SONY

Training Manual

Digital Camcorder

Circuit Description and Troubleshooting

Course: D8MM-01

Table of Contents

Introduction

Overview

This book is designed to give the servicer knowledge of the new D8 camcorder format that will allow them to repair this product to the board level. We will discuss this format in relationship to the analog Hi8/8 format. This information includes basic track layout, video and audio paths and servo operation. Emphasis will be placed on areas that are not similar to the previous analog formats. Symptom/failure identification and the differences in analog and digital tolerances to electrical and mechanical misalignment will be discussed. We will also cover some of the new 8mm features and the new Radar W jig.

Much of the new D8 circuitry will not be troubleshot to component level. That is because the main board, VC-213, contains components that use BGA technology. BGA stands for Ball Grid Array. This means that the leads for these components are actually balls that are located underneath the IC. These ICs cannot be removed or installed using conventional soldering technology. The equipment needed is very expensive so all component level repairs will be done at a central repair depot. You should also note that soldering is prohibited on the VC-213 board. This is because the BGA devices are extremely sensitive to sudden temperature changes, such as that caused by a soldering iron. The only time a soldering iron can be used on this board is if the data from the EEPROMs cannot be uploaded. Then you are permitted to remove them and place them on the new board.

NOTES

New Camcorder Features

Overview

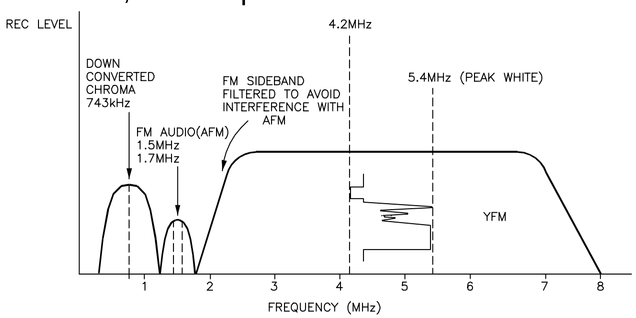
In this section we will briefly discuss three new features found in Sony camcorders. These features include 8mm and Hi8 XR, Night Shot and Laserlink. These features can be used in any camcorder, analog or digital, with the exception of 8mm XR, which is exclusive to 8mm camcorders.

8mm and Hi 8 XR (Extended Resolution)

The 8mm Hi8/XR systems were produced in an effort to increase the resolution of new 8mm products while remaining compatible with the 8mm and Hi8 systems. This system achieves 280 lines of horizontal resolution versus 240 lines for 8mm. In Hi8 XR the resolution is increased from 400 lines to 440 lines. In order to understand this new technology, let's look at the old 8mm and Hi8 frequency spectrums.

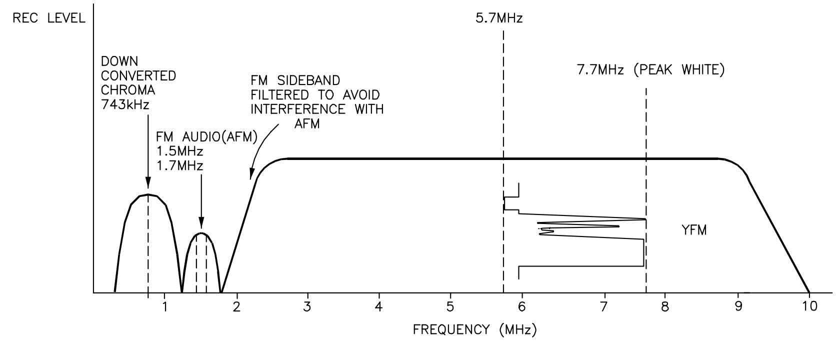
Background

The 8mm Recording Signal Spectrum below shows the down converted chroma signal to be centered at 743 KHz. The audio signal is centered between the 1.5 MHz and 1.7 MHz audio carriers and the video signal takes up the rest of the spectrum. The Y signal is frequency modulated onto a carrier so that the sync tip is at 4.2 MHz and the peak white signal is at 5.4MHz. The rest of the area inside the Y spectrum is for the side bands produced by the frequency modulation of the video. Since greater picture detail is located in the higher frequencies of the Y signal, the side bands contain the picture detail. This means that if we can extend the side bands area, we can produce more detail.



Analog 8mm Recording Spectrum

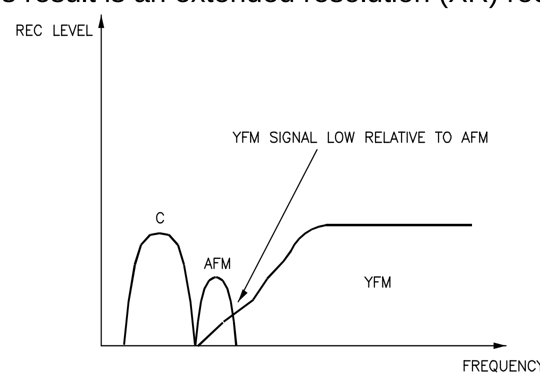
This is more evident when comparing the amount of side band information in the Hi8 spectrum. The Hi8 system allows for greater picture detail by allowing for a wider side band area. Extending the bandwidth increases picture quality (resolution).



Hi8 Recording Spectrum

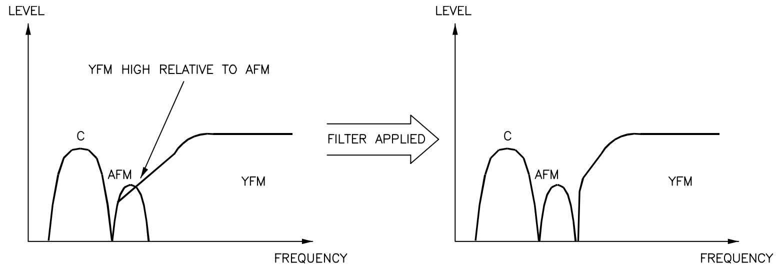
Conventional vs. XR (Extended Resolution)

In the conventional systems discussed above, a fixed band stop filter is used during recording to keep the audio and Y signals from interfering with each other. These filters are necessary in a conventional system, but they do tend to eliminate some of the detail from the video. The XR system is dynamic and the filter is not applied until the relative level of the YFM in the AFM region is determined. If it is determined that the amplitude of the YFM signal is low enough in the AFM area, then the filter will be switched out. The resulting signal, which is sent to the head, is shown below. This result is an extended resolution (XR) recording.



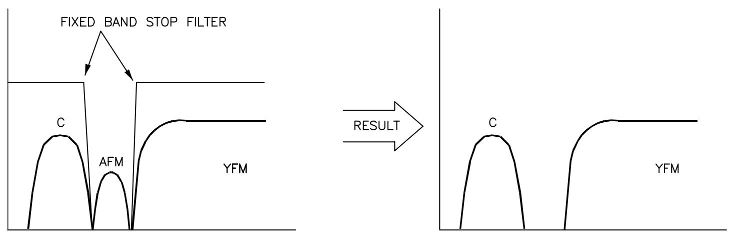
XR Record - Filter Out

If the system determines that the amplitude of the YFM signal is High relative to the AFM, then the conventional filtering system will be employed. The result would be a standard resolution recording.



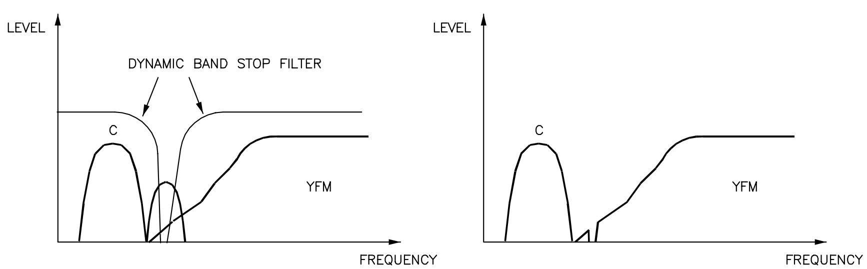
Conventional Record - FIlter In

A conventional system uses the fixed band stop filter to separate the signals again in playback. The result is a standard resolution playback signal.



Conventional Playback

A dynamic band stop filter is used in the XR system. This filter senses the presence of the relatively low YFM signal inside the AFM band and adjusts its filtering accordingly. The result is a YFM signal with extended resolution.



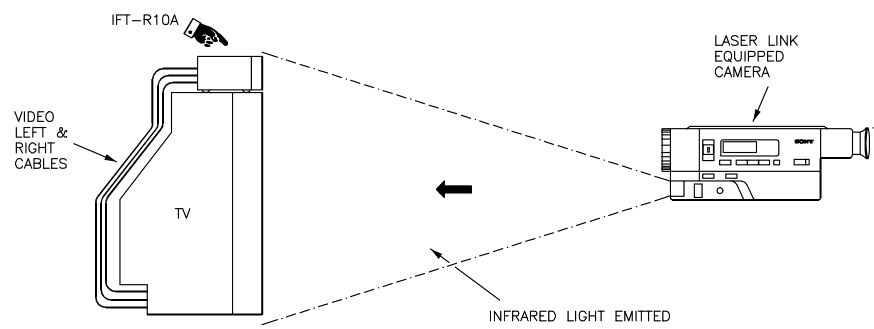
XR Playback

Laserlink

Laserlink is a feature in Sony camcorders that sends Sircs information and audio/video signals via infrared emitter to a Sony TV and an optional IR receiver. There is no noticeable loss of picture quality between Laserlink and composite video.

In order for the system to work you need the IFT-R10A infrared wireless receiver or a new Sony Laserlink equipped VHS machine. This is an optional accessory and is only necessary if you want to use the Laserlink function. This accessory contains a composite video output that is connected to your video display's input. It also contains separate left and right audio outputs that are connected to the component that will be producing your sound.

In order to use the system, you simply point the camera in the direction of the IR receiver and the TV and press PLAY. Sircs signals are then sent from the camcorders infrared emitters. The first of these signals is the TV ON command and the second is the selection of the video input source. You can select Video 1, Video 2 and Video 3 or OFF using the camera's menu. You may also select whether or not you would like the Power ON command sent by using the camera's menu. Once the Sircs commands have been sent, audio and video information is transmitted from the camera's infrared emitters to the infrared receiver. The receiver decodes the infrared signals and outputs them so that the picture can be seen and the sound heard.

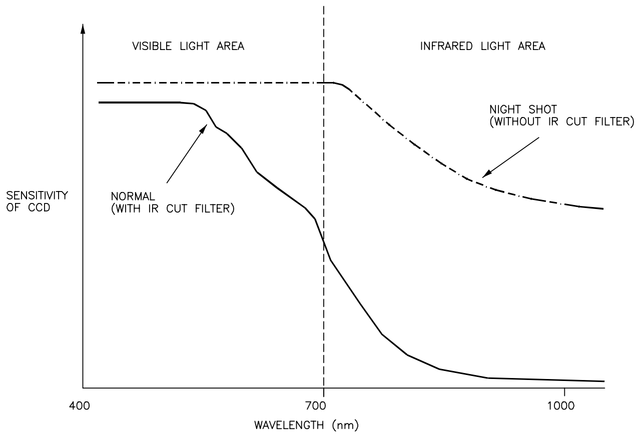


Laserlink

NightShot

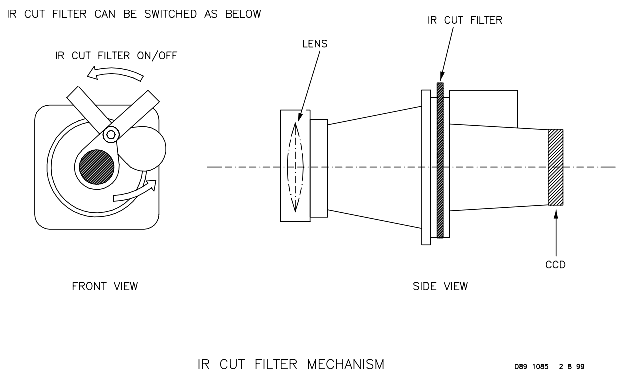
NightShot is the name Sony has given to its 0 Lux system. 0 Lux means that camcorders with this feature can literally see in the dark. How is this miraculous feature possible?

The main technology used for NightShot has been inherent in the camcorder lens system for years. The lens focuses outside light on the CCD, which can see light in the infrared spectrum. As a matter of fact, a normal camera lens has an IR-cut filter built into it to dramatically cut down the CCD's sensitivity to infrared light. This brings the sensitivity of the camcorder closer to that of the human eye.



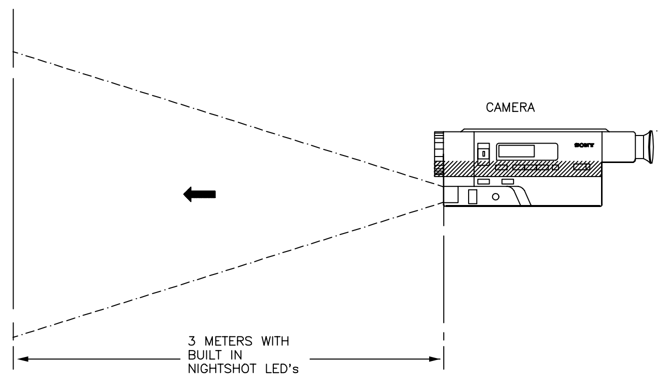
CCD Sensitivity

We can use the CCD to its full potential if we take out the IR-cut filter. Without the filter, the picture appears to be completely washed out in the presence of light. This allows objects to be seen in the dark. NightShot utilizes both types of systems by using a mechanical switch to move the IR-cut filter in and out.



IR Cut Filter MEchanism

When the NightShot switch is turned ON, it turns ON the Laserlink LEDs located in front of the camcorder, as well as physically moving the IR-cut filter. The light emitted by these LEDs is projected in front of the camcorder and acts like a spotlight. The LEDs allow images to be seen in the dark up to three meters away. Optional accessories are available that emit more infrared light and allow images to be seen up to 100 feet away in the dark.



NightShot Range

The NightShot picture has a couple of "quirks". When viewing video shot using NightShot, the color is not correct and appears washed out and greenish in tint. The other problem is the presence of a "hot spot". This hot spot is normal and is caused by the varying intensity of the LEDs that project infrared light in front of the camera. It can be thought of as if a flashlight were being used as a light source while shooting. Due to the unevenness of the light source, one area would appear brighter than the rest.

IEEE-1394

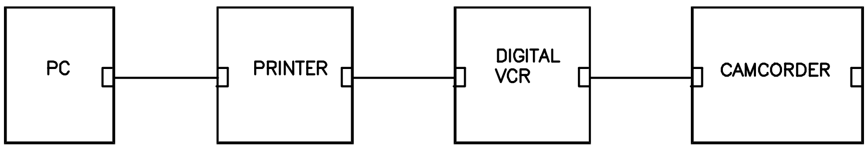
Overview

IEEE-1394 is high-speed digital interface that can be used by many types of products, including computers and consumer electronics. It uses transaction-based packet technology to communicate between devices. This standard was developed to help bridge the gap between PCs and consumer electronic products.

Advantages

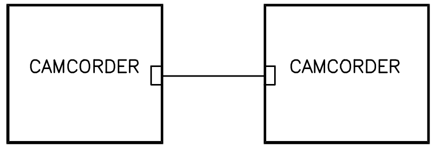
The IEEE-1394 has been chosen as the standard interface for digital consumer products because of its many advantages. Listed below are several of these advantages:

- It is a hot pluggable and unpluggable system. Devices may be added or removed at anytime and their presence or absence will be recognized by the system.
- It is a non-proprietary standard adapted by the Institute for Electrical and Electronic Engineers. There are no licensing problems at this time to keep companies from adapting this format.
- It allows for flexible hookups and easy connection. One thin cable between devices does it all. The system allows for daisy chaining up to 63 devices together at one time and also supports branching. It is Plug and Play and does not require ID jumpers or switches. There is no need for terminators.



Typical IEEE1394 Hookup

- Peer to peer communications are possible. Any device should communicate with any other device without a need for a hub or a PC to be connected.



PEER to PEER Connection

- The system uses scalable architecture that will allow older, slower devices to communicate with newer, faster devices at the slower rate. Different combinations of faster and slower devices can be used on the same bus.

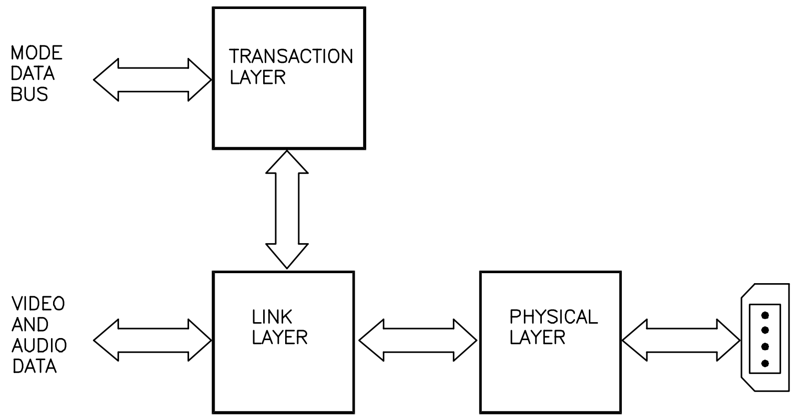
Hardware

There is hardware currently available to support speeds of 100, 200 and 400 Mb/s (Megabits per second). These speeds are fine for digital video since it has a data rate of 30 Mb/s. Data rates of 800 and 1600 Mb/s are already scheduled for release. A data rate of 3200 Mb/s is in the planning stage.

