug/socket B+ voltage interlocks with which instruments covered by this service manual might be equipped.

c. Do not apply AC power to this instrument and /or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.

d. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the test instrument positive lead. Always remove the test instrument ground lead last.

Note : Refer to the Safety Precautions section ground lead last.

(2) The service precautions are indicated or printed on the cabinet, chassis or components. When servicing, follow the printed or indicated service precautions and service materials.

(3) The components used in the unit have a specified flame resistance and dielectric strength.
When replacing components, use components which have the same ratings. Components identified by shading, by(⚠) or by (⚠) in the circuit diagram are important for safety or for the characteristics of the unit. Always replace them with the exact replacement components.

(4) An insulation tube or tape is sometimes used and some components are raised above the printed wiring board for safety. The internal wiring is sometimes clamped to prevent contact with heating components. Install such elements as they were.

(5) After servicing, always check that the removed screws, components, and wiring have been installed correctly and that the portion around the serviced part has not been damaged and so on. Further, check the insulation between the blades of the attachment plug and accessible conductive parts.

1-2-2 Insulation Checking Procedure

Disconnect the attachment plug from the AC outlet and turn the power ON. Connect the insulation resistance meter (500V) to the blades of the attachment plug. The insulation resistance between each blade of the attachment plug and accessible conductive parts(see note) should be more than 1 Megohm.

Note : Accessible conductive parts include metal panels, input terminals, earphone jacks, etc.

1-3 ESD Precautions

Electrostatically Sensitive Devices (ESD)

Some semiconductor (solid state) devices can be damaged easily by static electricity.
Such components commonly are called Electrostatically Sensitive Devices(ESD). Examples of typical ESD devices are integrated circuits and some field-effect transistors and semiconductor chip components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

(1) Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.

(2) After removing an electrical assembly equipped with ESD devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.

(3) Use only a grounded-tip soldering iron to solder or unsolder ESD devices.

(4) Use only an anti-static solder removal devices. Some solder removal devices not classified as “anti-static” can generate electrical charges sufficient to damage ESD devices.

(5) Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ESD devices.

(6) Do not remove a replacement ESD device from its protective package until immediately before your are ready to install it.(Most replacement ESD devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive materials).

(7) Immediately before removing the protective materials from the leads of a replacement ESD device, touch the protective material to the chassis or circuit assembly into which the device will be installed.

CAUTION : Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.

(8) Minimize bodily motions when handling unpackaged replacement ESD devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ESD device).

1-4 Handling the optical pick-up

The laser diode in the optical pick up may suffer electrostatic breakdown because of potential static electricity from clothing and your body.

The following method is recommended.

(1) Place a conductive sheet on the work bench (The black sheet used for wrapping repair parts.)

(2) Place the set on the conductive sheet so that the chassis is grounded to the sheet.

(3) Place your hands on the conductive sheet(This gives them the same ground as the sheet.)

(4) Remove the optical pick up block

(5) Perform work on top of the conductive sheet. Be careful not to let your clothes or any other static sources to touch the unit.

- Be sure to put on a wrist strap grounded to the sheet.
- Be sure to lay a conductive sheet made of copper etc. Which is grounded to the table.

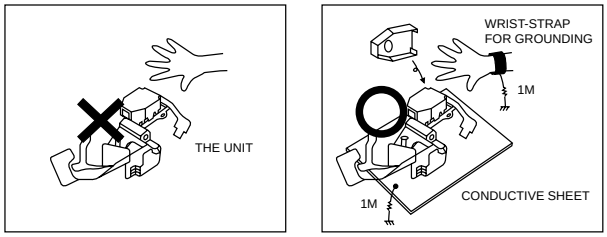


Fig.1-3

(6) Short the short terminal on the PCB, which is inside the Pick-Up ASS'Y, before replacing the Pick-Up. (The short terminal is shorted when the Pick-Up Ass'y is being lifted or moved.)

(7) After replacing the Pick-up, open the short terminal on the PCB.

1-5 Pick-up disassembly and reassembly

1-5-1 Disassembly

1) Remove the power cord.
2) Disassemble the Deck-Assy.
3) Make solder land 2 points short on Pick-up.
   (See Fig. 1-4)
4) Disassembly the Pick-up.

1-5-2 Assembly

1) Replace the Pick-up.
2) Remove the soldering 2 points on Pick-up.
3) Reassemble the Deck-Assy.

Note : If the assembly and disassembly are not done in correct sequence, the Pick-up may be damaged.

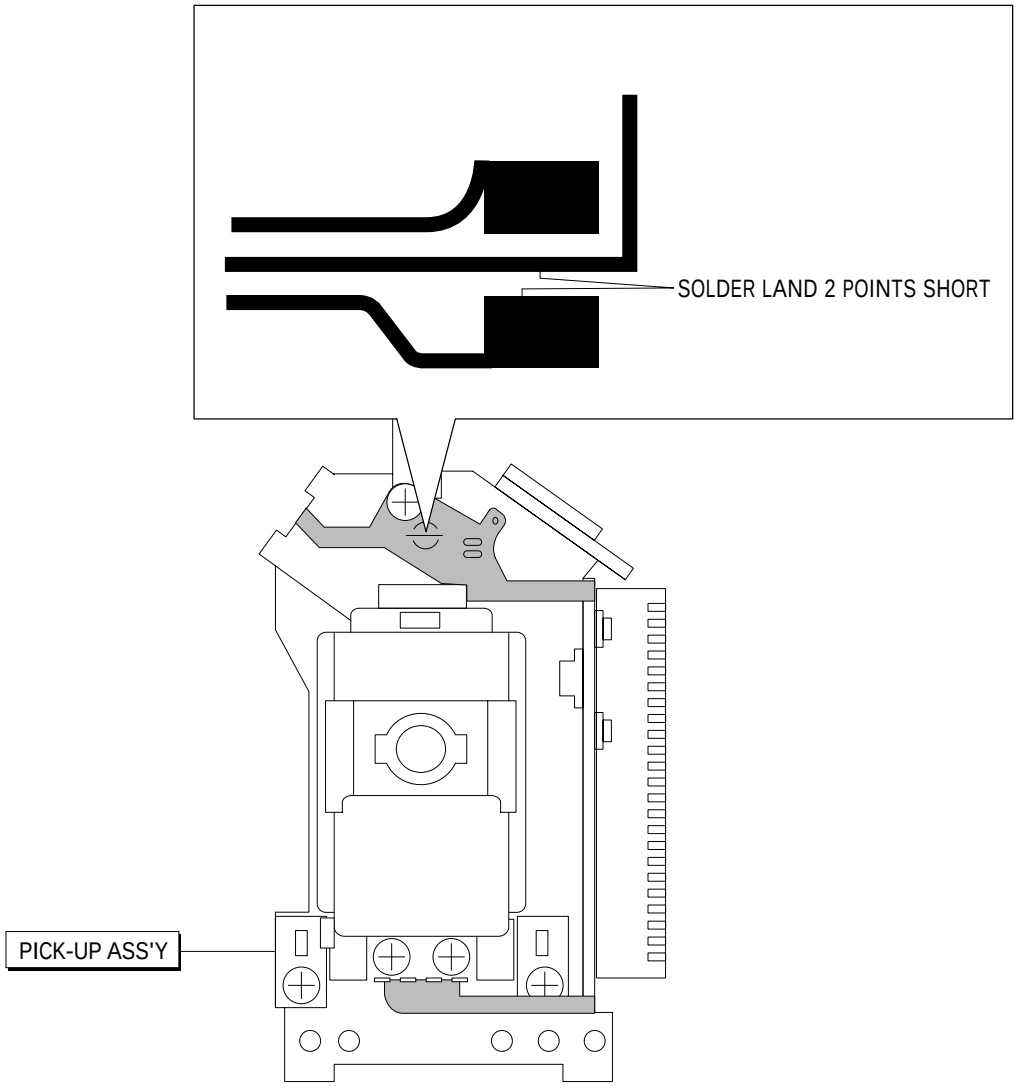


Fig. 1-4

2. Reference Information

2-1 Introduction to DVD

2-1-1 The Definition of DVD

DVD is the next generation medium and is the acronym of the Digital Versatile Disc or the Digital Video Disc, which maximizes the saving density of the disk surface using the MPEG-2 compression technology to enable the storage of 17G bytes of data on the same size CD.

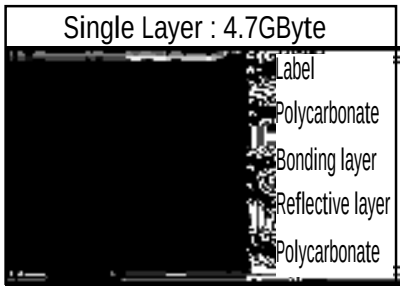
1) 7 times the storage capacity of the conventional CD
- ◆ Minimized the track pitch and pit size to 1/2 of conventional CD.
- ◆ Uses red laser with short-wavelenght of 650nm (635nm).

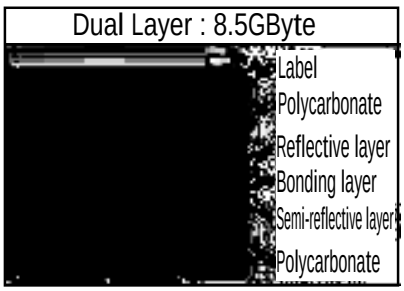
⌘ C O

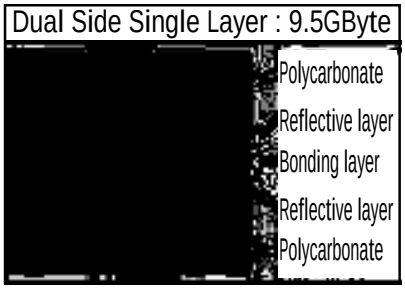
	DVD		CD-ROM
	Single-Layer	Dual-Layer	
Laser Wavelength	650nm (635nm)		780nm
Track Pitch	0.75um		1.6um
Disc Diameter	120mm		
Disc Thickness	1.2 (0.6 x 2) mm		1.2mm
Linear Velocity	3.49m/s	3.84m/s	1.2 ~ 1.4m/s

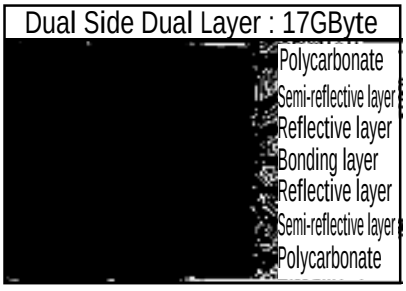
o t

DVD consists of two 0.6mm discs attached together, enabling access to the upper and lower side of the disk, and 4 sides could be used at maximum.









2-1-2 DVD Types

FORMAT	TYPE	APPLICATIONS
DVD-Video	Playback Only	High quality image and sound for movies and other video media.
DVD-ROM	Read Only	Multi-functional, multi-midia software that requires large storage capacity.
DVD-Audio	Playback Only	High quality sound that exceeds the CD, multi-channel Audio.
DVD-R	1 Time Recording	Storage media for the computer.
DVD-RAM	Rewritable	Data access/storage media for the computer.

2-2 DVD-Video Fromat

2-2-1 Main Features

1) Able to store up to 160 minutes of Movie by utilizing the MPE -2 compression technology. (Aver. 133min.)

2) Enables more than 500 lines of horizontal resolution. (Class corresponding to the Master Tapes used in broadcasting stations)

3) Provides Dolby Digital 5.1ch Surround 3D sound, which enables theater quality sound (NTSC area).
- ◆ For PAL areas, 1 of either MPE -2 Audio or Dolby Digital must be selected.

4) Multi-Language
- ◆ Able to store up to 8 languages of dubbing.
- ◆ Able to store up to 32 subtitle languages.

5) Milti-Aspect Ratio
3TV Mode alternatives 16: Wide Screen (DVD Basic) / 4:3 Pan Scan / Letter Box.

6) Multi-Story
Possible to implement Interactive Viewing which enables the user to select the scenario.

7) Multi-Angle
Able to view the camera angle you selected among the scenes recorded with multiple camera angles.

Note The above media features must have the DVD Title that contains the appropriate contents to function properly.

2-2-2 Audio & Video Specifications

<table>
<tr><th colspan="2">Classification</th><th colspan="2">DVD-Video</th><th>Video-CD</th><th>LD</th></tr>
<tr><td rowspan="6">VIDEO</td><td>Compression</td><td colspan="2">MPEG-2</td><td>MPEG-1</td><td rowspan="2">Analog</td></tr>
<tr><td>Pixel</td><td colspan="2">720 x 480</td><td>352 x 240</td></tr>
<tr><td>Horizontal resolution</td><td colspan="2">Max. 500 Lines</td><td>Max. 250 Lines</td><td>Max.420 Lines</td></tr>
<tr><td>Compression rate</td><td colspan="2">1/40</td><td>1/140</td><td rowspan="2">Analog</td></tr>
<tr><td>Transmission speed</td><td colspan="2">Max. 9.8Mbps (variable)</td><td>1.15Mbps (fixed)</td></tr>
<tr><td>TV aspect</td><td colspan="2">16:9 / 4:3</td><td>4:3</td><td>4:3</td></tr>
<tr><td rowspan="5">AUDIO</td><td>Audio</td><td colspan="2">Max. 8 streams</td><td>2CH stereo</td><td rowspan="5">2 Analog CH.
2 Digital CH.
(16Bit/44.1KHz)
or
1 Analog CH.
1 Stream of Dolby Digital
2 Digital CH.
(16Bit/44.1KHz)</td></tr>
<tr><td>Recording type</td><td>Dolby Digital</td><td>Linear PCM</td><td>MPEG-1 Layer 2</td></tr>
<tr><td>Transmission rate</td><td>448Kbps/stream</td><td>6.144Mbps/stream</td><td>224Kbps</td></tr>
<tr><td>Channel</td><td>5.1CH/stream</td><td>8CH/stream</td><td>2CH</td></tr>
<tr><td>Sampling frequency</td><td>48KHz</td><td>16, 20, 24Bit/48, 96KHz</td><td>16Bit/44.1KHz</td></tr>
</table>

2-2-3 Detailed Feature

DVD-Video Feature 1 — **When Developing the DVD Software, various addition and modification is possible.**

As the storage capacity increases, the DVD-Video separates the main data and the additional data such as the Multi-Function into different data areas, enabling the control of time-data ratio to provide the format that enables the flexible Software development

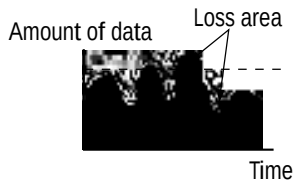
◆ 1 Movie (3.5Mbps)
+ Subtitle (1 Language)
+ Surround Audio (1 Language)
160min storage (4.673 bytes)

◆ 1 Movie (3.5Mbps)
+ Subtitle (4 Language)
+ Surround Audio (4 Language)
160min storage (4.680 bytes)

◆ 1 Music Video (4Mbps)
+ 2ch High quality Audio (6kHz/24bit)
72min storage (4.648 bytes)

DVD-Video Feature 2 — **Application of the MPEG-2 compression technology.**

DVD-Video uses the variable compresion technology, the MPE -2 to compress the moving image optimally, minimizing the Data loss to Provide a clear, natural screen while increasing the storage time.

DVD-Video	◆ MPE -2 (Variable compression : Max. 1/40) ✓ Field unit compression. ✓ Compression rate change according to the amount of Data. ✓ Differentiates the still image anf the moving image compression rete, reducing Data loss and enables efficient compression.	
Video-CD	◆ MPE -1 (Fixed compression : Max. 1/140) ✓ Frame unit compression. ✓ Compresses all data using the same ratio. - Fast movements are jagged, and unnatural	

DVD-Video Feature 3 | **High quality surround audio.**

DVD-Video can store the audio using the 5.1ch Dolby Digital compression or the advanced Liner PCM method, providing the better-than-CD quality and theater like audio quality.

◆ Dolby Digital (AC-3)
- ✓ Unlike the traditional Dolby pro-Logic method, the Dolby Digital method separates all 5 main channels (Front L/R, Center, Surround (Rear) L/R)and the Sub woofer to provide live surround audio.
- ✓ Using the Down Mix method, the conventional Dolby Pro-Logic and Stereo are all compatible.
- ✓ Each separated channels are played back at CD quality sound. (Frequency band: 20Hz 20 Hz)

◆ Linear PCM (Pulse Code Modulation)
- ✓ Provides the high quality Digital sound without the audio data compression.
- ✓ Various Digital Recordings are possible as shown in the table to the right.

Sampling Frequency	Bit Rate
48KH	16bit
	20bit
	24bit
96KH	16bit
	20bit
	24bit

◆ Dolby Digital compatible Audio Mode

Audio Coding Mode	Channel Format					Remark
	Front			Surround (Rear)		
	L	C	R	L	R	
1/0		O				Mono
2/0	O		O			Stereo
3/0	O	O	O			Surround
2/1	O		O	Mono		
3/1	O	O	O	Mono		
2/2	O		O	O	O	
3/2	O	O	O	O	O	

DVD-Video Feature 4 — Multi-Language

- Audio Dubbing - Max. 8 Languages
- Subtitle - Max. 32 Languages. Capable of storing, and selectiong.
- Linear PCM (Pulse Code Modulation)

DVD-Video Feature 5 — Multi-Aspect

- Unlike the conventional VCD or LD, DVD-Video has the default of 16: Wide, and can be viewed using the conventional 4:3 TV, enabling the expansion of viewer selection capabilities.

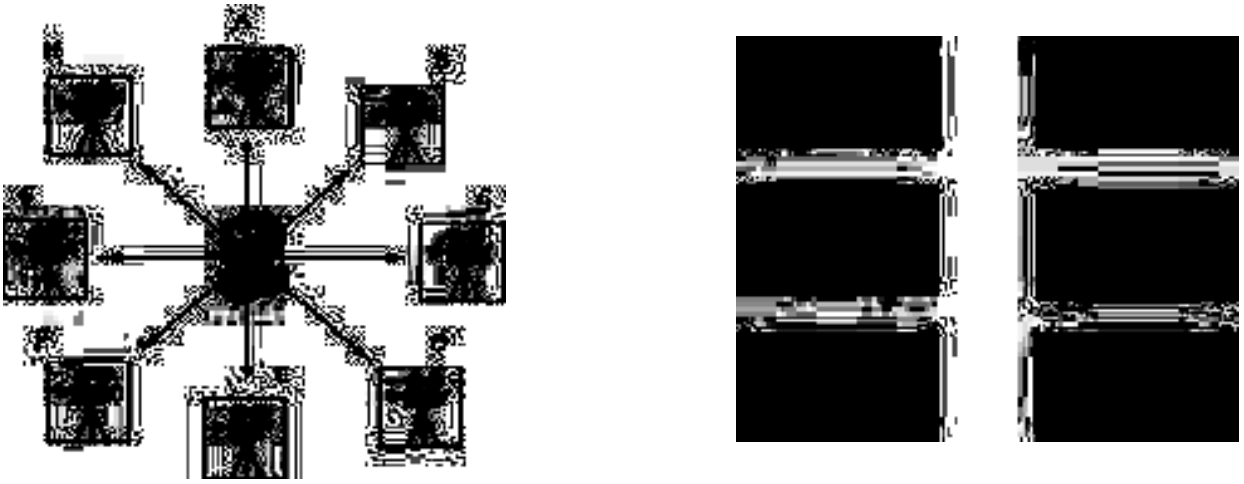
  ✓ 16 : TV : Wide Mode (16: Wide Full Screen)
  ✓ 4 : 3 TV : Letter Box Mode, Pan Scan Mode

16:9 Wide 4:3 Pan & Scan 4:3 Letter Box

Note Only enable to be worked correctly by an appropriate data supported this function in Disc.

DVD-Video Feature 6 — Multi-Angle

- Up to angles of view may be stored, enabling the viewer to select a specific viewpoint at a given time.
  -- Especially, for the Music Video and Sports Title, this provides a more lively image of the scene.



Note Only enable to be worked correctly by an appropriate data supported this function in Disc.

DVD-Video Feature 7 | **Multi-Story**

◆ DVD-Video provides the enviroment suitable for the bi-directional Software develoment, providing multiple scenarios. This feature enables the Multi-Story function.

OPTION | **Parental Lock**

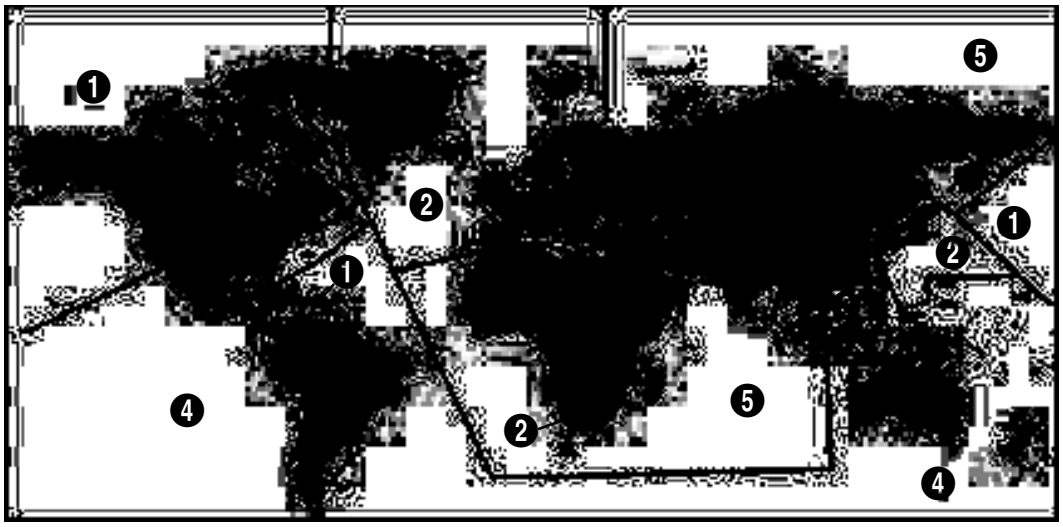
◆ For the titles that are not suitable for children viewing, Parental Locks are set, requesting user defined passwords for viewing
◆ Parential Locks may be set on specific frames of the Title, enabling the player to skip those frames during playback.

COPYRIGHT | **Regional Code & Macrovision**

◆ Classify the world into 6 regions, and if the DVD Title and the Player's "Reginal Code" do not agree, playback is prohibited.

⌘ e o Co o to ote ot e e o e e o A Co e tte e e e o e t o tte o te e o o e o e

✓ Region 1 : The United States and its territories, Canada.
✓ Region 2 : Europe, apan, reenland, Egypt, South Africa, the Middle East.
✓ Region 3 : Taiwan, Hongkong, orea, South East Asia.
✓ Region 4 : Mexico, South America, Australia, New ealand.
✓ Region 5 : Russia, Eastern Europe, India, Africa.
✓ Region 6 : China.
✓ Region 0 : Worldwide (All Code)



◆ Adoptation of the Macrovision System disables the copying on to other media.

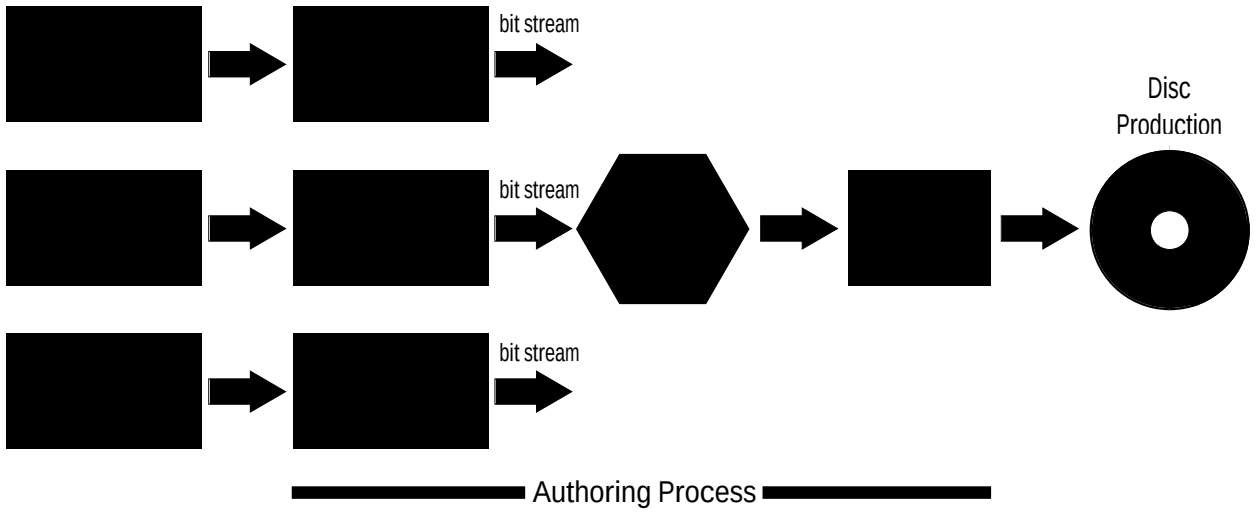
Remark

DVD-Video Authoring Process

◆ The image quality of the DVD-Video may vary accoring to the quality of the Master and the Authoring Process

- ✓ The image quality of the DVD-Video varies according to the Digital Mastering Source such as the conventional LD, VCD, or Original Film.
- ✓ Different Authoring Process are used accoring to the Software developers, and this may affect the DVD image quality.

⌘ **A t o o e**



3. Product Specification

General	Rated Voltage	110 - 240V, 50/60Hz
	Power Consumption	23 Watts
	Weight	3.8Kg
	Size	430mm x 265mm x 94mm
	Operating ambient Temperature	+5°C ~ +35°C
	Installation Conditions	Operation position : Horizontal, Relative humidity : Below 75%
Input	Video input (Rear)	RCA jack : 1.0Vp-p (unbalanced) 75ohm
	Audio input (Rear)	RCA jack : -8dBm, 47Kohm unbalnced
Output	RF out	UHF 21-69 (Australia : UHF 28-69)
	Audio (DVD, VCR)	RCA jack
	Audio (DVD only)	Digital audio out (OPTICAL, COAXIAL)
	Video (DVD, VCR)	RCA jack
	Video (DVD only)	S-Video out
VCR	Tape format	VHS type video tape, S-VHS type video tape (Playback only)
	Color system	PAL, MESECAM, NTSC3.58, NTSC4.43, NTSC playback on PAL TV
	Video S/N	Above 43dB (standard recording)
	Resolution	Above 240 lines (standard recording)
	Audio S/N	Above 68dB (Hi-Fi), 39dB (Mono)
	Audio frequency characteristics	20Hz - 20KHz (Hi-Fi)
DVD	Disc	DVD, CD (12Cm), CD (8Cm), VIDEO-CD (12Cm)
	Audio S/N	95dB
	Audio dynamic range	105dB

MEMO

5. Disassembly and Reassembly

5-1 Cabinet and PCB

5-1-1 Cabinet Top Removal

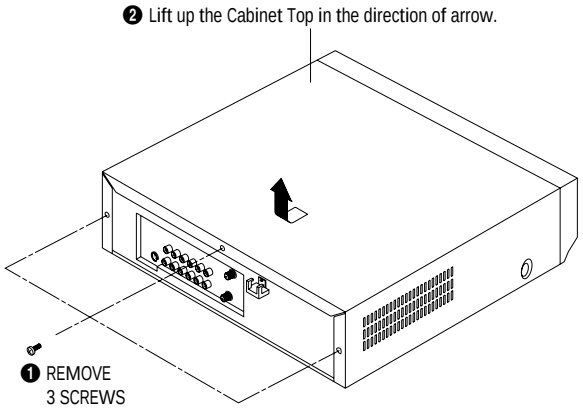


Fig. 5-1 Cabinet Top Removal

5-1-2 Bottom Cover Removal

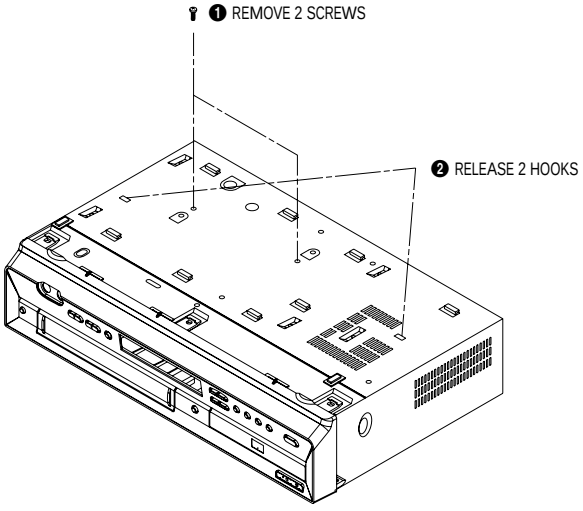


Fig. 5-2 Bottom Cover Removal

5-1-3 Ass y Front Panel Removal

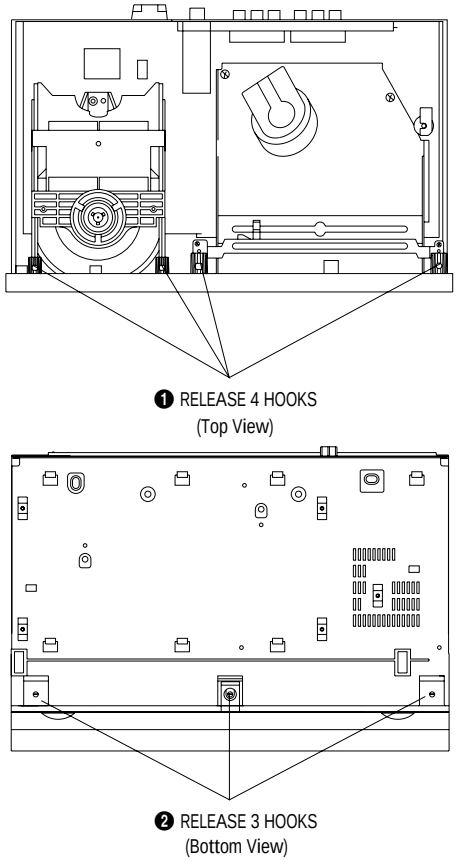


Fig. 5-3 Ass'y Front Panel Removal

5-1-4 Function PCB Removal

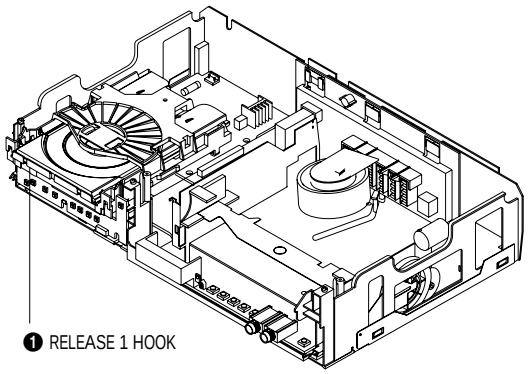


Fig. 5-4 Function PCB Removal

5-1-5 Chassis Removal

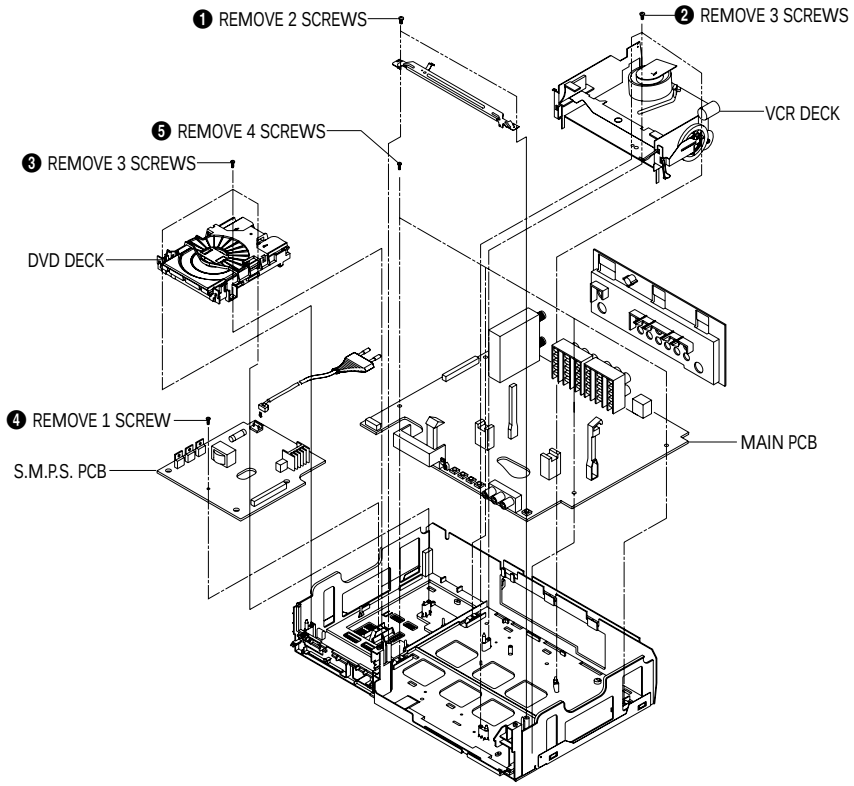


Fig. 5-5 Chassis Removal

5-1-6 VCR Main PCB Removal

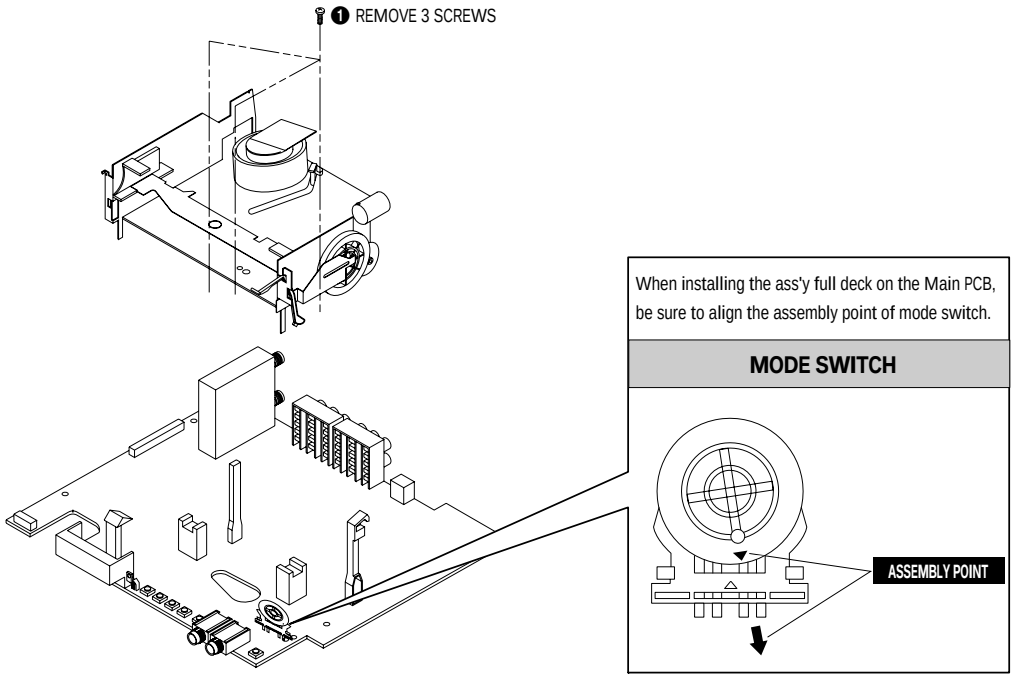


Fig. 5-6 VCR Main PCB Removal

5-2 Circuit Board Locations

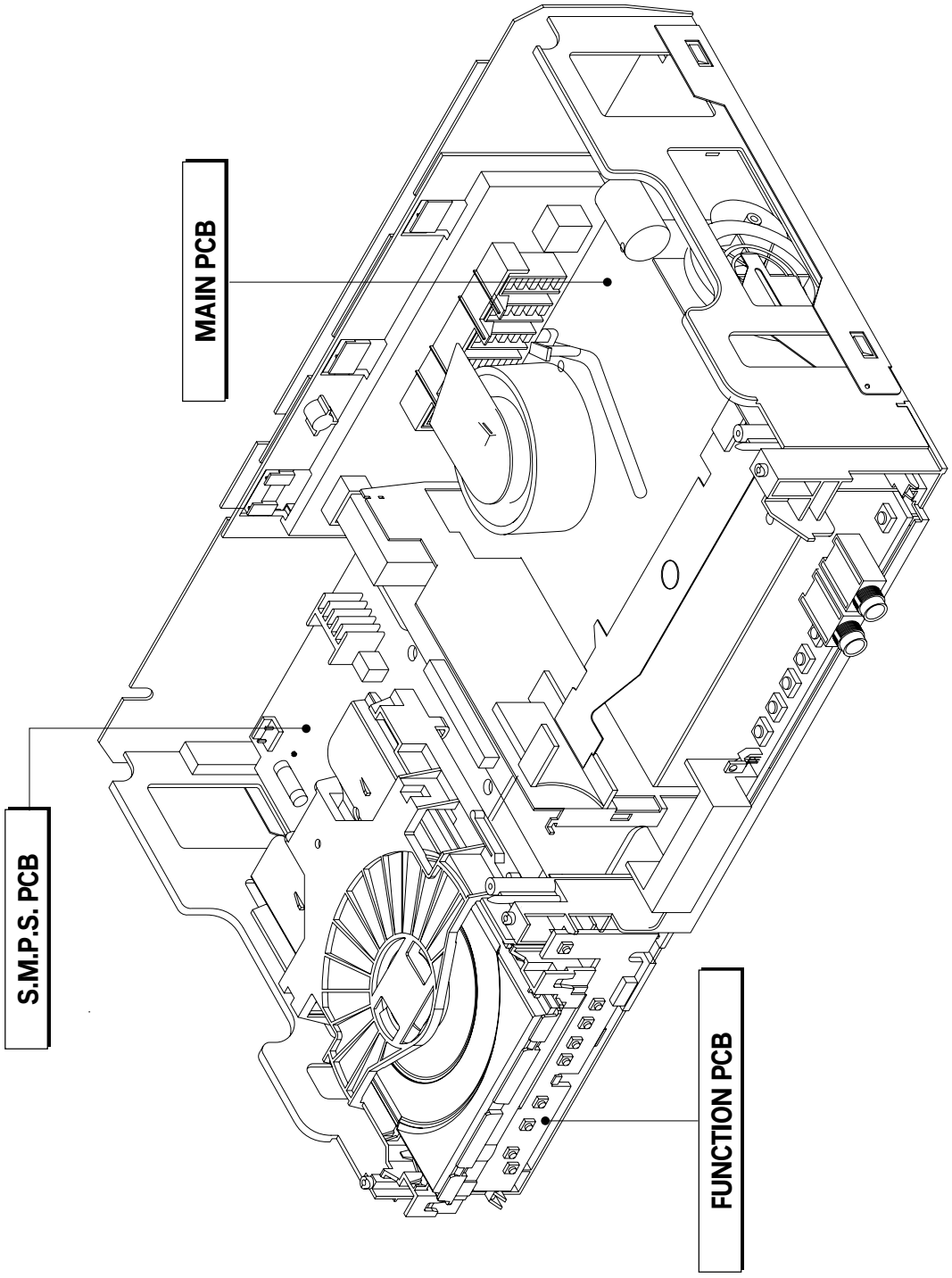


Fig. 5-7 Circuit Board Locations

5-3 VCR Deck Parts Locations

5-3-1 Top View

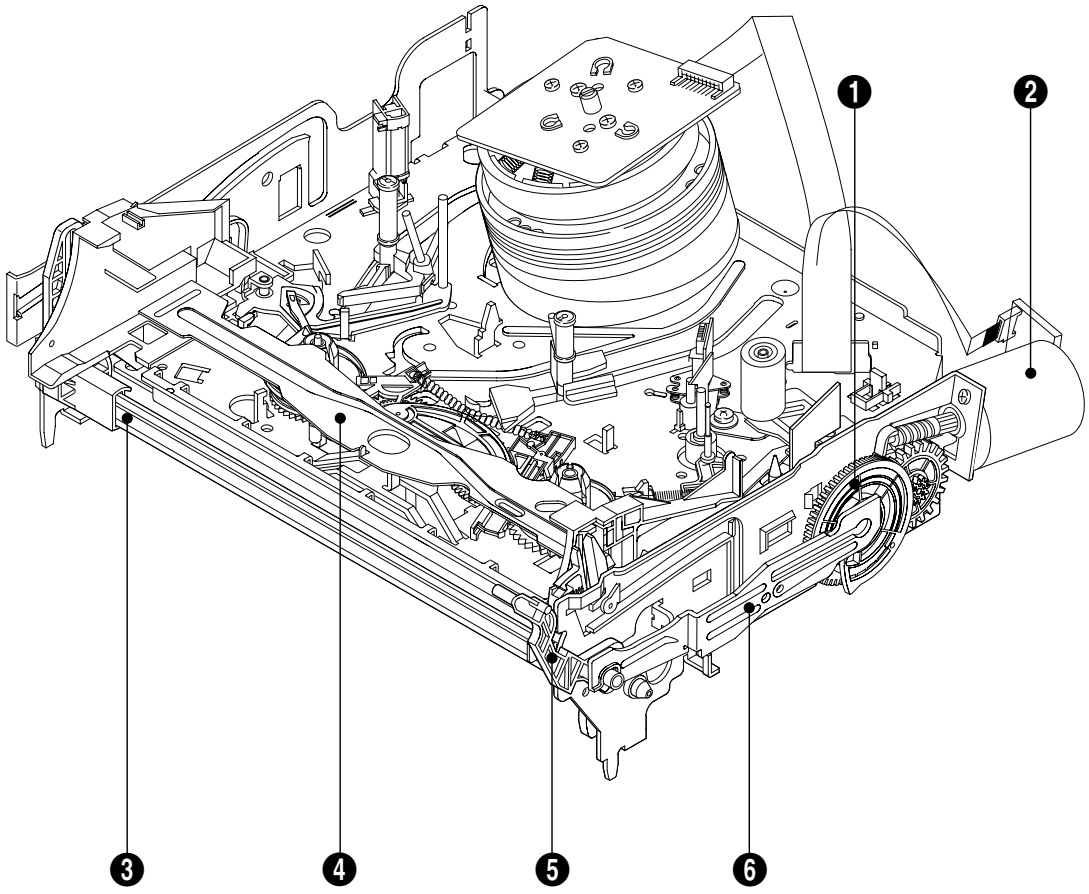


Fig. 5-8 Top parts Location-1

1. GEAR FL CAM
2. MOTOR LOADING ASS'Y
3. LEVER FL ARM ASS'Y
4. HOLDER FL CASSETTE ASS'Y
5. LEVER FL DOOR
6. SLIDER FL DRIVE

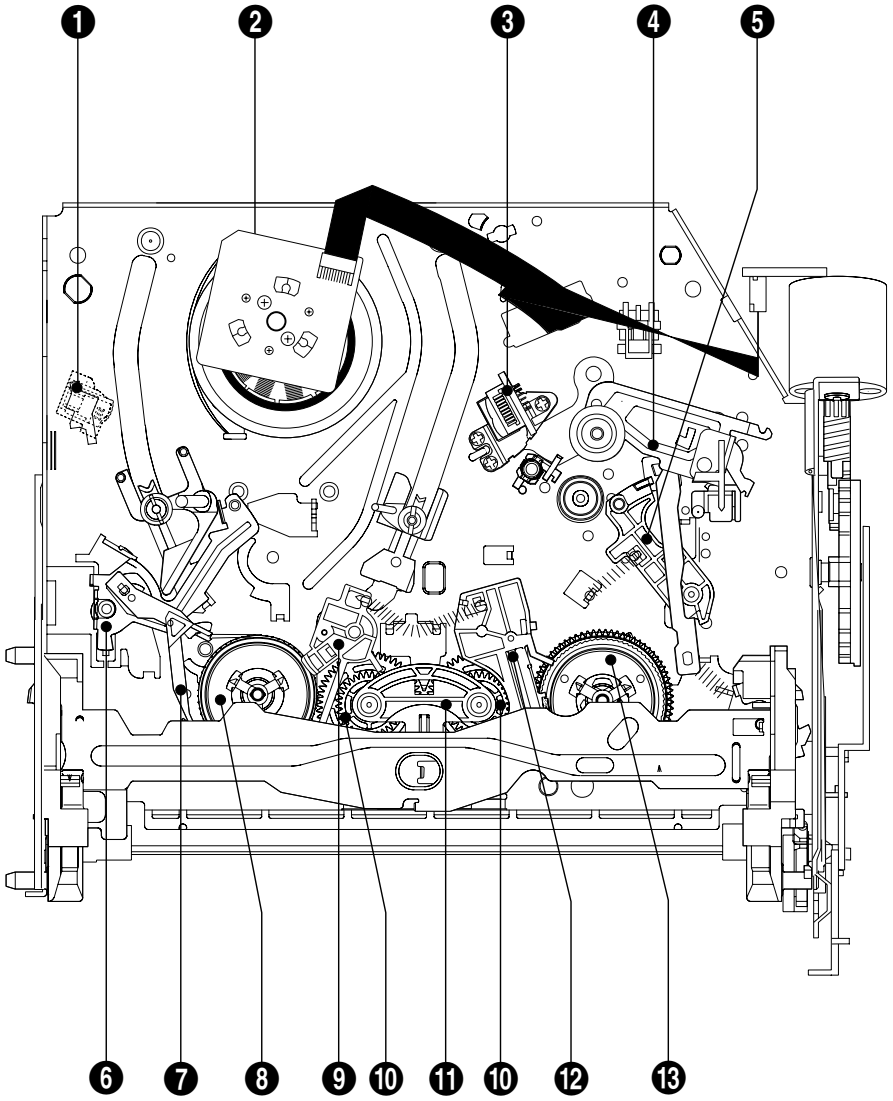


Fig. 5-9 Top Parts Location-2

1. FE HEAD
2. CYLINDER ASS'Y
3. ACE HEAD ASS'Y
4. LEVER UNIT PINCH ASS'Y
5. LEVER #9 GUIDE ASS'Y
6. LEVER TENSION ASS'Y
7. BAND BRAKE ASS'Y
8. DISK S REEL
9. LEVER S BRAKE ASS'Y
10. GEAR IDLE
11. LEVER IDLE
12. LEVER T BRAKE ASS'Y
13. DISK T REEL

5-3-2 Bottom View

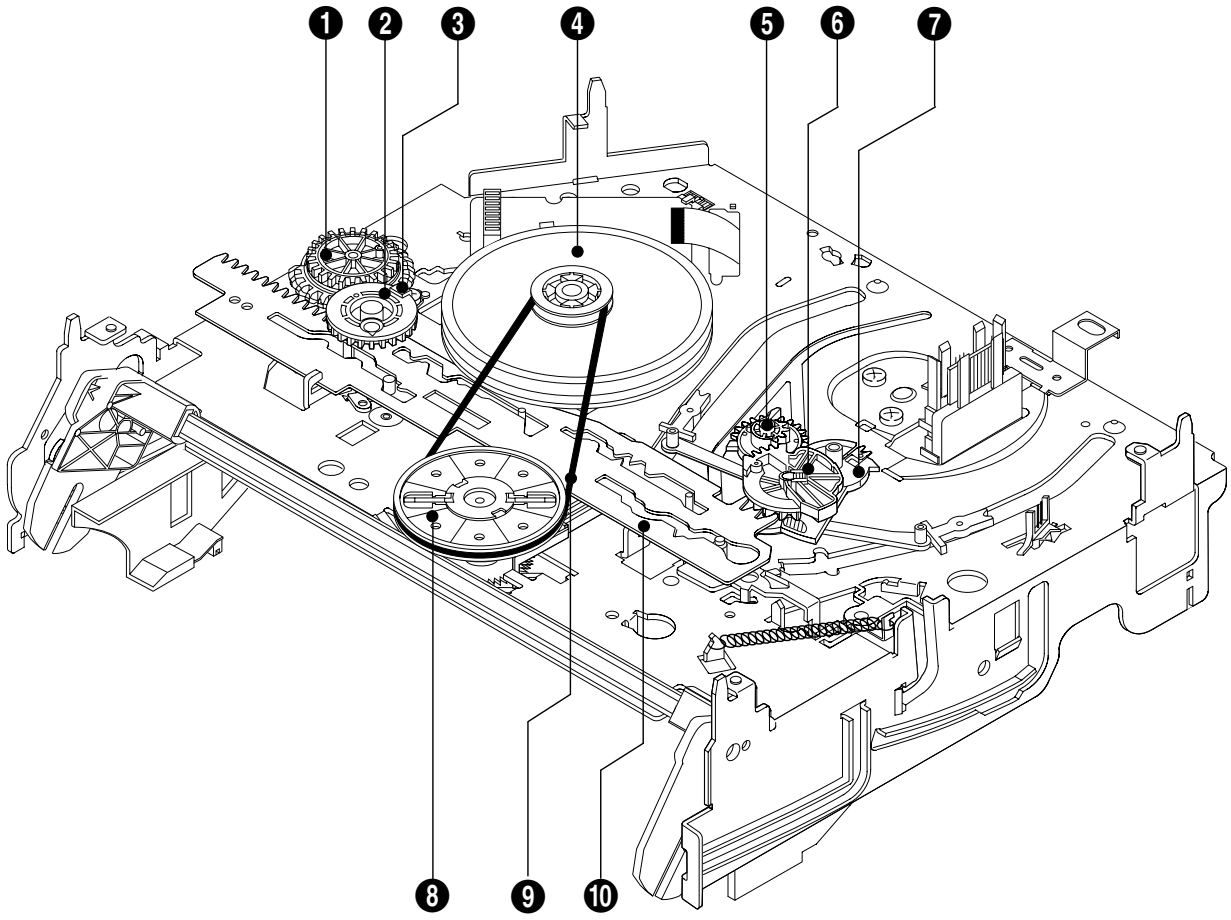


Fig. 5-10 Bottom Parts Location

1. GEAR JOINT 1
2. GEAR JOINT 2
3. BRAKET GEAR
4. MOTOR CAPSTAN ASS'Y
5. LEVER T LOAD ASS'Y
6. GEAR LOADING DRIVE
7. LEVER S LOAD ASS'Y
8. HOLDER CLUTCH ASS'Y
9. BELT PULLEY
10. SLIDER CAM

5-4 VCR Deck

5-4-1 Holder FL Cassette Ass y Removal

1) Pull the Holder FL Cassette Ass'y ❶ to the eject position.
2) Pull the Holder FL Cassette Ass'y ❶ as grasping the Holder FL Cassette Ass'y ❶ and Lever FL Cassette-R ❷ in the same time to release hooking from Main Base until the Boss [A] of Holder FL Cassette Ass'y ❶ is taken out from the Rail [B].
3) Lift the Holder FL Cassette Ass'y ❶, in this time, you have to grasp the Lever FL Cassette-R ❷ Continuously until the Holder FL Cassette Ass'y ❶ is taken out completely.

Note : Be sure to insert Lever FL Cassette-R ❷ in the direction of "A" to prevent separation and breakage of the Lever FL Cassette-R ❷ at disassembling and reassembling.

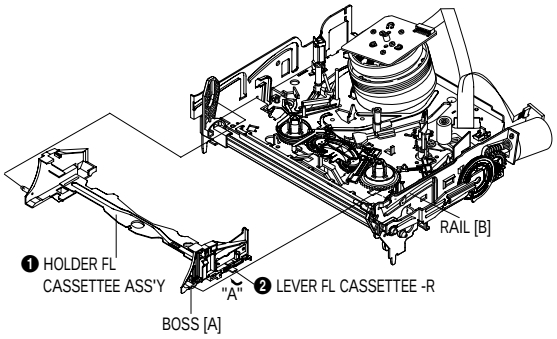


Fig. 5-11 Holder FL Cassette Ass'y Removal

5-4-2 Lever FL Door Removal

1) Release the Hook ❷ and Remove the Lever FL Door ❶ in the direction of arrow "A".

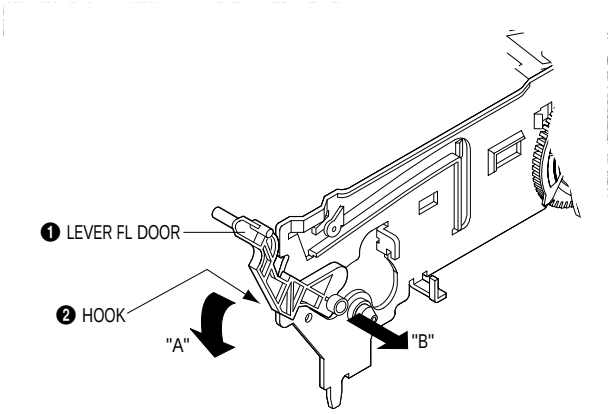


Fig. 5-12 Lever FL Door Removal

5-4-3 Slider FL Drive, Gear FL Cam Removal

1) Pull the Slider FL Drive ❶ to the front direction.
2) Remove the Slider FL Drive ❶ in the direction of arrow. (Refer to Fig. 5-13)
3) Remove the Gear FL cam ❷.

Note : When reinstalling be sure to reassemble Slider FL drive ❶ after you insert the Boss of Lever FL ARM-R in Groove of Slider Fl drive ❶.

Assembly : Align the Gear FL Cam ❶ with the Gear worm wheel Post as shown drawing.
(Refer to Timing point)

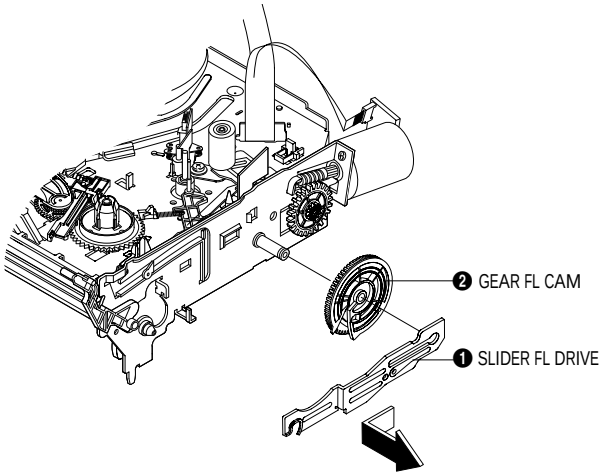


Fig. 5-13 Slider FL Drive Removal

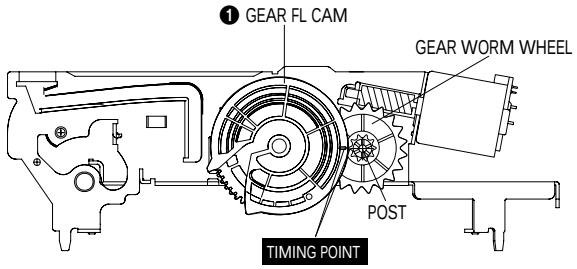


Fig. 5-14 Gear FL Cam, Gear Worm

5-4-4 Lever FL Arm Ass y Removal

1) Push the hole “A” in the direction of arrow “B” use the pin.(about Dia. 2.5)
2) Pull out the Lever FL Arm Ass'y ❶ from the Boss of Main Base.
3) Remove the Lever FL Arm Ass'y ❶ in the direction of arrow “C”.

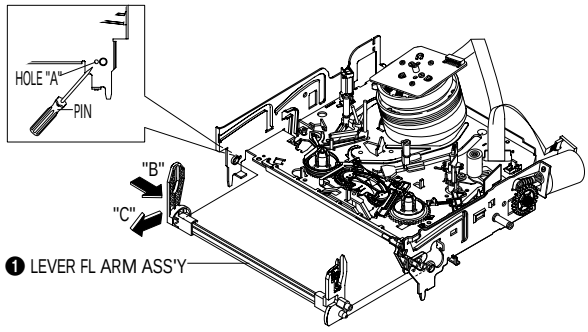


Fig. 5-15 Lever FL Arm Ass’y Removal

5-4-5 Gear Worm Wheel Removal

1) Remove the Gear Worm wheel ❶.

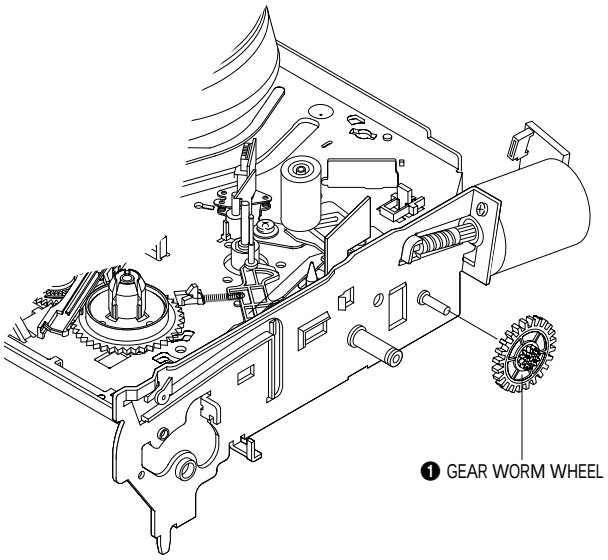


Fig. 5-16 Gear Worm Wheel Removal

5-4-6 Cable Flat Removal

1) Remove the Drum connecting part of Cable Flat ❶ from Connector Waffer ❷.
2) Remove the Loading Motor connecting part of Cable Flat ❶ from Connector Waffer ❸.

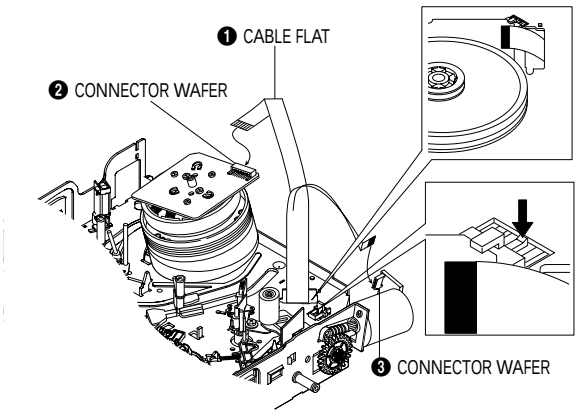


Fig. 5-17 Cable Flat Removal

5-4-7 Motor Loading Ass y Removal

1) Remove the screw ❶.
2) Remove the Motor Loading Ass'y ❷.

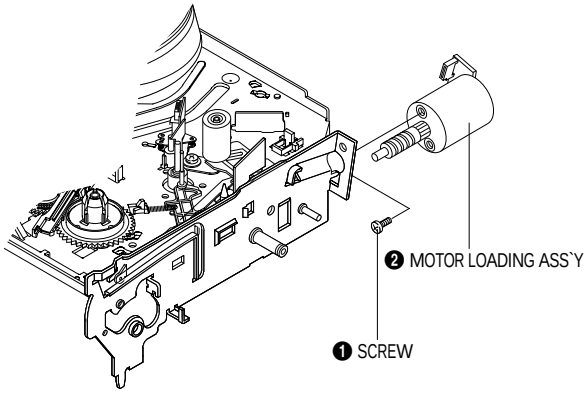


Fig.5-18 Motor Loading Ass'y Removal

5-4-8 Bracket Gear, Gear Joint 2, 1 Removal

1) Remove the SCREW ❶.
2) Remove the Bracket Gear ❷.
3) Remove the Gear Joint 2 ❸.
4) Remove the Gear Joint 1 ❹.

Assembly :
1) Be sure to align dot mark of Gear Joint 1 ❶ with dot mark of Gear Joint 2 ❷ as shown Fig 5-20. (Refer to Timing point1)
2) Confirm the Timing Point 2 of the Gear Joint 2 ❷ and Slider Cam ❸.

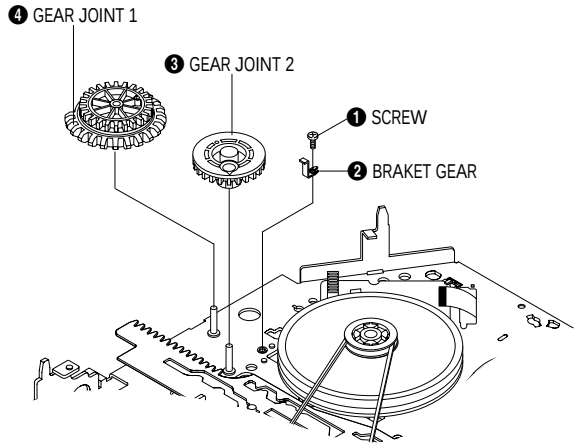


Fig. 5-19 Bracket Gear, Gear Joint 1,2 Removal

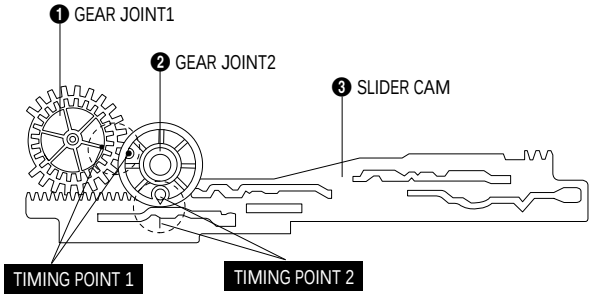


Fig. 5-20 Gear Joint 1,2 Assembly

5-4-9 Gear Loading Drive, Slider Cam, Lever Load S, T Ass y Removal

1) Remove the Belt Pulley. (Refer to Fig. 5-38)
2) Remove the Gear Loading Drive ❶ after releasing Hook [A] in the direction arrow as shown in detail drawing.
3) Remove the Slider Cam ❷.
4) Remove the Lever Load ❸, Link Load ❺ & Lever Load ❹, Link Load ❻.

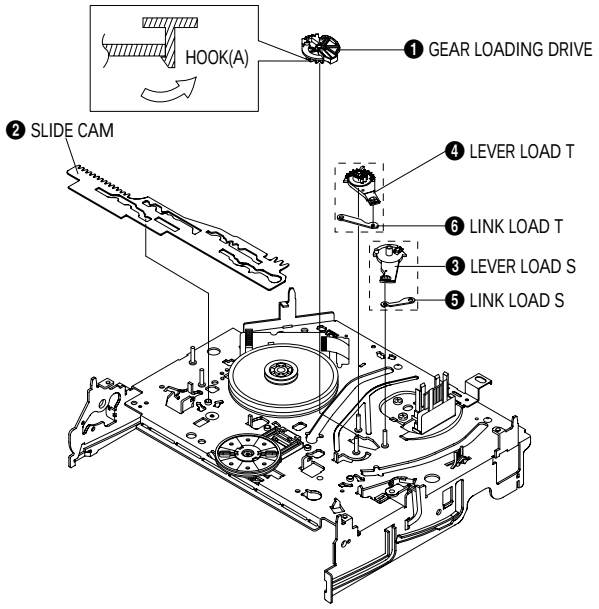


Fig. 5-21 Gear Loading Drive, Slider Cam, Lever T, S Load Ass'y Removal

5-4-10 Gear Loading Drive, Slider Cam, Lever Load S, T Ass y Assembly

1) When reinstalling, be sure to align dot of Lever Load T Ass'y ❶ with dot of Lever Load S Ass'y ❷ as shown in drawing, (Refer to Timing Point 1).
2) Insert the Pin A,B,C,D into the Slider Cam ❸ hole,
3) Be sure to align dot of Lever Load T ❶ and dot of Gear Loading Drive ❹, (Refer to Timing Point 2).
4) Aline dot of Gear Loading drive ❹ with mark of Slider Cam ❸ as shown in drawing(Refer to Timing Point 3).

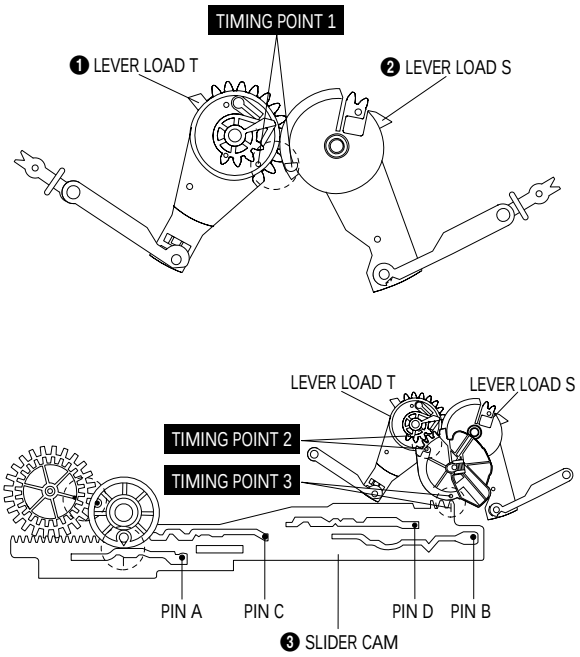


Fig. 5-22 Gear Loading Drive, Slider Cam, Lever Load S, T Ass'y Assembly

5-4-11 Lever Pinch Drive, Lever Tension Drive Removal

1) Remove the Lever Pinch Drive ❶, Lever Tension Drive ❷.

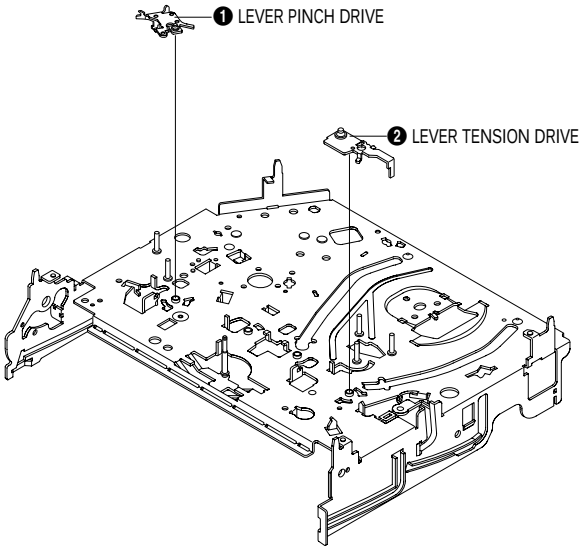


Fig. 5-23 Lever Pinch Drive, Lever Tension Drive Removal

5-4-12 Lever Tension Ass y, Band Brake Ass y Removal

1) Remove the Lever Brake S Ass'y (Refer to Fig 5-25).
2) Remove the Spring Tension Lever ❶.
3) Rotate stopper of Main Base in the direction of arrow "A".
4) Lift the Lever Tension Ass'y ❷ & Band brake Ass'y ❸.

Note :
1) When replacing the Lever Tension Ass'y ❷, be sure to apply Grease on the post,
2) Take care not to touch stain on the felt side, and not to be folder and broken Band brake Ass'y
3) After Lever Tension Ass'y seated, Rotate stopper of Main Base to the Mark[B].

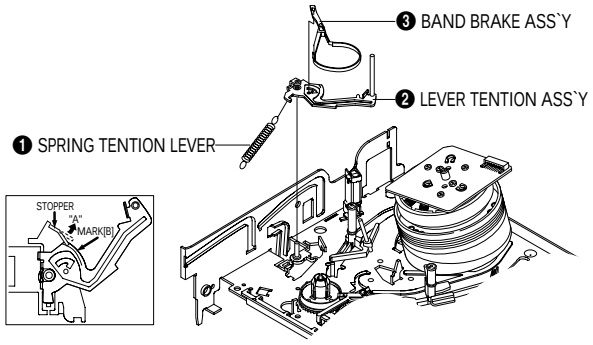


Fig. 5-24 Lever Tension Ass'y, Band Brake Ass'y Removal

5-4-13 Lever Brake S, T Ass y Removal

1) Release the Hook [A] and the Hook [B], [C] in the direction of arrow as shown in Fig 5-25.
2) Lift the Lever S, T Brake Ass'y ❶, ❷ with spring brake ❸.

Assembly :
1)Assembly the Lever S Brake Ass'y ❶ on the Main Base.
2)Assembly the Lever T Brake Ass'y ❷ with spring brake ❸.

Note : Take extreme care not to be folded and transformed Spring Brake at removing or reinstalling.

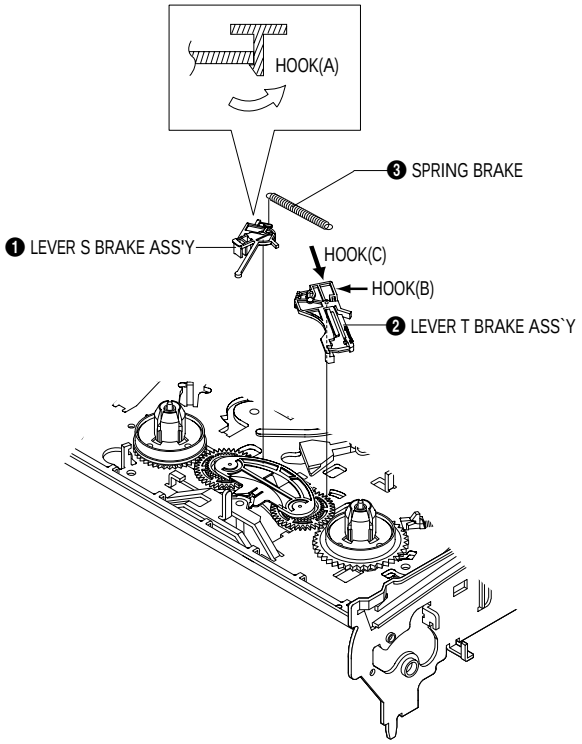


Fig. 5-25 Lever Brake S, T Ass'y Removal

5-4-14 Gear Idle Ass y Removal

1) Push the Lever Idle ❶ in the direction of arrow "A", "B".
2) Lift the Lever Idle ❶.

Assembly :
1) Apply oil in two Bosses of Lever Idle ❶.
2) Assemble the Gear Idle ❷ with the Lever Idle ❶.

Note : When replacing the Gear Idle ❷, be sure to add oil in the boss of Lever Idle ❶.

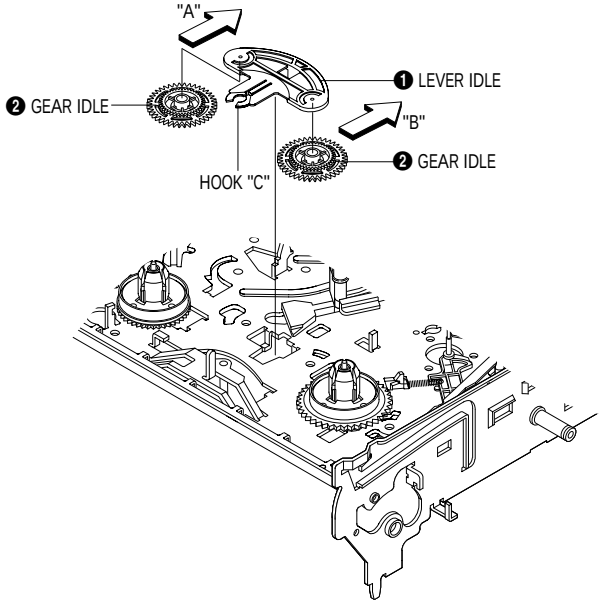


Fig. 5-26 Gear Idle Ass'y Removal

5-4-15 Disk S, T Reel Removal

1) Lift the Disk S, T Reel ❶, ❷.

