

**HDI® 5000  
Ultrasound System**

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**Field Service Manual**

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A Philips  
Medical Systems  
Company

**Rev A August 2000**

ATL Ultrasound  
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# About This Manual

## Audience

This manual supports the field service maintenance and repair of the HDI 5000 Ultrasound System. The user of this document is a qualified ultrasound electronics technician who has completed training classes on the system and its peripherals.

## Manual Format

This manual is available in two versions: Portable Document Format (PDF), for viewing on a laptop-computer screen, and hard copy. In the PDF a list of bookmarks functions as a table of contents, and the bookmarks, index entries, table-of-contents entries, and cross-references use hypertext links to provide access to the referenced information.

## Conventions Used in This Manual

The following conventions are used in this manual:

- All procedures are numbered. You must complete steps in the sequence they are presented to ensure a reliable result.
- Bulleted lists indicate general information about a particular function or procedure. They do not imply a sequential procedure.
- Control names are spelled and capitalized in the manual as they are on the system.
- Menu items or titles appearing on the monitor are spelled and capitalized in the manual as they are on the monitor.
- Scanheads and pencil probes both are referred to as scanheads, unless the distinction is important to the meaning of the text.
- Pages changed or added after the initial release are identified by a change date at the bottom of the page. A change bar (■) in the outside margin denotes the specific part of a page that was changed on that date. On pages with change dates but no change bars, only the page number has changed.

## **Questions or Comments About the Manual**

If you have questions about the service manual, or you discover an error in the manual, contact ATL Technical Publications:

- atl-bothell.techpubs@philips.com
- Technical Publications, MS 405  
ATL Ultrasound  
P.O. Box 3003  
Bothell, WA 98041-3003  
USA

## **Customer Assistance**

Various support locations around the world can provide customers with technical assistance regarding the ultrasound system.

Customers should contact the sales office where they purchased the system or the nearest ATL office. ATL office addresses and telephone numbers are in the “Read This First” section of the system reference manual (P/N 4703-0027-XX).

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# **1 General Information**

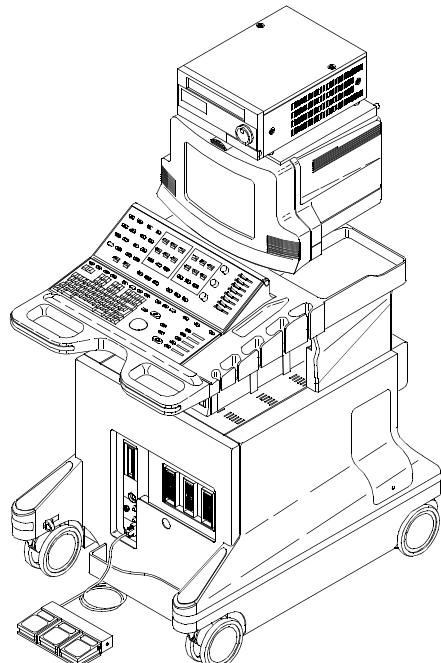
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## **1-1 Introduction**

The HDI 5000 Ultrasound System is a general-purpose, mobile, software-controlled, diagnostic ultrasound system. Its function is to acquire, process, and display ultrasound data ([Figure 1-1](#)).

The operator can measure anatomical structures and generate reports for health care professionals. The primary users are physicians and sonographers in clinics and hospital departments that provide diagnostic ultrasound services.

The system has a basic set of imaging modes and measurement tools. There also are modes and measurement tools which are only available when a specific mode or analysis package is purchased and enabled for customer use. Upgrade security is controlled through the use of system-specific passwords and software.



**Figure 1-1 HDI 5000 Ultrasound System**

## 1-1.1

### Scanheads

The following scanhead types are supported:

- phased arrays
- linear arrays
- convex arrays
- compact linear array
- CW pencil probes
- multiplane transesophageal

Refer to: [Section 4, "Theory of Operation"](#), for front end theory; [Section 6, "Performance Tests"](#), for operating parameters; and [Section 13, "Configuration"](#), for compatibility and replacement data.

## 1-1.2

### Physical Description

#### Frame

The frame provides the primary structural support for the system. It has a one-piece weldment. Front casters are swivel mounted with brake locks, rear casters are fixed. Casters have integral shock mounts. The frame provides the mounting base and swivel mechanism for the monitor module.

#### Card Cage

The removable card cage slides into the frame and is secured with screws. It incorporates a center motherboard, or centerplane, with modules inserted from the front and rear. The card cage is designed to allow for future motherboard, power supply, and fan module upgrades. Rear mounted fans provide forced air cooling.

Eight slots are dedicated with appropriate shielding for channel boards. Two additional shielded slots are available for the AIM+ PCB and a spare PCB. External connections are provided through connectors mounted on brackets attached directly to the card cage modules to eliminate cabling to remote connectors. All power supplies, disk drives and PCBs are slide-in modules with card-edge connectors, switches, and LEDs, as necessary.

#### Peripheral Bay

Peripherals are installed into the cart with their control panels accessible to the operator. Some peripheral controls also are available on the system control panel for various OEM functions.

The open peripheral bay will accept a variety of peripherals. Peripherals are mounted by one or more straps on a universal adapter plate. The plate can easily be modified or replaced to accommodate future peripherals. A VCR mounts on top of the monitor or in the OEM bay.

## **Control Panels**

Operator controls consist of a full-size keyboard, a trackball and an array of pushbuttons, toggle switches, slidepots, and rotary controls. Pressing certain switches displays menus on the video screen. The trackball is then used to select from the menus. Slidepots control TGC. Rotary controls are used for gain control.

Included on the control module assembly are scanhead holders, storage trays at the rear, and the handle used to move the system. The keyboard wrist rest also serves as an ESD ground for the operator.

## **Monitor**

The monitor assembly includes a single 15-inch, 120 or 220 Vac, 50/60 Hz non-interlaced, all-digital monitor, monitor enclosure, and mounting for the VCR. The VCR and monitor are removable for mobile systems. The monitor is mounted on a swivel base that is mounted on the frame. Video resolution is 512 x 640 pixels in NTSC format and 512 x 768 pixels in PAL format.

The monitor senses the input video format and will also display interlaced video with horizontal sync frequencies, nominally 15 kHz, with vertical sync signal frequencies of 25 Hz and 30 Hz.

The monitor also accepts progressive video with horizontal sync frequencies, nominally 31 kHz, with vertical sync signal frequencies between 50 Hz and 60 Hz.

## **Cables**

Internal power cables are routed from the AC Input Module (ACIM) through the right rear of the system (with the observer facing the rear of the system) to the OEM or module requiring power. Internal signal cables are routed from the Internal Interface Module (IIM) through the left rear of the system to each OEM or the monitor. Refer to [Section 11, "Cabling"](#), for more information.

## **2 Specifications**

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### **2-1 Scanheads**

contains the scanhead name that appears on the system monitor, the scanhead label, the scanhead frequency, and the Doppler frequency of system scanheads.

[Table 2-2](#) contains a summary of scanhead types, capabilities, and advantages.

**Table 2-1 Scanhead Information**

<b>Scanhead Name</b>	<b>No. Elems.</b>	<b>Scanhead Label</b>	<b>Operating Frequency</b>	<b>Doppler Frequency</b>
L7-4 38 mm	128	Linear Array L7-4	7.0 - 4.0 MHz	4.0 MHz
LI9-5	128	Linear Array LI9-5	9.0 - 5.0 MHz	5.0 MHz
LAP L9-5	128	Linear Array L9-5	9.0 - 5.0 MHz	6.0 MHz
L10-5 38 mm	192	Linear Array L10-5	10.0 - 5.0 MHz	6.0 MHz
L12-5 38 mm	192	Linear Array L12-5	12.0 - 5.0 MHz	6.0 MHz
L12-5 50 mm	256	Linear Array L12-5	12.0 - 5.0 MHz	6.0 MHz
CL10-5	128	Compact Linear Array CL10-5	10.0 - 5.0 MHz	6.0 MHz
C4-2 40 mm	128	Curved Array C4-2	4.0 - 2.0 MHz	2.5 MHz
C5-2 40 mm	128	Curved Array C5-2	5.0 - 2.0 MHz	2.5 MHz
C7-4 40 mm	128	Curved Array C7-4	7.0 - 4.0 MHz	4.0 MHz
CT8-4 40 mm	128	Curved Array CT8-4	8.0 - 4.0 MHz	6.0 MHz
C8-4v 11 mm	128	Curved Array C8-4v	8.0 - 4.0 MHz	5.0 MHz
C8-5	128	Curved Array C8-5	8.0 - 5.0 MHz	5.0 MHz
C9-5 ICT 8 mm	128	Curved Array C9-5	9.0 - 5.0 MHz	5.0 MHz
P3-2 20 mm	64	Phased Array P3-2	3.25 - 1.75 MHz	2.0 MHz
P4-2 20 mm	64	Phased Array P4-2	4.0 - 2.0 MHz	2.0 MHz
P5-3 16 mm	64	Phased Array P5-3	5.0 - 3.0 MHz	3.0 MHz
P6-3 28 mm	128	Phased Array P6-3	6.0 - 3.0 MHz	3.0 MHz
P7-4 16 mm	64	Phased Array P7-4	7.0 - 4.0 MHz	4.0 MHz
MPT7-4 10 mm	64	Phased Array MPT7-4	7.0 - 4.0 MHz	4.0 MHz
BPT9-5	2x64	Phased Array BPT9-5	9.0 - 5.0 MHz	6.0 MHz
TCD Static	1	D2 TC		2.0 MHz
D2 Static	2	D2 CW		2.0 MHz
D5 Static	2	D5 CW		5.0 MHz
D10 Static	2	D10 CW		10.0 MHz

**Table 2-2 Scanhead Types, Capabilities, and Advantages**

Type	Capabilities	Advantages
<b>Linear Array</b>		
- L7-4 40 mm - LI9-5 33 mm - LAP L9-5 - L10-5 38 mm - L12-5 38 mm - L12-5 50 mm - CL10-5	- 2D, M-mode, pulsed Doppler, Power, and Color	- Dynamic receive focus for optimal lateral resolution - Multiple transmit focal zones - Wide field of view - High frame rate - Excellent tissue definition and contrast resolution - Excellent small parts imaging
<b>Curved Array</b>		
- C4-2 40R - C5-2 40R - C7-4 40 mm - C8-4v - CT8-4 - C8-5 - C9-5 8 mm	- 2D, M-mode, pulsed Doppler, Power, and Color	- Combines the advantages of phased array and linear array scanheads - Multiple transmit focal zones - Sector format with wide field of view at skin surface - Aperture size consistent across sector results in good lateral resolution - Dynamic receive focus - Excellent resolution and detail - Design is lightweight and easy to use - C5-2 has Contrast Specific Imaging capability
<b>Phased Array</b>		
- P3-2 20 mm - P4-2 20 mm - P5-3 16 mm - P6-3 28mm - P7-4 16mm - MPT7-4 10 mm - BPT9-5	- 2D, M-mode, pulsed Doppler, CW Doppler (except P6-3), Power, Color, and Color M-mode	- Multiple transmit focal zones - Dynamic receive focus - MPT7-4 for transesophageal applications - P3-2, P4-2, and P5-3 have Contrast Specific Imaging capability
<b>Pencil Probes</b>		
- D2 CW - D5 CW - D10 CW	- CW Doppler	- Good continuous-wave Doppler sensitivity
- D2 TC	- Pulsed Doppler	- Good pulsed Doppler sensitivity

## **2-2 System Specifications**

### **2-2.1 Physical Dimensions**

- Width: 72 cm (28.35 in)
- Height: 157.5 cm (62 in) with VCR  
142 cm (56 in) without VCR  
122 cm (48 in) when monitor is removed for transport
- Depth: 110.4 cm (43.45 in)
- Weight: 172-200 kg (380-440 lbs) (depends upon the hardcopy device that is installed)

### **2-2.2 System Architecture**

- Digital broadband beamformer
- Extended signal processing
- Modular microcomputer structure

### **2-2.3 Imaging Modes**

- Gray-scale 2D
- M-mode
- Doppler (PW and CW)
- Power (CPA and PMI)
- Color 2D
- Color M-Mode
- 3D Gray scale
- 3D Color Power Angio (3D CPA)
- Tissue Doppler Imaging (TDI)
- Tissue Harmonic Imaging (THI)
- SonoCT Real-time Compound Imaging

### **2-2.4 Update Methods**

- Update or Duplex
- Triple Mode
- Simultaneous

### **2-2.5 Clinical Options**

- Abdominal
- Abdominal Surgery
- Adult Cardiology
- Advanced Breast Imaging
- Cardiology Contrast Specific Imaging (CSI)
- Cerebrovascular

- General Imaging CSI
- Generic
- Gynecological and Fertility
- Musculoskeletal
- Neurosurgery
- Obstetrical
- Pediatric/Fetal Cardiology
- Pediatric General Imaging
- Peripheral Vascular
- Prostate
- Small Parts
- Transesophageal Cardiology
- Transcranial Doppler
- Vascular Surgery

## **2-2.6**

### **Gain**

- Slidelot controls for TGC (b/w , color, and TDI)
- 2D gain rotary control
- Doppler gain rotary control
- Color gain rotary control

## **2-2.7**

### **Gray Shades**

- 256 in 2D
- 256 in M-mode
- 256 in Doppler

## **2-2.8**

### **Image Processing**

- 2D graymaps
- 3D CPA and grayscale displays
- Chroma maps
- Doppler graymaps
- Dynamic range
- Color maps
- CPA maps
- CPA blending
- CPA display type
- Dynamic Motion Differentiation

- 2-2.9 Scan Conversion**
- Sector for phased and curved array scanheads
  - Rectangular for linear array scanheads, steered for Color and Doppler imaging
  - Up to 512 scan lines (scanhead and application dependent)
- 2-2.10 Frame Rate**
- Scanhead dependent
  - Frame rate control
- 2-2.11 User Control System**
- Monitor brightness, contrast, lightbar, and background color controls (default settings)
  - Rotary controls
  - Slidepot controls
  - Keyboard
  - Volume control
  - Dedicated primary imaging controls
  - Menus and superkeys for secondary imaging controls
  - Color and tint controls for VCR playback
  - Softkeys
  - Digital Video Streaming (DVS) hand controller
  - Footswitch
- 2-2.12 Digital Signal Processing**
- Selectable compression (dynamic range)
  - Automatic system bandwidth adjustment
  - Selectable receive bandwidth patient optimization
  - Software-controlled bandwidth, filter, and frequency optimization
  - SonoCT Real-time Compound Imaging
  - Intelligent Frame Rate Accelerator (multi-line processing)
- 2-2.13 Image Modification**
- Zoom and pan of real-time or frozen 2D image
  - Up to eight times magnification of 2D images
  - High Definition Zoom
  - Up to five times M-mode zoom
  - 2D persistence
  - Color persistence
  - Color capture
  - Color tag

- Color smoothing
- TDI Blend

## 2-2.14

### Programmability

- Application and scanhead optimization
- Optimization for 3D, harmonic imaging, frame rate, and 2D/Color imaging
- Quick Save of user settings by application and scanhead
- On-screen programming for internal and external hardcopy devices
- User-defined acquisition protocols with the DVS option
- Analysis configuration
- Annotation text

## 2-2.15

### Display Annotation

- Patient name and identification
- Institution
- Time and date
- Biopsy guide line
- Title, text, arrows, scanhead position, and body marker annotation
- Tissue specific body markers
- Additional Image Information
- Image Management status
- TI and MI values
- M cursor
- Doppler sample volume and angle correction
- Graphics control with the DVS option

## 2-2.16

### Image Presentation

- Up/down orientation
- Left/right orientation

## 2-2.17

### 2D

- Image orientation marker
- Application-specific selectable graymaps
- 2D gain control
- Up to 5 transmit focal zones
- 2D persistence
- Dynamic range (compression curves)
- Chroma maps (gray-scale colorization)
- 2D sector size and steering
- Zoom
- HD Zoom

- 2D PRF control
  - SonoCT Real-time Compound Imaging (Survey and Target modes)
- 2-2.18      3D**
- Calibrated with position sensor and workstation
  - Uncalibrated
  - Cardiology with the MPT7-4 scanhead
- 2-2.19      M-Mode**
- Four sweep speeds
  - Time markers
  - M-mode review
  - M-mode zoom
  - Three display sizes
- 2-2.20      Doppler**
- Digital wall filters
  - Pulsed wave (PRF range: 1.25–22.7 kHz)
  - Continuous wave (Sample rate: 1.50–41.7 kHz)
  - High PRF
  - Adjustable sample volume (1.5–20 mm)
  - Adjustable zero baseline
  - Normal or inverted display
  - Three display sizes
  - Four sweep speeds
  - Doppler gain control
  - Doppler review
  - Doppler graymaps
  - Low flow capability
  - Equivalent 5 MHz annotation
  - High Q Automatic Doppler Results Display
  - Angle correction
  - Tissue Doppler Imaging for PW Doppler
- 2-2.21      Color and Tissue Doppler Imaging**
- 2D Color/Tissue Doppler Imaging
  - M-Mode Color
  - Color gain control
  - Selectable color maps
  - Velocity, variance, and power displays
  - Dynamic Motion Differentiation (DMD)

- Sensitivity
- Priority threshold
- Line density
- Color persistence
- Color smoothing
- Color tag
- Color capture
- Blending
- Frequency or velocity units
- Tissue Doppler Imaging for Color 2D and M-mode

## 2-2.22

### **Power and Power Motion Imaging**

- 2D Color Power Angio Imaging/Power Motion Imaging
- 3D Color Power Angio Imaging
- Power Motion Imaging
- Selectable maps
- Dynamic Motion Differentiation
- Adjustable background (on or off)
- Display (Topography)
- Background (Blend)
- Dynamic Range
- Persistence
- Sensitivity
- Line Density

## 2-2.23

### **Physio**

- ECG
- High-Level ECG
- Pulse
- Phono
- Auxiliary

**Table 2-3 Physio ECG Performance Characteristics**

Lower Frequency Cut-off	0.65 Hz $\pm$ 0.06 Hz
Upper Frequency Cut-off	> 30 Hz $\pm$ 3.0 Hz
Nominal Input Amplitude	1 mVp-p
Minimum Sensitivity	5 X 10 <sup>-3</sup> V

**Table 2-4 Physio High Level ECG Performance Characteristics**

Lower Frequency Cut-off	0.0 Hz ± 0.1 Hz
Upper Frequency Cut-off	> 32 Hz ± 3.2 Hz
Gain Range	21 dB ± 1 dB
Minimum Sensitivity	2 X 10 <sup>-2</sup> V

**Table 2-5 Physio Pulse Performance Characteristics**

Transducer Type	Fukuda Denshi	Other
Lower Frequency Cut-off	0.5 Hz ± 0.1 Hz	0.5 Hz ± 0.1 Hz
Upper Frequency Cut-off	> 50 Hz	> 50 Hz
Gain Range	45 dB ± 1 dB	35.5 dB ± 1 dB
Minimum Sensitivity	50 X 10 <sup>-6</sup> V	2 X 10 <sup>-3</sup> V

**Table 2-6 Physio Auxiliary Performance Characteristics**

Lower Frequency Cut-off	0.5 Hz ± 0.1 Hz
Upper Frequency Cut-off	> 800 Hz
Gain Range	28.5 dB ± 1 dB
Minimum Sensitivity	5 X 10 <sup>-3</sup> V

**Table 2-7 Physio Phono Performance Characteristics**

Phono Filter	Low Frequency Cut-off	Upper Frequency Cut-off	Gain Range		Minimum Sensitivity	
			Fukuda Denshi	Other	Fukuda Denshi	Other
Off	28 ± 2.8 Hz	810 ± 81 Hz	51 ± 1 dB	56 ± 1dB	50 X 10 <sup>-6</sup> V	50 X 10 <sup>-6</sup> V
Low	78 ± 7.8 Hz	385 ± 38.5 Hz	51 ± 1 dB	56 ± 1dB	15 X 10 <sup>-6</sup> V	15 X 10 <sup>-6</sup> V
Medium	90 ± 9.0 Hz	620 ± 62 Hz	51 ± 1 dB	56 ± 1dB	15 X 10 <sup>-6</sup> V	15 X 10 <sup>-6</sup> V
High	180 ± 18 Hz	800 ± 80 Hz	51 ± 1 dB	56 ± 1dB	10 X 10 <sup>-6</sup> V	10 X 10 <sup>-6</sup> V

## 2-2.24 Triggering Modes

- Single (A or B channel)
- Dual (simultaneous A and B channels)
- Timer (A channel only, capture initiated by system clock)

## 2-2.25 Calculations (Power Calcs)

- General Imaging
- Cardiology
- Analysis Configuration (Configurable CALCS)

## 2-2.26 Measurement Tools

- Distance
- Area

- Time/slope
- Volume
- Volume Flow
- Cardiac Output
- Heart rate
- High Q set region
- High Q mean trace
- High Q peak trace
- Calibration
- Optional hip angle
- Optional d:D ratio
- Optional % diameter reduction
- Optional % area reduction

## **2-2.27**

### **Image Storage and Retrieval**

- Cineloop Image Review, 2D
- Cineloop Image Review, 3D
- Doppler Review
- M-mode Review
- Image Management Option, DEFF-compatible, and for systems with the DVS option, DICOM-compatible
- VCR Playback and Frame Grab
- Digital Video Streaming (DVS) Option

## **2-2.28**

### **Optional Hardcopy Devices**

- Super VHS VCR
- Multi-Image camera
- Color page printer
- Report printer
- Black-and-white page printer

## **2-2.29**

### **External Connections**

- RGB-S (Red, Green, Blue, and Sync) video 50/60 Hz frame rate, non-interlaced for external video monitors: Sub-D 9-pin connector
- RGB-S-CB (Red, Green, Blue, Sync, and Composite Blanking) video 25/30 Hz frame rate, interlaced for external hardcopy devices: Sub-D 15-pin connector (input and output connector)
- Composite gray scale for external hardcopy output: BNC connector
- VCR-S Video input/output: 9-pin DSUB connector
- VCR composite video output: BNC connector
- VCR composite input: BNC connector

- VCR audio output (left/right): dual RCA jacks
- VCR audio input (left/right): dual RCA jacks
- External line printer output, RS-232A: D-sub 9-pin connector
- System diagnostic and network I/O (Ethernet), USD port RS-232A: D-sub 9-pin connector (disconnect cable for systems with DVS option)

## **2-2.30 Electrical and Video Parameters**

- 100Vac, (V~), at 50 Hz or 60 Hz, 1450 VA
- 120Vac, (V~), at 60 Hz, 1450 VA
- 220-240 Vac, (V~), at 50 Hz, 1450 VA
- 220-240 Vac, (V~), at 60 Hz, 1450 VA
- Integral AC line conditioner
- Power consumption: 800 watts; with optional OEMs, 1150 watts

## **2-2.31 Monitor**

- One 15-inch, high-resolution, color monitor
- Provides a tilt and swivel adjustment
- Adjustable contrast, brightness, and lightbar controls
- Audio speakers
- Safety latches
- Microphone connector

## **2-2.32 Languages - System Software**

- English
- French
- German
- Italian

## **2-2.33 Languages - User Interface Assemblies (Control Panels)**

- English, upper and lower
- French, upper and lower
- German, upper and lower
- Italian, upper and lower
- Danish, lower (use English upper)
- Norwegian, lower (use English upper)
- Swedish/Finnish, lower (use English upper)

## **2-2.34 Storage**

- Unified cable management system
- Gel bottle

- Footswitch
- Two general purpose trays

## 2-2.35

### Temperature, Pressure, and Humidity Limits

- Storage and Shipping
  - High: 65°C (150°F), Low: -35°C (-31 °F)
  - All at 1060 hPa to 303 hPa (1.05 ATM to 0. 3 ATM)
  - 15% to 95% relative humidity
- Operating Environment
  - High: 40°C Low: 10°C:
  - All at 1060 hPa to 700 hPa (1.05 ATM to 0. 7 ATM)
  - 15% to 95% relative humidity

## 2-2.36

### Safety Requirements

- Classification:
  - Class I with Type B, BF, and CF applied parts
  - Ordinary Equipment
  - Non-AP/APG
- Electromechanical safety standards met:
  - CSA C22.2 No. 601.1, Canadian Standards Association, Medical Electrical Equipment
  - EN 60601-1, Second Edition, including Amendments 1 and 2, European Norm, Medical Electrical Equipment
  - EN 60601-1-2, First Edition, European Norm, Collateral Standard Electromagnetic Compatibility
  - IEC 1157:1992, International Electrotechnical Commission, Requirements for the declaration of acoustic output of medical diagnostic ultrasonic equipment
  - JIS T-1000 Series, Japanese Industrial Standard, Medical Electrical Equipment
  - UL 2601-1, Underwriters Laboratories, Medical Electrical Equipment

- Agency approvals:
  - Canadian Standards Association (CSA)
  - Japanese Ministry of Health and Welfare (pending)
  - ISO 9001, EN46001 Quality Assurance Standard; Certificate #FM28256 issued by the British Standards Institution (BSI) for Quality Systems
  - CE Marked to the European Community Medical Device Directive 93/42/EEC per Annex II, as a Class IIa device, in accordance with Annex IX (BSI Certificate #0604)

ATL Ultrasound reserves the right to change specifications contained herein or discontinue manufacture at any time without prior notice. Current specifications are supplied with each system.

# **3 Safety**

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## **3-1 Safety Information**

### **3-1.1 Introduction**

**Please read this information before using an ATL ultrasound system.** It applies to the ultrasound system, scanheads, recording devices, and any optional equipment.

This device is intended for use by, or by the order of, and under the supervision of a licensed physician qualified to direct the use of the device.

In this manual, a **WARNING** describes precautions necessary to prevent injury or loss of life.

In this manual, a **CAUTION** describes precautions necessary to protect the equipment.

### **3-1.2 Electrical Safety**

This equipment has been Certified by a recognized third-party testing agency as a Class I device with Type B non-isolated and Type BF and Type CF isolated patient-applied parts. For maximum safety observe these warnings:

#### **WARNINGS**

- Before connecting and applying power, all ACIM (power input panel) mounting screws must be in place and properly secured to complete the system ground path.
  - Shock hazards may exist if this system is not properly grounded. Protection against electrical shock is provided by grounding the chassis with a 3-wire cable and plug. The system must be plugged into a hospital-grade three-hole outlet. The grounding wire must not be removed or defeated.
  - Do not remove the protective covers on the system; hazardous voltages are present inside. Cabinet panels must be in place while the system is in use. All internal adjustments and replacements must be made by a qualified ATL customer support representative.
  - Do not operate this system in the presence of flammable gases or anesthetics. Explosion can result.
  - Always inspect the scanhead or pencil probe face, housing, and cable before use. Do not use the scanhead or pencil probe if the face is cracked, chipped, or torn, the housing is damaged, or the cable is abraded.
  - Always disconnect the system from the wall outlet before cleaning the system.
-

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<b>WARNINGS</b>	<ul style="list-style-type: none"> <li>• Connection of optional devices not supplied by ATL could result in electrical shock. When such optional devices are connected to your ultrasound system, ensure that the total system chassis risk current does not exceed 100 <math>\mu</math>A for 120 Vac systems and 500 <math>\mu</math>A for 230 Vac systems.</li> <li>• In general, only the area of the scanhead acoustic window is watertight. Except where specified in specific scanhead cleaning instructions, do not immerse the remainder of a scanhead in any liquid.</li> </ul>
<b>CAUTIONS</b>	<ul style="list-style-type: none"> <li>• Always place the system ON/STANDBY switch to STANDBY for five to ten seconds before setting the system I/O circuit breaker to OFF.</li> <li>• Always wait five to ten seconds after placing the ON/STANDBY switch to STANDBY before placing the switch to ON. A power-down sequence, similar to the initialization that occurs when power is first turned on, saves certain operating parameters and turns off power supplies in a sequential order. Review the power subsystem discussion in <a href="#">Section 4, "Theory of Operation"</a>.</li> <li>• Always verify that the power cord voltage label matches the voltage on the device before plugging in the power cord. On 230 Volt systems VCR power is 230 Volts but the monitor is 120 Volts. Applying 230 Volts to the monitor will destroy it.</li> <li>• This equipment contains components that are electrostatic sensitive. Proper static procedures, protection and equipment must be used prior to opening and during handling of this equipment. Failure to use ESD procedures will cause damage to these components. Such damage to components is not covered by ATL warranties.</li> </ul>

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### 3-1.3 Mechanical Safety

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<b>WARNINGS</b>	<ul style="list-style-type: none"> <li>• Be aware of the casters, especially when moving the system. The system can weigh 200 kg (440 pounds), depending upon configuration, and it could cause injury to you or others if it rolls over feet or into shins.</li> <li>• ATL recommends pushing the system, instead of pulling it, and exercising special caution when going up or down ramps.</li> <li>• Position external hardcopy devices away from the system. Ensure that they are secure. Do not stack them on the system.</li> </ul>
<b>CAUTIONS</b>	<ul style="list-style-type: none"> <li>• Ensure that scanhead cables are secure. Use the cable management system to ensure that scanhead cables are protected from damage.</li> <li>• Electrostatic discharge (ESD) can amount to a significant voltage which may cause damage to PCBs or other system components. The following precautions can reduce ESD: anti-static spray on carpets; anti-static spray on linoleum; anti-static mats; use of a ground wire connection between the system and the patient table or bed; use of the ESD pads on the system handles and the wrist support of the system keyboard.</li> </ul>

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### 3-1.4 Equipment Protection

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#### CAUTIONS

- Excessive bending or twisting of a scanhead or pencil probe cable may cause failure or intermittent operation of the system.
  - Do not sterilize a scanhead using gas or heat methods. Never autoclave a scanhead or expose it to temperatures exceeding 55°C (131°F). These sterilization methods may permanently damage the scanhead. For disinfection and sterilization instructions, see the *Using Disinfectants and Gels* manual, part number 4700-0249-XX.
  - Inspect the system power cord and plug on a regular basis. Ensure that they are not damaged in any way.
  - The power supplies continue to operate when the system is in standby. Ensure that the circuit breaker is off, before unplugging the system from the wall outlet.
  - For optimal performance, your ATL ultrasound system should be connected to a 15 Ampere dedicated circuit with an isolated ground for 100V/120V systems or a 7.5 Ampere dedicated circuit with an isolated ground for 220V/240V systems.
-

## Safety Symbol Definitions

The International Electrotechnical Commission (IEC) has established a set of symbols to classify electrical connections and warn of potential hazards on medical electronic equipment.

**These symbols are used on the outside of the system:**



Grounded patient connection. Protection against electrical shock is provided by connection of chassis to the safety ground.



Isolated patient connection.



Isolated patient connection for applied parts in direct contact with major vessels. (Type CF)



I and O on the circuit breaker represent ON and OFF.



On the power switch, represents ON and STANDBY.



This symbol identifies a safety note. Ensure you understand the function of this control before using it. Refer to the appropriate section in the Reference Manual for an explanation of the control.



IPX-1

Drip-proof appliance on scanhead, pencil probe, or footswitch. This instrument may be safely handled in a damp environment.



IPX-7

Water-proof appliance (scanheads only). This instrument may be safely immersed.



Identifies equipotential ground (located next to ground stud on the rear panel).

**The following symbols are used inside the system:**



Identifies high voltage components operating above 750 Vac (RMS) or 750 Vdc.



Identifies the point where the system safety ground is fastened to the chassis.

**Save these instructions.**

# ***4 Theory of Operation***

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## **4-1 Introduction**

This section describes the electronics of the system and how the echo data flows through it. Also included are descriptions of the control architecture, software architecture, and the packaging.

## **4-2 Operating System**

The software operating system is supported by X-Windows software. X-Windows is an industry-standard software system that allows the development of graphical user interfaces, which consist of windows, graphics, and displayed text.

X-Windows is made up of a server and a client. The server resides on the Pixel Conversion Module (PCM), and the client resides on the Central Processing Unit (CPU).

- The server completely controls all input and output devices
- The client communicates with the server using Ethernet, an asynchronous byte-stream protocol
- CPU software controls all ultrasound functions

## **4-3 Subsystems**

The electronics of the system can be divided into five basic functional subsystems ([Figure 4-1](#)). Each subsystem contains several modules that perform specific functions within the subsystem:

- Power Subsystem
- Control Subsystem
- Acquisition Subsystem
- Processing Subsystem
- Display Subsystem

## 4-3.1 System Block Diagram

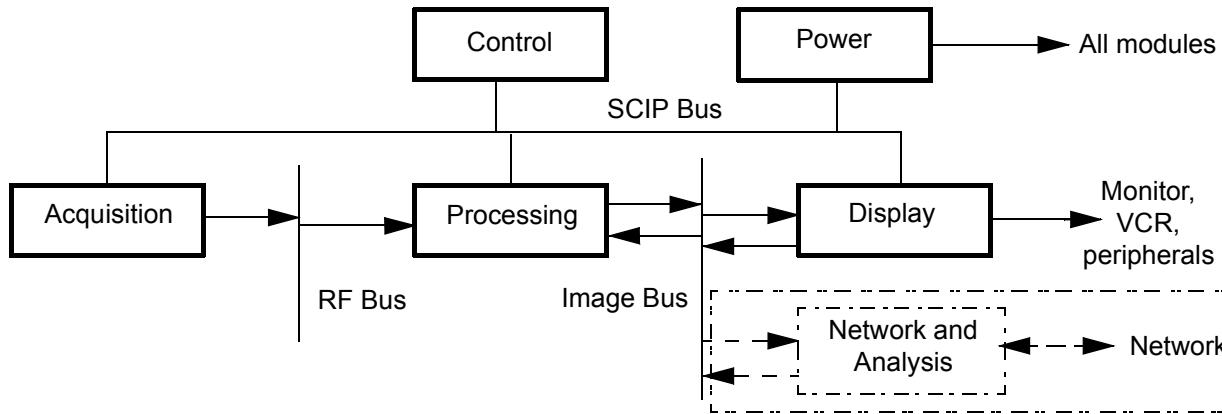


Figure 4-1 System Block Diagram

## 4-3.2 Power Subsystem

The Power Subsystem (Figure 4-2) includes AC Input Module (ACIM) and Power Supply Module (PSM). The power subsystem is monitored by the Front End Controller (FEC) using the Front End Processor (FEP) bus.

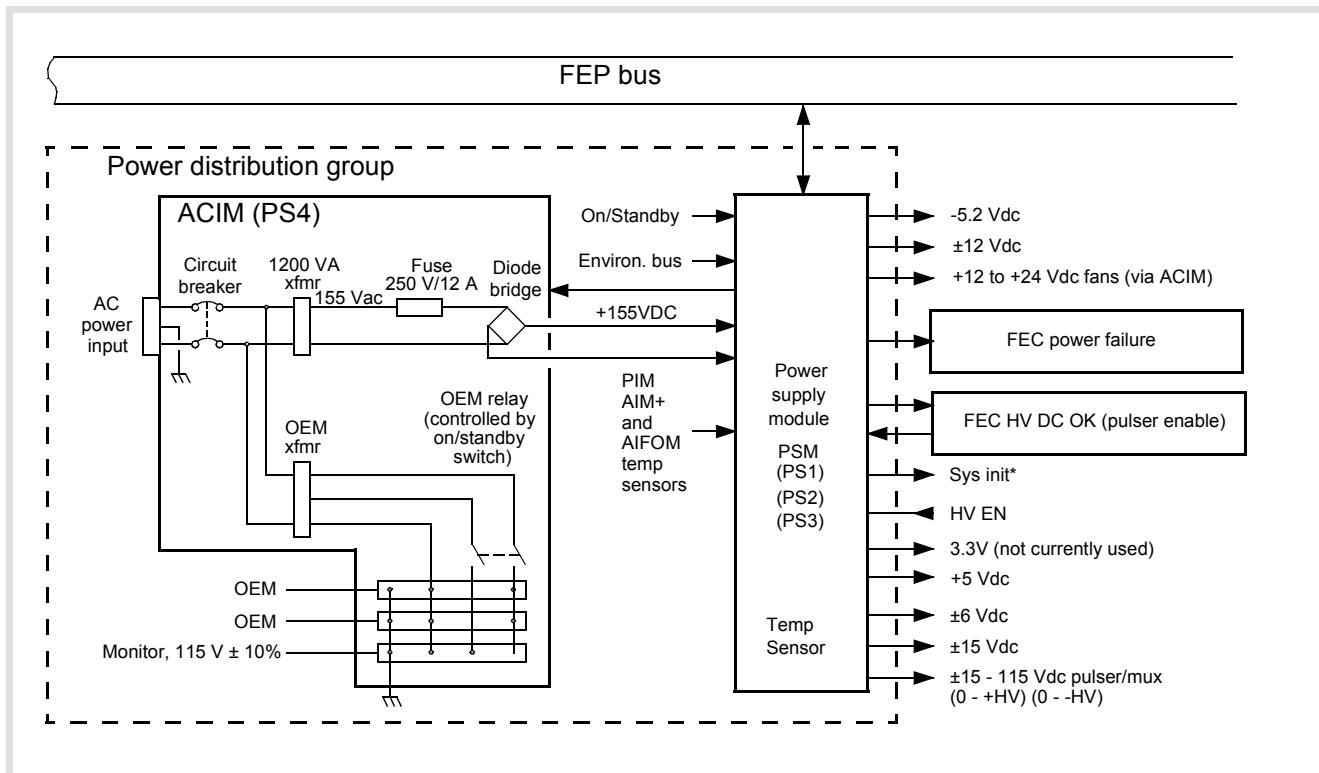
System power is not field-configurable. Four versions of the ACIM provide 100-120 Vac/60 Hz, 100-120 Vac/50 Hz, 240 Vac/50 Hz, and 230 Vac/60 Hz configurations.

The Power Subsystem also includes a shielded line cord, On/Off circuit breaker, a ferro-resonant isolation transformer, a linear transformer, resonant filter capacitors, manual ON/STANDBY switch (on user interface), software-controlled power ON/STANDBY switch (controlled by CPU), and over-load protection in the individual power supplies (watchdog circuitry on FEC). All power supplies plug directly into the centerplane to supply all DC power.

There are no power supply adjustments. The subsystem converts high voltage AC into DC voltages, and busses these DC voltages over the centerplane to the modules that require them. Status LEDs on the ACIM and PSM are covered in Section 9, "Troubleshooting". Refer to paragraph 4-4.11 for Output Power Monitor theory.

The voltages supplied by the PSM are:

- +5 Vdc
- -5.2 Vdc
- ±6 Vdc
- ±15 Vdc
- ±12 Vdc
- +12 to +24 Vdc (fans)
- ±115 Vdc (0 to +HV and 0 to -HV, for variable pulsers)



**Figure 4-2 Power Subsystem**

## Power Subsystem Operation

The Power Subsystem operates in three modes:

- **Power-Up**  
Brief initialization period after system circuit breaker is turned on
- **STANDBY**  
ON/STANDBY switch remains in STANDBY. Power supplies on: no power to card cage, or internal OEMs; system INIT\* set low.

### CAUTION

HVDC is present on the Centerplane.

- **ON**  
ON/STANDBY switch set to ON. All power rails turned on, system initialized, no faults detected, OEM voltages enabled

Refer to [paragraph 4-4.11](#), Output Power Monitor Theory for information about watchdog circuits mentioned below.

**Power-Up Mode** - occurs when the system circuit breaker is turned on. During power-on:

- PSM powers its ON/STANDBY circuit
- All Power Subsystem outputs are disabled
- PSM resets latches to enable the Vicor power supplies
- The system is placed into STANDBY mode

**STANDBY to On Mode** - PSM monitors the ON/STANDBY signal from UIF via the SCIP bus. When the ON/STANDBY switch is set to ON, the following occurs:

- Card cage voltages are enabled and monitored by the FEC for operation within ON mode limits.
- Fans start at full speed. After timeout, speed is adjusted to minimize fan noise while maintaining normal operating temperature.
- +5 V Vicor power supply comes up.
- System begins initialization; system INIT\* set to high.
- OEM power is enabled.
- PSM watchdog circuit sends data to FEC regarding HV voltages.
- PSM monitors Power Subsystem and airstream temperature.
- FEC interprets the voltage, current, and temperature values and responds by updating ACIM LEDs.
- DVS Module powers up.

**On to STANDBY Mode** - PSM monitors the ON/STANDBY signal from CPU via the SCIP bus. When the ON/STANDBY switch is set to STANDBY, the system is set to STANDBY mode as follows:

- Contents of static RAM are copied to non-volatile RAM (time, temperature, status).
- DVS Module powers down. System CPU starts time-out for system shutdown.
- FEC requests permission to enter STANDBY mode from CPU via SCIP bus and starts a time-out to prevent software lockup.
- PSM watchdog circuit stops sending data to FEC. If FEC does not respond to PSM watchdog circuit, PSM shuts down HV supply.
- CPU initiates a wait period and saves active operating parameters to non-volatile RAM. If CPU does not respond, FEC proceeds with standby sequence.
- HV supply disabled.
- Power removed from internal OEMs.
- System INIT\* is set low to reset the system.
- Card cage voltages are disabled (fans are off).

## AC Input Module (ACIM) - PS4

- AC input receptacle (Figure 4-3), I/O circuit breaker (main power switch), ground stud and LED display
  - LEDs provide diagnostic information (See Section 9, "Troubleshooting")
- Provides power interface to transformers and OEMs
- Provides HVDC to PSM

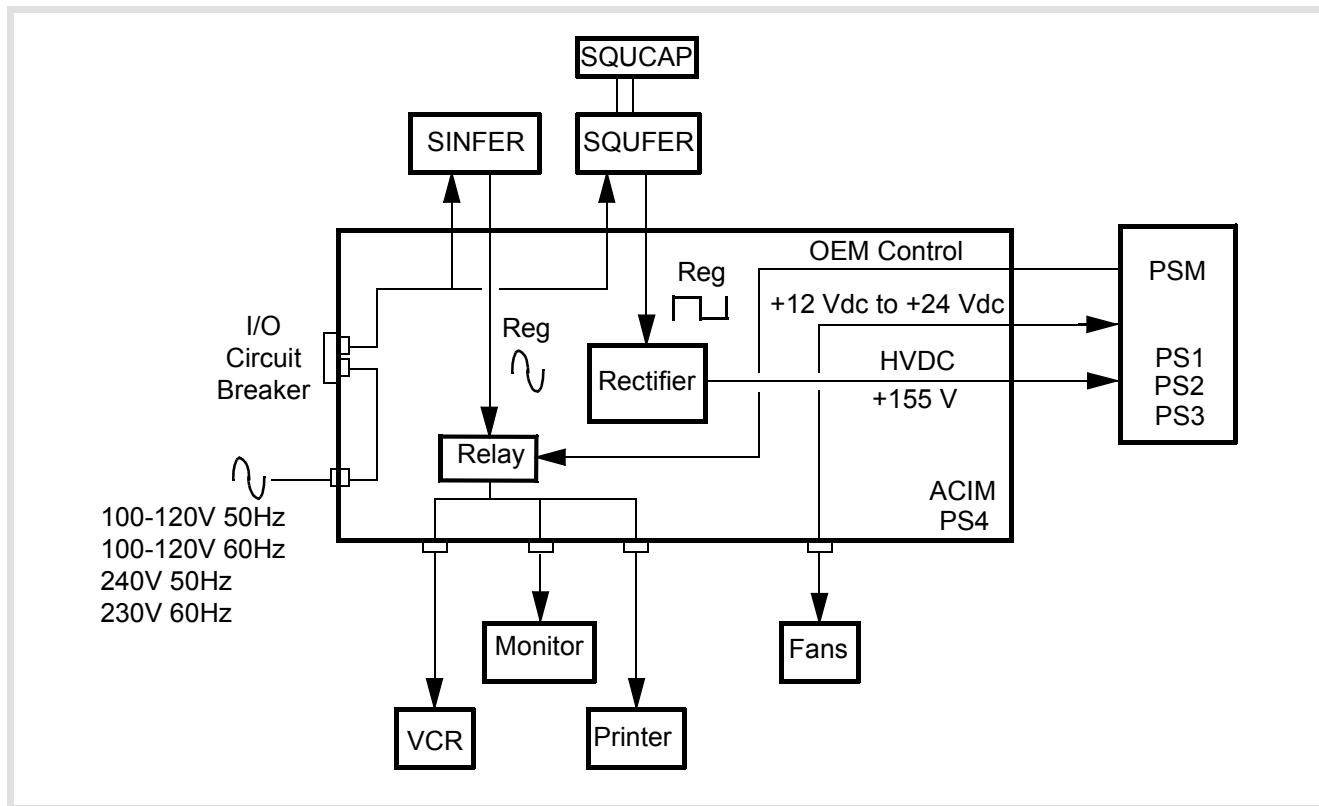


Figure 4-3 ACIM Module

## Power Supply Module (PSM) - PS1, PS2, PS3

- Provides -5.2 Vdc, +5 Vdc, ±6 Vdc, +3.3 Vdc (not currently used), +12 Vdc to +24 Vdc, ±12 Vdc, ±15 Vdc, 0 to +HV, and 0 to -HV
- Monitors thermistors located on PCBs around the card cage (PSM, AIM+, PIM, and AIFOM). Averages temperature from thermistors and controls voltage to system fans. (Power supply is disabled in Standby. Fans are not functional.)
- Variable "HV powers HV pulsers and scanheads with HV multiplexers. Generates voltages from ±15 Vdc to ±115 Vdc
- Disables all power supplies if HVDC goes below +90 Vdc
- HV watchdog circuit detects if the FEC fails to monitor the HV voltages/currents. Enables the user to shut down the system if the FEC fails or is not installed

- Monitors HVDC and notifies the CPU if it goes below 100 Vdc. CPU uses this information to protect storage devices against data corruption
- Relays status of HVDC from the ACIM to the FEC
- PSM diagnostics are performed by the FEC, voltage, current, and system temperature monitoring
- Monitors individual power supplies for over-voltage conditions and shuts down faulty power supplies
- Contains system “standby” circuitry
- Enables OEM power

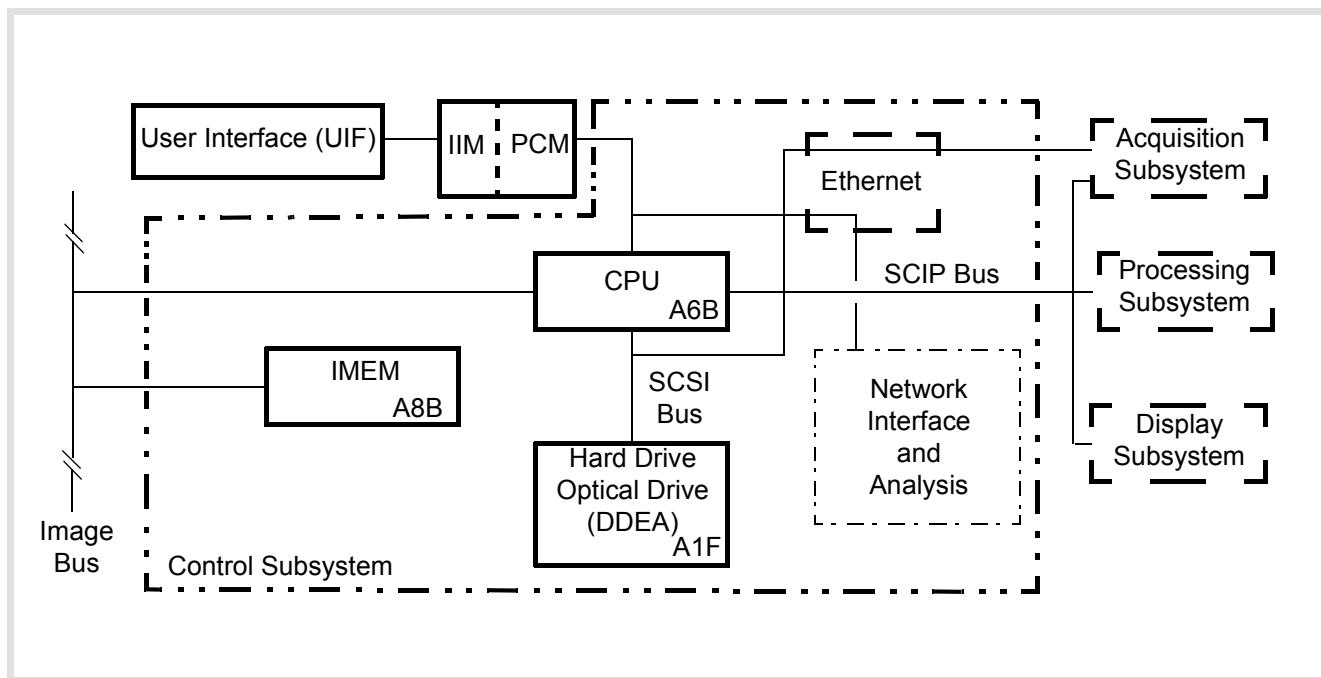
#### 4-3.3

### Control Subsystem

The Control Subsystem ([Figure 4-4](#)) monitors user input, gives status to the user through UIF, provides system coordination, provides data storage, and service access.

The Control Subsystem consists of:

- System CPU Module (CPU)
- Image Memory Module (IMEM)
- Disk Drive ECG Assembly (DDEA)



**Figure 4-4 Control Subsystem Block Diagram**

## **System CPU (CPU) - A6B**

- Motorola 68040 microprocessor; VX Works operating system.
- Loads modules requiring operating software at boot-up.
- Transfers scanhead tables to the FEC as needed.
- Generates coefficients and data tables for Processing Subsystem.
- Performs analysis calculations.
- Queries Power Subsystem for Acoustic Power & Intensity (AP&I) status.
- X-bus interface to Display Subsystem (PCM).
- Time and date.
- Stores user setups.
- 32 Mb RAM for Image Management. 48 Mb RAM for systems with Performance 2000 upgrade (17X.XX software). Additional RAM supports addition of the Performance 2000 feature set.
- Verifies major H/W, F/W, S/W revision, upgrade compatibility.
- Performs system diagnostics and stores results.
- Provides Ethernet connection to the DVS Module.

## **Image Memory (IMEM) - A8B**

- 64 Mb RAM for data storage
- Provides Image Bus arbitration, control, and timing
- Reports PCB board revision and SIMM data to system CPU
- Stores data from ADAPTR for transfer to PSP or PCM, or both
- Stores data from PCM for transfer to PSP during framegrab
- History buffers for 2D Echo, 2D Color, M-mode Echo, Color M-mode, Scrolling Doppler, Physio, and High Q Analysis

## **Disk Drive ECG Assembly (DDEA) - A1F**

- Houses optical drive and hard drive of varying capacities. All hard drives formatted to 2100 Mb due to operating system constraints.
- Provides SCSI interface to the optical and hard drives
- Provides +5 Vdc and +12 Vdc power to the optical and hard drives
- Connects and low pass filters footswitch signals to the PCM
- Amplifies and filters ECG, Aux ECG, Respiration, Channel A, and Channel B signals. Routes signals to ADAPTR
- Reports PCB board revision to system CPU

#### 4-3.4

## Acquisition Subsystem

The Acquisition Subsystem (Figure 4-5) controls the transducer, generates the electrical impulse (pulse) that creates the sound wave, and converts the returning echo information into digital data.

The Acquisition Subsystem consists of:

- Front End Controller Module (FEC)
- Scanhead Select Module (S/HSEL)
- Eight Channel Boards (CB0 - CB7)
- Analog Interface Module Plus (AIM+)
- Regulator Module (only in systems with a depopulated AIM+ PCB shipped prior to April 1998, PCB P/N 7500-1026-XX)

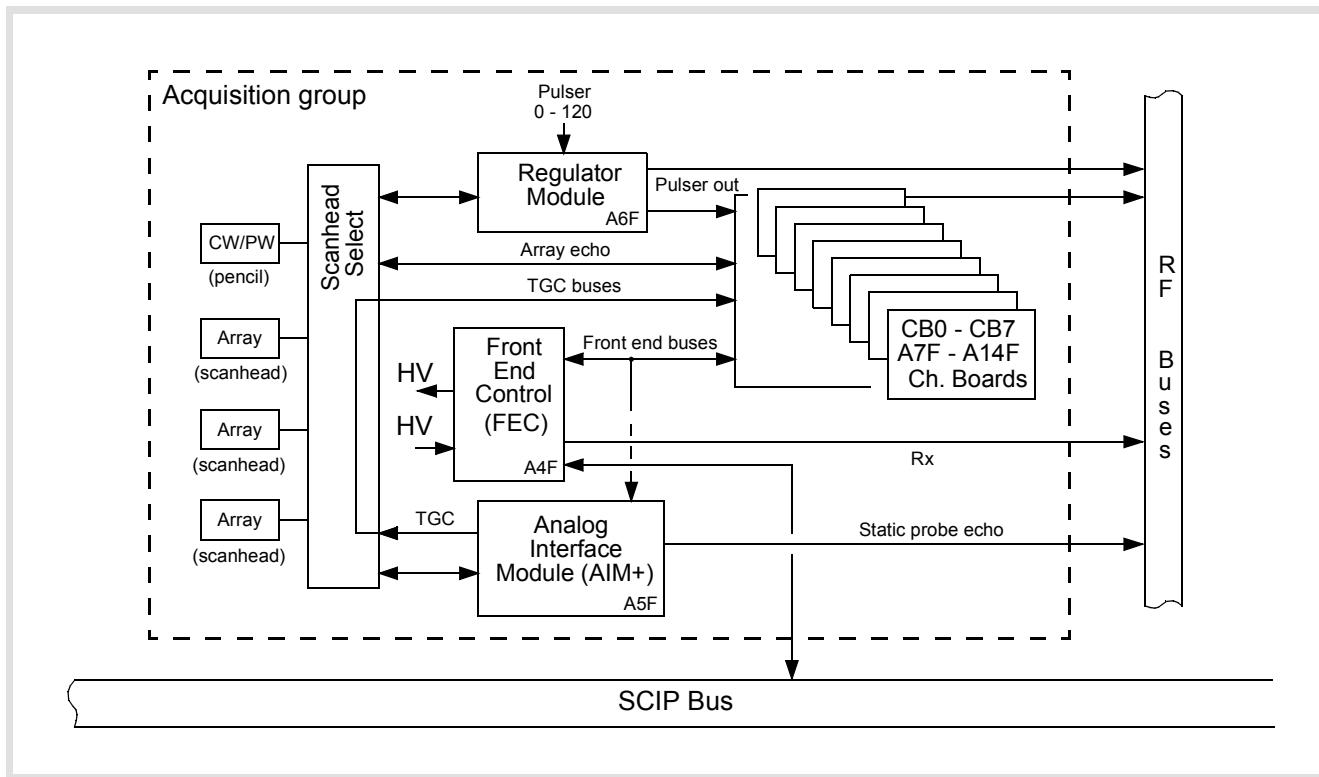


Figure 4-5 Acquisition Subsystem

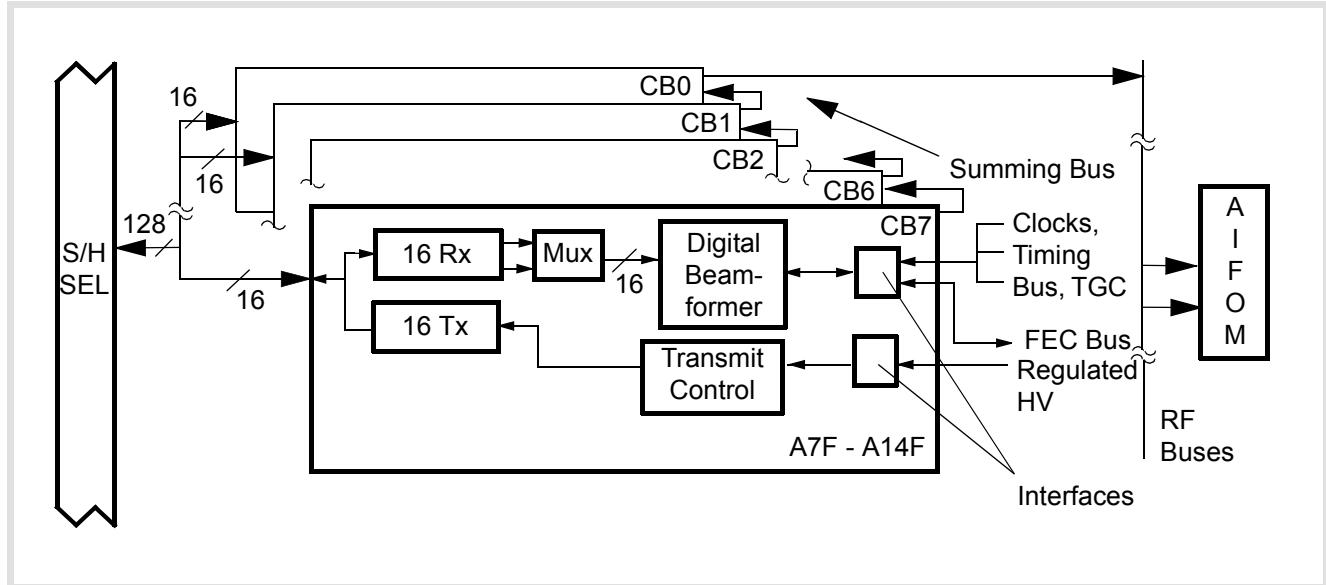
## **Front End Controller (FEC) - A4F ()**

The FEC downloads operational parameters from CPU and provides real-time control of the front end for transmit, receive, and beamforming functions.

- Interfaces with CPU via SCIP bus to determine scanning sequence and mode of operation.
- Provides timing signals for Tx and Rx cycle.
- Controls scanhead selection, personality, and HV Mux through the AIM+ and S/HSEL.
- Sends scanhead operating parameters to Channel Boards through FEC bus.
- Receives scanning sequence instructions from CPU and generates digital TGC, PRI and other timing sequencing.
- Controls sample volume cursor position to the AIFOM.
- Monitors voltages from PSM via FEP bus.
- Generates RF headers for image data to AIFOM.
- AP&I power monitor control.
- Bus Interfaces: SCSI, FEP, Clock, SHC, TGC, RF, TTag, FEC, Sync, SC, and SCAN (see [paragraph 4-5](#)).
- Changes to FEC for 17X.XX systems allow more imaging modes to be selected, such as SonoCT Real-time Compound Imaging.
- Supports dual AIFOMs for 17X.XX systems.
- Integrated CSI and Pulse Inversion.

## **Channel Boards - A7F through A14F**

- Channel Board RAM is loaded with operational parameters for selected scanhead. Parameters define Tx, Rx and beamforming behavior for each scan line and depth. Transfers data under FEC control for each new PRI
- Transmit apodization/power control under FEC control
- Transmits to, and receives from transducer elements under FEC control
- Digitizes RF, beamforms, adds TGC, and sends digital Rx data to Processing Subsystem over the RF buses for all modes
- Anti-aliasing filtering
- Static CW RF receive and mix to baseband (Channel board 0)
- Static PW transmit, receive, and process (Channel board 1)
- Steered CW receive and mix to baseband
- 512 channel
- Bus Interfaces: Summing, TGC, RF, Clocks, Timing, FEC, and FEP



**Figure 4-6 Channel Boards - A7F through A14F**

### Analog Interface Module Plus (AIM+) - A5F

- Generates system clock frequency of 240 MHz
- Subdivides the clock frequency into 120, 80, 60, 48, 30, and 24 MHz
- Supplies clock frequencies (80, 60, 48, 30, and 24) to centerplane for distribution to other PCBs
- Supplies 120 MHz to S/HSEL
- Receives +5 Vdc, +6 Vdc, ±15 Vdc, ±80 Vdc, and -5.2V from centerplane and regulates ±15 Vdc to become +10 Vdc, and ±12 Vdc
- Supplies ±80 Vdc, ±12 Vdc, +10 Vdc, and +5 Vdc to S/HSEL
- Generates and monitors two analog TGC voltages. Supplies TGC signals to S/HSEL for use by Channel PCBs
- Receives I/Q CW signals from Channel PCBs for steered and static CW processing
- Thump filter, variable wall filters, and low pass anti aliasing filters for I/Q
- Digitizes I and Q using 16 bit AD converters. Exports I and Q to RF buses
- Sends S/HSEL status and personality data to FEC via FEP bus
- Buffers and provides HV Mux selection data to the scanhead
- FEP bus interface
- Relay control for desired scanhead on S/HSEL
- Thermal sensor to monitor internal system temperature for fan speed control
- Scanhead temperature sensing to FEC via FEP
- Supplies high voltage to HV Muxes on S/HSEL
- Supports acquisition with the MPT7-4 scanhead (motor control for 3D acquisition) on Performance 2000 systems (17X.XX software)

## **Regulator Module - A6F**

**NOTE** The functions listed below were moved to the AIM+ PCB for systems shipped after April 1998.

- Regulates HV from PSM to Channel PCBs
- Controlled by FEP Bus interface

## **Scanhead Select Module (S/HSEL)**

- Selects between the scanhead connectors
- Interfaces between the front-end PCBs and the scanhead
- Connects the TGC control voltages from the AIM+ to the Channel boards
- Connects the baseband CW quadrature current bus from the Channel boards to the AIM+
- Connects the 120 MHz clock signal from the AIM+ to the Regulator Module
- Connection and mux for transducer elements and the channel boards for array transducer
- Provides connection for static CW and TCD transducers

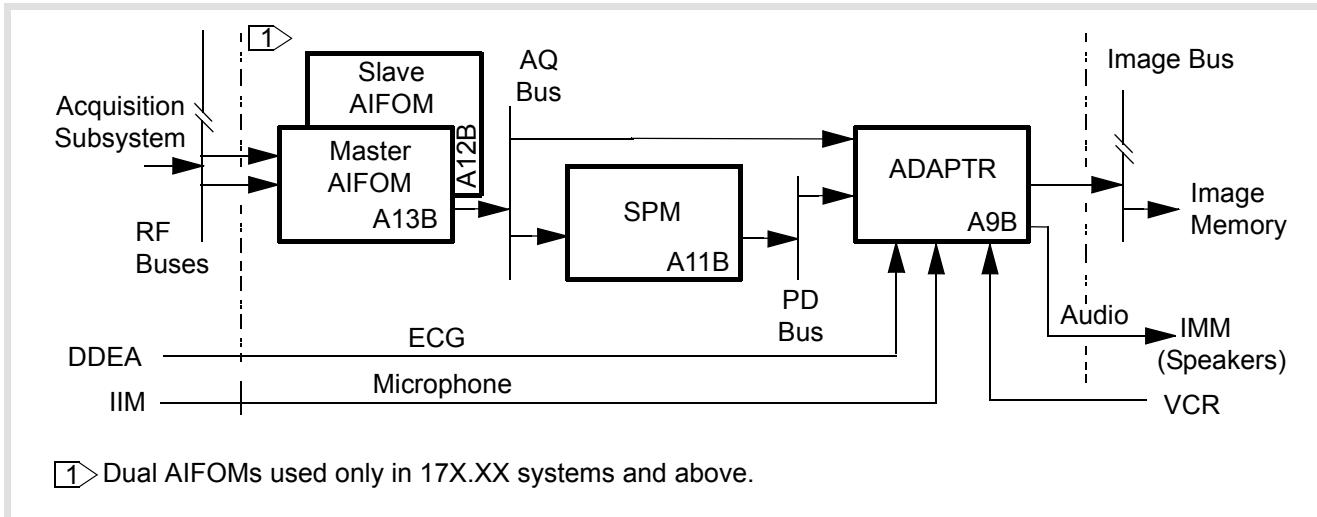
### **4-3.5**

## **Processing Subsystem**

The Processing Subsystem ([Figure 4-7](#)) filters the echo information, and transforms it for display processing. The processing subsystem generates Doppler audio and routes various audio sources to the speakers and VCR. The processing subsystem digitizes, filters, and transforms ECG data for the display. Post-processing and data storage for zoom take place in this subsystem.

The Processing Subsystem consists of:

- Single Advanced IF Output Module (AIFOM) on systems below 17X.XX software
- Dual Advanced IF Output Modules (Master and Slave AIFOMs) on 17X.XX systems
- Signal Processing Module (SPM)
- Advanced Digital Audio and Physio Translator Module (ADAPTR)



**Figure 4-7 Processing Subsystem**

### **Advanced Intermediate Frequency Output Module (AIFOM) - A12B/A13B**

- Processes 2D, Color Flow, Spectral Doppler, and M-mode data
- Synthetic aperture
- Dynamic Range
- Demodulates all beamformer data (except CW Doppler) into In-phase and Quadrature data (I and Q)
- Additional processes for 2D and M-mode echo data are amplitude detection, multi-zone reconstruction, and multi-rate filtering
- CW Doppler passes through AIFOM without being processed
- Uses 24 MHz clock to time data onto the PCB from the RF buses and control data flow through the PCB
- Receives 60 MHz and 40 MHz clocks from the centerplane and divides the signals for use in MOP and SCIP circuits
- Dual AIFOMs installed on systems with 17X.XX software. All other systems have single AIFOM.
- A13 is Master AIFOM. A12 is Slave. Controlled by system software
- A12 AIFOM is used only for high frame rate mode and for Intelligent Frame Rate Accelerator operation

## **Signal Processing Module (SPM) - A11B**

- Processes Color Flow, Spectral Doppler, and M-mode data. Also processes 2D on systems with 124.13 software and up
- Processes 2D persistence and Dynamic Contrast Enhancement on systems with 124.13 software and up
- Velocity, variance, and power
- Color Flow processes include Dynamic Motion Differentiation (DMD), wall filter, 2D auto correlation, and spectral estimation
- Color Flow processing include persistence, hole filling, segmentation
- Spectral Doppler processing includes wall filter, gain, FFT, gap fill, averaging, interpolation, and High Q Automatic Doppler calculations (mean and peak)
- Doppler processing includes Hilbert Transformation to generate forward and reverse audio
- M-mode processing includes temporal filtering/decimation

## **Signal Processing Module Plus (SPM+) - A11B (17X.XX Systems and Above)**

- All signal paths go through SPM+. All data path functions are programmed through software
- Contains two daughterboards with DSPs for additional processing power
- Operating speed increased from 32 MHz to 40 MHz
- Performs SonoCT Real-time Compound Imaging functions

## **Advanced Digital Audio, Physio, and Translator Module (ADAPTR) - A9B**

- Translates Acquisition Bus (AQ) or Processed Data (PD) bus headers to image bus addresses as part of the transfer to AQ bus and PD bus data to Cineloop/history buffers in IMEM
- Maintains buffer descriptors in IMEM for all data types output by this module
- Provides bus arbitration, error monitoring, and clock generation for the AQ and PD bus
- Provides ECG A/D conversion, filtering, display gain/positioning
- Triggers front end acquisition based on ECG R-wave detection
- Sends heart rate info to CPU based on ECG R-wave detection
- Provides a D/A audio reproduction path for Doppler audio
- Selects speaker source between Doppler and VCR
- Provides volume control and mute for speakers
- Routes microphone to VCR
- Provides audio connectors for external VCR
- Processes microphone and VCR audio; A/D conversion, gain and filtering

#### 4-3.6

## Display Subsystem

The Display Subsystem (Figure 4-8) formats the echo information for display, and transfers it to the video monitor and peripheral devices.