IEEE-1394 consists of three layers of hardware called the physical, link and transaction layers. These components may be found in a single IC or in several ICs. These layers will perform the same function regardless of how many ICs there are. A description of each layer is listed below:

- **Physical Layer** – Provides the electrical and mechanical interface between a device and a connector. This layer also provides initialization and arbitration between devices. There is a built-in arbitration subroutine that will make one of the devices the bus master. This device will assign IDs to the nodes (devices connected) and control traffic.
- **Link Layer –** The link layer handles all data packet transmissions and receptions. The data can be either asynchronous or isochronous.

- **Transaction Layer –** Manages asynchronous data protocols. This layer is also responsible for communicating between a device that is using IEEE 1394, such as a digital camcorder or a capture card, and the link layer. This would be the system control IC in a camcorder and the PCI bus in a PC.



Example: IEEE1394 Interface in Camcorder

Protocol

Data Transfer

There are two types of data transfer possible using IEEE-1394. They are as follows:

- **Asynchronous –** This is a memory mapped system. Each packet of data is sent to a specific address to be stored and buffered by the recipient. An acknowledge signal is sent when the data is properly received.
- **Isochronous -** Isochronous data needs to be sent and received at a steady rate that is in close timing with the ability of the receiving device to process the data. For example, if a digital camcorder processes data at approximately 30 Mb/s, then the receiving device must be able to use this data at the same rate. Data is essentially broadcast at a predetermined rate and not checked for accuracy.

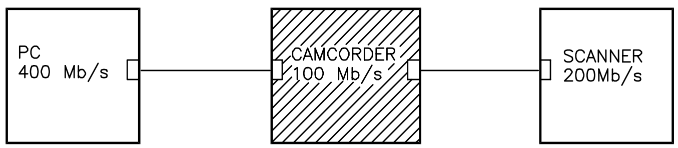
Dynamic Node Addressing

Each device, called a node, is assigned a specific address. This occurs when a bus reset occurs or a new device is added to the system. Three steps occur when these events happen:

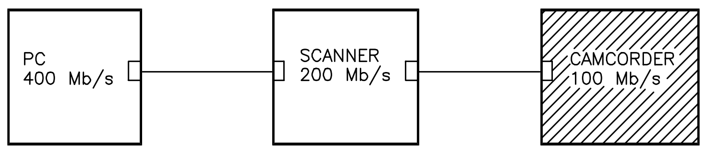
- **IDs Cleared** - All previous ID information is erased.
- **Tree ID** - The device, which is the bus master, assigns each node a specific address. This is called the Tree ID Process.
- **Self-ID** - After IDs have been assigned, the system allows time for each device to identify itself to the other nodes in the network.

Multi-Speed Transactions

The IEEE-1394 allows for data transmission speed to vary over the network. If necessary, a faster device will change its speed to communicate with a slower one. The paths taken between devices also limit data rates. In Example A below, the PC or scanner would have no trouble communicating with the camcorder at a rate of 100 Mb/s. However, the scanner could not communicate with the PC at its top data rate of 200 Mb/s because the path between the two contains a 100 Mb/s device (the camcorder). The maximum data rate that can be achieved through another device is limited to the speed of that device. In example B, the PC and the scanner would be able to communicate at the scanner's top rate of 200 Mb/s. It is very important that when an IEEE-1394 network is set up that care is taken to properly place devices that need to communicate with each other at top speeds.



BANDWIDTH LIMITED BY SLOWER DEVICE

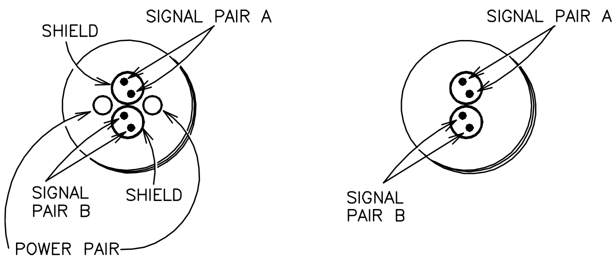


BANDWIDTH NOT LIMITED BY SLOWER DEVICE

Cable Technology

Wire

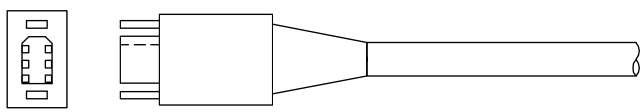
A standard six-wire cable is used by the PC industry as an IEEE-1394 connection. There is also a four-wire connection used by Sony and other manufacturers on digital camcorders and similar devices. The six-wire cable contains B+, Gnd, and one differential pair for transmitting data and one differential pair for receiving data. The four-wire cable only contains the two differential pairs for data. There are adapters available if one device uses a 4-wire cable and other uses a 6-wire cable.



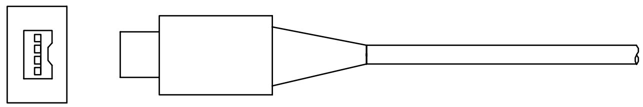
6–WIRE CABLE 4–WIRE CABLE

Connector

The connectors are simple sturdy and reliable. They are designed with the contacts inside the connector to reduce corrosion and shock hazard. They are childproof, if there is such a thing, and are based on the Nintendo NES™ connector.



SIX WIRE CONNECTOR



FOUR WIRE CONNECTOR

Trade Names

There are a few trade names associated with the IEEE-1394 standard. The most notable are Firewire, which is an Apple trademark and i.LINK, which is the Sony trademark.

Future Developments

IEEE1394 seems poised to take its place as the home networking standard of the future. Its high speed and ease of use are part of the keys that may one day make it the bond between all the components in your home. Sony, along with other industry leaders, is working on a standard called HAVi. HAVi, which stands for Home Audio Video Interoperability, would be an “open architecture” system. This means that software, application programming interfaces and communication protocols will allow all digital electronic components to work together regardless of manufacturer. This might mean that you could control your DTV set top box, digital audio system and the temperature of your refrigerator all from one central location. The amount of products that may use this system is limitless. We are heading for a digital future and it seems that IEEE1394 will be a large part of it.

Digital 8 Introduction

Overview

Digital 8, or D8, is a new format developed by Sony. It is not an extension or an improvement of the analog 8mm systems, like XR, but a totally new format. The analog 8mm systems include standard 8mm and Hi8. However, this new format does use the same tapes as Hi8 and is backward compatible. This means it can play back old 8mm tapes, including tapes recorded in LP or SP modes. The symbol below is the logo for Digital 8. It will be seen on all new products that are Digital 8 compatible.

D8 Logo

Digital 8 Basics

Digital Recording/Playback

The Digital 8 format uses technology that was developed for the DV bit stream recording and playback. DV is the name of the standard that uses 6mm wide tape to record and play back digital images. This format is also referred to as DVC.

Analog Playback

Digital 8 camcorders will play back your old 8mm recordings. This includes SP and LP recordings in Hi8 or standard 8mm. These cameras do not record in analog.

Compatibility

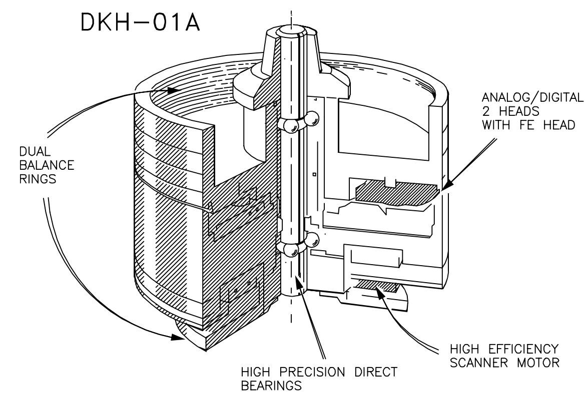
Cassette

The Digital 8 system uses Hi8 tapes. These tapes will be marketed in the future as Hi8/D8 tapes. Standard 8mm tapes should not be used as they may cause compatibility issues between D8 camcorders because of the type of metal particulate material they use. **Note: All compatibility issues related to making digital recordings using standard 8mm tapes are not to be recognized as servicing issues.**

There is one drawback to the use of existing tapes. Due to the nature of the Digital 8 format, the recording time will be half what it would be in a standard analog 8mm format. This means that an E6-120 type cassette would only have a 60-minute recording time instead of the usual 120 minutes. New tapes that contain the D8 logo will have both times clearly marked on the tape.

Mechanism

The new Digital system is completely backward compatible with the older analog 8mm system and the newer 8mm XR and Hi8 XR systems. The drum is the same diameter, the wrap is the same and the head azimuths are the same. In fact the mechanism used in 1999 D8 camcorders is a B mechanism. The B mechanism has been used in all Sony 8mm/Hi8 camcorders for the last several years. There are some differences between a standard 8mm B mechanism and a D8 B mechanism, such as more precision drum and capstan motors, but functionally they are the same. These differences are necessary due to an increase in speed of both servos during Digital 8 recording and playback.



New Drum Motor

The Digital 8 camcorder automatically recognizes the type of recording, digital or analog, on the tape and adjusts its servos to play that type. The camcorder is set up to start with its servos in the mode they were in previously. If a different format is detected, the servos will automatically switch to the other format. This auto-detection action takes about six to eight seconds from distinguishing the type of recording to the beginning of playback. Tapes may also contain any combination of standard 8mm, Hi8 or D8. When a different format is detected during playback, the tape is stopped, the servos are adjusted and playback begins using the new format. You will also see one of the two displays below over a blue background depending on what type of change is taking place.

1999 Digital 8 Standard Features

There will be five basic Digital 8 camcorders released this year. One model, DCR-TR7000, will be part of the TR series of camcorders. Four will be part of the Vision series and their model names will be DCR-TRV103/110, DCR-TRV310 and DCR-TRV510. Vision series camcorders contain a color LCD panel on the side for easy viewing. These camcorders have many features that standard 8mm camcorders have, including AE modes, digital picture effects and world time clock. They also contain the following important features:

- **InfoLithuim Battery** - The InfoLithium Battery is a lithium-ion battery pack which can exchange data with the camcorder about its battery consumption and charge time remaining. This results in increased battery life.
- **20x Optical/360 Digital Zoom** – These models feature an optical and digital zoom. The digital zoom can be turned off using the customer's menu.
- **Nightshot** – The 0 Lux feature allows an image to be seen without light. This year's Nightshot uses a slow shutter mode to increase image quality.
- **Intelligent Shoe** – Allows Sony's intelligent accessories to be used with these camcorders.
- **Laserlink** – This feature can be used with an optional accessory to send audio/video information across the room without wires. It is an infrared system.
- **Digital Stereo** – Sound can be recorded in 12-bit or 16-bit digital PCM Stereo.
- **PhotoMode** - Allows you to capture a still image for seven seconds while the audio continues recording, allowing you to provide narration for the still image.
- **SteadyShot** – Stabilizes the image being recorded by reducing shaking. SteadyShot utilizes motion sensors located in the lens assembly area that are designed to sense camcorder motion
- **i.LINK** – This is Sony's IEEE1394 interface. It allows you to edit, dub, archive or playback between two digital components with virtually no generation loss. These digital components include camcorders, computers, DTV set top boxes and many more.
- **Data Code** – Stores the time and date of the recording on the tape. The user can access this information at any time.
- **16:9 Wide Mode** – Allows you to record and playback in "widescreen" mode. During record the camcorder takes advantage of the oversized imager used for SteadyShot to produce the wider image. You should note that SteadyShot does not function in 16:9 Wide Mode.

Digital 8 Additional Features

Listed below are some of the additional features of the basic models. These additional features determine the differences between models:

- **Color Viewfinder**
- **LCD Size**
- **DSC (Digital Still Camera)** –. A model with this feature emulates a still camera by storing a field or frame of video in "flash" memory in JPEG files. These files can be read from the camera through the use of a built-in RS-232 port, which would be attached to a PC, and software that comes with the camcorder.

Model	Viewfinder	LCD Size	DSC
DCR-TR7000	Color	N/A	No
DCR-TRV103/110	B/W	2.5"	No
DCR-TRV310	B/W	3.5"	No
DCR-TRV315	Color	3"	No
DCR-TRV510	Color	4"	Yes

Digital 8 Format

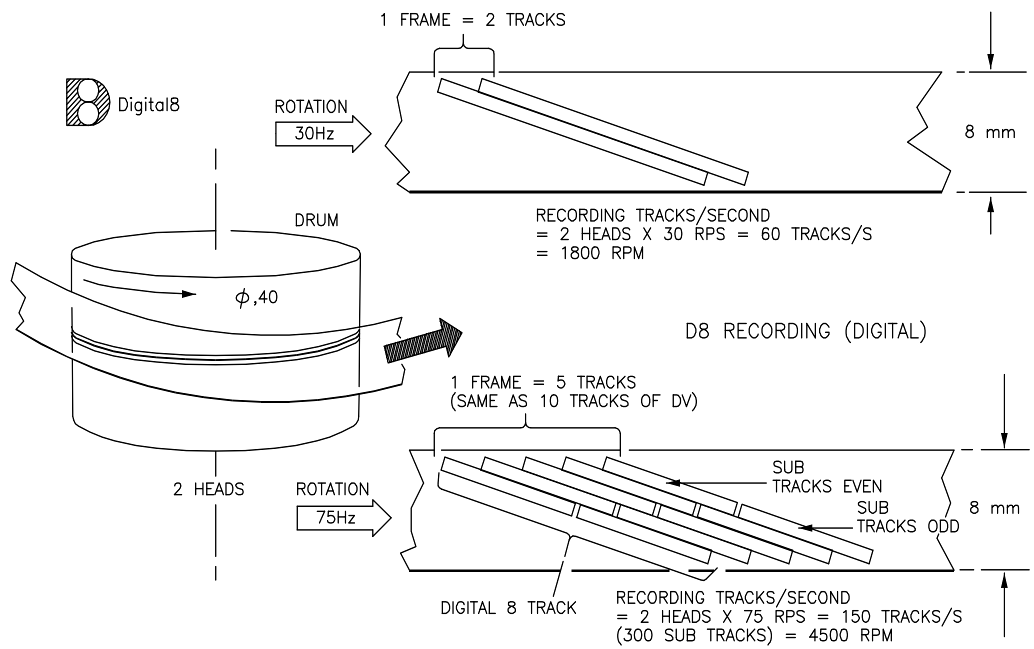
Overview

This section will discuss the new format used to record digital information on a tape. This format will be compared to the analog 8mm format so that it easier to understand how Digital 8 was created to remain compatible with analog 8mm, while giving us the benefits of digital recording.

Track Layout

In the analog 8mm system, the heads would put two swipes or tracks on the tape for each frame of video. Two tracks on the tape are equivalent to one frame of analog video information. Therefore the drum rotates at a frame rate of 30Hz or 30 complete revolutions per second. The result would be a drum speed of 1800 revolutions per minute (rpm).

In the D8 system, the heads put five swipes or tracks on the tape for each frame of video. These swipes are broken down into sub tracks and there are two sub tracks for every track. The reason for this is to keep the technology similar to the DV format, which uses ten tracks per frame of video. The drum speed needs to be increased in order for the system to use five tracks per frame. At a drum speed of 75 Hz, or 75 revolutions per second, we can place five tracks on the tape for each frame of video using two heads. The result is 150 tracks of information placed on the tape at a drum speed of 4500 revolutions per minute (rpm). It is important to note here that the way the information is placed on the tracks will have a great impact on the symptoms that will be seen when the tape path is misaligned or a head is clogged or lost.

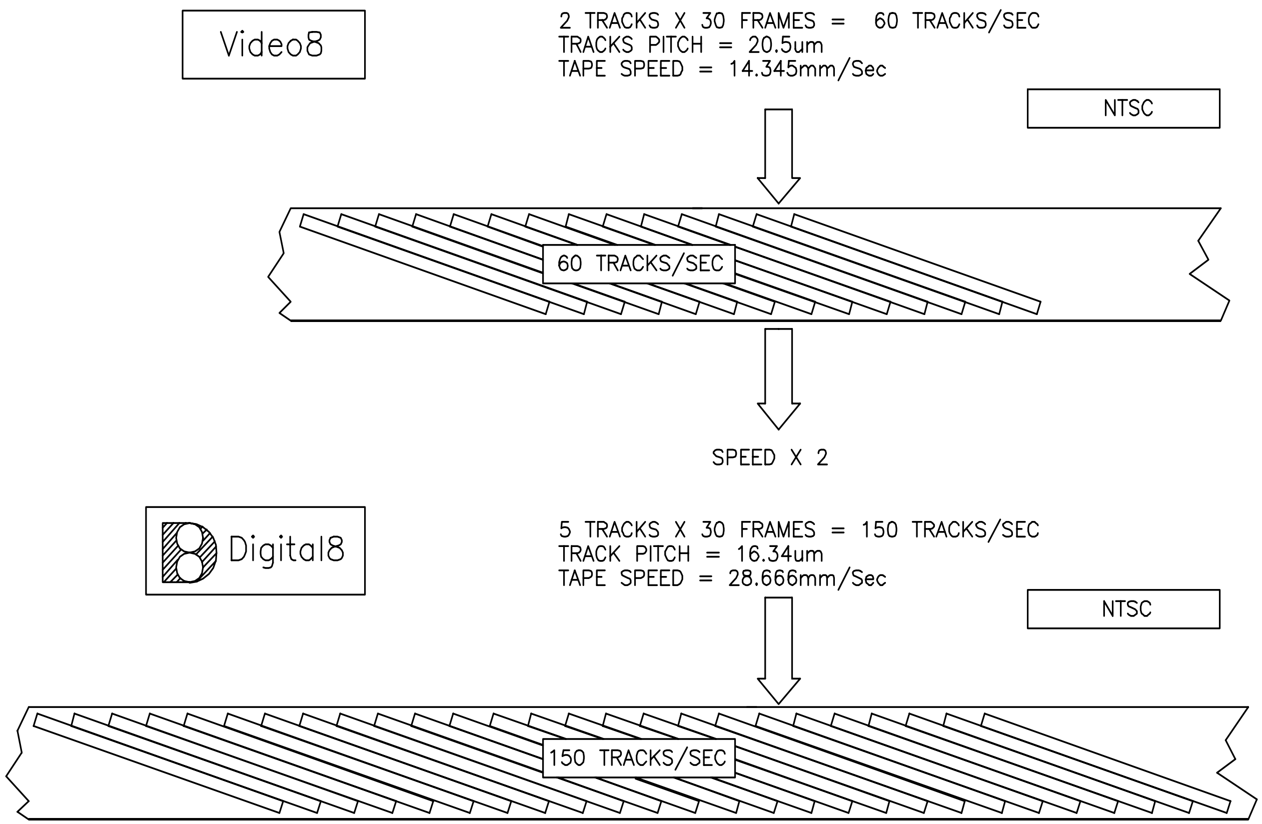


TRACK LAYOUT COMPARISON (ANALOG 8 VS D8)

Tape Speed

Since the drum speed was increased, there became a need to also increase the tape speed. If the tape speed were not increased, 150 tracks would have to be squeezed into the same area on the tape as 60 tracks. The system could not function this way and use the same heads. Consequently, the tape speed has been roughly doubled from 14.345 mm/sec to 28.666 mm/sec. This allows digital 8 to have a track pitch (width) that is close to that of analog 8. This allows for the use of the same heads for analog playback and digital recording and playback.

