



Projection Television

Training Manual

Including...

Down-to-1

High Speed Troubleshooting

T^{TECHNICAL}
RAINING

2005

2006



V29

WD-52627

WD-62628

V30

WD-52628 WD-62827 WD-73727

WD-62628

WD-73827

V31

WD-62927

WD-73927



V28L

WD-52526 WD-62526

V28

WD-52527 WD-62527

WD-52528 WD-62528

2005-2006 PROJECTION TELEVISION TECHNICAL TRAINING AND TROUBLESHOOTING MANUAL

TABLE of CONTENTS

Introduction

About Mitsubishi Electric US	1
------------------------------------	---

Chapter 1... Display Technologies and PTV Product Line

Display Technologies	1-1
PTV Product Line	1-3

Chapter 2... Disassembly and Service

Engines	2-1
Identification	2-4
Chassis	2-4
PWBs	2-5
Mirror Access	2-7
LCD Access for Cleaning	2-8

Chapter 3... Alignment Procedures

Option Menu	3-1
Service Mode	3-1
Mechanical Adjustments	3-2
Electrical Adjustments	3-8

Chapter 4... Down-to-1 Troubleshooting

Front Panel LEDs	4-1
Self Diagnostics	4-2
Interface Troubleshooting	4-3
Symptom/Cause Troubleshooting	4-4

Chapter 5... Circuit Block Diagrams

Power Supplies	5-1
Video Signal Path	5-11
Sound Signal Path	5-15
Control Circuitry	5-16
Lamp Control Circuitry	5-17
Protection Circuitry	5-18

Introduction

About Mitsubishi Electric US Companies

Mitsubishi Electric US markets an extensive line of consumer, commercial and industrial electrical and electronics products. Mitsubishi Electric has more than 2,000 employees in 30 locations throughout the USA. www.MitsubishiElectric.com

Mitsubishi Digital Electronics America, Inc.

Mitsubishi Digital Electronics America, Inc. (MDEA) manufactures and markets a premium line of high definition, microdisplay, projection, plasma and LCD flat panel televisions and displays; advanced video products such as DVD and digital VHS components; presentation products and projectors; dye sublimation printers; medical and time-lapse VCRs; security digital video recorders; and photo kiosks. www.mitsubishi-tv.com

Elevator & Escalator Division

Mitsubishi Electric's Elevator & Escalator Division markets and services elevators and escalators throughout the United States. The division designs and installs premier vertical transportation systems, including high-speed elevators and the world's only spiral escalators. www.MitsubishiElectric.com

Heating, Ventilation & Air Conditioning Division

Mitsubishi Electric HVAC Advanced Products Division offers Mr. Slim split-ductless air conditioners; CITY MULTI, an inverter technology-driven simultaneous cooling and heating system; PlasmaPure room air purification systems; and Jet Towel hand dryers. www.MitsubishiElectric.com/hvac

Semiconductor Division

Mitsubishi Electric's Semiconductor Division markets advanced digital and mixed-signal products that provide unmatched flexibility, design reuse, innovative packaging options, ultra-low power and proven high quality across a wide range of technologies. www.mitsubishichips.com

Mitsubishi Electric Automotive America, Inc.

Mitsubishi Electric Automotive America (MEAA) offers all aspects of engineering, manufacturing, sales and marketing, distribution and service of electrical and electronic systems and components for automobile manufacturers and industrial engine manufacturers. www.meaa-mea.com

Mitsubishi Electric Automation, Inc.

Mitsubishi Electric Automation, Inc. (MEAU) is a supplier of factory automation solutions that include automation platforms; programmable logic controllers; human machine interfaces; programming and control software; industrial computers; variable frequency drives, servo motors and amplifiers; motion controllers; computer numerical controllers; robots; uninterruptible power supplies; and industrial sewing equipment. www.meau.com

Mitsubishi Electric Power Products, Inc.

Mitsubishi Electric Power Products, Inc. (MEPPI) is responsible for serving the North American electric utility, rail transportation, and water treatment industries with electrical and electronic products, systems and services. MEPPI also provides equipment and services for broadband over powerline systems.

www.meppi.com

Within MEPPI is the Diamond Vision Division, which markets and installs large-scale video displays for stadiums and arenas, as well as LED displays for indoor and outdoor applications.

www.diamond-vision.com

Mitsubishi Electric US Products & Services

Automation Products

- Computer Numerical Controllers
- Industrial Sewing Equipment
- Motion Control Systems
- Programmable Logic Controllers
- Uninterruptible Power Supplies
- Variable Frequency Drives Human-Machine Interfaces

Automotive Equipment

- Automotive Electronics & Sensors
- In-car Entertainment Systems
- Ignition Coils
- Starters
- Alternators
- ITS Components
- Vehicle Navigation & Safety Systems

Elevators and Escalators

- Elevators Escalators Maintenance & Refurbishing

Heating and Air Conditioning

- Mr Slim & CITY MULTI Climate Control Systems
- PlasmaPure Air Purifiers Jet Towel Hand Dryers
- Compressors

Semiconductors

- Optoelectronic, Microwave/RF Semiconductors

Home Theater, Presentation & Imaging Products

- High Definition TVs
- LCD Projectors
- Big Screen TVs
- Plasma & LCD Displays
- DVD & VCR Players
- DataWalls
- Dye Sublimation & Thermal Imaging Printers
- Time Lapse Recorders
- Photo Kiosks

Power Products

- Broadband Over Power Line (BPL)
- Custom & Industrial Power Systems
- Flexible AC Transmission
- Gas Circuit Breakers
- Gas Insulated Substations
- Large Power Transformers
- Ozone Water Treatment Systems
- Rail Transportation Systems
- Surge Arresters

Large Screen Displays

- Stadium & Arena Displays
- Scoreboards LED Signs

Other Technologies

- PhotoVoltaic Power Systems
- Car Vision Systems

Chapter 1

Display Technologies & PTV Product Line

Display Technologies

Mitsubishi's Digital Television Product Line for 2005-2006 consists of several different display technologies. They are categorized as either Rear Projection or Direct View.

Rear Projection Television Technologies:

- CRT
- LCD
- DLP™
- LCoS

Direct View Television Technologies:

- Plasma
- LCD

This training manual is directed towards Projection Television technologies.

Each technology offers its own strengths and weaknesses. Otherwise, only one type would need to be made available. Understanding the differences in each technology will aid the technician when discussing a given set's performance with a consumer. *Tables 1-1 and 1-2* outline some of the strengths and weaknesses of each one. Of course, the strengths and weaknesses will change as each technology evolves over time.

CRT Technology - V27 Chassis

This is the most mature technology of the four. It may even be viewed as somewhat "low tech" by some people. However, Mitsubishi's product line includes all the latest digital features. As such, it can still offer the best "bang for the buck" of all the technologies. The V27 Chassis is used in 55", 65" and 73" models.

LCD Technology - V28 Chassis

While LCD projection television is certainly not new, recent strides have improved this technology so that Mitsubishi can offer it in 4 models this year.

DLP Technology - V29/V30/V31 Chassis

Mitsubishi, the first to bring DLP technology to market in a rear projection television, marks another "first" by introducing 1080p DLP in 9 different rear projection models. This is twice the resolution of High Definition. It will come in 52, 62 and 73 inch screen sizes, with the 73 inch models being the largest DLP models ever available.

LCoS

Mitsubishi's use of LCoS technology is in the form of a 3 chip system carried over in the 82" rear projection model WL-82913.

CRT	LCD	DLP	LCoS
Excellent Color	Excellent Color	Excellent Color	Excellent Color
Excellent Contrast	Improving Contrast	Excellent Contrast	Excellent Contrast
Relatively Inexpensive	Relatively Inexpensive	Cost Improving	Excellent Resolution
	Light weight	Light weight	
	Shallow depth	Shallow depth	

Table 1-1: Rear Projection Television Strengths

CRT	LCD	DLP	LCoS
Heavy	Screen Door Effect	Potential for Rainbow Effect	Fairly Expensive
Deep Cabinet			Limited Availability
Potential for Phosphor Burn	Slower refresh rates		

Table 1-2: Rear Projection Television Weaknesses

Light Engines

The CRT technology used in the V27 chassis is electrically the same as the V25 chassis. Since the V25 Training Manual covers it in-depth, no further discussion will be necessary.

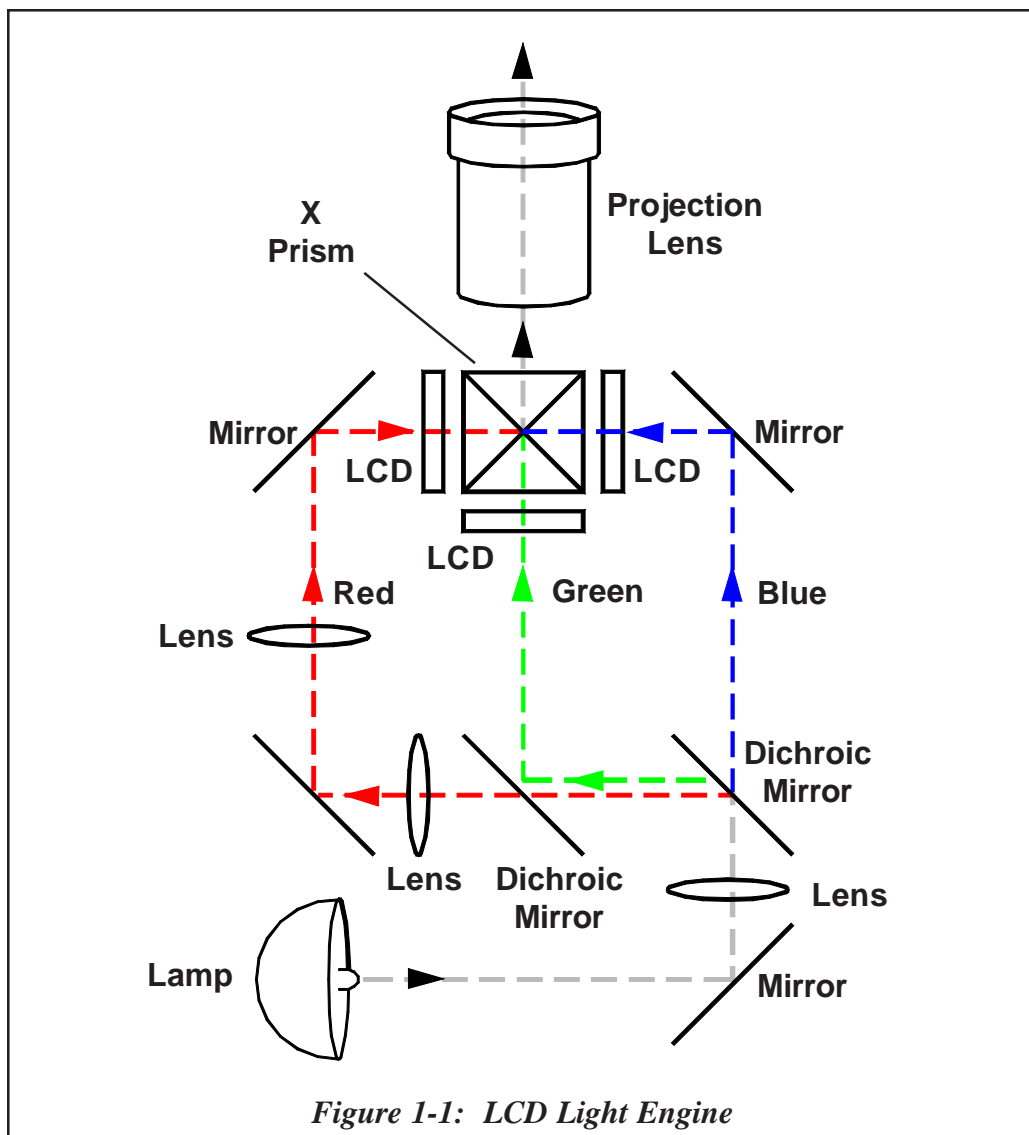
LCD, DLP and LCoS are known as “Micro-Display” technologies. The Light Engines are configured differently for each.

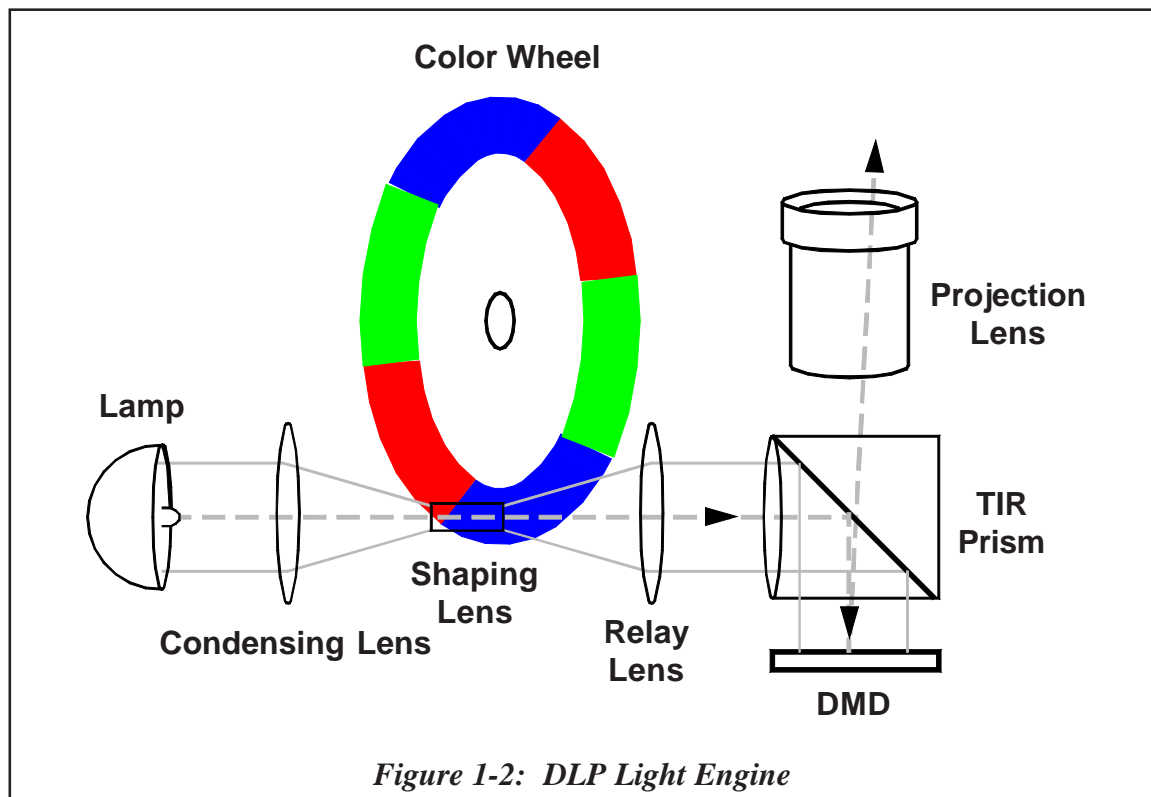
LCD uses the “light transmissive” method of producing a picture as light passes through the panel. DLP and LCoS use the “light reflective” method of producing a

picture as light reflects off the surface of the display device.

An LCD must use 3 devices to produce a color picture. DLP and LCoS can be configured as either single, or 3 device engines. Mitsubishi currently uses a single chip DLP and a 3 chip LCoS system.

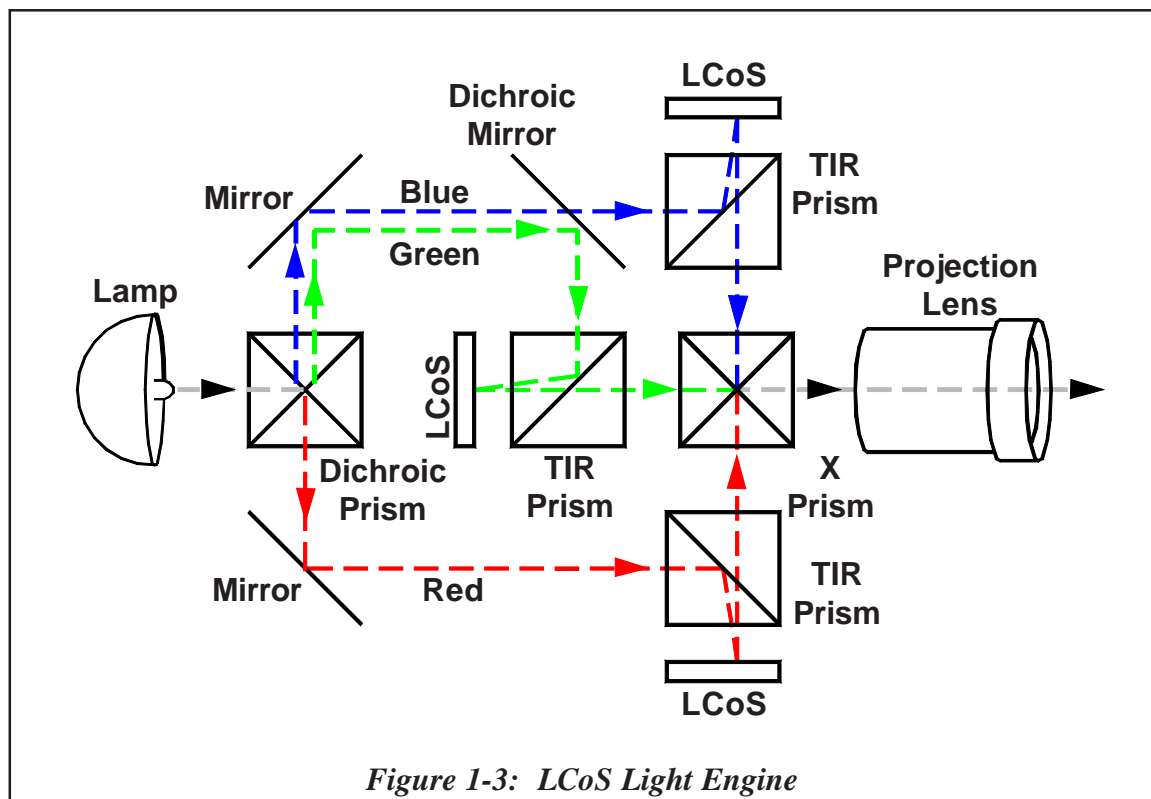
The LCD Light Engine, shown in *Figure 1-1*, uses 3 LCD “Panels” to individually produce the red, green and blue elements of the picture. Dichroic mirrors separate the red, green and blue elements of light, and an X-Prism is used to re-combine the 3 colors after the pictures have been produced.





The single device DLP Light Engine, shown in *Figure 1-2*, produces a color picture using a color wheel and the “field sequential” method of displaying the red, green and blue elements of the picture.

Figure 1-3 shows an LCoS engine in a 3 chip arrangement. Like LCD, it produces each color individually. And like DLP, it uses reflective light to produce the picture.



Performance Improvement Technologies

The 2005-2006 PTV product line uses several new performance improvement technologies for LCD and DLP displays.

LCD Improvements:

- Quick Motion™
- SmartShutter™

DLP Improvements:

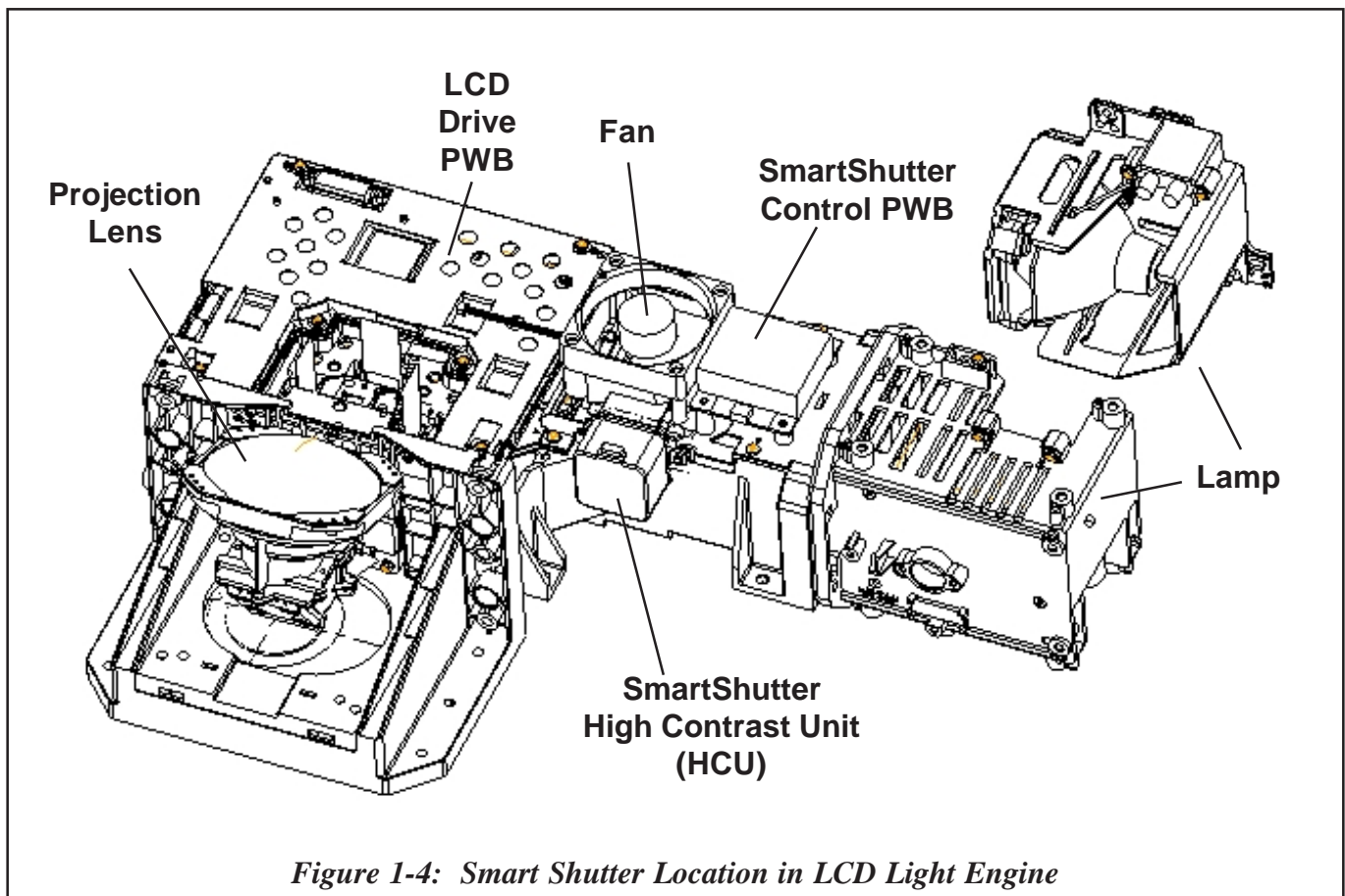
- 1080p
- Dark Detailer™
- 10,800 RPM Color Wheel

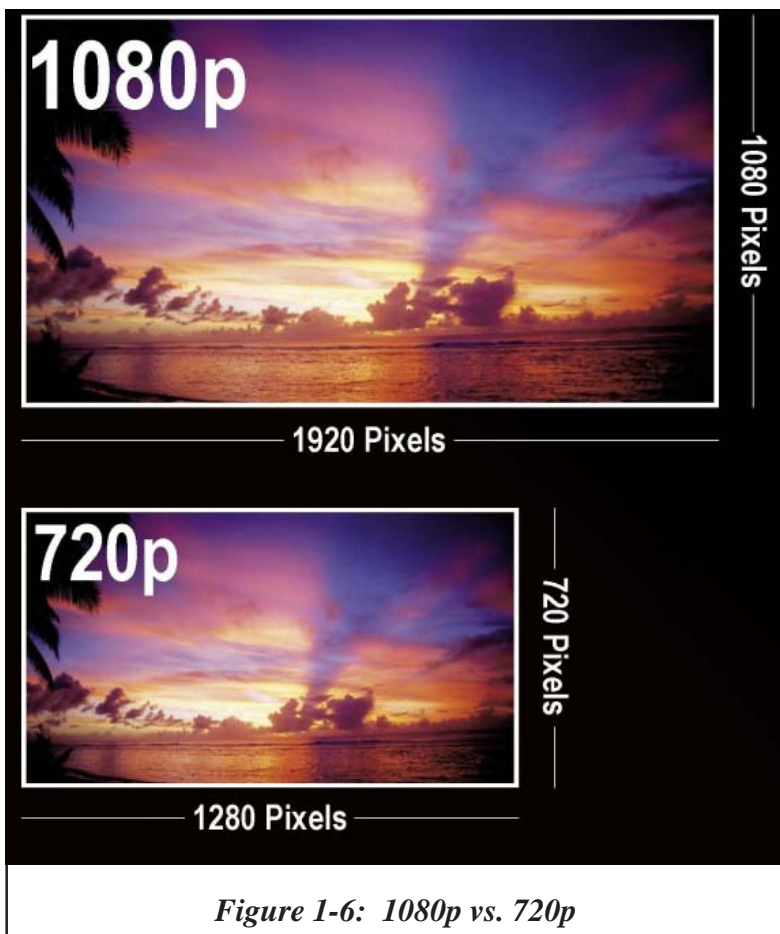
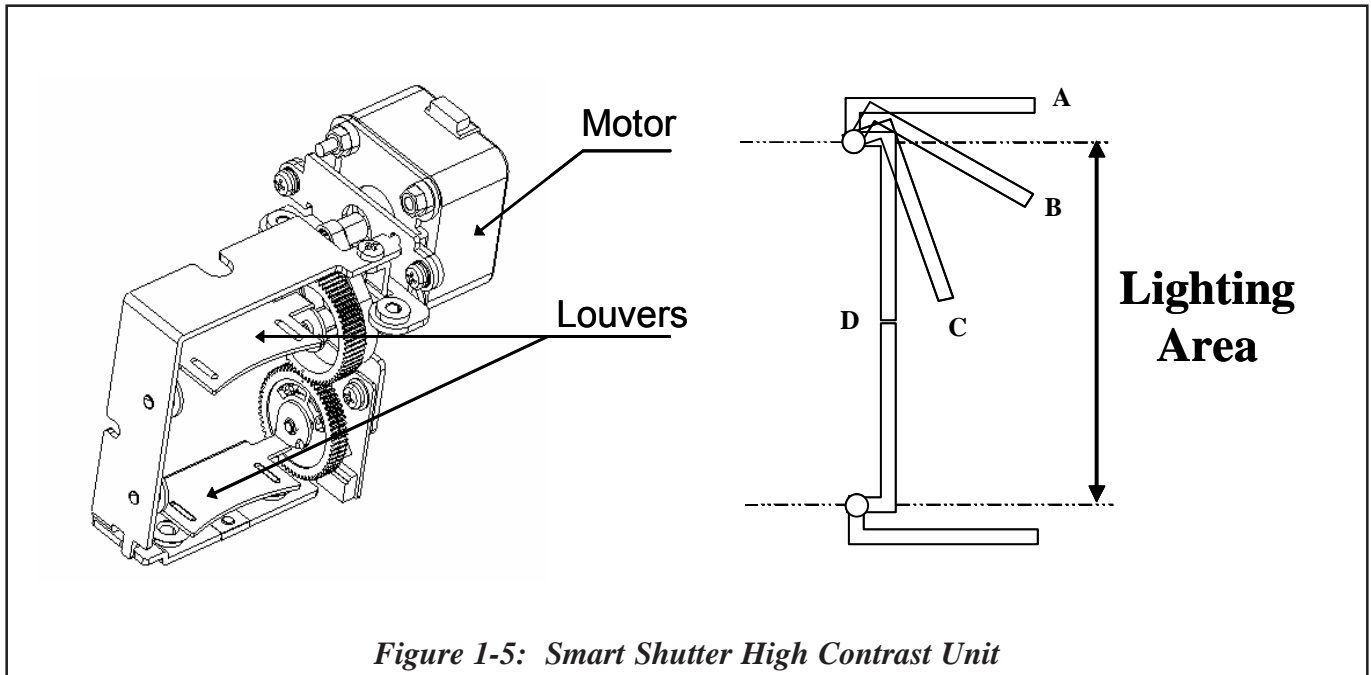
Quick Motion™ is an advanced high speed drive system that derives faster response from LCDs, virtually eliminating the blurs that often occur when the moving picture has fast motion.

SmartShutter™ is a dynamic aperture system that improves black levels and adds a large palette of dark grey shades. It does this by reducing light output during dark scenes without negatively affecting other picture characteristics.

Shown in *Figure 1-4*, the SmartShutter High Contrast Unit (HCU) is located in the light path between the lamp output and the optics.

The HCU is a motor driven device that dims the lamp output by physically blocking it with movable louvers. See *Figure 1-5*. As dark scenes are detected, the louvers move from position A, full light output, through positions B, C and D to accurately control the amount of light necessary as the picture brightness varies. It is controlled by the PWB-Motor Driver.





The 1080p technology in Mitsubishi's DLP product line offers twice the pixel resolution of 720p HDTV. See *Figure 1-6*.