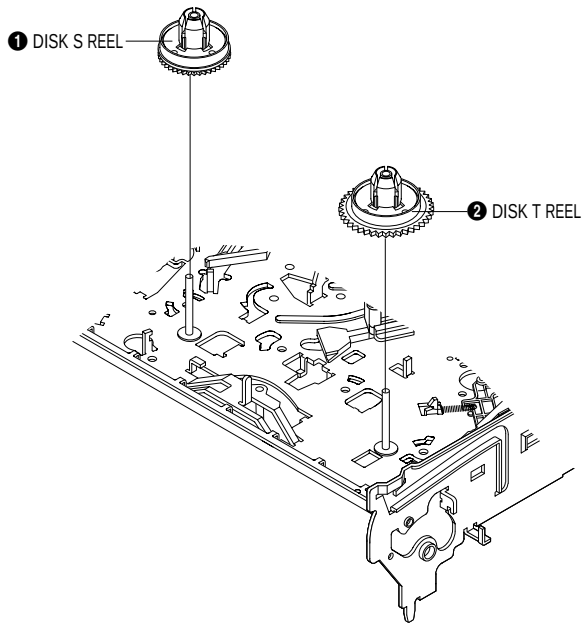
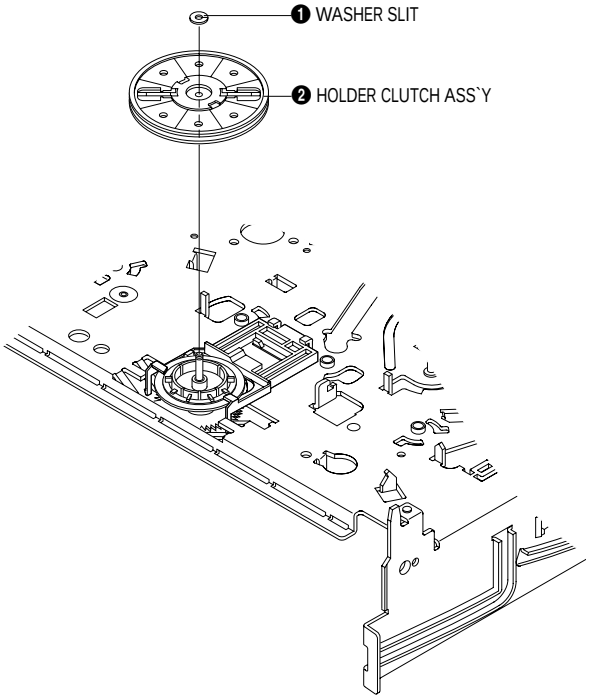


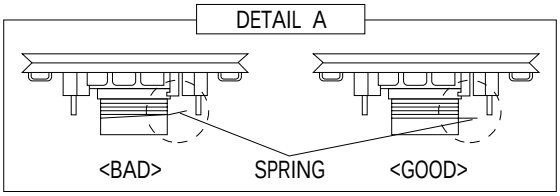
Fig. 5-27 Disk S, T Reel Removal

5-4-16 Holder Clutch Ass y Removal

1) Remove the Washer Slit ❶.
2) Lift the Holder Clutch Ass'y ❷.

Note : When you reinstall Holder Clutch Ass'y
1) Check the condition of spring as shown in detail A.
2) Don't push Holder Clutch Ass'y down with excessive force Just insert Holder Clutch Ass'y into post center with dead force and Rotate it smoothly.
Be sure to confirm that spring is in the slit of Gear Center Ass'y as shown in detail B.





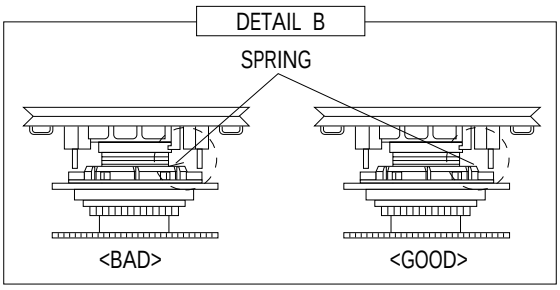


Fig. 5-28 Holder Clutch Ass'y Removal

5-4-17 Lever Up Down Ass y, Gear Center Ass y Removal

1) Remove the 2 hooks in the direction of arrow as shown Fig. 5-28 and lift the Lever Up Down Ass'y ❶.
2) Lift the Gear Center Ass'y ❷.

Assembly :
1) Insert the Lever Up Down Ass'y ❶ in the rectangular holes on Main Base as shown in Fig 5-30.
2) Lift the Lever Up Down Ass'y ❶ about 35°. (Refer to Fig 5-30)
3) Insert Ring of the Gear Center Ass'y ❷ in the Guide of the Lever Up Down Ass'y ❶.
4) Insert the Gear Center Ass'y ❷ in the post on Main Base.
5) Push down the Lever Up Down Ass'y ❶ for locking of the Hook.

Note :
1) Take care not to separate and sentence does not mark sense.
2) Be sure to confirm that Ring of the Gear Center Ass'y ❷ is in the Guide of the Lever Up Down Ass'y ❶ after finishing assembly of Lever Up Down Ass'y ❶ and Gear Center Ass'y ❷.

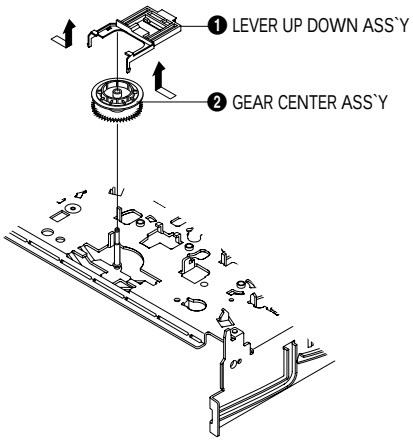


Fig. 5-29 Lever Up Down Ass'y Removal

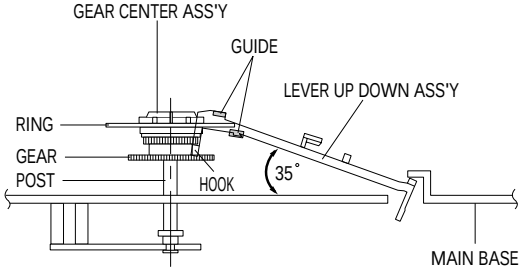


Fig. 5-30 Lever Up Down Ass'y Removal

5-4-18 Guide Cassette Door Removal

1) Lift the Hook [A].
2) Rotate the Guide Cassette Door ❶ in the direction of arrow.

Note : After reinstalling the Guide Cassette Door ❶ sure the Hook [A].

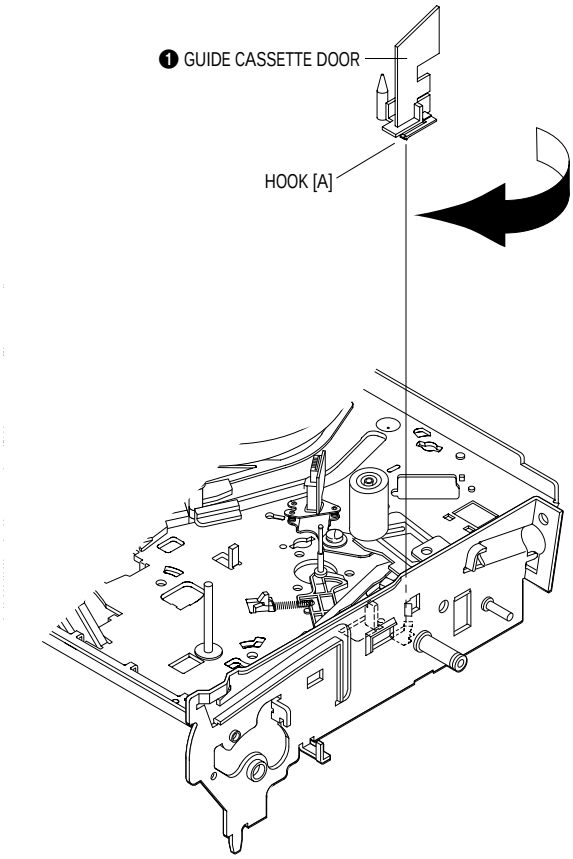


Fig. 5-31 Guide Cassette Door Removal

5-4-19 Lever Unit Pinch Ass y, Plate Joint, Spring Pinch Drive Removal

1) Lift the Unit Pinch Ass'y ❶.
2) Remove the Plate Joint ❷ from Lever Pinch Drive.
3) Remove the Spring Pinch Drive ❸.

Note :
1) Take extreme care not to touch the grease on the Roller Pinch.
2) When reinstalling, be sure to apply grease on the post pinch roller.

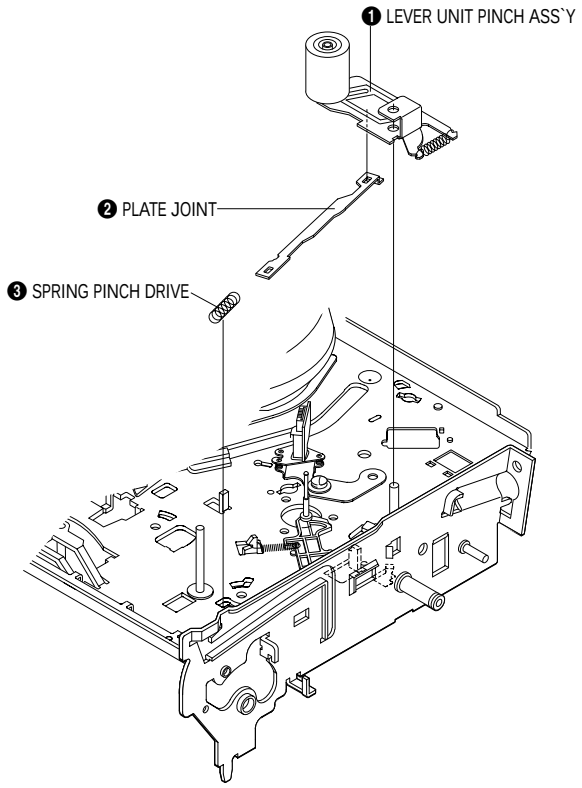


Fig. 5-32 Lever Unit Pinch Ass'y, Plate Joint, Spring Pinch Drive Removal

5-4-20 Lever #9 Guide Ass y Removal

1) Remove the Spring #9 Guide ❶.
2) Lift the Spring #9 Guide Ass'y ❷ in the direction of arrow "A".

Note :
1) Take extreme care not to get grease on the tape Guide Post.
2) After reinstalling, check the bottom side of the Post #9 Guide to the top side of Main Base.

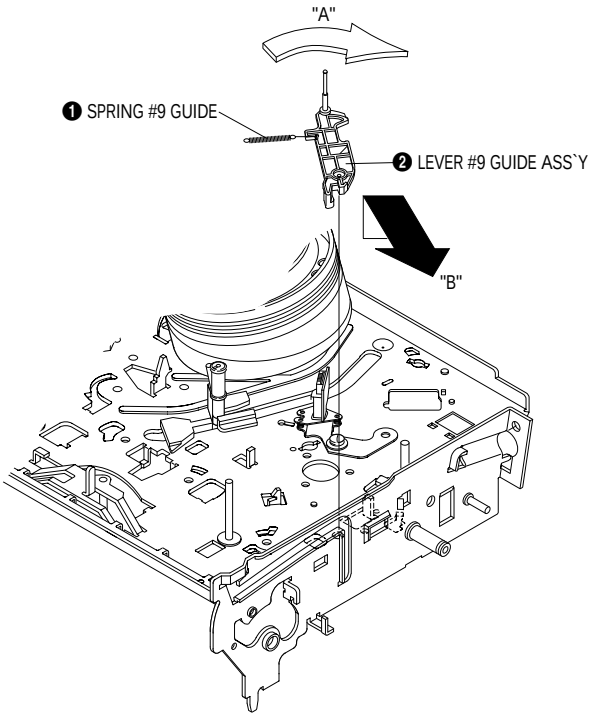


Fig. 5-33 Lever #9 Guide Ass'y Removal

5-4-21 FE Head Removal

1) Remove the screw ❶.
2) Lift the FE Head ❷.

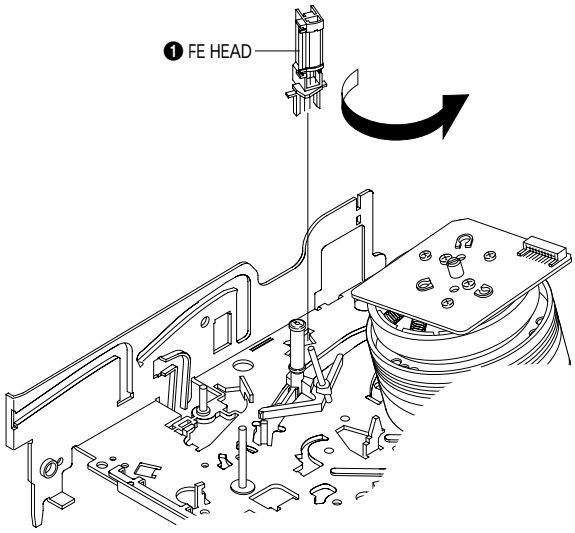


Fig. 5-34 FE Head Removal

5-4-22 ACE Head Removal

1) Pull out the FPC from connector of ACE Head Ass'y ❷.
2) Remove the screw ❶.
3) Lift the ACE Head Ass'y ❷.

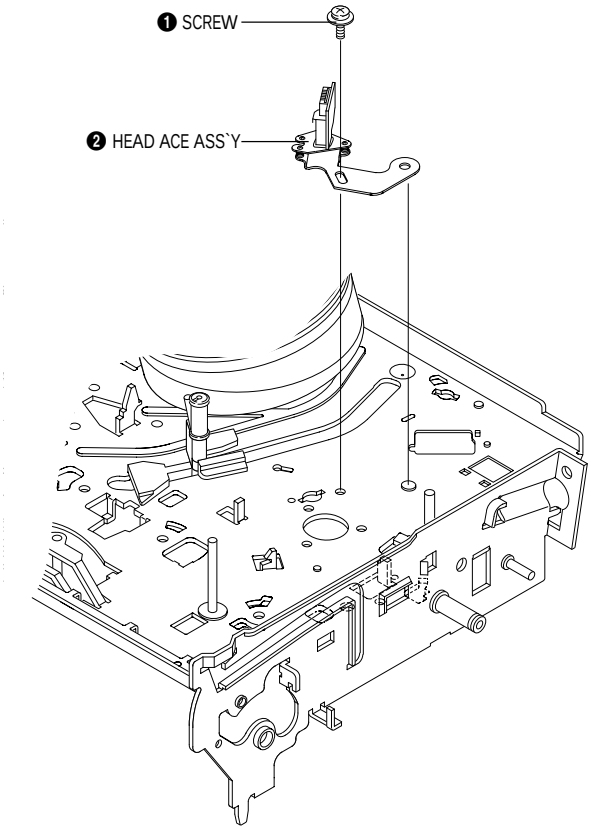


Fig. 5-35 ACE Head Removal

5-4-23 Slider S, T Ass y Removal

1) Move the Slider S, T Ass'y ❶, ❷ to slot, and then lift it to remove. (Refer to arrow)

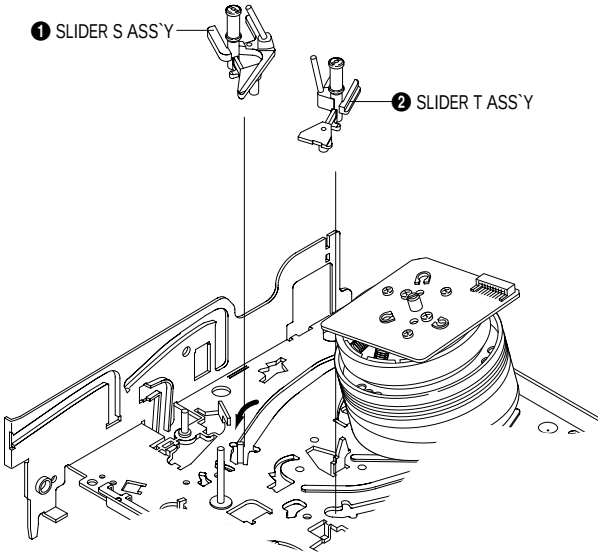


Fig. 5-36 Slider S, T Ass'y Removal

5-4-24 Plate Ground Deck, Cylinder Ass y Removal

1) Remove the 3 Screws ❶.
2) Lift the Plate Ground Deck ❷.
3) Lift the Cylinder Ass'y ❸.

Assembly :
1) Match the 3 holes in the bottom of Cylinder ass'y ❸ to the 3 holes of Main Base as attending not to drop or knock the Cylinder ass'y ❸.
2) Tighten the 1 Screw ❶.
3) Match the Plate Ground Deck ❷ to the Hole of Base Main.
4) Tighten the other 2 Screws ❶.

Note :
1) Take care not to touch the Cylinder Ass'y ❸ and the tape guide post at reinstalling.
2) When reinstalling, Don't push down too much on Screw Driver.

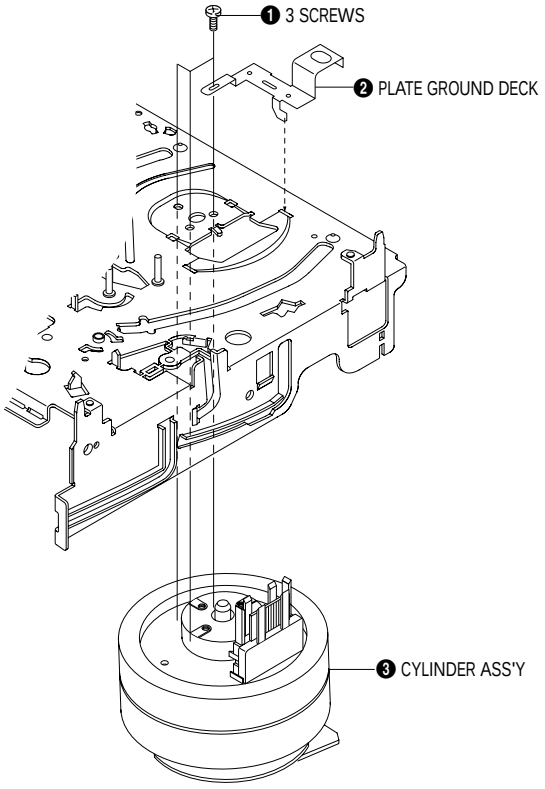


Fig. 5-37 Plate Ground Deck, Cylinder Ass'y Removal

5-4-25 Belt Pulley Removal

1) Remove the Belt Pulley ❶.

Note : Take extreme care not to get grease on Belt Pulley ❶ at assembling or reassembling.

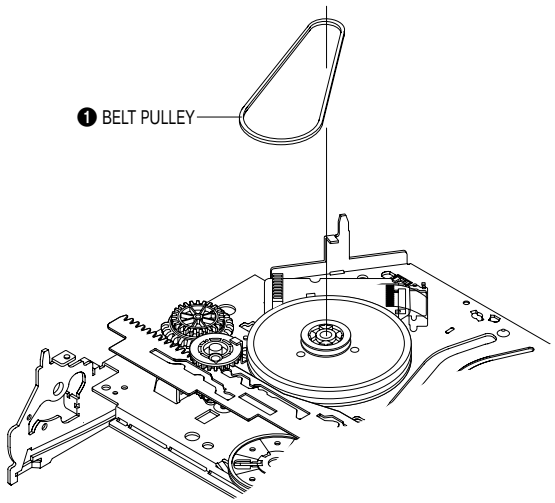


Fig. 5-38 Belt Pulley Removal

5-4-26 Motor Capstan Ass y Removal

1) Remove the Damper Capstan ❶ in the direction of arrow.
2) Remove the 3 Screws ❷.
3) Remove the Motor Capstan Ass'y ❸.

Assembly :
1) Match the 3 holes of Motor Capstan Ass'y ❸ to the 3 holes of Main Base. Be careful not to drop or knock the Motor Capstan Ass'y ❸.
2) Tighten the 3 Screws ❷ in the direction of arrow as shown detail drawing.
3) Assemble the Damper Capstan ❶.

Note : After tightening screws, check if there is gap between the head of screws and the top side of Main Base. There should have no gap between the head of screws and the top side of Main Base.
After reinstalling, adjusting the tape transport system again.

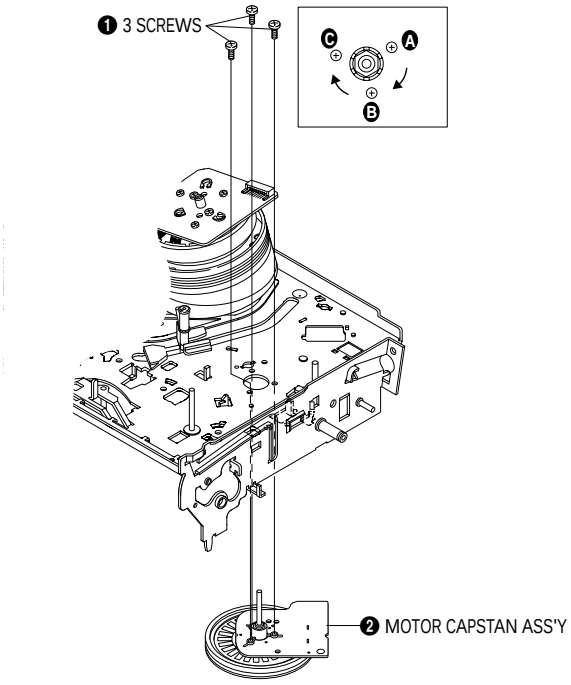


Fig. 5-39 Motor Capstan Ass'y Removal

5-4-27 Post #8 Guide Ass y Removal

1) Rotate the Post #8 Guide Ass'y ❶ in the direction of arrow to lift up.

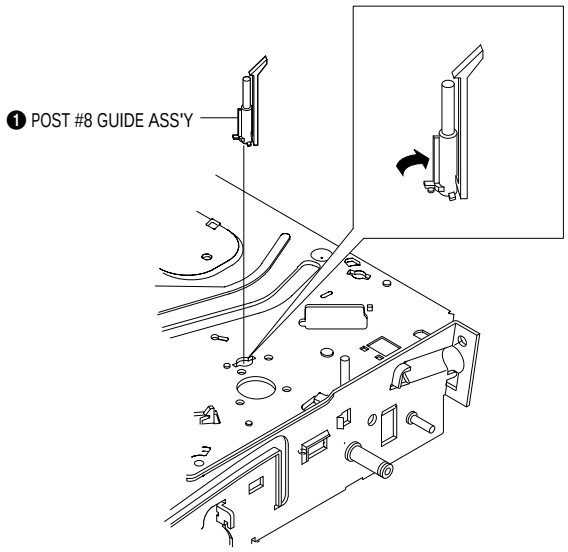


Fig. 5-40 Post #8 Guide Ass'y Removal

5-4-28 Level Head Cleaner Ass y Removal (Optional)

1) Release the Hook ❶.
2) Lift the Lever Head Cleaner Ass'y ❷.

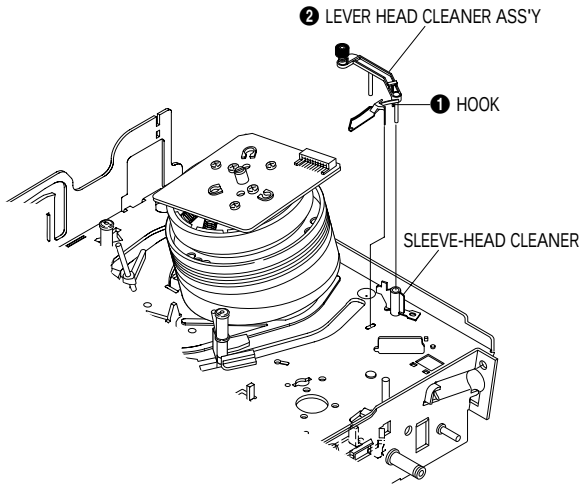


Fig. 5-41 Lever Head Cleaner Ass'y Removal

5-4-29 How to Eject the Cassette Tape (If the unit does not operate on condition that is inserted into housing ass y)

1) Turn the Gear worm ❶ clockwise with screw driver.(Refer to arrow)
(Other method : Remove the Screw of Motor Load Ass'y, Separate the Motor Load Ass'y)

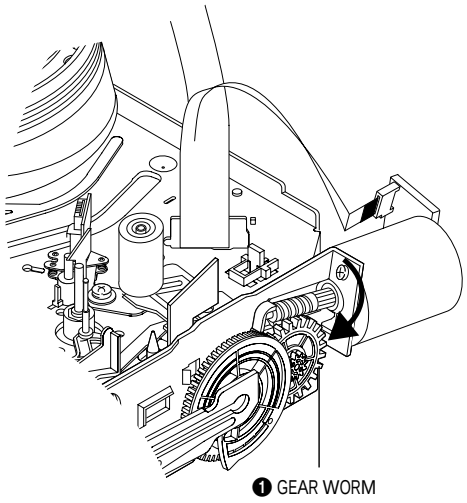


Fig. 5-42

2) When Slider S,T are approched in the position of unloading, rotate holder Clutch counterclockwise after inserting screw driver in the hole of frame's bottom in order to wind the unwinded tape. (Refer to Fig.5-43)
(If you rotate Gear Worm ❶ continuously when tape is in state of unwinding, you may cause a tape contamination by grease and tape damage. Be sure to wind the unwinded tape in the state of set horizontly.)
3) Rotate Gear Worm ❶ clockwise using screw driver again up to the state of eject mode and then pick out the tape.(Refer to Fig.5-42)

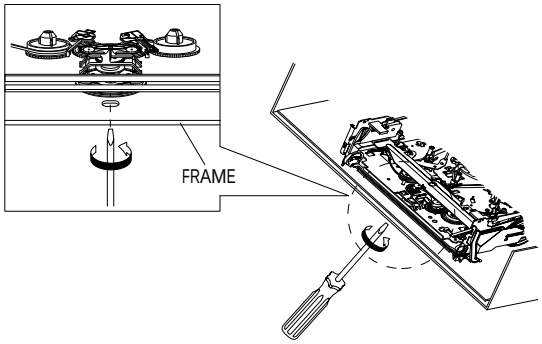


Fig. 5-43

5-5 The table of cleaning, Lubrication and replacement time about principal parts

1) The replacement time of parts is not life of parts.
2) The table 5-1 is that the VCR Set is in normal condition (normal temperature, normal humidity).
   The checking period may be changed owing to the condition of use, runtime and environmental conditions.
3) Life of the Cylinder Ass'y is depend on the condition of use.
4) See exploded view for location of each parts.

<Table 5-1>

*	Parts Name	Checking Period										Remark
		500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
TAPE PATH SYSTEM	POST TENSION	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	- To clean the parts, use patch and alcohol (solvent). - After cleaning, use the video tape after alcohol is gone away completely. - We recommend to use oil [EP-50] or solvent. - One or two drops of oil should be applied after cleaning with alcohol.
	SLANT POST S, T	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	
	#8 GUIDE SHAFT	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	
	CAPSTAN SHAFT	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	
	#9 GUIDE POST	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	
	#3 GUIDE POST	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	
	GUIDE ROLLER S, T	Δ	Δ	Δ	O	O	O	O	O	O	O	
	CYLINDER ASS'Y	Δ	O	O	O	O	O	O	O	O	O	
	FE HEAD	Δ	Δ	Δ	O	O	O	O	O	O	O	
	ACE HEAD	Δ	O	O	O	O	O	O	O	O	O	
	PINCH ROLLER	Δ	O	O	O	O	O	O	O	O	O	
	POST REEL S, T		◆		◆		◆		◆		◆	- Periodic time of applying oil (Apply oil after cleaning) - The excessive applying oil may be the cause of malfunction.
	SLEEVE TENSION		◆		◆		◆		◆		◆	
	POST CENTER		◆		◆		◆		◆		◆	
	LEVER IDLE BOSS (2Point)		◆		◆		◆		◆		◆	
DRIVING SYSTEM	CAPSTAN MOTOR PULLEY	Δ	Δ	Δ	Δ	Δ	O	O	O	O	O	
	BELT PULLEY				O	O	O	O	O	O	O	
	HOLDER CLUTCH ASS'Y	Δ	O	O	O	O	O	O	O	O	O	
	GEAR CENTER ASS'Y		O	O	O	O	O	O	O	O	O	
	GEAR IDLE (2Point)		O	O	O	O	O	O	O	O	O	
	LOADING MOTOR		O	O	O	O	O	O	O	O	O	
BRAKE SYSTEM	BAND BRAKE ASS'Y		O	O	O	O	O	O	O	O	O	
	BRAKE T ASS'Y		O	O	O	O	O	O	O	O	O	

Δ : Cleaning O : Check and replacement in necessary ◆ : Add Oil

5-6 DVD Deck

5-6-1 Tray Disc Removal

1) Insert a Screw Driver ❶ into Emergency Hole ❷ and push the Slider Housing ❸ in the direction arrow “A”.
2) When the Tray Disc ❹ comes out a little, pull it in the direction arrow “B” by hand.
3) Pull the Tray Disc ❹ to disassemble , while simultaneously pushing 2 Stoppers ❺ (left, right) in the direction arrow “C”, “D”.

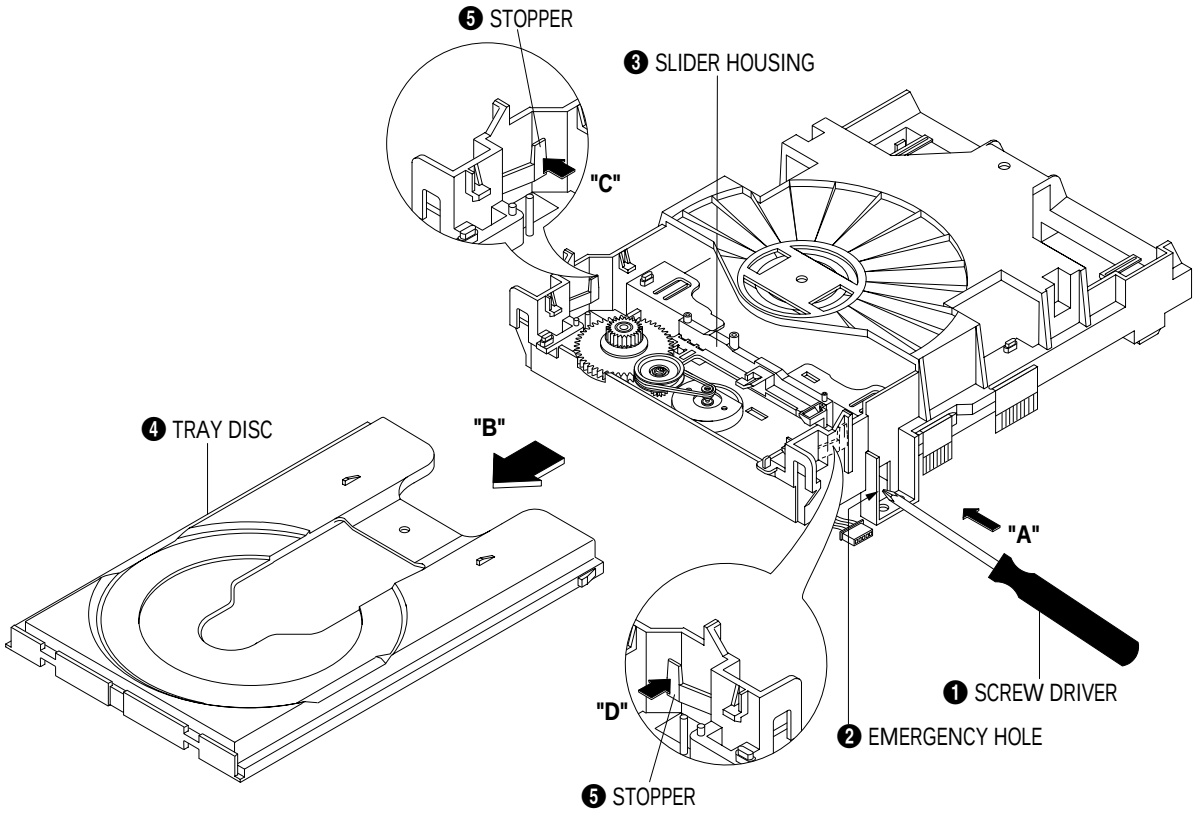


Fig. 5-44 Tray Disc Removal

5-6-2 Assy P/U Deck Removal

1) Disconnect DCN2 ❶, DCN3 ❷.
2) Lift down the Assy P/U Deck ❸ while simultaneously pushing 2 Hooks ❹, ❺ in the direction of arrow "A", "B".

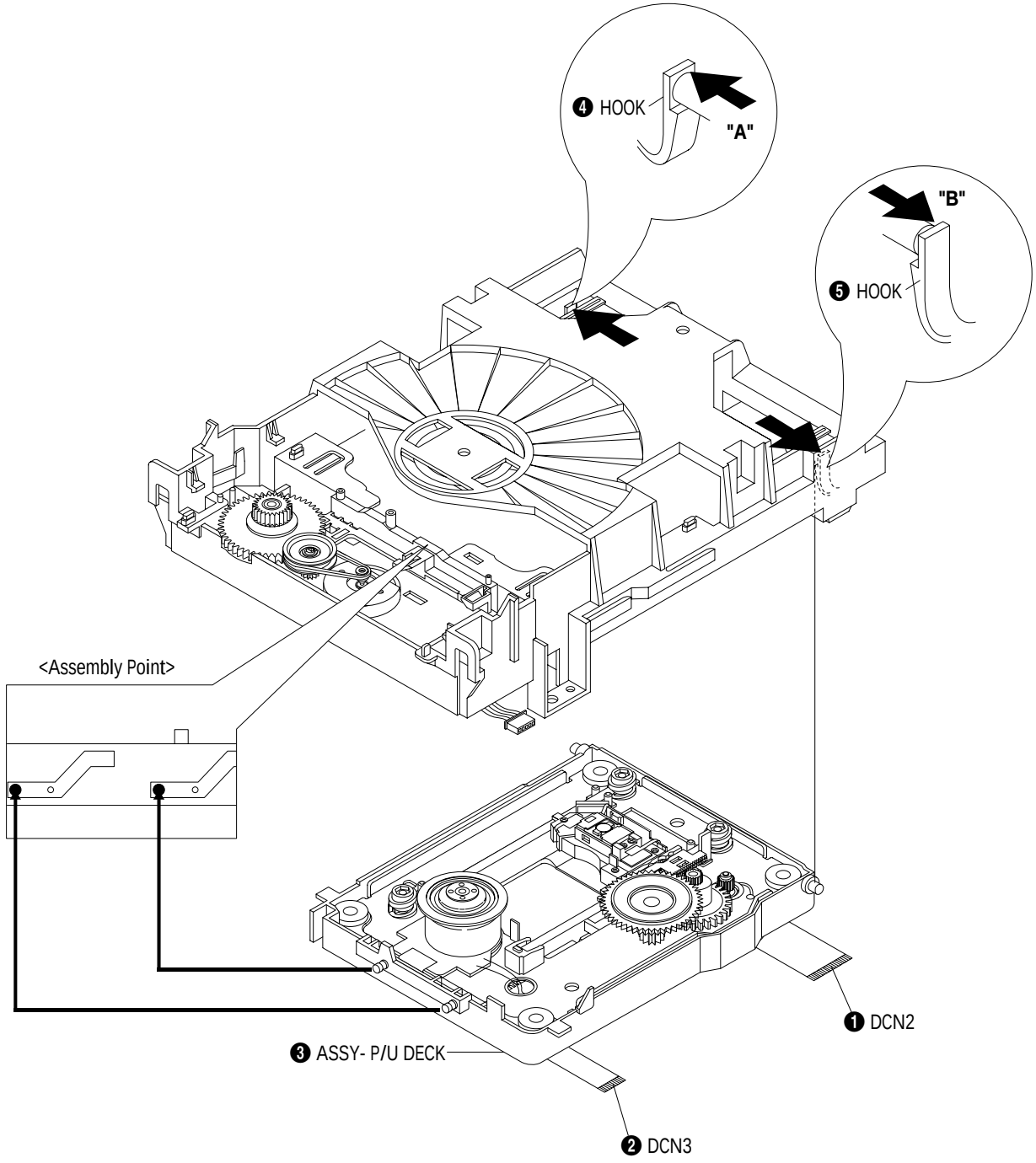


Fig. 5-45 Assy P/U Deck Removal

5-6-3 Housing Ass y Removal

1) Remove Belt ❶.
2) Push the Hook ❷ in the direction arrow "A" and lift up Pulley Gear ❸.
3) Push the Slider Housing ❺ in the direction arrow "B" and lift up the Gear Tray ❹.
4) Lift up the Slider Housing ❺.
5) Remove 2 Screws ❻ and lift down the Motor Load Assy ❼.
6) Remove Clamper Ass'y ❽.

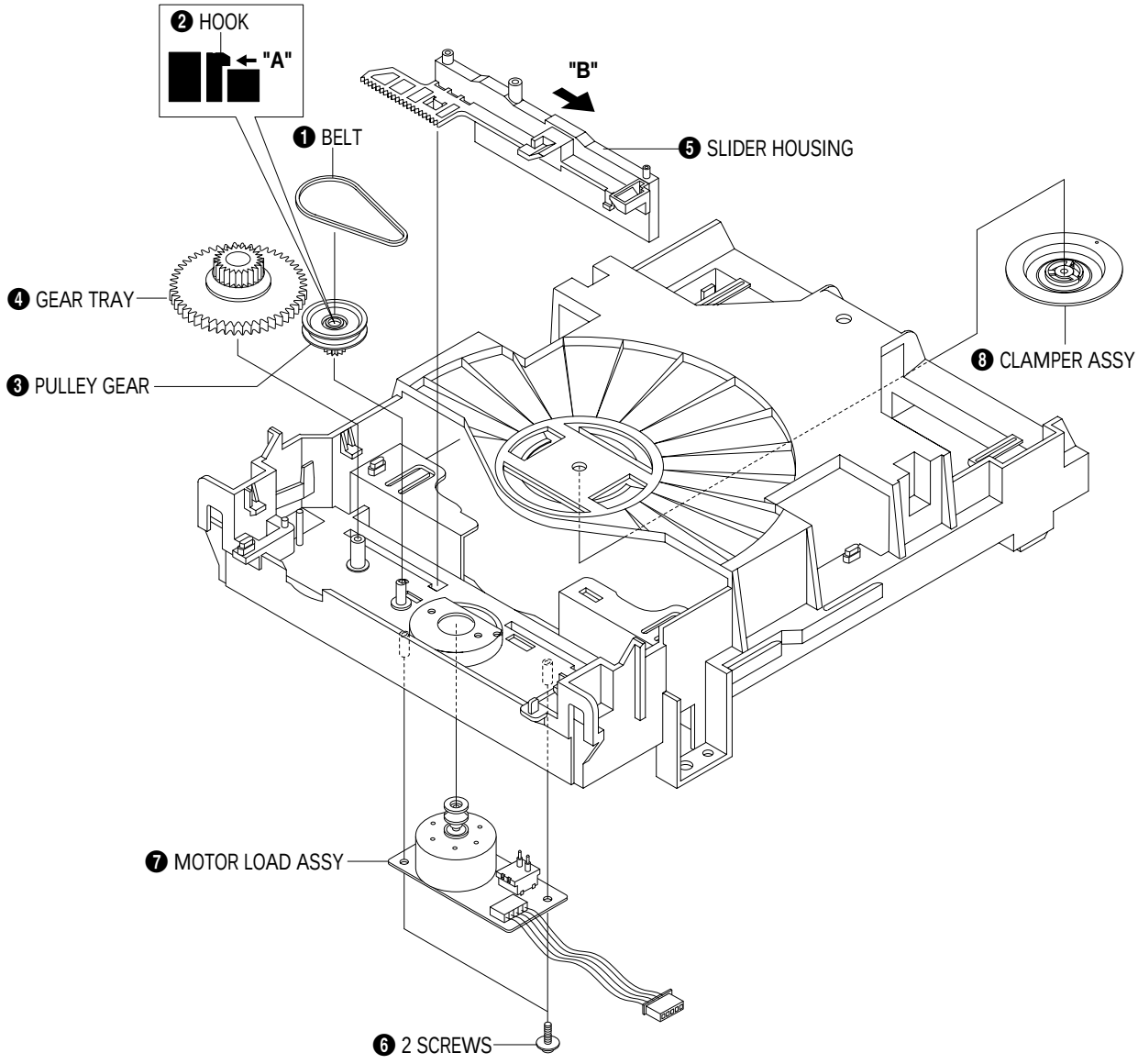


Fig. 5-46 Housing Ass'y Removal

5-6-4 Sub Chassis Removal

1) Remove the Soldering of Motor Feed (+, - wire) ❶.
2) Remove the 4 Screws ❷.
3) Lift up the Ass'y Brkt Deck ❸.

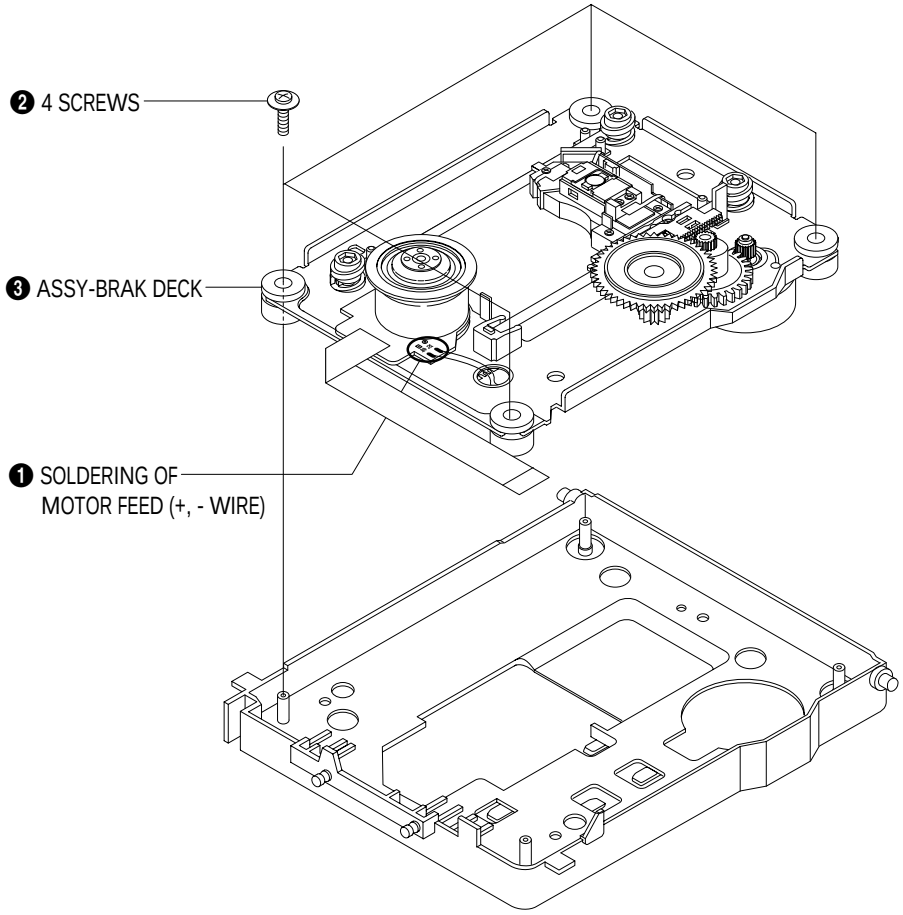


Fig. 5-47 Sub Chassis Removal

5-6-5 Ass y Brkt Deck Removal

1) Push the Hook ❶ in the direction arrow "A" and lift up Gear Feed B ❷.
2) Remove 3 Screws ❸ and 3 Holder Cam Skew ❹.
3) Remove Shaft Pick-Up ❺ and Pick-Up Assy ❻.
4) Remove Gear Feed A ❼.
5) Remove 2 Screws ❽.
6) Remove Motor Feed Ass'y ❾.
7) Remove 3 Screws ❿.
8) Remove Motor Spindle ⓫.

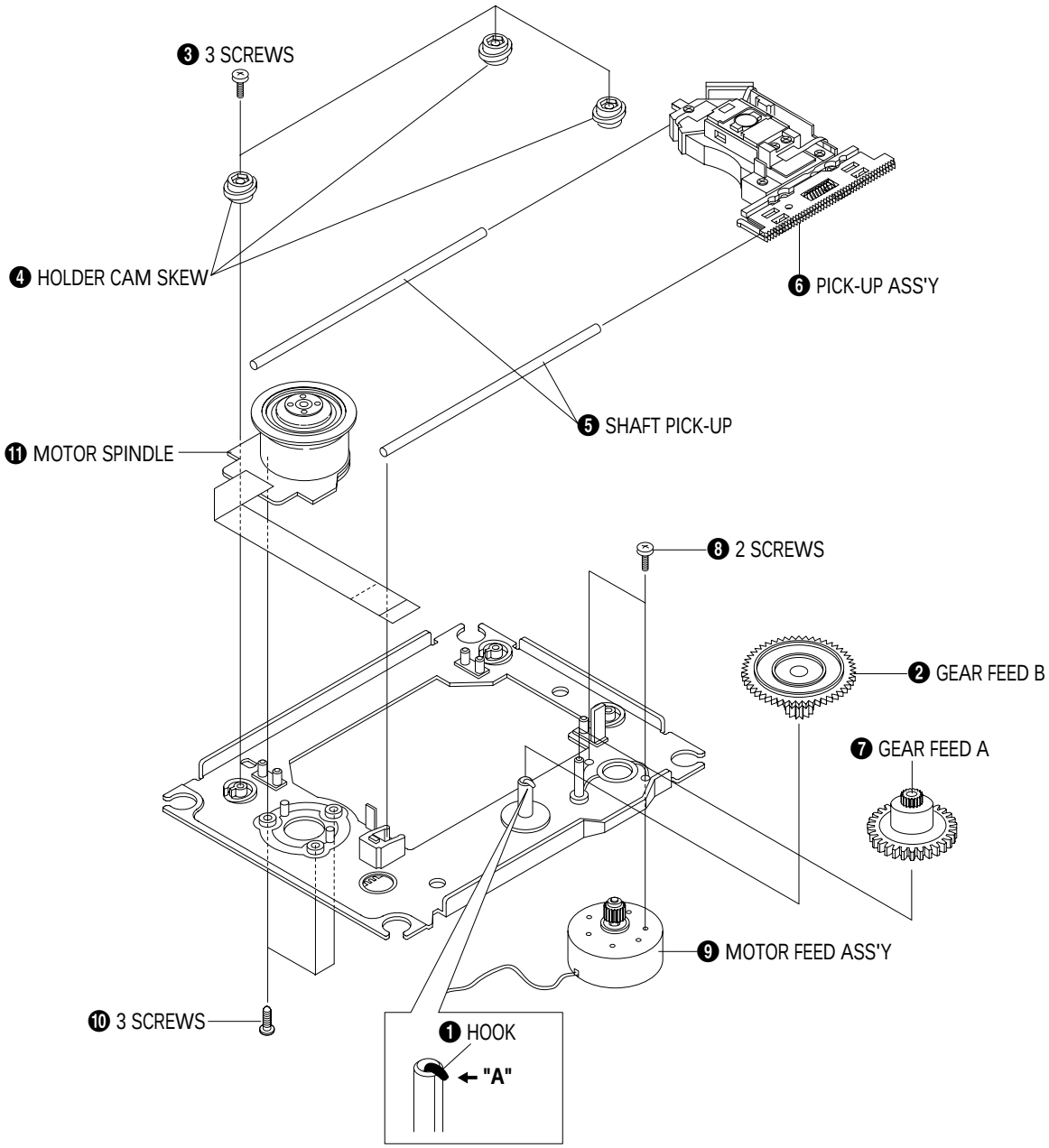


Fig. 5-48 Ass'y Brkt Deck Removal

6. Alignment and Adjustments

6-1 VCR Adjustment

6-1-1 Reference

1) X-Point (Tracking center) adjustment, “Head switching adjustment” and “NVRAM option setting” can be adjusted with remote control.
2) When replacing the Main PCB Micom (IC601) and NVRAM (IC605 ; EEPROM) be sure to adjust the “Head switching adjustment” and “NVRAM option setting”.
3) When replacing the cylinder ass’y, be sure to adjust the “X-Point” and “Head switching adjustment”.
4) How to adjustment.
   - Intermittently short-circuit the Test Point on Main PCB with pincers to the adjustment mode.
   - If the corresponding adjustment button is pressed, the adjustment is performed automatically.
   - If the adjustment is completrd, be sure to turn the power off.

6-1-1(a) Location of adjustment button of remote control

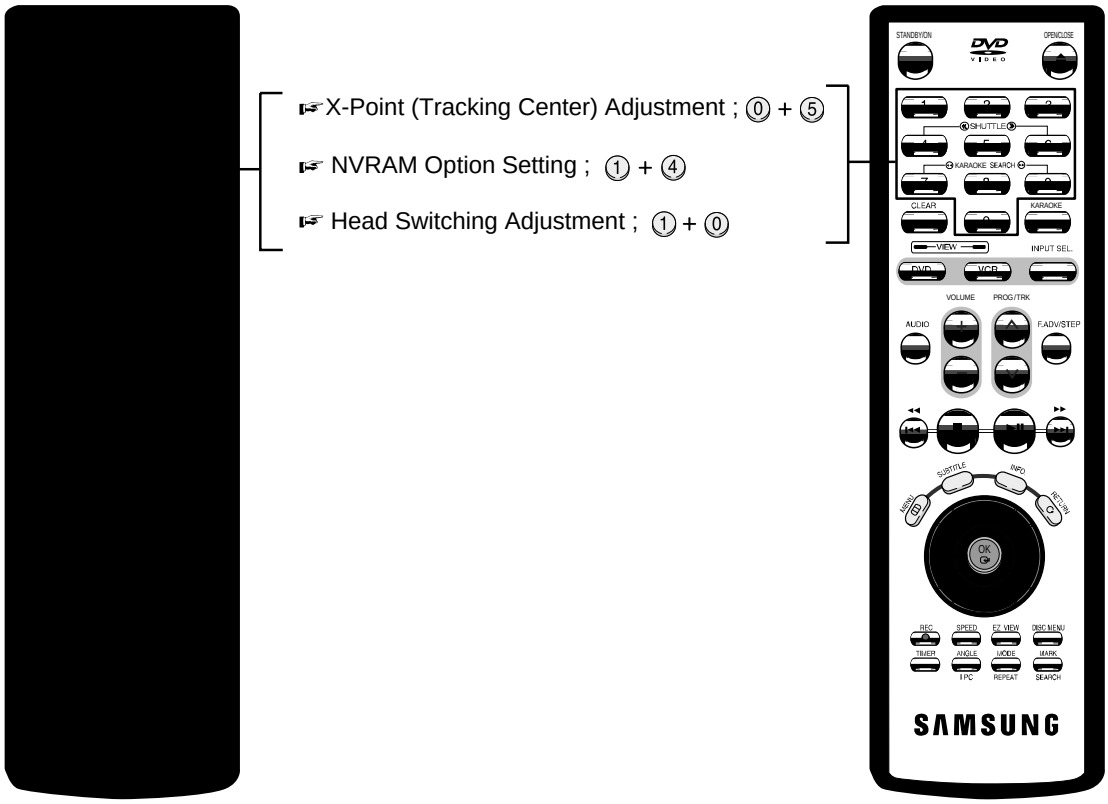


Fig. 6-1

6-1-1(b) TEST location for adjustment mode setting

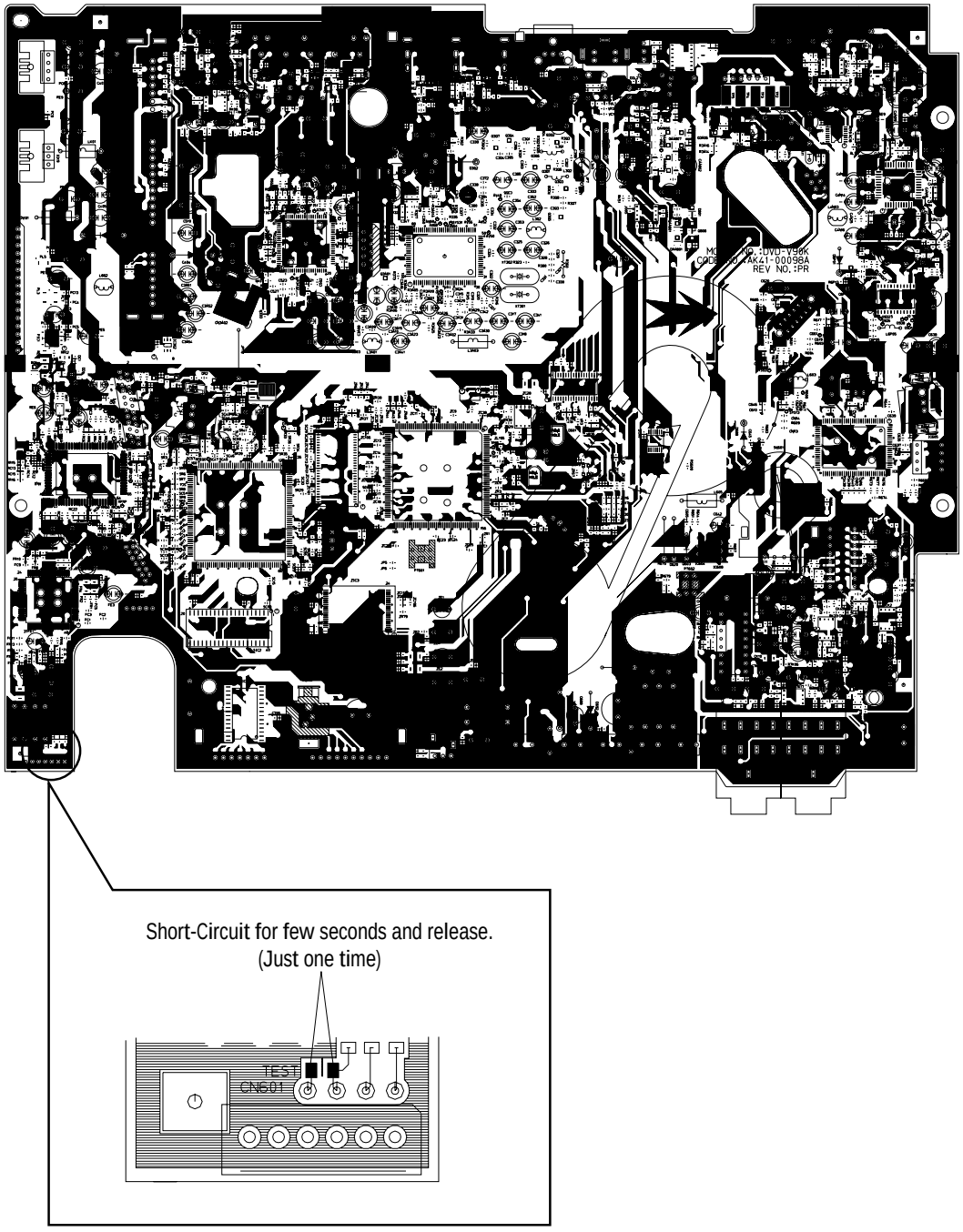


Fig. 6-2 Main PCB (Top View)

6-1-2 Head Switching Point Adjustment

1) Playback the alignment tape.
2) Intermittently short-circuit the two Test Points on Main PCB while setting the adjustment mode. (See Fig. 6-2)
3) Press the “1, 0” buttons remote control adjustment operates automatically. (See Fig. 6-1)

6-1-3 NVRAM Option Setting

1) NVRAM Option is adjusted in the factory.
2) In case Main PCB Micom (IC601) and NVRAM (IC605 ; EEPROM) are replaced, be sure to set the corresponding option number of the required model. (If the option is not set, the unit will not operate.)

1) Intermittently short-circuit the two Test Points on Main PCB. (See Fig. 6-2)
2) Press the “1, 4” buttons on the remote control. The option setting appears. (See Fig. 6-3)
3) Select the option number (See table 6-1) of corresponding model with “◀, ▶, ▲, ▼” buttons on the remote control.
4) After selecting the option number is completed, press the “▲” button of remote control.
   (If “▲” button is pressed, the selected number is changescolor. See Fig. 6-4)
5) Press the “ENTER” button of remote control again to store the option number.
6) Turn the Power off.

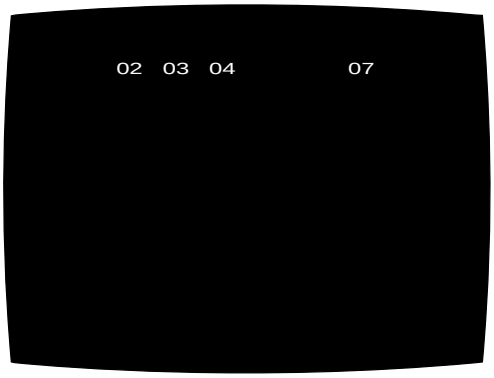


Fig. 6-3

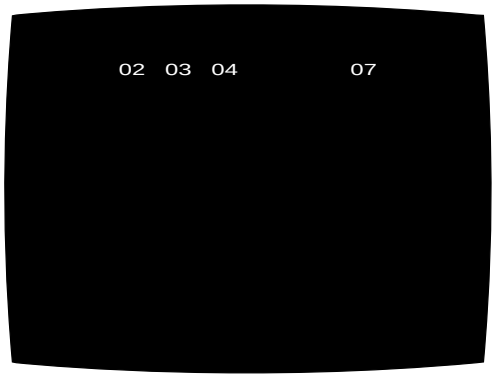


Fig. 6-4

<Table 6-1 NVRAM Option Table>

MODEL	OPTION NUMBERS
DVD-V90K/CHN	6, 7, 8, 9, 10, 12, 16, 20, 22, 25, 26, 28, 31, 36, 38, 39, 42, 44, 47, 57, 61, 63, 65, 70
SV-DVD20/XEV	6, 9, 10, 12, 16, 20, 33, 34, 35, 36, 37, 39, 40, 42, 44, 47, 49, 54, 57, 61, 63, 65, 68, 70
DVD-V90K/XSA	1, 6, 7, 9, 10, 12, 16, 20, 28, 33, 34, 39, 42, 45, 47, 53, 57, 61, 63, 65, 70
DVD-V90K/XSH	1, 6, 7, 8, 9, 10, 12, 16, 20, 22, 25, 28, 35, 36, 37, 38, 42, 45, 47, 57, 61, 63, 65, 70
DVD-V90K/XST	6, 7, 8, 9, 10, 12, 16, 20, 22, 34, 36, 37, 38, 42, 44, 47, 53, 57, 61, 63, 65, 70
DVD-V90K/XSS, SMR	6, 7, 8, 9, 10, 12, 16, 20, 22, 34, 36, 37, 38, 42, 44, 47, 53, 57, 61, 63, 65, 70
DVD-V90K/BPT, XSV	6, 7, 8, 9, 10, 12, 16, 20, 22, 34, 36, 37, 38, 42, 44, 47, 53, 57, 61, 63, 65, 70
DVD-V19000K	6, 7, 8, 9, 10, 12, 16, 20, 22, 34, 36, 38, 42, 44, 47, 50, 56, 57, 61, 63, 65, 66, 70
DVD-V17000K	6, 9, 10, 12, 16, 20, 22, 33, 34, 35, 36, 38, 40, 42, 44, 47, 49, 50, 56, 57, 61, 63, 65, 66, 68, 70
DVD-V90K/XSG, ELT	6, 7, 8, 9, 10, 12, 16, 20, 22, 34, 36, 38, 42, 44, 47, 55, 57, 61, 63, 65, 70
DVD-V90K/UMG, TAW	6, 7, 8, 9, 10, 12, 16, 20, 22, 34, 36, 38, 42, 44, 47, 55, 57, 61, 63, 65, 70
DVD-V65K/XSG, ELT	6, 9, 10, 12, 16, 20, 22, 33, 34, 35, 36, 38, 40, 42, 44, 47, 49, 55, 57, 61, 63, 65, 68, 70
DVD-V65K/UMG, TAW	6, 9, 10, 12, 16, 20, 22, 33, 34, 35, 36, 38, 40, 42, 44, 47, 49, 55, 57, 61, 63, 65, 68, 70
DVD-V62K/XSG, ELT	9, 10, 12, 16, 20, 22, 33, 34, 35, 36, 38, 40, 42, 44, 47, 49, 55, 57, 61, 63, 65, 68, 70
DVD-V62K/UMG, TAW	9, 10, 12, 16, 20, 22, 33, 34, 35, 36, 38, 40, 42, 44, 47, 49, 55, 57, 61, 63, 65, 68, 70
DVD-V90K/XTL	6, 7, 8, 9, 10, 12, 16, 20, 22, 34, 36, 37, 39, 42, 44, 47, 53, 57, 61, 63, 65, 70

6-2 DVD Adjustment

6-2-1 Location of Test Point

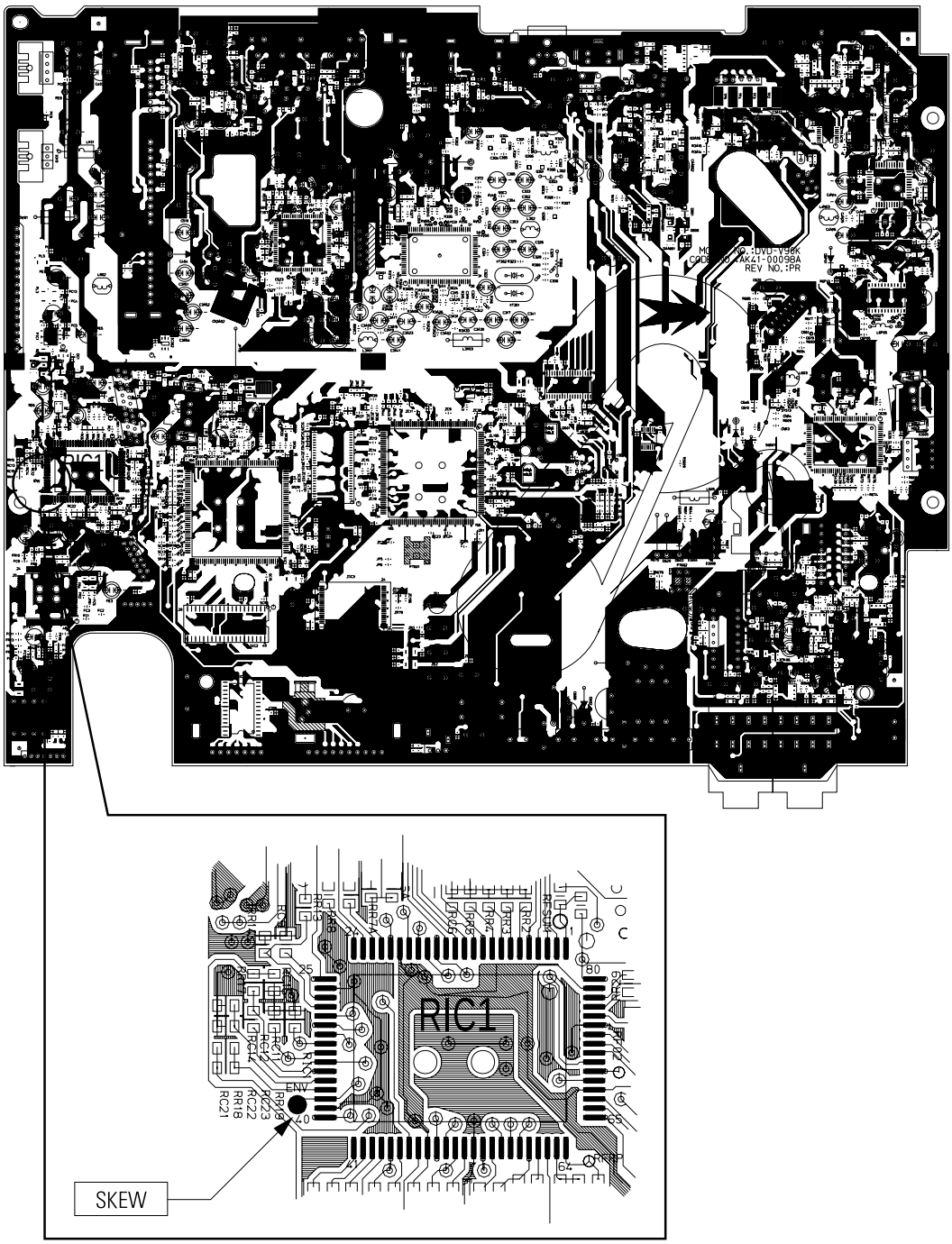


Fig. 6-5 Location of test Point (Main PCB - Top Side)

6-2-2 Skew Adjustment

6-2-2(a) Adjustment Spec. and Test Point

<Table 6-2>

◆ Test Disc ; Service not Available

Test Disc	Adjustment Spec.	Test Point	Adjustment Location
TDV-533 Chapter 14	Flat Waveform	" ENV" (DVD Main PCB - Top Side) (See Fig. 6-5)	Ass'y Deck - Top Side (See Fig. 6-6)

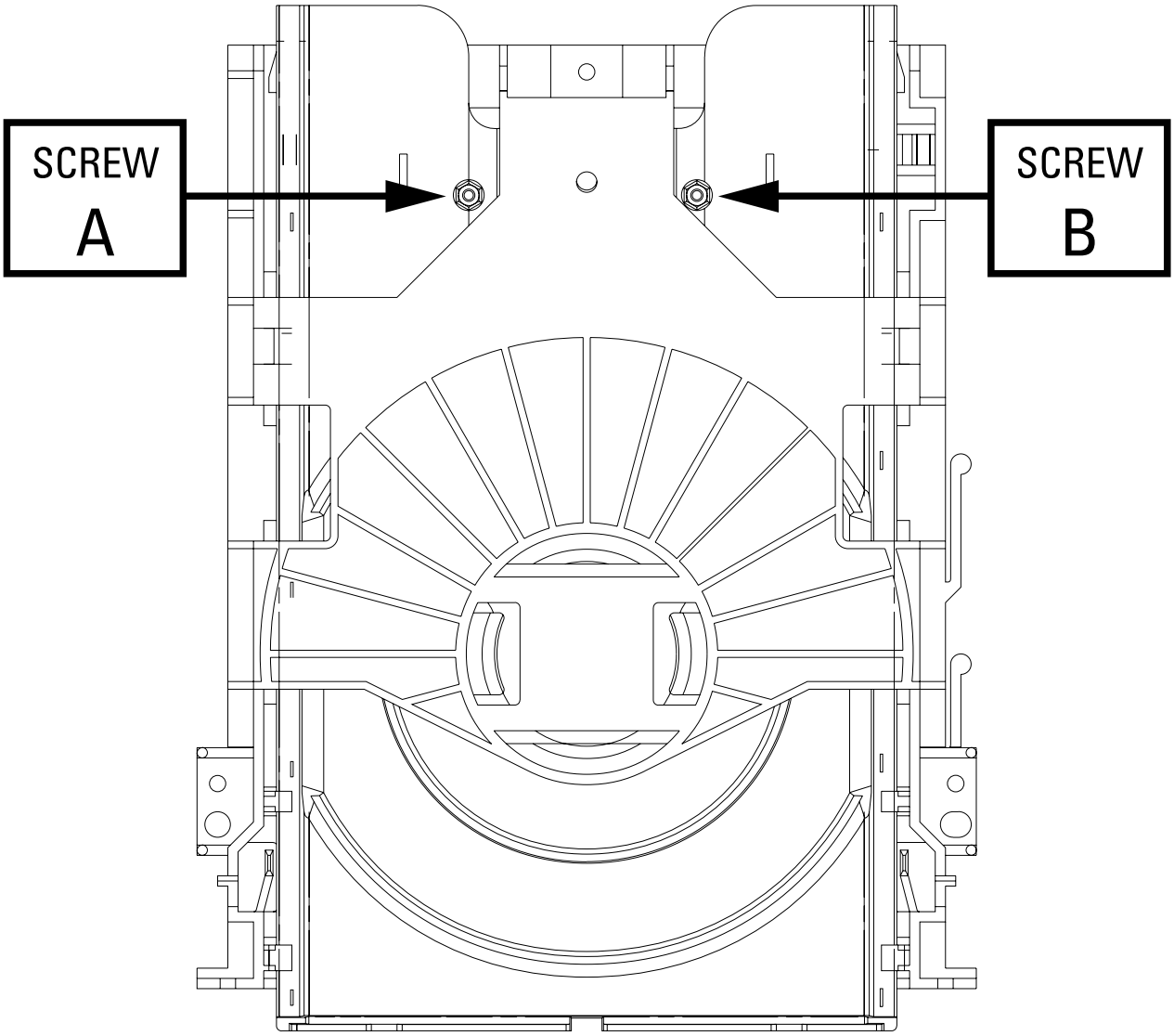


Fig. 6-6 Ass'y Deck (Top Side)

6-2-2(b) SKEW Adjustment Method

Needed to minimize the variations in Skew of the Pickup unit and to provide optimum match with the recorded signal on the Disc.

1) Connect an Oscilloscope to the “ENV” Test Point (See Fig. 6-5).
2) Connect Power, Open the Tray and Play the TDV-533 Disc, Chapter 14.
   ◆ Set the Oscilloscope Range as follows :
   (Voltage 50mV / Div., Frequency 10m Sec.)
3) Adjust the Screws “A” and “B” (See Fig. 6-6) using a Hex screwdriver until you obtain a Flat Waveform and the picture is stable.
   Then, go to Chapter 1 and make sure the Waveform is Flat here as well.
   If not, you have to go back to Chapter 14 and adjust again.
   If you cannot obtain a Flat waveform, then the unit is defective.

Note : The Deck must be in a horizontal position. Use both “A” and “B” screws to adjust.

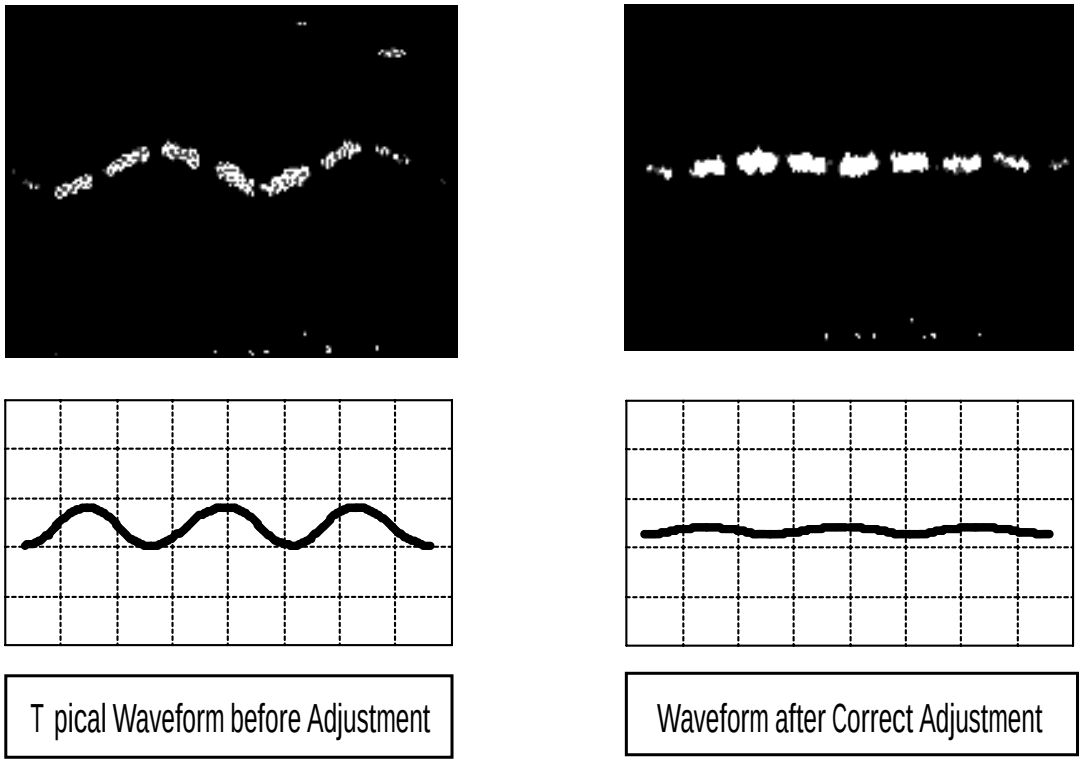


Fig. 6-7 Envelope Waveform

6-3 VCR Mechanical Adjustment

6-3-1 Tape Transport System and Adjustment Locations

The tape transport system has been adjusted precisely in the factory. Alignment is not necessary except for the following :
1) Noise observed on the screen.
2) Tape damage.
3) Parts replacement in the tape transport system.