	Analog 8mm	**Digital 8**
Track Information	Analog	Digital
Tracks per frame	2	5
Tracks per second	60	150
Drum rotation speed	1800 rpm	4500 rpm
Track pitch (width)	20.5 um	16.34 um
Tape speed	14.345 mm/sec.	28.666 mm/sec
Recording time P6-120	120 minutes	60 minutes



TAPE SPEED COMPARISON (VIDEO 8 VS. D8)

D818 1094 2 10 99

Sub Track Information

The sub track information can be broken down into four distinct sectors. These are called the ITI, Audio, Video and Subcode sectors. Each of these sectors is separated by a gap. These gaps are there to allow for small tracking errors that may occur when editing.

Each sector has its own designated purpose:

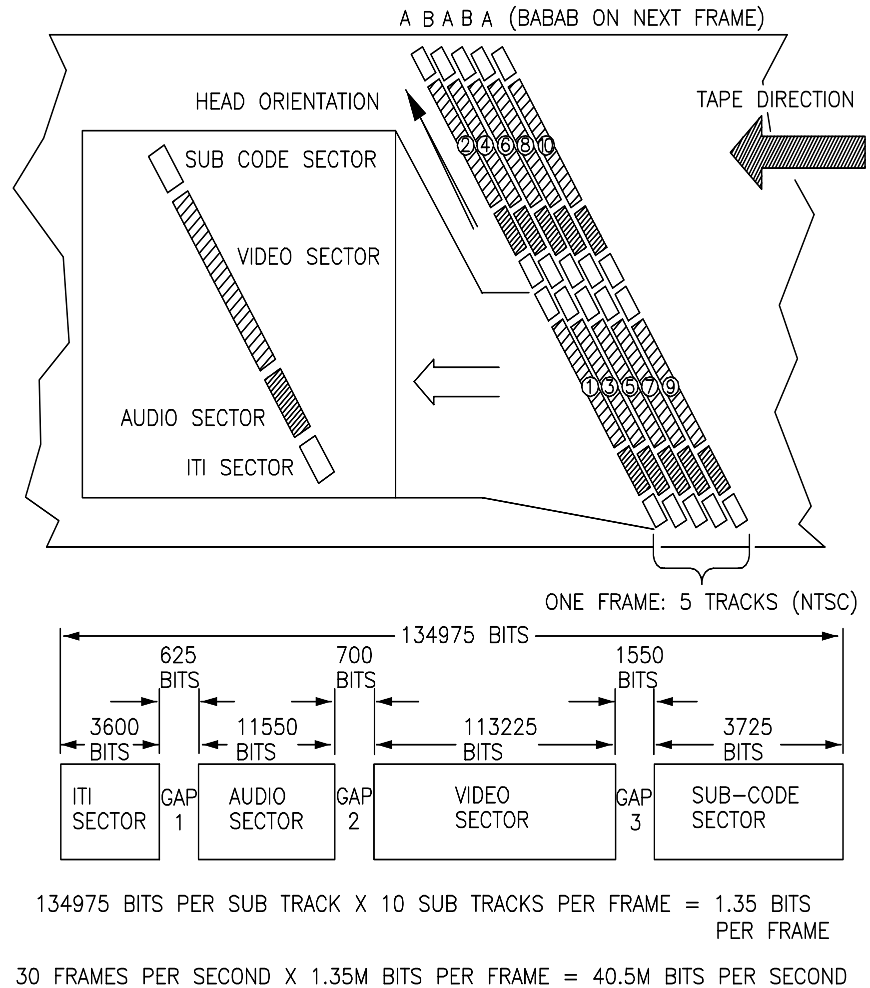
- **ITI Sector** – ITI stands for Insert and Track Information. It is used to control the tracking for insert editing. It also contains data that identifies the track format. The ITI sector contains 3600 bits per sub track.
- **Audio Sector** – This contains the audio information and parity bits used for error correction. The audio sector contains 11,550 bits per sub track.
- **Video sector** – This contains the video information and parity bits used for error correction. The video sector contains 113,225 bits per sub track.
- **Subcode Sector** – This contains an ID block which contains an index ID, PP-ID (still picture search marker), Skip ID and absolute track number. The data block contains subcode data for time code, REC date and REC time. Parity information is also contained in this sector. The subcode sector contains 3725 bits per sub track.

In addition to the sectors, there are three Gap areas between the four sectors. They are called Gap 1, 2 and 3 and contain a preset run of bits. These gaps contain 625, 700 and 1550 bits respectively.

If we add up the total number of bits in a complete sub track we will count 134,975 bits. Since there are ten sub tracks per frame, we have 1.35Mb per frame. Since the NTSC signal contains 30 frames per second, we will have a total of 40.5Mb per second.

Alternating Head Pattern

Since there is an odd number of tracks in one frame, it is important to note that the head pattern alternates every frame. This gives us two distinct head patterns for a frame, ABABA and BABAB. This becomes an important fact since a bad head will cause a flickering of the picture in five distinct bands.



SUB–TRACK INFORMATION

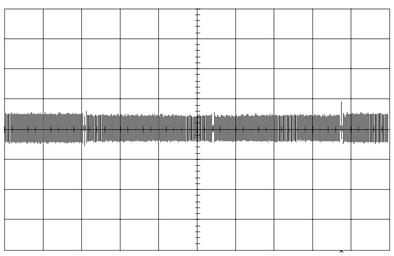
D821 1101 3 22 99

Tape Wrap Angle

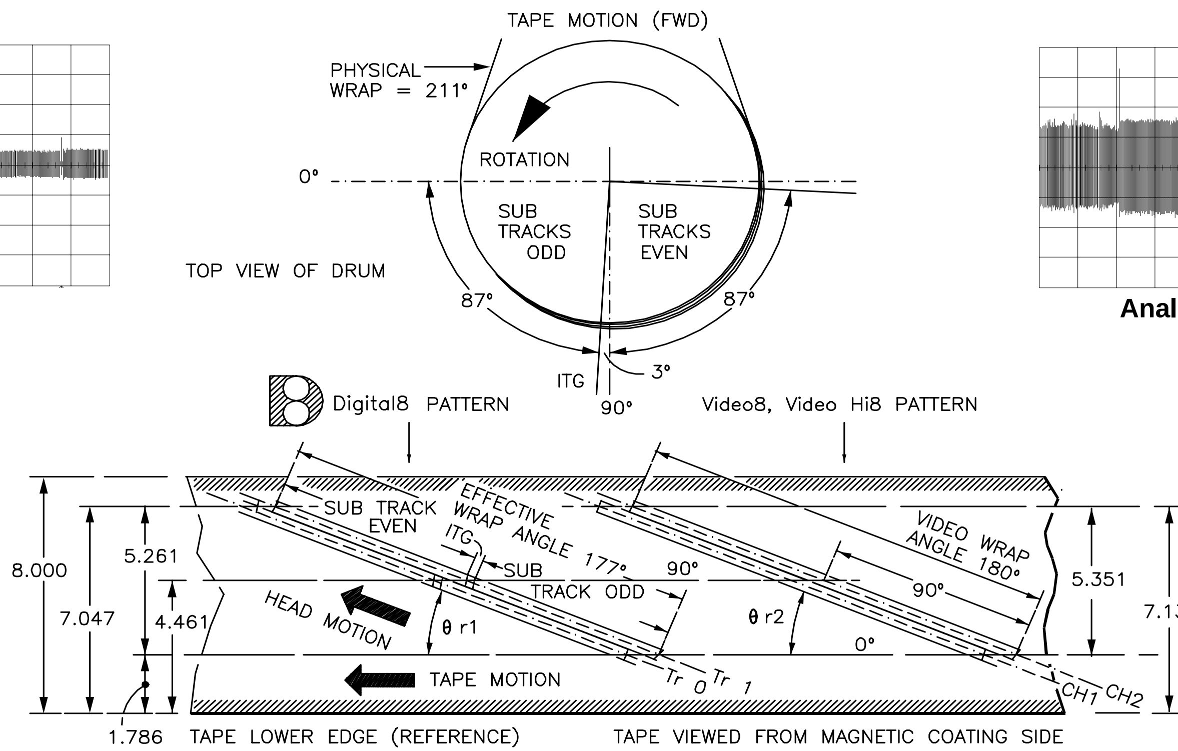
The tape wrap angle for an analog 8mm system must be at least 180 degrees for video to be recorded. This means that one head is in contact with the tape for the full 180 degrees and lays down one field of video information.

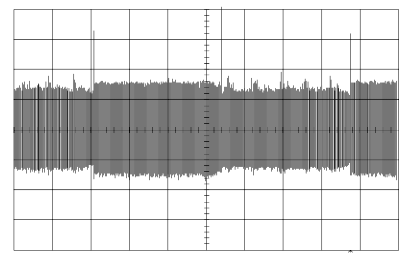
The physical tape wrap of the B mechanism is 211 degrees. This means the tape wraps around the drum for 211 out of a possible 360 degrees. 211 degrees is used because it makes the mechanism compatible with 8mm PCM, but that feature is no longer available in US camcorders and hasn't been for several years. Camcorders that use a B mechanism use switching to limit the effective wrap of the tape to 180 degrees.

D8 uses the B mechanism and also does not need the entire 211 degree wrap. D8 uses switching to limit the effective wrap angle to 177 degrees. The first 87 degrees of this effective wrap are used to put down the first sub track. The next three degrees are used for ITG. ITG is the Inter Track Guard that separates two sub tracks. The remaining 87 degrees are used to place the second sub track on the tape. This process continues while the tape is playing or recording.



D8 Envelope





Analog Envelope

Video Signal Block

Overview

The purpose of this section is to discuss the three different video paths. The three paths are D8 record, D8 playback and analog 8mm playback. We will discuss this in a block level only since component troubleshooting is not necessary. This will help to give you an overall idea of the three signal paths.

D8 Record

Recording can be done either by using the signal from the camera section, analog line input or through the IEEE1394 input.

Camera Front End Processing

The camera front end-processing block contains the lens, CCD, timing generator and associated circuitry. This section processes the CCD image data and outputs 10 bit CCD Data to the Tanuki (Traffic Cop) section.

Tanuki (Traffic Cop)

A portion of this section's function is to process the information from the camera front end processing block. This would function similar to a portion of the core IC in an analog 8mm camera. This IC outputs data to the DSP/Compression block.

Line In

When a line input signal is to be recorded, it is input to a A/D Converter on the main board. The signal is digitized and output to the compression section. This data is sent on the same bus as the data from the camera section.

DSP/Compression

This section compresses the data, reducing the amount of video data from 162 Mbps to 25 Mbps. It also codes the data and interleaves it with the ITI, Audio and Subcode data. This data is then streamed to the Head Amplifier. It also outputs the compressed video to the IEEE1394 interface, as well as analog signals for the viewfinder and Line Out.

Head Amp

The head amp adds a clock signal and amplifies the data. It is then applied to the heads and recorded on the tape.

D8 Playback

Head Amp

The head amp receives the signal from the heads and amplifies and equalizes the signals from each head. This section also inputs the RF signal to a PLL circuit, which produces a stable clock for processing the head data.

DSP/Decompression

This block separates the data back in to its various sectors. The video data is decompressed and restored back to an analog video signal. It outputs analog signals to the viewfinder and Line Out, as well as a digital signal to the IEEE1394 interface.

Analog 8mm Playback

Head Amp

The head amp creates a separate RF signal if an analog tape is played back.

8mm Playback RF Amp

This block separates the Y RF and C RF signals.

Camera Front End

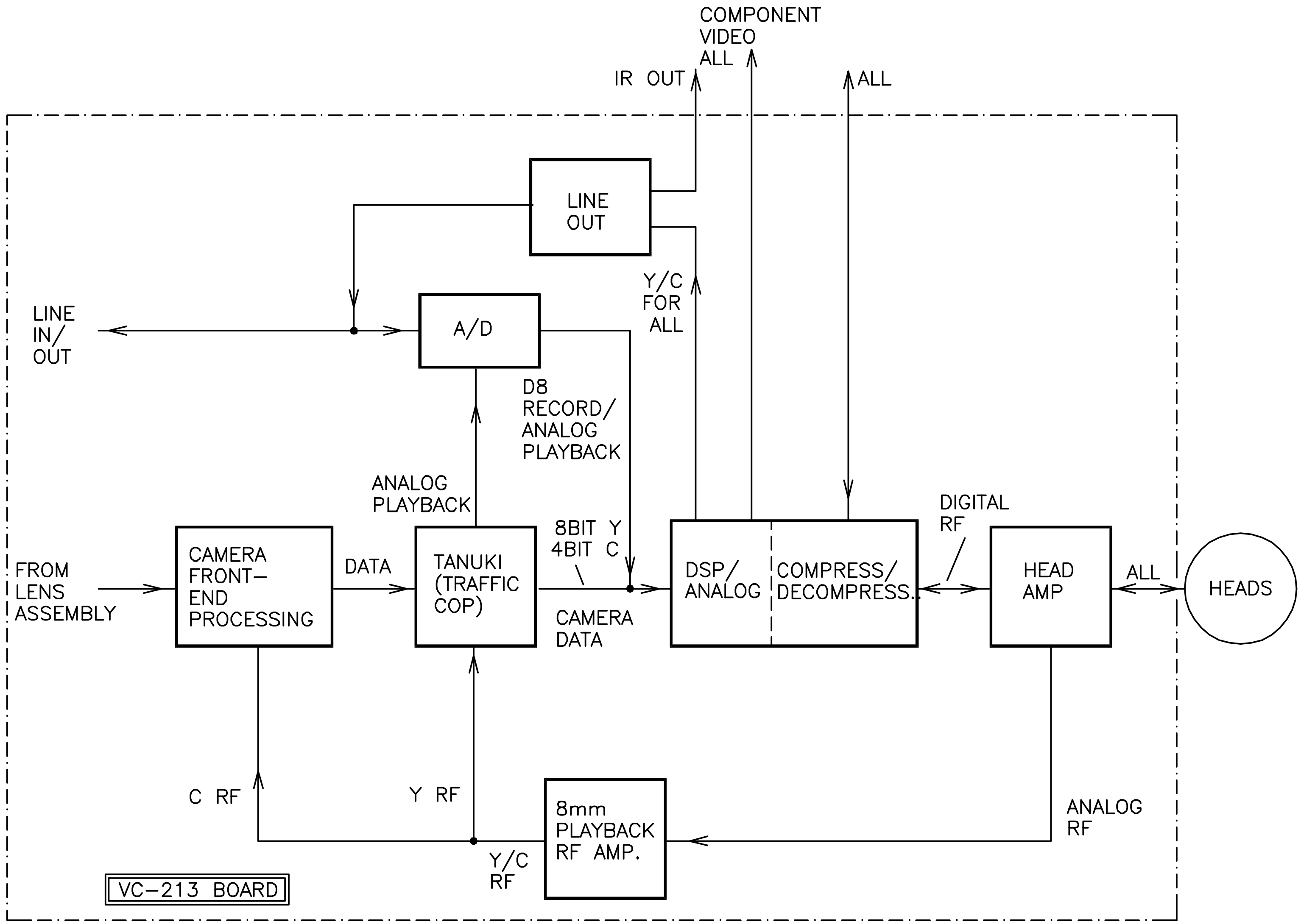
The C RF signal is applied to this block. This block digitizes the C RF signal and applies it to the Traffic Cop block via the 10 bit bus.

Tanuki

This block receives the Y and C RF signals and demodulates them. It outputs analog Y and C to the A/D converter. The A/D converter is the same one used by the Line In circuit in D8 record. Its output is applied to the DSP/Compression block.

DSP/Compression

The signal is sent to this block so that it can be output to the line out and viewfinder. It is also compressed so that it can be output to the IEEE1394 interface.



VIDEO SIGNAL BLOCK

D827 1112 3 23 99

D8 Record/Playback

Overview

The purpose of this section is to explain the theory of the digital video signal paths in the D8 camcorders. This is just an overview of the theory. Much of the detail has been left out because of its complexity and the fact that this product will only be repaired to board level. **Note: You should only expect to have a basic understanding of what is done to the video signal, not a complete understanding**. The diagram can also be used for board level troubleshooting. It shows you the connectors that leave the VC-213 board. You can troubleshoot to board level by determining if the signals are leaving or going to the proper connector pins.

D8 Record

Recording can be done by using the signal from the camera section, the analog line input or through the IEEE1394 input.

Camera Signal Processing

The camera processing block contains the lens, CCD, timing generator and associated circuitry. This section processes the CCD image data for use by the camera core.