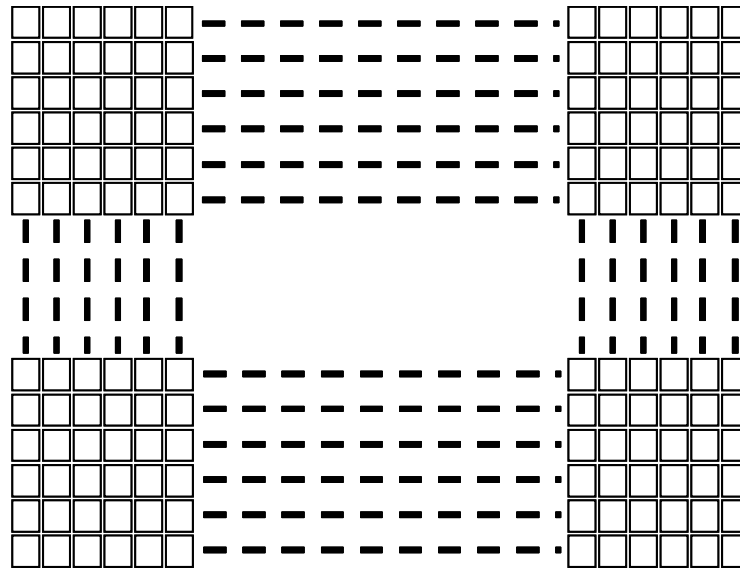
Not only does this technology give a full 1920 x 1080 resolution, it does so using half the micro-mirrors. This yields a smooth appearance without "pixel gaps."

A comparison of a 720p DMD and a 1080p DMD is given in *Figure 1-7*.

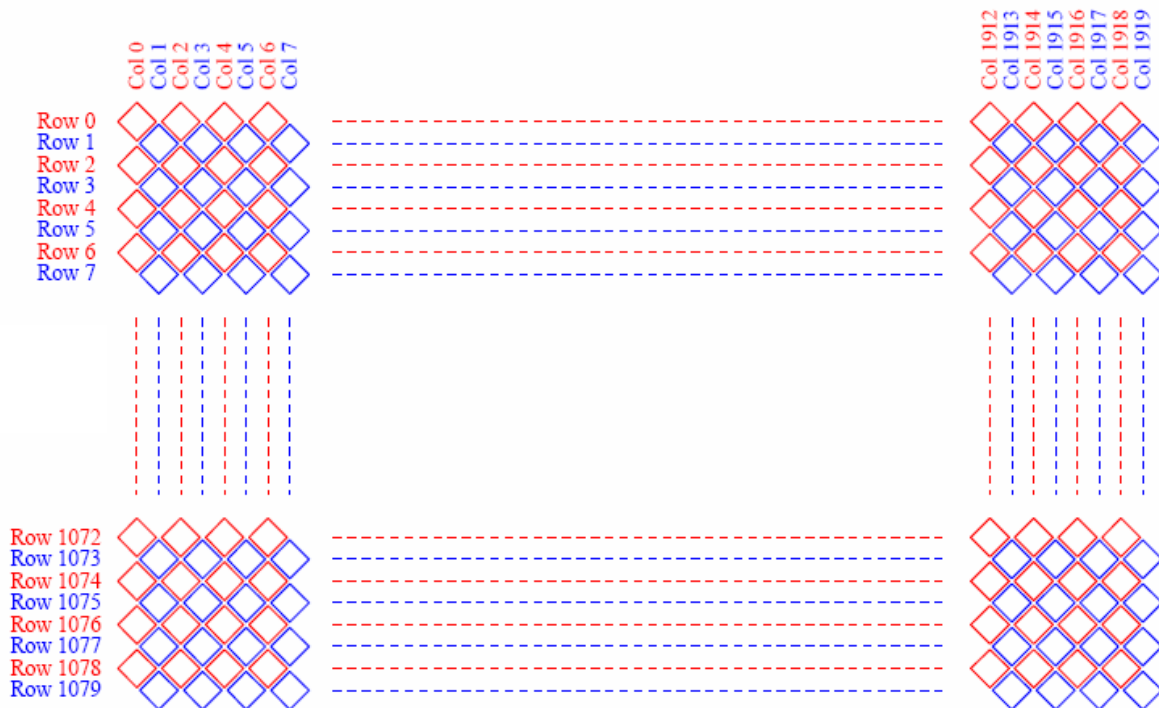
A 720p DMD uses a square pixel arrangement while a 1080p DMD uses a diagonal pixel arrangement. Pixel gaps are eliminated by dividing the 1080p picture into 2 sub-frames and interleaving the image by shifting the second sub-frame down by 1/2 pixel. See *Figure 1-8*.

The image shift is accomplished with the use of a single coil driven mirror located in the optical output stage of the DLP light engine. See *Figure 1-9*.

	720p DMD Chip	1080p DMD Chip
Pixel Arrangement	Square Pixel Arrangement	Diagonal Pixel Arrangement
Final Pixel Image	1280X720	1920X1080

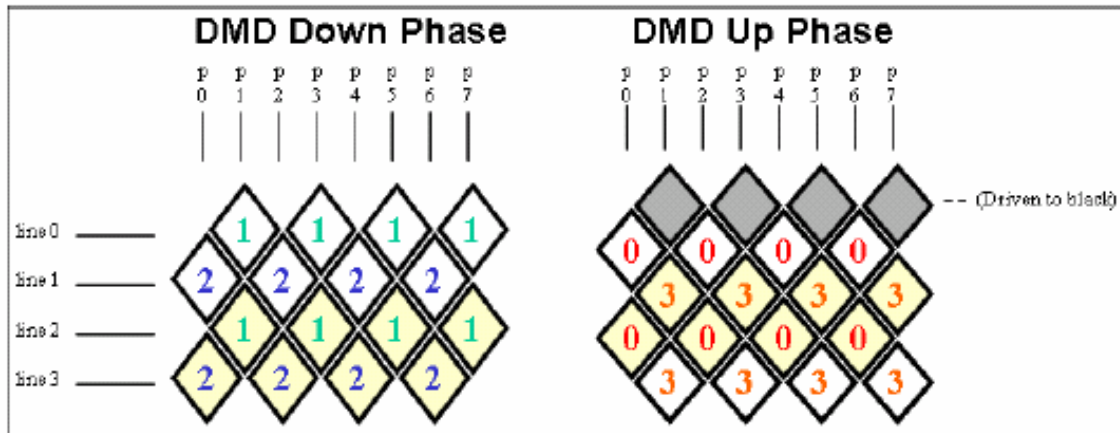


720p DMD

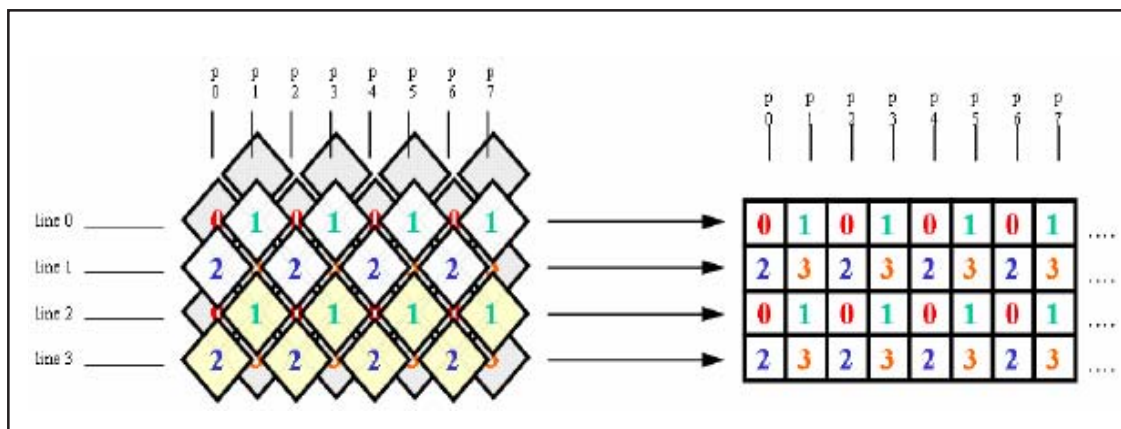


1080p DMD

Figure 1-7: 720p DMD vs. 1080p DMD



The data is divided into two subframes, each with half the original data. During one of the subframes, the image is shifted down by 1/2 pixel. The eye integrates the two consecutive subframes to create the final image. This process is completed every 1/60 of a second, displaying all of the data, every frame, just as is the case for other traditional DMDs.



The resulting image exhibits the same pixel resolution as the original input data in both horizontal and vertical directions, using half the number of mirrors. The gaps are also minimized in the process, resulting in an image that is not only full resolution, but smooth in appearance - without the typical pixel gaps.

Figure 1-8: Sub-frame Integration

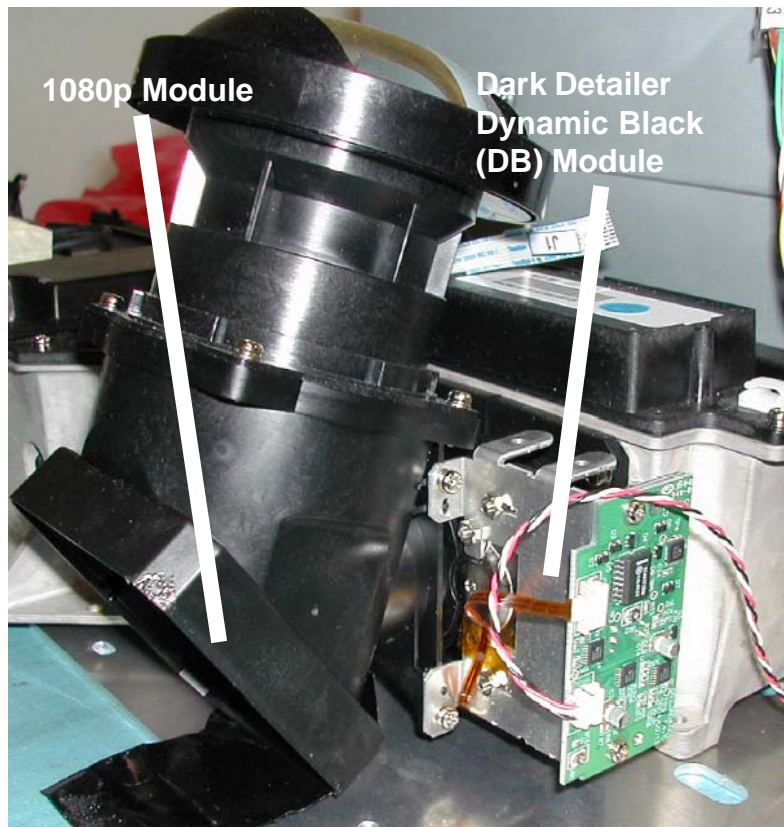


Figure 1-9: DLP Light Engine - 1080p and Dark Detailer Modules

Dark Detailer™ is another type of dynamic aperture system used with DLP based models. It displays deeper blacks and better dark scene detail.

The location of the Dark Detailer, also referred to as the Dynamic Black (DB) module, is shown with its cover removed in *Figure 1-9*. It is located in the light path between the lamp and DLP optics.

Figure 1-10 shows the DB module after it has been removed from the engine. The light shutter can be seen at the top of the picture. It moves into and out of the light path to reduce the lamp output during dark scenes. An aperture opening in the shutter can also be seen.

Figure 1-11 depicts how the one-sided aperture system provides the best reliability along with better contrast and uniformity over the entire TV picture.

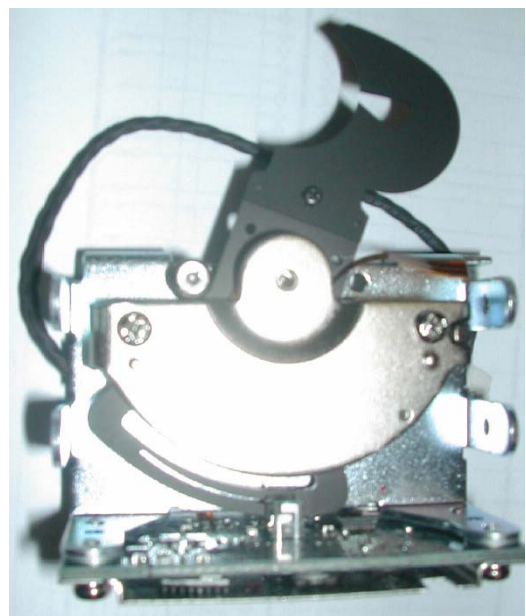
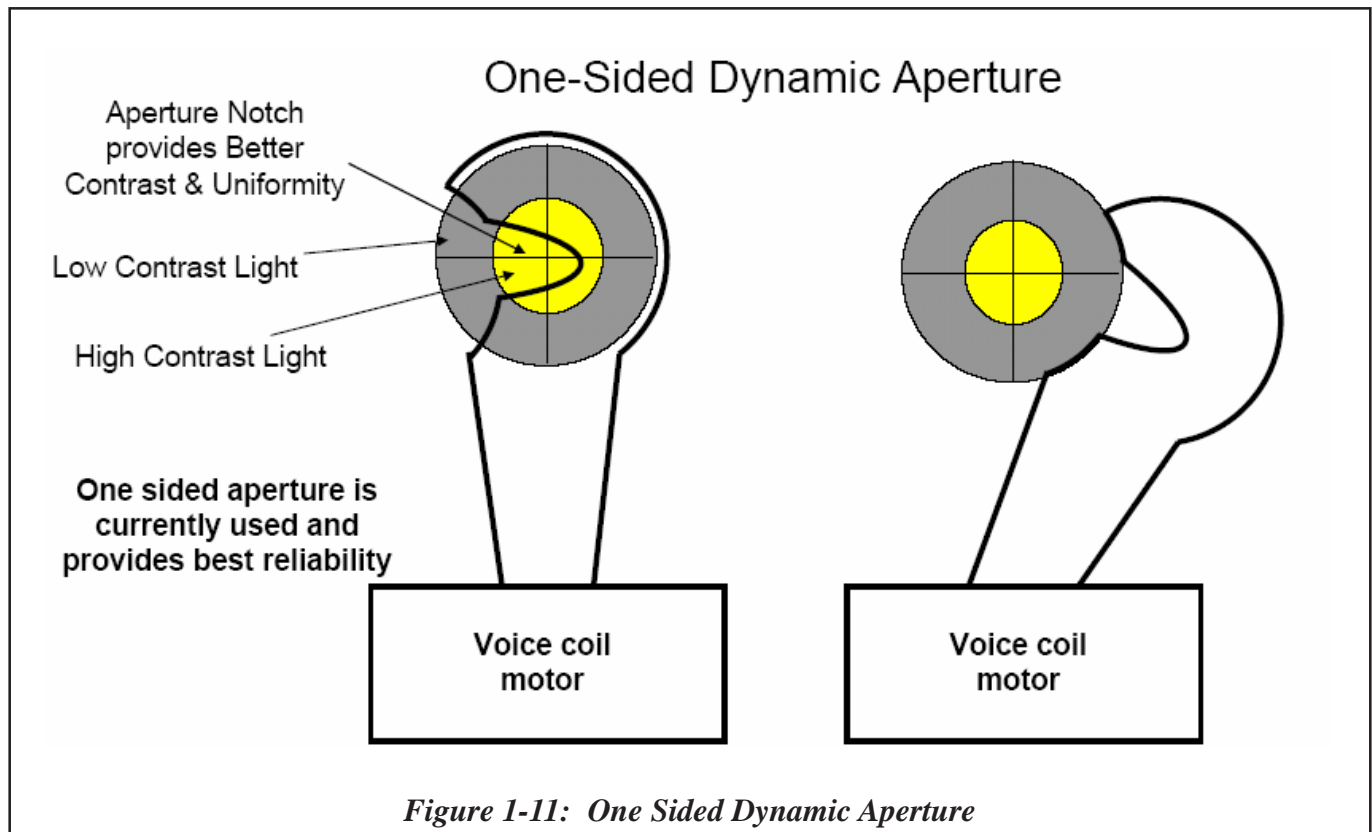


Figure 1-10: Dark Detailer Module



Because some people can experience a “rainbow effect” due to differences in their persistence of vision, a **10,800 RPM Color Wheel** is now used in the 2005-2006 DLP product line. This represents a 50% speed increase over last years 7,200 RPM wheel.

Service Technologies

The 2005-2006 PTV product line carries several technologies that affect service. They are:

- PWBs are constructed with Lead Free Solder.
- Mirror area is easier to access on 52” LCD & all DLP to simplify cleaning.
- Elimination of ribbon cables in the Electrical Chassis improves reliability.

- The Interface PWB between the Chassis and Light Engine is convenient for troubleshooting.
- Access to the Electrical Chassis is improved for troubleshooting and PWB replacement.
- LED diagnostics have been expanded to simplify troubleshooting.

These topics will be discussed further in this manual.

2005-2006 PTV Product Line

Specifications for the 2005-2006 PTV product line are given starting on the following page.

517 Series

V27 Chassis Digital Cable Ready HDTV

Preliminary Specifications



WD-55517



WD-65517



WD-73517

Model	Screen Size	Preliminary Cabinet Dimensions/Weight (HxWxD, lbs.)
WS-55517	55"	50.7" x 50.5" x 28", 215 lbs.
WS-65517	65"	62" x 58.9" x 28.4", 330 lbs.
WS-73517	73"	66.3" x 65.9" x 29.9", 395 lbs.

Video Features

Plush™ Imaging	•
Comb Filter	Motion-Adaptive 480-Line 3D Y/C
Automatic Film Mode (3:2 pulldown compensation)	•
DefinEdge™ VSM	Selectable by input
HDTV Scanning Rate	1080i
Picture Format Modes for analog 480i/480p and 4:3 digital sources	6
Picture Format Modes for analog 1080i and digital 16:9 sources	2

Picture Performance

ColorTuned™ Shield	User-Removable
CRT Size	7" WS-55517 and WS-65517 9" WS-73517

User Interface

Control Features

NetCommand®	•
CableCommand™ (Digital Cable Control)	•
ChannelView™ (On-screen Channel List)	•
IR System Control with Learning Mode	•
PerfectColor™ / Auto Color Correction	Selectable by input
Full Screen Freeze Frame	•

PIP/POP Features

Multi-Image	1 PIP, 3 and 9 POP
Split Screen	•
Channel Preview/Input Strobe (analog channels only)	•

Audio

Speakers	
WS-55517, WS-65517, WS-73517	5" Full Range x 2
Output Power (Watts)	10W x 2

Features, specifications and dimensions are preliminary and are subject to change.

CableCARD is a trademark of Cable Television Laboratories, Inc.

FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

DTVLink is a trademark of Consumer Electronics Association.

Tuning

Digital Tuner (Air/Cable-ATSC/QAM)	1
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes

Antenna (RF) Inputs

Analog / Digital Combined	2
CableCARD™ Slot	•

AV Inputs (Analog)

AV Inputs with S-Video (Front/Rear) with Stereo Audio	1/2
Component Video Inputs with Stereo Audio	2 (480i/480p/1080i)

AV Outputs (Analog)

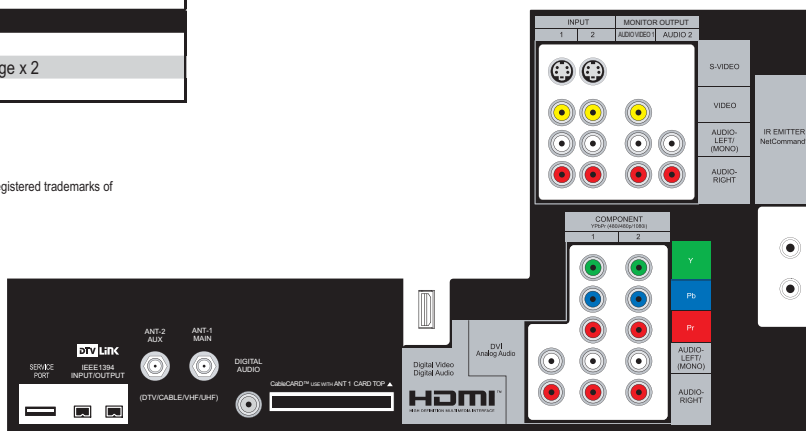
Monitor A/V Output (for recording)	•
Stereo Audio Output (fixed audio)	•

Inputs/Outputs (Digital)

FireWire® (IEEE 1394) (Front/Rear)	1/2
HDMI™ with analog stereo input	1
Digital Audio Bitstream Output (Dolby® Digital)	1 (coaxial)

Included Accessories

Multibrand Illuminated Remote Control	Illuminated
IR Emitter Cable	1 (2-headed)
Digital Coaxial Audio Cable	1



526 Series

V28L Chassis LCD HDTV

Model	WD-52526	WD-62526
Screen Size	52"	62"
Aspect Ratio	16:9 (widescreen)	16:9 (widescreen)
Height	33.9"	40.3"
Width	49.6"	58.3"
Depth	17.8"	19.9"
Height On Base	51.9"	58.4"
Weight	110 lbs.	133 lbs.
Power Consumption	225 Watts	225 Watts



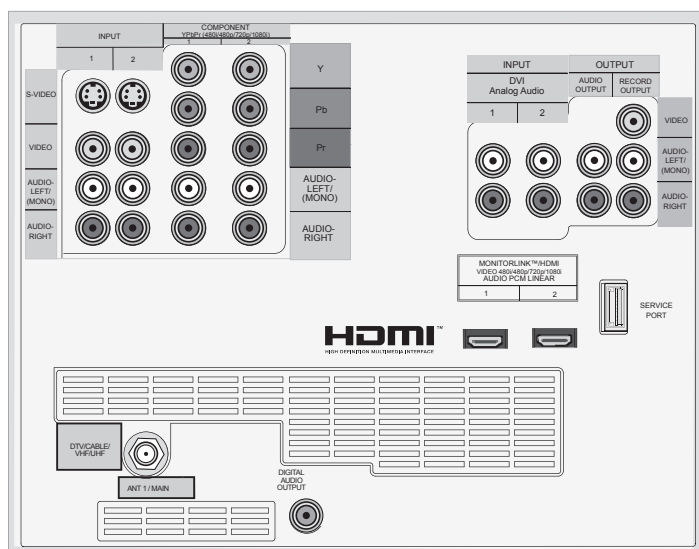
WD-52526 Shown on Optional Matching Base

Optical System	
Light Engine	Proprietary 3LCD
Pixel Resolution (horizontal x vertical)	1280 x 720
LCD Driver	QuickMotion™
Lamp Power	110W
High Contrast System	SmartShutter™
Screen Protective Shield	No
Video Performance	
Video Signal Conversion	Plush720p™
PerfectColor™	•
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2
User Interface	
Control Features	
ChannelView™ (on-screen channel list)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Bright/Natural Mode	•
Full Screen Image Freeze	•
PIP with External Devices	
PIP Still, Exchange, and Move	•
Split Screen	•
Audio	
Internal Loudspeakers	Stereo Full Range
Speaker Sizes	5 1/2" x 2 1/4"
Output Power (watts x ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for All Analog Sources	•
Tuning	
HDTV Air/Cable (ATSC/QAM)	1
Analog Air/Cable (NTSC)	1
Antenna (RF) Inputs	
Analog / Digital Combined	1
AV Inputs (Analog) with Stereo Audio	
Front A/V Inputs with S-Video	1
Rear A/V Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	2

Inputs / Outputs (Digital)	
HDMI™/ MonitorLink™ with DVI Stereo Audio (480i/480p/720p/1080i/PCM audio)	2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Outputs (Analog)	
Stereo Audio Output	2 (fixed)
Video Output	1
Customization Features	
Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•
Included Accessories	
Multibrand Illuminated Remote Control	•
Digital Coaxial Audio Cable	No

Descriptions and specifications subject to change without notice.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC. Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.



527 Series

V28 Chassis LCD HDTV

Preliminary Specifications

Model	WD-52527	WD-62527
Screen Size	52"	62"
Aspect Ratio	16:9 (widescreen)	16:9 (widescreen)
Height	34"	40.5"
Width	49.6"	58.3"
Depth	17.8"	19.9"
Height On Base	51.9"	58.4"
Weight	110 lbs.	132 lbs.
Power Consumption	295 Watts	295 Watts



WD-52527 Shown on Optional Matching Base

Optical System	
Light Engine	Proprietary 3LCD
Pixel Resolution (horizontal x vertical)*	1280 x 720
LCD Driver	Quick Motion™
Lamp Power	110W
High Contrast System	SmartShutter™
Screen Protective Shield	No
Video Performance	
Video Signal Conversion	Plush720p™
PerfectColor™	•
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2
User Interface	
Control Features	
TV Guide On Screen® (8-day interactive guide)	•
NetCommand® 5.0 Home Theater Control	•
IR Learning	•
ChannelView™ (On-screen Channel List)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Day / Night mode	•
Full Screen Image Freeze	•
2-Tuner PIP	
PIP Still, Exchange, and Move	•
Split Screen	•
Audio	
Internal Loudspeakers	Stereo Full Range
Speaker Sizes	5 1/2" x 2 1/4"
Output Power (watts x ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for all Analog Sources	•
Tuning	
Digital Tuner (Air/Cable-ATSC/QAM)	1
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes
Antenna (RF) Inputs	
Analog / Digital Combined	2
AV Inputs (Analog) with stereo audio	
Front A/V Inputs with S-Video	1
Rear A/V Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	2

Inputs / Outputs (Digital)	
MonitorLink™ / HDMI™ with DVI stereo audio (480i/480p/720p/1080i/PCM Audio)	2
FireWire® (IEEE1394) (MPEG2) front/rear	0/2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Outputs (Analog)	
Stereo Audio Output	1 (fixed)
Independent Record AV Output	1
NetCommand® / G-Link™ IR Emitter	2
Customization Features	
Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•
Included Accessories	
Multibrand Illuminated Remote Control	•
IR Emitter Cable	1 (2-headed)
Digital Coaxial Audio Cable	No

Features, specifications and dimensions are preliminary and are subject to change.

CableCARD is a trademark of Cable Television Laboratories, Inc.

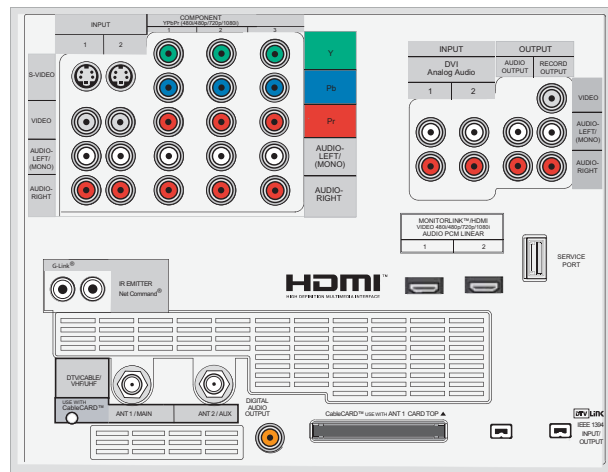
FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

DTVLink is a trademark of Consumer Electronics Association.

TV GUIDE and other related marks are registered marks of Gemstar-TV Guide International, Inc. and/or one of its affiliates.



528 Series

V28+ Chassis LCD HDTV

Preliminary Specifications

Model	WD-52528	WD-62528
Screen Size	52"	62"
Aspect Ratio	16:9 (widescreen)	16:9 (widescreen)
Height	34"	40.5"
Width	49.6"	58.3"
Depth	17.8"	19.9"
Height On Base	51.9"	58.4"
Weight	110 lbs.	133 lbs.
Power Consumption	295 Watts	295 Watts



WD-52528 Shown on Optional Matching Base

Optical System	
Light Engine	Proprietary 3LCD
Pixel Resolution (horizontal x vertical)*	1280 x 720
LCD Driver	Quick Motion™
Lamp Power	110W
High Contrast System	SmartShutter™
Screen Protective Shield	No
Video Performance	
Video Format Conversion	Plush720p™
PerfectColor™	•
DeepField™ Imager (switchable)	Yes
SharpEdge™ (switchable)	Yes
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2
User Interface	
Control Features	
TV Guide On Screen® (8-day interactive guide)	•
NetCommand® 5.0 Home Theater Control	•
IR Learning	•
ChannelView™ (On-screen Channel List)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Day / Night mode	•
Full Screen Image Freeze	•
2-Tuner PIP	
PIP Still, Exchange, and Move	•
Split Screen	•
Channel Preview	3 POP
Audio	
Internal Loudspeakers	Stereo Full Range
Speaker Sizes	5 1/2" x 2 1/4"
Output Power (watts/ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for all Analog Sources	•
Tuning	
Digital Tuner (Air/Cable-ATSC/QAM)	1
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes
Antenna (RF) Inputs	
Analog / Digital Combined	2
AV Inputs (Analog) with stereo audio	
Front AV Inputs with S-Video	1
Rear AV Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	3

Inputs / Outputs (Digital)	
MonitorLink™ / HDMI™ with DVI stereo audio (480i/480p/720p/1080i/PCM Audio)	2
FireWire® (IEEE1394) (MPEG2) front/rear	0/2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Outputs (Analog)	
Stereo Audio Output	1 (fixed)
Independent Record AV Output	1
NetCommand® / G-Link™ IR Emitter	2
NetCommand® Remote Control	
Illuminated	•
Full Screen Remote Sensor	•
Customization Features	
Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•
Included Accessories	
Multibrand Fully-Illuminated Remote Control	•
IR Emitter Cable	1 (4-headed)
Digital Coaxial Audio Cable	•

Features, specifications and dimensions are preliminary and are subject to change.

CableCARD is a trademark of Cable Television Laboratories, Inc.

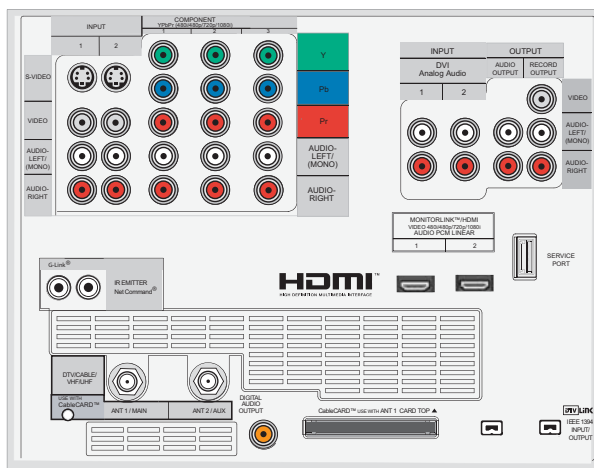
TV GUIDE and other related marks are registered marks of Gemstar-TV Guide International, Inc. and/or one of its affiliates.

FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

DTVLink is a trademark of Consumer Electronics Association.



627 Series

V29 Chassis 1080p DLP™ HDTV

Preliminary Specifications

Model	WD-52627	WD-62627
Screen Size	52"	62"
Aspect Ratio	16:9 (widescreen)	16:9 (widescreen)
Height	34"	40.5"
Width	49.6"	58.3"
Depth	18.6"	20.3"
Height On Base	51.9"	58.4"
Weight	121 lbs.	133 lbs.
Power Consumption	295 Watts	295 Watts

Optical System

Light Engine	Proprietary DLP™ Light Engine
Pixel Resolution (horizontal x vertical*)	1920 x 1080
Color Wheel	6-Segment (10,800 RPM)
Lamp Power	120W
Dark Detailer™	•
Screen Protective Shield	No

Video Performance

Video Format Conversion	Plush1080p™
PerfectColor™	•
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2

User Interface

Control Features

TV Guide On Screen® (8-day interactive guide)	•
NetCommand® 5.0 Home Theater Control	•
IR Learning	•
ChannelView™ (On-screen Channel List)	•
MediaCommand™ (9-format Memory Card Reader)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Day / Night mode	•
Full Screen Image Freeze	•

2-Tuner PIP

PIP Still, Exchange, and Move	•
Split Screen	•
Channel Preview	No

Audio

Internal Loudspeakers	Stereo 2-Way
Speaker Sizes	1.5" Round x 2, 5.5" x 2.2" x 2
Output Power (watts/ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for all Analog Sources	•

Tuning

Digital Tuner (Air/Cable-ATSC/QAM)	1
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes

Antenna (RF) Inputs

Analog / Digital Combined	2
---------------------------	---



WD-52627 Shown on Optional Matching Base

AV Inputs (Analog) with stereo audio

Front A/V Inputs with S-Video	1
Rear A/V Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	3

Inputs / Outputs (Digital)

MonitorLink™ / HDMI™ with DVI stereo audio (480i/480p/720p/1080i/PCM Audio)	2 (1 VGA-XGA/60HZ)
FireWire® (IEEE1394) (MPEG2 / DV) front/rear	1/2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Memory Card Reader (JPEG/MP3/WMA)	9-Format

Outputs (Analog)

Stereo Audio Output	1 (fixed)
Independent Record AV Output	1
NetCommand® / G-Link™ IR Emitter	2

NetCommand® Remote Control

Illuminated	•
Full Screen Remote Sensor	•

Customization Features

Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•

Included Accessories

Multibrand Illuminated Remote Control	•
IR Emitter Cable	1 (2-headed)
Digital Coaxial Audio Cable	No

*TV and some PC displays have standard overscan

Features, specifications and dimensions are preliminary and are subject to change.

Digital Light Processing, Digital Micromirror Device, and DLP are trademarks of Texas Instruments.

CableCARD is a trademark of Cable Television Laboratories, Inc.

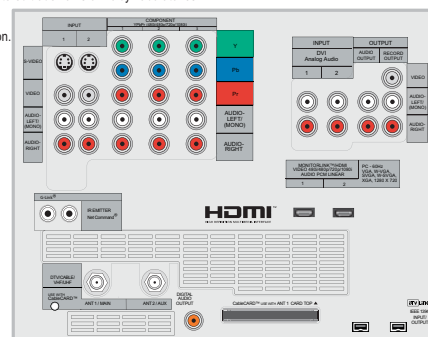
TV GUIDE and other related marks are registered marks of Gemstar-TV Guide International, Inc. and/or one of its affiliates.

FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

DTVLink is a trademark of Consumer Electronics Association.



628 Series

V30 Chassis 1080p DLP™ HDTV

Preliminary Specifications

Model	WD-52628	WD-62628
Screen Size	52"	62"
Aspect Ratio	16:9 (widescreen)	16:9 (widescreen)
Height	34"	40.5"
Width	49.6"	58.3"
Depth	18.6"	20.3"
Height On Base	51.9"	58.4"
Weight	121 lbs.	133 lbs.
Power Consumption	295 Watts	295 Watts

Optical System	
Light Engine	Proprietary DLP™ Light Engine
Pixel Resolution (horizontal x vertical*)	1920 x 1080
Color Wheel	6-Segment (10,800 RPM)
Lamp Power	120W
Dark Detailer™	•
Screen Protective Shield	No
Video Performance	
Video Format Conversion	Plush1080p™
PerfectColor™	•
DeepField™ Imager (switchable)	Yes
SharpEdge™ (switchable)	Yes
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2
User Interface	
Control Features	
TV Guide On Screen® (8-day interactive guide)	•
NetCommand® 5.0 Home Theater Control	•
IR Learning	•
ChannelView™ (On-screen Channel List)	•
MediaCommand™ (9-format Memory Card Reader)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Day / Night mode	•
Full Screen Image Freeze	•
2-Tuner PIP	
PIP Still, Exchange, and Move	•
Split Screen	•
Channel Preview	3 POP
Audio	
Internal Loudspeakers	Stereo 2-Way
Speaker Sizes	1.5" Round x 2, 5.5" x 2.2" x 2
Output Power (watts/ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for all Analog Sources	•
Tuning	
Digital Tuner (Air/Cable-ATSC/QAM)	1
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes
Antenna (RF) Inputs	
Analog / Digital Combined	2

*TV and some PC displays have standard overscan

Features, specifications and dimensions are preliminary and are subject to change.



WD-52628 Shown on Optional Matching Base

AV Inputs (Analog) with stereo audio	
Front A/V Inputs with S-Video	1
Rear A/V Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	3
Inputs / Outputs (Digital)	
MonitorLink™ / HDMI™ with DVI stereo audio (480i/480p/720p/1080i/PCM Audio)	2 (1 VGA-XGA/60HZ)
FireWire® (IEEE1394) (MPEG2 / DV) front/rear	1/2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Memory Card Reader (JPEG/MP3/WMA)	9-Format
Outputs (Analog)	
Stereo Audio Output	1 (fixed)
Independent Record AV Output	1
NetCommand® / G-Link™ IR Emitter	2
NetCommand® Remote Control	
Fully-Illuminated	•
Full Screen Remote Sensor	•
Customization Features	
Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•
Included Accessories	
Multibrand Fully-Illuminated Remote Control	•
IR Emitter Cable	1 (4-headed)
Digital Coaxial Audio Cable	Yes

Digital Light Processing, Digital Micromirror Device, and DLP are trademarks of Texas Instruments.

CableCARD is a trademark of Cable Television Laboratories, Inc.

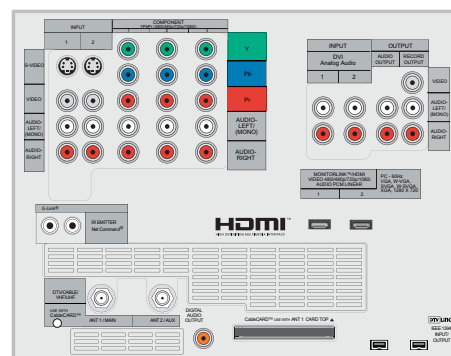
TV GUIDE and other related marks are registered marks of Gemstar-TV Guide International, Inc. and/or one of its affiliates.

FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

DTVLink is a trademark of Consumer Electronics Association.



727 Series

V30 Chassis 1080p DLP™ HDTV

Preliminary Specifications

Model	WD-73727
Screen Size	73"
Aspect Ratio	16:9 (widescreen)
Height	44.8"
Width	69.9"
Depth	21.5"
Height On Base	62.7"
Weight	165 lbs.
Power Consumption	335 Watts



WD-73727 Shown on Optional Matching Base

Optical System	
Light Engine	Proprietary DLP™ Light Engine
Pixel Resolution (horizontal x vertical*)	1920 x 1080
Color Wheel	6-Segment (10,800 RPM)
Lamp Power	150W
Dark Detailer™	•
Screen Protective Shield	No
Video Performance	
Video Format Conversion	Plush1080p™
PerfectColor™	•
DeepField™ Imager (switchable)	Yes
SharpEdge™ (switchable)	Yes
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2
User Interface	
Control Features	
TV Guide On Screen® (8-day interactive guide)	•
NetCommand® 5.0 Home Theater Control	•
IR Learning	•
ChannelView™ (On-screen Channel List)	•
MediaCommand™ (9-format Memory Card Reader)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Day / Night mode	•
Full Screen Image Freeze	•
2-Tuner PIP	
PIP Still, Exchange, and Move	•
Split Screen	•
Channel Preview	3 POP
Audio	
Internal Loudspeakers	Stereo 2-Way
Speaker Sizes	1.5" Round x 2, 5.5" x 2.2" x 2
Output Power (watts/ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for all Analog Sources	•
Tuning	
Digital Tuner (Air/Cable-ATSC/QAM)	1
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes
Antenna (RF) Inputs	
Analog / Digital Combined	2

AV Inputs (Analog) with stereo audio	
Front A/V Inputs with S-Video	1
Rear A/V Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	3
Inputs / Outputs (Digital)	
MonitorLink™ / HDMI™ with DVI stereo audio (480i/480p/720p/1080i/PCM Audio)	2 (1 VGA-XGA/60HZ)
FireWire® (IEEE1394) (MPEG2 / DV) front/rear	1/2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Memory Card Reader (JPEG/MP3/WMA)	9-Format
Outputs (Analog)	
Stereo Audio Output	1 (fixed)
Independent Record AV Output	1
NetCommand® / G-Link™ IR Emitter	2
NetCommand® Remote Control	
Illuminated	•
Full Screen Remote Sensor	•
Customization Features	
Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•
Included Accessories	
Multibrand Illuminated Remote Control	•
IR Emitter Cable	1 (4-headed)
Digital Coaxial Audio Cable	No

*TV and some PC displays have standard overscan

Features, specifications and dimensions are preliminary and are subject to change.

Digital Light Processing, Digital Micromirror Device, and DLP are trademarks of Texas Instruments.

CableCARD is a trademark of Cable Television Laboratories, Inc.

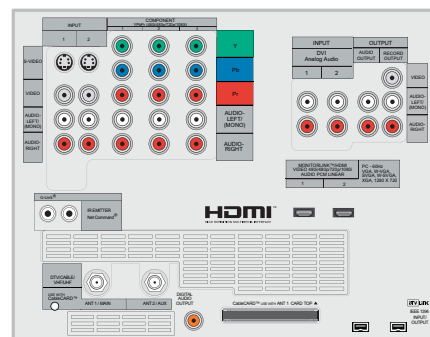
TV GUIDE and other related marks are registered marks of Gemstar-TV Guide International, Inc. and/or one of its affiliates.

FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

DTVLink is a trademark of Consumer Electronics Association.



827 Series

V30+ Chassis 1080p DLP™ HDTV

Preliminary Specifications

Model	WD-62827	WD-73827
Screen Size	62"	73"
Aspect Ratio	16:9 (widescreen)	16:9 (widescreen)
Height	40.5"	44.8"
Width	60.3"	69.9"
Depth	20.3"	21.5"
Height On Base	58.4"	62.7"
Weight	133 lbs.	165 lbs.
Power Consumption	31 Watts	350 Watts



WD-73827 Shown on Optional Matching Base

Optical System	
Light Engine	Proprietary DLP™ Light Engine
Pixel Resolution (horizontal x vertical*)	1920 x 1080
Color Wheel	6-Segment (10,800 RPM)
Lamp Power	150W
Dark Detailer™	•
Screen Protective Shield	Removable Anti-Glare
Video Performance	
Video Format Conversion	Plush1080p™
PerfectColor™	•
DeepField™ Imager (switchable)	Yes
SharpEdge™ (switchable)	Yes
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2
User Interface	
Control Features	
TV Guide On Screen® (8-day interactive guide)	•
NetCommand® 5.0 Home Theater Control	•
IR Learning	•
ChannelView™ (On-screen Channel List)	•
MediaCommand™ (9-format Memory Card Reader)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Day / Night mode	•
Full Screen Image Freeze	•
PVR Features	
Internal DVR (Hard Disc Drive Recorder)	160 GB
Live TV Pause and Instant Replay	•
Digitally Record Analog Channels	•
Digitally Record Digital SD and HD Channels	•
Record One Program While Watching Another Program or Input	•
Schedule Recordings from TV Guide On Screen®	•
Digitally Record from Video / S-Video Devices	•
Digitally Record / Playback from FireWire®	•
MPEG2 Devices	•
Dolby® Digital Record for analog audio	•
2-Tuner PIP	
PIP Still, Exchange, and Move	•
Split Screen	•
Channel Preview	3 POP

*TV and some PC displays have standard overscan

Features, specifications and dimensions are preliminary and are subject to change.

Digital Light Processing, Digital Micromirror Device, and DLP are trademarks of Texas Instruments.

CableCARD is a trademark of Cable Television Laboratories, Inc.

TV GUIDE and other related marks are registered marks of Gemstar-TV Guide International, Inc. and/or one of its affiliates.

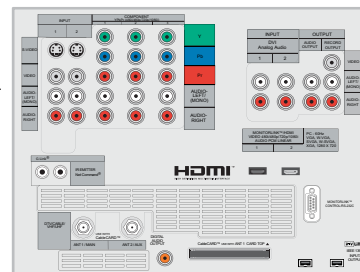
Audio	
Internal Loudspeakers	2 Stereo 2-Way
Speaker Sizes	1.5" Round x 2, 5.5" x 2.2" x 2
Output Power (watts/ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for all Analog Sources	•
Tuning	
Digital Tuner (Air/Cable-ATSC/QAM)	2
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes
Antenna (RF) Inputs	
Analog / Digital Combined	2
AV Inputs (Analog) with stereo audio	
Front A/V Inputs with S-Video	1
Rear A/V Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	3
Inputs / Outputs (Digital)	
MonitorLink™ / HDMI™ with DVI stereo audio (480i/480p/720p/1080i/PCM Audio)	2 (1 VGA-XGA compatible)
FireWire® (IEEE1394) (MPEG2/DV) front/rear	1/2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Memory Card Reader (JPEG/MP3/WMA)	9-Format
Outputs (Analog)	
Stereo Audio Output	1 (fixed)
Independent Record AV Output	1
NetCommand® / G-Link™ IR Emitter	2
NetCommand® Remote Control	
Fully-Illuminated	•
Full Screen Remote Sensor	•
Customization Features	
Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•
RS-232C Input	•
Included Accessories	
Multibrand Fully-Illuminated Remote Control	•
IR Emitter Cable	1 (4-headed)
Digital Coaxial Audio Cable	•

FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

DTVLink is a trademark of Consumer Electronics Association.



927 Series

V31 Chassis 1080p DLP™ HDTV

Preliminary Specifications

Model	WD-62927	WD-73927
Screen Size	62"	73"
Aspect Ratio	16:9 (widescreen)	16:9 (widescreen)
Height	40.5"	44.8"
Width	60.3"	69.8"
Depth	20.3"	21.5"
Height On Base	58.4"	62.7"
Weight	133 lbs.	165 lbs.
Power Consumption	330 Watts	350 Watts



WD-73927 Shown on Included Matching Base

Optical System	
Light Engine	Proprietary DLP™ Light Engine
Pixel Resolution (horizontal x vertical*)	1920 x 1080
Color Wheel	6-Segment (10,800 RPM)
Lamp Power	150W
Dark Detailer™	•
Screen Protective Shield	Removable Anti-Glare
Video Performance	
Video Format Conversion	Plush1080p™
PerfectColor™	•
DeepField™ Imager (switchable)	Yes
SharpEdge™ (switchable)	Yes
Video Noise Reduction	•
Picture Format Modes (4:3 sources, including anamorphic DVDs)	6
Picture Format Modes (16:9 sources)	2
User Interface	
Control Features	
TV Guide On Screen® (8-day interactive guide)	•
NetCommand® 5.0 Home Theater Control	•
IR Learning	•
ChannelView™ (On-screen Channel List)	•
MediaCommand™ (9-format Memory Card Reader)	•
AV Adjustment (memorized by input/device)	•
Color Temperature Control (by device)	High/Low
Day / Night mode	•
Full Screen Image Freeze	•
PVR Features	
Internal DVR (Hard Disc Drive Recorder)	250 GB
Live TV Pause and Instant Replay	•
Digitally Record Analog Channels	•
Digitally Record Digital SD and HD Channels	•
Schedule Recordings from TV Guide On Screen®	•
Record One Program While Watching Different Program or Input	•
Digitally Record from Video / S-Video Devices	•
Digitally Record / Playback from FireWire®	•
MPEG2 Devices	•
Dolby® Digital Record for analog audio	•
2-Tuner PIP	
PIP Still, Exchange, and Move	•
Split Screen	•
Channel Preview	3 POP

*TV and some PC displays have standard overscan

Features, specifications and dimensions are preliminary and are subject to change.

Digital Light Processing, Digital Micromirror Device, and DLP are trademarks of Texas Instruments.

CableCARD is a trademark of Cable Television Laboratories, Inc.

Audio	
Internal Loudspeakers	Stereo 2-Way
Speaker Sizes	1.5" Round x 2, 5.5" x 2.2" x 2
Output Power (watts/ch.)	10W x 2
Level Sound (dynamics limiter)	•
Digital Output (PCM) for all Analog Sources	•
Tuning	
Digital Tuner (Air/Cable-ATSC/QAM)	1
Analog Tuner (Air/Cable)	2
CableCARD™ Slot	Yes
Antenna (RF) Inputs	
Analog / Digital Combined	2
AV Inputs (Analog) with stereo audio	
Front A/V Inputs with S-Video	1
Rear A/V Inputs with S-Video	2
Component Video Inputs (480i/480p/720p/1080i)	3
PC Input (VGA-XGA, 1280x720, 1920x1080/60Hz)	1
Inputs / Outputs (Digital)	
MonitorLink™ / HDMI™ with DVI stereo audio (480i/480p/720p/1080i/PCM Audio)	2 (1 VGA-XGA / 60Hz)
FireWire® (IEEE1394 (MPEG2/ DV)) front/rear	1/2
Digital Audio Output (Dolby® Digital / PCM)	1 (coaxial)
Memory Card Reader (JPEG/MP3/WMA)	9-Format
Outputs (Analog)	
Stereo Audio Output	1 (fixed)
Independent Record AV Output	1
NetCommand® / G-Link™ IR Emitter	2
NetCommand® Remote Control	
Fully-Illuminated	•
Full Screen Remote Sensor	•
Customization Features	
Direct IR Input Selection	•
Direct IR Format Selection	•
Independent Power ON/OFF	•
RS-232 Input	•
Included Accessories	
Multibrand Fully-Illuminated Remote Control	•
IR Emitter Cable	1 (4-headed)
Digital Coaxial Audio Cable	•

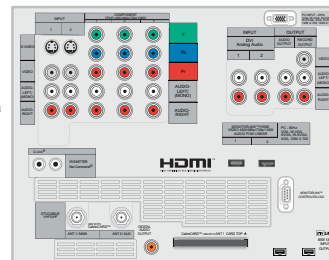
TV GUIDE and other related marks are registered marks of Gemstar-TV Guide International, Inc. and/or one of its affiliates.

FireWire is a registered trademark of Apple Computer, Inc.

HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

Dolby and Dolby Digital are registered trademarks of Dolby Laboratories.

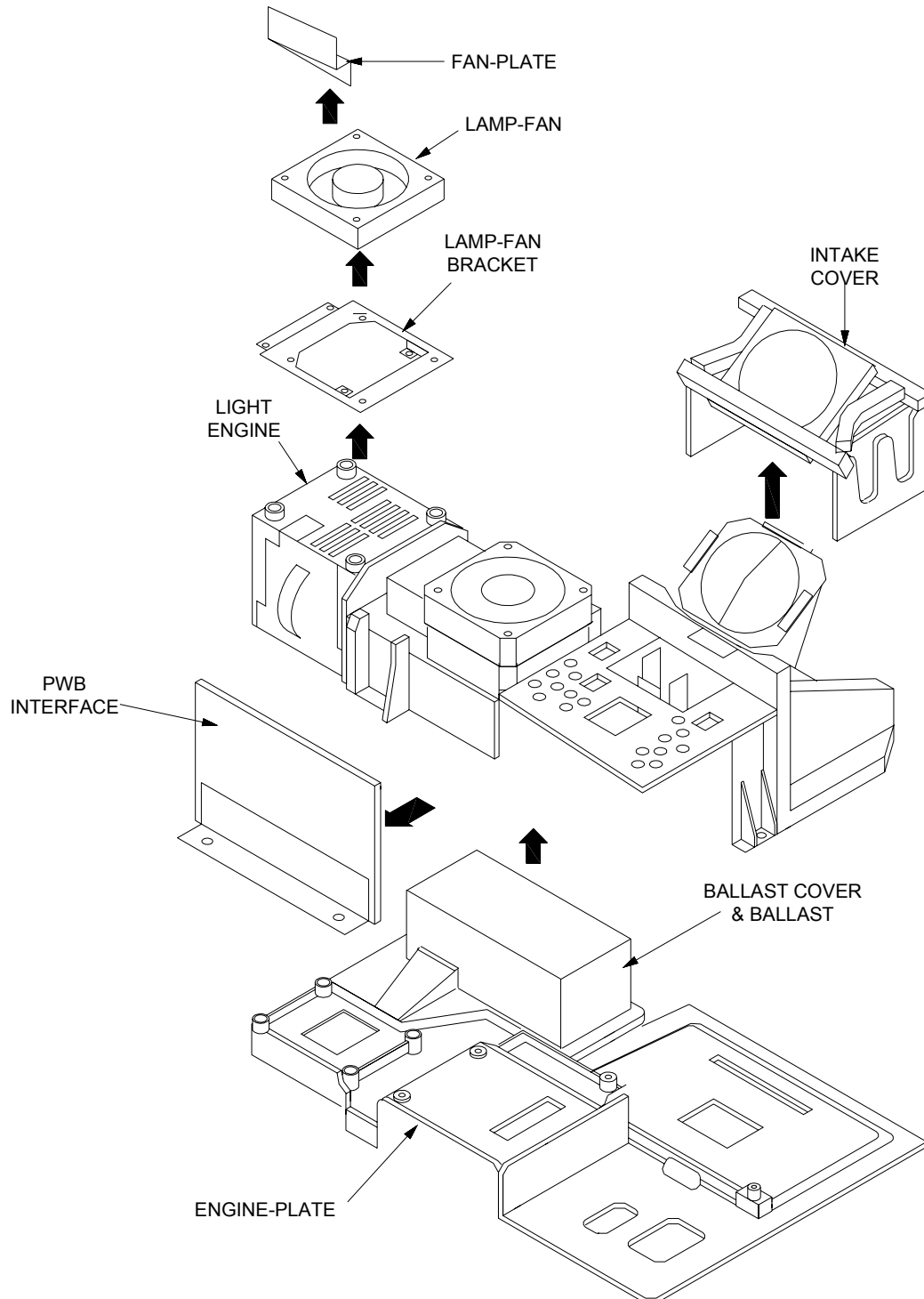
DTVLink is a trademark of Consumer Electronics Association.



Chapter 2

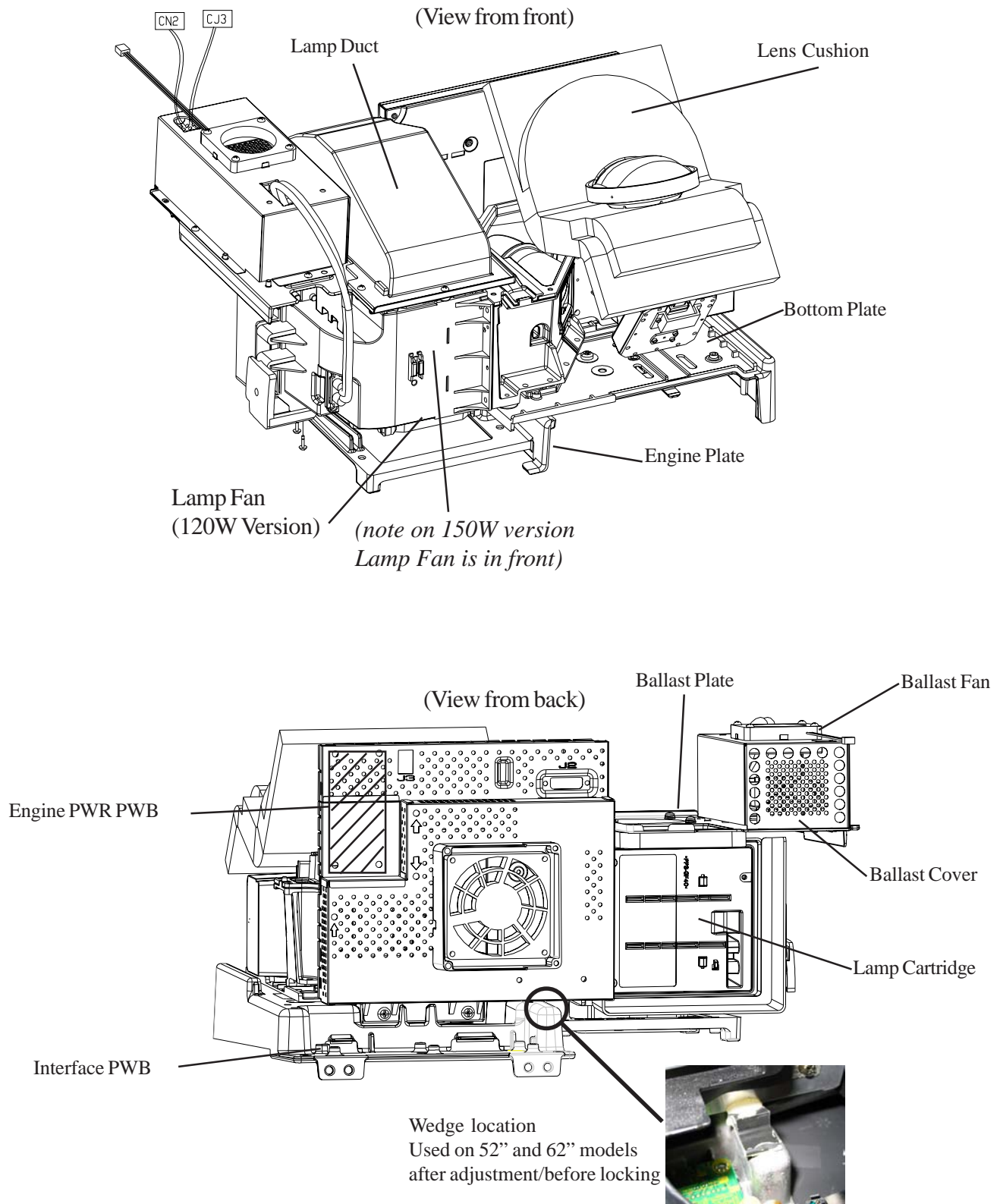
Disassembly and Service

V28L / V28 / V28+ LCD Optical Engine



Light Engine Removable Parts

V29 / V30 / V30+ / V31 DLP Optical Engine



Engine replacement instructions are included in the applicable service manuals as well as being included with the replacement part when it is shipped.

ENGINE DATA COPY (V29/30/31 Only)

After engine has been installed the engine data needs to be copied to the chassis.

Press MENU + 2457 + 0

Press ENTER to select copy light engine EEPROM to DM

→ Copy Light Engine EEPROM to DM
Restore backup
UPLOAD TERMINAL BOARD DATA
DOWNLOAD WB ALIGNMENT TO FMT

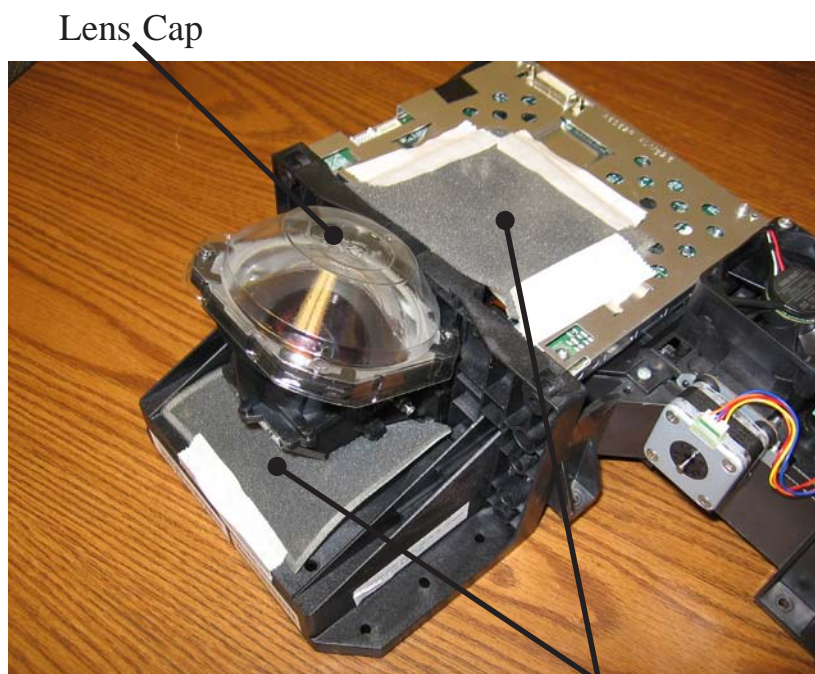
ENGINE SHIPPING PREP

From replacement engine:

Remove Lens Cap and install to original engine.

Remove 2 protective foam pieces and install to original engine for shipping.