Lower flange height of tape guide is used as the reference for the transport adjustment.
To maintain the height of the tape guide and prevent damage, do not apply excessive force onto the main base.

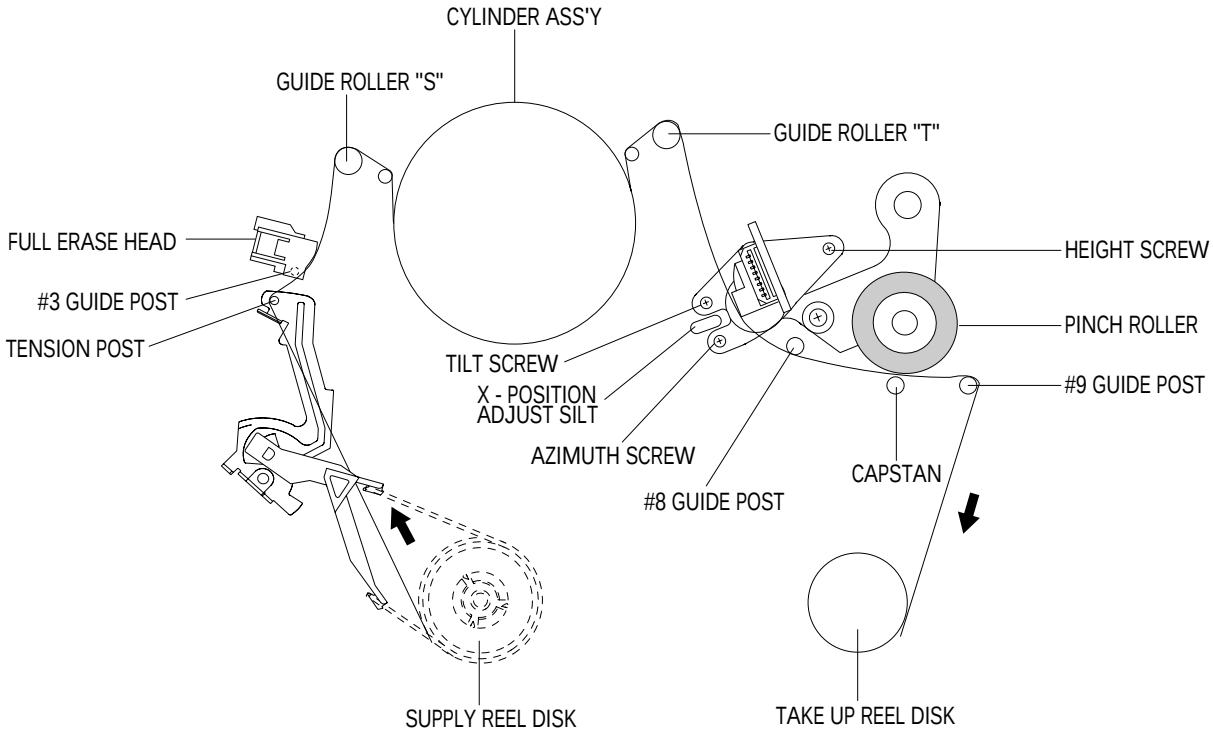


Fig. 6-8 Location of Tape Transport Adjustment

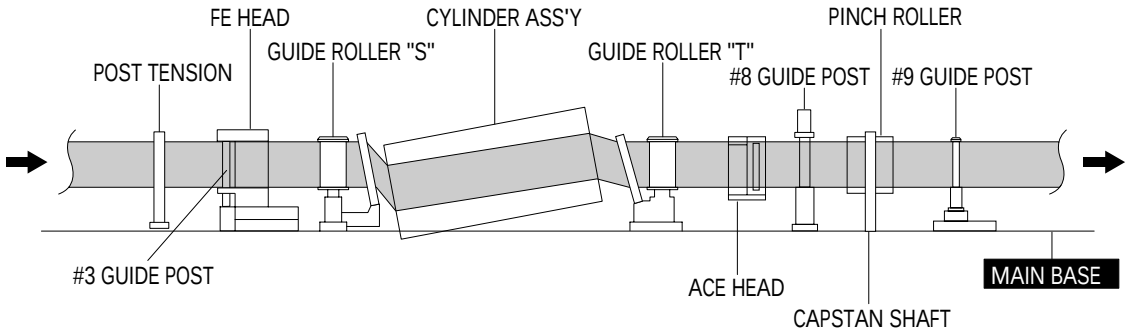


Fig. 6-9 Tape Travel Diagram

6-3-2 Tape Transport System Adjustment

When parts are replaced, perform the required adjustments by referring to procedures for the tape transport system. If there are any changes to the tape path, first run a T-120 tape and make sure excessive tape wrinkle does not occur at the tape guides.

◆ If tape wrinkle is observed at the guide roller S, T, turn the guide roller S, T until wrinkle disappears.
◆ If the tape wrinkle is still observed at the tape guide, perform the tilt adjustment of the ACE head.

(1) ACE Head Assembly Adjustment

a. ACE HEAD HEIGHT ADJUSTMENT

1) Run the alignment tape (Color bar) in the playback mode.
2) Observe surface of the audio head using a dental mirror.
3) Turn screw (C) clockwise or counterclockwise until the gap of lower tape edge and the lower edge of the control head is about 0.25mm. (Refer to Fig. 6-10 and 6-11)

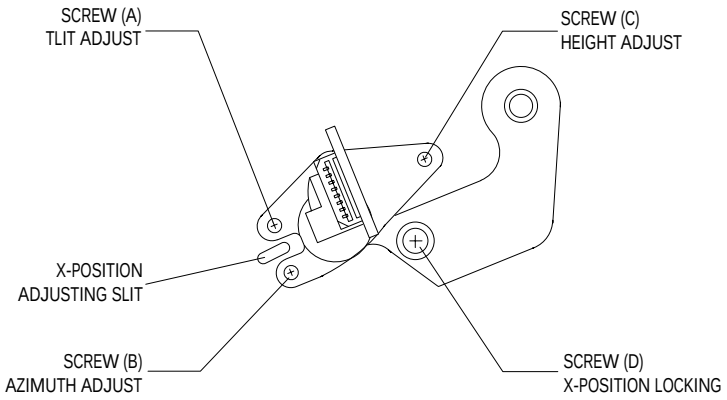


Fig. 6-10 Location of ACE Head Adjustment Screw

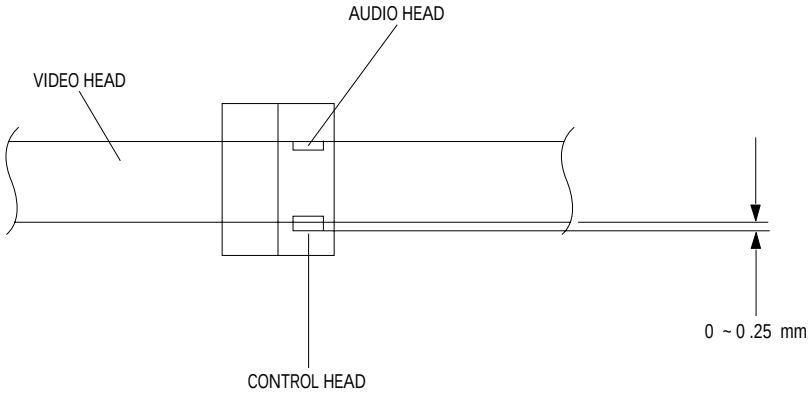


Fig. 6-11 ACE Head Height Adjustment

b. ACE HEAD TILT ADJUSTMENT

1) Playback a blank tape and observe the position of the tape at the lower flange of tape guide.
2) Confirm that there is no curl or wrinkle at the lower flange of tape guide as shown in Fig. 6-12 (B).
3) If a curl or wrinkle of the tape occurs, slightly turn the screw (A) tilt adjust on the ACE head ass'y.
4) Reconfirm the ACE head height.

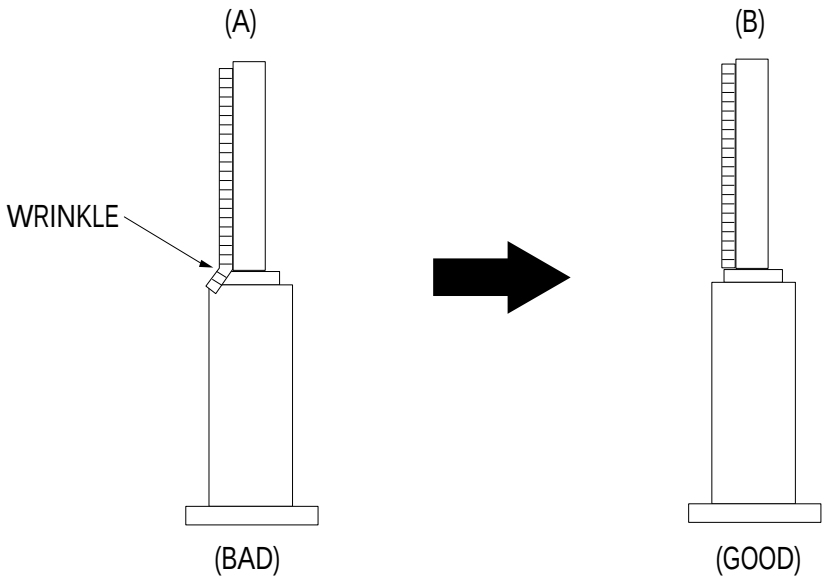


Fig. 6-12 Tape Guide Check

c. AUDIO AZIMUTH ADJUSTMENT

1) Load alignment tape (Mono scope) and playback the 6 Hz signal.
2) Connect channel-1 scope probe to audio output.
3) Adjust screw (B) to achieve maximum audio level. (See Fig. 6-10)

d. ACE HEAD POSITION (X-POINT) ADJUSTMENT

1) Playback the alignment tape (Color bar)
2) Intermittently short-circuit the two Test Points on Main PCB. (See Fig. 6-2)
3) Press the “0, 5” remote control buttons, then adjustment is operates automatically. (See Fig. 6-1)
4) Connect the CH-1 probe to “Envelope” the CH-2 probe to “H’D switching pulse” and then trigger to CH-1.
5) Insert the (-) driver into the -Point adjustment hole and adjust it so that envelope waveform is maximum.

Test point :	TP2 (Audio Output)
	TP3 (Envelope)
	TP4 (H’D S/W -Trigger)
	TP5 (Control Pulse)

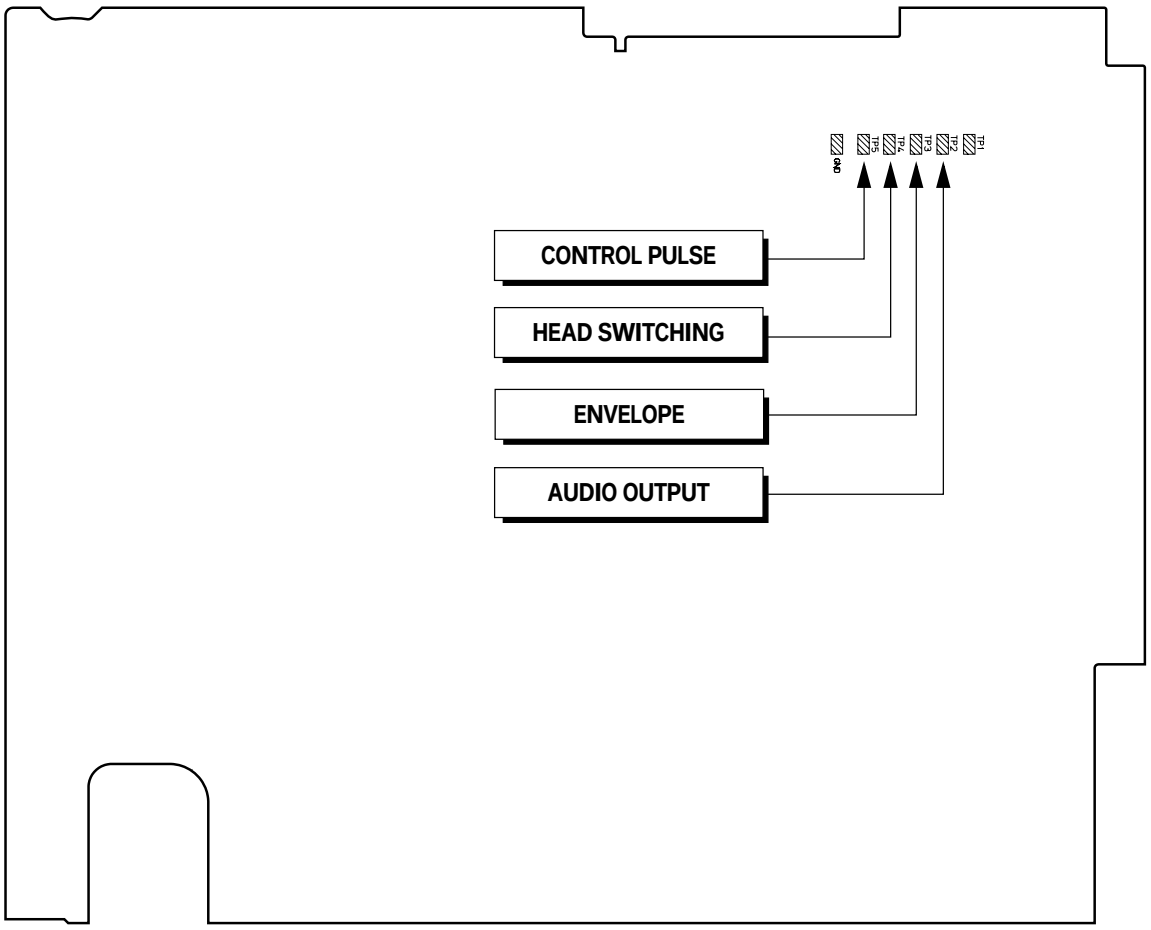


Fig. 6-13 Location of Test point (Main PCB-Top View)

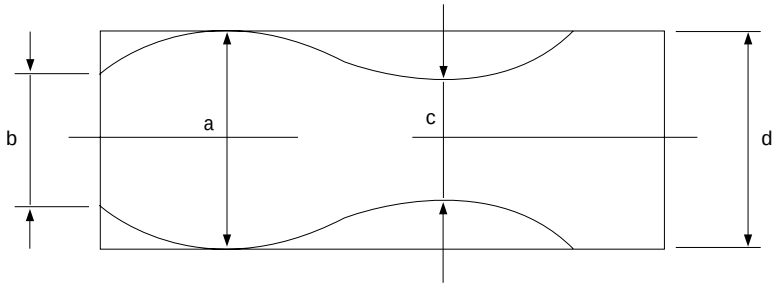
(2) Linearity adjustment (Guide roller S, T adjustment)

1) Playback the Mono Scope alignment tape (SP mode).
2) Observe the video envelope signal on an oscilloscope (triggered by the video switching pulse).
3) Make sure the video envelope waveform (at its minimum) meets the specification shown in Fig. 6-14.
   If it does not, adjust as follows :

Note :

Maximum output of the video RF envelope.
Minimum output of the video RF envelope at the entrance side.
Minimum output of the video RF envelope at the center point.
Maximum output of the video RF envelope at the exit side.

4) If the section A in Fig. 6-15 does not meet the specification, adjust the guide roller S up or down.
5) If the section B in Fig. 6-15 does not meet the specification, adjust the guide roller T up or down.



a b c d

c,b,d/a $\geqq$ 63%

Fig. 6-14 Envelope Waveform Adjustment

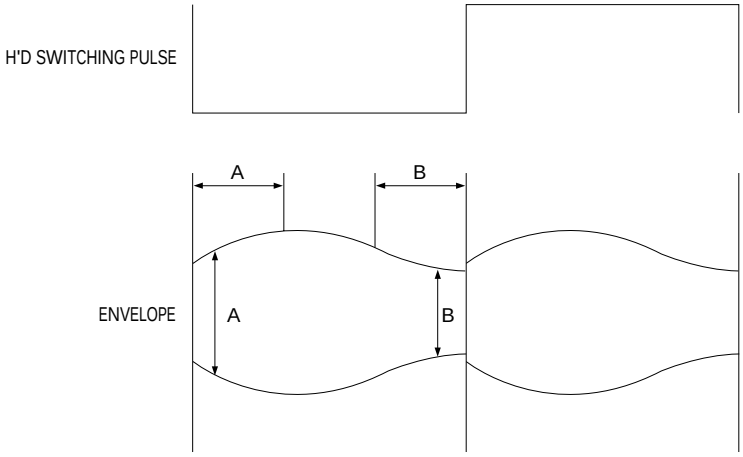


Fig. 6-15 Adjustment Points

6) Play back the Mono Scope alignment tape (SP mode).
7) Connect an oscilloscope CH-1 to the “Envelope” and CH-2 to the “H’D SW Pulse” for triggering.
8) Turn the guide roller heads with a flat head ( ) driver to obtain a flat video RF envelope as shown in Fig. 6-16.

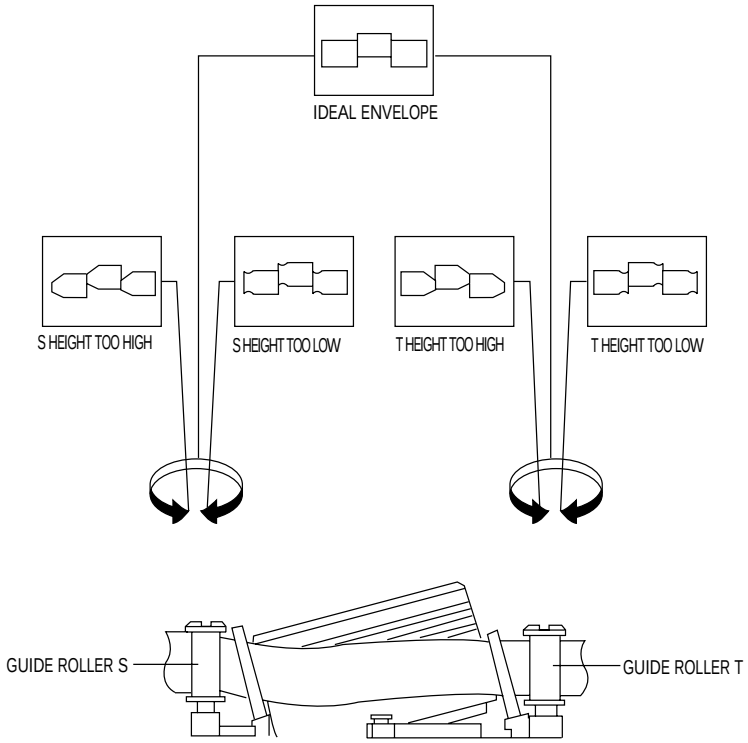


Fig. 6-16 Guide Roller S, T Height Adjustment

(3) Check Transitional Operation from RPS to Play

Check transition from RPS mode to play mode : Using a pre-recorded SP tape, make sure the entry side of envelope comes to an appropriate steady state within 3 seconds (as shown in Fig. 6-17).
If the envelope waveform does not reach specified peak-to peak amplitude within 3 seconds, adjust as follows :

1) Make sure there is no gap between the supply roller lower flange and the tape.
   If there is a gap, adjust the supply guide roller again.
2) Change operation mode from the RPS to the play mode (again) and make sure the entry side of envelope rises within 3 second.

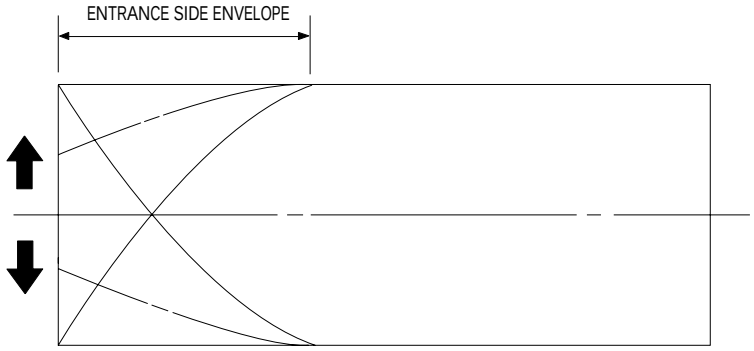


Fig. 6-17 Video Envelope Rising when Operation mode Changes from RPS to Play Mode

(4) Envelope Check

1) Make recordings on T-120 (E-120) and T-160 (E-180) tape.
   Make sure the playback output envelope meets the specification as shown in Fig. 6-18.
2) Play back a self recorded tape (recording made on the unit using with T-120 (E-120).
   The video envelope should meet the specification as shown in Fig. 6-18.
   In SP mode, (A) should equal (B).
   If the head gap is wide, upper cylinder should be checked.

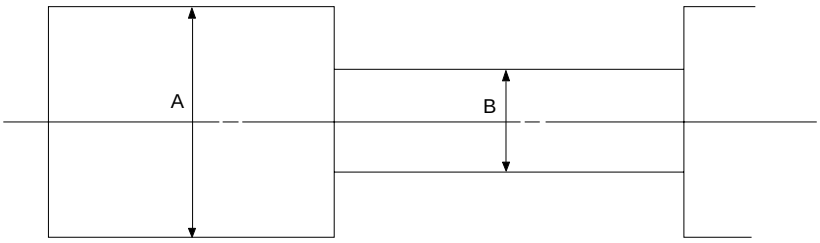


Fig. 6-18 Envelope Input and Output Level

(5) Tape Wrinkle Check

1) Run the T-160 (E-180) tape in the playback, FPS, RPS and Pause modes and observe tape wrinkle at each guide.
2) If excessive tape wrinkle is observed, perform the following adjustments in Playback mode :

- Tape wrinkle at the guide roller S, T section : Linearity adjustment.
- Tape wrinkle at tape guide flange : ACE head assembly coarse adjustment.

6-3-3 Reel Torque

1) The rotation of the capstan motor causes the holder clutch ass'y to rotate through the belt pulley.
2) The spring wrap PLAY / REV of holder clutch ass'y drives the disk reel S, T through gear idler by rotation of gear center ass'y.
3) Brake is operated by slider cam at FF / REW mode.
4) Transportation of accurate driving force is done by gears. (ear Center Ass'y)

Note : If the spec. does not meet the followings specifications, replace the holder clutch ass'y and then recheck.

<Table 6-3>

MODE	TORQUE g/cm	GAUGE
PB	42 11	Cassette Torquemeter
RPS	145 30	Cassette Torquemeter

O

7. Circuit Operating Descriptions

7-1 Power Supply (Free Voltage)

(1) Comparsion between Linear Power Supply and S.M.P.S.

(a) Linear

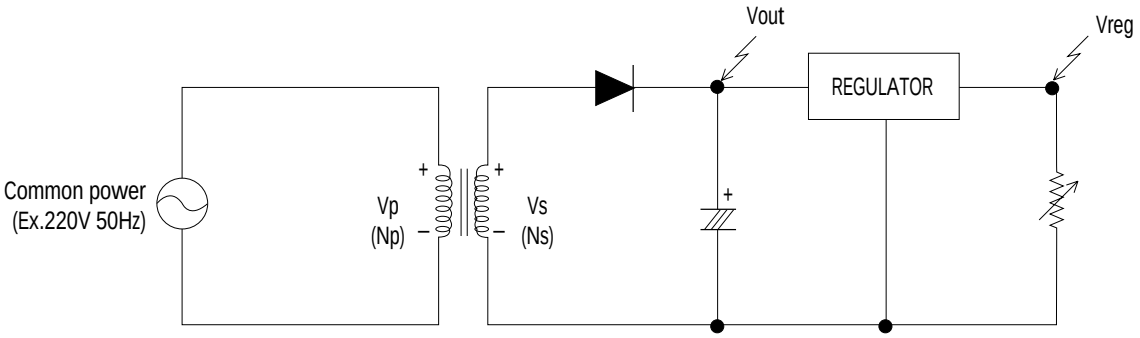


Fig. 7-1 Linear Power Supply

◆ Waveform/Description

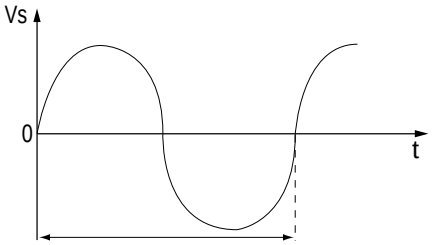


Fig. 7-2

Input : Common power to transformer (Vp).

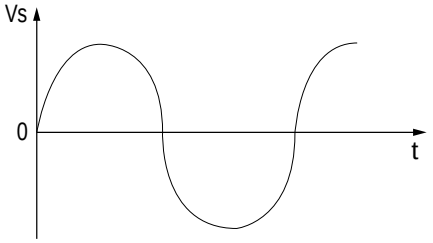


Fig. 7-3

The output Vs of transformer is determined by the ratio of 1st Np and 2nd Ns.
Vs = (Ns / Np) x Vp

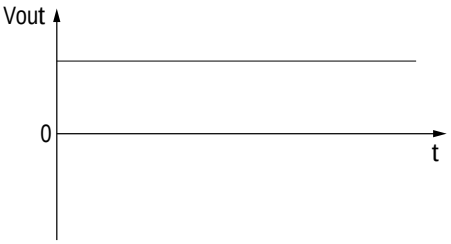


Fig. 7-4

Vout is output (DC) by diode and condensor.

◆ Advantages and disadvantages of linear power supply

1) Advantages : Little noise because the output waveform of transformer is sine wave.

2) Disadvantages :
- ❶ Additional margin is required because Vs is changed (depending on power source). (The regulator loss is caused by margin design).
- ❷ Greater core size and condensor capacity are needed, because the transformer works on a single power frequency.

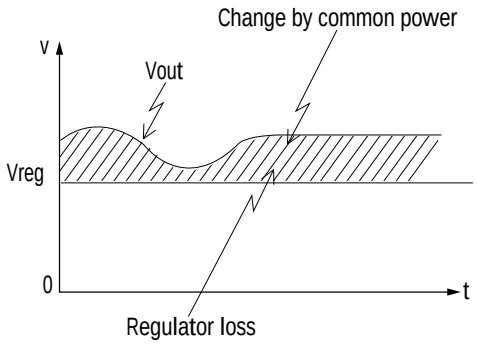


Fig. 7-5

(b) S.M.P.S. (Switch Mode Power Supply)

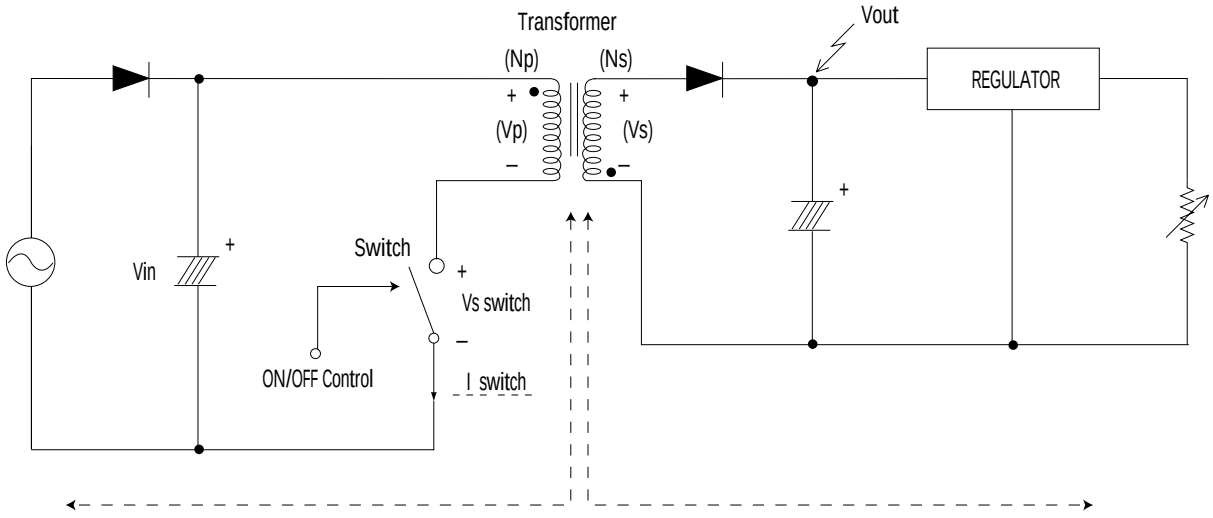


Fig. 7-6

◆ Terms

1) 1st : Common power input to 1st winding.
2) 2nd : Circuit followings output winding of transformer.
3) f (Frequency) : Switching frequency (T : Switching cycle)
4) Duty : (Ton / T) x 100

(2) Circuit description (FLY-Back PWM (Pulse Width Modulation control)

(a) AC Power Rectification/Smoothing Terminal

1) D1SS01, D1SS02, D1SS03, D1SS04 : Convert AC power to DC(Wave rectification).
2) C1SS10 : Smooth the voltage converted to DC.
3) L1SS01, L1SS02, C1SS01, C1SD02 : Noise removal at power input/output.
4) R1SS01 : Rush current limit resistance at the moment of power cord insertion.
   - Without R1SS01, the bridge diode might be damaged as the rush current increases.

(b) SNUBBER Circuit : R1SD11, R1SD13, C1SD12, C1SD16, D1SS11

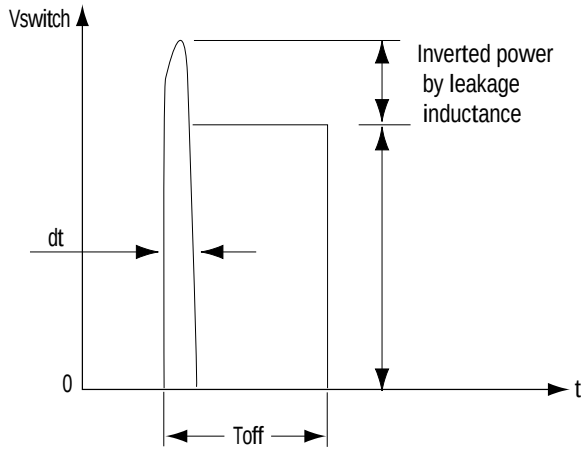


Fig. 7-7

1) Prevent residual high voltage at the terminals of switch during switch off/Suppress noise.
   High inverted power occurs at switch off, because of the 1st winding of transformer :
   (V= LI xdi/dt. LI : Leakage Induction)
   A very high residual voltage exists on both terminals of SCS11A because dt is a very short.

2) SNUBBER circuit protects SCS11A from damage through leakage voltage suppression by RC,
   (Charges the leakage voltage to D1SS11 and C1SD12 and discharges to R1SD11 and R1SD13).

3) C1SS16 : For noise removal

(c) IC1SS2 Vcc circuit

1) R1SR01, R1SR02, R1SR03 : IC1SS2 driving resistance
   (IC1SS2 works through driving resistance at power cord in)
2) IC1SS2 Vcc : R1SS08, D1SF02, C1SF02
   ❶ Use the output of transformer as Vcc, because the current starts to flow into transformer while IC1SS2 is active.
   ❷ Rectify to D1SF02 and smooth to C1SF02.
   ❸ Use the output of transformer as IC1SS2 Vcc : The loads are different before and after IC1SS2 driving.
   (Vcc of IC1SS2 decreases below OFF voltage, using only the resistrance due to load increase after IC1SS2 driving.)

(d) Feedback Control Circuit

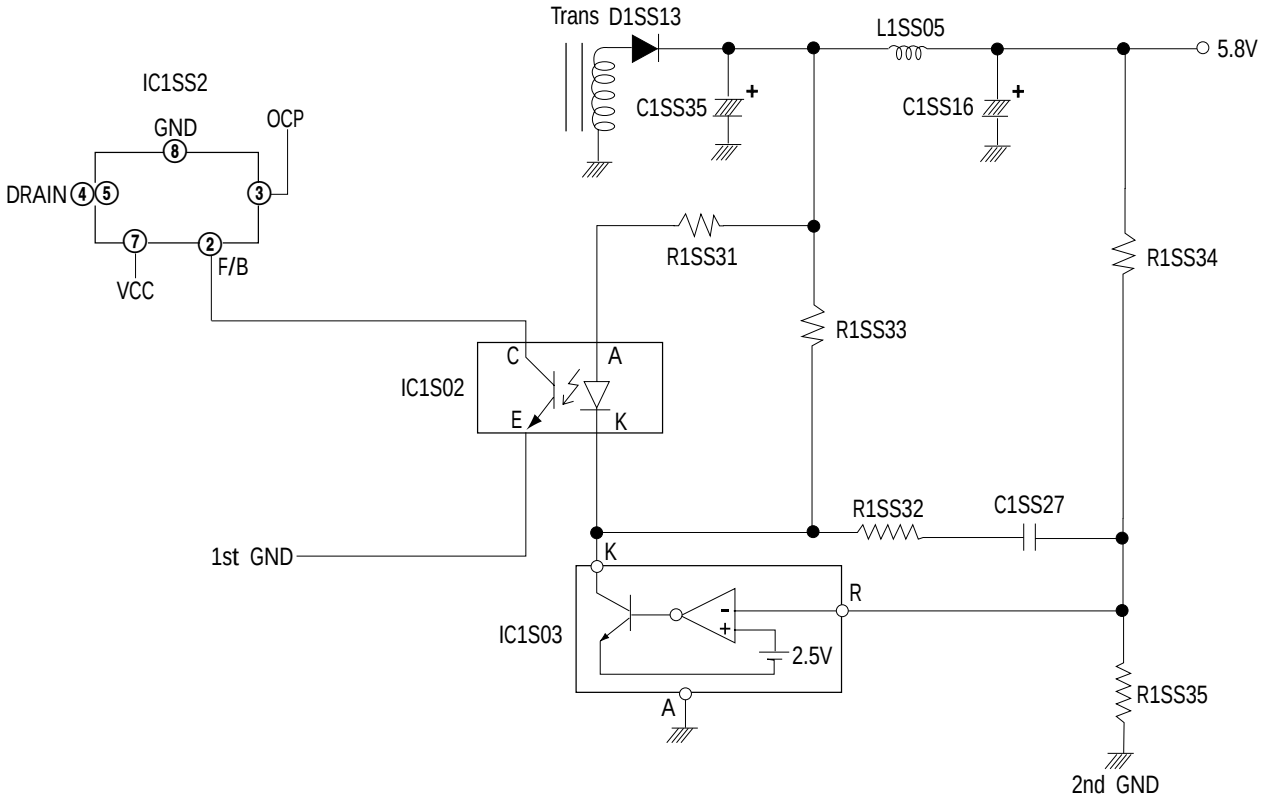


Fig. 7-8

1) F/B terminal of IC1SS2 determines output duty cycle.
2) C-E(Collector-Emitter) of IC1SF01 and F/B potential of IC1SS2S are same.

◆ Operation descriptions

1) Internal OP-Amp '+' base potential of IC1S03 is 2.5V and external "-" input potential is connected with R1SS35 and R1SS34 to maintain Vout of 5.8V. (Vout = (((R1SS34)xR1SS35) / R1SS35) x 2.5V)
2) If load of 5.8 V terminal increases(or AC input voltage decreases) and Vout decreases below 5.8V, then : IC1S03 "P" potential down below 2.5V --> IC1S03 A-K of base current down --> IC1S03 of A-K current down --> IC1S03 Diode current down --> IC1S03 C-E current down --> IC1S03 C-E voltage up --> IC1SS2 F/B voltage up --> Out Duty up --> Transformer 1st current up --> Transformer 1st power up --> Vout up --> Maintain Vout 5.8V
3) If load of 5.8 V terminal decreases(or AC input voltage rises) and Vout rises above 5.8V, then : Reverse sequence of the above description --> Duty down --> Vout down --> Maintain 5.8V (i.e., the feedback to maintains 5.8V).
   ❶ R1SS33, R1SS31 : Reduce 5.8V overshoot
   ❷ R1SS32, C1SS27 : Prevent IC1S03 oscillation(for phase correction)

(3) Internal Block Diagram

(a) Internal Block Diagram of S.M.P.S. Circuit

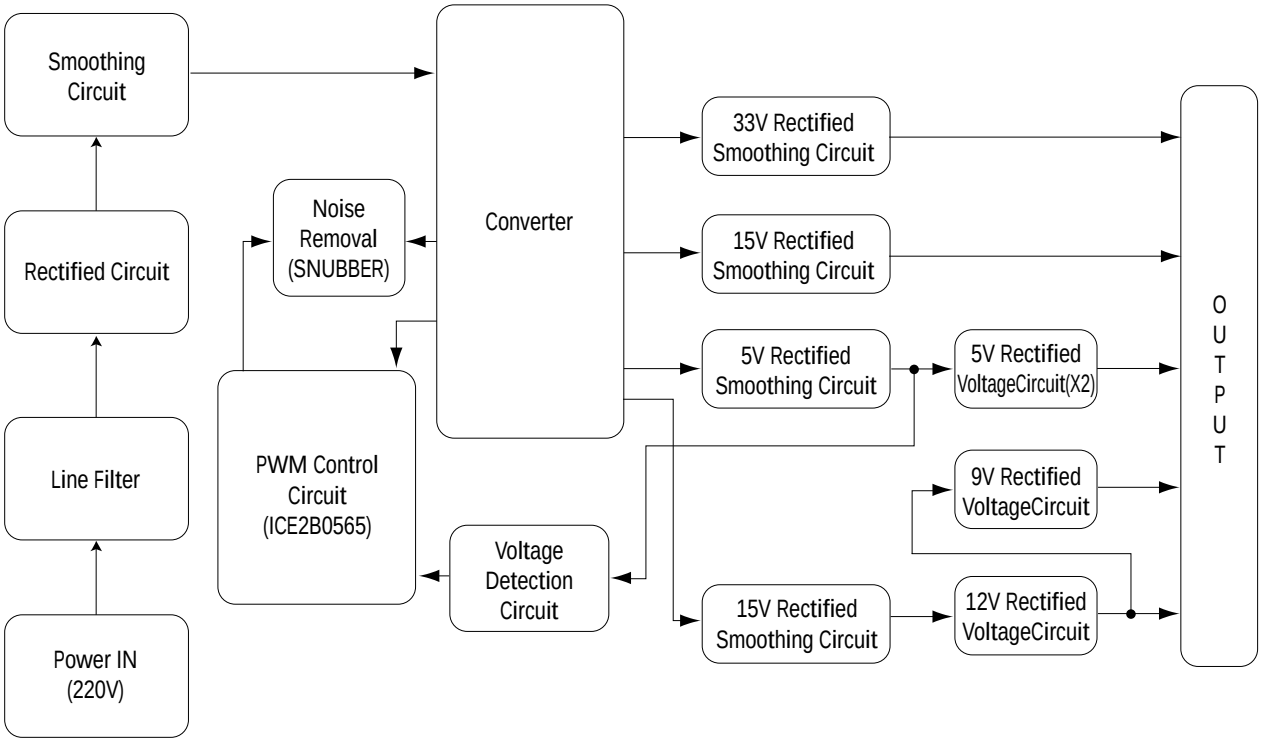


Fig. 7-9

(b) IC1SF01 (ICE2B0565) Internal Block Diagram

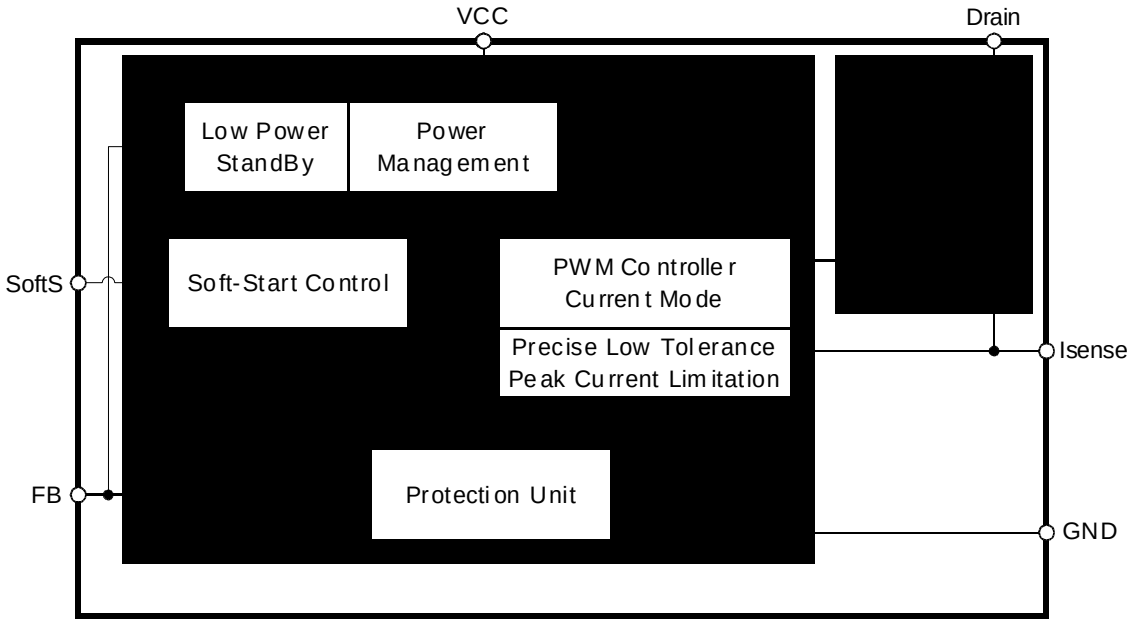


Fig. 7-10

7-2 System Control

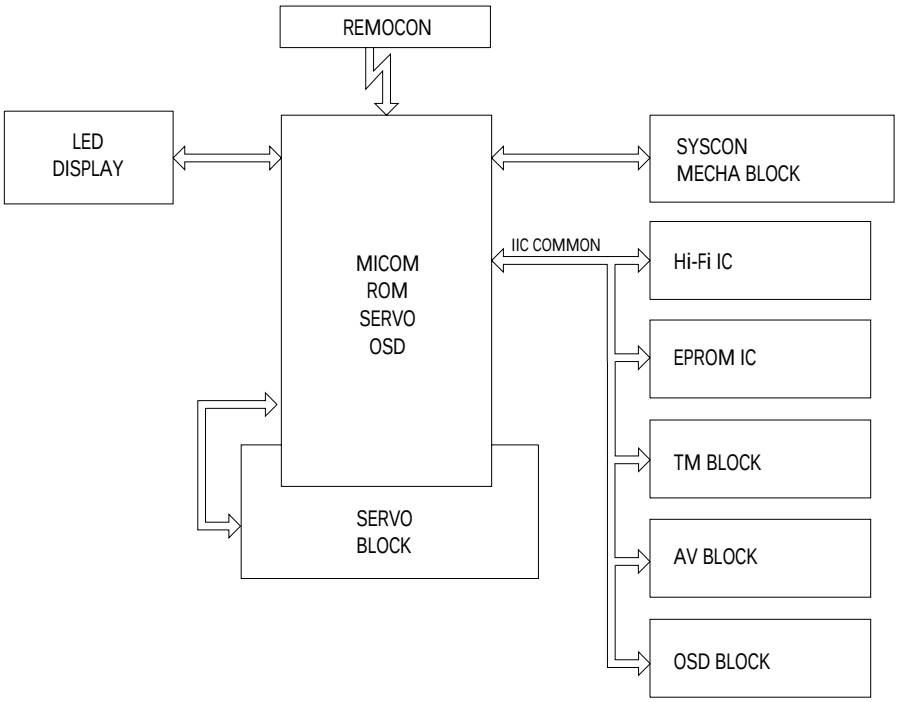


Fig. 7-11 Micom Block Diagram

(1) Outline

The system control circuit inputs the commands given by the operator to set the mechanism and circuit to the commanded mode. The circuit also inputs the detected output from the tape and mechanism protection sensor and protects the VCR and tape against abnormal operation.
Fig. 7-11 is a simplified system control block diagram.
The system control is performed by 4 control sections. (System and timer control, Servo control, F/S Tuner, On Screen Display).

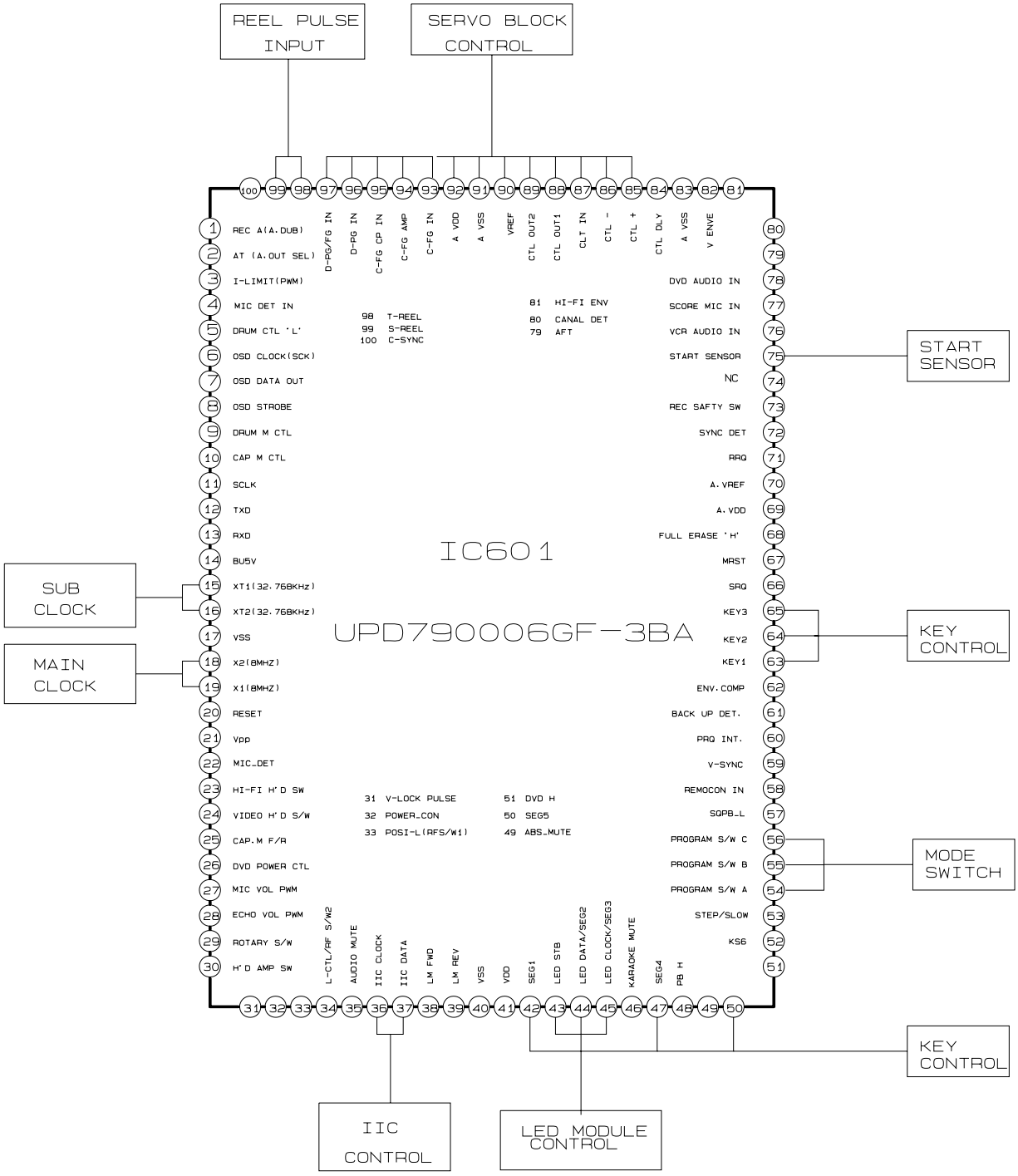


Fig. 7-12 Block Diagram

(2) Mechanism/Circuit Control

When the u-COM inputs operator's commands via the key input or remote input, the mechanism and circuits are set to the command mode. This function controls mechanism / servo section and audio / video processing section.

1) Cassette Loading Control

Controls loading and ejection of a cassette and determines the mechanism operation mode tape loading / unloading, action / release of various breaks, tension, take up mechanism etc.

T e ote t o e o o to

Detects abnormal operation in tape using the supply and take up end sensor, reel sensor and SW 25Hz pulse for drum rotation.

C t oto Co t o

Determines the tape speed and direction, fast forwards and rewinds the tape etc.

T e Co te Co t o

Counts the control pulses on the control track, picked up by the control head and shows it on the digital multidisplay.

e o Co t o

Determines the operation mode of the servo circuit. Control the speed of drum and capstan motor, and then Control the phase of drum and capstan motor.

e o et T ete t o

Detects the safety tab on the rear of a cassette to prevent a prerecorded program from being erased.

o U o o t o

Controls a series of loading / unloading operation after the u-COM judges the operation mode and sets the mechanism to suitable mode. Fig. 7-13 show correlation between u-COM and peripheral components during the loading / unloading operation.

The mechanism state switch (PRO . SW) detects the mechanism position. When the driving gear is turned by the loading motor, the switch driving slider traces the groove, and this switch stops at the correct position corresponding to each mode. In other words, the u-COM judges the present mechanism state from the PRO SW after receiving the mode data, then it outputs the loading motor and capstan motor control signals. This continues until the PRO SW reaches the correct state by the u-COM.

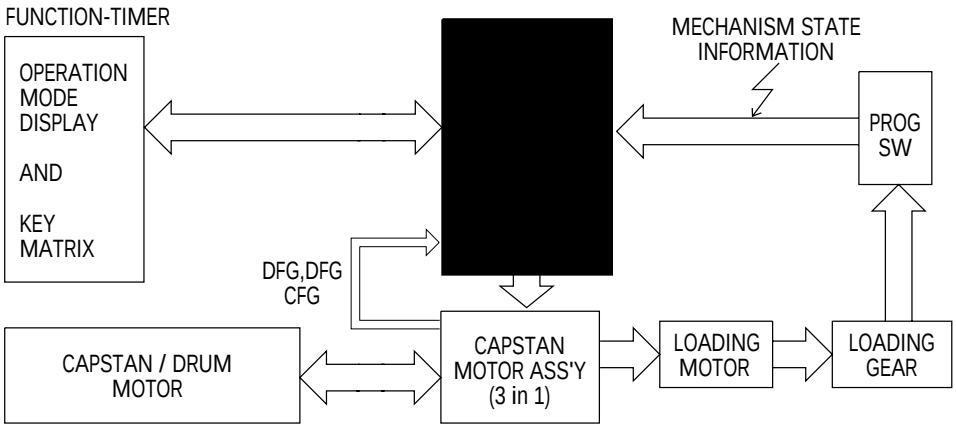


Fig. 7-13 The Relationship Between u-COM, Capstan, Cylinder and Loading Motor

(3) Program SW Input

The mechanism state for each mode is shown in table 7-1 below. The mechanism state is classified into position, and correlation between the switch position and mechanism state is shown in table 7-1, also.

Table 7-1 : Prog. SW State in Each Mode

POSION	CAM S/W			START SEN	ACTION MODE
	A	B	C		
STANBY	0	0	0	0	Eject
POWER OFF	0	0	0	1	Unload POWER OFF
LOADING START	0	0	0	1	(Tape loading start point)
LOADING END	1	0 1	1	1	(Tape loading end point)
REV	1	1	0	X	Reverse picture search, reverse SLOW
PLAY	0	1	0	X	Play, Rec, F-PS, Still, SLOW, F-ADV
STOP 1	0	0	1	1	Stop (Play position 5 Min. over)
STOP 2	0	0	1	X	(MAIN Break ON MODE)
FF/REW 1	1	0	0	X	High speed Rew, Low speed FF
FF/REW 2	0	1	1	X	High speed FF, Low speed Rew

(4) Motor Control

In case of Scorpio-2 Deck, Loading Motor Drive IC lies in Capstan Motor, not like Scorpio-1 Deck.
In detail, Capstan Motor Drive IC is designed to drive Loading Motor + Capstan Motor + Cylinder Motor in one IC.

Table 7-2 : Motor Control Logic

CN604-PIN10	MOTOR
0 ~ 1V	Reverse
2 ~ 3V	Stop
4 ~ 5V	Forward

(5) Stop Mode

The VCR enters the stop mode when the stop button is pressed during playback, record, rewind and fast forward mode. When trouble is detected, the VCR enters the stop mode to protect the tape and mechanism or when the tape reaches the end, etc.

State Input
Power switch on position.
Stop button operation in all mode, except for timer recording and PR.

(6) Loading/Unloading Operation

mechanism operation in loading / unloading is as described previously.

Signal Processing
Audio, video record / play
Micom controls the AV1 chip by IIC line.

(7) Play Mode

State input Play button operated in stop, fast forward, rewind, forward search, reverse search, still mode, etc.,
Indication output
"PLAY" lights in LED display.
Output at
IC601 Pin 25 (CAP F/R) : Hi

(8) Trick Play Mode

Trick play modes are classified into forward search, reverse search, still, slow and frame advance.
Audio signal is muted. V-lock is controlled by pin 31 of IC601.

(9) Forward Search Mode

5 Times play speed search in SP.

State input Press the fast forward button on the VCR front panel or the remote control in play or still mode.
Indication output First digit rotates in LED display.
Output at
IC601 Pin 25 (CAP F/R) : Hi

(10) Reverse Search Mode

5 times play speed reverse search in SP.

State input Press the rewind button on the VCR front panel or on the remote control in play or still mode.
Indication output First digit rotates in LED display.
Output
IC601 Pin 25 (CAP F/R) : Low

(11) Slow Mode

State input Press the still button and next press the FF button on the remote control.
Indication output First digit rotates in LED display.
Output at
IC601 Pin 25 (CAP F/R) : Hi

(12) Frame Advance Mode

Views one stop-action "frame" after another.
State input Press the F.ADV/STEP button on the remote control in still mode.
Indication output Counter blinks in LED display.
Output at
IC601 Pin 25 (CAP F/R) : Hi

(13) Play/Still Mode

The same track is traced by the video heads.
State input Press the ⏯ button in play and search modes.
Indication output Counter blinks in LED display.
Output at
IC601 Pin 25 (CAP F/R) : Hi

(14) Record Mode

Must use a cassette with the safety tab.
Index signal is recorded on the control track of the tape at the start of recording.
State input
Press the record button during stop mode and record pause mode or at the preset time reached in the timer record mode. Press the REC button in stop mode.
Indication output "R" lights in LED display in normal record mode.
Output at
IC601 Pin 25 (CAP F/R) : Hi

(15) Record Pause Mode

The pinch roller is released from the capstan shaft in a moment. The brake is applied to the take up reel to prevent tape slack during the record pause mode.
State input Press the pause button in the record mode.

Note : Inoperative during recording and PR mode.

Indication output "R" blinks in LED display.

(16) Fast Forward Mode

Tape fast forward operation using capstan motor.
State input Press the rewind button in the stop or fast forward modes.
Indication output First digit rotates in LED display.
Output at
IC601 Pin 25 (CAP F/R) : Hi

(17) Rewind Mode

Tape rewind operation using the capstan motor.
State input Press the rewind button in the stop or fast forward modes.
Indication output First digit rotates in LED display.
Output at
IC601 Pin 25 (CAP F/R) : Low

(18) Rewind Shut-Off Mode

Tape rewind operation then power off mode.
State input Press the power button in the rewind mode.

(19) VISS (VHS Index Search System)

Index search
Find a certain point of the tape using high speed REW/FF and start playback. (Fig. 7-14). The detection is obtained by adjusting the width of the control pulse. (duty cycle) When recording starts, the duty cycle of control pulse will change and then record on the control track of the tape for 2 seconds.

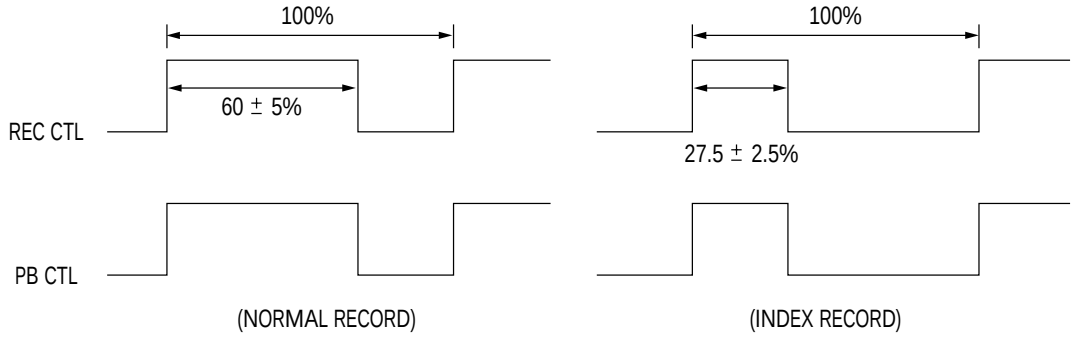


Fig. 7-14 Index Recording

Index Detection Process
The detector block in IC601 detects the duty cycle of the control pulse input at Pin 85, 86.
When detecting the index mark, the Micom controls the next operation such as scan play.

Intro Scan
Continues FF or REW then playback at the index mark point for about 5 seconds and repeats the operation the end of the tape or the start sensor is detected during intro forward scan or intro reverse scan.

(20) Trouble Detection

The trouble detection circuits are provided to protect the from damage (Fig. 7-15). The reel lock sensor detects incorrect rotation of supply and take up reel. The reel lock sensor consists of the disk and photo sensor installed at the bottom of the reel disk. the disk has 6 or 8 shielder parts and the photo sensor consists of the LED and photo transistor assembly. When the light is shielded by the the shielder or enters the photo transistor, the output is obtained from the photo sensor. IC601 measures the period of the pulse. When it is 4 seconds or more during record / play, the VCR enters the reel emergency mode.
The VCR maintains the unload-power-on state in the reel emergency.

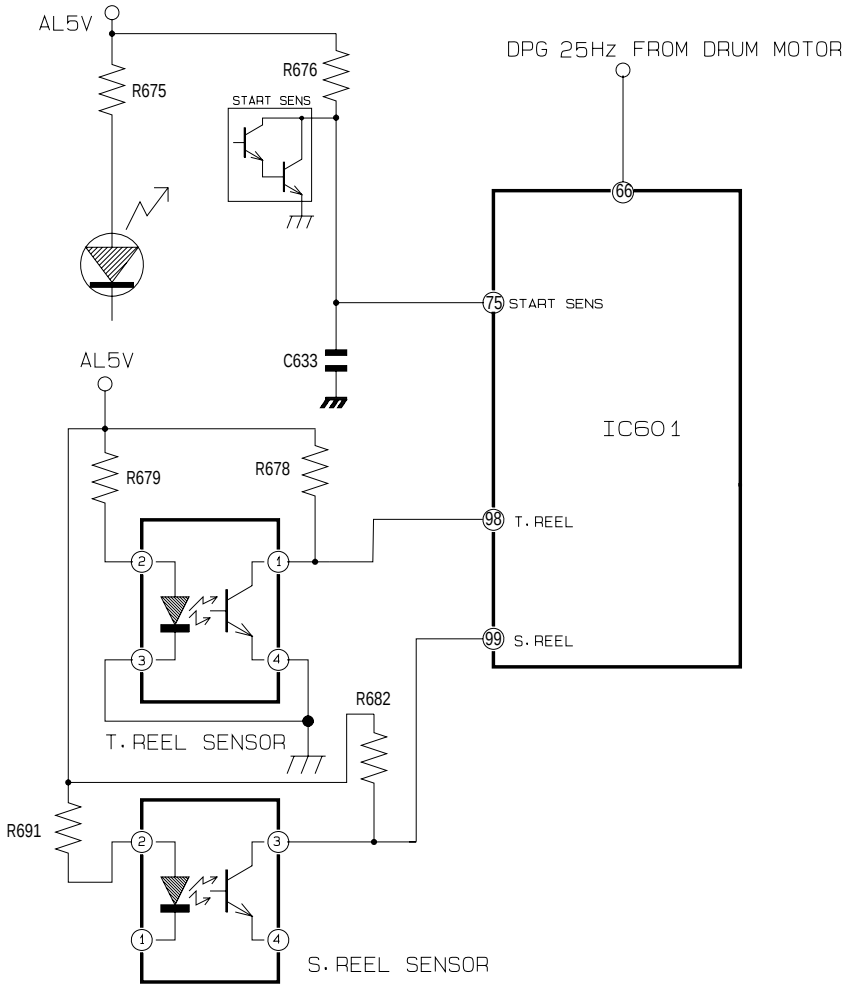


Fig. 7-15 Reel and Cylinder Lock T.END/S.END Sensor

(21) Cylinder Lock Sensor

Cylinder lock sensor detects abnormal rotation of the cylinder motor. Cylinder F pulse is supplied to pin 7 of IC601. MICOM measures the period of the pulse in the play / record, search and trick play models. When H'd S / W frequency is less than 10Hz for 5 seconds, the VCR enters the stop mode.

(22) Tape Counter Control

Fig. 7-16 is a simplified diagram of the tape counter control circuit. The tape counter in the u-COM counts the control pulses derived from control head. The control signal on the control track of the tape is picked up by the control head and supplied to pins 85, 86 of IC601. The control pulse is amplified by the u-COM IC. The u-COM determines the tape direction so the counter counts up when the "CAP F/R"signal is Hi and the counter counts down when the "CAP F/R" signal is Low. By counting the control pulse, the counter data is supplied to the VF display. Counter displays the time and it is increased or decreased by one minute after counting 1500 control pulses. Counter mode is switched to clock mode when the display button is pushed or when the VCR goes to power off mode. When the reset button is pressed, the counter is reset to "00 : 00".
The tape counter has a memory stop function.

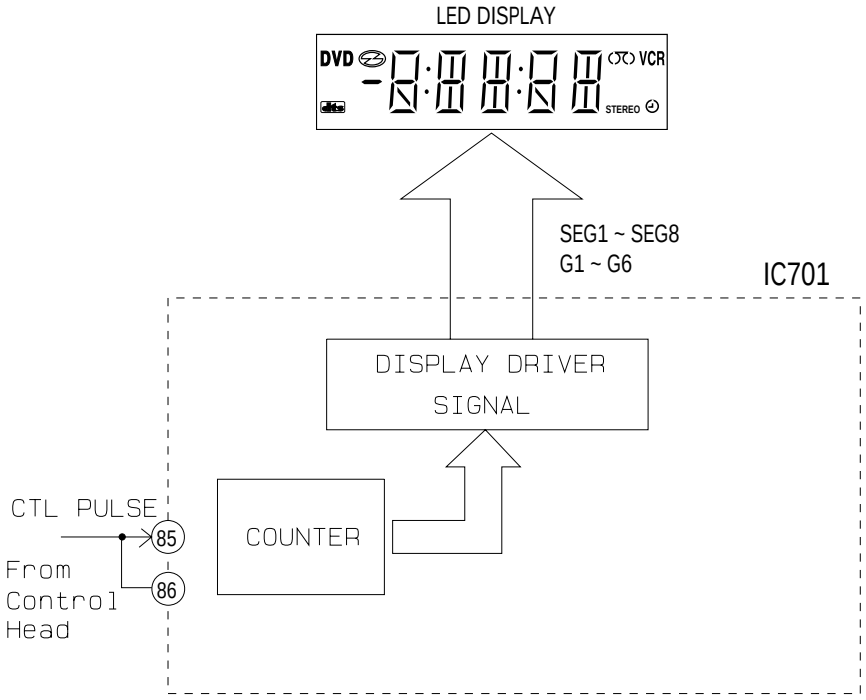


Fig. 7-16 Counter Display

(23) Timer/OTR Control

The timer can preset 6 programs in one year including daily and weekly programs.
Express recording lets the operator record up to hours without programming the timer.

(24) Clock Display

The clock generator inside of the u-COM counts the oscillation signal of T601 for the timer clock data.

(25) Power Failure Detection

u-COM goes to the power failure mode when the 61 port is lower than 4/5 of AD Vcc level.

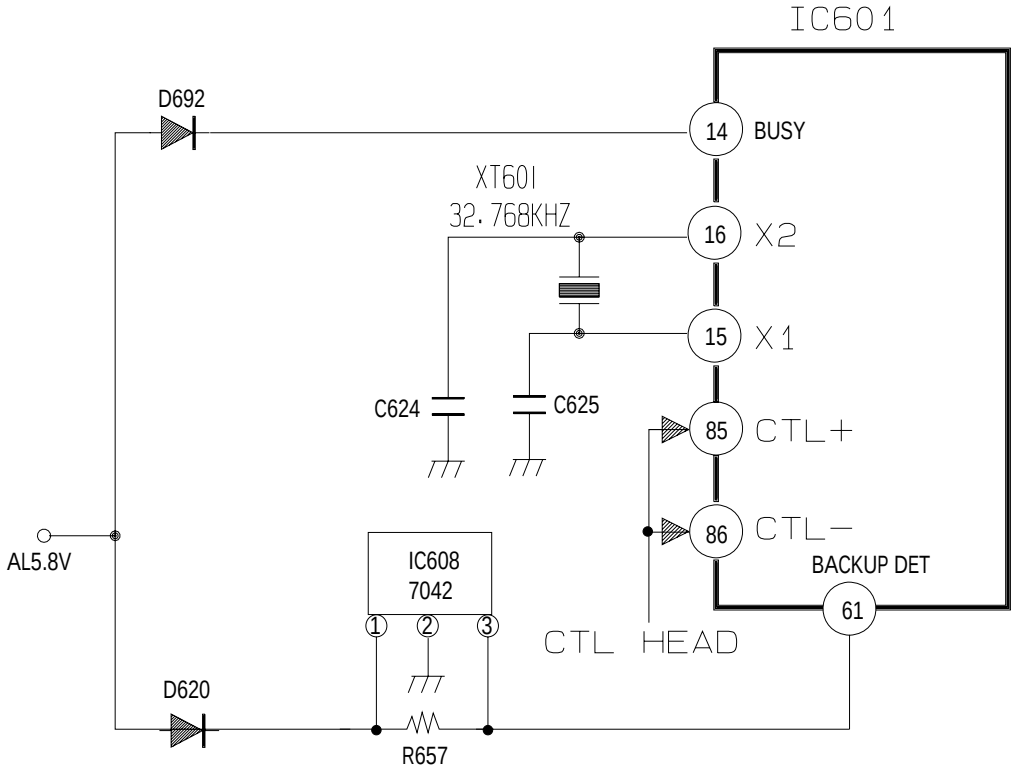


Fig. 7-17 Clock Control and Power Failure Detection

(26) 4H D Control

During trick play (Still, Slow, F-Advance), it is necessary to control pre-amp, Video circuit.
The Micom control pin 2 (C-ROTARY), pin 30 (HD-AMP) of the IC601 during PB period in Slow mode.
These port is applied to Video IC to operate the trick play.

7-3 Servo

(1) Outline

The servo system is divided into three loops. The cylinder servo controls the rotation of video heads, the capstan servo controls the tape speed, and the tension. In addition it's necessary to control cylinder motor, especially during trick play in 4H'D models. The tension servo maintains the tape tension constant: it keeps the compression strength of tape against the video heads at the optimum level so that a stable RF signal is produced during recording and playback. The tension servo operation is entirely mechanical. The cylinder servo loop controls the phase and speed of the cylinder motor. The speed is kept at a constant 1500 RPM and the phase determines the mechanical position relative to the vertical Sync signal. The capstan servo loop controls the phase and speed of the capstan motor so that the video head can trace the video track correctly.
It keeps tape speed constant according to the mode (SP, LP)during playback and recording.

Table 7-3 : Servo System Signal

MOTOR	SYSTEM	MODE	REFERENCE SIGNAL	COMPARISON SIGNAL
CYLINDER (VIDEO HEAD) (4H' D)	PHASE	REC	V-SYNC	SW 25Hz
		PB	REF25Hz	
	SPEED	COMMON	8MHz	CYLINDER FG(500Hz)
	SPEED& PHASE	TRICK PLAY (STILL. SLOW)	MICOM CONTROL CYLINDER SPEED TO MATCH H-SYNC SPEED	
CAPSTAN (4H' D)	PHASE	REC	DIVIDED CFG PULSE	REF 25Hz
		PB	CTL 25Hz	
	SPEED	COMMON	8MHz	CAPSTAN FG
	SPEED& PHASE	TRICK PLAY (STILL. SLOW)	MICOM CONTROL CAPSTAN DRIVE SIGNAL WITH STEP SLOW AND CAP C.L	

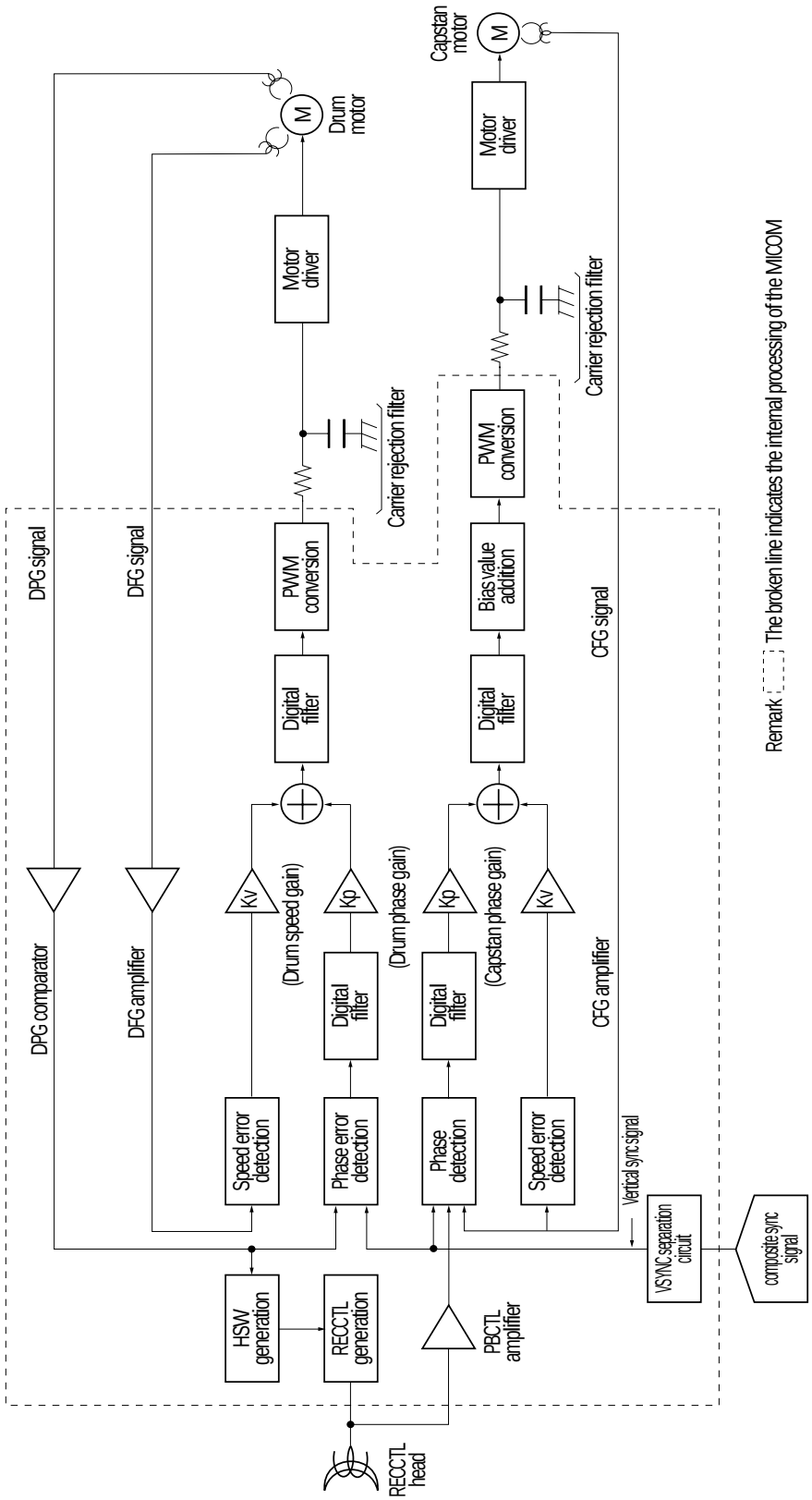


Fig. 7-18 Block Diagram

(2) Capstan Speed Error Detector

The capstan speed control operates so as to hold the capstan at a constant rotational speed, by measuring the period of the CF signal. A digital counter detects the speed deviation from a preset value. The speed error data is added to phase error data in a digital filter. this filter controls a pulse-width modulate (PWM) output, which controls the rotational speed and phase the captain.
When the error is zero, the PWM circuit outputs a waveform with a 50 duty cycle.

