SONY *Training Manual*

DVP-NS415

DVP-NS655P

DVP-NS875P

5th Generation DVD Player

Models:

DVP-NS300	DVP-NC650
DVP-NS315	DVP-NC655P
DVP-NS400D	DVP-CX875P
DVP-NS415	DVP-F25
DVP-NS500P	DVO-F41MS
DVP-NS700P	
DVP-NS715P	
DVP-NS755P	
DVP-NC600	

Circuit Descriptions & Troubleshooting

Table of Contents

Chapter 1 - What's New?

The popular fifth generation Sony DVD players introduced for the years 2001 and 2002 are physically and electrically different from previous generation players; they have greater appeal and are lower in cost.

Physical Differences

The single disc players are thinner than the previous fourth generation models and take up less vertical space. Some models are available in both black and silver (same model number) to blend with different decors. Two models, DVP-F25 and DVP-F41, have slot type loading (like a car CD player) which makes them smaller; they can also be played horizontally or vertically; a pedestal base can be attached to the side for vertical mounting, as in Figure 1-1.

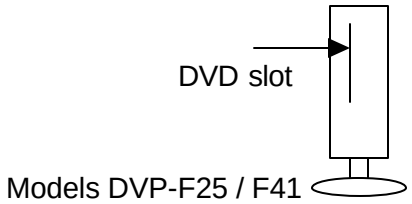


FIGURE 1-1 - VERTICAL MOUNTED "F" SERIES DVD PLAYER

Features

These players can play computer "burned" -R and ±RW (CD or DVD) discs. A built-in MP-3 decoder allows MP-3 encoded CD's to be played. All 5th generation players have outputs for composite video, component video (Y, R-Y, B-Y) and Dolby Digital ™ / dts ® digital coax/optical digital audio (except DVP-F25 and DVP-F41 models which only have high grade component video and optical audio outputs) Other features on some models are: multi-format SACD music CD PB (audio); and high resolution 480p progressive video output.

Table 1-1 shows some of the features of the Fifth Generation models.

Table 1-1 - Sony's Popular Fifth Generation DVD Players

Model Number	Intro Year *	Type	Feature
DVP-NS300	2001	1 disc tray	Case = Blk or Silver finish. Does not PB –R or ±RW discs.
DVP-NS315	2002	1 disc tray	Black or Silver finish
DVP- NS400D	2001	1 disc tray	Built in 5.1 Digital Dolby Decoder
DVP- NS415	2002	1 disc tray	Silver, Built in 5.1 Digital Dolby Decoder
DVP- NS500P	2001	1 disc tray	Progressive scan
DVP- NS700P	2001	1 disc tray	Progressive scan
DVP- NS715P	2002	1 disc tray	Progressive scan, Silver
DVP- NS755P	2002	1 disc tray	Progressive scan, SACD, Built in 5.1 Digital Dolby Decoder, Blk.
DVP-NC600	2001	5 disc Changer	No thinner case like the tray units.
DVP-NC650	2001	5 disc Changer	SACD
DVP-NC655P	2002	5 disc Changer	Progressive scan, Blk/Silver.
DVP-CX875P	2002	300 disc changer	Progressive scan, Built in 5.1 Digital Dolby Decoder.
DVP-F25	2002	1 disc slot	Case = Blk or Silver finish.
DVP-F41MS	2002	1 disc slot	Memory stick for JPEG pix view

* Optical Assemblies for 2001 year Models are KHM240AAA and KHM250AAA Optical Assemblies for 2002 year Models are KHM270AAA and KHM275AHA.

Dual Laser Optical Block

Disc Playback Characteristics

All fifth generation DVD models, (except basic model DVP-NS300) can play back computer made –R or +RW discs.

Computer made (burned) –R or ±RW discs have different characteristics than machine stamped counterparts and stamped CDs have different characteristics than DVDs. To insure full compatibility, the optical block uses two lasers. One is optimized for CDs and the other for DVDs.

To understand how separate lasers insure playback of computer burned discs, some basics are explained here.

The reflected Laser light from the disc to the optical block contains the data. DVD discs (including DVD-R and ±RW discs) reflect best in the 650-635nM wavelength band. CD discs (including –R or +RW discs) reflect light best at 780nM.

Figure 1-2 shows that maximum CD-R disc reflection (RF) occurs at 780nM. Since –R or +RW discs have lower reflectivity than stamped discs (reflectivity also varies from brand to brand) output is maximized if two lasers are used: one operating at 648nM for DVDs and another at 780nM for CDs.

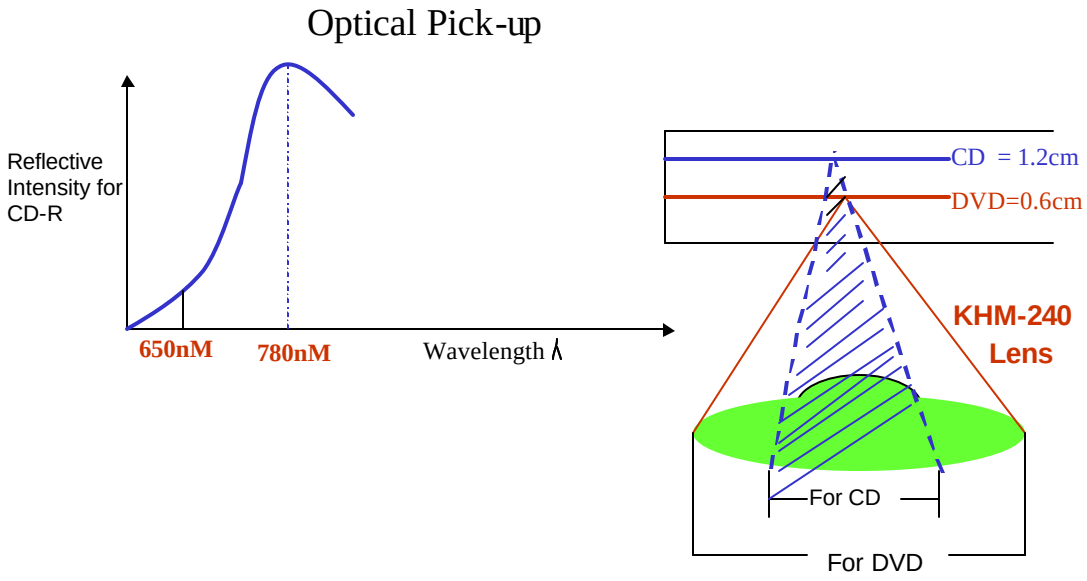


FIGURE 1-2

Disc Warp Correction

Because of the finer DVD pitch, the laser must be perpendicular to the disc for maximum RF output from the optical block. Figure 1-3 illustrates the differences between old servo tilt mechanism system (A) and the new DTC system (B) that keeps the laser beam perpendicular. In earlier generations, a tilt servo (A) adjusted the angle of the laser platform to keep the monitored RF level at peak. This system is complex and the platform can "bottom out", limiting its range.

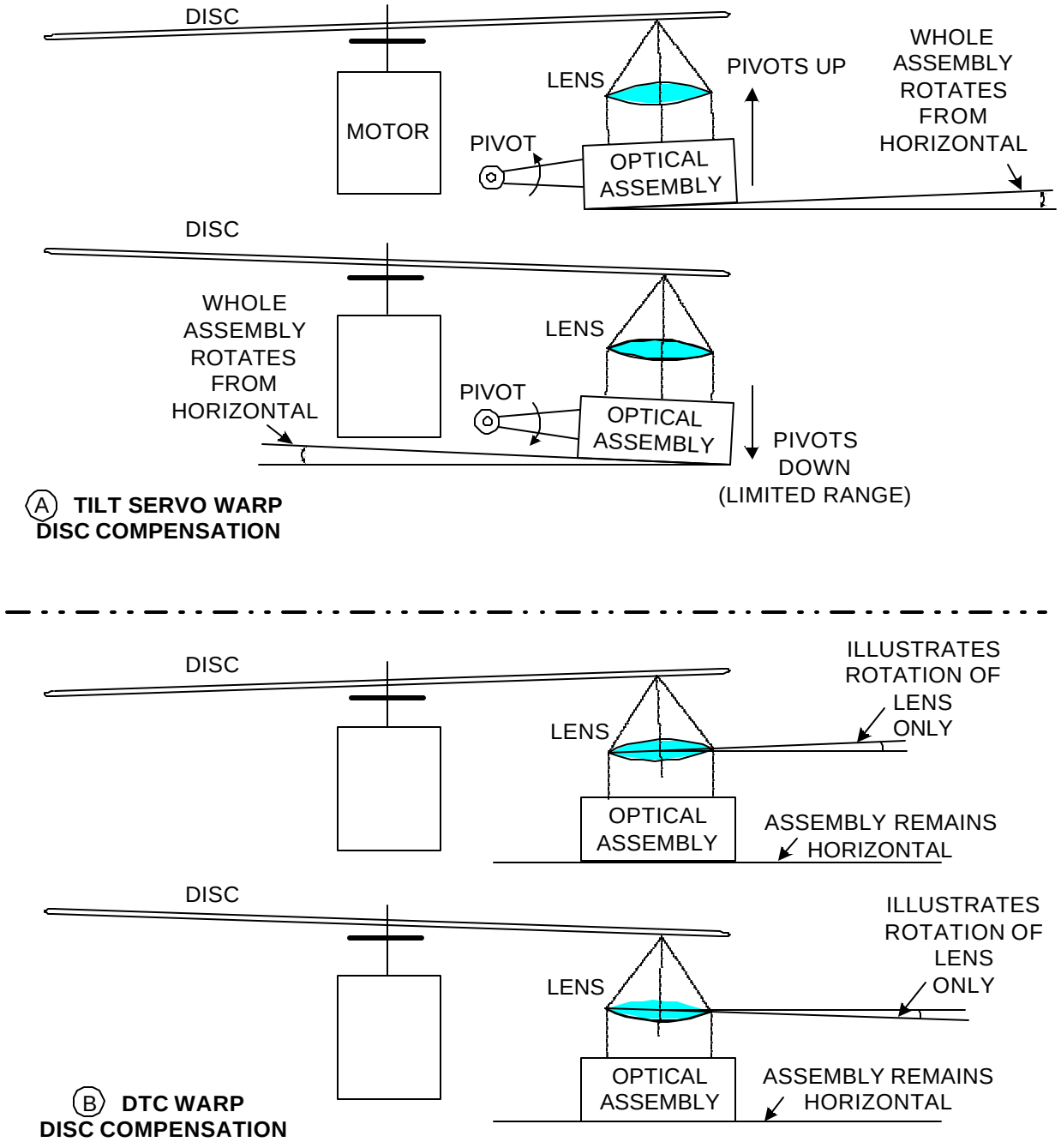


FIGURE 1-3 - TILT SERVO (A) VS. DTC (B) GGW5 1545 4/9/03

In fifth generation DVD players, an ingenious Dynamic Tilt Correction (DTC) system replaces the tilt servo. Warped disc readability is achieved by tilting the lens during focus correction. The greater the focus correction, the more the tilt.

The DTC concept and mechanics are as follows:

The DVD disc information layer is at a height determined by the spindle motor hub. This is considered as the mechanical focus center of the lens. As the optical block moves towards the outside of the disc, disc warp increases. At the points where the disc is angled up by warp, the focus point also moves up to compensate. Raising the focal point causes the lens to change its angle and remain perpendicular to the disc. Conversely, when the disc angles down (Figure 1-2 B), the lens focus goes below center and the lens tilts in the opposite direction.

Mechanically, DTC is achieved by modifying the lens supports. The front lens supports are stronger than the rear. See Figure 1-4. As the lens moves up, it is tilted toward the weaker support. As it moves down, the lens is tilted toward the stronger support. The tilt is always in the direction of the warpage so the lens remains perpendicular to the disc.

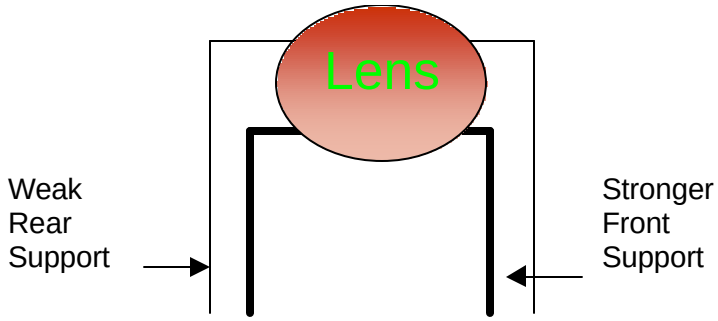


FIGURE 1-4 - DTC SYSTEM

Disc Identification

The DVD player first determines what type of disc is in the tray before playing it. The player powers up one of the lasers and begins looking for the disc's information layer(s). The time it takes to find a layer determines how deep the layer is inside the disc (T=0.6cm, 2T =1.2cm). Because the tracking servo is disabled at this time, the lens will continue past the focus point of the DVC and look for a second information layer (DL disc). The disc ID method is shown in Figure 1-5. This procedure is repeated with the second laser to insure identification of the lower output –R and +RW discs.

Figure 1-5 also shows that the laser takes the least time to find a DVD disc (Figure 1-5, B, C, or D). If a second focal point is also found, the disc is either a dual layer DVD (Figure 1-5 C) or SACD (Figure 1-5 D).

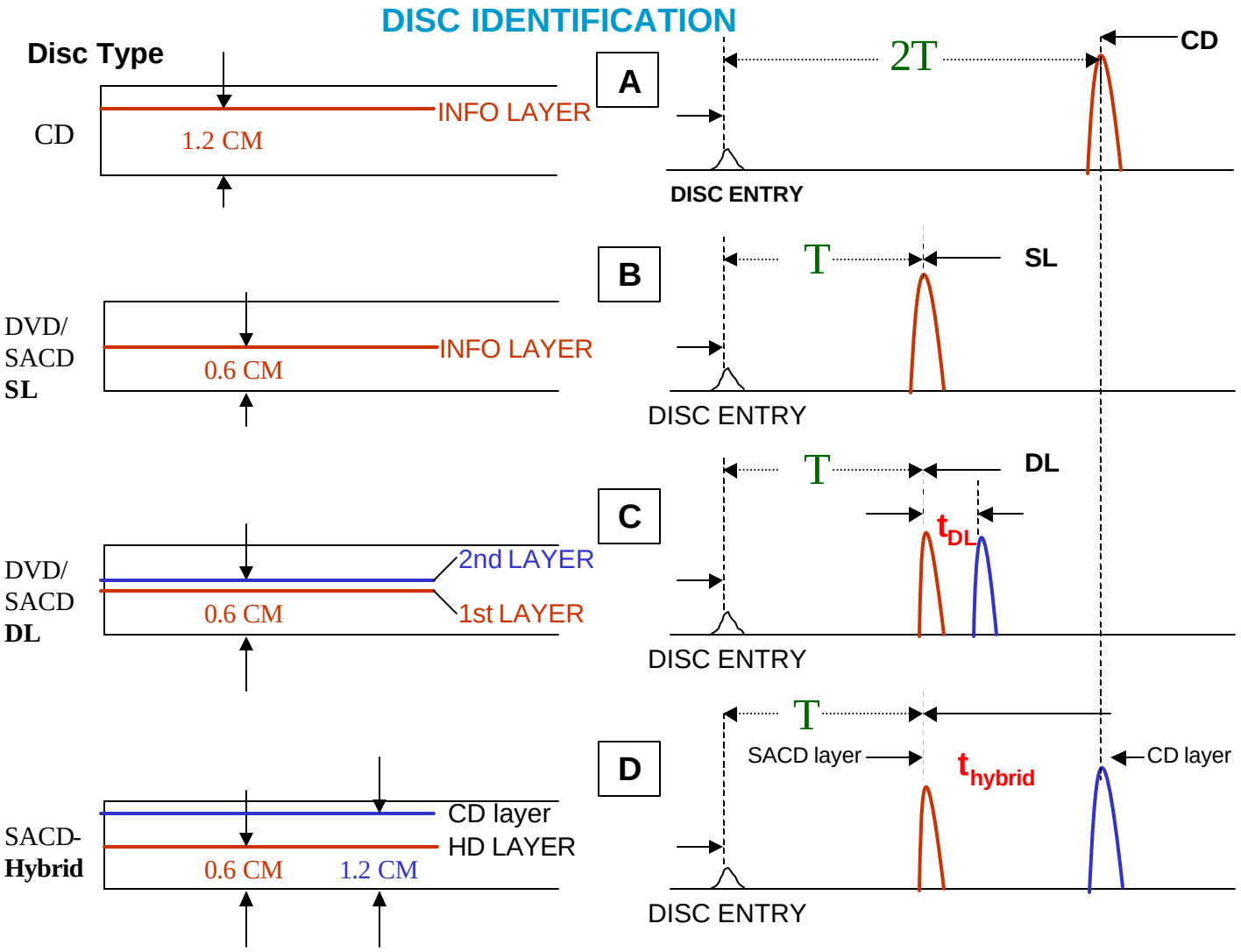


FIGURE 1-5 - DISC IDENTIFICATION

Super Audio Compact Disc (SACD)

There are three types of SACDs, all played from the bottom of the disc (disc is not flipped over): See Figure 1-6.

1. Single Layer: The single high-density (HD) layer can contain 2 channel and multi-channel DSD recordings, text (such as song tiles and lyrics), video clips and graphics.

2. Dual layer - Two layers with twice the playing time / information as a single layer.
3. Hybrid layer – Contains one HD layer and a standard CD layer so it can be played on any standard CD player too.

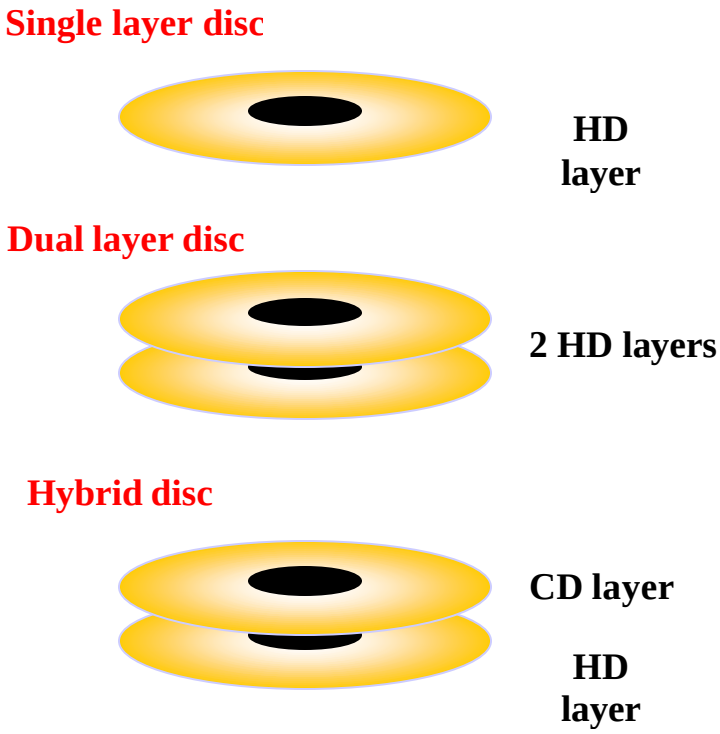


FIGURE 1-6 - SACD TYPES

Logos

High-end products that can play one or all versions of SACD discs have at least one of three of the logos shown in Figure 1-7.

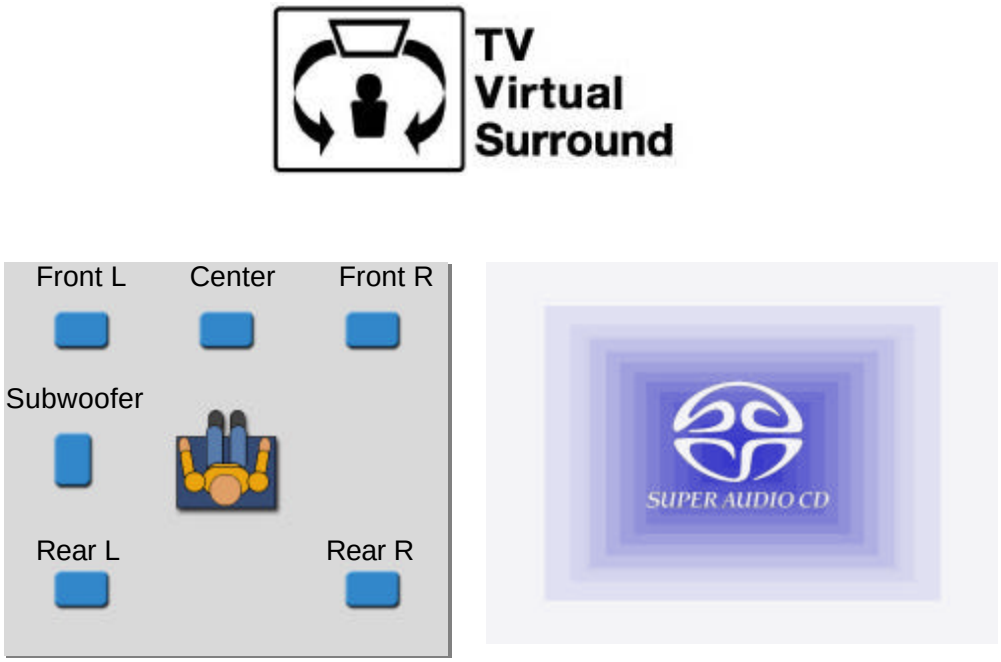


FIGURE 1-7 -SACD LOGOS

Video Noise Reduction

Block Noise Reduction (BNR)

BNR reduces dissimilarities (noise) at the edges of blocks (Figure 1-8).