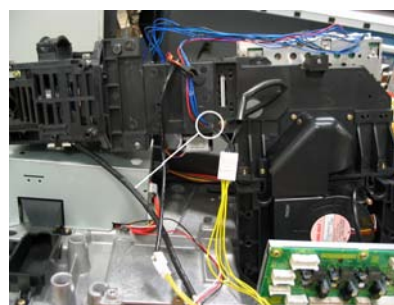
V28 engine pictured. V29-V31 engines also require lens cap but do not have protective foam.



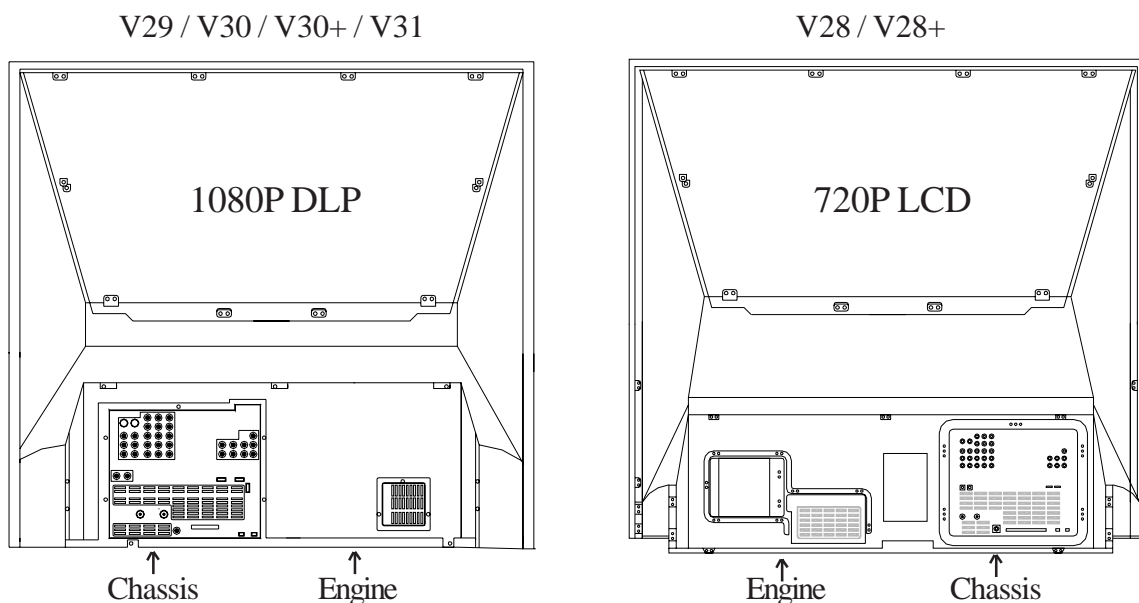
2 Protective Foam pieces

V28 ENGINE SHUTTER (Contrast control system)

LCD engine has a contrast control shutter unit. If this unit is not functioning the TV may not turn on. Error code can report "5-6", you may want to check CN5.



MODEL-CHASSIS IDENTIFICATION



EXTERNAL TESTING

The PWB chassis can be operated outside of the cabinet for testing. This gives access for voltage or signal measurements on all PWBs.

Detailed instructions are included in the service manual.

The unit can be operated without the Terminal PWB installed or with the chassis fan disconnected. However, with the chassis fan disconnected the TV will shutdown if the temperature on the bottom side of the Micro PWB gets too hot.

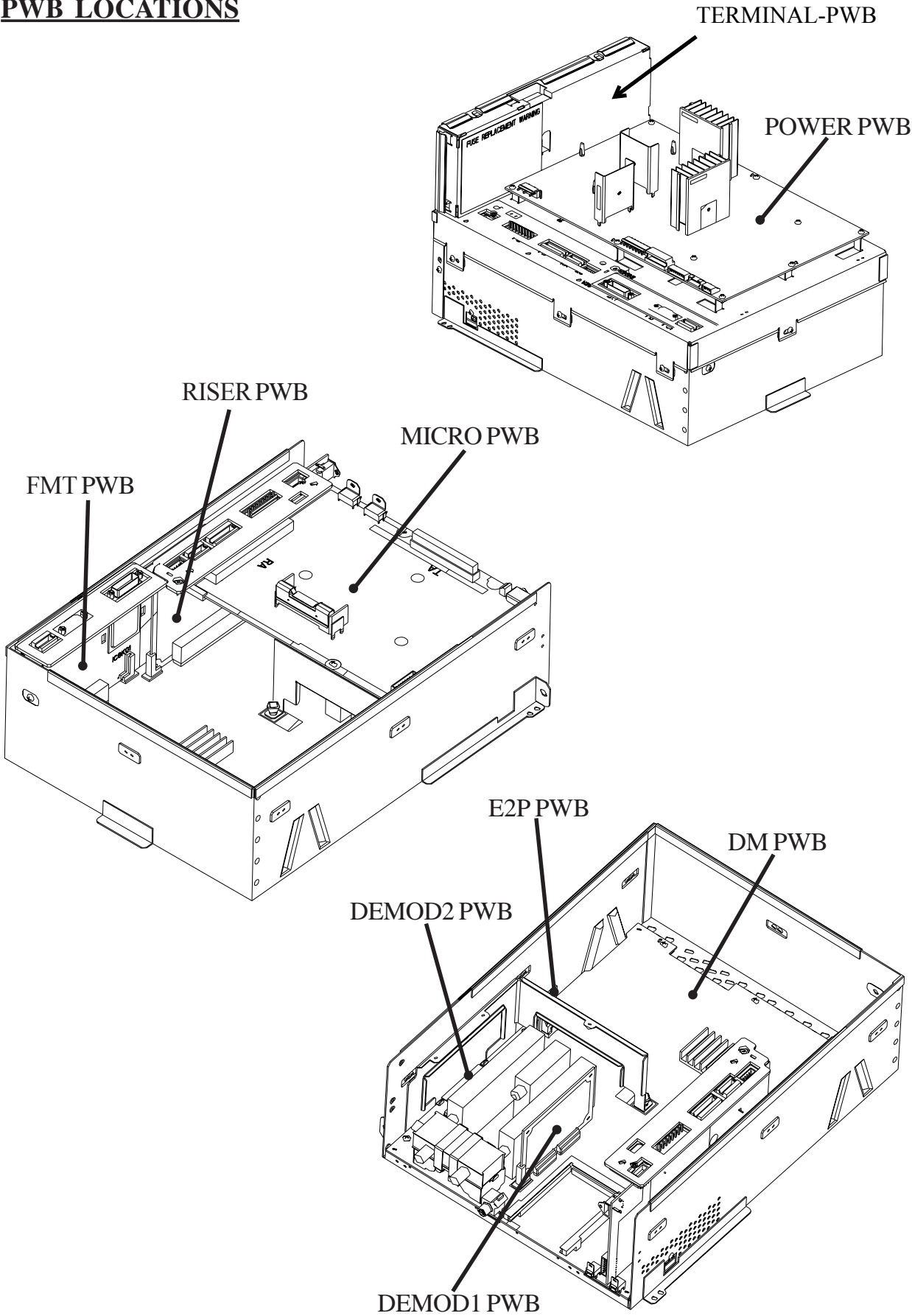
(WD-52627 PICTURED)



CHASSIS PWB SIMILARITIES

PWB	V28L	V28	V28+	V29	V30	V30+	V31
DEM0D1	935D819002	935D819001	↔	↔	↔	↔	↔
DEM0D2	N/A	N/A	N/A	N/A	N/A	935D839001	↔
DM	934C152009	934C152001	↔	934C152005	934C152006	934C152007	↔
E2P	935D820001	↔	↔	↔	↔	↔	↔
INTERFACE	934C155001	↔	↔	934C155005	↔	↔	↔
MICRO	934C151002	934C151001	↔	934C151005	↔	934C151006	↔
POWER1	930B933001	↔	↔	N/A	N/A	N/A	N/A
POWER2	N/A	N/A	N/A	934C159001	↔	934C159002	↔
RISER	934C154003	934C154001	↔	934C154002	↔	934C154005	↔
TERMINAL	934C150001	↔	934C150002	934C150005	↔	934C150006	↔
FMT	934C153001	↔	↔	934C160001	↔	↔	934C160002
ENG-PWR	N/A	N/A	N/A	955C283001	↔	↔	↔

PWB LOCATIONS

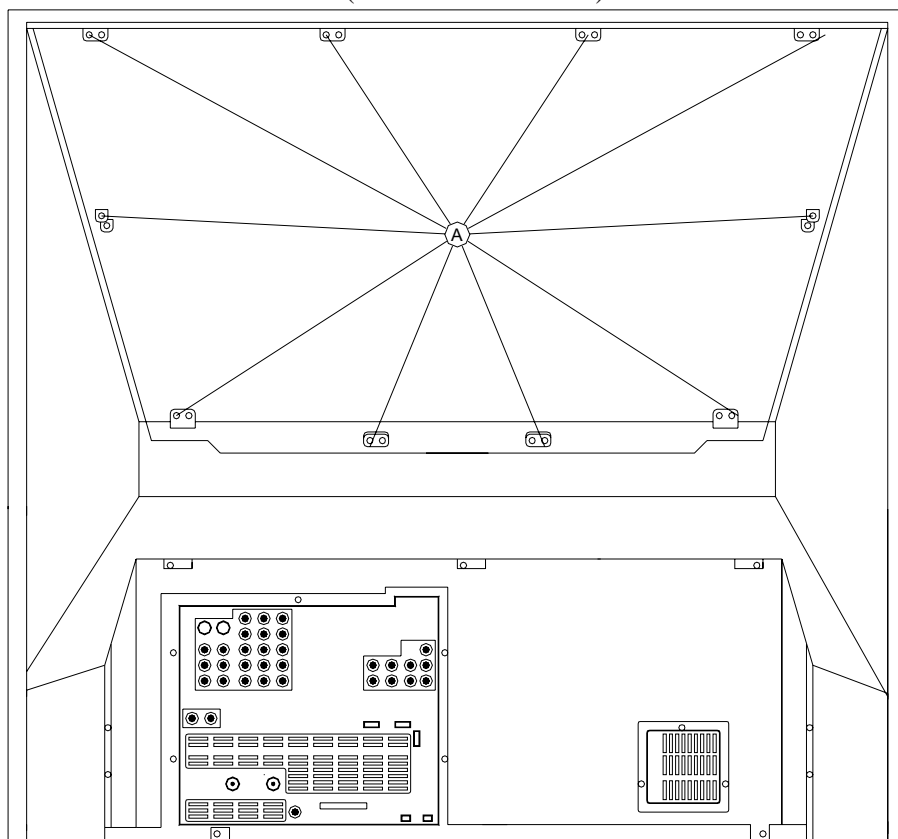


PWB NAME	PWB FUNCTION	LAYER	CIRCUIT
POWER1	Converts input AC current to DC supply voltages and creates ballast board voltage.	2 layer	V28 POWER SUPPLY
POWER2	Converts input AC current to DC supply voltages and creates ballast board voltage.	2 layer	V29 POWER SUPPLY
TERMINAL	Analog inputs and outputs for audio and video. Also houses the audio select circuitry. All analog audio and video connected to the terminal PWB are sent to the PWB-MICRO then eventually to the DM for processing before conversion in the PWB-FMT.	2 layer	PINJACKS AUDIO SWITCH
MICRO	Final processing and amplifier for audio. Main and sub video switching. TV micro processor and system 5 micro processor well as HDMI decoding.	4 layer	TV MICRO PIC MICRO HDMI AUDIO CONTROL AUDIO AMP VIDEO SWITCH
RISER	TVGuide data slicer and RS232 transceiver. Accepts composite video from SUB-Y signal from video switch on PWB-MICRO, slices the data from the carrier signal and sends it to the PWB-DM.	4 layer	G+ (TVGuide) M-LINK (RS232)
DM	Digital and analog video/audio signal processing. All video signals are converted to digital YPrPb and output to PWB-FMT. All Audio signals converted to analog left and right signals and sent to PWB-MICRO for final processing and amplification	6 layer	X226 (ATI Xilleon 226) MPEG encoder A/D converter DPM7 POD (CableCard) 1394 TUNERS
DEM0D1	Demodulates ATSC signal from main tuner.	4 layer	T313R
DEM0D2	Demodulates sub signal. V30+ and V31 only	4 layer	T310R
FMT-V28	Converts digital YPrPb video signal, input from DM, to TMDS (DVI) RGB video signal, output to engine. The format output is 720p	6 layer	SUITE FMT MICRO TMDS Transmitter
FMT-V29	Converts digital YPrPb video signal, input from DM, to TMDS (DVI) RGB video signal, output to engine. The format output is 1080p	8 layer	ADC PRELUDE SUITE FMT MICRO TMDS Transmitter
FRONT	Allows for an analog input connect in the front of the TV. This signal is passed to the Terminal PWB.	2 layer	Front Inputs
PREAMP	Receives IR signal from remote control and sends the commands to the TV micro and to System5 micro on the PWB-MICRO.	2 layer	Remote Control IR
SW-FILTER	Limit switch detects the presence of a filter installed. This circuit sends a signal to the TV micro to turn off the TV if a filter is not detected. V28/V28+ only	2 layer	Filter Detect
SW-LAMP	Limit switch detects the presence of a lamp installed. This circuit sends a signal to the TV micro to turn off the TV if a lamp is not detected.	2 layer	Lamp Detect
INTERFACE	Houses the lamp/engine/fan protection circuitry. Sends signal to the FMT or the PWB-MICRO to turn TV off if there is sensor or fan failure.	2 layer	FAN CONTROL CONNECTORS
CONTROL	Front panel control buttons. Sends signal to TV micro on PWB-MICRO.	2 layer	Panel Buttons
E2P	EE2PROM stores many of the data variables for adjustment and other functions.	4 layer	
ENG-PWR	Generates DC voltages to DLP engine (V29/V30/V30+/V31 only)	4 layer	V29 only : engine power

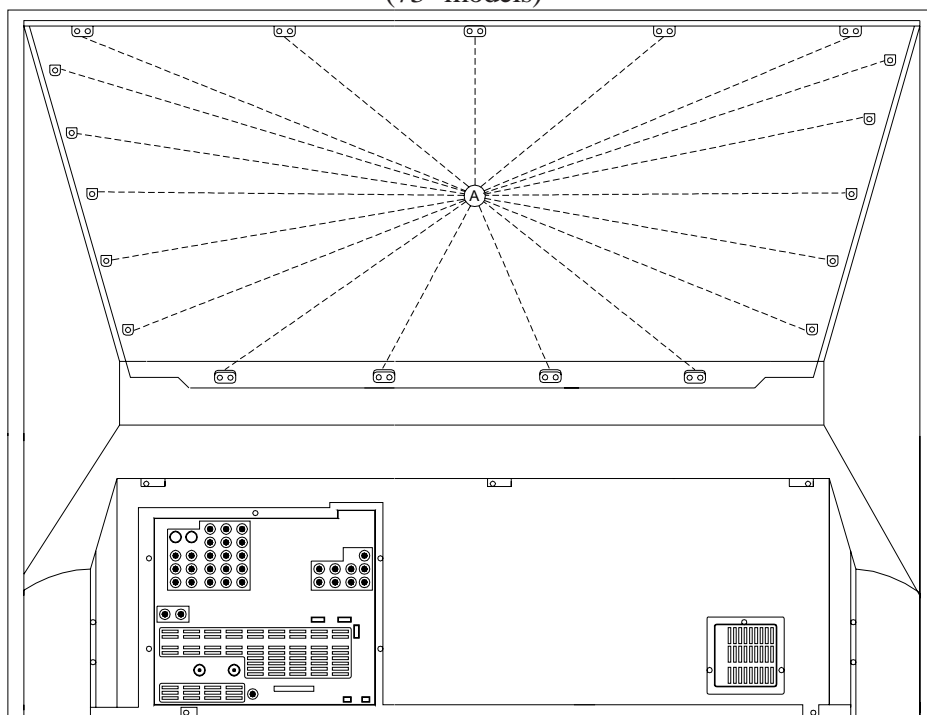
MIRROR ACCESS

Remove **(10)** screws maked “**A**” below for 52” and 62” models and **(19)** screws maked “**A**” below for 73” models. Panel can then be removed to expose the mirror and inside of the upper cabinet

(52” and 62” models)



(73” models)



LCD ENGINE ACCESS PANEL

Remove (2) screws shown below to gain access to the LCD engine area for cleaning of debris (V28/V28+ only).



(View from Front of unit)

Lead Free Solder

Mitsubishi's 2005-2006 product line, including the V28, V29, V30 and V31 chassis, will be constructed using lead free solder.

This is the first part of a 3 phase program to eliminate the lead content in all MDEA's electronic products. The 3 phases are:

- Phase 1... PCB's constructed using Pb-free solder. PCB surface finishing and components may contain Pb.
- Phase 2... Solder, PCB surface finishing and component lead plating is Pb-free. Components may have internal Pb.
- Phase 3... Solder, PCB surface finishing and components are Pb-free. (100% Pb-free)

Displays used to indicate Pb-free

PCBs will be marked, indicating the level of Pb-free construction. *Table 2-1* defines the levels by phase and shows the different symbols that will be displayed on the PCB. Additionally, a PCB constructed using Pb-free solder may be simply marked **LFS**.

When possible, the indication will be placed close to the part number that is screened onto the PCB (not the part label). *Figure 2-1* is an example of a PCB showing the display and its location.

Pb free solder differs from conventional leaded solder.

- The amount of tin in Pb-free solder is greater.
- The melting point of Pb-free solder is higher.







Pb-Free Phase	Definition	Display	Short Display (When the area is too small)
Phase-1	PCB's constructed using Pb-free solder.		
Phase-2	Solder, PCB surface finishing and component lead plating is Pb-free. Components may have internal Pb.		
Phase-3	Solder, PCB surface finishing and components are Pb-free. (100% Pb-free)		

Table 2-1: Pb-Free Phases and Symbols

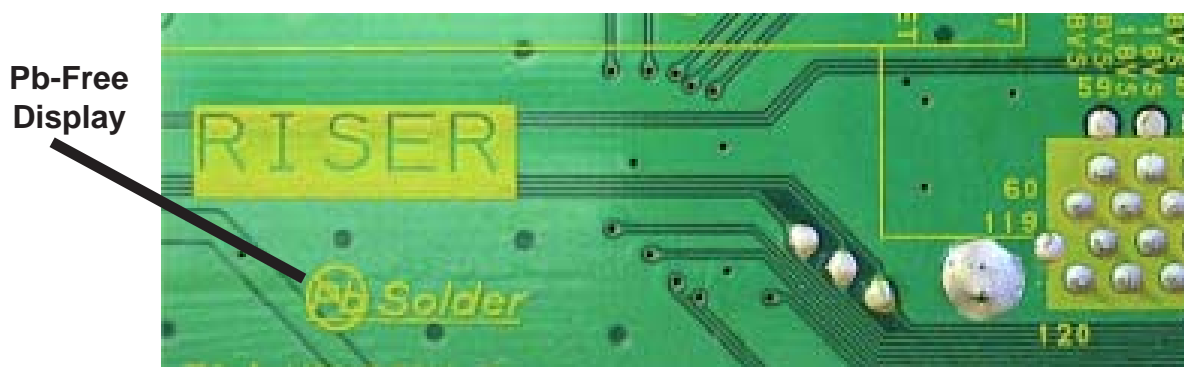


Figure 2-1: Pb-Free Display on PCB

Also, Lead-free solder does not "wet" as well as leaded solder. That means it has trouble adhering to both the soldering iron tip and the surface being soldered. To counteract this, the flux used is more corrosive. Lead-free solder also does not change from solid to liquid or back again all at once. It passes through a soft state. So, the melting process actually occurs through a range of temperatures.

This makes a significant impact when repairing PCBs using Pb-free solder. Problems that can be encountered working with Pb-free solder are:

- Excessive heat can cause the PCB to warp, detaching surface mount components.
- Excessive heat may cause thermal damage to components.
- Excessive heat can cause plastics such as connectors, relays, LEDs, electrolytic capacitors, etc. to melt or warp.
- Higher temperatures can cause surface oxidation resulting in poor solder spread-ability and wet-ability.
- The flux is more corrosive.
- The time required for a good solder connection may be longer.
- Poor wet-ability can cause solder balls.
- Higher temperatures can cause flux spattering.
- Soldering iron tip life is shortened.
- Duller finish solder joint can appear to be a "cold" solder joint.

Pb-free Hand Soldering

Hand soldering with lead-free solder doesn't necessarily require higher soldering temperatures. The melting time will be slightly slower than with leaded solder, requiring an increase in contact time. The solder joint will also look different. It will have a dull finish that is similar in appearance to a "cold" solder connection when using leaded solder.

To help eliminate problems working with lead free solder, consider the following points.

Temperature... Use the same soldering temperature as you would with tin-lead solder, about 700 F. If hotter, you may be making it more difficult to solder. The higher temperature causes oxidation to form faster, making wetting even more difficult. Excessive temperatures can also lengthen the cooling time, allowing micro-cracks to form within the joint.

Thermal Recovery... Use a soldering iron with good thermal recovery. When the iron is first applied to a cool joint, the heat transfer causes the tip temperature to drop. A higher powered iron will bring the tip back up to the proper temperature faster. Using a shorter tip will also improve thermal recovery.

Thermal Conduction... Use the widest tip possible in relation to the joint being soldered. This will allow the heat to conduct to the joint better. Also keep the tip wetted for better heat transfer.

Tip Cleanliness... Important! Keep the soldering iron tip clean at all times using a damp sponge. Re-tin the tip before returning the iron to its stand. To extend the tip life, do not leave the iron on when it is not being used for longer periods of time.

De-soldering... For the same reasons as soldering, increasing the temperature for de-soldering is not desirable. However, if a vacuum de-soldering tool is used, the solder must remain molten from the tip, all the way to the entrance to the filter. If the solder hardens along the way, it can clog the tool.

Solder

When performing repairs, it is necessary to use solder as that is compatible with that used in the original manufacture. Leaded solder cannot be used when soldering PCBs manufactured with Pb-free solder. And, Pb-free solder cannot be used on PCBs manufactured using leaded solder.

The Mitsubishi standard for service requires the use of Tin-Silver-Copper (Sn-96.5, Ag-3.0, Cu-0.5) solder. It can be obtained through the Parts Department.
Order part number: **PB FREE SOLDER**

Chapter 3

Adustments

Option Menu

The Option Menu and Option Menu access is the same on all chassis. To activate the Option Menu press “MENU-2-4-7-0”. *Figure 3-1* shows the Option Menu.

Service Mode

Activation of the Service Mode is also the same on all chassis, Press “MENU-2-4-5-7”. The procedure for using the Service Mode has not changed:

- “AUDIO” selects a function
- “VIDEO” selects a specific adjustment item
- “UP & DN” buttons adjusts data
- “ENTER” saves data changes.

There are two Adjustment Function on Each chassis type.

V28 Adjustment Functions

- 1) AD9881 Sub
- 2) fmt

V29/V30/V30+/V31 Adjustment Functions

- 1) Doubler
- 2) fmt

In either case, only the “fmt” function is used to perform service Adjustments.

Data Transfer

The data Transfer mode is activated when in the Service Mode by pressing “0”. *Table 3-1* show the Data Transfer choices in the V28 chassis, and *Table 3-2* the choices in the DLP chassis (V29/V30/V30+/V31)

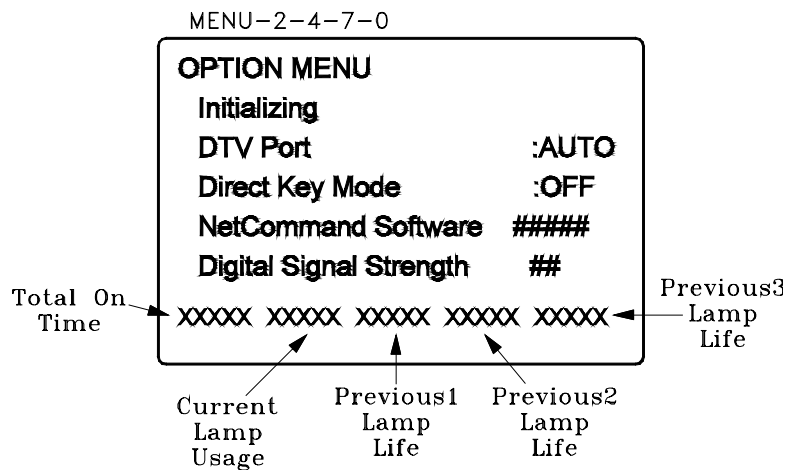


Figure 3-1: Option Menu

All chassis types can:

- Be Reset to Factory values
- Down load WB data to the FMT board

Down loading WB (White Balance) data to the FMT board is necessary if the PWB-FORMAT is replaced. The DLP chassis, “Copy Engine E2PROM data to the DM” is added. This is necessary if the DLP Engine is replaced.

Data Transfer

"MENU-2-4-5-7-0"

Display	Description
Restore Back Up	Resets data to factory values
Upload Terminal Data	Not used
Down load WB data to FMT	Use after replacing Engine PWB-FORMAT

Table 3-1: V28 Data Transfer Choices

Data Transfer

MENU-2-4-5-7-0

Display	Description
Copy Engine E2PROM to DM	Transfers Engine data to DM E2PROM
Restore Backup	Restores data to factory values
UPLOAD TERMINAL BOARD DATA	DO NOT USE
Download WB Alignment to FMT	Transfers Engine data to FMT

Table 3-2: DLP Chassis Data Transfer Choices

Service Adjustments

Adjustments are divided into two categories, mechanical and electrical. The Electrical Adjustments are positioning (centering) adjustments and the procedures are the same on both the LCD and DLP models.

Mechanical Adjustments

The Mechanical Adjustments are similar, but differ due to the different type Light Engines, Adjuster Assemblies and accessing procedures differ.

The Mechanical Adjustments on the V28 chassis are:

- Vertical Keystone Adjustmennt
- Picture Rotation Adjustmennt

On the V29~V31 chassis the Mechanical Adjustments are:

- Picture Rotation Adjustment
- Horizontal Keystone Adjustments
- Vertical Keystone Adjustments.

Adjustment Test Pattern

Figure 3-2 shows the internal Test Pattern is used on all chassis to perform the adjustments. When adjustments are complete press “MENU” twice to

The internal Test Pattern can be activated when in the Service Adjustment Mode:

- 1) Press “MENU-2-4-5-7” in sequence to activate the Service Mode.
- 2) Press “REW” while in the Service Mode to activate the Test pattern.
- 3) When Adjustments are complete press “ENTER” to save and “MENU” twice to exit the Service Mode.

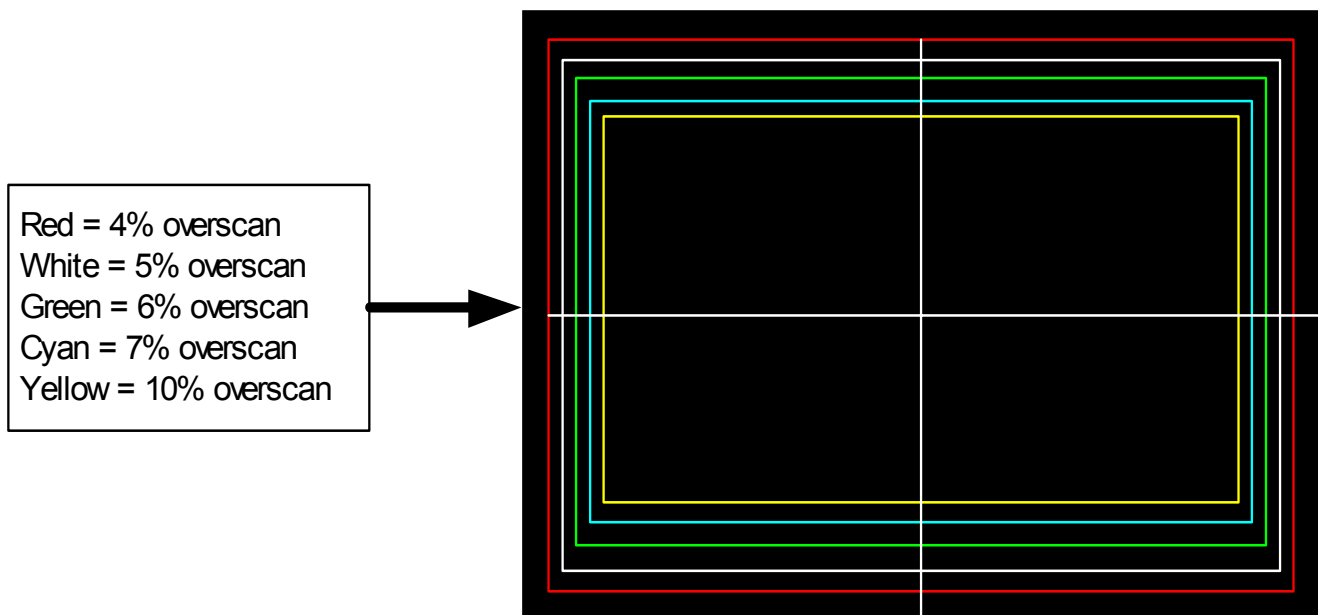


Figure 3-2: Internal Test Pattern

V28 Mechanical Adjustments

In the V28 chassis, the Mechanical Adjuster is accessed from the rear. Refer to the disassembly instructions and remove the BACK-COVER.