The Display Subsystem consists of:

- User Interface Module (UIM)
- Pixel Space Processors 1 and 2 (PSP1 and PSP2)
- Pixel Conversion Module (PCM)
- Peripheral Interface Module (PIM)
- Internal Interface Module (IIM)

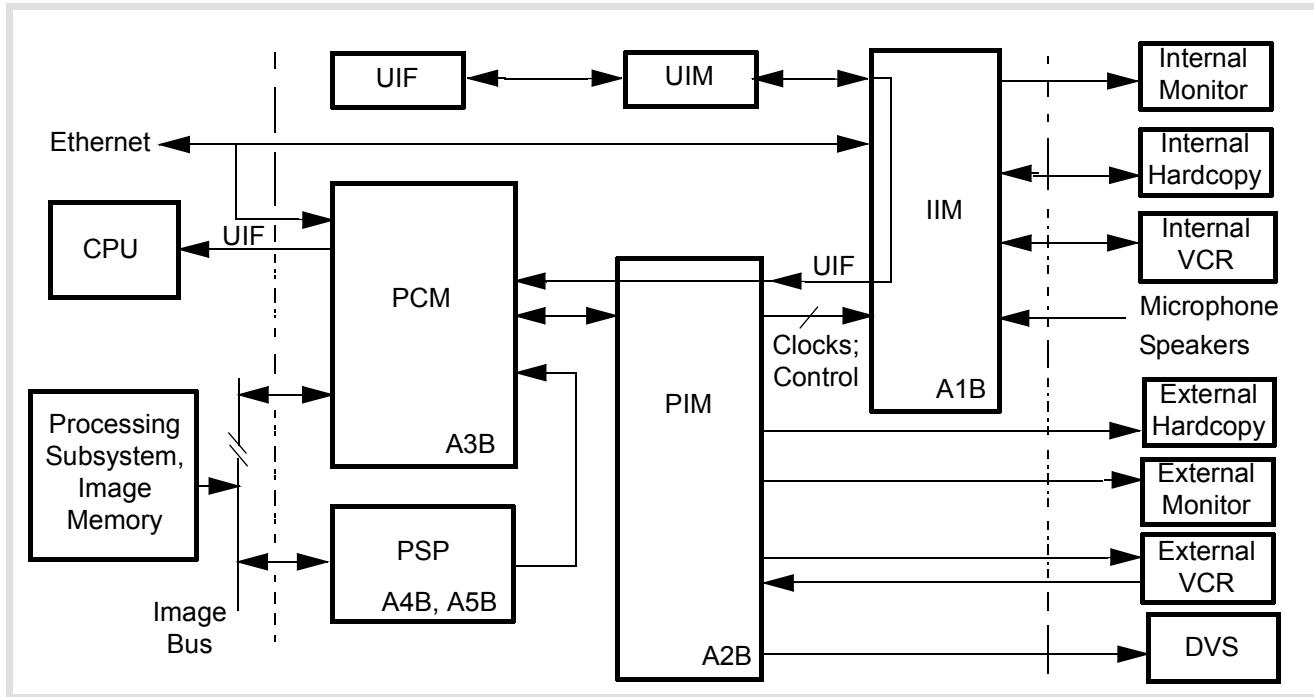


Figure 4-8 Display Subsystem

### User Interface Module (UIM)

- Upper and lower control panels (UCP and LCP)
- User Interface Module (UIM)
- Controlled by PIM
- User interface for pull down menus for functions which are user options and dedicated controls for functions used during examinations

**NOTE** System self-diagnostics includes the UIM as part of the Display Subsystem.

## **Pixel Space Processor (PSP1 & 2) - A5B, A4B**

- Acquires image data from IMEM
- 2D scan conversion
- Zoom
- Static and scrolling graphics
- Freeze (buffer memory located on PSP1)

## **Pixel Conversion Module (PCM) - A3B**

- Controls UIF window displays (X-windows)
- Gray scale and color LUTs (look-up tables)
- Converts non-interlaced 60/50Hz to interlaced 30/25Hz for OEMs
- Gray and color bar generator
- Hidden digital data
- Provides image background and image windows
- Monitors user interaction including keystrokes, trackball movement, and footswitch activity
- All graphics and overlay capabilities
- User interface windows, menus, and icons
- Framegrab functions
- Routes DVS overlay graphics from/to the PIM

## **Peripheral Interface Module (PIM) - A2B**

- Controls UIF through UIM (control PIM)
- Encode/Decode NTSC and PAL composite Y/C video (video PIM)
- System video sync (video clock) originates on AIM+ (video PIM)
- Controls internal OEMs through IIM (video PIM)
- Sends digital video to and from the DVS Module (video PIM)
- Routes DVS overlay graphics to the PCM through the PIM and to the monitor (video PIM)

## **Internal Interface Module (IIM) - A1B**

- Routes video signals to/from monitor, hardcopy devices, and VCR. (No video processing is done on IIM)
- Buffers and routes audio signals to/from VCR
- Amplifies and routes audio signals to the speakers in the monitor housing
- Routes logic signals to/from the monitor, hardcopy devices, and UIM
- Buffers the signal from the microphone to the system

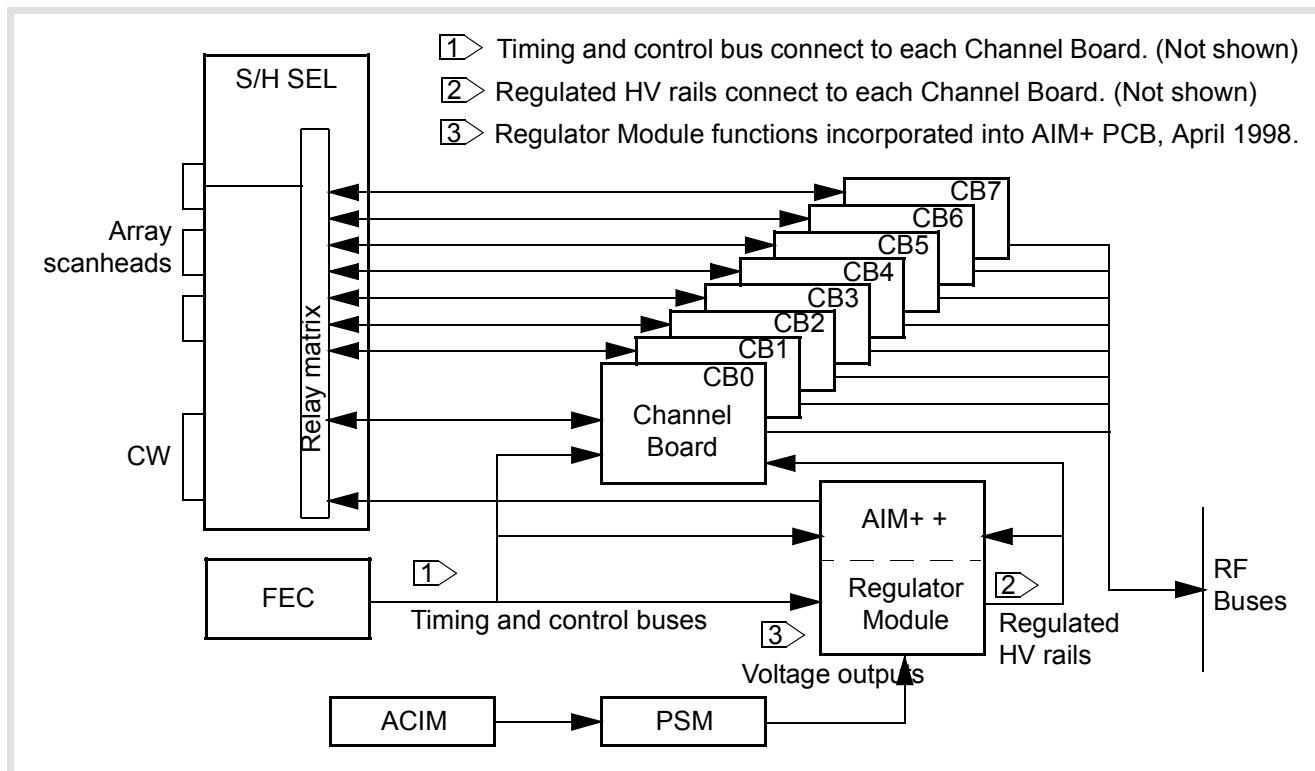
## 4-4

# Data Paths

Data path block diagrams are contained in [Figure 4-9](#) through [Figure 4-24](#). The data paths in the illustrations are shown by thick dashed lines. Solid thin lines indicate that a connection exists but is not used for that data path.

## 4-4.1

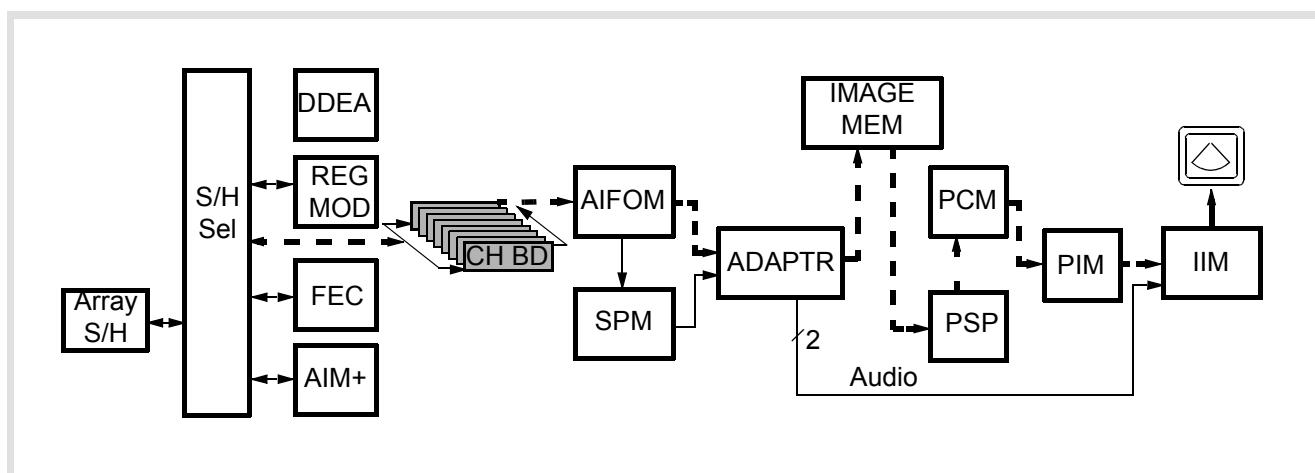
### 2D/PW/Color Front End Signal Path



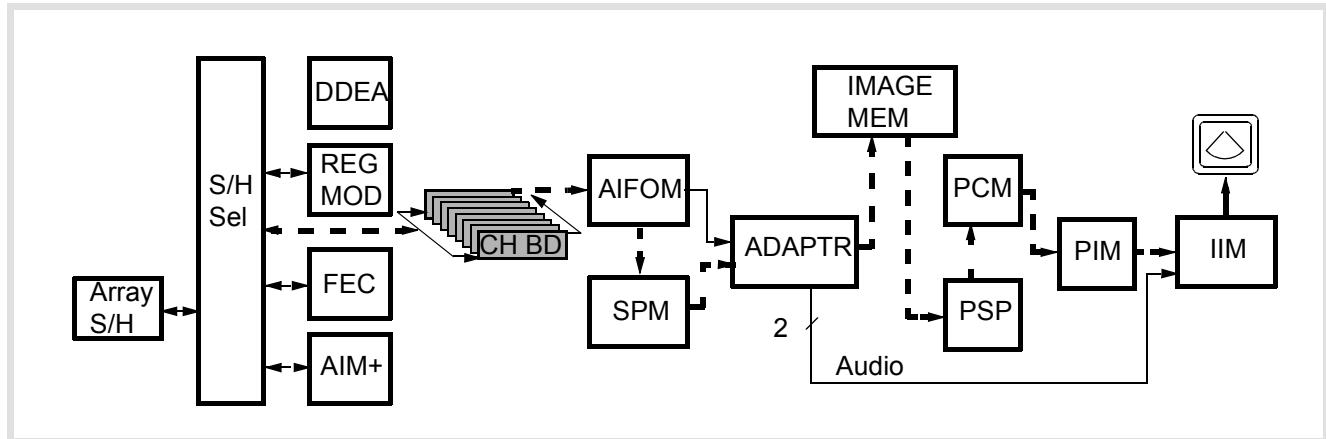
**Figure 4-9 2D/PW/Color Front End Signal Path**

## 4-4.2

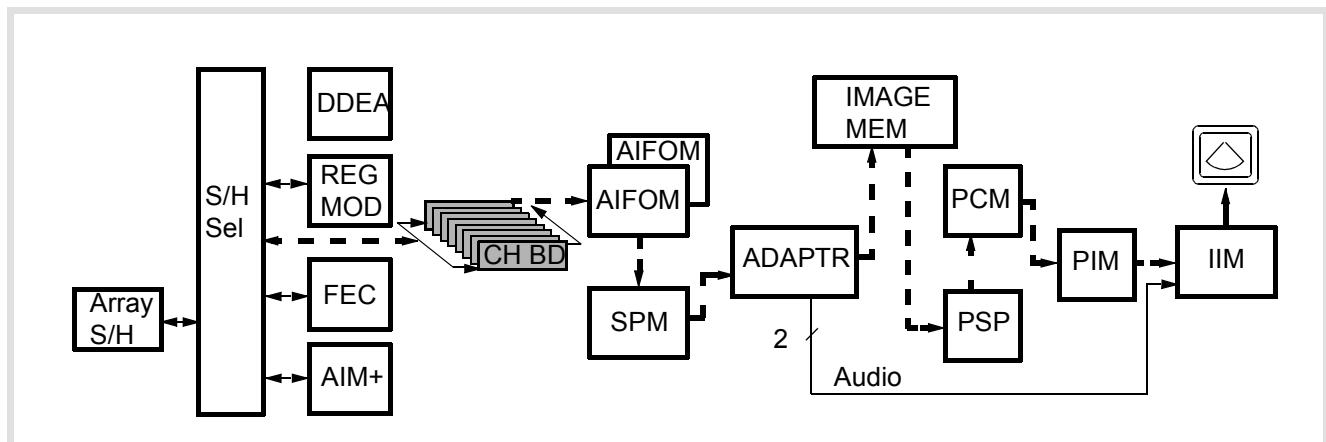
### 2D Data Path



**Figure 4-10 2D Signal Path (108.XX Systems and Below)**



**Figure 4-11 2D Signal Path (124.13 through 127.XX Systems)**



**Figure 4-12 2D Signal Path (17X.XX Systems and Above)**

#### 4-4.3

### PW Doppler and Color Data Path

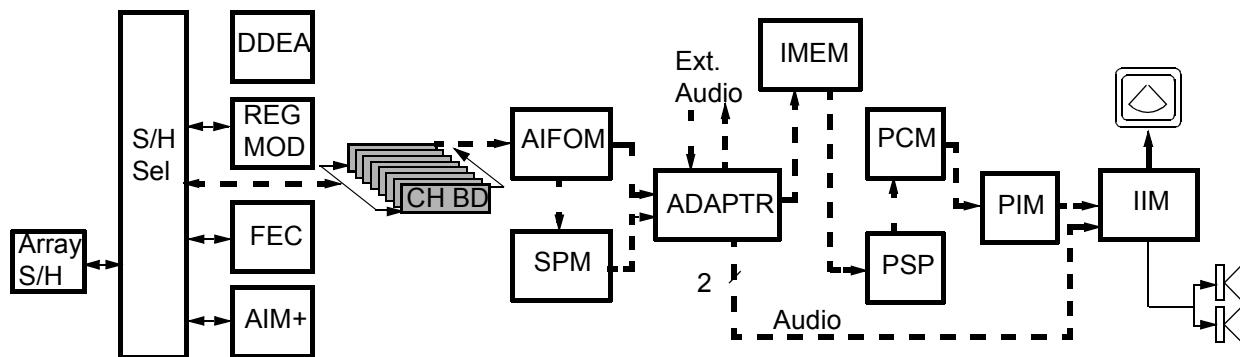


Figure 4-13 PW Doppler and Color Path (108.XX Systems)

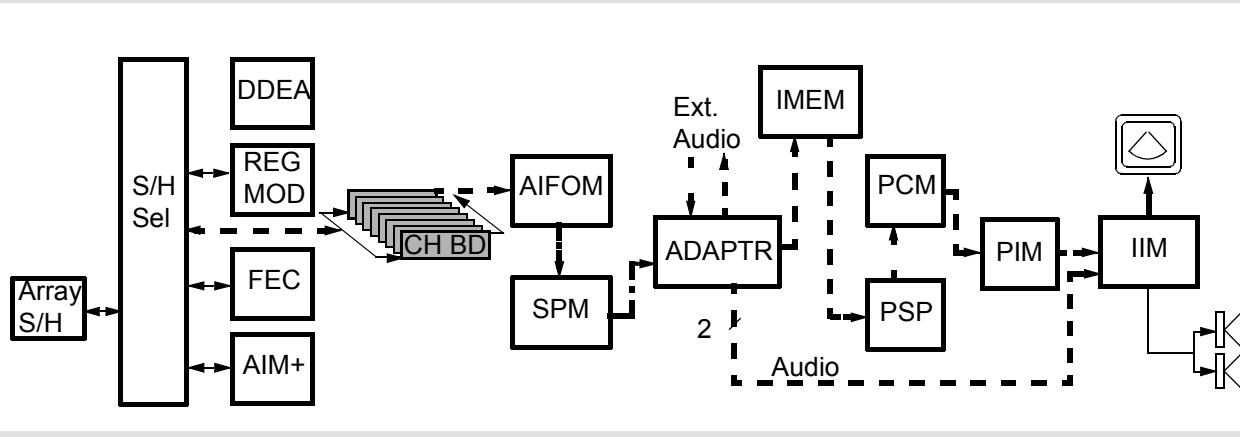


Figure 4-14 PW Doppler and Color Path (124.13 Through 127.XX Systems)

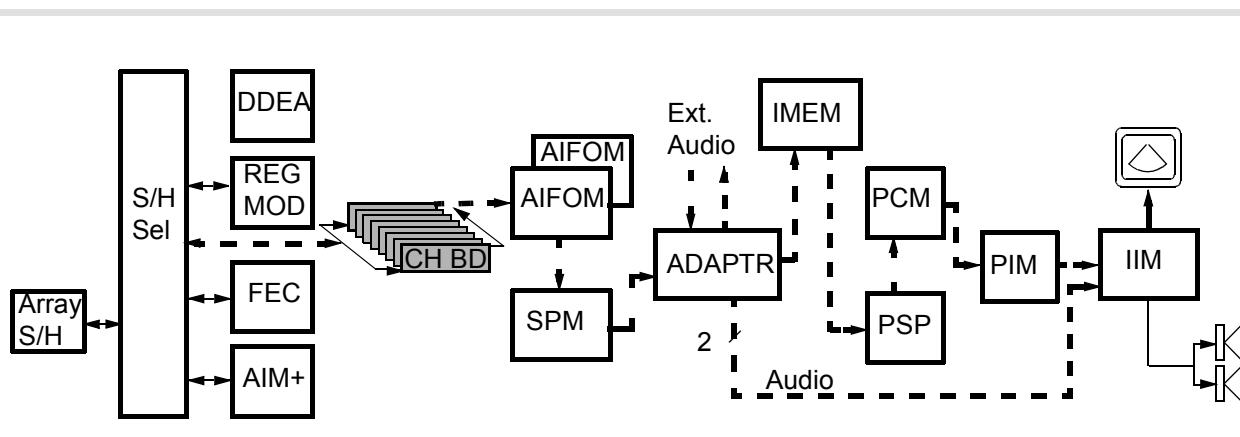


Figure 4-15 PW Doppler and Color Path (17X.XX Systems)

#### 4-4.4

#### Static PW Front End Signal Path

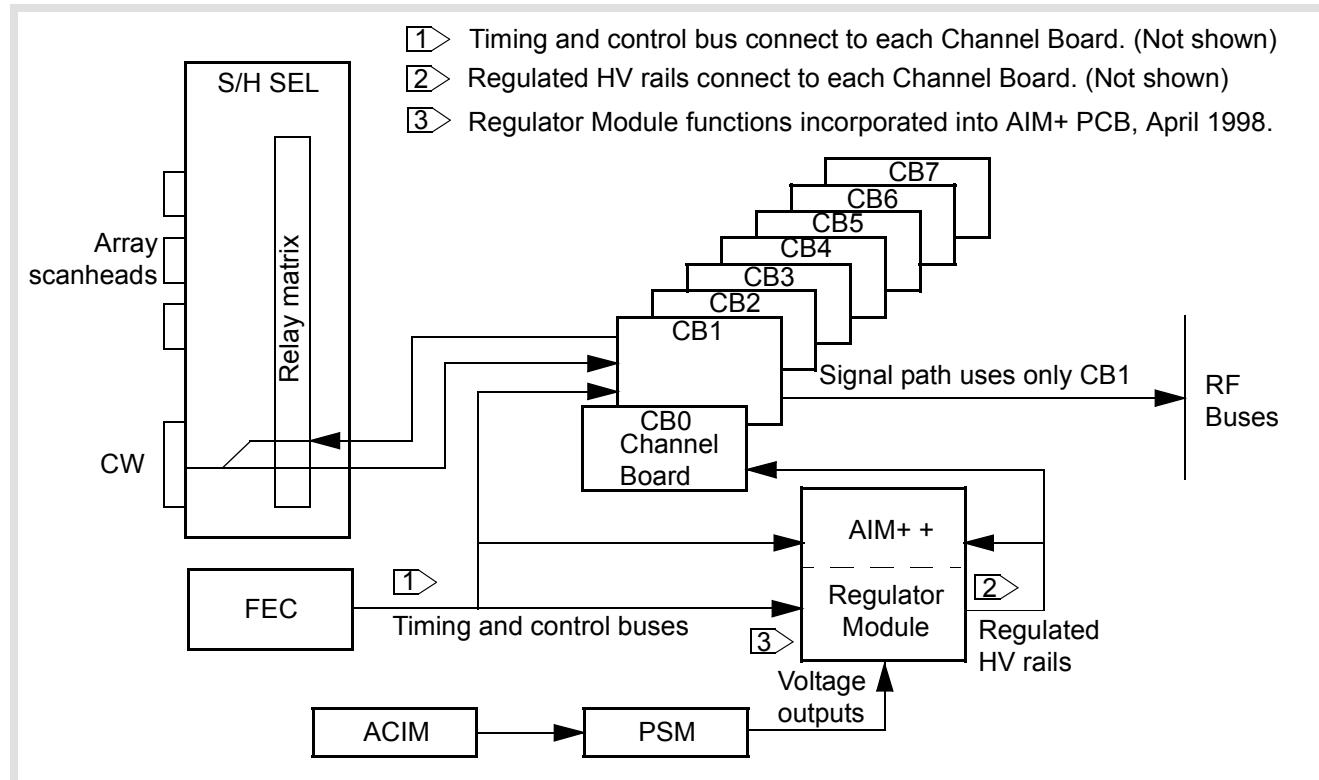


Figure 4-16 Static PW Front End Signal Path

#### 4-4.5

#### CW and Static PW Doppler Data Path

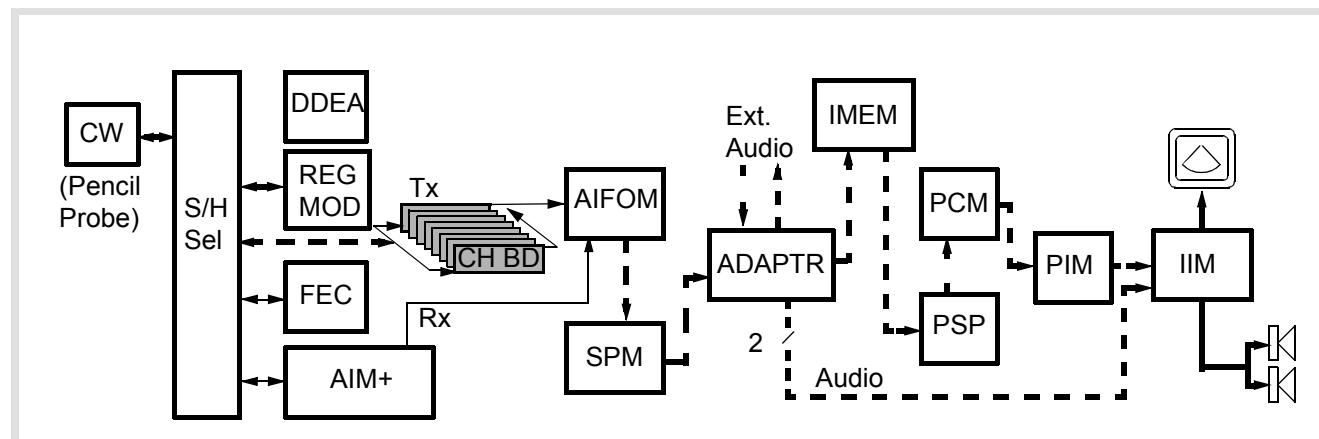
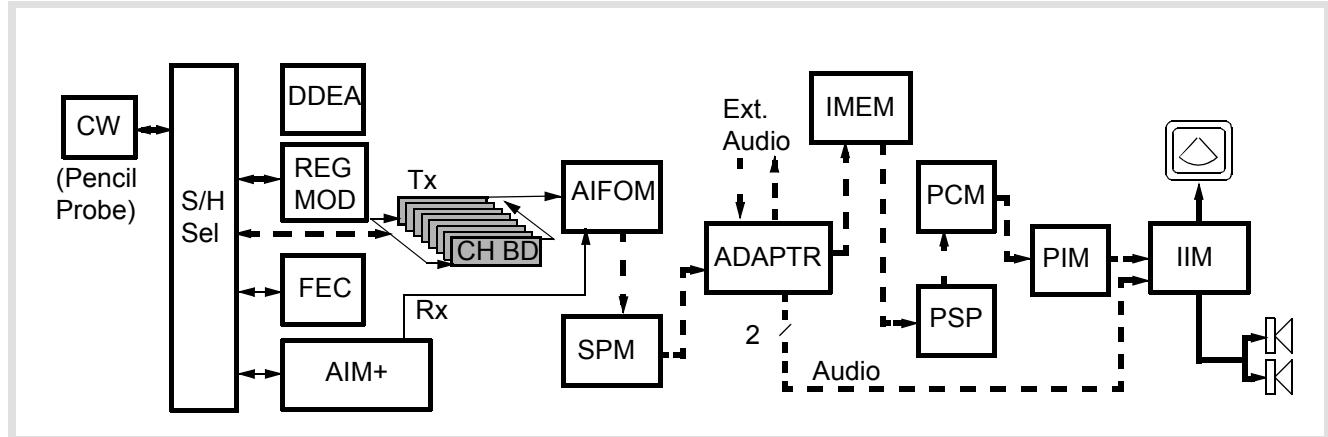
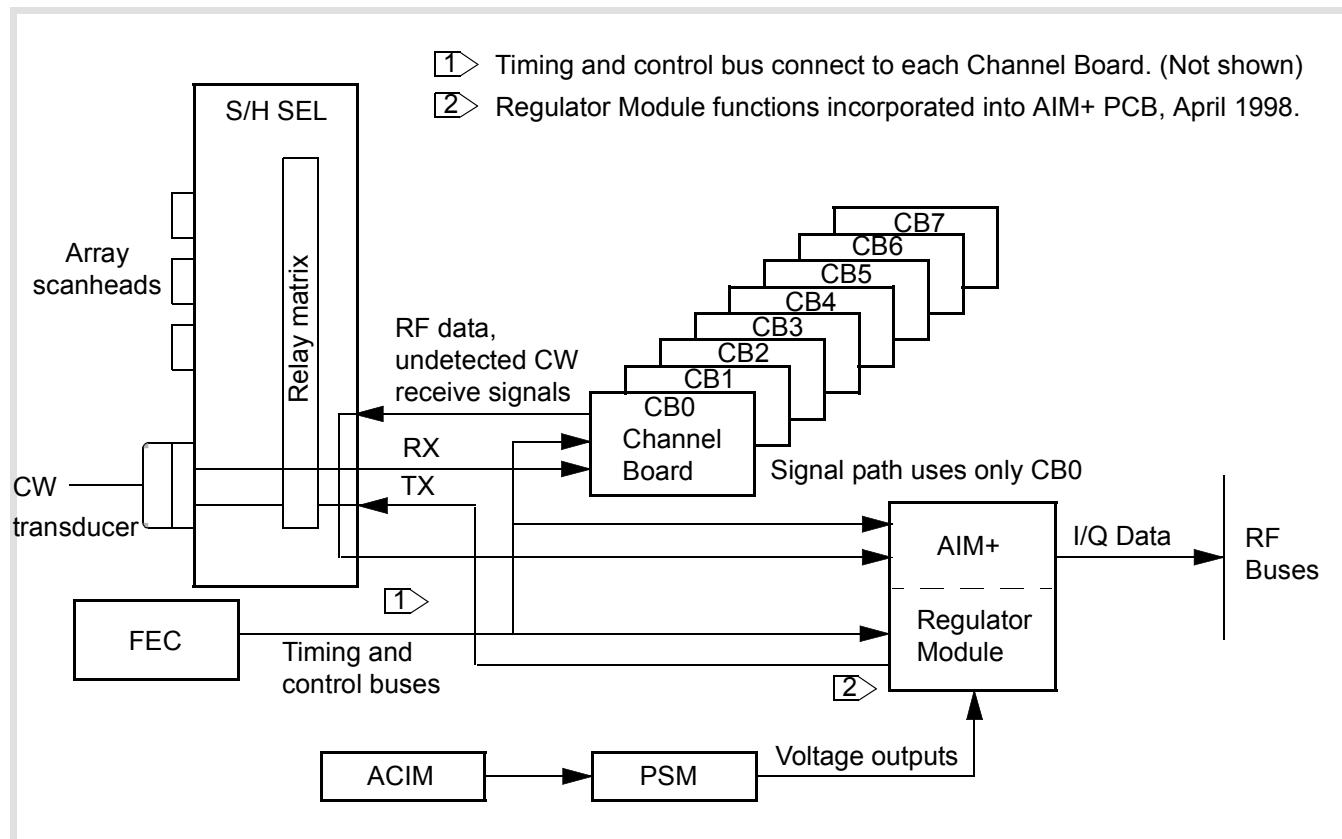


Figure 4-17 CW and Static PW Doppler (TCD) Signal Path (127.XX Systems and Below)



**Figure 4-18 CW and Static PW Doppler (TCD) Signal Path (17X.XX Systems)**

#### 4-4.6 Static CW Front End Signal Path



**Figure 4-19 Static CW Front End Data Path**

#### 4-4.7

#### Steered CW Front End Signal Path

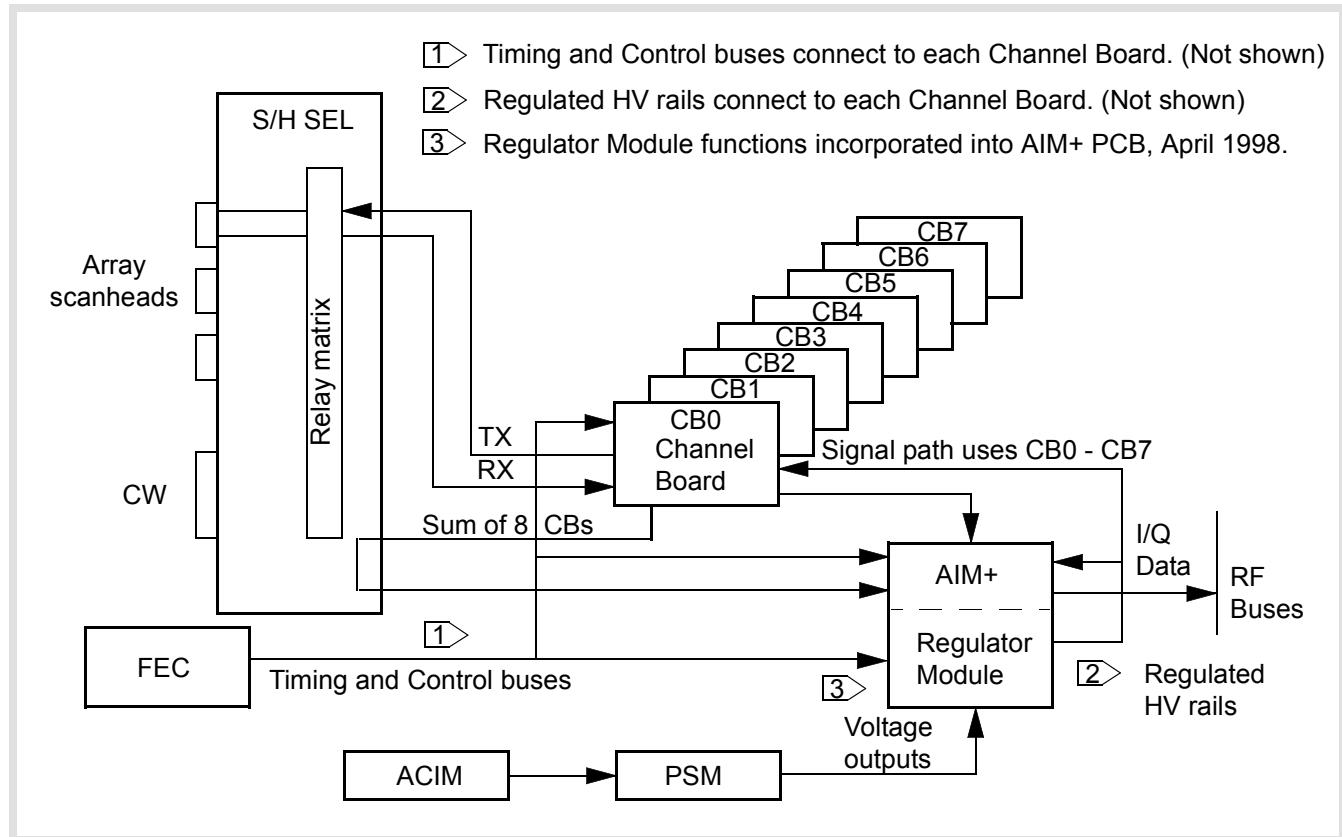


Figure 4-20 Steered CW Front End Signal Path

#### 4-4.8

#### M-Mode Echo/M-Mode Color Data Path

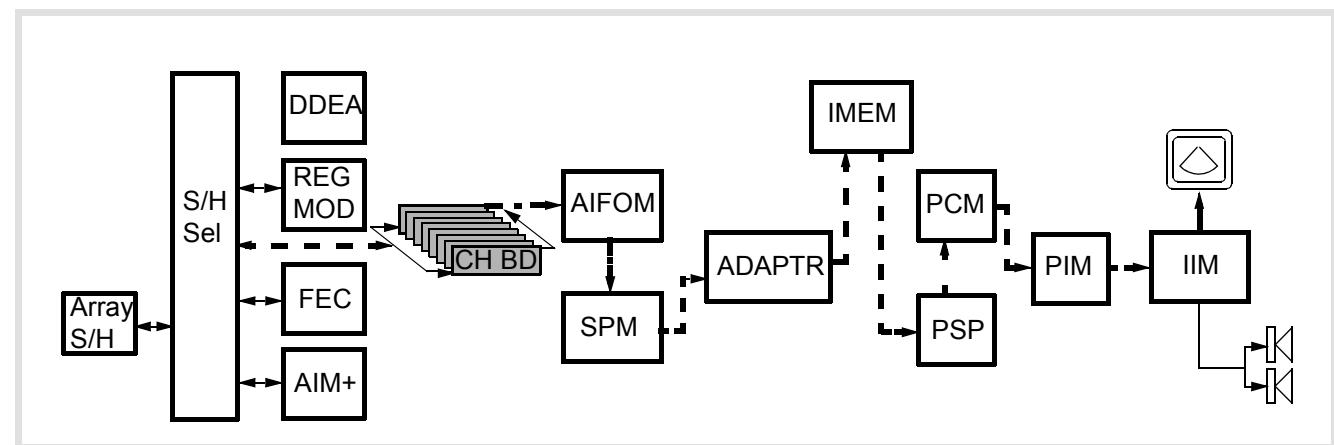
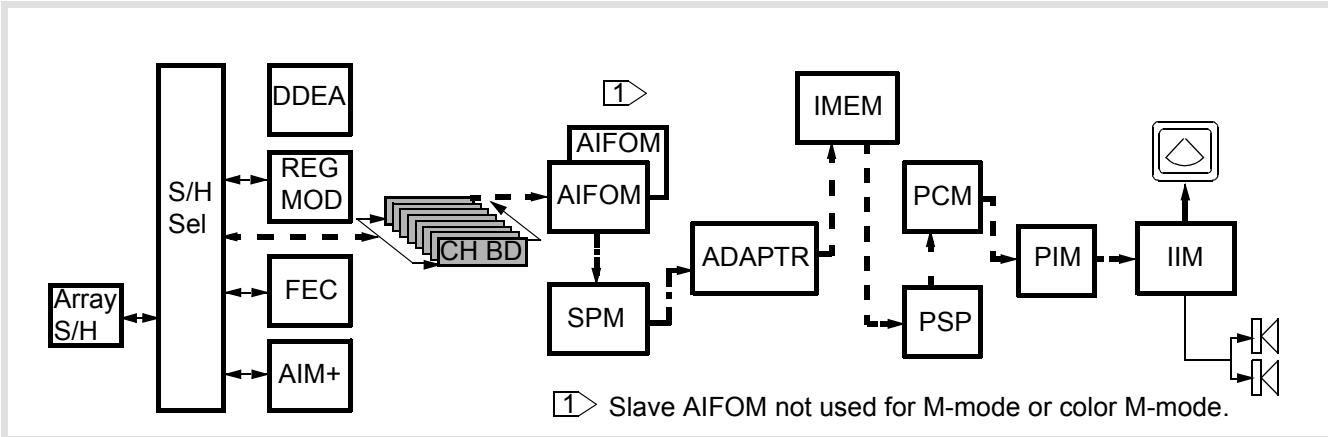
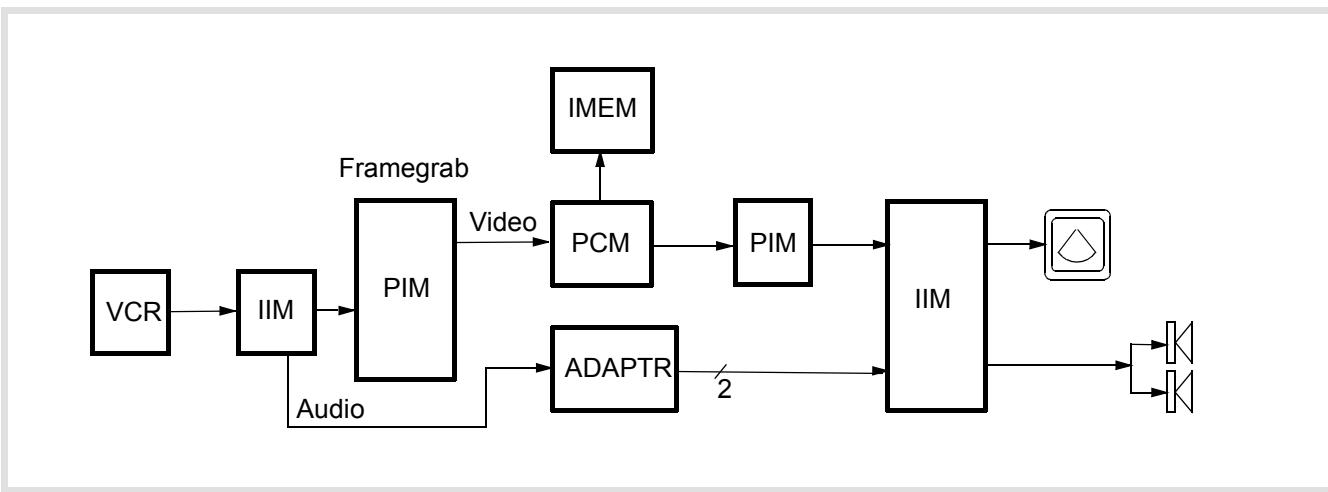


Figure 4-21 M-Mode Echo/M-Mode Color Data Path (127.XX Systems and Below)



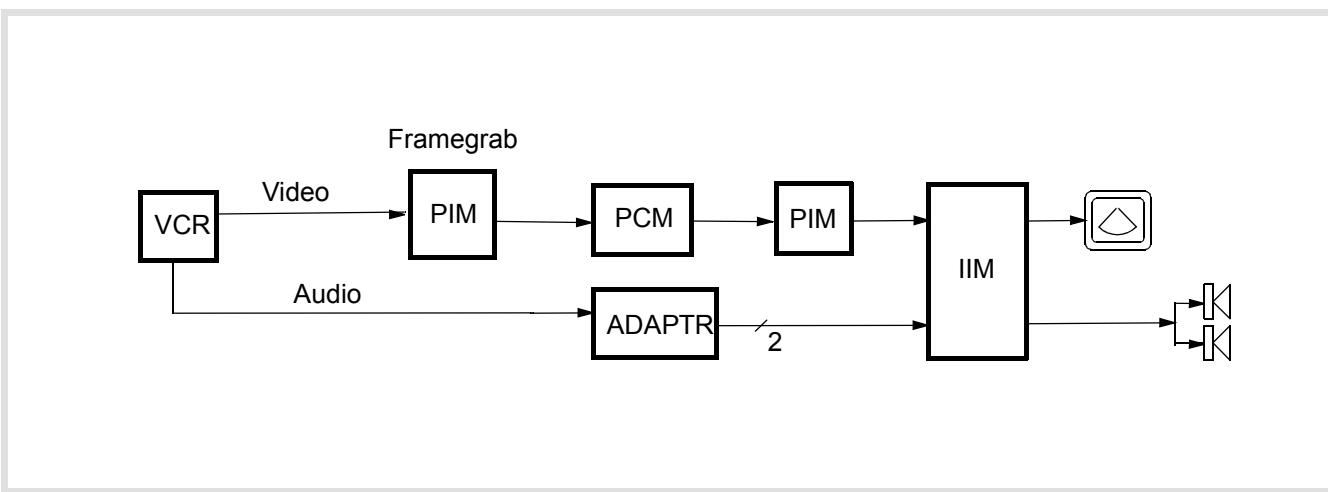
**Figure 4-22 M-Mode Echo/M-Mode Color Data Path (17X.XX Systems)**

#### 4-4.9 Internal VCR Playback Path



**Figure 4-23 Internal VCR Signal Path**

#### 4-4.10 External VCR Playback Path



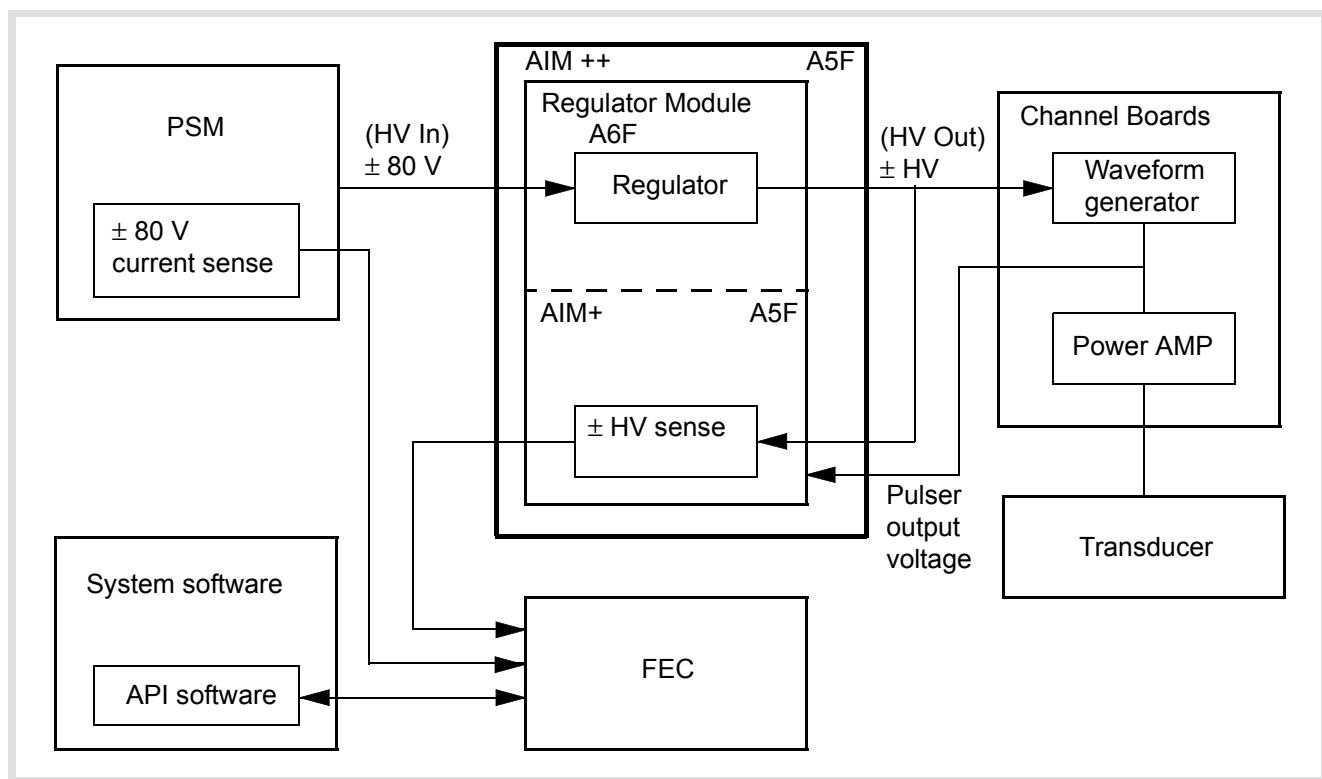
**Figure 4-24 External VCR Signal Path**

#### 4-4.11

## Output Power Monitor Theory

Output power monitor (Figure 4-25) provides patient safety by ensuring that the system is operating within acoustical power and intensity (AP&I) limits. It also protects hardware from destructive or unsafe conditions. It consists of AP&I software, which resides on the System CPU; FEC software; PSM firmware; Power Subsystem monitors in each power supply; Regulator Module; pulser monitors in each channel board; and a beamformer monitor.

The output power monitor is designed to detect any single failure in the system, for example, a faulty power supply, a faulty beamformer, a software failure, a defective scanhead or scanhead data files. Mode information, (PRI, voltage, burst, etc.) sent to the beamformer is also verified before allowing the beamformer to start. This prevents the system from inadvertently creating a temporary over-power condition.



**Figure 4-25 Power Monitor Block Diagram**

Both software and hardware watchdogs disable the transmit function when errors are detected. Software watchdogs monitor variable parameters (for example, AP&Is vary from scanhead to scanhead). When the software watchdog in the system CPU receives an error report from a power monitor, it disables the system from transmitting. Hardware watchdog circuits disable or shut down the system when maximum, and in some cases minimum, parame-

ters are exceeded (for example, minimum power supply output voltage or minimum current limits).

The CPU uses the AP&I software program and system control settings to calculate the required power output for the selected transducer and operating mode. These values are sent to the channel boards to control generation of pulsers for the beamformer. Voltage and current monitors compare the measured pulser control values with the allowable limits listed in the AP&I software tables.

**NOTE** Software AP&I tables contain power maximums for each transducer in its allowed operating modes. AP&I theory is included in the *Scanheads and Safety* manual (P/N 4701-0027-XX). AP&I tables are included in the *Acoustic Output Tables* manual (4706-0027-01).

The power monitor also provides system and hardware protection through hardware watchdog circuitry for maximum voltage, maximum pulser currents and output electrical power. When measured parameters exceed allowable values, the power monitor circuitry disables the supply and signals the error to the system CPU.

The beamformer monitors the average pulser voltage supplied to the beamformer, pulser output voltage and average current. If the monitored values exceed the maximums for voltage and pulser currents, maximum pulser output electrical power and maximum pulser power dissipation, the beamformer software watchdog disables the beamformer and signals the system controller.

Timeouts in the system software verify that the system software can communicate with the FEC and the Power Subsystem. If either subsystem is not active and functioning, the system stops the beamformer and shuts down the pulser supply. Timeouts are initiated at regular intervals and acknowledged by the affected circuits, if operating properly. Timeout alerts usually are reset if mode, power, or some other function is changed.

## 4-5

# Bus Functions

### 4-5.1

## Control Subsystem Buses

### Serial Control Interface Processor (SCIP)

- Relieves Module Operation Processor (MOP) in servicing control bus activity
- Master-slave multi-drop communication network

### Small Computer System Interface (SCSI)

- Interfaces optical and hard disk drives to CPU
- Provides an external port for future use

## 4-5.2

## Acquisition Subsystem Buses

### FEC Bus

Provides operational parameters, and controls use of them by Channel Boards

### Timing Bus

- Carries real-time control signals to Channel Boards, AIM and DOPACQ
  - Carefully controlled to ensure sync with front end clocks
  - Start and stop Tx/Rx cycle
  - Controls output of the front end ultrasound data on SUM and RF buses

### FEC Sync Bus

Transfers real time motor control sync data between Motor Servo and FEC

### Power Supply Sync Bus

Transfers real-time high voltage power supply status between FEC and PSM to sync starting, stopping and power level changes in the system

### SUM Bus

Daisy-chained bus that passes from Channel Board to Channel Board carrying the partially beamformed sum. Each Channel Board sums its channels. It then sums its result with the sum of the previous Channel Board and passes the result to the next Channel Board

### S/H Control Bus

Unidirectional bus between FEC (master) and AIM

### RF Buses

Carry data from the front end to the AIFOM on two separate RF buses

### Digital TGC Bus

- Carries current digital value of TGC curves and digital values for pulser voltage regulators
- AIM receives digital TGC values for D-to-A conversion to analog TGC voltages
- AIM receives digital pulser values for D-to-A conversion to a high-voltage analog DC value for each channel

### Analog TGC Bus

Two differential analog buses on S/HSEL driven by AIM and received by all Channel Boards for two variable gain stages

## **CW Sum Bus**

- Differential current bus on the S/HSEL driven by Channel Boards
- AIM receives and processes current representation value of beamformed CW data

## **FEP Bus**

Extension of CPU bus on FEC bus used for nonreal-time tasks such as output power monitoring and scanhead interface control (controls scanhead personality access, sends relay pulses to the S/HSEL module and senses the scanhead disconnect status). The FEP bus is an extension of the FEC's CPU bus.

## **Time Tag Bus (TTag)**

Used by digital signal processing modules for time tag data. FEC generates time tag signals

## **4-5.3**

## **Processing Subsystem Buses**

### **Acquisition Bus (AQ)**

- Transfers real-time data from AIFOM to SPM or ADAPTR
- Transfers I/Q test data from ADAPTR to SPM
- ADAPTR module provides the clocks, bus arbitration, and bus monitoring for AQ bus

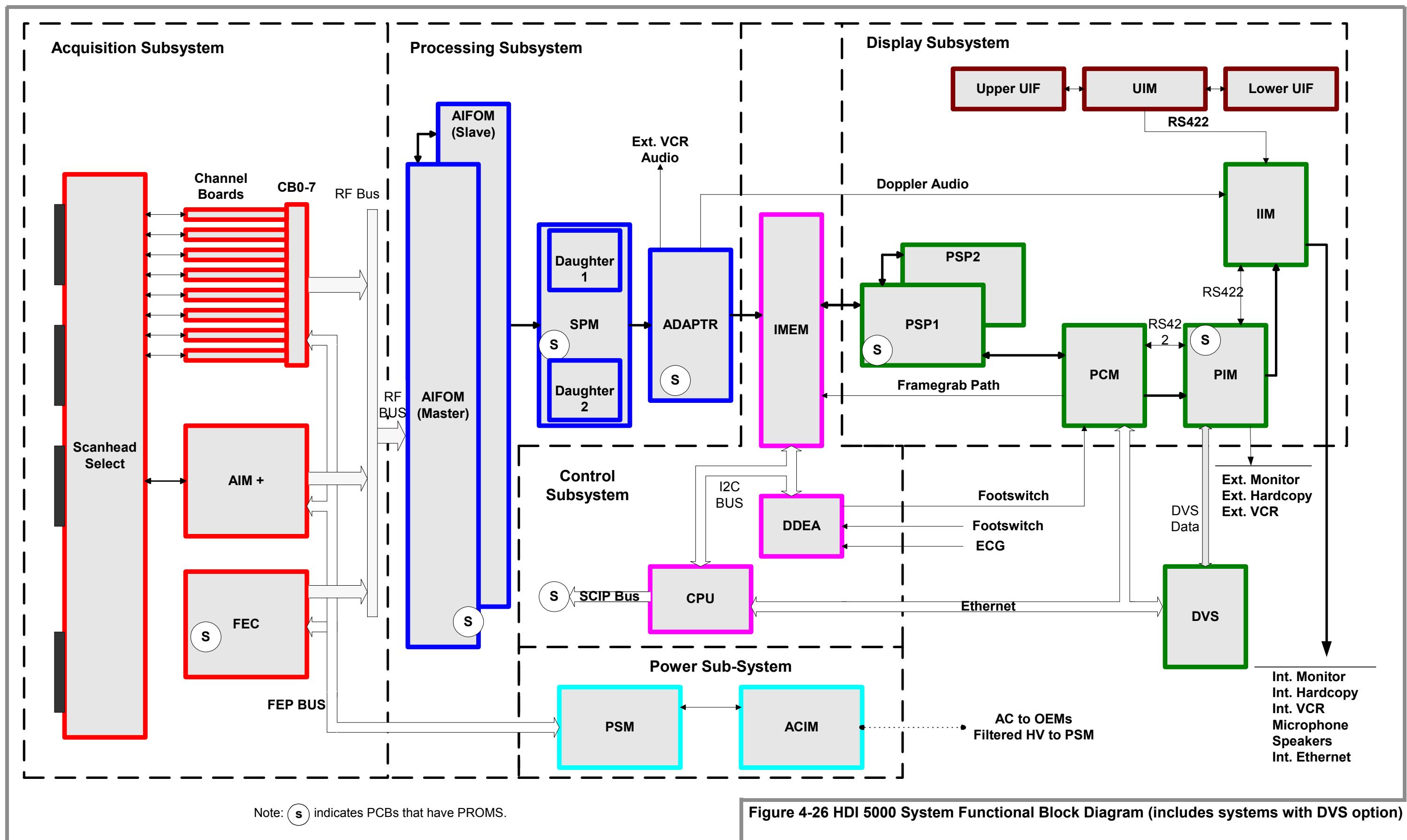
### **Processed Data Bus (PD)**

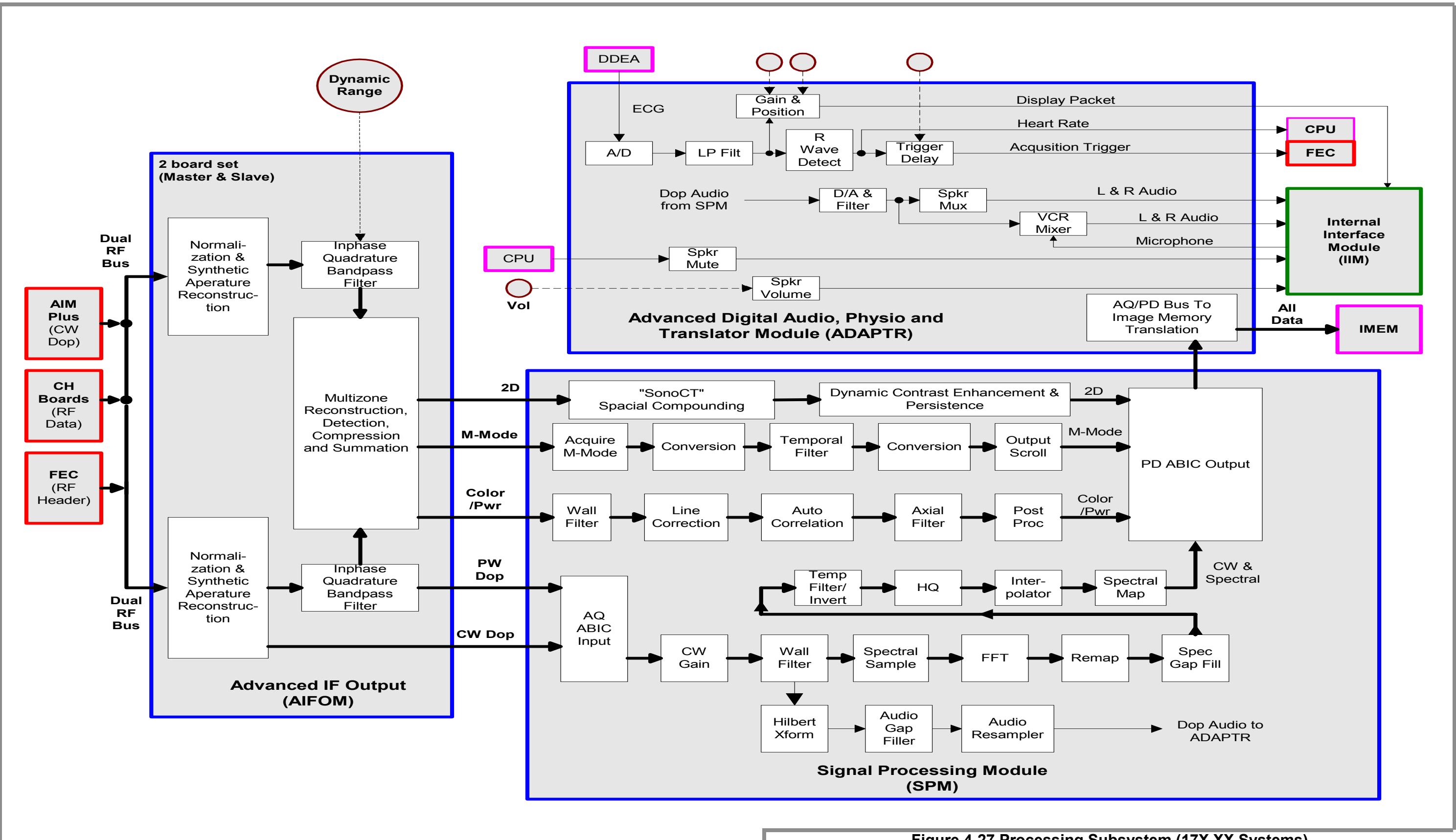
- Transfers real-time data from SPM to ADAPTR
- Transfers color test data from SPM to ADAPTR
- ADAPTR module provides the clocks, bus arbitration, and bus monitoring for PD bus

## **4-6**

## **DVS Module**

- K6-2, 450 MHz CPU, 384 MB RAM
- Saves image data to drives
- Provides Ethernet connection to the HDI 5000 system CPU
- Generates overlay graphics
- Receives and transmits overlay graphics to and from the PIM
- Converts RLE (Run Length Encoding) information to digital RGB





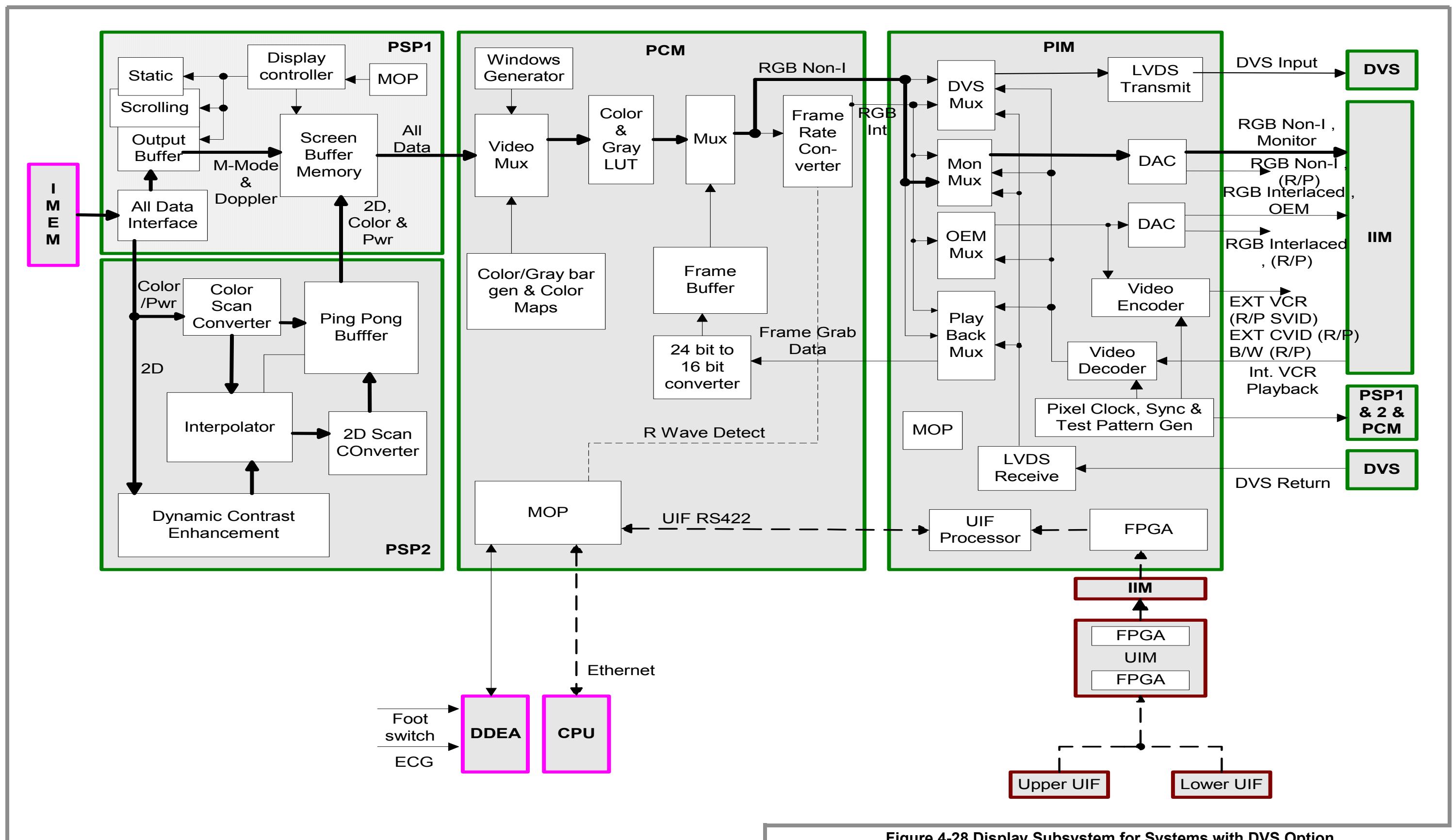


Figure 4-28 Display Subsystem for Systems with DVS Option

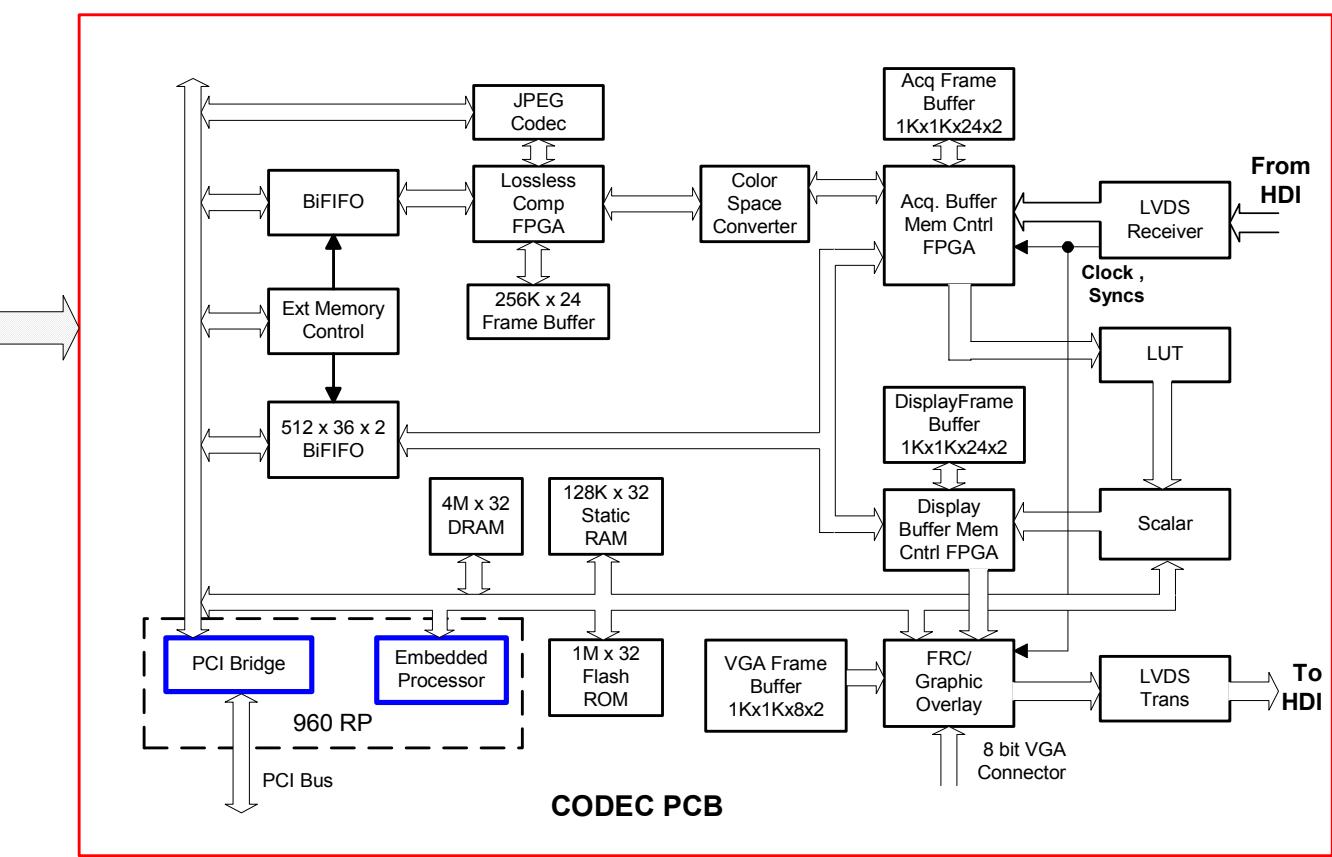
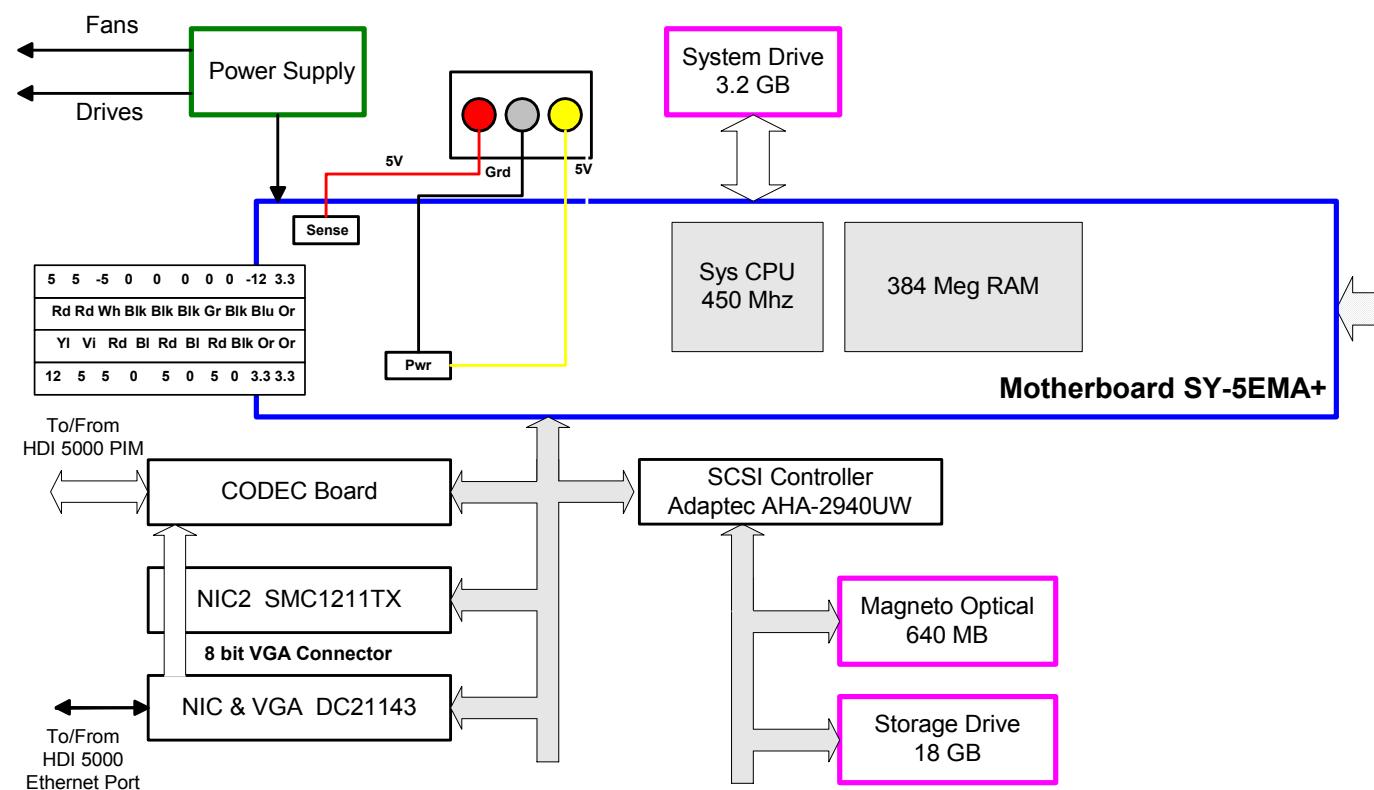


Figure 4-29 DVS Module Block Diagram

# **5 Installation**

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## **5-1 Pre-Installation**

### **5-1.1 Introduction**

The purpose of the pre-installation on-site evaluation (pre-site) is to ensure a trouble-free installation and to assist the customer in providing an environment that supports the reliable performance of an ATL ultrasound system. These instructions are intended to guide you through a comprehensive inspection that ensures all physical, electrical, and environmental conditions are appropriate for optimal system operation.