IC251 Tanuki

Video Processing – A portion of this IC's function is to process the information from the camera signal processing block. This would be the core IC in an analog 8mm camera. This IC outputs Y and C signals to IC601 BBI.

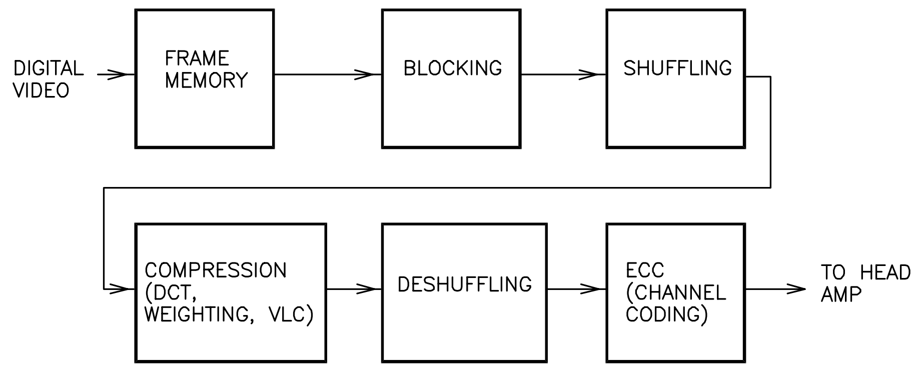
IC601 BBI

The BBI functions as an A/D Converter for the Line Input signal. It outputs 8 bits of Y and 4 bits each of the color difference signals, Cb and Cr. It also outputs horizontal and vertical sync signals.

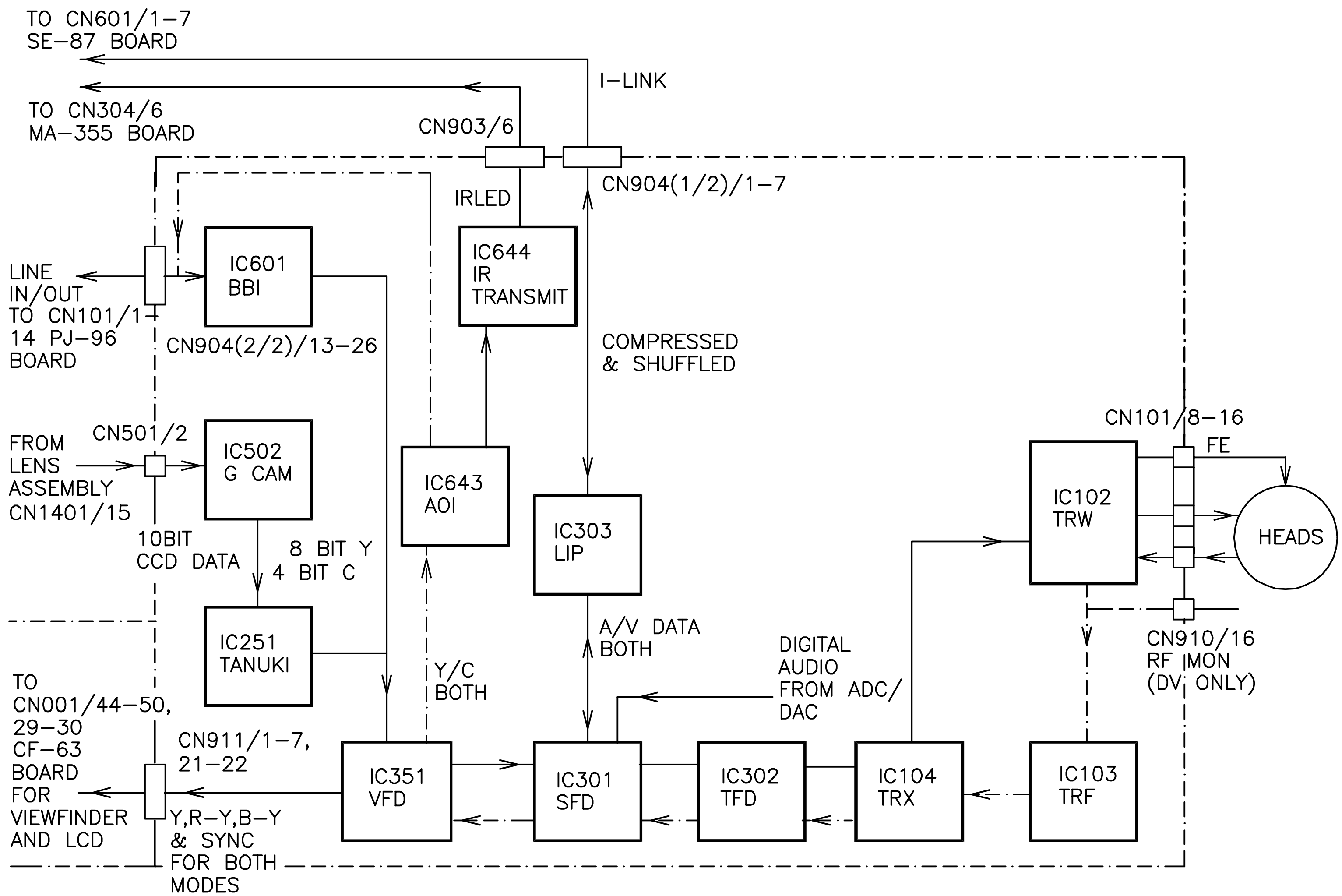
Compression Block

The block diagram below outlines the steps that need to be taken to compress the amount of video data from 162 Mbps to 25 Mbps. Each frame of video is processed alone. This is called Intra-frame compression. It is different from MPEG 2 because the MPEG system does not compress each frame individually. The MPEG compression type scheme is called Inter-frame compression.

Each frame of video is loaded into a frame memory. This frame is used alone and not compared to any other frames. The picture is then divided into blocks by the Blocking stage. These blocks are then combined so that the data from different parts of the frame is used. This process, called shuffling, maintains an average compression ratio throughout the frame. The video from these shuffled blocks is then compressed. After compression the data is put back in the appropriate order through a process called de-shuffling. This data is then coded, amplified and applied to the tape.



COMPRESSION BLOCK



D8 RECORD/PLAYBACK

D828 1111 4 6 99

The following explains the compression process as the 1999 D8 models use it. Each IC's purpose is examined to provide you with a better understanding of the whole process.

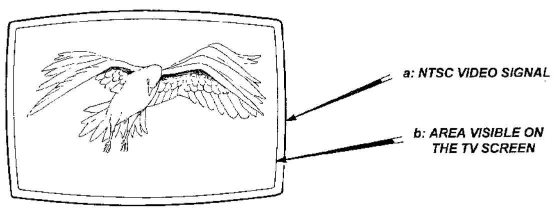
IC351 VFD

Video Encode

IC351 also contains a NTSC encoder so that it may send composite signals to the IR Out and Video Out, and component video to the viewfinder and LCD if applicable.

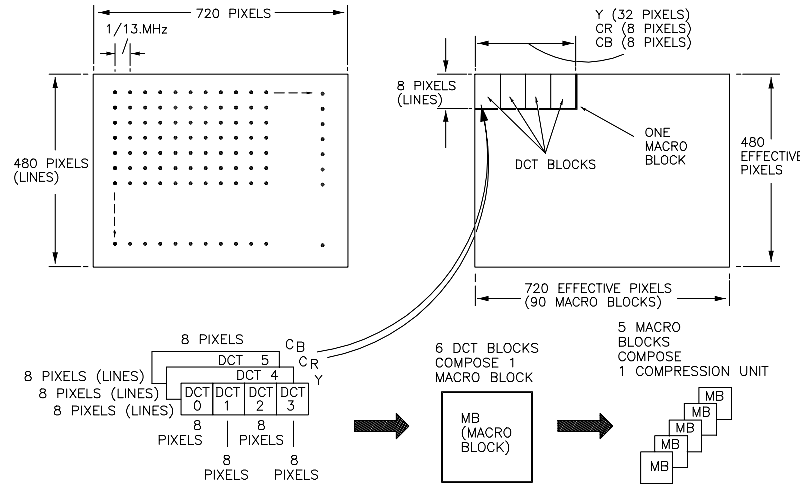
Blocking

- The first step in bit reduction is taken here by eliminating portions of the frame that cannot be seen. This is done by removing the data that cannot be seen from the outside edges of the picture. This reduces the number of bits from 162Mbps to 127Mbps.



M-BIT/SEC. COUNT REDUCTION

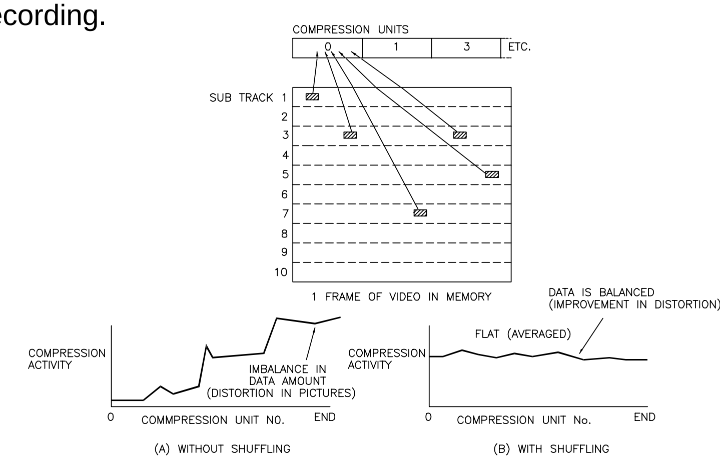
- The frame would be 720 pixels by 480 pixels after the unseen picture information is eliminated. This is then broken down into 8 pixels by 8 pixels segments called DCT blocks. These blocks are then combined into Macro blocks. One Macro block consists of four DCT blocks of Y and one DCT block each of the color difference signals, Cb and Cr. Consequently a macro block is made up of a total of six DCT blocks. Later, we will see that five Macro blocks make up one compression unit.



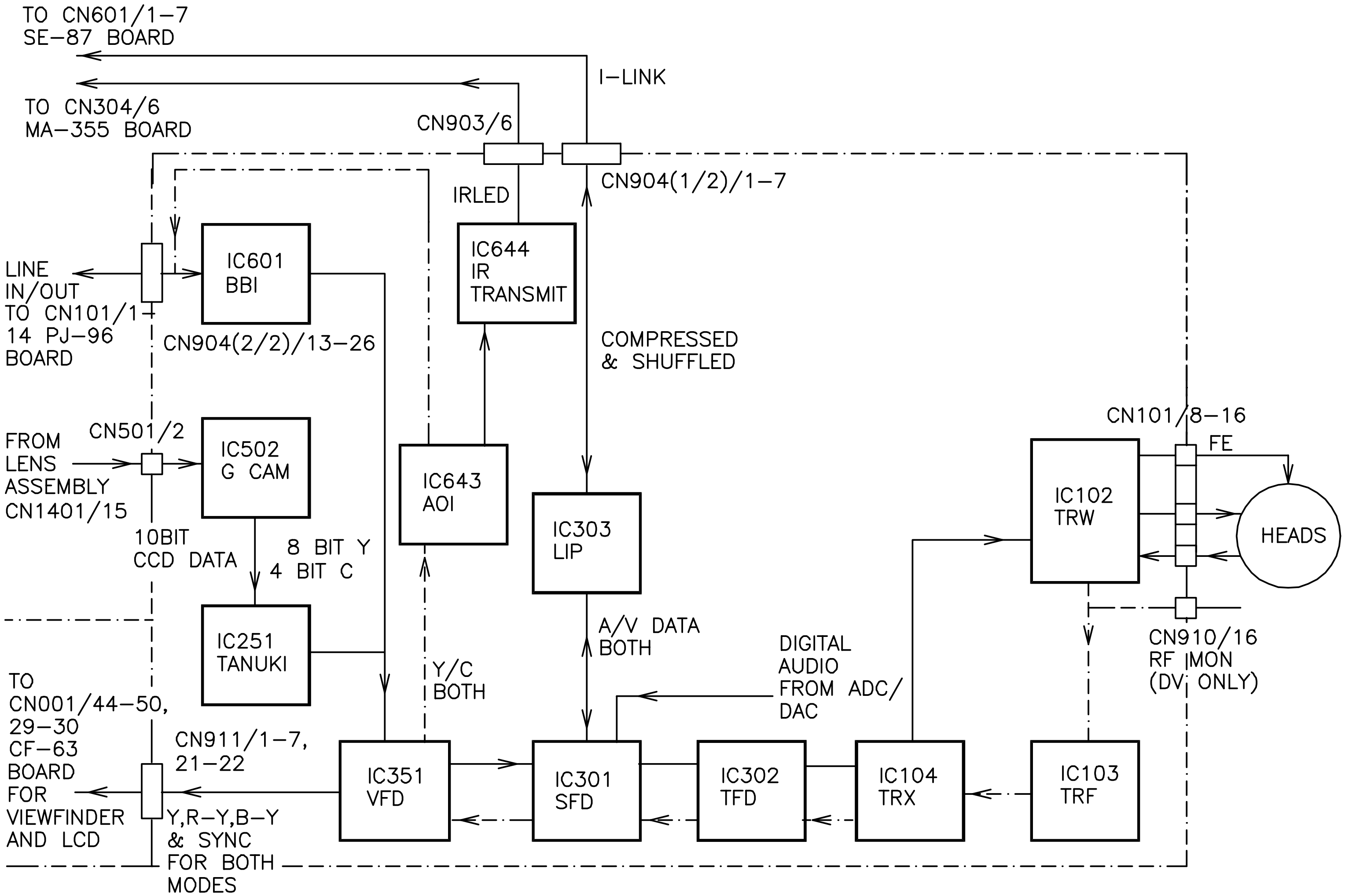
Blocking

Shuffling

Shuffling is a technique used to keep the activity level of the compression circuit relatively smooth. The macro blocks are divided into ten bands. **Note: There are ten sub tracks of video in one frame.** Shuffling works by building the compression blocks out of macro blocks that are not adjacent to each other. While shuffling may randomize the data, it does operate on a preprogrammed equation. This is so the data can be de-shuffled before recording.



Shuffling



D8 RECORD/PLAYBACK

D828 1111 4 6 99

IC643 AOI

The Y and C signals are output by IC351 VFD and then input to IC643 AOI. This IC controls whether A/V signals are input from or output to the analog video and audio jacks. It also outputs a composite video signal to IC644 IR Transmitter.

IC644 IR Transmitter

IC644 IR transmitter modulates the audio and video signals it receives and transmits them through the air using the LEDs on the front of the camcorder. Sircs data can also be transmitted if a TV input is selected in the menu.

IC301 SFD

Video Compression

- **Discrete Cosine Transform**

The shuffled data, which has been formed into compression units, is input to IC301 SFD. The first step is to perform a DCT (Discrete Cosine Transform) on the data. This process converts the image data into a series of frequencies. After the transformation you would have one DC component and 63 AC components from an 8X8 pixel block. The DC component represents the average value of the signal, while the AC components represent the amount of change from that value.

- **Weighting**

This data is then input to a weighting coefficient circuit. This weighting coefficient mimics the way the human eye perceives picture detail. It eliminates data that it determines cannot be seen by the human eye.

- **Quantization and Variable Length Coding (VLC)**

Quantization and VLC (Variable Length Coding) are two distinct sections that work together to further reduce the amount of data used to represent video. The number of bits allocated to a picture pattern is evaluated to prevent distortion. The data is converted to a variable length code that is between 3 and 16 bits. This is the final step in a compression system that took the 162Mbps of data and converted it down to 25Mbps.

Audio Signal Baseband Processing

The audio signal is frequency converted so that its sample rate matches the video signal. The signal will not be compressed.

Audio Signal Interleave

The audio data is interleaved into the video data. However, it is not processed by the video compression circuitry. The audio data is held in RAM so that it is put in the proper position with the video signal. This ensures that the picture and the voice are in sync.

DV In/Out Transformation

The interleaved audio and shuffled video data is output to IC303 LIP.

IC303 LIP

This IC contains the three layers needed for an IEEE1394 connection. The three layers are the physical, link and transaction layers. See the section on IEEE1394 for more details.