The CF input signal from the capstan motor is a square wave the CF input signal is compared by a comparator and than sent to speed error detector as the CF signal.
The speed error detector uses the system clock to measure the period of the CF signal, and detects the deviation from a preset data value. The preset data is the value that would result from measuring the CF signal period with the clock signal if the capstan motor were running at the correct speed.

The error detector operates by latching a counter value when it detects an edge of the CF signal.
the latched counter provides 16 bits of speed error data for the digital filter to operate on.
The digital filter adds the speed error data to phase error data from the capstan phase control system,then sends the result to the pulse-width modulator as capstan error data.

(3) Capstan Phase Error Detector

The capstan phase error detector consists of a 16-bit counter, a capstan phase preset data register pair, a latch signal circuit driven by a feedback signal, and a captan phase error data register pair.

The capstan phase control in rec mode is executed by comparing HD S/W, which is synchronized with V-sync, with divided CF signal. And than it does in playback mode by comparing HD S/W, which is synchronized with DF and DP , with PB CTL signal.

The latch signal for the phase error data in record mode is the divided CF signal, which is divided from the CF signal in the CF frequency divider to a frequency of 25Hz.
In playback, the latch signal is the divided CF signal obtained by frequency division from the rising edge of PB-CTL signal (playback control pulse signal).

The error data is a signed binary value centered on a phase error of zero (corresponding to the correct rotational phase). If the phase legs the correct phase ,the error is positive (+).
If the phase leads the correct phase, the error is negative (-).

(4) Drum Speed Error Detector

Drum speed control operates so as to hold the drum at a constant rotational speed , by measuring the period of the DF signal . A digital counter detects the speed deviation from a preset value. The speed error data is added to phase error data in a digital filter. The filter controls a pulsewidth modulated (PWM) output,which controls the rotational speed and phase of the drum.

The DF input signal from the drum motor is a square wave. The DF input signal is compared by a comparator and than sent to the speed error detector as the DF signal.

The speed error detector uses the system clock to measure the period of the DF signal, and detects the deviation from a preset data value. The preset data is the value that would result from measuring the DF signal period with the clock signal if the drum motor were running at the correct speed.

The error detector operates by latching a counter value when it detects an edge of the DF signal. The latched count provides 16 bits of speed error data for the digital to operate on.
The digital filter adds the speed error data to phase error data from the drum phase control system, then sends the result to the pulse-width modulator as drum error data.

(5) Drum Phase Error Detector

Drum phase control must start operating after the drum motor is brought to the correct rotational speed by the speed control system . Drum speed control works as follows in record and playback.

- ◆ Record : Phase is controlled so that the vertical blanking intervals of the recorded video signal will line up along the edge of the tape.
- ◆ Playback : Phase is controlled so as to trace the recorded tracks accurately.

A digital counter detects the phase deviation from a preset value. The phase error data is added to speed error data in a digital filter. this filter controls a pulse-width modulated (PWM) output, which controls the rotation phase and speed of the drum.When the error is zero, the PWM circuit outputs a waveform with a 50 duty cycle.

The phase counter error detector compares the phase of the DP pulse (tach pulse),which contains video head phase information, with a reference signal. In the actual circuit , the comparison is carried out by comparing the head-switching (HSW) signal,which is delayed by a counter that is reseted by DP , with a reference signal. The reference signal is the REF 25Hz signal,which differs between record and playback as follows.

- ◆ Record : V sync signal extracted from the video signal to be recorded (frame rate signal, actually 1/2 V sync).
- ◆ Playback : 25Hz signal divided from the system clock.

(6) SW 25H Pulse Generation

The SW25Hz pulse is generated from IC601.

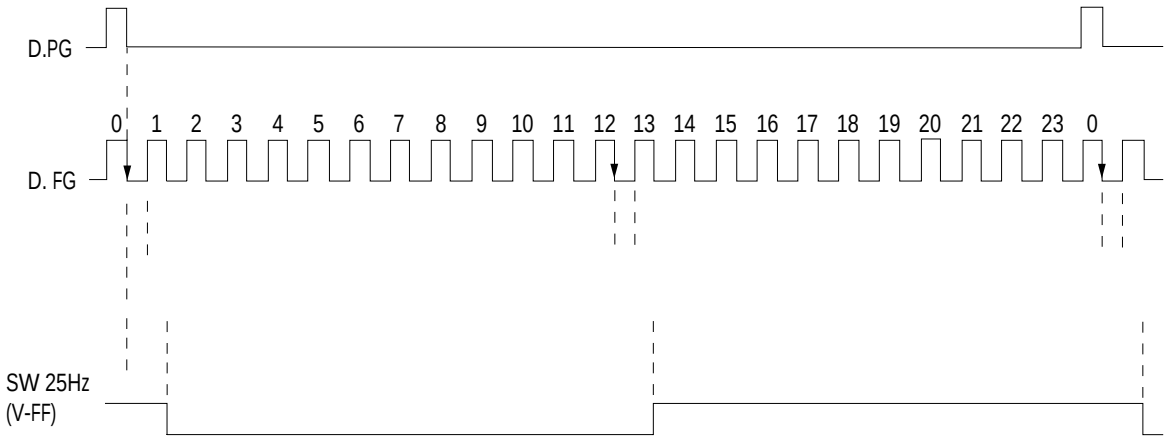


Fig. 7-19 SW 25Hz TIMING CHART

(7) V-Lock Phase

V-lock pulse is used for adjusting the picture's vertical vibration in trick play (still,slow).
The value is varied by tracking up / down key in trick play mode the variable range from 3H to 12H .
In trick play mode, the V-LOC pulse position of CH-1 is variable but CH-2 is fixed.
During search mode ,both CH-1, 2 and V-LOC position are fixed to 6.5H.

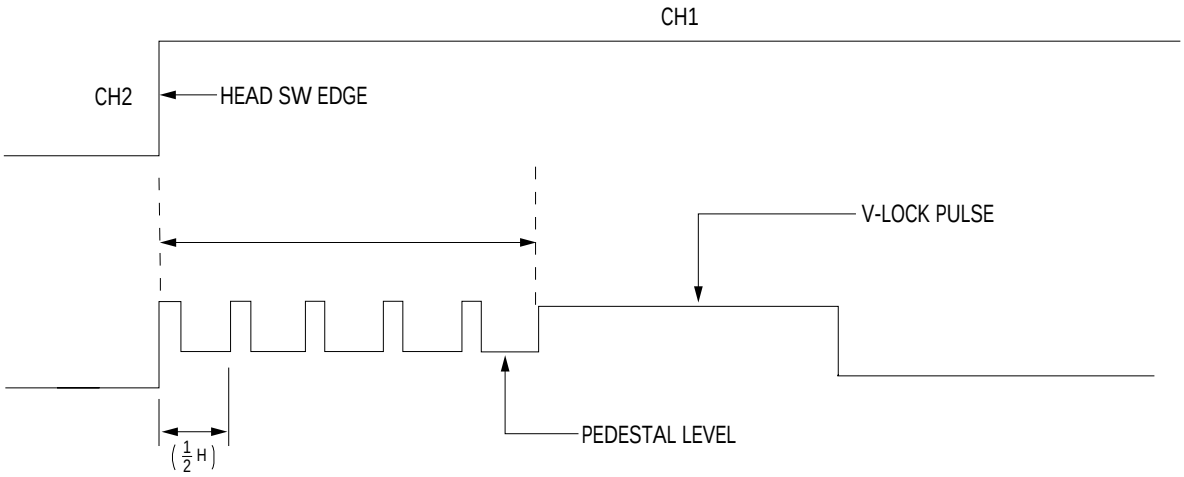


Fig. 7-20 V-LOCK PULSE

7-4 VCR Video

(1) Luminance Signal Recording System

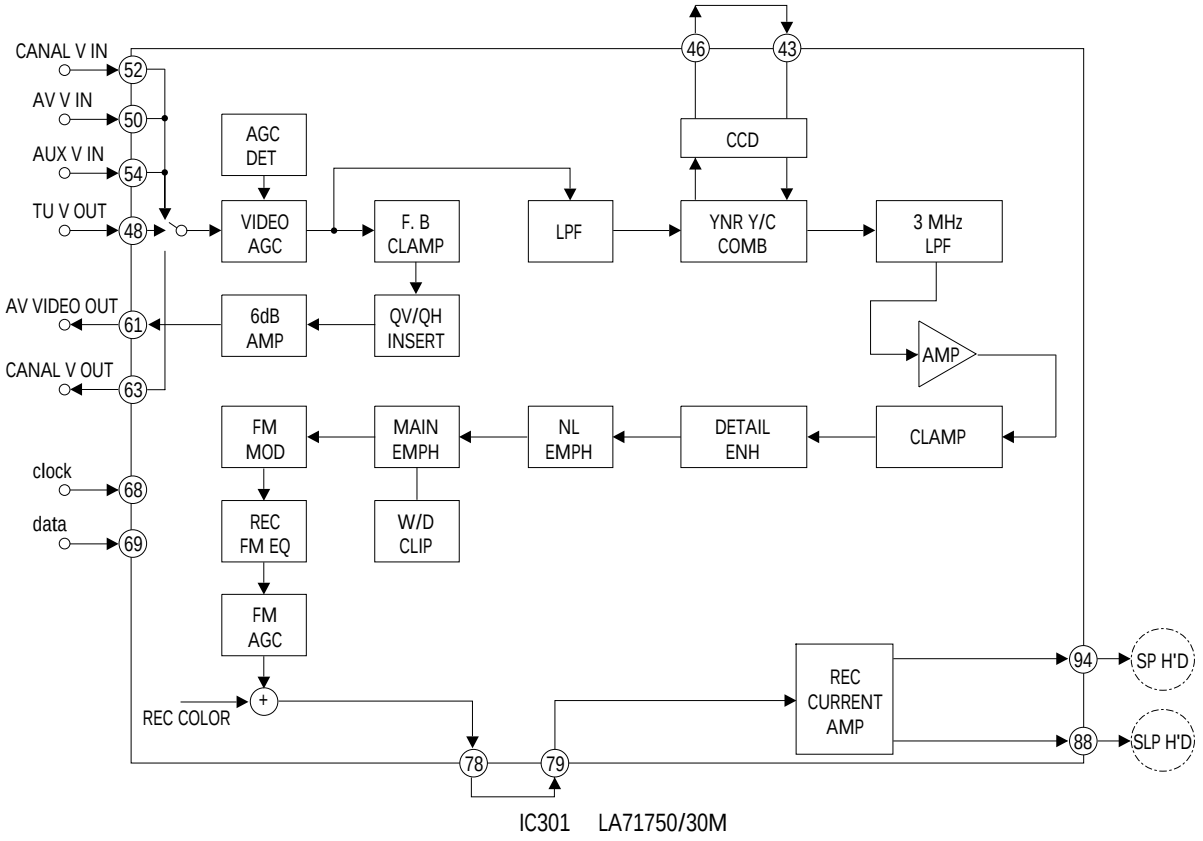


Fig. 7-21 Luminance Record Process

O t e

Fig. 7-21 shows the video signal recording system. Line input signal or tuner input signal is selected by Micom. Input selection is done with the INPUT SELECT button on the remote. The input select control signal is supplied to the pin 68(clock),6 (data) of video IC from Micom IC.
The selected video input signal goes to pin 48(TUNER),50(AV), 52(CANAL), 54(AU) of Lumi/Chroma processor IC (IC301). And then it enters VIDEO A C circuit. The gain of A C circuit is controlled by A C detector so that the output is constant (approx. 2Vp-p). The output signal of A C is clamped by the FBC(Feed Back Clamp) circuit. This signal appears at pin 26, after being amplified at the internal video amp and driver.

The output signal from the clamp circuit enter the detail enhancer circuit. In the detail enhancer circuit, the low level high frequency video signal is emphasized to improve the original signals frequency characteristics.
onlinear emphasis circuit is employed to improve S/N and frequency response characteristics together with the following main emphasis. Noise effects the FM wave at a higher frequency, so the S/N can be improved by emphasizing the higher frequency before recording and by suppressing the play signal during demodulation.
The difference of non linear emphasis from main emphasis is that the emphasis characteristics change is depending on the input level. The gain of the emphasis circuit is inversely proportional to the level of the high frequency component of the signal. That is, if the high frequency portion of the signal is low the main emphasis circuit will amplify the signal.

C t

The dynamically emphasized luminance signal is now supplied to the main emphasis circuit where all the high frequency components of the signal are boosted more than the low frequency components. The boosting action is required for the high frequency components because in the FM recording method, the noise of the playback signal increases in proportion to the modulated signal frequency or low level signal. By using the nonlinear emphasis and main emphasis system, the total S/N ratio is increased. The output of the main emphasis circuit is then supplied to the white and dark clip circuit.

te C C t

After emphasis is performed, large overshoots and undershoots in the luminance signal are limited to a specified level. This is done to avoid FM over modulation. The output of the main emphasis circuit is then supplied to the FM modulator circuit.

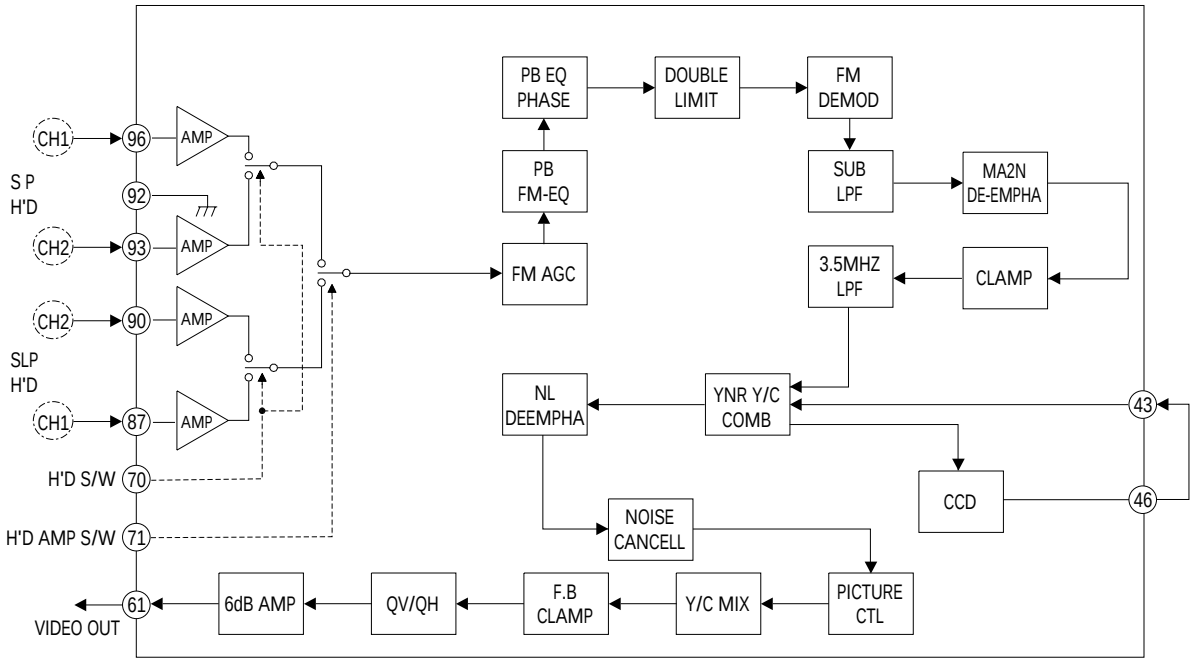
o to

(a) The amplitude of the FM signal is limited, so the signal is recorded on tape near the maximum record level which increases the S/N ratio.
(b) The FM carrier is se to 3.8MHz (at the Sync tips) and the deviation to 4.8MHz by inside IC circuit (for the white peak). The actual device which constitutes the FM modulator is a stable multivibrator.
This multivibrator generates a sine wave output of variable frequency.
The frequency of sine wave is governed by the level of the processed video signal at any given point.
Therefore, the processed video signal varies the frequency of the sine wave which is frequency modulation (FM).
During playback in SLP mode, the crosstalk of the adjacent track is more apparent than is standard mode.
It appears as jitter and noise on the monitor. To reduce this noise from the screen, the FM carrier frequency has to be 1/2fh shifted up during recording. This is done by applying the head switching pulse to the FM modulator during SLP recording. The FM modulated luminance signal goes to record equalizer circuit and it is mixed with chrominance signal at the record Amp circuit inside video IC.

e o A

The frequency modulated luminance signal and chroma signal are mixed in the record amp of pre-amp block inside video IC. Then this mixed signal is amplified and supplied to the video heads via the rotary transformer and recorded on the magnetic tape.
Tape speed selection determines which video heads will be used.
That is, signal output from pin88 (SLP) and 4 (SP) of pre-amp block are supplied to video heads.
Control signal of speed mode is applied to pin 68(clock), 6 (data) of video IC from Micom IC.

(2) Luminance Signal Playback System



IC301 LA71750/30M

Fig. 7-22 Luminance Playback Process

O t e

The video signal recorded on the tape is picked up by CH1, CH2 head and is supplied to pre-amp block via rotary trans. During playback, as per the speed, SP and SLP head is determined by Pin70 of respectively. CH1 signal inputs to Pins 87 and 6 while CH2 signal inputs to Pins 0 and 3 of video IC. The pick up operation is controlled by the head switching pulse inputted to pin 70. During the high portion of the switching pulse, CH2 is picked-up and just the opposite is true for CH1. In the pre amp IC, the FM signal is amplified 60dB and this signal is applied to FM A C.

A C A

At the FM A C Amp (FM), signals are automatically balanced. One of the A C circuit outputs is fed to A C detector circuit which detects signal level fluctuations. The detector output signal is applied to the FM A C Amp to keep the output constant.This output is applied to the PB FM E block. FM E is correct the phase distortion and level. The signal through PB E circuit is applied to the double limiter.

o e te C t

A FM signal on the tape which contains AM components will be read during playback. If there is a severe AM component, a drastic drop in FM carrier can occur. This lack of FM carrier can be called a noise region. Double limiting is used for improving the S/N ratio and carrier loss. The playback FM signal is split into two paths, one goes to high pass filler and sub-limiter. The other goes to the main-limiter after passing through a LPF. ONE path of the FM signal goes to the high pass filter, so that the low frequency(AM) component can be removed, and the other carrier is supplied to the sub-limiter. The output signal of sub-limiter is mixed with the signal from the low-pass filter and sent to the FM demodulation circuit.

O U ATO

The FM demodulator consists of a stable mono multivibrator balanced modulator (BM) and a LPF. The FM demodulator circuit first converts the FM signal to a pulse width modulator signal. Then the circuit smoothes the PWM signal to demodulate the video signal. This demodulated signal is fed to the LPF to remove its FM carrier component and any other harmonics. The demodulated luminance is applied to the 3.5MHz LPF through main deemphasis circuit. To reduce demodulation noise, the output of the 3.5MHz LPF is applied to a non-linear deemphasis circuit through YNR circuit.

e e C t

Before modulation, main emphasis was performed. Because the high frequency components of video signal were boosted more than the low frequency components in the recording mode, main deemphasis must be performed to obtain a normal video signal. That is this circuit returns the emphasized high frequency component to the original value.

No e e C t

This circuit is the counter part of the dynamic pre-emphasis circuit during recording. The characteristics are also the opposite of those in recording.

o O t Co e to N C t

This circuit compensated for missing parts of the FM signal due to dust, dirt on the tape or irregular tape coating, etc. The clamped video signal is supplied to the CCD 1H circuit. The 1H delayed video signal from CCD block is also supplied to the 6MHz LPF to reject the sampling noise of CCD IC.
Then, the output of LPF is applied to Pin 43 of video IC. When the DOC detector detects the FM loss, a 1H delayed video signal is added in place of the missing signal.

No e C e e C t

The noise canceller circuit removes the high frequency noise contained in the video signal which has the reverse characteristics of the detail enhance in the recording mode. The output of the noise canceller circuit is supplied to the Luminance and Chrominance mixer circuit. The mixed chroma and luminance signal are then output at Pin 61.

(3) Chroma Signal Recording System

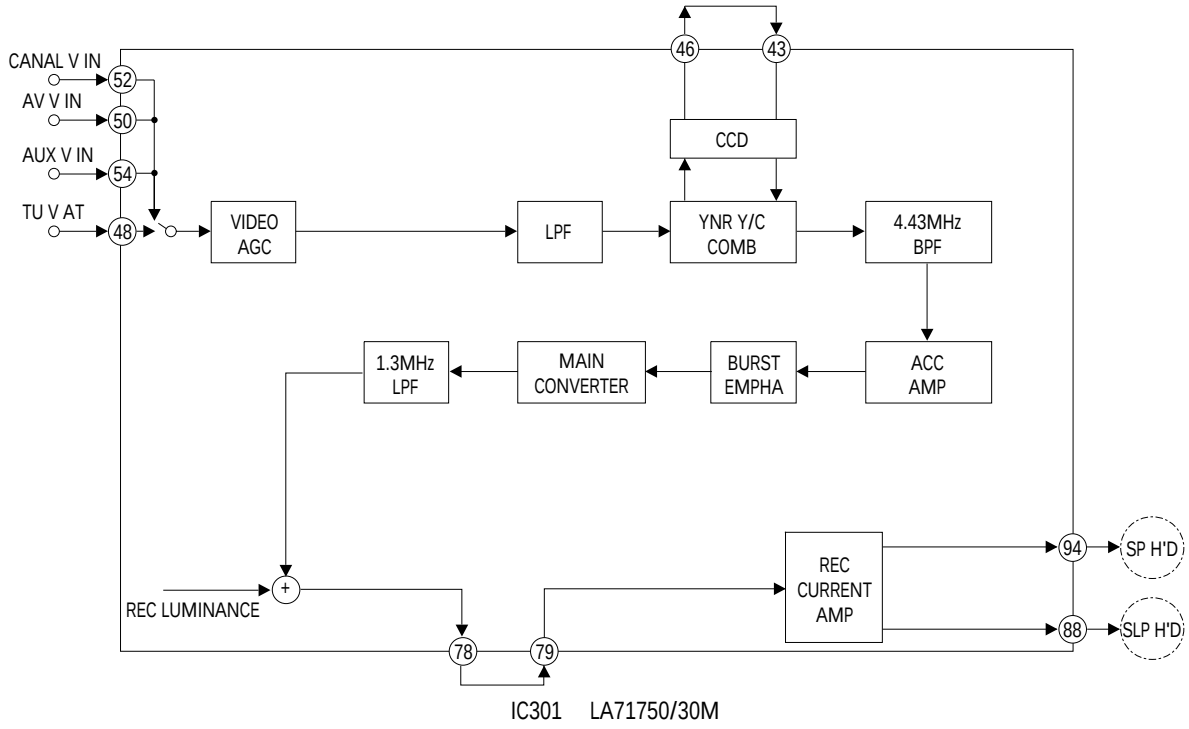


Fig. 7-23 Chrominance Record Process

O t e

Fig. 7-23 shows the chroma signal recording system. The chroma signal recording process is performed by video IC. The input video signal is supplied to Y/C COMB circuit through A C AMP.

The output signal of Y/C COMB circuit is applied to ACC amplifier. The ACC amplifier is used for both burst ACC which keeps the burst level at a constant value in recording and the color ACC which controls the reference level of the burst ACC with the color signal level. The color ACC works to maintain a relatively high output level by boosting low level input signals to improve color S/N ratio. The signal is then applied to the burst emphasis circuit. Burst emphasis emphasizes the burst signal by +6dB during recording and feeds it to the main converter. The 4.43MHz signal are mixed in the main converter to perform frequency conversion.

The main converter is a mixer having the two types of output components which are the added frequency of 5.06+4.43 .4 MHz and the difference frequency component 627 Hz.

Added frequency is rejected by the 1.3MHz LPF and the 627 Hz down converted chroma signal is supplied to the luma/chroma mixer of pre-amp block and then recorded on the tape via the record amp and heads.

AFC detection is performed with the head switching pulse and the fh signal generated from 321fh VOC output. The detector output controls the VCO frequency which will be locked precisely at 321fh (5.016MHz).

he 321fh signal is counted down to 1/8 and the resultant 40.125fh (627 Hz)carrier signal is phase shifted triggered by each horizontal sync signal which is wave shaped as a 50 duty pulse by the pulse generator.

The direction of the rotational phase shift depends on the levels of the rotary head switching signal and when the switching signal is H level, the phase is retarded by 0 degrees for every 1H, and when is is at a L level it will advance by 0 degrees for every 1H this 40fh phase shifted sub-carrier (PSSC) signal enters the sub-converter and the 4.43MHz carrier signal is locked at the color burst frequency by the record APC.

The PSSC signal is frequency converted into 4.43MHz +/-627 Hz. Then 5.06MHz component (4.43MHz+/-627 Hz)is extracted through a 5.06MHz BPF. The 5.06MHz signal is used as a carrier signal for down conversion of the color signal as described previously.

ACC A to t Co o Co t o C t

The ACC is used as burst ACC in the LP mode, however it is also used for peak ACC in the SP/SLP mode. The purpose of using two different ACC operations is to improve the overall Chroma S/N ratio during playback. In SP and SLP, there is H-sync alignment. This indicates that there is bust alignment as well. Whenever two video tracks overlap or a video head picks up crosstalk from an adjacent track, beats are produced during playback. Perhaps the most noticeable beats are produced by H-sync and burst. But in SP and SLP, these beats occur right at H-sync and burst and are out of the picture. In LP, however, there is no H-sync alignment and these beats can be seen in the picture. To keep the beats at a minimum in LP, we keep the burst level constant so that the beat intensity is constant. We know that ACC acts to improve the color S/N,and in LP, the ACC detector locks at the burst level,and keeps it constant. Thus we have ACC operation with the least beats. In SP and SLP, the beats caused by burst overlap are out of picture, so we don t really mind if the burst level changes or not. To improve the color S/N ratio even more,we use peak ACC in SP and SLP.That is,if the chroma level is too low to record, the amplification degree is increased by 3dB. However, the chroma level is sufficient for recording, this peak ACC is changed to burst ACC to avoid over amplification. By changing the ACC according to picture color content, the burst level may vary. The color ratio improvement is based on the color content itself during SP and SLP provides a somewhat better S/N ratio.

o e ot t o

CH1 is advanced 0 degrees every channel, while CH2 is delayed 0 degrees. When the frequency is set to 627 Hz, if phase is shifted by +/- 0 it becomes 627 Hz +/- 0. The 40fh+/- 0(627 Hz +/- 0)is balanced modulated via fsc (4.43MHz) depending on which side band is detected. That is, the fs +40fh+/- 0 (4.2MHz+/- 0) of total frequency is supplied to the main converter. In record mode, the signal operates same as in play back mode. During playback, the phase is returned to original state.

A C A to t e e Co t o C t

Luminance signal is input to H-sync separator. The H-sync is separated and supplied to phase comparator. This signal can be described as fh (Horizontal Sync frequency of input video signal). However, VCO oscillates at 321fh(5.016MHz). This 321fh is counted down by 1/8 and 1/40 and resultant fh is supplied to phase comparator. fh and fh are supplied to the phase comparator for comparison of their phases. After comparison, the phase differences is output to VCO (321fh) in terms of error voltage. Therefore, the oscillation frequency of VCO is controlled by this error voltage. That is, if the fh phase is changed by H-sync signal fh, error voltage is changed accordingly and if the phases of fh and fh are met due to change of VCO oscillation frequency, error voltage does not feedback. 321fh VCO is oscillated in accordance with phase sync at fh. Therefore, 40.125fh input to sub converter by phase shift is always sync horized with phase. The AFC loop performs the same operation during record and playback. In recording, phase of VCO is in accordance with H-sync signal of current video signal. Which in playback, the phase sync of VCO is consistent with H-sync signal which is separated from the video signal.

(4) Chroma Signal Playback System

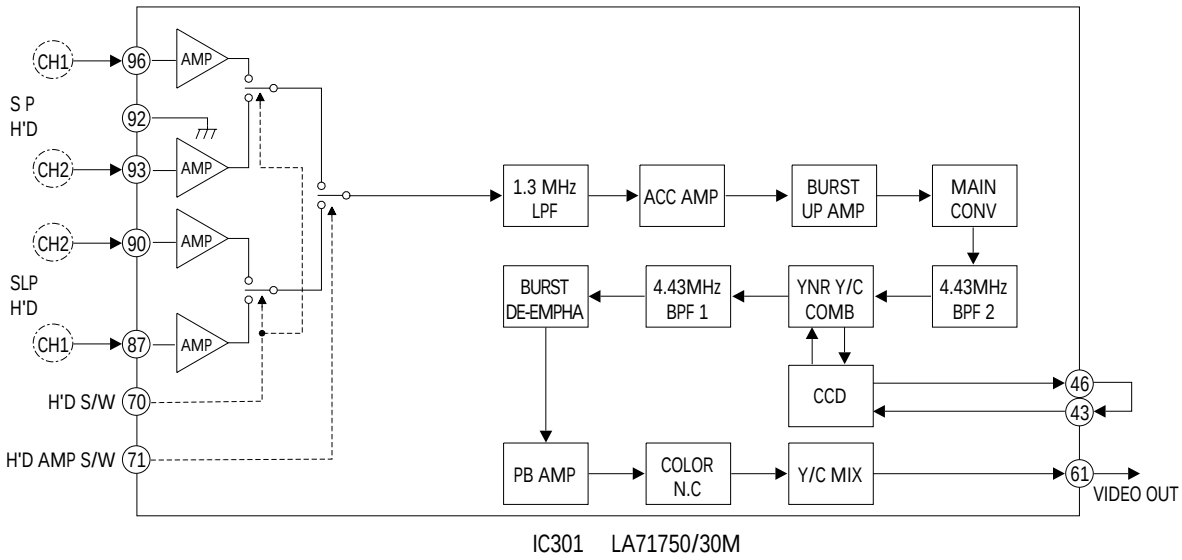


Fig. 7-24 Chrominance Playback Process

O t e

Fig. 7-24 shows the chroma signal playback system.
The FM signals picked up by the CH-1 and CH-2 video heads are supplied to the pre-amp block.
The FM signal from CH-1 and CH-2 are alternately selected by the switch and output signal as a continuous signal. oes to the ACC amp through the 1.3MHz LPF. The 1.3MHz LPF is used for passing only down converted 627 Hz chroma signal in the playback mode. The ACC amp stabilizes the 627 Hz color signal level.
The output color signal from amp then enters the main converter circuit. In the main converter circuit this signal is mixed with the 5.06MHz phase shifted carrier signal and converted into 5.06MHz + 627 Hz signals.

Co e te

Inside of IC, the main converter converts the 627 Hz rotational chroma signal to a 4.43MHz non-rotational signal. The two inputs of this main converter are the 627 Hz signal, which comes from the output of the ACC, and a 5.06MHz which has the same rotational phase as the 627 Hz signal. It is important that the rotational phase of the 5.06MHz signal is the same direction as the 627 Hz playback chroma signal. To obtain the 4.43MHz non-rotational stable signal, the same direction rotational signal should be mixed with the rotational chroma signal. During the conversion process, the phase is also mixed by the frequency. Therefore, when 627 Hz is subtraced from 5.06MHz,the result is the non-rotational 4.43MHz stable signal. The output signal of the main converter goes to the 4.43MHz BPF. In the 4.43MHz BPF,the conversion noise(5.06MHz+627 Hz 5.7MHz) is rejected and the 4.43MHz color signal goes to the comb filter.
In the comb filter, the crosstalk components due to the adjacent track are eliminated and the color signal is applied to PB-AMP, BURST De-Emphasis, iller and are applied to LUMA and CHROMA mixer input through the CNC block.

7-5 Hi-Fi Audio

(1) Outline

Hi-Fi circuit consists of HiFi audio LPF, VCO, BPF, FM detect circuit and switching noise compensator, PRE-AMP etc. Linear audio consists of an ALC circuit,REC E circuit and a PB E circuit.
Hi-Fi and Linear audio share the same input selector,output selector and mute circuit.

C o e C O

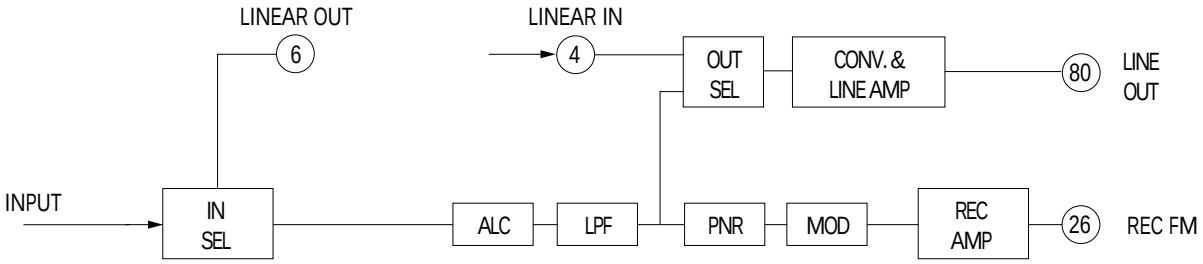


Fig. 7-25 REC Mode (L-CH Only)

o e C O

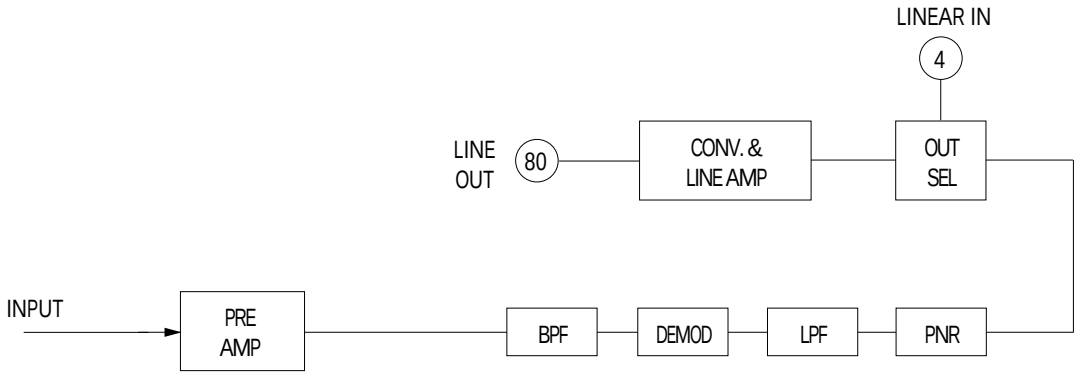


Fig. 7-26 PB Mode (L-CH Only)

(2) Block Description

I t e e to
Input selector outputs 1 signal from 4 different signals received. It outputs 1 selected signal from tuner, rear, front.

No e e e to
Two signals,L-CH and R-CH are inputed to Hi-Fi IC.But,linear audio is capable of receiving only one signal. Therefore the 2 input signals must be selected. Usually,the outputs are mixed signals of L-CH and R-CH unlike the input selector, the normal selector does not amplify the selected signal.

O t t e e to
It selects to output Hi-Fi L-CH,Hi-Fi R-CH,LINEAR and MI (Hi-Fi+LINEAR) signals with the final output7 IC pin 78(R-CH) and pin 80(L-CH).

O t t A C Co e to
ALC is used because when the input level of RF converter gets bigger,it shows up as noise on the screen. But, this block is not used this model(ALC OFF)

N e No e e t o
It is a type of emphasis,de-emphasis function to eliminate noise during modulation / demodulation PNR operates as that of VHS FORMAT to reduce noise.

A o te
Before modulating the signals from PNR block, it limits signals exceeding the size limit to max deviation of +/- 150 Hz.

CO o t e Co t o O t o
It is a modulation function that oscillates 1.3MHz(L-CH) and 1.7MHz(R-CH)

It is a function to eliminate the harmonic components of Hi-Fi carrier formed during VCO, which may affect other block. It's pass-band approximately 2MHz.

I
It mixes the Hi-Fi carrier formed in L-CH and R-CH. However,due to the frequency difference between L-CH and R-CH,when equal amount of R-CH is recorded to tape,R-CH is must smaiier than L-CH.
Therefore, the R-CH output is approximately 10dB bigger than L-CH.

C e t A
It is the final amplifier which change the size of Hi-Fi envelope.

A C A to Co t o
It maintains uniform size of Hi-Fi envelope,which is inputed by pre-amp in play back mode.

te
L-CH and R-CH each has BPF. The center frequency is same as carrier frequency.
It is used to receive only Hi-Fi carrier from all signals inputed to pre-amp.

No e Co e t o
Unlike the linear audio,insted of using fixed head,drum heads are used,which creates halting points However, in order for the audio to be headed continuously, the damages from halting points are modulated, which creates noise. SW noise compensation is a block to minimize this particular noise.

o e

It makes standard signal(Pulse) to compensate SW noise.

T IN A

From the Hi-Fi envelope inputed from pre-amp,it decides whether the signal passing through L-CH BPF is Hi-Fi or LINEAR tape it's size(the signal passing through BPF is below 10mVpp, it is not Hi-Fi, therefore, it output linear)

OC o O t Co e t o

If demodulation is conducted without properly treating the damage on Hi-Fi envelope caused by scratch on the tape,noise occurs.
In order to improve this noise occurrence, DO DET compensate the drop-out using the same methode of compensating the switching noise when the damage on the envelope ranges 10 15mVpp.

N T

To obtain optimal tracking,envelop must be peak to peak and micom should be in DC. It is a function to convert Hi-Fi envelop to DC. If it is lower than 0.8V at micom,it sends linear mode date to HiFi IC.

e t e o e

It receives I2C BUS to enable the operation of inner block and decodes into serial data.

7-6 Linear Audio

(1) Block Diagram

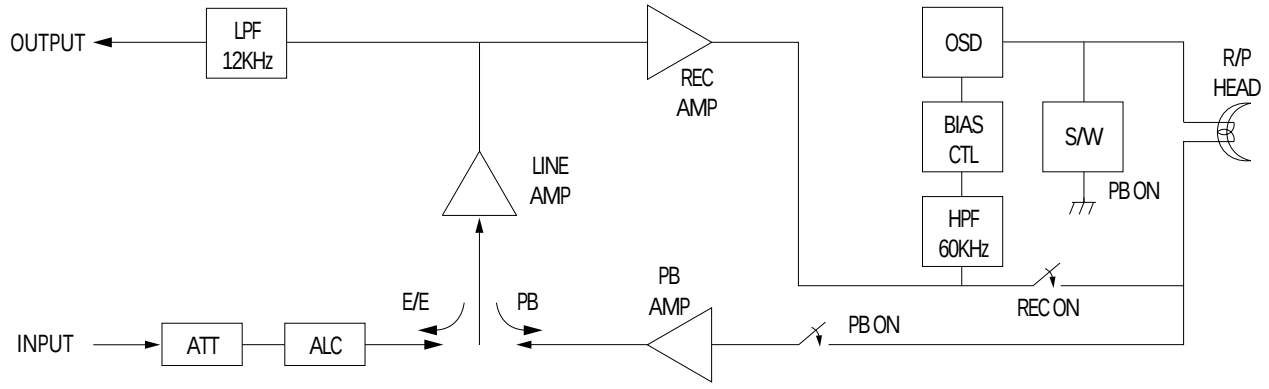


Fig. 7-27 Block Diagram

(2) Block Description

ATT Atte t o

Line amp is shared between PB mode and E/E mode, which reduces the recorded signal by 20dB and resister.

A C A to e e Co t o

If the signal level is lower than the reference signal (-6dBm) level, the output signal will equal the input signal. However, if the input signal is higher than the reference signal, the output will not equal the input and will gen erate uniform signal.

ALC Application Purpose : Since linear audio is in AM (amplitude modulation) and uses magnetic recording device, it only records limited size and as the size of input signal increases, distortion increases. To prevent this occurance, mark sure the signal does not get bigger even if the level of distortion repodly increases.

IN A

Line amp's gain is approximately 23dB. The purpose of the line amp is to amplify to 68dB in order to obtain the recorded signal on the tape during playback. As the amp gain increases, the passband decreases, which enables the amplification of low frequency. However, it is impossible to amplify frequency of 10 Hz to 68dB with just 1 OPAMP. Therefore, to satisfy frequency and gain.

Line amp must be constructed into 2 steps of OP AMP. (gain is fixed within IC)

There are various noises to signal output. The loudest noise is the "Video SYNC Frequency" of 15.734 Hz In order to eliminate the "Video SYNC Frequency", "LPF" and "TRAP" are combined to "LPF".

A

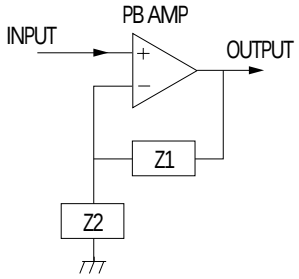


Fig. 7-28 PB Amp

The diagram to the left is the playback amp and the gain input/output are as follows.

$$Av \quad 1 + \frac{1}{2} \qquad \frac{1}{2}$$

The playback characteristic of VHS format can be satisfied by using $_1$, $_2$ in the above equation.
PB amp gain should be designed to be approximately 45dB (1 Hz).

C A

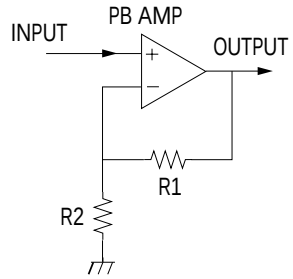


Fig. 7-29 REC Amp

The diagram to the left is REC AMP. The amp gain is approximately 14dB.
R_1 and R_2 that determine the gain is located inside the IC.
It is uniform and independent to frequency. Frequency characteristics should be considered when designing rec amp. The REC amp should be the opposite to playback characteristics.

O C O t o

Oscillation frequency is 70 Hz. It's size is approximately 40Vp-p. it operates on recoed mode. It is supplied to audio erase head and full erase head used to erase already recorded signals.
Also, it conducts "AM (Amplitude Modulation)" using oscillation signals.

IA Co t o

Output level changes according to the impedance of F/E, A/E and R/P head connected to the coil.

There must be standard signal for bias control and that signal uses HPF only to obtain oscillation signal that comes through R/P head.

The switch opens when recording, shorts during playback and exterior transister is used.

7-7 TM

(1) Outline

RF and frequency synthesized tuning system

eneral description : The receiving circuit consists of both ANT input and output circuits, channel selection circuit, sPIF circuit and SIF circuit. The receiving circuit selects a desired broadcast signal from TV signals induced on an antenna and sends stable video and audio signals to their respective processing circuits. The output signals from the video and audio circuits are converted into a conventional TV signal modulated for UHF Channel 21 6 by an RF modulator so that the signal can be received by conventional TV receivers.

(2) Feature

As explained, this model is designed in one package to contain a RF MODULATOR BLOC , TUNER BLOC AND IF DEMODULATOR BLOC . Its size is greatly reduced and other noise interference can be minimized to make performance high.

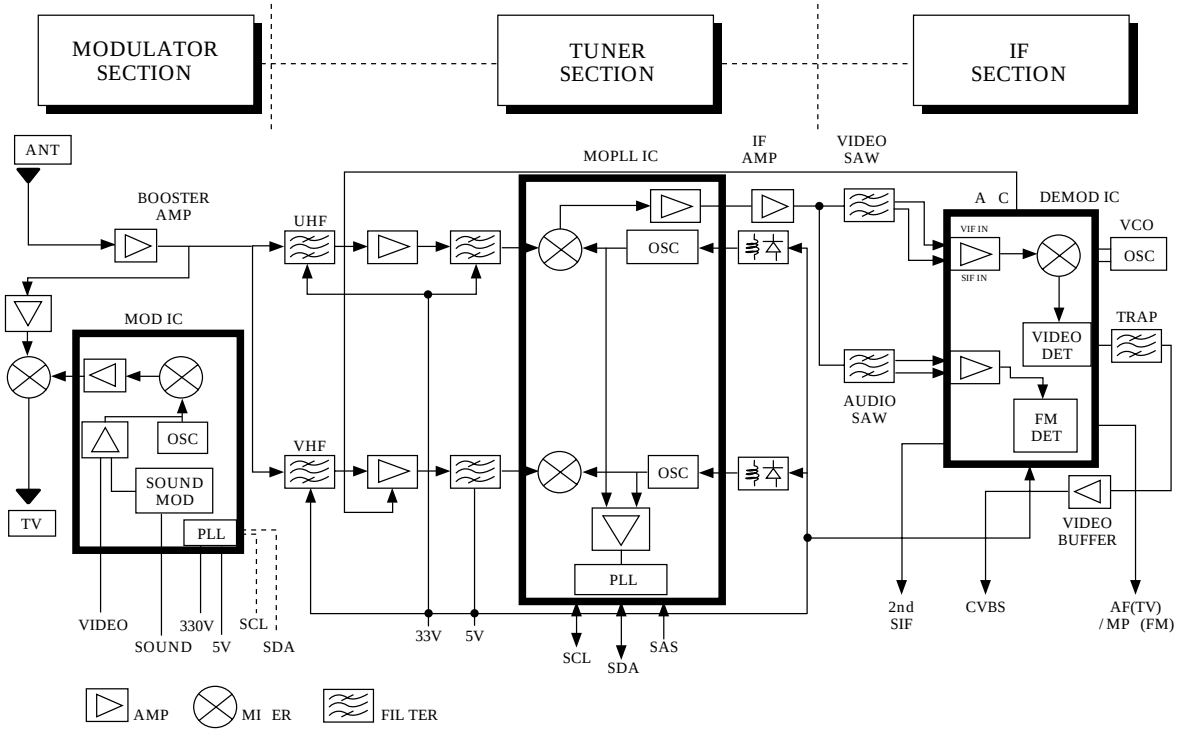


Fig. 7-30 Tuner/demodulator Block Diagram

(3) Modulator Section

A. RF Modulator generates, from a baseband video and audio signal, PLL frequency synthesized RF TV channel signal in UHF band. (21ch 6 ch 471.25MHz 855.25MHz)
B. PLL synthesized RF VCO, channel selection by I2C Control
C. PLL synthesized audio FM(5.5 6.5Mhz), system selection by I2C Control
D. The 4MHz reference frequency for PLL can either be generated internally or input from an external source.

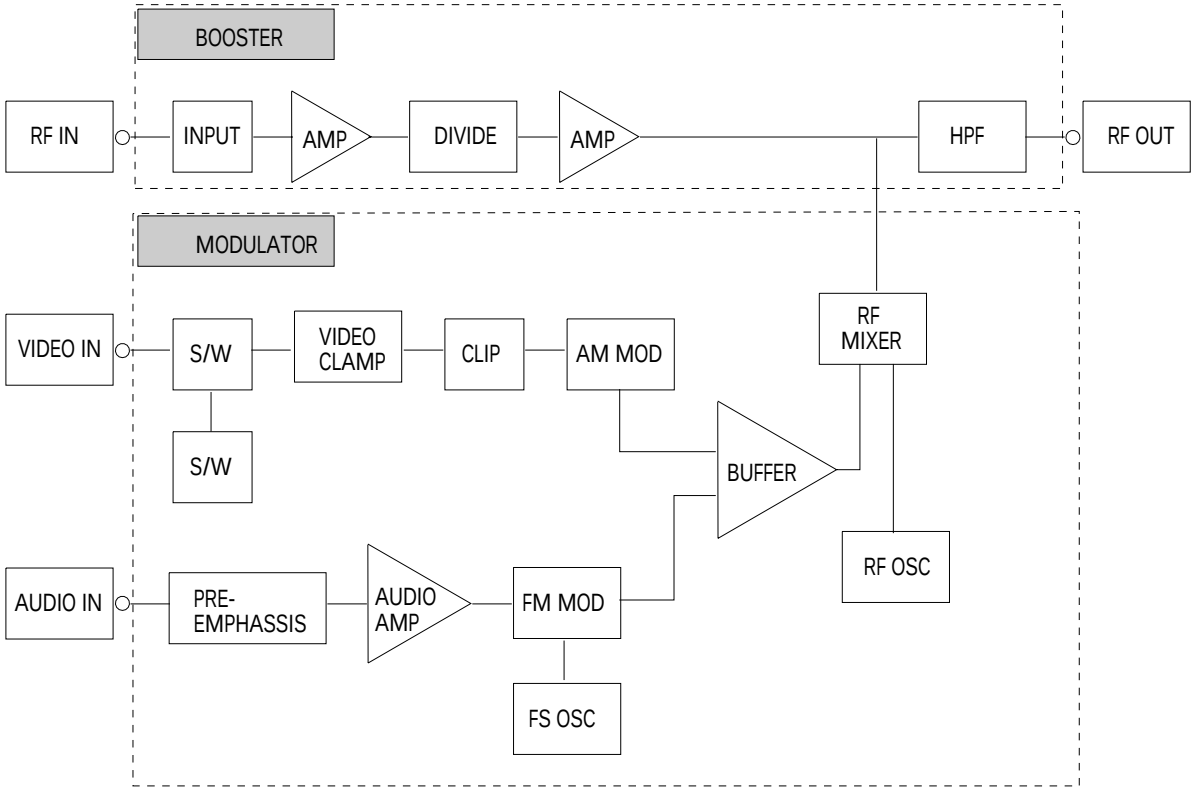


Fig. 7-31 Modulator Section Block Diagram

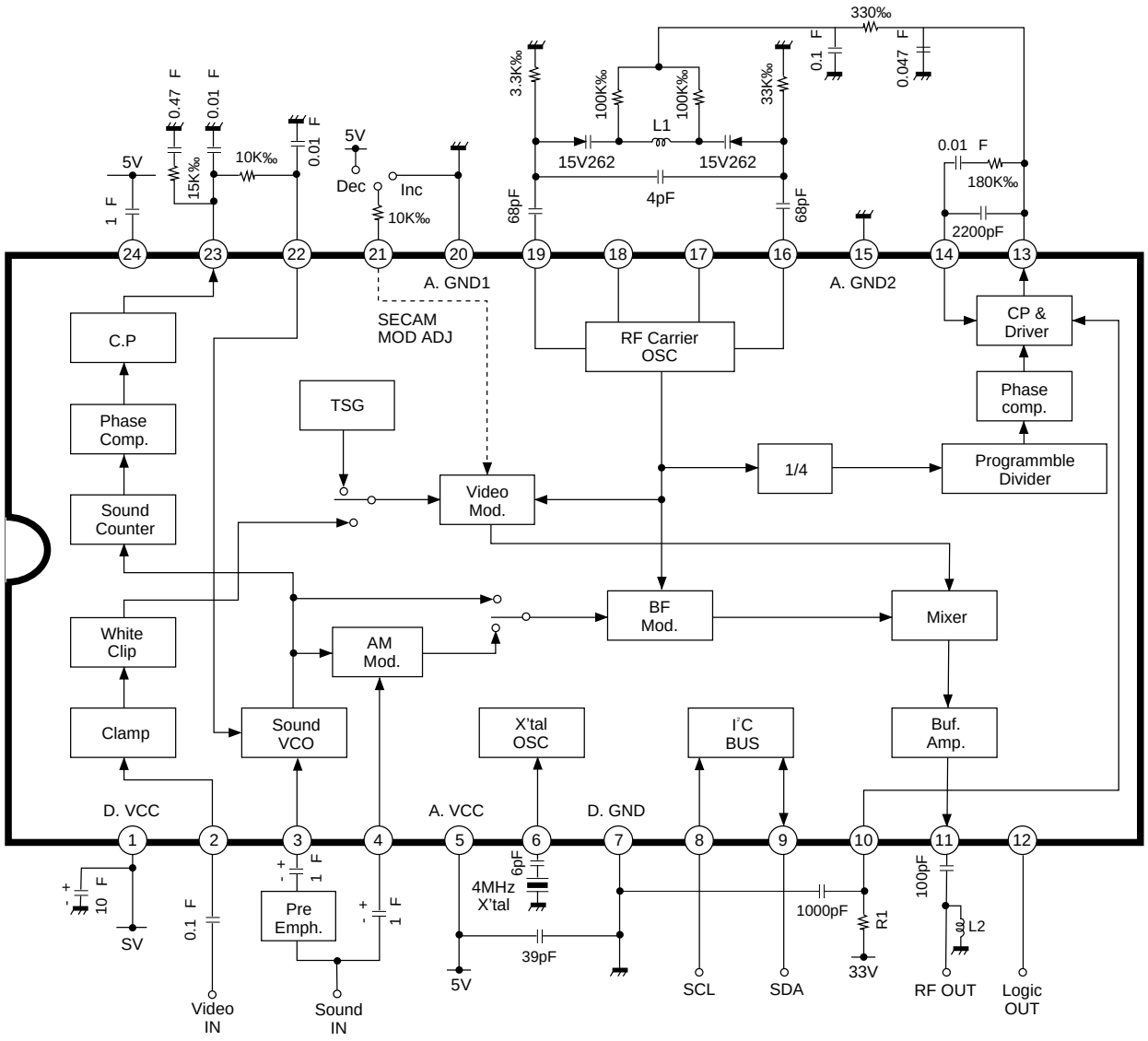

330‰
0.1 F
0.047 F
3.3K‰
100K‰
100K‰
33K‰
L1
15V262
15V262
4pF
68pF
68pF
0.01 F
180K‰
2200pF
0.47 F
0.01 F
5V
15K‰
10K‰
0.01 F
5V
Dec
Inc
10K‰
1 F
24
23
22
21
20
19
18
17
16
15
14
13
A. GND1
A. GND2
SECAM
MOD ADJ
C.P
RF Carrier
OSC
CP &
Driver
Phase
comp.
TSG
Phase
Comp.
1/4
Programmble
Divider
Video
Mod.
Sound
Counter
BF
Mod.
Mixer
White
Clip
AM
Mod.
Clamp
Sound
VCO
X'tal
OSC
I²C
BUS
Buf.
Amp.
D. VCC
A. VCC
D. GND
1
2
3
4
5
6
7
8
9
10
11
12
6pF
4MHz
X'tal
39pF
1000pF
R1
100pF
L2
10 F
SV
0.1 F
Video
IN
Pre
Emph.
1 F
Sound
IN
5V
SCL
SDA
33V
RF OUT
Logic
OUT

Fig. 7-32

(4) Tuner Section

A. Low pass filter high pass filter

This consists of IF trap circuit and UHF VHF separation circuit. If the input signal is IF(38. MHz), this filter prevents interference.

B. Single tune RF AMP

This consists of a filter circuit, RF AMP, impedance conversion circuit, image trap and a single tuning circuit. It prevents noise and other interference signals. RF AMP is controlled by A C come from IF DEMOD block.

C. Double tune

It consists of a double tuning circuit to improve rejection characteristic which results in a better band characteristic.

D. MOP IC (Mixer, OSC, PLL)

It consists a VHS and UHF OSC and mixer circuit. We applied a double balance mixer to have better rejection characteristic, it shows especially various beat characteristic.

It selects channels and contains charge pump band driver. The minimum step standard frequency 50 H .

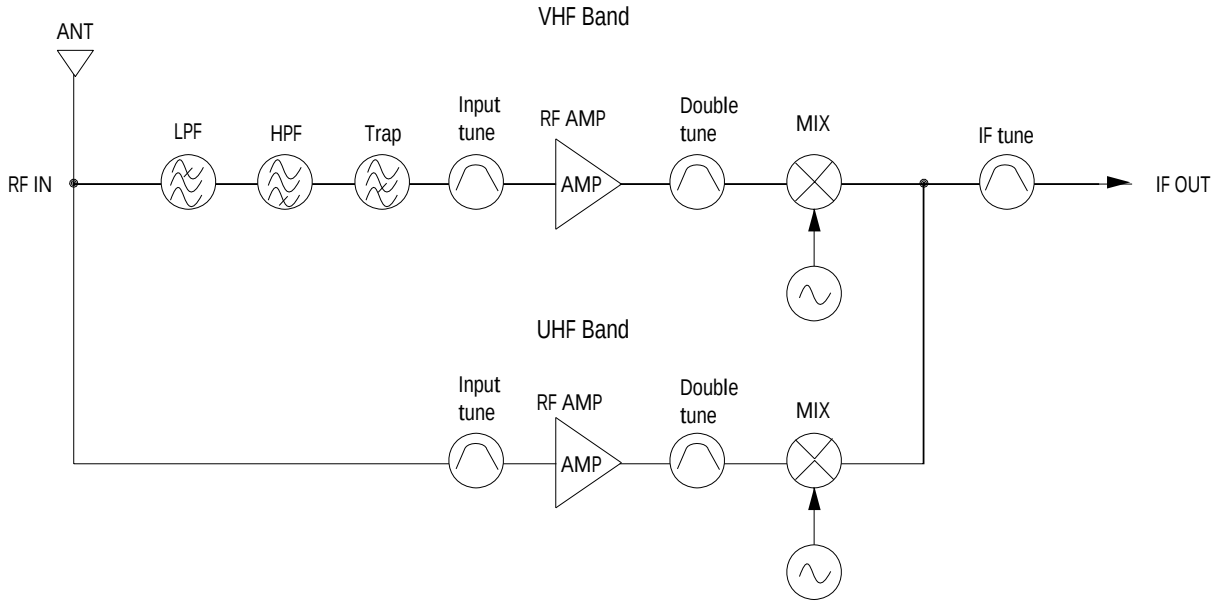


Fig. 7-33 Tuner Section Block Diagram

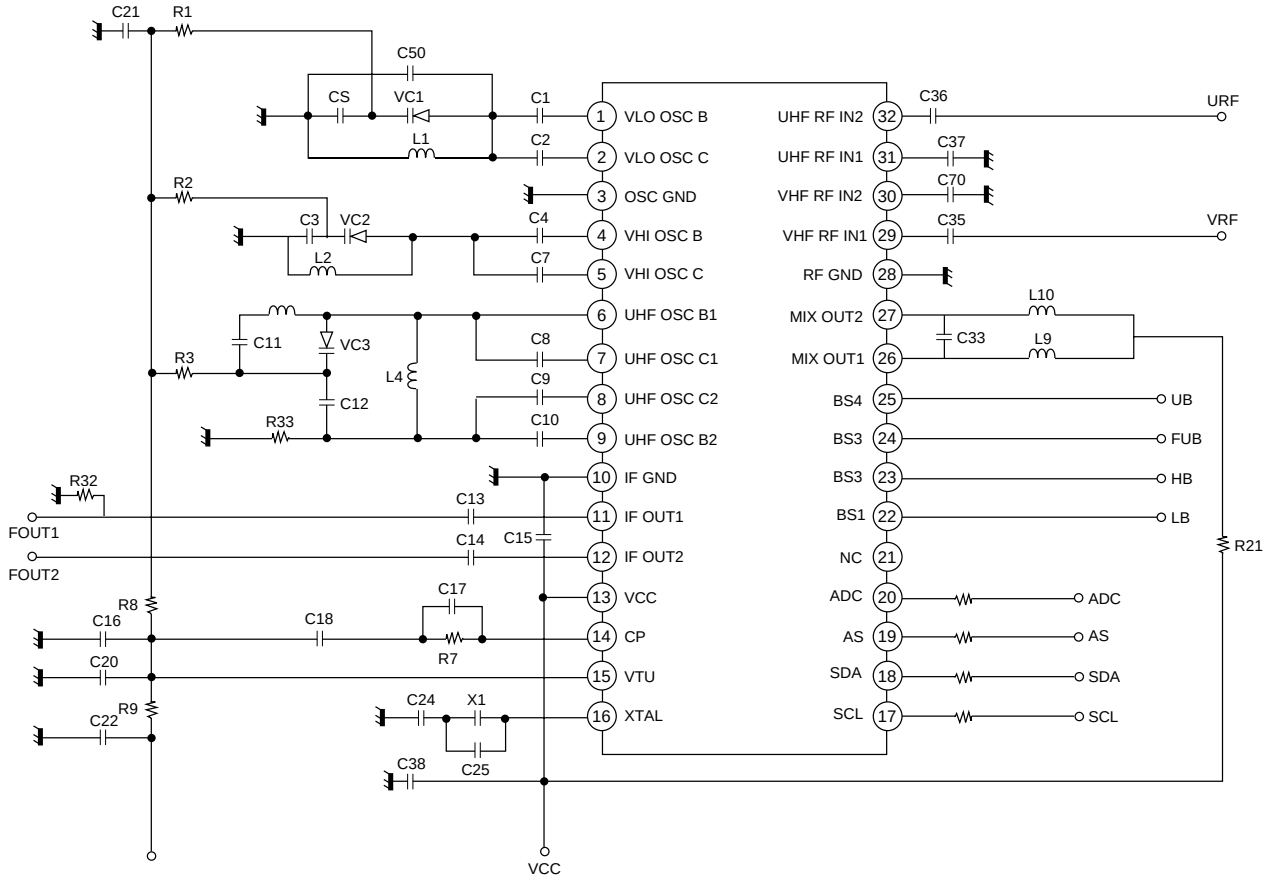

C21
R1
C50
CS
VC1
C1
L1
C2
R2
C3
VC2
C4
L2
C7
C11
VC3
C8
R3
L4
C9
C12
R33
C10
R32
C13
FOUT1
C14
C15
FOUT2
R8
C17
C16
C18
R7
C20
R9
C22
C24
X1
C25
C38
VCC
1 VLO OSC B
2 VLO OSC C
3 OSC GND
4 VHI OSC B
5 VHI OSC C
6 UHF OSC B1
7 UHF OSC C1
8 UHF OSC C2
9 UHF OSC B2
10 IF GND
11 IF OUT1
12 IF OUT2
13 VCC
14 CP
15 VTU
16 XTAL
UHF RF IN2 32
UHF RF IN1 31
VHF RF IN2 30
VHF RF IN1 29
RF GND 28
MIX OUT2 27
MIX OUT1 26
BS4 25
BS3 24
BS3 23
BS1 22
NC 21
ADC 20
AS 19
SDA 18
SCL 17
C36
URF
C37
C70
C35
VRF
L10
C33
L9
UB
FUB
HB
LB
R21
ADC
AS
SDA
SCL

Fig. 7-34

(5) IF Section

A. SAW FILTER

It passes only needed band of the signal that is converted to IF frequency and decrease other band to minimize the effect of adjacent channel.

B. IF AMP

IF signal ,which is selected in SAW FILTER, is amplified in IF amp frequency enough to be detected.
The IF AMP has parallel inputs outputs structure and consists of 3 series step AMP.Each step has about 20dB gains.These gains are controlled by A C voltage has maximum 63dB attenuation range.

C. RF A C CONTROL

It is adjusted to determine RF A C working point in tuner.

D. FM DETECTOR

After removing AM signal in the limiter AMP ,amplified SIF signal is applied FM detector.
This FM detector is PLL detecting type.

E. AFT DETECTOR

AFT automatically controls the OSC frequency in the tuner, so that it retains a constant level.
It is a quadrature detection type. The carrier, which is detected from video det is directly input to AFT detector.
The 0 degree delayed phase signal is input at the same time to AFT detector and ,the results come out.
Detected AFT voltage is amplified by DC AMP and then applied to pin 13.

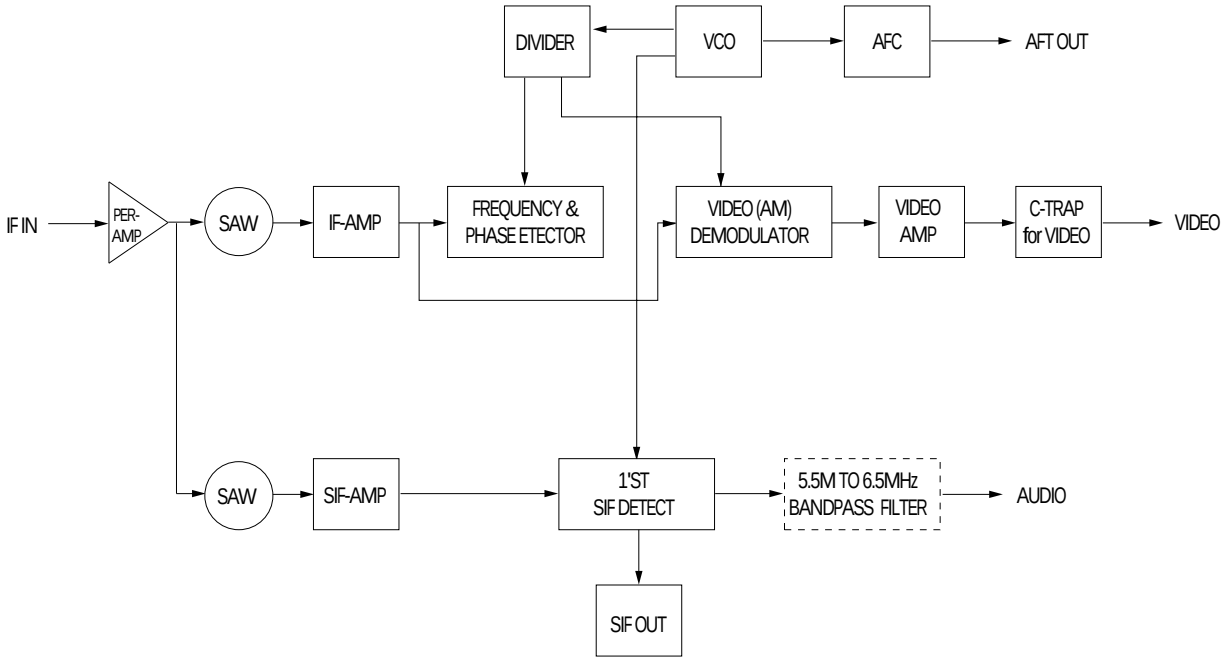


Fig. 7-35 IF Ssection Block Diagram

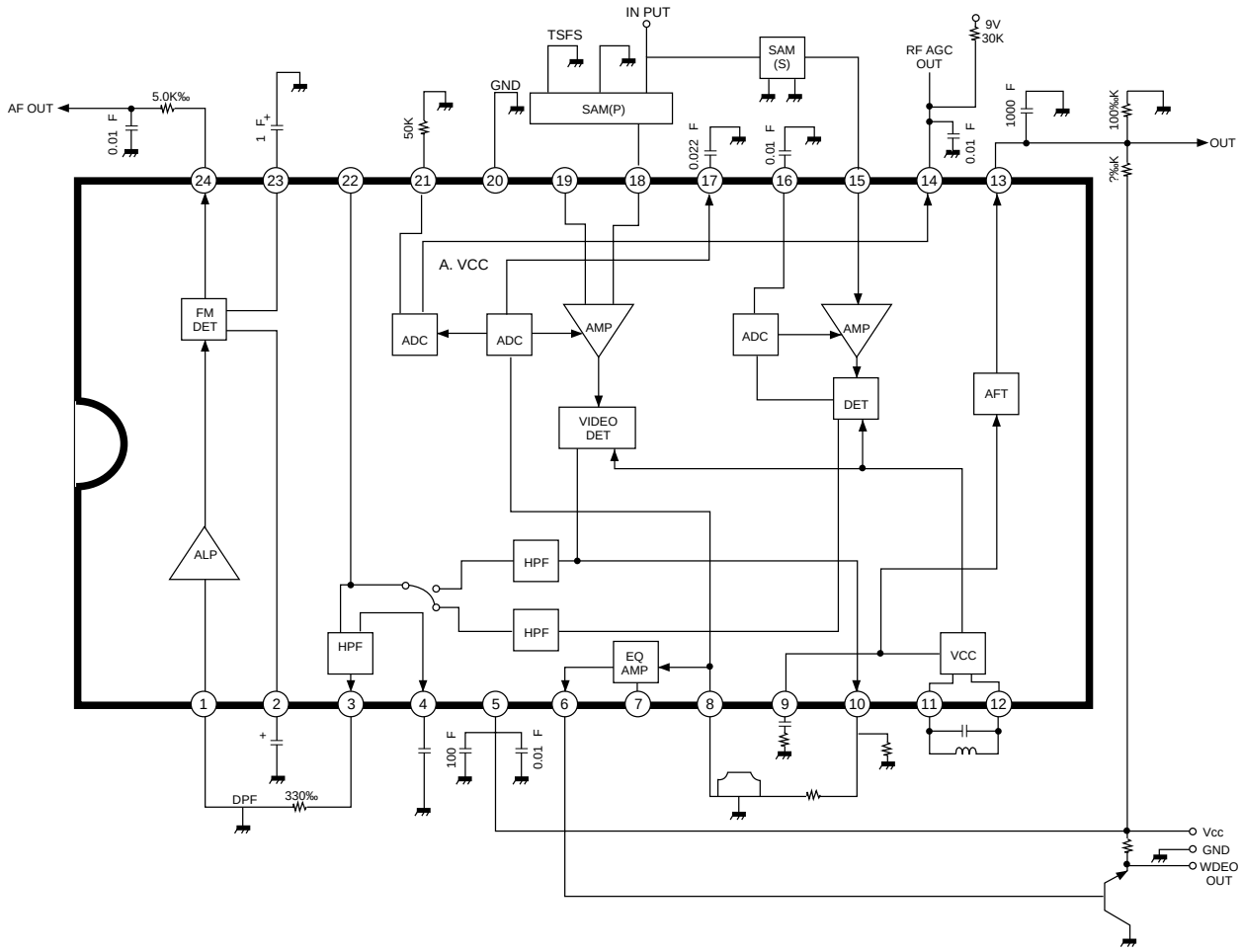

IN PUT
TSFS
SAM (S)
SAM(P)
GND
9V
30K
RF AGC OUT
AF OUT
5.0K‰
0.01 F
1 F
50K
0.022 F
0.01 F
0.01 F
1000 F
100‰K
7‰K
OUT
24
23
22
21
20
19
18
17
16
15
14
13
A. VCC
FM DET
ADC
ADC
AMP
ADC
AMP
DET
AFT
VIDEO DET
ALP
HPF
HPF
HPF
EQ AMP
VCC
1
2
3
4
5
6
7
8
9
10
11
12
100 F
0.01 F
DPF
330‰
Vcc
GND
WDEO OUT

Fig. 7-36

7-8 OSD

The on screen display circuit consist of a character generator decoder, video mixer, sync separator and sync generator, sync detector circuit.
The data is decoded and generates characters in syncro with composite video signal applied pin 1 .
Also the sync detector circuit discriminates the presence of a video signal by detecting sync, if no sync is detected, a blue screen is displayed. In other word, the OSD circuit displays character on the video when there is a video signal or on blue screen when there is no video signal. (No sync).