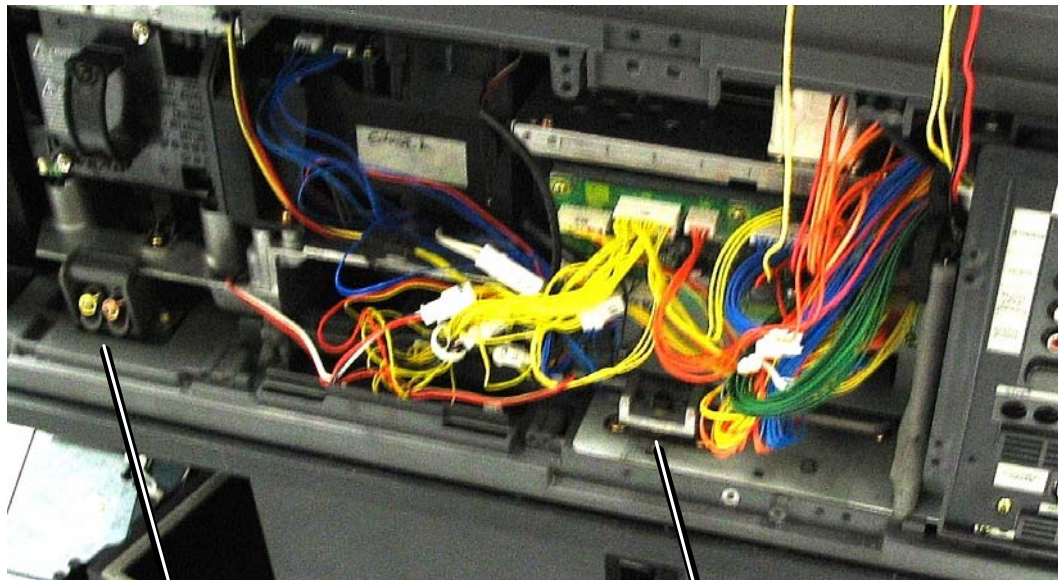
Tools Required:

- 2mm L shaped Allen wrench
- 4mm L shaped Allen wrench
- Hex wrench

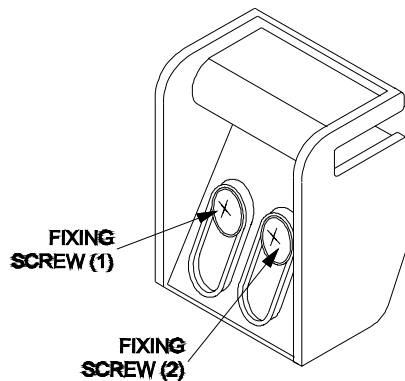
Preliminary

(Refer to *Figure 3-3*)

- 1) Loosen the Fixing Screw (1) and (2) in the Slide -Lock-Mate.
- 2) Loosen Nuts (1) and (2) on the Adjuster
- 3) Loosen [A-1] and [A-2] on the Adjuster (4mm Allen wrench)



SLIDE-LOCK-MATE



ADJUSTER

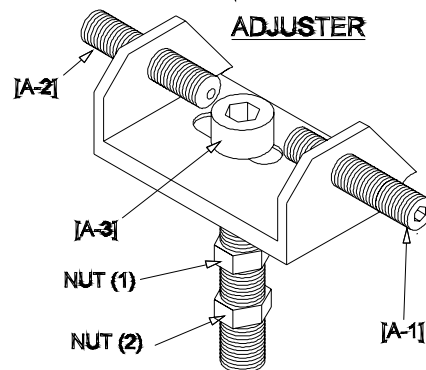


Figure 3-3: Locking Screws & Nuts

Keystone Distortion Adjustment

(Figure 3-4)

- 1) Loosen [A-1] and [A-2] so they clear [A-3].
- 2) For distortion at the top of the picture rotate [A-3] counter-clockwise.
- 3) For distortion at the bottom of the picture rotate [A-3] clockwise.

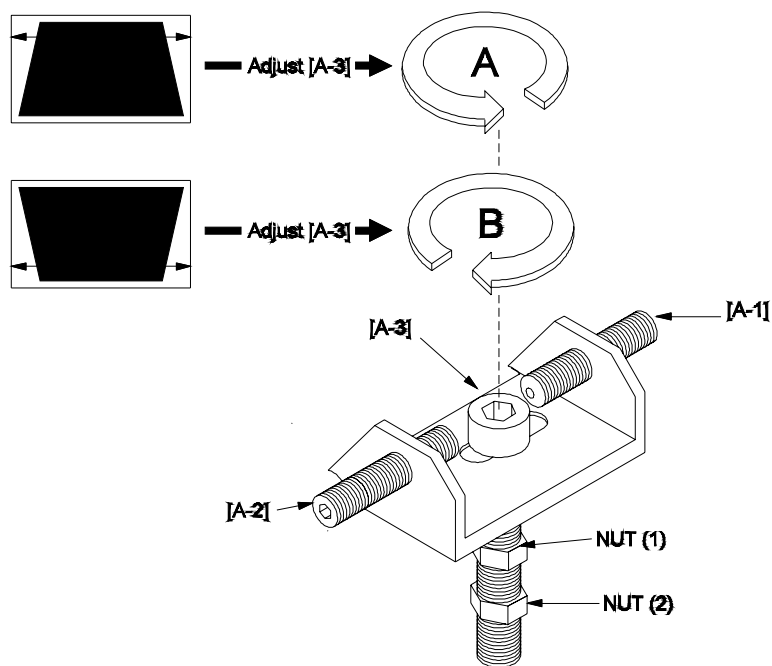


Figure 3-4: Keystone Adjustment

Rotation Adjustment

(Figure 3-5)

Clockwise Rotation Needed

- 1) Loosen [A-2].
- 2) Use [A-1] to adjust rotation.

Counter Clockwise Rotation Needed

- 1) Loosen [A-1].
- 2) Use [A-2] to adjust rotation,

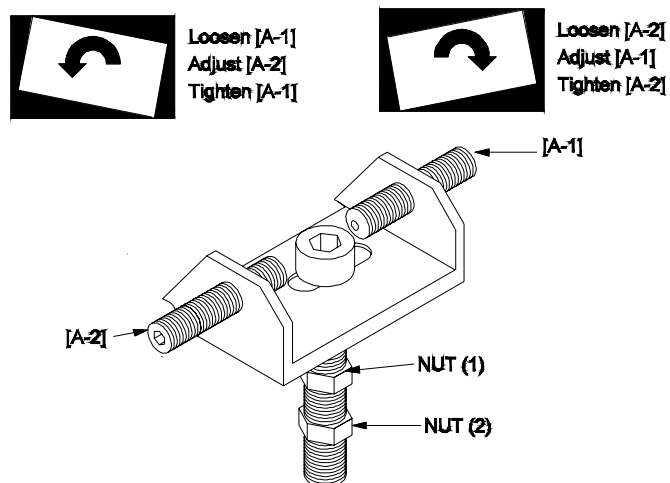


Figure 3-5: Rotation Adjustment

After Adjustment

- 1) Tighten Nuts (1) and (2).
- 2) Tighten Slide Lock-Mate screw (1) and (2).
- 3) Insure [A-1] and [A-2] are flush against [A-3]

DLP Chassis Mechanical Adjustments

Test Signal Activation

Use the same procedure as in the V28 chassis.
(MENU-2-4-5-7-REW)

Required Tools

- 4mm hex wrench (10 inches long minimum)
- 5mm Allen wrench (10 inches long minimum)
- 10mm hex or Phillips driver

Preliminary

Mechanical Optical Engine Adjustments are made using the UNIT-ADJUSTER shown in *Figure 3-6*. The UNIT-ADJUSTER is mounted under the Light Engine on the Engine Plate. It is accessed from the front of the set through the opening for the Card Reader. Refer to the model specific Disassembly Instructions and remove the:

- Back Cover
- Speaker Grille
- Card Reader

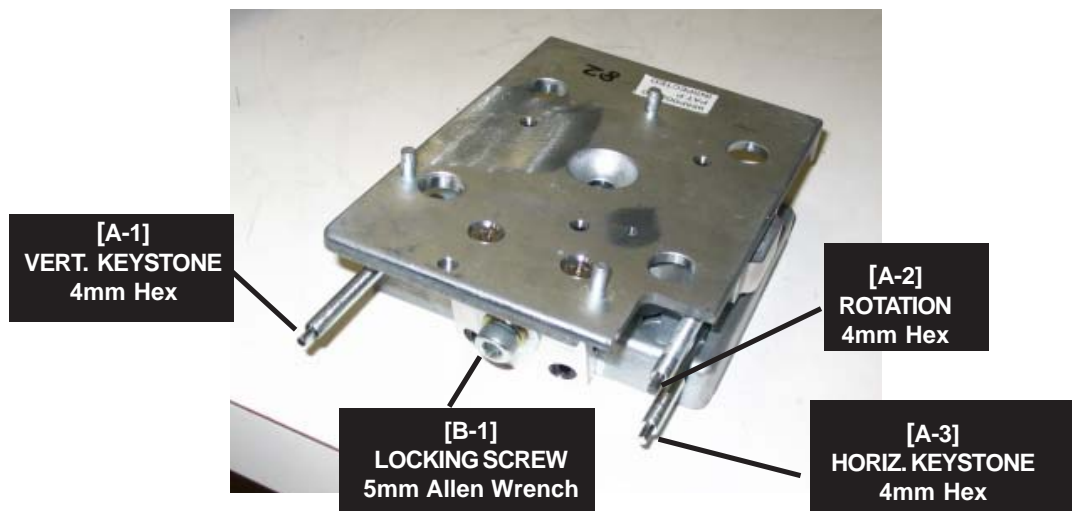


Figure 3-6: UNIT-ADJUSTER

Locking Screws and Wedge Removal

Before mechanical adjustments can be made, locking screw [B-1] and [B-2] must be loosened.

- [B-1] is located on the front of the UNIT-ADJUSTER, refer to *Figure 3-6* and *Figure 3-9*.
- [B-2] is accessible from the rear of the unit on the right side of the Optical Engine, refer to *Figure 3-7*.
- Remove the Rubber Wedge shown in *Figure 3-8*

NOTE: There is no Wedge used in 73 inch models

WARNING: DO NOT loosen [B-2] too far. The nut on the other side may drop off. Then the Optical Engine must be removed to re-install the nut.

[B-2]

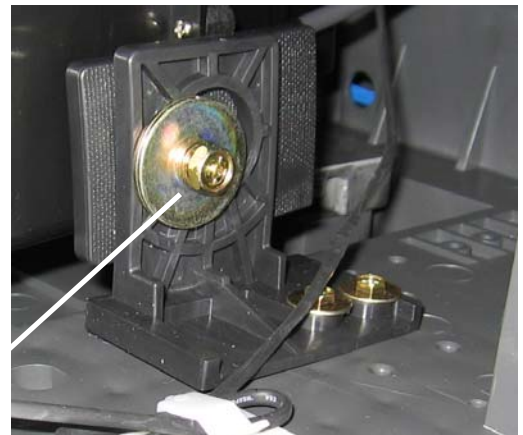


Figure 3-7: [B-2] Lock Screw

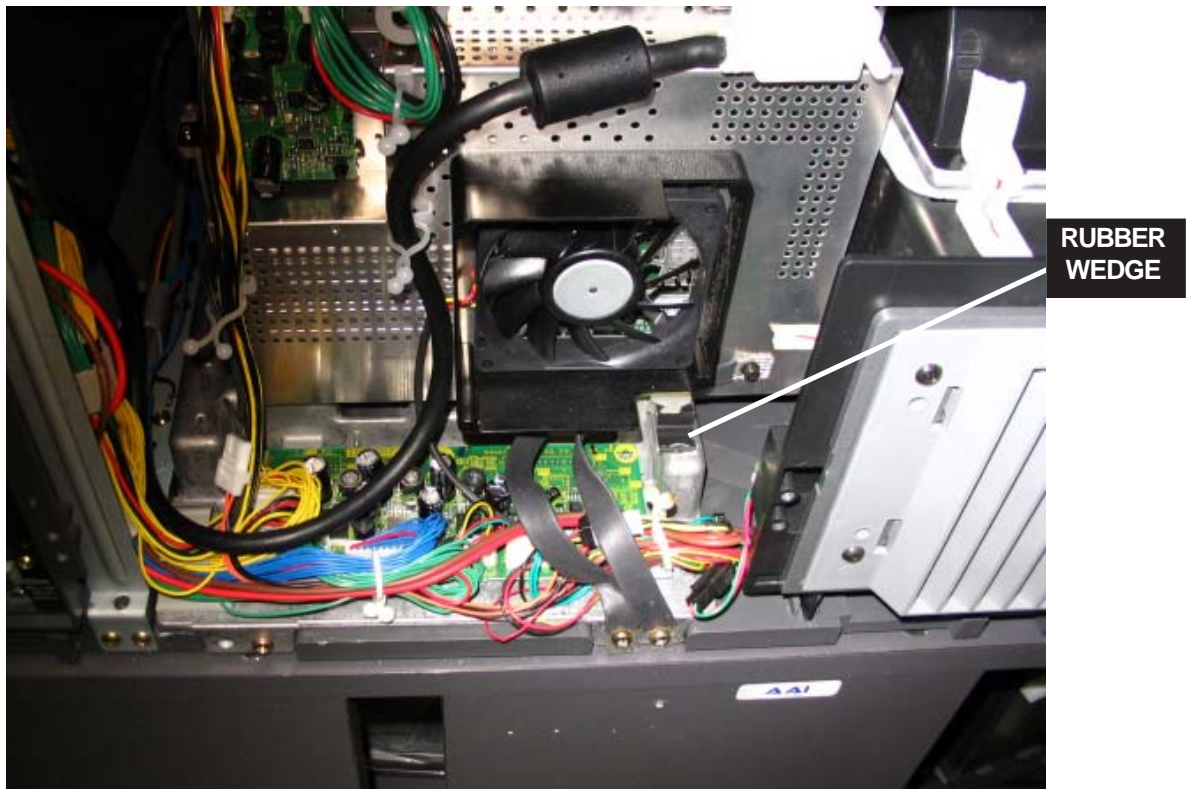


Figure 3-8: Rubber Wedge (52 and 62 inch models only)

Adjustment Procedures

Adjustment Locations

The Mechanical Adjustment are accessed through the front opening for the Card Reader. Locations of the adjustments are shown in *Figure 3-9*

CAUTION: Do Not force an adjustment past the end of it's range, UNIT-ADJUSTER damage may result.

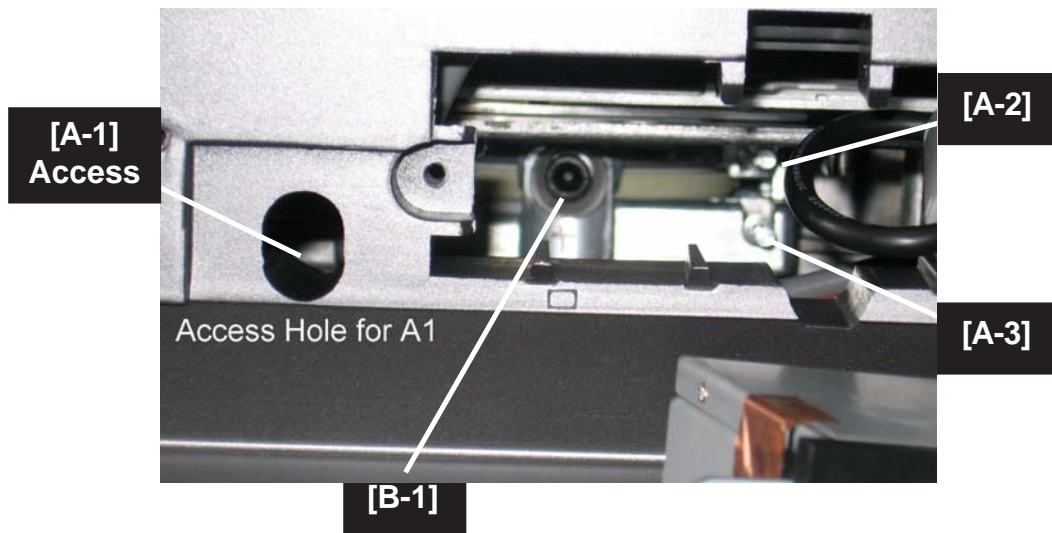
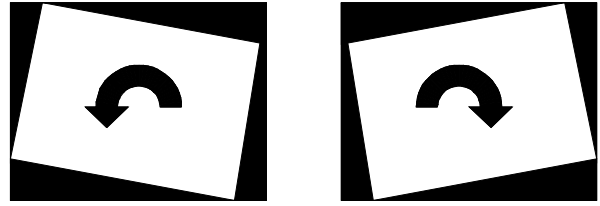


Figure 3-9: Adjustment Locations

Rotation Adjustment

Adjust [A-2] to remove any picture rotation

ROTATION [A-2]

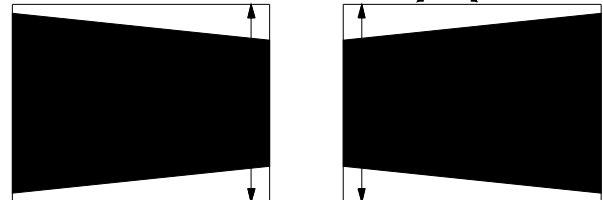


Horizontal Keystone Adjustment

Adjust [A-3] to remove horizontal keystone distortion.

NOTE: Vertical Positioning may shift

HORIZ. KEYSTONE [A-3]



Vertical Keystone Adjustment

Adjust [A-1] To remove vertical keystone distortion.
[A-1] can only be accessed by the front access hole shown above.

NOTE: Horizontal Positioning may shift.

VERT. KEYSTONE [A-1]

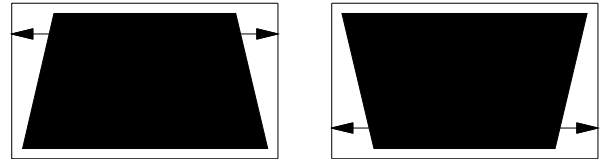


Figure 3-10: Adjustments

After Adjustment

- 1) Slide the rubber wedge under the Engine slowly until it makes solid contact. (*Figure 3-8 and Figure 3-11*)
- 2) Tighten side locking screw [B-2]. (*Figure 3-7*)
- 3) Check the picture, re-adjustment may be required (usually Rotation).
- 4) Tighten front locking screw. (*Figure 3-9*)



Figure 3-11: Wedge Insertion

Electrical Adjustments

The only Servicer electrical adjustments are picture position (centering). These adjustments are the same on all chassis (V28 / V29 / V30 / V30+ / V31). They are also the same as last years DLP models. They are repeated here as a reference.

Horizontal & Vertical Positioning

- 1) Press "MENU-2-4-5-7", activates the Service Mode..
- 2) Select the "FORMAT" function (AUDIO button).
- 3) Press "REWIND", activates the Overscan Test Pattern
- 4) Select "Item 1" HPOS (VIDEO button).
- 5) Use the ADJUST buttons to center the picture horizontally.
- 6) Press ENTER to save the new setting.
- 7) Select "Item 2" VPOS (VIDEO button).
- 8) Use the ADJUST buttons to center the picture vertically.
- 9) Press ENTER to save the new setting.
- 10) Press MENU to exit the Service Mode.

Chapter 4

Down-to-1 Troubleshooting

The goal of *Down-to-1* troubleshooting is... *using a minimum amount of time and test equipment, make an accurate diagnosis of a failure 9 out of 10 times.* The 2005-2006 Micro-Display product line lends itself to this discipline very well.

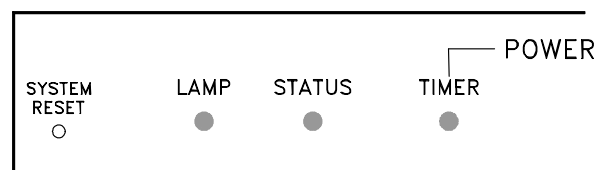


Figure 4-1: Front Panel LEDs

Using The Front Panel LEDs

The front panel LEDs, *Figure 4-1*, provide an indication of the sets operation, and the possible cause of a malfunction. There are three front panel LEDs, “Power”, “Status” and “Lamp”. Which LED is lit, the color and whether it is blinking or steady indicates to the customer the current status, or a possible malfunction. Using the Front Panel LEDs is similar for LCD and DLP based sets. The indications are also listed in the Owners Guide.

Normal Indications... The LEDs provide the customer with status information that indicates several normal operational modes. Normal indications are given in *Table 4-1*.

Abnormal Indications... The LEDs also provide the customer with status information indicating abnormal conditions. Abnormal indications are given in *Table 4-2*.

Normal LED Indications

POWER LED	STATUS LED	LAMP LED	Power Status	Condition
Off	Off	Off	Stby	Off
Green	Off	Off	P-ON	Power On
Off	Off	Blinks Green	30 Seconds After Off	Set cannot be turned On until Lamp has cooled.
Blinks Green	Off	Off	Stby	Booting after AC applied
Slow Blinks Green	Off	Off	Stby	On Timer is set

Table 4-1

Abnormal LED Indications

POWER LED	STATUS LED	LAMP LED	Power Status	Condition
Off	Yellow	Off	Low Power	Excess Temperature
Off or On	Off	Yellow	No change	Lamp time over 4000 Hrs.
Off	Off	Blinks Yellow	Low Power	Lamp Cover open
Off	Blinks Yellow	Off	"	Filter Cover Open (V28 Only)
Off	Off	Red	Stby	Lamp did not turn On
Off	Blinks Red	Off	Low Power	Fan Stopped
Off	Red	Off	"	Circuit Failure

Table 4-2

Self Diagnostics... When an abnormal condition is indicated by the front panel LEDs. Or, when the TV turns On and then shuts Off, the Self Diagnostics help isolate the problem. This is similar to the Self Diagnostic feature on previous model TVs. For both the V28 and V29/30/31 Chassis, it has been greatly expanded.

The Self Diagnostics activation procedure is described as follows:

- 1) With the TV Off
- 2) Press and hold the front panel "MENU" and "DEVICE" buttons for 5 seconds.
- 3) The LED will flash the Error Code indicating what caused the TV to shut Off.
- 4) The Error Code will be repeated 5 times.
When the LED stops flashing, the mode is automatically terminated.

V28 ERROR CODES

Error Code	Description
12	No error detected
32	Lamp Cover open
33	Air Filter Cover open
34	Lamp abnormality
35	DM Fan failure
36	Exhaust or Lamp Ballast Fan failure
37	LCD Engine Fan failure
38	Lamp temperature abnormally high
39	LCD temperature abnormally high
41	Short is detected
42	Lamp Fan failure
44	DVI cable between Format and Engine disconnected
45	Shutter (PBS) Fan Failed
46	JC connector disconnected
47	DM Temperature too high
48	Engine power supply short detected
51	Speaker short detected
56	Shutter not connected

V29/V30/V31 ERROR CODES

Error Code	Description
12	No error detected
32	Lamp Cover open
34	Lamp abnormality
35	DM Fan failed (Chassis Fan)
36	Exhaust or Lamp Ballast Fan failure
37	DMD Engine Fan failure
38	Lamp temperature abnormally high
39	DMD temperature abnormally high
41	Short is detected (Standby Power Supplies)
42	Lamp Fan failure
44	DVI cable between Format and Engine disconnected
46	DMD Fan failed (JC connector disconnected)
47	DM Temperature too high
48	Engine power supply short detected
51	Speaker short detected
52	HDD excess temperature (V30+ & V31 only)
55	HDD Fan Stopped (V30+ & V31 only)

Table 4-3: Error Codes

Reading the Error Codes

The Error Codes are two digit numbers. The LED:

- Flashes the value of the most significant digit (MSD).
- Then there is a pause.
- Flashes the value of the least significant digit (LSD).
- The Error Code is repeated 5 times.

Example: If the Error Code is “32”, the LED will flash three times, pause, and then flash two times then repeat the sequence 5 times. If the technician is still uncertain of the code, repeat the procedure.

After the error code is known, troubleshoot the area indicated. For instance, if excessive temperature is indicated when the set is known to be cool, suspect a failed sensor.

Interface Troubleshooting

The Interface PWB provides the service technician with a convenient test point for many of the peripheral components such as the Engine, Lamp Circuit, Fans and Sensors. It is easily accessible as it is located in the center of the set, directly in the rear of both the LCD and DLP models.

Figure 4-2 shows the layout of the Interface for the LCD, V28 Chassis. Figure 4-3 shows the layout for the DLP, V29/30/31 chassis. These layouts are as the technician is viewing the PWB from the rear of the set.

To save time, use the Symptom/Cause information along with the Circuit Block Diagrams to make checks on the Interface PWB first.

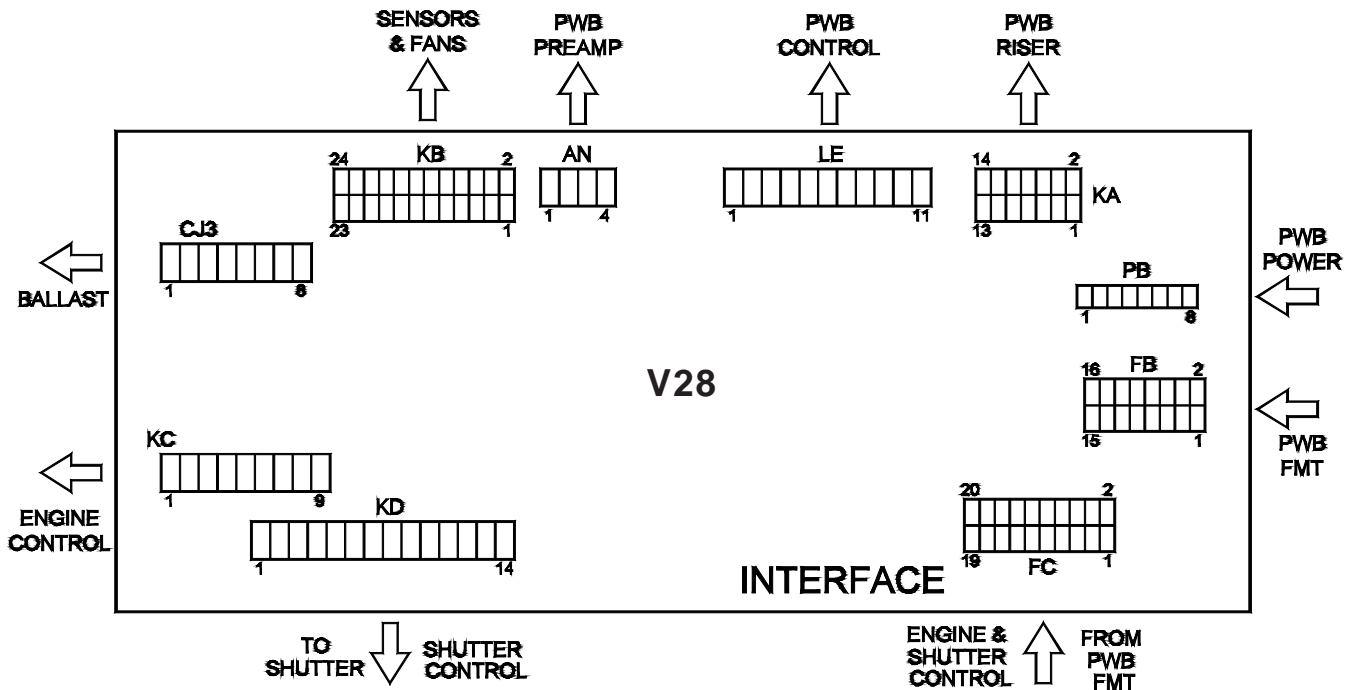


Figure 4-2: V28 Chassis PWB Interface Layout... As viewed from the rear.

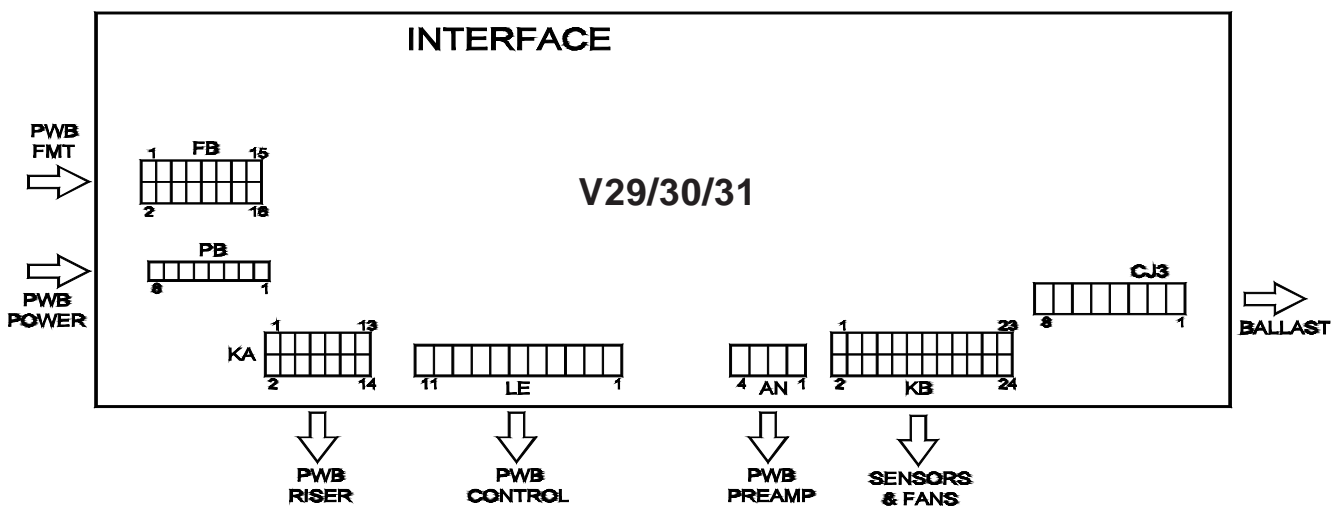


Figure 4-3: V29/30/31 Chassis PWB Interface Layout... As viewed from the rear.