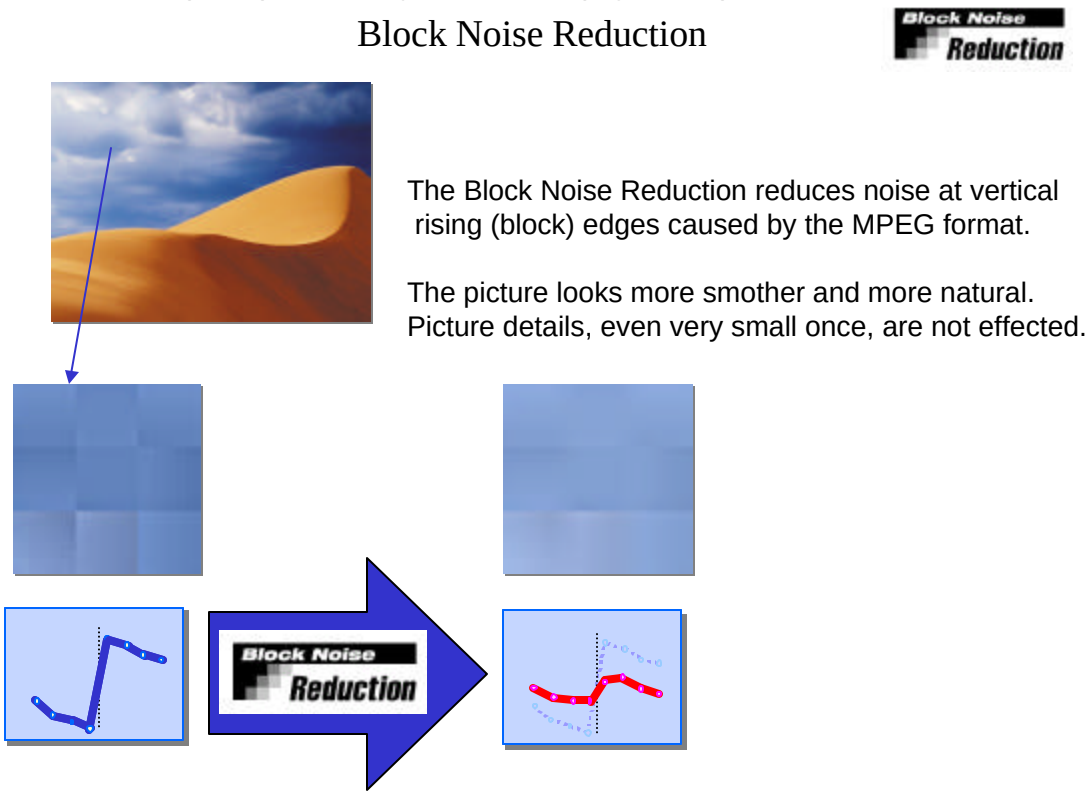


FIGURE 1-8 - BLOCK NOISE REDUCTION

Digital Video Enhancer (DVE)

DVE corrects the frequency response of the video signal and emphasizes picture details, see Figure 1-9. Since DVE (Digital Video Enhancer) emphasizes BLOCK NOISE, the BNR circuit is used before the DVE .

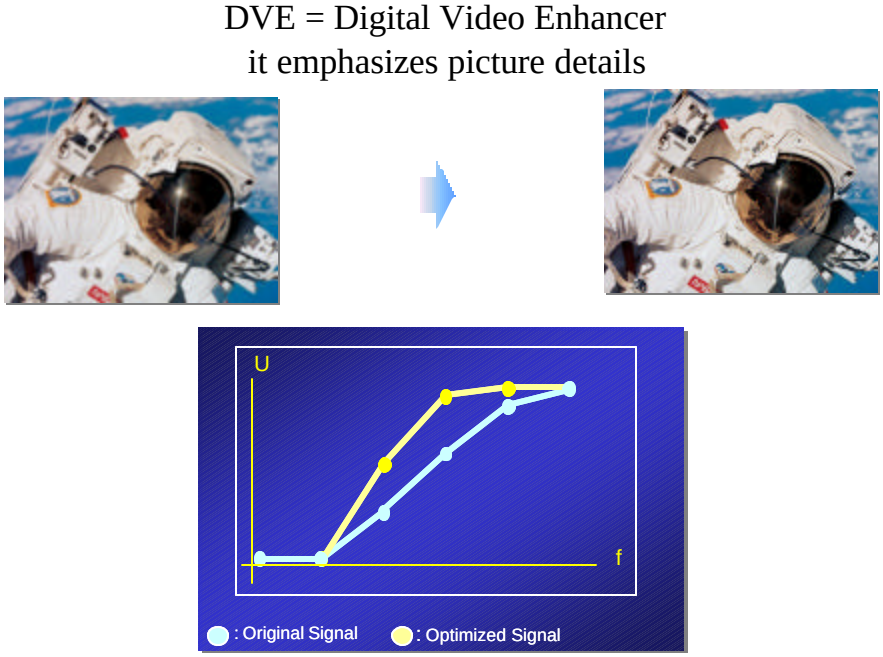


FIGURE 1-9 - DIGITAL VIDEO ENHANCER

Digital Video Enhancer & Block Noise

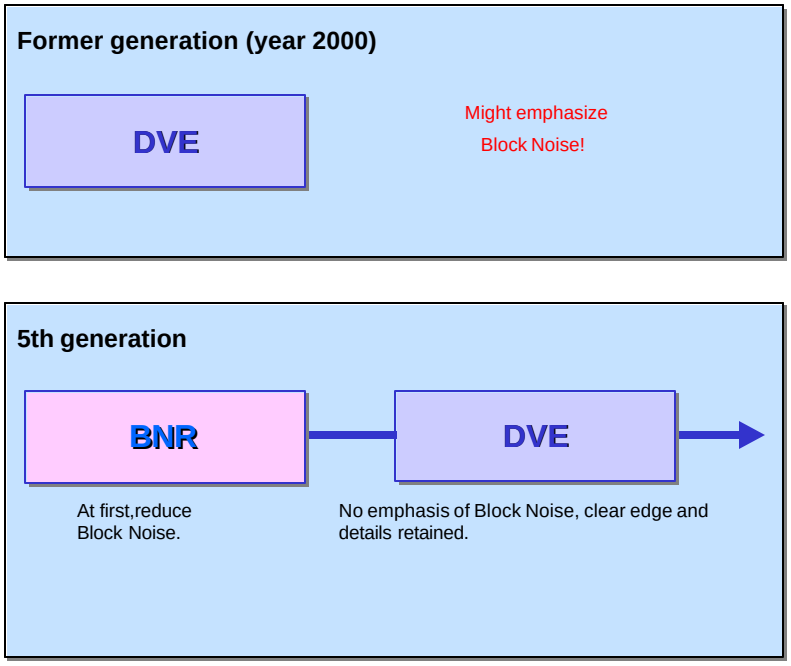


FIGURE 1-10 - BNR AND DVE ORDER

Chapter 2 - Block Diagram

Figure 2-1 shows a block diagram of fifth generation DVD players. They have the following features:

- New type of optical pickup unit. (CD or DVD laser selection not shown.)
- All analog Driver functions input to one IC ("IF Con").
- No External RAM for Syscon IC.
- Block Noise Reduction IC.
- ARP and Servo DSP is combined in one IC.

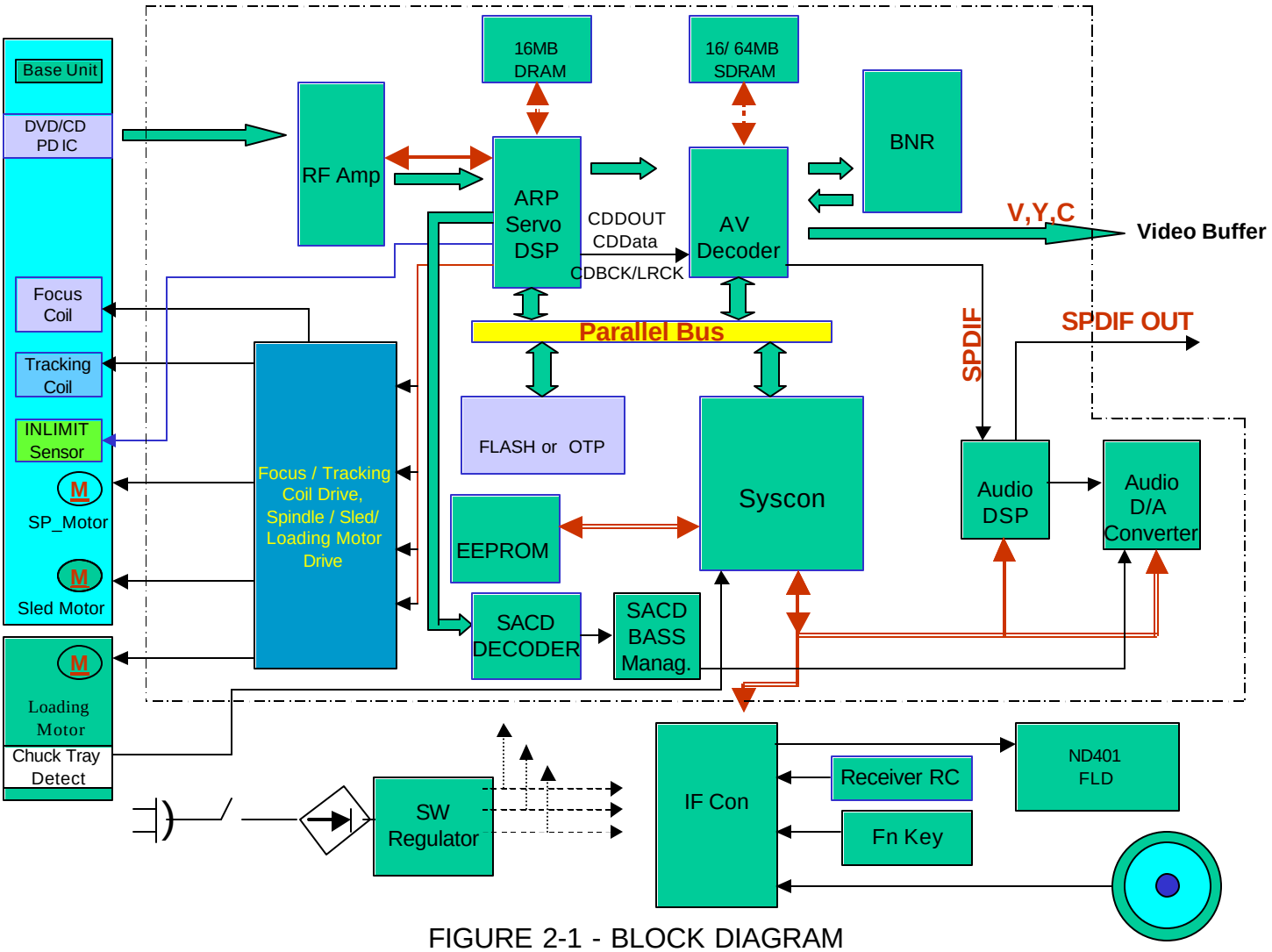


FIGURE 2-1 - BLOCK DIAGRAM

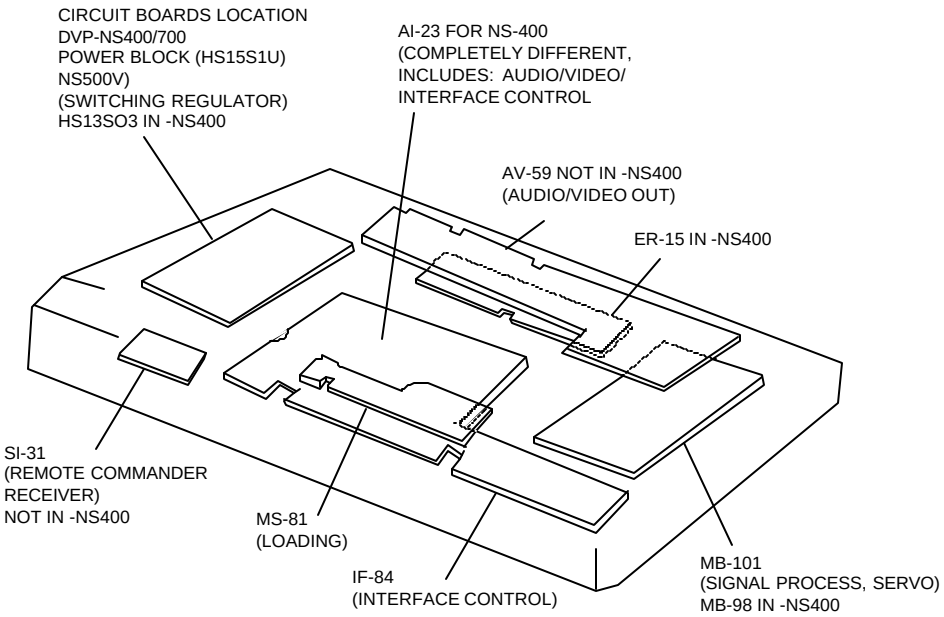


FIGURE 2-2 - CIRCUIT BOARD

Table 2-1 - MB Board Main IC Functions

IC Name	DVP-NS400 Ref Number	DVP-NS700 Ref Number	Purpose
RF Amp / Digital Servo	IC202	IC201	DVD/CD RF Amp, Servo
EEPROM	IC101	IC101	Servo Setting Data, Emer. History, Hour meter, Disc Parameters.
Flash / OTP	IC107	IC106 & IC107	Start up instructions / sequence ROM
Syscon	IC103	IC104	Overall Operation
(ARP) / Servo DSP Advanced RF Processor	IC302	IC302	CD/DVD Data Processing, Servo Control.
16M DRAM	IC303	IC301	RAM for ARP IC302
BNR	IC601	IC504	Black Noise Reduction
A/V Decoder	IC503	IC502	MPEG2, AC-3 ® (Dolby Digital) decoder
64M SDRAM	IC504 / IC505	IC507	RAM for A/V Decoder
Analog Servo	IC401	IC202	Analog Servo Control

Chapter 3 - Power Supply

Power Supply

The 5th Generation power supplies have the following features:

- No STANDBY circuit (Hard wire ON / OFF switch SW101).
- Simple MAIN POWER SUPPLY circuit. Q101 = switching osc. Q102 / PC101 / IC301 = feedback.
- Simple Stdby/Power ON controll.

Figure 3-1 shows a block diagram of the power supply:

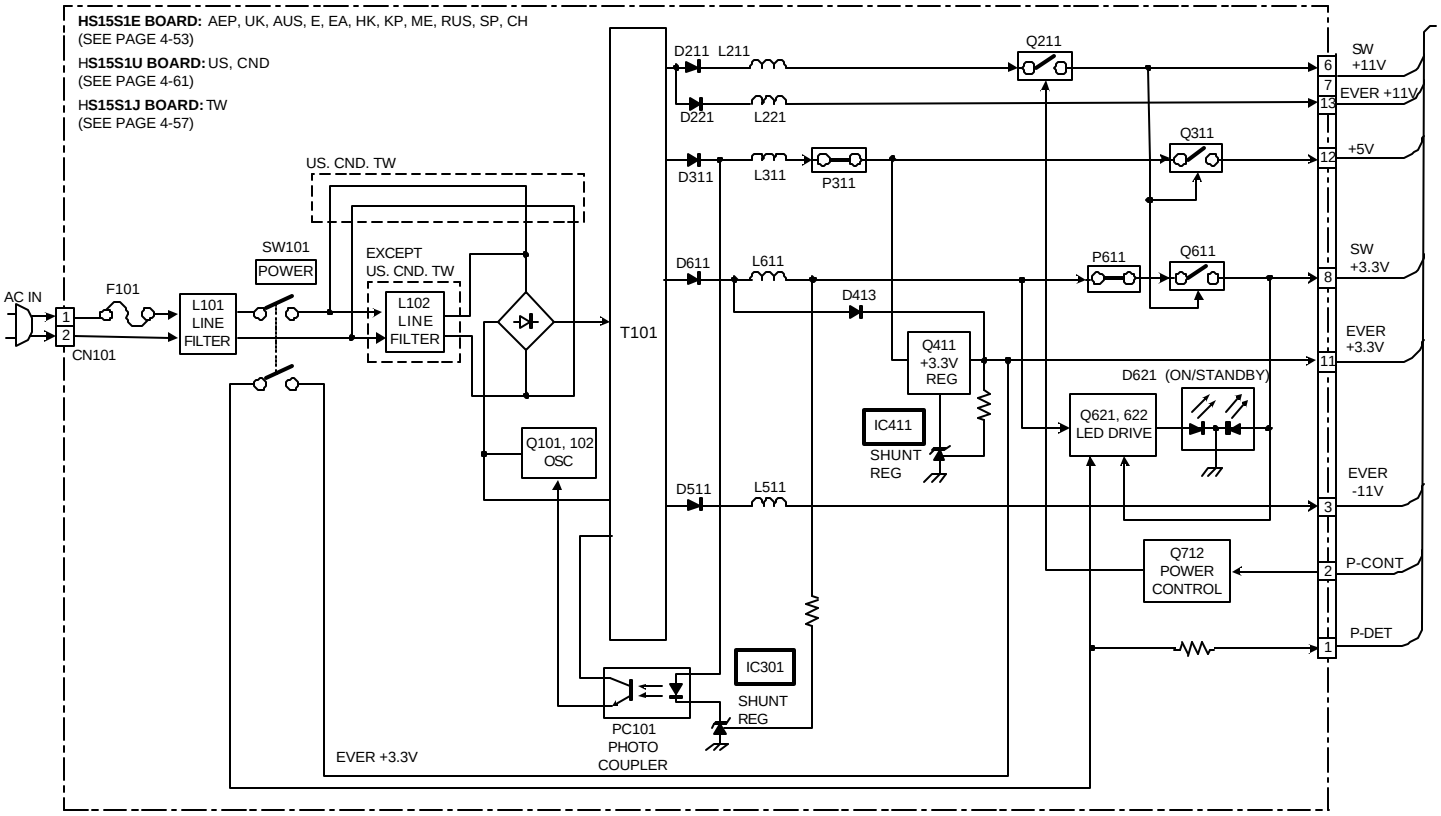


FIGURE 3-1 - POWER SUPPLY

Power ON Operation

The power supply circuitry before T101 (Primary) and after (Secondary) are explained. Refer to Figures 3-1 for the block diagram. The load and additional regulators are shown in Figure 3-2.

Primary

After closing main switch SW101, oscillator circuit Q101 and the primary coils of T101starts. Regulation comes from sampling the secondary +3.3 V at L611. The sample is sent to inverter/shunt regulator IC301, to the opto-coupler PC101 and finally back to oscillator Q101.

EVER +3,3V from Q411 is switched via the other leg of SW101 and is applied to power ON LED D621 (RED) drive. It is also applied to IC404/pin19 (not shown) as a P-DET signal. The output of IC404 controls the rest of the power supply secondary circuit via the P-CONT line. EVER +3.3V powers IC404, IR remote receiver, cursor stick and audio muting (all not shown).

Keep in mind that SW101 is a “hard off” switch. With the switch OFF, the unit will not turn ON with the remote. Soft ON/OFF(standby) is controlled by the P-CONT line and Q712: it controls +11V via Q211, +5V via Q311, and SW+3.3V via Q611.