IC302 TFD

Data De-shuffling

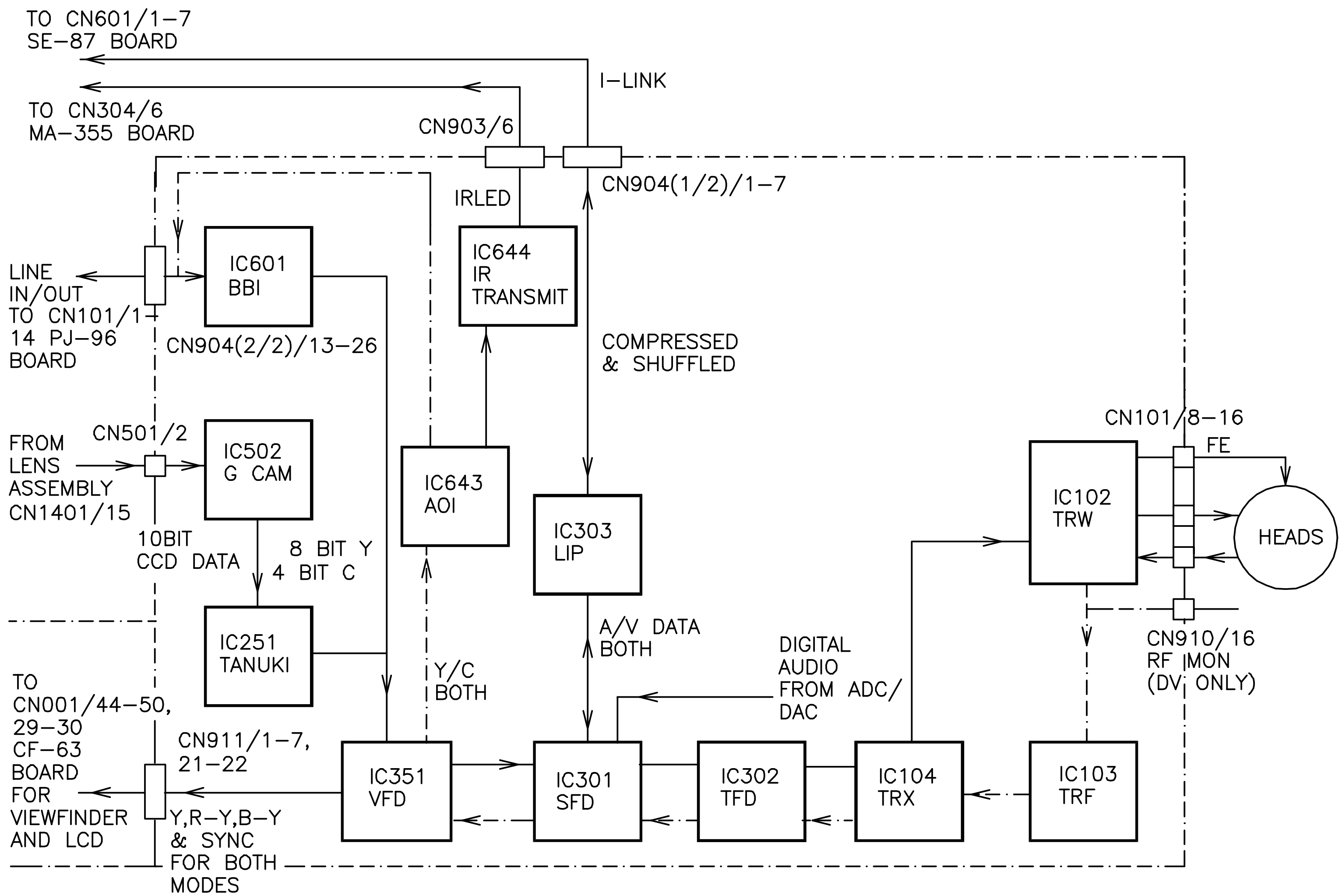
Now that compression is complete, the data must be put back in its original position. This operation is called de-shuffling. When we do this we reconstruct the ten bands that were created before shuffling. Each of these bands represents a sub track on the tape.

ECC (Error Correction Code)

The outer parity bits are added to the data. The ECC is Reed-Solomon Code like that used in CD, Mini-Disc, etc. The inner parity bits are added later.

Channel Coding

The audio/video data stream has Inner parity, Sync and ID data added to it. This data is then 24-25 modulated. This is for ATF operation and will be discussed in more detail in the servo section. After this the outer parity bits are added. The ITI data is then added to the stream and converted to scrambled interleaved NRZI (Non Return to Zero Invert) format. This format uses two bit systems that function alternately and makes it easier to obtain a stable clock signal during playback.



D8 RECORD/PLAYBACK

D828 1111 4 6 99

IC104 TRX

The data passes through this IC. No operations are performed here during record.

IC102 TRW

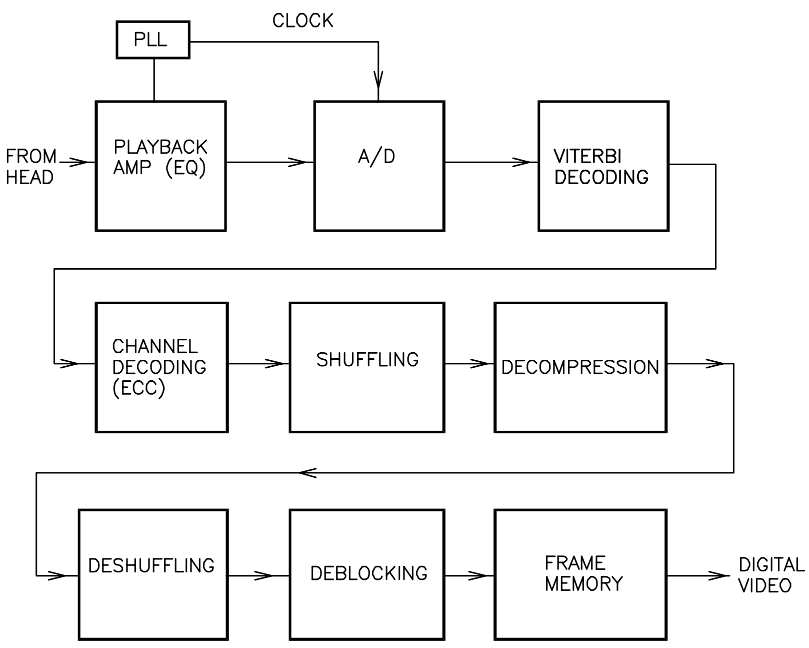
REC Amplifier

The recording data is combined with a 41.8 MHz clock signal. The result is amplified and output to the two-video heads.

D8 Playback

Overview

The playback process is basically the opposite of the record process with a few extra steps added. These extra steps have to do with clocking and data recognition. The diagram below shows the basic steps in a playback/decompression system.



DECOMPRESSION BLOCK

IC102 TRW

The signal is received from the heads, combined and amplified. RF is output from two different pins, one for analog and another for digital.

IC103 TRF

EQ

The EQ circuit equalizes the level of the two heads and also assures that they are in phase. The signal that exits is split into two different circuits - PLL and the A/D Converter.

PLL

An oscillator is phase compared to the data input from the EQ circuit. The phase comparator output is used to control the oscillator so that it is the same frequency and phase as the incoming data. The oscillator output is used to clock the playback data.

A/D Converter

The A/D Converter converts the analog RF signal to a digital signal. It outputs seven bits of parallel data to IC104 TRX.

IC104 TRX

Viterbi Decode

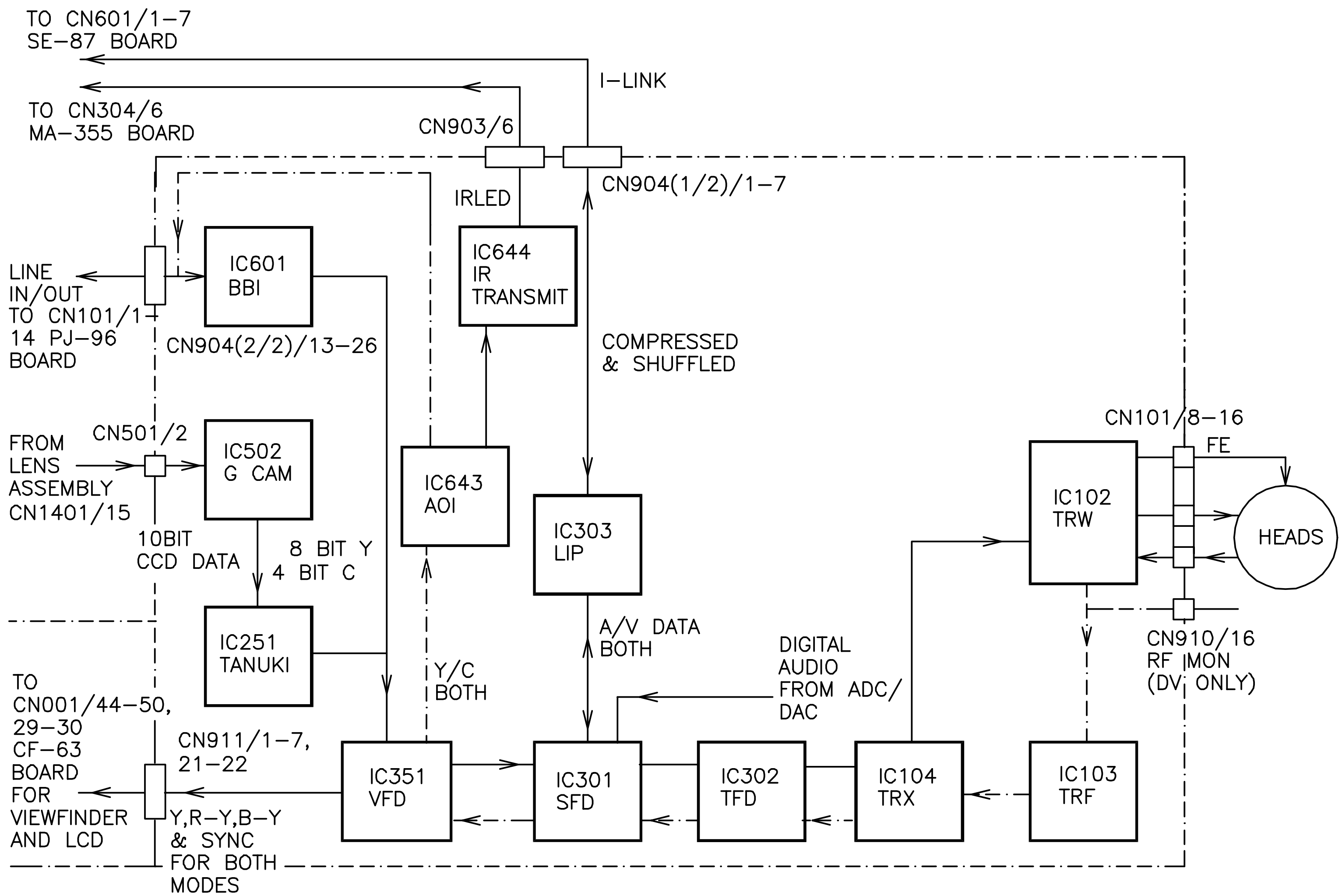
A Viterbi decoder uses an algorithm to decipher the data. It takes the data and noise that are input to it and outputs the data that is most likely to be correct. This is not error correction, but is a way to separate actual data from noise that may occur during the recording and playback process.

Sync/ID Detect

After Viterbi decoding, the data is structured enough so that sync and ID data can be detected. We now have data that we can actually use.

ATF

The ATF error signal is output from this IC. It is developed from the pilot signals created by 24-25 modulation. This will be covered in more detail in the servo section.



D8 RECORD/PLAYBACK

D828 1111 4 6 99

IC302 TFD

Channel Decoding

The incoming data stream now has the Sync, ID and ITI data removed from it for processing. The interleaved video and audio data continue on to the next stage. Data error is corrected using inner parity.

TBC

The incoming signal is time base corrected. The removes any jitter in the data that may have been caused by the mechanical operation of the servos.

ECC

Outer parity errors are corrected at this stage.

Shuffling

The video data is shuffled again. Five DCT blocks at a time are selected from different parts of the picture to form Macro blocks. This will keep the activity level of the decompression circuit relatively equal throughout operations.

IC301 SFD

DV In/Out Transformation

The interleaved audio, shuffled video data and subcode information from the tape are output to IC303 LIP.

Audio Deinterleave

The audio signal data is separated from the video signal data.

Video signal Expansion

- **Reverse Quantization and Variable Length Decoding (VLD)**

The data is converted from its variable length code to a fixed length code.

- **Inverse Discrete Cosine Transform (IDCT)**

This section takes the one DC and 63 AC coefficients in a DCT block and converts them to the original uncompressed data stream.

IC303 LIP

This IC contains the three layers needed for an IEEE1394 connection. The three layers are the physical, link and transaction layers. See the section on IEEE1394 for more details.

IC351 VFD

De-shuffling

Now that decompression is complete the data must be put back in its original position. This operation is called de-shuffling. When we perform this we reconstruct the ten bands that were read off of the tape. Each of these bands represents a sub track on the tape.

Deblocking

The pixels are released from their blocks. We now have a full frame that is not separated into blocks.

Video Encode

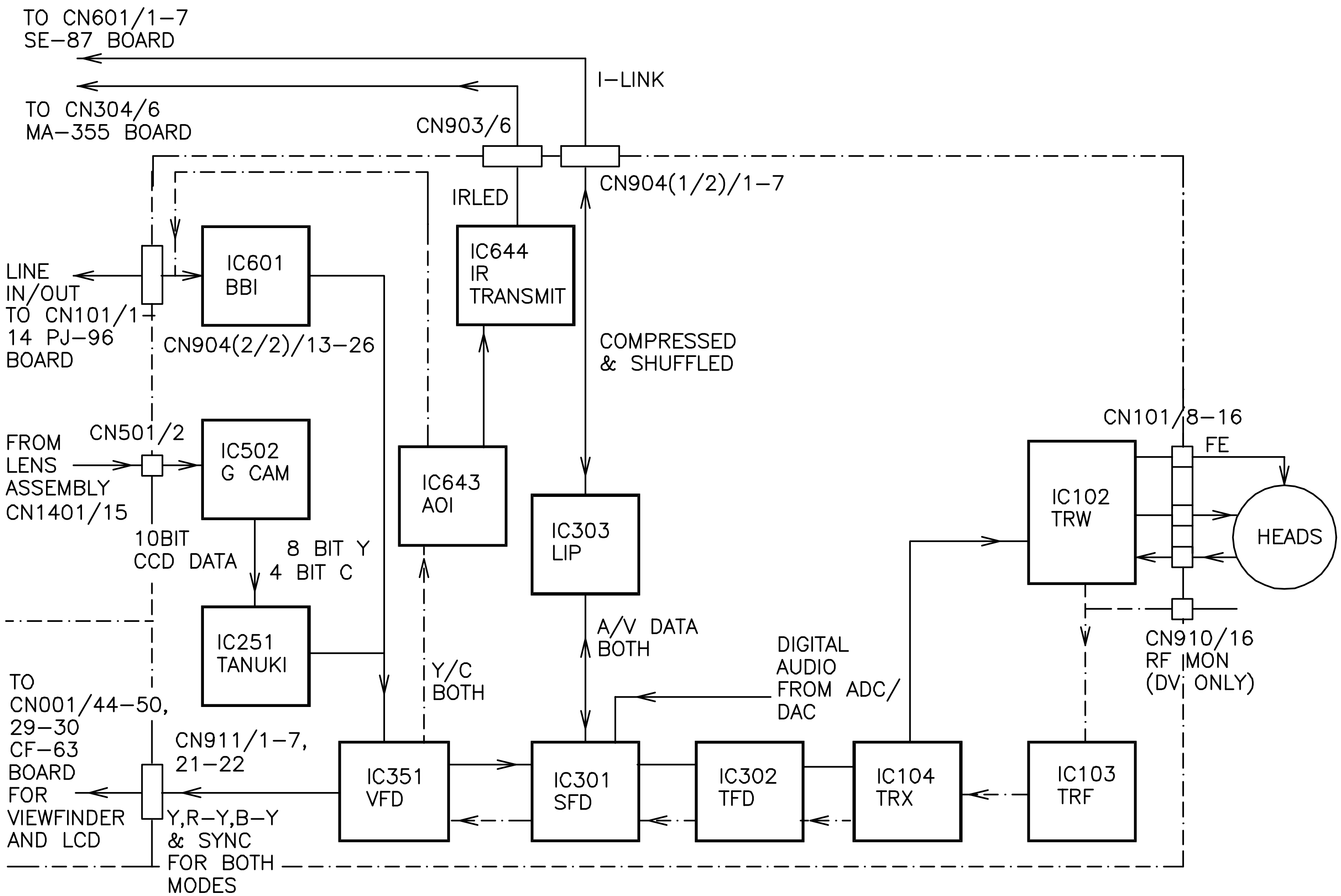
IC351 also contains a NTSC encoder so that it may send composite signals to the IR Out and Video Out, and component video to the viewfinder and LCD if applicable.

IC643 AOI

The Y and C signals are output by IC351 VFD and input to IC643 AOI. This IC outputs a composite video signal to IC644 IR Transmitter and to the Line In/Out jack.

IC644 IR Transmit

IC644 IR transmitter modulates the audio and video signals it receives and transmits them through the air, using the LEDs on the front of the camcorder. Sircs data can also be transmitted if a TV input is selected in the menu.



D8 RECORD/PLAYBACK

D828 1111 4 6 99

Analog 8mm Playback

Analog 8mm Playback

IC102 TRW

The signal is received from the heads, combined and amplified. RF is output from two different pins, one for analog and one for digital.

IC201 PB Amp

This IC takes the RF from IC102 TRW and separates it into its components. It outputs two signals, the Y/AFM signal and the C/ATF signal.

IC502 Gcam

This IC digitizes the C signal for use by IC251. It is output as 10 parallel bits.

IC251 Tanuki

C Processing

The 10 bits of parallel data are D/A converted. Then the C signal is demodulated and output to IC601 BBI.

Y Processing

The PB Y RF is input to the IC. The signal is demodulated and the Y signal is output to IC601 BBI.

IC601 BBI

The BBI functions as an A/D Converter. It outputs 8 bits of Y and 4 bits each of the color difference signals, Cb and Cr. It also outputs horizontal and vertical sync signals.

IC351 VFD

This IC performs the same task as it would for a D8 record signal. This is because the analog 8mm signal is going to be processed so its signal can be output on the IEEE 1394 bus. It should be noted here that the data output here does not contain time code information. This is because it was not put on the original recording. It also outputs signals for use by the viewfinder, IR Transmit and Line Output circuits.

IC643 AOI

The Y and C signals are output by IC351 VFD and input to IC643 AOI. This IC outputs a composite video signal to IC644 IR Transmitter and to the Line In/Out jack.