Refer to the system specifications in [Figure 5-1](#) and [Figure 5-2](#) when evaluating the site.

### **5-1.2 Required Materials**

- Tool Kit and Digital Voltmeter (DVM)
- Oscilloscope
- ONEAC Line Viewer
- Three-prong Test Plug (6005-0564-01)
- ATL General Service Manual (4720-0219-XX)
- Power Line Data Sticker (4765-0247-XX)
- Fluke LAN Tester
- Work Order

### **5-1.3 Environmental Requirements**

Verify the system is to be operated in a room that meets the environmental requirements listed in [Table 5-1](#).

**Table 5-1 System Specifications (Crated/Uncrated)**

Parameter	Metric Value	U.S. Value
Height <sup>1</sup>	152/136 cm	60/53.6 in
Width	99.7/70.1 cm	39.3/27.6 in
Depth	113.7 / 97.2 cm	44.8/38.3 in
Weight with Peripherals <sup>1</sup>	200 kg	440 lbs
Fully Crated Shipping Weight (VCR separate)	295 kg	600 lbs
Ambient Operational Temperature <sup>2</sup>	16 to 40°C	61 to 104°F
Internal Operational Temperature <sup>2</sup>	16 to 55°C	61 to 131°F
Internal Operational Humidity	15 to 95% RH (non-condensing)	
Storage Temperature <sup>3</sup>	-35 to 65°C	-31 to 149°F
Storage Humidity	5 to 95% RH (non-condensing)	
Heat Output <sup>4</sup>	3590 BTU/Hr at 1050W	

1. Height with VCR is 152.0 cm (60 in); height with monitor removed is 106.7 cm (42 inches); weight without monitor or peripherals is 172 kg (380 lbs).
2. Atmospheric pressure must be between 1013 hPa to 709 hPa (1.0 to 0.7 Atm).
3. Atmospheric pressure must be between 1013 hPa to 303 hPa (1.0 to 0.3 Atm).
4. Heat output at current draw listed in [Table 5-2](#). Peripherals will increase heat load. Discuss with the facilities engineer the possible requirement for additional air circulation to handle the heat load from the system.

## 5-1.4 Electrical Power Requirements

**WARNING**

For safety and liability reasons, do not disassemble any power outlet or open any electrical panel. Have the facility representative confirm wiring compliance with the criteria specified below.

**To verify a dedicated/isolated line:**

1. Explain to the facilities representative that the system requires a dedicated/isolated line meeting the power requirements as listed in [Table 5-2](#).
2. Verify that the outlet to be used is a dedicated/isolated line:

- a. Have the facility representative open the circuit breaker.
  - b. With a DVM or three-wire test plug, confirm that power is still applied to all other outlets and hard-wired devices in the immediate area and that power is removed only from the dedicated/isolated outlet box.
3. Verify the proper wiring of the outlet using a three-wire test plug. This plug also tests for the presence of a ground, but it cannot detect neutral/ground reversals.
  4. Inform the facility representative of the current draw of the system and its acceptable voltage range. It is the responsibility of the facility representative to determine the proper size of the wire based upon the length of the feed.
  5. Using your DVM at the outlet, measure the hot/neutral, hot/ground, and neutral/ground voltages with a comparable load (for example, another ultrasound system) on the line.
  6. To determine line loss, if a facility representative is available:
    - a. Have the facility representative measure the voltage at the line's circuit breaker primary in the distribution sub-panel.
    - b. Measure the voltage at the wall outlet.
    - c. Calculate the percentage of voltage loss across the line using the formula:
 
$$\text{Percent line loss} = [(A - B)/A] \times 100$$
 where A and B are the voltages at the circuit breaker and wall outlet with the system on, respectively
    - d. Continue with [step 8](#).
  7. If a facility representative is not available:
    - a. Measure the voltage at the outlet with the load on and off.
    - b. Calculate the percentage of voltage loss across the line using the formula:
 
$$\text{Percent line loss} = [(A - B)/A] \times 100$$
 where A is the voltage at the wall outlet with the system off and B is the voltage at the wall outlet with the system on
  8. Use an ONEAC line viewer and oscilloscope to measure power-line noise following the procedures specified in Section 3, "Power," of the *General Service Manual* (4720-0219-XX). Repeat with a load applied, for example, another ultrasound system.
  9. Record your power quality observations and measurements.
  10. Affix a Power Line Data sticker to the most qualified outlet in each of the primary operating areas. Add the circuit breaker number and location.
  11. Review the electrical site evaluation with the facility representative.

**Table 5-2 Power Specifications**

<b>Measurement (System Only)</b>	<b>100 Vac, 50 Hz</b>	<b>120 Vac, 50 Hz 120 Vac, 60 Hz</b>	<b>230 Vac, 50 Hz 230 Vac, 60 Hz</b>
Hot/Neutral	90 - 110 Vac	96-132 Vac	184-253 Vac
Current Draw (normal/ peak) <sup>1</sup>	8.0/10.9 A	6.7/8.9 A	3.4/4.7 A
Power Draw (normal/ peak) <sup>1</sup>	800/1090 VA	800/1070 VA	800/1075 VA
	775/1028 W	775/1023 W	775/1050 W
Power Dissipation (maximum/intermittent) <sup>2</sup>	1050/1300W		
Neutral-to-Ground	< 3 Vac RMS		
Line Loss	< 3%		
Distortion	< 20%		
Common Mode Noise	< 1.5 Vp-p		
Normal Mode Noise	< 10 Vp-p		

1. Current draw and power draw specifications are for the rated voltage ranges. (The “normal” specification includes system operation without OEMs. The “peak” specification includes system operation with OEMs.)
2. Peripherals will increase heat load. (The “maximum” specification includes the system and OEMs during continuous operation. The “intermittent” specification includes the system and OEMs during an intermittent duty cycle, such as a print cycle lasting a minute or less.)

## 5-1.5 Electrostatic Discharge

During normal system operation, the presence of electrostatic discharge (ESD) can cause system lock-ups and reliability problems.

### CAUTION

With system covers or shields removed, ESD *will always* cause component damage. ESD damage is cumulative and may not be apparent at first, as indicated by a hard failure, but can cause degraded performance. Therefore, always use proper ESD handling procedures.

ESD can result from low humidity, carpeting, linen, and clothing. Avoid placing the system directly under or close to HVAC vents. While special equipment is

required to measure ESD levels, you can determine the presence of ESD during the following steps.

1. Check for the presence of ESD by walking around where the system will be installed and touching grounded surfaces.
2. Ask the operators if they have experienced static discharge in the work area.
3. Suggest possible ESD minimizing devices and their usage, for example, static mats, humidifiers, and sprays.

Some facts about ESD:

- ESD voltages in excess of 2,000 V cause a shock.
- ESD is audible above 5,000 V.
- ESD is visible above 10,000 V.

## 5-1.6

## **Electromagnetic and Radio Frequency Interference**

Electromagnetic interference (EMI) and radio frequency interference (RFI) typically cause image noise. EMI and RFI can be generated by a variety of electrical devices and may not be apparent until installation. The interference can be transmitted over power lines or radiated through the air.

1. Use an AM radio tuned between stations around 1600 KHz as an EMI/RFI tester while walking around the room.
2. Note any obvious or potential noise generators. Typical generating devices include (but are not limited to) gel warmers, coffee pots, air conditioners, fans, photocopiers, computers, printers, electric typewriters, lab equipment, surgical equipment, MRI units, elevators, radios, light dimmers, and refrigerators.

## 5-1.7

## **Dust**

Air circulation requirements of the system and the location of its air filter can cause dust to accumulate rapidly on the air filter and cause the system to overheat. Advise the customer about the need to maintain a low level of dust in the room.

Refer to [Section 8, "Preventive Maintenance"](#), for the fan filter cleaning procedure.

## 5-1.8

## **Lighting**

Ambient light can interfere with the viewing of video monitors. A darkened room is preferred. Note if there are shades or blinds, small lamps or dimmer switches in the room which can be used to control ambient light.

## 5-1.9

# System Specifications

## Wiring Requirements

The electrical feed to the system shall be a dedicated/isolated line (no other equipment on the same line) with a third-wire ground. The ground wire shall be an insulated, isolated solid copper conductor bonded to the ground bus of the service panel. The outlet shall be a Hospital Grade Receptacle (for installations in North America) or an Isolated Ground Receptacle (International). Proper installation shall reflect compliance with the national electrical code.

## 5-1.10

# Image Management Network Requirements

The customer or their contractor will install the network cabling. If in-wall cabling is used, it is the customer's responsibility to install the correct type of cable in accordance with all applicable building and fire codes. It is also the customer's responsibility to maintain the in-wall cabling for the life of the system. The most common type of cable used is CAT5 (Category 5, 10 Base-T unshielded twisted pair).

**NOTE** Category 5 is the highest rating for network cabling.

**Perform the following steps before installing the NetLink option:**

1. Identify the system administrator (and backup person, if possible).
2. Obtain the following information from the system administrator:
  - A list of all equipment that is part of the Image Management network. Also include device type, model number, and software version applicable to each piece of equipment.
  - Logical diagram of the network showing topology, subnets, etc.
  - Locations of equipment
  - Locations of all NetLink LAN attachment points
  - Locations of power outlets and connector types
  - Locations of any dedicated analog phone lines
  - All necessary Internet Protocol (IP) addresses and subnet information.
3. Determine the type of network cabling installed:
4. Identify OEM equipment installers and contact them regarding the installation.
5. Check device compatibility prior to connecting new devices (printers, archive devices) to the network.

## 5-2 System Installation

### 5-2.1 Introduction

This section contains inspection and installation procedures.

**NOTE** Some parts of this section include policies, equipment requirements, and procedures that may apply only to U.S. field use. Distributors, affiliates, or other authorized service personnel, should use their equivalent document.

Perform a site inspection as described in [paragraph 5-1](#). After you have completed the inspection and installation of the system, verify correct operation using the performance tests in Section 6.

### 5-2.2 Materials and Equipment

- Three-prong Test Plug (6005-0564-01)
- FSE Tool Kit
- Oscilloscope
- ONEAC Line Viewer
- DVM (digital volt meter)
- Installation Work Orders
- RMI Model 413 Tissue Equivalent Phantom (199-12204-00)
- RMI Model 406 Dual Attenuation Phantom (2100-1610-01)
- Quality Assurance Audit (PM) label (4100-0941-XX) and label overlay (4100-0941-XX)
- Service manuals for the peripheral devices included in the system

### 5-2.3 Preliminary Inspection

- Inspect the shipping crate before unpacking the system.**
1. Examine the shipping crate for damage caused by rough handling. Look for evidence that the crate was opened.
  2. Verify that the Shockwatch and Tiltwatch indicators on the outside of the carton have not been activated. If the indicators appear red in color, check the system for further damage.
  3. Report any damage or pilferage to the carrier and to the ATL traffic department.

## 5-2.4

# Uncrating Instructions

## Wood Crate

### CAUTION

Before uncrating the system, ensure that the area in front of the shipping crate ramp is clear for at least nine feet. (The ramp is the front side and is labeled "OPEN THIS END".)

#### To uncrate the system from a wood crate:

1. Remove the four bolts securing the top and remove the top ([Figure 5-1](#) and [Figure 5-2](#)).
2. Remove the six bolts securing the ramp (the crate front).
3. Lower the hinged ramp.
4. Remove the front and side cardboard/foam panels.
5. Remove the front caster chock.
6. Verify the upper UIF panel is securely latched (slide button is in up position) on the left side of the UIF panel.
7. Verify the monitor is correctly installed and latched:
  - a. Grasp the monitor under one speaker and lift. If the latch is properly latched, the monitor will not raise.
  - b. Repeat step a on the opposite side of the monitor.
  - c. If the monitor is not secured properly, remove the VCR, then remove the monitor from the system.
  - d. Re-install the monitor ensuring the monitor mounting prongs mate into both latches.
  - e. Repeat steps a and b to verify the monitor assembly is secure. Refer to [Figure 5-3](#) for the monitor latch positions.

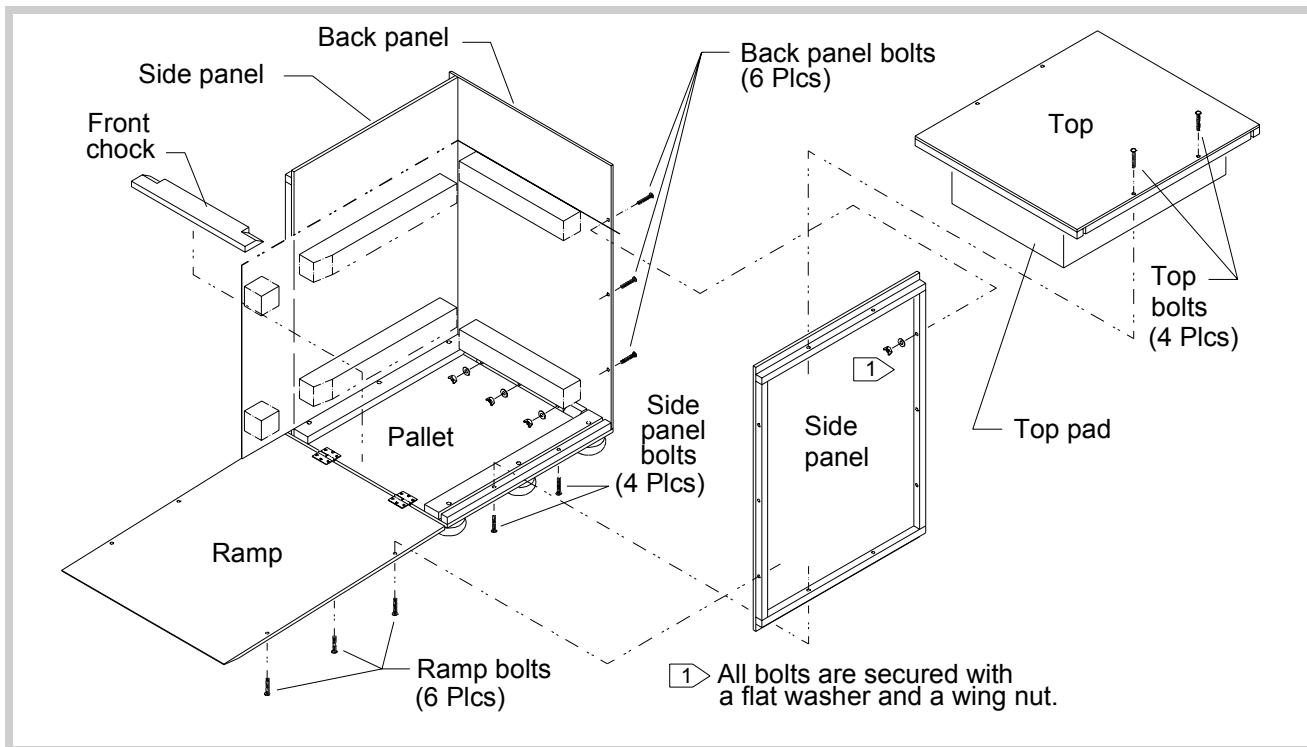
### CAUTIONS

- It is possible for the monitor to be installed in the tilt swivel base without the locking prongs mating with the latches. In this case, the latches can still be placed in the correct latching positions, but the monitor will not be secure.
- The monitor locking latches are for removal of the monitor only and not to assist in loosening the monitor for ease in positioning. Leaving the monitor latches in the unlocked position will allow the monitor and VCR (if attached) to fall from the system. Monitor latches should remain locked unless removing the monitor from the system.

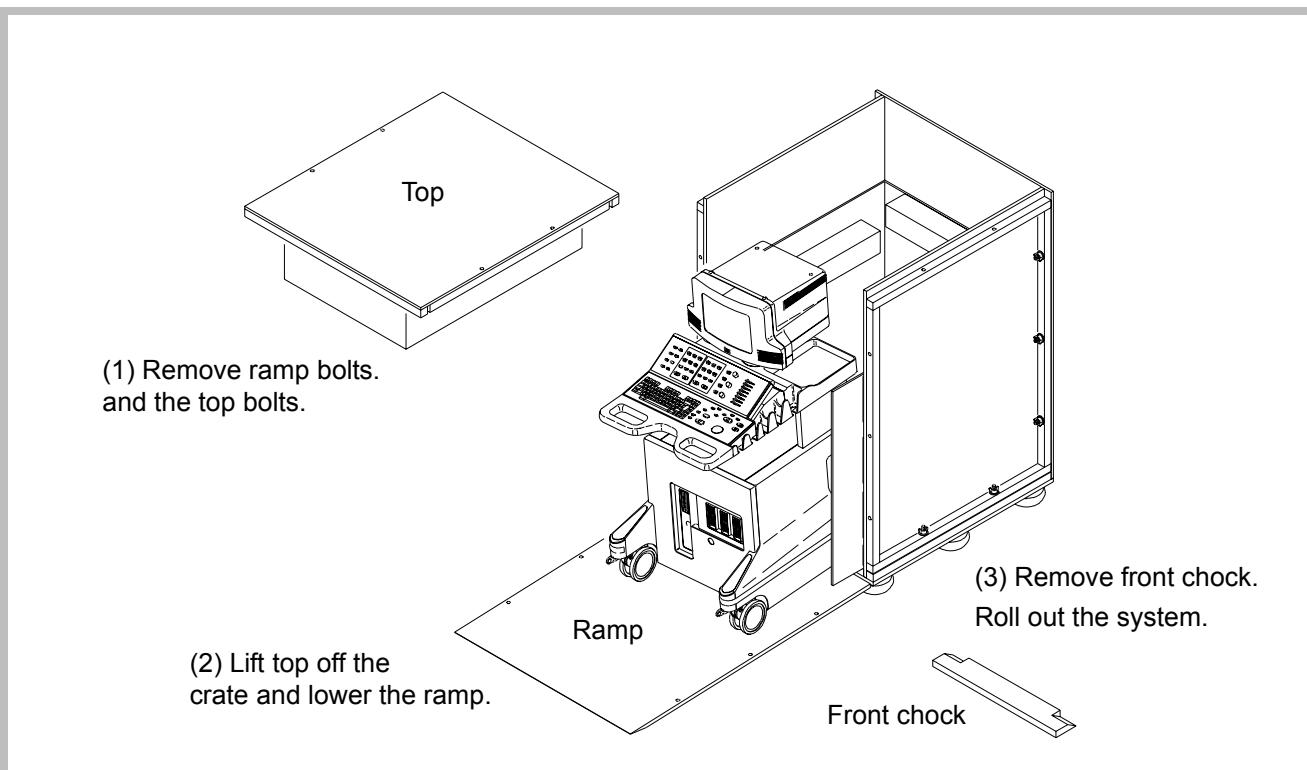
### WARNING

Use care when moving the system down the ramp. Serious injury or equipment damage can result if the system becomes out of control.

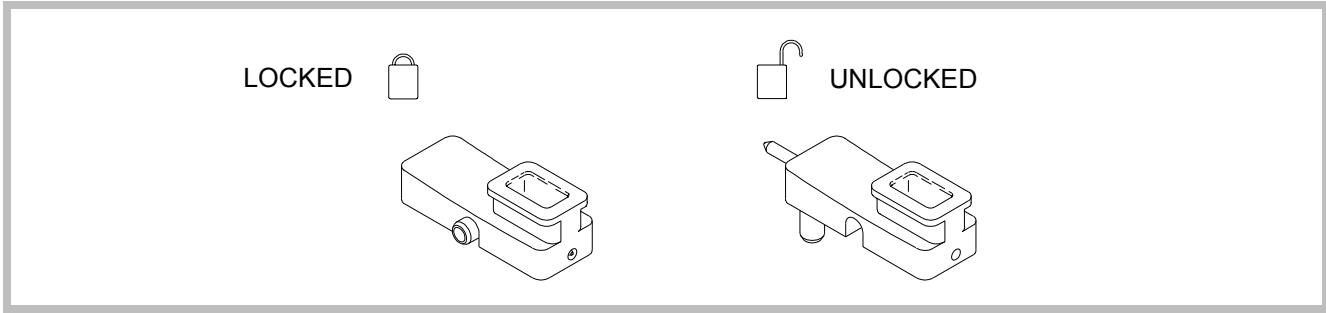
8. Verify the caster brakes are released and roll the system down the ramp.
9. Knock the wood crate down flat and return to ATL.



**Figure 5-1 Wooden Crate Details**



**Figure 5-2 Unpacking Details**



**Figure 5-3 Monitor Latch Positions**

## **Corrugate Crate**

---

### **CAUTION**

Before uncrating the system, ensure that the area in front of the shipping crate ramp is clear for at least nine feet. (The ramp is the front side and is labeled "OPEN THIS END.")

---

**To uncrate the system from a corrugate crate:**

---

### **WARNING**

Use caution when removing the strapping bands securing the shipping container. These bands are under enough tension to cause injury if removed carelessly.

---

1. Remove (cut) the two plastic strapping bands from around the corrugate container ([Figure 5-4](#)).
2. Remove the top cover from the corrugate crate.
3. Remove any accessories placed on the corrugate tray in front of the monitor ([Figure 5-5](#)).
4. Cut the taped edges of the container and remove the two-piece corrugate box from around the system.
5. Remove accessories and other loose-packed items not removed in [step 4](#).
6. Remove the two 9/16-inch bolts securing the front section of the inner crate to the pallet. This piece also serves as a ramp.
7. Position the tall end of the ramp so that it butts up against the pallet at the front of the system with the beveled end of the ramp sloping to the floor.

---

### **WARNING**

Use care when moving the system down the ramp. Serious injury or equipment damage can result if the system becomes out of control.

---

8. Verify the upper UIF panel is securely latched (slide button is in up position) on the left side of the UIF panel.

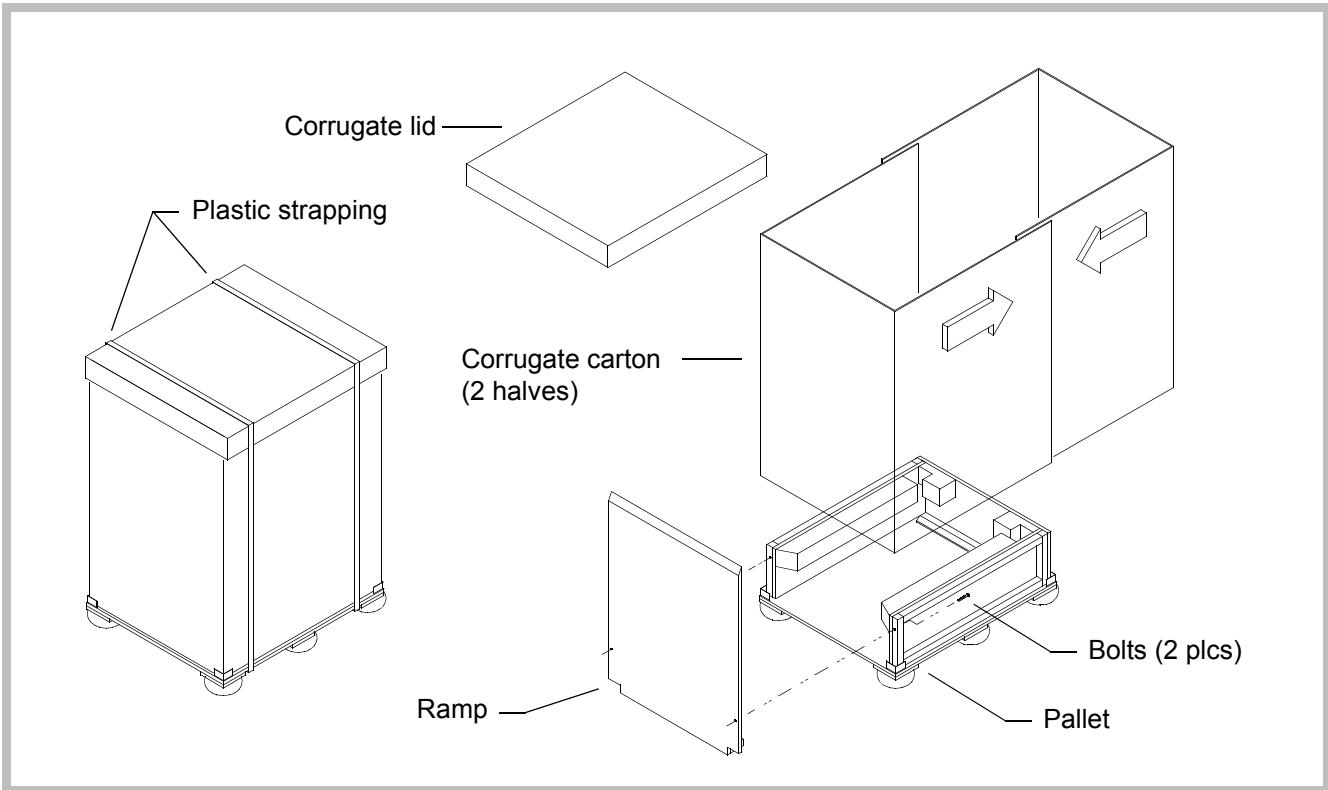
9. Verify the monitor is correctly installed and latched:
  - a. Grasp the monitor under one speaker and lift. If the latch is properly latched, the monitor will not raise.
  - b. Repeat step a on the opposite side of the monitor.
  - c. If the monitor is not secured properly, remove the VCR, then remove the monitor from the system.
  - d. Re-install the monitor, ensuring the monitor mounting prongs mate into both latches.
  - e. Repeat steps a and b to verify the monitor assembly is secure. Refer to [Figure 5-3](#) for the monitor latch positions.

---

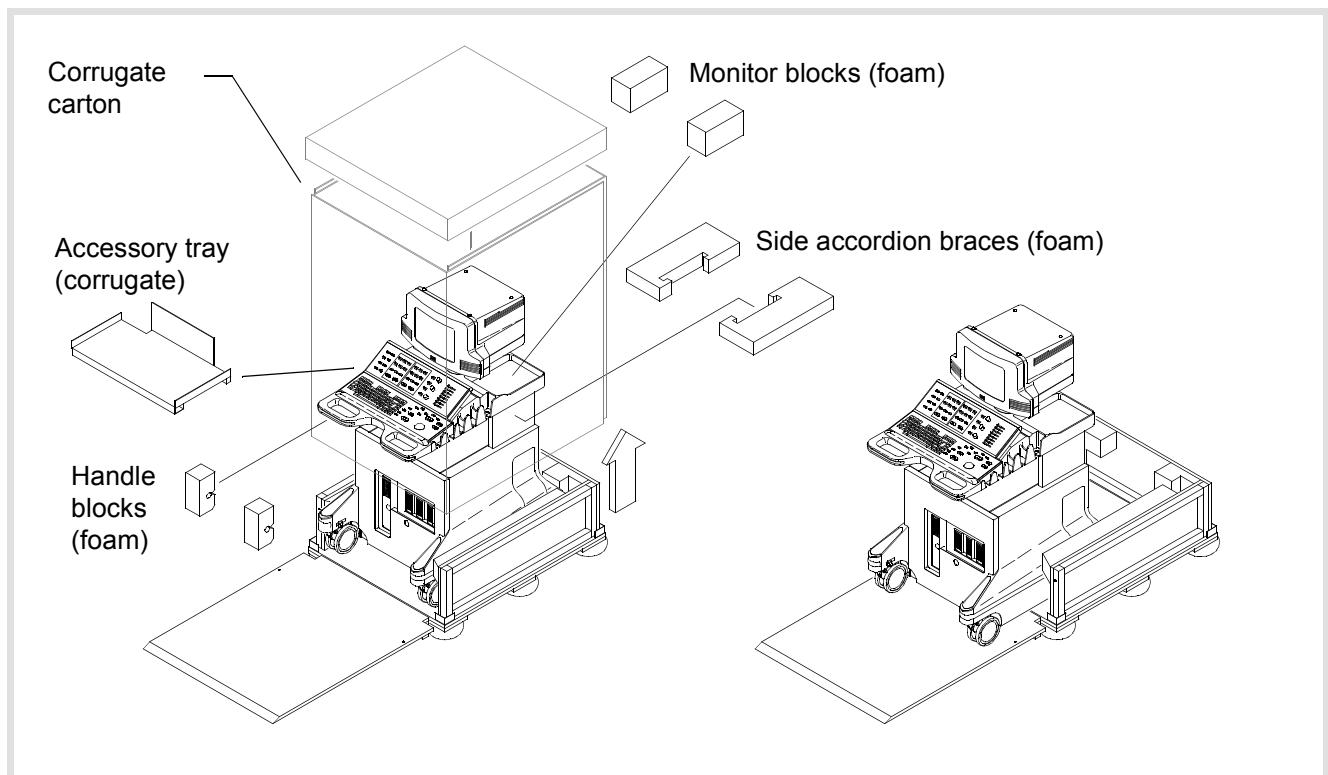
**CAUTIONS**

- It is possible for the monitor to be installed in the tilt swivel base without the locking prongs mating with the latches. In this case, the latches can still be placed in the correct latching positions, but the monitor will not be secure.
  - The monitor locking latches are for removal of the monitor only and not to assist in loosening the monitor for ease in positioning. Leaving the monitor latches in the unlocked position will allow the monitor and VCR (if attached) to fall from the system. Monitor latches should remain locked unless removing the monitor from the system.
- 

10. Carefully pull the system off of the pallet and down the ramp.
11. Properly dispose of the shipping materials. Do not return these materials to ATL.



**Figure 5-4 Corrugate Crate Details**



**Figure 5-5 Corrugate Crate Unpacking Details**

## 5-2.5 General Inspection

---

### WARNING

Dangerous voltages are present inside the system. Do not connect the system to AC line voltage until correct line voltage has been verified and a thorough inspection of the system has been performed.

---

1. Inventory the shipment against the packing list.
  2. Inspect the video monitor for damage.
  3. Mount the monitor on the system. (See the "Mechanical Procedures" section.)
  4. Connect power and signal cables to the monitor. Verify that the *shorter* power cord, labeled "120 Volts" and "MONITOR," is connected to the monitor.
- 

### CAUTION

The VCR power cord can be connected to the monitor by mistake. On 230 Volt systems, this will apply 230 Volts to the 120 Volt monitor which will damage the monitor.

---

5. Verify that the monitor swivels correctly on its base from left to right and up and down.
6. Inspect the outside surfaces of the system for damage.
7. Verify that the system rolls and turns smoothly on its casters.
8. Remove the front, rear, and right side covers.
9. Verify the hardcopy device is undamaged and firmly fastened to the system.
10. Inspect the VCR and mount it securely on top of the monitor.
11. Remove any loose packing material, dust, or debris from the interior of the system.

## 5-2.6 Mechanical Inspection

---

### CAUTION

Do not damage cables connected to modules or peripherals.

---

1. Verify all modules are secure.
2. Inspect the remaining fasteners.
3. Seat and tighten modules and connectors as necessary.

## 5-2.7 Electrical Inspection

The electrical inspection may require reference to the power distribution wiring and cabling diagrams ([Section 11, "Cabling"](#)). The parts list also contains information on PCB locations and part numbers ([Section 14, "Parts"](#)). The configu-

ration section contains current information on module and PROM replacement revision levels ([Section 13, "Configuration"](#)).

1. Remove the rear cover from the system.
2. Verify the VCR and hardcopy device power cords are plugged into the ACIM.
3. Verify that all transformer and power connections are secure.
4. Remove the control panel lock bar. Verify that the ribbon cable connections on the UIM are correct and secure.
5. Verify the connections on the VCR and video printer are secure and correct.
6. Refer to the *VCRs and Report Printers* service manual and verify that the VCR is set up correctly.
7. Refer to the *Color Video Printers* service manual and verify that the color video printer is set up correctly.

**NOTE** Use the inspection procedure appropriate to the hardcopy device installed in the system.

## 5-2.8 Reassembly

---

### CAUTION

Use extreme care when reassembling the system to avoid pinching, stretching, or otherwise damaging the system signal and power distribution cables. Also use care to avoid damage to the air filter latch.

---

Reassemble the control panels and replace all covers.

## 5-2.9 Setup

1. Dispose of packing materials and clean up the unloading area.
  2. Move the system to the installation location.
  3. Verify proper wall outlet wiring and voltage levels with a three-prong test plug and a DVM.
- 

### WARNING

Do not plug the system in if a wiring fault is discovered. Advise the customer immediately and proceed only after the fault has been corrected.

---

4. Connect scanheads, peripheral cables, and the power cable.
5. Set the monitor brightness control to 20 and contrast to 80.
6. Verify that the system fans are operating.
7. Verify proper system operation with the procedures in [Section 6, "Performance Tests"](#).

## 5-2.10 VCR Control Settings

**NOTE** To ensure proper system operation, turn on all OEMs prior to checking system functionality.

### Panasonic AGMD830P VCR

The VCR can be programmed using the on-screen programming menu or the VCR front panel display screen. To use the VCR's front panel screen, refer to the OEM manual or the *VCR and Report Printers Field Service Manual*, P/N 4720-0223-XX.

1. Press Setups and select Peripherals, Internal VCR, and Panasonic MD830. Select Close at the bottom of the display.
2. Set the MENU switch on the VCR to SET. Set the MODE LOCK switch to OFF ([Table 5-3](#)).
3. Press Superkey and Video simultaneously to toggle through the on-screen menus (internal VCR, internal color printer, etc.). The VCR menu lists on-screen menu items from [Table 5-4](#).
4. Verify the VCR parameter settings. Refer to [Table 5-5](#) for VCR front panel control functions while in programming mode.

5. Press Setups and change the VCR configuration to SVHS to return to normal configuration.
6. Set VCR Menu switch to OFF.

**Table 5-3 VCR Programming Control Settings**

Parameter	Setting
Audio Out	Mix
Audio Out	Normal
Input	S-Video
S-VHS	Auto
Menu	Set (During programming) Off (During normal operation)
Mode Lock	Off

**Table 5-4 Panasonic AGMD830P NTSC/PAL 120 V VCR Setup**

Parameter	Setting
<b>Tilt Down Panel</b>	
MODE LOCK	OFF
MENU	SET
<b>On Screen Menu</b>	
VISS	Off
Tape Select	T-120 (NTSC) or E-180 (PAL)
Auto Back	On
Tape In Mode	Stop
Tape End Mode	Stop
REC Tape End	Stop
STBY Off Time	5 Min.
Bit Length	8 Bit
Stop Bit	Stop-1
Parity	None

**Table 5-4 Panasonic AGMD830P NTSC/PAL 120 V VCR Setup (Continued)**

Parameter	Setting
Baud Rate	9600
Hour Meter	XXXX Hr
HI-FI REC	On
Audio Dub	CH1
Edit (NTSC only)	Off
YC Filter (NTSC only)	Off
Notch (PAL only)	Off

**Table 5-5 VCR Programming Control Functions**

VCR Control	Programming Operation
Stop	Moves the selection item cursor forward
Rewind	Moves the selection item cursor backward
Play	Returns to the previous menu page
Record	Advances to the next menu page
Fast Forward	Moves the menu selection to the item below
Inside Search Dial	Moves the menu selection to the item above or below

## 5-2.11

## Printer Control Settings

For printers that use on-screen programming, use the following procedure to setup the printer menus.

1. Press Menu on the printer front panel.
2. Press Superkey and Video simultaneously to toggle through the on-screen menus.
3. Set the printer control settings as specified in the printer setup tables below ([Table 5-6](#) through [Table 5-18](#)).
4. Set the Menu switch to OFF.

**Table 5-6 Sony UP-5250 Color Video Printer Setup (Early Model)**

Parameter	Setting
<b>Sony UP-5250 early model used for HDI 3000 systems upgraded to HDI 5000 systems only</b>	
<b>Menu 1</b>	
Print QTY	001
Multi Pix	1
Separate	****
Input SEL	RGB
FRM/FLD	Frame
Sharpness	M
<b>Menu 2 (Color Adjust)</b>	
Display	Full
Preset	1
Red	0
Green	0
Blue	0
Dark	-1
Light	1
<b>Select SETUP menu to verify the following settings</b>	
Size	Wide
H Shift	0
V Shift	0
Monitor	E To E
Display	On
Remote 2	M & Print
Baud Rate	Not Used
LCD CONTR	0

**Table 5-7 Sony UP-5250MD Color Video Printer Setup**

Parameter	Setting
<b>Front Panel</b>	
Manual/Auto	Manual
Gain	Center detent
Color	Center detent
Source/Memory	S
Memory Page	1A1B
<b>Rear Panel</b>	
RGB/R-Y/Y/B-Y	RGB
RGB 75Ω Termination	ON
NTSC 75Ω Termination	ON
Monitor RGB	Center detent
<b>Menu 1</b>	
Print Quantity	001
Multi Pix	1
Separate	Asterisks show if 1 is selected for Multi Pix, otherwise set this feature to OFF.
Input SEL	R Appears as RGB when selected.
FRM/FLD	Frame
Sharpness	M
<b>Menu 2</b>	
Display	Full
Preset	1
Red	-1
Green	0
<b>Select SETUP menu to verify the following settings</b>	
Size	Wide

**Table 5-7 Sony UP-5250MD Color Video Printer Setup (Continued)**

Parameter	Setting
H Shift	6 Dots Right (or adjust image for best fit to Print out)
V Shift	0 Lines (or adjust image for best fit to print out)
Monitor	E To E
Display	On
Remote 2	M & Print
Baud Rate	Not Used
LCD CONTR	0
Blue	0
Dark	+1
Light	0

**Table 5-8 Sony UP-5600 Color Video Printer Setup**

Parameter	Setting
<b>Color Adjustment Setup Menu</b>	
Preset	1
Red C-R	R5
Green M-G	G5
Blue Y-B	B5
Dark	-5
Light	+5
Save	1
<b>Analog Setup Menu</b>	
Hue (NTSC only)	0
Color	0
Gain	0
AGC	OFF

**Table 5-8 Sony UP-5600 Color Video Printer Setup (Continued)**

Parameter	Setting
Moni C-R	0
Moni M-G	0
Moni Y-B	0
<b>System Setup Menu</b>	
Display	ON
Beep	ON
LCD	ON
LCD-CNTR	0
Baud Rate	9600
Monitor	EE
User Set	1
<b>Print Setup</b>	
H-Shift	-24 Dots (NTSC) -16 Dots (PAL)
V-Shift	-8 Lines (NTSC) -10 Lines (PAL)
H-Size	952 Dots (NTSC) 924 Dots (PAL)
V-Size	480 Lines (NTSC) 576 Lines (PAL)
<b>Setups</b>	
Separate	ON
Dup-Image	OFF
Sharpness	+4
<b>System Function Menu</b>	
Remote2	C&Print
Remote3A	Print (Does not matter. Used only with Sony footswitch)
Remote3B	Back-Sp (Does not matter. Used only with Sony footswitch)

**Table 5-8 Sony UP-5600 Color Video Printer Setup (Continued)**

Parameter	Setting
Remote3C	CAP/SRC (Does not matter. Used only with Sony footswitch)
Remote3E	Capture
Clear	Part
Capture	Single
Timer	OFF
<b>Control Panel Button Setups</b>	
Motion Correct	OFF
Input Select	RGB
Multi-Picture	1
Print QTY	1
User Preset	1
Display P in P	OFF
Caption ON/OFF	OFF
<b>Rear Panel Switches</b>	
R/G/B/Sync 75 Ohm	ON
S-Video 75 Ohm	OFF
NTSC/PAL	Set to appropriate video format

**Table 5-9 Mitsubishi CP700 Color Video Printer Setup**

Parameter	Setting
<b>Color Adj</b>	
BRT	0
CONT	-8
R-Sub	0
B-Sub	0
Center	OFF

**Table 5-9 Mitsubishi CP700 Color Video Printer Setup (Continued)**

Parameter	Setting
<b>Analog Adj</b>	
BRT	0
CONT	0
R-Sub	0
B-Sub	0
Center	OFF
<b>Signal Set</b>	
Input	RGB
Field	Normal
AFC	OFF
<b>Additional</b>	
Strobe	OFF
Multi: 1 for 1	OFF
<b>Print</b>	
Mode	L (large)
Grad	ECHO
APT	H1
Comment	OFF
Mirror	OFF
<b>System</b>	
Size	USER
H-Posi	0
Copy	OFF
Top	-8
Bottom	10
Left	-16
Right	6
Page Inc	ON

**Table 5-9 Mitsubishi CP700 Color Video Printer Setup (Continued)**

Parameter	Setting
Live Sel	DIGITAL
Convert	ON
Buzzer	ON
<b>Rear Panel Switch Settings</b>	
IMPEDANCE - RGB	75 Ω
IMPEDANCE - SYNC	HIGH

**Table 5-10 Mitsubishi CP700 Color Video Printer Memory SW Menu Control Settings Setup**

Parameter	Setting
<b>Time</b>	
Month	Not used with ultrasound systems.
Date	
Year	
Hour	
Minute	
Second	
<b>Key Set</b>	
KEY LOCK	OFF
MEM&PRN	ON
MEM&STOP	OFF
MEM&MON	OFF
PRINT&CLR	OFF
CLEAR KEY	ONE
<b>Signal Set</b>	
IN Sync	0.3 V
OUT Sync	0.3 V
Sync	NEGA

**Table 5-10 Mitsubishi CP700 Color Video Printer Memory SW Menu Control Settings Setup (Continued)**

Parameter	Setting
RGB SOG OUT	OFF
H Start	NORMAL
Spcl Timing	OFF
MON R-Sub	0
MON B-Sub	0
<b>Print Set</b>	
PRN DIR	NORMAL
PRN Speed	NORMAL
Margin Cut	OFF
V Position	34
Echo Gamma Adj.	a: (64, 0) b: (128, 0) c: (192, 0)
<b>System Setting</b>	
PRG All Init	OFF
Baud Rate	9600
Command Type	A
Response	RETURN
Remote Busy	H

**Table 5-11 Mitsubishi CP800 Color Video Printer Setup**

Parameter	Setting
<b>Color Adj</b>	
BRT	+5
CONT	0
R-Sub	0
B-Sub	0
Center	0

**Table 5-11 Mitsubishi CP800 Color Video Printer Setup (Continued)**

Parameter	Setting
<b>Analog Adj</b>	
Color	N/A
Tint	N/A
BRT	0
CONT	0
R-Sub	0
B-Sub	0
Center	OFF
<b>Input</b>	
Input	RGB
<b>Additional</b>	
Multi	OFF
Buzzer	T1
<b>Print</b>	
Mode	AUTO
Grad	ECHO
<b>GAMMA ADJ</b>	
Low Point	64
Mid Point	128
Hi Point	192
Apt	N
Com	OFF
Mirror	OFF
Comment	[>}
<b>SIZE/TIMING</b>	
H-Posi	0
H-Start	NOR
Size	W

**Table 5-12 Mitsubishi CP800 Color Video Printer Memory SW Menu Control Settings  
Setup**

Parameter	Setting
<b>Key Set</b>	
KEY LOCK	OFF
MEM&PRN	ON
MEM&STOP	OFF
MEM&MON	OFF
PRINT&CLR	OFF
Clear Key	PAGE
Keep Moni	OFF
<b>Signal Set1</b>	
Field	NORMAL
AFC	OFF
Sync	EXT
R-Sub	0
B-Sub	0
<b>Signal Set2</b>	
IN Sync	0.3 V
OUT Sync	0.3 V
Sync	NEGA
RGB SOG OUT	OFF
Spcl Timing	OFF
<b>Print Set</b>	
DIR	NORMAL
Margin Cut	OFF
Auto Cut	ON
OP Mode	4P

**Table 5-12 Mitsubishi CP800 Color Video Printer Memory SW Menu Control Settings Setup (Continued)**

Parameter	Setting
<b>System Setting</b>	
Page Inc	ON
Live Select	DIGITAL
Convert	ON
Remaining	OFF
<b>Remote Set</b>	
Baud Rate	9600
Command Type	A
Response	RETURN
Busy Level	H
Busy Mode	PRN
V Sync Mem	OFF
<b>Previous Error</b>	
Mecha Error	NOTHING
PRG All Init	OFF
<b>Rear Panel Switch Settings</b>	
IMPEDANCE - RGB	75 Ω
IMPEDANCE - SYNC	75 Ω

**Table 5-13 Sony UP1850 Color Video Printer Setup**

Parameter	Setting
<b>Sony UP1850 used for upgraded HDI 3000 systems only</b>	
<b>Menu 1</b>	
Print QTY	1
Input Sel	RGB
FRM/FLD	FRAME
Sharpness	0

**Table 5-13 Sony UP1850 Color Video Printer Setup (Continued)**

Parameter	Setting
<b>Color Adjust</b>	
Load	1
Red	0
Green	0
Blue	0
Dark	+1
Light	-2
Check	N/A
Save	1
<b>Signal Adjust</b>	
Color	0
Gain	0
Offset	0
AGC	OFF
<b>Multiplex</b>	
Split Mem	OFF
Interval	OFF
Separate	OFF
DUP Image	OFF
Image Size	L
Mirror	OFF
Pick Image	N/A
<b>Set Up</b>	
H Shift	0 DOT
V Shift	0 DOT
RM2 Mode	M&P
RM2 ACT	1ACT
LIVE MODE	OFF

**Table 5-13 Sony UP1850 Color Video Printer Setup (Continued)**

Parameter	Setting
<b>Monitor Adjust</b>	
Moni Red	0
Moni Blue	0
Display	OFF
Monitor	E to E
Sync on G	OFF
<b>Rear Panel Dip Switches</b>	
75 OHM	ON
SW1	ON
SW2 - SW8	OFF

**Table 5-14 Sony UP860/870 Video Printers**

Parameter	Setting
<b>Sony UP860/870 used for upgraded HDI 3000 systems only</b>	
<b>Front Panel</b>	
Contrast	Center
Brightness	Center
Thru/EE Switch	Thru
Posi/Neg Switch	Posi
<b>Rear Panel</b>	
Dip Switches	All ON, except switch 1 OFF
I II III Switch	II
D Adj	Center

**Table 5-15 Sony UP890 Video Printer**

Parameter	Setting
<b>Front Panel</b>	
Print Size	NORMAL
Contrast	10:00
Brightness	11:30
Thru/EE Switch	EE
STD/SIDE	STD
<b>Rear Panel</b>	
Dip Switches	All ON
GAMMA	II
Paper Type	IV

**Table 5-16 Sony UP910 Video Printer**

Parameter	Setting
<b>Front Panel</b>	
Dip Switches, NTSC	All OFF
Dip Switches, PAL	All OFF, except switch 5 ON
Contrast	Center
Brightness	Center
<b>Rear Panel</b>	
75 Ohm	ON

**Table 5-17 Aspect Multi-Image Camera**

Parameter	Setting
Brightness	35
Contrast	45
Polarity	+

**Table 5-18 System Setups for Video Printers and Aspect MIC**

Parameter	Setting
Use Print Button To	Print Local (Internal)
Environment	Print All
Print Color Images to B&W Printer	Yes
Store to Optical Disk During Exam	OFF

## 5-2.12

### DVS Module

The DVS Module is physically installed in the system prior to system shipment from ATL Bothell. However, DVS cabling is disconnected during system shipment to prevent connector damage from boxes packed around the system in the shipping crate. Use the following procedure to connect the DVS cabling:

1. Remove the disconnected cabling (P/N 3500-2921-01 and 2275-0402-01) from the OEM bay.
2. Remove bubble wrap from the connectors.
3. Connect the cabling to the system.
4. Performance test the system per the procedures in paragraph 6-5.12.

## 5-2.13

### Final Inspection and Documentation

1. Perform an inspection if one was not previously completed. Record all pertinent information on the work orders.
2. Verify electrical power quality using the system and its peripherals as the final load. Also compare your pre-install observations of ambient temperature, RFI, and ESD conditions to present conditions. Record all measurements and observations on the Installation Work Order.

3. Ensure the Manual Updates and Operating Notes are with the user manual set. Have the user manuals available for review by the system operator so that questions can be answered during the system presentation.
4. Complete a Quality Assurance Audit (PM) sticker and attach it to left side of the monitor.
5. Tell the facilities representative that the system is installed and ready for any safety tests that they normally conduct.

## 5-2.14

## System Presentation

When the system and the customer documents are ready, present them to the operators using the following in-service procedure.

1. Review the customer order with the customer to familiarize them with the system and its options and to assure them that they have received what they ordered.
2. Present the user manuals and operating notes. Describe these publications and emphasize that all information needed to operate the system and peripherals is in them. As questions come up, guide the operators through these publications.
3. Show the operators how to turn on the system and any external OEMs. Explain the differences between the main circuit breaker and the ON/STANDBY switch.
4. Describe the initialization process and explain that the system programs itself during this process.
5. Explain why it is important for them to never remove covers from the system because of ESD and warranty considerations.
6. Explain the reasons for the following cautions:

---

### CAUTIONS

- Always place the system ON/STANDBY switch to STANDBY for five to ten seconds before setting the system I/O circuit breaker to OFF.
  - Always wait five to ten seconds after placing the system ON/STANDBY switch to STANDBY before placing the switch back to ON. A power-down sequence, similar to the initialization that occurs when power is first turned on, saves certain operating parameters and then turns off power supplies in a sequential order.
  - This equipment contains components which are electrostatic sensitive. Proper static procedures, protection, and equipment must be used prior to opening and during handling of this equipment. Failure to use ESD procedures *will* cause damage to these components. Such damage to components *is not* covered by ATL warranties.
- 
7. Once the system is fully initialized, give the operators a brief demonstration of system controls. Limit the discussion of the MENU buttons to the con-

cept that pull-down menu boxes contain higher level commands for the functions selected by the mode buttons. Review the following:

- How to set Time and Hospital Name
  - How to enter patient data
  - Mode buttons
  - Rotary controls
  - Up/Down spring-loaded control switches
  - Trackball and SELECT control, including their use with pull-down menus
  - Volume control
  - VCR and hardcopy device operation
  - Signal ports, including scanheads
8. Instruct the operator on how to optimize image quality using the control settings in [paragraph 5-2.15](#).
  9. Describe and demonstrate system maintenance procedures to be performed as needed:
    - Fan filter cleaning
    - System cleaning
    - Scanhead disinfection and sterilization (refer to *Using Disinfectants and Gels*, P/N 4700-0249-XX)
    - B/W printer head cleaning
    - Other peripherals, as necessary

## 5-2.15

### Image Optimization

Image optimization on the HDI 5000 uses different settings than those used on other ATL systems. Set the system to the following settings for optimum image quality.

- Monitor brightness to 20 and contrast to 80. (Higher brightness levels produce flat images.)
- TGC slidepots in a straight line. Then, adjust as necessary for patient habitus. Set slidepots before setting a new TSI.
- Compression curve to C2. Lowering compression decreases image noise. You may need to increase compression for THI images.
- Gray Maps as required by customer. (Dedicated gray maps exist for General Imaging and Cardiac Imaging.)
- Power as required. (Reduce to decrease artifacts)

## 5-2.16

### Completing the Installation

1. Discuss the present status of the system with your customer and review the hardcopy prints that were taken during the system check out. Be sure to cover any environmental concerns as well, making suggestions as appropriate.
2. Ask your customer if there are any questions that they have about the new system or ATL.
3. Review the customer procedures to place a service call or to call for technical assistance.
4. Complete the work order.

## 5-3

### NetLink Installation

NetLink is installed by programming the HDI 5000 host table with the proper network configuration. The following steps summarize the installation process.

1. Determine configuration information: all IP addresses, model IDs, subnet masks, gateway addresses, port numbers, and device aliases. Obtain the information from the network administrator.
2. Use the configuration information to program the host table using the ultrasound system to edit, install, and copy the configuration files. Refer to the *Reference Manual*.
3. Verify the accuracy of the syntax of these files by selecting the Save option from the bottom of the display. If there are no errors, then the files are syntactically correct; otherwise, they are not, and the problem is described in an error message. Edit the files, fix the syntax, and apply until no errors occur.
4. Use the Image Management Network Configuration setups to verify the network configuration (host table, device table, and device files). From the Printer Selection option, verify that the printers are displayed in the appropriate lists on the B/W and Color Printer setups panels. Verify that the ultrasound system appears in the Ultrasound System Net ID and that all of the archive devices appear in the archive list.
5. Select Image Management Configuration Files and create a backup copy of the configuration files on the system hard disk.
6. Select the correct printer and archive device(s) using Printer Selection and Network Configuration. Refer to [Section 6, "Performance Tests"](#), to create an exam, take several images, and end the exam. Verify the images are printed and that the exam appears on all archive devices.

7. If devices are to be added to the device table after the original network installation, load the site disk obtained from TSG and copy the new configuration files.
8. Backup the network configuration files after upgrades or modifications to the host or device tables.

Detailed instructions for installing NetLink are contained in the “Image Management” section of the *HDI 5000 Reference Manual*, part number 4703-0027-XX.

### 5-3.1

## Host Table, Device Table, and Device Files

The host table must contain the correct alias, IP address, port number, model ID, title, and subnet for each device on the network. The device table maps each model ID in the host table to a file that describes the capability of that device. These capabilities include such things as printer type, film size, film type, orientation, destination, and density, etc.

Most of the attributes or capabilities listed in the printer device file appear as setups on the Image Management Net Admin: B/W Printers and Color Printers system setups screens. From these screens you can select the settings for the desired print attributes. You must first select a printer type before setting the other print attributes.

The information in the host table, device table, and device files establishes the network configuration. This information must be consistent, or an error message will be displayed on the system monitor when the configuration files are saved.

The host table, device table, and device files establish the following relationships and must be setup to reflect the network configuration:

- TCP/IP addressing for server and clients on the network
- DICOM print connections
- Print media selection
- Print media size selection
- Print film type selection
- Print orientation selection
- Print contrast and density settings
- Print format

### DICOM storage device connections

Once the network configuration has been established and setup, create a site disk by copying the host table, device table, and device files.

# **6 Performance Tests**

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## **6-1 Introduction**

This section contains a series of performance tests to be performed on the system following installation, upgrade, or repair. The purpose of these tests is to verify the correct operation of the system (hardware and firmware). The checklist included at the end of this section can be used to ensure that all tests are performed.

The major test sections in this procedure are organized to follow a logical progression through each of the major system modes. It is not a requirement to perform the sections in any particular order. However, it is best to perform the tests in order to promote a thorough and consistent testing process.

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### **WARNINGS**

- Measurement accuracy must be verified after installation, after every repair involving PCB or power supply module replacement and during every preventive maintenance inspection. If measurements are inaccurate, misdiagnosis may result in harm to patients.
  - Wrist straps should not be worn when working on a system with its power turned on. The +5 Vdc supply is a very high current supply. Use caution when troubleshooting.
- 

**NOTE** Before performing these tests, the site power should be inspected in accordance with the pre-site inspection procedures detailed in the “Site Inspection” section of the *General Field Service Manual*.

## **6-2 Test Equipment and Materials**

- FSE Tool Kit (193-90003-01)
- RMI Model 413 Tissue Equivalent Phantom (199-12204-00)
- RMI Model 406 Dual Attenuation Phantom (2100-1610-01)
- Leakage Tester/ECG Simulator (6005-0555-01)

## WARNING

The following series of tests requires applying power to the system while protective covers are removed. Dangerous voltages are present. Use extreme caution.

The initial setup procedure consists of observing system power-up and initialization, verifying system configuration against the customer order acknowledgement (COA), and adjusting the monitor for optimal viewing.

### 6-3.1

#### System Power Up and Initialization

This section verifies the status of system power supply voltages as reported by the power supply boards.

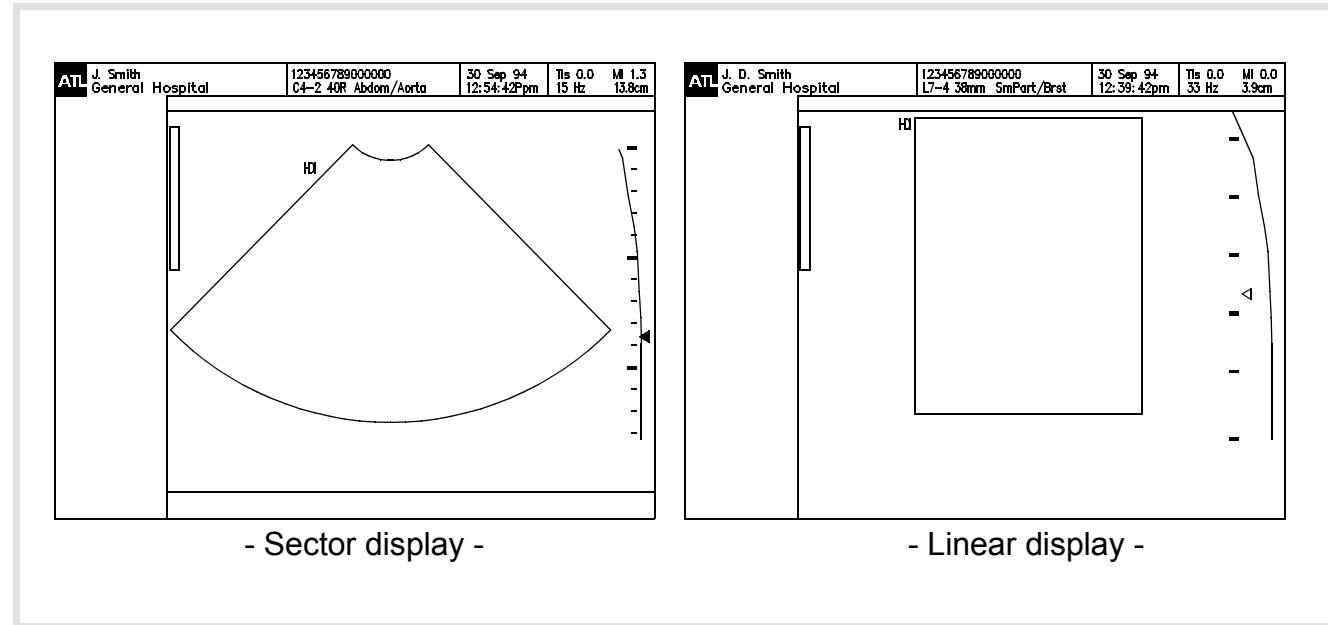
**NOTE** Before proceeding, refer to [Section 3, "Safety"](#), and [paragraph 4-3.2, Power Subsystem](#), and review the discussion of the three power states (Off, Standby, and On).

1. Turn system off and disconnect power cord before proceeding.
2. Perform the system electrical inspection as described in [Section 5, "Installation"](#).
3. Connect an array scanhead to the system.
4. Turn on all OEMs prior to checking system functionality.
5. Load OEM paper or film, as required.
6. Connect the system power cord to a hospital grade AC outlet: specifically, a single branch circuit, 15 or 20 Ampere, 120 Vac, with an isolated and insulated ground wire (or the equivalent International circuit).
7. Set the system circuit breaker to ON.
8. Wait 15 seconds, then set the ON/STANDBY switch to ON (?).
9. Verify that LEDs 6 and 7 on the ACIM are constantly lit.
10. Verify power indicators are illuminated on internal peripherals.
11. Turn on power to all external peripherals and verify power indicators are illuminated.

**NOTE** Observe the required warm-up period for each peripheral before conducting image quality tests. Refer to the OEM manual supplied with the peripheral or the appropriate peripheral field service manual.

12. After completion of the initialization process, verify the following:
  - The scanhead connected in [step 3](#) of this procedure is selected and enabled.
  - A real-time 2D image (sector or linear) is displayed on the monitor ([Figure 6-1](#)).

13. Throughout the performance tests, verify the following:
- The image is correctly placed on the video display.
  - The LEDs associated with the buttons on the control panel are lit when that feature is activated.
  - Toggle switches, slidepots, trackball, and other moveable controls operate smoothly and efficiently.



**Figure 6-1 Power-up Displays**

### 6-3.2 System Configuration

Refer to [paragraph 9-5.5](#) to check the installed system options against the COA.

### 6-3.3 Adjusting the Monitor for Optimal Viewing

The following procedure is used to set up the monitor for optimal viewing, and to check the range of contrast and brightness of the monitor.

1. Set the background color to midrange for all three colors (Color 1, Color 2, or Color 3).
2. Set brightness and contrast to minimum. Verify that the video display has a flat black appearance.
3. Set contrast to maximum. Verify that the level of contrast varies.
4. Adjust the brightness of the lightbar from maximum to minimum.
5. Set the background color, brightness, contrast, and light bar intensity to the factory default settings by simultaneously pressing and holding the up and down controls for each parameter.