Power Supply 8
AV-59 Board

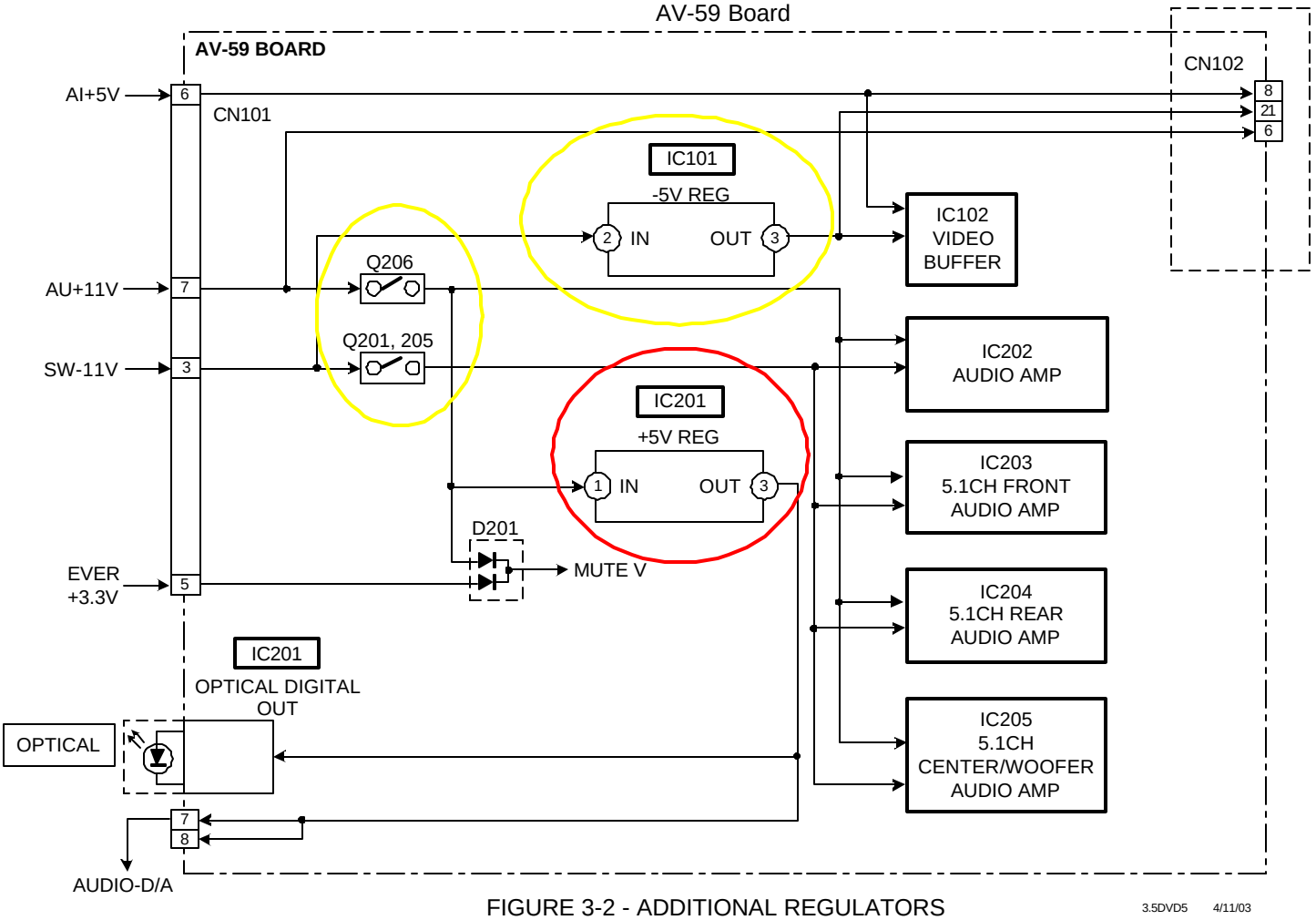


FIGURE 3-2 - ADDITIONAL REGULATORS 3.5DVD5 4/11/03

Waveforms

These waveforms were taken at key areas of the power supply:

Figure 3-3 - Scope Shot – Q101 / Drain – Stby Mode. - 304.5 Vpp Timebase: 0.1 ms

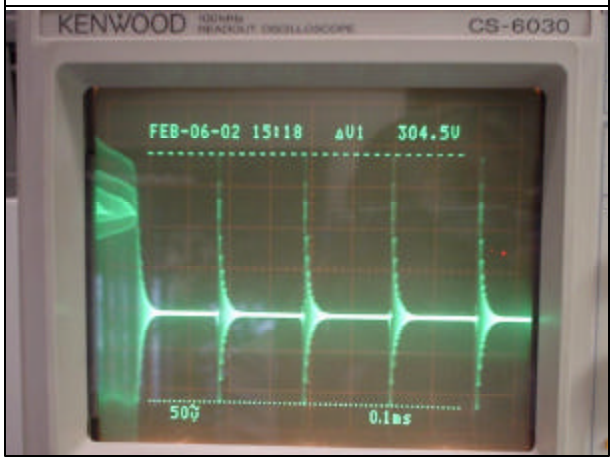
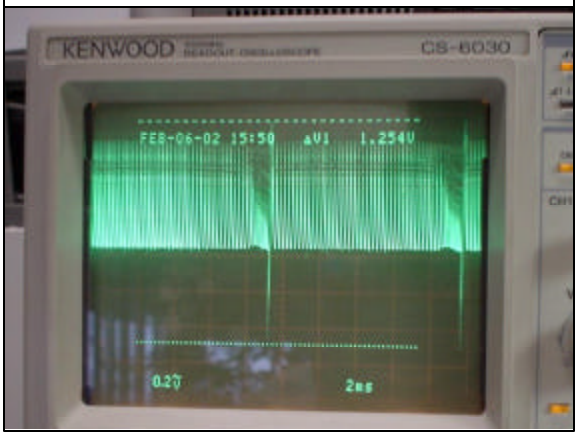
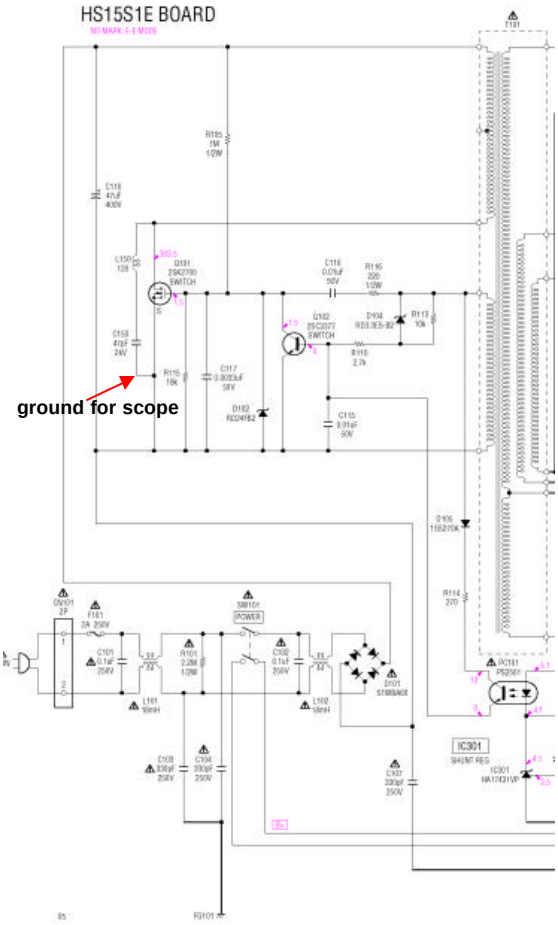
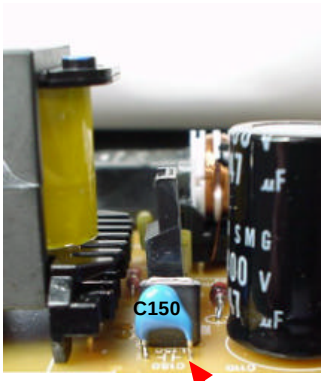


Figure 3-4 - Scope Shot – Q102/Gate – Stby Mode. 1.254 Vpp (small: ~0.6 Vpp) Timebase: 2 ms

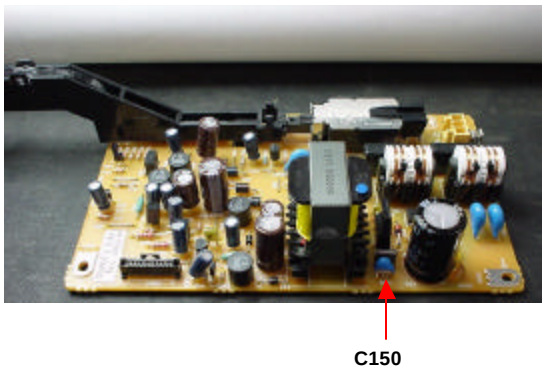


Measurements on the primary side of the power supply





Connect the scope`s ground here



Measurements values on the primary side	
Q101, DRAIN voltage	304,5 Vpp
Q101, GATE voltage	12,5 Vpp
Q102, BASE voltage	1,25 Vpp

All measurements use 1:10 probe in standby mode!

For safety reasons do not connect the unit to an AC out outlet!
Use an isolation transformer!

FIGURE 3-5 - HOT AC LOCATIONS

Plug-In Communications

Figure 3-6 shows the general sequence of IC communications during Plug-in time.

1. System controller IC104 communicates with Flash Memory to retrieve the Instructions / programs.

   In the event the communication with the Flash Memory is not accomplished, System control will inform Interface IC 404 to switch the power to standby mode.

2. Similarly the initial communication (Hand Shaking) takes place with IC 503/ AV Decoder and IC302 /ARP.

   In the event the communication with these ICs is not accomplished, System control will inform Interface IC 404 to switch the power to standby mode.

A failure of any of the ICs (IC104, IC503 or IC302) will cause the unit to enter the Standby mode.

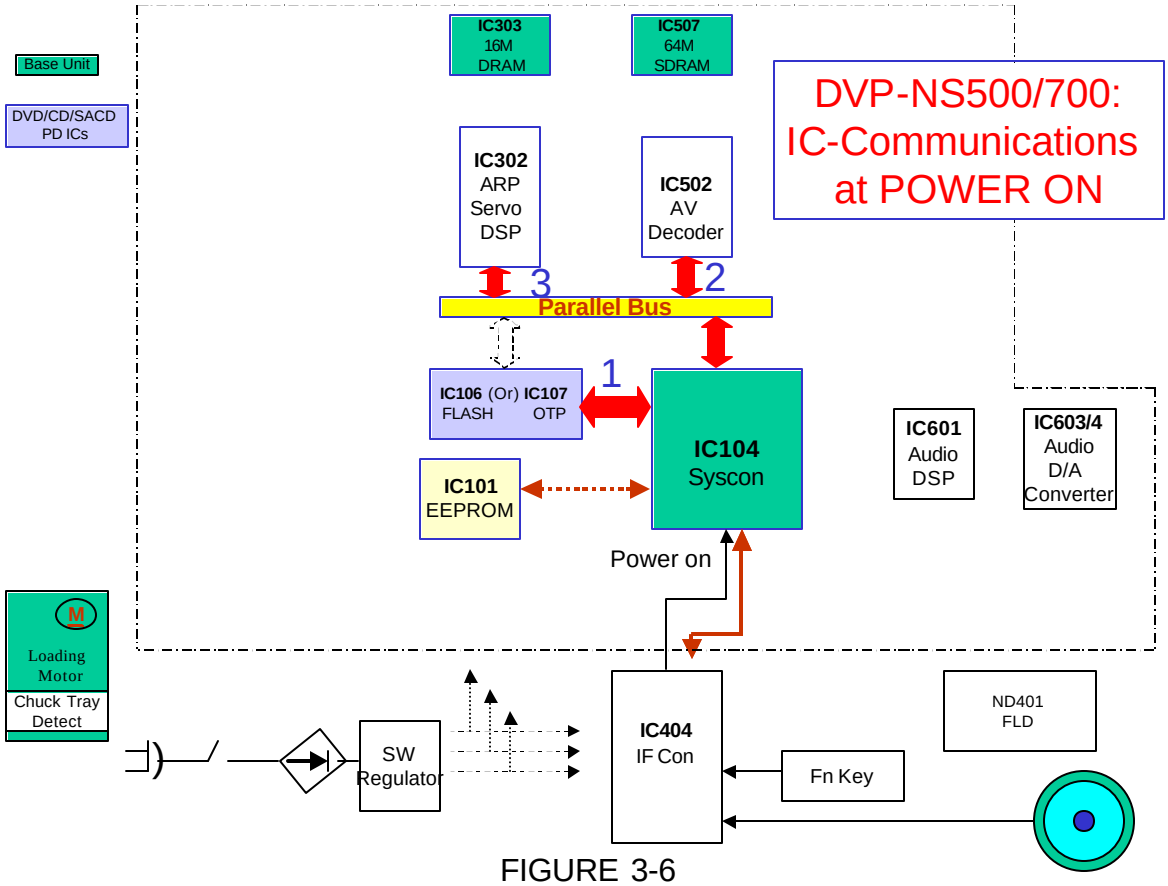


FIGURE 3-6

The Plug In communications sequence is as follows:

1. AC plug in.
2. Ever 3.3V is applied to Interface IC404 PIN 78.
3. 401 (8MHz) becomes active.
4. Pcont from IF IC404 / Pin 26 goes HIGH to Power the set.
5. After this sequence of Power ON, the following communications will take place as shown in Figure 3-7:
   - Ready Pulse is output from IC404 /Pin 27 (interrupt line) to begin communications with IC103/4.
   - System Controller IC103/4 sends chip select from Pin 51 to IC404 / Pin 14.
   - System Controller IC103/4 sends bit clock (Pin17) and display data (Pin 26) to IC404.
6. If users command have been initiated, then these commands will be sent from IC404/Pin 16 to IC 103, 104/ Pin 25. Otherwise, IC404 will bring “Pcont” low and RST pulse /Pin 7 will be sent to IC103/4 Pin 76.
7. Set goes to Stby.

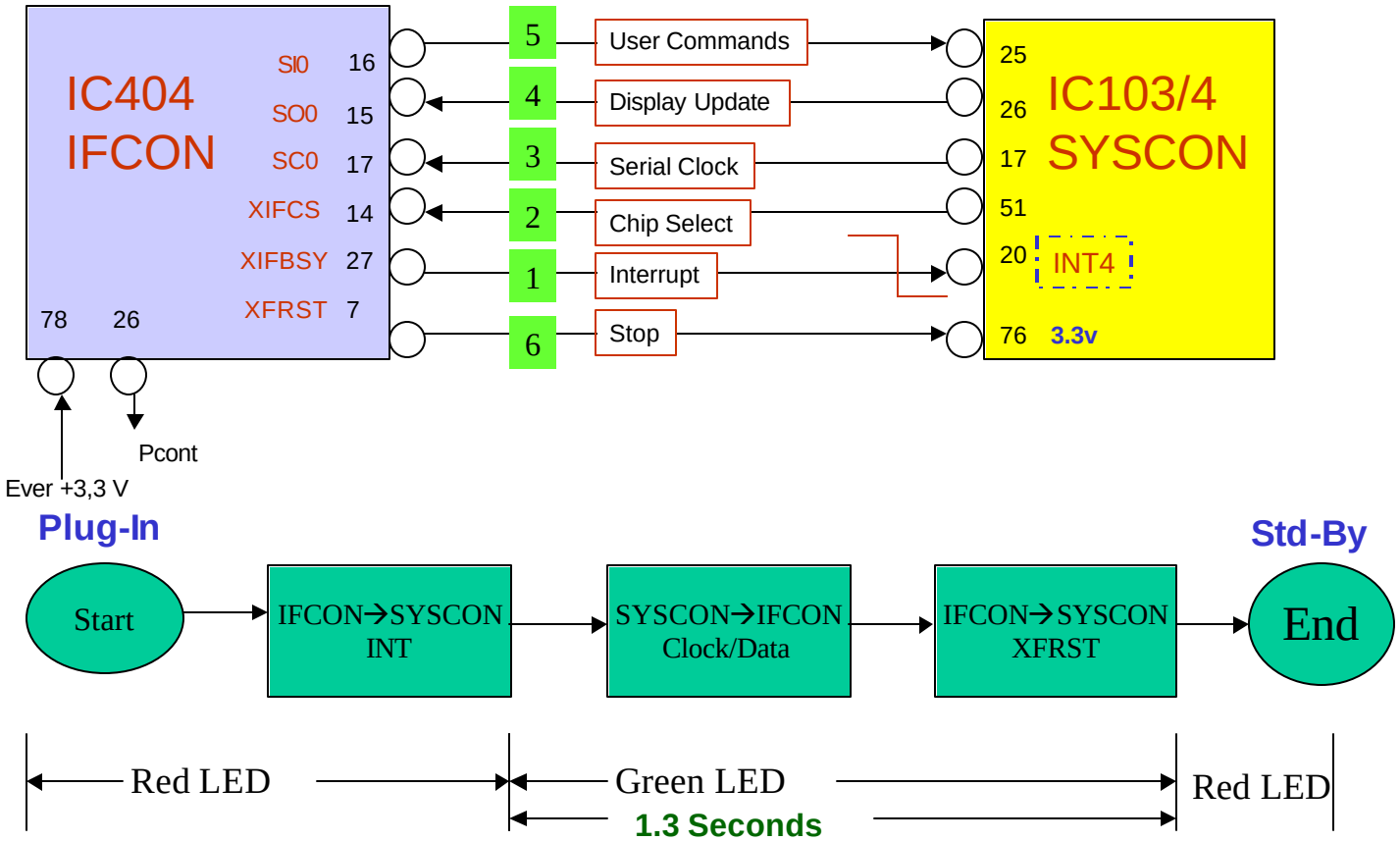


FIGURE 3-7 - PLUG IN SEQUENCE

Serial Data Communications after Power ON

The serial data bus connects several ICs and consists of two or three lines. Serial data is transmitted from one IC to another on a unidirectional line (arrows shown in one direction). This data is accompanied by a clock signal for a total of two lines in a unidirectional serial communication. The interface control IC404 and syscon IC104 communicate bidirectionally (arrows shown in two directions). Three lines are necessary when bi-directional transmissions are used. There is a data line for each direction. The additional clock signal makes a total of three lines for a bi-directional serial bus. The clock signal usually comes from the controlling micro, which in this case is syscon IC104.

IC104 communications with interface IC404, EEProm IC101, SACD decoder IC806, SACD bass management IC807 and DSP IC601 are bi-directional.

Syscon communications to the Digital to Analog Converters (DAC) IC603, IC604 are uni-directional.

Parallel Data Communications after Power ON

See Figure 3-8

The parallel data bus consists of address lines, data lines, a WE (write enable) and a RE (read enable) line, and a clock line. The parallel bus is contoleed by system control IC202.

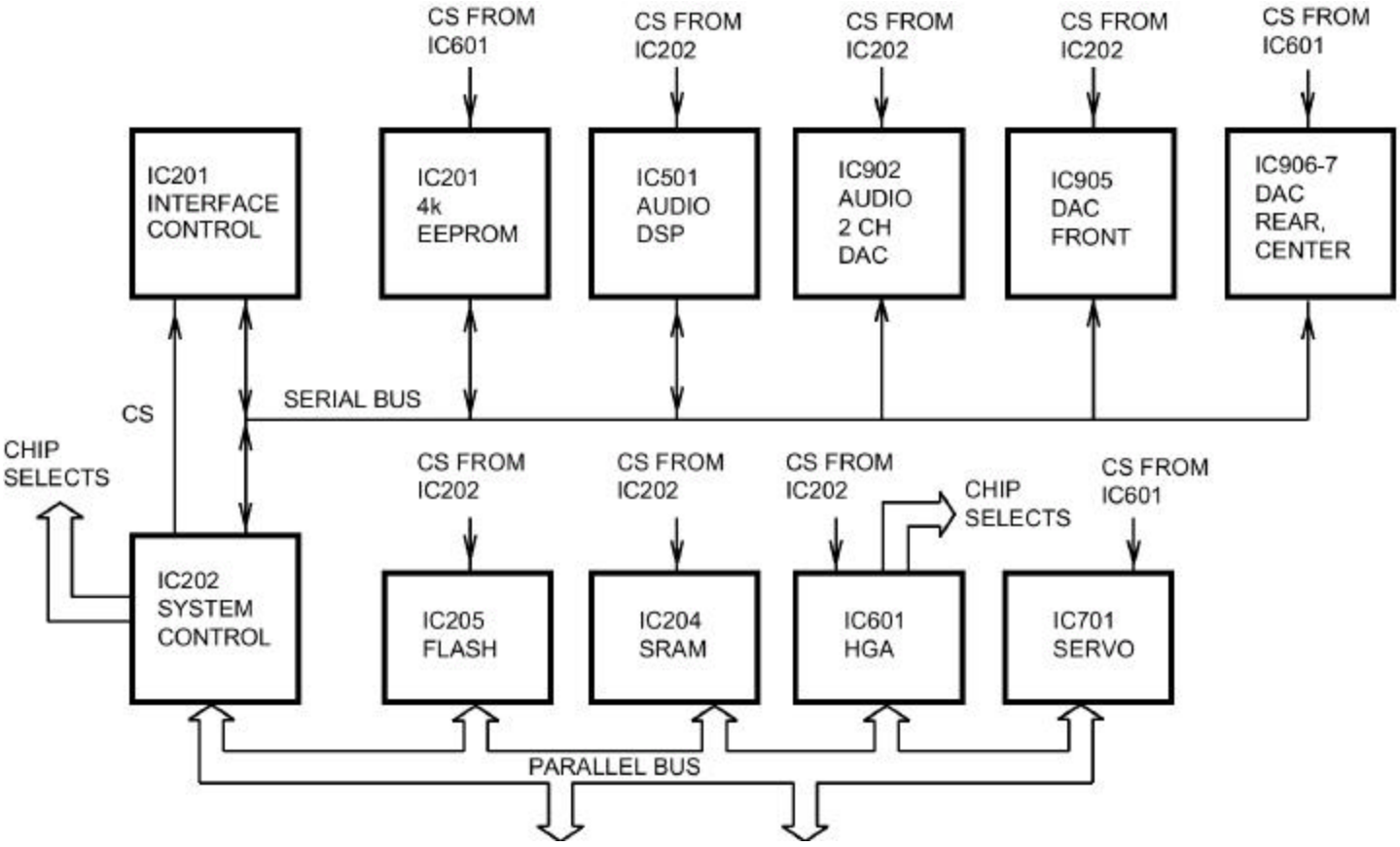


FIGURE 3-8 - COMMUNICATIONS BLOCK

Chapter 4 - Testing and Test Point Access

This section is divided into two parts: 1) Test point access; and 2) testing the RF and servo sections using the service / test mode.