Symptom/Cause Troubleshooting

Use the following symptom/cause charts to determine the most likely cause of a failure.

The areas covered are:

- PWB Symptom/Cause
- Optical Engine

- Power Supply PWB
- Micro & Terminal PWB

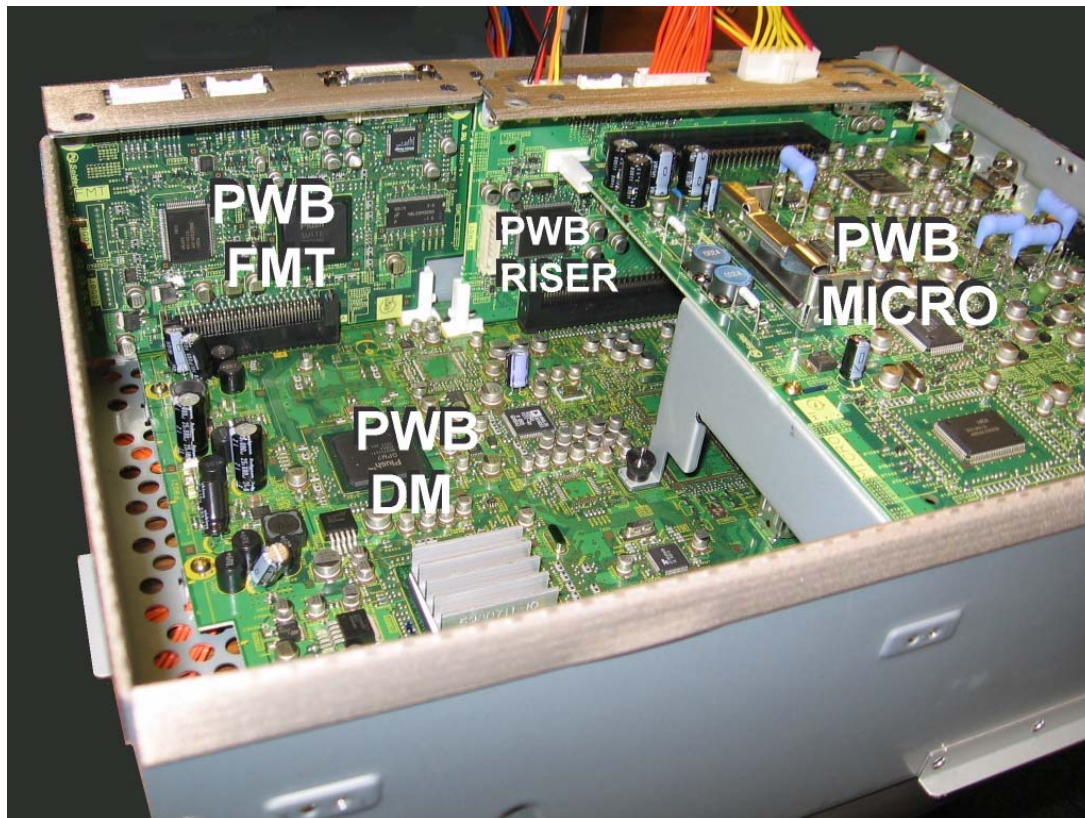
First use the PWB Symptom Cause chart to narrow down the problem to a PWB. Then check the connections to the PWB specified. The additional charts can help repair the set without ordering a PWB.

PWB Symptom/Cause Troubleshooting

Symptom	Most Likely	Other Possibility
Video Problems, all Inputs & Menu bad. Audio OK	Reseat DVI Cable between Engine and Chassis	
Analog Tuning problems. External Inputs & Digital OK	PWB-DM	PWB-MICRO
Analog Tuning & External Inputs Problems. Digital OK	PWB-MICRO	PWB-TERMINAL
Digital Tuning problems. Analog OK	PWB-DM	
Analog & Digital Tuning Problems. External Inputs OK	PWB-DM	
External Input Problems. Tuning OK	PWB-TERMINAL	PWB-MICRO
No Sync	PWB-FMT	
Video Problems. Digital noise, lines or artifacts in picture	PWB-FMT	Optical Engine
Card Reader Problems	Memory Card Reader	PWB-DM
1394 Problems	PWB-DM	
Audio Problems. Speakers Bad. Analog & Digital Out good	PWB-MICRO	
Audio Problems. Speakers, Monitor A/V 1, Audio 2, Digital Out Bad	PWB-DM	
Audio Problems. Digital Good. Analog Bad	PWB-TERMINAL	
Power LED blinking constantly. Won't power on.	PWB-DM	
CableCARD problems	PWB-DM	
NetCommand problems	PWB-DM	
Control problems	PWB-DM	
Control problems (Front Panel)	PWB-CONTROL	PWB-INTERFACE
Control problems (Remote)	PWB-PREAMP	PWB-INTERFACE

Note: V28L models do not include the features below. Naturally, these models will not experience failures associated with these features.

- TV Guide On Screen®
- CableCARD™ (Some Versions)
- Firewire® (IEEE1394)
- NetCommand®
- Sub-Tuner & RF Relay (Only 1 NTSC/ATSC/QAM Tuner and RF Input)

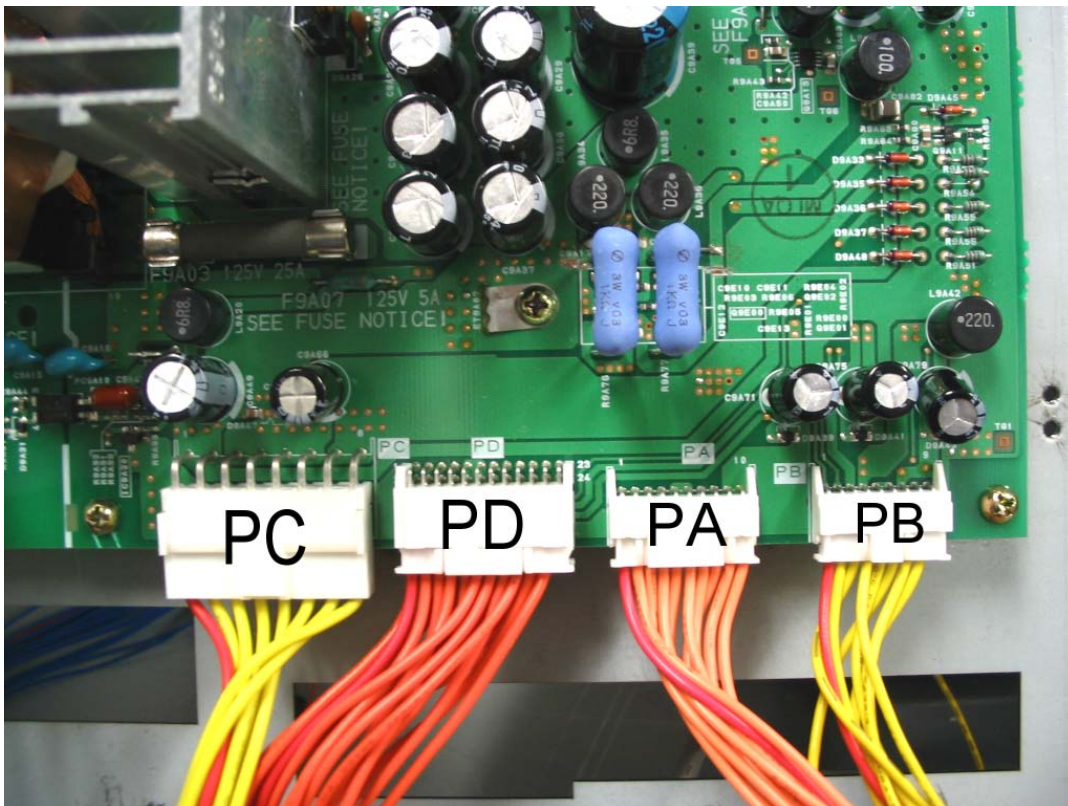


OPTICAL ENGINE TROUBLESHOOTING

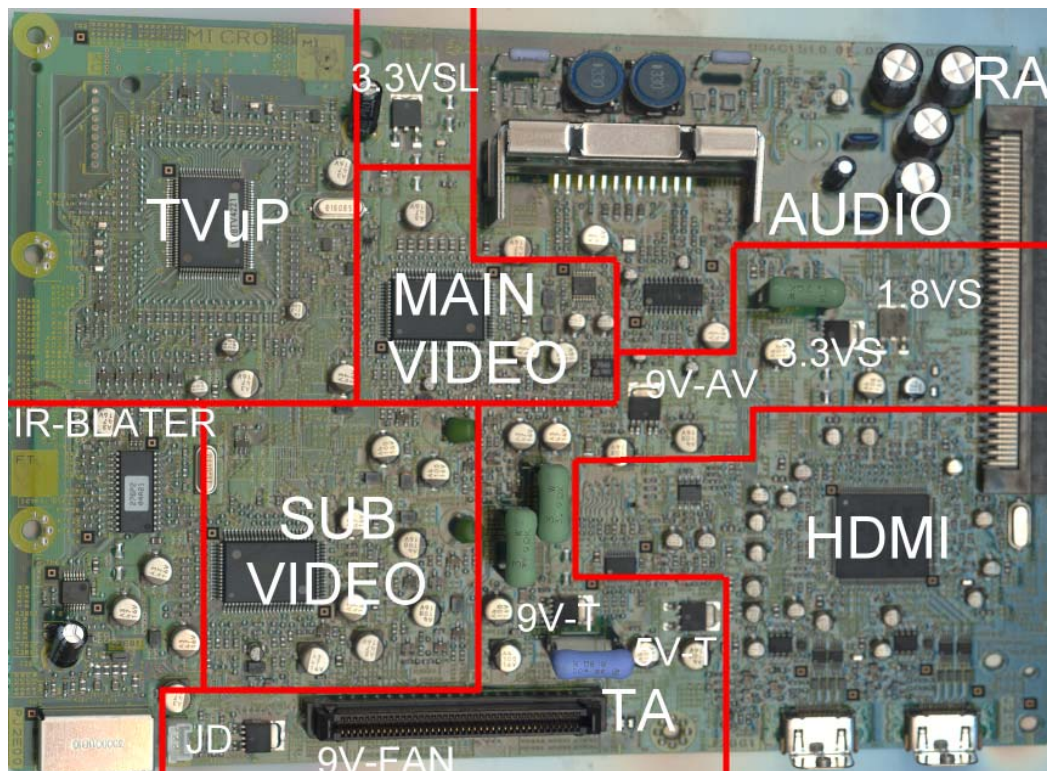
Symptom	Cause	What to check
No Light	FMT does not turn on lamp due to fault detection	Check error code on front panel. Check problem indicated.
	No DC supply to ballast	Check power PWB PL connector for approx. 340VDC. Check connections PL-JE, JE-CN2
	No Lamp enable signal	Check FMT output Lamplitz FB pin 1. Check connections FB-FB, CJ3-CJ3
	Lamp end of life	Replace lamp and check
	Ballast Broken	Replace ballast and check
No Picture, bad picture	FMT does not turn on video	Check diagnostic code. Check circuit indicated.
	DVI cable not connected	check DVI connections
	Engine power missing	Check connections PA2-CN102
	Engine is blanked.	Check control connections FC-FC, KC-CN3100.
	FMT not providing video signal	Check FMT Board.
	Engine broken	Replace engine and check.
High Contrast Unit not Working (V28)	No power to Shutter	Check 18V from Power board PB pin4. Check connections PB-PB, KD-CN1
	No control of shutter	Check connections CN5-JG, JG-KD, KD-CN2
	FMT does not control shutter	Replace FMT and check.
	Shutter broken	Replace engine.
Set Shuts down after a while	Fan not working. Temp sensor.	Check error code and check indicated fan or sensor.
	Filter clogged (V28)	Check filter and clean or replace.
	Temp sensor problem	Check error code. Check connections DT-KB, LT-KB. Check sensor
	Air path blocked	Check air flow from each engine fan.

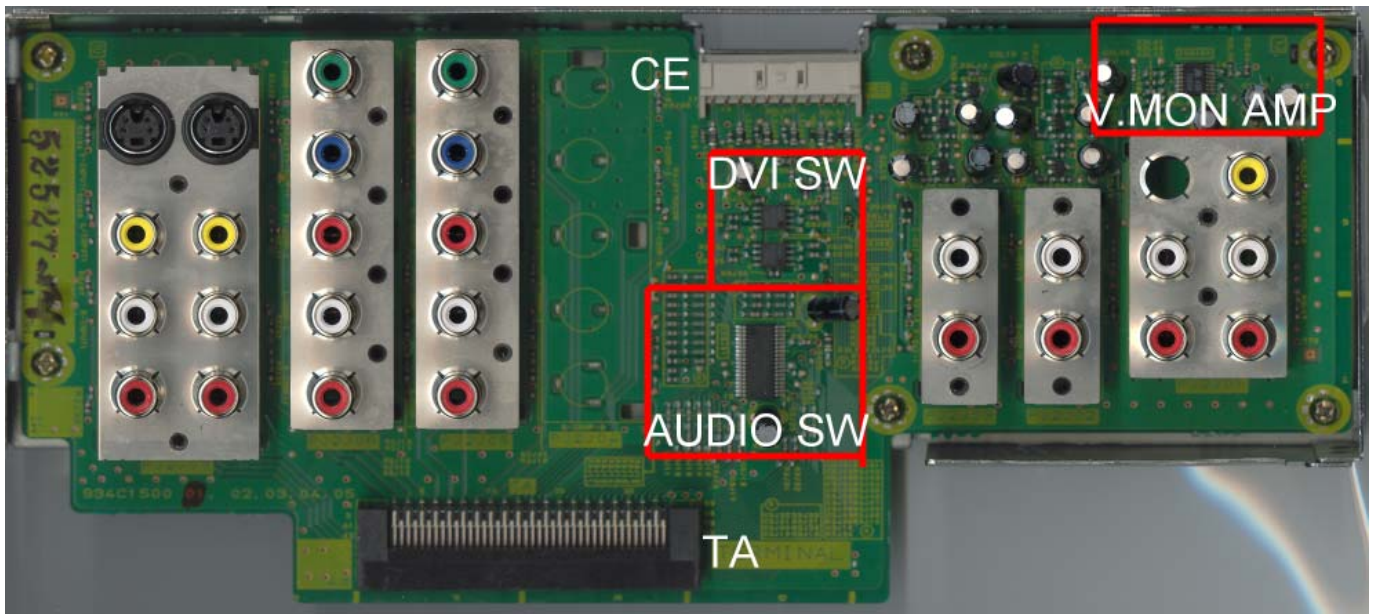
POWER PWB TROUBLESHOOTING

SYMPTOM	CHECK POINT	POSSIBLE CAUSE
ERROR CODE 51	Check +15VS @ connector PD pin 1	Check Q9E00 circuit
	Check -15VS @ connector PD pin 7	Check Q9E00 circuit
ERROR CODE 34	Check 340VDC @ connector PL	Check doubler circuit
		Check ballast circuit
ERROR CODE 48	Check 3.3V @ connector PA2 pin 1	IC9A24 circuit
	Check 18V @ L9A45/C9A82	Zener D9A43
ERROR CODE 41	Check 12VS @ connector PD pin 14	IC9A23 circuit
		Zener D9A41
	Check 5VS @ connector PC pin 8	IC9A21 circuit
		Q9A12 circuit
	Check 4.5V @ connector PD pin 19	Zener D9A47
		F9E10
NO POWER	CHECK ALL FUSES	F9E11
	Check 18V @ TP18VS	T9A10 circuit
		IC9A10 circuit
	Check 5VSL @ connector PD pin 16	IC9A22 circuit
		Zener D9A39
	Check connector PD pin 20 for HIGH (active)	PC9A21 circuit



Micro & Terminal PWB Troubleshooting	
Symptom	Possible Causes
No audio or video on one input	Physical damage on RCA jack, broken solder or trace at pin on terminal board
No video on all inputs	TA connector loose, No Vcc to IC2K01, IC9C00, IC9C10, IC9C20
No audio on all inputs	TA connector loose, No Vcc to IC3J01, IC9C00, IC9C10, IC9C20, IC3E00, IC3E01
No HDMI signal	Source not HDMI compliant, physical damage to J2001, J2101, no Vcc to IC2000, IC2600, IC9C20, IC9C71, IC9C81
No HDMI audio	Source is DVI mode, IC2401, IC9C71
No DVI audio	IC3J02, IC3J03
No power or TV won't boot	Loose RA connector, no Vcc to IC7A00, IC9C51
TV shuts down	Loose or disconnected JD connector , no Vcc to IC7C81
Main picture ok, no PIP	Loose or disconnected JD connector , no Vcc to IC7C81
Main picture ok, no PIP	IC2K01, Q2M20, 21, 22
PIP ok, no main picture	IC2K02, 03, 04, Q2M00, 01, 02
No closed captioning	Q2K07, 08, 09, 30, 31, 32
IR blaster not working	Physical damage on phono jack PJ2E00, 01, broken solder or trace at pin on Micro board, no Vcc to IC7P01-05





Chapter 5

Block Diagrams & Signal Path

Power Supplies

Although the LCD Light Engine models (V28 chassis) and DLP Light Engine models (V29, V30, V30+, V31) are different, a large part of the circuitry is the same or very similar in all chassis types.

The material in this chapter covers differences in circuitry between the LCD and DLP chassis. Since troubleshooting will be mainly to board level, the Power Supplies, Signal Path and Control circuitry connections and paths between the various PWBs is also described.

The simplified Block Diagrams should help in isolating problems to a specific PWB.

Power Supply Basic Description

Figure 5-1 shows the Basic Power Supply that is the basis for all the chassis types. The Main Power Supply is on PWB-POWER. The main Standby, Switched and Ballast DC supplies are generated on the PWB-POWER. It is also the source for the Fan Power Supplies located on the PWB-INTERFACE.

On the DLP chassis, a PWB-ENG-PWR board is added. This board generates the DC supplies required by the DLP Engine.

In the V30+ and V31 chassis models, a Hard Disc Drive (HDD) has been added. The additional Power Supply

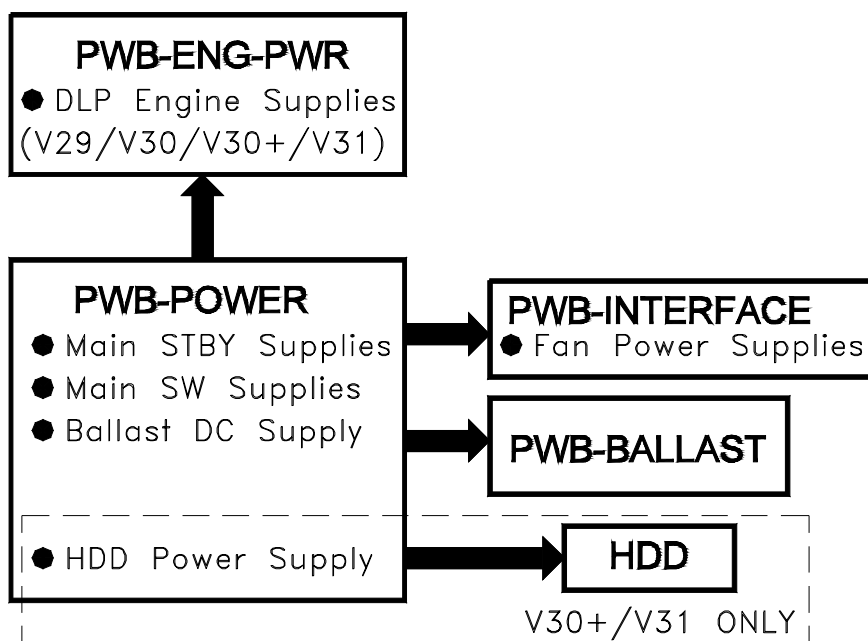


Figure 5-1: Basic Power Supply Block Diagram

PWB	Part Number	Models
ASSY-PWB-POWER1	930B933001	All V28 models
ASSY-PWB-POWER2	934C159001	WD-52627 / WD-52628 / WD-62627 / WD-62628 / WD-73727
ASSY-PWB-POWER2	934C159002	WD-62727 / WD-62927 / WD-73827 / WD-73927

Table 5-1: PWB-POWER Part Numbers

for the HDD is located on the PWB-POWER for these two chassis types.

Due to differences between the various chassis there are three version of the PWB-POWER. These are listed in Table 5-1.

Switch Mode Regulator

The Switch Mode Regulator (SMR) on the PWB-POWER is the initial source for all DC Supplies except the DC supply for the Ballast.

Figure 5-2 shows a simplified diagram of the Switch Mode Regulator. This circuitry is conventional and is

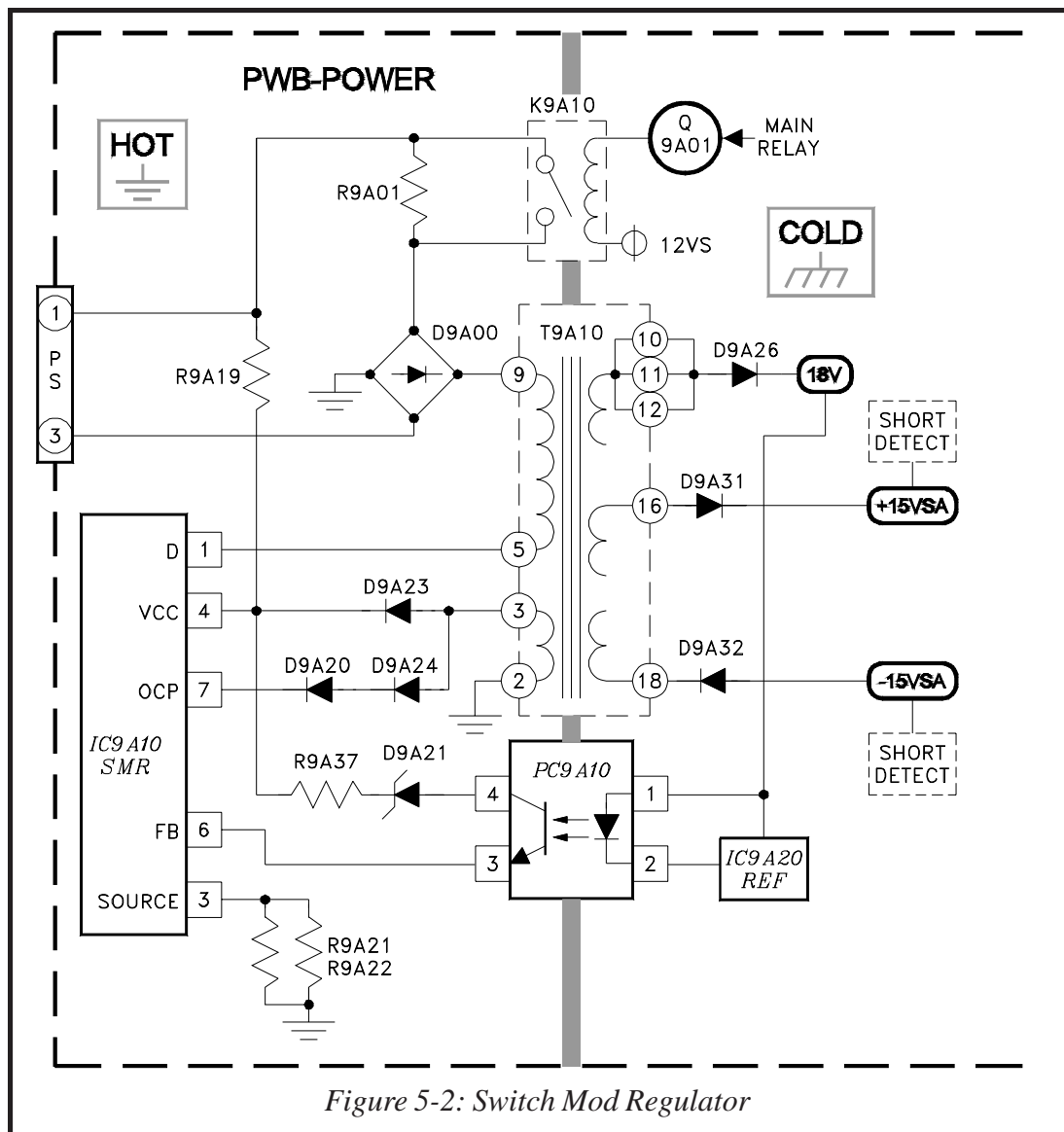


Figure 5-2: Switch Mod Regulator

the same on all three of the PWB-POWER boards. It is the original source for both Standby and Switched supplies.

With the TV Off, AC from the PS connector is applied to D9A00 through R9A01. The SMR generates +15V, -15V and 18V standby supplies. The +15V and -15V supplies are the source for switched +15V and -15V supplies. The 18V supply is the source for all other standby supplies.

Regulation is achieved by monitoring the 18V supply, and comparing it to a reference in IC9A20, Any error in voltage is coupled through PC9A10 to the SMR IC9A10.

When the TV is switched ON the MAIN RELAY command goes High, closing K9A10 which removes current limiting resistor R9A01 from the circuit.

Although the SMR circuitry is the same on all PWB-POWER boards, the Standby and Switched DC to DC Converter circuitry does vary according to chassis type.

DC to DC Converters.

A comparison of DC supplies generated on the LCD and DLP Power Supply boards is shown in *Tables 5-2* and *5-3*. Note that there is no Switched 12V or 5VR supplies generated on the LCD Power board, and no switched 18V supply is generated on the DLP Power board.

The DC to DC Converter circuitry on the LCD Power board is illustrated in *Figure 5-3A*. The DC to DC Converter circuitry on the DLP Power board is shown in *Figure 5-3B*. The difference in circuitry in *Figure 5-3* is high lighted by shading.