- NOTES**
- Focus is not currently field adjustable.
  - You must wait for longer than 30 seconds, after changing control settings on 3500-2532-XX monitors (Brightness, Contrast, and Light Bar Intensity), for the settings to be retained in the monitor EEPROM. Turning off the monitor power during this period will require you to reset the control settings.

## 6-4

# User Interface Tests

The following tests verify various system defaults and user-selectable configuration items, and selection of scanheads and applications.

**NOTE** Some controls listed in this section are feature-dependent and will not show up on all systems.

### 6-4.1

## Keyboard

1. Press Text or Title. Title allows annotation entry in the upper part of screen; Text enters characters at cursor's active position.
2. Press each alphanumeric key and verify the appropriate character is displayed.
3. Press Shift and the arrow keys and verify the appropriate symbols are displayed.
4. Press Shift and verify the shift functions for keys with shift characters.
5. Press remaining keys and verify proper operation. For example, Backspace, Return, Erase Text.

### 6-4.2

## Softkeys

The softkeys are operational only when certain machine options have been installed. The machine options include: VCR, NetLink, 3D CPA, 3D Grayscale, and Advanced 3DI. If a machine option has been installed on the system and that particular mode of operation has been selected, the softkey LEDs display commands available for that particular mode. Refer to the *HDI 5000 Reference Manual* (P/N 4703-0027-XX) for the softkey functions.

### 6-4.3

## Installation Defaults Setup

1. Press the Setups key and click on Display.
2. Enter the appropriate Institution name, date and time. Click on the diamonds to select desired time and date formats.
3. Exit Setups.

### 6-4.4

## Patient Data on Systems without Worklist Feature

1. Press Patient Data.

2. On systems with 127.05 and lower, continue with step 3. On systems with 170.XX and higher, select Patient Data.
  3. Enter your name in the New Patient field.
  4. Enter the system sales order (SO) number in the ID field.
  5. Select Study Data. Enter your birth date in Date of Birth.
  6. Verify your age is displayed correctly.
- NOTE** The Accession number is an optional 16-digit field used to track patient exams on systems with Image Management. It is unnecessary to enter anything into that field for this procedure.
7. Select Previous Exam and Close. Then close the Patient Data menu.

## 6-4.5

### Patient Data on Systems with Worklist Feature

Systems with the Worklist feature are capable of automatically entering patient data in preparation for an exam. The worklist server and ultrasound system must be properly configured and communicating over a network. The worklist server must also have a worklist to transfer to the ultrasound system. Refer to Manual Set Update (P/N 4706-0027-06) for information on how to use the Worklist feature.

## 6-4.6

### Scanhead Initialization

1. Press the Scanhead key.
2. Connect the following scanheads or equivalents as shipped with the system:  
L12-5 C8-4v P3-2 D5CW
3. Verify the scanheads connected are correctly displayed.
4. Select the desired scanhead. and scanhead application. Verify that the correct scanhead is identified at the top of the screen.
5. Verify that the patient data and other information is correctly displayed and that the clock is updating.

## 6-4.7

### 2D Primary Controls

#### 2D Gain

**NOTE** The TGC graphic on the display does not correlate to the TGC slidepot positions. The TGC graphic on the display represents the actual curve used by the beamformer.

1. Image the phantom while performing these steps.
2. Connect any phased or curved array scanhead to the system
3. Select the Generic/General optimized preset and select 2D mode.
4. Set all TGC slidepots to the center position.

5. Verify that adjusting 2D GAIN from minimum to maximum moves the displayed TGC line from a flat line at the left edge of the depth markers to a flat line at the right edge of the display.
6. Verify that as 2D GAIN is increased and decreased, there is a corresponding increase and decrease in echo intensity.
7. Set 2D GAIN to mid-range.

### **TGC Slide Pots**

1. If the TGC display is not present, press Setups, select Display and turn TGC Display ON. (Moving a TGC slidepot will only bring up the TGC display for three seconds.)
2. Set 2D GAIN to mid-range or higher.
3. Verify that adjusting each TGC slidepot from minimum to maximum moves the corresponding portion of the displayed TGC line from the left edge of the depth markers to the right edge of the display.
4. Verify that increasing and decreasing the TGC gain results in a corresponding increase and decrease in echo intensity (depends on overall gain settings).
5. Set all TGC slidepots to the center position.

### **Focal Zones (number of focal zones)**

1. Verify that pressing ZONES up increases the number of focal zones (the number of Zones varies with scanhead type) or changes the distance between zones.
2. Verify that pressing ZONES down decreases the number of focal zones (the number of Zones varies with scanhead type) or changes the distance between zones.

### **Focus**

1. Verify that pressing FOCUS up moves the focal zone up (positioned at shallower depths).
2. Verify that pressing FOCUS down moves the focal zone down (positioned at deeper depths).

### **Depth**

1. Verify that pressing DEPTH up decreases the displayed depth and that the frame rate increases.
2. Verify that pressing DEPTH down increases the displayed depth and that the frame rate decreases.

### **Output**

1. Verify that pressing OUTPUT up increases the echo intensity.

2. Verify that pressing OUTPUT down decreases the echo intensity.

### **Top/Bottom**

1. Verify that pressing TOP/BOT up or down inverts the image top to bottom.
2. Verify that depth markers, focal zone marker, and the orientation marker change their orientation with the sector orientation.
3. Verify that adjusting the top TGC slide pot still controls the near field part of the image while the image is inverted.

### **L/R Invert**

1. Place the scanhead on the phantom with the orientation marker to the left. Verify that the image orientation marker corresponds to the orientation mark on the scanhead.
2. Verify that pressing L/R INVERT switches the image and the orientation marker left to right.

### **Compress**

1. Press COMPRESS up or down.
2. Verify that the dynamic range compression curve annotation changes from C1 to C6.

### **Sector Width**

1. With a sector scanhead, verify that pressing SEC WIDTH down decreases the sector width.
2. Verify that the frame rate increases as the sector width is decreased.
3. Verify that pressing SEC WIDTH up increases the sector width.
4. Verify that the frame rate decreases as the sector width is increased.

### **Zoom**

1. Verify that pressing ZOOM up increases the image magnification.
2. Verify that the image orientation marker repositions to the far upper left of the display.
3. Verify the depth markers re-scale with the zoomed image.
4. Verify that moving the trackball allows all portions of the image to be viewed.
5. Set the zoom to normal magnification.
6. Verify the image, image orientation marker, and depth markers return to the normal state.

## **Cursor**

1. Press CURSOR.
2. Verify a dotted line with a depth cursor is displayed.
3. Verify the trackball moves the dotted line and the depth cursor.

## **HD Zoom**

1. Press HD ZOOM and verify the zoom box is displayed and that the trackball will position the box anywhere within the image.
2. Verify that pressing SELECT fixes the position of the upper left corner of the box and that the trackball now positions the lower right corner of the box to size it.
3. Position and size the box to surround a distinct feature (cysts or pins) within the phantom.
4. Press HD ZOOM and verify the image zooms so that the area defined within the box is displayed to fill the image. Verify that the HD ZOOM LED is lit.
5. Press HD ZOOM and verify the image returns to normal magnification and that the box is no longer displayed.

## **Dual**

1. Press DUAL and verify that the sector is displayed on the left half of the display and is updating.
2. Press UPDATE and verify another sector is displayed on the right half of the display.
3. Verify the right sector is updating and the left sector is frozen.
4. Press UPDATE to toggle the live and frozen images from the left sector to the right and the right sector to the left.
5. Verify that adjusting any imaging control (except HD ZOOM, GAIN, TGC, and OUTPUT) affects only the live sector and that each sector independently retains its imaging control settings from the last time it was active.
6. Press DUAL and verify that a single full size sector is displayed.

## **SonoCT Real-Time Compound Imaging**

1. Connect an L12-5 to the system.
2. Select a clinical option and a Tissue Specific preset. Verify the system defaults to 2D imaging.
3. Press COMP IMG. Verify Compound imaging begins, and image information indicates Fr Rate:Surv or Fr Rate:Targ.

4. Press FR RATE to alternate the image information between Fr Rate:Surv and Fr Rate:Targ. Verify that each setting has a different ultrasound beam scanning geometry.

**NOTE** To change frame rate during SonoCT Real-Time Compound Imaging use the 2D PRF menu option on the 2D/M-mode menu.

5. Select the one that provides the best image quality.
6. Press COMP IMG to return the system to its previous state. Entering any other imaging mode cancels compound imaging. Returning to 2D imaging automatically activates compound imaging if you had it selected.

## 6-4.8

## 2D Secondary Controls

### Initial Setup

1. Connect any phased or curved array scanhead to the system.
2. Select the Generic/General optimized preset.
3. Select 2D mode and the desired scanhead.
4. Press 2D/M M to call up the 2D secondary control menu.
5. Image the phantom while performing these steps.

### Gray Maps

Verify that selecting - or + GMAP# changes the gray map number, the gray scale assignment of the gray bar, and the image data.

### Chroma

1. Select Chroma.
2. Verify that when Chroma 1 or Chroma 3 is selected, the image and gray bar are colorized to a reddish hue.
3. Verify that when Chroma 2 or 4 is selected, the image and gray bar are colorized to a bluish hue.
4. Set Chroma off.

## **Persistence**

It may be easier to see any changes in the Persistence if the scanhead is uncoupled from the phantom and the 2D Gain is turned up so the Far Field is saturated with noise.

Verify that increasing persistence smooths the image and mid level echoes move in slow motion in response to scanhead movement.

## **6-4.9**

## **2D Color Primary Controls**

### **Initial Setup**

1. Connect a scanhead to the system.
2. Select the Generic/General optimized preset.
3. Select 2D Color mode.
4. Acquire a Doppler image.

### **Color Gain**

1. Increase and decrease Color Gain.
2. Verify that as Color Gain is increased and decreased the amount of color noise displayed within the color box increases and decreases.
3. Set Color Gain to mid-range.

### **Color Box**

1. Verify that the Color annotation is displayed.
2. Verify the trackball will position the Color Box anywhere within the image.
3. Verify that pressing SELECT fixes the position of the upper left corner of the box and that the trackball now positions the lower right corner of the box to size it.

### **Steer (Linear Scanheads Only)**

1. Press STEER. Verify the color box changes shape shifting left or right pivoting around its center.
2. Press STEER again several times. Verify that the system cycles through the various steering angles on the display.

### **Baseline**

1. Press BASELINE up and verify the baseline of the color bar moves to the top of the color bar and that the color scale updates accordingly.
2. Press BASELINE down and verify the baseline of the color bar moves to the bottom of the color bar and that the color scale updates accordingly.

### **Scale**

Verify that pressing SCALE up and down will increase and decrease the range of the color bar scale image data.

### **Wall Filter**

Verify that pressing FILTER up and down changes the wall filter setting from low, medium, high, to max.

### **Invert**

Verify that pressing INVERT up and down changes the color map from top to bottom.

### **Priority**

1. Press PRIORITY up and verify the write priority mark on the gray bar moves to the top of the bar and color overwrites the corresponding gray shades.
2. Press PRIORITY down and verify the write priority mark on the gray bar moves to the bottom of the gray bar and gray shades overwrite the color.

## **6-4.10**

### **2D Color Secondary Controls**

#### **Initial Setup**

1. Connect any phased, curved, or linear scanhead to the system.
2. Select the Generic/General optimized preset.
3. Select Color mode.
4. Display the color annotation.
5. Press COLOR MENU.

#### **Color Maps**

1. Select Color Maps.
2. Verify that selecting each of the color maps changes the color assignment of the color bar.

#### **Persistence**

1. Select Persistence.
2. Verify that selecting higher settings slow the color image update rate and that the annotation is updated.

#### **Post Processing - Color Capture**

Verify that selecting Capture turns the feature on and off.

## **Post Processing - Color Tag**

**NOTE** The color tag range depends on the color settings.

1. Set the system parameters as indicated in [Table 6-1](#).
2. Press FREEZE.
3. Repeatedly select Color Tag and verify the feature turns on and off.
4. Verify the parameters for position and size of Color Tag are operational and that the display updates accordingly.

**Table 6-1 Color Tag Parameter Settings**

Parameter	Setting
Color Velocity	1-128
Position	Increments by 8
Size	Increments by $\pm 2$ from center position
Velocity/Variance	1 - 32
Position	Increments by 2
Size	Increments by $\pm 1$ from center position

## **Line Density**

Verify that selecting higher settings increases the image sharpness and that the annotation is updated.

## **Color Smoothing**

1. Select Smooth.
2. Verify the setting changes from low, medium, high to off, and that the displayed color transitions accordingly.

## **Mode**

1. Select Mode.
2. Verify that the setting changes from V+V, Vel, to Pwr and that the color bar changes accordingly.

## **Color Display**

1. Press Superkey and CDisp.
2. Verify the color bar and the image color data are not displayed.
3. Press Superkey and CDisp.
4. Verify the color bar and the image color data are displayed.

## **DMD (Dynamic Motion Differentiation)**

Verify that selecting DMD turns the feature on or off.

### **Units**

Verify that selecting Freq or Vel changes the scaling annotation of the color bar.

**NOTE** Units do not apply to Power mode.

## **6-4.11**

## **Doppler Primary Controls**

### **Initial Setup**

1. Select and initialize an L12-5 scanhead.
2. Select the Generic/General optimized preset.
3. Press PULSED.
4. Acquire a Doppler image.
5. Verify the Doppler image information is displayed.
6. Press UPDATE.
7. Verify the Doppler display is scrolling.

### **Wall Filter**

Press FILTER up and verify that the wall filter annotation changes from low to medium to high.

### **Baseline**

Press BASELINE up and down to verify the Doppler baseline can be positioned from the top to the bottom of the scale.

### **Scale**

Press SCALE up. Verify the range displayed on the Doppler scale changes.

### **Angle Correction**

1. Press 0/60° and verify that the M Line changes from +60° to -60° to 0°.
2. Press ANG COR. Verify that the angle correction graphic moves and the annotation graphics update by 2° increments.

### **Sample Volume Size**

Press SV SIZE and verify the displayed sample volume changes size and the annotation is updated with the new size.

### **Invert**

Press Invert and verify the Doppler spectral data and the scale inverts relative to the baseline.

## **Footswitch**

1. Press Patient Data and enter "Y" to select New Patient.
2. Enter your name in the Name field.
3. Press Patient Data to begin the new exam.
4. Connect a footswitch assembly to the system.
5. Configure the system to store an image to the hard disk or to print to an internal printer to activate the footswitch print function.
6. Press the left footswitch and verify that the system prints or stores an image.
7. Press the middle footswitch and verify that 2D freezes and the UPDATE LED is not lit. Press it again and verify that 2D is updating and the UPDATE LED is on.
8. Press the right footswitch and verify that the system freezes and the FREEZE LED is lit. Press it again and verify the system begins updating and the FREEZE LED is not lit.
9. Disconnect the footswitch assembly from the system and delete any exams saved to the hard disk.

### **6-4.12**

## **Doppler Secondary Controls**

### **Initial Setup**

1. Connect any phased, curved, or linear scanhead to the system.
2. Select the Generic/General optimized preset.
3. Press PULSED.
4. Press DOPPLER MENU to display the Doppler secondary control menu.
5. Acquire a Doppler image.

### **Doppler Gray Maps**

1. Select Gray Maps.
2. Verify that selecting each of the gray maps changes the grayscale assignment of the Doppler data.
3. Verify that the selected grayscale map is displayed in the Doppler annotation.

### **Chroma**

1. Select Chroma.
2. Verify that when Chroma 1 is selected, the image and gray bar are colorized to bluish-yellow.
3. Verify that when Chroma 2 is selected, the image and gray bar are colorized to violet-yellow.

4. Verify that when Chroma 3 is selected, the image and gray bar are colorized to blue.
5. Verify that when Chroma 4 is selected, the image and gray bar are colorized to gold.
6. Set Chroma off.

### **Scale Units**

Verify that the Doppler scale displays the scale units selected.

### **Doppler Sweep Speed**

1. Select each Doppler sweep speed.
2. Verify that the right to left display movement (sweep speed) changes accordingly.

### **Display Format**

1. Select the Small, Medium, and Large display formats and verify that the Doppler display changes accordingly.
2. Select 2D.

## **6-4.13 M-mode Primary Controls**

### **Initial Setup**

1. Connect any phased, curved, or linear scanhead to the system.
2. Select the Generic/General optimized preset.
3. Select M-mode.
4. Acquire an image.

### **M-Line**

Verify that the trackball smoothly moves the M-line from the left image edge to the right image edge.

## **6-4.14 M-mode Secondary Controls**

### **Initial Setup**

Press 2D/MM to display the 2D/M-mode secondary control menu.

## **Sweep Speed**

1. Select Speed.
2. Verify that as higher and lower settings are selected, the M-mode display rate correspondingly increases and decreases with the setting.

## **Display Format**

Select the Small, Medium, and Large display formats and verify that the M-mode display changes accordingly.

# **6-5**

## **Mode Tests**

### **6-5.1**

#### **2D**

##### **Array Channel Test (Tower Test)**

1. Select 2D mode and an L12-5 scanhead. (If an L12-5 scanhead is not available, use another linear or curved array scanhead.) Set OUTPUT, 2D GAIN and TGC to maximum, # Focal Zones to 1, and FOCUS to less than maximum depth.
2. Slowly slide the narrow edge of a six-inch metal ruler from one end of the face of the scanhead to the other.
3. Verify that a single vertical band of echoes moves across the image in coordination with the motion of the ruler.

##### **2D Penetration**

**NOTE** While performing the steps in this section, image the phantom.

1. Select a cardiology scanhead and the Adult Card - Gen Adult Card application.
2. Select 2D and scan the phantom to obtain an image that clearly shows both the horizontal and vertical rows of pins.
3. Press DISTANCE to activate a cursor.

**NOTES**

- Do not place the cursor under cysts or pins.
- Always apply the phantom reference value and tolerance to the measurement.

4. Set the cursor at the deepest vertical position where the scatter echoes start to break up and tissue definition is lost.
5. Verify scanhead performance.

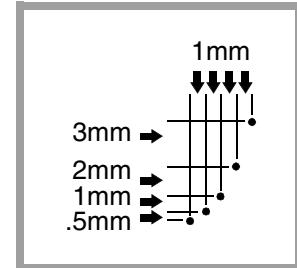
##### **Image Quality**

1. Adjust the position of the scanhead on the phantom and 2D controls to obtain an image that clearly shows both the horizontal and vertical rows of pins.

2. Verify the image presents a uniform homogeneous echo pattern from the point of closest focus to the limit of penetration.
3. Adjust the focal zone position to correspond to the depth of a cyst.
4. Verify that the cystic structure at the focal zone is echo free, round, and with sharp wall definition.

## 2D Axial Resolution

Obtain a phantom image of a set of axial resolution pins. Refer to the diagram (right). Distances between the pins may vary by phantom model. See the *General Service Manual*, P/N 4720-0219-XX, or reference your phantom service manual for details.



## 2D Axial Measurement Accuracy

1. Connect a P3-2 or P4-2 scanhead to the system.  
Select the Generic/General preset.
2. Select 2D mode.
3. Adjust the position of the scanhead on the phantom and 2D system controls to obtain an image that clearly shows both the horizontal and vertical rows of pins.
4. Press FREEZE to freeze the image.
5. Press DISTANCE to display the measurement cursor.
6. Measure the distance between the center of two pins that are vertically spaced 6 cm apart.
7. Verify/record the distance measured is  $6.00\text{ cm} \pm 0.06\text{ cm}$ .

## 2D Lateral Measurement Accuracy

1. Perform [step 1](#) through [step 5](#) of the 2D Axial Measurement Accuracy procedure.
2. Measure the distance between the center of two pins that are horizontally spaced 6 cm apart.
3. Verify/record the distance measured is  $6.00\text{ cm} \pm 0.12\text{ cm}$ .
4. Press FREEZE to unfreeze the system.

## 2D Registration Accuracy

1. Connect a P3-2 or P4-2 scanhead to the system and select the Generic/General preset.
2. Select 2D mode. Set the depth to 15.2 cm.
3. Press DISTANCE to display the measurement cursor.
4. Place the cursor on the center of the top depth marker.

5. Press SELECT and place the second cursor on the center of the 13 cm depth marker.
6. Verify/record the distance measured is 13.00 cm  $\pm$  0.26 cm.
7. Press Del Meas to remove all measurement cursors.

### **Cineloop Manual Playback**

1. Slowly slide the scanhead across the phantom.
2. Press FREEZE.
3. Verify that trackball movement left or right scrolls through the captured Cineloop frames.

### **Cineloop Automatic Playback**

1. Display the Cineloop menu.
2. Verify that Play/Pause starts and pauses Cineloop and the image data indicates loop.
3. Verify that selecting + Speed increases the playback speed.
4. Verify that selecting - Speed decreases the playback speed.
5. Verify that selecting Sweep/Loop changes between sweep and loop mode and that the image data reflects the current mode selected.
6. Verify that selecting Trim displays the Cineloop trim graphic.
7. Verify that trackball and SELECT allow positioning of both trim markers.
8. Verify that selecting Play/Pause loops through the frames defined by the trim markers.

### **Annotation**

1. Verify pressing Body Marker sequences through the available body markers and the marker can be positioned anywhere within the image.
2. Verify pressing Superkey + SH Pos displays the scanhead marker on the body marker.
3. Verify the trackball can position the scanhead marker anywhere within the body marker and can rotate the scanhead marker.
4. Verify pressing Erase Screen clears the body marker, and the scanhead marker.
5. Verify pressing Title displays the cursor in the default home position.
6. Verify data can be entered into the title field and pressing Erase Line clears all entered data.
7. Verify pressing Text displays the cursor in the default home position.
8. Verify data can be entered into the text field and pressing Erase Text clears all entered data.

9. Verify pressing Arrow creates a pointer.
10. Verify the trackball can position the arrow anywhere within the image.
11. Verify pressing Erase Arrow clears the pointer.

## 6-5.2

## Color Power Angio

### Initial Setup

1. Connect a L10-5 or L12-5 scanhead to the system.
2. Select the Generic/General optimized preset.
3. Select Power Imaging mode.
4. Obtain a Doppler image that clearly shows fluid flow.
5. Verify that the power imaging background is of uniform color and texture.
6. Verify that the colorized Doppler information is displayed within the vessel.
7. Display the PWR secondary menu.

### Power Maps

1. Select Power Maps.
2. Verify that selecting each of the color maps changes the color assignment of the color bar and the power imaging background.

### Persistence

1. Select Persistence.
2. Verify that selecting higher settings slow the color image update rate.

### Line Density

Verify that selecting higher settings increase the image sharpness.

### 3D CPA

1. Adjust the scanhead position to obtain an image that clearly shows fluid flow.
2. Press 3D and acquire data. For systems with 124.13 software and above, press 3D UNCAL.
3. Press FREEZE.
4. Press 3D/CINE to display the 3D/Cine secondary menu.
5. Select Create 3D.

6. Verify the system indicates it is rendering a 3D image.
7. When rendering is complete, verify the system is sweeping through the 3D Cineloop.
8. Press FREEZE.

## 6-5.3

### Simultaneous Modes

#### Initial Setup

1. Connect an L12-5 scanhead to the system.
2. Select the Cerebrovascular/Carotid optimized preset.

#### Simultaneous 2D + PW Doppler

1. Press PULSED.
2. Press DOPPLER MENU to display the Doppler secondary control menu.
3. Select 2D UPDATE.
4. Select Simul.
5. Verify that both 2D and Doppler are active.

#### Simultaneous 2D + PW Doppler + Color

1. Select Color mode.
2. If the Doppler secondary control menu is not displayed, press DOPPLER MENU.
3. Select 2D UPDATE.
4. Select Simul.
5. Verify that 2D, Doppler, and Color are active.

#### Simultaneous 2D + PW Doppler + CPA

1. Press PULSED.
2. If the Doppler secondary control menu is not displayed, press DOPPLER MENU.
3. Select 2D UPDATE.
4. Select Simul.
5. Select Power Imaging.
6. Verify that 2D, Doppler, and CPA are active.

## 6-5.4

### PW Doppler Noise Bands

1. Connect a P3-2 or P4-2 scanhead to the system.
2. Select the Generic/General optimized preset.
3. Select Pulsed Doppler mode.

- Set the system controls as indicated in [Table 6-2](#).

**Table 6-2 PW Doppler Noise Band Control Settings**

Control	Setting
Output	Maximum
Sample Volume Depth	9.0 cm
Sample Volume Size	1.5 mm

- Reduce DOP GAIN just until the background noise disappears.
- Observe the spectral display for noise bands.
- Obtain a Doppler spectral trace.
- Increase and decrease the PRF and observe the display for noise bands.
- Repeat steps 5 through 8 for sample volume sizes of 2, 3, and 5 mm.

## 6-5.5

### Steered CW Doppler Noise Bands

- Disconnect all scanheads.
- Use the ON/STANDBY switch to cycle system power off, then on.
- Press Superkey + 0 to display the Machine Diagnostics login dialog box.
- Login as “CSR” to the Machine Diagnostics interface. The password is “USER.”
- Select Test, Utils, from the Diagnostics menu.
- Double click Machine, and select Doppler Ultrasound and Tests and Utils.
- Execute CW Calibration Utility, and verify it reports a passing condition.
- Reboot the system using the ON/STANDBY switch.
- Connect a P3-2 or P4-2 scanhead to the left scanhead receptacle. Keep the face of the scanhead dry and uncoupled for performance of this test.
- Select the Generic/General Tissue Specific preset.
- Select Pulsed Doppler mode.

12. Set the system controls as indicated in [Table 6-3](#).

**Table 6-3 Steered CW Doppler Noise Band Parameter Settings**

Parameter	Setting
Output	Maximum
Depth	P3/P4-2: 17.7 cm, P5-3: 17.5 cm
Sample Volume Depth	P3/P4-2: 16 cm, P5-3: 10 cm
Doppler Gray Map	Map 2
Doppler Display Format	Large

13. Press CW. Press UPDATE.

14. Adjust DOP GAIN to obtain clearly visible background noise in the scrolling display.

15. Adjust the D-line  $\pm 15$  degrees around the centerline of the 2D image to locate the position that produces the most CW noise.

16. Adjust DOP GAIN according to [Table 6-4](#), and verify the spectral display is clear of noise bands.

17. Repeat this procedure using the P5-3 scanhead connected to the right scanhead receptacle.

**Table 6-4 Steered CW Noise Detection Thresholds**

PRF (Hz)	Doppler Gain (%)
50,000	53
41,667	54
31,250	54
25,000	55
20,000	56
15,625	56
14,286	57
11,905	57
10,000	57
8,333	58
5,000	5
3,731	6
2,500	6
1,515	7

## 6-5.6 DiskLink

### Begin Exam

1. Press Patient Data.
2. Select New Patient.
3. Enter your name in the name field.
4. Press Patient Data to begin the new exam.

### Storing Black-and-White Images

1. Press Print to store the image to the hard disk.
2. Verify the system freezes the image.
3. Verify the system beeps.
4. Verify the system unfreezes the image.

5. Verify that the BW# and/or PG# annotation on the left side of the display increments one number to indicate a black and white image has been stored.
6. Press FREEZE.
7. Press PRINT to store six additional images.
8. Press DEL IMG.
9. Select Delete.
10. Verify that the BW# and/or PG# decrements one number indicating an image has been deleted.

### **Storing Color Images**

1. Select Color mode.
2. Increase the COL GAIN until color pixels are displayed.
3. Press PRINT to store the image to the hard disk.
4. Verify the system freezes the image.
5. Verify the system beeps.
6. Verify the system unfreezes the image.
7. Verify that the COL# and/or PG# annotation on the left side of the display increments one number to indicate a color image has been stored.
8. Press FREEZE.
9. Press PRINT to store 4 additional images.
10. Press DEL IMG.
11. Select Delete.
12. Verify that the COL# and/or PG# indicates the last color image has been deleted.
13. Press END EXAM.

### **Storing Loops**

1. Select Color mode.
2. Increase the COL GAIN until color pixels are displayed.
3. Press FREEZE.
4. Use the trackball to scroll through each frame of the loop.
5. Verify that there are no image artifacts in each frame.
6. Press CAPTURE.
7. Verify that the frame number increments indicating the loop is being stored.
8. Press END EXAM.

## **Reviewing Images**

1. Press NET/DISK.
2. Select Hard Disk to display the exam directory on the hard disk.
3. Verify the information entered for the exam just completed is correct.
4. Select the exam just completed.
5. Select Review Images.
6. Select the Zoom Graphic on one of the stored images.
7. Verify the image is displayed in one-on-one format.
8. Select Meas/Edit.
9. Verify the image appears like a normal acquisition screen.
10. Press REVIEW.
11. Verify the image is displayed in multi-image format.

## **Copying Images**

1. Begin a new exam.
2. Press PRINT to store an image.
3. Press END EXAM.
4. Insert a formatted optical disk in the system drive.
5. Select Exam Dir to display the list of exams on the hard disk.
6. Select the last exam.
7. Select Copy To, then select OK to copy the image to the optical disk.
8. Display the Exam Directory on the optical disk. Verify the image was copied from the hard disk to the optical disk.
9. Delete the image from the hard disk (before copying from the optical disk to the hard disk).
10. Select the exam just copied to the optical disk.
11. Select Copy To, then select OK to copy the image to the hard disk.
12. Display the Exam Directory on the hard disk.
13. Select the exam just copied to the hard disk.
14. Select Review Images.
15. Verify that the image quality of each of the images is the same and that image quality has not degraded.
16. Press Patient Data.
17. Select New Patient. Do not enter data in the Name or ID fields.
18. Press Patient Data to begin the new exam.
19. Display the Exam Directory on the hard disk.
20. Delete all exams.

21. Display the Exam Directory on the optical disk.
22. Delete all exams.
23. Press Setups.
24. Select Image Management.
25. Select Printer Selection to display the Image Management Printer setup panel.
26. Set the printer setup options as indicated in [26..](#)

**Table 6-5 DiskLink Printer Setup Options**

Option	Setting
B&W Film Format	1 x 2
Color Film Format	2 x 3
Printed Image Destination	All to B/W Printer

**NOTE** If “Printed Image Destination” is set to “All to B/W Printer”, the images stored to the optical disk will be black and white images only.

27. Select Setups Directory.
28. Select Image Management.
29. Select General Options.
30. Select Close.
31. Press NET/DISK and eject the optical disk by selecting Eject Disk.

## 6-5.7

### NetLink

1. Press Setups.
2. Select Image Management and press SELECT.
3. Select Printers and press SELECT.
4. Select a B&W print destination. Also select whether the B&W images are to be sent to the color printer.
5. Select Close and press SELECT.
6. Press Patient Data.
7. Select New Patient.
8. Enter your name in the name field.
9. Press Patient Data to begin the new exam.
10. Scan a phantom.
11. Press PRINT to save the image.
12. Press END EXAM to end the exam.
13. Verify the image has been printed on the network printer.

## 6-5.8

### WebLink

1. Establish an IP address for the system at the site.
2. Verify that system is connected to site network.
3. Verify that WebLink option is enabled in setups. (Setups > Image Management >Network Configuration > WebLink On)
4. Connect a PC or Workstation at the site to the network and have a Web-Browser (Netscape or Internet Explorer) available.
5. Open a connection to the system by typing the IP address of the system directly at the web-browser's location prompt. For example:  
`http://149.59.240.75/`
6. Verify that a prompt is displayed requesting a user name and password for WebLink.
7. If this is the first time WebLink has been used, enter "admin" for the user name, and "WebLink" for the password.
8. Select OK.
9. Verify that a Web page is displayed.

## 6-5.9

### ECG

1. Connect a P3-2 or P4-2 scanhead to the system.
2. Select the Adult Card/General preset.
3. Connect an ECG cable to the system.
4. Set the Leakage Tester/ECG simulator as indicated in [Table 6-6](#).

**Table 6-6 Leakage Tester/ECG Simulator Setup Options**

Option	Setting
Output	2.0 mV
Rate	180
OFF/ECG/PULSE	ECG

5. Verify the ECG R wave is a positive going pulse.
6. Verify the measured heart rate stabilizes at 180 BPM  $\pm$ 5 BPM.
7. Set the ECG simulator Rate to 120 BPM.
8. Verify the measured heart rate stabilizes at 120 BPM  $\pm$ 1 BPM.
9. Set the ECG simulator Rate to 60 BPM.
10. Verify the measured heart rate stabilizes at 60 BPM  $\pm$ 1 BPM.
11. Display the Physio secondary control menu.

12. Increase the ECG Gain and verify the amplitude of the ECG waveform increases.
13. Decrease the ECG Gain and verify the amplitude of the ECG waveform decreases.
14. Increase the ECG Position and verify the ECG waveform moves up on the display.
15. Decrease the ECG Position and verify the ECG waveform moves down on the display.
16. Select Configure.

## Triggering

1. Set the ECG trigger type A and B to ON.
2. Slowly increase A Delay and verify the A trigger moves to the right above the ECG waveform.
3. Slowly decrease A Delay and verify the A trigger moves to the left.
4. Slowly increase B Delay and verify the B trigger moves to the right.
5. Slowly decrease B Delay and verify the B trigger moves to the left.
6. Position both triggers so they are clearly visible on the ECG waveform.
7. Press UPDATE to enable triggering mode. Verify the UPDATE submenu appears in the lower left of the monitor.
8. Slide the scanhead across the phantom. Verify the image is updated at each trigger.
9. Slide the scanhead across the phantom. Press FREEZE and verify the UPDATE submenu disappears.
10. Verify that trackball movement scrolls the Cineloop marker along the ECG waveform and the image updates as the marker crosses each trigger.
11. Press FREEZE, then UPDATE. Verify the image updates continuously.
12. Select M-mode.
13. Center the ECG waveform vertically on the M-mode display.
14. Set the ECG simulator rate to 30 BPM.
15. Verify the measured heart rate stabilizes at 30 BPM  $\pm 1$  BPM.
16. Immediately after a new QRS waveform is displayed, press FREEZE.
17. Press ADV MEAS to display the Meas Tools menu.
18. Select Time/Slope.
19. Position the cursor on a distinctive location on the QRS waveform and press SELECT.
20. Position the second cursor on the corresponding location on the next QRS waveform (left or right).

21. Verify the measured time interval is 2.00 ±0.04. seconds (less than 2 percent error.)
22. Press DEL MEAS.

### **Multi-Frame Triggering**

1. Press 2D, then TRIGGERS.
2. Press + and - Frames. Verify the Frames setting increments.
3. Press + and - to increase and decrease the Frame Interval. The Frame Interval is used to select a delay between frames if there are multiple frames for each trigger. FR is the normal frame rate.
4. Disconnect the ECG simulator.

## **6-5.10**

### **Multiplane TEE Scanhead Face Temperature**

Refer to the Multiplane TEE Scanhead Service Manual (4720-0292-XX) to determine whether the particular ultrasound system and scanhead are capable of detecting a scanhead over-temperature condition.

## **6-5.11**

### **ISEM Tests**

#### **System Setup**

1. Press Setups.
2. Select Peripheral from the Directory of Setups.
3. Set the Internal Printer option to Select Sony Color.
4. Exit Setups.
5. Connect a P3-2 or P4-2 scanhead to the system.
6. Select the Adult Card/General preset.
7. Select 2D Color mode.
8. Display a large color box filled with color.

#### **ISEM Setup**

1. If the shipping disk is installed, eject the disk.
2. Verify the system LED is lit on the video control box.
3. Select Stress Echo as the video source. Verify the ISEM menu bar is displayed above a blue screen, and that the Stress Echo LED is lit.
4. Select Digital/Live. Verify that system video is displayed.
5. Select Setup on the Menu Bar.
6. Select Input Source.
7. Set the video source options as indicated in [Table 6-7](#).
8. Select OK.

9. Select Setup on the menu bar, then select Video Calibration.

**Table 6-7 ISEM Video Source Settings**

Parameter	Setting
Video Source	RGB
Video Sync Type	Composite
ECG Source	Hidden
Machine Type	HDI 3000

10. Set the video calibration settings as indicated in [Table 6-8](#).

**Table 6-8 ISEM Video Calibration Settings**

Parameter	Setting	Setting
	NTSC	PAL
Audible ECG	On	On
ECG Threshold	23%	23%
Brightness	60%	63%
Contrast	50%	47%
Graphics	68%	68%

11. Select OK.

12. Select Setup on the menu bar, then select Control Panel.

13. Set the date and time setup options as indicated in [Table 6-9](#).

**Table 6-9 ISEM Date and Time Setup Options**

Parameter	Setting
Date Format	Month-Day-Year
Time	Current Time
Date	Current Date
Mouse Tracking Speed	Default Value

14. For NTSC systems, click on DONE to close the Control Panel window.

15. For PAL systems, click on the system video to close Control Panel window.

16. Press CNTL+N to begin a new patient.

17. Enter your name into the name field.

18. Enter a made-up ID number into the ID field.

19. Select OK.

## **ISEM Footswitch**

1. Press ALT+A and select Page-full, then OK. Verify the footswitch icons are displayed.
2. Press the left footswitch and verify the system indicates that images are being captured.
3. Press the middle footswitch and verify the system indicates it is preparing the image for storage.
4. Press the right footswitch and verify the footswitch icons and the status bar disappear.

## **ISEM Hand Controller**

1. Press ALT+A and select Page-full, then OK. Verify the footswitch icons are displayed.
2. Press the  key on the hand controller and verify the system indicates that images are being captured.
3. Press the  key on the hand controller and verify the system indicates it is preparing the image for storage.
4. Capture several more images.
5. Press the  key on the hand controller and verify the footswitch icons and the status bar disappear.
6. Select 2D mode.

## **Image Review**

1. Select Patient Files then select Patient Directory.
2. Select the patient name entered in step ? of the ISEM Setup test procedure.
3. Select Load.
4. Verify the menu bar indicates image x of y, where x is the image number and y is the number of images captured.
5. Press the left and right arrow keys on the hand controller to sequence through the images. Verify that each of the images accurately reflect the system image.

## Hard Disk Clean-up

1. Select Display, then select Close all Collections, and then select Yes.
  2. Select Patient Files, then select Patient Directory and OK.
- NOTE** Do not delete the patient files named “TEST, NTSC (or PAL), and Monitor Setup.
3. Highlight the patient entries created during this test, then select Delete and OK.
  4. Verify the selected files have been deleted.
  5. Select Cancel.
  6. Select System as the video source. Verify the system monitor is no longer displaying ISEM video, and that the System LED is lit.

## 6-5.12

## DVS Tests

### Setup

1. Verify the DVS Module is properly connected to the ultrasound system ([Figure 11-43](#)).
2. Power up the system and the DVS Module.
3. Verify that the compression timer is displayed (indicating that the DVS Module has booted correctly).
4. Press Patient Data.
5. Select New Patient.
6. Enter a patient name and other information into the data fields.
7. Close the Patient Data Entry form.
8. Verify that the Digital Echo and Stress Echo options are enabled ([paragraph 9-5.5](#)).
9. Connect and select a phased array scanhead.
10. Select the Adult Card/General preset.
11. Press COLOR.
12. Increase COL GAIN until color pixels are displayed.
13. Press BASELINE up repeatedly until blue color pixels are displayed.
14. Press Setups.
15. Select Acquisition Parameters.
16. Select Configure Clips in the User Options menu.
17. Set the capture parameters as indicated in [Table 6-10](#).
18. Select Close.

**Table 6-10 DVS Module Capture Parameter Settings**

Parameter	Setting
Capture Format	Dual
Accept Prior to Save	On
ECG Trigger	On
Capture Length	Time/15s (seconds)
Compression	Lossy High

### **Image Capture**

1. Connect an ECG simulator to the system.
2. Set the simulator to 60 or 120 bpm.
3. Press INVERT.
4. Use the trackball to position the region of interest (ROI) to the left side of the display.
5. Press CAPTURE.
6. Verify the capture has completed.
7. Press ACCEPT.
8. Press CAPTURE and PAUSE.
9. After about 30 seconds, press RESUME.
10. Verify that the capture has completed.
11. Press ACCEPT.
12. Move the ROI to the right side of the display.
13. Press CAPTURE.
14. Verify the capture process has completed.
15. Press REJECT.
16. Move the ROI to the center of the display.
17. Press CAPTURE and DONE.
18. Press ACCEPT.
19. Press M MODE and UPDATE.
20. Press PRINT.
21. Press INVERT and PRINT.
22. Press PROTOCOL.
23. Select End.

## **Image Review**

1. Press NET/DISK.
2. Select Directory.
3. Select the patient name from the Hard Drive subdirectory.
4. Select the date of the study listed in the patient's subdirectory.
5. Select Freeform under the date of the subdirectory.
6. Select the clips and frames in the right window of the Patient Directory menu.
7. Select Load at the bottom of the display.
8. Press TOOLBAR to load image review tools.
9. Select X on the toolbar repeatedly until the image appears.

## **Image Management**

1. Insert an MO disk into the DVS Module drive.
2. Press NET/DISK.
3. Select Directory.
4. Select the patient name from the list.
5. Select Copy To and OK. A confirmation message appears when the clips and frames have been copied.
6. Select the arrow to the right of Hard Drive on the NET/DISK menu.
7. Select Optical.
8. From the Optical subdirectory select the patient name.
9. Select Copy To and OK.
10. Select the arrow to the right of the Optical menu and Hard Disk.
11. Select the last date under the patient subdirectory.
12. Select Freeform under the date subdirectory.
13. Highlight the clips or frames and select Load.
14. Verify the clips are displayed.
15. Press REVIEW until the 2D image is displayed.
16. Reboot the system with the ON/STANDBY switch.
17. Press NET/DISK.
18. Select Directory.
19. Highlight the patient data.
20. Select OK, and then Close.
21. Press NET/DISK.
22. Select Format Disk.

23. Select Optical.
24. Select Format.
25. Select OK.
26. Press NET/DISK.
27. Select Eject Disk.
28. Select Optical
29. Select Eject Disk.

## 6-5.13

### OEM Tests

OEMs are only tested for basic functionality and their interface to the system.

#### VCR

1. Press COLOR on the system.
2. Press Play + REC and verify the VCR begins recording.(For internal VCRs use the on-screen controls or the VCR control panel. External VCRs do not have on-screen controls.)
3. Record several minutes of image data and audio.
4. Rewind the cassette and press PLAY.
5. Verify the playback image is stable.
6. Adjust Doppler gain and color gain. Verify color hue and intensity is adjusted on the monitor.
7. Verify that audio plays back.
8. Pause the image during playback.
9. Verify the paused image is stable.
10. While in the Pause mode verify that the VCR will search forward and reverse where the speed of the search is dependent on the directional movement of the VCR search control.
11. Verify that positive flow audio is on the left speaker, and negative flow is on the right speaker.
12. Verify that audio volume can be varied with the volume control.
13. Press STOP on the VCR.
14. Select 2D mode.
15. Set Depth to 15.2 cm.
16. Adjust the position of a scanhead on the phantom and the 2D system controls to obtain an image that clearly shows both the horizontal and vertical rows of pins.
17. Record a few minutes of the 2D image.
18. Rewind the tape and play the recorded 2D image.

19. Press FREEZE.
20. Verify the VCR image displayed is frozen.
21. Verify the VCR has paused.
22. Using the trackball, verify each of the grabbed images can be displayed.
23. Press DISTANCE to display the calibration menu.
24. Calibrate the measurement cursors using the depth markers.
25. Place the cursor on the center of one of two pins vertically spaced 6 cm apart.
26. Press SELECT and place the second cursor on the center of the other pin that is 6 cm apart vertically.
27. Verify the distance measured is  $6.00 \text{ cm} \pm 0.12 \text{ cm}$  ( $\pm 2\%$ ).
28. Press DEL MEAS to remove the measurement cursors.
29. Press FREEZE.
30. Verify the VCR resumes playback.
31. Press STOP, then EJECT and remove the tape.

### **B/W Video Printer**

Verify that pressing PRINT initiates a B/W hardcopy print.

### **Color Video Printer**

1. Select Color Doppler mode and obtain a color image.
2. Press PRINT to take a print.
3. Verify that the print LED blinks when Print is pressed, and 45 to 90 seconds later, blinks again three times to indicate completion of print (refer to color printer service manual).
4. Verify that the prints have the correct image size, blanking, and color reproduction.

### **Multi-image Camera**

1. Acquire an image using a phantom.
2. Set the system depth, TGC, and gain controls to mid-range. Adjust the 2D maps to achieve a mid-level gray.
3. Press FREEZE.
4. Take a print of a positive 2D image and a print of a scrolling video display (M-mode or Doppler).
5. Take six exposures for each sheet of film. After the sixth exposure, verify the camera alternately displays “Complete” then “Remove Cassette”.
6. Re-install the dark slide with the black border of the dark slide outward, and remove the film cassette from the camera.

7. Process the film and verify the following:
  - a. There is no video blanking visible within 1.0 mm of any image border.
  - b. The gray bar transitions evenly from white to black.
  - c. The print graphics are clear, legible, and not cut-off.
  - d. The print density is even throughout the print.
  - e. There is no fogging, chemical marks, roller scratches, smudges, or light leaks.

## Performance Test Checklist

- Initialization .....
- Setup Parameters .....
- Video Monitors ..... 
  - Contrast .....
  - Brightness .....
  - Linearity .....
- Control Panel Test ..... 
  - Keyboard .....
  - Menu controls .....
  - Dedicated pushbuttons .....
  - Footswitches .....
  - Trackball .....
  - Miscellaneous controls .....
- 2D Tests ..... 
  - Gain, Output, and Depth .....
  - Freeze .....
  - 2D Measurements .....
  - Biopsy Guides .....
  - Cineloop .....
  - Save-Recall Test .....
  - Zoom .....
- Color Power Angio .....
- Color ..... 
  - 2D .....
  - Color Capture .....
  - M-Mode .....
- Spectral Doppler ..... 
  - Pulsed Doppler .....
  - Spectral Doppler Auto Update .....
  - Simultaneous Spectral Doppler .....
- M-Mode ..... 
  - Simultaneous M-Mode .....
  - Dual M-Mode .....
  - HD Zoom .....
- DiskLink .....
- NetLink .....
- WebLink .....
- ECG .....

Heart Rate . . . . .	□
Headphones . . . . .	□
Phased Array Scanhead . . . . .	□
Scanhead Control . . . . .	□
Focal Zones and Focal Depth . . . . .	□
Sector Angle. . . . .	□
Image Quality. . . . .	□
Linear Array Scanhead . . . . .	□
Scanhead Control . . . . .	□
Focal Zones and Focal Depth . . . . .	□
Image Quality. . . . .	□
Curved Array Scanhead . . . . .	□
Scanhead Control . . . . .	□
Focal Zones and Focal Depth . . . . .	□
Image Quality. . . . .	□
Multi-plane TEE Scanhead . . . . .	□
ISEM . . . . .	□
DVS . . . . .	□
OEMs . . . . .	□
VCR . . . . .	□
Black and White Video Printer . . . . .	□
Color Video Printer. . . . .	□
Multi-Image Camera. . . . .	□

# **7 Adjustments**

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## **7-1**

## **Power Supply Voltage Adjustments**

There are no power supply voltage adjustments. The voltages can be measured directly on the PSM rear panel or remotely using UpLink. Refer to [Section 9, "Troubleshooting"](#) for the test point locations or to the UpLink manual (P/N 4730-0236-XX). If a voltage is out of tolerance, the system will not automatically shut down, but may attempt to cycle power continuously, until the system is manually shut off, and the PSM is replaced. Voltages are monitored by the FEC.

## **7-2**

## **Monitor Adjustments**

Monitor field adjustments include contrast, brightness, color background, and lightbar brightness ([Figure 7-1](#)). The adjustments can be set to factory default settings or to any setting desired by the user.

The adjustment settings are retained in an EEPROM in the monitor. However, to limit the number of settings written to the EEPROM, there is a delay of 30 seconds between the time the adjustment is made and the time the settings are stored. If the ultrasound system is powered down before the monitor has stored the new settings to the EEPROM, the previous control settings will be used the next time the monitor is powered up.

When a control is pressed, the current control setting is displayed for approximately 3 seconds.

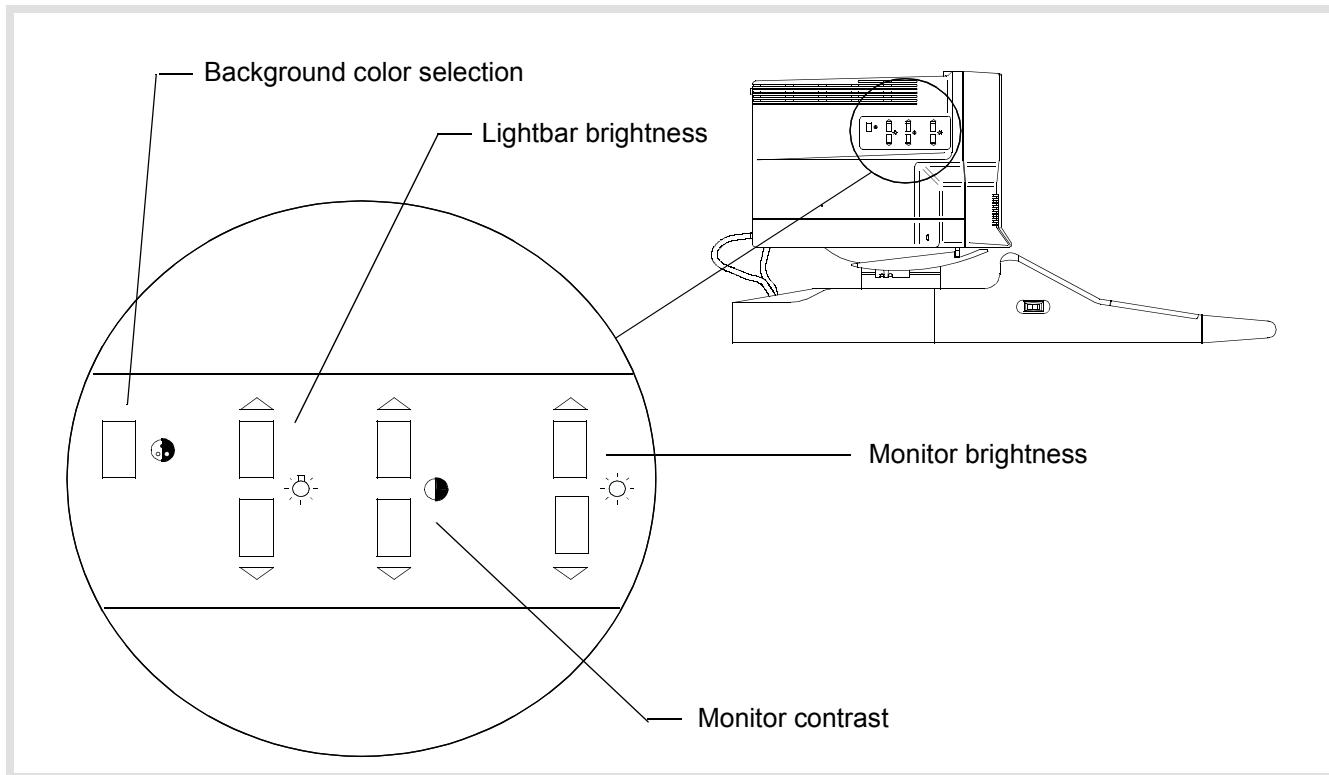
All other monitor adjustments are microprocessor controlled. The procedures and the software required to manually adjust the microprocessor controlled adjustments are currently being developed.

**To set the monitor controls to the factory default settings:**

1. Simultaneously press the up and down contrast controls twice to set the monitor to the factory default of 80.
2. Simultaneously press the up and down brightness controls twice to set the monitor to the factory default of 20.
3. Simultaneously press the lightbar controls twice to set the monitor to the factory default of 16.
4. Press the background color control to select the background color on the display. Color 1 is the factory default option. (Color 1 adds a blue tint to the background, Color 2 is neutral, and Color 3 adds a red tint.)
5. Press the lightbar brightness control to adjust control panel illumination.
6. To store the factory default settings in the monitor EEPROM, wait 30 seconds before powering down the system.

**To set the monitor controls to user defined settings:**

1. Refer to the control locations in [Figure 7-1](#) and adjust the contrast, brightness, color background, and lightbar brightness to the control settings desired by the user.
2. Wait 30 seconds before powering down the system to retain the factory default settings in the monitor EEPROM.



**Figure 7-1 Monitor Control Locations**

# **8 Preventive Maintenance**

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Preventive maintenance inspections are part of the USA Customer Service Quality Assurance (QA) Program.

## **8-1 Fan Filter**

1. Remove the filter from under the front of system.
2. Vacuum and reinstall the filter. If there is a spare filter, install the spare filter into the system. Clean the dirty filter with soap and water and allow time to dry before reinstalling.
3. Demonstrate the filter cleaning procedure to customer.

## **8-2 Optical Disk Drive Head Cleaning**

The recommended interval for cleaning the lens (head) internal to the (optional) optical disk drive is once every six months. The procedure for head cleaning is to insert a head cleaning cartridge (ATL P/N 2100-1419-01) into the optical drive with power applied. The head cleaning cartridge will load, automatically clean the head, and automatically unload when the cleaning cycle has completed (approximately 10 seconds).

The condition of the head cleaning cartridge is important to the process. Inspect the condition of the cleaning brush by opening the shutter of the cleaning cartridge. Check to see if the tip of the cleaning brush is open. If it is, use a newer head cleaning cartridge.

## **8-3 Other Maintenance**

1. Verify screws are securely in place on all PCB hold down tabs (PIM, CPU, ADAPTR, ACIM, DDEA, and IIM).
2. Verify all screws are securely in place on the Scanhead Select PCB. Tighten the screws in the correct sequence ([Figure 10-5](#)). Do not over-tighten. Damaged screws or PEM nuts may require card cage replacement.
3. Clean the trackball.
4. Verify all cooling fans are operational.
5. Inspect the casters for signs of cuts or excessive wear. Replace if necessary. Verify the caster hubcaps are not missing. Verify that the front caster brakes are operational. If broken, order brake lever knob P/N 1065-2611-02.

6. Verify that the OEM bay contains no OEMs which are hard-wired to the ACIM.
7. Re-attach loose rubber bumpers and touch up paint scratches.
8. Run the Machine Comprehensive Test, verify system functionality, and check image quality.
9. If the system has the DVS option, inspect the cabling to and from the DVS module.
10. Perform other cleaning and inspection procedures as per Customer Service policy.
11. Fill out a quality assurance label. Attach it to the system per Customer Service policy. Cover the label with a label overlay. (ATL P/Ns: Label, 4100-0940-01. Overlay, 4100-0941-01.)
12. Complete a work order.

# **9 Troubleshooting**

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## **9-1 Introduction**

The HDI 5000 Ultrasound System contains extensive software and hardware diagnostic capabilities. However, the system must boot up before the operator has access to diagnostics. This section contains information on the core bootup fault isolation procedure, system alerts, general fault isolation, and system diagnostics.

## **9-2 Core Bootup Fault Isolation**

The HDI 5000 System requires the following PCBs for core bootup: ACIM, PSM, AIM+, UIM, IIM, PIM, PCM, SYSCPU, DDEA, and CTRBRD. It also requires the control interface module cables, the video cable, and the monitor for core bootup.

**NOTE** Core bootup may take up to 25 minutes if there are malfunctioning PCBs or missing PCBs.

**The core bootup fault isolation procedure is as follows:**

1. Set the ON/STANDBY switch to STANDBY and circuit breaker to off.  
Unplug the system power cord.
2. Verify all card cage PCBs required for bootup (ACIM, PSM, AIM+, CPANEL, IIM, PIM, PCM, SYSCPU, and DDEA) are securely seated into the CTRBRD.
3. Verify that all cables to the IIM and ACIM are properly connected.
4. Set the circuit breaker and the ON/STANDBY switch to on.
5. If the system does not boot from the hard drive, insert the backup disk into the optical drive and attempt to boot the system from the optical drive. If the system does not bootup, continue with [step 7](#).
6. If the system boots up from the optical drive, replace the hard drive. The hard drive should be loaded with 107.10 software or higher.

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**CAUTION**

Ensure that the circuit breaker is set to off before removing PCBs.

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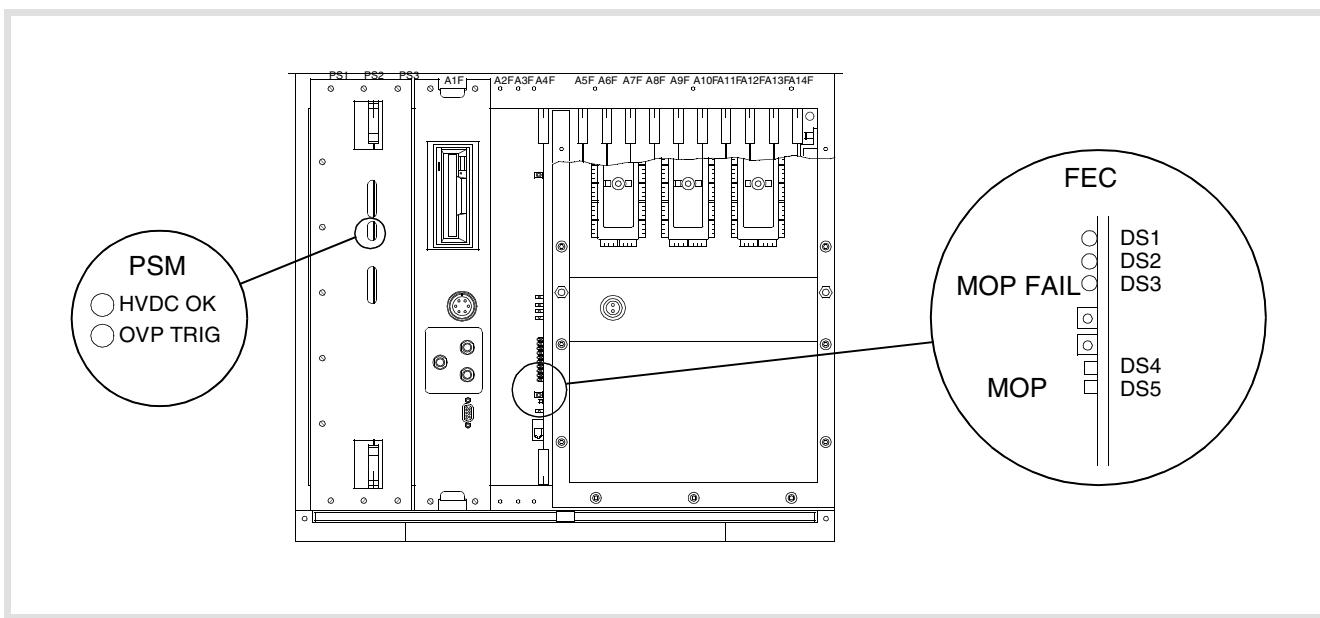
- If the system does not boot from the hard drive, turn the circuit breaker to off, and remove the PSP1, PSP2, FEC, IMEM, SPM, ADAPTR, AIFOM, CB0-7 (all Channel Boards), SHSEL, and Regulator Module. Reboot the system.

If the system boots up with the PCBs removed, one of the removed PCBs was preventing other PCBs from accessing a bus. Replace the PCBs individually until you determine the faulty PCB.

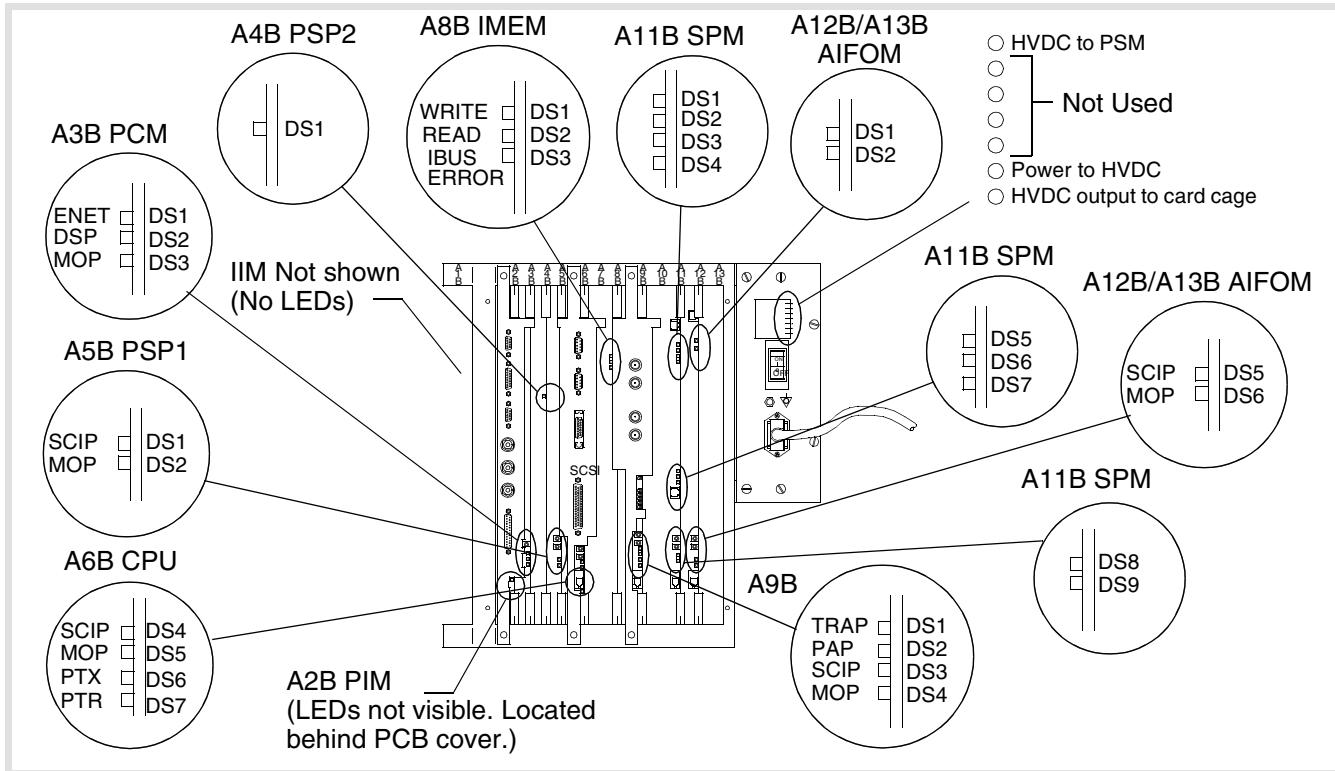
- NOTES**
- It will take several minutes (up to 25 minutes) for the system to boot without the PSP1, PSP2, FEC, IMEM, SPM, ADAPTR, AIFOM, CB0-7 (all Channel Boards), SHSEL, and Regulator Module.
  - With the FEC removed, the system will turn on, but not turn off. Use the circuit breaker to turn the system off.

- Check the LEDs on each PCB. Refer to [Figure 9-1](#), [Figure 9-2](#), [Table 9-1](#) and [Table 9-2](#).

**NOTE** The system monitors the power supply enable voltages to ensure they are within tolerance. If the voltages are not within the tolerances listed in [Figure 9-3](#), the system will shut down. If the system shuts down, none of the voltages will be enabled (all voltages will be 0V). If the system shuts down due to a power supply failure, check the PSM LEDs using [Figure 9-1](#) and [Table 9-2](#). Refer to [Figure 9-3](#) and [Figure 9-4](#), for PCB voltage locations.



**Figure 9-1 Card Cage PCB LED Locations (Front)**



**Figure 9-2 Card Cage PCB LED Locations (Rear)**

**Table 9-1 Normal Core Bootup and PCB LED Sequence**

Core Bootup Sequence	Field Replaceable Unit - Visual Indication <sup>1</sup>
<b>Main power switch off, ON/STANDBY switch off</b> <ul style="list-style-type: none"><li>• AC power to ACIM</li></ul>	ACIM - all LEDs off.
<b>Main power switch on, ON/STANDBY switch off</b> <ul style="list-style-type: none"><li>• HVDC to PSM</li><li>• Connection made to ON/STANDBY switch</li></ul>	ACIM - LEDs #6 and #7 are lit continuously. #6 indicates power to HVDC transformer after internal fuse F1 (ACIM input). #7 indicates HVDC to PSM (ACIM output).
<b>Main power switch on, ON/STANDBY switch on (system power on)</b> <ul style="list-style-type: none"><li>• Individual power supply voltages are turned on 2-3 seconds after Main Power switch or ON/STANDBY switch is turned on</li><li>• PCBs get power and begin initializing</li><li>• PIM generates test pattern</li><li>• CPNL, UIM, IIM, PIM, PCM data path established</li><li>• HD loads applications and operating system to CPU</li><li>• CPU completes bootup</li><li>• CPU/PCM establish client/server (Ethernet)<sup>2</sup></li><li>• PCM test pattern generated</li></ul>	CPNL - LEDs lit for 5 seconds, flash 4 times, then off. PCM - DS2 flickers, 1 Hz after 5 seconds. PIM - DS2 flickers, 1 Hz after 5 seconds CPU - SCIP quick flash, 1 Hz after 5 seconds. SCIP flickers at 1 Hz, MOP flickers at 2 Hz PCM - DS1 on, all others pulse Monitor - color test pattern, blank screen, gray pattern Subsystem PCBs - refer to <a href="#">Figure 9-2</a> for SCIP and MOP information Fans - full speed for 2 seconds, 3/4 speed until bootup, then controlled speed.
<b>System Initialization</b> <ul style="list-style-type: none"><li>• CPU begins loading subsystem PCBs</li><li>• CPU/PCM client/server operational</li><li>• HD/DDEA completes loading applications and operating system</li><li>• IDs and configuration are checked</li><li>• System operational files loaded and scanheads initialized</li></ul>	CPU - SCIP flickers at 1 Hz, MOP flickers at 2 Hz PCM - top LED stays on, all others pulse Monitor - Splash screen SHSEL - relays energize. System bootup time is approx. 1.5 minutes ACIM - LED #1 flickers at 1 Hz
<b>Core bootup complete</b> <ul style="list-style-type: none"><li>• CPU using applications, SW, and MO files, checks configuration</li><li>• CPU checks bootup error status</li><li>• UIF enabled</li></ul>	Subsystem PCBs - refer to <a href="#">Table 9-2</a> Monitor - displays 2D image and static graphics (Static graphics displayed only if scanhead is connected to system during bootup) Fans - Fan speed depends on the card cage temperature averaged from 4 thermistors located on PCBs throughout the card cage. Correct fan voltage is sent from PSM to the fans (0 Vdc - +24 Vdc)

1. The sequence described is the normal sequence of events during core bootup. If these visual indications are not observed, refer to the [Core Bootup Fault Isolation](#) procedure.