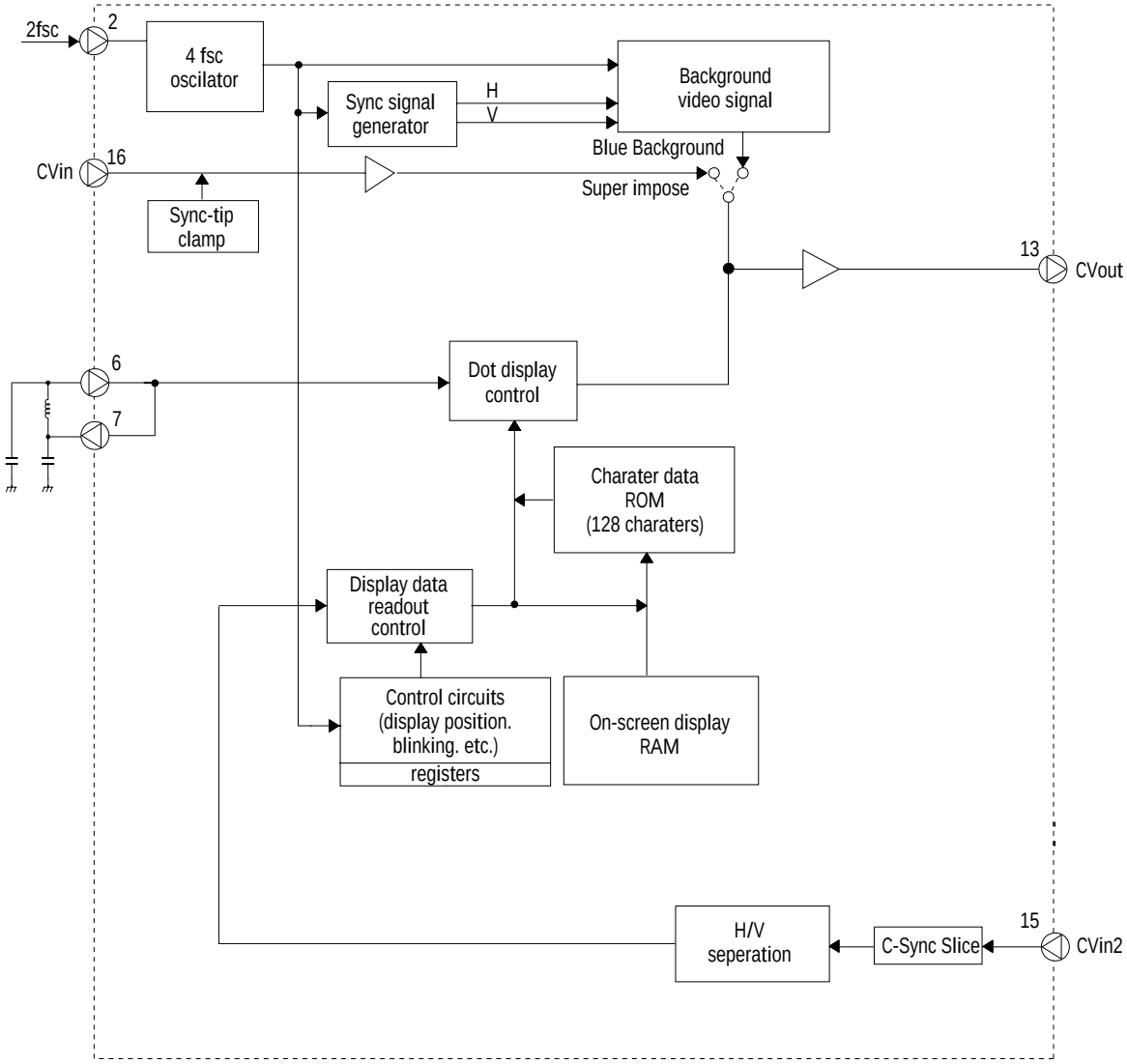


Fig. 7-37 Block Diagram

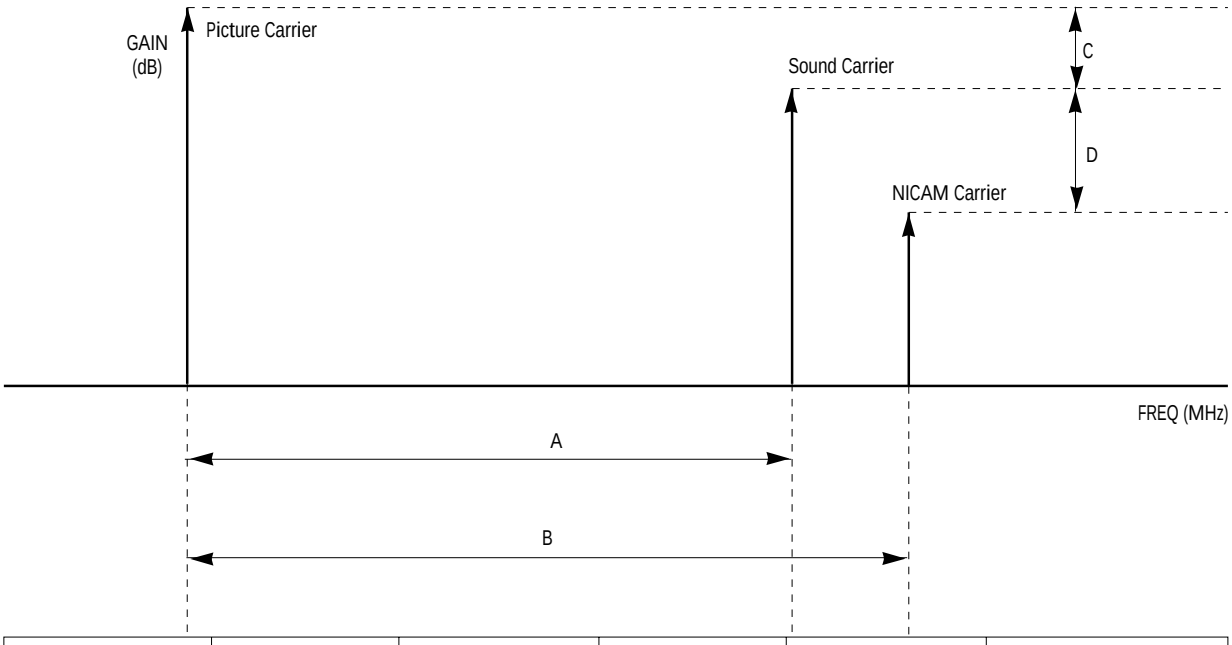
7-9 A2/NICAM

(1) Outline

The Multiplex signal(SIF signal) that come from Tuner enters into the MTS IC(IC4N01) 2 pin.and A2 or NICAM signal can be detected.
In the IC, the SIF signal is converted to two Audio signal.
the two Audio signal is output from the 30,31 pin.
It's controlled by IIC DATA and CLOC from the MAIN MICOM
MSP3417D: A2 / NICAM
MSP3407D: A2 ONLY

(2) A2: Analog Two Carrier System

Since September 1 81, stereo and dual sound programs have been transmitted in ermany using the 2-carrier system. Sound transmission consists of the already existing first sound carrier and a second sound carrier additionally constaining an identification signal.

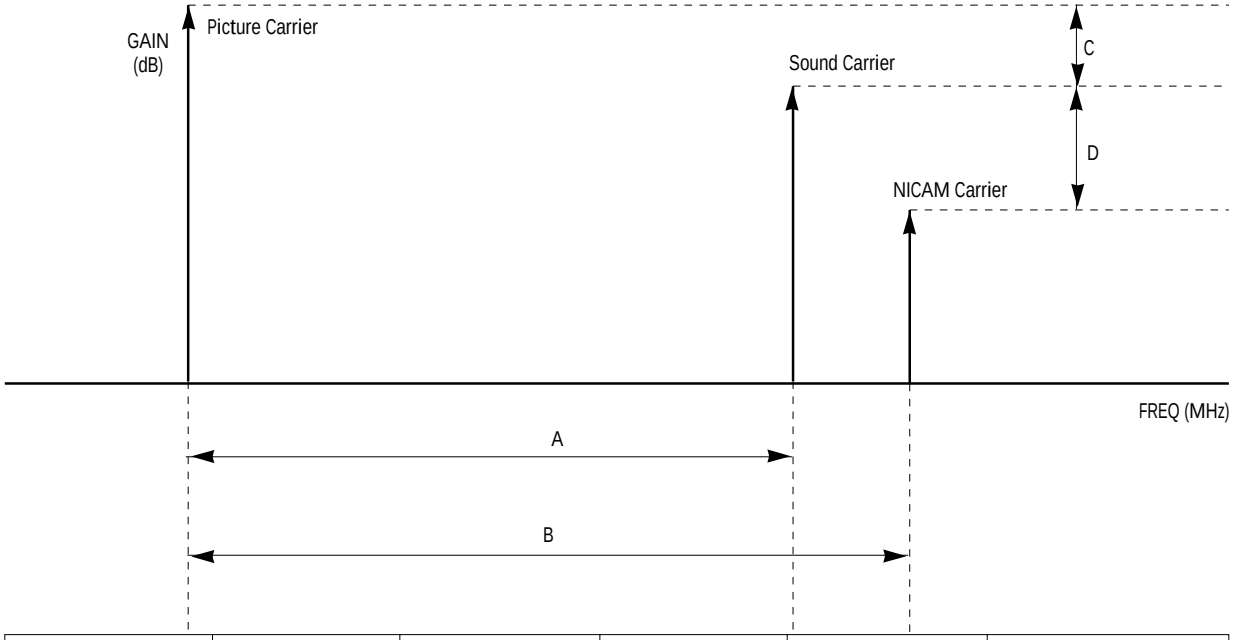


SYSTEM	A	B	C	D	COUNTRY
M	4.5 (FM)	4.72	13	7	Korea
B/G	5.5 (FM)	5.74	13	7	German, Australia
D/K	6.5 (FM)	6.25	13	7	USSR

Fig. 7-38 The base band spectrum of A2

(3) NICAM : Near Instantaneously Compand Audio Multiplex

According to the British, Scandinavian, Spanish, and Frech TV-standards, high-quality stereo sound is transmitted digitally. The systems allow two high-quality digital sound channels to be added to the already existing FM / AM-channel. The sound coding follows the format of the so-called Near Instantaneously Companding System(NICAM).



SYSTEM	A	B	C	D	COUNTRY
I	6.0 (FM)	6.552	10	10	U.K , Hong Kong
B/G	5.5 (FM)	5.85	13	7	SCAN , Spain
L	6.5 (FM)	5.85	10	17	France
D/K	6.5 (FM)	5.85	13	12	China , Hungary

Fig. 7-39 The base band spectrum of NICAM

7-10 DVD System Control

(1) Outline

The main micom peripheral circuit is composed of 4M EDO ROM (SIC2) for Microcode and data save, 2 bit EE-PROM (IC7) for permanent storage of data needed at power off, 64Mbit SDRAM (IC2) for temporary data read and write.
The Micom (IC1, Vaddis 5E) mounted in main board analizes the key commands of front panel or instructions of remote control through communication with Micom (IC601) of front and controls the devices on board to execute the corresponding commands after initializing the devices connected with micom on board at power on.

(2) Block Diagram

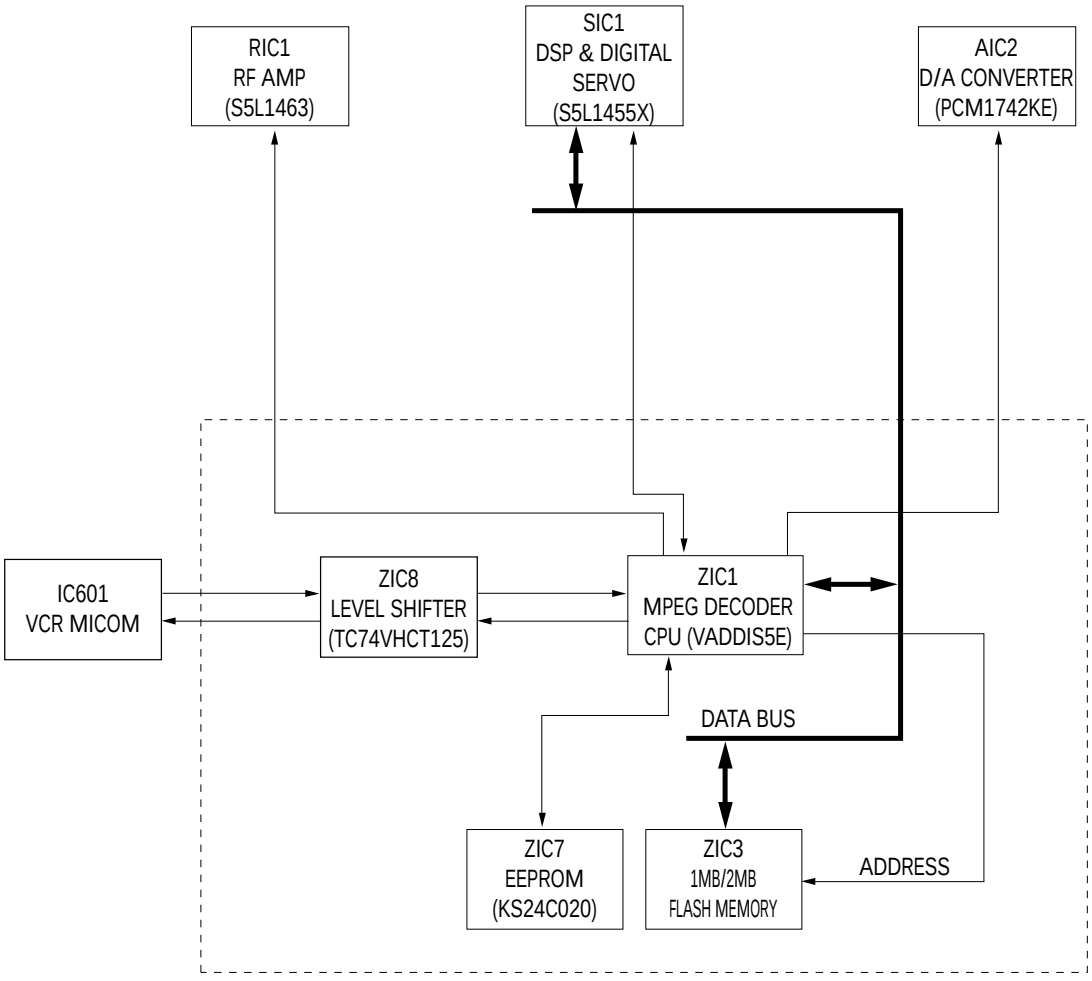


Fig. 7-40

(3) Waveform Description

When micom accesses each device sharing bus, it falls the chip select signal of corresponding chip to (/dspcs : IC1-123, /FLASH DSP : IC1-126, /DSPCS : DIC1-2, /DVD1CS : IC1-208, CSB : SIC1-10) 0 (Low) before trial.
So to speak, the bus is used by time-division as shown in Fig. 7-41.
Two and more devices can t be accessed simultaneously.

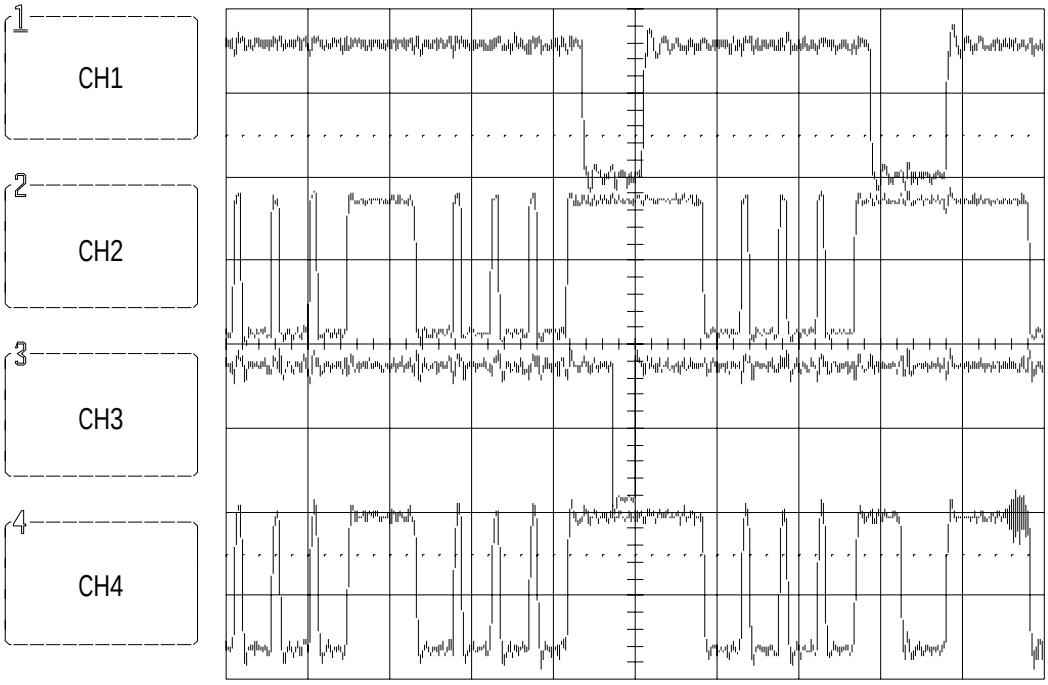


Fig. 7-41 Servo Chip Access

- CH1 : /DSPCS (ZIC1-123, DSP CHIP SELECT)
- CH2 : /FLASHCS (ZIC1-126, FLASH CHIP SELECT)
- CH3 : /WR 9ZIC1-129, MICOM OUTPUT WRITE SIGNAL)
- CH4 : /RD (ZIC1-128, MICOM OUTPUT READ SIGNAL)

7-11 DVD RF

(1) RIC1 (S5L1463)

S5L1463 is combined with S5L1455 as bipolar IC developed for DVD SERVO system.
Main features include DVD waveform equalizing, CD waveform equalizing, focus error signal generation, 3-beam tracking error signal generation, DPD 1-beam tracking error, defect, envelope, MIRR output, Laser Power Control, etc.

(a) Basic Potentiometer

S5L1463 Uses 5V / 3.3V and reference voltage is 2.5V.
V (Pin 1 , 32, 45, 4 , 58-) terminal is needed for IC, which uses the peripheral V.

(b) RF signal

Fig. 7-42 shows the flow of signal generated by the pick-up.
A, B, C, D signals detected from pick-up are converted in to RF signal(A+B+C+D) via RF summing AMP.

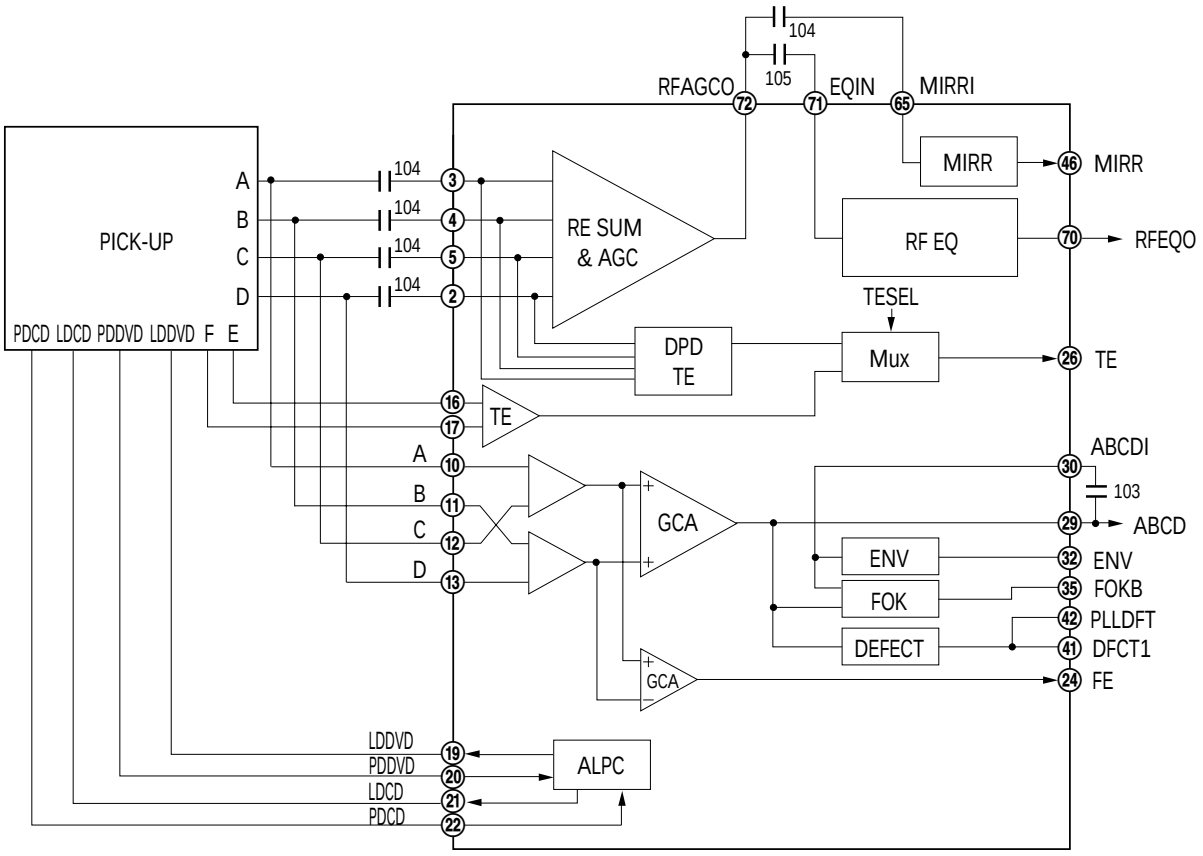


Fig. 7-42

Fig. 7-43 shows the waveform-equalizing block diagram for the RF signal.
It outputs to E out (Pin 70) terminal by initially changing switching AMP gain of DVD and CD, and then adjusting the level in RF SUM A C.
RF SUM and A C is Contvolled by PWM Signal and pin 78 80.
E out Pin is Connected E in.

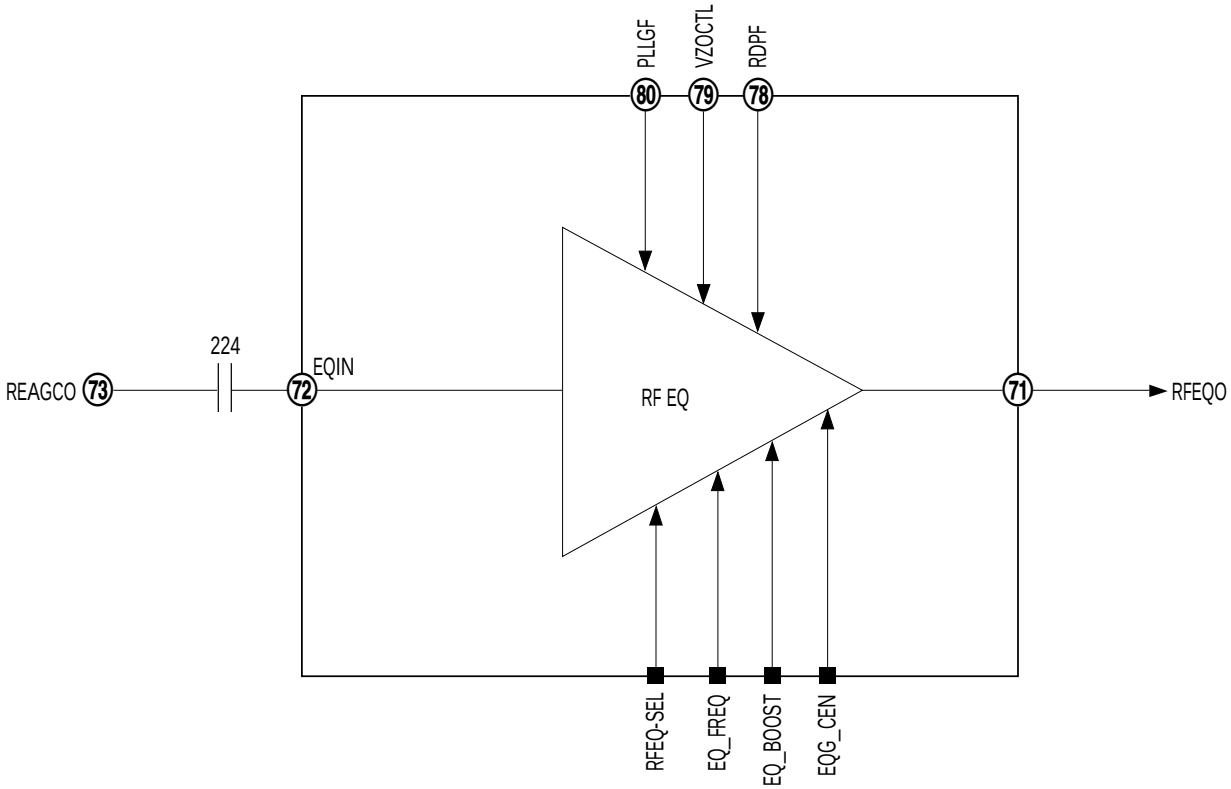


Fig. 7-43

The control parameters of DVD E and CD E are as follows.

(1) DVD CD E control parameter

❶ E CEN E BOOST : Changes the gain of peak frequency with E frequency characteristic.

❷ E FRE : Changes the peak frequency with E frequency characteristic.

7-14 DVD Servo

(1) Outline

SERVO system of DVD is Compoced of Focusing SERVO, Tracking SERVO, SLED Linked SERVO and CLV SERVO (DISC Motor Control SERVO).

1) Focusing SERVO : Focuses the optical spot output from object lens onto the disc surface. Maintains a uniform distance between object lens of Pick-up and disc (for surface vibration of disc).

2) Tracking SERVO : Make the object lens follow the disc track in use of tracking error signal (created from Pick-up).

3) SLED Linked SERVO : When the tracking actuator inclines outwardly as the object lens follows the track during play, the SLED motor moves slightly (and counteracts the incline).

4) CLV SERVO (DISC Motor Control SERVO) : Controls the disc motor to maintain a constant linear velocity (necessary for RF signal).

(2) Block Diagram

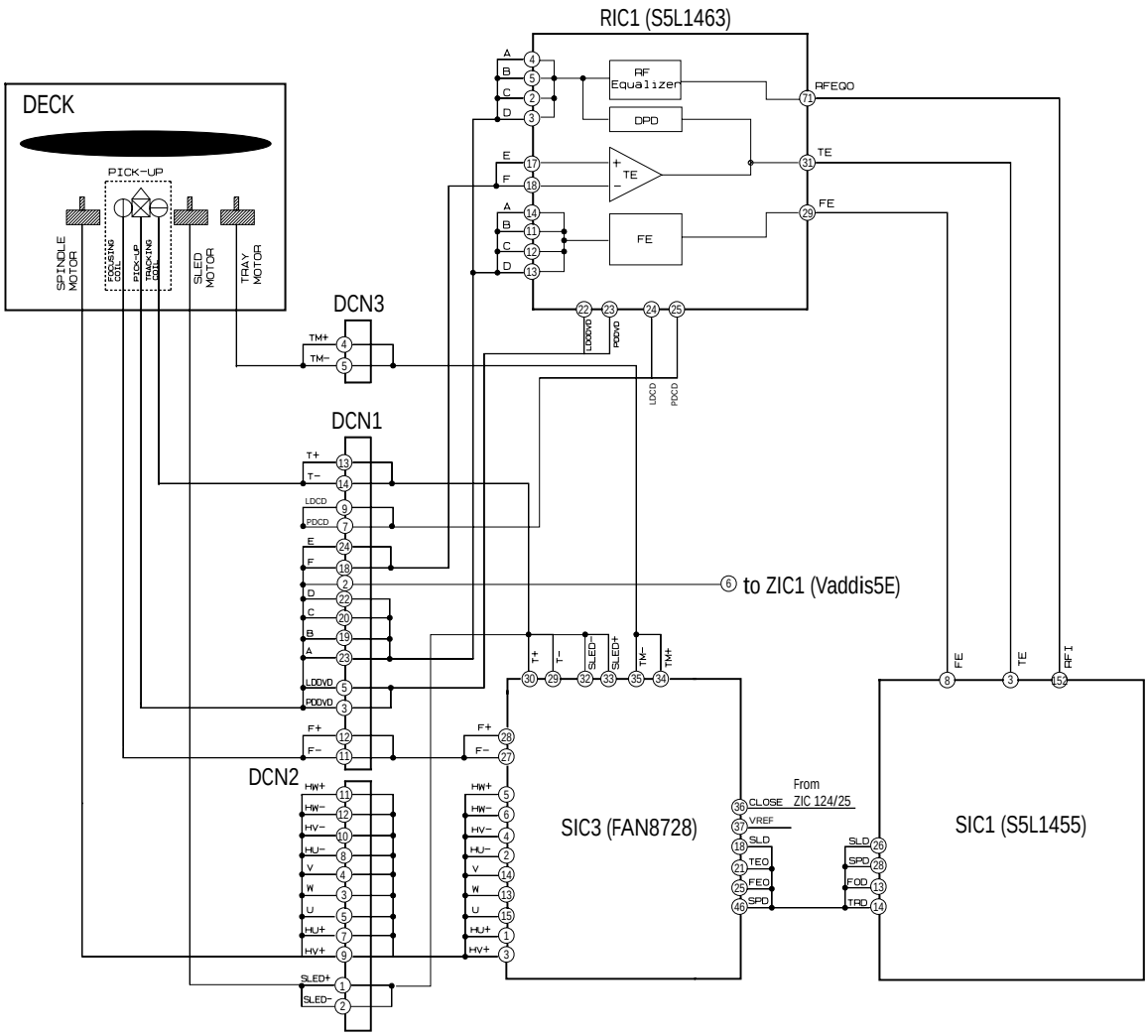


Fig. 7-44

(3) Operation

1) FOCUSING SERVO

(a) Focus Input

The focus loop is changed from open loop to closed loop, and the triangular waveform moves the object lens up and down (at pin 13 of SIC1 during Focus SERVO ON.) At that time, S curve is input to pin 8 of SIC1.

ABCD (pin 34 of RIC1) signal, summing signal of PD A, B, C, D, is generated, and zero cross(1.65V) point occurs when S curve is focused and ABCD signal exceeds a preset,constant value. The focus loop is changed to closed loop, and the object lens follows the disc movement, maintaining a constant distance from the disc. (these operations are same in CD and DVD).

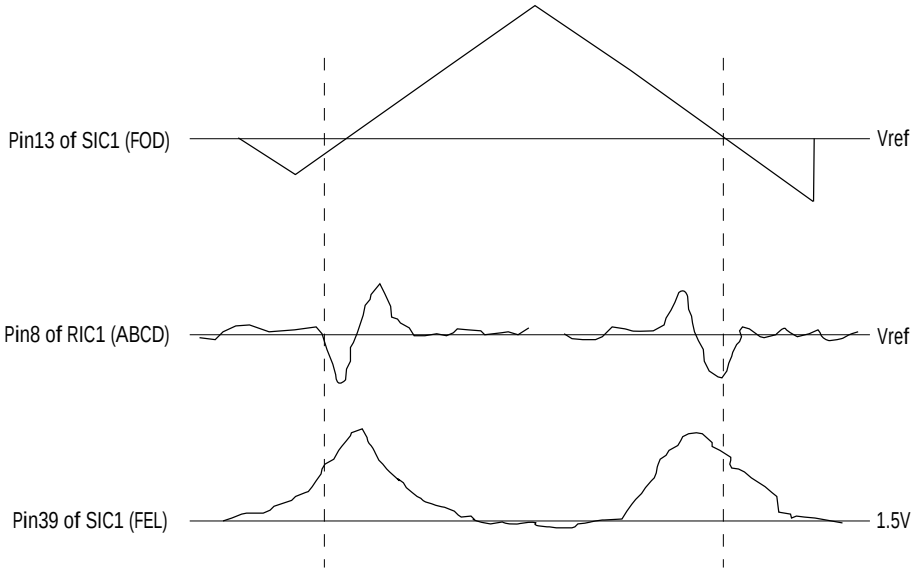


Fig. 7-45

(b) Play

When focus loop closes the loop during focus servo on, both pin 65 and pin 75 of SIC1 are controlled by VREF voltage (approx. 1.65V), and pin 26, 27 of SIC3 are approximately 2.5V.

2) TRACKING SERVO

A. NORMAL PLAY MODE

❶ For DVD

Composite : The signal output from PD A, B, C, D of Pick-up, the tracking error signal (pin31 of RIC1) uses the phase difference of A+C and B+D in RIC1, and inputs to terminal 3 of SIC1. Then, it is output to SIC1 pin 14 via digital equalizer, and applied to the tracking actuator through SIC3.
Pin 14 of SIC1 is controlled by VREF(approx. 1.65V) during normal play.
Meanwhile, DVD repeats the track jump from 1 to 4 in inner direction at normal play (because data- read speed from disc is faster than data output speed on screen).

❷ For CD, VCD

Receive the signal output through E, F of Pick-up, from RIC1. The tracking error signal is similar to DVD.

B. SEARCH Mode :

Search mode : Fine seek,(Moving the tracking actuator slightly little below 255 track) and coarse search, moving much in use of sled motor. The coarse search will be described in sled linked servo and now, the fine seek is explained shortly.
If the object lens is located near target, cut off the tracking loop and give the control signal as many as desired count to move the tracking actuator via SIC1 pin 14 terminal(TRD).

3) SLED LINKED SERVO

Normal play mode
Move SLED motor slightly by means of PWM signal in SIC1 pin 26, as the tracking actuator moves along with track during play. Control to move the entire Pick-up as the tracking actuator moves.

Coarse serach mode
In case of long-distance search (such as chapter serach), SIC1 uses MIRR and T C signal of SIC1-37, 15 .
Then, read ID and compute the existing track count after input of next track.
If the existing track count is within fine seek range, tracking begins using fine seek.

4) CLV SERVO(DISC MOTOR CONTROL SERVO)

Input RF signal (from Pick-up) to SIC1 pin 152.
Detect SYNC signal from RF in SIC1, and output PWM signal to SIC1 pin 28 for constant linear velocity.

7-13 DVD Data Processor

(1) Outline

SIC1(S5L1455) performs Sync detection, EFM demodulation and error correction and Spindle motor control (CLV control) after inputting sliced EFM signal of RF signal at disc playback and EFM read clock (PLC) signal generated from PLL. Outputs data which converted to the last audio and video from A / V decoder (IC1). SIC1 uses external memory(4M DRAM) as buffer as well as for error correction and carries out Variable Bit Rate transfer function. VBR function uses the external buffer as buffer to absorb the difference of transfer rate occurring because the transfer rate of disc playback is faster than data transfer rate demanded by A / V decoder (Video / Audio Signal Process Chip).
In case of general disc refresh, the memory is almost filled up periodically. It is because Write rate to memory after disc playback and signal process is faster than Read of A / V decoder. When the memory is filled, this status is reported by interrupt to main micom, which controls the servo to kick back the pick-up to the previous track after memorizing the last data read from disc until now. It takes some times to jump to the previous track and return to the original(jump location) again. The memory will have an empty space because A / V decoder reads out data of memory.
When the memory has an empty space, where data can be processed and written and the pick-up correctly gets to the original location(before kick back location) again, it reads data again avoids the interrupt of data read previously. The basic operation repeats to perform as described above.

(2) Block Diagram

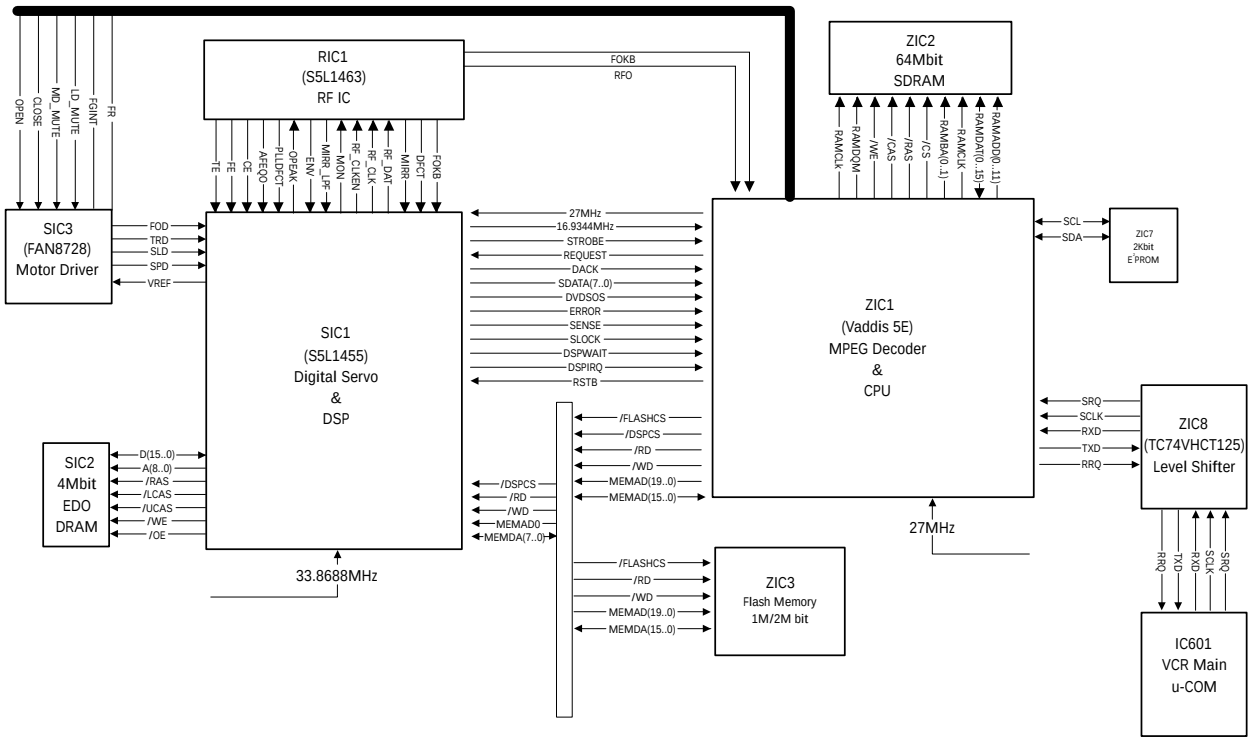


Fig. 7-46

(3) Waveform Description

It measures the timing that data processed in SIC1 at DVD playback.

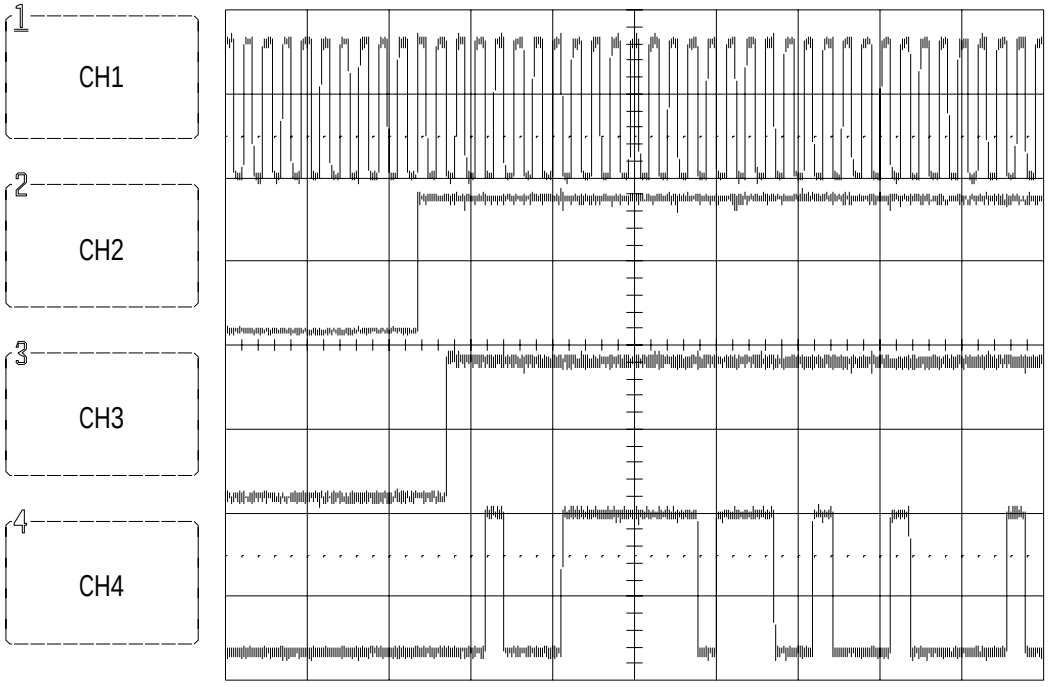


Fig. 7-47

- CH1 : STROBE (SIC1-123, CLOCK)
- CH2 : REQ (SIC1-124, DATA REQUEST)
- CH3 : DACK (SIC1-125, DATA ACKNOWLEDGE)
- CH4 : SDATA (SIC1-126~133, SDATA)

7-14 DVD Video

(1) Outline

IC1(A/V decoder with video encoder) diverges from the 27MHz crystal, then generates VSYNC and HSYNC.
IC1(A/V decoder with video encoder) does R B encoding, copy guard processing and D/A conversion of 8bit video data internally inputted from video decoder block by Micro Process block.
Video signal converted into analog signal is outputted via amplifier of analog part.

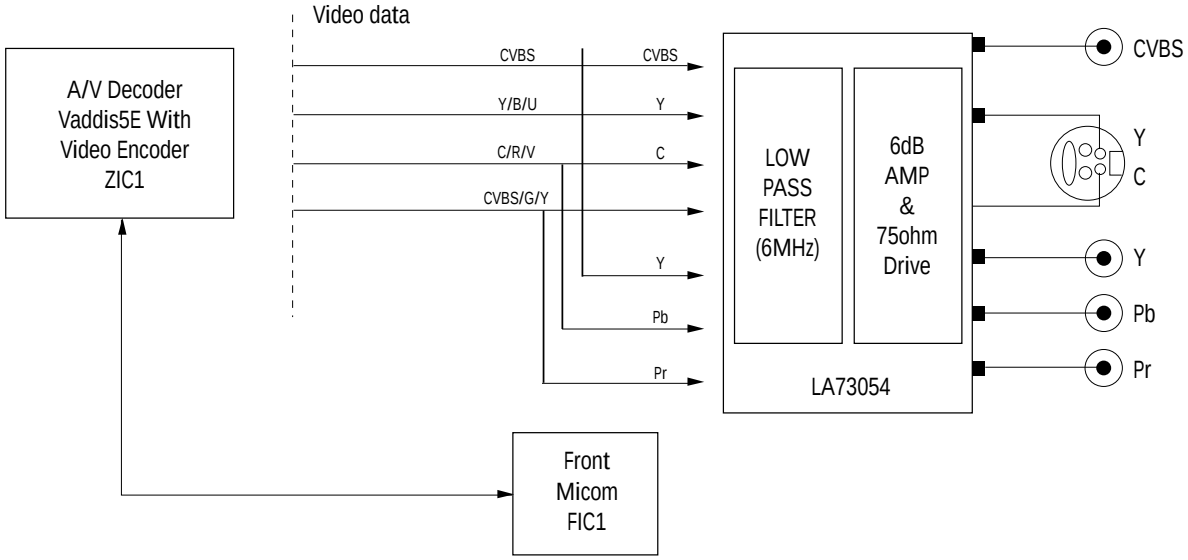


Fig. 7-48 Video Output Block Diagram

(2) NTSC/PAL Digital Encoder (VADDIS 5E ; Built in video encode)

IC1 inputted from pin 161 with 27MHz generates HSYNC and VSYNC which are based on video signal.
IC1 is synchronous signals with decoded video signal and control the output timing of 8bit video signal of ITU-R601 format. The separate signal is encoded to NTSC/PAL by control of MIC1.
The above signals, which are CVBS (Composite Video Burst Synchronized)/ (REEN)/Y PIN13 , Y (S VIDEO)/B (BRUE)/Pb PIN145 and C (S VIDEO)/R (RED)/Pr PIN151 , are selectively outputted CVBS +S VIDEO, R B/Component by the rear switch. In Course of encoding, 8bit data can extend to 10bit or more. To convert the extended data to quantization noise as possible, IC1 adopts 10bit D/A converter.
IC1 perform video en-coding as well as copy protection.

(3) Amplifier (VIC1: LA73054)

VIC1 is 6dB amplifier.
Based on CVBS signal, the final output level must be 2Vpp without 75ohm terminal resitance.
Because the level of video encoder output is only 1.1Vpp, the level is adjusted with the special amplifier.
When mute of pin 5 is high active, if the pin is floating and connecte to power, the output signal is never ouputted.
CVBS, Y, C, R, Pb(B), Pr(R) outputted from video encoder are inputted to VIC1 (Pin 2, 8, 6, 16, 14).
The signal to which gain is adjusted by amplifier is outputted from jack via 75ohm Resistance (VR11 VR16).

7-15 DVD Audio

(1) Outline

A/V decoder (IC1 Vaddis 5E) is supply to DATA 0 for 2-channel mixed audio output.
The audio data transmitted from A/V decoder (IC1 Vaddis 5E) are converted into analog signal via audio D/A converter and outputted via post filter and amplifier.
CD and VCD are outputted with only 2 channels audio data and transmit them to Data 0.
If DVD of multichannel Source disc, if is downmixed and transmit them to Data0.
If you want to listen to the multichannel output, you have to connect digital output with AC-3 amp or MPE /DTS amp.

(2) Block Diagram

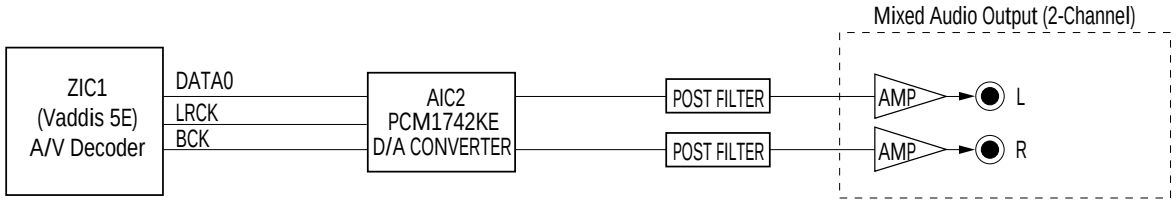


Fig. 7-49

(3) DVD Audio Output

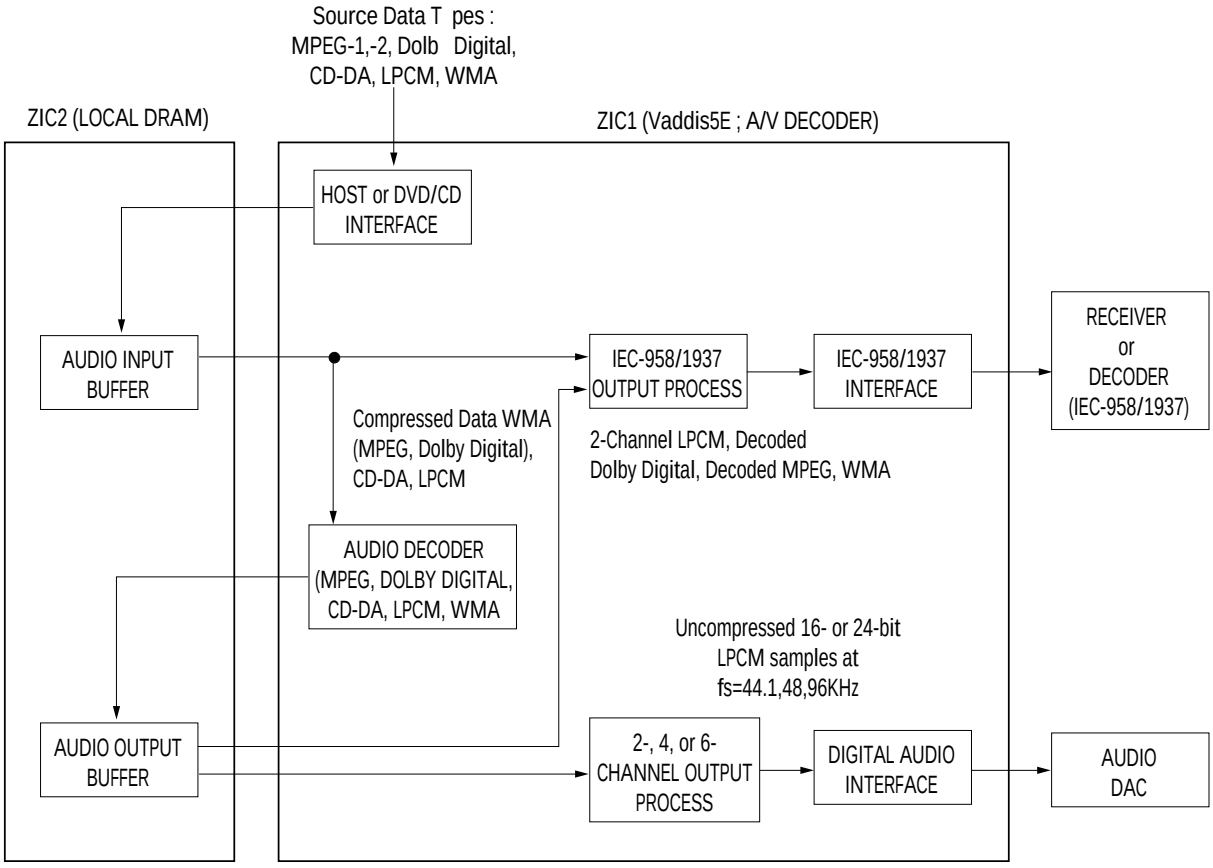


Fig. 7-50 Audio Decoder and Output Interface Datapath

1) Compressed Data

The audio data inputted to IC1 (Vaddis 5E) A/V decoder is divided into compressed data and uncompressed data.
It is compressed data that is compressed with multi-channel audio data such as Dolby digital, MPE , DTS, WMA,etc. The compressed data inputted to IC1 (Vaddis 5E) is converted into the uncompressed data of 2, 4, and 6 channels through IC1 built-in audio decoder and is outputted to Data 0 through digital audio interface. The compressed data is transmitted to external AC-3 amplifier or MPE /DTS amplifier as IEC- 58/1 37 transmission data format compressed by IC1 built-in IEC- 58 output process.

2) Uncompressed Data

The uncompressed data is that data isn't compressed, so it is called CD-DA, LPCM data.
The 2 channels data is converted through audio decoder 2-channel data and Data 0 and are outputted in digital audio interface.Via IEC- 58 output process, they is transmitted to digital amplifier or AC-3/MPE /DTS amplifier built in the external digital input source with IEC- 58/1 37 transmission format.

8. VCR Deck Operating Description

8-1 Features of Mechanism

The following items describe features of the mechanism in VCR.

(1) This VCR uses 3-motor system consisted of a cylinder motor, capstan motor, and loading motor.
A capstan motor is used to drive the reel and the driving force is transmitted throuch the belt capstan.
The cassette loading, tape loading, and mode shift operation are performed by the loading motor.

(2) The time duration from cassette-in to picture appearance is shortened by employing the loading drive mechanism (automatic transferring operation from the cassette loading to the tape loading by rotating the loading motor continuously), and by increasing the speed of the tape loading, etc

(3) Employment of the full loading system shortens time required to shift the mode such as STOP to PLAY-BACK picture display.

(4) To simplify wiring and others, the electrical components relating to operation of the mechanical deck, such as sensors, mode switch, servo microcomputer, etc. are mounted on the PCB arranged all over the bottom side of the mechanical deck.

8-2 Basic Configuration of Mechanism

As shown in Fig. 8-1, the mechanism of VCR is configured with five main blocks, and each operation is precisely controlled by the microcomputer built in the system control section.

First, load a video cassette tape in VCR :

(1) The cassette is automatically set on the reel disc.

(2) The tape is pulled out from the cassette, and wrapped around the cylinder.

(3) The cylinder turns in a constant speed rate synchronizing with the vertical Sync. signal of video signal.

(4) The tape runs in synchronization with cylinder rotation and traces the video tracks precisely.

(5) The running tape is taken up by the reel, the tape feeding side is given with a proper tension so that tape is not slacked.

The above series of operations are performed under control of the system control section. The system control section also sends commands to each mechanism according to the operation buttons, thus the VCR is designed so that various operations such as recording, playback, special playback, FPS/RPS, and FF/REW, etc. are correctly performed.

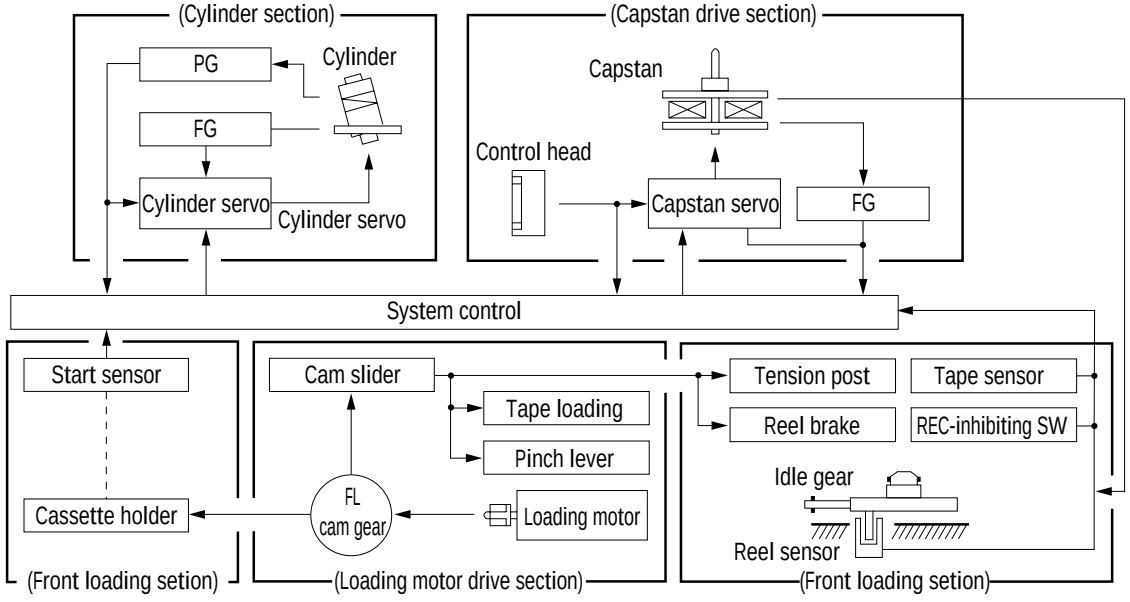


Fig. 8-1 Basic Configuration of Mechanism

8-3 Main Mechanism and Functions

8-3-1 Tape Path System

The tape come out from the supply reel (S) of the video cassette runs through paths shown in Figs. 8-2 and 8-3, and is taken up by the take-up (T) reel. (S stands for the supply reel, and T for the take-up reel, hereafter.)
At S reel side (tape enterance side of the cylinder) against the cylinder, a tension post to allow the tape surface to contact with each head with a proper tension which assures stable running, an FE head which erases entire data of the tape, and an S guide roller which restricts tape motion in upward / downward direction are provided.
In the same way, a T guide roller, audio head to record audio signals at upper side of the tape, control head to record and reproduce a control signal at lower side of the tape, and an audio erase head to erase only the audio signals and perform after-recording in parallel with the audio head are provided at T reel side. (tape exit side of the cylinder).
The guide parts marked with asterisks (*) are equipped with the adjusting mechanism to stabilize the tape running or to record and reproduce the signals precisely.

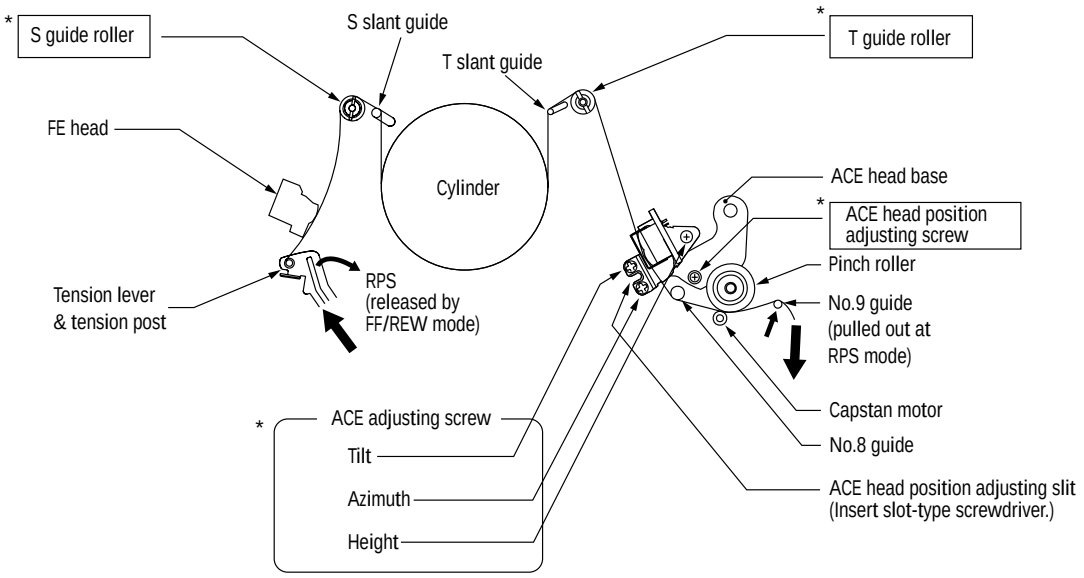


Fig. 8-2 Tape Path System

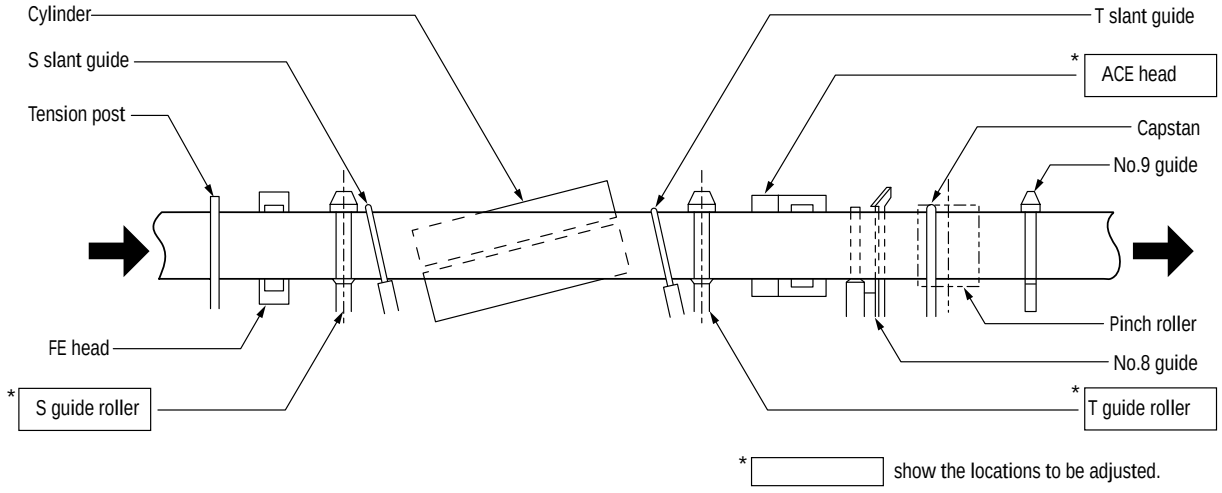


Fig. 8-3 Guide Path System

8-3-2 Reel Drive System

The reel drive system consists of a capstan motor as a drive power source, belt as a power transmission mechanism, clutch mechanism, idle gears, and a reel disc. Selecting of forward rotation or reverse rotation is carried out by an idle gear which changes its rotating direction according to rotating direction of the clutch holder.
Reel take-up torque is selected according to an operation mode.
In the record, playback, fps, rps modes, the reel take-up torque is controlled by the clutch mechanism, thereby the tape fed by the capstan is taken up with a proper torque.
In the FF and REW modes, the clutch enters a direct connecting status in which the clutch mechanism does not operate and the capstan drive torque is transmitted without reduction, so a high speed taking-up is enabled.

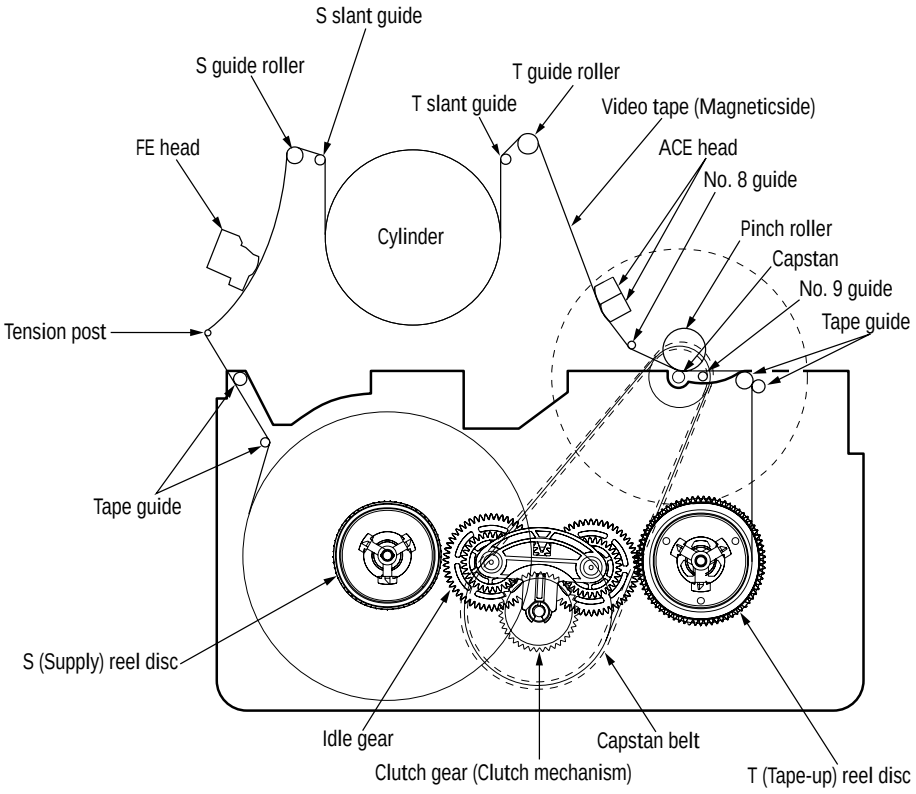


Fig. 8-4 Reel Drive System

8-4 Basis of the Mechanism

8-4-1 Front Loading

(1) When a video cassette is inserted into the cassette holder and pushed furthermore, FL arm lever is rotated by motion of the cassette holder. The rotation of FL arm lever makes the horizontal moving of FL drive slider.
(2) When the information of Start Sensor OFF is transmitted to the microcomputer, the loading motor starts to rotate.
(3) The rotation is transmitted in a sequence shown below :
Loading motor - worm gear - worm wheel - FL Cam Gear - FL Drive Slider - FL Arm Lever - Cassette Holder
(4) The video cassette is horizontally moved.
(5) The cassette tape is vertically moved.
In this case, the cassette lid is opened.
(6) The cassette tape is set on the reel disc, and loading operation completes.
(7) The cassette tape is loaded.
(8) The status becomes full loading.
(9) When the cassette is out, the reverse steps of the above procedure are carried out.

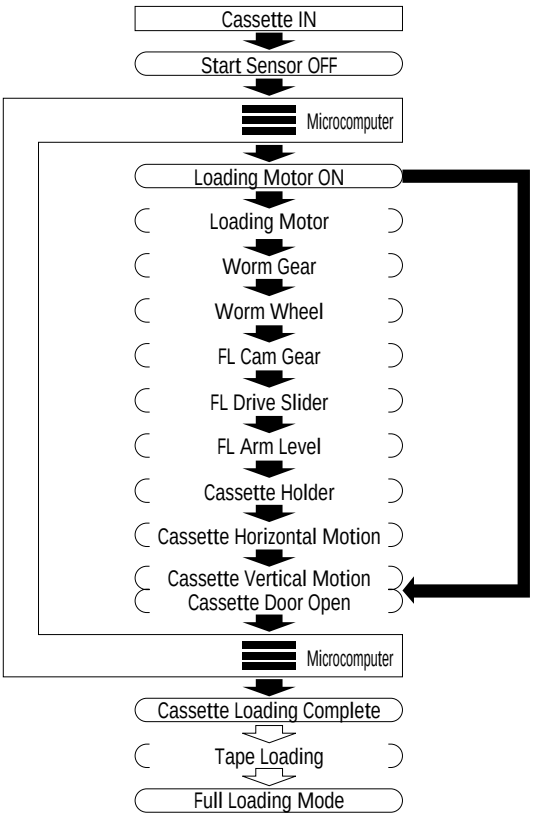


Fig. 8-5

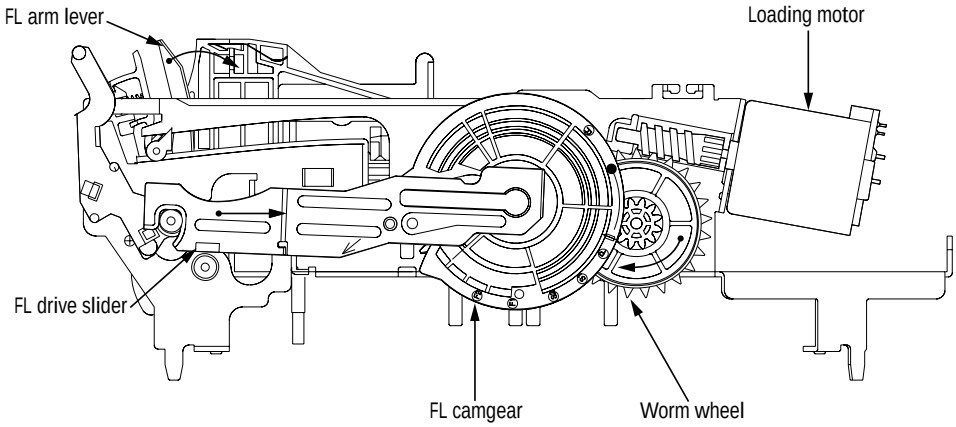


Fig. 8-6 Drive Transmission Path

8-4-2 Cassette loading/unloading Modes

When a cassette is entered in the VCR, the cassette is set on the reel disc by the front loading mechanism.
In this case, the tension post, loading tape guide, capstan motor, and the No.9 guide are positioned inside of the tape in the cassette case.

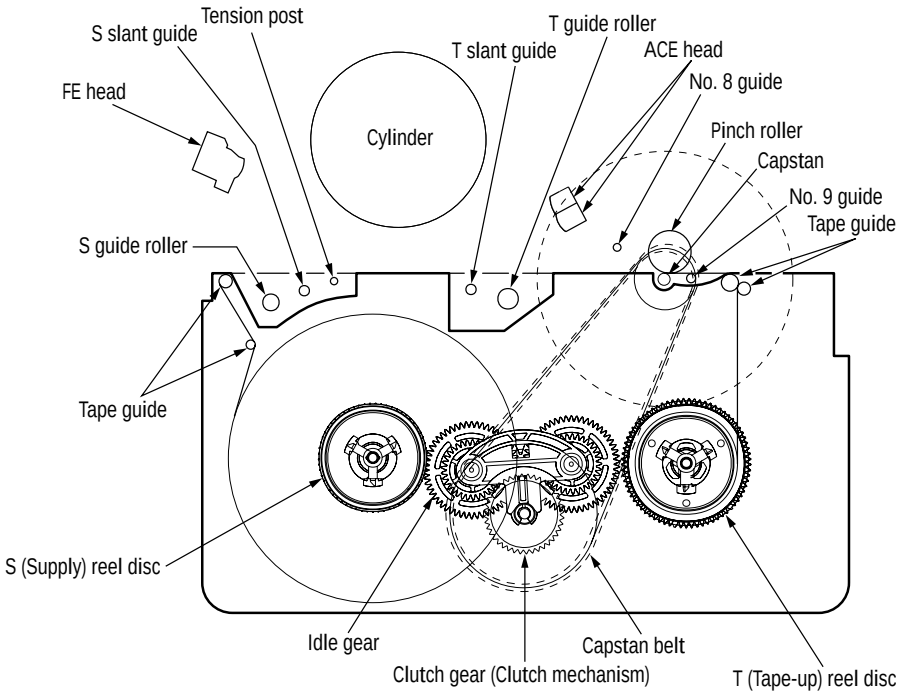


Fig. 8-7 Cassette IN/OUT Mode

8-4-3 Tape Loading

A full loading system is employed.
In the full loading system, the tape loading starts at the same time when the cassette loading operation has completed and cassette has been mounted, and the tape is pulled out, wrapped around the cylinder and the mechanism enters the stop status under this condition.

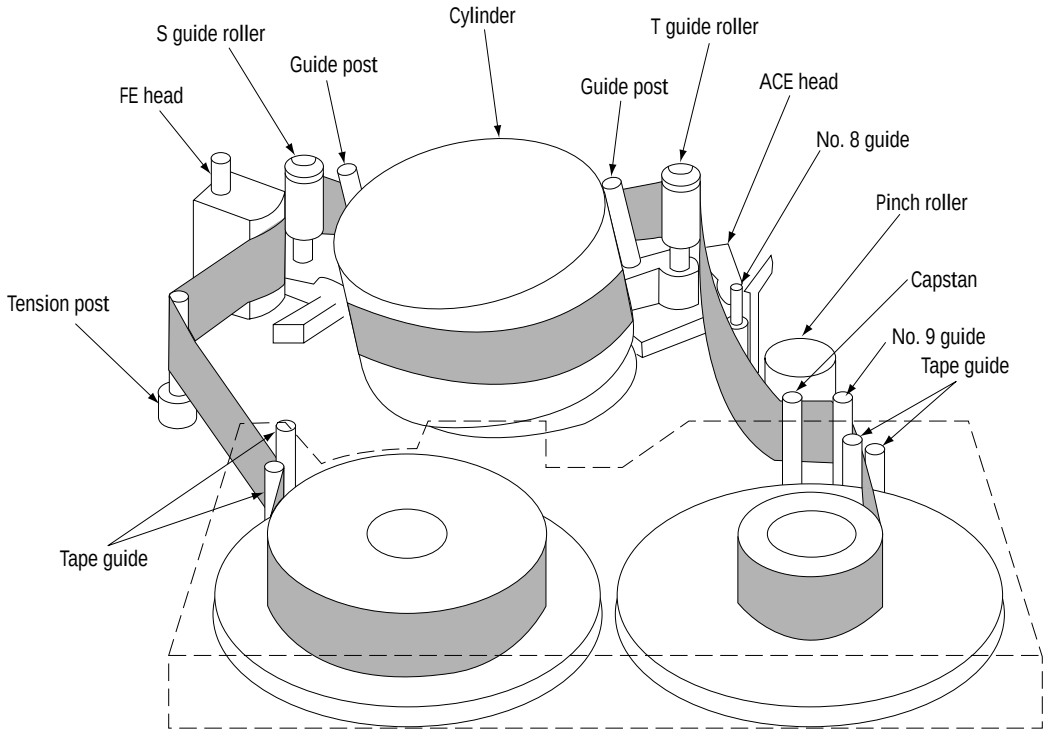


Fig. 8-8 Tape Loading

8-4-4 Playback Standby Mode

In the full loading system, the tape loading starts at the same time when the cassette mounting has completed, the mechanism shifts to the playback position, and enters the standby status with keeping tape wrapped around the cylinder.
In this case, tape tension applied to the cylinder is decreased to protect the tape and to prevent the tape from scratches.