V28 Chassis PWB-POWER Supplies

STANDBY SUPPLIES		SWITCHED SUPPLIES	
AC Applied	STBY Command	Sw Supply	Command
18VS	5VS	18V	18V-ON
18VF	12VS	3.3V	ENG-PWR-ON
5VSL			
+15VSA			
-15VSA		+15VS	PWR-ON
		-15VS	PWR-ON
		340V	LMP-RLY

Table 5-2

V29 /V30 /V30+ /V31 Chassis PWB-POWER Supplies

STANDBY SUPPLIES		SWITCHED SUPPLIES	
AC Applied	STBY Command	Sw Supply	Command
18VS	5VS		
18VF	12VS	3.3V	ENG-PWR-ON
5VSL		12V	ENG-PWR-ON
+15VSA		5VR	PWR-ON
-15VSA		+15VS	PWR-ON
		-15VS	PWR-ON
		340V	LMP-RLY

Table 5-3

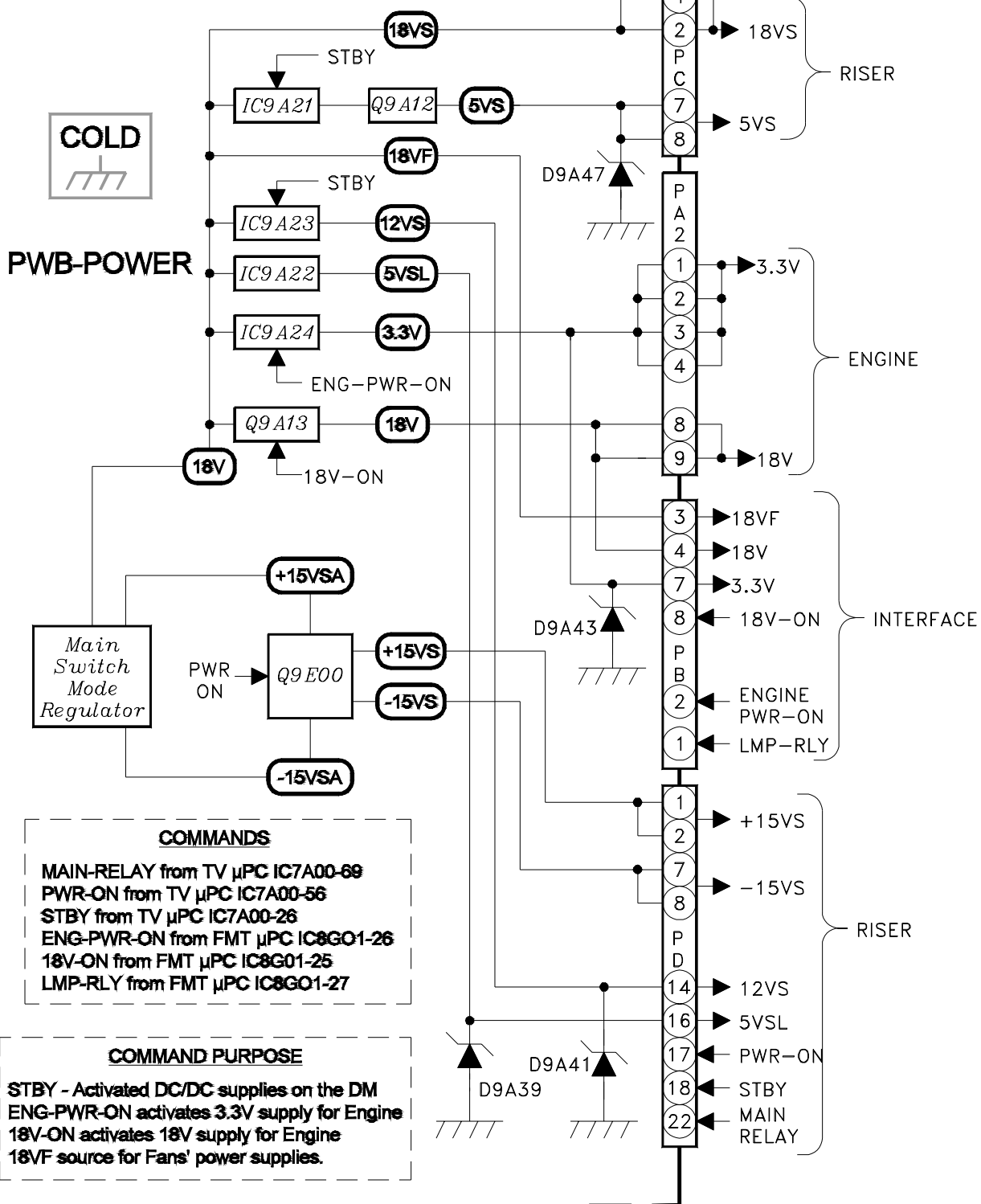
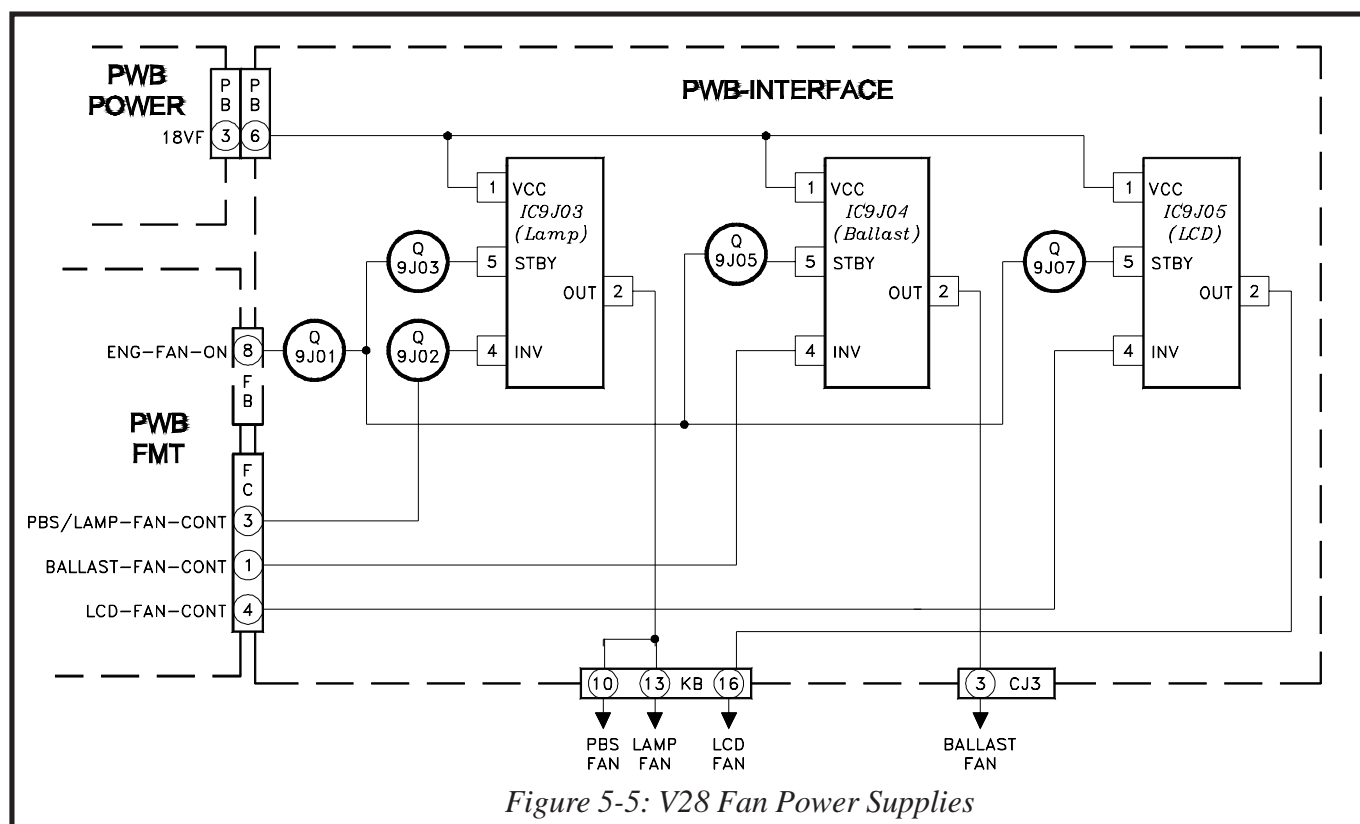
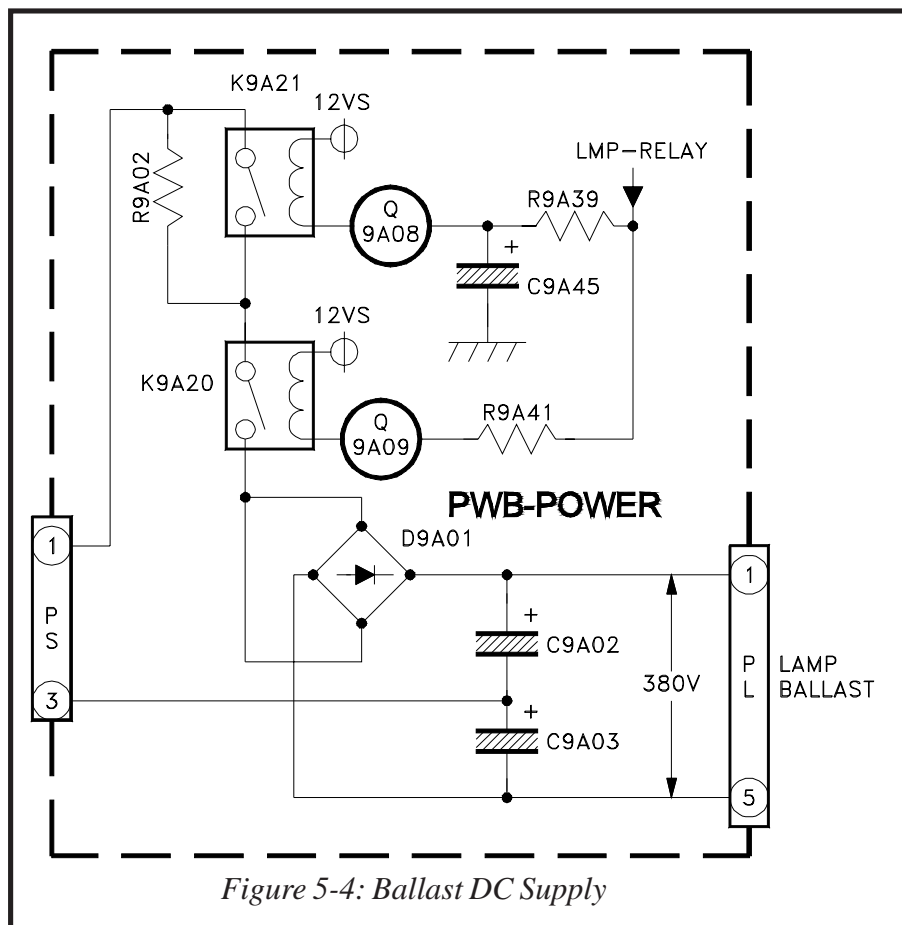


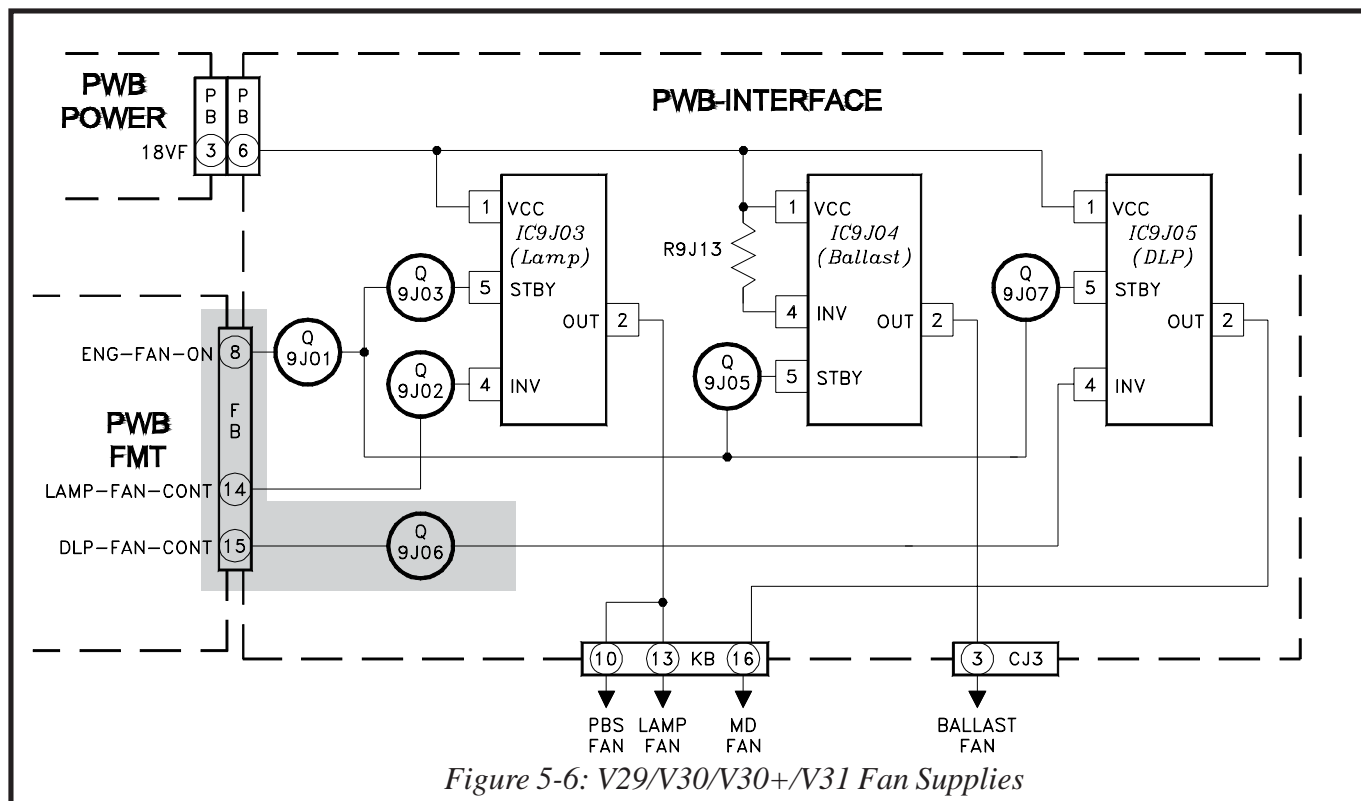
Figure 5-3A: V28 PWB-POWER DC to DC Supplies

This circuit is the same on all three Power boards. A simplified version of the circuit is shown in *Figure 5-4*.

The DC supplies for the fans are generated on the PWB-INTERFACE board., The circuitry is supplied by the 18VF Standby Supply on the PWB-POWER. The actual Fan Supply circuitry on the PWB-INTERFACE differs between LCD and DLP models.

Figure 5-5 illustrates the circuitry in LCD models and *Figure 5-6* the circuitry in DLP models. Differences in the circuitry are high lighted in *Figure 5-6*. Note that Fan control signals are from the PWB-FMT, through the FC connector on LCD models, and through the FB connector in DLP models.





PWB-ENG-PWR

It was previously mentioned that the PWB-ENG-PWR board is added in DLP models. *Figure 5-7* shows this circuitry. It is basically a PWM Regulator with a push pull FET output circuit, generating a 2.5V supply for the DLP Engine. The board also serves as an interface for the 12V, 5V and 3.3V Standby supplies from PWB-POWER.

Hard Disc 7Drive (HDD) Supply

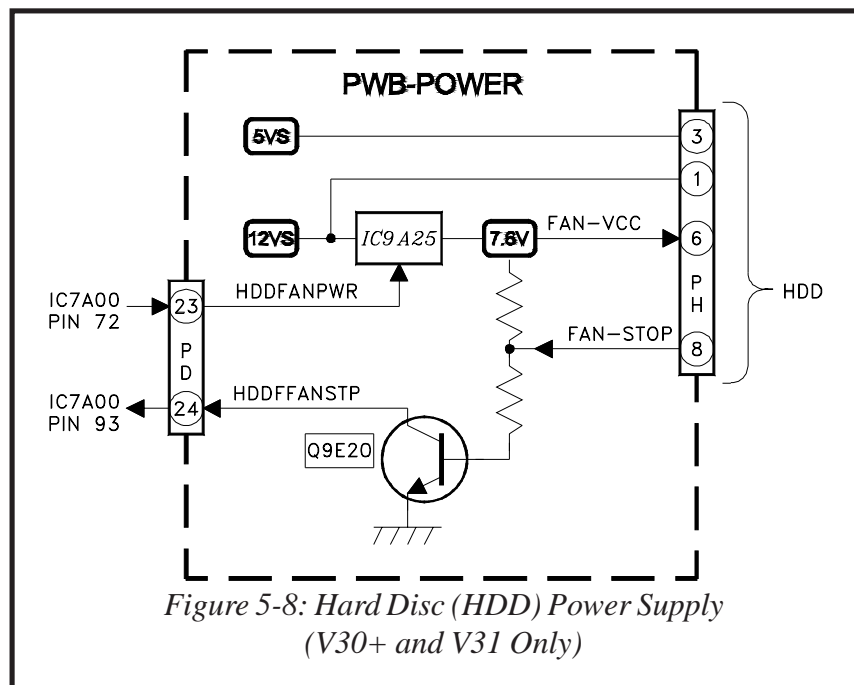
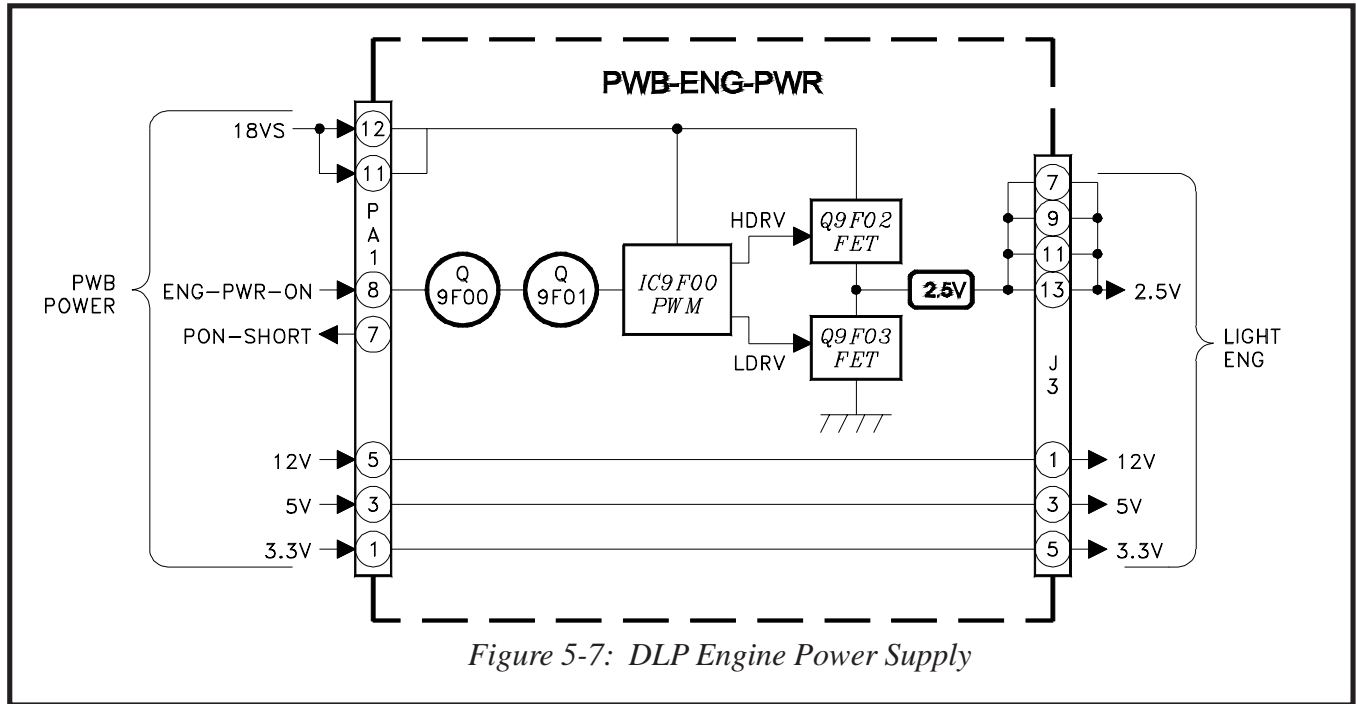
Additional power supply circuitry is required for the V30+ and V31 chassis. Both of these chassis types feature a Hard Disc Drive. Added power circuitry for the HDD is on the PWB-POWER, refer to *Figure 5-8*. Note that the Fan Stop monitoring circuit for the HDD is also added to PWB POWER.

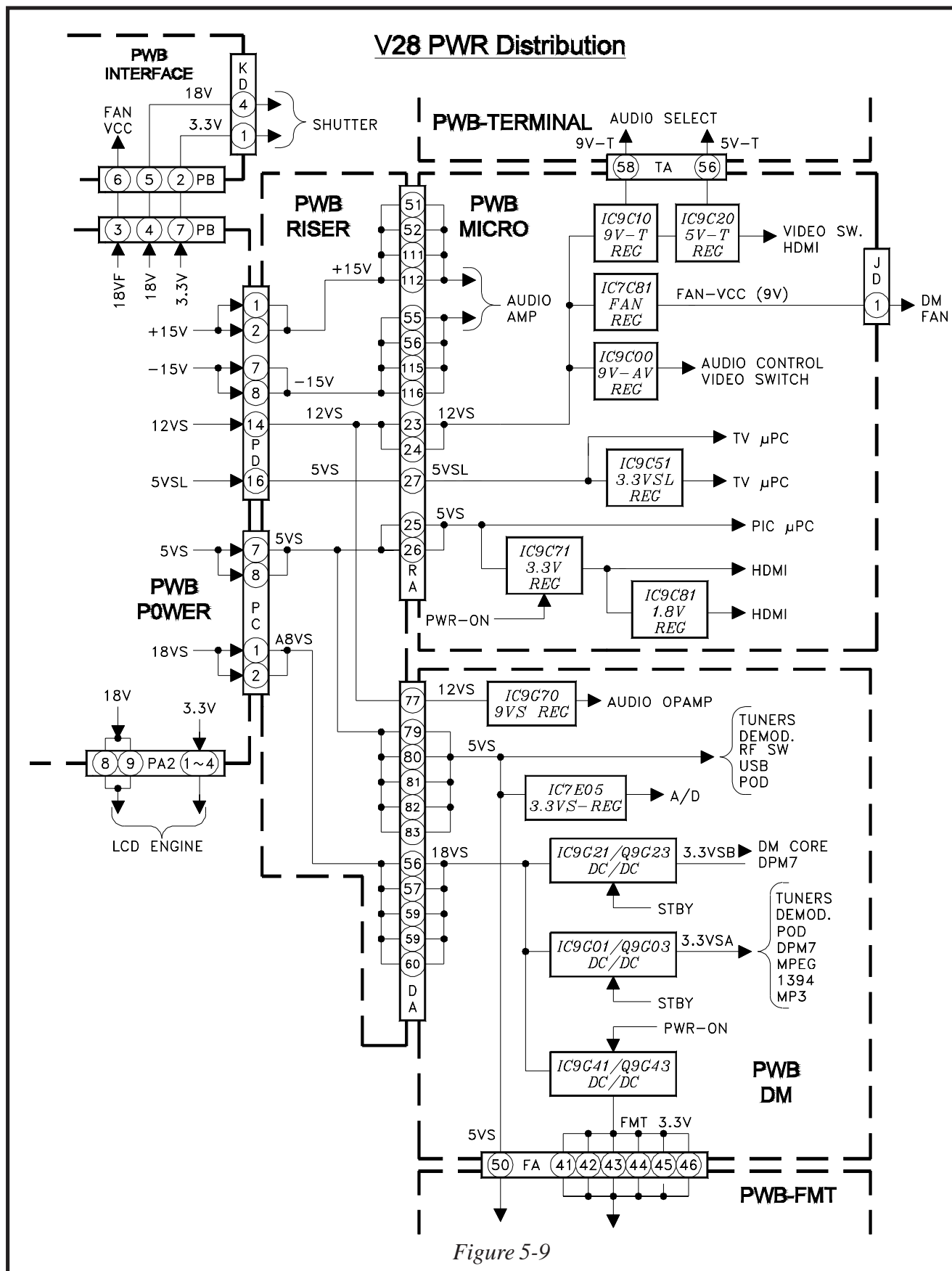
Power Distribution

When a specific PWB is suspected as the cause of a problem, the following should be checked before ordering a new board:

- Power supply voltages supplied to the PWB.
- Signals supplied to the PWB.

Power Distribution diagrams are helpful in locating the source of a missing power supply voltage. *Figure 5-9* shows the Power Distribution for the V28 chassis. *Figure 5-10* illustrates Power Distribution in the DLP chassis. Although the two chassis types are similar there are some differences. The shaded areas in *Figure 5-10* indicate differences from the V28 chassis.





V29/V30/V30+/V31 PWR Distribution

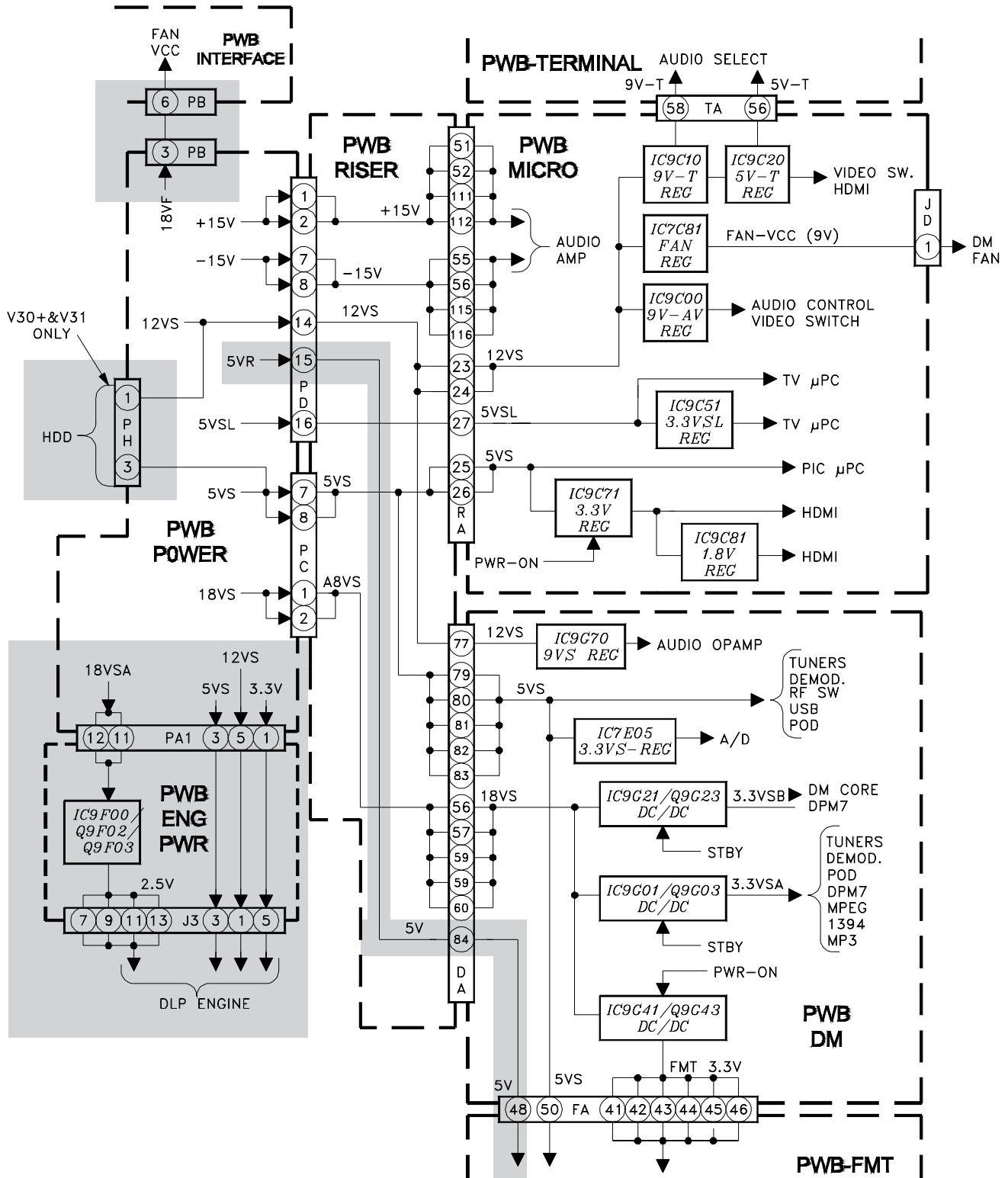


Figure 5-10

Video Signal Path

Analog Video Path

The Video signal path is also similar on all the chassis types. *Figure 5-11* illustrates the Basic Analog Video Signal Path. The Tuners are located on the PWB-DM. The Analog video from the Tuners is directed through PWB-RISER to the Video Select Circuitry on PWB-MICRO.

The Video Select circuitry is comprised of IC2K01 and IC2K02. IC2K01 selects the Sub Video signal source and the External Video Input source for the Main Picture. It then forwards the External Main Picture signal to IC2K02. IC2K02 selects the main picture source from the signals from IC2K01, an External Component input or the Main Tuner.

The selected Main and Sub Video signals are directed through the PWB-RISER to A/D Converters on PWB-DM. The outputs from the A/D Converters are directed to 3DYC, Line Double and PIP/POP circuitry.

The signals from the PWB-DM are directed to the PWB-FORMAT. The signals are digital Y,Pb,Pr. In the V28 chassis the signals are in 720p format. In the DLP chassis the signals are in the 1080i format.

On the PWB-FORMAT the signals are processed and converted to the drive format for that specific Engine. In the DLPPWB-FORMAT, the signals are converted from 1080i to 1080p.

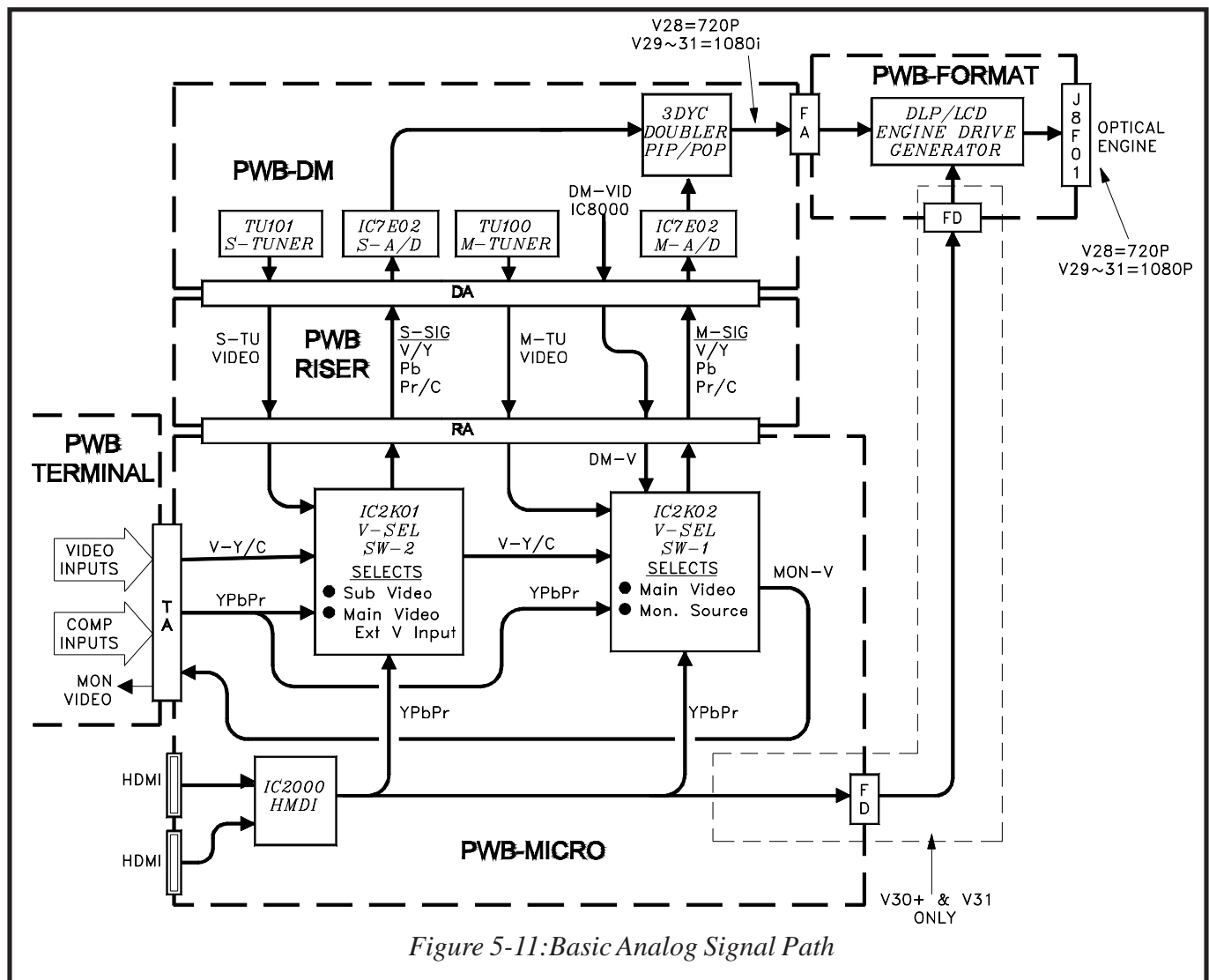


Figure 5-11: Basic Analog Signal Path

Figure 5-12 illustrates the Basic Digital Video Signal Path. The Digital Signal output from the Main Tuner is an I.F. signal. The signal from the Main Tuner is directed to PWB-DEMOD1.