**Table 9-2 PCB LED Functions and Status after Core Bootup**

PCB	Slot Location	LED Status
<b>Card Cage, Front</b>		
PSM	PS1 PS2 PS3	DS1 - HVDC OK - Normally lit. Indicates that 155 Vdc is present to the PSM
FEC	A4F	DS2 - OVP TRIG - When lit, indicates that +6V or -6V have higher than normal voltage, or -5.2V current limiting has been activated (-5.2V circuits are drawing more than 14.3A). DS1 - not used
		DS2 - not used
		DS3 - MOP Fail - When lit, indicates MOP did not bootup
		DS4 - MOP LED <sup>1</sup>
		DS5 - SCIP LED <sup>2</sup>
<b>Card Cage, Rear</b>		
PIM	A2B	DS1 - Control panel interface processor LED
		DS2 - SCIP / MOP LED <sup>1</sup>
PCM	A3B	DS1 - Flickers when Ethernet communications with the CPU are active
		DS2 - DSP LED, flickers during image bus processing
		DS3 - MOP LED <sup>1</sup>
PSP2	A4B	DS1 - During power up is momentarily on while its program is loaded from PSP1. After bootup, is an activity indicator (glows according to how busy the PSP2 is.) During high frame rates/color the LED should stay lit. Flickers when scan converting.
PSP1	A5B	DS1 - SCIP LED <sup>2</sup>
		DS2 - MOP LED <sup>1</sup>

**Table 9-2 PCB LED Functions and Status after Core Bootup**

PCB	Slot Location	LED Status
CPU	A6B	DS1 through DS3 - not used
		DS4 - SCIP LED <sup>2</sup>
		DS5 - MOP LED <sup>1</sup>
		DS6 - PTX, flickers during Ethernet communications with CPU
		DS7 - PTR, flickers during Ethernet communications with CPU
		DS8 through DS11 - not used
IMEM	A8B	DS1 - Write LED, flickers during scanning
		DS2 - Read LED, flickers during scanning
		DS3 - IBUS ERROR LED, is normally off
ADAPTR	A9B	DS1 - TRAP (Translation Processor) LED, flickers in all scanning modes. In 2D or Doppler the rate is so fast, the LED appears constantly on. In Color the rate is visible
		DS2 - PAP (Physio-Audio Processor) LED, off in all modes
		DS3 - SCIP LED <sup>2</sup>
		DS4 - MOP LED <sup>1</sup>
SPM	A11B	DS1 through DS7 - not used
		DS8 - SCIP LED <sup>2</sup>
		DS9 - MOP LED <sup>1</sup>
		DS10 - not used (located behind DS5, DS6, and DS7)
		DS11 - not used (located behind DS5, DS6, and DS7)
AIFOM	A12B A13B	DS1 - not used
		DS2 - not used
		DS5 - SCIP LED <sup>2</sup>
		DS6 - MOP LED <sup>1</sup> , Blinks at one-second intervals during system bootup and two-second intervals when loading flash code.

**Table 9-2 PCB LED Functions and Status after Core Bootup**

PCB	Slot Location	LED Status
ACIM	PS5	DS1 - After system bootup, flashes at approximately 1 Hz. Indicates HVDC to PSM after system bootup.
		DS2 - not used
		DS3 - not used
		DS4 - not used
		DS5 - not used
ACIM	PS5	DS6 - Normally lit (after system circuit breaker is set to on). Indicates power to HVDC after internal fuse F1.
		DS7 - Normally lit (after system circuit breaker is set to on). Indicates HVDC +155 Vdc from rectifier to card cage PCBs.

1. The Module Operation Processor (MOP) controls PCB operation. The MOP LED blinks at one-second intervals during system bootup, and at a two-second rate after bootup.
2. The Serial Communications Interface Processor (SCIP) communicates between the PCB and the CPU. The SCIP LED blinks at one-second intervals after bootup.

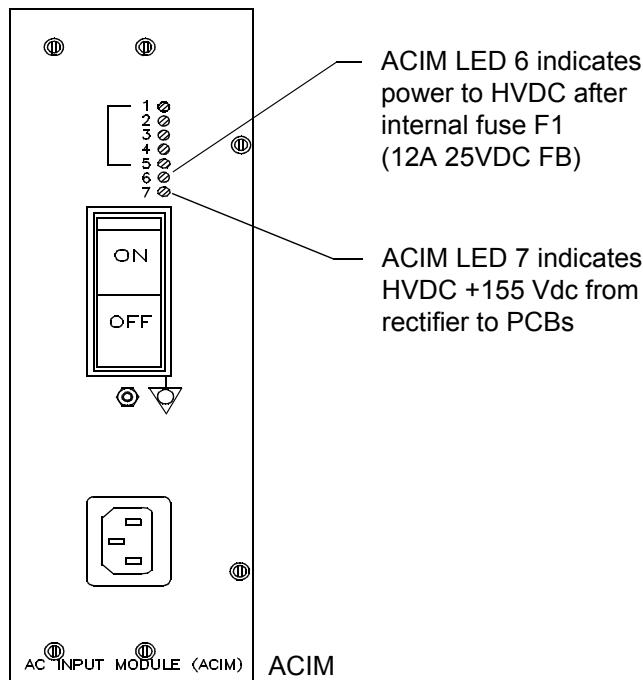
Test Points Tolerances		
P2	GND	—
	-15 V	±0.45 Vdc
	+15 V	—
	-12 V	±0.36 Vdc
	+12 V	—
	-6 V	±0.12 Vdc
	+6 V	—
	-5.2 V	±0.104 Vdc
	+5 V	±0.10 Vdc
	GND	—
P3	GND	—
	-HV/10	-HV X 0.0991 ±2%
	+HV/10	+HV X 0.0991 ±2%
	FAN	0+0 +24V
	+3.3 V	Not currently used
	REF +5 V	±0.10 V
	REF 2.5 V	±0.05 V
	+5 V STBY	±0.10 V
	+2.5 V STBY	±0.05 V
	GND	—
		When lit, indicates HVDC is present. — ● HVDC OK
		When lit, indicates over voltage protection is on or -5.2V current limiting has been activated. — ● OVP TRIG

**Figure 9-3 PSM Voltage Measurement Locations (PS1, PS2, PS3)**

**CAUTION: Remove power to the system by disconnecting the power cord and wait 15 seconds before removing or replacing power supply PCBs. Otherwise, damage to PCBs and motherboard will result.**

ACIM LED 1 indicates HVDC to PSM when the system has booted up

ACIM LEDs 2–5 are not used



**Figure 9-4 ACIM Voltage Measurement Locations (PS5)**  
**3500-1578-02/03, 3500-1579-02/03, 3500-1580-01**

## 9-3 Alert Information

Alerts indicate the system has detected a performance problem. These performance problems are caused by hardware faults or by system sensitivity to a particular series of keystrokes made by the operator. Alerts have a blue banner across the top of the dialog box.

**To remove the alert from the display:**

1. Simultaneously press Superkey and F6 (the sixth key to the right in the top row of keys on the lower user interface) to display a second page of error information ([Figure 9-5](#)).
2. Print or record the information on the second page. The second page of error information identifies the file and the line of software code containing the error.
3. Repeat [Step 1](#) to remove the alert message from the display and to continue scanning or other diagnostic procedures.
4. On systems with 170.XX software and up, press Superkey and Print to save the alert information to the hard drive for later retrieval with UpLink (version 2.0 or higher).

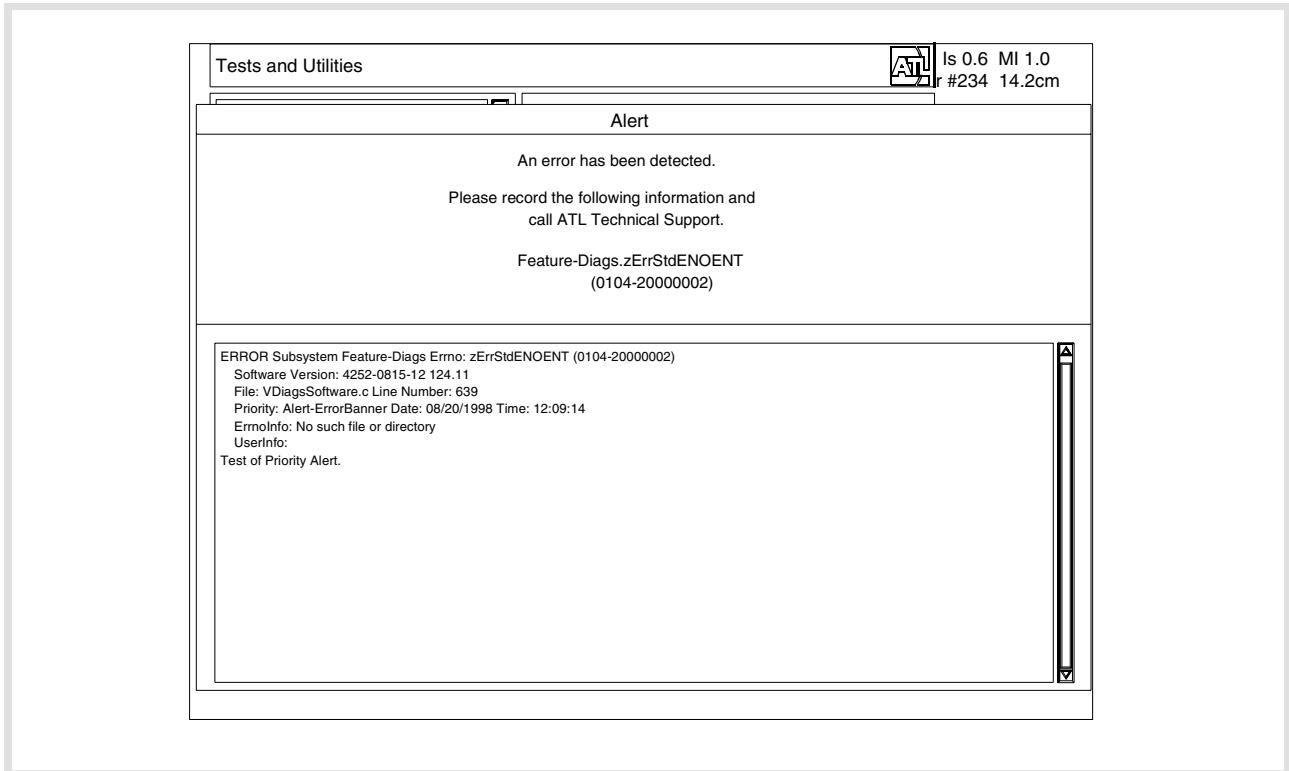


Figure 9-5 Alert with Second Page of Information Displayed

## 9-4

## Miscellaneous Diagnostic Information

### 9-4.1

### User Event Log

The user event log is helpful in determining the cause of system lockups by recording the sequence of user events (keystrokes or control activations) that resulted in the system lockup. The log records the last 500 keystrokes or control activations and the time they were entered from the system control panel. The event sequence is retained even if the system power switch and the circuit breaker are turned off. Any one of 10 pages of user events are displayed with 50 events on each page (2 columns of 25). The user events may include keystrokes, slidepot changes, control knob rotations, or trackball movements.

1. Verify the system has booted up.
2. Simultaneously press and hold the Superkey and Shift keys. Press the characters indicated in [Table 9-3](#) to display the user event log for the desired language. Page 10 is displayed with the previous 50 events listed.

**Table 9-3 User Event Log Language Differences**

		Keystrokes Required		
Test		English	French	German
User Event Log		=	=	"spacebar"

3. Select the Next button on the bottom of the display to display the next page or the Prev button to display the previous page. Press SELECT. The display appears similar to [Figure 9-6](#).
4. Select the Reset Log button to clear all entries from the event log. Press SELECT.
5. To exit, select the Close button on the bottom of the display. Press SELECT. The display returns to the previous imaging mode.

User Log						
08/20/98	11:47:35	Timeout		08/20/98	12:20:03	Start
08/20/98	12:07:44	PushBtn	OK	08/20/98	12:20:08	PushBtn
08/20/98	12:07:44	End	ConfirmDialog	08/20/98	12:20:12	PushBtn
08/20/98	12:07:51	Superkey	Diags	08/20/98	12:21:04	PushBtn
08/20/98	12:07:51	Start	Diags	08/20/98	12:23:52	PushBtn
08/20/98	12:07:58	PushBtn	OK	08/20/98	12:23:57	PushBtn
08/20/98	12:08:06	PushBtn	Tests, Utils.	08/20/98	12:24:00	PushBtn
08/20/98	12:08:58	PushBtn	Execute	08/20/98	12:24:15	PushBtn
08/20/98	12:09:14	PushBtn	Execute	08/20/98	12:24:22	PushBtn
08/20/98	12:09:45	Button	3D	08/20/98	12:24:27	PushBtn
08/20/98	12:17:20	Button	3D	08/20/98	12:24:29	PushBtn
08/20/98	12:17:23	PushBtn	Hide	08/20/98	12:24:32	End
08/20/98	12:17:29	PushBtn	Error Log	08/20/98	12:24:32	PushBtn
08/20/98	12:17:58	PushBtn	Close	08/20/98	12:24:35	Start
08/20/98	12:18:01	PushBtn	Close	08/20/98	12:24:39	PushBtn
08/20/98	12:18:13	End	Diags	08/20/98	12:24:47	PushBtn
08/20/98	12:18:14	Start	ProgressDialog	08/20/98	12:24:48	PushBtn
08/20/98	12:19:30	PowerUp	-----	08/20/98	12:24:48	PushBtn
08/20/98	12:19:40			08/20/98	12:54:50	Acquiring
08/20/98	12:19:41	Start	ConfirmDialog	08/20/98	12:54:50	Timeout
08/20/98	12:19:58	ModeChange	2d	08/20/98	13:24:51	Timeout
08/20/98	12:19:58	Acquiring	2d	08/20/98	13:54:53	Timeout
08/20/98	12:19:59	PushBtn	OK	08/20/98	14:14:23	Button
08/20/98	12:19:59	End	ConfirmDialog	08/20/98	14:14:23	Acquiring
08/20/98	12:20:03	Superkey	Diags	08/20/98	14:18:43	Start

<a href="#">Close</a>	<a href="#">Reset Log</a>	<a href="#">Prev</a>	<a href="#">Next</a>	10 of 10
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**Figure 9-6 User Event Log**

## 9-4.2 Formatting a Blank Optical Disk

**To format a blank optical disk:**

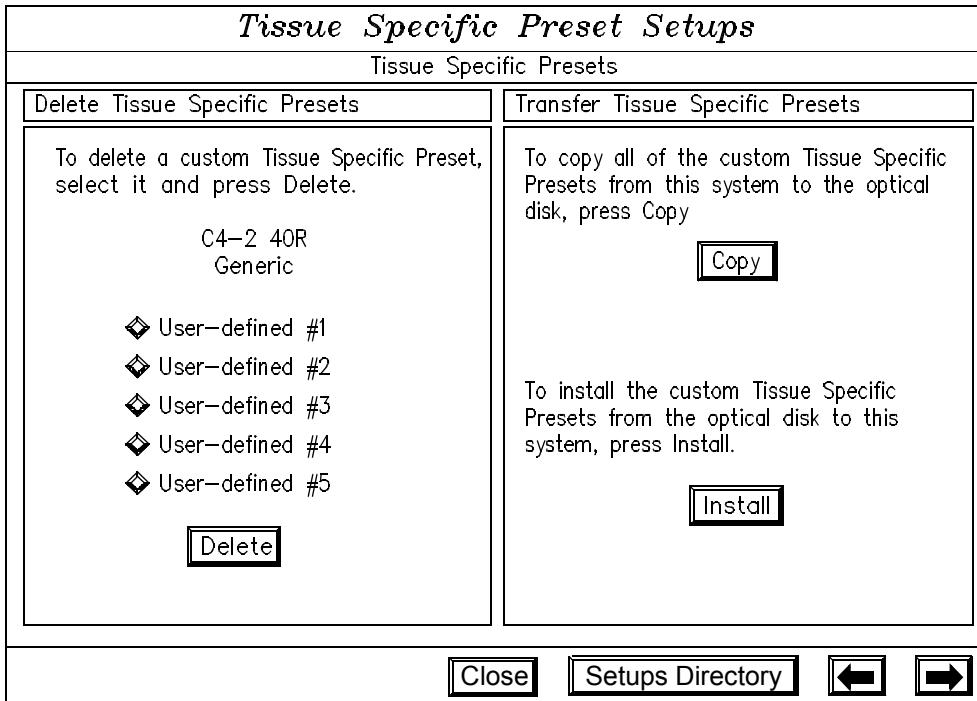
1. Boot up the system.
2. Press NET/DISK.
3. Verify that the blank optical disk is not write-protected (not write-protected = notch closed).

4. Insert the disk into the optical drive.
5. Select the Format Disk option displayed at the top left of the display. The optical drive LED will light during formatting.
6. Select the Eject Disk option to eject the formatted disk.
7. Press NET/DISK again to return to the previous imaging mode, or select Close at the bottom of the menu and press SELECT.

### 9-4.3

## Formatting an Optical Disk/Copying Presets

- To format a blank optical disk and copy Tissue Specific Presets to the optical disk:**
    1. Boot up the system.
    2. Press Setups. The Directory of Setup Options is displayed.
    3. Verify that the blank optical disk is not write-protected (not write-protected = notch closed).
    4. Insert the disk into the optical drive.
    5. Select Tissue Specific Presets. Press SELECT. The display appears as in [Figure 9-7](#).
    6. Select Copy and press SELECT. The process of formatting and copying the presets to the optical disk takes several minutes.
- NOTE** If the optical disk is not formatted, the system will display prompts asking you whether you wish to format it. If you choose to format, the prompts will also be displayed to guide you through the format procedure. If you have formatted the disk, repeat step 6 and continue with the procedure.
7. To copy the presets from the optical disk to the hard drive, select Install and press SELECT.



**Figure 9-7 Formatting Optical Disk/Copying Tissue Specific Presets**

#### 9-4.4

### Core Dump Utilities

The core dump utilities are used to simultaneously store error data, to the hard disk and the optical disk or to the hard disk only. This procedure is similar to the Backup Diags Data procedure in [paragraph 9-5.6](#) and applies to U.S. FSEs. Other service personnel should contact their respective Technical Support Group prior to performing the procedure.

**To use the core dump utilities to backup data:**

1. Verify the system clock is updating. (A sector or linear image is displayed.)
2. Verify that the blank formatted optical disk is not write-protected (not write protected = notch closed).
3. Insert the blank disk into the optical drive. Refer to [paragraph 9-4.2](#) for the formatting procedure.
4. To write files first to the hard disk then copy them to the optical disk, refer to step a. To write files only to the hard disk, refer to step b.
  - a. Simultaneously press Superkey, Shift, and Text C. This procedure will take approximately 5 minutes. The LED on the optical drive will be lit continuously as the drive is storing data to the disk. The optical disk will be automatically ejected once the data transfer has been completed.

**NOTE** When performing this task, the system clock stops and there is no dialog box or message displayed.

- b. Simultaneously press Superkey, Shift, and Text D. This procedure will take approximately 3 minutes. The core files will be automatically trans-

ferred to an optical disk the next time the Backup Diags Data (paragraph 9-5.6) procedure is performed.

5. Label the disk with the following information:

- Service Order (S.O.) number
- Machine ID number
- Chassis ID number
- Account name
- Install date
- FSE number

**NOTE** Mark your FSE number on the disk with an indelible marker. The disk will be returned for re-use.

6. Return the disk to the Technical Support Group at ATL Bothell.

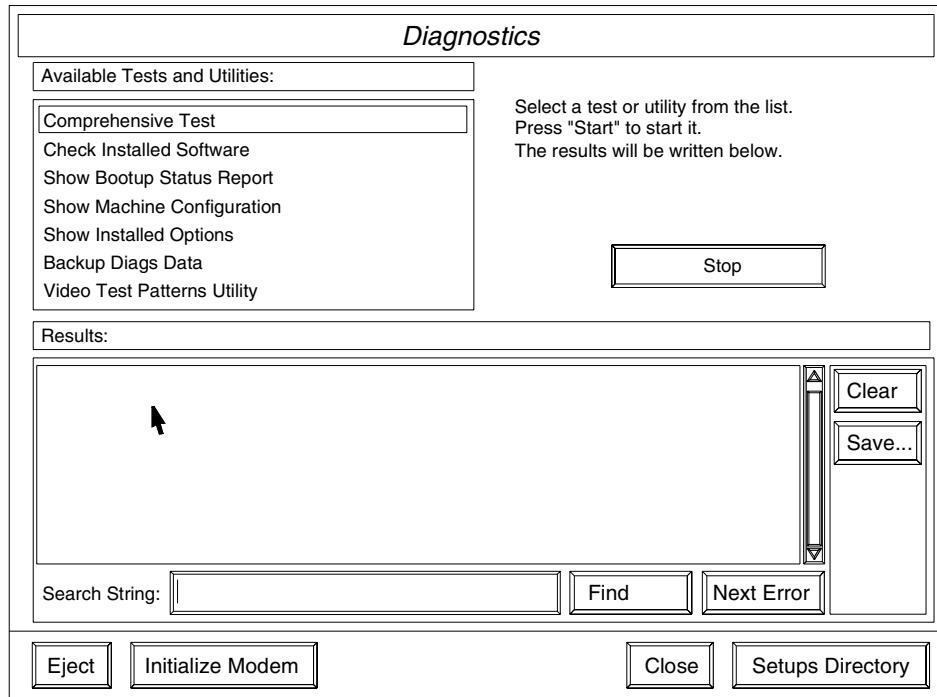
## 9-5

## Accessing User Diagnostics

The user diagnostics enable the user to access several diagnostic capabilities. These capabilities enable the user to quickly diagnose system operational status or acquire the information needed to assist others in system diagnosis.

**To access the user diagnostics:**

1. Boot up the system.
2. Press Setups. The Directory of Setup Options is displayed.
3. Use the trackball to move the cursor to Diagnostics in the lower left corner of the display.
4. Press SELECT. The display appears as in [Figure 9-8](#).



**Figure 9-8 User Diagnostics Menu**

5. Move the cursor to the desired test or option. If the test or option is not highlighted with reverse video, press SELECT to highlight it.
6. Refer to [paragraph 9-5.1](#) to run the Comprehensive Test. For all other tests or options move the cursor to Start and press SELECT to initiate or display the results. Information on the other tests and options is listed in [paragraph 9-5.2](#) through [paragraph 9-5.7](#).

## 9-5.1

### Comprehensive Test

The Comprehensive Test is used to determine system operational status. The test comprises numerous sub-tests. If a sub-test fails, the system completes the remaining sub-tests. When the Comprehensive Test has been completed, the results are displayed on the monitor.

If a sub-test fails, a failure code is displayed. The code is for engineering use only. It has no value to field personnel.

The Comprehensive Test should be run any time a system error is displayed or if the user suspects problems with the system. If an error message is displayed during the test, reboot the system with the ON/STANDBY switch.

The test takes from 15 to 20 minutes to run, depending on which software version is installed in the system.

**To invoke the Comprehensive Test:**

1. Verify that there are no scanheads connected.
2. Perform [step 1](#) through [step 4](#) of [paragraph 9-5](#) to access the Comprehensive Test.

3. Move the cursor to Comprehensive Test. If the Comprehensive Test is not highlighted with reverse video, press SELECT to highlight it.
4. Move the cursor to the START button. Press SELECT. A windowed message is displayed stating:  

This test will take more than fifteen (15) minutes. Also, the display will appear to be ‘corrupted’ at times (or blank) but it should return to normal after several minutes. Should I continue?
5. Move the cursor to the Continue button. Press SELECT. The test status is indicated by a row of “periods” across the results window. If a failure occurs, an error code is displayed.
6. To exit the Diagnostics Menu, use the trackball to select Close. Press SELECT. The following note is displayed:  

**NOTE** System parameters have changed. It is necessary to reboot the machine before further scanning can be done.
7. Use the trackball to select the Reboot option. Press SELECT to reboot the system.

## 9-5.2

### Check Installed Software

This test comprises Cyclic Redundancy Checks (also known as CRCs) of all read-only system software files. If a CRC fails, it may indicate a disk drive problem. If this is the case, re-install the system software and check the DDEA PCB.

1. Perform [step 1 through step 4](#) of [paragraph 9-5](#) to access the user diagnostics.
2. Move the cursor to Check Installed Software.
3. Press SELECT to highlight the option with reverse video.
4. Move the cursor to Start. Press SELECT. A message is displayed stating, “Please wait, this process will take approximately 2 minutes.”
5. Use the trackball to select OK. Press SELECT. The Start button changes to a Stop button. When the test is complete, the results are displayed in the results window, and the Stop button turns into the Start button again. The results are displayed as Completed: PASS (or FAIL).
6. Press Stop to abort the test if needed.

## 9-5.3

### Show Bootup Status Report

During system bootup the CPU queries the individual PCBs and displays the bootup status on the monitor.

1. Perform [step 1 through step 4](#) of [paragraph 9-5](#) to access the user diagnostics.
2. Move the cursor to Show Bootup Status Report.

3. Press SELECT to highlight the option with reverse video.
4. Move the cursor to Start. Press SELECT to initiate the option. The system instantaneously displays a note stating that the “Bootup status reported NO errors.” Test results are displayed as Completed: PASS (or FAIL).

## 9-5.4

### Show Machine Configuration

The Show Machine Configuration option displays the machine ID number, hard disk part number, and software version (software build) number. The machine ID number is a unique number assigned to each system and is programmed into a chip on the SYSCPU PCB. All machine options to be installed onto a particular system must contain the correct machine ID number for that particular system or no options will be enabled.

1. Perform [step 1](#) through [step 4](#) of [paragraph 9-5](#) to access the user diagnostics.
2. Move the cursor to Show Machine Configuration.
3. Press SELECT to highlight the option with reverse video.
4. Move the cursor to Start. Press SELECT to initiate the option. The results are displayed as:

Machine ID: 0000005fXXXX

Hard-Disk Software: 4252-0XXX-XX 1XX.XX (“X” indicates a numerical placeholder)

## 9-5.5

### Show Installed Options

The Show Installed Options selection displays the system options that are installed on a particular system whether those options were purchased when the system was ordered or for an upgrade. Refer to the COA (Customer Order Acknowledgement) for the customer ordered features, and check the installed options list for the options configured for the system. If there is a discrepancy, order a Machine Options Configuration disk for that particular system.

Re-install the files from the new machine options disk onto the hard drive and check the configuration again.

1. Perform [step 1](#) through [step 4](#) of [paragraph 9-5](#) to access the user diagnostics.
2. Move the cursor to Show Installed Options.
3. Press SELECT to highlight the option with reverse video.
4. Move the cursor to Start. Press SELECT to initiate the option.
5. Refer to [Table 9-4](#) for a list of the machine options possible with each released software version. Machine options will be added as the system matures through the product life cycle.

**NOTE** If there are no machine options listed for a particular software version, that software version is not listed in the following table.

**Table 9-4 Machine Options/Software Build Compatibility Matrix**

	Part Number	Description	Software Version							Notes
			107.10	108.15	124.13	125.11	127.05	170.31	177.13	
1	8501-8523-01	English Language/UIF	•	•	•	•	•	•	•	
2	8501-8524-01	German Language/UIF	•	•	•	•	•	•	•	
3	8501-8525-01	French Language/UIF	•	•	•	•	•	•	•	
4	8501-8523-03	English Language	•	•	•	•	•	•	•	
5	8501-8524-03	German Language	•	•	•	•	•	•	•	
6	8501-9648-01	Italian Language				•	•	•	•	
7	8501-9645-01	Danish Language				•	•	•	•	
8	8501-9646-01	Norwegian Language				•	•	•	•	
9	8501-9647-01	Swedish Language				•	•	•	•	
10	8501-9341-01	Finnish Language				•	•	•	•	
11	8501-8525-03	French Language	•	•	•	•	•	•	•	
12	8501-8533-01	Voltage/Video 120/NTSC	•	•	•	•	•	•	•	
13	8501-8534-01	Voltage/Video 230/NTSC	•	•	•	•	•	•	•	
14	8501-8536-01	Voltage/Video 230/PAL	•	•	•	•	•	•	•	
15	8501-8536-02	Voltage/Video 230/PAL IEC-601-1	•	•	•	•	•	•	•	
16	8501-9503-01	NTSC Video	•	•	•	•	•	•	•	
17	8501-9504-01	PAL Video	•	•	•	•	•	•	•	
18	8501-9432-01	Clin. Opt., Vasc: TCD	•	•	•	•	•	•	•	
19	8501-9442-01	Clin. Opt., Vasc: Cerebro Vasc	•	•	•	•	•	•	•	
20	8501-9433-01	Clin. Opt., Vasc: Peripheral	•	•	•	•	•	•	•	
21	8501-9441-01	Clin. Opt., Vasc: Intraoperative		•	•	•	•	•	•	
22	8501-9451-01	Clin. Opt., Vasc: CSI		•	•	•	•	•	•	
23	8501-9513-01	Clin. Opt., Rad CSI		•	•	•	•	•	•	
24	8501-9437-01	Clin. Opt., Genim: Abdomen	•	•	•	•	•	•	•	
25	8501-9444-01	Clin. Opt., Advanced Breast	•	•	•	•	•	•	•	
26	8501-9438-01	Clin. Opt., Genim: Small Parts	•	•	•	•	•	•	•	
27	8501-9439-01	Clin. Opt., Genim: Prostate	•	•	•	•	•	•	•	
28	8501-9440-01	Clin. Opt., Genim: Pediatric	•	•	•	•	•	•	•	

**Table 9-4 Machine Options/Software Build Compatibility Matrix (Continued)**

	Part Number	Description	Software Version							Notes
			107.10	108.15	124.13	125.11	127.05	170.31	177.13	
29	8501-9436-01	Clin. Opt., OB	•	•	•	•	•	•	•	
30	8501-9446-01	Clin. Opt., Neurosurgical	•	•	•	•	•	•	•	
31	8501-9522-01	Clin. Opt., Abdominal Surgery	•	•	•	•	•	•	•	
32	8501-9443-01	Clin. Opt., Musculoskeletal	•	•	•	•	•	•	•	
33	8501-9435-01	Clin. Opt., Gyn/Fert	•	•	•	•	•	•	•	
34	8501-9447-01	Clin. Opt., Card: CSI	•	•	•	•	•	•	•	
35	8501-9497-01	Clin. Opt., Card: FCT	•	•	•	•	•	•	•	
36	8501-9127-01	Clin. Opt., Harmonic Research	•	•	•	•	•	•	•	
37	8501-9429-01	Clin. Opt., Card: Adult	•	•	•	•	•	•	•	
38	8501-9430-01	Clin. Opt., Card: Ped/Fetal Echo	•	•	•	•	•	•	•	
39	8501-9431-01	Clin. Opt., Card: Transesophageal	•	•	•	•	•	•	•	
40	8501-8507-01	Extended Doppler Capability	•	•	•	•	•	•	•	
41	8501-8507-02	Extended Doppler Capability EMI	•	•	•	•	•	•	•	
42	8501-9425-01	Capability, CW2	•	•	•	•	•	•	•	
43	8501-9426-01	Capability, CW5	•	•	•	•	•	•	•	
44	8501-9427-01	Capability, CW10	•	•	•	•	•	•	•	
45	8501-9428-01	Capability, TCD2	•	•	•	•	•	•	•	
46	8501-9408-01	Capability, P3-2 20 mm	•	•	•	•	•	•	•	
47	8501-9419-01	Capability, P4-2 20 mm		•	•	•	•	•	•	
48	8501-9411-01	Capability, C9-5 ICT	•	•	•	•	•	•	•	
49	8501-9412-01	Capability, C7-4 40R	•	•	•	•	•	•	•	
50	8501-9413-01	Capability, C4-2 40R		•	•	•	•	•	•	
51	8501-9424-01	Capability, C5-2 40R	•	•	•	•	•	•	•	
52	8501-9417-01	Capability, L10-5 38 mm		•	•	•	•	•	•	
53	8501-9416-01	Capability, L7-4 38 mm	•	•	•	•	•	•	•	
54	8501-9414-01	Capability, CL10-5 26mm		•	•	•	•	•	•	
55	8501-9409-01	Capability, P7-4 11 mm	•	•	•	•	•	•	•	
56	8501-9407-01	Capability, P5-3 16mm	•	•	•	•	•	•	•	
57	8501-9420-01	Capability, P6-3 28mm	•	•	•	•	•	•	•	

**Table 9-4 Machine Options/Software Build Compatibility Matrix (Continued)**

	Part Number	Description	Software Version							Notes
			107.10	108.15	124.13	125.11	127.05	170.31	177.13	
<b>58</b>	8501-9518-01	Capability, CT8-4 40R		•	•	•	•	•	•	
<b>59</b>	8501-9517-01	Capability, LI9-5 33mm		•	•	•	•	•	•	
<b>60</b>	8501-9421-01	Capability, C8-4v	•	•	•	•	•	•	•	
<b>61</b>	8501-9410-01	Capability, L12-5	•	•	•	•	•	•	•	
<b>62</b>	8501-9422-01	Capability, C8-5	•	•	•	•	•	•	•	
<b>63</b>	8501-9418-01	Capability, MPT7-4	•	•	•	•	•	•	•	
<b>64</b>	8501-9415-01	Capability, BPT9-5			•	•	•	•	•	
<b>65</b>	8501-9394-01	Capability, L12-5 50mm					•	•	•	
<b>66</b>	8501-9395-01	Capability, LAP L9-5	•	•	•	•	•	•	•	
<b>67</b>	8501-9492-01	Color Power Angio Imaging	•	•	•	•	•	•	•	
<b>68</b>	8501-9493-01	3D Color Power Angio Imaging	•	•	•	•	•	•	•	
<b>69</b>	8501-9533-01	3D Grayscale	•	•	•	•	•	•	•	
<b>70</b>	8501-9166-02	ResearchLink		•	•	•	•	•	•	
<b>71</b>	8501-9167-01	On Board Diagnostics	•	•	•	•	•	•	•	
<b>72</b>	8501-9499-01	Color M-Mode	•	•	•	•	•	•	•	
<b>73</b>	8501-9498-01	Steered CW	•	•	•	•	•	•	•	
<b>74</b>	8501-9500-01	Frame Grab	•	•	•	•	•	•	•	
<b>75</b>	8501-9501-01	Triple Mode	•	•	•	•	•	•	•	
<b>76</b>	8501-9502-01	TSI Patient Optimization	•	•	•	•	•	•	•	
<b>77</b>	8501-9534-01	Auto Cardiac Output/VF			•	•	•	•	•	
<b>78</b>	8501-9600-01	THI Optimization		•	•	•	•	•	•	
<b>79</b>	8501-9593-01	TDI			•	•	•	•	•	
<b>80</b>	8501-9606-01	Digital Echo						•		1
<b>81</b>	8501-8703-01	Stress Echo						•		1
<b>82</b>	8501-9641-01	A3DI Ready			•	•	•	•	•	1
<b>83</b>	8501-9651-01	High PRF			•	•	•	•	•	
<b>84</b>	8501-9652-01	Simultaneous 2D/CW			•	•	•	•	•	
<b>85</b>	8501-9050-01	Auto Scaling			•	•	•	•	•	
<b>86</b>	8501-9051-01	DICOM Scaling				•	•	•		

**Table 9-4 Machine Options/Software Build Compatibility Matrix (Continued)**

	Part Number	Description	Software Version							Notes
			107.10	108.15	124.13	125.11	127.05	170.31	177.13	
87	8501-9494-01	DiskLink	•	•	•	•	•	•	•	2
88	8501-9495-01	NetLink	•	•	•	•	•	•	•	2
89	8501-9496-01	WebLink	•	•	•	•	•	•	•	2
90	8501-9742-01	Spatial Compounding (SonoCT)					•	•		
91	8501-9774-01	3D Card Acquisition					•	•		
92	8501-9775-01	Modality Worklist					•	•		
93	8501-9833-01	Echo Multi-line (Intelligent Frame Rate Accelerator)						•		

1. A3DI must be turned off if Digital Echo or Stress Echo are enabled.
2. With DVS option installed, all ultrasound system networking functionality is disabled; including DiskLink, NetLink, WebLink, and ResearchLink. For customers who have DiskLink, NetLink, WebLink, and ResearchLink, the features will remain enabled, but non-functional. Customers who order DVS are not able to order DiskLink, NetLink, WebLink, or ResearchLink.

## 9-5.6 Backup Diags Data

This option saves the error log, the results of the last Comprehensive Test, the user event log, and other diagnostic information to a blank formatted optical disk. The Backup Diags Data option can be performed using UpLink by FSEs or the following procedure by biomedical technicians and end-users. Questions about use of the procedure should be directed to the ATL Technical Support Group.

Refer to [paragraph 9-4.4](#) for a similar procedure, which allows you to store data on the optical or hard drives or both.

**To backup the diagnostic data to an optical disk:**

1. Perform [step 1](#) through [step 4](#) of [paragraph 9-5](#) to access the user diagnostics.
2. Move the cursor to Backup Diags Data. Press SELECT. The Backup Diags Data option is highlighted with reverse video.
3. Verify that the blank formatted optical disk is not write-protected (not write-protected = notch closed).
4. Insert the blank disk into the optical drive. Refer to [paragraph 9-4.2](#) for the formatting procedure.
5. Move the cursor to Start. Press SELECT. The results are displayed as Completed: PASS. The process takes approximately 20 seconds to complete.

**NOTE** If a disk has not been inserted in the drive, a dialog box is displayed. The LED on the optical drive is lit and the Start button changes to Stop while data is being transferred, however, the Stop function has not been implemented.

6. Move the cursor to Eject in the lower left of the display. Press SELECT to remove the disk from the drive.
7. Label the disk with the following information:
  - Service Order (S.O.)
  - Machine ID number (Base ID)
  - Chassis ID number
  - Account name
  - Install date
  - FSE number

**NOTE** Mark your FSE number on the disk with an indelible marker. The disk will be returned for re-use.

8. Return the disk to the Technical Support Group.

## 9-5.7

### Video Test Patterns Utility

The Video Test Pattern Utility is used to isolate monitor, printer, and VCR video problems.

1. Perform [step 1 through step 4 of paragraph 9-5](#) to access user diagnostics.
2. Move the cursor to Video Test Patterns Utility. The option is highlighted with reverse video.
3. Move the cursor to Start. Press SELECT. A note is displayed stating:

The test patterns will be displayed one at a time. Press the spacebar to view the next pattern, 1 through 0 to view a specific pattern, or any other key to quit.
4. Move the cursor to OK. Press SELECT. A grayshade test pattern is displayed.
5. Use the spacebar to move through the individual test patterns or refer to the test pattern numbers in [Table 9-5](#) and press the appropriate number to obtain the desired test pattern

**Table 9-5 Video Test Patterns**

Test Pattern Number	Description
1	Sixteen grayshade bars displayed vertically. White bars on left, black on right
2	Eight color bars displayed vertically. White, yellow, light blue, green, purple, red, dark blue, and black
3	Cross hatch pattern. Black background, with white grid
4	Entire screen displays the letter "y" in every character position. White letters on a black background
5	Quartered display with circle in the center of the display. Black background with white pattern
6	Quartered display with circle in the center of the display. White background with black pattern
7	White rectangle on black background
8	White screen
9	Flat black screen
0	Flat black screen with grid of white dots

## 9-6      Remote Diagnostics

The HDI 5000 system has a full suite of remote diagnostic capabilities. Contact your local technical support center for more information.

# **10 Disassembly**

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<b>WARNING</b>	Always turn power off, disconnect the main power cord from the wall outlet, and wait at least 30 seconds before removing or installing any PCB, module or component.
<b>CAUTIONS</b>	<ul style="list-style-type: none"><li>• Always use correct ESD procedures. ESD damage is cumulative and may not be noticeable at first. ESD symptoms may be first exhibited as a slight degradation of performance or image quality.</li><li>• Do not pull and reinsert PCBs or other modules while main circuit breaker is ON. To reset PCBs, use the reset button provided on the card edge of many modules.</li></ul>

## **10-1 Card Cage PCBs and Modules**

	<p><input type="checkbox"/> <b>To remove most PCBs and modules:</b></p> <ol style="list-style-type: none"><li>1. Turn off the system circuit breaker and disconnect power cord.</li><li>2. Remove covers as necessary to gain access to the part requiring replacement.</li><li>3. Loosen captive screws on those boards with shields, or loosen the retaining clips as necessary.</li></ol>
<b>CAUTION</b>	Several modules require that adjacent modules be removed in order to provide ease of removal or allow correct alignment. For example, remove the PIM to correctly align the IIM module by hand to prevent misalignment of the PCB and centerplane.

**To remove the IIM:**

1. Remove the right side panel in addition to rear panel.
2. Remove all cable connectors from both the IIM and PIM.
3. Remove modules immediately to the right (to slot A3B).
4. Remove the IIM.

**To insert the IIM:**

1. Remove both modules immediately to the right (to slot A3B).
2. Use your right hand to align the IIM with the card guides and to ensure the connectors mate correctly with the centerplane.

**CAUTION**

---

Use caution when inserting the IIM into the centerplane. If connector pins are bent during insertion of the IIM, damage to the IIM or centerplane may result.

---

3. Replace the PIM and PCM.
4. Tighten all fasteners to ensure proper EMI/RFI shielding.

## 10-2

### Monitor

**NOTE** Always place the monitor on its back to prevent damage to the locking tabs when the monitor is not installed on the system. (Four plastic feet are on the back of the monitor.)

**To install the monitor:**

1. Turn off the system circuit breaker and disconnect power cord.
2. Place the monitor on the system with the tabs inserted into the latching assemblies.
3. Slide the retaining levers forward to engage the locking tabs.
4. Rotate the retaining levers out and up to secure the monitor.
5. Connect the video/audio (monitor signal) cable and engage the slide lock.
6. Connect the power cord to the monitor and rotate the cable lock to secure the connector to the monitor.

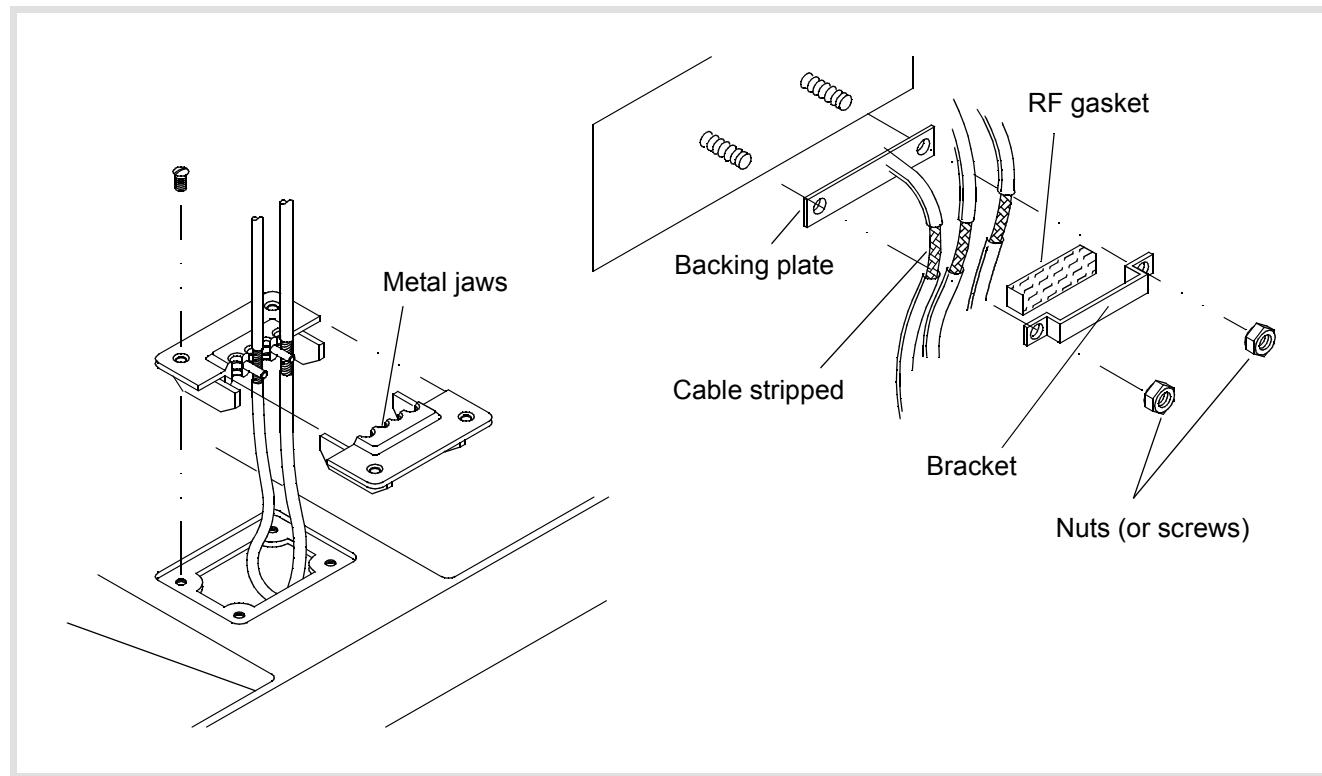
**To remove the monitor:**

1. Turn off the system circuit breaker and disconnect power cord.
2. Remove the VCR.
3. Release the cable lock on the power cord connector on the lower rear of the monitor by rotating it to the rear of the system.
4. Disconnect the power cord from the monitor.
5. Slide the locking plate on the video/audio (monitor signal) cable to the left.
6. Disconnect the video/audio cable connector from the monitor.

7. Rotate down and slide to the rear the retaining levers under each side of the monitor to release the monitor tabs.
8. Lift the monitor up and off of the system.

**To remove monitor cable clamps:**

Refer to [Figure 10-1](#) to remove the monitor cable clamps.



**Figure 10-1 Monitor Cable Clamp Installation**

## Control Panel PCBs, Trackball, and On/Standby Switch

To remove the Control Panel PCBs, trackball, or On/Standby switch (Figure 10-2):

1. Turn off the system circuit breaker and disconnect power cord.
2. Use a small common screwdriver to push in the locking bar latch release on the left rear of the upper user interface assembly (step 1 in Figure 10-2).
3. Slide the lock bar to the right and remove it (step 2).
4. Lift the top edge of the upper user interface assembly and remove the assembly to gain access to the UIM or the lower user interface assembly and trackball (step 3).
5. Disconnect and remove components as necessary.

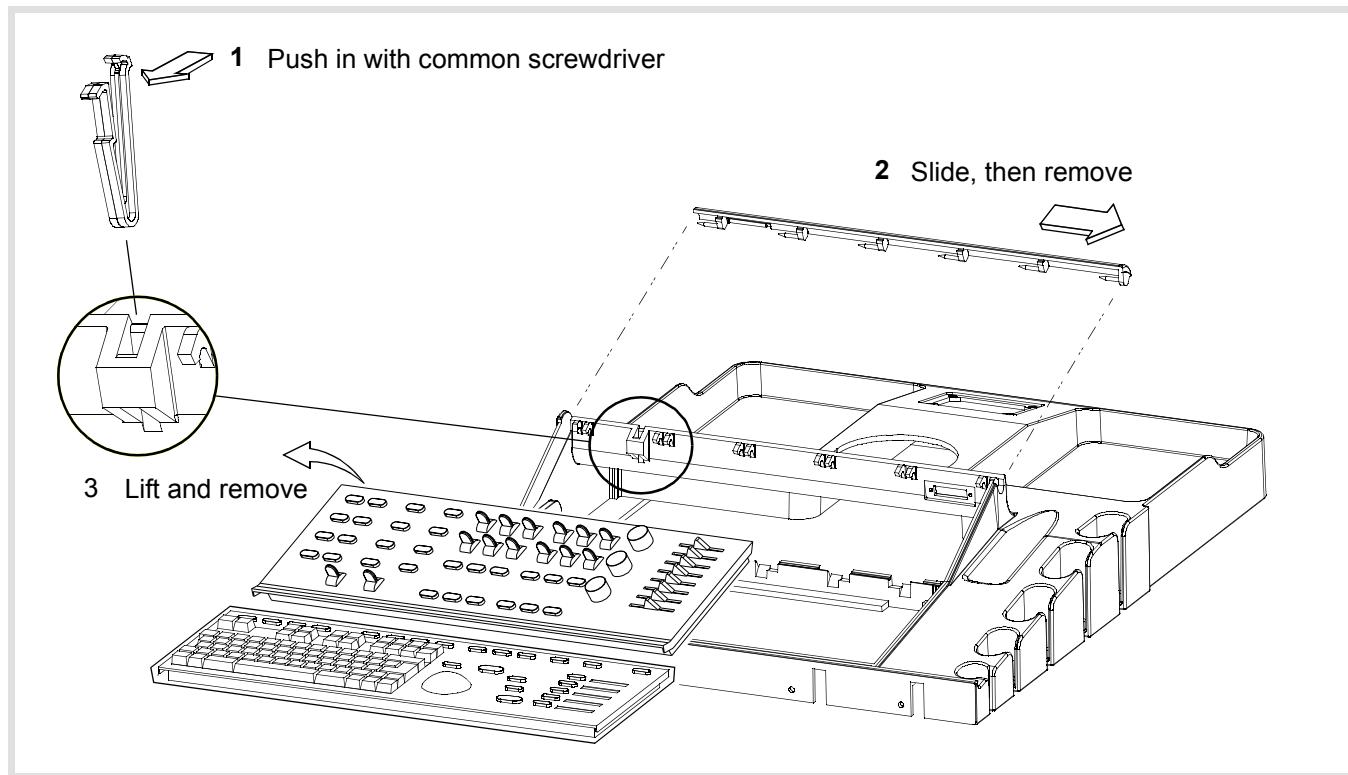
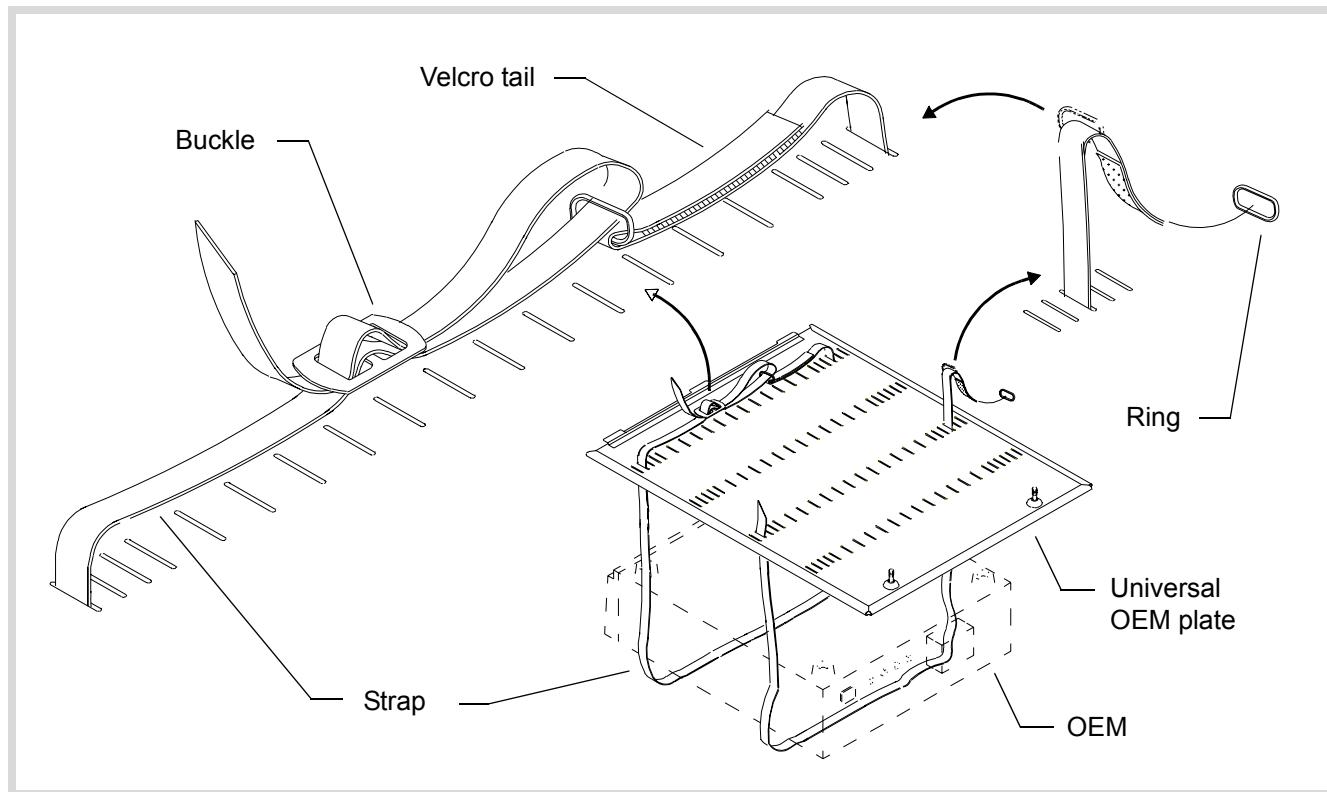


Figure 10-2 Control Panel Details

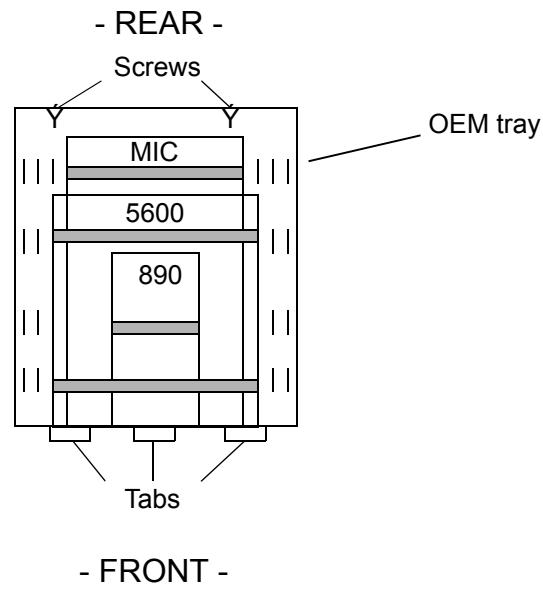
## 10-4 Internal OEMs

### To install an Internal OEM:

1. Lay two straps on a flat surface; place OEM device upside down on straps ([Figure 10-3](#)).
2. Place OEM plate upside down on OEM. Refer to [Figure 10-4](#) for OEM orientation.
  - Center the OEM between the sides of the tray with the captive screw to the rear of the OEM (see detail above).
  - The front of the tray should slightly overhang the OEM.



**Figure 10-3 Internal OEM Installation**

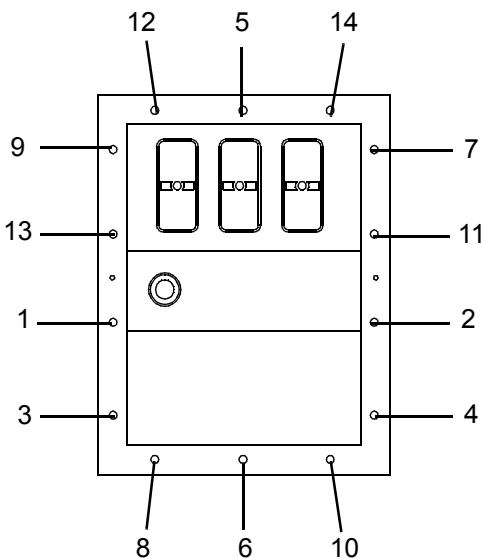


**Figure 10-4 OEM Orientation on OEM Tray**

3. Pass straps through the first slots outside of the OEM with the ring, velcro and buckle as shown.
4. Adjust buckle as tight as possible.
5. Loosen velcro, pull on both ends of the strap until snug, and reattach velcro.
6. Repeat [step 5](#) for the remaining strap.
7. Secure tray in OEM bay with tabs in slots.

## 10-5 Scanhead Select Module

Refer to [Figure 10-5](#) for information on removing and installing the Scanhead Select Module.



### Removal

1. In the reverse order shown, use a 7/64 allen wrench to loosen screws 1 turn at a time. Repeat until all screws are loose.

2.) Remove S/HSEL Module, and inspect for damage.

### Installation

**CAUTION: Carefully align the S/HSEL Module over the Channel Boards. Do not damage the RF gasket.**

1. Hand tighten screws (P/N 1563-0258-01) in the order shown.

2. Use a 7/64 allen wrench to tighten the screws an additional 1/4 turn in the order shown.

**Figure 10-5 S/HSEL Removal/Installation Details**

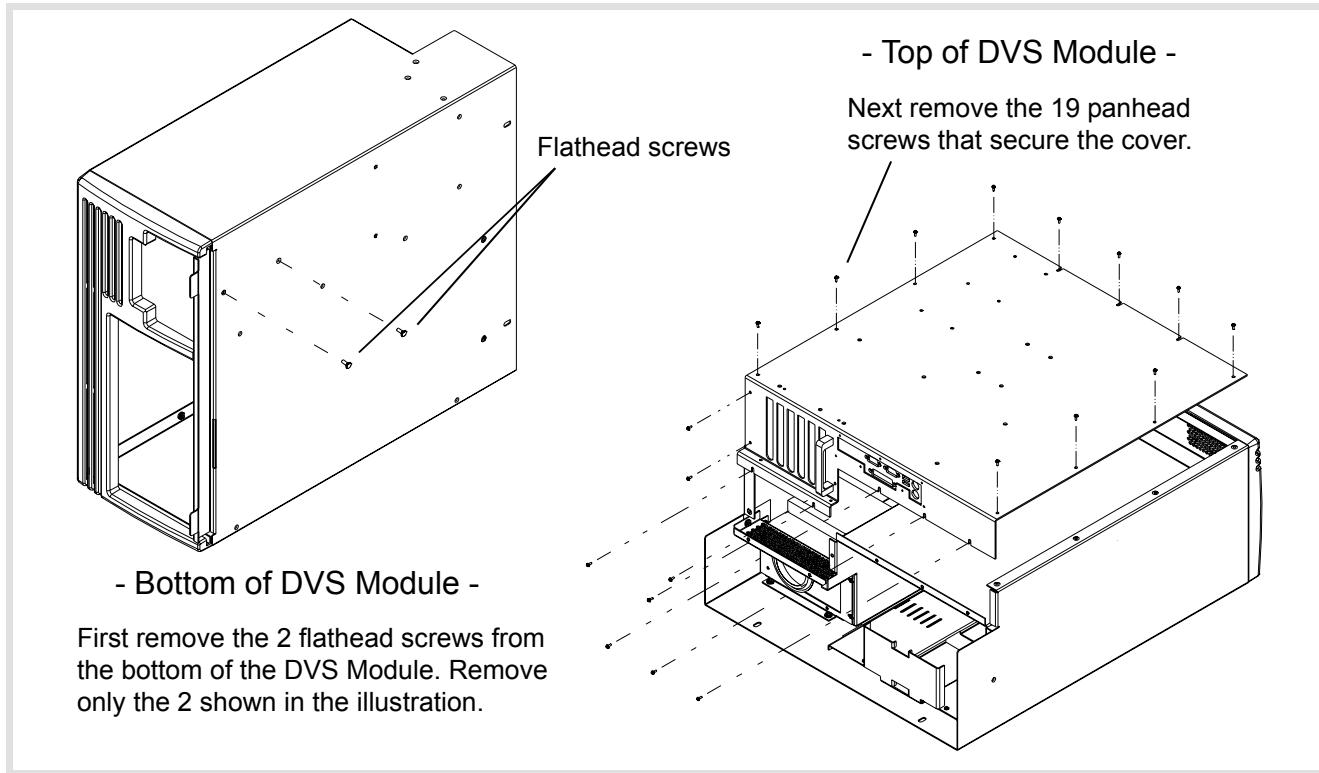
## 10-6 DVS Module

### 10-6.1 Removing the DVS Module Cover

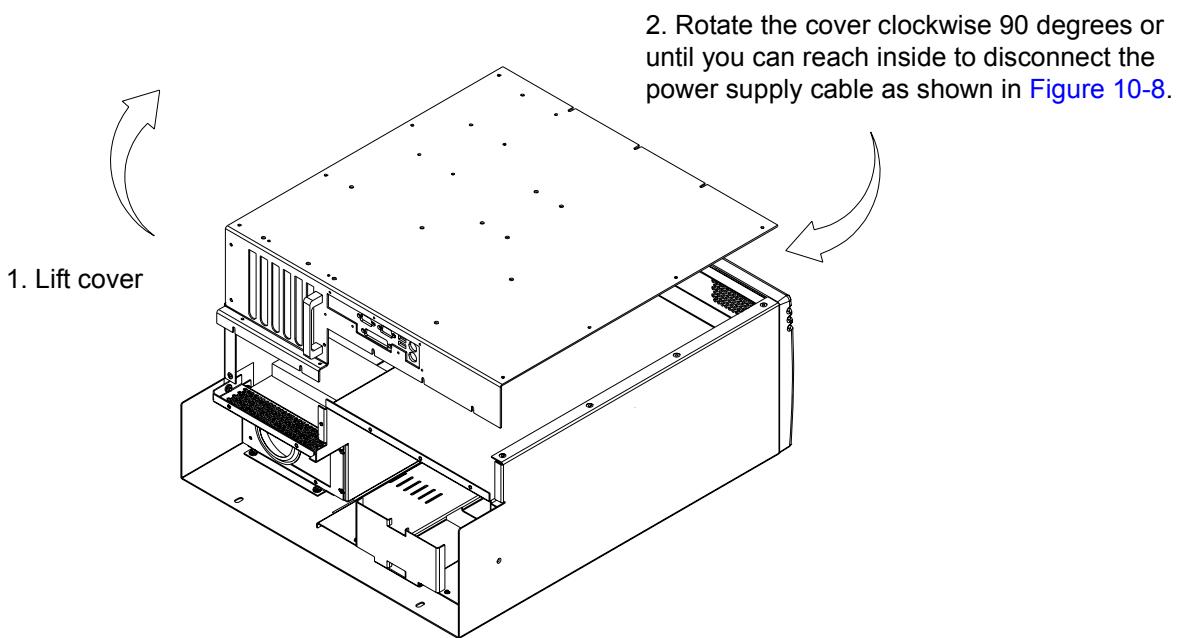
**To remove the DVS Module cover ([Figure 10-6](#) through [Figure 10-8](#)):**

1. Position the DVS Module so you can access the screws on the bottom (left detail of [Figure 10-6](#)).
2. Remove the two flathead screws securing the drive assembly at the left front of the unit.
3. Position the DVS Module so you can access the cover screws on the top and the rear of the unit (right detail of [Figure 10-6](#)).
4. Remove the 11 panhead screws on the top of the DVS Module and the eight panhead screws on the rear.
5. Lift the cover off the unit from the rear and rotate the cover clockwise 90 degrees ([Figure 10-7](#)).

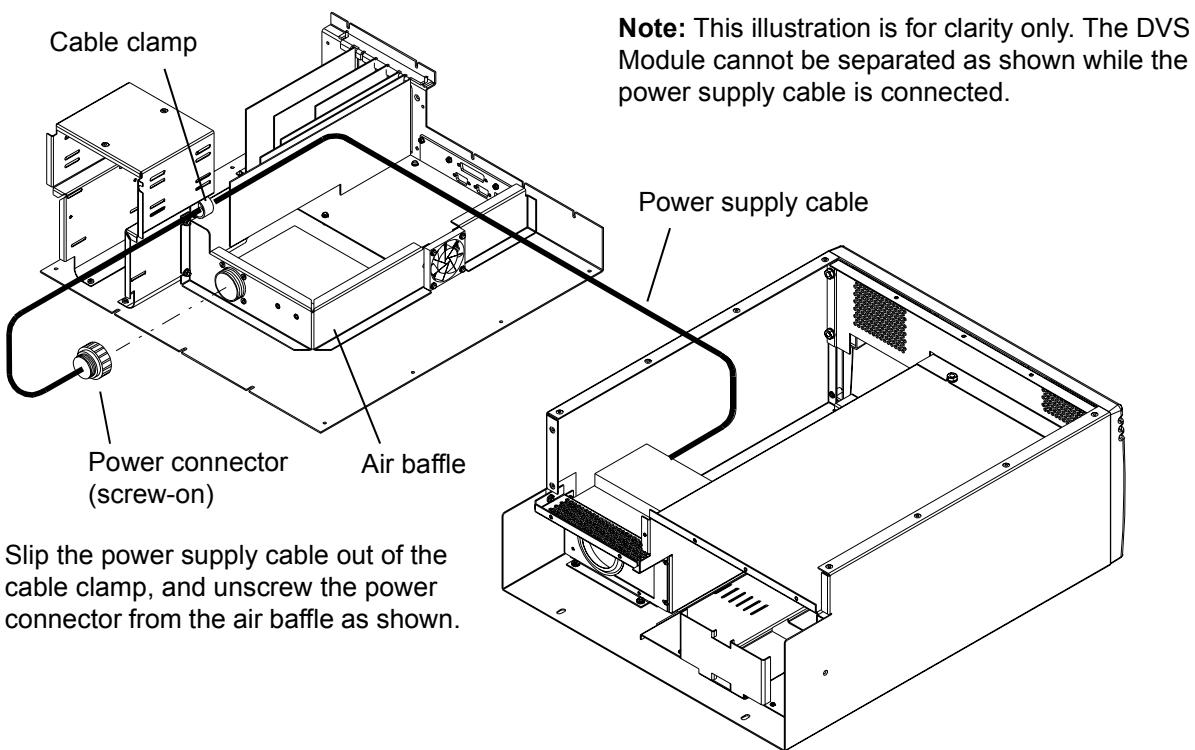
6. Reach under the cover and remove the power supply cable from the cable clamp.
7. Disconnect the cable.
8. Lift the cover off the unit.