IC644 IR Transmit

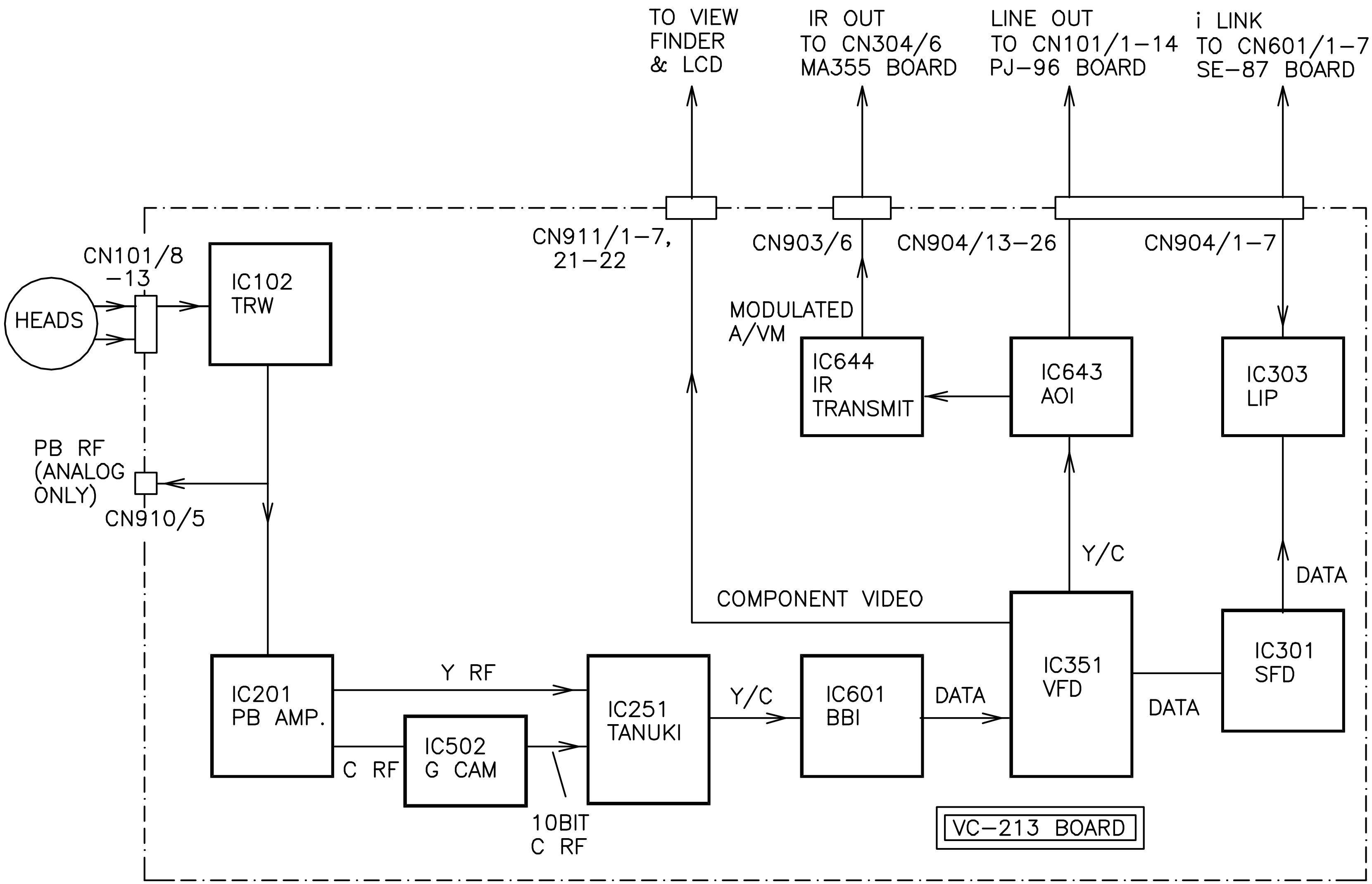
IC644 IR transmitter modulates the audio and video signals it receives and transmits them through the air using the LED’s on the front of the camcorder. Sircs data can also be transmitted if a TV input is selected in the menu.

IC301 SFD

This IC performs the same functions that it would for a D8 record signal. This allows the signal from 8mm playback to be processed and output to the IEEE 1394 connector.

IC303 LIP

This IC contains the three layers needed for an IEEE1394 connection. The three layers are the physical, link and transaction layers. See the section on IEEE1394 for more details.



ANALOG 8mm PLAYBACK

D829 1113 4 6 99

Audio Signal Block

Overview

The purpose of this section is to discuss the three different audio paths. The three paths are D8 record, D8 playback and analog 8mm playback. We will discuss this in block level only since component troubleshooting is not necessary. The connectors will help to determine if the failure is on the VC-213 board or not.

D8 Record

Recording can be done either by using the signal from the camera mic audio, analog audio line input or through the IEEE1394 input. The camcorder can record audio in 12-bit or 16-bit modes. The frequency response of the 12-bit mode is limited, but you have greater editing capabilities because insert editing is possible. The sampling rates used are 32 kHz for 12-bit mode and 48kHz for 16-bit mode. There is also a 44 kHz sampling mode in the DV standards. The 1999 D8 models do not record in this mode, but they will playback a tape that contains this type of 16-bit audio. The Audio Check tape (WR5-3ND) can be used to check all three modes during playback.

In record, the switch block can be used to switch between the Line In and the Mic inputs. If the Mic input is used, it is amplified in this IC. Whichever audio signal is chosen is output to the IR Transmitter and the ADC/DAC blocks.

The IR transmitter modulates the audio and video signals it receives and transmits them through the air using the LEDs on the front of the camcorder.

The audio input is converted to a digital signal by the ADC section of the block. The signal is then sent to the DSP/Compression stage to be processed.

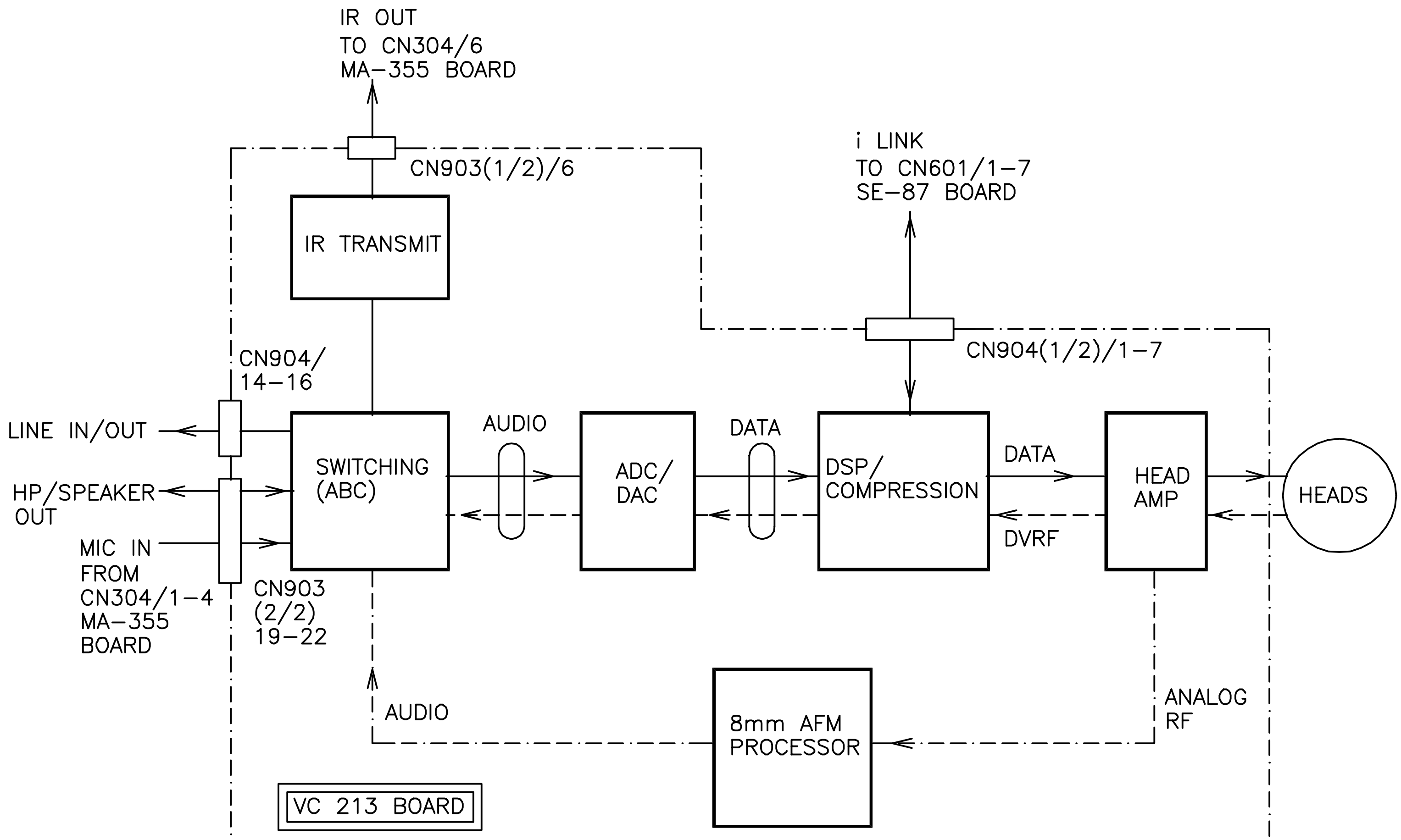
The DSP/Compression block interleaves the audio data with the video data. Once this is done, the audio signal follows the same path as the video signal until it is put on the tape by the video heads. Keep in mind that the audio signal is not compressed. Its data is only interleaved with the video data. It is also sent along with the video to the IEEE1394 interface.

D8 Playback

When the heads read the signal, it first goes to the Head Amp. This signal contains audio and video information that is interleaved together. The DSP/Decompression block processes this signal. This block sends the signal to the IEEE1394 interface. It also deinterleaves the audio and video signals. The audio signal is output to ADC/DAC block where it is converted back to analog. The analog audio signal is passed to the Switching (ABC), which outputs it to the speaker, line out and IR Transmitter IC.

Analog 8mm Playback

The signal from the heads is applied to the Head Amp, which amplifies and outputs the RF signal. The signal is then applied to the 8mm AFM Processing Block. This block extracts the audio signals from the RF. This signal is applied to the Switching block (ABC). This block outputs the audio signals to the speaker, line out and IR Transmitter. This block also outputs the audio signal to the ADC/DAC block. The signal is digitized and sent through the D8 record signal path so that it can be output from the IEEE1394 connector.



AUDIO BLOCK DIAGRAM

D830 1130 3 23 99

Servo Block

Overview

The servo block in a D8 camcorder must control the mechanism for two different modes - analog and digital. In order to do this, the D8 uses two separate mechanism control ICs. The inputs of these two ICs are wired ORed together. This means that each of these ICs can control the mechanism. When one Mecha Control IC is operating the mechanism, the lines on the other IC are at a high impedance state. Communication between IC401 DV Mecha Control, IC902 8mm Mecha Control (Analog) and IC801 Mode Control determine who is controlling the mechanism.

Analog Mode

When the camcorder is in analog playback mode, the servos and all switches and sensors are used for the same purpose they would be in a normal analog camcorder. IC902 8mm Mecha Control controls these operations.

D8 Mode

When the camcorder is in D8 mode, the capstan operates at twice the normal speed and the drum runs at 4500 rpm instead of 1800 rpm. You can tell if you are in this mode by the sound of the drum. Due to the speed, the drum makes a distinct sound that is higher in pitch than the standard analog drum. The speed of the tape is also a good indicator since it travelling twice as fast.

IC401 DV Mecha Control is controlling the mechanism while the servo is in digital mode. This IC checks for proper information coming from all of the sensors and switches. These sensors and switches have the same functions that they normally would on an analog 8mm camera. This IC controls the speed and phase of the drum and capstan motors.

Drum

The drum FG pulses are used to determine the drum speed in record mode. Comparing the incoming V sync signal to an Xtal oscillator creates a reference signal. This reference is compared to the drum PG signal to maintain phase. The drum PG signal is a 75 Hz signal.

The drum FG pulses are used to determine the drum speed in play mode. The drum FG signal should be 450Hz. Drum phase is controlled by comparing the Xtal oscillator signal to the Drum PG pulses.

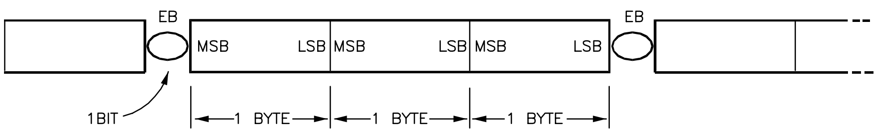
Capstan

The capstan FG pulses determine the capstan speed in record mode. There is no capstan phase control in record.

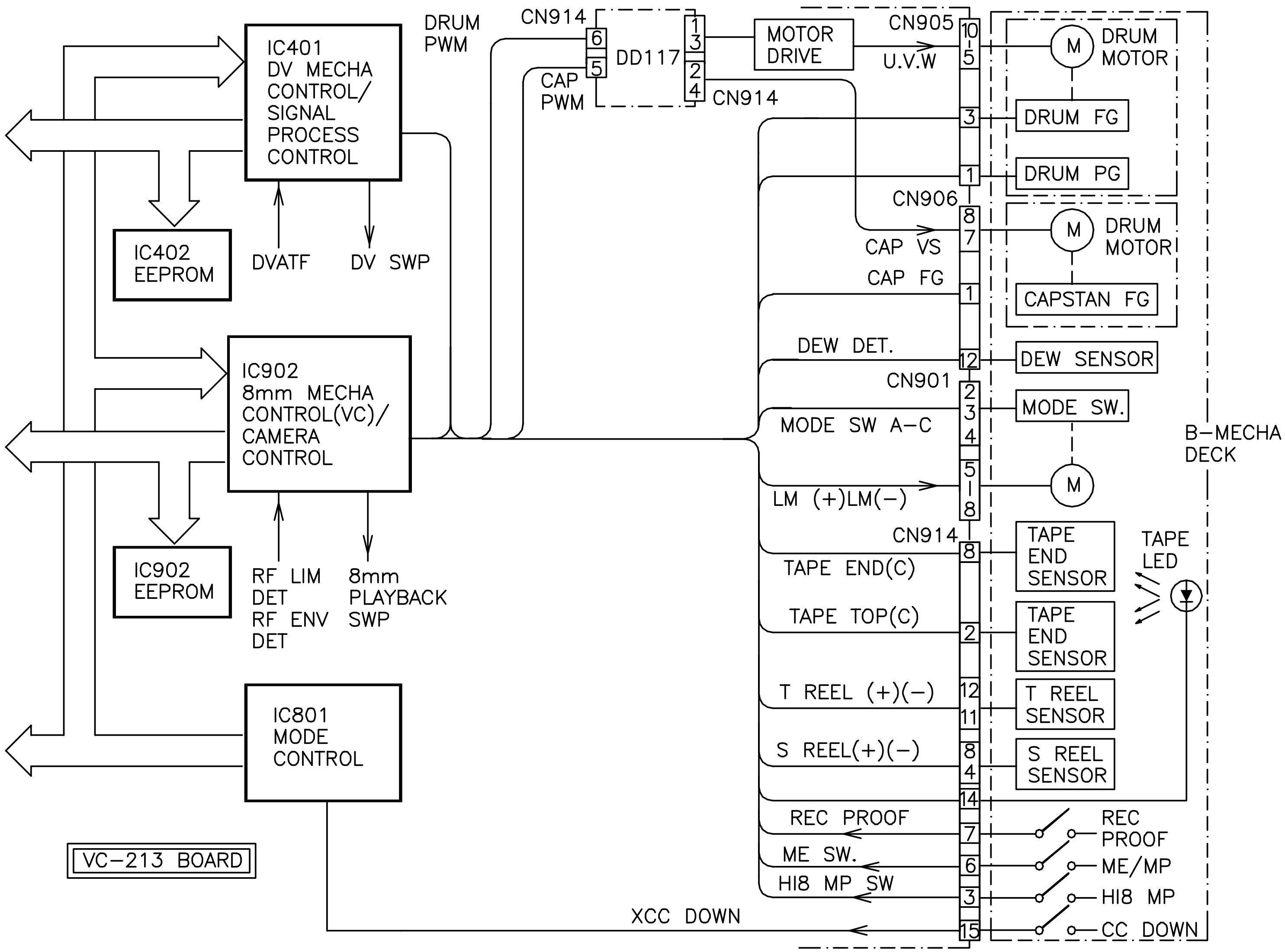
The capstan FG pulses determine the capstan speed in playback mode. The phase of the capstan circuit is controlled by the ATF signal, which is read from the tape.

ATF

As mentioned earlier in the Video path section, the D8 system employs ATF. A process called 24-25 Modulation is used to create pilot signals. 24-25 Modulation means that an extra bit is added to every three bytes of information. By using certain patterns for the extra-bit, different frequencies are obtained during playback.



24-25 Modulation

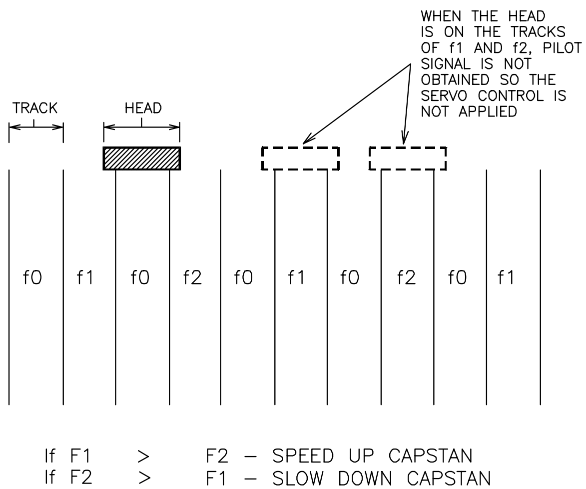


SERVO BLOCK

D831 1127 3 23 99

Three extra bit patterns are used to create three different signals during playback. These are called F0, F1 and F2. The F0 tracks do not contain a pilot signal. F1 contains a 465 kHz pilot and F2 contains a 697.5kHz pilot.