The Demodulated Output (MPEG) signals are direct back to PWB-DM and via the POD circuitry to the MPEG Decoder. The output of the MPEG Decoder is processed by Doubler and PIP/POP circuitry and is directed to the PWB-FORMAT.

Note that Prelude and A/D Converter circuitry added in the DLP chassis PWB-FORMAT. These used for signal conversion to 1080p and to process signals from a PC. In V29 through V30+ chassis PC connection is though one of the HDMI inputs on the rear of the TV.

In the V31 chassis a conventional VGA input is added on the PWB-FORMAT.

Note that in the V30+ and V31 chassis the PWB-DEM0D2 is added to process HD signals from the Sub Tuner. This allows the Sub Tuner HD signals to be selected as the PIP/POP sub picture signal source.

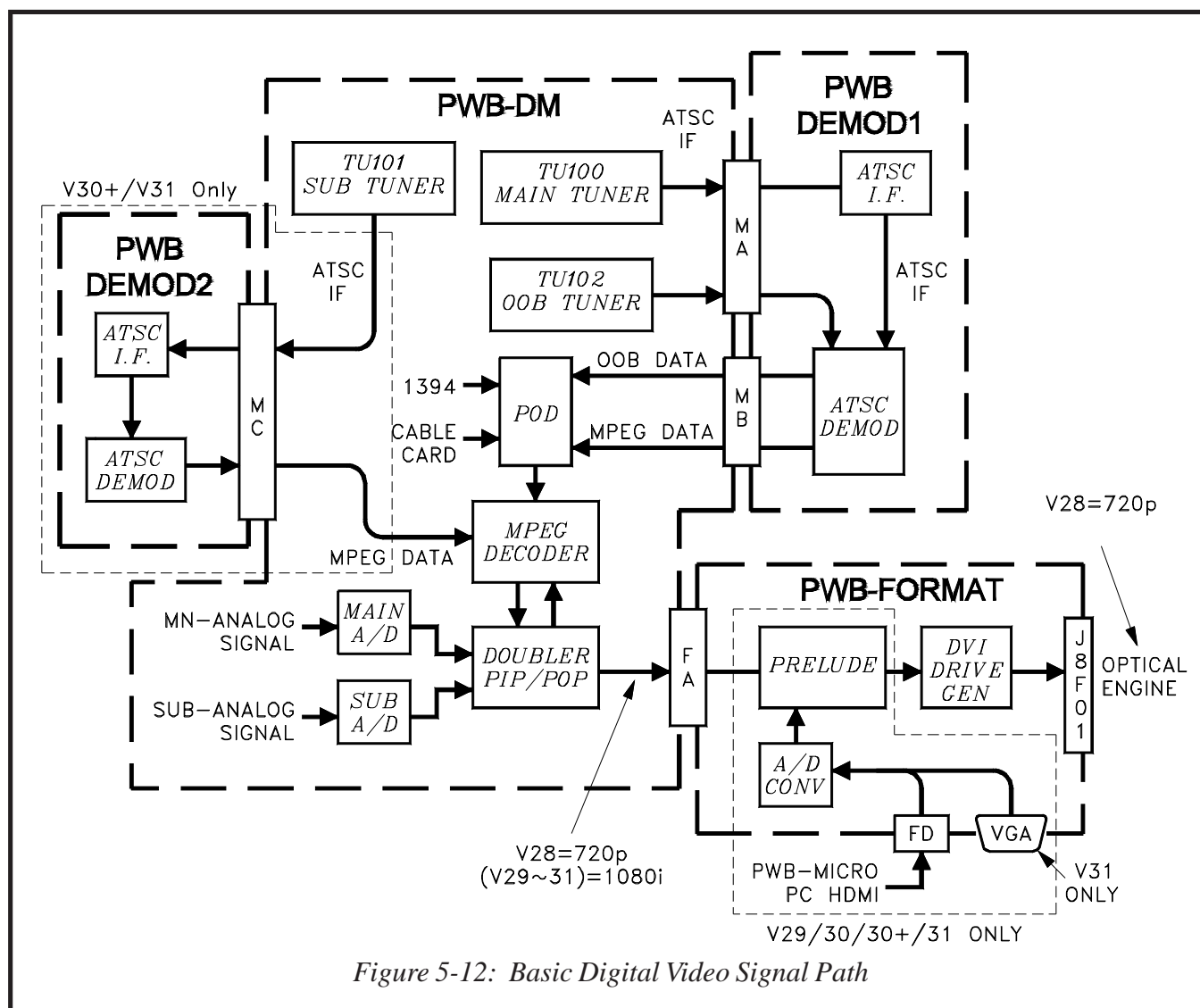
As a reference for troubleshooting, *Figures 5-13 through 5-15* are more detailed Video Signal Path diagrams:

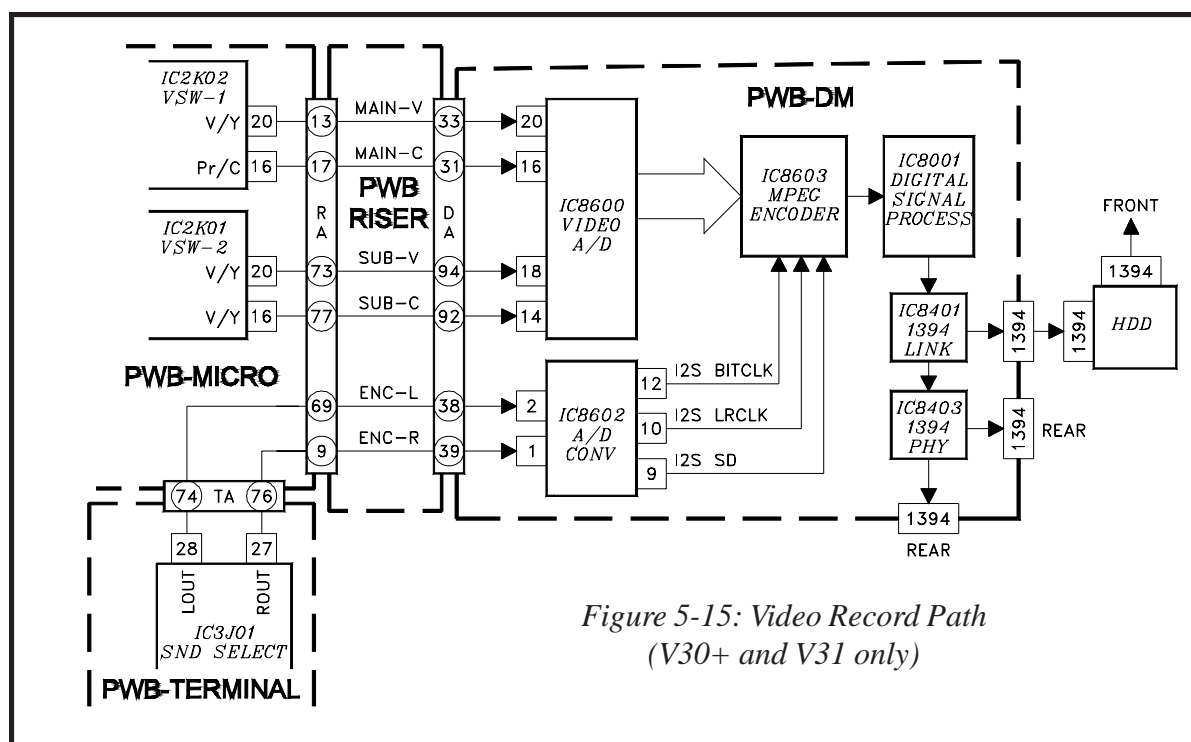
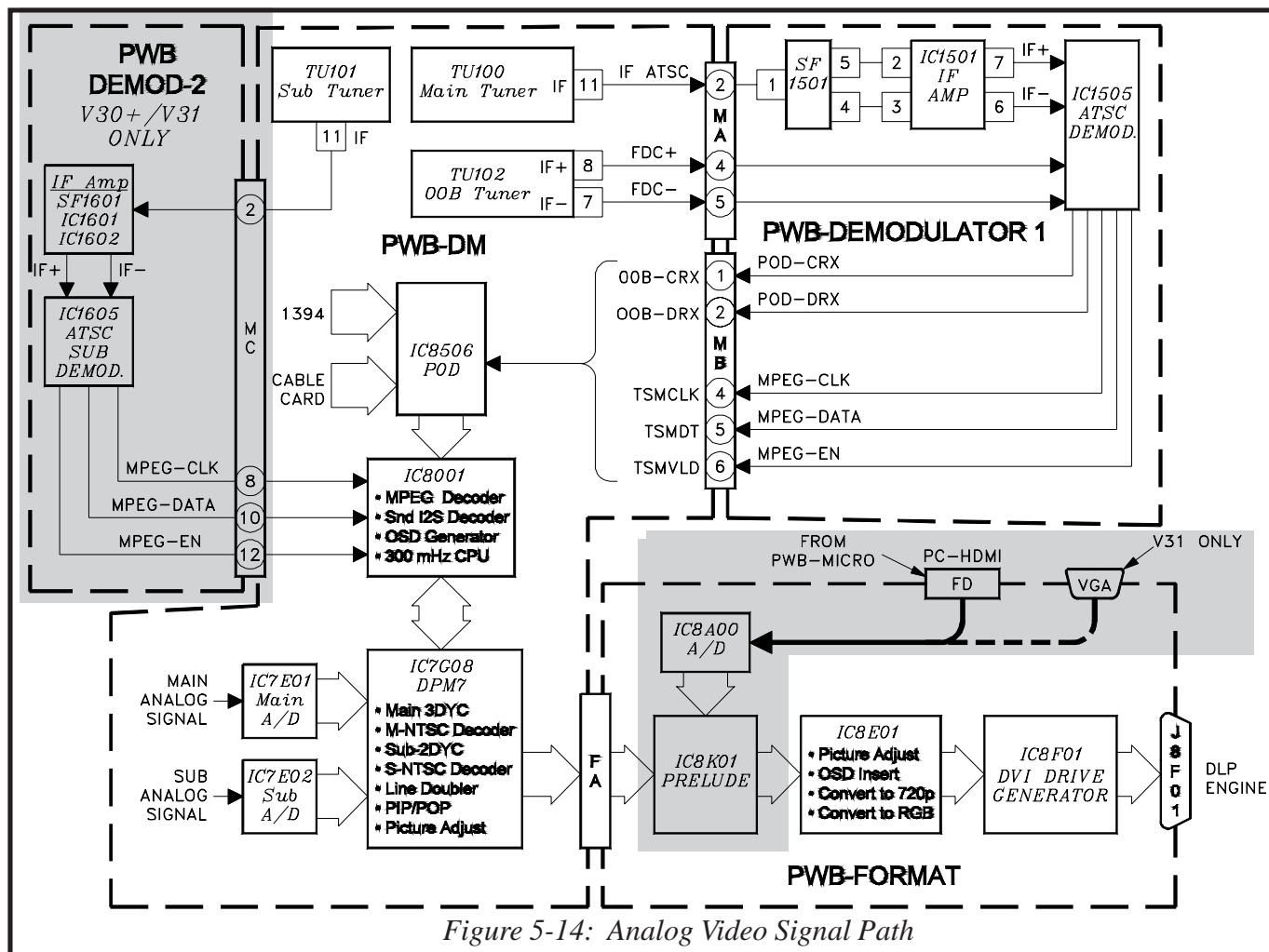
Figure 5-13: Analog Video Signal Path

Figure 5-14: Digital Video Signal Path

Figure 5-15: Record Signal Path

Shaded Areas differ from the V28 circuitry.





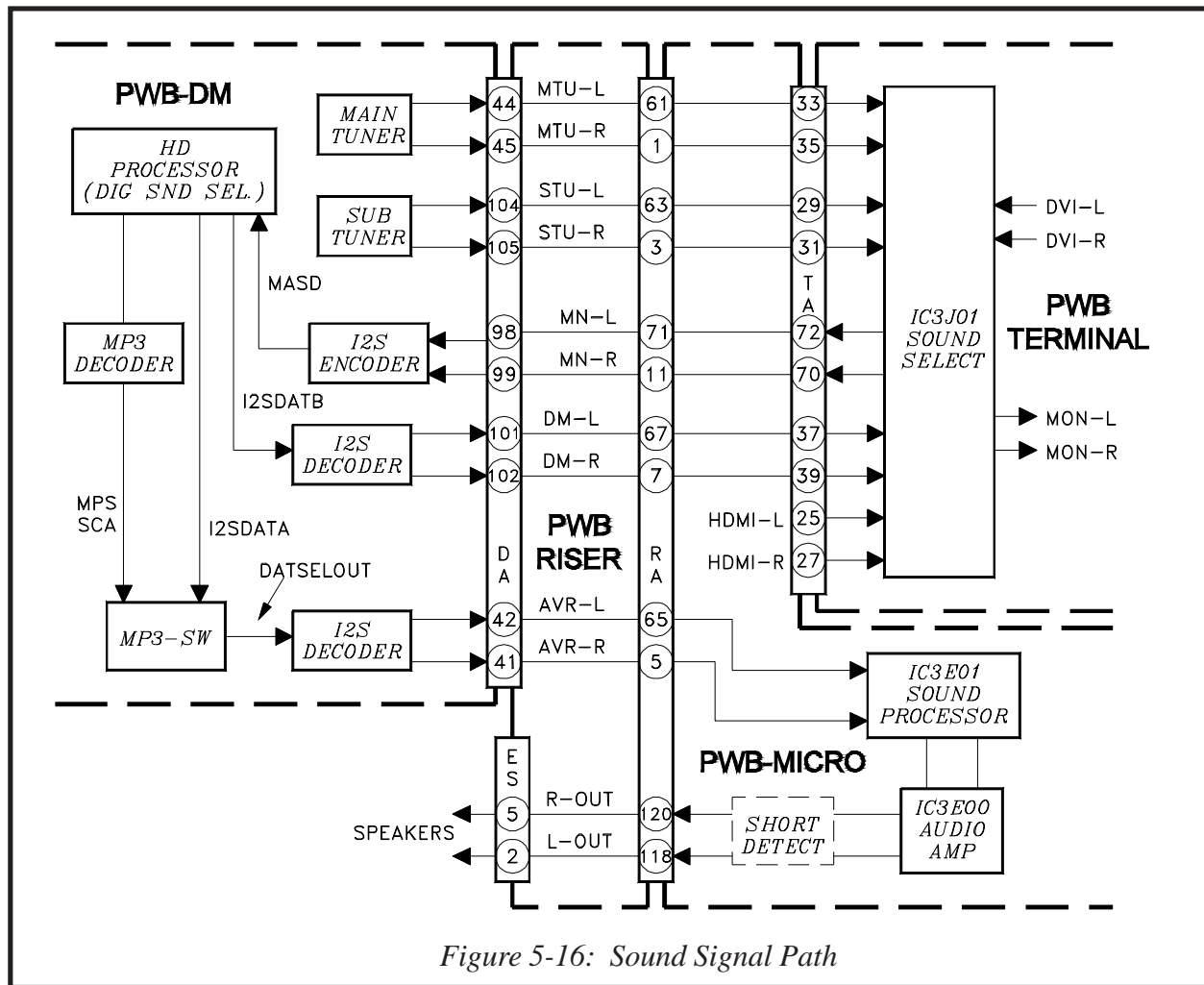


Figure 5-16: Sound Signal Path

Sound Signal Path

Figure 5-16 shows the Sound Signal Path in both LCD and DLP chassis. The Sound Circuitry is the same on both LCD and DLP chassis. IC3J01 on PWB-TERMINAL select the analog sound signal source. The selected signal is directed to PWB-DM. The signal is converted to a digital I2S format and is applied the Digital Sound Selection portion of the HD Processor.

The signal is then directed to an MP3 Switch. If the signal source is digital, it is processed by an MP3 Decoder and is also directed to an input on the MP3 Switch.

An I2S Decoder converts the selected signal to analog left and right audio. The signals are directed through PWB-RISER and are processed by a sound processing IC, then amplified and directed to the set's speakers.

The only new circuitry is Speaker Short Detect circuit shown in Figure 5-17.

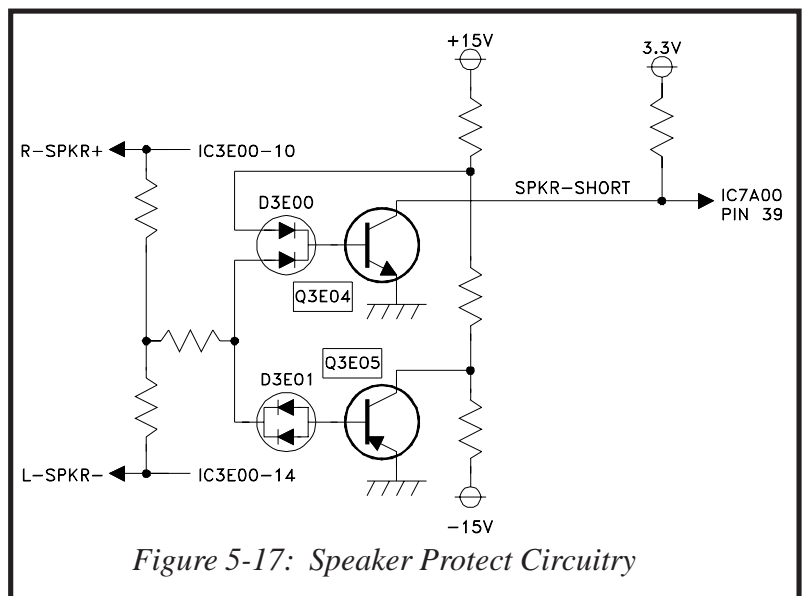


Figure 5-17: Speaker Protect Circuitry

Control Circuitry

Overall Control Circuitry

There are 5 Control μ PCs in the LCD and DLP chassis.

- IC7A00 TV μ PC on PWB-MICRO
- IC8001 DM μ PC on PWB-DM
- IC7P01 SYS-5 μ PC on PWB-MICRO

- IC8G01 FORMAT μ PC on PWB-FORMAT
- IC7R05 TVGOS μ PC on PWB-RISER

Figure 5-18 shows the interconnect paths between the five μ PCs, and the command input paths from the Remote Control and the Front Panel buttons.

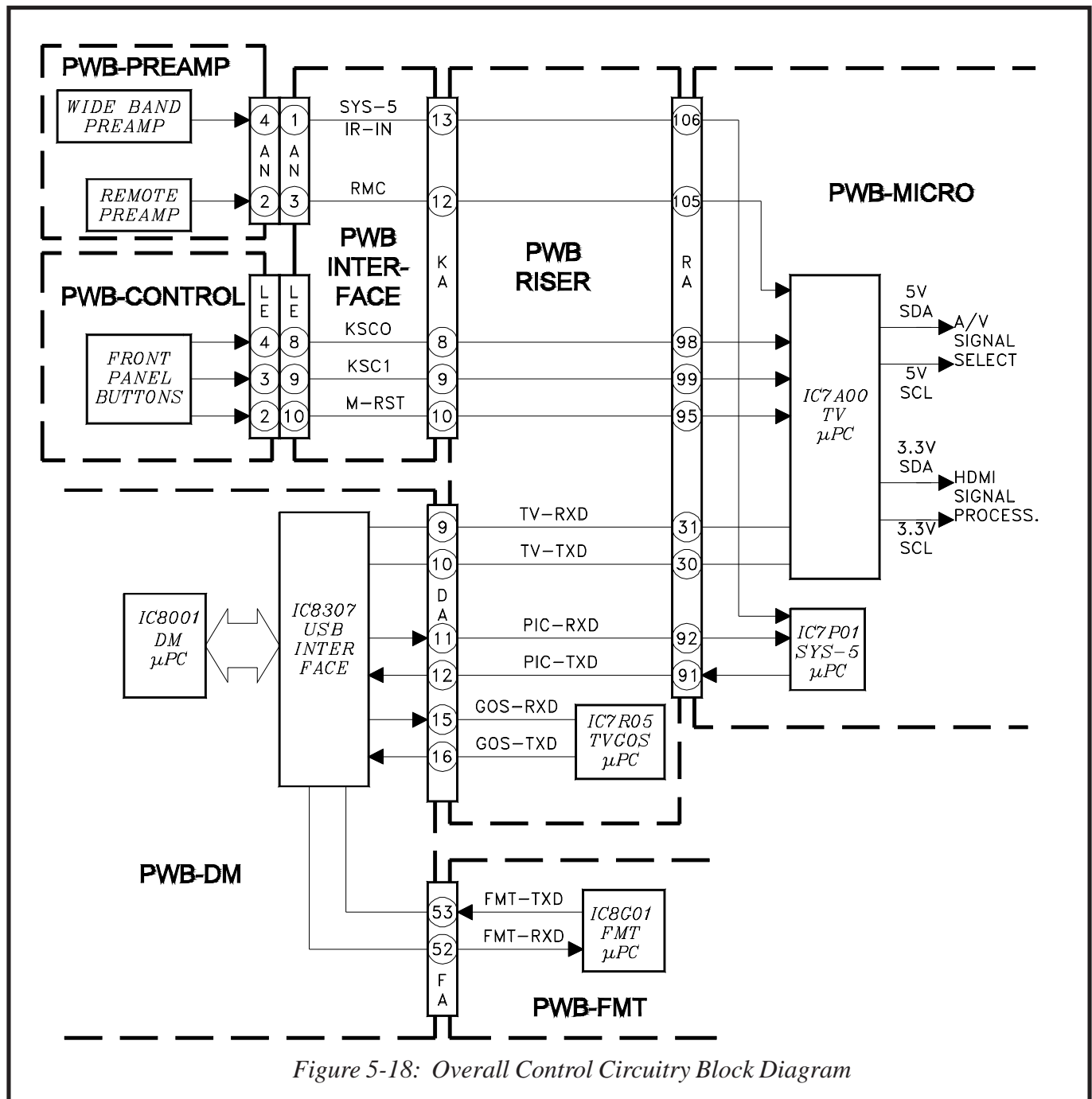
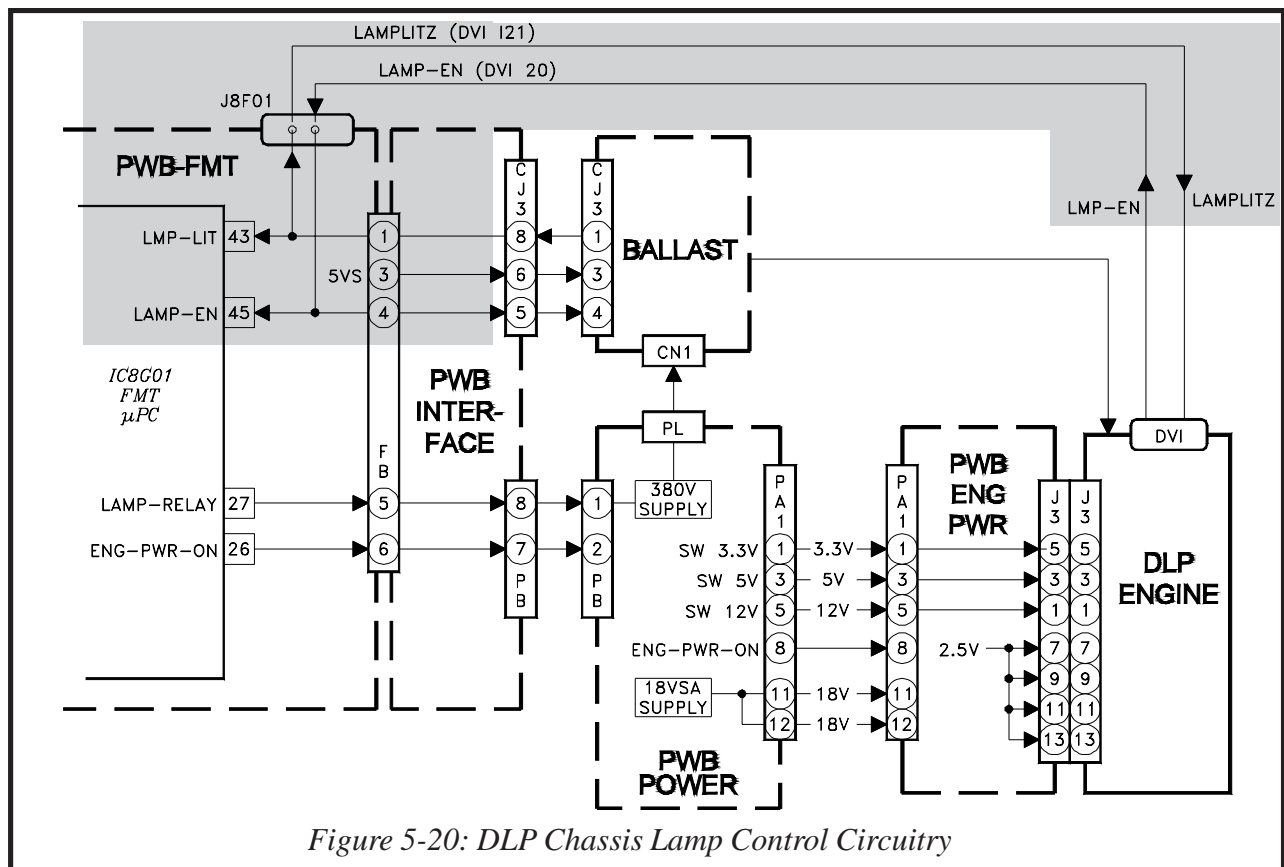
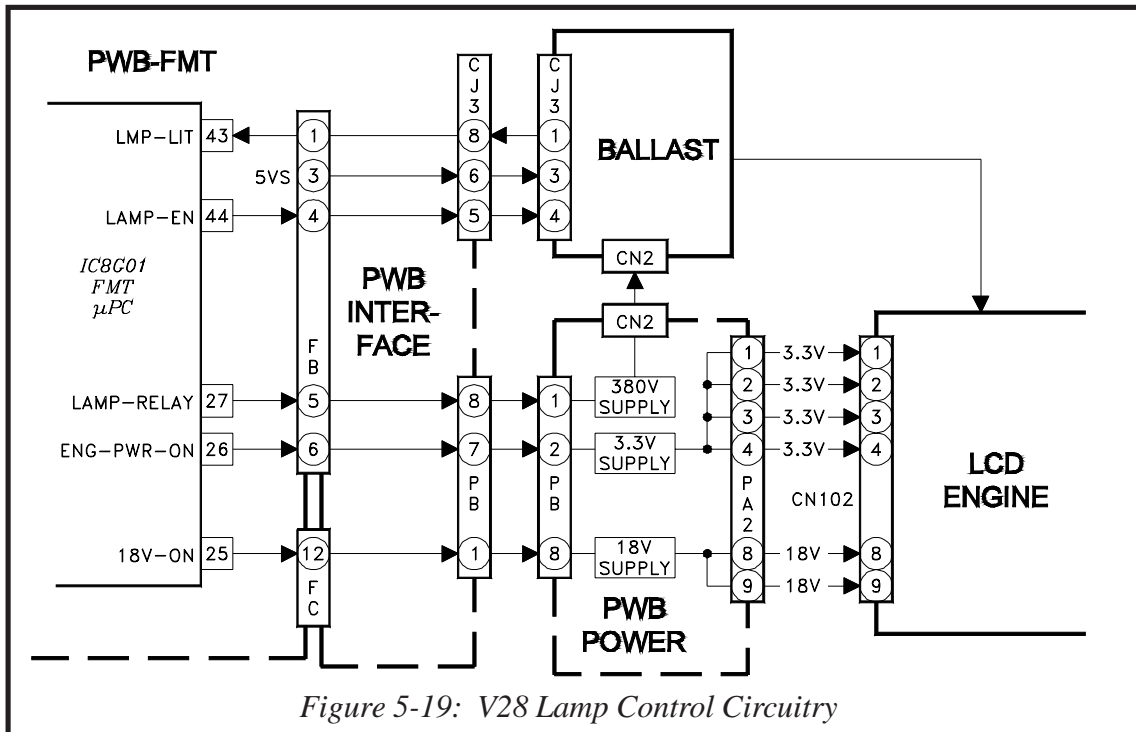


Figure 5-18: Overall Control Circuitry Block Diagram

Lamp Control Circuitry

Figure 5-19 shows the Lamp Control Circuitry in V28 chassis, and Figure 5-20 the circuitry in the DLP chassis. Differences from the V28 chassis are shaded in

Figure 5-20. Mainly in the V28 the LAMP-EN command is from the FMT μ PC, and in the DLP chassis it comes from the Light Engine



Engine Protect Circuitry

This circuitry monitors the temperature in the Light Engine, and Lamp, and also monitors the operation of the various cooling fans. *Figure 5-21* shows the Engine Protect circuitry in the V28 chassis, and *Figure 5-22* the Engine Protect circuitry in the DLP chassis. The main difference between the two circuits is there is no Air Filter in the DLP chassis, so there is no FILTER

DET status line. The FILTER-DET line is shaded in *Figure 5-21*.

Short & Speaker Protect Circuitry

As a quick reference, the Short Protect circuitry is illustrated in *Figure 5-23*. There are two Short Protect circuits, one for Standby Supplies and one for Switched Supplies (PON supplies)..