**Figure 10-6 DVS Module Cover Removal (1 of 3)**



**Figure 10-7 DVS Module Cover Removal (2 of 3)**



**Figure 10-8 DVS Module Cover Removal (3 of 3)**

## 10-6.2      **Installing the DVS Module Cover**

**To install DVS Module cover:**

1. To connect the power supply cable, place the cover on the unit lifted and rotated as shown in [Figure 10-7](#).
2. Reach under the cover, connect the power supply cable, and secure the cable in the clamp.
3. Place the cover on the unit.
4. Loosely install the screw to the right of the handle on the rear of the unit.
5. Loosely install the four screws on the top corners of the unit.
6. Position the unit so you can access the screws on the bottom.
7. Install the two flathead screws into the drive assembly.
8. Position the unit so you can access the screws on the top and rear.
9. Install the remaining panhead screws.
10. Tighten all screws.

# 11 Cabling

## 11-1 System Cabling and Connectors

### 11-1.1 Centerplane and PCB Layout

Figure 11-1 shows the numbering pattern of centerplane and PCB connectors. Also shown is the general layout of PCBs, the general locations of test points, LEDs, reset and interrupt switches, and a phone jack on modules so configured. Not all modules have all of these card edge features, and a few may have a different layout.

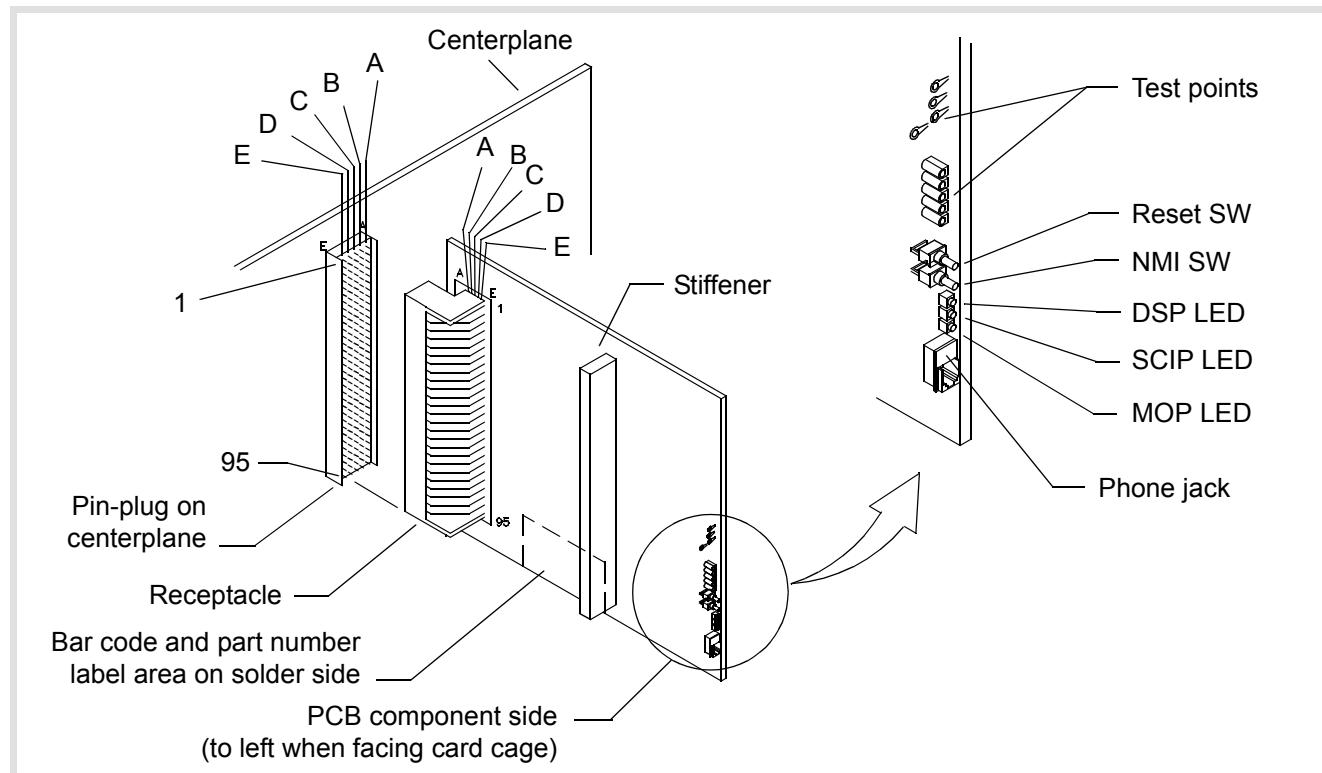
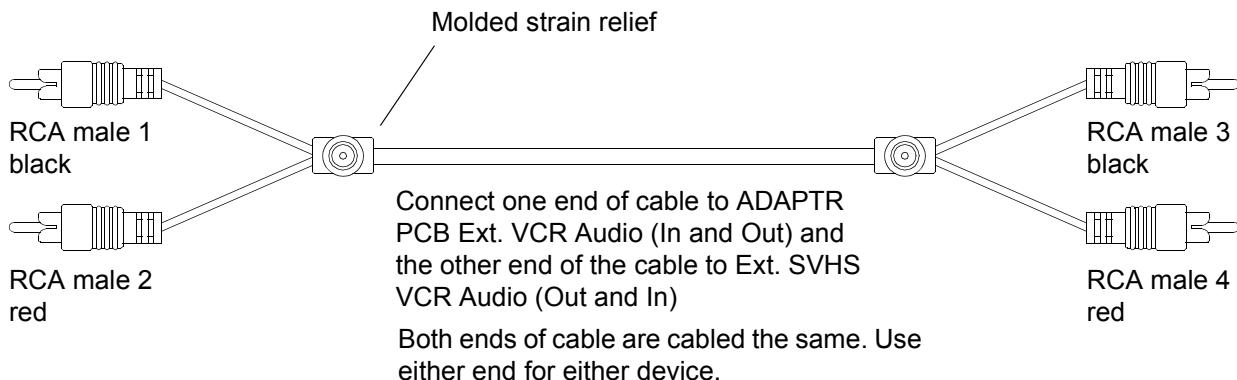


Figure 11-1 Centerplane Connector and Card Edge Features

### 11-1.2 Signal Cables

System and OEM (internal and external) signal cables are illustrated in Figure 11-2 through Figure 11-25. Pinout information for these cables are provided in Table 11-1 through Table 11-23.

2275-0267-XX



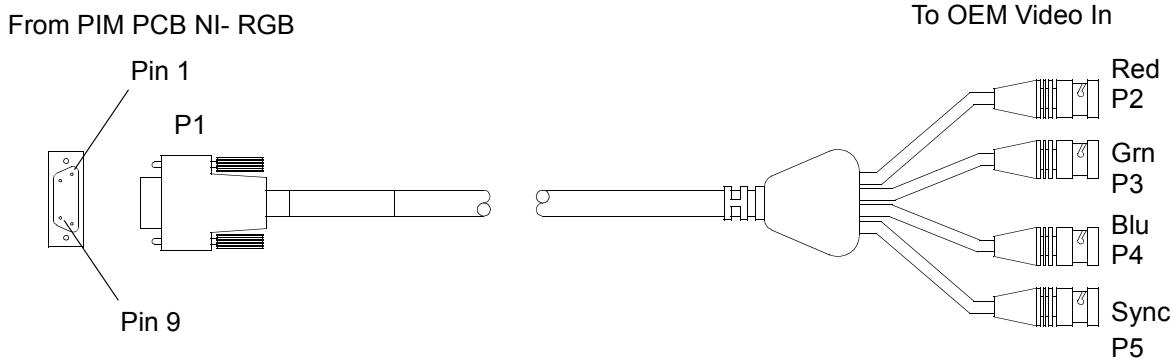
*See Table 11-1*

**Figure 11-2 RCA-RCA, Stereo Cable Assembly (P/N 2275-0267-XX)**

**Table 11-1 RCA-RCA, Stereo Cable Assembly (P/N 2275-0267-XX)**

From ADAPTR PCB Audio In/Out	To External VCR Audio Out/In	Function
MALE 1 TIP	MALE 3 TIP	R-AUDIO
MALE 1 RING	MALE 3 RING	R-AUDIO GND
MALE 2 TIP	MALE 4 TIP	L-AUDIO
MALE 2 RING	MALE 4 RING	L-AUDIO GND

2275-0326-XX

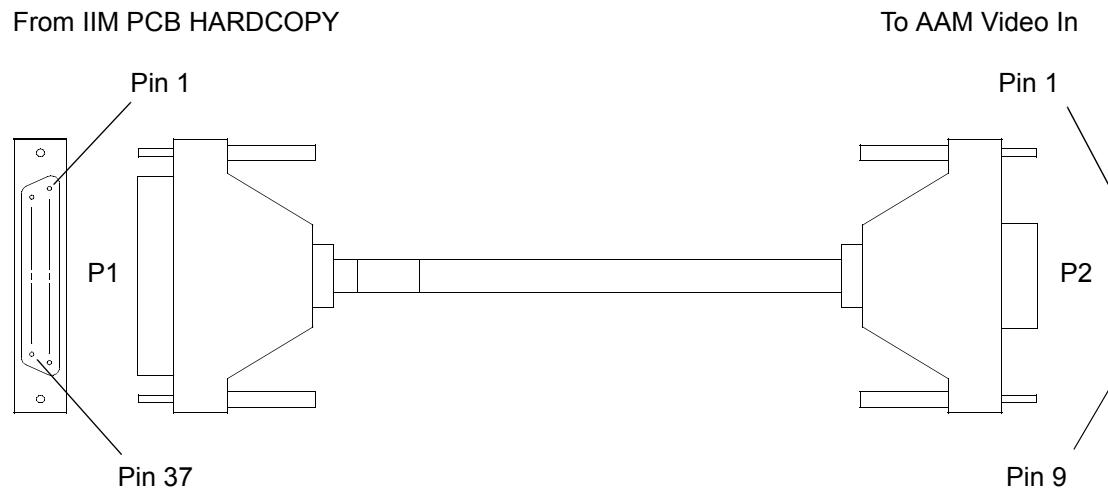


*See Table 11-2*

**Figure 11-3 OEM Cable Assembly, External (P/N 2275-0326-XX)**

**Table 11-2 OEM Cable Assembly, External (P/N 2275-0326-XX)**

From PIM PCB	To OEM Video In Connectors	Function
P1-1	P2 CENTER	RED SIGNAL
P1-6	P2 SHIELD	RED_RETURN
P1-2	P3 CENTER	GREEN SIGNAL
P1-7	P3 SHIELD	GREEN_RETURN
P1-3	P4 CENTER	BLUE SIGNAL
P1-8	P4 SHIELD	BLUE_RETURN
P1-4	P5 CENTER	SYNC SIGNAL
P1-9	P5 SHIELD	SYNC_RETURN

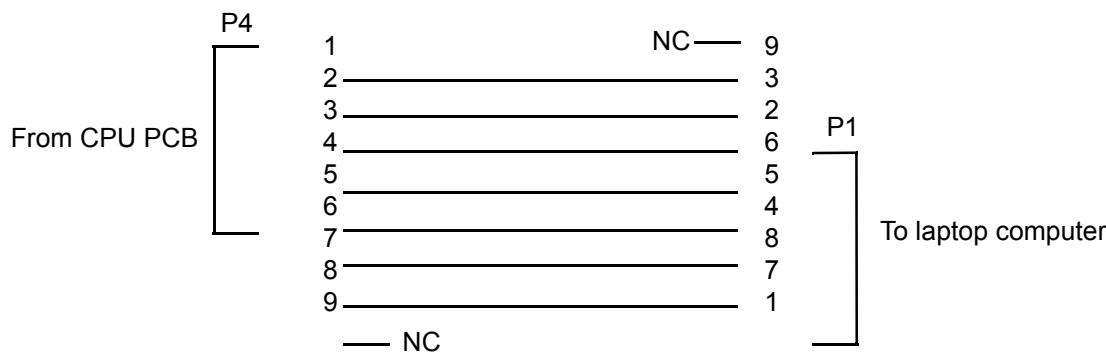


*See Table 11-3*

**Figure 11-4 AAM Video Input Signal Cable Assembly, Internal  
(P/N 2275-0327-XX)**

**Table 11-3 AAM Video Input Signal Cable Assembly, Internal  
(P/N 2275-0327-XX)**

From IIM (HARDCOPY)	To AAM (Video In)	Function
P1-1	P2-5	RED SIGNAL
P1-20	P2-4	RED_RETURN
P1-2	P2-3	GREEN SIGNAL
P1-21	P2-4	GREEN_RETURN
P1-3	P2-1	BLUE SIGNAL
P1-22	P2-2	BLUE_RETURN
P1-4	P2-6	SYNC SIGNAL
P1-23	P2-2	SYNC_RETURN



P4 is the second connector from the top of the CPU PCB (9 pin Dsub, male).

Either end of the cable may be used on the HDI 5000 or the laptop connectors.

The only wires needed for communication between the HDI 5000 and a laptop computer are the TX, RX, and GND wires.

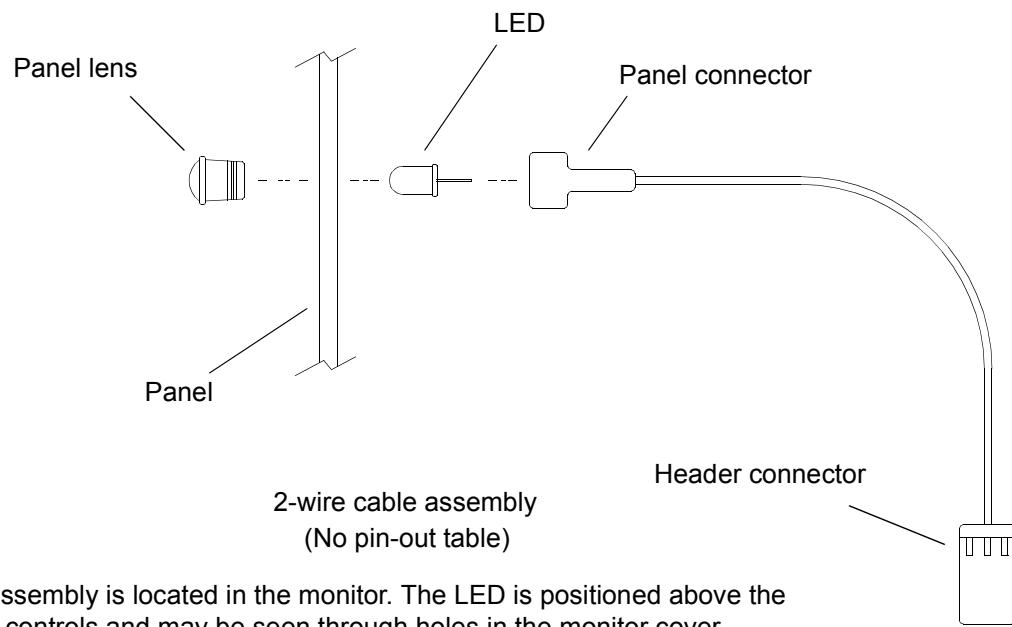
*See Table 11-4*

**Figure 11-5 Serial Data Cable Assembly (P/N 2275-0337-XX)**

**Table 11-4 Serial Data Cable Assembly (P/N 2275-0337-XX)**

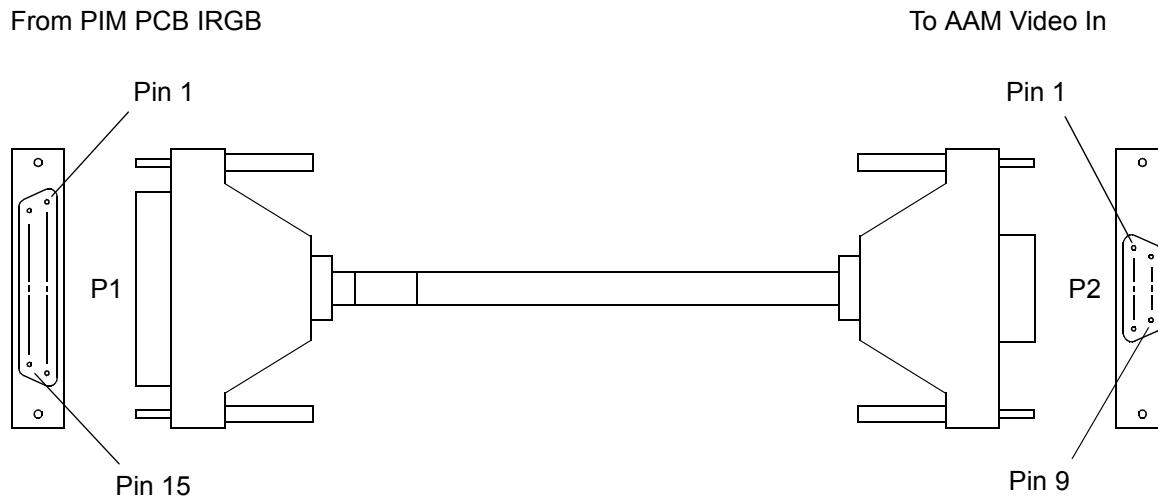
From CPU	To Laptop	Signal Function (P4 on CPU)
P4-1 to P4-6	-	CD
P4-2	P1-3	RX
P4-3	P1-2	TX
P4-4	P1-6 to P1-1	DTR
P4-5	P1-5	GND
P4-6	P1-4	DSRn
P4-7	P1-8	RTS
P4-8	P1-7	CTS
P4-9	-	NO CONNECTION
-	P1-9	

2275-0393-XX



**Figure 11-6 LED Cable Assembly (P/N 2275-0393-XX)**

2275-0394-XX



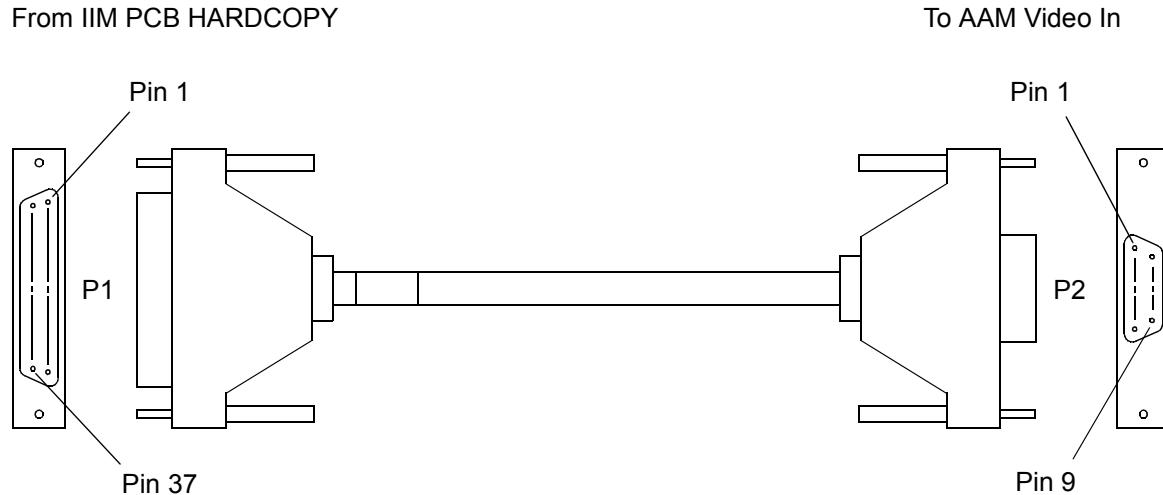
*See Table 11-5*

**Figure 11-7 AAM Input Cable Assembly, External (P/N 2275-0394-XX)**

**Table 11-5 AAM Input Cable Assembly, External (P/N 2275-0394-XX)**

From PIM (IRGB)	To AAM (Video In)	Function
P1-1	P2-5	RED SIGNAL
P1-9	P2-4	RED RETURN
P1-2	P2-3	GREEN SIGNAL
P1-10	P2-4	GREEN RETURN
P1-3	P2-1	BLUE SIGNAL
P1-11	P2-2	BLUE RETURN
P1-4	P2-6	SYNC SIGNAL
P1-12	P2-2	SYNC RETURN

2275-0395-XX

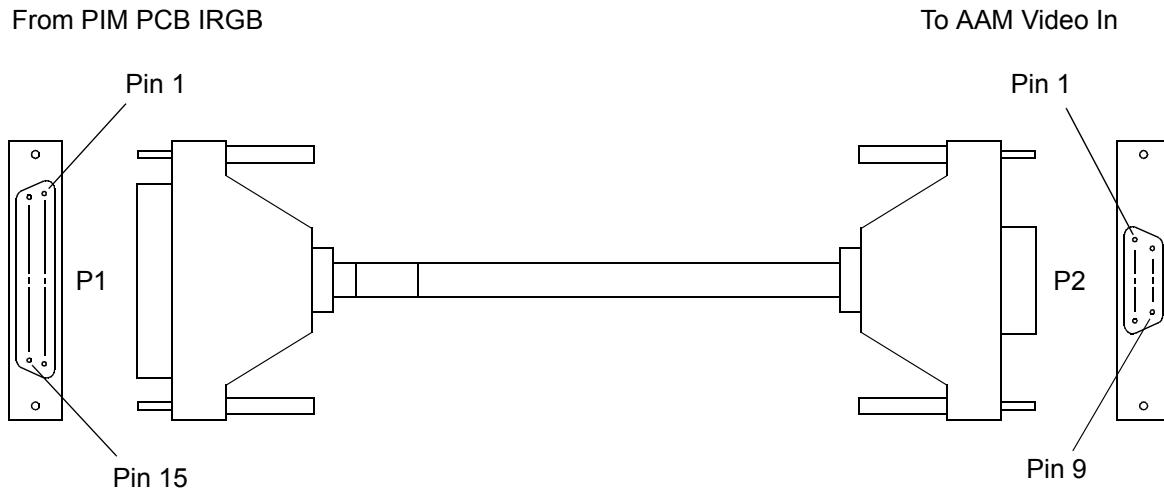


*See Table 11-6*

**Figure 11-8 AAM Output Cable Assembly, Internal (P/N 2275-0395-XX)**

**Table 11-6 AAM Output Cable Assembly, Internal (P/N 2275-0395-XX)**

From IIM (HARDCOPY)	To AAM (Video In)	Function
P1-9	P2-3	Y-SIGNAL
P1-10	P2-8	Y-RETURN
P1-15	P2-4	C-SIGNAL
P1-5	P2-9	C-RETURN



*See Table 11-7*

**Figure 11-9 AAM Output Cable Assembly, External (P/N 2275-0396-XX)**

**Table 11-7 AAM Output Cable Assembly, External (P/N 2275-0396-XX)**

From PIM (IRGB)	To AAM (Video In)	Function
P1-9	P2-3	Y-SIGNAL
P1-10	P2-8	Y-RETURN
P1-15	P2-4	C-SIGNAL
P1-5	P2-9	C-RETURN

3500-1404-XX

See Table 11-8

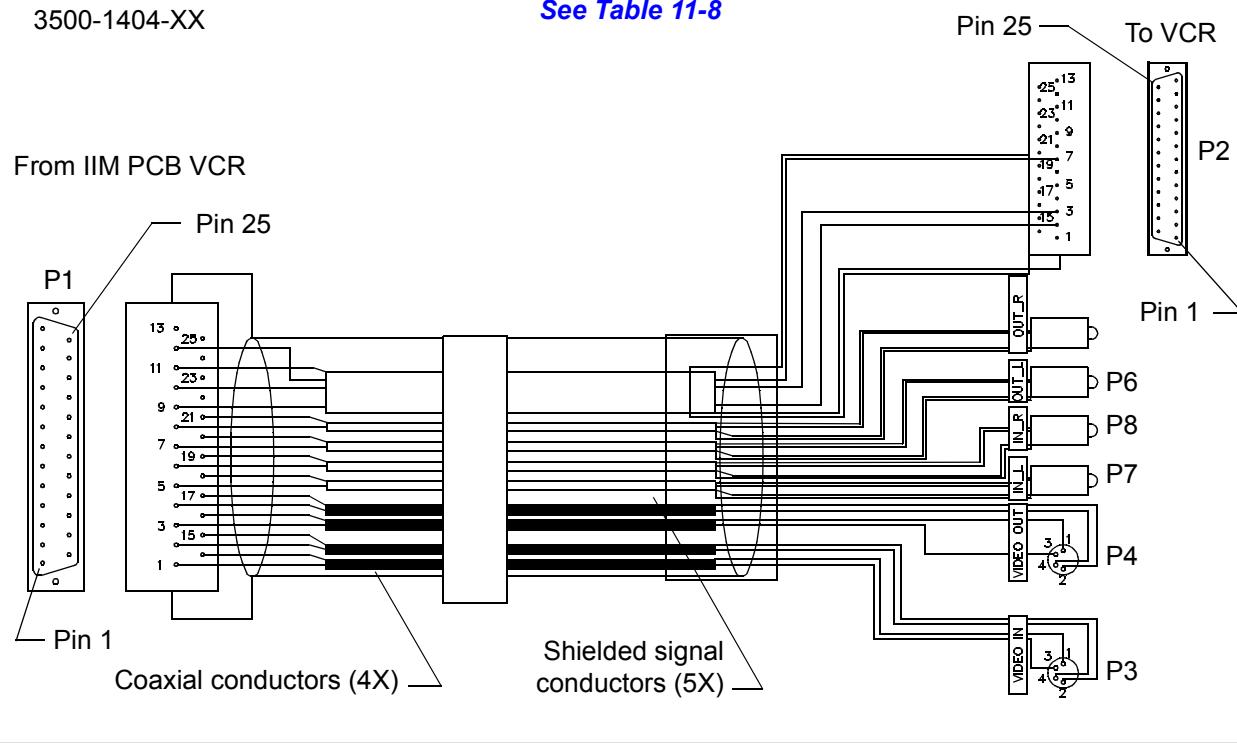


Figure 11-10 VCR Signal Cable Assembly, Internal (P/N 3500-1404-XX)

Table 11-8 VCR Signal Cable Assembly, Internal (P/N 3500-1404-XX)

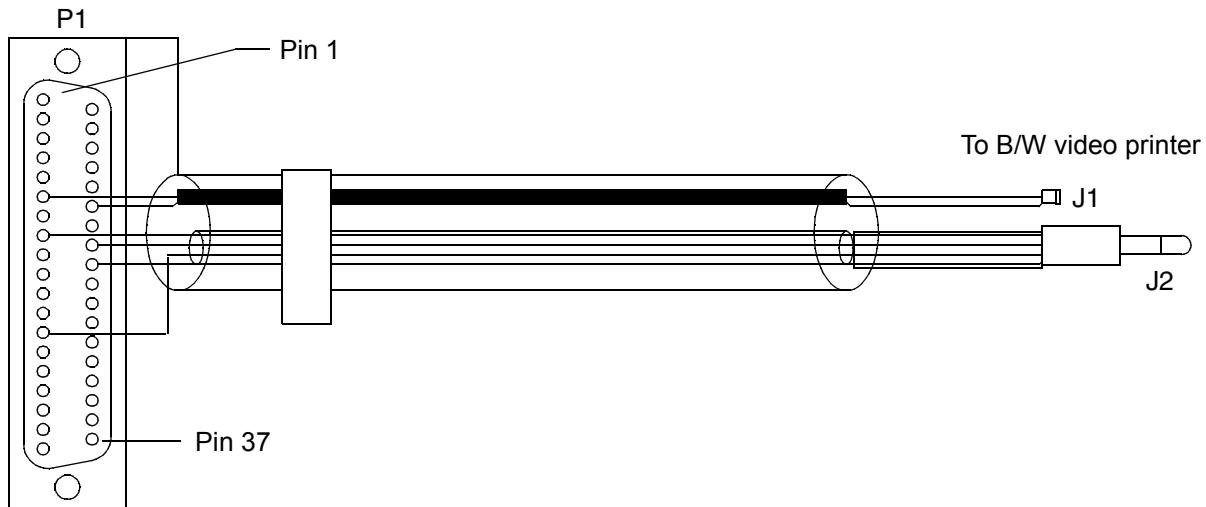
From IIM (VCR)	To VCR	Function
P1-1	P3-3	VCR_IN_Y
P1-14	P3-1 (Shield)	VCR_IN_Y return
P1-2	P3-4	VCR_IN_C
P1-15	P3-2 (Shield)	VCR_IN_C return
P1-9	P2-2	TX
P1-10	P2-3	RX
P1-12	P2-7	Return
P1-11	P2-Shell	Shield
P1-3	P4-3	VCR_OUT_Y
P1-16	P4-1 (Shield)	VCR_OUT_Y return
P1-4	P4-4	VCR_OUT_C
P1-17	P4-2 (Shield)	VCR_OUT_C return
P1-5	P7-Center	IN_L
P1-18	P7-Shield	IN_L_RET
P1-6	P8-Center	IN_R
P1-19	P8-Shield	IN_R_RET

**Table 11-8 VCR Signal Cable Assembly, Internal (P/N 3500-1404-XX)**

<b>From IIM (VCR)</b>	<b>To VCR</b>	<b>Function</b>
P1-7	P6-Center	OUT_L
P1-20	P6-Shield	OUT_L_RET
P1-8	P5-Center	OUT_R
P1-21	P5-Shield	OUT_R_RET

3500-1540-XX

From IIM PCB HARDCOPY

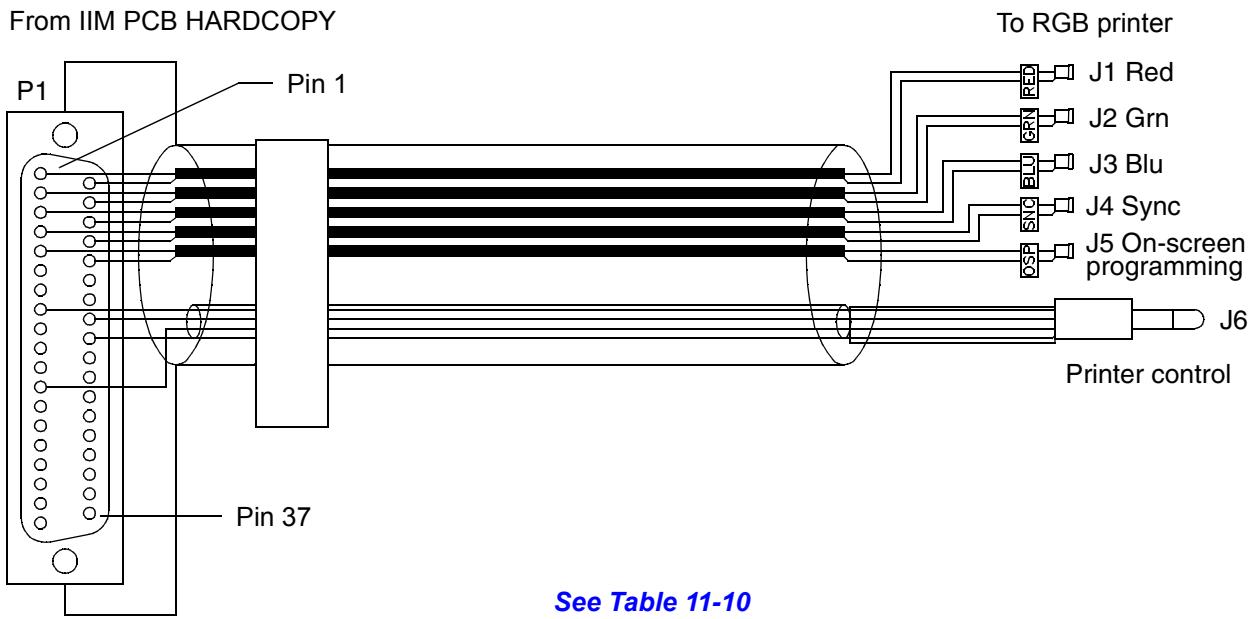


*See Table 11-9*

**Figure 11-11 B/W Video Printer Signal Cable Assembly, Internal (P/N 3500-1540-XX)**

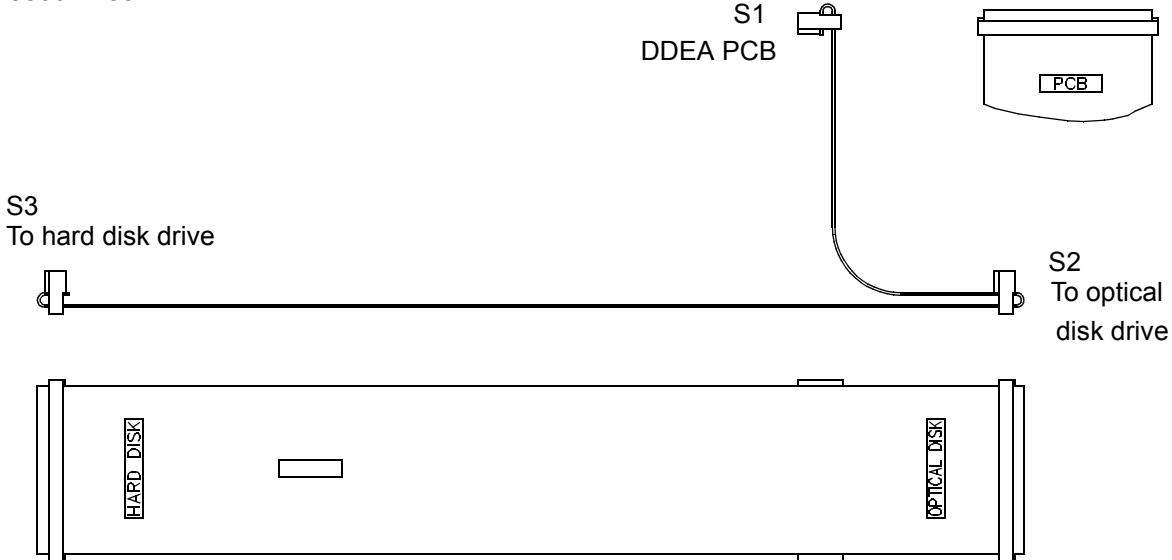
**Table 11-9 B/W Video Printer Signal Cable Assembly, Internal (P/N 3500-1540-XX)**

From IIM (HARDCOPY)	To B/W Video Printer	Function
P1-6	J1 Center	VIDEO
P1-25	J1 Shield	VIDEO_RETURN
P1-8	J2 Tip	PRINT
P1-13	J2 Ring	READY
P1-27	J2 Housing	RETURN
P1-28	J2 Shell	(Drain wire)

**Figure 11-12 RGB Printer Signal Cable Assembly, Internal (P/N 3500-1541-XX)****Table 11-10 RGB Printer Signal Cable Assembly, Internal (P/N 3500-1541-XX)**

From IIM (HARDCOPY)	To RGB Printer	Function
P1-1	J1 Center	RED (R)
P1-20	J1 Shield	RED_RETURN
P1-2	J2 Center	GRN (G)
P1-21	J2 Shield	GRN_RETURN
P1-3	J3 Center	BLU (B)
P1-22	J3 Shield	BLUE_RETURN
P1-4	J4 Center	SNC (Sync)
P1-23	J4 Shield	SNC_RETURN
P1-5	J5 Center	OSP (VIDEO OUT)
P1-24	J5 Shield	OSP_RETURN (VIDEO OUT RETURN)
P1-8	J6 Tip	-
P1-12	J6 Ring	-
P1-27	J6 Housing	-
P1-28	Shield (Drain)	(Shield connected to housing at J6)

3500-1483-XX



*See Table 11-11*

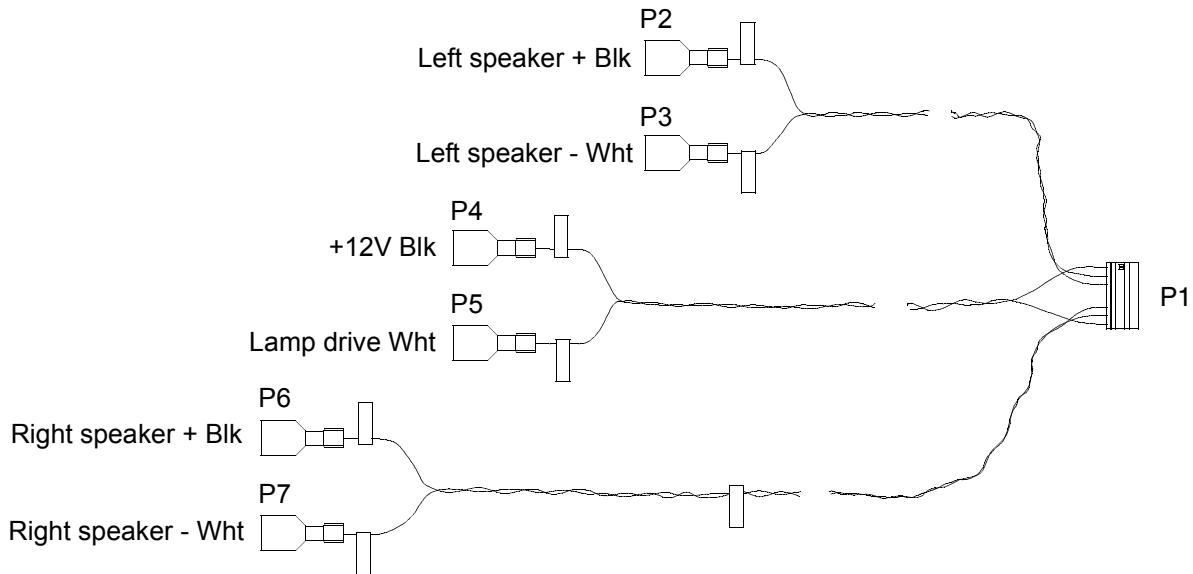
All wires have corresponding pins on both plugs.

**Figure 11-13 Disk Drive Signal Cable Assy (P/N 3500-1483-XX)**

**Table 11-11 Disk Drive Signal Cable Assembly (P/N 3500-1483-XX)**

From DDEA	To Optical Drive	To Hard Drive
S1-1	S2-1	S3-1
S1-2	S2-2	S3-2
S1-3	S2-3	S3-3
S1-X	S2-X	S3-X
S1-49	S2-49	S3-49
S1-50	S2-50	S3-50

3500-2614-XX



*See Figure 11-14*

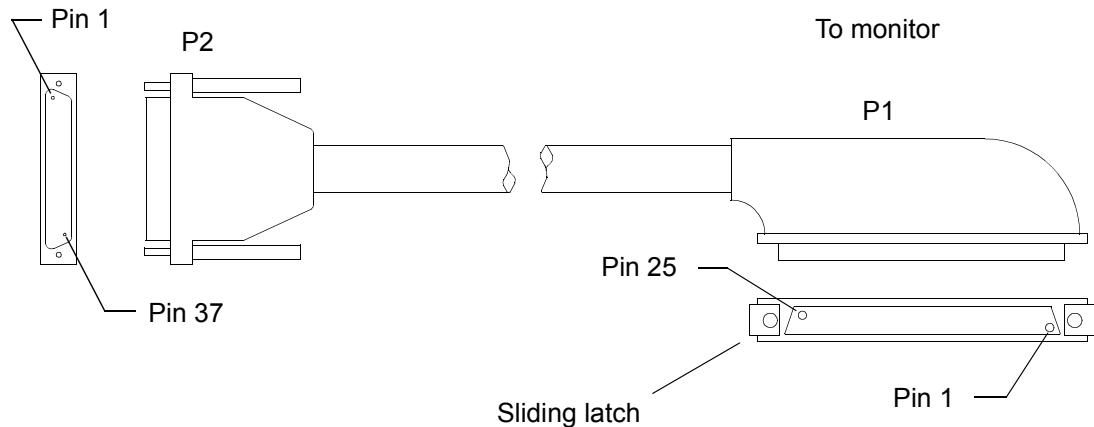
**Figure 11-14 Monitor Lower Bezel Cable Assembly (P/N 3500-2614-XX)**

**Table 11-12 Monitor Lower Bezel Cable Assembly (P/N 3500-2614-XX)**

P1	P2	P3	P4	P5	P6	P7	Function
1	-	-	1	-	-	-	+12V (black)
2	1	-	-	-	-	-	Left Speaker+ (black)
3	-	1	-	-	-	-	Left Speaker- (white)
4	-	-	-	-	-	-	Ground (not used)
5	-	-	-	-	1	-	Right Speaker+ (black)
6	-	-	-	-	-	1	Right Speaker- (white)
7	-	-	-	1	-	-	Lamp Drive (white)

3500-2633-XX

From IIM PCB MONITOR

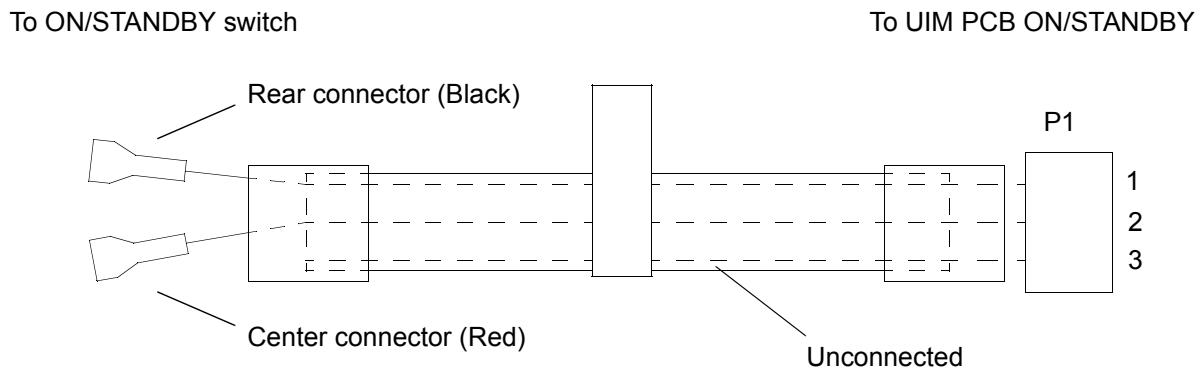


*See Table 11-13*

**Figure 11-15 Monitor Signal Cable Assembly (P/N 3500-2633-XX)**

**Table 11-13 Monitor Signal Cable Assembly (P/N 3500-2633-XX)**

From IIM (MONITOR)	To Monitor	Function
P2-1	P1-10	GND
P2-20	P1-9	L_SPKR
P2-2	P1-22	GND
P2-21	P1-21	R_SPKR
P2-14	-	AUDIO SHIELD
P2-11	P1-11	MICR+
P2-30	P1-13	MICR-
P2-12	P1-12	MICR_SHIELD
P2-33	P1-17	CSYNC_INTMON
P2-15	P1-4	GND
P2-17	P1-16	BLUE_INTMON
P2-35	P1-3	BLUE_INTMON_REF
P2-18	P1-15	GREEN_INTMON
P2-36	P1-2	GREEN_INTMON_REF
P2-19	P1-14	RED_INTMON
P2-37	P1-1	RED_INTMON_REF



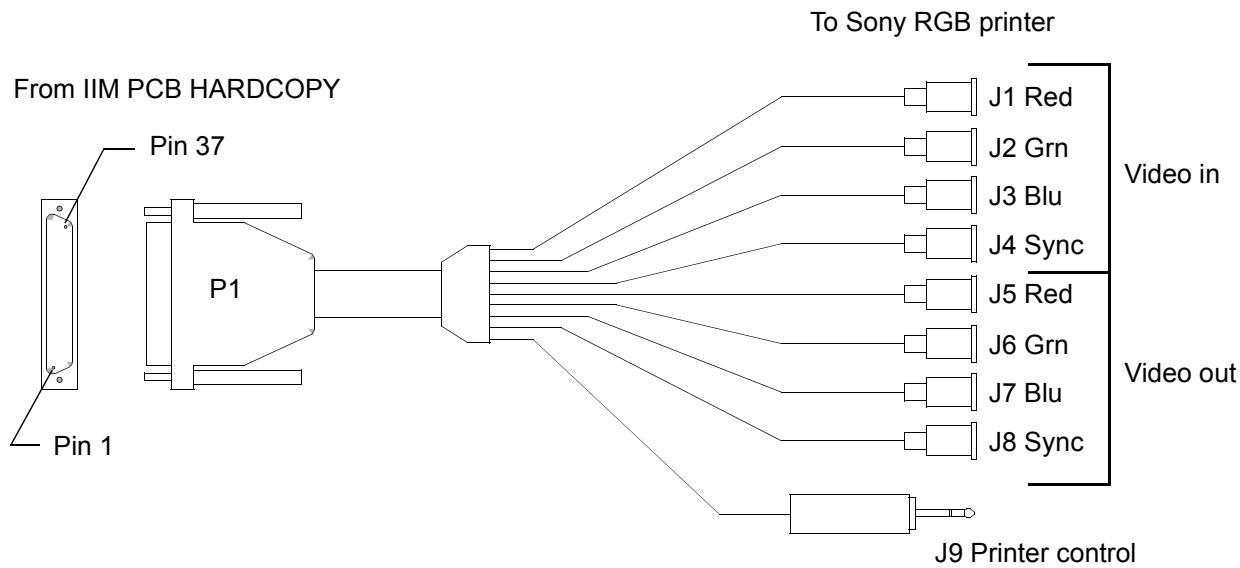
*See Table 11-14*

**Figure 11-16 On/Standby Switch Cable Assembly (P/N 3500-2639-XX)**

**Table 11-14 On/Standby Switch Cable Assy (P/N 3500-2639-XX)**

From UIM PCB	To ON/STANDBY Switch Spade Lugs	Function
P1-1	Spade Lug (Black wire)	GROUND
P1-2	Spade Lug (Red wire)	IIM_P2-8
P1-3	Drain - No Connection (Gnd)	GROUND

3500-2641-XX



*See Table 11-15*

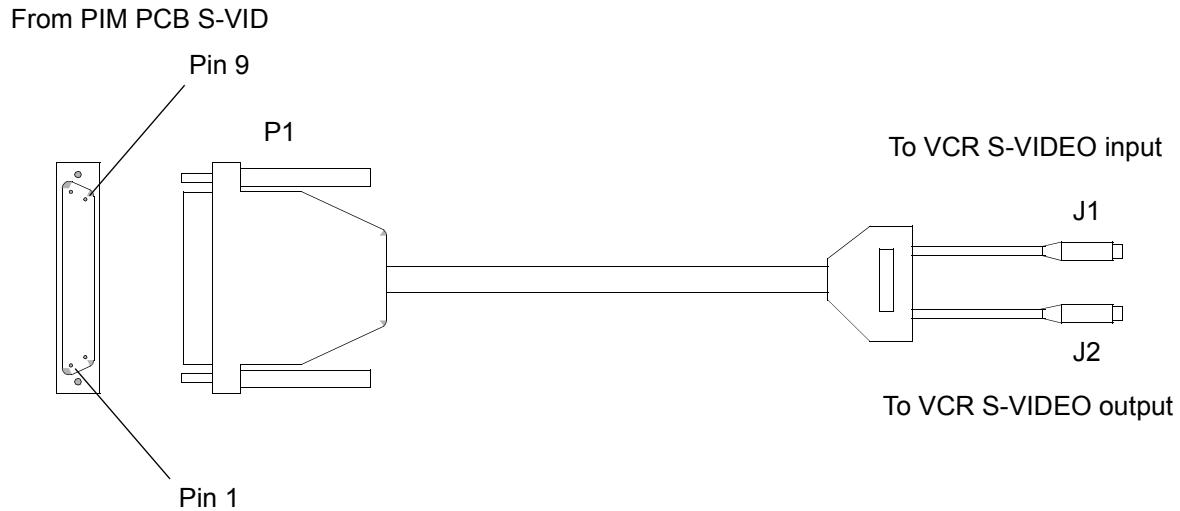
**Figure 11-17 Sony RGB Printer Cable Assembly (P/N 3500-2641-XX)**

**Table 11-15 Sony RGB Printer Cable Assembly (P/N 3500-2641-XX)**

From IIM HARDCOPY	To Coax Connectors	Function
P1-1	J1 Center	PIM_RED_INTHRDCPY
P1-20	J1 Shield	RED_OUT_RETURN
P1-2	J2 Center	PIM_GRN_INTHRDCPY
P1-21	J2 Shield	GRN_OUT_RETURN
P1-3	J3 Center	PIM_BLUE_INTHRDCPY
P1-22	J3 Shield	BLUE_OUT_RETURN
P1-4	J4 Center	PIM_CSYNC_INTHRDCPY
P1-23	J4 Shield	CSYNC_OUT_RETURN
P1-14	J5 Center	INTHRDCPY_RED_PIM
P1-25	J5 Shield	RED_IN_RETURN
P1-15	J6 Center	INTHRDCPY_GRN_PIM
P1-26	J6 Shield	GRN_IN_RETURN
P1-16	J7 Center	INTHRDCPY_BLUE_PIM
P1-27	J7 Shield	BLUE_OUT_RETURN
P1-17	J8 Center	INTHRDCPY_CSYNC_PIM
P1-28	J8 Shield	CSYNC_IN_RETURN

**Table 11-15 Sony RGB Printer Cable Assembly (P/N 3500-2641-XX)**

<b>From IIM HARDCOPY</b>	<b>To Coax Connectors</b>	<b>Function</b>
P1-8	J9 Tip	PIM_CNTRL_0_INTHRDCPY
P1-12	J9 Ring	INTHRDCPY_STATUS_0_PIM
P1-29	J9 Housing	GROUND
P1-30	J9 Housing	SHIELD

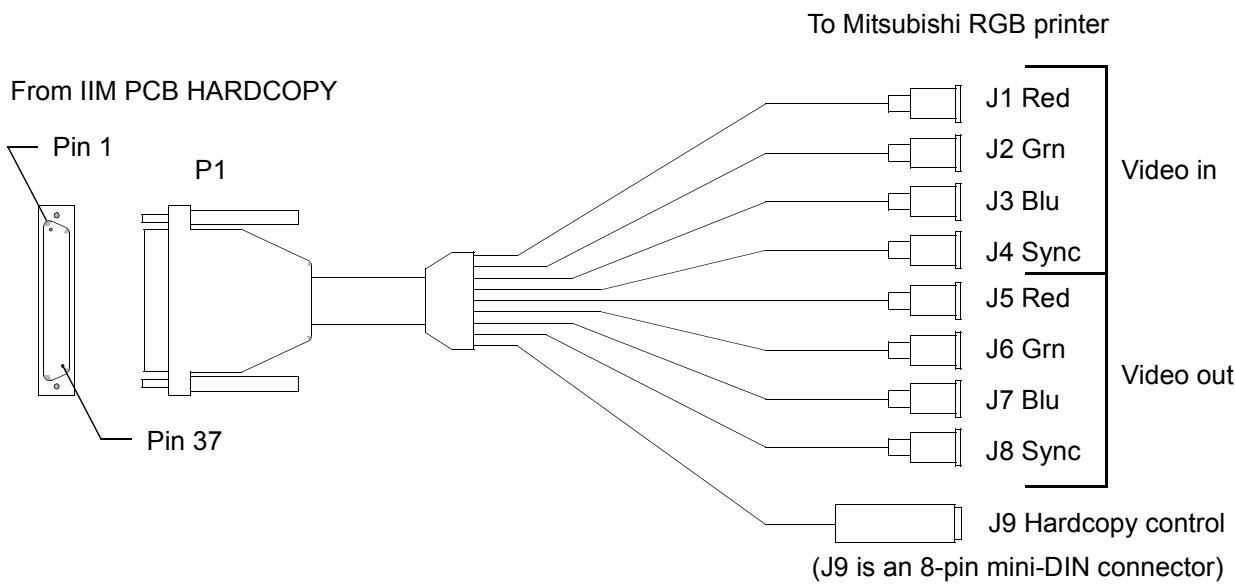


*See Table 11-16*

**Figure 11-18 SVHS VCR Cable Assembly, External (P/N 3500-2642-XX)**

**Table 11-16 SVHS VCR Cable Assembly, External (P/N 3500-2642-XX)**

From PIM SVID	To J1/J2	Function
P1-1	J1-3	PIM_LUMA_EXTVCR
P1-5	J1-1	PIM_LUMA_EXTVCR_RETURN
P1-2	J1-4	PIM_CHROMA_EXTVCR
P1-6	J1-2	PIM_CHROMA_EXTVCR_RETURN
P1-3	J2-3	EXTVCR_LUMA_PIM
P1-7	J2-1	EXTVCR_LUMA_PIM_RETURN
P1-4	J2-4	EXTVCR_CHROMA_PIM
P1-8	J2-2	EXTVCR_CHROMA_PIM_RETURN



*See Table 11-17*

**Figure 11-19 Mitsubishi RGB Printer Cable Assembly (P/N 3500-2643-XX)**

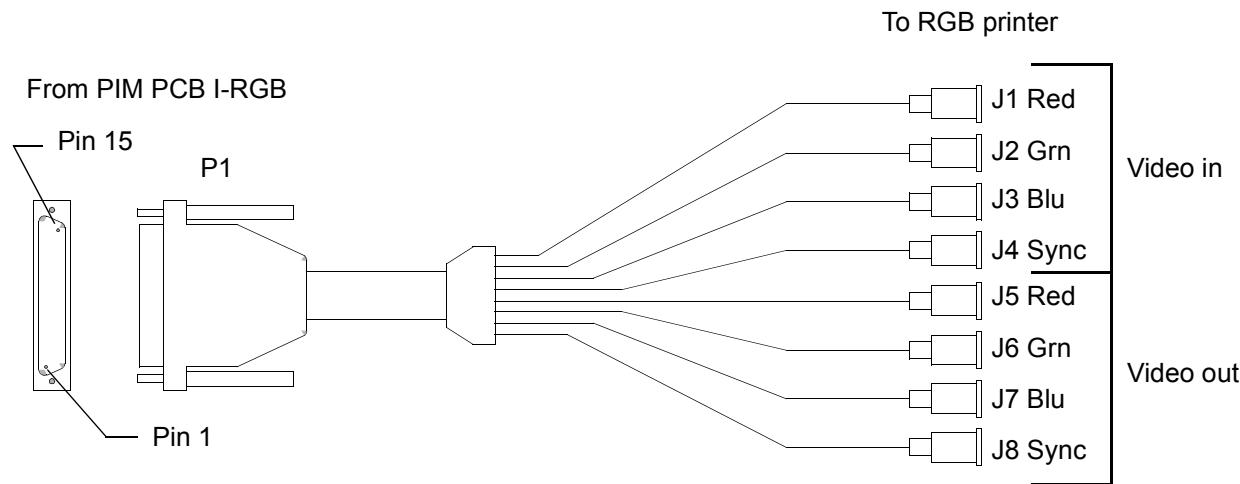
**Table 11-17 Mitsubishi RGB Printer Cable Assembly (P/N 3500-2643-XX)**

From IIM HARDCOPY	To Coax Connectors	Function
P1-1	J1 Center	PIM_RED_INTHRDCPY
P1-20	J1 Shield	RED_OUT_RETURN
P1-2	J2 Center	PIM_GRN_INTHRDCPY
P1-21	J2 Shield	GRN_OUT_RETURN
P1-3	J3 Center	PIM_BLUE_INTHRDCPY
P1-22	J3 Shield	BLUE_OUT_RETURN
P1-4	J4 Center	PIM_CSYNC_INTHRDCPY
P1-23	J4 Shield	CSYNC_OUT_RETURN
P1-14	J5 Center	INTHRDCPY_RED_PIM
P1-25	J5 Shield	RED_IN_RETURN
P1-15	J6 Center	INTHRDCPY_GRN_PIM
P1-26	J6 Shield	GRN_IN_RETURN
P1-16	J7 Center	INTHRDCPY_BLUE_PIM
P1-27	J7 Shield	BLUE_OUT_RETURN
P1-17	J8 Center	INTHRDCPY_CSYNC_PIM
P1-28	J8 Shield	CSYNC_IN_RETURN
P1-8	J9-5	PIM_CNTRL0_HRDCPY

**Table 11-17 Mitsubishi RGB Printer Cable Assembly (P/N 3500-2643-XX)**

From IIM HARDCOPY	To Coax Connectors	Function
P1-9	J9-2	PIM_CNTRL1_HRDCPY
P1-12	J9-4	HRDCPY_STATUS0_PIM
P1-29	J9 Shield	SHIELD

3500-2644-XX



*See Table 11-18*

**Figure 11-20 RGB Printer Cable Assembly, External (P/N 3500-2644-XX)**

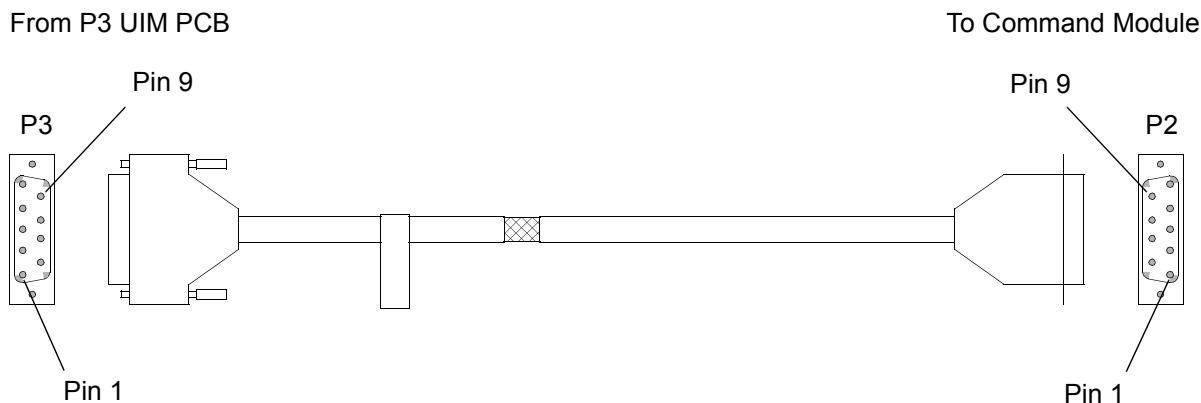
**Table 11-18 RGB Printer Cable Assembly, External (P/N 3500-2644-XX)**

From PIM IRGB	To Coax Connectors	Function
P1-1	J1 Center	PIM_RED_EXTHRDCPY
P1-9	J1 Shield	RED_OUT_RETURN
P1-2	J2 Center	PIM_GRN_EXTHRDCPY
P1-10	J2 Shield	GRN_OUT_RETURN
P1-3	J3 Center	PIM_BLUE_EXTHRDCPY
P1-11	J3 Shield	BLUE_OUT_RETURN
P1-4	J4 Center	PIM_CSYNC_EXTHRDCPY
P1-12	J4 Shield	CSYNC_OUT_RETURN
P1-8	J5 Center	EXTHRDCPY_RED_PIM
P1-13	J5 Shield	RED_IN_RETURN
P1-7	J6 Center	EXTHRDCPY_GRN_PIM

**Table 11-18 RGB Printer Cable Assembly, External (P/N 3500-2644-XX)**

From PIM IRGB	To Coax Connectors	Function
P1-14	J6 Shield	GRN_IN_RETURN
P1-6	J7 Center	EXTHRDCPY_BLUE_PIM
P1-15	J7 Shield	BLUE_OUT_RETURN
P1-5	J8 Center	EXTHRDCPY_CSYNC_PIM
P1-15	J8 Shield	CSYNC_IN_RETURN

3500-2741-XX

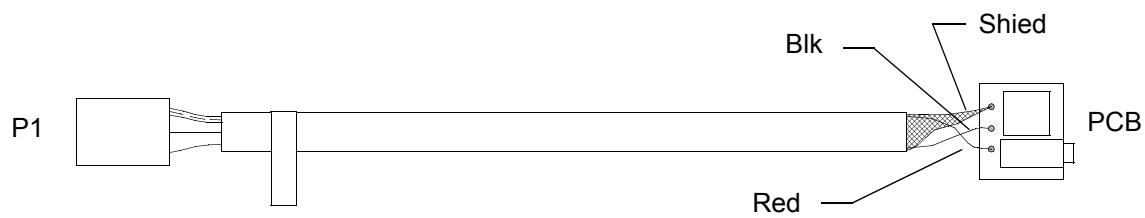


*See Table 11-19*

**Figure 11-21 Remote Control Port Cable Assembly (P/N 3500-2741-XX)**

**Table 11-19 Remote Control Port Cable Assembly (P/N 3500-2741-XX)**

From P3 UIM	To P2 Command Module	Function
P3-9	P2-9	+5 VOLT
P3-8	P2-8	+5 VOLT
P3-7	P2-7	GROUND
P3-6	P2-6	GROUND
P3-5	P2-5	GROUND (Not used)
P3-4	P2-4	RMOTE_DATA_UIF
P3-3	P2-3	PIM_CLOCK_UIF
P3-2	P2-2	PIM_STROBE_UIF
P3-1	P2-1	UIF_DATA_RMOTe

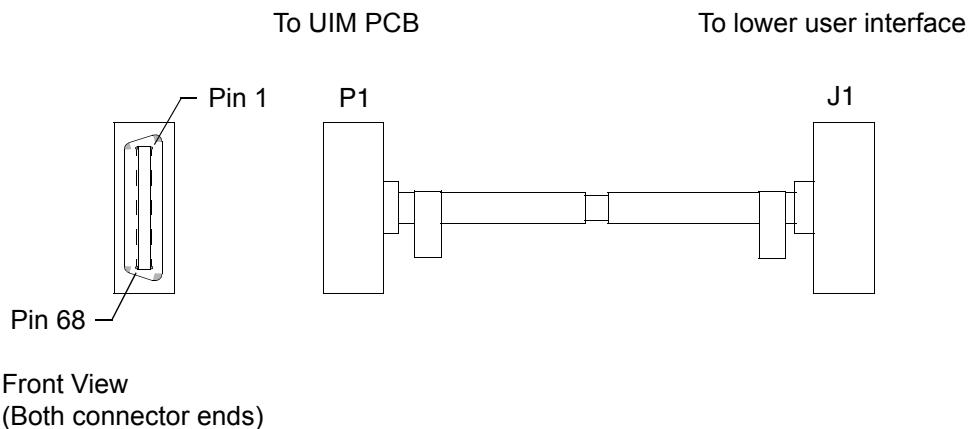


*See Table 11-20*

**Figure 11-22 Microphone Internal Monitor Cable Assembly (P/N 3500-2752-XX)**

**Table 11-20 Microphone Internal Monitor Cable Assembly (P/N 3500-2752-XX)**

From P1	To PCB	Function
P1-3	RED	MIC+
P1-2	BLACK	MIC-
P1-1	SHIELD	SHIELD



*See Table 11-21*

**Figure 11-23 UIM to Lower User Interface Cable Assembly (P/N 3500-2770-XX)**

**Table 11-21 UIM to Lower User Interface Cable Assembly (P/N 3500-2770-XX)**

From P1 UIM PCB	To J1 Lower UIF	Function
P1-1	J1-1	L_SENSE_12
P1-2	J1-2	L_SENSE_11
P1-3	J1-3	L_SENSE_09
P1-4	J1-4	L_SENSE_04
P1-5	J1-5	L_SENSE_07
P1-6	J1-6	L_SENSE_06
P1-7	J1-7	L_SENSE_00
P1-8	J1-8	L_SENSE_01
P1-9	J1-9	L_SENSE_03
P1-10	J1-10	TB_YA
P1-11	J1-11	TB_XB
P1-12	J1-12	TB_XA
P1-13	J1-13	L_LED_1
P1-14	J1-14	L_SENSE_15
P1-15	J1-15	L_SCAN_5
P1-16	J1-16	L_SCAN_3

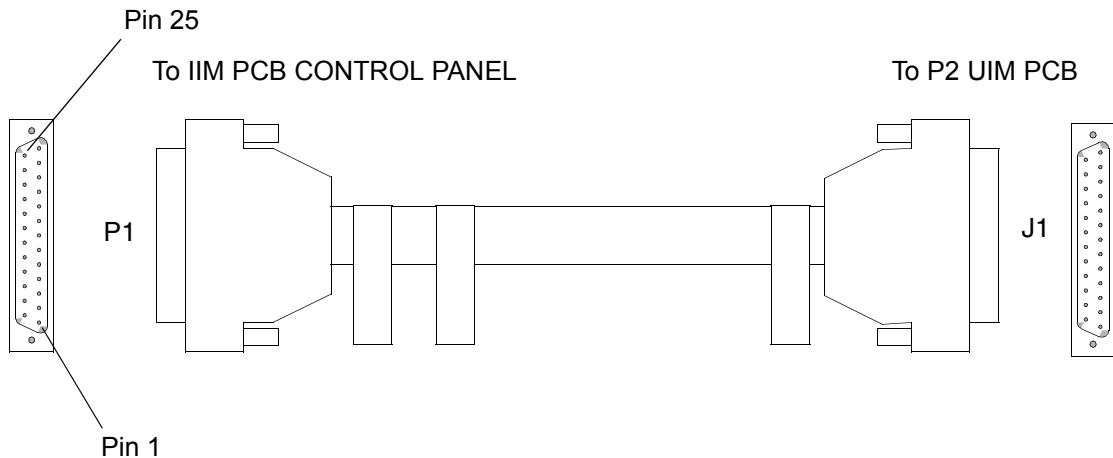
**Table 11-21 UIM to Lower User Interface Cable Assembly (P/N 3500-2770-XX)**