The signals are generated by the optical assembly's photo detectors as listed in Table 4-1.

Table 4-1 - Photo Detector and Their Manufactured Signals		
Photo Detector	Signals	Purpose
A-D	TE (DVD only), FE, PI, Mirror, RF (eye pattern)	TE = DVD tracking error. FE = Focus error. PI = "Pull In" is the analog sum of A-D detectors. Disc ID the disc and MIRR. MIRR counts tracks and ID disc. RF = Sum of A-D detectors.
E & F	TE + and TZC	CD tracking error, track counting
G & H	TE – and TZC	CD tracking error, track counting

Access - RF Output

The RF test point is easily accessed. See Figures 4-1 through 4-3. Figure 4-4 shows the RF waveforms.

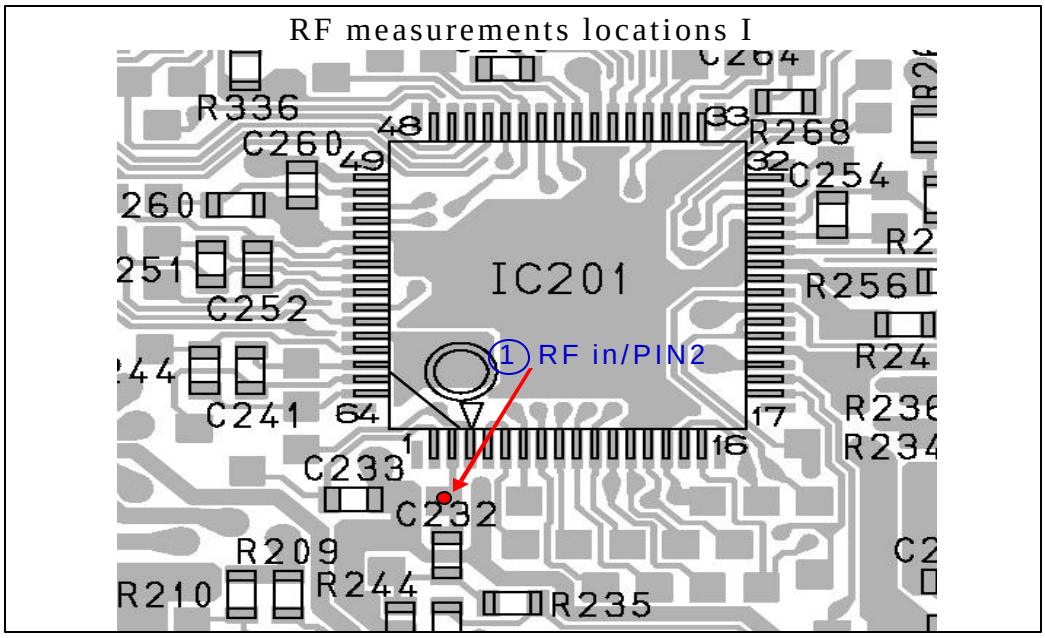


FIGURE 4-1 - IC201 RF TEST POINT

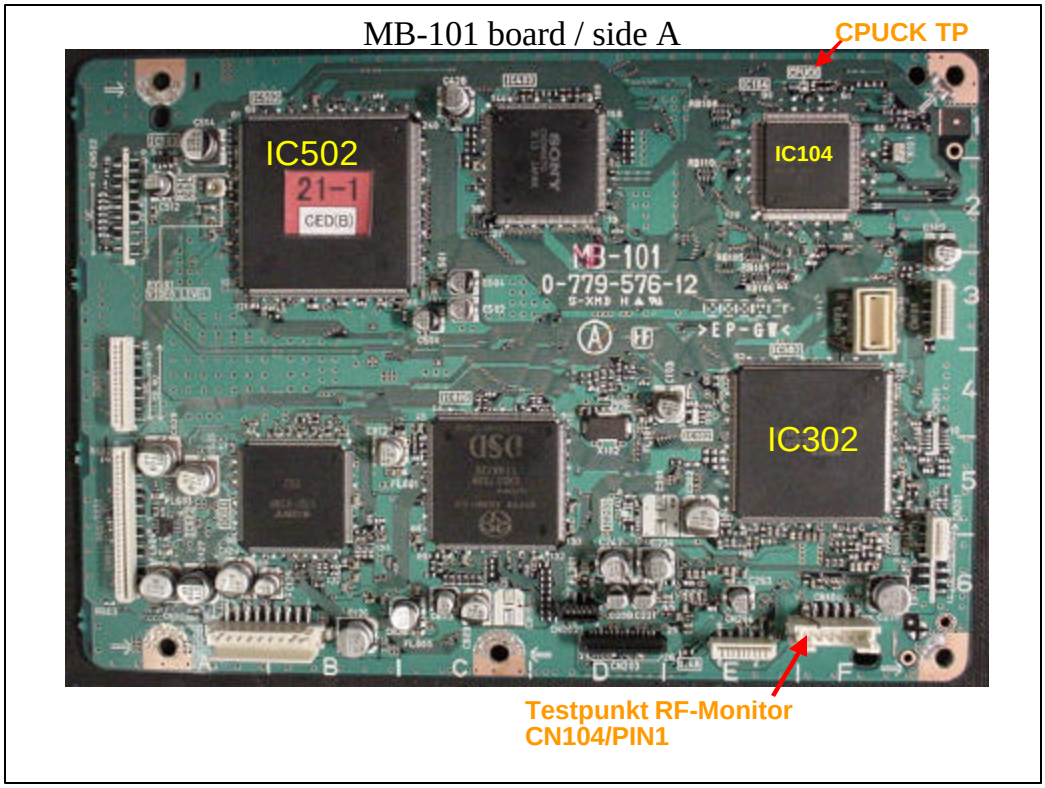


FIGURE 4-2 - ALTERNATE RF TEST POINT

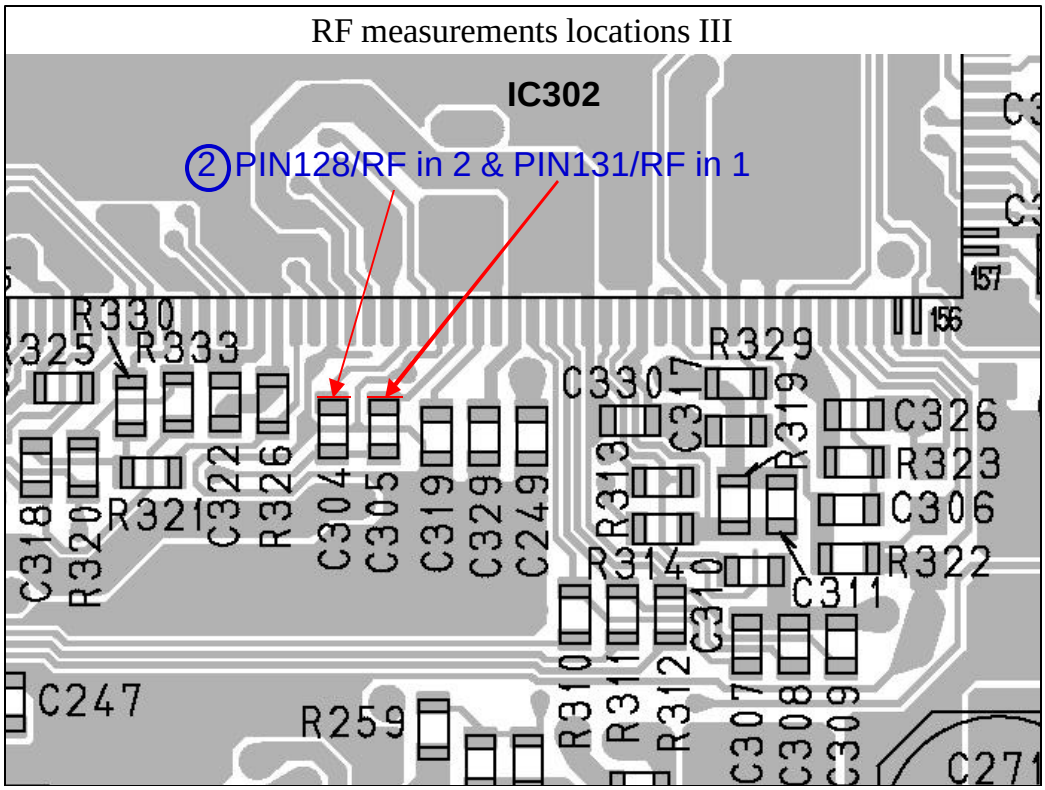


FIGURE 4-3

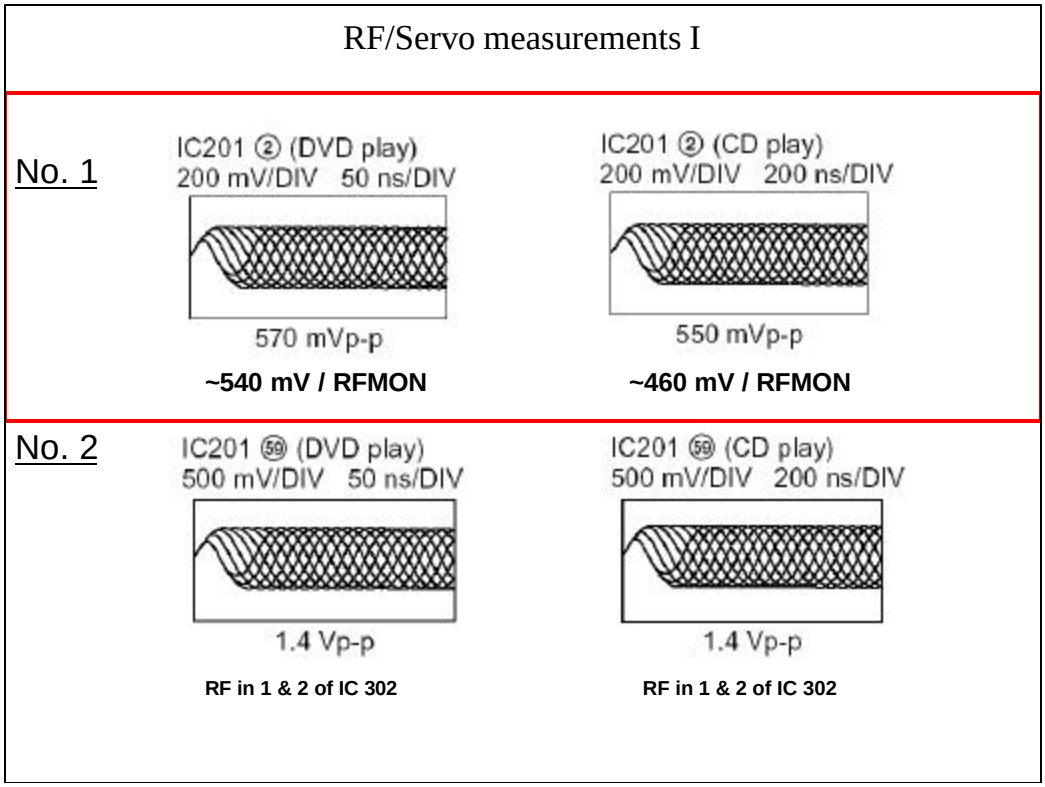


FIGURE 4-4

Focus and Tracking Error Test Points

Figures 4-5 and 4-6 show the focus test points and waveforms.

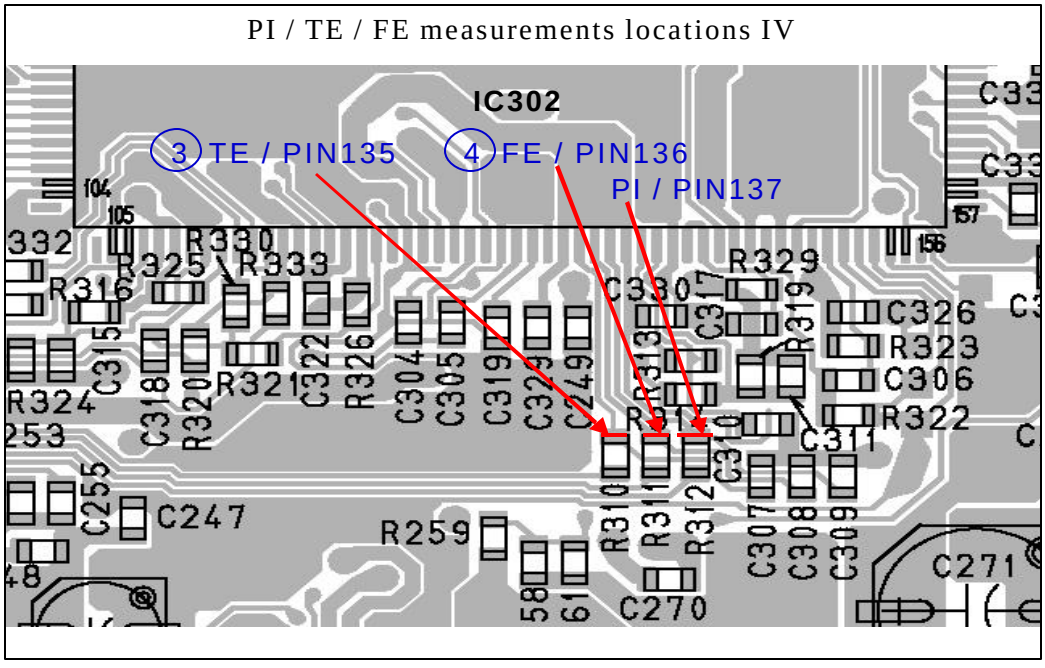
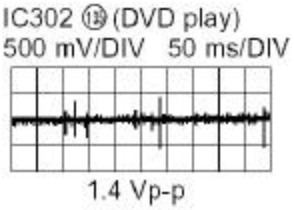


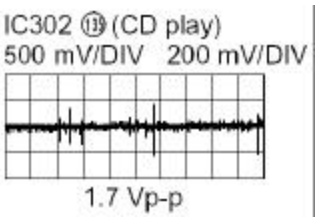
FIGURE 4-5

RF/Servo measurements III

No. 3

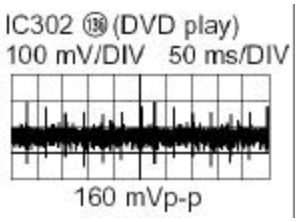


TE

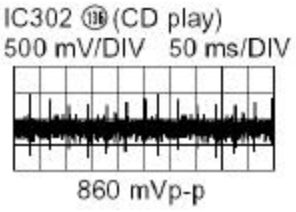


TE

No. 4



FE



FE

FIGURE 4-6

Chapter 5 - Testing

RF, Focus-Tracking Servo, Optical Assembly

The service or test mode permits us to repeat a signal so we can see it on the scope and verify its operation. In the first test, a YEDS-18 CD test disc was used to check focus and optical assembly detectors by looking at the PI and FE signals.

Entering the Service / Test Mode

1. Using the remote, press these buttons: TITLE, CLEAR, then POWER.
2. From the test menu, select "Drive Manual Operation"; select "Disc type"; select the disc type in the unit.
3. From the "Drive Manual Operation" menu, select "Servo Control"; turn on "1.LD" and 7.FCS.Srch.
4. Connect the CH1 scope probe to "PI" and the CH2 probe to "FE".

Testing - Focus

After using the service mode to repeat one time operations, the focus, tracking and RF signal levels can be monitored. Figures 5-1 to 5-4 show normal servo operation.

Figure 5-1 - CD Focus error showing balanced A-D detectors. (FE is equal above and below center). The 1st PI pip occurs at disc entry.

When a CD is played back (YEDS-18). S-Curve: 1,5 Vpp
The Player is in service mode „CD". PI-Level: 1 Vp

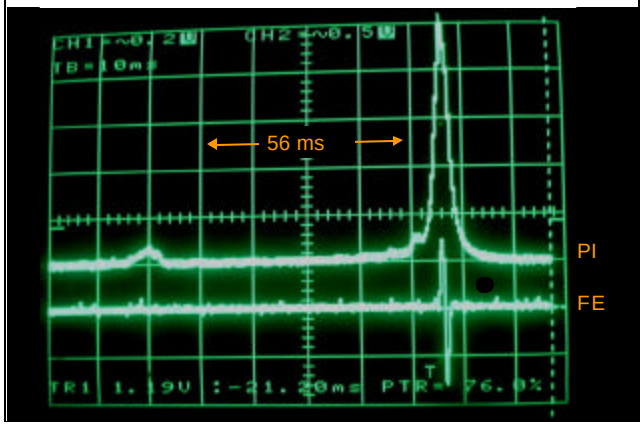


Figure 5-2 - DVD Focus Error showing same detectors are still balanced at the higher DVD laser frequency. Balanced FE means faster recovery after disturbance

A DVD single layer is played back (HLX-503). S-Curve: 1,5 Vpp
The player is in service mode „DVD-SL". PI-Level: 1 Vp

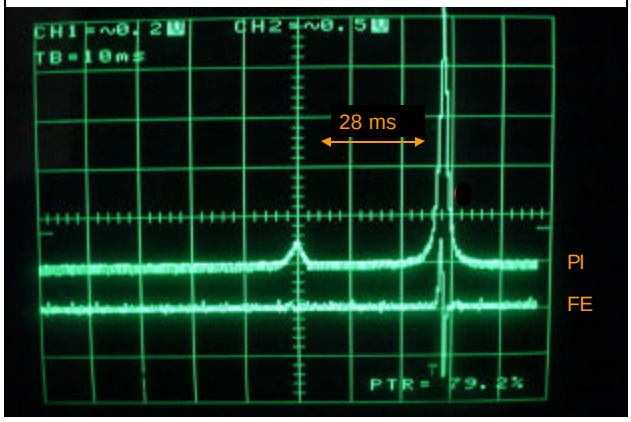


Figure 5-3 - DVD Focus Error of a Dual Layer (DL) disc. Two FE signals of equal amplitude mean both layers can be identified.

A DVD dual layer is played back (HLX-501). S-Curve: max. 1,6 Vpp
The player is in service mode „DVD-DL". PI-Level: 1 / 0,8 Vp

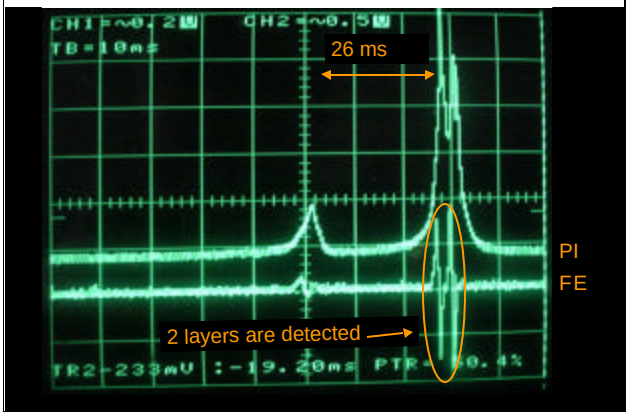
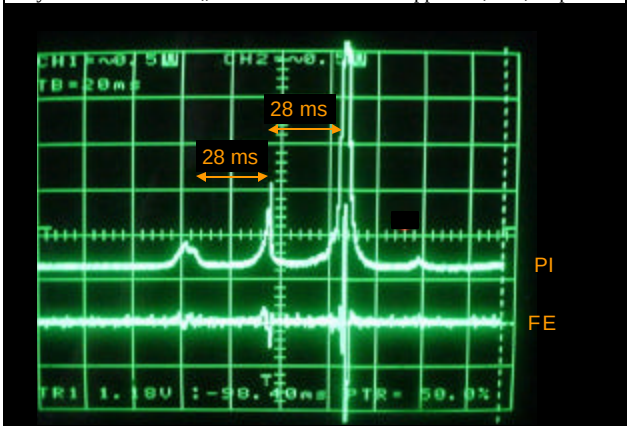


Figure 5-4 - Hybrid SACD Focus error and PI level shows three pips. 1 = disc surface entry, 2 = HD layer, 3 = CD layer an equal distance away (28 ms).