The system works similar to that in analog 8mm. The head is wider than the actual track that is being played back. Therefore signals from the adjacent tracks are read from the tape at the same time the main track is read. If we look at the drawing below, we can see that anytime the heads are on an F0 track, we can obtain different pilot signals from the adjacent tracks. These signals are level compared and an ATF error is generated. This ATF error controls the phase of the capstan motor. Whenever a F1 or F2 track is read, no ATF error is generated because the adjacent tracks are both F0 tracks. Even though the ATF circuit is only operational on every other track, it still maintains the phase of the capstan motor.



D8 ATF

Mech Initialization

One of the following sequences will occur when a tape is inserted and the door closed:

If the tape is completely rewound to the beginning

- The mech will pull the tape out of the cassette until it is in the fully loaded position.
- The mech will attempt to reverse play the tape in the analog 8mm mode. This attempt is aborted when the clear leader is seen.
- The tape will then turn forward until the clear leader is not detected and stop.

Determination of the type of recording is not done in this mode. After play is pressed, the unit will start in the digital mode. If it determines that tape being used is not digital, the unit will stop, adjust the servos and playback in the analog mode.

If the tape is not rewound

- The mechanism will pull the tape out of the cassette until it is in the fully loaded position.
- The mech reverse plays the tape in the analog 8mm mode for approximately one second.
- The mech plays the tape in the analog 8mm mode for approximately one second.
- The mech reverse plays the tape in digital mode for approximately one second.
- The mech plays the tape in digital mode for approximately one second.

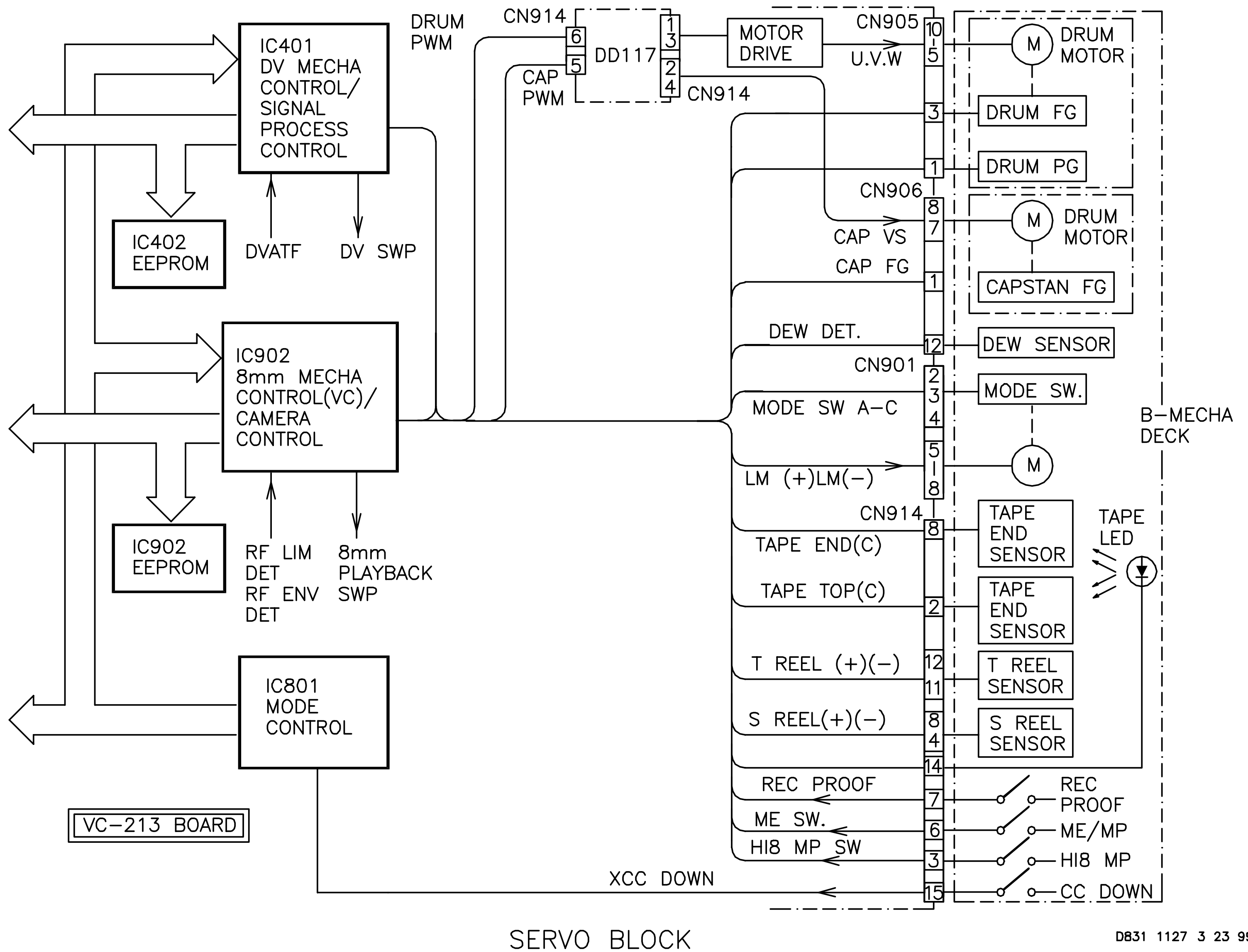
In this mode, a determination of what type of recording is on the tape is made during the initialization period. When play is pressed, the camcorder immediately enters the right mode.

Determining Recording Type

The determination of a D8 recording is done by recognition of the digital RF signal and the presence of system data. If an RF signal and system data are not detected, IC401 DV Mecha Control will go into high impedance state and IC902 8mm Mecha Control will take control of the mechanism.

The presence of the RF signal and the ATF pilot signals are used to determine if an analog tape is being used. If an analog recording is detected, then IC902 8mm Mecha Control will continue to operate the mechanism. If neither type of tape is detected, the unit will stay in analog mode. Therefore if a blank tape is inserted, the unit will default to analog mode.

See the troubleshooting section for instances when a recording type cannot be determined.

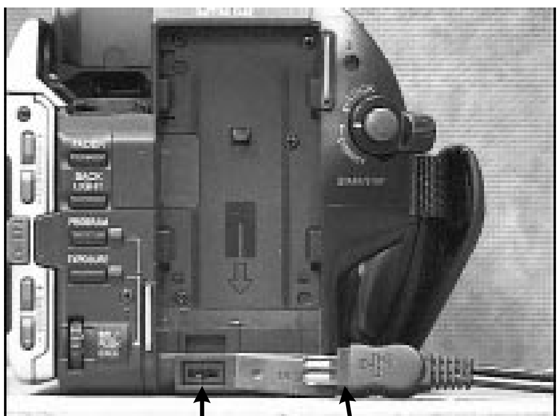

IC401
DV MECHA
CONTROL/
SIGNAL
PROCESS
CONTROL
IC402
EEPROM
DVATF
DV SWP
DRUM
PWM
CAP
PWM
CN914
DD117
CN914
MOTOR
DRIVE
CN905
U.V.W
DRUM
MOTOR
DRUM FG
DRUM PG
CN906
CAP VS
CAP FG
DRUM
MOTOR
CAPSTAN FG
DEW DET.
DEW SENSOR
CN901
MODE SW A-C
MODE SW.
LM (+)LM(−)
CN914
TAPE END(C)
TAPE
END
SENSOR
TAPE
LED
TAPE TOP(C)
TAPE
END
SENSOR
T REEL (+)(−)
T REEL
SENSOR
S REEL(+)(−)
S REEL
SENSOR
REC PROOF
REC
PROOF
ME SW.
ME/MP
HI8 MP SW
HI8 MP
XCC DOWN
CC DOWN
B-MECHA
DECK
IC902
8mm MECHA
CONTROL(VC)/
CAMERA
CONTROL
IC902
EEPROM
RF LIM
DET
RF ENV
DET
8mm
PLAYBACK
SWP
IC801
MODE
CONTROL
VC-213 BOARD
D831 1127 3 23 99

SERVO BLOCK

Power Supply

Overview

The 1999 camcorder line up features a new type of power supply and battery charging system. In the past, Sony camcorder batteries were charged on a separate charging unit. This charging unit could be used to power the camcorder directly or charge the battery. The new system uses a power supply that is connected to the camcorder. The battery will be charged by placing it on the unit with the Camera/VTR switch in the OFF position. These batteries can still be charged on an optional charger sold separately.



Troubleshooting of the power supply, DD-117 Board, can be difficult. The shutdown circuits in the power supply cannot be defeated. Therefore, there can be difficulty in determining if the problem is on the VC-213 Board or the DD-117 Board. The procedure outlined below should serve as a guide for power supply (Dead Unit) problems.

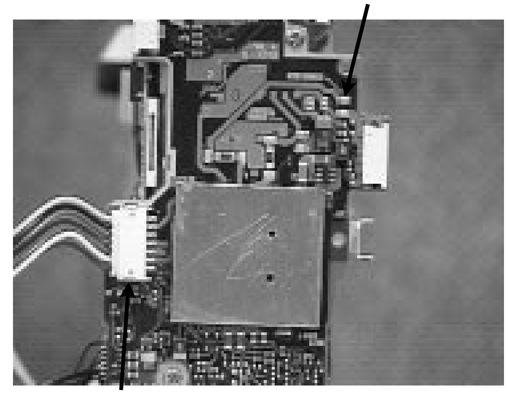
PS Troubleshooting

Be sure to check whether the unit will power ON with the battery or the power supply.

If a unit is dead, disassemble the unit down to the point where the Cabinet R (LCD Side) is taken off the unit but its cables are still connected.

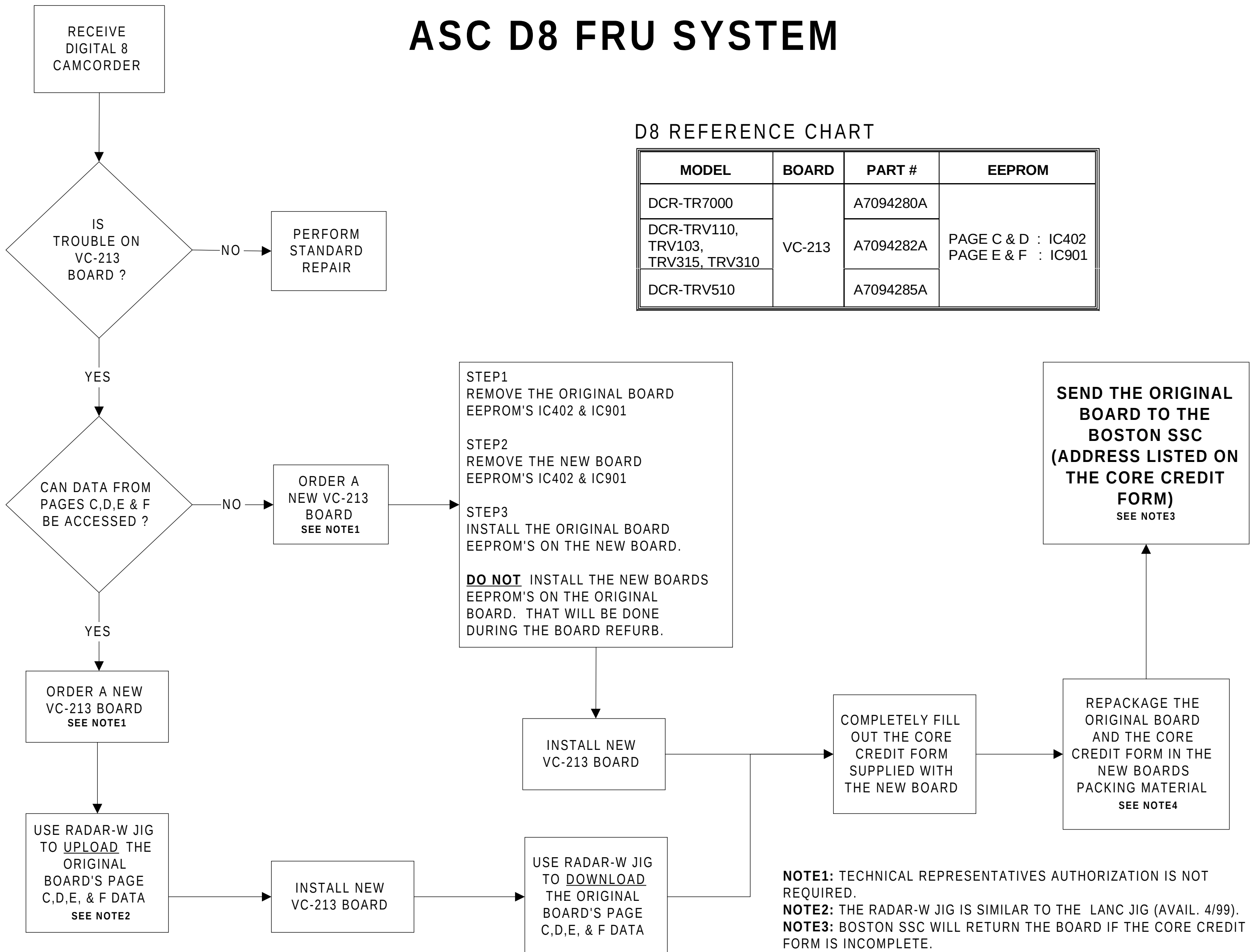
Plug in the RM-95 and then apply AC adapter power to the unit. Are there any signs of life on the RM-95? If there are, you may have problems with an individual supply to one circuit or a switching problem. Try to turn the unit ON using the RM-95. If the unit does not turn ON, check the individual supplies.

If there are no signs of life from the RM-95 you can start by checking for Ever 3V at CN911/38. If this voltage is present it is probable that the problem is on the VC-213 Board. If Ever 3V is missing, check the VTR Unreg voltage at CN911/44. If this voltage is present, change the VC-213 Board. If it is not, check the VTR Unreg test point on the DD-117 Board. If the voltage is missing at that test point, check the AC Supply voltage at CN801/6. If the power supply voltage is not present at CN801/6, check the wiring and the power supply input terminals. If the power supply voltage is present at CN801/6, check the fuses on the DD-117 Board. The board needs to be removed to do this. If a fuse is bad, replace it. If the fuses are good, replace the DD-117 Board.



If you cannot determine whether the problem is on the DD-117 or the VC-213 Board, it is recommended that you replace the DD-117 Board first. The DD-117 is replaceable and repairable so use your best judgement as to whether to replace or repair it. **The VC-213 Board is not repairable. You should not attempt to repair it even if you know it only needs resoldering.**

ASC D8 FRU SYSTEM



D8 REFERENCE CHART

MODEL	BOARD	PART #	EEPROM
DCR-TR7000	VC-213	A7094280A	PAGE C & D : IC402 PAGE E & F : IC901
DCR-TRV110, TRV103, TRV315, TRV310		A7094282A	
DCR-TRV510		A7094285A	

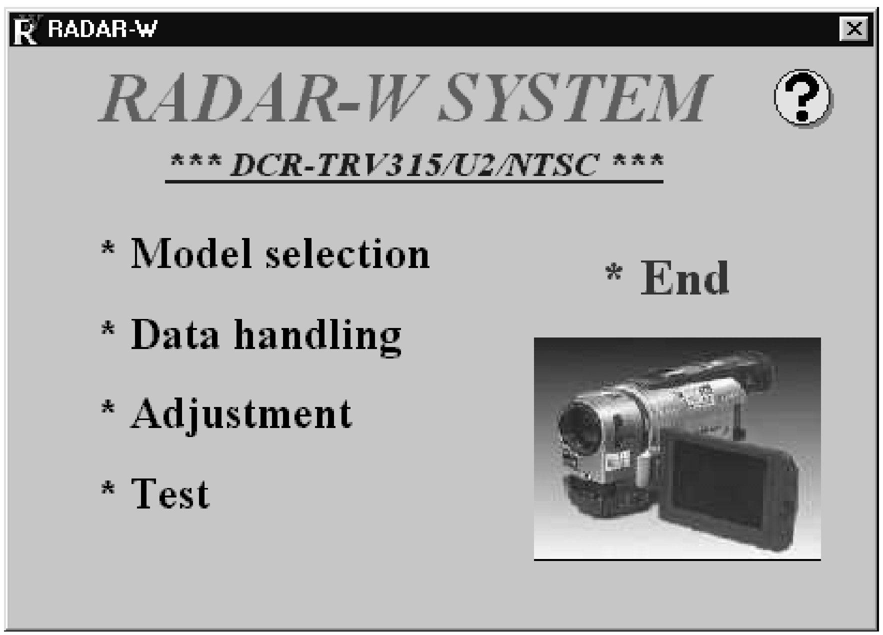
NOTE1: TECHNICAL REPRESENTATIVES AUTHORIZATION IS NOT REQUIRED.
NOTE2: THE RADAR-W JIG IS SIMILAR TO THE LANC JIG (AVAIL. 4/99).
NOTE3: BOSTON SSC WILL RETURN THE BOARD IF THE CORE CREDIT FORM IS INCOMPLETE.
NOTE4: THE ORIGINAL EEPROM'S DO NOT NEED TO BE RETURNED TO THE BOSTON SSC.

Radar W

The following section will include a look at the basic operation of the Radar W jig. This jig must be used in the repair process for D8 camcorders. The data from the old Lanc system will eventually be converted so that the servicers will only need one jig to service all camcorders. At the time of this writing, two jigs are still needed. The Radar W interface can be purchased through WRPC, Part #J-6082-429-A. Software can be downloaded from the appropriate Sony web page. More information will follow. See your Tech Rep if there is a problem.