From P1 UIM PCB	To J1 Lower UIF	Function
P1-17	J1-17	L_SCAN_0
P1-18	J1-18	L_SCAN_2
P1-19	J1-19	L_SCAN_6
P1-20	J1-20	L_SENSE_14
P1-21	J1-21	L_LED_2
P1-22	J1-22	DA_4
P1-23	J1-23	DA_5
P1-24	J1-24	DCS1n
P1-25	J1-25	DCS2n
P1-26	J1-26	DCS4n
P1-27	J1-27	AND_CLK
P1-28	J1-28	DD_1
P1-29	J1-29	DD_2
P1-30	J1-30	DD_4
P1-31	J1-31	DD_5
P1-32	J1-32	DA_0
P1-33	J1-33	DD_7
P1-34	J1-34	DA_1
P1-35	J1-35	L_SENSE_10
P1-36	J1-36	GROUND
P1-37	J1-37	L_SENSE_08
P1-38	J1-38	GROUND
P1-39	J1-39	L_SENSE_05
P1-40	J1-40	GROUND
P1-41	J1-41	L_SENSE_02
P1-42	J1-42	GROUND
P1-43	J1-43	TB_YB
P1-44	J1-44	-12 VOLT
P1-45	J1-45	L_LED_3
P1-46	J1-46	-12 VOLT
P1-47	J1-47	L_SENSE_13
P1-48	J1-48	L_SCAN_7
P1-49	J1-49	L_SCAN_1
P1-50	J1-50	+5 VOLT
P1-51	J1-51	L_SCAN_4

**Table 11-21 UIM to Lower User Interface Cable Assembly (P/N 3500-2770-XX)**

<b>From P1 UIM PCB</b>	<b>To J1 Lower UIF</b>	<b>Function</b>
P1-52	J1-52	+5 VOLT
P1-53	J1-53	L_LED_8
P1-54	J1-54	+5 VOLT
P1-55	J1-55	DA_3
P1-56	J1-56	+5 VOLT
P1-57	J1-57	DCS0n
P1-58	J1-58	+5 VOLT
P1-59	J1-59	DCS3n
P1-60	J1-60	+5 VOLT
P1-61	J1-61	DD_0
P1-62	J1-62	GROUND
P1-63	J1-63	DD_3
P1-64	J1-64	GROUND
P1-65	J1-65	DD_6
P1-66	J1-66	GROUND
P1-67	J1-67	DA_2
P1-68	J1-68	GROUND

3500-2771-XX



*See Table 11-22*

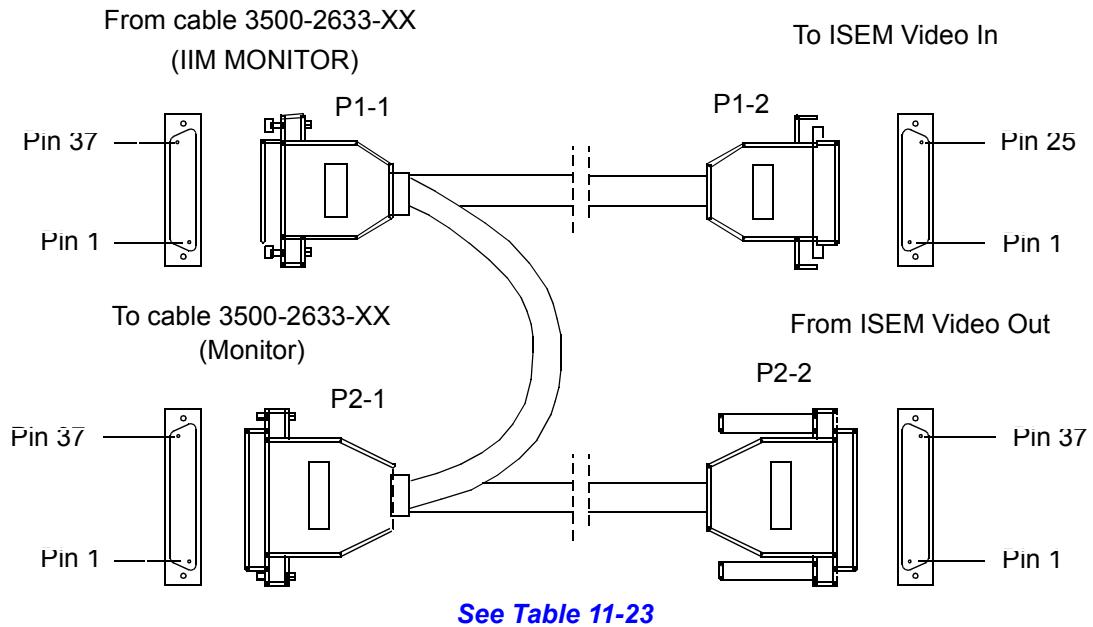
**Figure 11-24 IIM to UIM Cable Assembly (P/N 3500-2771-XX)**

**Table 11-22 IIM to UIM Cable Assembly (P/N 3500-2771-XX)**

To IIM PCB CONTROL PANEL	To P2 UIM PCB	Function
P1-1	J1-1	+5 VOLT
P1-2	J1-2	+5 VOLT
P1-3	J1-3	+5 VOLT
P1-4	J1-4	+5 VOLT
P1-5	J1-5	+12 VOLT
P1-6	J1-6	-12 VOLT
P1-7	J1-7	No Connection
P1-8	J1-8	ON/STANDBY SWITCH-2
P1-9	J1-9	No Connection
P1-10	J1-10	No Connection
P1-11	J1-11	GROUND
P1-12	J1-12	PIM_CLOCK_UIF
P1-13	J1-13	PIM_DATA_UIF
P1-14	J1-14	GROUND
P1-15	J1-15	GROUND
P1-16	J1-16	GROUND

**Table 11-22 IIM to UIM Cable Assembly (P/N 3500-2771-XX)**

To IIM PCB CONTROL PANEL	To P2 UIM PCB	Function
P1-17	J1-17	GROUND
P1-18	J1-18	GROUND
P1-19	J1-19	GROUND
P1-20	J1-20	SPEAKER LS1
P1-21	J1-21	GROUND
P1-22	J1-22	No Connection
P1-23	J1-23	No Connection
P1-24	J1-24	PIM_STROBE_UIF
P1-25	J1-25	UIF_DATA_PIM

**Figure 11-25 ISEM Adapter Cable Assembly (P/N 3500-2772-XX)****Table 11-23 ISEM Adapter Cable Assembly (P/N 3500-2772-XX)**

From P1-1 IIM MONITOR	To P1-2 ISEM Video In	Function
14	14	RED_VIDEO
1	1	RED_RETURN
15	15	GREEN_VIDEO
2	2	GREEN_RETURN
16	16	BLUE_VIDEO
3	3	BLUE_RETURN
17	17	COMPOSITE_SYNC
4	4	SYNC_RETURN
21	21	RIGHT_SPEAKER+
22	22	RIGHT_SPEAKER-
9	9	LEFT_SPEAKER+
10	10	LEFT_SPEAKER-
4	4	GROUND
11	11	UPHONE+
13	13	UPHONE-
12	12	UPHONE_SHIELD

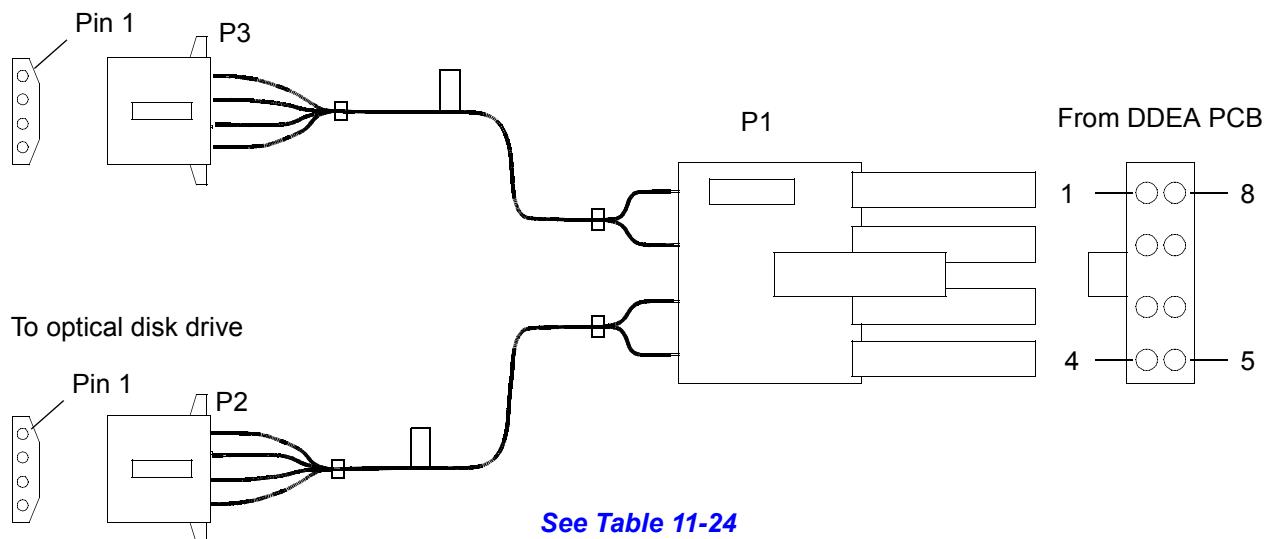
**Table 11-23 ISEM Adapter Cable Assembly (P/N 3500-2772-XX)**

From P2-1 Monitor	To P2-2 ISEM Video Out	Function
19	19	RED_VIDEO
37	37	RED_RETURN
18	18	GREEN_VIDEO
36	36	GREEN_RETURN
17	17	BLUE_VIDEO
35	35	BLUE_RETURN
33	33	COMPOSITE_SYNC
15	15	SYNC_RETURN
21	21	RIGHT_SPEAKER+
2	2	RIGHT_SPEAKER-
20	20	LEFT_SPEAKER+
1	1	LEFT_SPEAKER-
3	3	GROUND
11	11	UPHONE+
30	30	UPHONE-
12	12	UPHONE_SHIELD
<b>JUMPER</b>		
From P1-1 Pin	To P2-1 Pin	Function
5	7	+12 VOLT
8	6	GROUND
24	5	-12 VOLT
6	4	+5 VOLT
NO CONNECTION	25 CONNECT P2-1 PIN 6	GROUND
19	8	SCL
18	27	SDA
20	9	GROUND

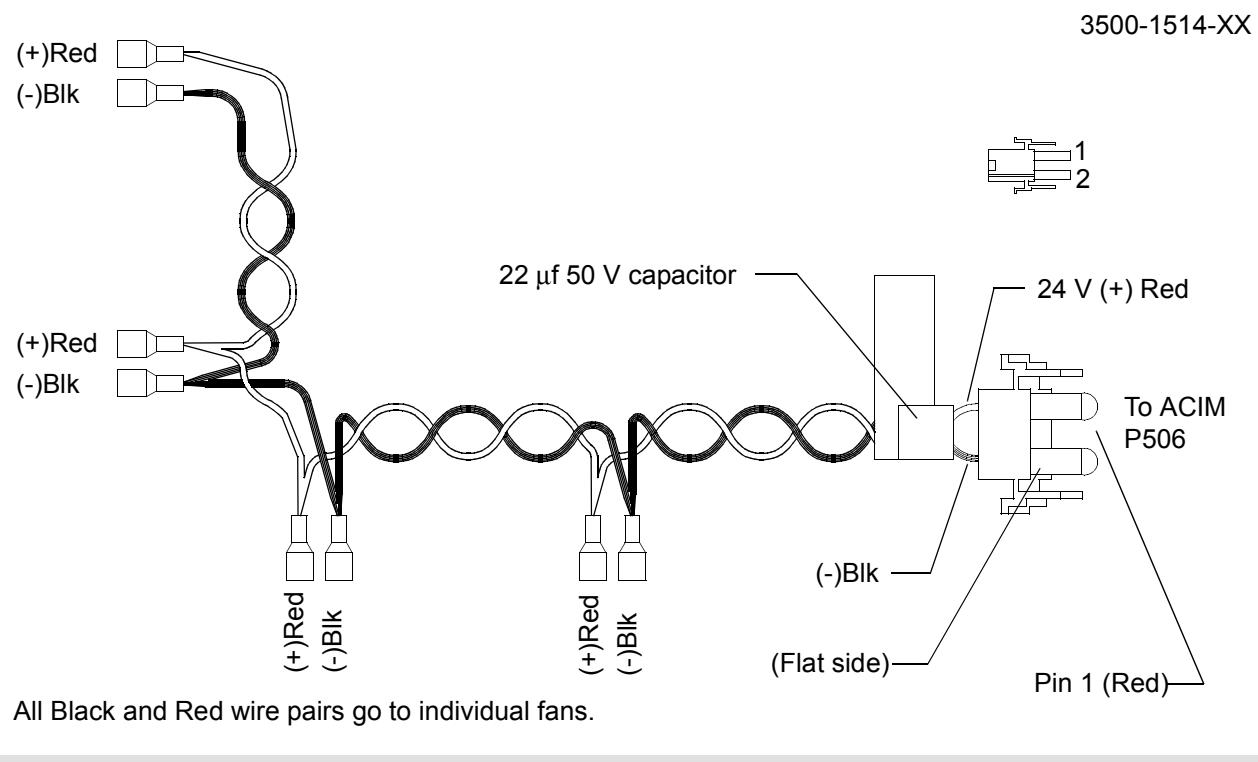
### 11-1.3 Power Cables

System and OEM (internal and external) power cables are illustrated in [Figure 11-26](#) through [Figure 11-30](#). Pinout information for these cables are provided in [Table 11-24](#) through [Table 11-27](#).

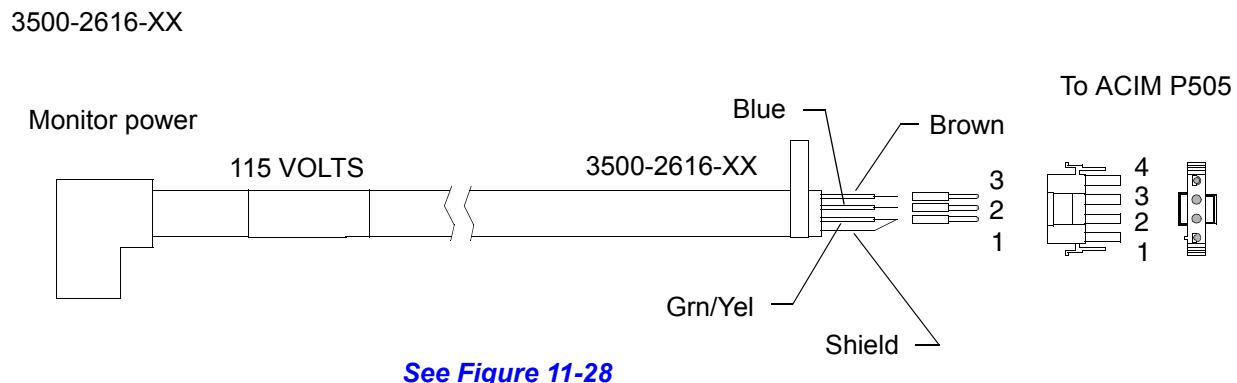
To hard disk drive

**Figure 11-26 Disk Drive Power Cable Assy (P/N 3500-1482-XX)****Table 11-24 Disk Drive Power Cable Assembly (P/N 3500-1482-XX)**

From DDEA PCB	To Optical Drive	To Hard Drive	Function
P1-1	P2-1	-	+12 VDC
P1-2	P2-4	-	+ 5 VDC
P1-3	-	P3-1	+ 12 VDC
P1-4	-	P3-4	+ 5 VDC
P1-5	P2-2	-	+ 12 VDC Return
P1-6	P2-3	-	+ 5 VDC Return
P1-7	-	P3-2	+ 12 VDC Return
P1-8	-	P3-3	+ 5 VDC Return



**Figure 11-27 Fan Power Cable Assembly (P/N 3500-1514-XX)**



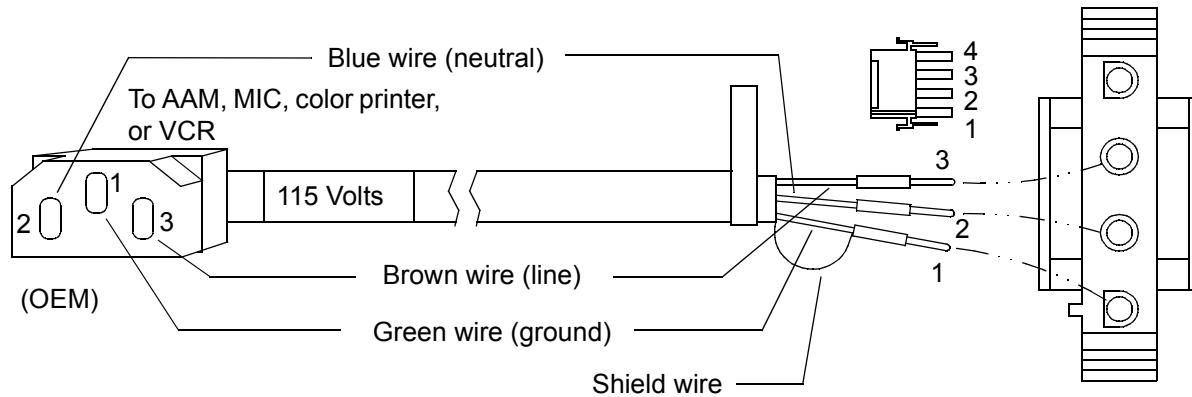
**Figure 11-28 Monitor Power Cable Assembly (P/N 3500-2616-XX)**

**Table 11-25 Monitor Power Cable Assembly (P/N 3500-2616-XX)**

From P505 on ACIM	To Monitor Power Connector	Function
Pin 1	Pin 1	GND from ACIM (Green/Yellow)
Pin 2	Pin 2	Neutral (Blue)
Pin 3	Pin 3	Line Voltage (Brown) 115V

3500-1517-XX - AAM      1  
3500-1873-XX - MIC or color printer  
3500-2780-XX - VCR

To 3500-1578 ACIM:  
Hardcopy - P503  
VCR - P504



*See Table 11-26*

1 Power cables are not interchangeable. Lengths will vary.

**Figure 11-29 OEM Power Cable Assembly, 115 VAC, Internal**

**Table 11-26 OEM Power Cable Assembly, 115 VAC, Internal**

From P503/P504 on ACIM	To OEM Power Connectors	Function
Pin 1	Pin 1	GND from ACIM (Green/Yellow)
Pin 2	Pin 2	Neutral (Blue)
Pin 3	Pin 3	Line Voltage (Brown) 115V

3500-1547-XX - Hardcopy 1

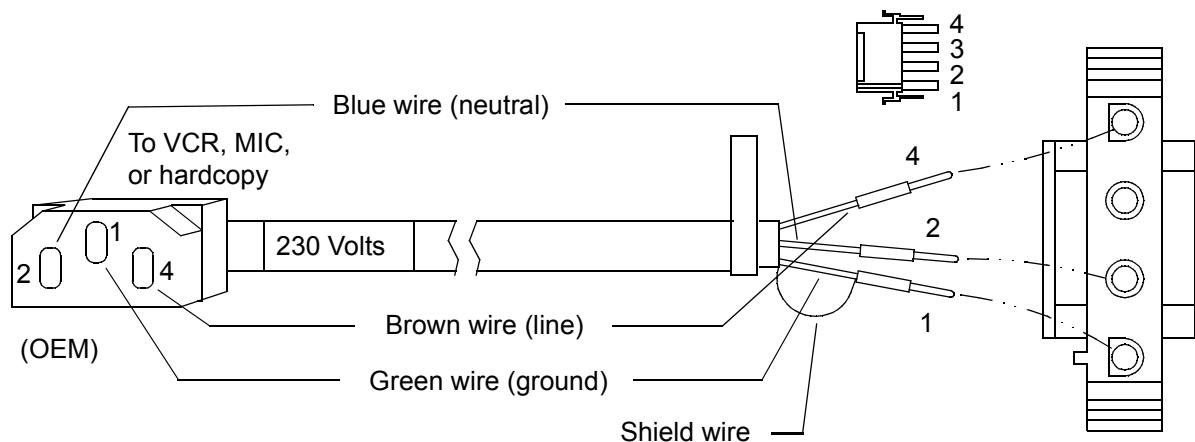
3500-2397-XX - MIC

3500-2781-XX - VCR

To 3500-1579/1580 ACIM:

Hardcopy - P503

VCR - P504



**See Table 11-27**

1 Power cables are not interchangeable. Lengths will vary.

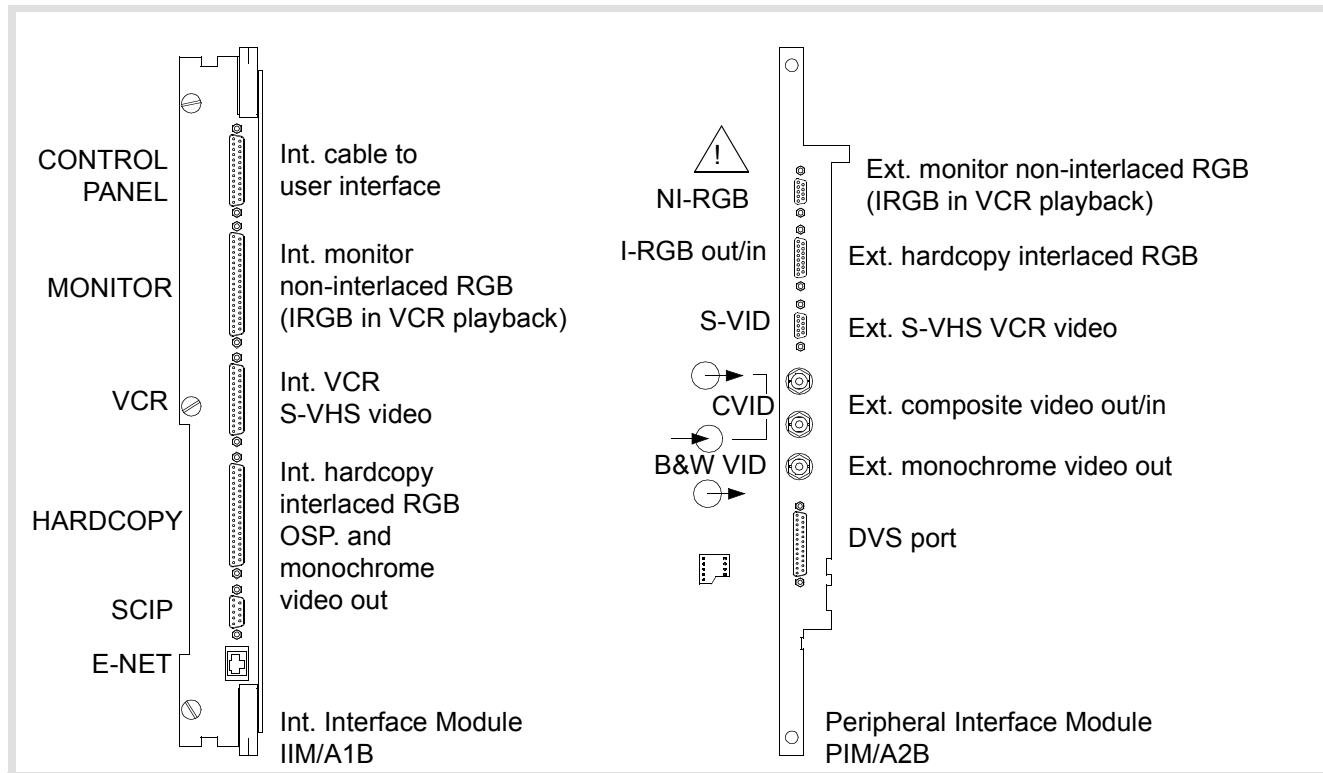
**Figure 11-30 OEM Power Cable Assembly, 230 VAC, Internal**

**Table 11-27 OEM Power Cable Assembly, 230 VAC, Internal**

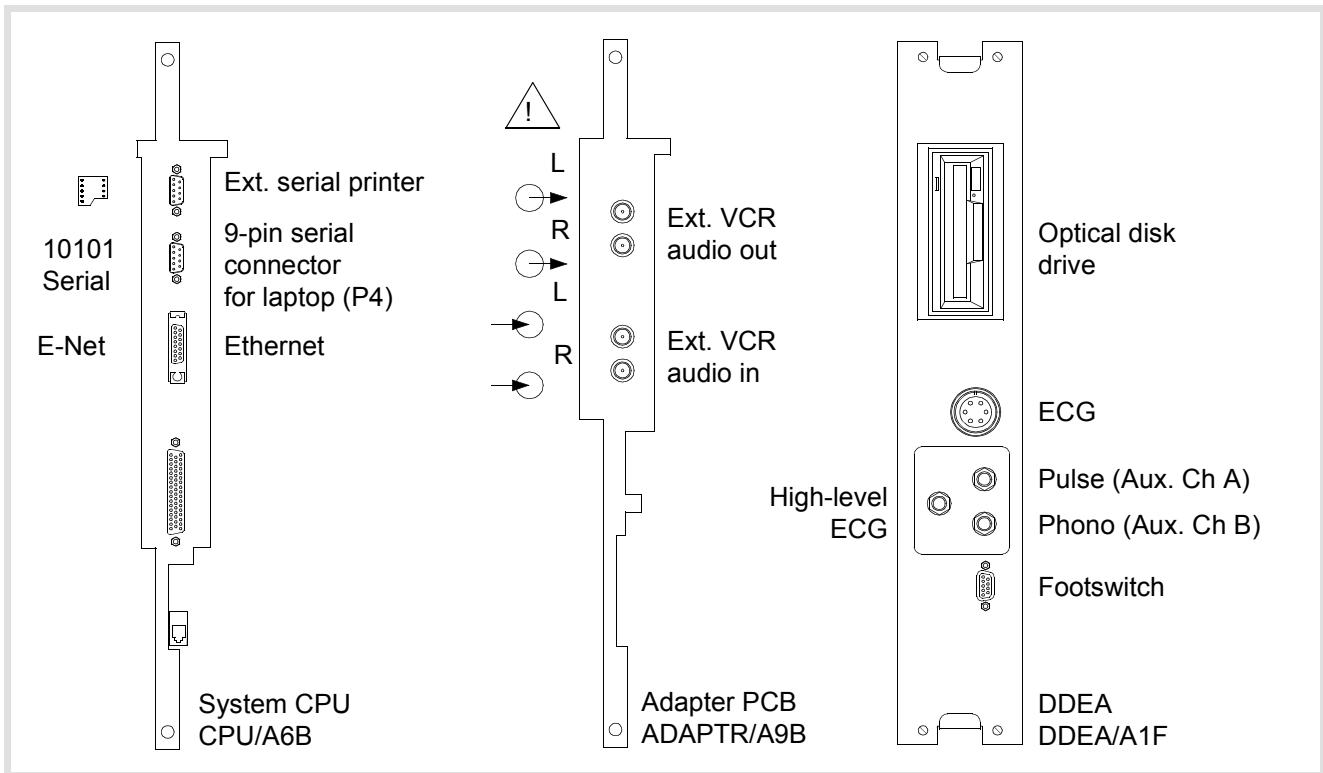
From P503/P504 on ACIM	To OEM Power Connectors	Function
Pin 1	Pin 1	GND from ACIM (Green/Yellow)
Pin 2	Pin 2	Neutral (Blue)
Pin 4	Pin 4	Line Voltage (Brown) 230V

## 11-1.4 System Connectors

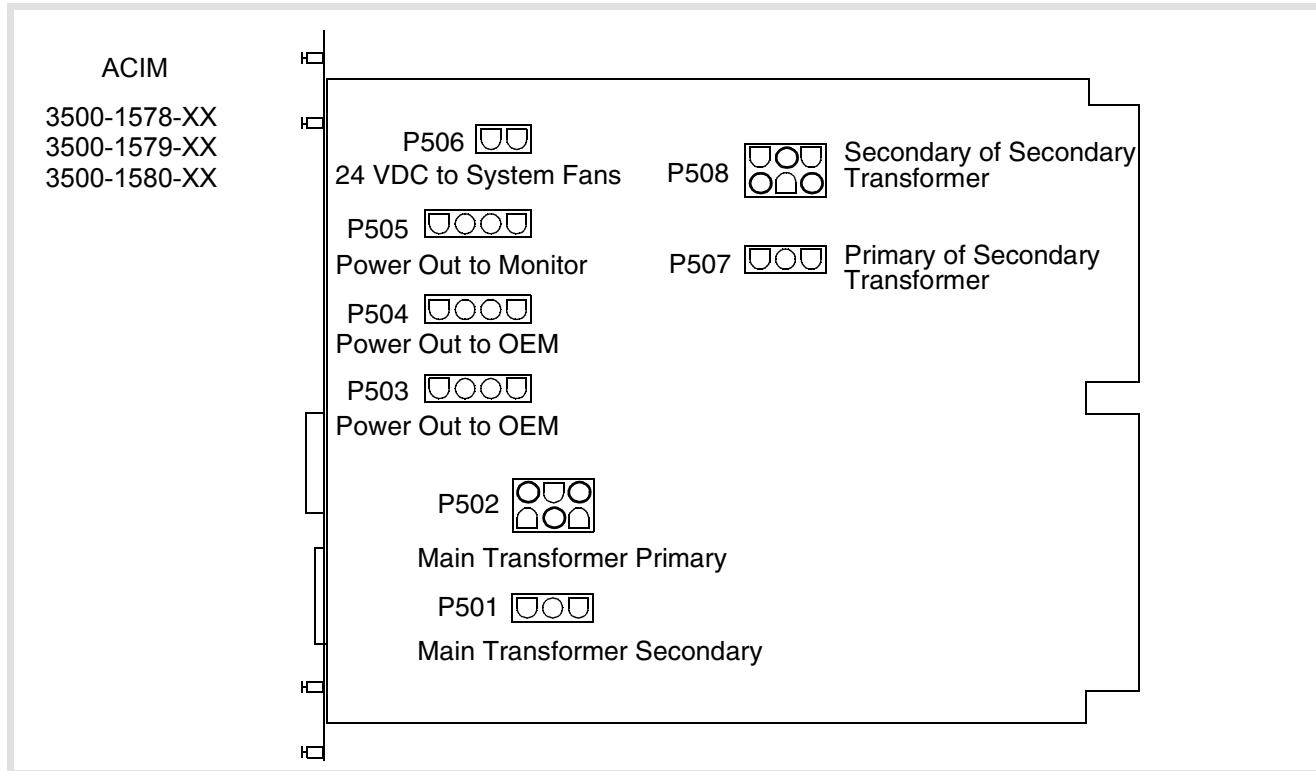
Connector locations are shown in [Figure 11-31](#), [Figure 11-32](#), and [Figure 11-33](#). Connector pinouts (signals) are shown in the individual cable figures. The S/HSEL PCB can have up to three “universal” Cannon array scan-head connectors and a Lemo static probe connector.



**Figure 11-31 Connector Locations (1 of 2)**



**Figure 11-32 Connector Locations (2 of 2)**



**Figure 11-33 ACIM Connector Diagram**

## 11-1.5

### Monitor Internal Cabling

Monitor internal cabling is illustrated in [Figure 11-44](#).

**NOTE** Some of the cables within the video monitor assembly are field replaceable, and some are not. Cables within the OEM monitor assembly (P/N 2100-1346-XX) are not field replaceable. If one of the cables in the OEM monitor assembly is bad, order the video monitor assembly (P/N 3500-2532-XX). Refer to [Figure 11-44](#) to determine which cables are included with the OEM monitor assembly.

## 11-1.6

### System Interconnect Cabling

Notes for the system interconnect cabling diagrams are provided in [Figure 11-45](#). System signal and power cabling are illustrated in [Figure 11-46](#) and [Figure 11-47](#).

## 11-2 DVS Cabling and Connectors

### 11-2.1 DVS Signal Cabling

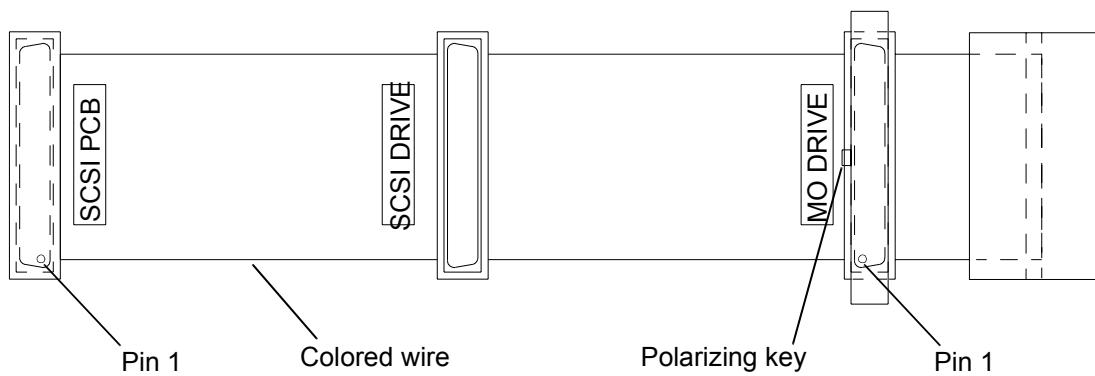
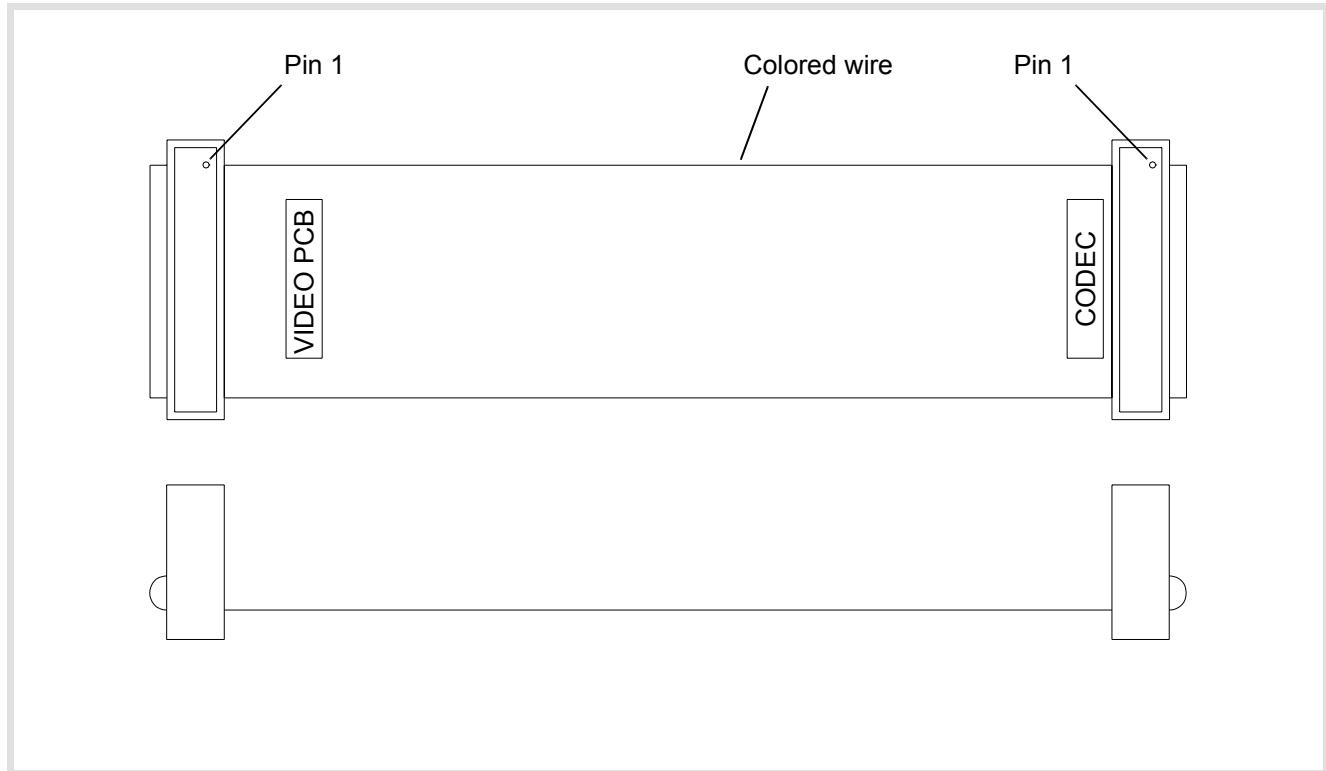
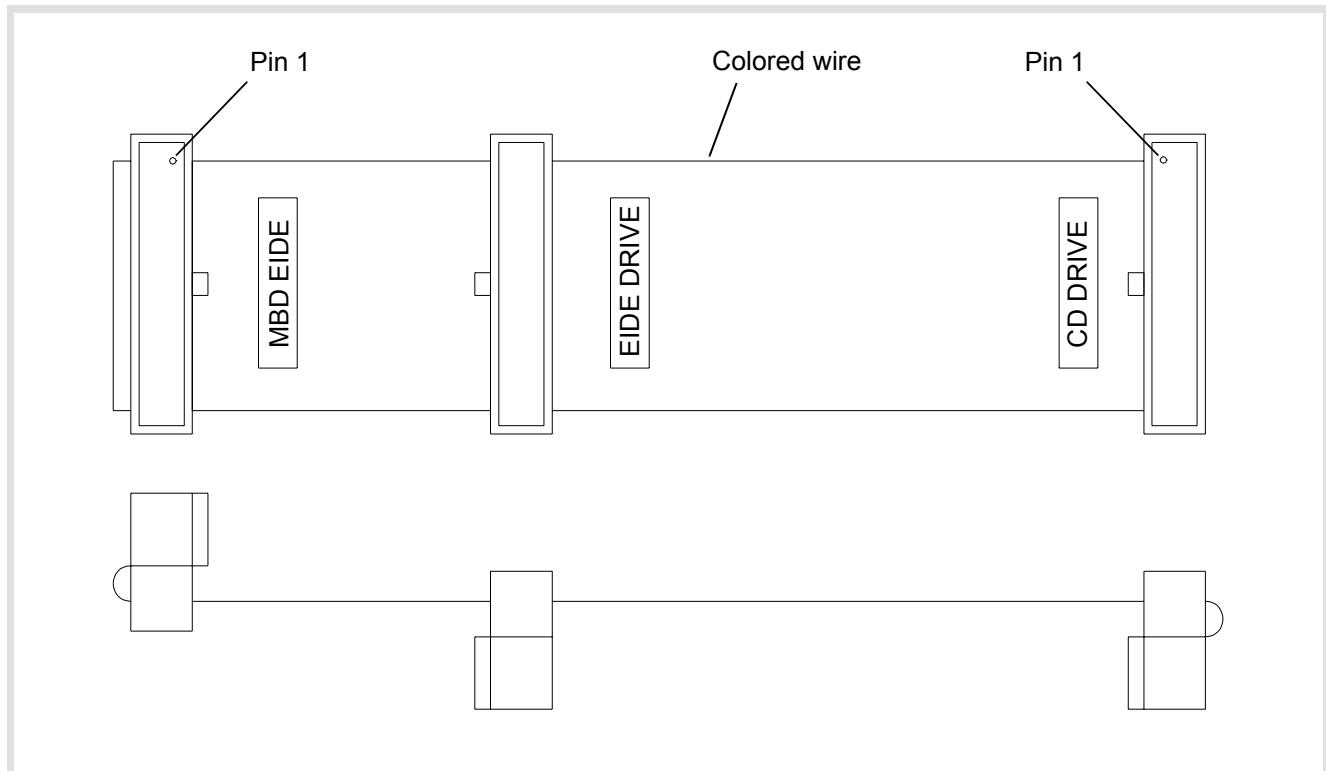


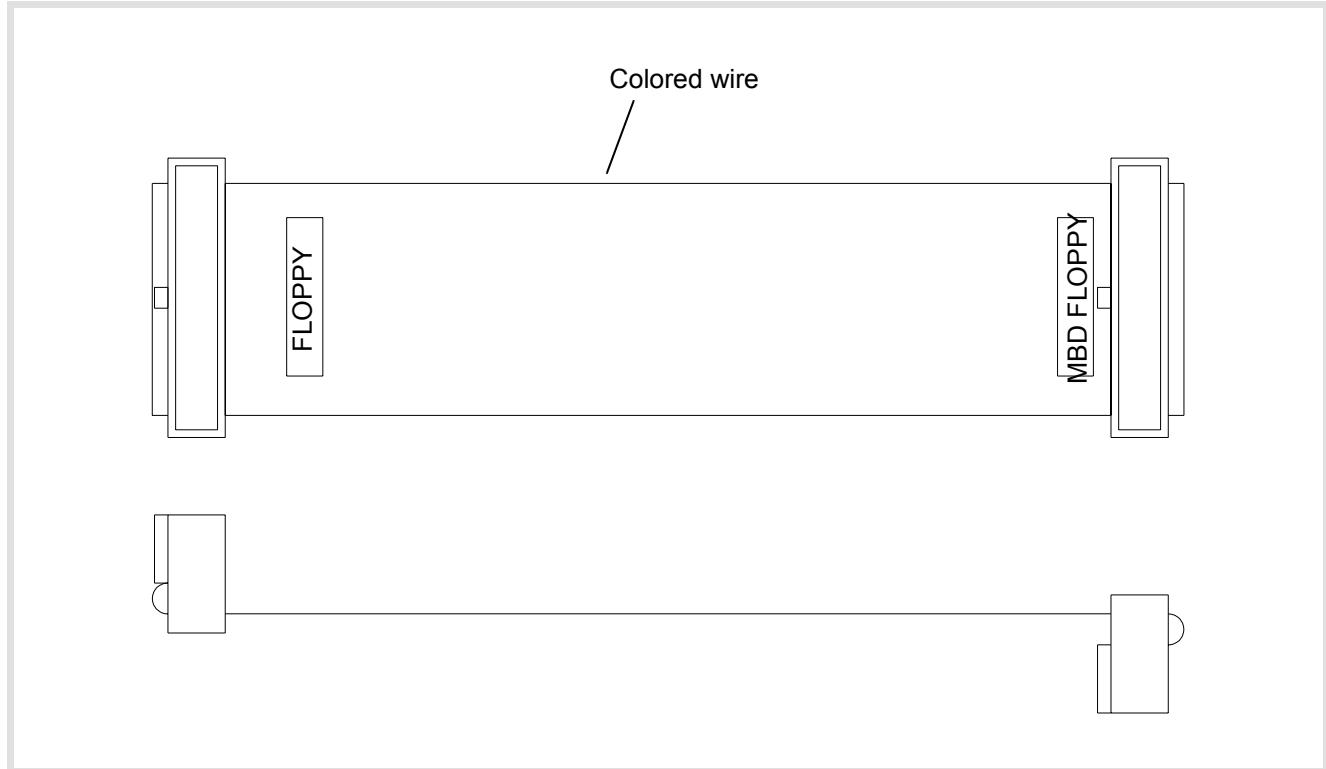
Figure 11-34 DVS SCSI Drive Cable Assembly (P/N 3500-2918-XX)



**Figure 11-35 DVS VESA Feature Cable Assembly (P/N 3500-2919-XX)**

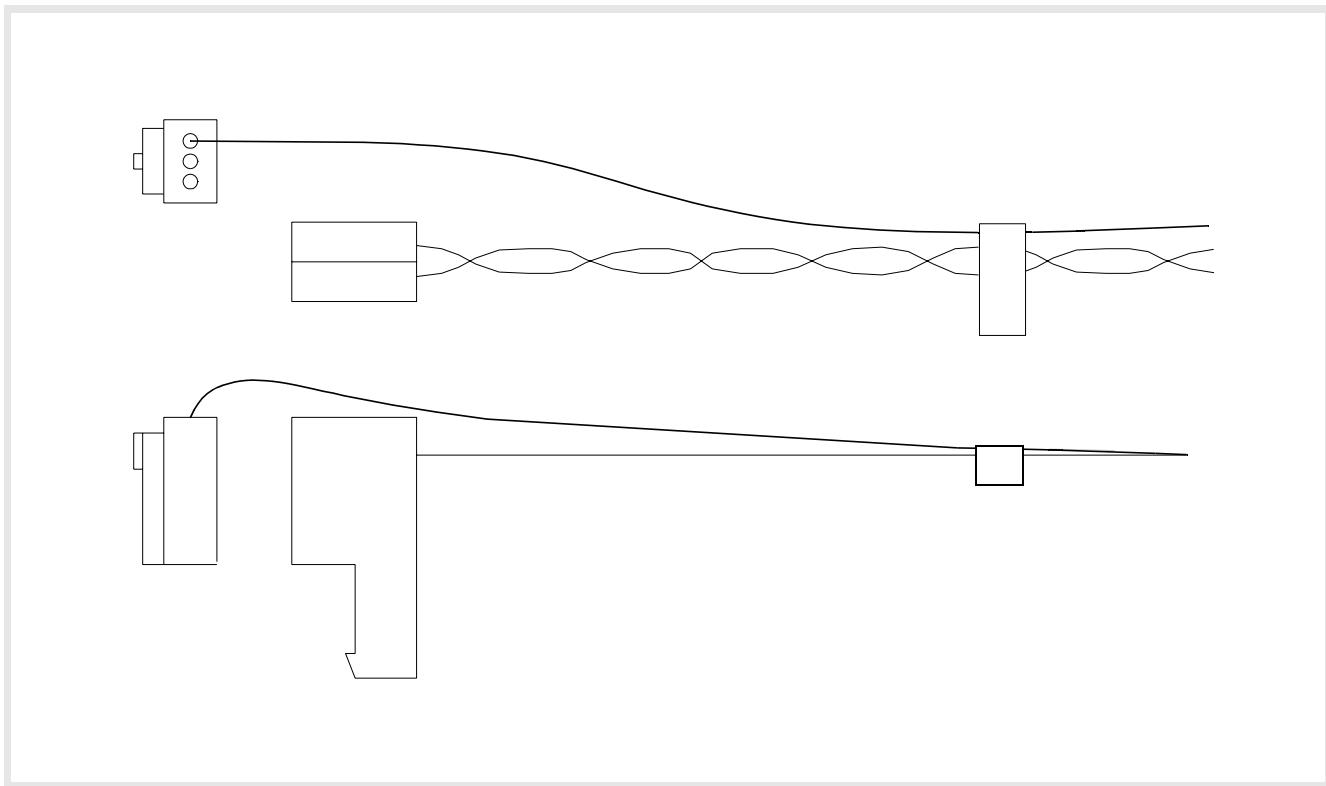


**Figure 11-36 DVS EIDE Drive Cable Assembly (P/N 3500-2920-XX)**



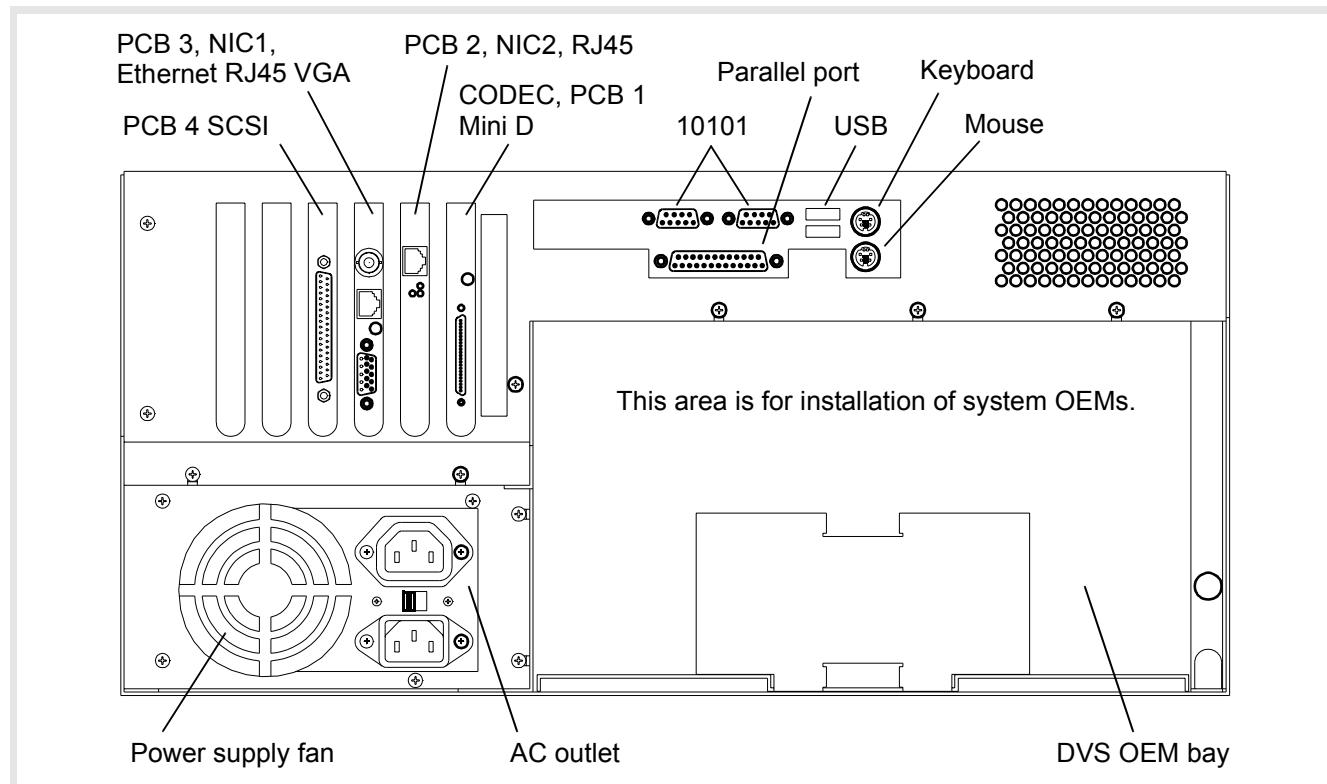
**Figure 11-37 DVS Floppy Disk Drive Cable Assembly (P/N 3500-2923-XX)**

## 11-2.2 DVS Power Cabling

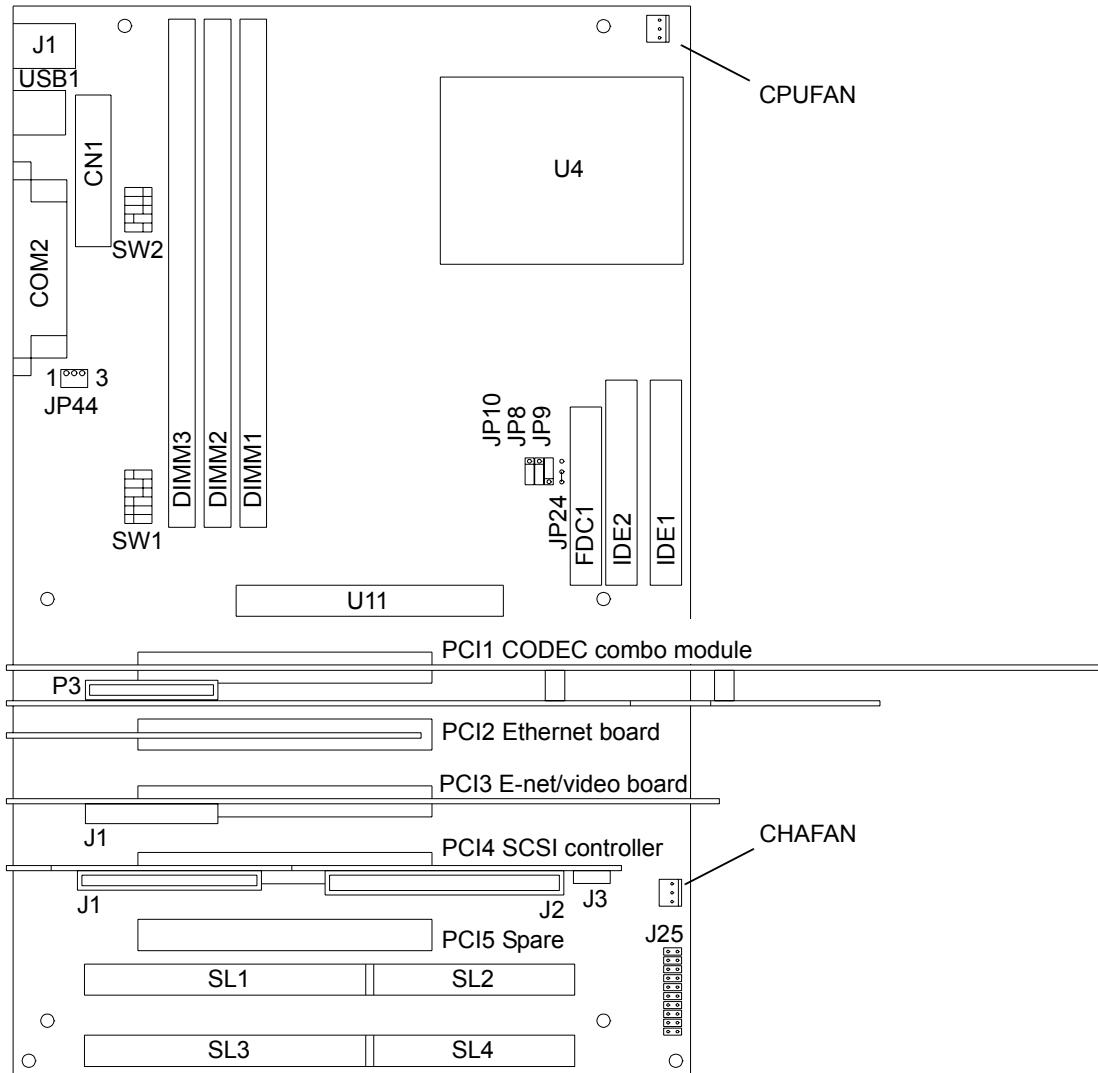


**Figure 11-38 DVS Power-On Cable Assembly (P/N 3500-3030-XX)**

### 11-2.3 DVS Interconnect Cabling



**Figure 11-39 External DVS Connector Locations**



**Figure 11-40 DVS Motherboard Connectors**

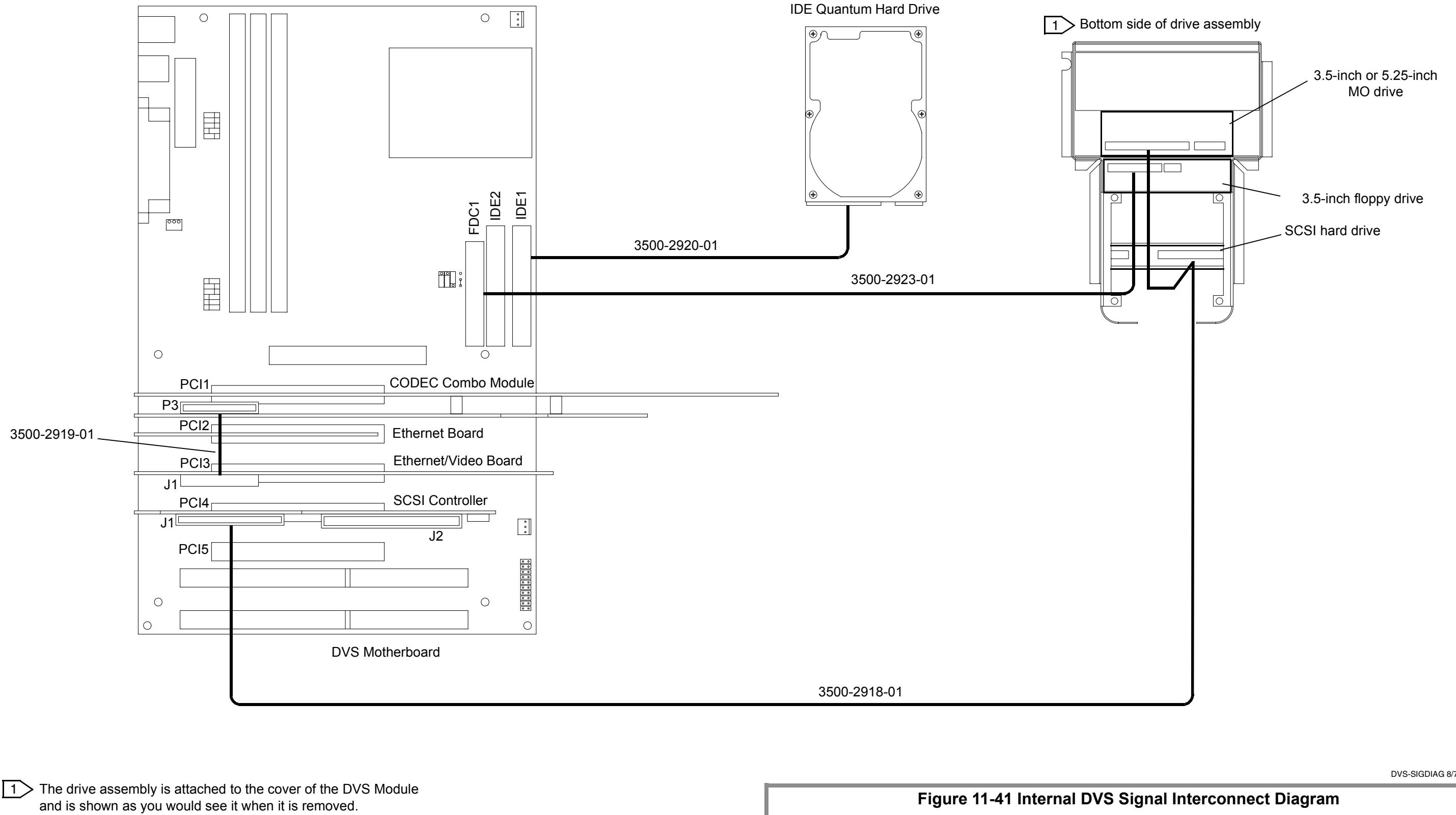
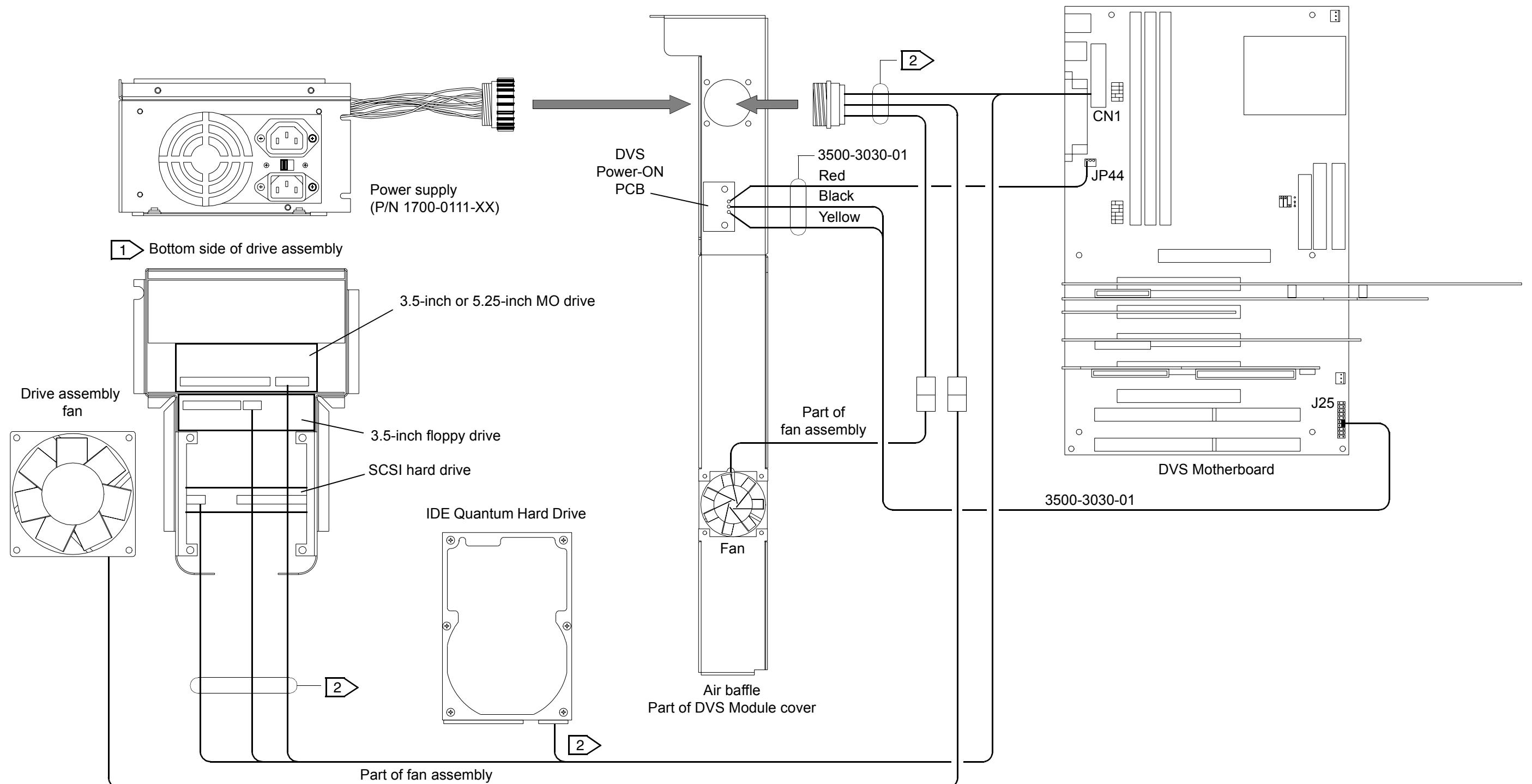


Figure 11-41 Internal DVS Signal Interconnect Diagram

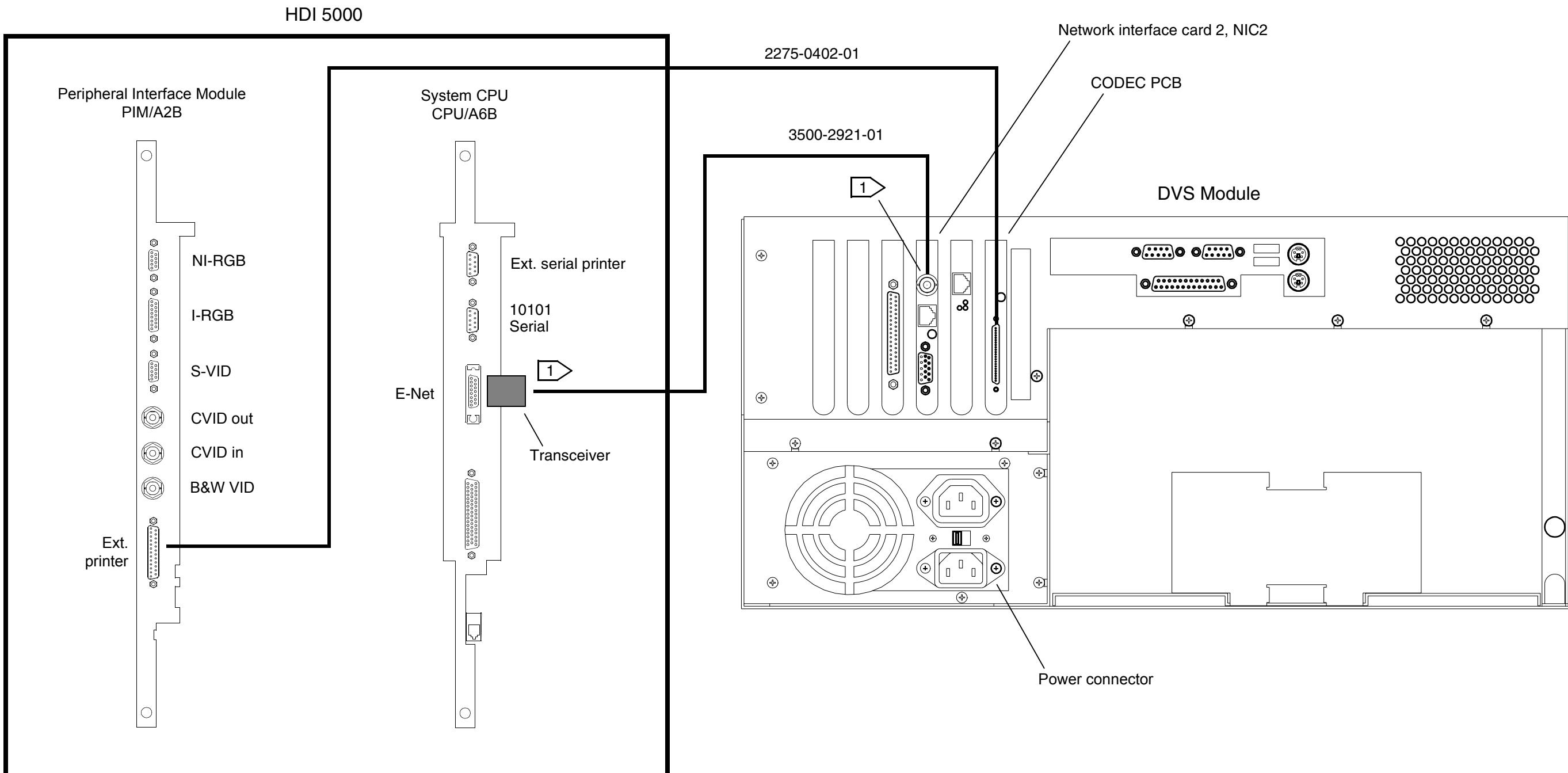


[1] The drive assembly is attached to the cover of the DVS Module and is shown as you would see it when it is removed.

[2] Part of power supply (P/N 1700-0111-XX)

DVS-PWRDIAG 5/17/00

**Figure 11-42 Internal DVS Power Distribution Diagram**



Requires BNC coax plus connector and 50 Ohm terminator.