When a hybrid disc is played back. S-Curve: approx. 0,5 / 2,5 Vpp
Player is service mode „LCD". PI-Level: approx. 0,8 / 2,3 Vp



Verifying Focus Layer Jumping:

This check is only possible in service mode. A dual layer disc must be inserted.

1. Switch ON the “Drive Manual Operation” (2).
2. Next switch to “Disc Type” (1). Now check the inserted disc Type, select “Disc Type Auto Check” (1). The detected disc type is shown on th bottom of the screen; it should be “DVD DL 12 cm”.
3. Push “RETURN” and select “Servo Control” (2).
4. Start disc PB by switching the following ON: “LD ON” (1), “SP ON” (2), “Focus ON” (3), “TRK ON” (4), “Sled ON” (5) and “CLVA ON” (6).
5. Push “RETURN” once again and select “Track/Layer Jump” (3).

FIGURE 5-5 - TRACK / LAYER JUMP SCREEN

6. On the right side of the screen (Figure 5-5) you will see the information for controlling layer jumping. Use the UP & Down buttons of the remote controller as follows:

- L1 to L0 push once the “UP” button.
- L0 to L1 push once the “DOWN” button.

The layer jump will be performed. After jumping, PB will continue on the other layer as indicated by the advancing sector / frame numbers .

Figure 5-6 shows the track jump to the upper layer. The top waveform is PI and the bottom waveform shows FE. The focus layer jump was from L0 to L1. The player is in service mode with a DVD „DL disc”. Figure 5-7 shows the track jump back to the lower layer. The top waveform is PI and the bottom waveform shows FE. The focus layer jump was from L1 to L0. The player is in service mode with a DVD „DL disc”.

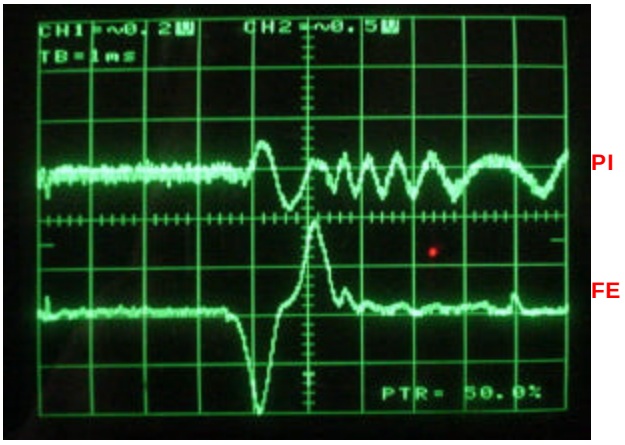


FIGURE 5-6 - ELECTRICAL VERIFICATION OF JUMP TO THE UPPER DISC LAYER

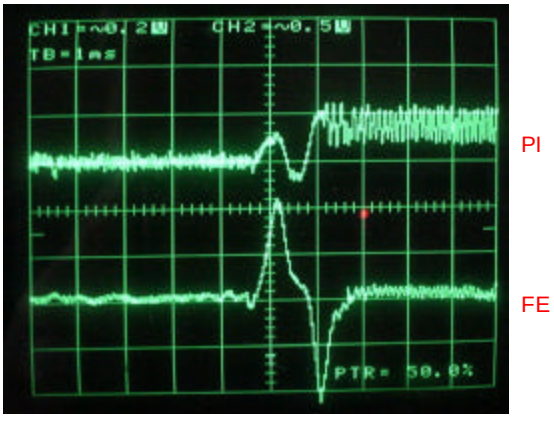


FIGURE 5-7 - ELECTRICAL VERIFICATION OF JUMP TO THE LOWER DISC

Testing - Tracking Servo Checks

Table 5-1 lists the ICs responsible for track jump and basic servo operation.

Table 5-1 - Tracking IC Responsibilities			
Device	Servo	Track Jump	Purpose
RF Amp IC201	Yes		Creates TE voltage
Servo IC302	Yes	Yes	Sets tracking position
Driver IC202	Yes	Yes	Voltage to current driver
Tracing coil (Optics)	Yes	Yes	Corrects lens position
System Control (Syscon) IC104		Yes	Determines when to jump (look for another location)
EEPROM IC101		Yes	Stores previous / future jump location.
HGA IC403		Yes	Expansion port for Syscon IC104

Testing -Checking the TE signal:

This check is only possible in service mode.

1. On the remote press buttons: Title, clear, then Power.
2. A SL test disc must be inserted.
3. Switch ON the “Drive Manual Operation” (2).
4. Next switch to “Disc Type” (1). Now check the inserted disc Type, select “Disc Type Auto Check” (1). The detected disc type is shown on th bottom of the screen; it should be “DVD SL 12 cm.
5. Push “RETURN” and select “Servo Control” (2).
6. Start PB by switching “LD ON” (1), “SP ON” (2) and “Focus ON” (3). [See Figure 5-8]
7. The measured traverse TE signal level is aproximately 1,6 Vpp. The DC-Level in relation to „VC” is around 780 mV.

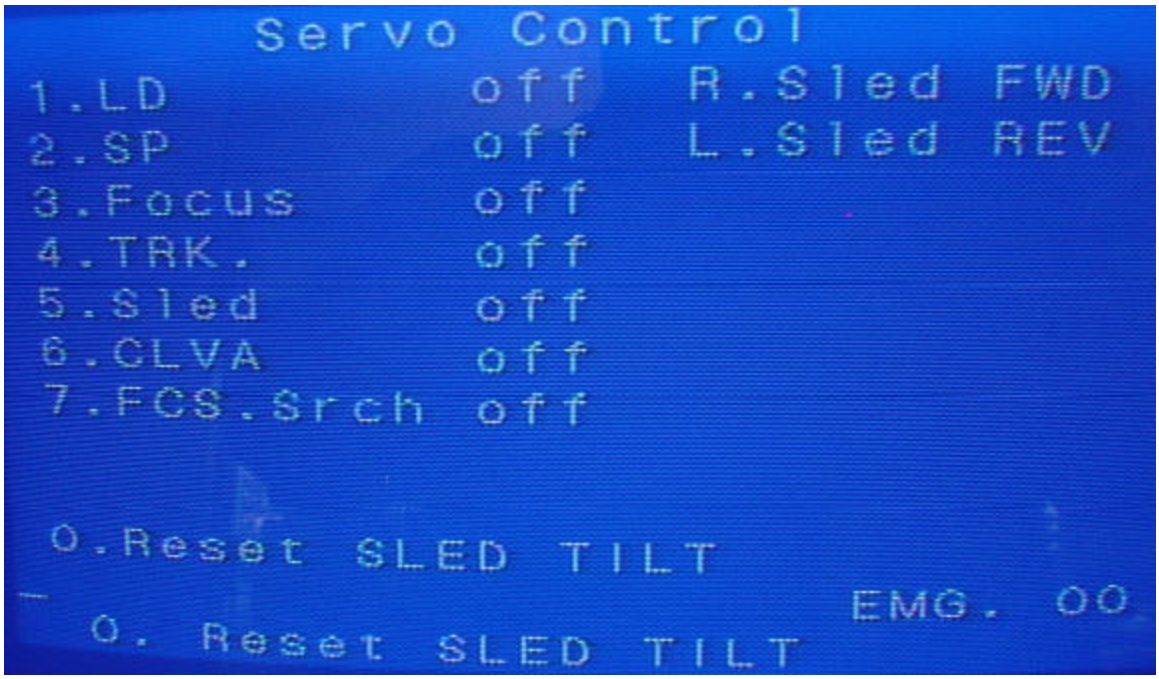
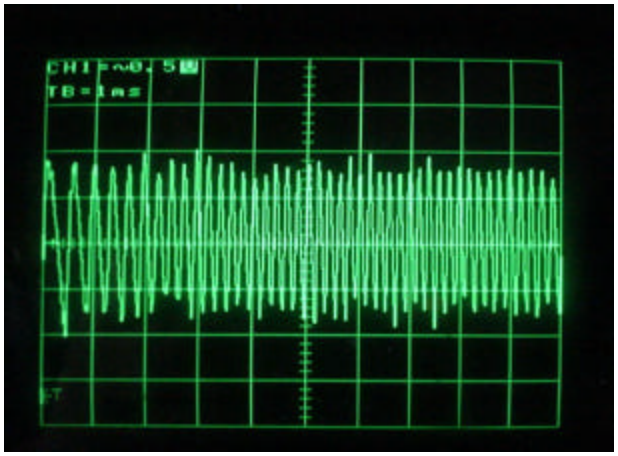


FIGURE 4-8 - SERVO CONTROL TV SCREEN IN DVD SERVICE MODE

Testing - TE traverse check:

Earlier you checked the FE signal for symmetry (equal amount of signal above and below the center Vc point. That proved the A-D detectors were balanced (equal output) at normal PB levels. The Traverse waveform (Figure 5-9) checks the balance of the same detectors dynamically at a higher light level such as when the optical assembly is moving to another track or layer.

Figure 5-9 - Traverse waveforms quickly checks the detectors dynamically. TE is disabled (turned OFF) from Figure 9-18 screen to produce this waveform. Signal level approx. 1,6 Vpp SL disc. DC level in relation to „VC" is ~780 mV.



Jigs and Tools

Extender cable package J6090-116A permits you to move the Mechanism Deck so you can access areas underneath. You can also access under the MB board and see the Mechanism operation from the bottom. See Figure 5-10.

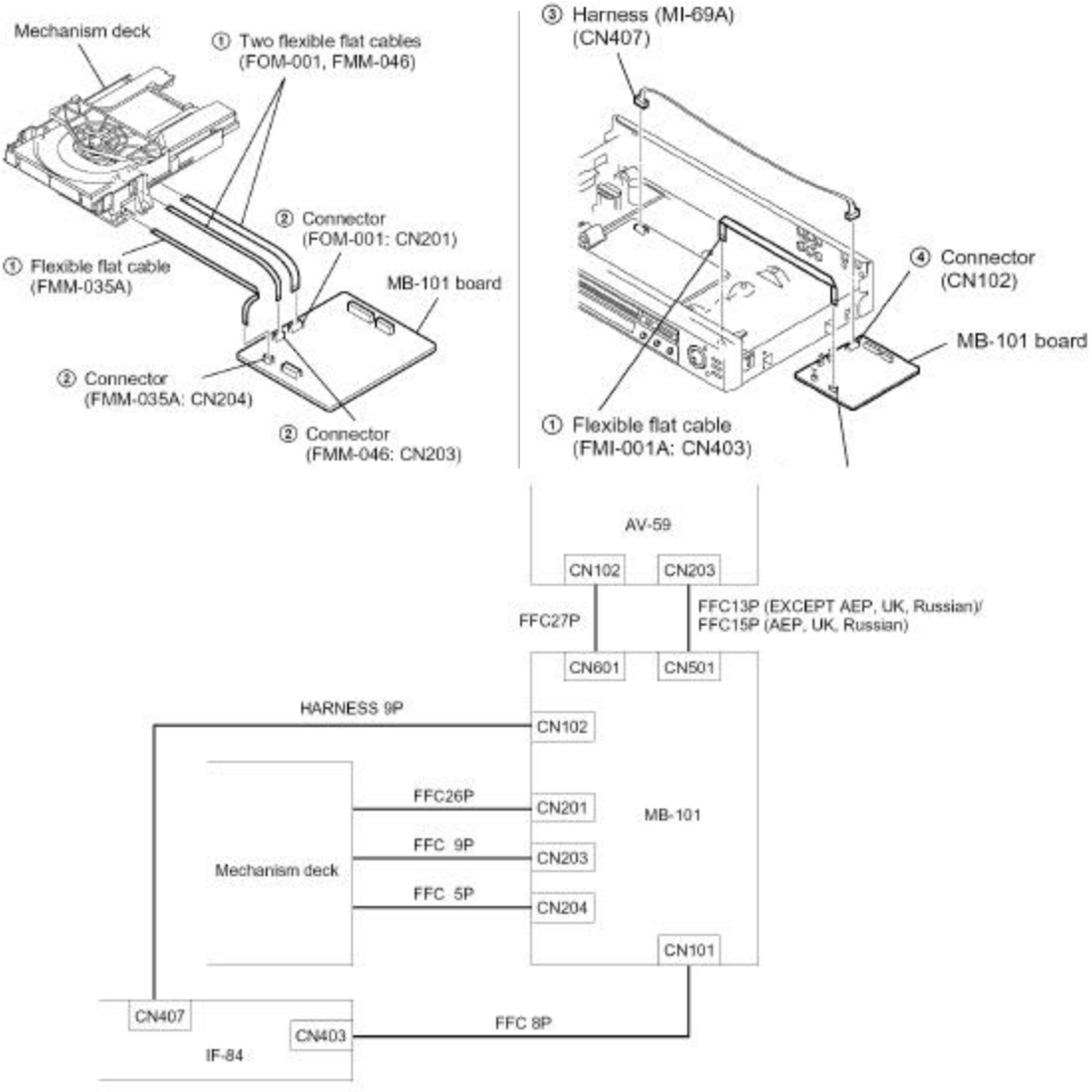


FIGURE 5-10 - USING THE TRANSPORT EXTENSION JIG J6090-116A

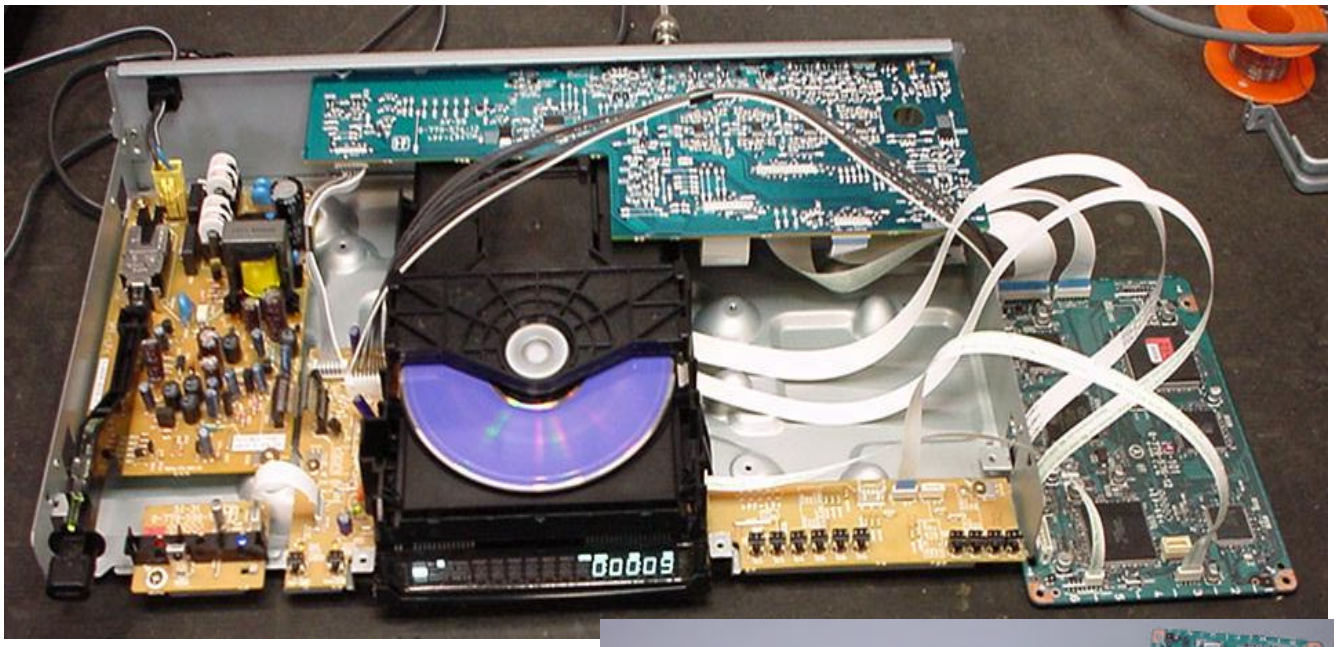


Figure 5-11a - “Jigged” DVD Player Top View

Figure 5-11b - “Jigged” DVD Player Side View

Chapter 6 - Troubleshooting

Process Flow

This section is divided into flow charts targeted for general symptoms.

A. No Test Mode Menu

B. No Power

C. Checking the Laser

No Test Mode Menu

Figure 6-1a diagnoses the symptom of No Test Mode Menu.

- If 33 MHz is available at Pin 77 at IC 103 / 104, communications between Flash ROM and Syscon are probably OK.
- If 33MHz clock output is missing at Pin 77, either System controller and related power supply circuits or the Crystal may be faulty. Try changing the Crystal before replacing the IC.

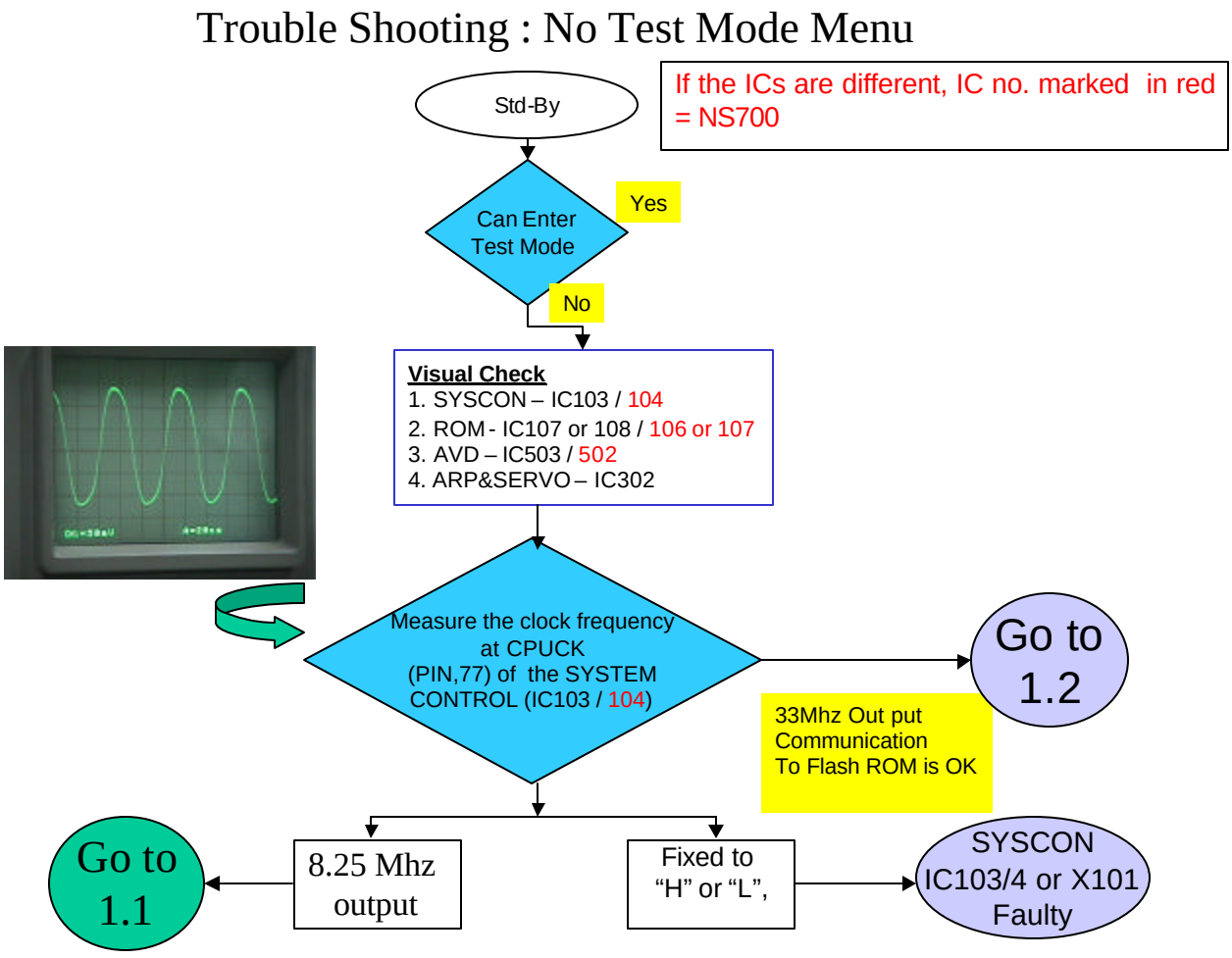


FIGURE 6-1a - NO TEST MODE

In Figure 6-1b, missing read/write data may be caused by a power supply failure or if Syscon IC104 held is in constant reset.