8-4-5 FF/REW Modes

The reels enter a free status by rotating the loading motor to go to FF/REW position.
In this case, the capstan motor rotates in colck-wise direction in the REW mode. The idle gear is swung rightward or leftward according to the rotating direction of the capstan motor. As a result, the T reel rotates in the FF mode or the S reel rotates in the REW mode, thus taking up the tape to the rotating reel.

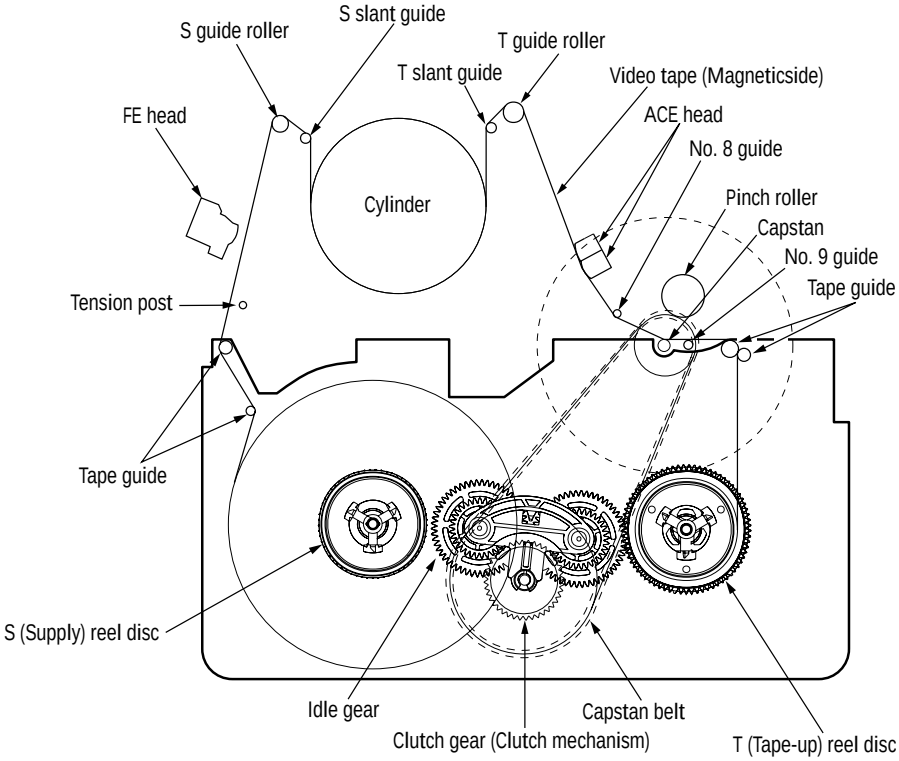


Fig. 8-9 FF/REW Mode

8-4-6 Record/Playback Modes

When the record or playback button is pressed, the tape is fed by the rotation of the capstan motor.
In this case, a tension post touches the tape and braking froces created by the band brake linked with the tension post is applied to the S reel, thereby stabilizing the tape tension. The tape fed by the capstan is taken up around the T reel. The T reel is driven with a constant torque generated by transmitting rotation of the capstan motor to the clutch mechanism.

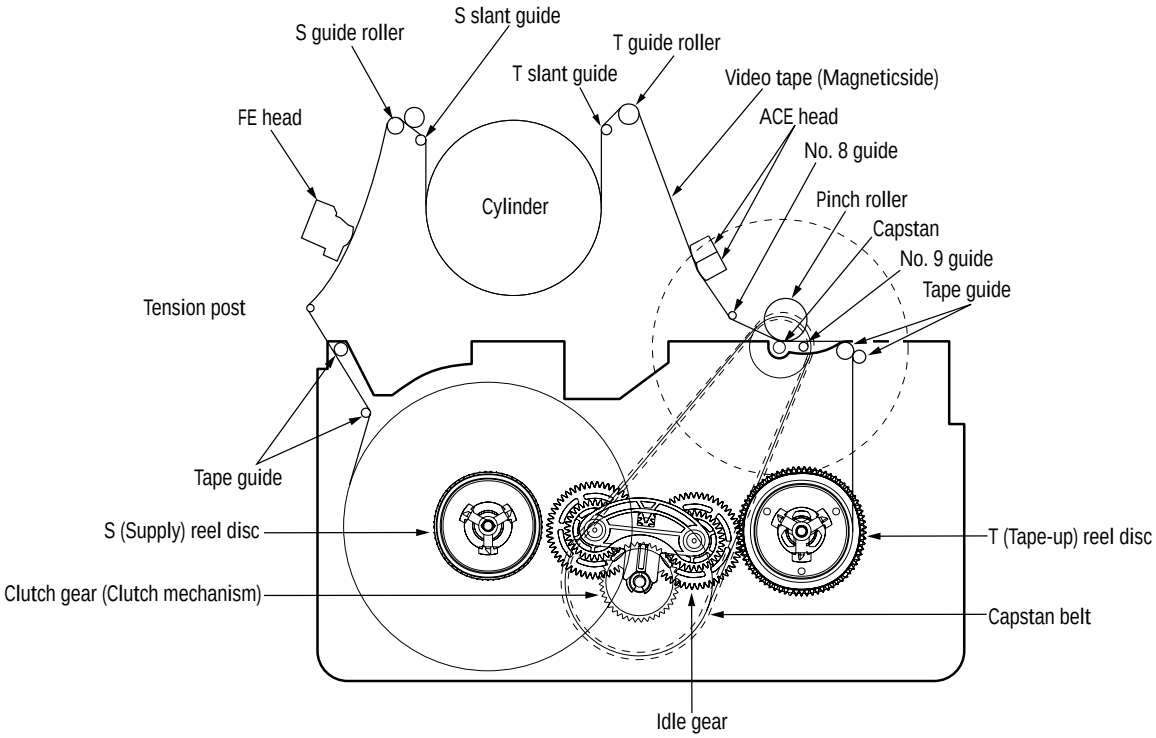


Fig. 8-10 Record/Playback Mode

8-5 System Control

In the VCR, complex mechanism, video, audio, servo circuits, etc. must be operated in specified timings matched each other. The system control circuit performs entire controls for the VCR.
An automatic stop function is also provided to protect important tape if a trouble occurs on the complex mechanism and the electrical circuits.
For this purpose, status of each part of the mechanism is always monitored with various sensor switches, and the microcomputer controls collectively the unit so that the best condition is kept.
Moreover, the microcomputer controls signal switchings for each circuit according to the mechanism status.

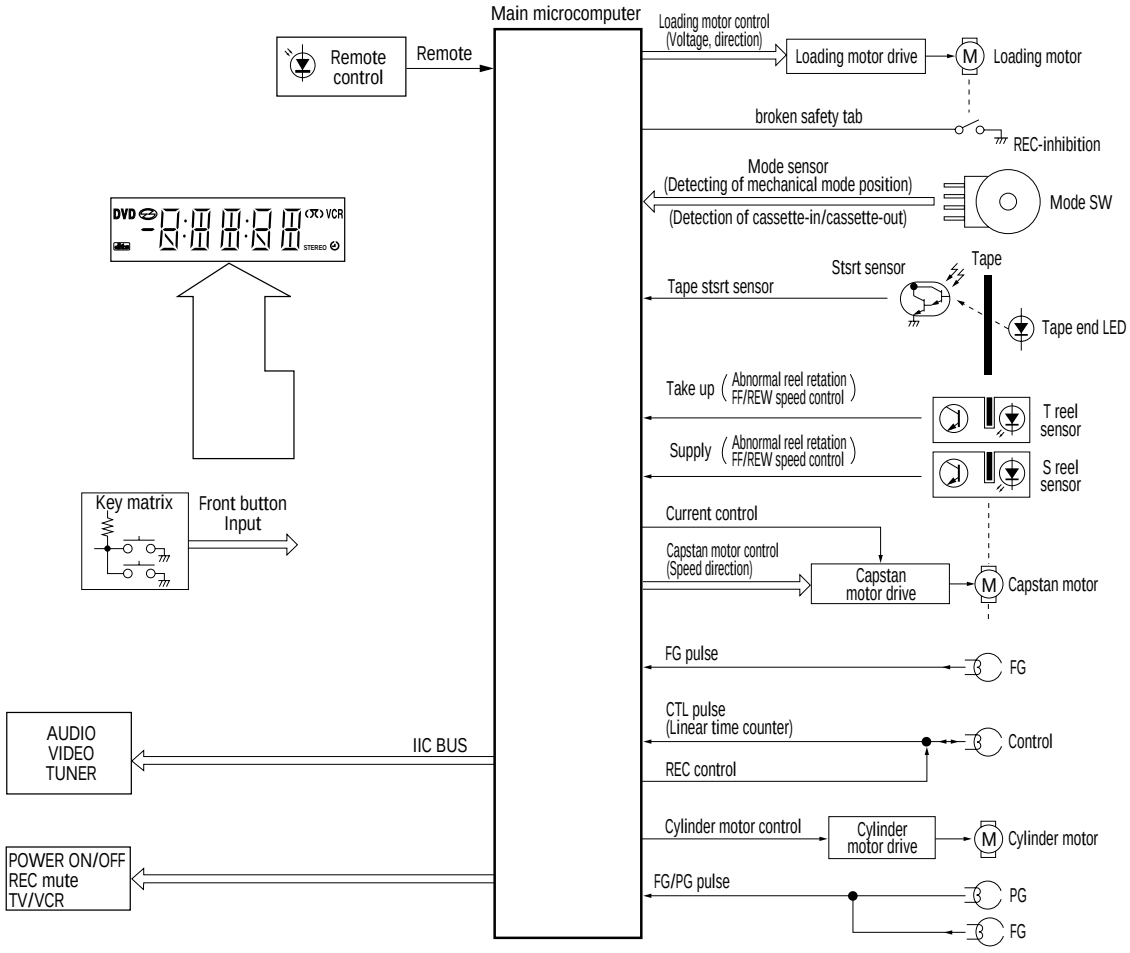


Fig. 8-11 System Control Block Diagram

8-6 System Control and Mechanical Operations

8-6-1 Mechanical Operation

The operation of mechanism is performed by rotation of the loading motor, and the transmission path of the operation is as shown in Fig. 8-12.

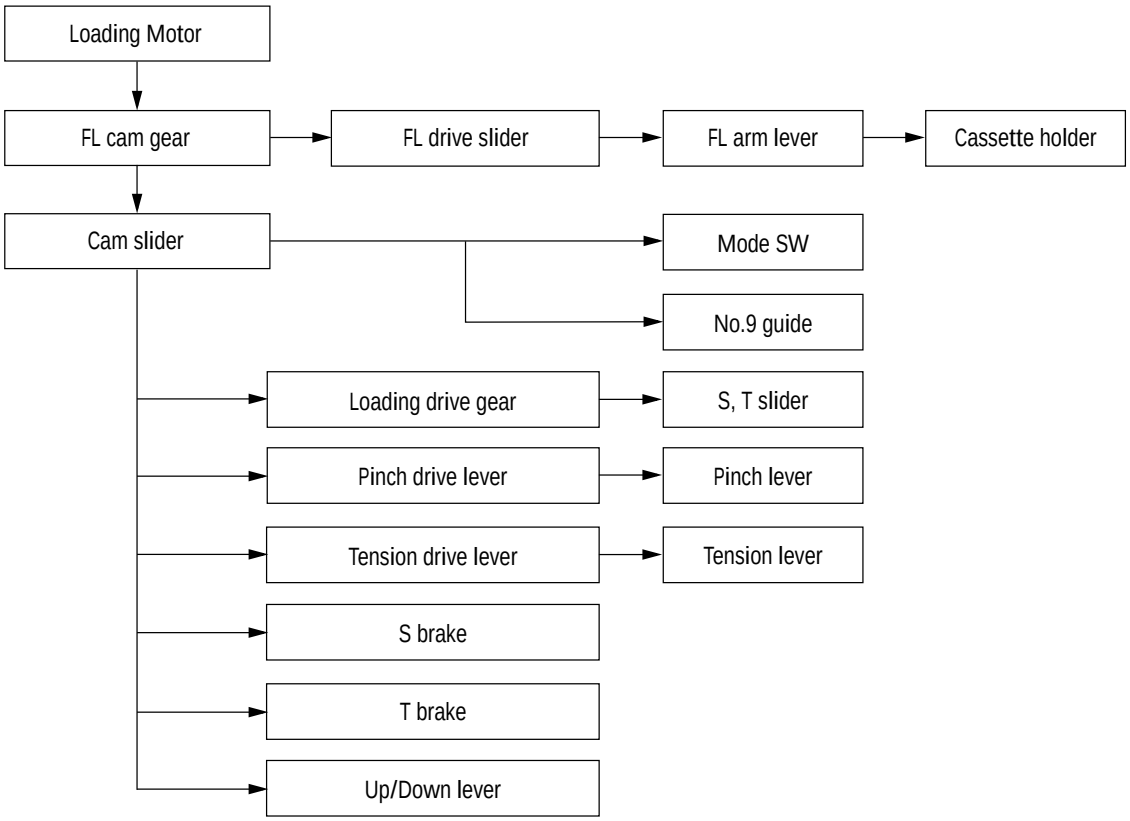
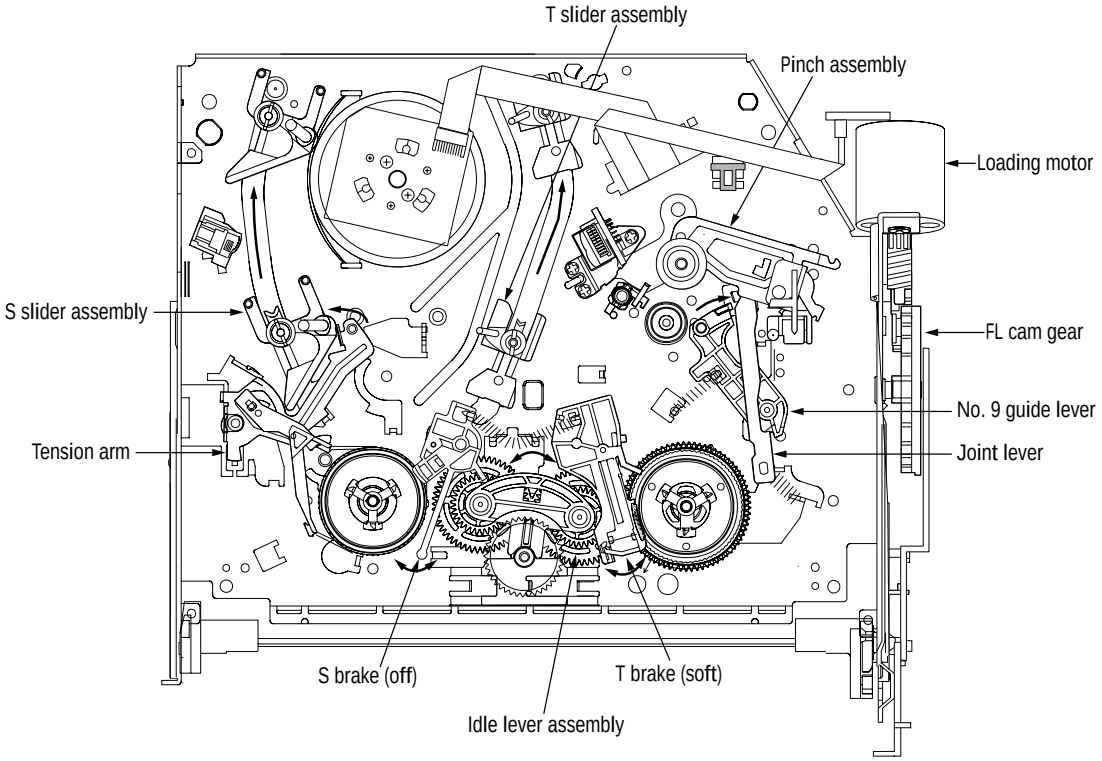


Fig. 8-12 Transmission Path of Operation

Fig. 8-14 shows each mode and mechanism status in each mode concerned with the rotation of the FL cam gear or cam slider shift. The mechanism operates as shown in Fig. 8-13 according to the timing chart in Fig. 8-14.

Note :
The Start Sensor is actuated by the horizontal moving of Slider FL Drive and turned on or off by insertion or ejection of a cassette.

<Top View>



<Bottom View>

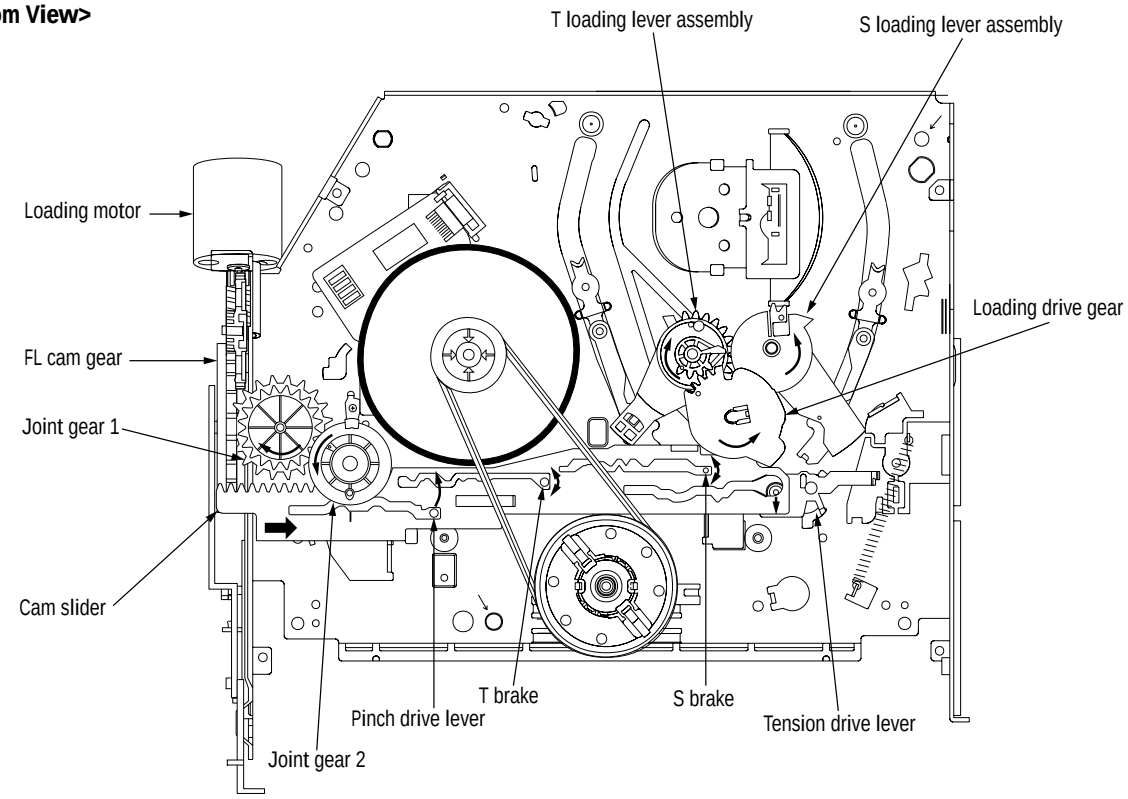


Fig. 8-13 Mechanical Operation

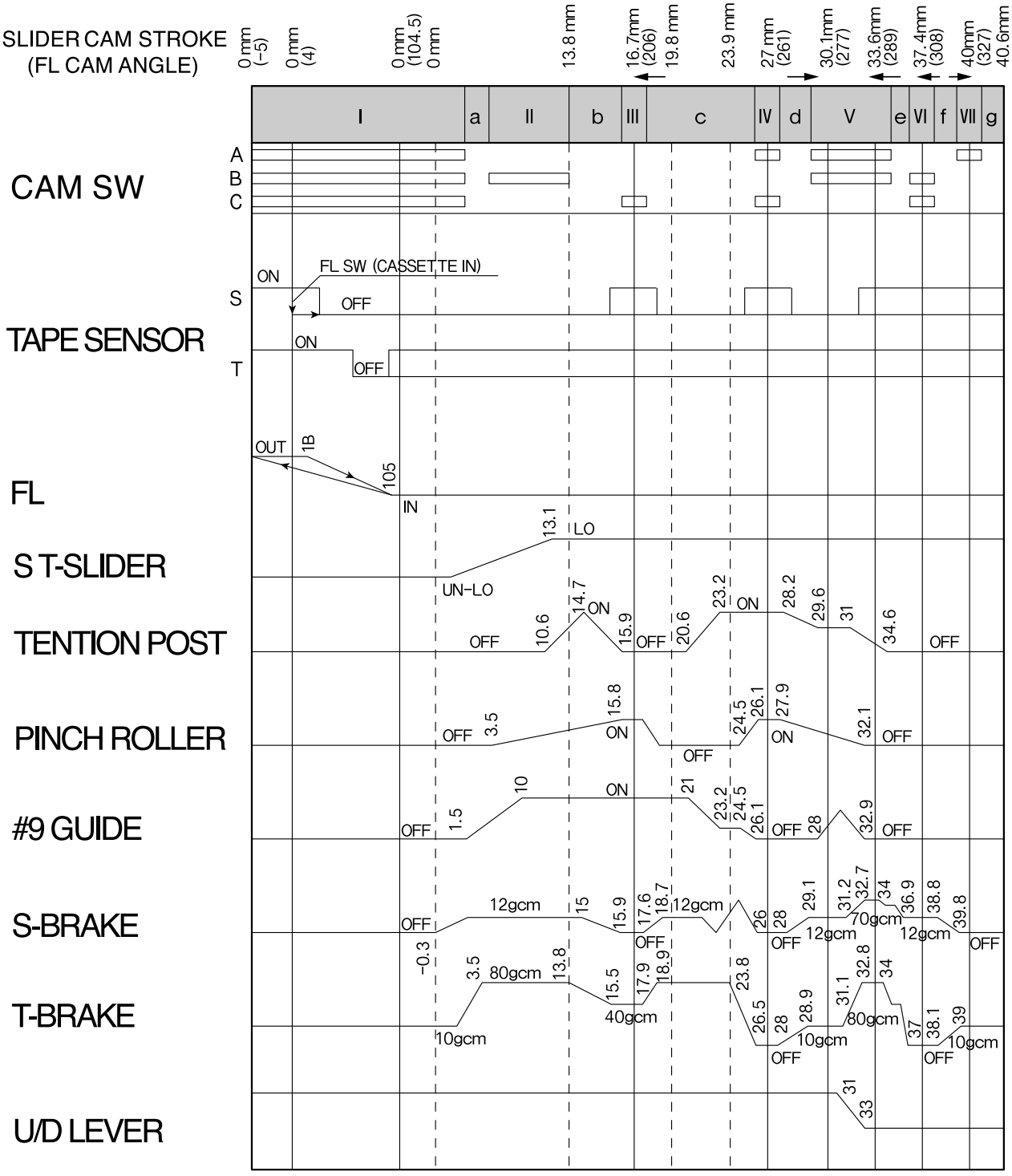


Fig. 8-14 Mecha Timing Chart

(1) There are two STOP modes and two FF/REW modes.

1) STOP 1

This mode is performed when PB and FF/REW is not done for 5 miniute at power on.
The small load is given to S REEL DISC and T REEL DISC. And the cylinder motor is stopped.

2) STOP 2

This mode is performed when you press the stop button as performing FF/REW.
The large load is given to S REEL DISC and T REEL DISC.

3) FF/REW 1

This mode is performed when

❶ The tape load is small during performing FF and reducing speed.

❷ The tape load is large during performing REW.

The small load is given to S REEL DISK and no load is given to T REEL DISC.

4) FF/REW 2

This mode is performed when

❶ The tape load is large during performing FF.

❷ The tape load is small during performing REW and reducing speed

No load is given to S REEL DISK and the small load is given to T REEL DISK.

(Cf) According to acceleration, deceleration, and the location of tape, tension control which is caused by converting FF/REW 1 and FF/REW 2 each other is performed during FF or REW.

(2) The condition of S Brake and T Brake at each mode.

< S BRAKE>

1) OFF BRAKE (Unloading completion, RPS, PLAY, FF/REW 2)

- S BRAKE is detached from S REEL DISC completely. So S REEL DISC is free.

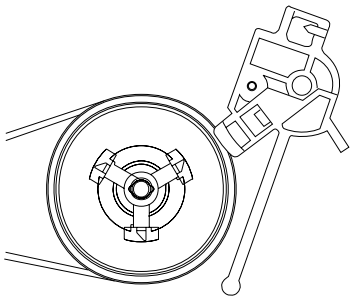


Fig. 8-15

2) SOFT BRAKE(during LOADING, STOP 1, FF/REW 1)

- The small load is given to S REEL DISC.

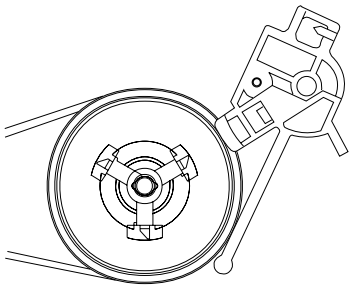


Fig. 8-16

3) MAIN BRAKE (STOP 2)
- The large load is given to S REEL DISC.

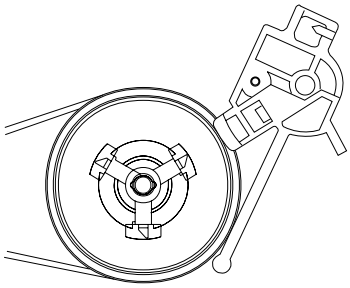


Fig. 8-17

< T BRAKE>
1) OFF BRAKE (PLAY, FF/REW 1)
- T BRAKE is detached from T REEL DISC completely. So T REEL DISC is free.

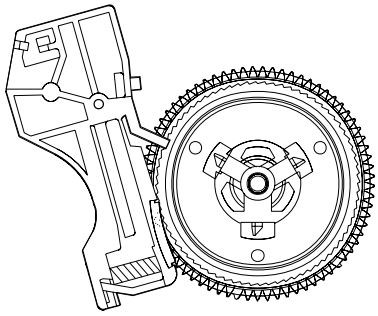


Fig. 8-18

2) SOFT BRAKE (UNLOADING Completion ,STOP 1, FF/REW 2)
- The small load is given to T REEL DISC.

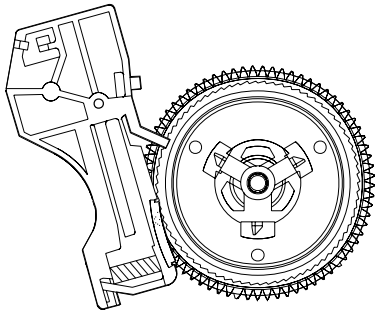


Fig. 8-19

3) REVERSE SEARCH BRAKE (RPS)
- The medium load is given to T REEL DISC.

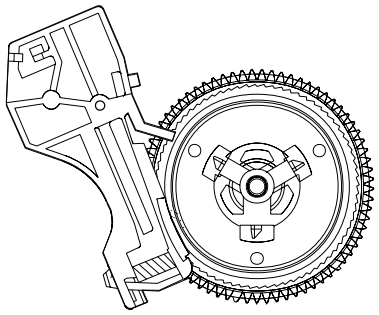


Fig. 8-20

4) MAIN BRAKE (on the loading, STOP 2)
- The large load is given to T REEL

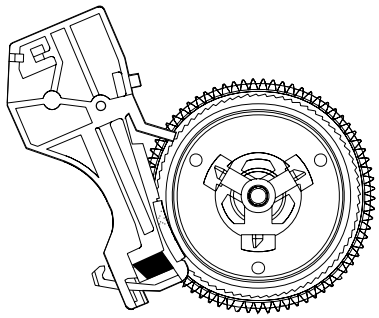


Fig. 8-21

8-6-2 Mode Sensor Drive

The mode sensor converts each mode of the mechanism into an electrical signal and transmits it to the microcomputer. The FL cam gear is rotated by the loading motor, and the cam slider slides after operation of the cassette holder.
Then the mode switch also rotates synchronized with the cam slider and outputs a signal corresponding to each mode. This signal is transmitted to the microcomputer and the microcomputer stops the cam slider at a specified angle, thus establishing each mode.
The IC601 controls Capstan Motor Drive IC for each mode to make the loading motor rotate in forward or reverse direction, thereby setting the mechanism at a specified position.
The mode switch develops three outputs A, B and C.
The circuit configuration of the mode sensor drive is shown in Fig. 8-22.

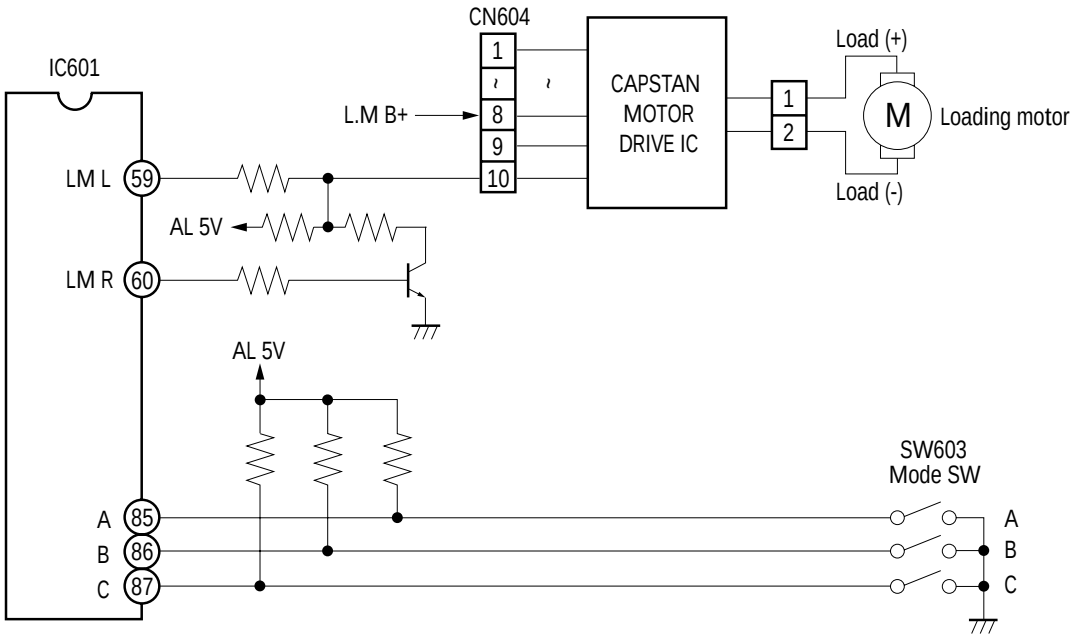


Fig. 8-22 Mode Sensor Drive

8-6-3 Operations in Each Mode

[1] Cassette loading & Tape loading mode

<Cassette loading>

(1) The FL cam gear is in the Cassette unloading (position I)position, and the cassette holder is in the out status (start sensor ON). Under this condition, each motor is stopped.

(2) Status of the mechanism is as follows.
   1) S.T guide rollers, tension post, No.9 guide are in unloading status and housed in the reel disc side.
   2) S brake is released and T brake is in soft brake status.
   3) The clutch holder assembly is in clutched status and idle lever assembly is enabled to be engaged with both S and T reel discs.

(3) When a cassette is inserted, the lock lever of cassette holder is released from the stopper, the cassette holder moves, the FL arm lever rotates, and the FL Drive Slider slides, thereby closing the start sensor.

(4) IC601 controls Capstan Motor Drive IC to rotate the loading motor in forward direction, and move the cassette holder. At the same time, the capstan motor rotates in the reverse direction and moves the cassette down (vertical motion) while rotating the S reel disc.

(5) The cassette lid opens when the vertical motion starts.

(6) When the vertical motion has completed and the cassette is mounted, the capstan motor rotates in the reverse direction. At that time the position “a” is detected with the cam slider shifted and the loading/capstan motors are stopped. After 300msec the loading motor rotates in the forward direction and enters the tape loading operation.

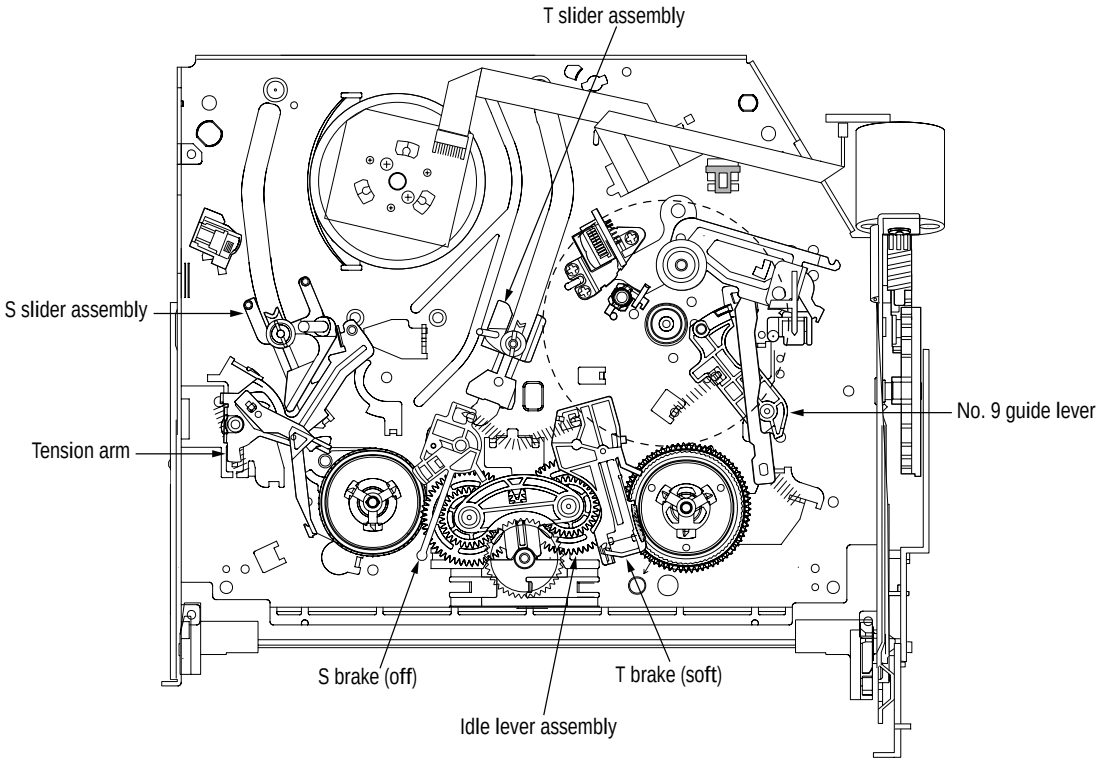


Fig. 8-23 Cassette-Loading Mode (Position I)

<Tape loading>

(1) After slot-in operation (cassette loading), FL cam gear rotates and the cam slider starts shifting, and a loading gear is ready to start.
Under this condition, the mechanism status is as follows :
1) The T main brake actuates so that tape does not com out from the T reel during the loading operation.
(2) The cylinder starts to rotates after the loading motor is rotated.
(3) When the cam slider reaches the position II (loading / unloading modes), the mechanism enters the loading status and operates as described below.
1) S,T sliders are moved through the loading drive gear and trun on the tension post.
2) The No. 9 guide is loaded.
3) The pinch roller is loaded up to front of the capstan.
4) The head cleaner is actuated during loading operation.
5) The S soft brake is actuated.
(4) When the cam slider passes through the position III, and detects the position IV (playback standby mode), the loading motor stops. Under this condition, the mechanism status is described as below :
❶ The pinch roller is pressed to the capstan.
❷ The No.9 guide is stored in the cassette.
❸ The tension post touches the tape, band brake force is applied, and the tension servo brake mechanism actuates.
❹ Brakes for the reel discs are all off.

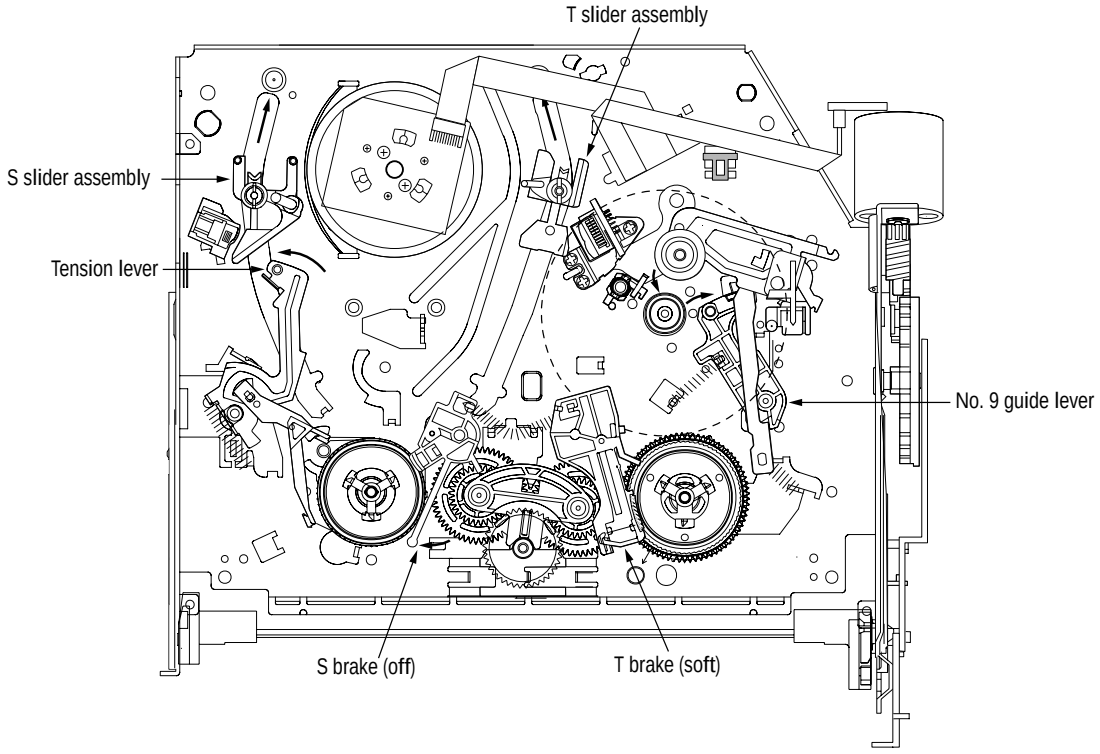


Fig. 8-24 Tape Loading Operation (Position II)

<Playback Stand-by (Stop) mode>

(1) The tape loading operation completes and the loading motor stops.
(2) In the same way as in the playback mode, the capstan motor rotates in forward direction and the T reel disc takes up the tape. (For more details, refer to the playback mode.)
(3) After running the tape for 0.6s, the mechanism rotates the capstan in the reverse direction for 0.3s to slack the tape properly with pinch roller pressed.
(4) If nothing is operated for about 5 minutes, the loading motor rotates in the forward direction and the cam position reaches the position V, and both the loading motor and the cylinder motor stop.
(5) During this period, the video and audio systems are in the same status as in the stop mode.

[2] Tape unloading & Cassette unloading

<Tape Unloading>

(1) When the [EJECT] button is pressed in the stop mode, the mechanism enters the eject mode.
(2) IC601 controls cylinder motor drive IC to make the cylinder motor rotates.
(3) IC601 makes the loading motor rotate in the reverse direction, and shifts the cam slider.
1) The mechanism components move in the reverse direction against the loading operation.
(4) When the cam slider reaches the position II, IC601 makes the capstan motor rotate in the reverse direction (LP X11) and takes up the tape at a specified torque using the clutch mechanism.
(5) When the cam slider reaches the position I, it brakes the capstan motor to stop, and then stops the loading motor after 230ms passed.

<Cassette unloading>

(1) Furthermore, IC601 makes the loading motor rotate in the reverse direction and also the capstan motor in reverse direction, applies braking force to the capstan motor by detecting the tape start sensor OFF --> ON, and the capstan motor stops.
(2) IC601 makes the loading motor stop after 150ms passed from sensing “ON”.
(3) Also IC601 makes the loading motor rotate in the forward direction after 120ms passed.

[3] Stop mode

(1) The cam slider is in the stop mode (position V) and each motor stops.
(2) The mechanism status is as follows :
1) The S, T guide rollers are in the loading status.
2) The pinch roller is kept away from the capstan.
3) The tension post is shifted to the reel disc side. That is, the band brake is released from the ON status and the back tension is also released.
4) The S, T soft brakes are being applied.

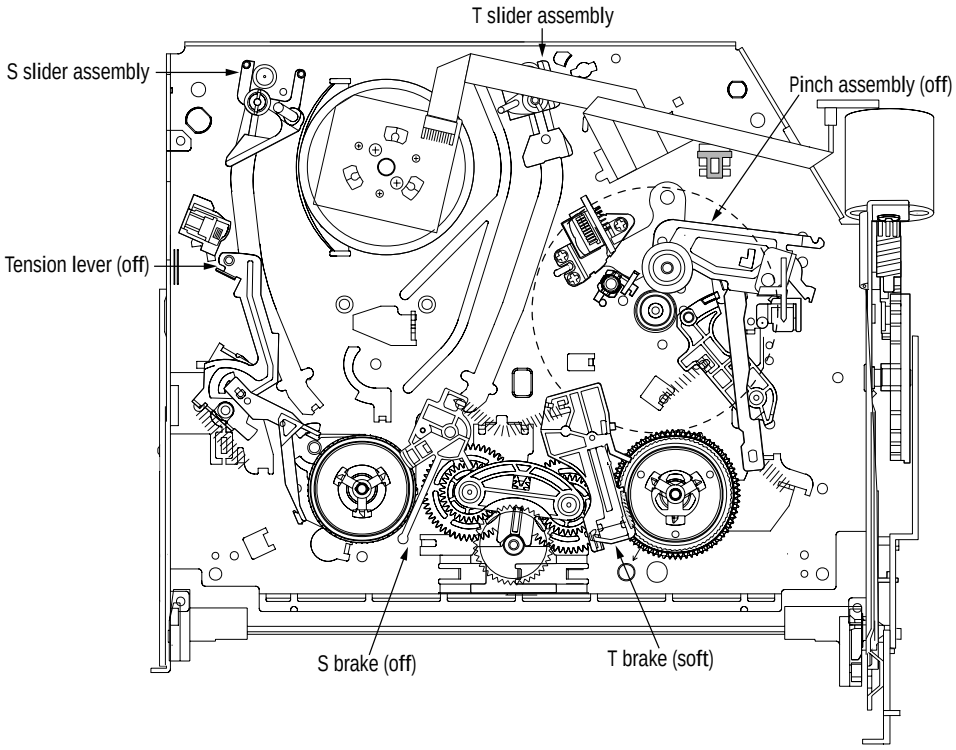


Fig. 8-25 Stop Mode (Position V)

[4] FF/REW mode

(1) When the [REW] button is pressed in playback standby mode, the mode enters the FF/REW mode.
(2) IC601 controls Capstan Motor Drive IC and makes the loading motor rotate in the forward direction.
The loading motor stops when the cam position reaches the position VI, VII (FF/REW mode).
The mechanism status is as follows :
1) The pinch roller is OFF.
2) The No. 9 guide is once loaded but immediately returned.
3) The tension post is moved to the reel disc side. That is, the band brake is released from the ON status and the back tension is released.
4) The clutch holder assembly is in the direct status and the capstan driving force is directly transmitted to the reel disc.
5) Brakes for the reel discs are as follows :
❶ VI position FF/REW 1 mode (S Brake : soft brake, T Brake : off)
❷ VII position FF/REW 2 mode (S Brake : off, T Brake : soft brake)
(3) IC601 makes the capstan motor rotate in the forward direction and the idle gear transmits the rotation to the S/T reel discs to take up the tape.

[5] FF/REW to STOP mode

(1) When the [STOP] button is pressed in the REW mode, the mechanism enters the playback standby mode.
(2) IC601 makes the loading motor rotate in the reverse direction and stops at the position V.
With this mode shift, the mechanism actuates S, T main brakes to stop the tape. Then, the capstan motor also stops by braking force 70ms after detecting “e” position.
(3) IC601 makes the loading motor rotate in the reverse direction again and stops the loading motor when the cam slider reaches the position IV (playback mode), thus setting the playback standby mode.

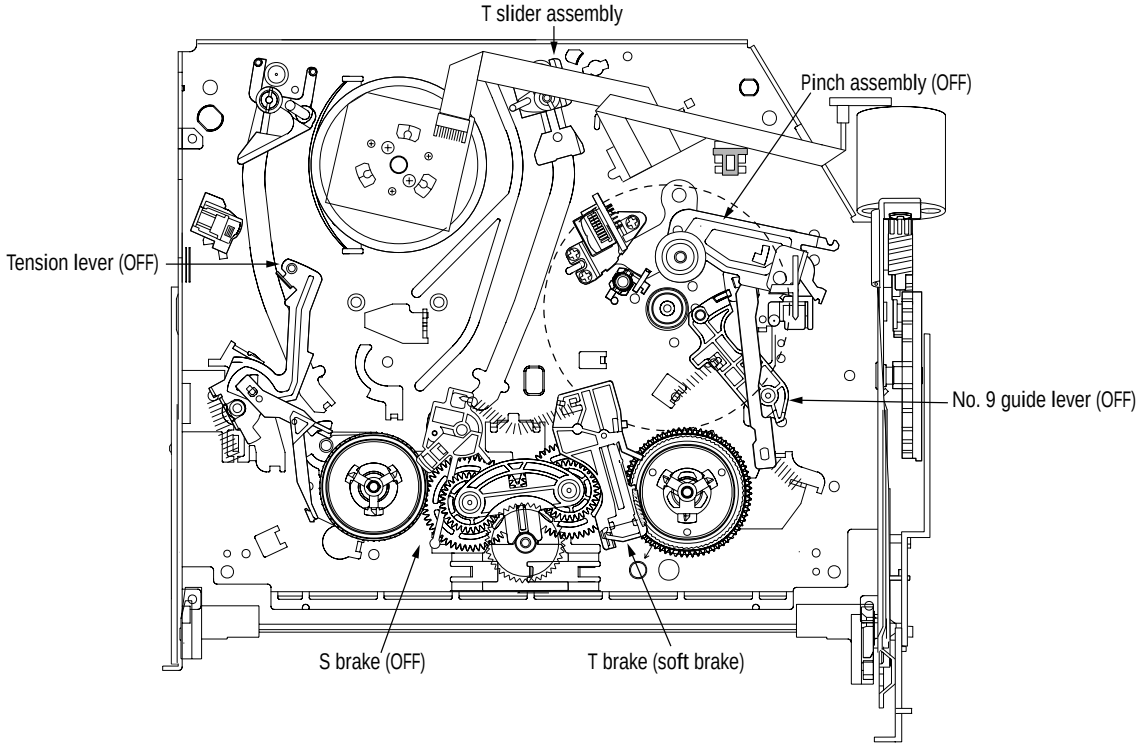


Fig. 8-26 FF/REW 2 Mode (Position VII)

[Playback mode]

(1) When the [PLAY] button is pressed in the stop mode, the mechanism enters the playback mode.
(2) IC601 controls cylinder motor drive IC and rotates the cylinder motor.
(3) IC601 controls Capstan Motor Drive IC to rotate the loading motor in the reverse direction and stops the motor when the cam slider reaches the position IV (playback mode). (When operating from the playback standby mode, the cam slider has been already on the position IV.) The mechanism works as follows :
  1) The pinch roller moves toward the capstan side and press fits the capstan.
  2) The No.9 guide is loaded once and then returned immediately.
  3) The tension post touches the tape, the band braking force is applied, and the tension servo mechanism works.
  4) The clutch holder assembly enters clutched condition.
  5) S,T brakes are released.
(4) IC601 makes the capstan rotate in the forward direction and feeds the tape. The idle gear transmits the rotation to the T reel disc and the reel disc takes up the tape at a constant torque by the clutch mechanism.
(5) IC601 controls the video circuit and switches the playback screen.
(6) The recording speed data identified by IC601 is displayed in the Led module.

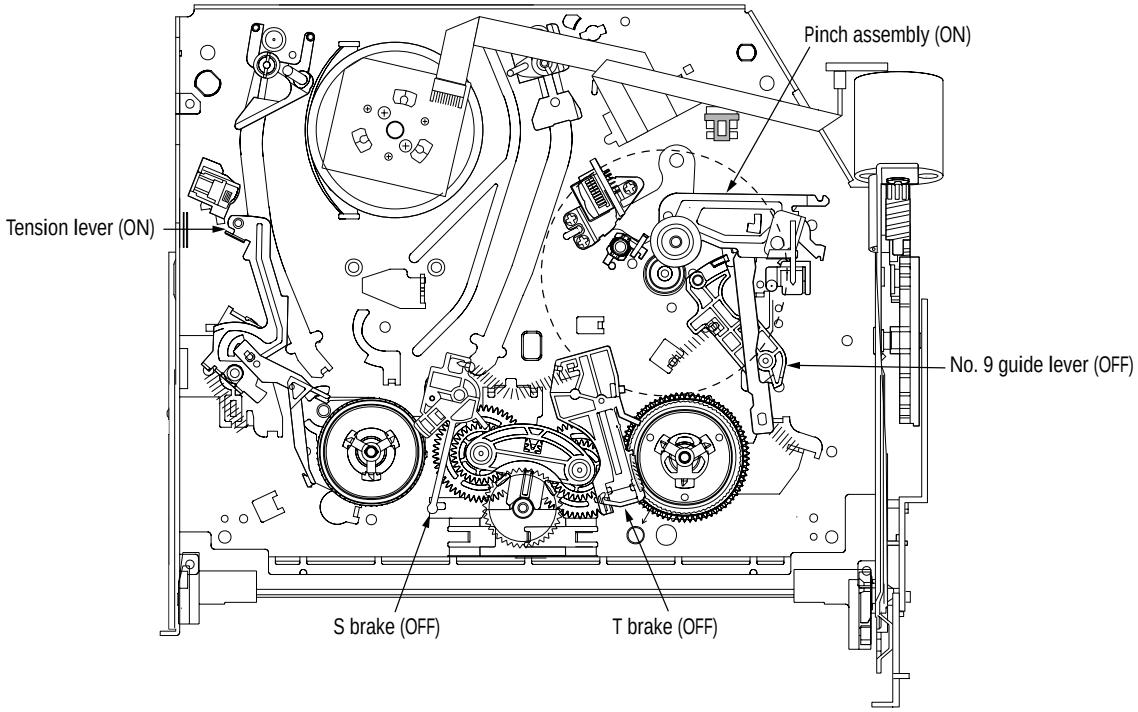


Fig. 8-27 Playback Mode (Position IV)

<Still mode>

(1) When the [PAUSE] button is pressed in the playback mode, the mechanism enters the still mode.
The cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor is rotating in the forward direction.
(2) IC 601 controls the audio circuit and actuates the audio mute function.
(3) The capstan motor enters the intermittent operation mode and then stops.
(4) IC 601 maintains the recording speed data just before the still operation.
(5) In the slow mode, the capstan motor rotates continuously in the intermittent driving.

<FPS mode>

(1) When the [FF] button is pressed in the playback mode, the mechanism enters the FPS mode (forward picture search). The cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor is rotating in the forward direction.
(2) IC 601 controls the audio circuit to actuate the audio mute operation.
(3) IC601 makes the capstan rotate at 7 times for SP, 21 times for SLP to feed the tape, respectively.
The tape is taken up at a constant torque by the clutch mechanism. (The mechanical operation is the same as that in the playback mode.)
(4) The recording speed data identified by IC601 is displayed on the Led module.

<RPS mode>

(1) When the [REW] button is pressed in the playback mode, the mechanism enters the RPS mode.
The cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor is rotating in the forward direction.
(2) IC601 controls the audio circuit to actuate the audio mute operation.
(3) IC601 controls Capstan Motor Drive IC to make the loading motor rotate in the reverse direction.
After 180ms the loading motor stops for 250ms. During the mode shift operation, the mechanism rotates the capstan motor in the forward direction for a constant time so that the tape is not slackened.
(4) When the cam slider reaches the position "c" (loading motor stoped for 250ms), the capstan motor is rotated in the reverse direction for a constant time, and the idle gear is swung toward the S reel disc side.
Then, the loading motor rotates in reverse direction and shifts to the position III (RPS mode).
When the cam slider reaches the position III (RPS mode), the loading motor stops.
The mechanism status is as follows :
1) The No.9 guide is loaded.
2) The tension post is separated from the tape.
3) The T soft brake is turned on.
The cpastan motor rotates in the reverse direction at 7 times for SP, 21 times for SLP to feed the tape in the REW direction, respectively. At the same time, the idle gear transmits the rotation to the S reel disc and the S reel disc takes up the tape by the clutch mechanism.
(5) The recording speed data identified by IC601 is displayed on the Led module.

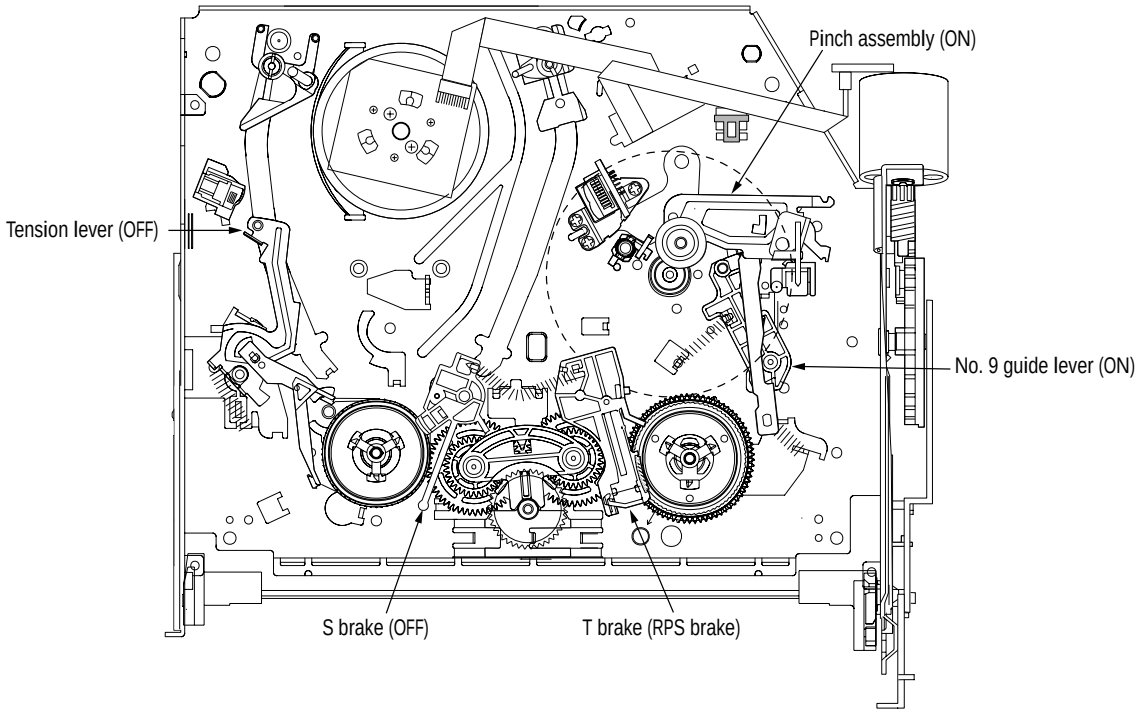


Fig. 8-28 RPS Mode (Position III)

[7] REC mode

<REC mode>

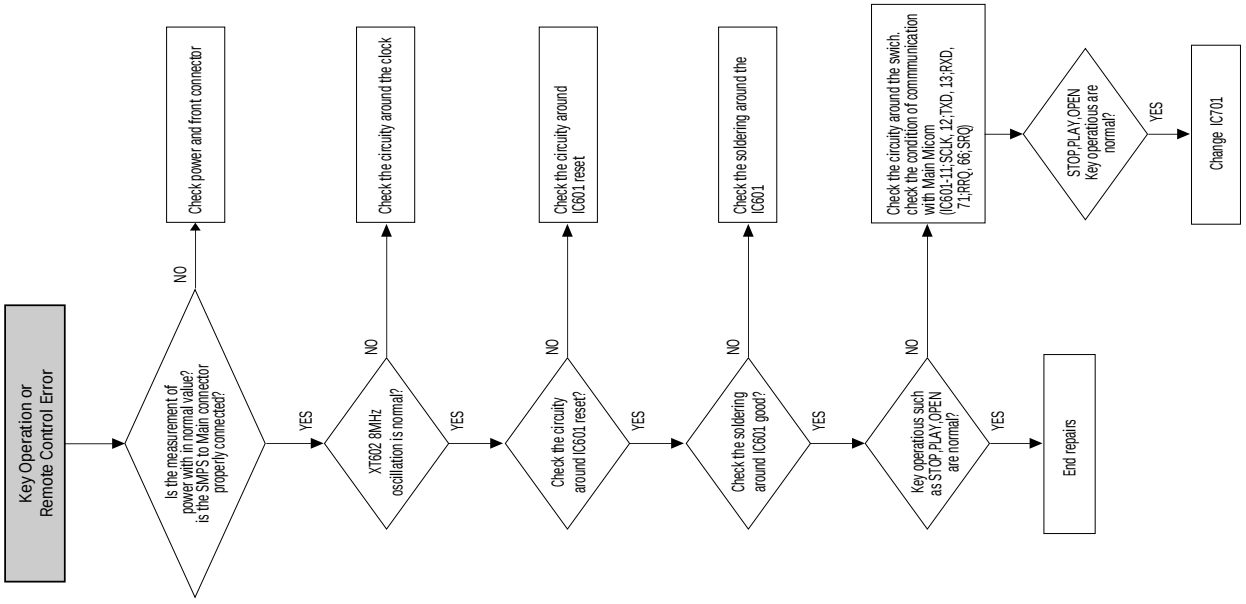
(1) When the [REC] button is pressed in the stop mode, the mechanism enters the REC mode.
(2) The cylinder motor starts and then the loading motor rotates in reverse direction.
The cam slider reaches the position IV (playback mode).
The tape is taken up at a constant torque. The mechanism operations are the same as those in the playback.
(3) IC601 controls the audio circuit and video circuit to set the record enable mode.
(4) Recording mute is released, thus setting the recording status. The CTL signal is output for recording.

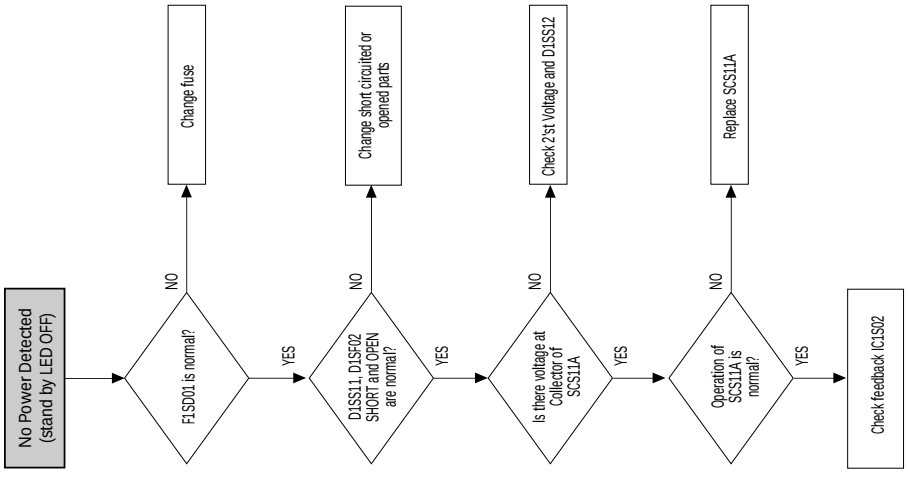
<REC PAUSE mode>

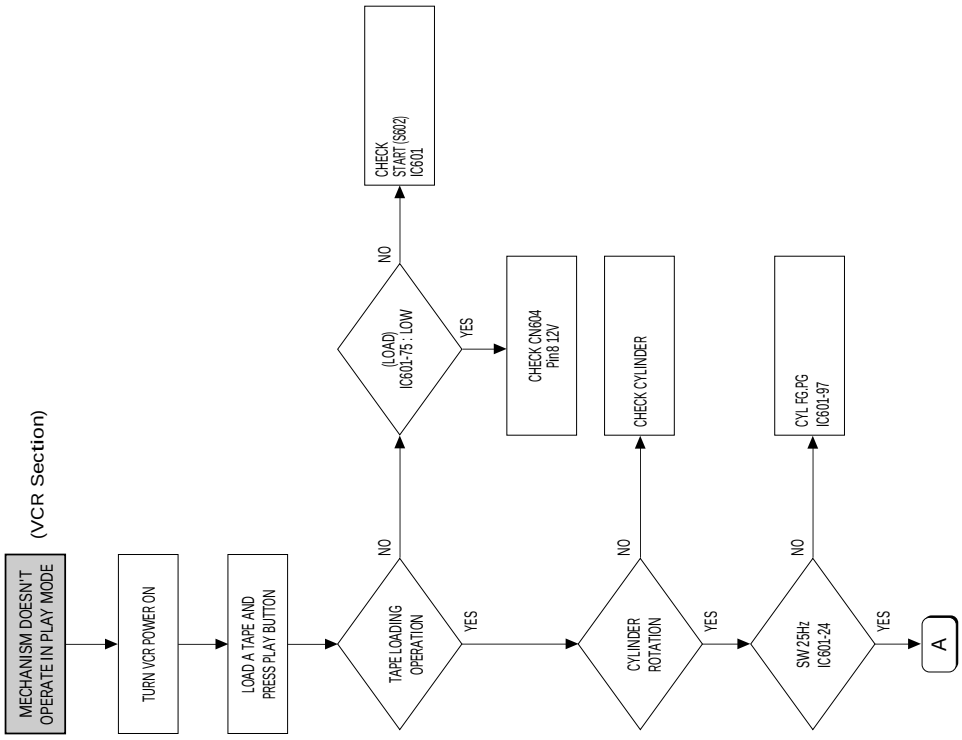
(1) When [PAUSE] button is pressed in the REC mode, the mechanism enters the REC pause mode.
(2) IC601 controls the audio circuit and the video circuit, and releases the record enable mode and performs the rewinding for synchronous editing.
(3) After completion of the rewinding for synchronous editing, the cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor and the loading motor stop.