Using Radar W

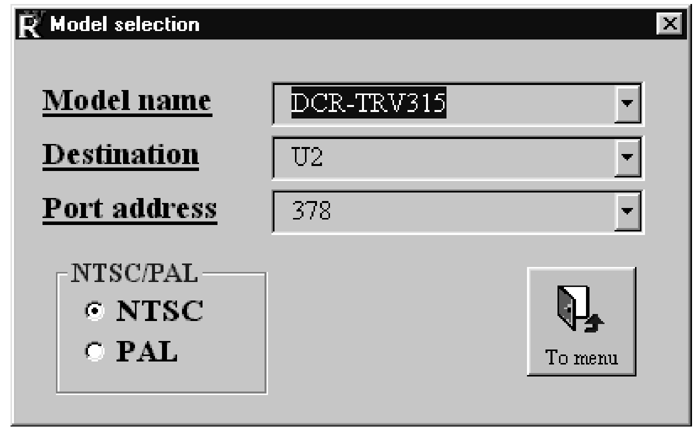
When Radar W is launched from the Start menu, the following screen will be displayed.



Main Menu

This screen shows you the options available in Radar W. You can make a selection using the mouse. When you place the mouse on that selection the text turns purple and a hand with a finger extended is shown.

This screen also shows what model is selected at the top. If we want to change the model we would choose Model Selection from the menu by pointing to it with the mouse and clicking the left mouse button when the selection text turns purple and the hand with finger extended is seen.



Model Selection

This will bring us to the Model Selections screen. We have three selections to make in the model selection screen: Model name, Destination and Port Address. Model name, of course, means the name of the model you are using. Destination means the country code for the country in which the model is sold. **U2** is the country code for the United States. Port Address refers to the address to which your PC's parallel port is assigned. This should always remain the same once it is set. In addition, we need to select whether the unit is an NTSC or a PAL model. Once we have made our selection we need to click the To Menu button to return to the Main Menu.

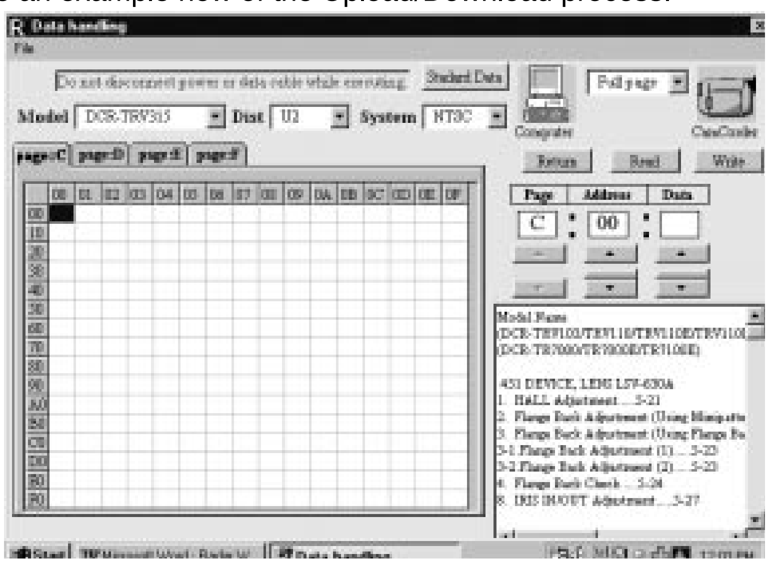
In order to do an upload or download of data we need to select the Data handling screen. All uploading and downloading is handled by the Data handling screen. The data handling screen shows you the Model, Destination and Format. There are also three purple buttons on the screen:

Return, Read and Write. Return will return the data values to their previous state if they have been changed. Read will read the data from the camcorder, and Write will write a specific file to the camcorder.

Above the three purple buttons is a drop down menu. The choices from the drop down menu are Full page, 1 page and 1 Data. Full page means return, read or write data to all pages. 1 page means to return, read or write data to 1 page. 1 Data means to return, read or write data to a specific address. The buttons below the three purple buttons show you the Page, Address and data value that is selected. These buttons can be used to displayed the current data at a particular address or change that data.

The data values are also displayed in table format to the left of these buttons. These tables are laid out in a tab format. When each tab is clicked, the data on that page is selected. The adjustments from the service manual are listed in a window below the Address selection buttons.

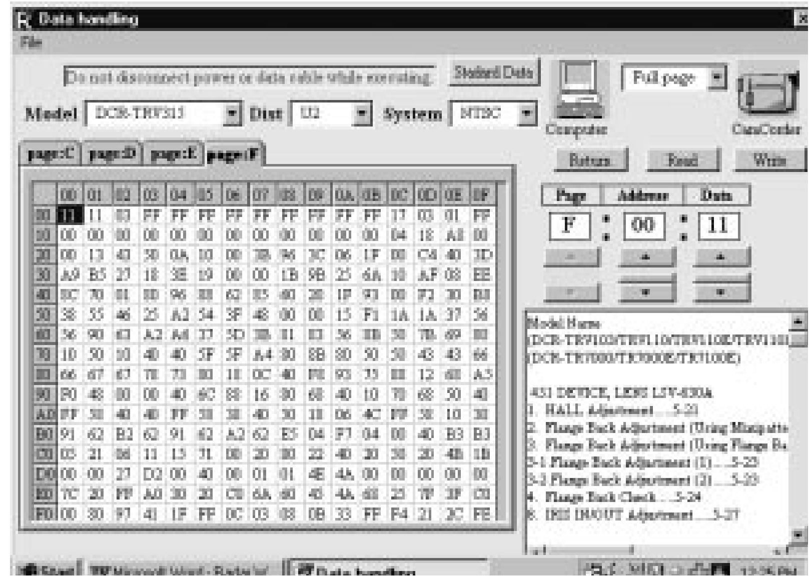
This screen will be used to do all uploading and downloading of data. We will give an example now of the Upload/Download process.



Data Handling

Upload/Download

To upload the data from the camcorder, press the Read button. The following screen will be displayed. The only difference between this screen and the previous one is that the data table is full of data. This is the data from the camcorder under test. You can now save the data that was read from the camcorder.

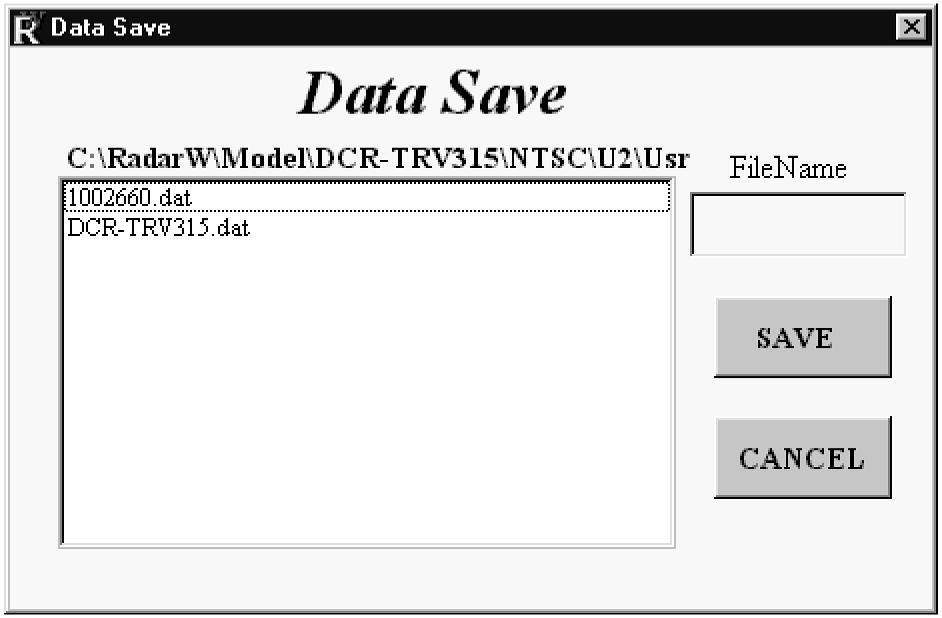


Data Handling After Read

This is done by clicking on the File pull down menu on the top left of the Data handling window. The following options will be given in this menu: Full Page Loading, Save of Full Page and To Menu. Full page loading is for writing a data file to a camcorder. Save of full page is for saving data that has been read from a camcorder. This choice will be used to save the uploaded data from a camcorder. The final choice, To Menu, will bring you back to the Main Menu.

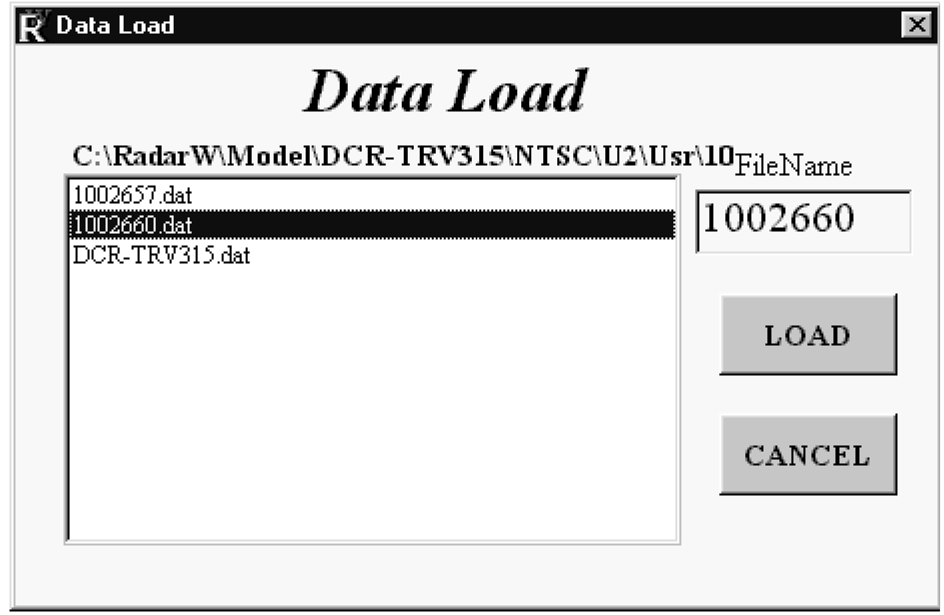
File Pulldown Menu

If we select Save of full page, the following screen will appear.



Use this screen to name the data file for this camcorder. We suggest the use of the serial number as the name for the file. Type the serial number into the box under the words File Name. After you are done, left click the mouse on the Save button. This saves the file in a folder under the Model Name in the Radar W folder.

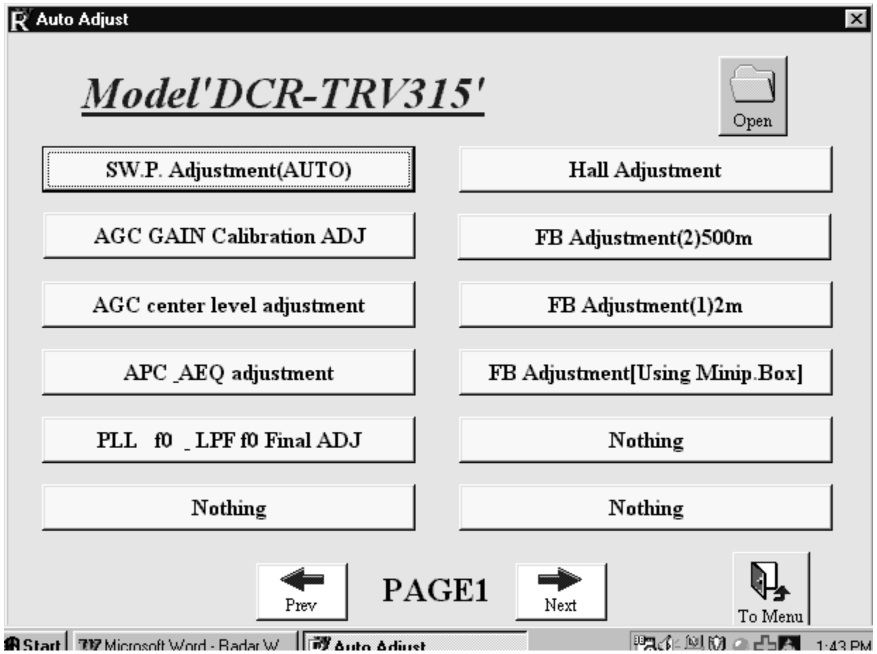
In the event of something such as the replacement of the VC-213 board, we would then want to write that data back into the camera. This is done by selecting Full page loading from the File drop down menu at the top left of the Radar W window. When we select Full Page loading, the following window is displayed:



Next, select the file (named by serial number) that you want by left clicking it with the mouse. After this, left click the Load button. This will bring you back to the Data handling window. You can now click the Write button to write the data from the file to the camcorder. This completes the Upload/Download process.

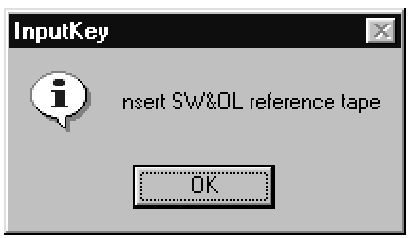
Adjustment

We now talk about using the adjustment section of the Radar W software. This section allows us to do automatic adjustments. Select Adjustments from the Main Menu to begin. The following window appears.



Auto Adjustment

Select the adjustment that needs to be performed. We will choose SW.P. Adjustment (Auto) by pointing to it with the mouse and clicking the left mouse button. Follow the instructions in the dialog box and click OK when complete. The window behind the dialog box shows the steps that are being followed in the adjustment. They are generally hard to follow and should be ignored.



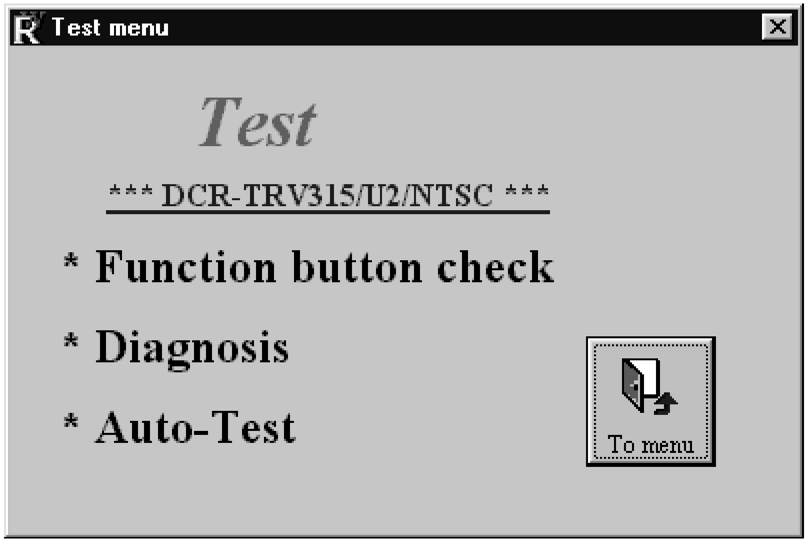
Insert Tape Dialog Box

The following screen will appear. Click OK. This ends the adjustment and returns you to the Adjustment menu. We will not be doing any more Auto Adjustments since the software is still in development at the time of this writing.

Adjustment Complete Dialog Box

Test

The test section of the Radar W software is accessed by choosing Test from the Main Menu. When Test is chosen the following window appears.



Test Menu

Three options are given in this menu: Function button check, Diagnosis and Auto Test. Function button test will allow you to see a screen with the name of each button on it. When you press that button, the name will be highlighted on the screen. This is useful for troubleshooting switch problems.

Diagnosis will bring up a window that shows you the Self Diagnostic history and the present Emergency codes. These can be read from the camcorder by pressing the Read button in that window. You can also clear the emergency information from this screen.

Auto-Test can be used for scripting sequences as was used in Lanc. A script would contain operation that the camcorder would complete such as Play 10 seconds, Rewind 5 seconds and Stop. The camcorder can then be set to repeat this sequence an infinite number of times. This feature was not available at the time of this writing. It may not be included in the first release of Radar W software either.

This concludes the discussion on the basic use of the new Radar W jig.

SONY®

Sony Service Company
National Technical Services
A Division of Sony Electronics Inc.
Park Ridge, New Jersey 07656

CONFIDENTIAL
Service Bulletin
Camera/Camcorder

CSV-3

Model: **DCR-TR7000, DCR-TRV103, DCR-TRV110, DCR-TRV310, DCR-TRV315, DCR-TRV510**

No. **496**

Subject: **Repair policy of new Digital 8mm (D8) Camcorders**

Date: March 29, 1999

Symptom:
(****)

As many of you already know, Sony has introduced a new line of camcorders known as Digital 8mm (D8). The units will be repaired at all Camcorder authorized Sony repair facilities.

D8 has reverse compatibility with the existing 8 mm formats (Video8 and Hi8). That is, the D8 format will play back the analog tapes. New recordings will be made in digital. The digital processing is virtually the same as the DVC consumer format. Additional information available in the D8mm-01 course.

Due to the specialized equipment required to rework the VC-213 board used in these models, the complete board needs to be replaced. Attempted repair may cause permanent and unrepairable damage to the ball grid components used in D8. For specific repair procedures, refer to the D8 service policy procedures sent separately.

Solution: The following is the recommended test equipment:

PART DESCRIPTION	PART NUMBER
CPC-13 Jig	J-6082-443-A
Extension Cable (16 Pin)	J-6082-357-A
Extension Cable (70 Pin)	J-6082-439-A
SW/OL Standard (WR5-2D) Tape	8-967-993-22
Audio Operation Check (WR5-3ND) Tape	8-967-993-32
System Operation Check (WR5-5ND) Tape	8-967-993-42
RADAR-W Interface Jig	J-6082-429-A
RADAR-W Software	Available 4/99 on Sony Intra/internet *

* Contact Technical Specialist or Technical Representative if you need assistance.