Trouble Shooting : No Test Mode Menu _ No 33Mhz output

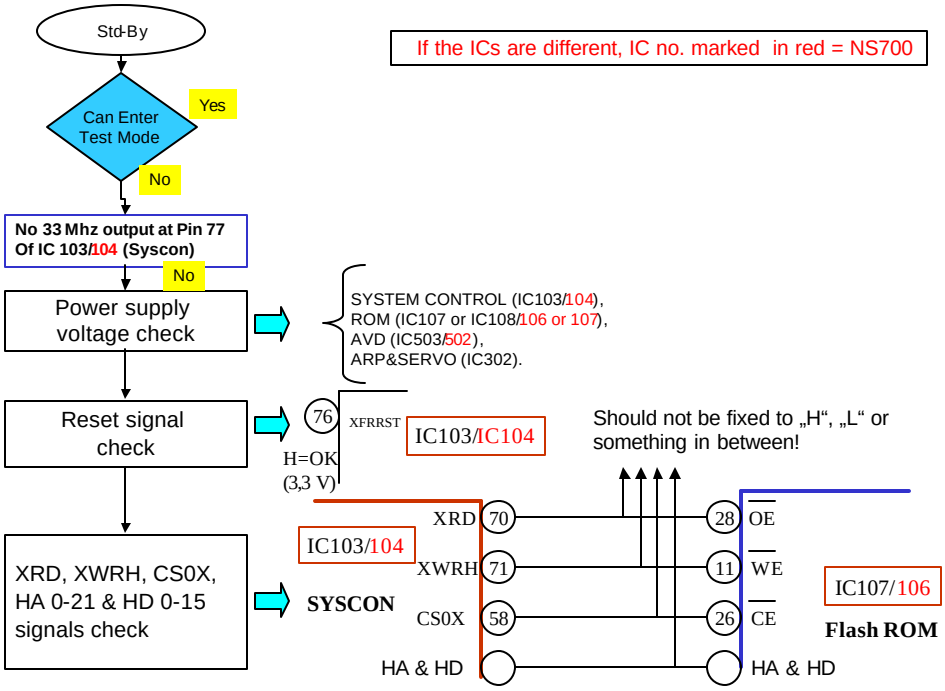


FIGURE 6-1b - NO TEST MODE

If 33 MHz is present but not the Test Mode menu, then follow the procedure in figure 6-1c, at IC503 AV Decoder IC.

Trouble Shooting : No Test Mode Menu (33Mhz output OK)

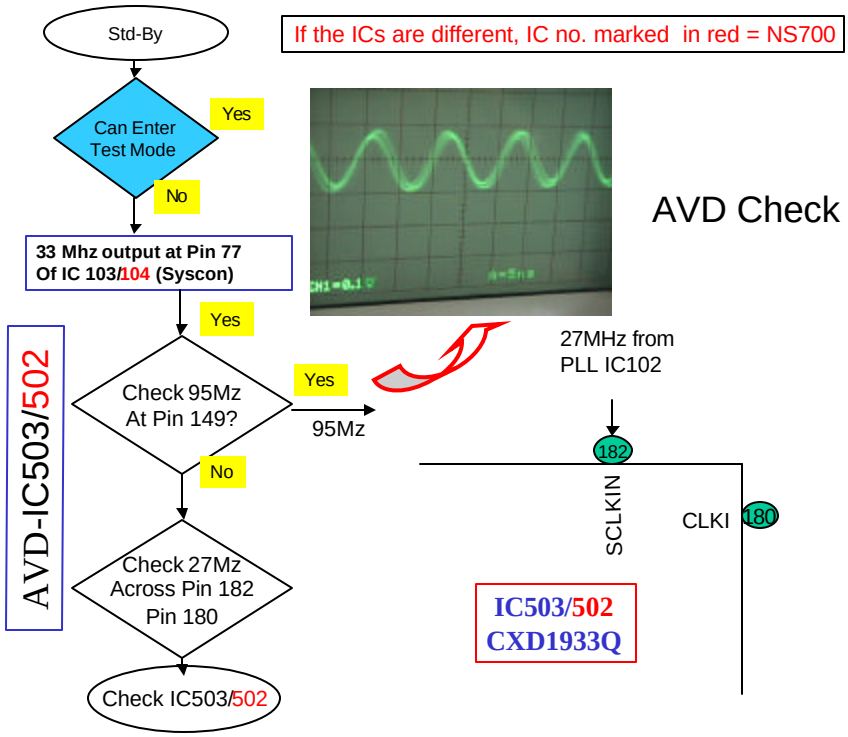


FIGURE 6-1b - NO TEST MODE (CON'T)

Figure 6-1d shows the Pins for “Chip Select” of the System Controller.

Check the source of the signal if the chip select pins do not carry any signal and/or if they are constantly at a fixed voltage.

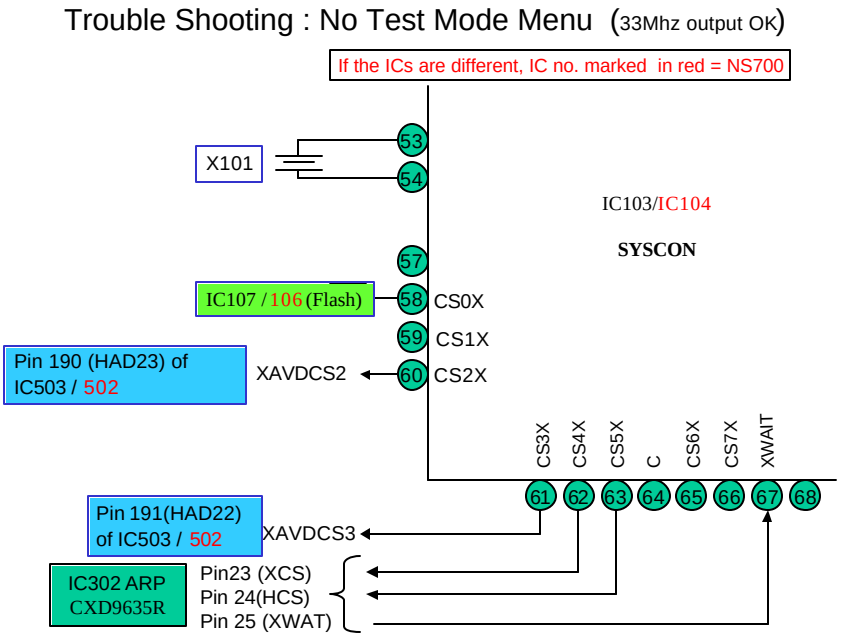


FIGURE 6-1d - NO TEST MODE (CON’T)

Figure 6-1e shows the flow of INT (Interrupt) signal between the ICs.

Note the interrupt pulse on the CDT screen shot.

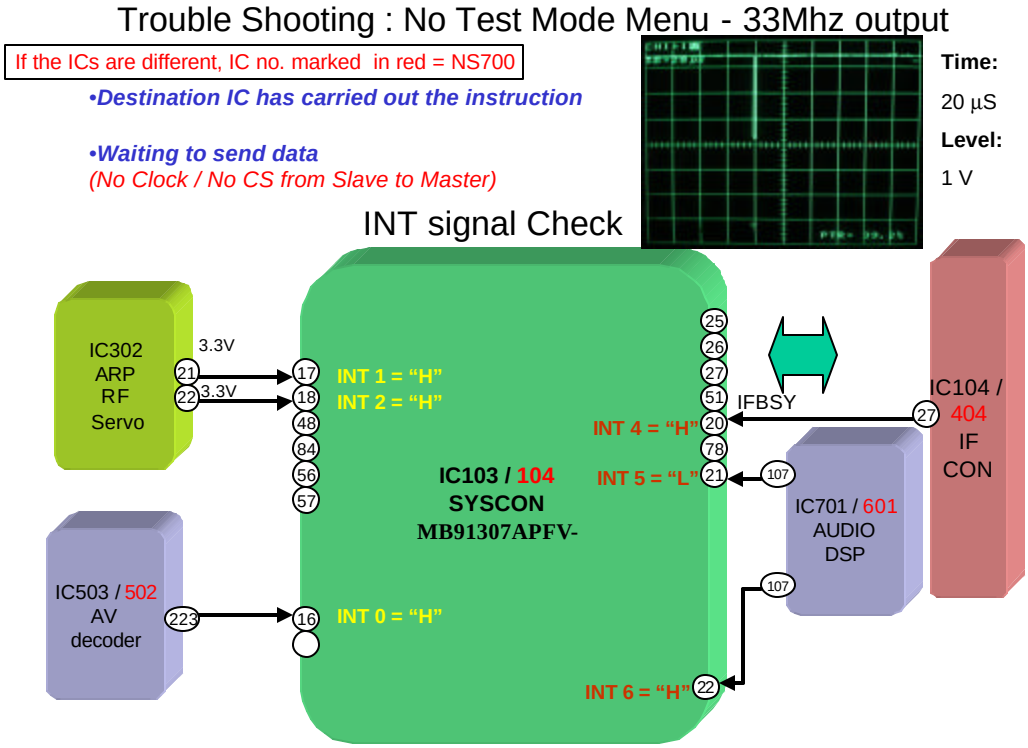


FIGURE 6-1e - NO TEST MODE (CON’T)

No Power

Several simple things can cause NO Power in this DVD player: Refer to Figure 6-2.

In-limit Sensor:

If a In-Limit sensor is defective, IC302 will cause the System Controller to shut off power.

Also, check the "INLIM" sensor signal to ARP. If there is no change in the voltage at Pin 166 of ARP (IC302), check the "INLIM" sensor or flex cable continuity to the switch.

VCO Voltage:

The VCO voltage varies between 1.3 and 2.6 Volts. If outside of this range, the VCO is not operating and the unit will shut down. Check this voltage after switching ON the set with a disc inserted.

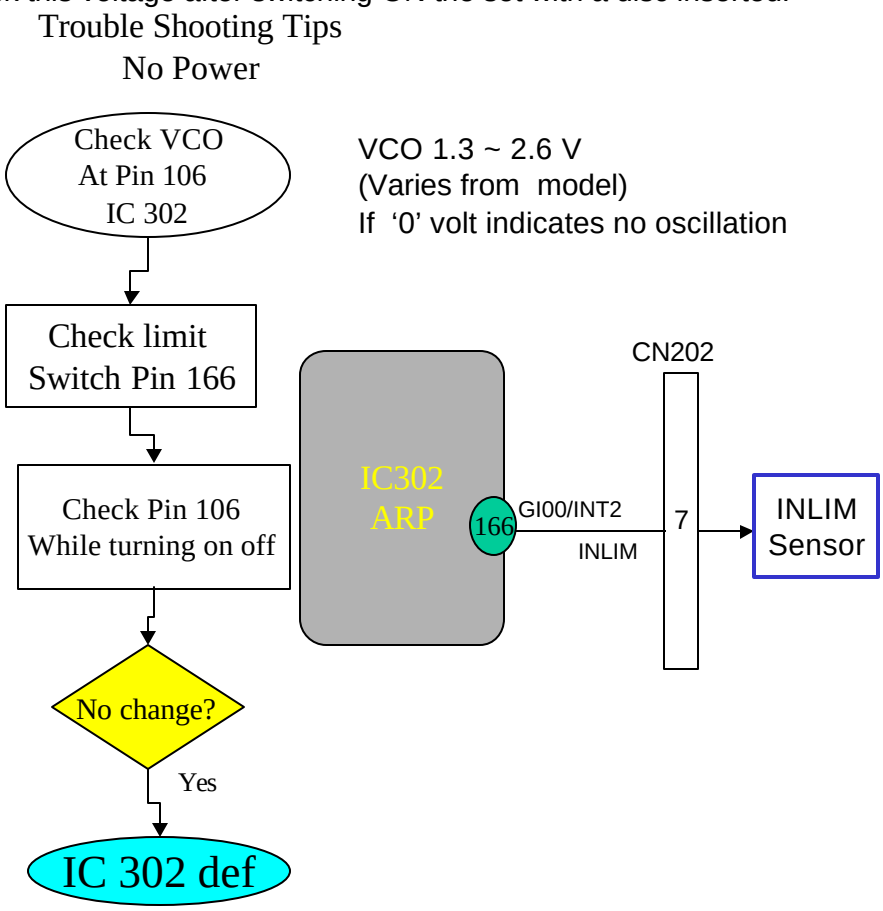


FIGURE 6-2 - NO POWER FLOW CHART

Checking Laser Current

The laser diode is extremely sensitive to static electricity and should not be probed with test probes. Laser diode current can be checked by determining the voltage drop on the emitter resistors of Q201 and converting it to current using ohms law. See Figure 6-3.

Emitter current I_E is calculated as: $I_E=V/R_E$. Since in our example R_E consists of two parallel resistors, the equation becomes $I_E=V/(1/(1/R207)+(1/R208))$. In our example V=0.9V and the emitter resistors are both 33 ohms, so the calculation becomes $I_E=0.9/(1/(1/33)+(1/33)) = 0.9/(1/(0.030)+(0.030) = 0.9/16.6 = 0.054A$ or 56mA.

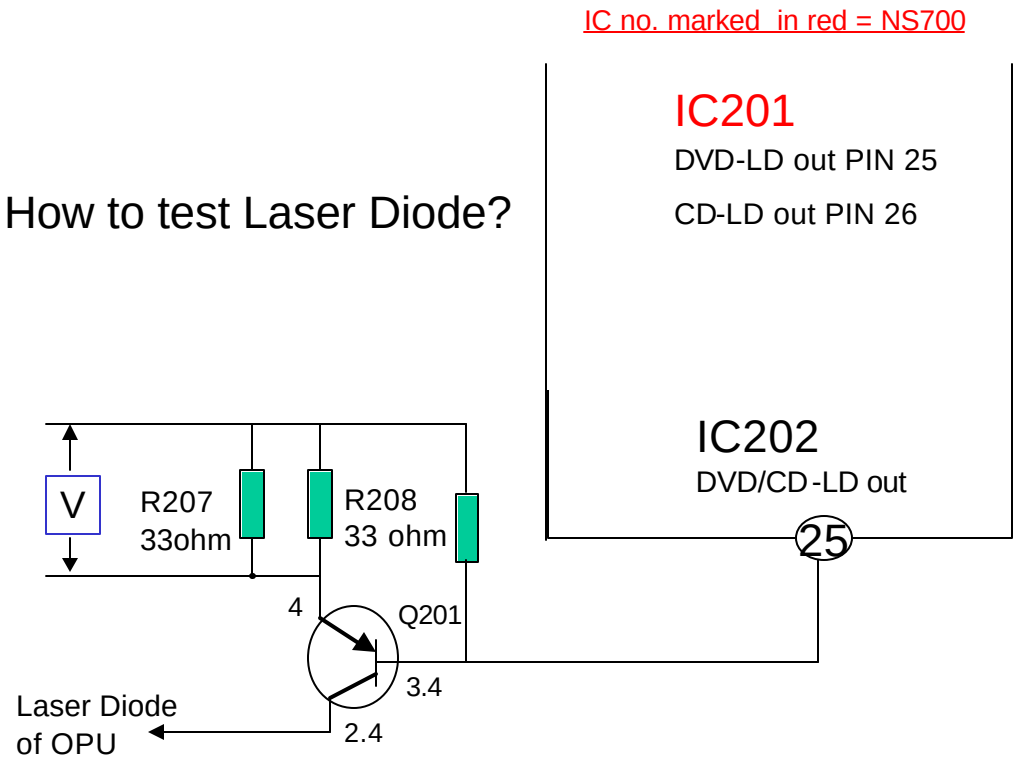


FIGURE 6-3 - LASER DIODE CHECKING

Chapter 7 - Service / Test Mode

Service mode testing consists of the following:

1. Initial Communications
2. Entering the Test Mode
3. Contents of the Test Mode

Initial Communications

Initial communications must occur before the unit remains ON and the test mode can be accessed. Therefore, if the unit does not power up, you must confirm the communications between a pair of ICs. The flow chart in Figure 7-1 helps you do this.

This process will determine if the data in the slave IC can be accessed, read and written.

If communications fail, error codes will be out put. Each error code identifies error type and IC stage where it occurred.

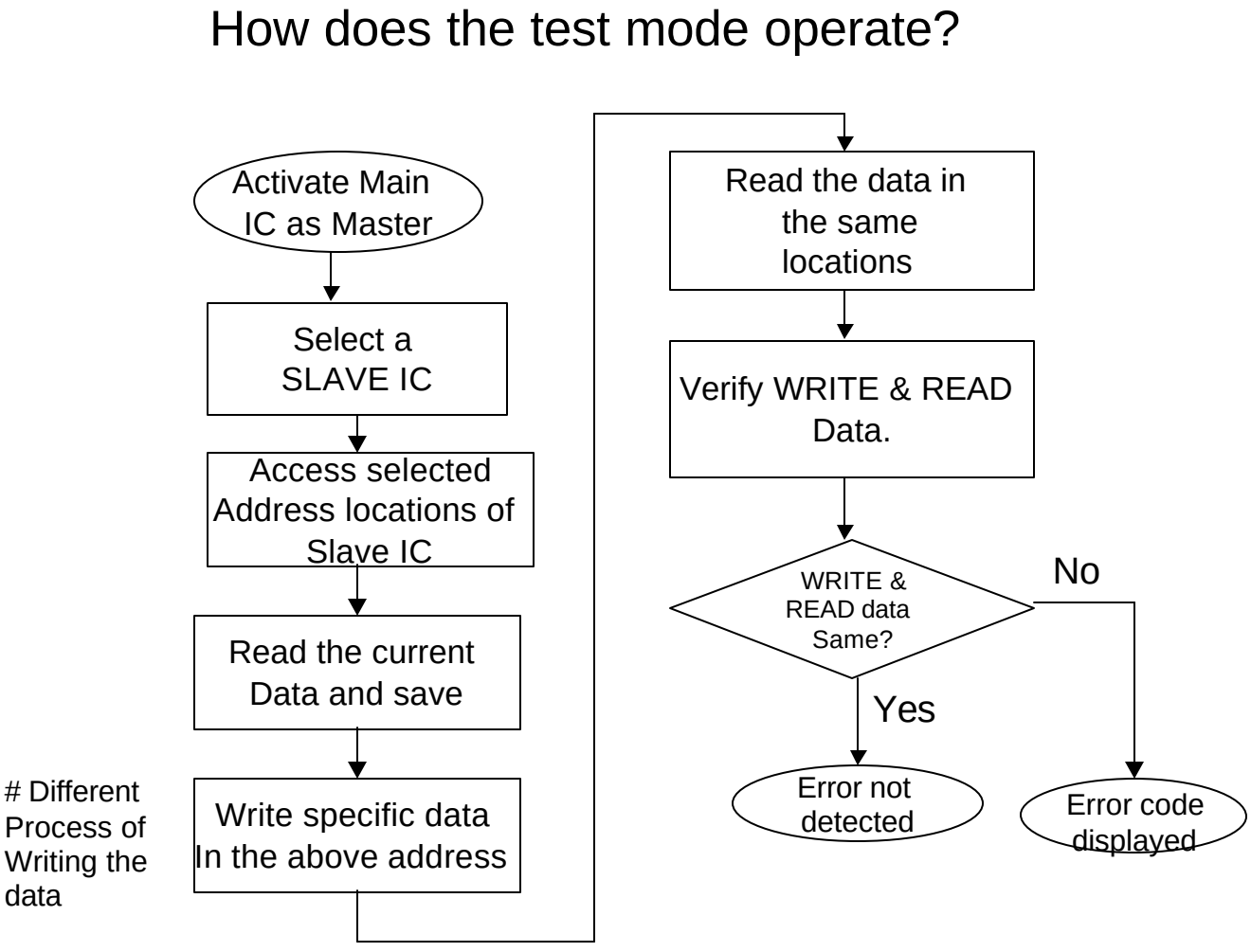


FIGURE 7-1 - DEAD SET / NO INITIAL COMMUNICATIONS

Entering the Test Mode

Figure 7-2 shows how to enter the test mode. Once in the test mode, there are six main diagnoses in the test mode menu.

TEST MODE

Press TITLE CLEAR POWER

Please use Remcon (previous generation) for using Numbered keys

FIGURE 7-2 - ENTERING THE TEST MODE

Contents of the Test Mode

System control diagnosis can give the diagnostic information in the “All”- check or for individual stages. Refer to Figure 7-3.

Once you select “All”, the system controller will communicate with stages and if there is an error, its code will be displayed.

You may also choose individual stages for diagnosis.

Please refer the service manual for more details.