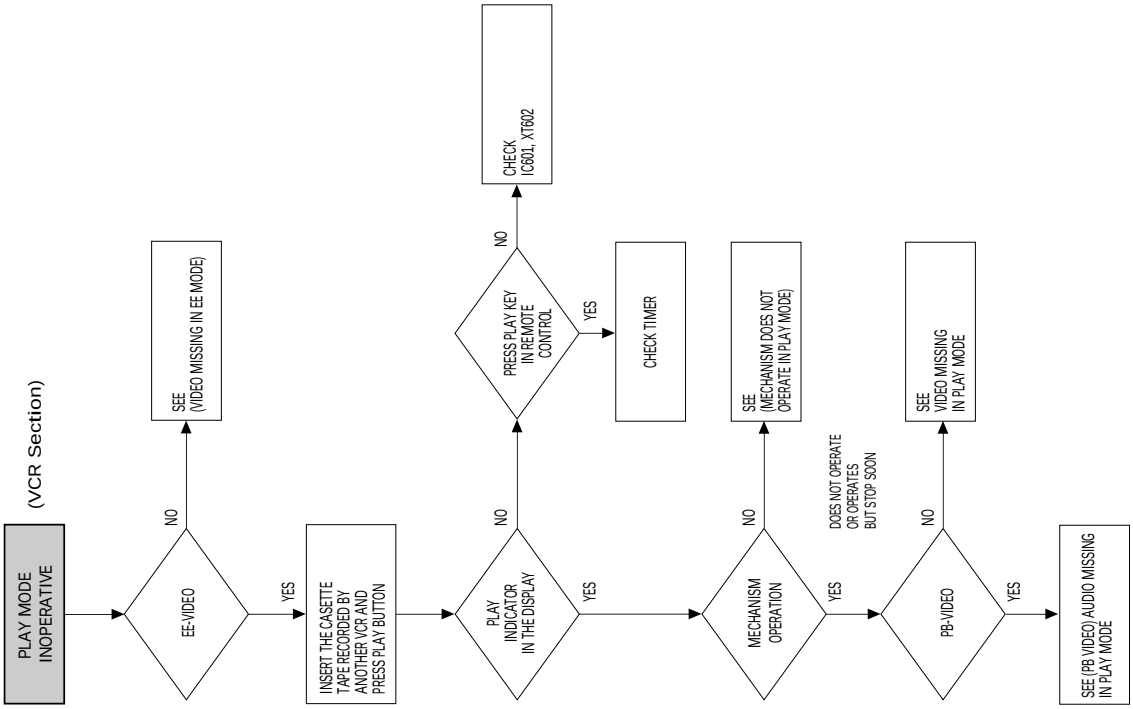
MEMO

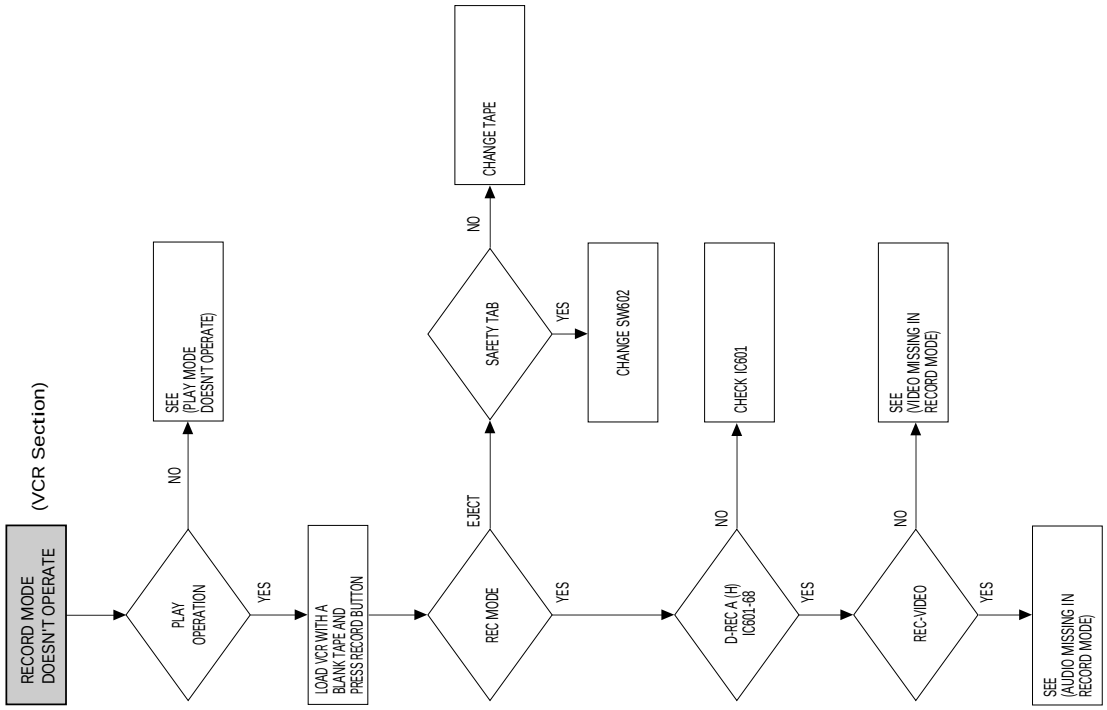
9. Troubleshooting

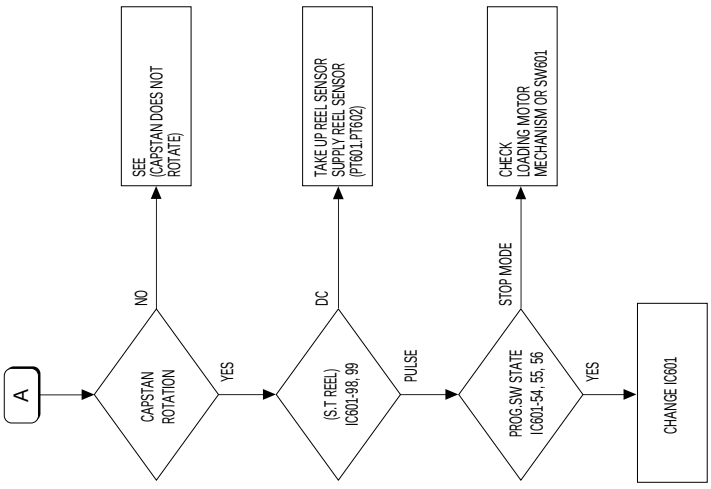


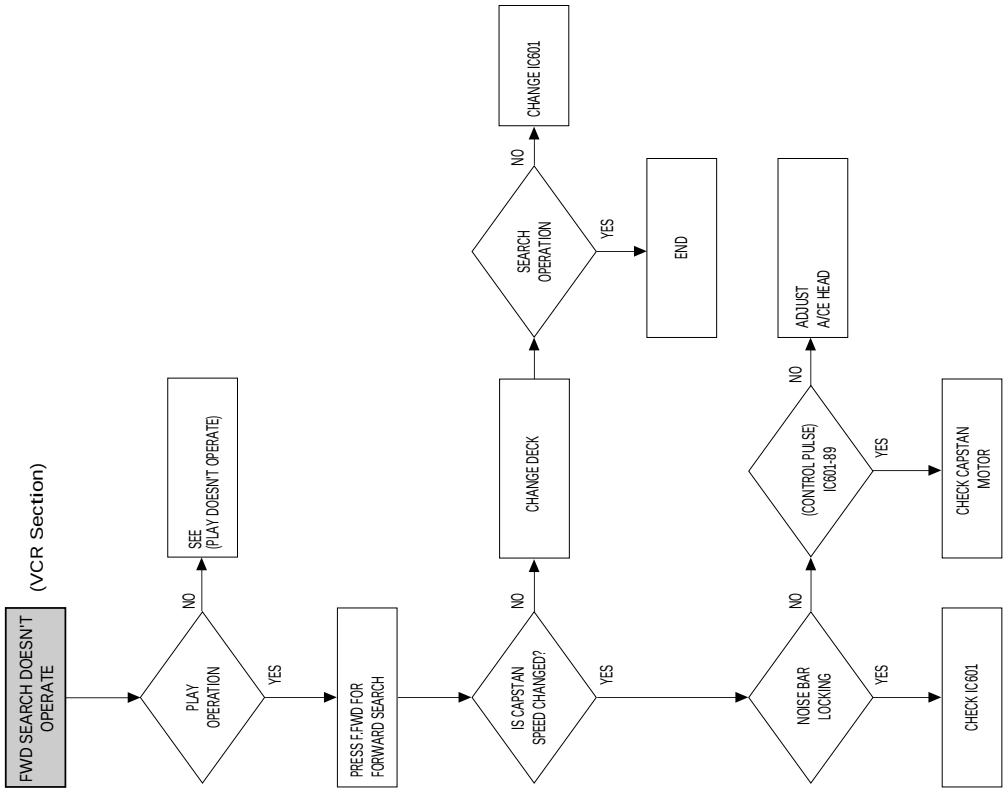


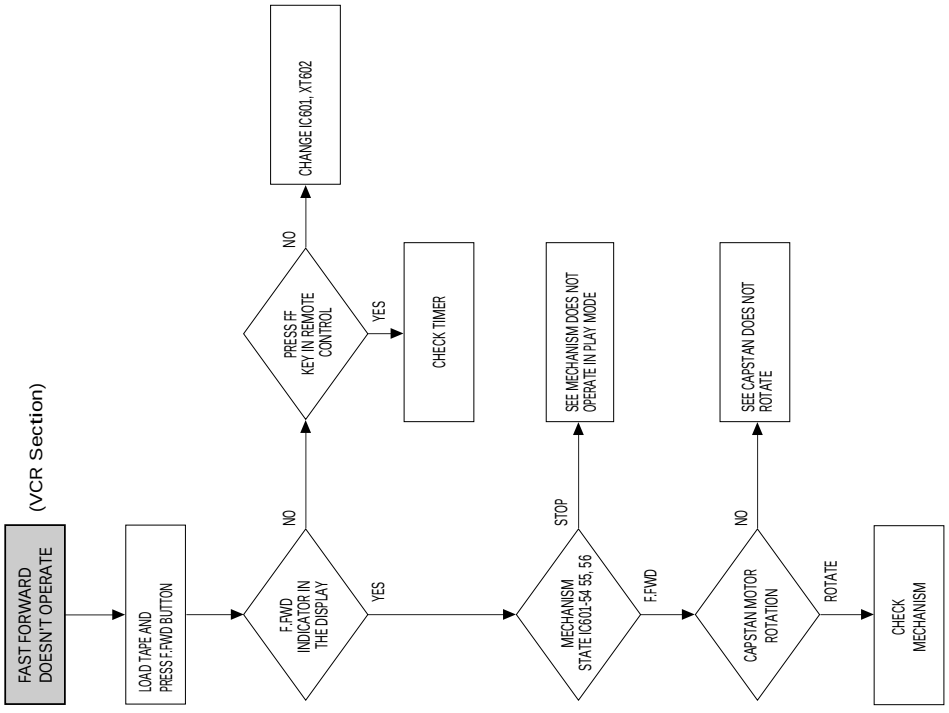

MECHANISM DOESN'T OPERATE IN PLAY MODE
(VCR Section)
TURN VCR POWER ON
LOAD A TAPE AND PRESS PLAY BUTTON
TAPE LOADING OPERATION
NO
YES
(LOAD) IC601-75 : LOW
NO
YES
CHECK START (S802) IC601
CHECK CN604 Pin8 12V
CYLINDER ROTATION
NO
YES
CHECK CYLINDER
SW 25Hz IC601-24
NO
YES
CYL FG:PG IC601-97
A

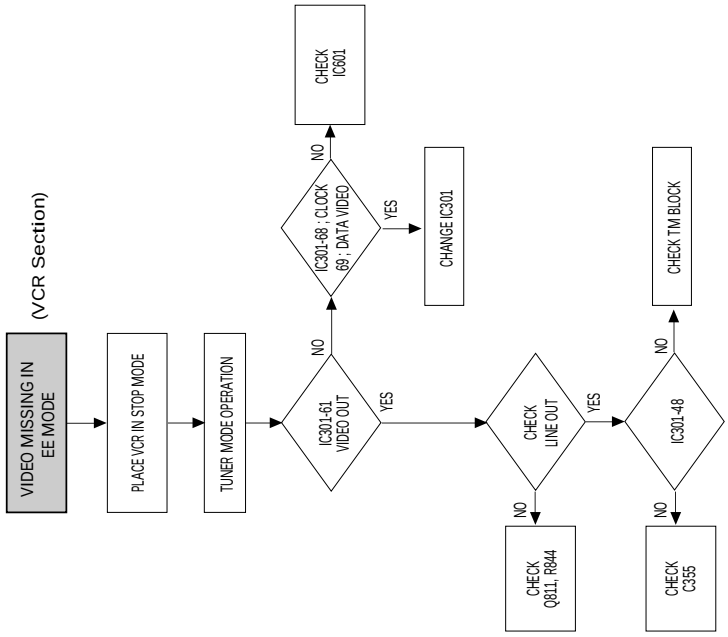

PLAY MODE INOPERATIVE
(VCR Section)
EE-VIDEO
NO
YES
SEE (VIDEO MISSING IN EE MODE)
INSERT THE CASETTE TAPE RECORDED BY ANOTHER VCR AND PRESS PLAY BUTTON
PLAY INDICATOR IN THE DISPLAY
NO
YES
PRESS PLAY KEY IN REMOTE CONTROL
NO
YES
CHECK IC601, XT602
CHECK TIMER
MECHANISM OPERATION
NO
YES
SEE (MECHANISM DOES NOT OPERATE IN PLAY MODE)
DOES NOT OPERATE OR OPERATES BUT STOP SOON
PB-VIDEO
NO
YES
SEE VIDEO MISSING IN PLAY MODE
SEE (PB VIDEO) AUDIO MISSING IN PLAY MODE

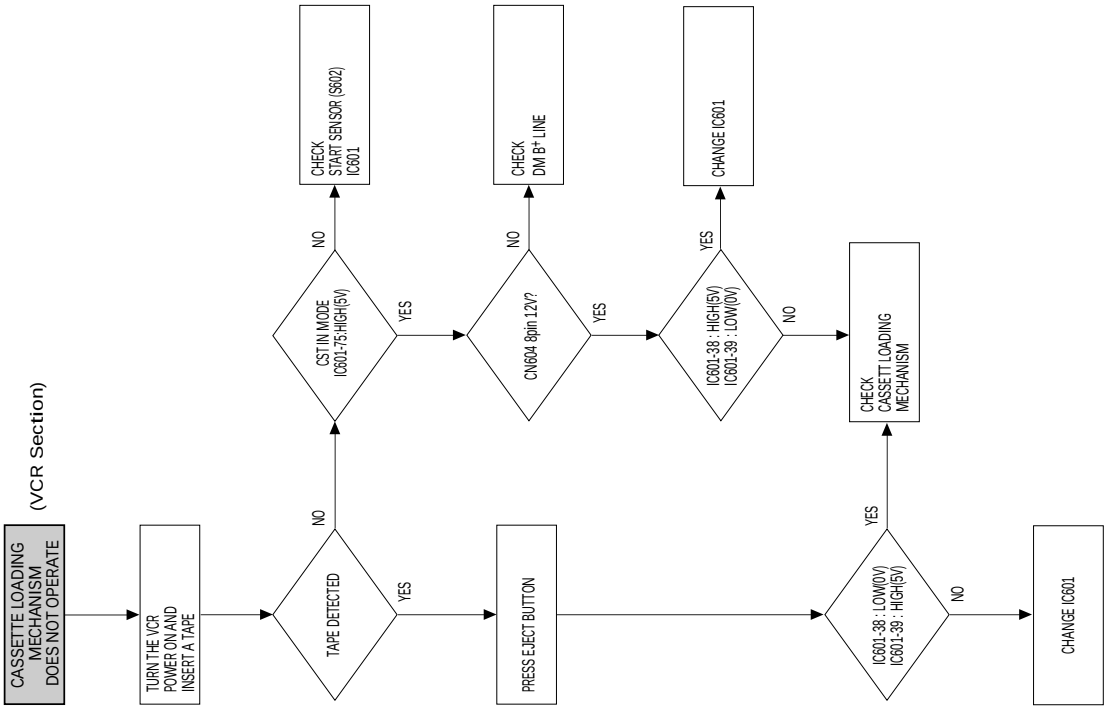

(VCR Section)
RECORD MODE DOESN'T OPERATE
PLAY OPERATION
NO
SEE (PLAY MODE DOESN'T OPERATE)
YES
LOAD VCR WITH A BLANK TAPE AND PRESS RECORD BUTTON
REC MODE
EJECT
SAFETY TAB
NO
CHANGE TAPE
YES
CHANGE SW602
YES
D-REC A (H) IC601-68
NO
CHECK IC601
YES
REC-VIDEO
NO
SEE (VIDEO MISSING IN RECORD MODE)
YES
SEE (AUDIO MISSING IN RECORD MODE)

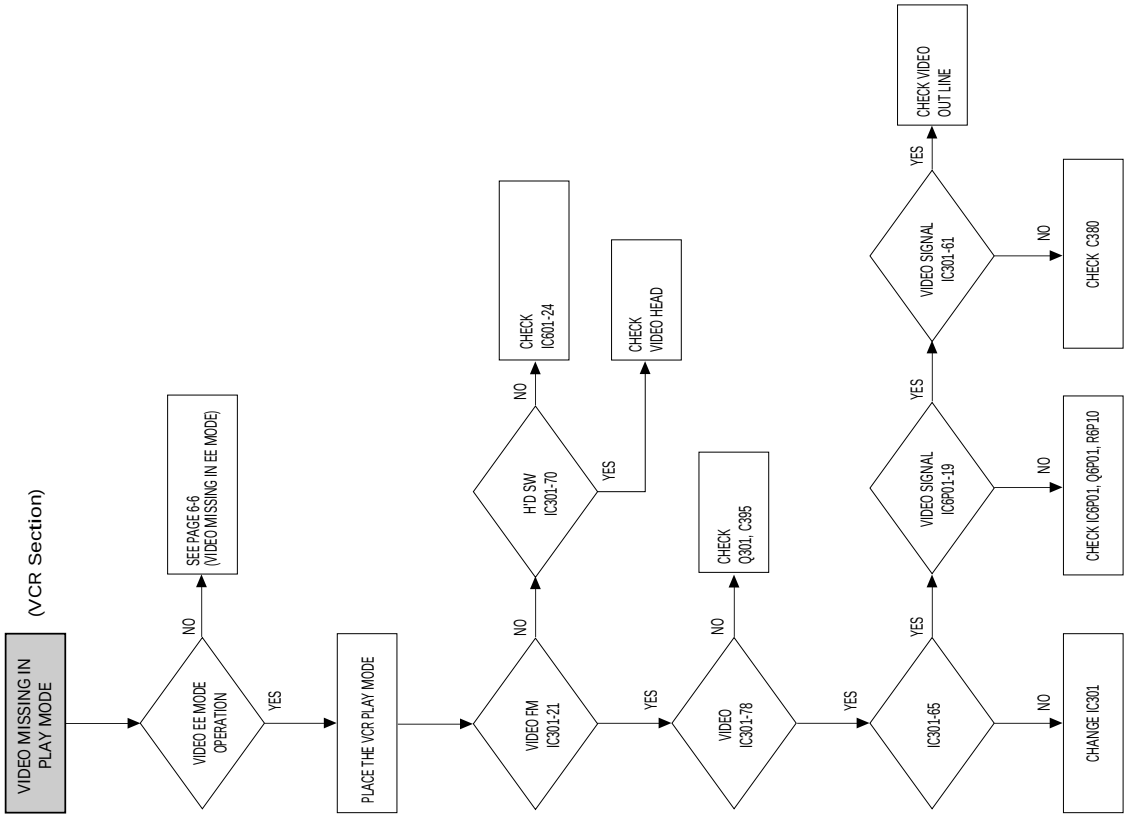

A
CAPSTAN ROTATION
NO
SEE (CAPSTAN DOES NOT ROTATE)
YES
(S.T REEL) IC601-98, 99
DC
TAKE UP REEL SENSOR SUPPLY REEL SENSOR (PT601,PT602)
PULSE
PROG.SW STATE IC601-54, 55, 56
STOP MODE
CHECK LOADING MOTOR MECHANISM OR SW601
YES
CHANGE IC601

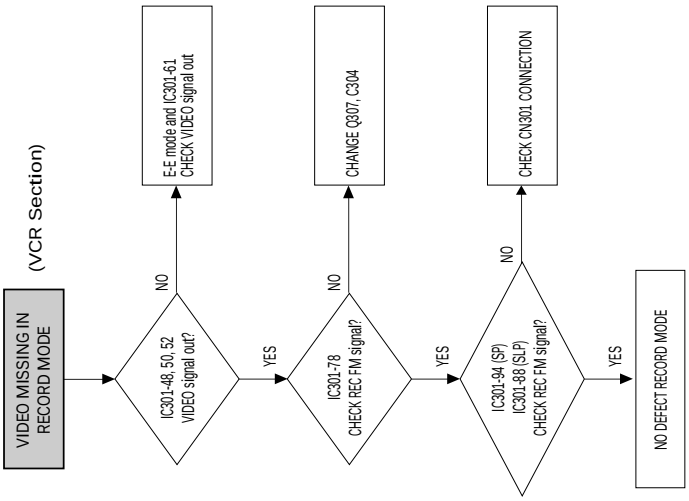

FWD SEARCH DOESN'T OPERATE
(VCR Section)
PLAY OPERATION
NO
SEE (PLAY DOESN'T OPERATE)
YES
PRESS F.FWD FOR FORWARD SEARCH
IS CAPSTAN SPEED CHANGED?
NO
CHANGE DECK
YES
SEARCH OPERATION
NO
CHANGE IC601
YES
END
NOISE BAR LOCKING
NO
(CONTROL PULSE) IC601-89
NO
ADJUST A/CE HEAD
YES
CHECK CAPSTAN MOTOR
YES
CHECK IC601

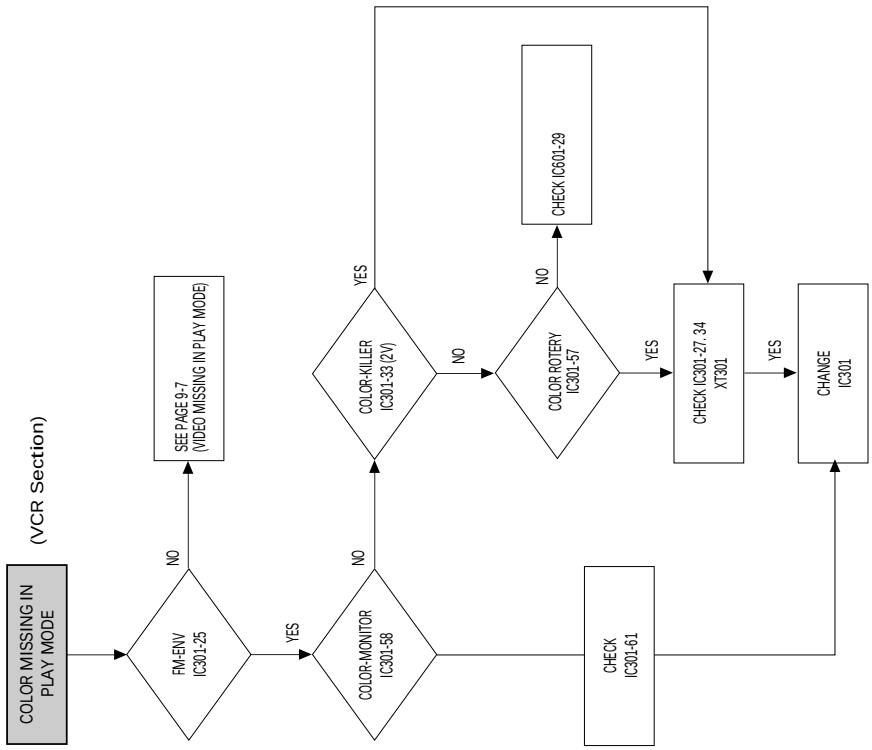

FAST FORWARD DOESN'T OPERATE
(VCR Section)
LOAD TAPE AND PRESS F.FWD BUTTON
F.FWD INDICATOR IN THE DISPLAY
NO
PRESS FF KEY IN REMOTE CONTROL
NO
CHANGE IC601, XT602
YES
CHECK TIMER
YES
MECHANISM STATE IC601-54, 55, 56
STOP
SEE MECHANISM DOES NOT OPERATE IN PLAY MODE
F.FWD
CAPSTAN MOTOR ROTATION
NO
SEE CAPSTAN DOES NOT ROTATE
ROTATE
CHECK MECHANISM

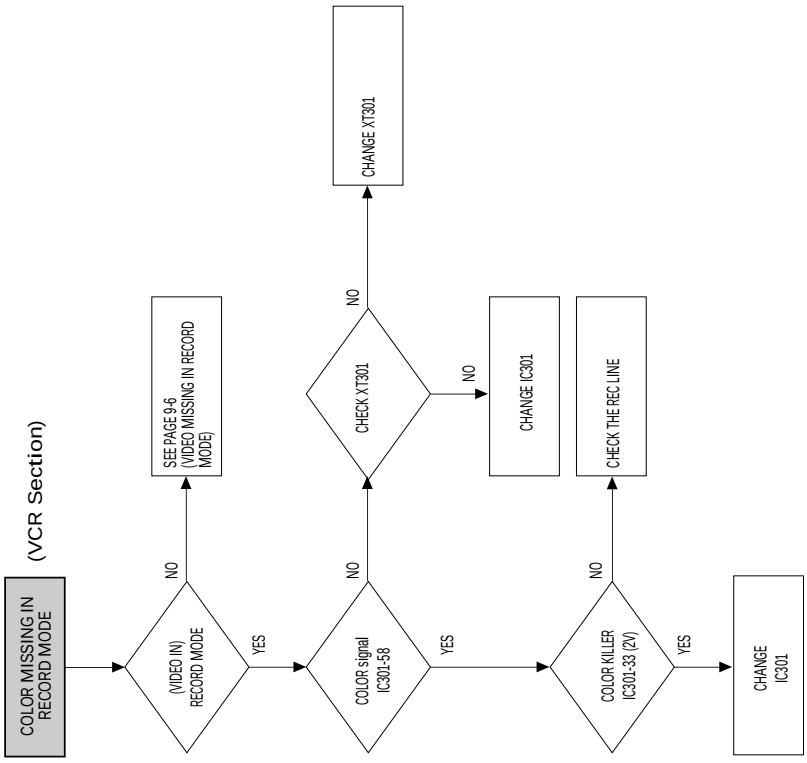

(VCR Section)
VIDEO MISSING IN EE MODE
PLACE VCR IN STOP MODE
TUNER MODE OPERATION
IC301-61 VIDEO OUT
NO
YES
IC301-68 : CLOCK 69 : DATA VIDEO
NO
YES
CHECK IC601
CHANGE IC301
CHECK LINE OUT
YES
NO
CHECK Q811, R844
IC301-48
NO
YES
NO
CHECK C355
CHECK TM BLOCK

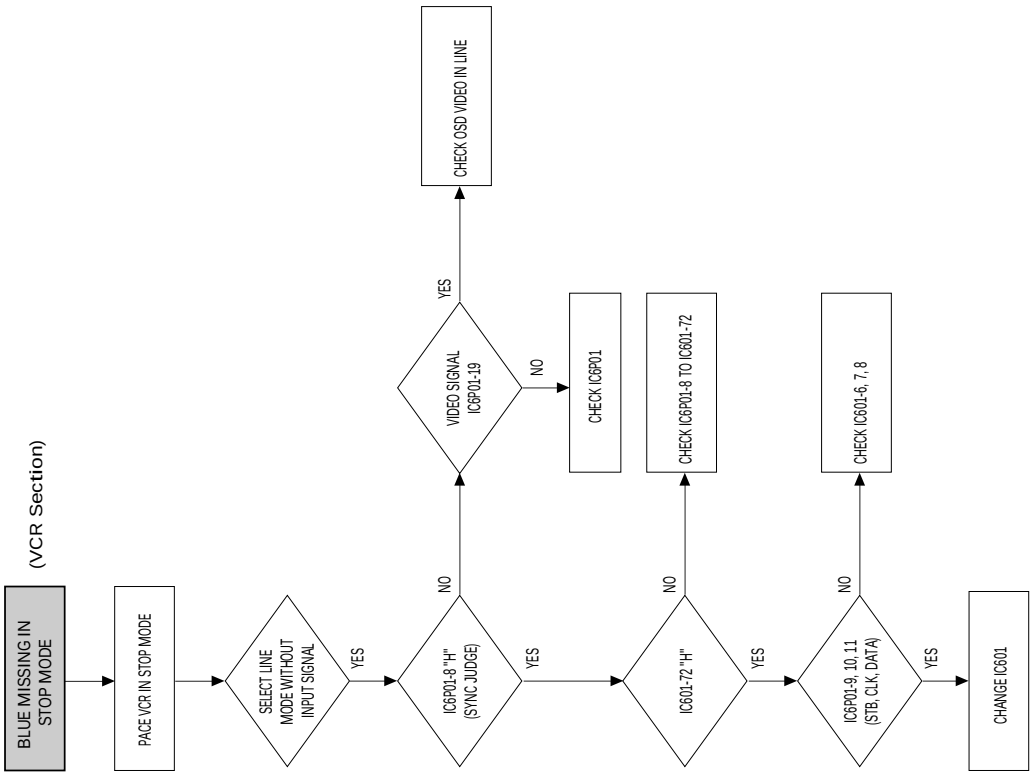

(VCR Section)
CASSETTE LOADING MECHANISM DOES NOT OPERATE
TURN THE VCR POWER ON AND INSERT A TAPE
TAPE DETECTED
NO
YES
CST IN MODE IC601-75:HIGH(5V)
NO
YES
CHECK START SENSOR (S902) IC601
CN604 8pin 12V?
NO
YES
CHECK DM B+ LINE
IC601-38 : HIGH(5V) IC601-39 : LOW(0V)
YES
NO
CHANGE IC601
PRESS EJECT BUTTON
CHECK CASSETT LOADING MECHANISM
IC601-38 : LOW(0V) IC601-39 : HIGH(5V)
YES
NO
CHANGE IC601

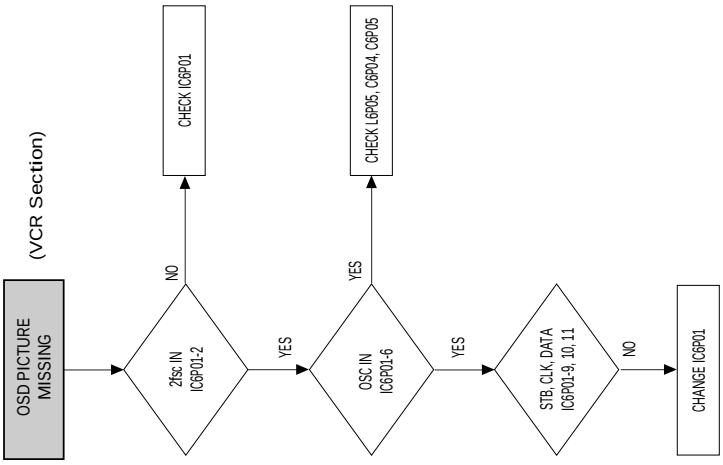

VIDEO MISSING IN PLAY MODE
(VCR Section)
VIDEO EE MODE OPERATION
NO
SEE PAGE 6-6 (VIDEO MISSING IN EE MODE)
YES
PLACE THE VCR PLAY MODE
VIDEO FM IC301-21
NO
CHECK IC601-24
H'D SW IC301-70
YES
CHECK VIDEO HEAD
YES
VIDEO IC301-78
NO
CHECK Q301, C395
YES
IC301-65
NO
CHANGE IC301
YES
VIDEO SIGNAL IC6P01-19
NO
CHECK IC6P01, Q6P01, R6P10
YES
VIDEO SIGNAL IC301-61
NO
CHECK C380
YES
CHECK VIDEO OUT LINE

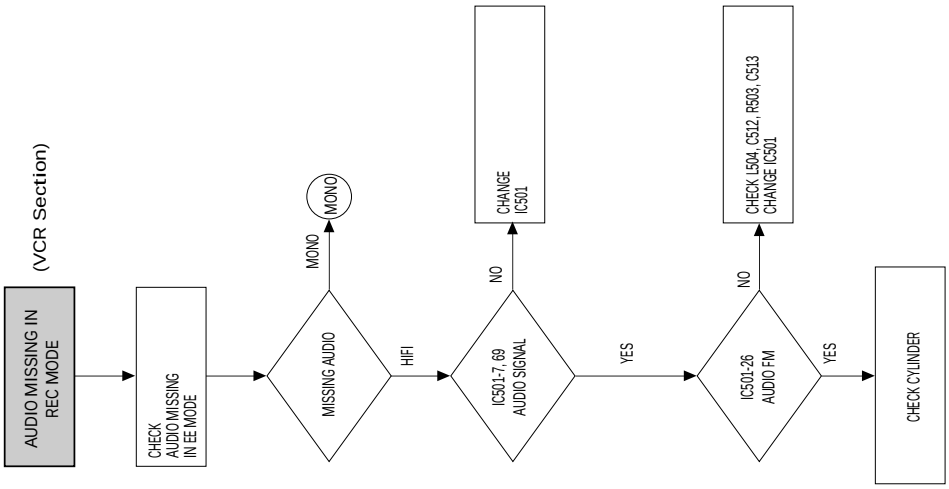

VIDEO MISSING IN RECORD MODE
(VCR Section)
IC301-48, 50, 52 VIDEO signal out?
NO
E-E mode and IC301-61 CHECK VIDEO signal out
YES
IC301-78 CHECK REC FM signal?
NO
CHANGE Q307, C304
YES
IC301-94 (SP) IC301-98 (SLP) CHECK REC FM signal?
NO
CHECK CN301 CONNECTION
YES
NO DEFECT RECORD MODE

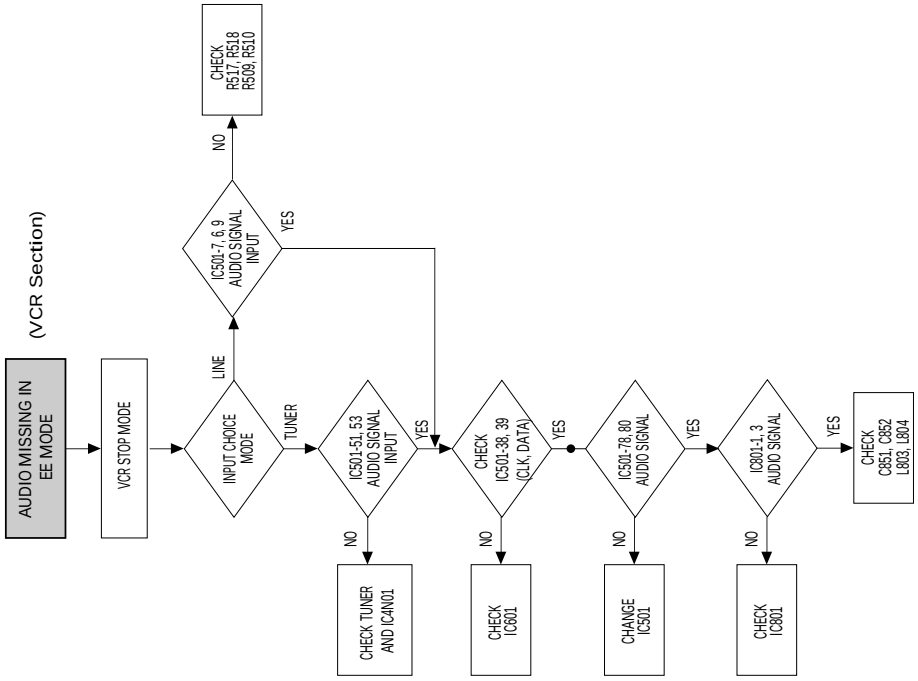

COLOR MISSING IN PLAY MODE
(VCR Section)
FM-ENV IC301-25
NO
SEE PAGE 9-7 (VIDEO MISSING IN PLAY MODE)
YES
COLOR-MONITOR IC301-58
NO
COLOR-KILLER IC301-33 (2V)
YES
NO
COLOR ROTERY IC301-57
NO
CHECK IC601-29
YES
CHECK IC301-27. 34 XT301
YES
CHANGE IC301
CHECK IC301-61

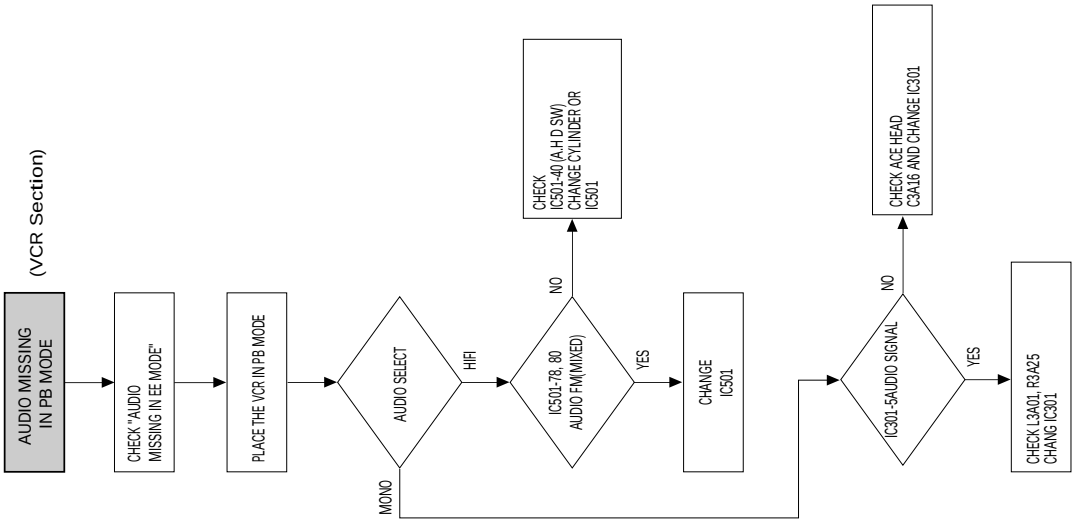

COLOR MISSING IN RECORD MODE
(VCR Section)
(VIDEO IN) RECORD MODE
NO
SEE PAGE 9-6 (VIDEO MISSING IN RECORD MODE)
YES
COLOR signal IC301-58
NO
CHECK XT301
NO
CHANGE XT301
YES
CHANGE IC301
COLOR KILLER IC301-33 (2V)
NO
CHECK THE REC LINE
YES
CHANGE IC301

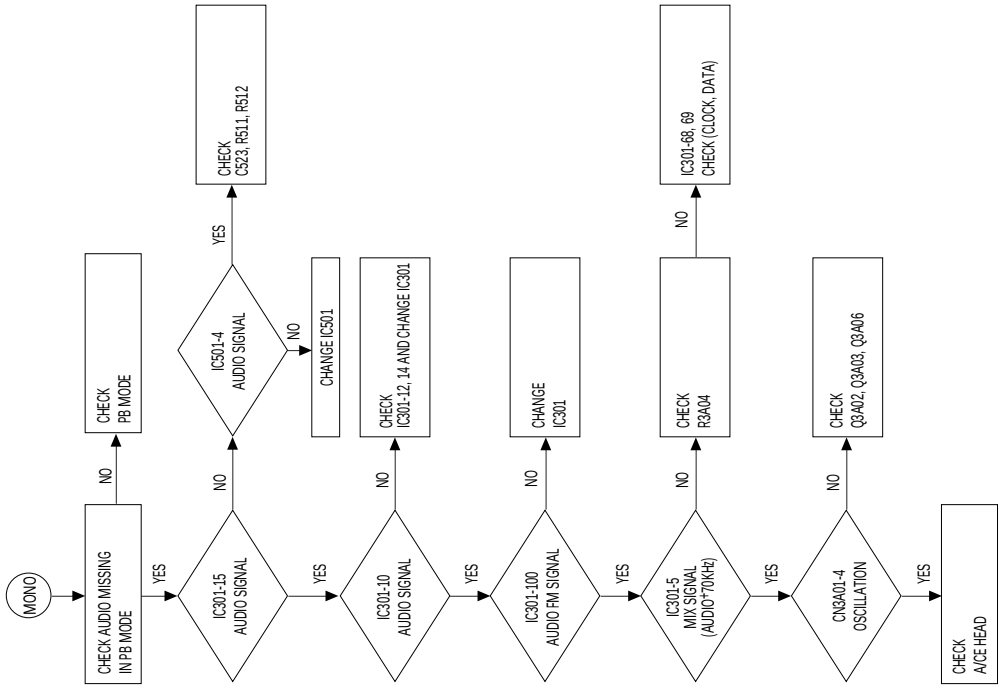

BLUE MISSING IN STOP MODE
(VCR Section)
PACE VCR IN STOP MODE
SELECT LINE MODE WITHOUT INPUT SIGNAL
YES
IC6P01-8 "H" (SYNC JUDGE)
NO
YES
VIDEO SIGNAL IC6P01-19
NO
YES
CHECK OSD VIDEO IN LINE
CHECK IC6P01
IC601-72 "H"
NO
YES
CHECK IC6P01-8 TO IC601-72
IC6P01-9, 10, 11 (STB, CLK, DATA)
NO
YES
CHECK IC601-6, 7, 8
CHANGE IC601

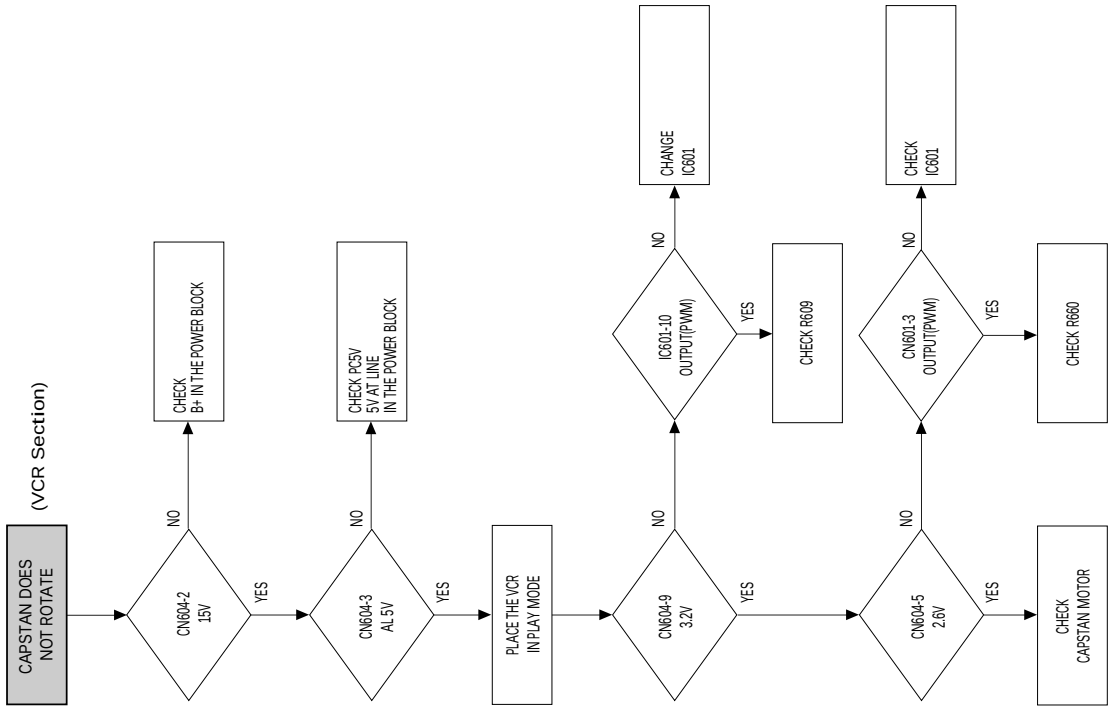

OSD PICTURE MISSING
(VCR Section)
2fsc IN IC6P01-2
NO
CHECK IC6P01
YES
OSC IN IC6P01-6
YES
CHECK L6P05, C6P04, C6P05
YES
STB, CLK, DATA IC6P01-9, 10, 11
NO
CHANGE IC6P01

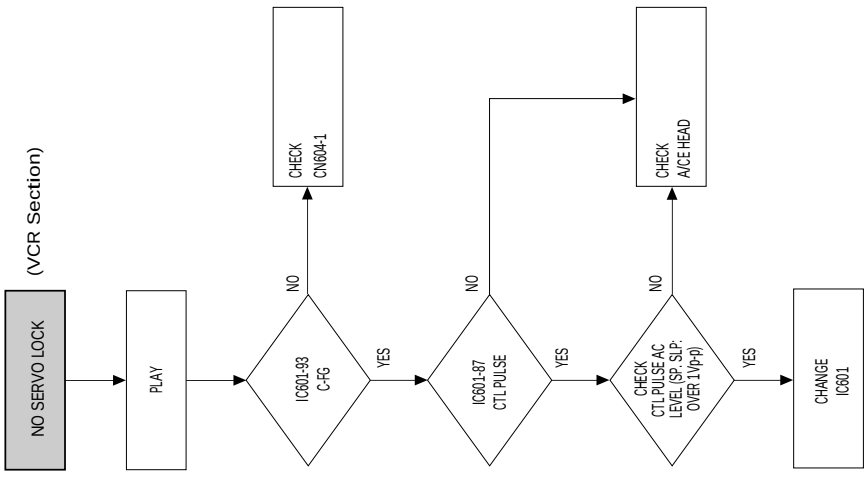

(VCR Section)
AUDIO MISSING IN REC MODE
CHECK AUDIO MISSING IN EE MODE
MISSING AUDIO
MONO
MONO
HIFI
IC501-7, 69 AUDIO SIGNAL
NO
CHANGE IC501
YES
IC501-26 AUDIO FM
NO
CHECK L504, C512, R503, C513 CHANGE IC501
YES
CHECK CYLINDER

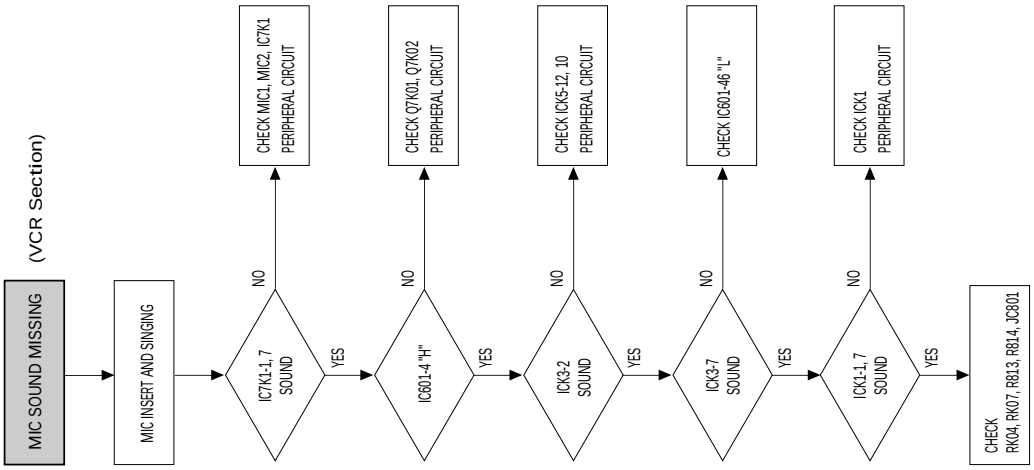

(VCR Section)
AUDIO MISSING IN EE MODE
VCR STOP MODE
INPUT CHOICE MODE
LINE
TUNER
IC501-7, 6, 9 AUDIO SIGNAL INPUT
YES
NO
CHECK R517, R518 R509, R510
IC501-51, 53 AUDIO SIGNAL INPUT
YES
NO
CHECK TUNER AND IC4N01
CHECK IC501-38, 39 (CLK, DATA)
YES
NO
CHECK IC801
IC501-78, 80 AUDIO SIGNAL
YES
NO
CHANGE IC501
IC801-1, 3 AUDIO SIGNAL
YES
NO
CHECK IC801
CHECK C851, C852 L803, L804

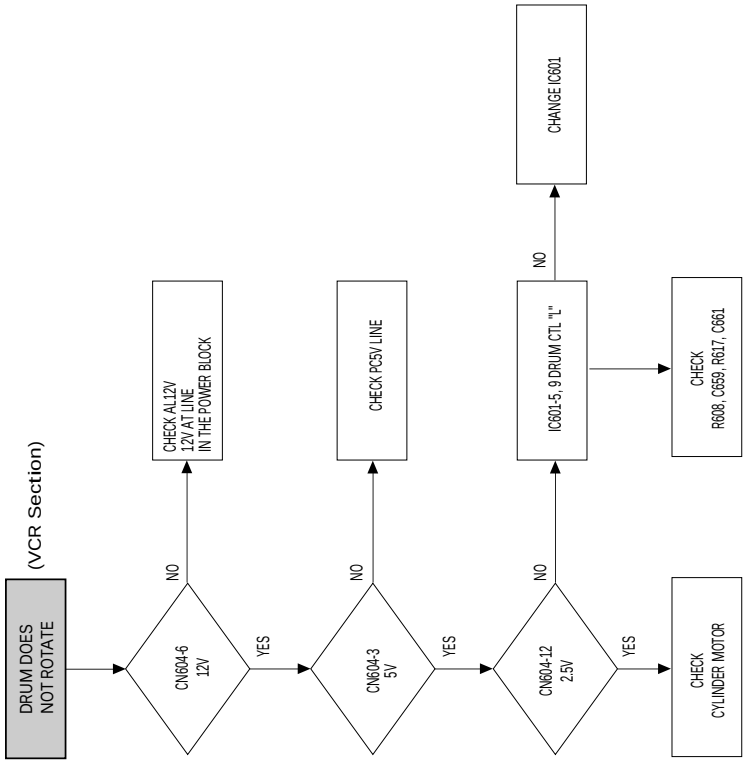

(VCR Section)
AUDIO MISSING IN PB MODE
CHECK "AUDIO MISSING IN EE MODE"
PLACE THE VCR IN PB MODE
AUDIO SELECT
HIFI
MONO
IC501-78, 80 AUDIO FM(MIXED)
NO
YES
CHECK IC501-40 (A.H.D S/W) CHANGE CYLINDER OR IC301
CHANGE IC501
IC301-5AUDIO SIGNAL
NO
YES
CHECK ACE HEAD C3A16 AND CHANGE IC301
CHECK L3A01, R3A25 CHANG IC301

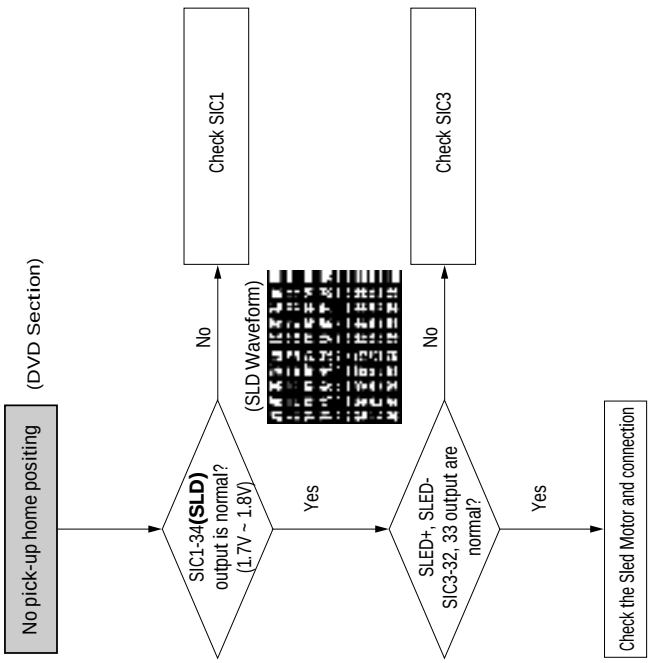

(MONO)
CHECK AUDIO MISSING IN PB MODE
NO
CHECK PB MODE
YES
IC301-15 AUDIO SIGNAL
NO
IC501-4 AUDIO SIGNAL
YES
CHECK C523, R511, R512
NO
CHANGE IC501
YES
IC301-10 AUDIO SIGNAL
NO
CHECK IC301-12, 14 AND CHANGE IC301
YES
IC301-100 AUDIO FM SIGNAL
NO
CHANGE IC301
YES
IC301-5 MIX SIGNAL (AUDIO*70KHz)
NO
CHECK R3A04
NO
IC301-68, 69 CHECK (CLOCK, DATA)
YES
CN3A01-4 OSCILLATION
NO
CHECK Q3A02, Q3A03, Q3A06
YES
CHECK A/CE HEAD

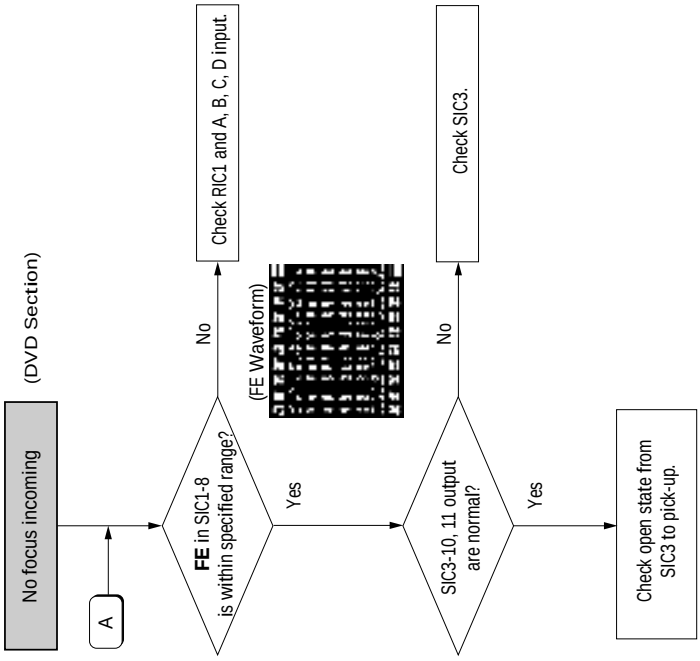

CAPSTAN DOES NOT ROTATE
(VCR Section)
CN604-2 15V
NO
YES
CHECK B+ IN THE POWER BLOCK
CN604-3 AL 5V
NO
YES
CHECK PC5V 5V AT LINE IN THE POWER BLOCK
PLACE THE VCR IN PLAY MODE
CN604-9 3.2V
NO
YES
IC601-10 OUTPUT(PWM)
NO
YES
CHANGE IC601
CHECK R609
CN604-5 2.6V
NO
YES
CN601-3 OUTPUT(PWM)
NO
YES
CHECK IC601
CHECK R660
CHECK CAPSTAN MOTOR

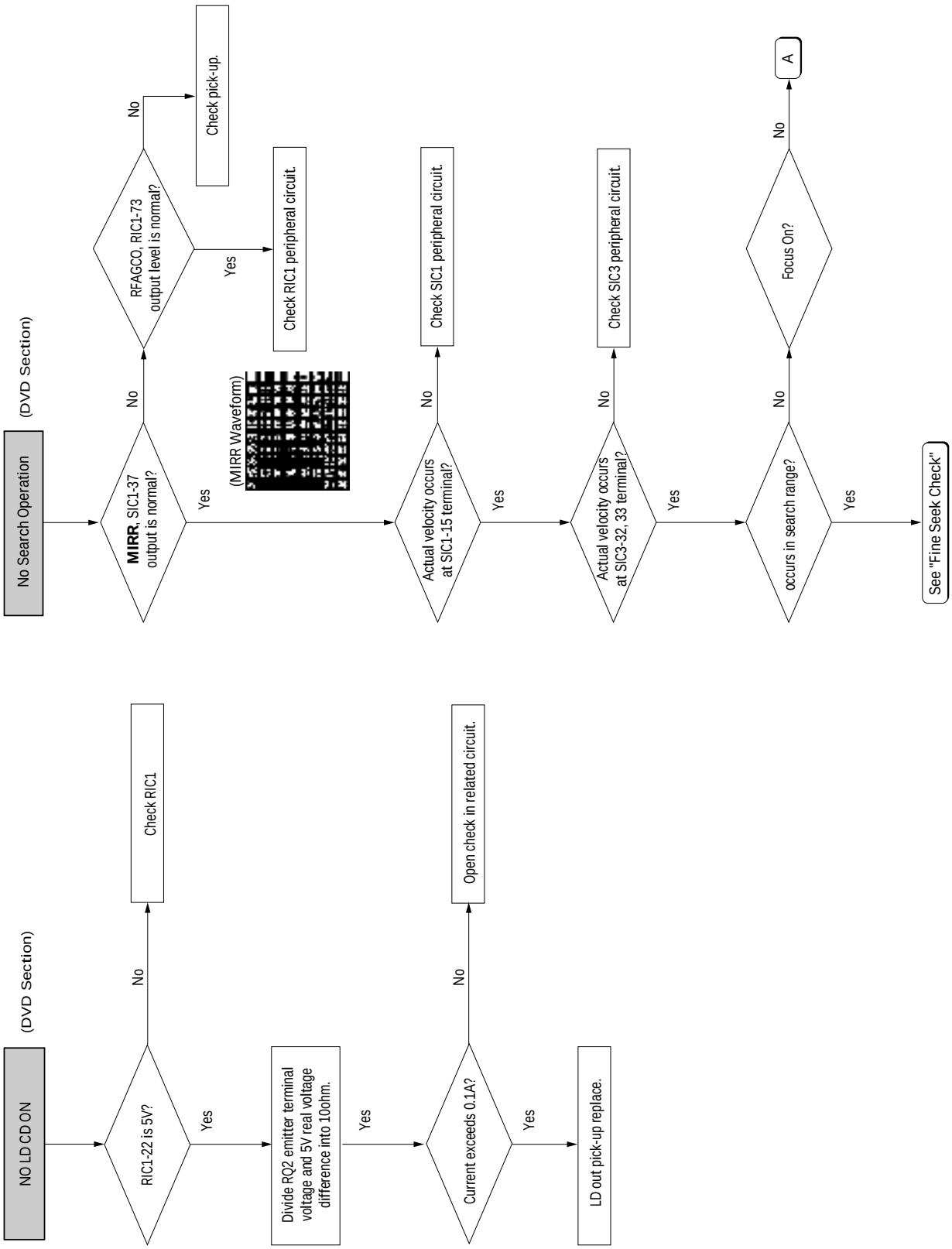

NO SERVO LOCK
(VCR Section)
PLAY
IC601-93 C-FG
NO
YES
CHECK CN604-1
IC601-87 CTL PULSE
NO
YES
CHECK CTL PULSE AC LEVEL (SP, SLP: OVER 1Vp-p)
NO
YES
CHECK A/CE HEAD
CHANGE IC601

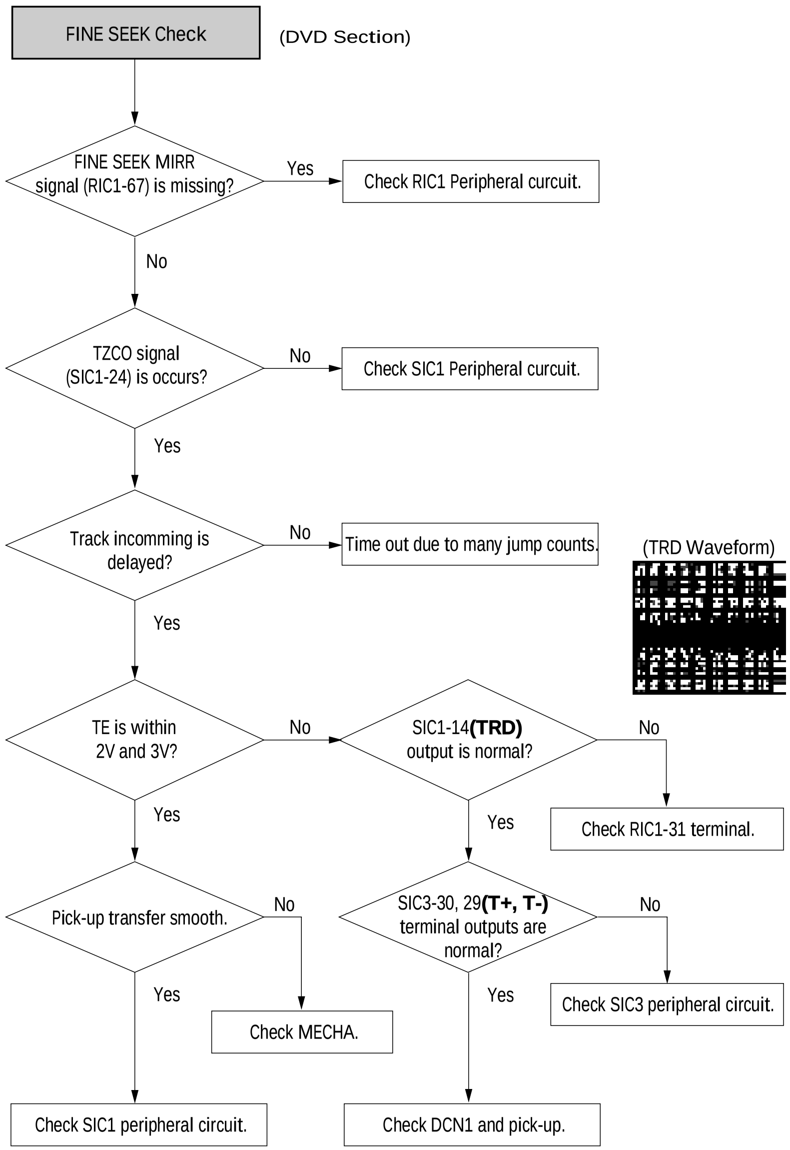

MIC SOUND MISSING
(VCR Section)
MIC INSERT AND SINGING
IC7K1-1, 7 SOUND
NO
YES
CHECK MIC1, MIC2, IC7K1 PERIPHERAL CIRCUIT
IC601-4 "H"
CHECK Q7K01, Q7K02 PERIPHERAL CIRCUIT
ICK3-2 SOUND
CHECK ICK5-12, 10 PERIPHERAL CIRCUIT
ICK3-7 SOUND
CHECK IC601-46 "L"
ICK1-1, 7 SOUND
CHECK ICK1 PERIPHERAL CIRCUIT
CHECK RK04, RK07, R813, R814, JC801

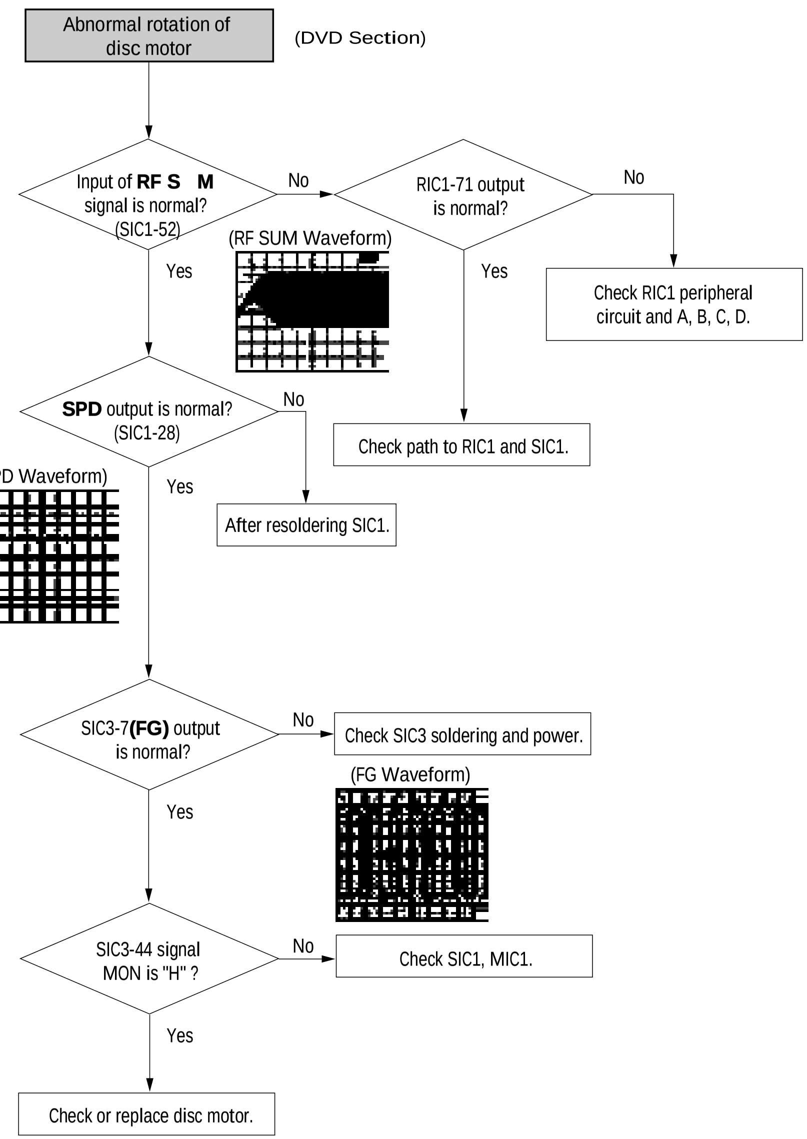

DRUM DOES NOT ROTATE
(VCR Section)
CN604-6 12V
NO
YES
CHECK AL12V 12V AT LINE IN THE POWER BLOCK
CN604-3 5V
CHECK PC5V LINE
CN604-12 2.5V
IC601-5, 9 DRUM CTL "L"
CHANGE IC601
CHECK CYLINDER MOTOR
CHECK R608, C659, R617, C661

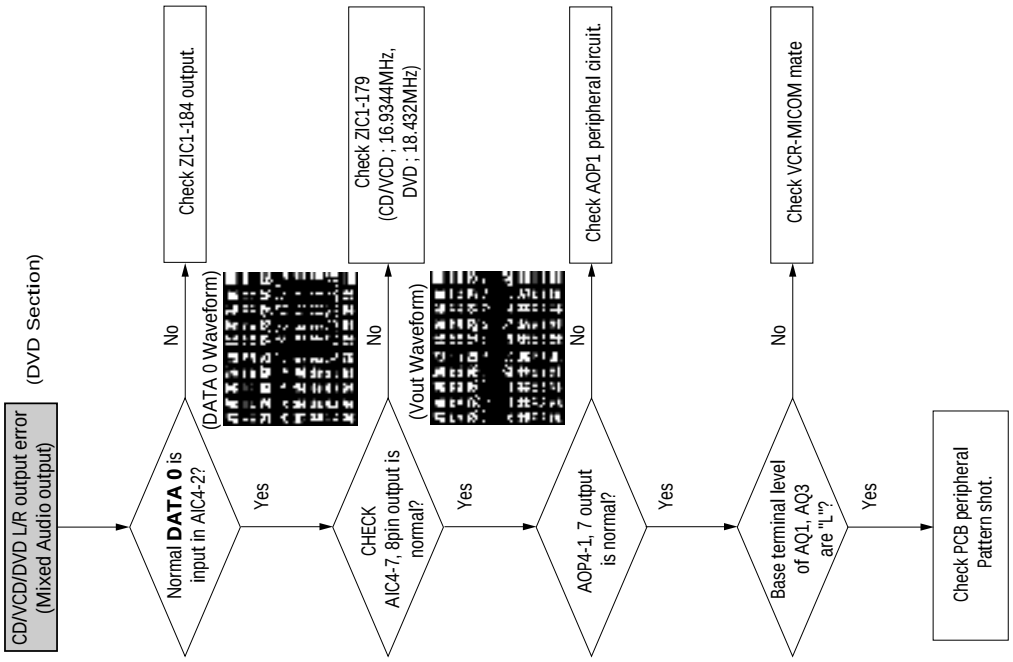

No pick-up home positing
(DVD Section)
SIC1-34(SLD) output is normal? (1.7V ~ 1.8V)
No
Check SIC1
Yes
(SLD Waveform)
SLED+, SLED- SIC3-32, 33 output are normal?
No
Check SIC3
Yes
Check the Sled Motor and connection

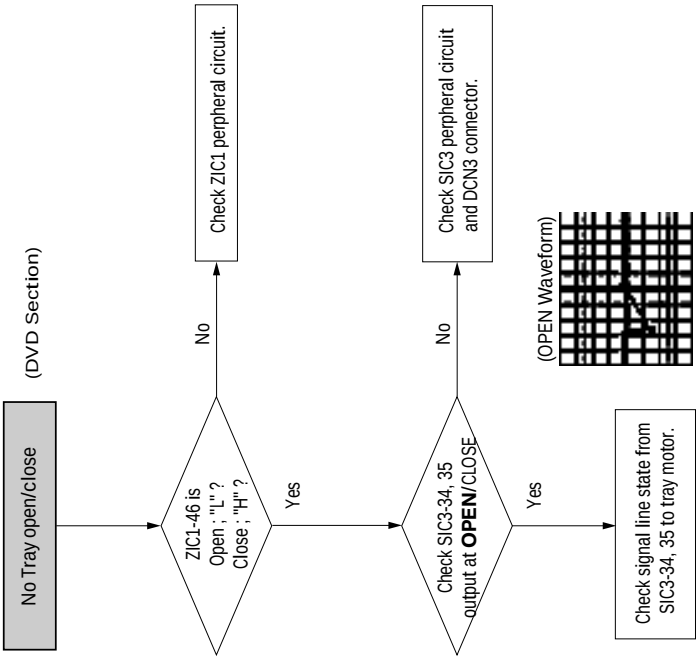

No focus incoming
(DVD Section)
A
FE in SIC1-8 is within specified range?
No
Check RIC1 and A, B, C, D input.
Yes
(FE Waveform)
SIC3-10, 11 output are normal?
No
Check SIC3.
Yes
Check open state from SIC3 to pick-up.

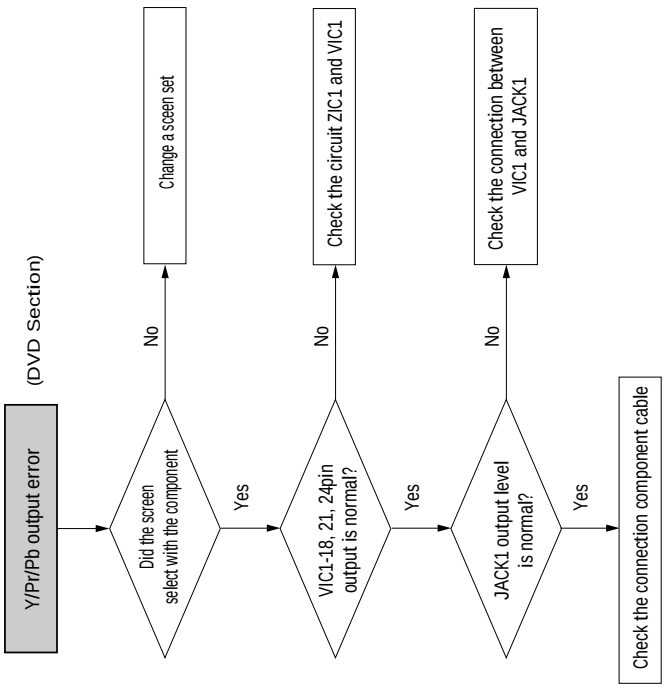

NO LD CD ON
(DVD Section)
RIC1-22 is 5V?
No
Check RIC1
Yes
Divide RQ2 emitter terminal voltage and 5V real voltage difference into 10ohm.
Yes
Current exceeds 0.1A?
No
Open check in related circuit.
Yes
LD out pick-up replace.
No Search Operation
(DVD Section)
MIRR, SIC1-37 output is normal?
No
RFAGCO, RIC1-73 output level is normal?
No
Check pick-up.
Yes
Check RIC1 peripheral circuit.
Yes
(MIRR Waveform)
Actual velocity occurs at SIC1-15 terminal?
No
Check SIC1 peripheral circuit.
Yes
Actual velocity occurs at SIC3-32, 33 terminal?
No
Check SIC3 peripheral circuit.
Yes
occurs in search range?
No
Focus On?
No
A
Yes
See "Fine Seek Check"

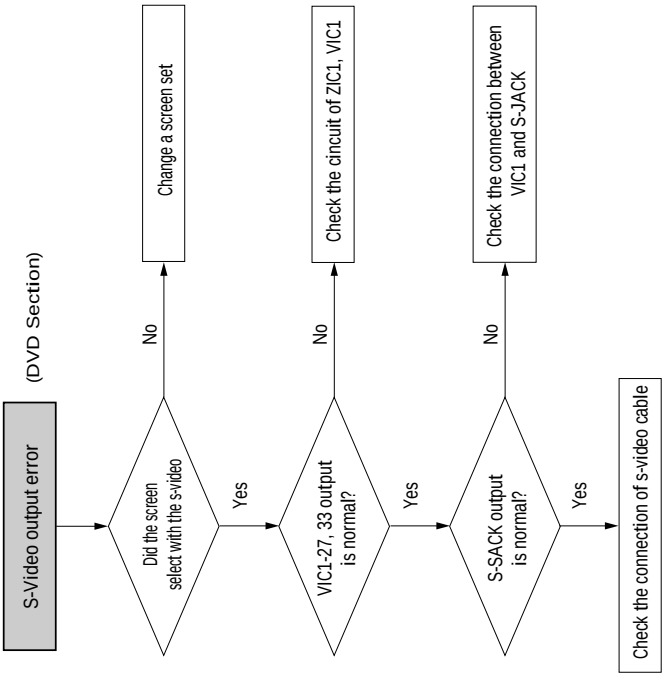

FINE SEEK Check
(DVD Section)
FINE SEEK MIRR signal (RIC1-67) is missing?
Yes
Check RIC1 Peripheral curcuit.
No
TZCO signal (SIC1-24) is occurs?
No
Check SIC1 Peripheral curcuit.
Yes
Track incomming is delayed?
No
Time out due to many jump counts.
Yes
TE is within 2V and 3V?
No
SIC1-14(TRD) output is normal?
No
Check RIC1-31 terminal.
Yes
SIC3-30, 29(T+, T-) terminal outputs are normal?
No
Check SIC3 peripheral circuit.
Yes
Check DCN1 and pick-up.
(TRD Waveform)
Yes
Pick-up transfer smooth.
No
Check MECHA.
Yes
Check SIC1 peripheral circuit.

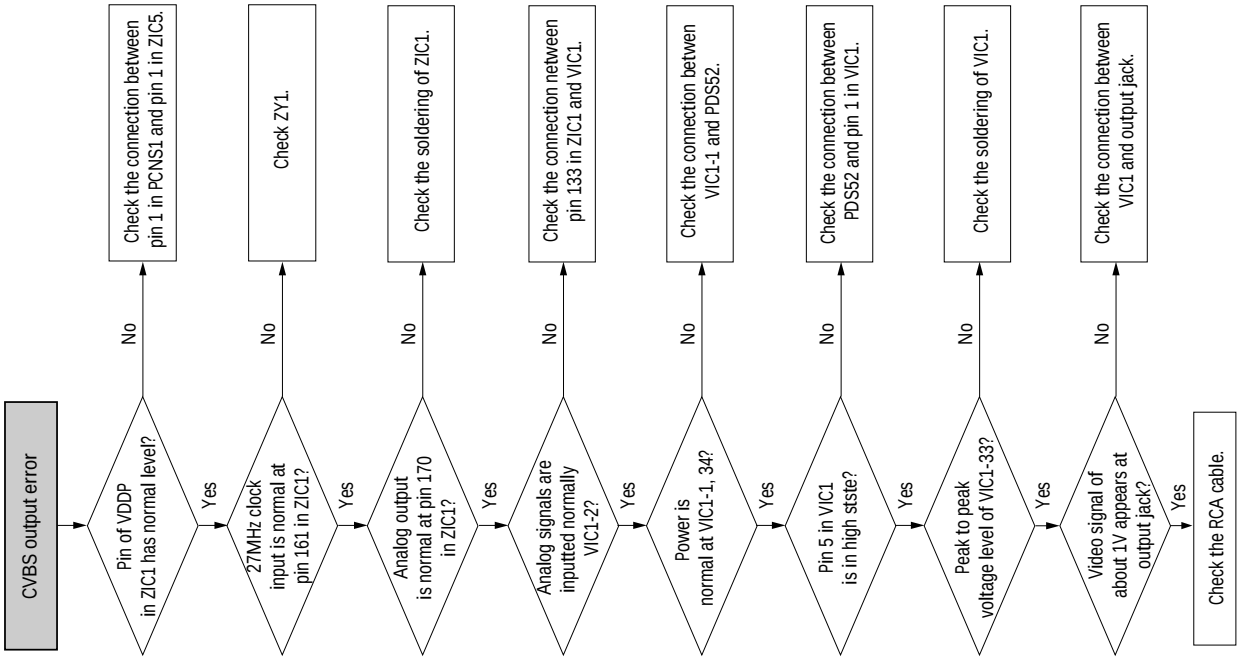

Abnormal rotation of disc motor
(DVD Section)
Input of RF S M signal is normal? (SIC1-52)
No
RIC1-71 output is normal?
No
Check RIC1 peripheral circuit and A, B, C, D.
Yes
Check path to RIC1 and SIC1.
(RF SUM Waveform)
Yes
SPD output is normal? (SIC1-28)
No
After resoldering SIC1.
(SPD Waveform)
Yes
SIC3-7(FG) output is normal?
No
Check SIC3 soldering and power.
(FG Waveform)
Yes
SIC3-44 signal MON is "H" ?
No
Check SIC1, MIC1.
Yes
Check or replace disc motor.


CD/VCD/DVD L/R output error
(Mixed Audio output)
(DVD Section)
Normal DATA 0 is input in AIC4-2?
No
Check ZIC1-184 output.
Yes
(DATA 0 Waveform)
CHECK AIC4-7, 8pin output is normal?
No
Check ZIC1-179
(CD/VCD ; 16.9344MHz, DVD ; 18.432MHz)
Yes
(Vout Waveform)
AOP4-1, 7 output is normal?
No
Check AOP1 peripheral circuit.
Yes
Base terminal level of AQ1, AQ3 are "L"?
No
Check VCR-MICOM mate
Yes
Check PCB peripheral Pattern shot.

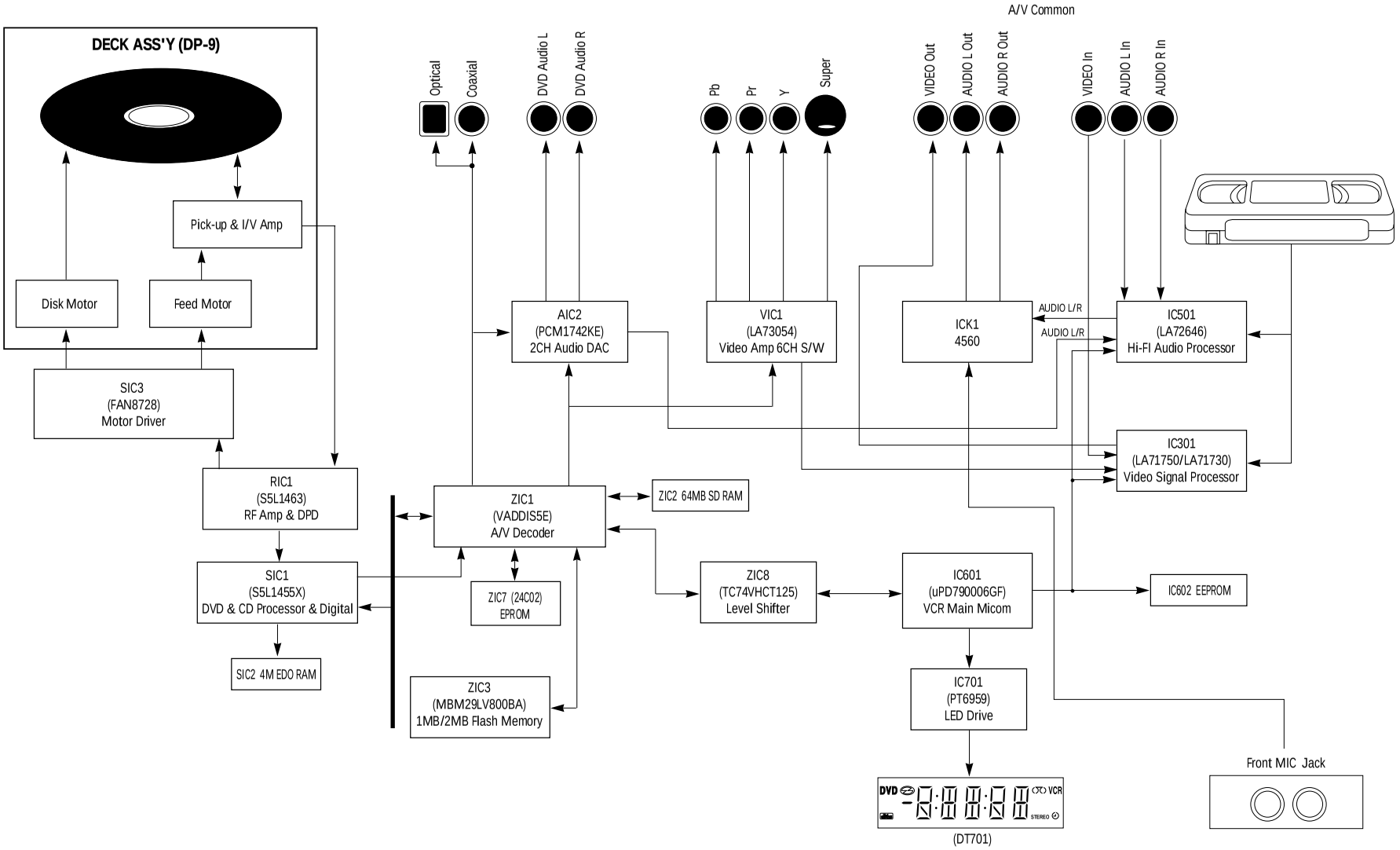

No Tray open/close
(DVD Section)
ZIC1-46 is Open ; "L" ? Close ; "H" ?
No
Check ZIC1 perpheral circuit.
Yes
Check SIC3-34, 35 output at OPEN/CLOSE
No
Check SIC3 perpheral circuit and DCN3 connector.
Yes
(OPEN Waveform)
Check signal line state from SIC3-34, 35 to tray motor.