TEST MODE

Select ‘0’ in the Main Test mode to view ‘Syscon Diagnosis’

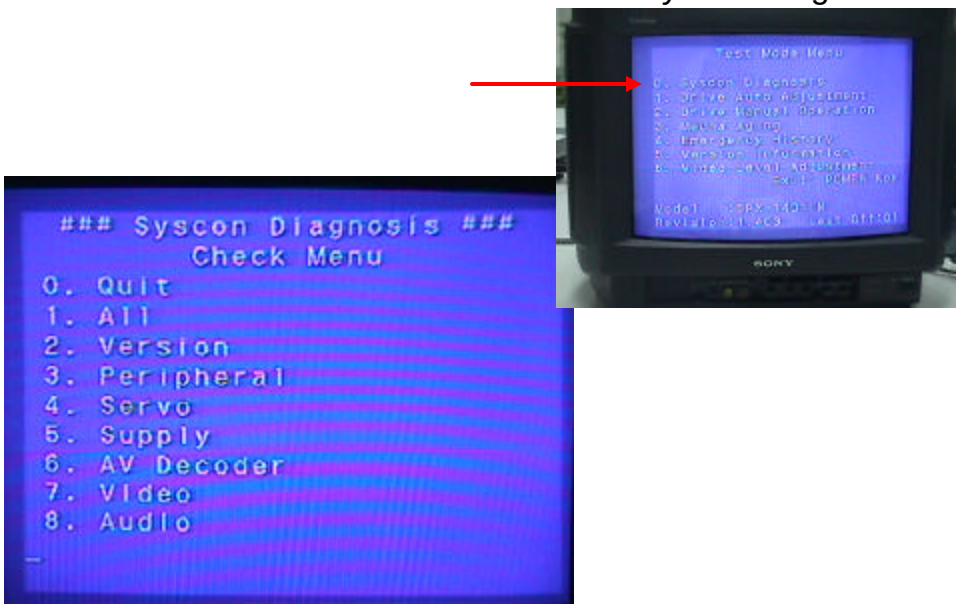


FIGURE 7-3 - FIRST PAGE OF THE TEST MODE

Chapter 8 - Mechanical Operation

The model DAV-C770 / C990 is an AM/FM 5.1 channel receiver with a 5 disc CD/DVD player. The CD/DVD service information is found in the core HCD-C770 / C990 service manual. The core manual does not have part numbers for the AM antenna, speakers and remote (1-477-332-11).

This new 5-disc changer will require alignment if gears are replaced.

FIGURE 8-1 - DAV-C990 CORE UNIT

This single slot disc entry mechanism uses three motors, two rotary encoder sensors (for transport position) and seven disc location sensors. The repair information is grouped as follows:

Powering the Unit

CD Mechanism Normal Operation

Disc loading, Stacker and Disc Clamping Motor Drive Access

Gear Alignment (Concepts, Procedure and Testing)

Powering the Unit

The top cover contains the CD operation buttons that must be connected for the mechanism to operate.

1. Remove the top cover, unplug black connector CN807 (power ON to micro) and lay the top panel on the side. Do not shear or disconnect the white ribbon connector (CN814 to CN005).
2. Plug the unit into AC and press the power ON button. The unit will not power ON until the micro receives the power ON via CN807.
3. On the front panel circuit board as shown in Figure 8-2, jump CN807. The unit should power up and show the model number in the display followed by "Ready".

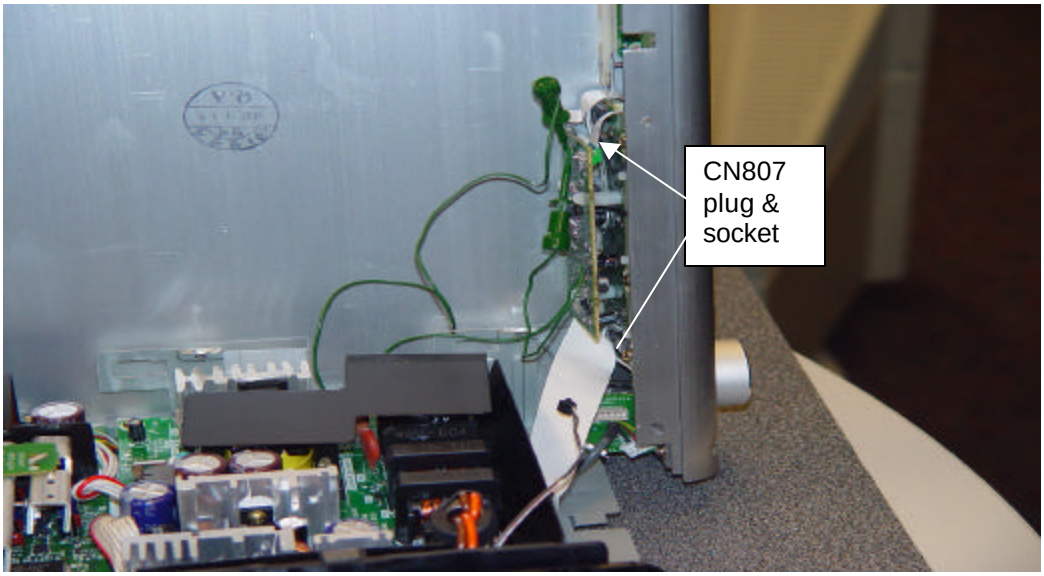


FIGURE 8-2 - COVER OFF / POWER ON

CD Mechanism Normal Operation

Loading

The disc entry is detected either by a photodetector or by Switch SW-11 closing. The loading motor starts and turns rollers to pull the disc in. The remaining switches on top, SW-11 to 18, shown in Figure 8-3 and Table 8-1, determine the position of the disc and its size to the microprocessor. The disc enters, overshoots the center and returns to center (loading motor reverses) so SW-14 momentarily opens. Figure 8-4 lists the switch positions during loading and Disc IN. O = Open, C = Closed, M = Momentarily.

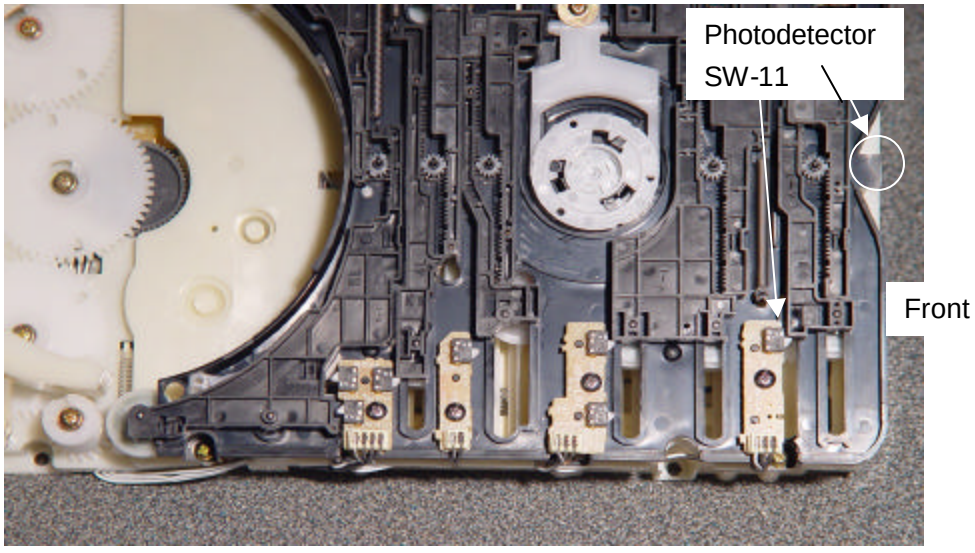


FIGURE 8-3 - CD MECH - TOP VIEW

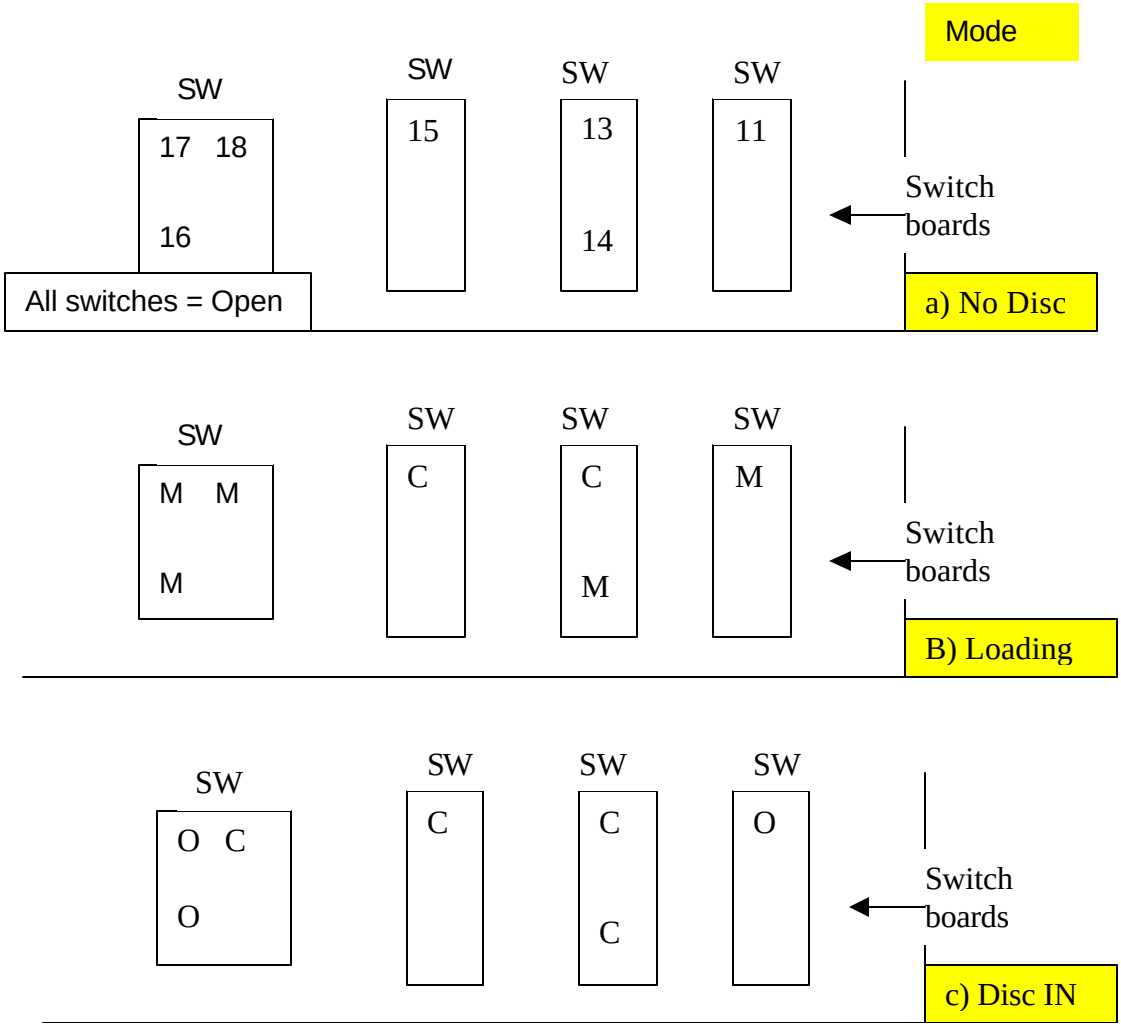


FIGURE 8-4 - DISC SWITCH STATES

Table 8-1 - Disc Position Switches

Mode	SW-18	SW-17	SW-16	SW-15	SW-14	SW-13	SW-11
No disc	Open	Open	Open	Open	Open	Open	Open
Loading	Momentary	Momentary	Momentary	Closed	Closed	Closed	Momentary
Disc IN	Closed	Open	Open	Closed	Closed	Closed	Open
Mini Disc In	Closed	Open	Open	Closed	Open	Open	Open

CD Playback

When SW-14 closes again during disc overshoot, the loading sequence ends (motor stops) and CD Playback sequence begins. The CD clamping motor turns ON to raise the laser assembly platform to the centered disc. Rotary encoder 2 (Figure 5-6) monitors the position of the laser platform. As the laser platform reaches the clamped position, the loading rollers are geared away from the disc. The clamped disc can spin / play.

Stacker Disc Storage

If another disc is selected for PB, the mechanism will release the clamped disc and store it into the rear stacker compartment before extracting the second disc. The clamping motor reverses to release the disc into the rollers and engage the rear stacker rollers. Meanwhile the stacker motor positions the rear stacker tray height. When rotary encoder 1 senses the correct stacker storage tray position, the loading motor rolls the disc into the stacker slot. Final disc location switches SW-16 and 17 determine that disc to storage tray is complete and reverses the loading motor to disengage the disc so the tray can move to the new disc slot.

Disc loading, Stacker and Disc Clamping Motor Drive Access

As shown in Figure 8-5, four screws secure the CD mechanism.

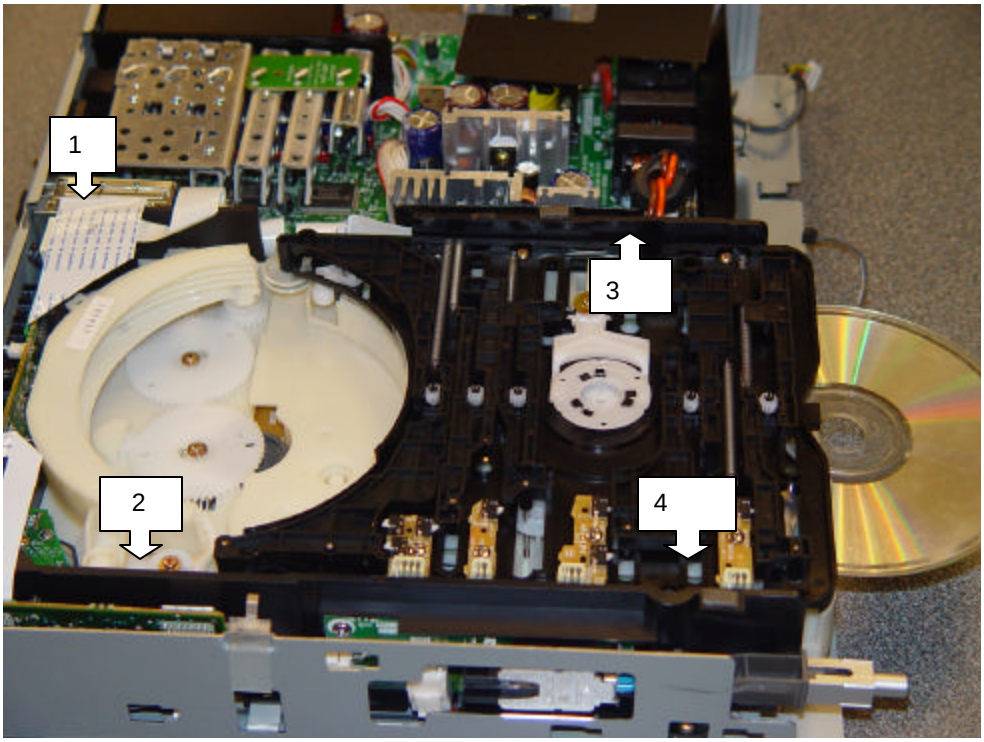


FIGURE 8-5 - DISC MECHANISM REMOVAL - TOP VIEW - 4 SCREWS

Figure 8-6 shows a bottom view of the disc mechanism. Table 8-2 lists the drive functions of the motor's gears pictured in Figure 8-6.

Table 8-2 - Drive Functions

Drive	Gear Alignment	Functions	Motor Stop Sensor
Stacker Motor	Stacker height encoder	Motor moves stacker up /down.	Rotary encoder 1 (see Fig 13-8)
Disc Loading / Unloading	None	Moves disc horizontally [Into Clamper (PB) or Stacker (storage)].	7 disc sensors (Sw 11-18. See Figure 13-3 & Table 13-1)
Disc Clamping	Disc entry lockout Clamping Encoder Stacker Disc Loading (1 & 2)	1. Prevents disc entry during PB. 2. Clamps disc 3. Positions rear rollers for stacker entry.	Rotary encoder 2 (see Fig 13-6)

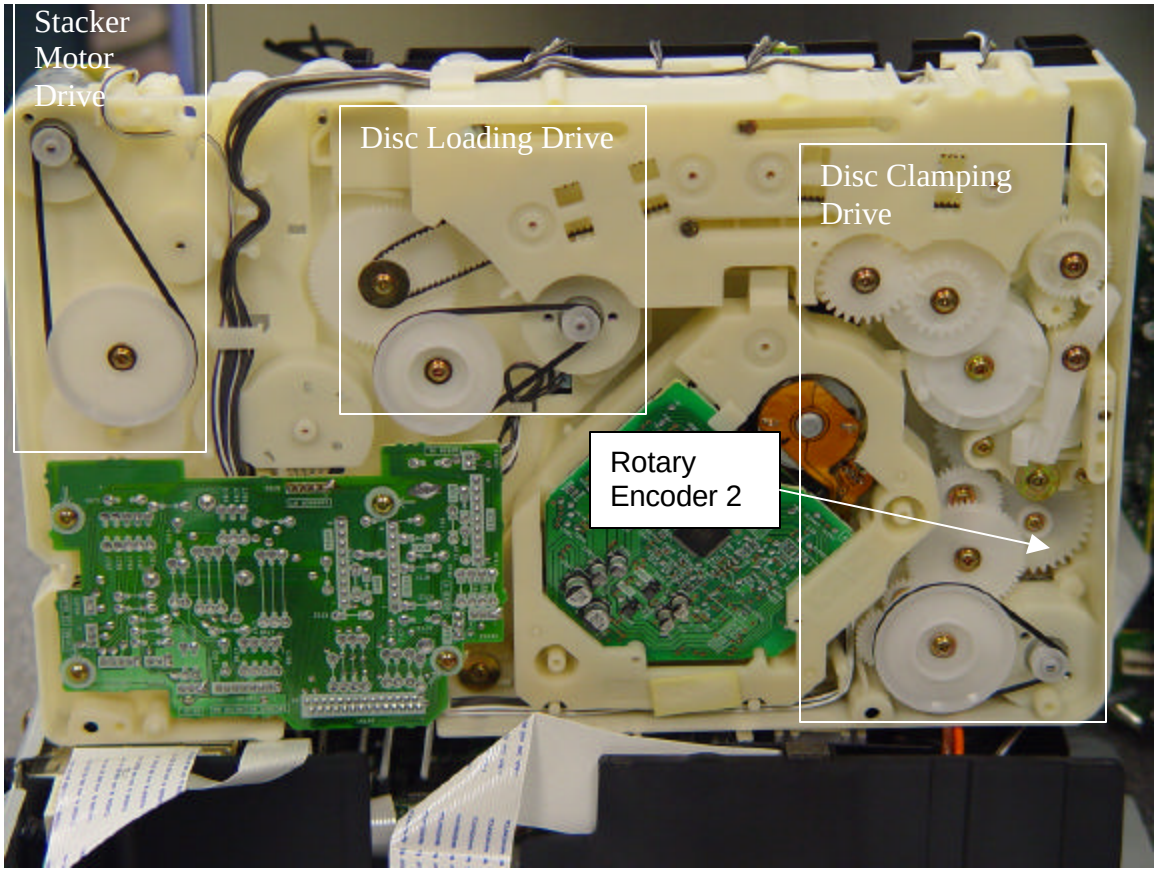


FIGURE 8-6 - DISC MECHANISM - BOTTOM VIEW

Gear Alignment (Concepts, Procedure and Testing)

The CD Mechanism gear alignment is grouped into functional names for ease of use:

1. Stacker Height Rotary Encoder (1) Alignment
2. Disc Entry Lockout Gear Alignment
3. Clamping Motor Rotary Encoder (2) Alignment
4. Disc to Stacker Gear Alignment

Stacker Height Rotary Encoder (1) Alignment

Concept: To ensure the rear disc storage tray (stacker) is positioned at the correct height to accept discs, two gears must be aligned (Figure 8-7).

Procedure: Prealign the black rotary encoder gear as shown in Figure 8-8. Place the Stacker tray on the 3-stacker tray screws (Figure 8-9). You will have to rotate the screws to accept the stacker and drop the stacker in place (this is above the top tray 5 position). Lastly, in Figure 8-9 place the large stacker (communications) gear in place.

Stacker Alignment Area

Test: By rotating the large stacking gear while watching the stacker for free vertical travel.