Y/Pr/Pb output error
(DVD Section)
Did the screen select with the component
No
Change a sceen set
Yes
VIC1-18, 21, 24pin output is normal?
No
Check the circuit ZIC1 and VIC1
Yes
JACK1 output level is normal?
No
Check the connection between VIC1 and JACK1
Yes
Check the connection component cable

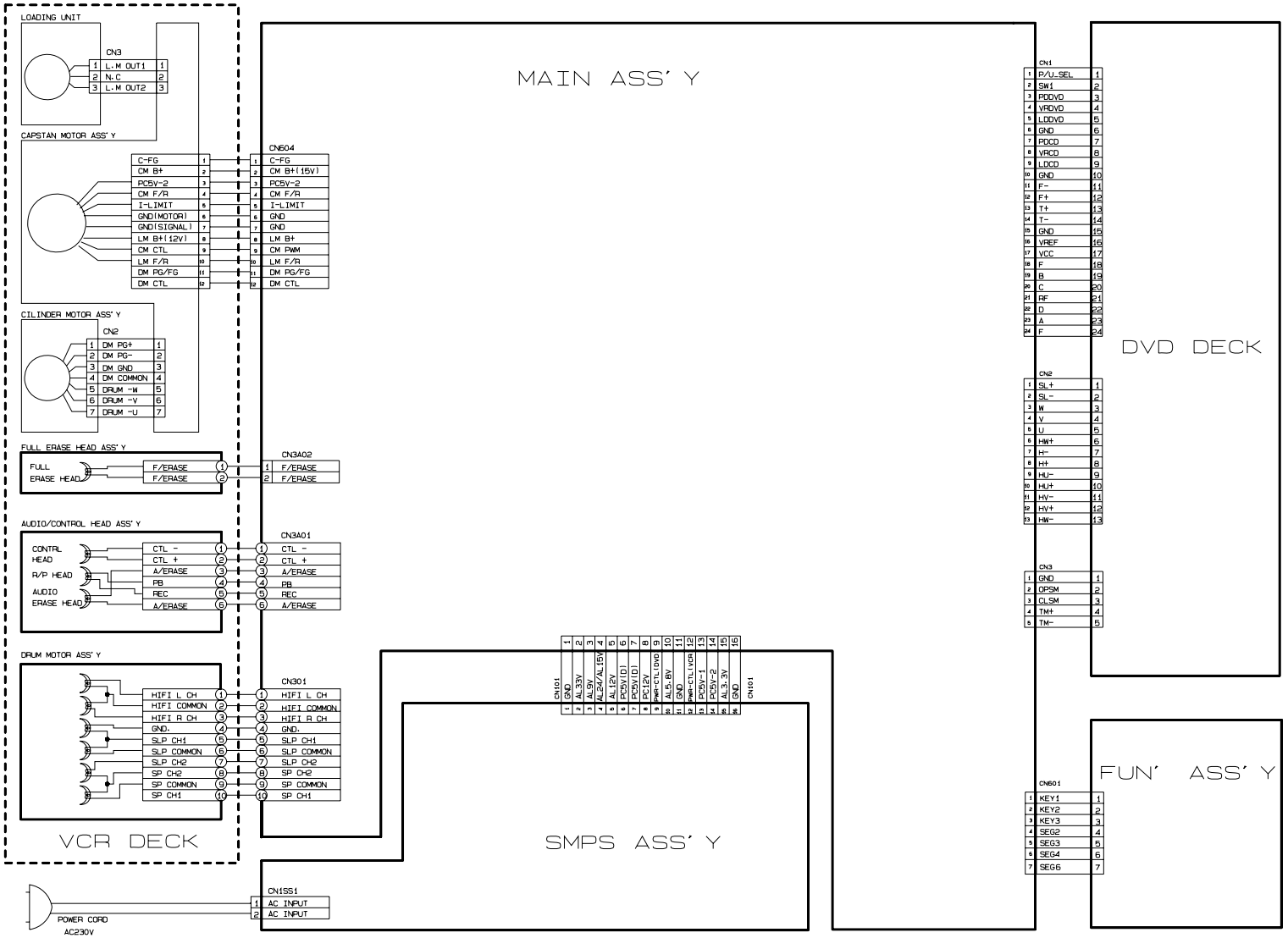

S-Video output error
(DVD Section)
Did the screen select with the s-video
No
Change a screen set
Yes
VIC1-27, 33 output is normal?
No
Check the cincuit of ZIC1, VIC1
Yes
S-SACK output is normal?
No
Check the connection between VIC1 and S-JACK
Yes
Check the connection of s-video cable


CVBS output error
Pin of VDDP in ZIC1 has normal level?
No
Check the connection between pin 1 in PCNS1 and pin 1 in ZIC5.
Yes
27MHz clock input is normal at pin 161 in ZIC1?
No
Check ZY1.
Yes
Analog output is normal at pin 170 in ZIC1?
No
Check the soldering of ZIC1.
Yes
Analog signals are inputted normally VIC1-2?
No
Check the connection netween pin 133 in ZIC1 and VIC1.
Yes
Power is normal at VIC1-1, 34?
No
Check the connection betwen VIC1-1 and PDS52.
Yes
Pin 5 in VIC1 is in high stste?
No
Check the connection between PDS52 and pin 1 in VIC1.
Yes
Peak to peak voltage level of VIC1-33?
No
Check the soldering of VIC1.
Yes
Video signal of about 1V appears at output jack?
No
Check the connection between VIC1 and output jack.
Yes
Check the RCA cable.

10. Block Diagram



MEMO


LOADING UNIT
CN3
1 L.M OUT1
2 N.C
3 L.M OUT2
CAPSTAN MOTOR ASS'Y
C-FG
CM B+
PC5V-2
CM F/R
I-LIMIT
GND(MOTOR)
GND(SIGNAL)
LM B+(12V)
CM CTL
LM F/R
DM PG/FG
DM CTL
CN604
CYLINDER MOTOR ASS'Y
CN2
DM PG+
DM PG-
DM GND
DM COMMON
DRUM -W
DRUM -V
DRUM -U
FULL ERASE HEAD ASS'Y
FULL ERASE HEAD
F/ERASE
CN3A02
AUDIO/CONTROL HEAD ASS'Y
CONTRL HEAD
R/P HEAD
AUDIO ERASE HEAD
CTL -
CTL +
A/ERASE
PB
REC
CN3A01
DRUM MOTOR ASS'Y
HIFI L CH
HIFI COMMON
HIFI R CH
GND.
SLP CH1
SLP COMMON
SLP CH2
SP CH2
SP COMMON
SP CH1
CN301
VCR DECK
POWER CORD
AC230V
CN1S1
AC INPUT
MAIN ASS'Y
CN101
GND
AL3.3V
AL9V
AL24/AL15V
AL12V
PC5V(D)
PC12V
PWR-CTL(DVD)
AL5.8V
PWR-CTL(VCR)
PC5V-1
PC5V-2
AL3.3V
SMPS ASS'Y
DVD DECK
P/U_SEL
SW1
PDDVD
VRDVD
LDDVD
PDCD
VRCD
LDCD
F-
F+
T+
T-
VREF
VCC
RF
SL+
SL-
W
V
U
HW+
H-
H+
HU-
HU+
HV-
HV+
HW-
OPSM
CLSM
TM+
TM-
FUN' ASS'Y
CN601
KEY1
KEY2
KEY3
SEG2
SEG3
SEG4
SEG6

MEMO

12. Schematic Diagrams

Note

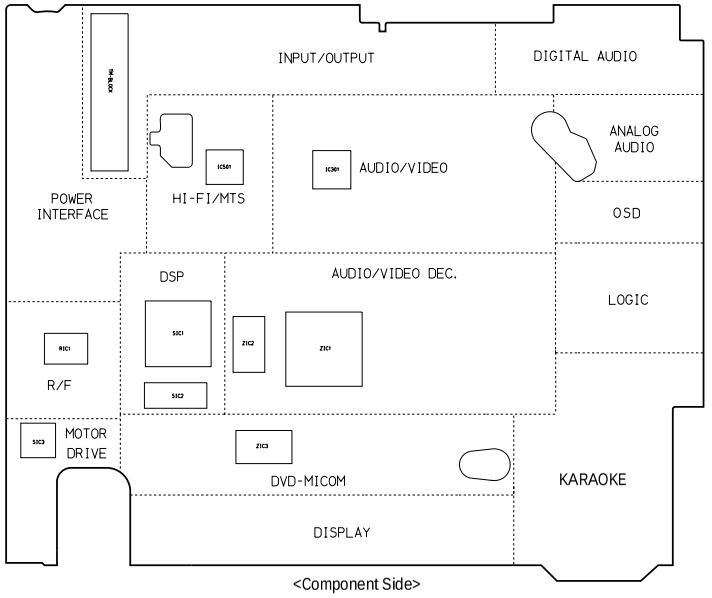
For schematic Diagram
- Resistors are in ohms, 1/8W unless otherwise noted.

Special note :
Most semiconductor devices are electrostatically sensitive and therefore require the special handling techniques described under the "electrostatically sensitive (ES) devices" section of this service manual.

Note :
Do not use the part number shown on this drawing for ordering. The correct part number is shown in the parts list (may be slightly different or amended since this drawing was prepared).

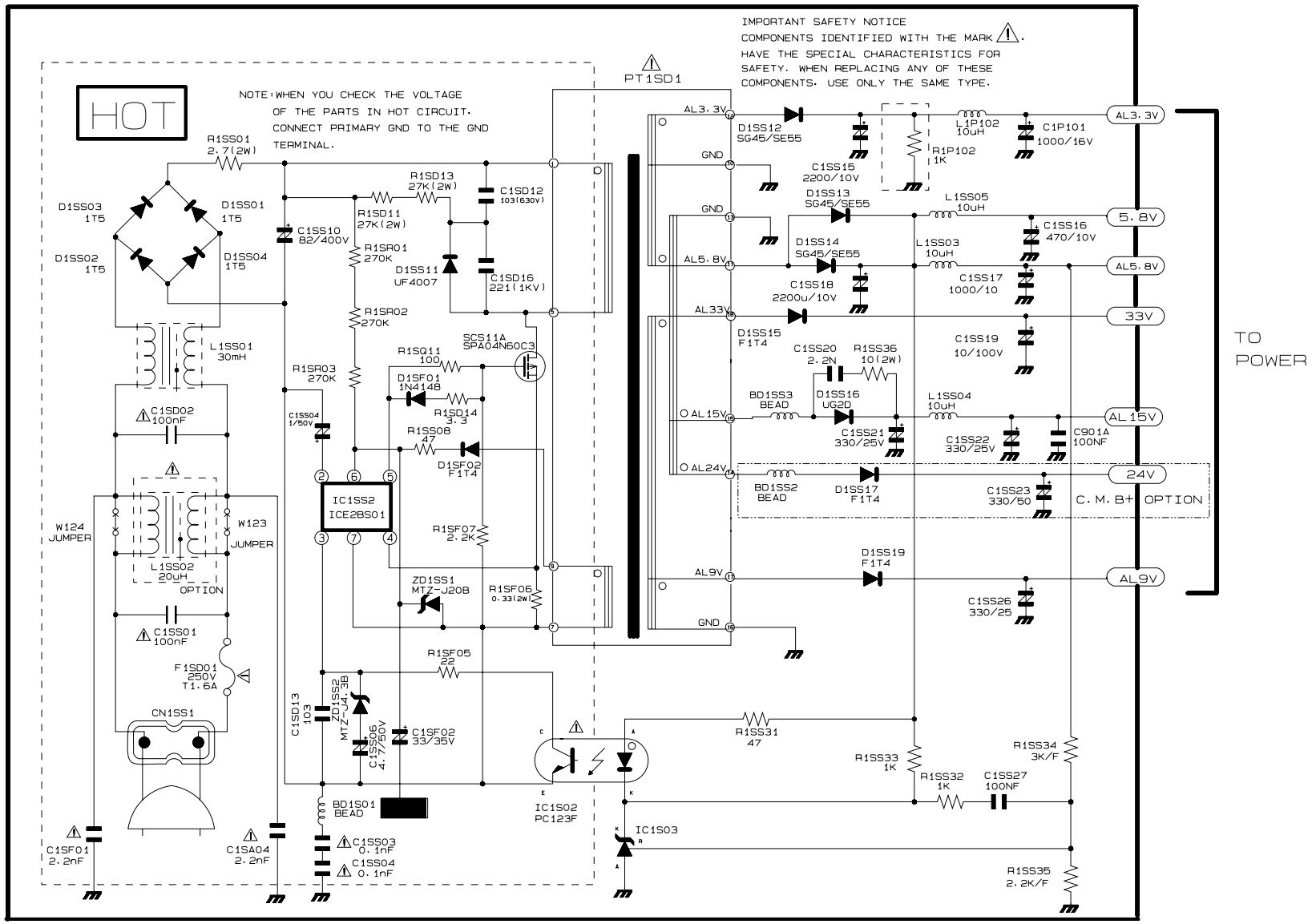
Important safety notices :
Components identified with the mark ⚠ have the special characteristics for safety. When replacing any of these components. Use only the same type.

◆ Block Identification of Main PCB

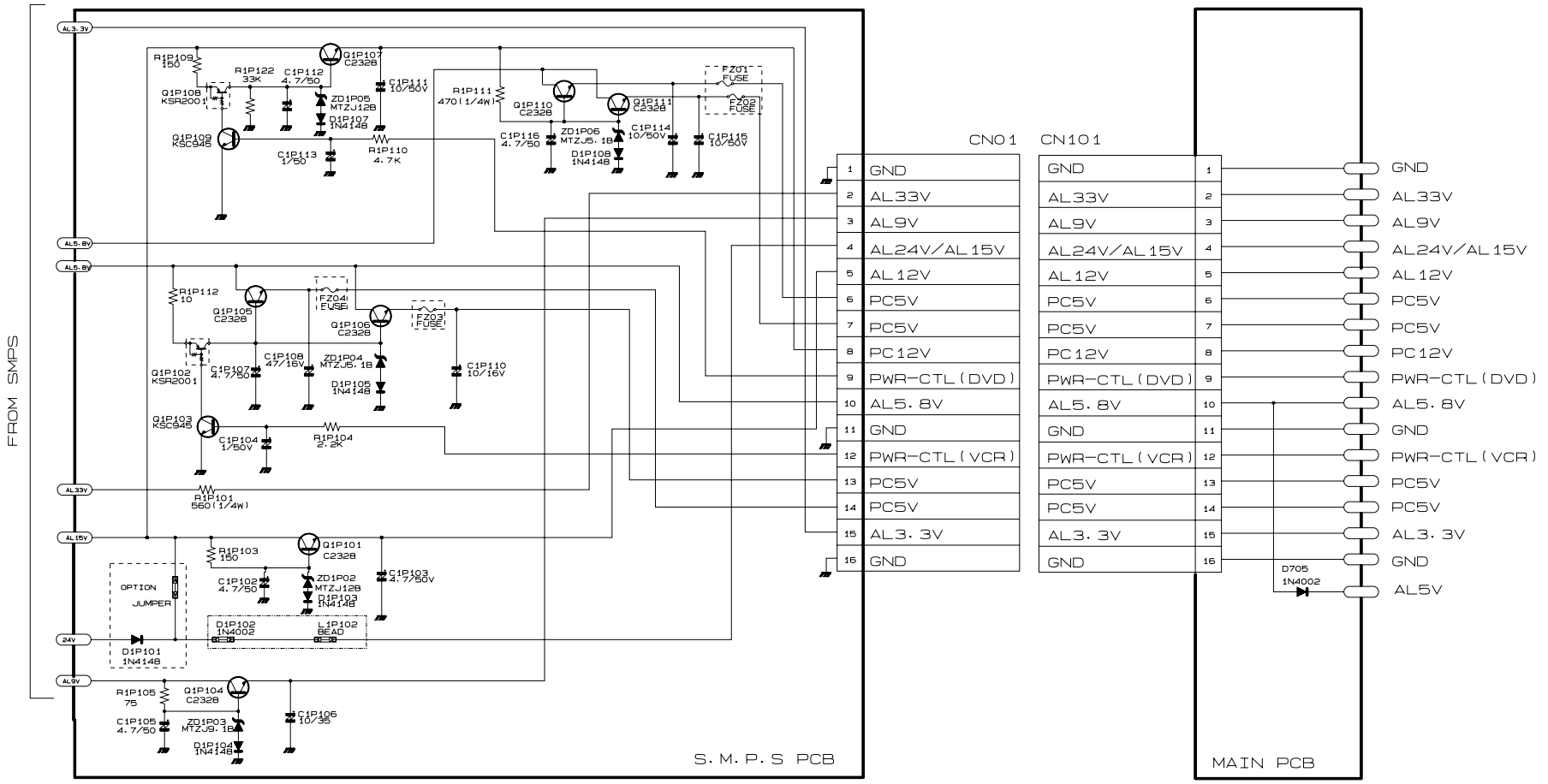


<Component Side>

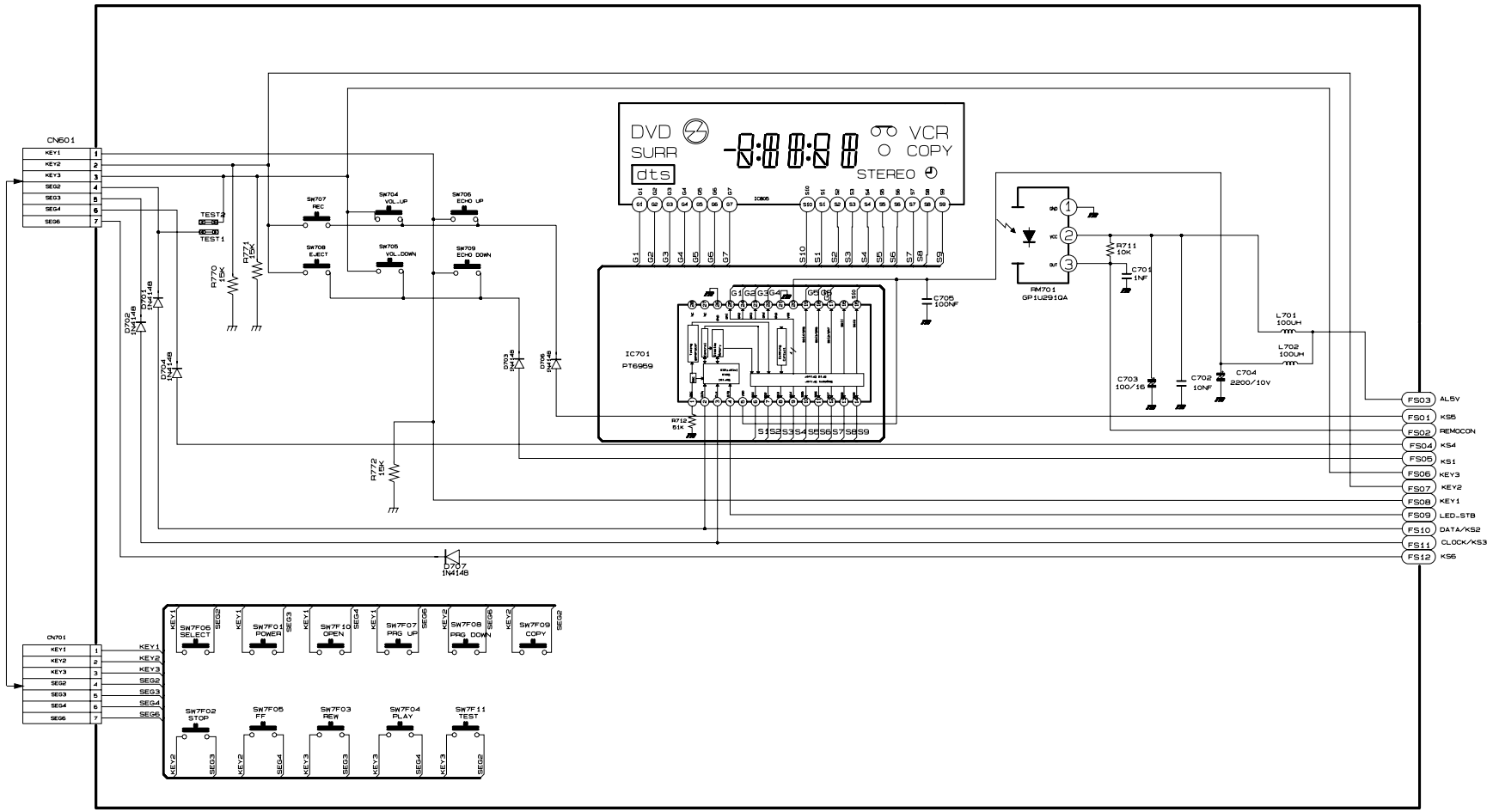
12-1 S.M.P.S.


HOT
NOTE:WHEN YOU CHECK THE VOLTAGE OF THE PARTS IN HOT CIRCUIT. CONNECT PRIMARY GND TO THE GND TERMINAL.
IMPORTANT SAFETY NOTICE
COMPONENTS IDENTIFIED WITH THE MARK ⚠. HAVE THE SPECIAL CHARACTERISTICS FOR SAFETY. WHEN REPLACING ANY OF THESE COMPONENTS. USE ONLY THE SAME TYPE.
PT1SD1
R1SS01 2.7(2W)
D1SS03 1T5
D1SS01 1T5
D1SS02 1T5
D1SS04 1T5
C1SS10 82/400V
R1SD13 27K(2W)
R1SD11 27K(2W)
C1SD12 103(630V)
R1SR01 270K
D1SS11 UF4007
C1SD16 221(1KV)
R1SR02 270K
R1SR03 270K
L1SS01 30mH
SCS11A SPA04N60C3
R1SQ11 100
D1SF01 1N4148
R1SD14 3.3
R1SS08 47
D1SF02 F1T4
C1SS04 1/50V
C1SD02 100nF
IC1SS2 ICE2BS01
R1SF07 2.2K
W124 JUMPER
W123 JUMPER
L1SS02 20uH OPTION
C1SS01 100nF
F1SD01 250V T1.6A
CN1SS1
ZD1SS1 MTZ-J20B
R1SF06 0.33(2W)
R1SF05 22
C1SD13 103
ZD1SS2 MTZ-J4.3B
C1SS06 4.7/50V
C1SF02 33/35V
BD1S01 BEAD
C1SF01 2.2nF
C1SA04 2.2nF
C1SS03 0.1nF
C1SS04 0.1nF
IC1S02 PC123F
R1SS31 47
R1SS33 1K
R1SS32 1K
C1SS27 100NF
R1SS34 3K/F
IC1S03
R1SS35 2.2K/F
AL3.3V
GND
GND
AL5.8V
AL33V
AL15V
AL24V
AL9V
GND
D1SS12 SG45/SE55
C1SS15 2200/10V
R1P102 1K
L1P102 10uH
C1P101 1000/16V
D1SS13 SG45/SE55
L1SS05 10uH
C1SS16 470/10V
D1SS14 SG45/SE55
L1SS03 10uH
C1SS17 1000/10
C1SS18 2200u/10V
D1SS15 F1T4
C1SS19 10/100V
C1SS20 2.2N
R1SS36 10(2W)
BD1SS3 BEAD
D1SS16 UG2D
L1SS04 10uH
C1SS21 330/25V
C1SS22 330/25V
C901A 100NF
BD1SS2 BEAD
D1SS17 F1T4
C1SS23 330/50
D1SS19 F1T4
C1SS26 330/25
AL3.3V
5.8V
AL5.8V
33V
AL15V
24V
C.M.B+ OPTION
AL9V
TO POWER

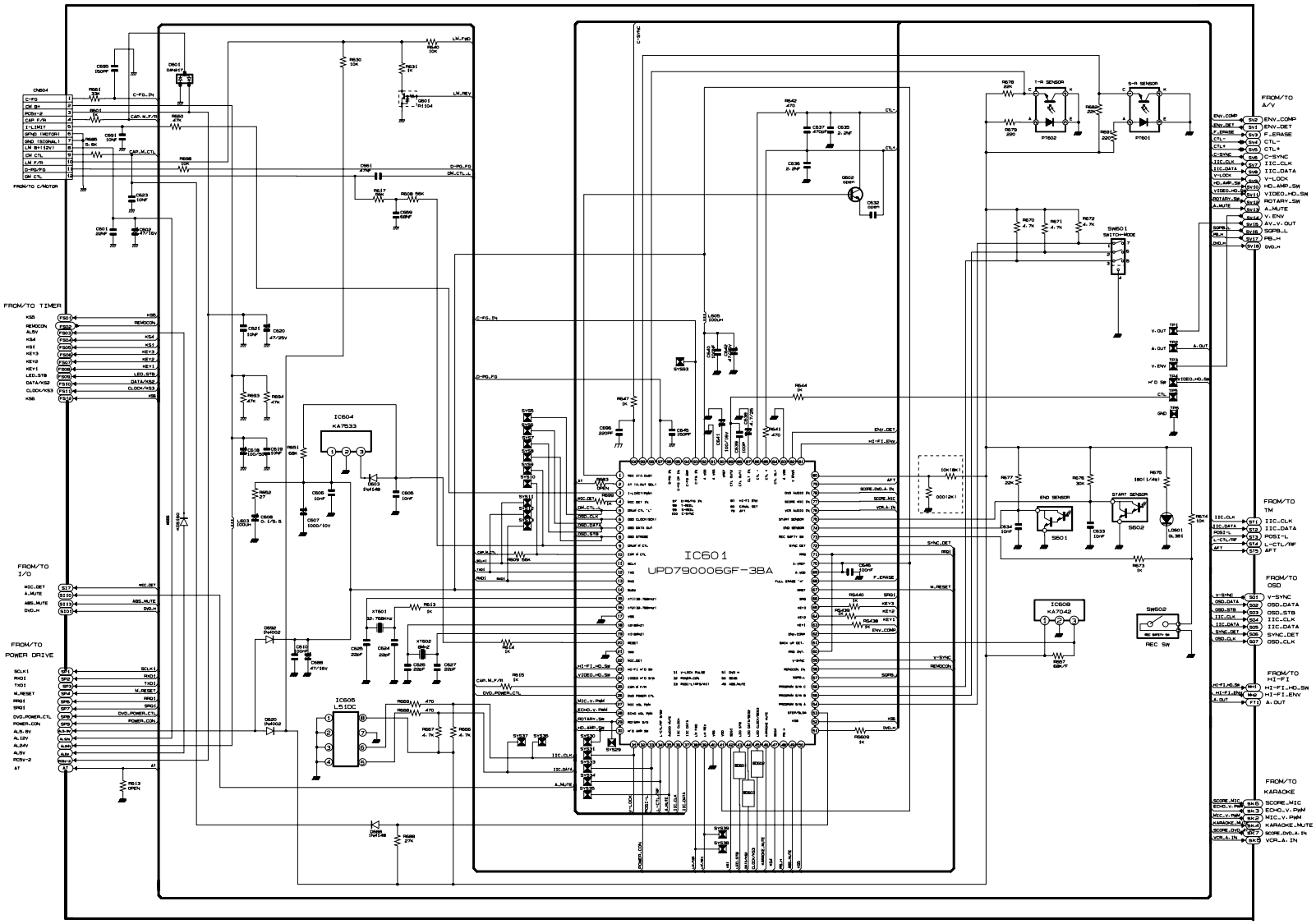
12-2 Power Drive



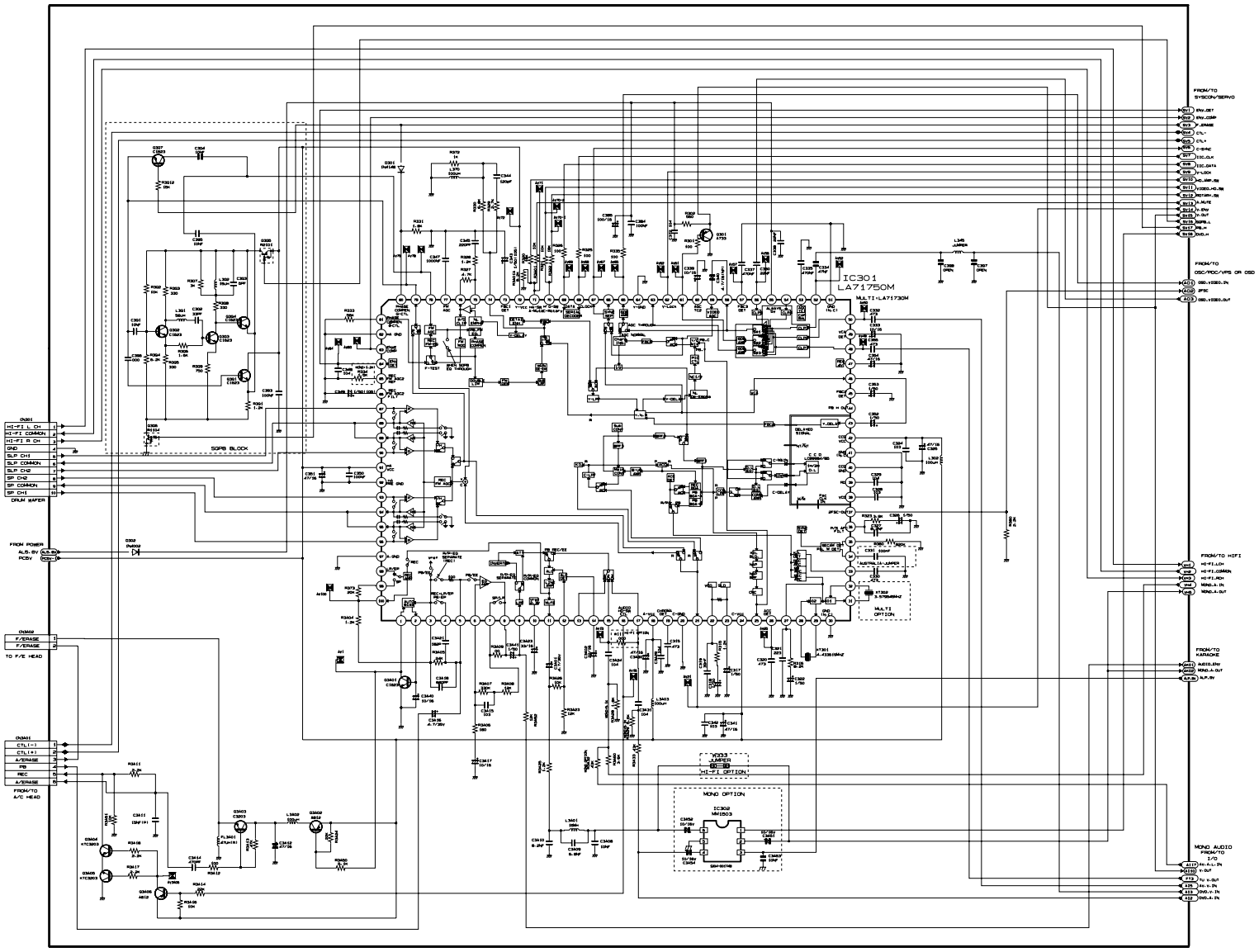
12-3 Display/Function



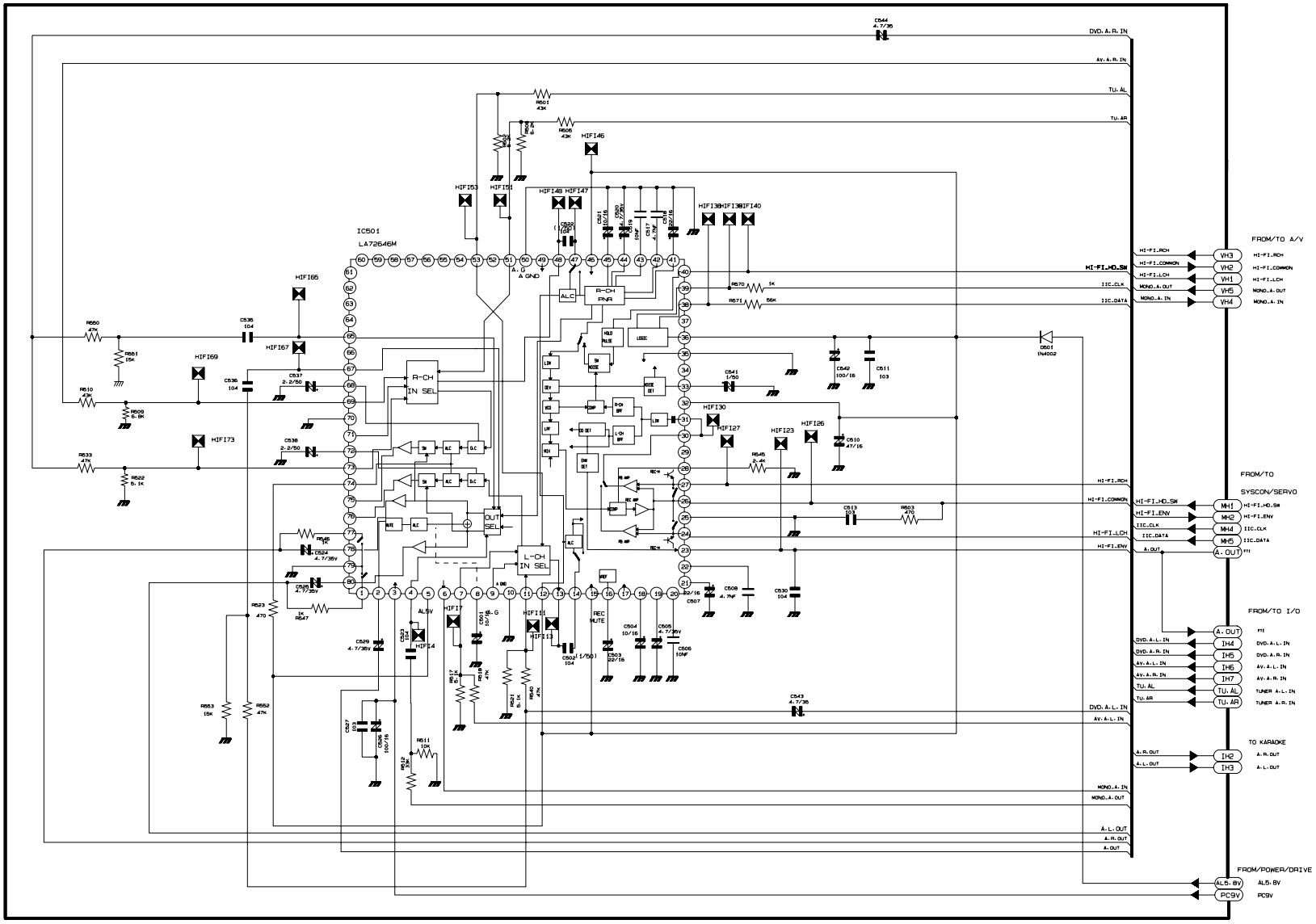
12-4 System Control/Servo



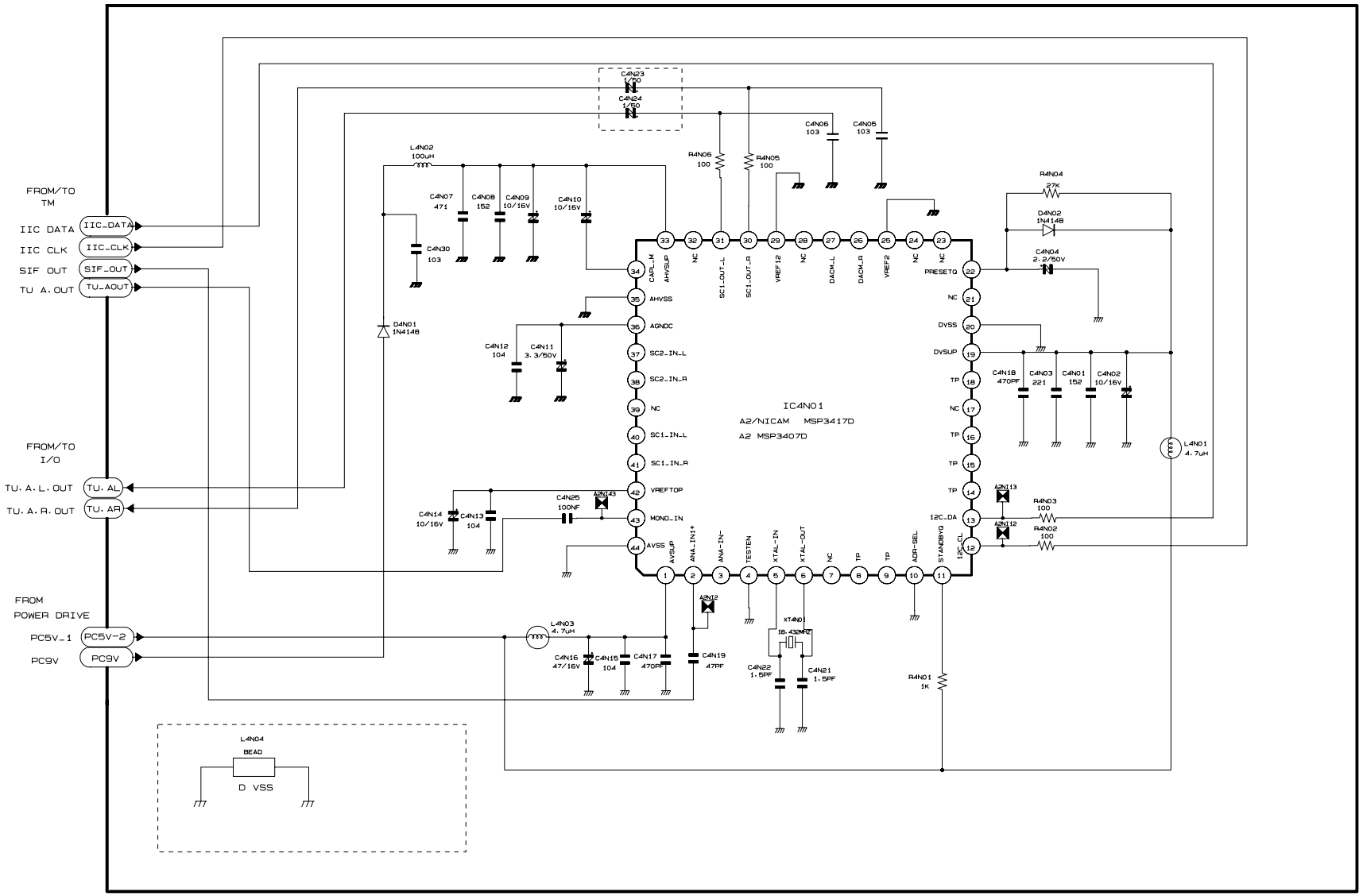
12-5 A/V


IC301
LA71750M
MULTI+LA71730M
SCPB BLOCK
DRUM MPER
TO F/E HEAD
FROM/TO A/C HEAD
FROM POWER
FROM/TO SYSCON/SERVO
FROM/TO OSC/PDC/VPS OR OSD
FROM/TO HIFI
FROM/TO KARAOKE
MONO AUDIO FROM/TO I/O
MONO OPTION
IC302
M61003
HI-FI OPTION
MULTI OPTION
AUSTRALIA JUMPER

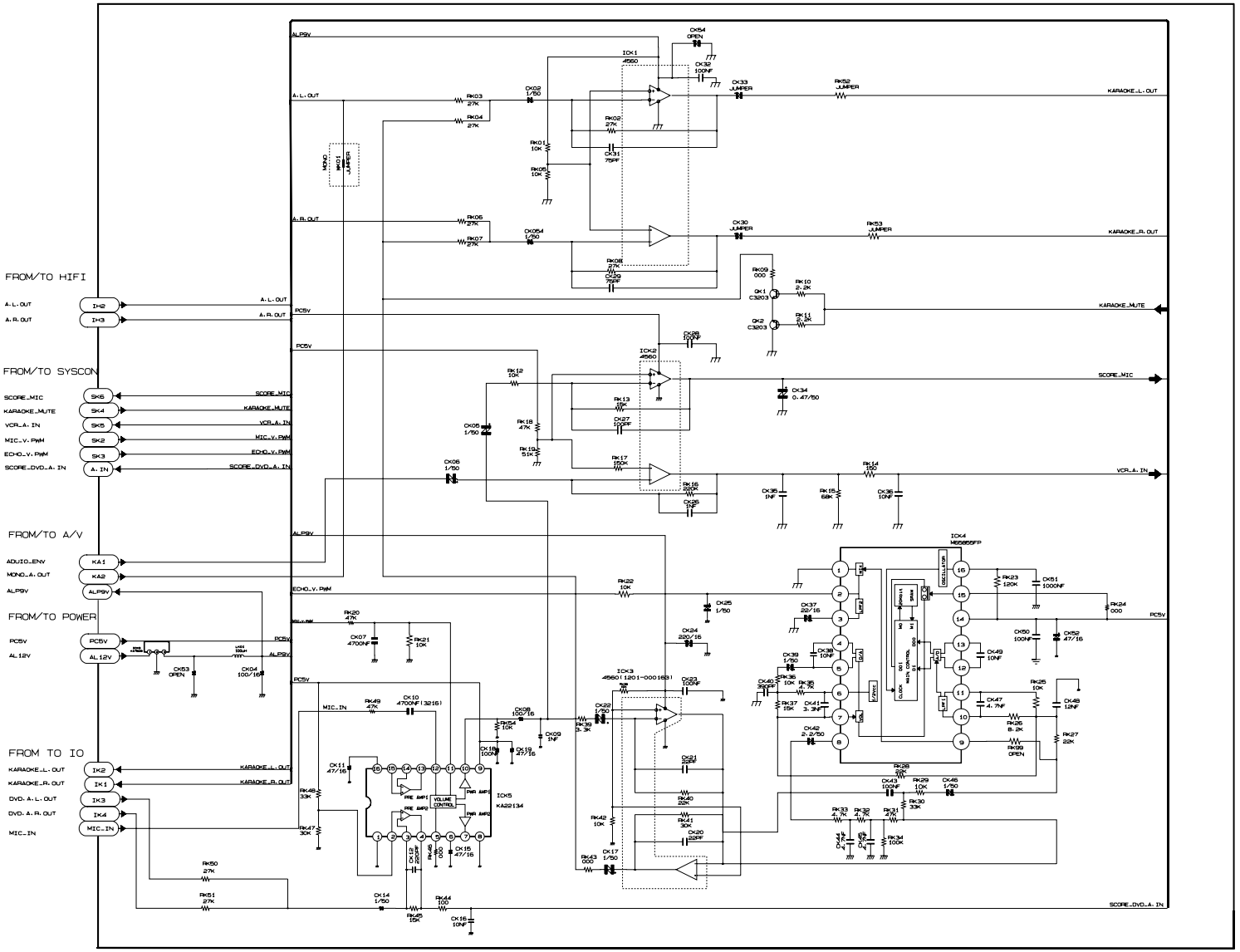
12-6 Hi-Fi


IC501
LA72646M
R-CH IN SEL
L-CH IN SEL
OUT SEL
R-CH PWR
ALC
REC MUTE
DVD.A.R.IN
AV.A.R.IN
TU.AL
TU.AR
HI-FI.HD.SW
IIC.CLK
IIC.DATA
MONO.A.IN
MONO.A.OUT
HI-FI.RCH
HI-FI.COMMON
HI-FI.LCH
HI-FI.ENV
A.OUT
DVD.A.L.IN
AV.A.L.IN
A.L.OUT
A.R.OUT
FROM/TO A/V
FROM/TO SYSCON/SERVO
FROM/TO I/O
TO KARAOKE
FROM/POWER/DRIVE
AL5.8V
PC9V
TUNER A.L.IN
TUNER A.R.IN

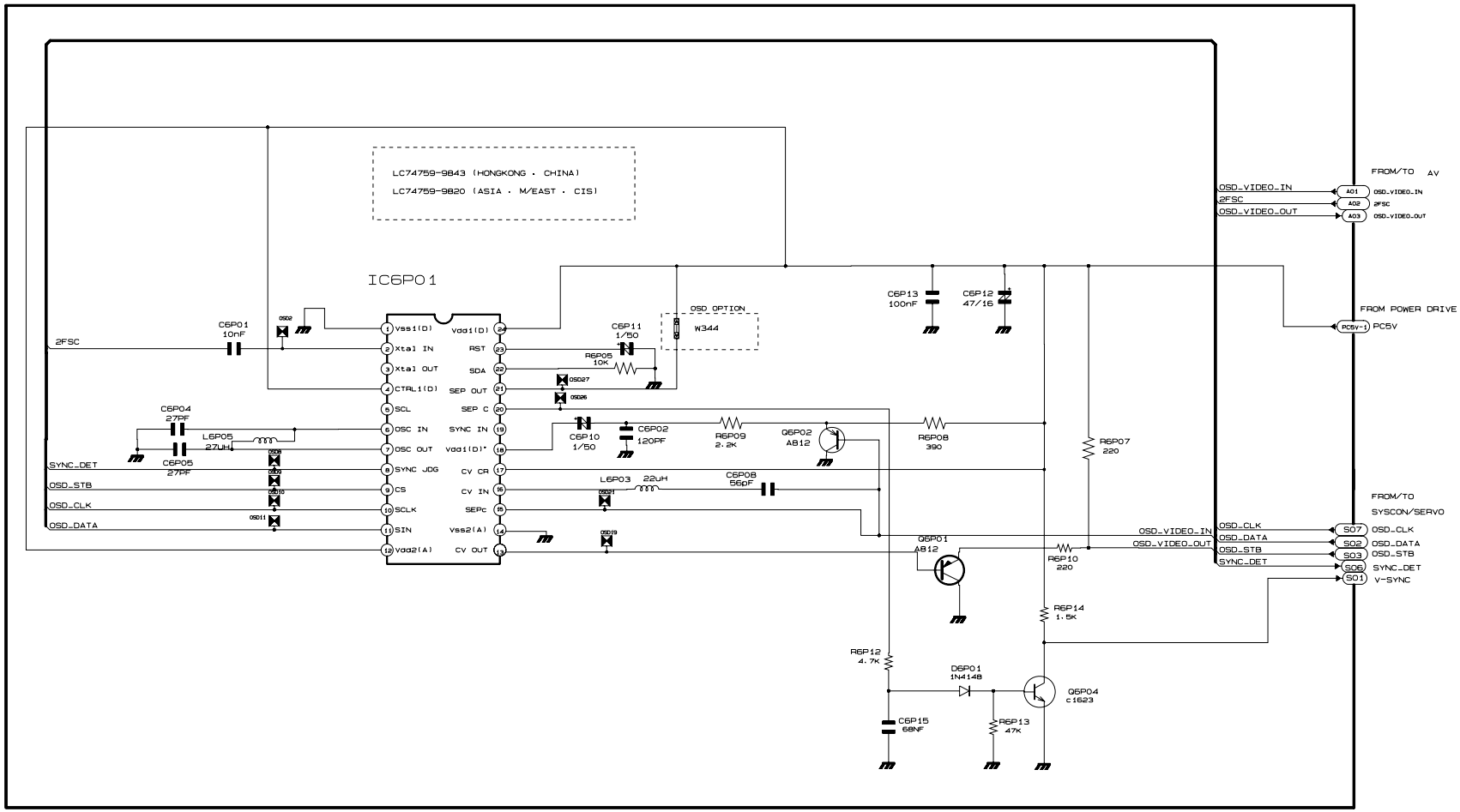
12-7 A2/NICAM


FROM/TO TM
IIC DATA
IIC CLK
SIF OUT
TU A.OUT
IIC_DATA
IIC_CLK
SIF_OUT
TU_AOUT
FROM/TO I/O
TU. A. L. OUT
TU. A. R. OUT
TU. AL
TU. AR
FROM POWER DRIVE
PC5V_1
PC9V
PC5V-2
PC9V
IC4N01
A2/NICAM MSP3417D
A2 MSP3407D
L4N02 100uH
C4N07 471
C4N08 152
C4N09 10/16V
C4N10 10/16V
C4N30 103
C4N23 1/50
C4N24 1/50
C4N06 103
C4N05 103
R4N06 100
R4N05 100
R4N04 27K
D4N02 1N4148
C4N04 2.2/50V
D4N01 1N4148
C4N12 104
C4N11 3.3/50V
C4N18 470PF
C4N03 221
C4N01 152
C4N02 10/16V
L4N01 4.7uH
C4N14 10/16V
C4N13 104
C4N25 100NF
A2N143
A2N113
A2N112
R4N03 100
R4N02 100
L4N03 4.7uH
C4N16 47/16V
C4N15 104
C4N17 470PF
C4N19 47PF
XT4N01 18.432MHZ
C4N22 1.5PF
C4N21 1.5PF
R4N01 1K
L4N04 BEAD
D VSS
CAPL_M
AHVSUP
NC
SC1_OUT_L
SC1_OUT_R
VREF12
NC
DACM_L
DACM_R
VREF2
NC
NC
PRESETQ
NC
DVSS
DVSUP
TP
NC
TP
TP
TP
12C_DA
12C_CL
AHVSS
AGNDC
SC2_IN_L
SC2_IN_R
NC
SC1_IN_L
SC1_IN_R
VREFTOP
MONO_IN
AVSS
AVSUP
ANA_IN1+
ANA_IN-
TESTEN
XTAL_IN
XTAL_OUT
NC
TP
TP
ADR_SEL
STANDBYQ

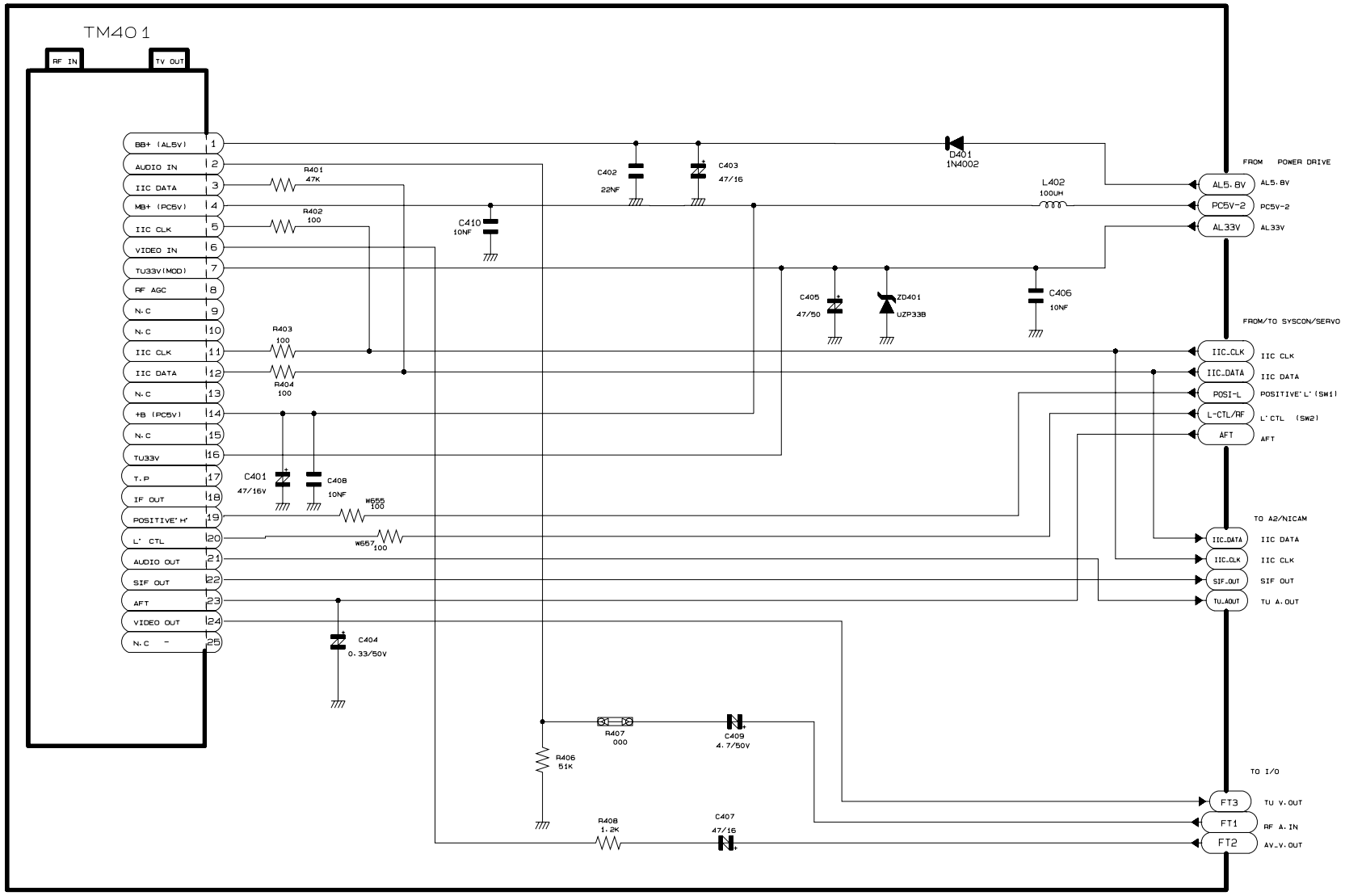
12-8 Karaoke


FROM/TO HIFI
A.L.OUT
A.R.OUT
FROM/TO SYSCON
SCORE_MIC
KARAOKE_MUTE
VCR_A. IN
MIC_V. PWM
ECHO_V. PWM
SCORE_DVD_A. IN
FROM/TO A/V
ADJUD_ENV
MONO_A. OUT
ALPSV
FROM/TO POWER
PCSV
AL12V
FROM TO IO
KARAOKE_L. OUT
KARAOKE_R. OUT
DVD. A. L. OUT
DVD. A. R. OUT
MIC_IN
KARAOKE_L. OUT
KARAOKE_R. OUT
KARAOKE_MUTE
SCORE_MIC
VCR_A. IN
SCORE_DVD_A. IN
IK1
4560
IK2
4560
IK3
4560(1201-0001631
IK4
M52055FP
IK5
KA22134

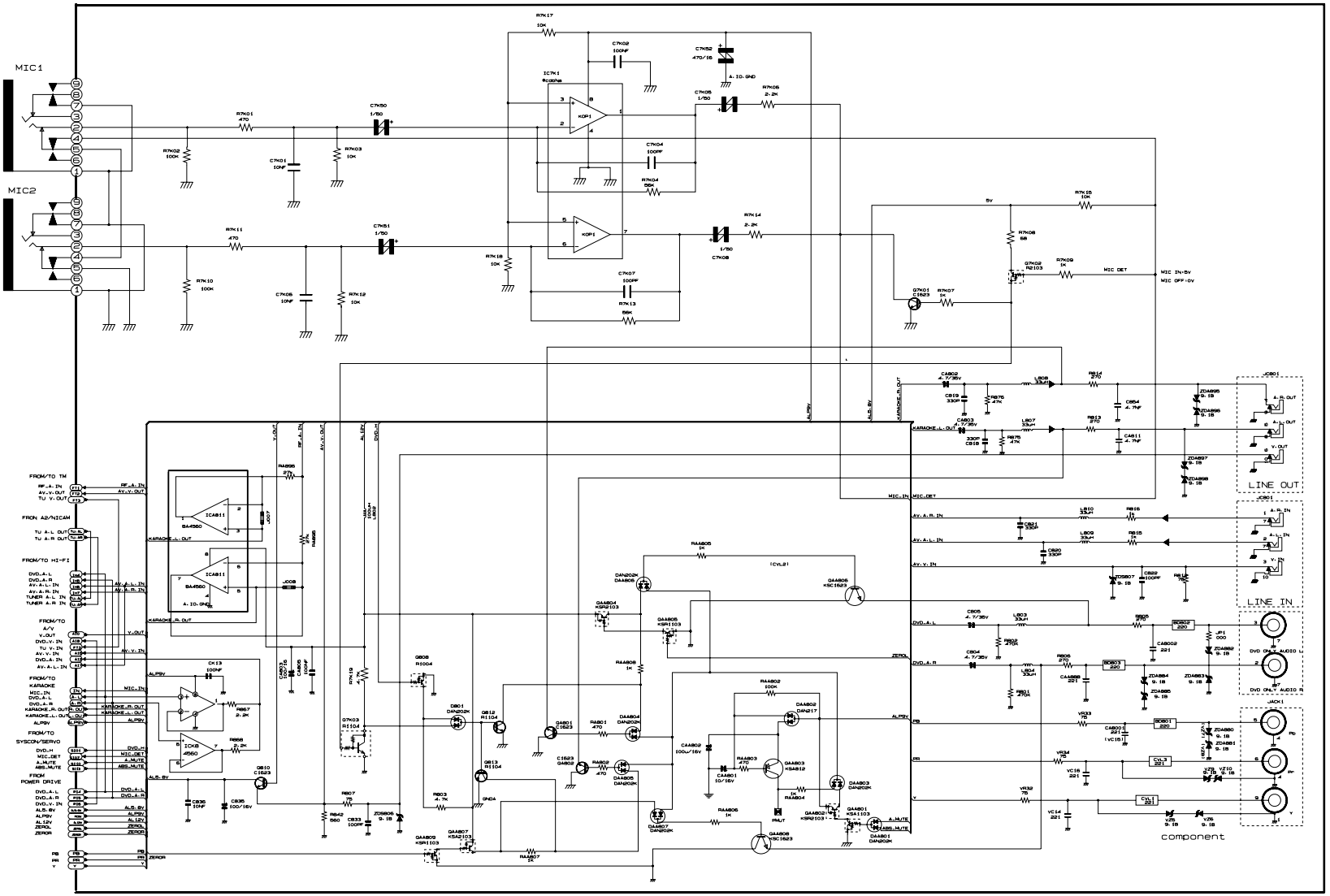
12-9 OSD/VPS/PDC



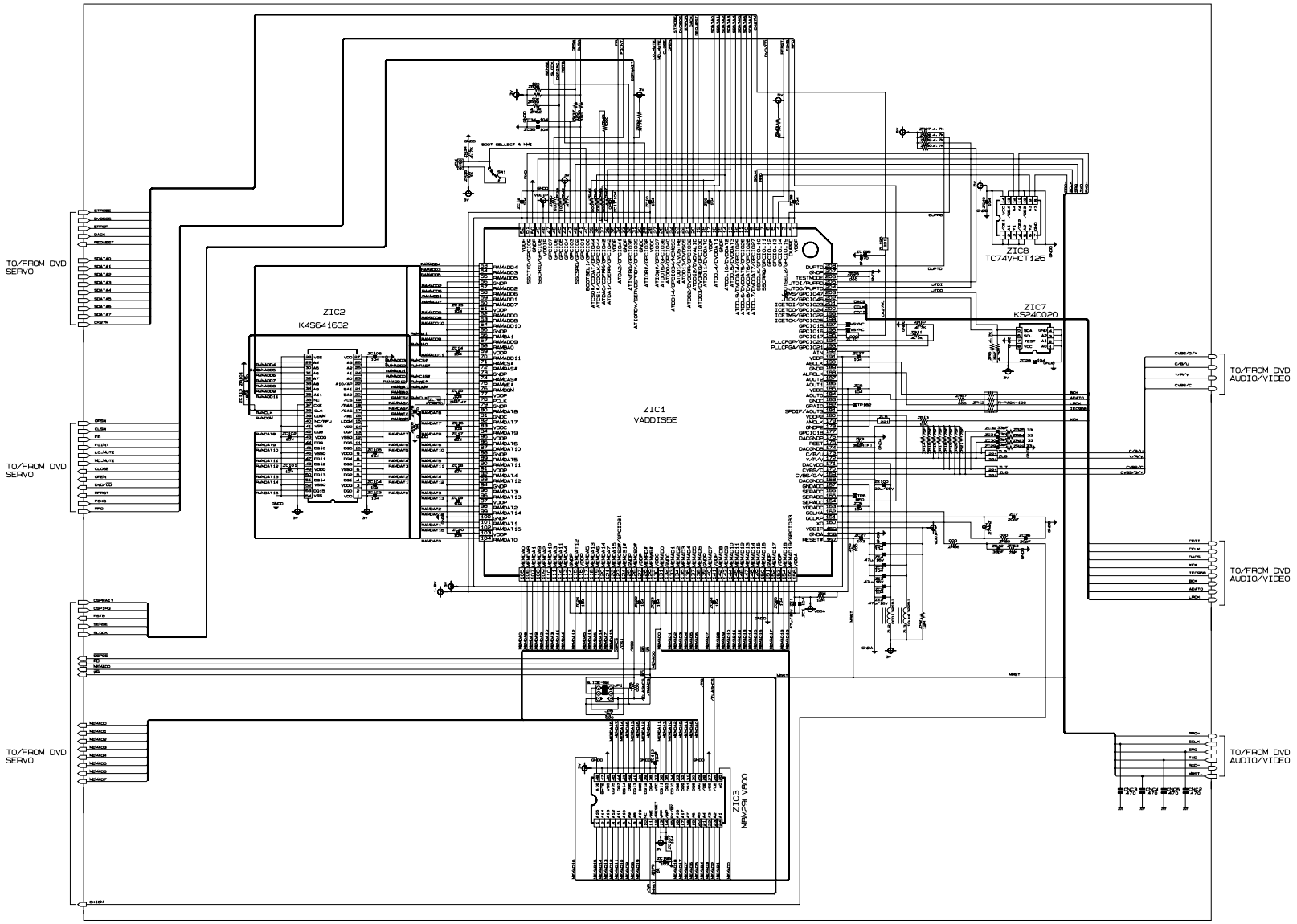
12-10 TM


TM401
RF IN
TV OUT
BB+ (AL5V) 1
AUDIO IN 2
IIC DATA 3
MB+ (PC5V) 4
IIC CLK 5
VIDEO IN 6
TU33V(MOD) 7
RF AGC 8
N.C 9
N.C 10
IIC CLK 11
IIC DATA 12
N.C 13
+B (PC5V) 14
N.C 15
TU33V 16
T.P 17
IF OUT 18
POSITIVE'H' 19
L' CTL 20
AUDIO OUT 21
SIF OUT 22
AFT 23
VIDEO OUT 24
N.C 25
R401 47K
R402 100
R403 100
R404 100
C401 47/16V
C402 22NF
C403 47/16
C404 0.33/50V
C405 47/50
C406 10NF
C408 10NF
C409 4.7/50V
C410 10NF
C407 47/16
D401 1N4002
ZD401 UZP33B
L402 100UH
W655 100
W657 100
R406 51K
R407 000
R408 1.2K
FROM POWER DRIVE
AL5.8V AL5.8V
PC5V-2 PC5V-2
AL33V AL33V
FROM/TO SYSCON/SERVO
IIC_CLK IIC CLK
IIC_DATA IIC DATA
POSI-L POSITIVE'L'(SW1)
L-CTL/RF L'CTL (SW2)
AFT AFT
TO A2/NICAM
IIC_DATA IIC DATA
IIC_CLK IIC CLK
SIF_OUT SIF OUT
TU_AOUT TU A.OUT
TO I/O
FT3 TU V.OUT
FT1 RF A.IN
FT2 AV_V.OUT

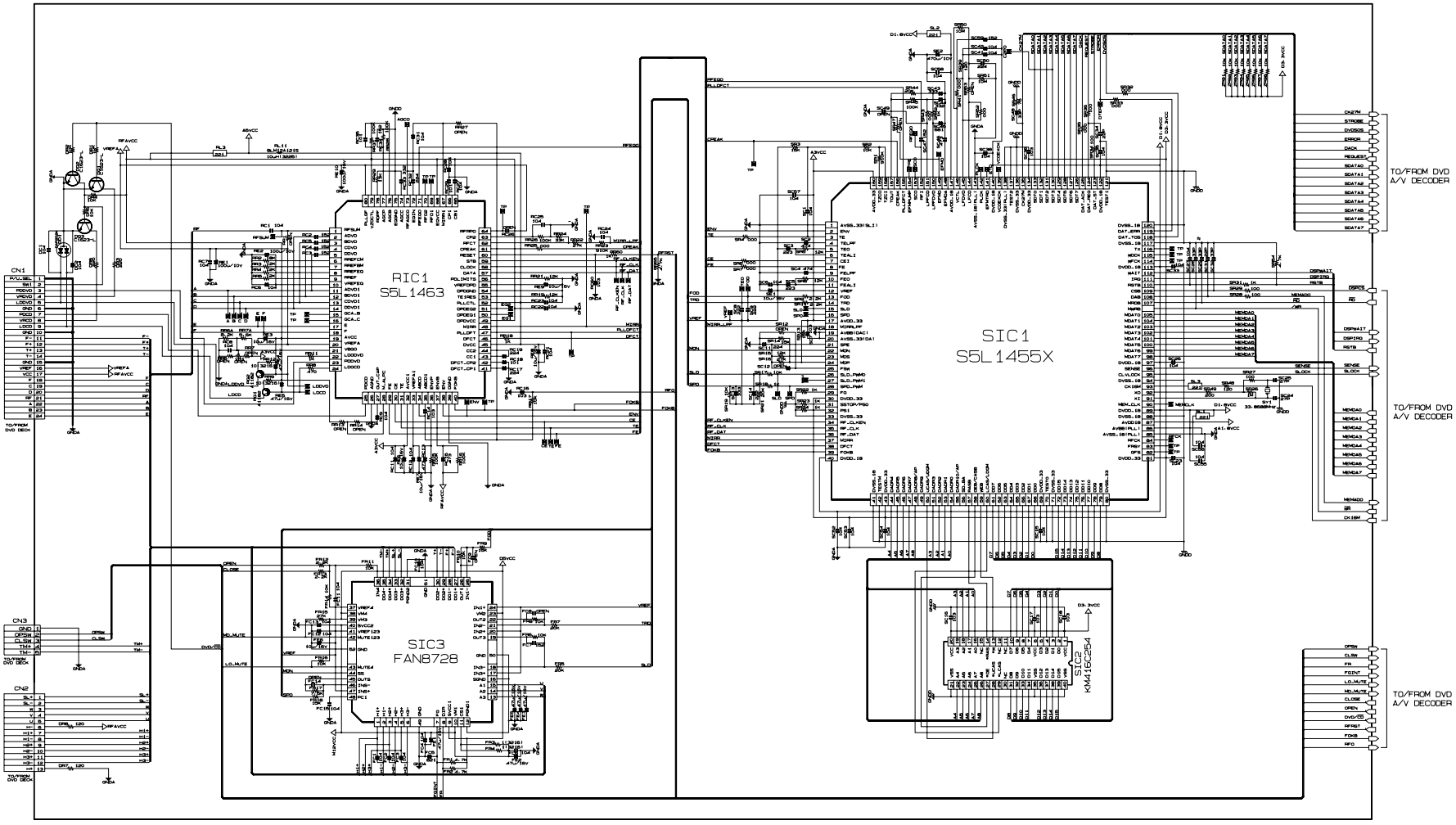
12-11 Input-Output



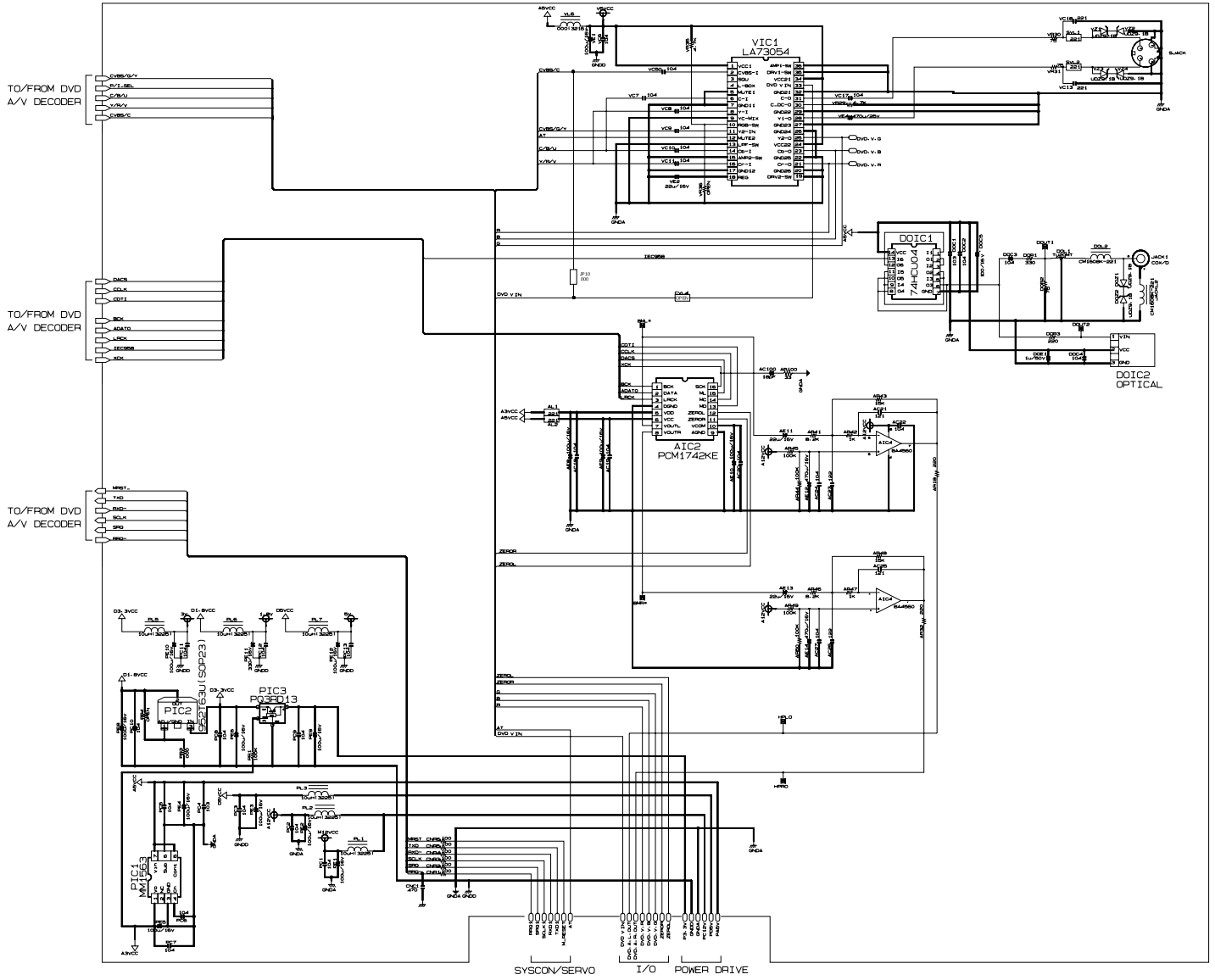
12-12 DVD AV-Decoder



12-13 DVD Servo



12-14 DVD Audio/Video



MEMO