Stacker Alignment Area

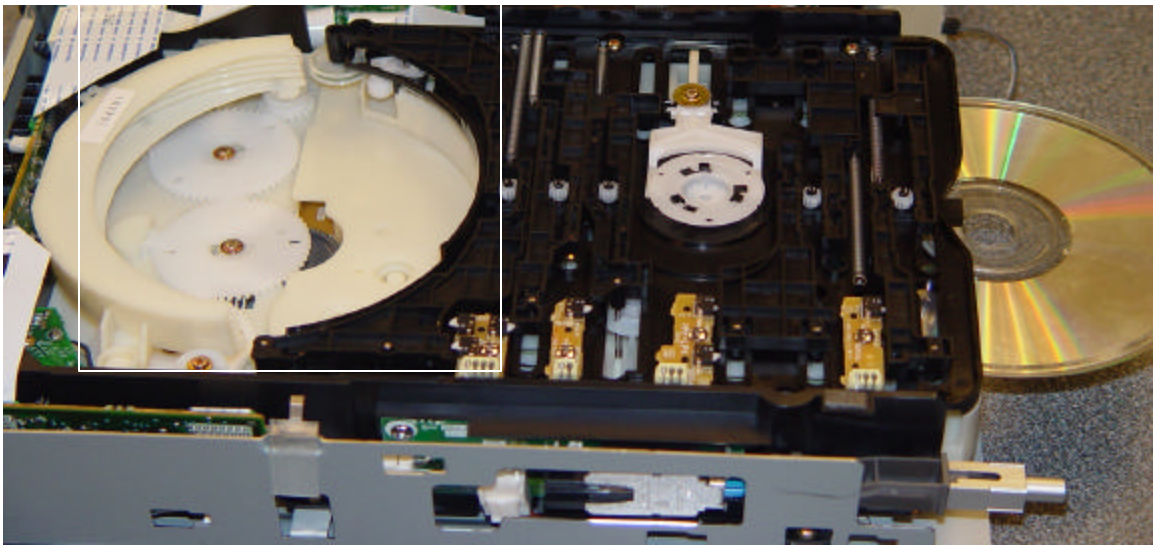


FIGURE 8-7 - STACKER GEAR ALIGNMENT AREA

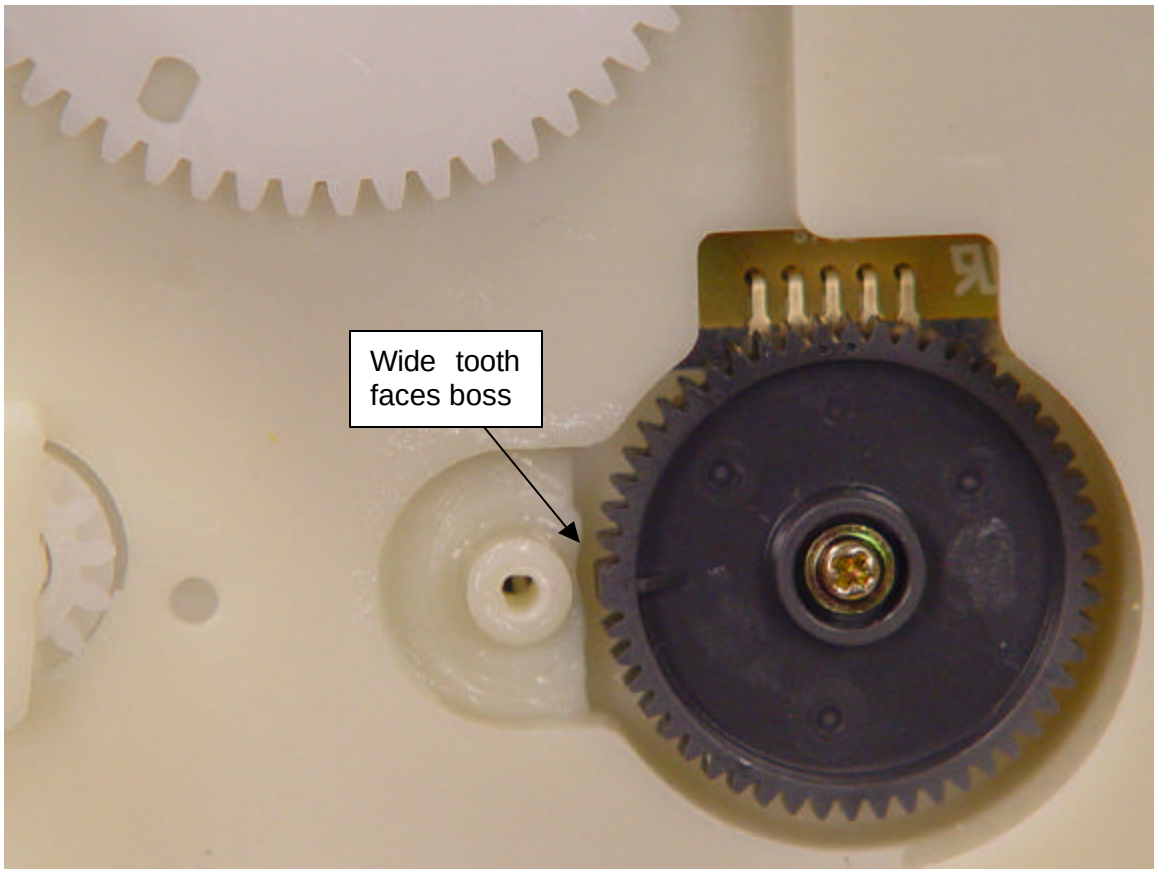


FIGURE 8-8 - ROTARY ENCODER 1 ALIGNMENT

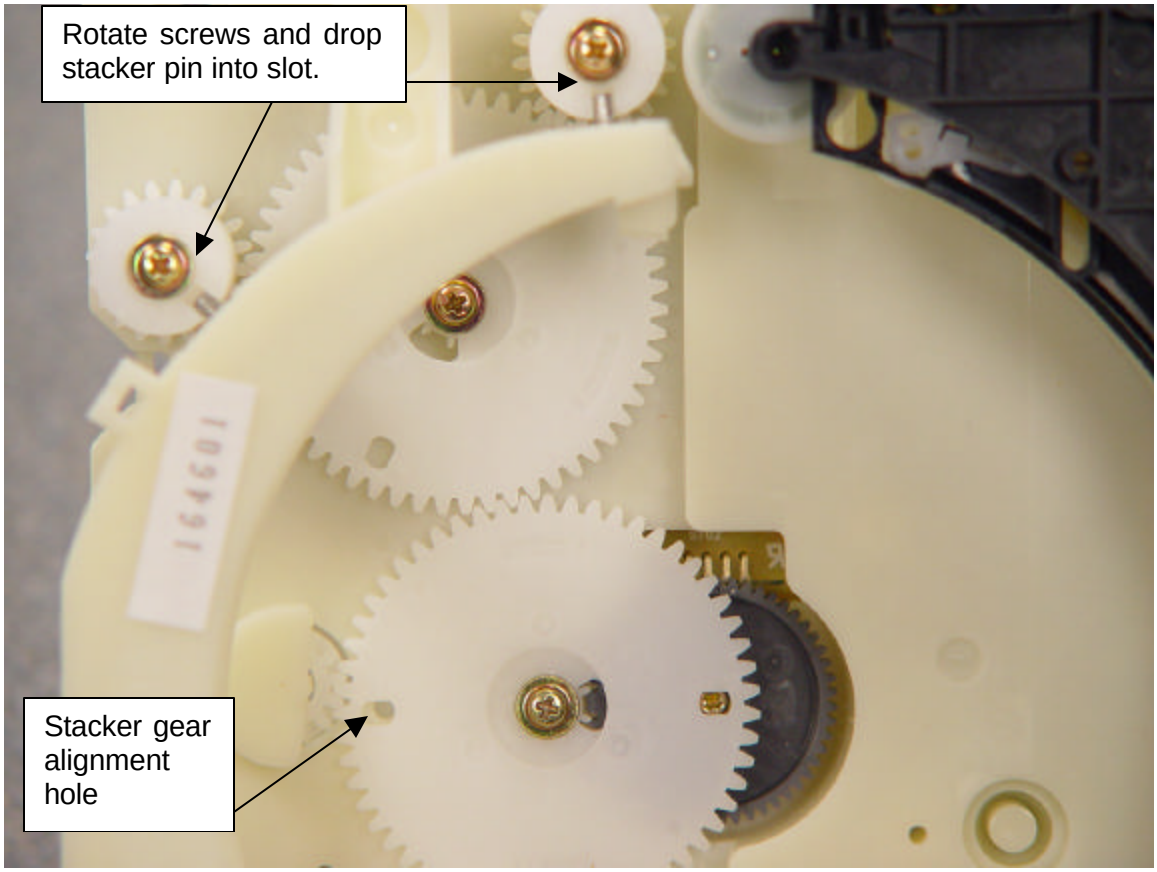


FIGURE 8-9 - STACKER GEAR AND SCREW ALIGNMENT

Disc Entry Lockout Gear Alignment

Concept: This single gear alignment prevents another disc from being inserted by locking the entry roller guides from moving when a disc is clamped.

Procedure: As in Figure 8-10 (mechanism bottom), rotate the Clamping motor gears until cam BU U/D is turned fully clockwise. Insert the smaller cam (eject lock) gear with the mark as shown.

Test: The first disc entry rollers should be free to move (SW711 in Figure 8-7) Rotate the Chucking motor so the Cam (BU U/D) is CCW (opposite Figure 8-10). The disc entry rollers should now be inhibited so they just move enough to close SW711.

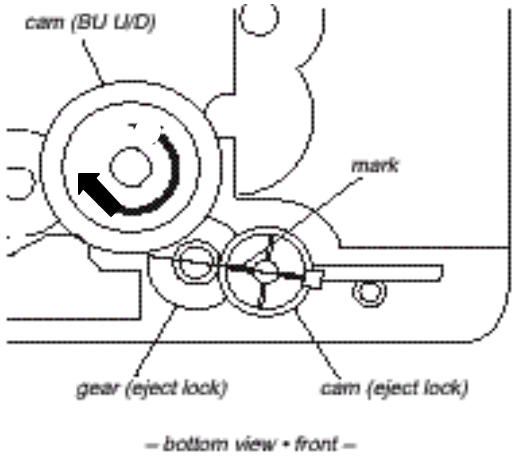


FIGURE 8-10 - DISC ENTRY LOCKOUT CAM GEAR

Clamping Motor Rotary Encoder 2 Alignment

Concept: Rotary encoder 2 (S701) sets the clamping motor limits. Since these gears also control the rear disc rollers, an encoder 2 misalignment can cause the disc not to travel to the rear stacker or grab the disc during PB (no spinning).

Procedure: Figure 8-11 (mechanism bottom) shows that the Clamping motor gears are rotated until cam BU U/D is turned fully counter-clockwise. Place the rotary encoder gear (S701) so its mark faces the plastic projection in the chassis as shown.

Test: Rotate the clamping motor. At one mechanical limit (unloaded as shown in Figure 8-11), the disc is unclamped. At the other limit, the disc is clamped. In-between these limits, SW716 and SW717 (Figure 8-4) close freeing the rear rollers.

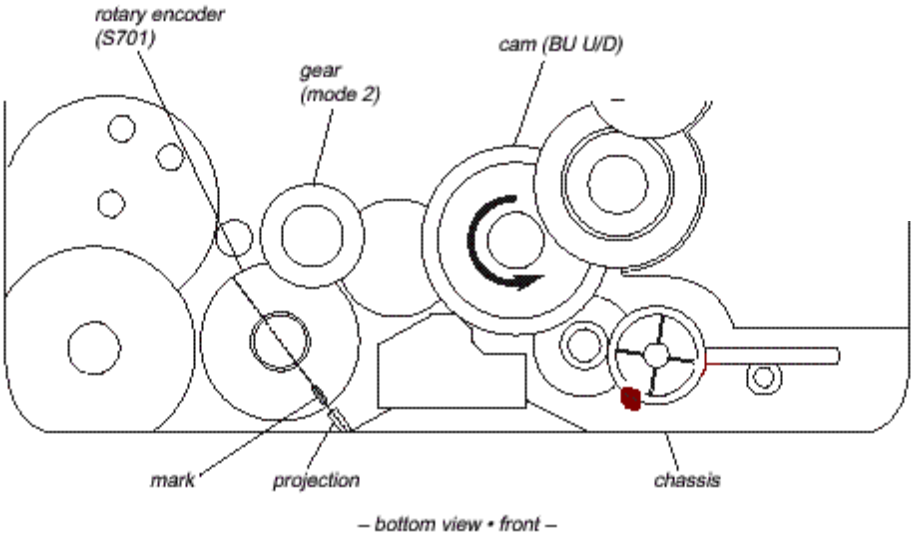


FIGURE 8-11 - ROTARY ENCODER 2 - FOR CLAMPING / STACKER LOADING

Disc to Stacker Gear Alignment

Concept: The clamping motor not only clamps and unclamps the disc, it also drives gears to position the rear rollers that move the disc into (and from) the stacker.

Procedure: As in Figure 8-12, rotate the clamping motor so the cam BU U/D is CCW (disc clamped). Install the Cam gear mark as shown. Then as in Figure 8-13, rotate the clamping motor so the cam BU U/D is CW (disc unclamped). Slide the shaft up. Drop the mode cam gear in mark as shown in Figure 8-13 and secure.

Test: Rotate the clamping motor. At one mechanical limit, the mechanism will clamp the disc and in the other, the rollers hold the disc. In-between these limits, SW716 and SW717 (Figure 8-4) should close freeing the rear rollers. See Figures 8-14 and 8-15 for the position of the clamping motor gears in the two extremes.

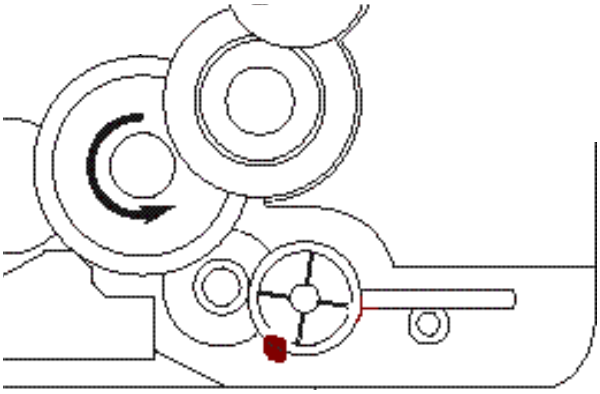


FIGURE 8-12 - DISC TO STACKER GEAR ALIGNMENT 1 (DISC CLAMPED)

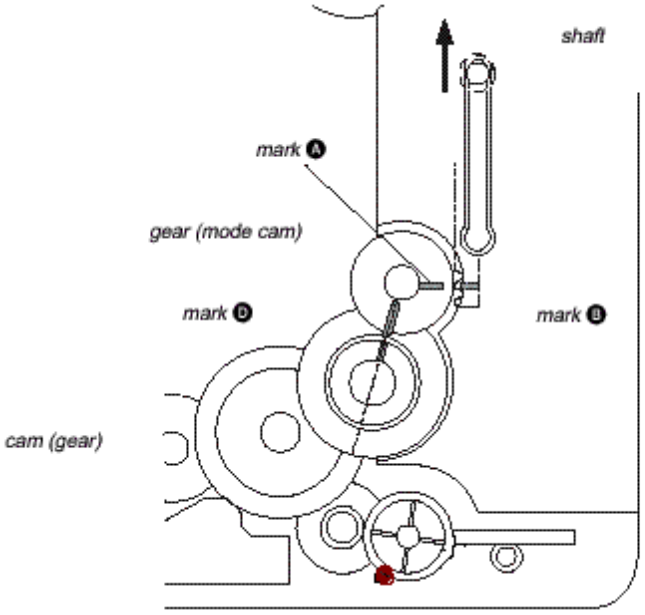


FIGURE 8-13 - DISC TO STACKER GEAR ALIGNMENT 2 (DISC UNCLAMPED)

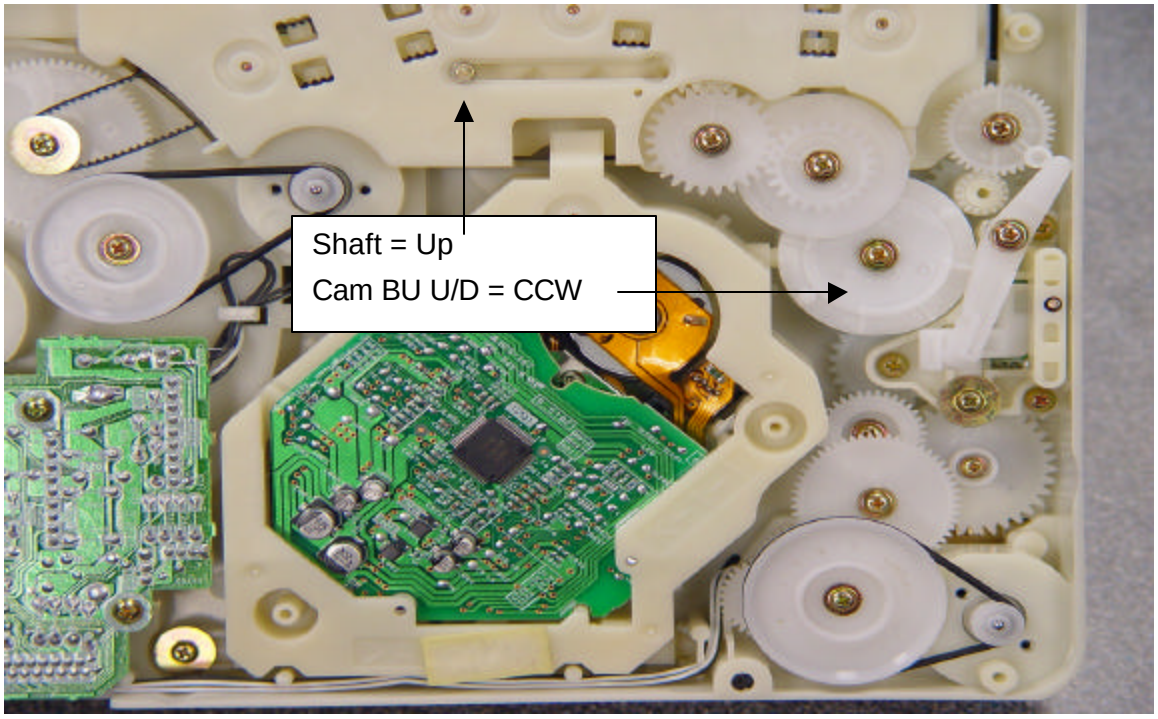


FIGURE 8-14 - UNCLAMPED MECHANISM POSITION

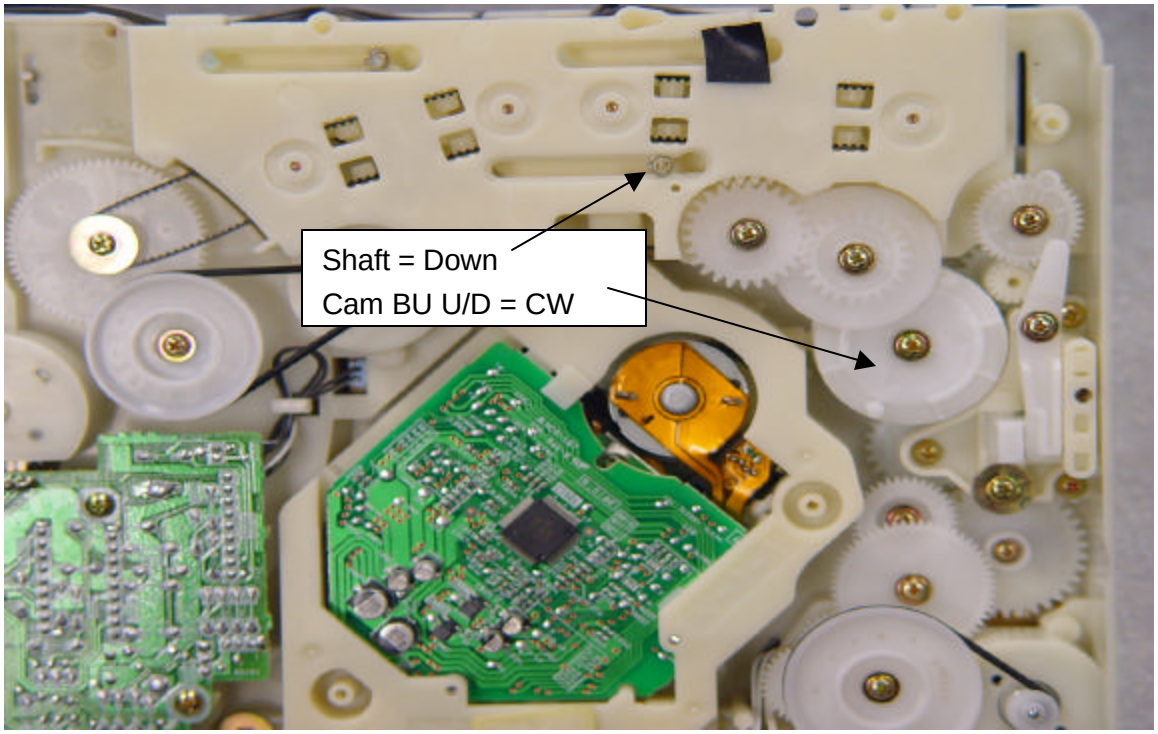


FIGURE 8-15 - DISC CLAMPED, ROLLERS DISENGAGED MECHANISM POSITION

SONY

EMCS - A Service Company
1 Sony Drive
Park Ridge, New Jersey 07656

DVD50403

4/11/03