Figure 11-43 DVS Module to HDI 5000 System Interconnections

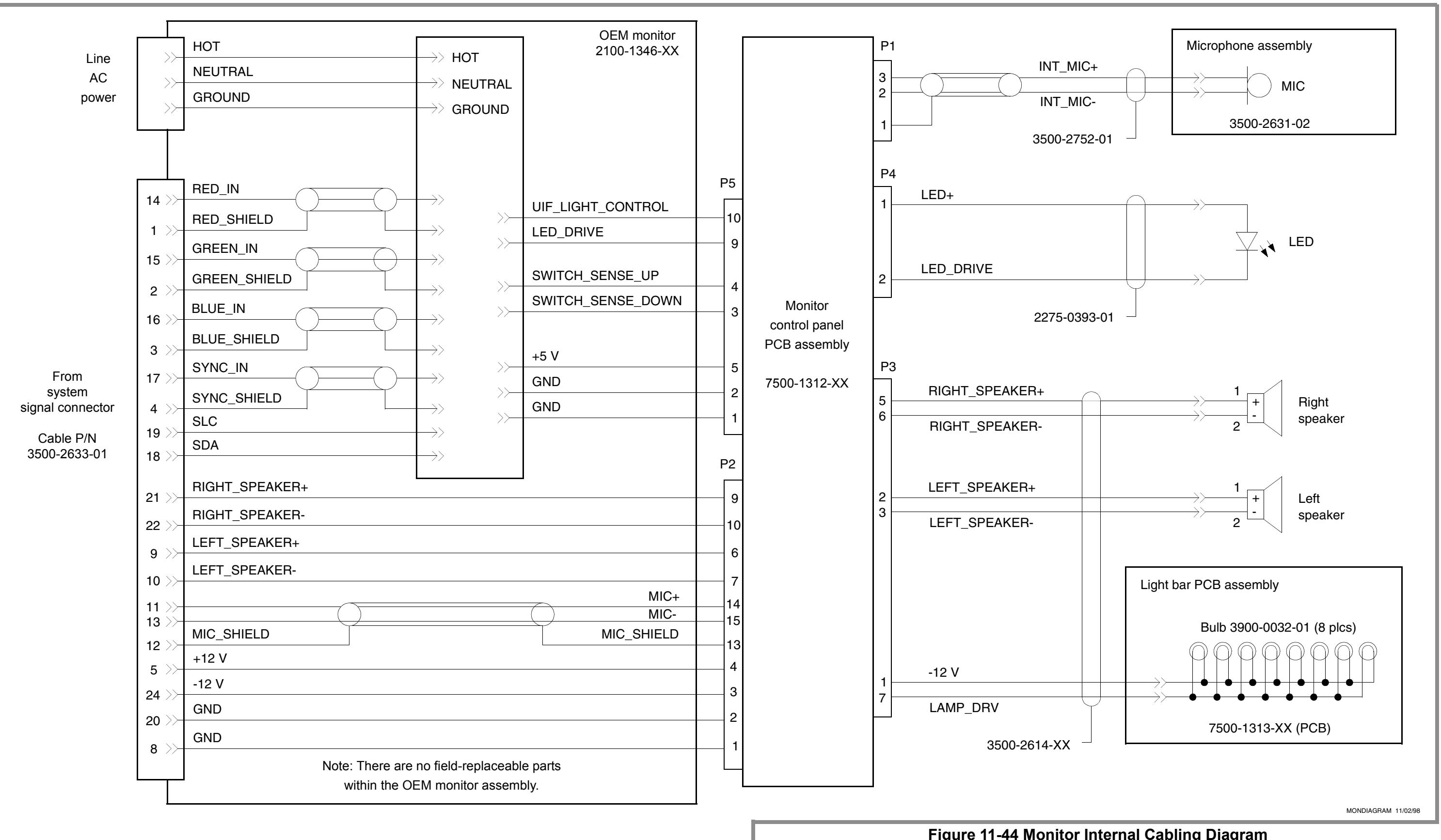
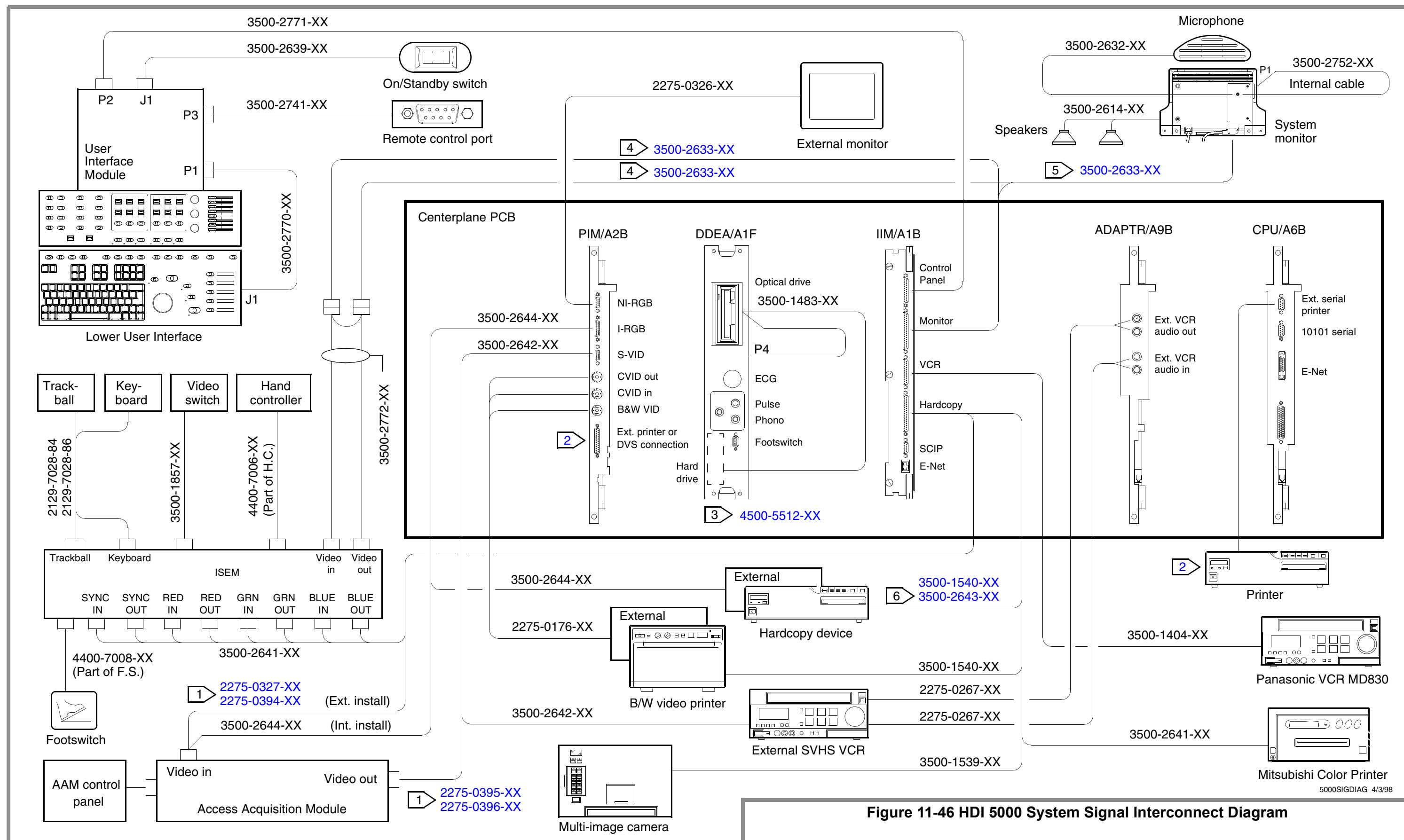


Figure 11-44 Monitor Internal Cabling Diagram

- [1] 2275-0327-XX and 2275-0394-XX = Internal installation  
2275-0395-XX and 2275-0396-XX = External installation
- [2] Do not connect external printer to printer connector on PIM PCB.  
Connector is used for DVS signal cable.
- [3] Part number 4500-5512-01 is an external disk drive test cable.
- [4] To obtain video loop-through when the ISEM is installed, video is routed from the monitor connector on the IIM PCB to the ISEM Video In and out the ISEM Video Out connector to the monitor. (Two 3500-2633-XX cables are required.)
- [5] When the ISEM is not installed, only one 3500-2633-XX is required.
- [6] Mitsubishi printer only.
- [7] Connect this end to P503 or P504 for UP5600 printer installation.
- [8] If a UP5600 is installed, disconnect the main transformer connector to P501 on the ACIM.  
Connect the UP5600 as shown.
- [9] ON/STANDBY switch controls system logic voltage to turn ultrasound system ON & OFF.

**Figure 11-45 Notes for HDI 5000 Signal/Power Interconnect Diagram**



**Figure 11-46 HDI 5000 System Signal Interconnect Diagram**

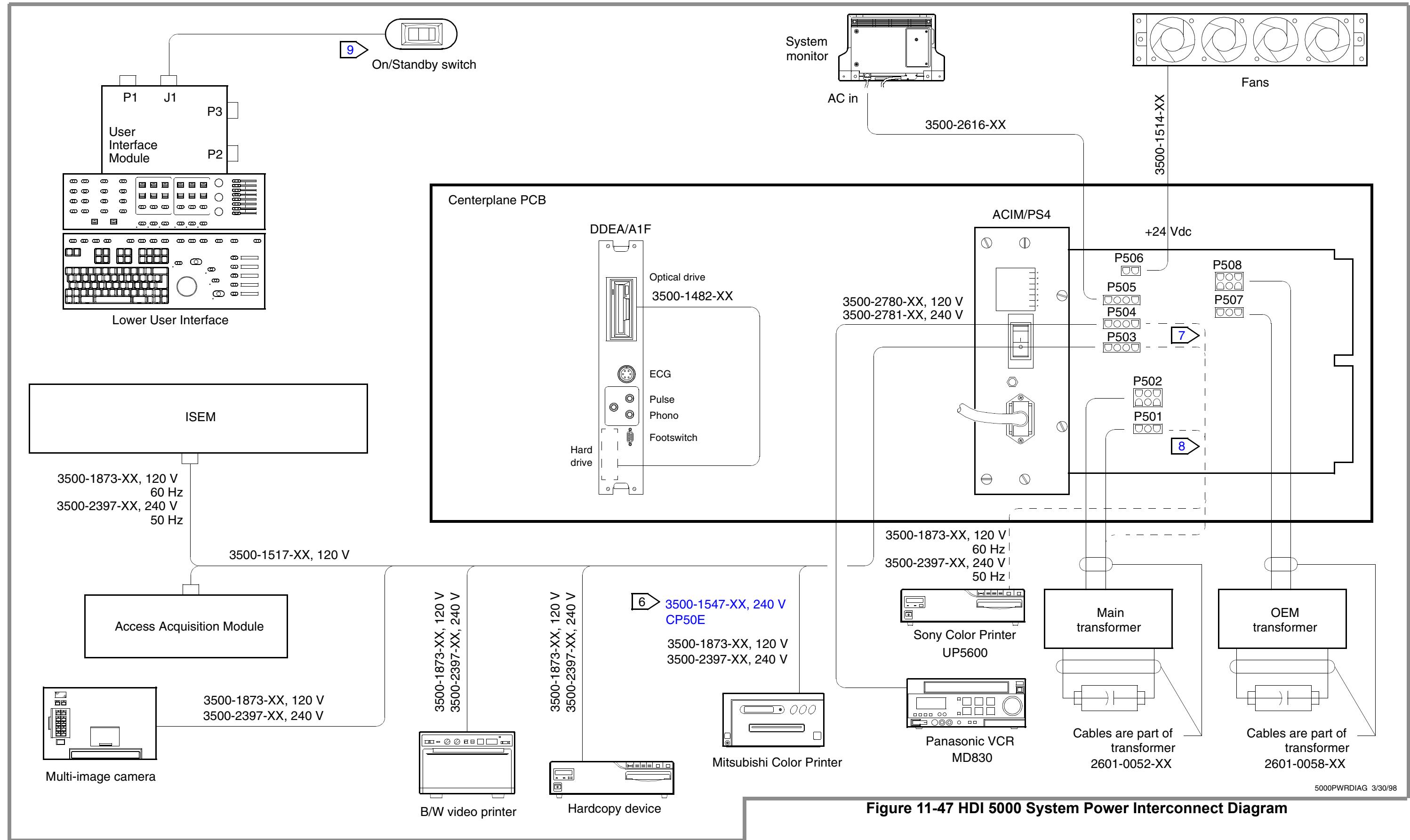


Figure 11-47 HDI 5000 System Power Interconnect Diagram

# **12 Change History**

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This section lists the software and hardware changes associated with a specific software release number. Unless noted under the Hardware Changes paragraph, the hardware changes are not required for that particular software release.

The part numbers listed after the software versions are the optical disk part numbers for that software version.

## **12-1 107.X Software Releases**

### **12-1.1 Features Supported**

#### **Broadband Phased Array Scanheads**

- P3-2 20 mm
- P5-3 (Radiology applications not supported for initial release.)
- P6-3
- P7-4
- MPT7-4 Multiplane Transesophageal Scanhead

#### **Broadband Linear Array Scanheads**

- L7-4 40 mm
- L12-5 38 mm

#### **Broadband Curved Array Scanheads**

- C5-2 40R
- C7-4 40R
- C8-4v 11mm
- C8-5 14R
- C9-5 ICT 8 mm Intracavity Scanhead (GYN applications not supported for initial release.)

#### **Doppler Transducers**

- TCD Static D2 TC
- D2 Static D2 CW
- D5 Static D5 CW
- D10 Static D10 CW

#### **Miscellaneous Features**

- 3D Grayscale
- Tissue Harmonic Imaging (P3-2 only)
- Cardiac Output/Volume Flow

## **12-1.2**

### **Features Not Supported**

#### **Broadband Phased Array Scanheads**

- P4-2
- P5-3 (radiology applications)

#### **Linear Array Scanheads**

- L10-5 38 mm Broadband
- LI9-5 Intraoperative Scanhead
- CL10-5 Compact Linear Intraoperative Scanhead

#### **Broadband Curved Array Scanheads**

- C4-2 40 mm
- CT8-4
- C9-5 ICT 8 mm Intracavity Scanhead GYN applications

#### **Miscellaneous Features**

- Surgical/Intraoperative applications
- General Imaging CSI
- Laparoscopic/Endoscopic imaging
- Pediatric Biplane TEE
- Soft keys on the lower user interface assembly

## **12-1.3**

### **107.10 (10.0)**

Released 4252-0799-11 on November 7, 1997

#### **New Features**

Refer to Features Supported in [paragraph 12-1](#).

#### **Problems Corrected**

Not applicable.

#### **Known Problems**

Refer to Operating Notes:

4707-0027-01	English
4787-0027-01	French
4777-0027-01	German

#### **Hardware Changes**

This is the initial release. There are no hardware changes.

## **12-1.4**

### **107.11 (10.0b)**

Released December 19, 1997.

4252-0810-01	Software files disk
4252-0808-01	Bootable image disk and system software, 230 MB
4252-0809-01	Bootable image disk without software, 128 MB

#### **New Features**

Not applicable.

#### **Features Not Supported**

Same as previous software build.

#### **Problems Corrected**

Raises the system over-temperature limits to prevent extraneous over-temperature messages from being displayed and allows the system to continue normal operation.

#### **Known Problems**

Refer to Operating Notes:

4707-0027-02	English
4787-0027-02	French
4777-0027-02	German

#### **Hardware Changes**

There are no hardware changes associated with this release.

## **12-2**

### **108.X Software Releases**

## **12-2.1**

### **108.15 (10.0.1)**

Released January 29, 1998.

4252-0811-09	Software files disk
4252-0813-04	Bootable Image disk with system software
4252-0814-04	Bootable Image disk without system software

#### **New Features**

- C4-2 40 mm Broadband Curved Array
- L10-5 38 mm Broadband Linear Array
- CL10-5 Compact Linear Intraoperative Scanhead
- P5-3 Broadband Phased Array (Radiology applications)
- C9-5 ICT 8 mm Broadband Intracavity Scanhead (OB/GYN applications)
- C5-2 CSI
- C5-2 THI

## **Features Not Supported**

- CT8-4 Scanhead
- LI9-5 Scanhead
- Soft keys on the lower user interface assembly

## **Problems Corrected**

- Corrects German and French translations of terms used for THI and CSI (Tissue Harmonic Imaging and Contrast Specific Imaging).
- Improves system monitoring of over-temperature conditions and fan speed control.
- Synchronizes image updates and scaling information during image zoom.
- Corrects thermal index values in AP&I calculations for 2 MHz static transducers (D2 TC and D2 CW). There were no patient safety issues because thermal index values limited output power.
- Corrects a system lockup issue when using a page printer and attempting to print OB graphs three times.
- Increases color frame rates when using ECG. Previously, the image update rate was irregular with ECG turned on. (The frame rate slowed down for approximately one second every two or three seconds.)
- Adds several ResearchLink enhancements.
- Adds functionality of THI control by adding a new lower interface assembly.
- Displays the following message in a dialog box if the upgrade disk is write-protected: “Removable disk is write protected. Enable writing disk then cycle power.”
- Enables the system to run the CW Cal test if the system is configured for radiology. Previously, if the system was not configured for the P3-2 and the D2 CW, the CW calibration would fail.
- Displays body markers that were not visible upon initial bootup in any mode of system operation. The body markers were displayed upon the subsequent bootup.
- Corrects a system error (run-time alert) when using the P3-2 scanhead and TCD during triple mode.
- Prevents an SPM false error (1202-5402-400A) from being entered into the error log when the SPM is queried by the CPU.
- Corrects a bootup error with the 3500-2636-05 Lower User Interface Assembly. The bootup error is reported to the USD port and may be displayed during diagnostics, but it is not displayed on the system monitor.
- Enables the HDDRIVE test to be executed via remote diagnostics. Previously, the test was stopped due to the display of a dialog box that requested a user response.

## **Known Problems**

Refer to Operating Notes:

4707-0027-04	English
4787-0027-04	French
4777-0027-04	German

## **Hardware Changes**

Software version 108.15 supports Tissue Harmonic Imaging (THI). Functionality of the THI key requires a new lower interface assembly for English, French, and German systems.

Other than the lower user interface assembly, there are no other hardware requirements for HDI 5000 systems with 108.15 software; however, a new AIM+ PCB (P/N 7500-1431-02) has been simultaneously released with 108.15 software. The new AIM+ combines the circuitry of the previous AIM+ PCB (P/N 7500-1026-03) and the Regulator Module (P/N 7500-1421-01). There are no new features added to make the new AIM+. The new AIM+ PCB is forward compatible only. Remove the Regulator Module from systems with the new AIM+ (P/N 7500-1431-02).

Also, simultaneously released with (but not required for), 108.15 software is the 7500-1316-05 PIM PCB. This PCB was released to correct for a blue tint artifact during VCR playback. The artifact was also displayed during image zoom.

## **12-2.2      108.16 (10.0.2)**

Released April 24, 1998.

4252-0811-10	Software files disk
4252-0813-05	Bootable Image disk with system software
4252-0814-05	Bootable Image disk without system software

## **New Features**

None.

## **Features Not Supported**

Same as previous software build.

## **Problems Corrected**

- Implements scaling changes when using the C5-2 scanhead after switching to harmonic imaging and selecting HD ZOOM while in simultaneous 2D/M-mode.
- Implements changes to the 2D and M-mode gain settings when in Tissue Harmonic Imaging (THI).

## **Known Problems**

Refer to Operating Notes:

4707-0027-07	English
4787-0027-07	French
4777-0027-07	German

## **Hardware Changes**

There are no hardware changes associated with this release.

**12-2.3**

## **108.17 (10.0.3)**

Released July 31, 1998.

4252-0811-11	Software files disk
4252-0813-06	Bootable Image disk with system software
4252-0814-06	Bootable Image disk without system software

## **New Features**

None.

## **Features Not Supported**

Same as previous software build.

## **Problems Corrected**

Implements a new conversion factor for manually calibrated images (VCR or DiskLink) when making measurements using the AREA key. Software version 108.17 releases a ship hold associated with this issue.

## **Known Problems**

Refer to Operating Notes:

4707-0027-13	English
4787-0027-13	French
4777-0027-13	German

## **Hardware Changes**

There are no hardware changes associated with this release.

**12-2.4**

## **108.18 (10.0.4)**

Released October 15, 1998.

4252-0811-12	Software files disk
4252-0813-07	Bootable Image disk with system software
4252-0814-07	Bootable Image disk without system software

## **New Features**

None.

## **Features Not Supported**

Same as previous software build.

## **Problems Corrected**

- Corrects measurement units displayed after a report has been edited. Previously, under certain conditions, measurement units from a second measurement replaced units from a first measurement, even though the numerical value of the first measurement did not change.
- Increases the DiskLink frame capacity from 100 frames per exam to 200.
- Prevents L10-5 scanhead mux damage when scanning with a static CW probe with the L10-5 connected to the right-most scanhead port.
- Corrects color M-mode scaling errors when entering color M-mode from color with a small color box zoomed.
- Corrects a measurement error in PW Doppler calculations after switching from CW Doppler.

## **Known Problems**

Refer to Operating Notes:

4707-0027-18	English
4787-0027-18	French
4777-0027-18	German
4847-0027-14	Brazilian (Portuguese)
4887-0027-14	Danish
4807-0027-14	Dutch
4837-0027-14	Finnish
4907-0027-14	Greek
4827-0027-14	Italian
4877-0027-14	Portuguese (Europe)
4797-0027-14	Spanish
4817-0027-14	Swedish

**NOTE** Operating notes for English, French, and German software were rev'd to -18. Operating notes for all other languages were not.

## **Hardware Changes**

There are no hardware changes associated with this release.

## **12-2.5**

## **108.19 (10.0.5)**

Released January 28, 2000.

4252-0811-13	Software files disk
4252-0813-08	Bootable Image disk with system software
4252-0814-08	Bootable Image disk without system software

## **New Features**

None.

## **Features Not Supported**

Same as previous software build.

## **Problem Corrected**

Corrects an intermittent problem that results in the Doppler spectral trace not being updated when the sample volume cursor is moved.

## **Known Problems**

Refer to Operating Notes:

4707-0027-26 Rev A English

4787-0027-26 Rev A French

4777-0027-26 Rev A German

## **Hardware Changes**

There are no hardware changes associated with this release.

# **12-3 124.X Software Releases**

## **12-3.1 124.13 (10.1)**

Released September 9, 1998.

4252-0815-14 Software files disk

4252-0828-03 Bootable Image disk with system software

4252-0829-03 Bootable Image disk without system software

## **New Features**

- P4-2 Phased Array Scanhead
- Tissue Doppler Imaging (TDI)
- High Pulse Repetition Frequency (HPRF) Doppler Imaging
- Simultaneous 2D/CW
- Pulse Inversion 2D Harmonic Imaging
- Harmonic Imaging
- Advanced 3DI option (only demo systems released - require additional hardware)
- Adult Cardiology clinical option for the CL10-5 scanhead
- Bowel TSI with the Small Parts clinical option for the C7-4, C8-5, L12-5, L10-5, and L7-4 scanheads
- P4-2, P5-3, and P7-4 biopsy guide brackets
- Retrospective loops with CAPTURE softkey
- VCR CTRL softkeys
- 3D UNCAL softkey

## **Features Not Supported**

- DiskLink/NetLink features
  - Capture of Doppler/M-mode loops
  - R-wave to R-wave automatic capture
  - Prospective loops
  - Capture of loops to optical disk
  - Automatic scaling for images recalled from the hard disk
- Power Harmonics on the C5-2 scanhead
- The following features of the Advanced 3DI option are not supported (A3DI option will be released with 125.X software)
  - Doppler, triple mode, and M-mode
  - Image acquisition with the MPT7-4 scanhead
  - Image acquisition with the L12-5 scanhead connected to the position sensor
- Graphics key
- PROTOCOL, PARAMS, TIMER, and TOOLBAR controls on the lower user interface assemblies
- Image storage to the MO drive
- VCR & Hardcopy Source setup
- 3D OPTIMIZATION control on the lower user interface assembly is operational on demo systems only

## **Problems Corrected**

- DiskLink/NetLink
  - Adds short loops that enable the operator to store retrospective captures of 2D or 3D frames with or without ECG data, to the hard disk or DICOM archive server. The maximum number of frames per loop (selectable in Setups menu) is listed in Table 12-1.

**Table 12-1 Maximum Number of DiskLink/NetLink Frames per Short Loop**

Type of Short Loop	Number of Frames per Loop	
	NTSC	PAL
Black and white	90	60
Color	45	30

- Increases the number of patients that can be stored on the hard drive from 100 to 200.
- Increases the number of images that can be stored in rapid succession from 10 to 27.

- Adds printer/archive device compatibility with several printers and archive devices.
- Improves DICOM compatibility by supporting VOI Look up table (LUT), Pixel aspect ratio, image type attribute, and a new ultrasound SOP class.
- Contrast Specific Imaging (CSI)
  - Adds Card CSI to the P4-2 and P5-3 scanheads.
  - Adds Pulse Inversion 2D Hrm, OPTISON™, and Levovist® TSIs to the Adult Card CSI clinical option. Also includes Myocardium, LV Opac/Myocard.
  - Adds 2D Harmonics and Pulse Inversion 2D Harmonics tissue specific presets for the C5-2 scanhead with the General Imaging CSI clinical option.
- Color Flow imaging
  - Improves the appearance of color flow images. Images now have smoother edges, softer transition between color and grayscale, improved texture, better vessel delineation, and reduction of dark hues created by persistence.
  - Improves axial and lateral resolution in cardiology applications.
  - Makes several changes to existing application-specific color maps.
  - Adds eight color maps for TDI.
  - Increases the frame rate in cardiology applications. (No frame rate increase for other applications.)
  - Changes the system default to velocity plus variance (instead of velocity only) to increase color resolution. A smoother color presentation can be obtained by turning variance off.
  - Increases the default PRF to 4,000 Hz (from 3,500 Hz) to increase the frame rate.
  - Changes the default wall filter to High to improve jet definition and frame rate.
  - Lowers the ensemble lengths to improve the frame rate.
  - Adds TGC for Power Motion Imaging (PMI) and TDI. In these modes the TGC slidepots affect only the color. Display of the TGC gain curve and gain values are available via Setups. Color TGC is also applicable to M-mode images. TGC values are used to ensure consistent gain for serial CSI studies.
- Harmonic Imaging
  - Adds support for Harmonic imaging on the P5-3, P4-2, and L7-4 scanheads.
  - Changes Harmonic optimization labels for the P5-3 and P4-2 scanheads for cardiology applications.
  - Changes Harmonic optimization labels for the P4-2, C5-2 and L7-4 scanheads for general imaging applications.

- New Fonts
  - Changes the font style on NTSC and PAL systems to improve readability (especially on hardcopies) and to improve optical character recognition.
  - Increases the font size on PAL systems.
- Echocardiography Enhancements
  - Reduces display format to 95% of the previous size.
  - Improves penetration on the P3-2 scanhead.
  - Replaces Chroma maps 1 and 2.
- General Imaging Enhancements
  - Improves C5-2 performance by reducing near-field gain for fundamental imaging, balancing focal zone gain for fundamental imaging, and changing wave-shaping for Harmonic imaging to increase resolution and penetration
  - Replaces Chroma maps 3 and 4. Swaps map 2 with map 1.
- Cineloop Image Review
  - Increases the maximum number of frames in a loop to 800.
  - Calculates the number of frames to be captured based on the imaging mode.
  - Captures up to 120 frames in a 3D loop.
  - Captures at least 25 seconds of non-triggered Doppler or up to 120 frames of a 3D loop.
- Expanded Dual Image
  - Extends the field of view from 36 mm to 76 mm at 30 mm depth with a seamless display when using linear scanheads.
  - Utilizes the full aperture of array in Dual imaging.
  - Returns the system to regular dual imaging (with a seam) if the image is zoomed.
- System Response Time
  - Decreases the amount of time required to change between imaging modes (that is, from 2D color to PW Doppler) by approximately twenty percent.
  - The amount of time required to bootup the system or to change scanheads has not changed.
- Miscellaneous Changes
  - Changes the New Patient entry on the Patient Data Entry screen. Several changes have been made, including allowance of up to 64 characters for the patient name (now conforms to the DICOM standard).
  - Changes system operation so that PISA (proximal isovelocity surface area calculation) is accessible in 2D.
  - Allows up to 18 characters in the Accession number field.
  - Makes numerous changes to the text annotation process.

## Known Problems

Refer to Operating Notes:

4707-0027-17	English
4787-0027-17	French
4777-0027-17	German
4827-0027-17	Italian
4847-0027-17	Brazilian (Portuguese)
4887-0027-17	Danish
4807-0027-17	Dutch
4837-0027-17	Finnish
4907-0027-17	Greek
4877-0027-17	Portuguese (Europe)
4797-0027-17	Spanish
4817-0027-17	Swedish

## Hardware Changes

Software version 124.13 requires a new version of upper and lower user interface assembly for English, French, and German languages. The new upper user interface assemblies have several control-location changes and add dedicated controls for Tissue Doppler Imaging and 2D imaging. The new lower user interface assemblies add optimization keys for 2D/Color, Harmonic, and 3D imaging, and enable functionality of the softkeys (programmable LED keys). The softkeys are programmed by system software to provide multiple functions for each key. There is no longer a LOOP control on the user interface. Refer to [Section 13, "Configuration"](#), for part numbers of the user interface assemblies required for 124.13 software.

Software version 124.13 requires four FEC PROMs to improve P4-2 performance. The part numbers are listed below.

4201-1994-04	PROM Assy, FEC 1, U35
4201-1995-04	PROM Assy, FEC 2, U34
4201-1996-04	PROM Assy, FEC 3, U37
4201-1997-04	PROM Assy, FEC 4, U36
8000-1504-01	PROM Kit, FEC

Also, the following PCBs are simultaneously released with software version 124.13:

7500-1398-03	PIM PCB
7500-1408-02	PCM PCB
7500-0713-14	PSP1 PCB
7500-1413-01	AIFOM PCB
7500-0911-08	Channel Board

These PCBs are required to support future features but are not required for system operation with 124.13 software.

Released November 6, 1998.

4252-0840-05	Software files disk
4252-0841-05	Bootable Image disk with system software
4252-0842-05	Bootable Image disk without system software

### New Features

- Italian language software, control panels, and manuals
- Scandinavian keycap set
- Scandinavian lower user interface assemblies to support Danish, Finnish, Norwegian, and Swedish languages. Support for these languages is limited to display of the three characters on the new keycaps. (System software has not been translated.)

### Features Not Supported

Same as software build 124.13.

### Problems Corrected

- Measurement Corrections
  - Corrects measurement units displayed after a report has been edited. Previously, under certain conditions, measurement units from a second measurement replaced units from a first measurement, even though the numerical value of the first measurement did not change.
  - Corrects a measurement error in PW Doppler calculations after switching from CW Doppler.
- Connectivity
  - Modifies device files for Kodak printers and Imation 3M 959 printer.
  - Restores DiskLink compatibility with PAL versions of ImageVue DCR.
  - Implements chunky conversion before sending the image to a network device. Chunky conversion is the ordering of the RGB pixel information before transferring the data to an archive device. The standard method up to this time has been planar. Planar data transfer is sending all the red data in one packet, all the green in another, and all the blue in another (or in another color order). With chunky conversion, the data is sent in a group of data with the RGB data in packets (red, with green, and blue). Chunky and planar data conversion is turned on with the device files. With this change, the HDI 5000 system is compatible with all Siemens MagicView and MagicStore products.
  - Changes system operation so that when the A3DI option is enabled, the user is able to move from one patient data field to another using the Return key. On systems with 124.13 software, use of the trackball was required.

- Translations
  - Changes translations of the terms “Contrast Specific Imaging” and “Tissue Harmonic Imaging” from German, French, and Italian back to English. European translations of these terms were confusing.
- Miscellaneous
  - Returns the machine option dash numbers for English, French, and German languages, P5-3 and P7-4 scanheads, and ResearchLink to the dash numbers existing prior to release of 124.13 software. The dash numbers had been inadvertently changed with this release.
  - Corrects FEC PCB firmware that causes the system to stop scanning after incorrect HVdc calibration.
  - Corrects an ACIM configuration error and power monitor errors that randomly occur during system bootup.
  - Prevents L10-5 scanhead MUX damage when the scanhead is connected to the right-hand scanhead receptacle and the system is scanning with a static CW scanhead.
  - Fixes a radial line artifact in 2D/color after the system enters triple mode.
  - Corrects triggering when using Advanced 3DI calibrated acquisition.

## Known Problems

Refer to Operating Notes:

4707-0027-16	English
4787-0027-16	French
4777-0027-16	German
4827-0027-16	Italian
4847-0027-16	Brazilian (Portuguese)
4887-0027-16	Danish
4807-0027-16	Dutch
4837-0027-16	Finnish
4907-0027-16	Greek
4877-0027-16	Portuguese (Europe)
4797-0027-16	Spanish
4817-0027-16	Swedish

## Hardware Changes

There is no new hardware required to support software version 125.09. However, Italian upper and lower user interface assemblies were released to support the Italian language. Also, Danish, Norwegian, Swedish/Finnish lower user interface assemblies (P/Ns 3500-2633-01, 3500-2634-01, and 3500-2635-01) have been released to support the respective languages. (Swedish and Finnish languages use the same lower user interface assembly.) English upper user interface assemblies (P/N 3500-2635-05) are used with the Danish, Norwegian, and Swedish/Finnish lower user interface assemblies.

Three keycaps are required to support Danish, Norwegian, and Swedish/Finnish languages on the lower user interface assembly. These nine keycaps have been released in a keycap set (P/N 4400-0096-01) with a tool to remove existing keycaps. To change a system to Danish, Norwegian, Swedish, or Finnish, the respective 8501 machine options file must be installed, and three keycaps changed on the existing lower user interface assembly. The remaining six keycaps in the keycap set may be discarded.

**NOTE** The Scandinavian keycaps allow use of Scandinavian characters in patient data headers and image annotations. The system software has not been translated into these languages.

You must have a machine options file for the appropriate language to change the system language. Changing the user interface assembly or the keycaps alone will not change the system language. If you have the machine options file for the appropriate language, you may order the user interface assembly for the appropriate language or the Scandinavian keycap set.

Two CPU PROMs have been released simultaneously with 125.09 software. The CPU PROMs are required to support a new CPU ID chip (replaces P/N 2070-1188-01) that will be released at a later date. The new ID chip requires the new PROMs. The old ID chip will work with the old or new PROMs. The new CPU ID chip and CPU PROMs require software version 125.09 and above. Refer to the PROM part numbers below.

4201-2015-01	PROM Assy, CPU HI, U68
4201-2016-01	PROM Assy, CPU LO, U59
8000-1663-01	PROM Kit, CPU HI/LO

## **12-4.2      125.10 (10.1.1.1)**

Released February 10, 1999.

4252-0840-06	Software files disk
4252-0841-06	Bootable Image disk with system software
4252-0842-06	Bootable Image disk without system software

No systems were shipped with this software version.

## **12-4.3      125.11 (10.1.1.2)**

Released February 16, 1999.

4252-0840-07	Software files disk
4252-0841-07	Bootable Image disk with system software
4252-0842-07	Bootable Image disk without system software

### **New Features**

None.

### **Features Not Supported**

Same as software build 125.09.

## **Problems Corrected**

- Corrects a 2D alignment error when making measurements across dual images using scanheads that support harmonic imaging, when one image was made using fundamental frequencies and the other was made using harmonics.
- Corrects XIO errors (PSP1 pointer out of bounds ErrID:2108:0105) associated with PCM crashes. The PCM crashes resulted in display of a vertical gray line pattern on the monitor that degenerated into several faint color screens. When the error occurred, the system circuit breaker had to be reset to clear the error. PCM send error ErrID:1f00:0005 is also associated with these errors.
- Prevents a blue banner error when booting up the system with a 3DI Position Sensor Adapter connected to a scanhead connector.
- Eliminates a blue banner error condition that occurs under certain conditions after selecting a D2CW probe while using a P4-2 or P3-2 scanhead. The error incorrectly states that the scanhead should be reselected. Cycling system power is actually required to clear the error.
- Prevents LMP, height, weight, and other patient information from the previous patient from being displayed in the current patient's report.

## **Known Problems**

Refer to Operating Notes:

4707-0027-22	English
4787-0027-22	French
4777-0027-22	German
4827-0027-22	Italian
4847-0027-22	Brazilian (Portuguese)
4887-0027-22	Danish
4807-0027-22	Dutch
4837-0027-22	Finnish
4907-0027-22	Greek
4877-0027-22	Portuguese (Europe)
4797-0027-22	Spanish
4817-0027-22	Swedish

## **Hardware Changes**

There are no new hardware requirements for software version 125.11.

The 4201-2015/2016 -XX CPU HI\LO PROMs released for software version 125.09 and higher are not supported for software version 125.11 due to issues with the planned release of the new CPU ID chip. Use the previously released CPU PROMs listed below instead.

4201-1931-06	PROM Assy, CPU HI, U68
4201-1932-06	PROM Assy, CPU LO, U59
8000-1308-01	PROM Kit, CPU HI/LO

## **12-5      127.X Software Releases**

### **12-5.1    127.04 (10.1.2)**

Released August 30, 1999.

4252-0867-04	Software files disk
4252-0868-03	Bootable Image disk with system software
4252-0869-03	Bootable Image disk without system software

#### **New Features**

- L12-5 50 mm scanhead and Small Parts, Pediatric, Advanced Breast, Cerebrovascular, Peripheral Vascular, Musculoskeletal, and Generic clinical options
- L12-5 50 biopsy guide
- Abdominal surgery clinical option on the LI9-5, LAP L9-5, and CT8-4 scanheads
- Neurosurgery clinical option on the C8-5, P7-4, and CL10-5 scanheads
- CSI improvements to the P4-2 scanhead
- High PRF, TDI, and THI improvements to the MPT7-4 scanhead

#### **Features Not Supported**

- Power Harmonics on the C5-2 scanhead
- Graphics key on lower user interface
- 3D Optimization key on lower user interface

#### **Problems Corrected**

- Networking
  - Corrects an issue where the ultrasound system rebroadcast network messages sent by other network devices.
  - Improves system slowdowns with NetLink and DiskLink configured.
  - Prevents DICOM images from being sent to the wrong patient's study at the DICOM workstation, when the previous patient's exam is reviewed and images are stored using the PRINT control.
  - Displays the thumbnail images in the thumbnail boxes when using Microsoft Internet Explorer with WebLink. Previously, when clicking on the empty thumbnail box, the full image was displayed.
  - Adds NetLink compatibility with the Kodak MLP-190 printer.
  - Corrects communications issues between the HDI 5000 system and the Sterling (Polaroid) Helios, Digital 200, Digital 400, HPS 400, and solid inkjet printers. Also, corrects communication issues between the HDI 5000 system and the Sterling DPS server.
  - Allows control of DICOM scaling from the device files. This allows Field Service Engineers to disable DICOM scaling when setting up the sys-

tem with a network device if difficulties are encountered during the setup process.

- Miscellaneous
  - Prevents the left image from disappearing behind the right image when the image is frozen or zoomed, or when panning during dual imaging.
  - Adds a low-level magneto-optical disk format capability to the user diagnostics menu. The low-level format capability alleviates system slow-down issues due to slow read/write times.
  - Decreases the amount of time required to retrieve patient data on systems with DiskLink.
  - Corrects an issue causing irrecoverable operation when using an L12-5 38 mm scanhead with the Small Parts clinical option and the Breast Tissue Specific preset.
  - Removes an extraneous orange diagonal line from the scan plane indicator that occurs under certain circumstances while using the MPT7-4 scanhead.
  - Adds the ability to select the Hadlock or Custom estimated fetal weight (EFW) percentile calculation method. The Custom option enables the user to select the modified Hadlock EFW percentile that was removed the system software version 107.11. The selection is made in Setups under OB measurements.

## Known Problems

Refer to Operating Notes:

4707-0027-23	English
4787-0027-23	French
4777-0027-23	German
4827-0027-23	Italian
4887-0027-23	Danish
4807-0027-23	Dutch
4837-0027-23	Finnish
4907-0027-23	Greek
4877-0027-23	Portuguese
4797-0027-23	Spanish
4817-0027-23	Swedish

## Hardware Changes

There is no new hardware required to support software version 127.04 or the scanheads released for software version 127.04.

**12-5.2**

## **127.05 (10.1.3)**

Released December 6, 1999.

4252-0867-05	Software files disk
4252-0868-04	Bootable Image disk with system software

### **New Features**

None.

### **Features Not Supported**

Same as those for the previous software version (127.04 software).

### **Problems Corrected**

- Corrects an intermittent problem that results in the Doppler spectral trace not being updated when the sample volume cursor is moved.
- Prevents the system from hanging after deleting images from the hard disk if one of the images is not readable. Unreadable images may be caused by turning off the system before the image has been fully saved to disk, a hard disk error, or a power supply problem.
- Modifies the system software-installation application, updating it for 10.1.3 software.

### **Known Problems**

Refer to Operating Notes:

4707-0027-25	English
4787-0027-25	French
4777-0027-25	German
4827-0027-25	Italian
4887-0027-25	Danish
4807-0027-25	Dutch
4837-0027-25	Finnish
4907-0027-25	Greek
4877-0027-25	Portuguese
4797-0027-25	Spanish
4817-0027-25	Swedish

### **Hardware Changes**

There is no new hardware required to support software version 127.05.

**170.23 (10.2 Demo Release)**

Released October 8, 1999.

4252-0851-19	Software files disk
4252-0874-01	Bootable Image install disk with system software
4252-0873-01	Bootable Image disk installation MO disk

**New Features**

- All features released with 127.04 software
- SonoCT Real-Time Compound Imaging on the L12-5 38 mm and L12-5 50 mm scanheads for breast, musculoskeletal, vascular, and small parts imaging applications
- Extended gain-range on selected
- 3D acquisition with the MPT7-4 scanhead and the ability to export data for off-line rendering (TomTec or other vendors)
- Biplane TEE (BPT9-5) for pediatric cardiac applications
- Connectivity enhancements including Worklist (automatic input of patient header information from hospital HIS/RIS systems)
- Analysis and calculations enhancements (Power Calcs)
- THI on the P6-3 and C7-4 scanheads for radiology applications
- Real-Time Perfusion Imaging on P4-2
- THI improvements to the C5-2 and L7-4 scanheads
- TDI improvements (blending control and improved lateral gain compensation)
- UpLink enhancements (supports version 2.0)
- Temporary options capability
- ECG trigger user interface improvements
- New high performance color processing
- Color Smoothing control
- Power Harmonics on the C5-2 scanhead
- Graphics key on lower user interface
- 3D Optimization key on lower user interface
- CPA Dynamic Motion Differentiation
- Color box behavior changed so that the system continues to scan at the previous location until the color box movement stops
- Added a faster sweep speed ([Table 12-2](#))

).

**Table 12-2 Sweep Speeds Available with 17X.XX Software**

Setting	PAL		NTSC	
<b>20 msec/column</b>	Low	16 mm/sec	Low	19 mm/sec
<b>10 msec/column</b>	Medium	32 mm/sec	Medium	38 mm/sec
<b>5 msec/column</b>	High	63.5 mm/sec	High	76 mm/sec
<b>3 msec/column</b>	Maximum	106 mm/sec	Maximum	127 mm/sec

## **Features Not Supported**

Same as those for the previous software version (127.04 software).

## **Problems Corrected**

- Miscellaneous
  - Adds a missing "OK" box to a banner message that occurs if the operator attempts to cycle system power while spooling images if the patient data fields are full. Recovery required the system to be allowed to finish spooling then be rebooted.
  - Adds a low-level format option for the optical drive to the user diagnostics display. The format option enables the end-users to format optical disks and speed up drive access time.
  - Resizes large text on OB reports when the reports are printed on an Okidata 600e printer.
  - Corrects a condition causing an inability to steer PW Doppler after viewing a VCR tape, DiskLink, or using the Superkey Video keys.
  - Labels the depth markers.
  - Puts the scanhead position function key back on hardkey.
- Translations
  - Corrects default settings in the Italian Image Management window. Settings were listed as B/W = 90, Color = 45. The settings should be listed as 60 and 30.
  - Translates various untranslated English phrases and corrects inconsistent translated phrases appearing in German system software. Also correctly displays the "@" symbol when this key is depressed. Previously, depression of this key resulted in display of the "&" symbol.
- Analysis
  - Enables the customer to access the diameter and area reduction tools with the P4-2 and C4-2 for abdominal studies.

- Corrects default settings in the Italian Image Management window. Settings were listed as B/W = 90, Color = 45. The settings should be listed as 60 and 30.

## Known Problems

Refer to Operating Notes:

4707-0027-24 Rev A	English
4787-0027-24 Rev A	French
4777-0027-24 Rev A	German
4827-0027-24 Rev A	Italian
4887-0027-24 Rev A	Danish
4807-0027-24 Rev A	Dutch
4837-0027-24 Rev A	Finnish
4907-0027-24 Rev A	Greek
4877-0027-24 Rev A	Portuguese
4797-0027-24 Rev A	Spanish
4817-0027-24 Rev A	Swedish

## Hardware Changes

Software version 170.23 requires the following hardware and firmware to support the released features.

- Centerplane PCB (P/N 3500-1720-05). Changes were made to the Centerplane PCB to accommodate two AIFOM PCBs, and SPM with daughter-cards, and to support future features.
- Additional AIFOM - (P/N 7500-1413-02). The additional AIFOM was added to support future features. The additional AIFOM is located in slot A13B.
- Signal Processing Module PCB (SPM) - (P/N 3500-2998-01). Two daughtercards were added to the 7500-1119-XX SPM PCB to make the 3500-2988-01 SPM+. The daughtercards double the processing capability of the 7500-1119-XX PCB and are required for SonoCT Real-Time Compound Imaging. Also, the operating speed of the SPM was increased from 32 MHz to 40 MHz.
- Front End Controller PCB (FEC) - (P/N 7500-1567-01/02). Changes to the FEC allow more imaging modes to be selected. These changes are required for SonoCT Real-Time Compound Imaging.
- FEC PROM kit (P/N 8000-1575-01) to allow selection of additional imaging modes.
- System CPU (P/N 3500-3070-01). An additional 16 MB of memory was added to the 32 MB CPU PCB to support SonoCT Real-Time Compound Imaging and future features.
- CPU PROM kit (P/N 8000-1663-05) to support 48 MB CPU PCB.

- Upper and lower UIF assemblies. The new UIF assemblies add keys for compound imaging and frame rate. Several other controls have been relocated. Refer to [Section 13, "Configuration"](#), for part numbers of the user interface assemblies required for 170.23 software.

## 12-6.2

### 170.30 (10.2 RFD Release)

Released November 22, 1999.

4252-0851-26	Software files disk
4252-0874-06	Bootable Image install disk with system software
4252-0873-05	Bootable Image disk installation MO disk

#### New Features

None.

#### Features Not Supported

Same as those for the previous software version (170.23 software).

#### Problems Corrected

All problems corrected were unnoticeable in field-based systems.

#### Known Problems

Refer to Operating Notes:

4707-0027-24 Rev C	English
4787-0027-24 Rev C	French
4777-0027-24 Rev C	German
4827-0027-24 Rev C	Italian
4887-0027-24 Rev C	Danish
4807-0027-24 Rev C	Dutch
4837-0027-24 Rev C	Finnish
4907-0027-24 Rev C	Greek
4877-0027-24 Rev C	Portuguese
4797-0027-24 Rev C	Spanish
4817-0027-24 Rev C	Swedish

#### Hardware Changes

There are no new hardware or firmware requirements for this software version.

**170.31 (10.2.1)**

Released December 30, 1999.

4252-0851-27	Software files disk
4252-0874-07	Bootable Image install disk with system software
4252-0873-06	Bootable Image disk installation MO disk

**New Features**

None.

**Features Not Supported**

Same as those for the previous software version (170.30 software).

**Problems Corrected**

- Changes the size of the scanplane movement (in degrees) to match the system specifications when acquiring images using the 3D Cardiology feature.
- Corrects for a significant loss of 2D gain during cardiology contrast imaging when turning Flash off from the high or low power setting. The values and display gain return to normal when the 2D gain is adjusted by the gain control or the TGC slide controls.
- Decrease the amount of digital noise in harmonic imaging when TGC is increased and overall 2D gain is decreased. The noise was most prevalent when using the P4-2, P5-3, and P7-4 scanheads in cardiology applications or the P6-3, C7-4, L12-5 38 mm, and L12-5 50 mm in general imaging applications.
- Fixes grayscale acquisition when acquiring data using the A3DI Position Sensor. Previously, under certain conditions, use of the position sensor caused acquisition of an incomplete and distorted data set. Freehand and color acquisitions were not affected.
- Corrects the issue of the system not recognizing 2/29/00, as a leap-year day for an LMP and age. (The system now accepts 2/29/2000 or 2/29/00 as valid dates.)
- Prevents the system from hanging if rapid keystrokes are entered after CALCS is pressed.
- Prevents the system from crashing at midnight if you are in VCR Raster Playback or Review Image display source.
- Corrects L12-5 38 mm and L12-5 50 mm scanhead center frequencies when transmitting at 9.0 MHz using Tissue Doppler Imaging (TDI).

**Known Problems**

Refer to Operating Notes:

4707-0027-27 Rev A	English
4787-0027-27 Rev A	French
4777-0027-27 Rev A	German

4827-0027-27 Rev A	Italian)
4887-0027-27 Rev A	Danish
4807-0027-27 Rev A	Dutch
4837-0027-27 Rev A	Finnish
4907-0027-27 Rev A	Greek
4877-0027-27 Rev A	Portuguese
4797-0027-27 Rev A	Spanish
4817-0027-27 Rev A	Swedish

## Hardware Changes

There are no new hardware or firmware requirements for this software version.

### 12-6.4

### 177.13 (10.2.5)

Released May 4, 2000.

4252-0878-19	Software files disk
4252-0888-06	Bootable Image install disk with system software

## New Features

- Digital Video Streaming (DVS) option
  - Streaming of compressed digital data to and from the DVS hard drive (up to one minute of video at 30 Hz rate)
  - Digital and Stress Echo options
  - Flexible protocol engine
  - JPEG compression
  - RLE (Run Length Encoding) compression for DICOM
  - DICOM disk support
  - Seamless video switching
  - Control of DVS features using the ultrasound system user interface
  - Seamless passing of patient demographics
  - Calibration of images for measurement
- Intelligent Frame Rate Accelerator (Multi-line feature)
- DICOM Modality Performed Procedure Step (MPPS) feature (on non-DVS systems)
- DICOM Storage Commit (SC) feature (on non-DVS systems)

## Features Not Supported

- Same as those for the previous software version (170.31 software).
- Quantification of DVS images
- With the DVS option installed, all ultrasound system networking functionality is disabled: including DiskLink, NetLink, WebLink, and ResearchLink. For customers who have DiskLink, NetLink, WebLink, and ResearchLink, the features will remain enabled, but non-functional. Customers who order DVS are not able to order DiskLink, NetLink, WebLink, or ResearchLink.

## **Problems Corrected**

- Corrects the High Q algorithm when making acceleration time measurements on a specific type of waveform.
- Corrects an SPM timing error (0304-20000102) when using the BPT9-5 scanhead in pediatric cardiology applications when in CPA with a large color box.
- Reduces digital noise when TGC slide pot gain is increased and the 2D gain is decreased. Also, improves noisy images when using Tissue Harmonic Imaging.
- Eliminates a blue banner message (0021) after freezing a VCR image and attempting calibration.
- Corrects an issue preventing the time from displaying on the monitor during system bootup. Previously, performing a system reboot corrected the problem, but system reboot had to be done with the circuit breaker.
- Eliminates a power dissipation error when using P1 PEN (with the P4-2 scanhead) at the maximum mechanical index during triggered imaging.
- Fixes an intermittent blue banner error message occurring on system bootup.
- Prevents the system from crashing when saving a user-defined Tissue Specific preset with SonoCT Real-Time Compound Imaging enabled.
- Eliminates errors caused by the system being unable to update after a menu control is activated following activation of another menu control.
- Fixed intermittent crashes occurring after the bootup splash screen.

## **Known Problems**

Refer to Operating Notes:

4707-0027-28 Rev B	English
4787-0027-28 Rev B	French
4777-0027-28 Rev B	German
4827-0027-28 Rev B	Italian
4887-0027-28 Rev B	Danish
4807-0027-28 Rev B	Dutch
4837-0027-28 Rev B	Finnish
4907-0027-28 Rev B	Greek
4877-0027-28 Rev B	Portuguese
4797-0027-28 Rev B	Spanish
4817-0027-28 Rev B	Swedish

## **Hardware Changes**

There is no new hardware required to support software version 177.13, but DVS functionality requires software version 177.13, the DVS Module, and the following HDI 5000 hardware:

- PIM (P/N 7500-1398-06) Updated board level PROMs were installed for compatibility with the DVS Module.
- DDEA (P/N to be released later). Increases ECG gain and changes the ECG input filtering. DVS functionality requires that the DDEA module have the 7500-1020-08 DDEA PCB.
- PCM (P/N 7500-1408-04). Changes to the PCM improve video timing required for DVS. The -04 PCM was released previously and is now required for the DVS option.

## **12-6.5**

## **178.04 (10.2.6)**

Released July 14, 2000.

4252-0899-03	Software files disk
4252-0900-03	Bootable Image install disk with system software

### **New Features**

None.

### **Features Not Supported**

Same as those for the previous software version (177.13 software).

### **Problems Corrected**

- Prevents the system from “hanging” when using an L12-5 scanhead (38 mm or 50 mm) under certain conditions when enlarging the color box from the upper right to lower left of the display.
- Fixes corrupted 2D images when transitioning from Tissue Doppler Imaging TDI low PRF to M-mode.
- Disables the 3D calibrate softkey in non-3D capture modes (Doppler and M-mode).
- Eliminates a system power supply warning related to the SPM PCB when using Color Power Angio (CPA) Imaging with the line density set to B on PAL systems.
- Reduces Pegasus task crashes and keyboard freezes when using the alphanumeric keys.
- Prevents the system from crashing when using the MPT7-4 scanhead with large sample volume sizes in simultaneous 2D/PW mode after decreasing depth.
- Fixes an error in the graphing function that prevented OB graphs from automatically displaying in the year 2000.
- Corrects a Worklist/patient data entry data mix-up that caused the second page of a patient study to be inserted into the previous patient’s file on the AGFA Impax archiving device and on the system hard drive.
- Corrects an intermittent bus conflict on the SPM PCB when using CPA.
- Improves CPA image quality when entering PW Doppler using the C5-2 and P6-3 scanheads.

- Fixes erratic trackball movement during Doppler and M-mode measurements when using Power Calcs.
- Eliminates the scanhead reselect error banner when using a L12-5 or L7-4 scanhead during Color or CPA imaging under certain conditions when changing the steering angle.
- Prevents Color/CPA artifacts and color misregistration when using the C9-4v or C9-5 scanheads with a reduced sector size while resizing or repositioning the region of interest (ROI) box.
- Corrects various M-line cursor and Doppler sample volume cursor issues.
- Restores missing M-mode fields to the cardiology report on NTSC systems. The missing fields include IVS(D), LVD(D), IVS(S), and LVPW(S).
- Modifies the data transfer software to support the Body Part Examined attribute for DICOM.
- Deletes Digital Video Streaming measurements that persist after starting a new patient or appending to a different patient selected from the patient directory.
- Eliminates the Doppler graybar that is displayed in spectral Doppler when the sample volume cursor is moved.
- Eliminates a power supply warning during SPM PCB standalone diagnostics on the 3500-2988-02 SPM.
- Fixes 2D and Color End-to-End test failures that occur after selection of a Cardiology clinical option.
- Fixes intermittent DDEA test failures that occur when measuring the high-pass frequency on both physio channels.

## **Known Problems**

Refer to Operating Notes:

4707-0027-32 Rev A	English
4787-0027-32 Rev A	French
4777-0027-32 Rev A	German
4827-0027-32 Rev A	Italian
4887-0027-32 Rev A	Danish
4807-0027-32 Rev A	Dutch
4837-0027-32 Rev A	Finnish
4907-0027-32 Rev A	Greek
4877-0027-32 Rev A	Portuguese
4797-0027-32 Rev A	Spanish
4817-0027-32 Rev A	Swedish

## **Hardware Changes**

There are no new hardware or firmware requirements for this software version.

# **13 Configuration**

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## **13-1 Compatibility**

The part number, dash level, and firmware software level of each PCB is determined by the CPU at boot up.

The system software contains a hardware and software configuration file that lists the part numbers and dash levels of installed PCBs and PROMs. If a different dash level PCB or PROM is installed, and "Save as Installed" is then selected, this file is updated. This should only be done if the replacement has been determined to be compatible with the system configuration. *The original configuration information cannot be retrieved after this file is modified. Refer to Section 9, "Troubleshooting", for more information.*

Hardware configuration and compatibility must be based on information in the PCB and PROM replacement matrices. Hardware configuration involves verifying that PCBs and PROMs are compatible with the specific system software.

## **13-2 Usage Rules for PCB Matrices**

1. Find the matrix for the PCB to be ordered. The PCB matrices are listed by slot location. The front card cage PCBs are listed first as they are installed from left to right, then the back, from left to right.
2. Find the software column matching the system software.
3. Find the PCB with an "R" in the software column.
4. If there is more than one "R", select the one with a "Y" that matches the system's features. Order that PCB.

"A" indicates "alternate". The factory may ship an alternate (equivalent) PCB instead of the PCB ordered.

"L" means "Like-for-Like". Only order this PCB if the part number and dash level are exactly the same as the PCB being replaced.

"C" indicates this PCB is compatible with the software and PCBs in the same column.

5. Refer to the PROM matrix if the PCB requires firmware.

## 13-3

### Usage Rules for PROM Matrices

A number of PCBs require operating software PROMs (firmware). The software for the CPU determines the overall system software level (for example, 1107.10). The software on other PCBs will never be higher than that of the CPU, and can be at a lower level.

System features may or may not be compatible with a specific PCB revision. The different codes that can be found here are:

Y - yes, feature is compatible with this PCB dash level,

N - no, feature is not compatible with this PCB dash level.

Order the software PROM kit required by the PCB part number being ordered.

## 13-4

### Usage Rules for Jumper and PROM Diagrams

- There are no jumpers that require configuration by field service representatives. There are no switches on PCBs.
- There are no diagrams for PCBs that do not have jumper headers or firmware PROMs installed.
- The relative position of firmware PROMs and certain jumpers are shown on the jumper and PROM diagrams.
- Only those jumpers requiring headers are shown on these diagrams.
- Jumpers requiring a jumper header are shown only for reference when verifying their integrity.
- If the jumper has three pins, the physical position of the header is shown.
- It is understood that if jumpers are not shown on the diagram, they are either hardwired or are not jumpered with a header.

## 13-5

### Usage Rules for Scanhead Matrix

Not all scanhead types may be supported by a specific system software level.

- Order scanheads by scanhead type or name and part number and current dash level.
- Backward compatible (Bkwd Comp.) indicates the previous versions which the latest dash level replaces.

## 13-6

### Ordering/Installing System Software

[Table 13-1](#) lists part numbers of system software files disks and upgrade disks. The part number of the software files disk is listed for reference because the part number is displayed on the system monitor (Setups - Diagnostics - Show Machine Configuration). The part number is also used on the Operating Notes. Beginning with software version 107.11 the software files disk no longer contains files to enable system bootup. If system software is to be ordered, order

the system upgrade disks with the system software. Refer to [Table 13-1](#) for upgrade disk part numbers.

Upgrade disks with system software (230 MB optical disks) automatically back-up the old system software and machine options, copy the new software, perform the software integrity scan, and transfer user presets. Messages are displayed on the system monitor to provide status of the installation process. If an error is detected during the installation process, the system automatically restores the previous software. Upgrade disks with system software are used to upgrade from one level of HDI 5000 software to another.

Upgrade disks without system software (128 MB optical disks) are used only to transfer system presets. The disk is inserted into the drive and the user pre-sets (OB tables and hospital name) are transferred to the disk. The hardware is then updated and the presets are copied to the hard drive. Upgrade disks without system software are used to transfer user presets (not TSI presets) when upgrading from an HDI 3000 to an HDI 5000. (System software files are already installed on the hard drive of the new DDEA module.)

To summarize the use of upgrade disks, use the 128 MB MO disk to transfer presets from an HDI 3000 to an HDI 5000. Use the 230 MB MO for transferring presets or installing software on any HDI 5000. If a system has a DDEA with a 640 MB MO drive, use a 230 MB upgrade disk. Use 540 MB disks for systems with software version 170.30 or higher.

**Table 13-1 System Software Files and Upgrade Disk Part Numbers**

Software Level	Build Level	Part Numbers			Notes
		Software Files <sup>1</sup>	Upgrade Disk w/o System S/W	Upgrade Disk w/System S/W	
10.0	107.10	4252-0799-11	4252-0801-06	4252-0800-06	<sup>2</sup>
10.0b	107.11	4252-0810-01	4252-0809-01	4252-0808-01	
10.0.1	108.15	4252-0811-09	4252-0814-04	4252-0813-04	
10.0.2	108.16	4252-0811-10	4252-0814-05	4252-0813-05	
10.0.3	108.17	4252-0811-11	4252-0814-06	4252-0813-06	
10.0.4	108.18	4252-0811-12	4252-0814-07	4252-0813-07	
10.0.5	108.19	4252-0811-13	4252-0814-08	4252-0813-08	
10.1	124.13	4252-0815-14	4252-0829-03	4252-0828-03	
10.1.1	125.09	4252-0840-05	4252-0842-05	4252-0841-05	
10.1.1.2	125.11	4252-0840-07	4252-0842-07	4252-0841-07	
10.1.2	127.04	4252-0867-04	4252-0869-03	4252-0868-03	
10.1.3	127.05	4252-0867-05	4252-0869-04	4252-0868-04	
10.2	170.23	4252-0851-19	4252-0873-01	4252-0874-01	<sup>3</sup>
10.2	170.30	4252-0851-26	4252-0873-05	4252-0874-06	<sup>3</sup>
10.2.1	170.31	4252-0851-27	4252-0873-06	4252-0874-07	<sup>3</sup>
10.2.5	177.13	4252-0878-19	-	4252-0878-06	<sup>3, 4</sup>
10.2.6	178.04	4252-0899-03	-	4252-0900-03	<sup>3, 4</sup>

1. The part numbers in this column are for reference only. The part numbers are of no use to field personnel.
2. Initial system release. Upgrade disk with system software is to upgrade systems requiring a new hard drive.
3. System software size has increased substantially with software version 170.30 (software version 170.23 was the non-released demo version). If a system has 170.30 software or above, use only the 540 MB disks included with the upgrade kits or the new system (P/N 2100-1409-01) to create backups.
4. Part number for upgrade disk without system software is no longer supported.

## 13-7 Ordering Replacement Hard Drives

Defective hard drives are to be replaced with pre-loaded drives (drives containing system software). Use the following procedure to order a hard drive with the correct software version.

### CAUTION

Improper handling of hard drives causes physical and electronic damage. Avoid shock damage and ESD damage to the hard drives during removal and installation. Use the procedure below to prevent drive damage.

1. Use proper ESD procedures when removing or installing the hard drive.
2. Place the drive on a soft surface to prevent shock damage. The end-caps in the drive packaging may be used.
3. Order hard drive part number 3500-3066-02 if replacing a Quantum hard drive, or 3500-3129-01 if replacing an IBM hard drive. (Do not order a blank hard drive P/N 2100-XXXX-XX.)
4. Specify the current software level and base ID number.
5. Return the damaged drive in the replacement drive packaging. Drives returned that are not in this packaging will be scrapped and billed to your service region.
6. If required, order the Machine Options (MO) files using the procedure in paragraph 13-8.

## 13-8

## Ordering/Installing System Features

If features or scanheads are to be added to a particular system, Machine Option (MO) files must be ordered for that system. Install features or scanheads directly into the system (if you are in front of the system) or remotely using UpLink PC Based Remote Diagnostics. Refer to the UpLink manual (P/N 4720-0236-0X) for remote installation. If you are in front of the system, use the following procedure to order and install features or scanheads.

1. Order Machine Options optical disk P/N 4252-0738-01.
2. Specify the CPU I.D. number for that particular system. A Machine Options optical disk will be created for that system I.D. and sent to you.
3. Insert the Machine Options disk into the MO drive and power up the system.
4. Follow the system prompts to install the feature.

## 13-9

## Replacement Code Legend (All Matrices)

- R Recommended replacement level
- A Alternate acceptable replacement level
- C PCB is compatible with software, but is no longer stocked.
- L Order like for like
- Y Yes, compatible with feature
- N Not compatible with feature
- Indicates incompatibility for a specific software version

## 13-10 PCB Replacement Tables

### 13-10.1 PS1,2,3 Power Supply Module (PSM)

7500-1342		Replacement Levels				Features		Notes	
Dash Number	107.10 thru 108.19	124.13 thru 127.05	170.23 and up						
02	C	C	-						
04-06, 08	L	L	-						
07	R	R	R						
10	-	R	R						
11	L	R	R						

### 13-10.2 A1F Disk Drive PCB (DDEA)

Part Number		Replace- ment Levels		Features						Notes
		107.10 and up		ECG/ Physio	ECG	Disk Link	DVS	MO <sup>1</sup>	Hard Disk <sup>1</sup>	
3500-2760	02	R		N	N	Y	N	540	1,280	2, 3
	03	R		N	N	Y	N	540	2,100	2, 3
	05	R		N	N	Y	N	540	9,100	2, 3
3500-2761	02	R		Y	Y	Y	N	540	1,280	2, 4
	03	R		Y	Y	Y	N	540	2,100	2, 4
	04	R		Y	Y	Y	N	540	1,280	2, 4
	05	R		Y	Y	Y	N	540	3200	2, 4
	07	R		Y	Y	Y	N	540	9100	2, 4
3500-3115	01	R		Y	Y	Y	Y	540	9100	2, 5

1. MO and hard disk sizes are listed in megabytes.
2. System-specific system software and MO files must also be ordered for replacement hard disk drives. However, if a backup copy of the hard drive has been created on a magneto optical disk, the copy may be used to re-create the system files and data on the hard drive.
3. Made from 7500-0843-XX PCB.
4. Made from 7500-1020-XX PCB.
5. Contains 7500-1020-08 PCB, required for DVS functionality.

### 13-10.3 A4F Front End Controller PCB (FEC)

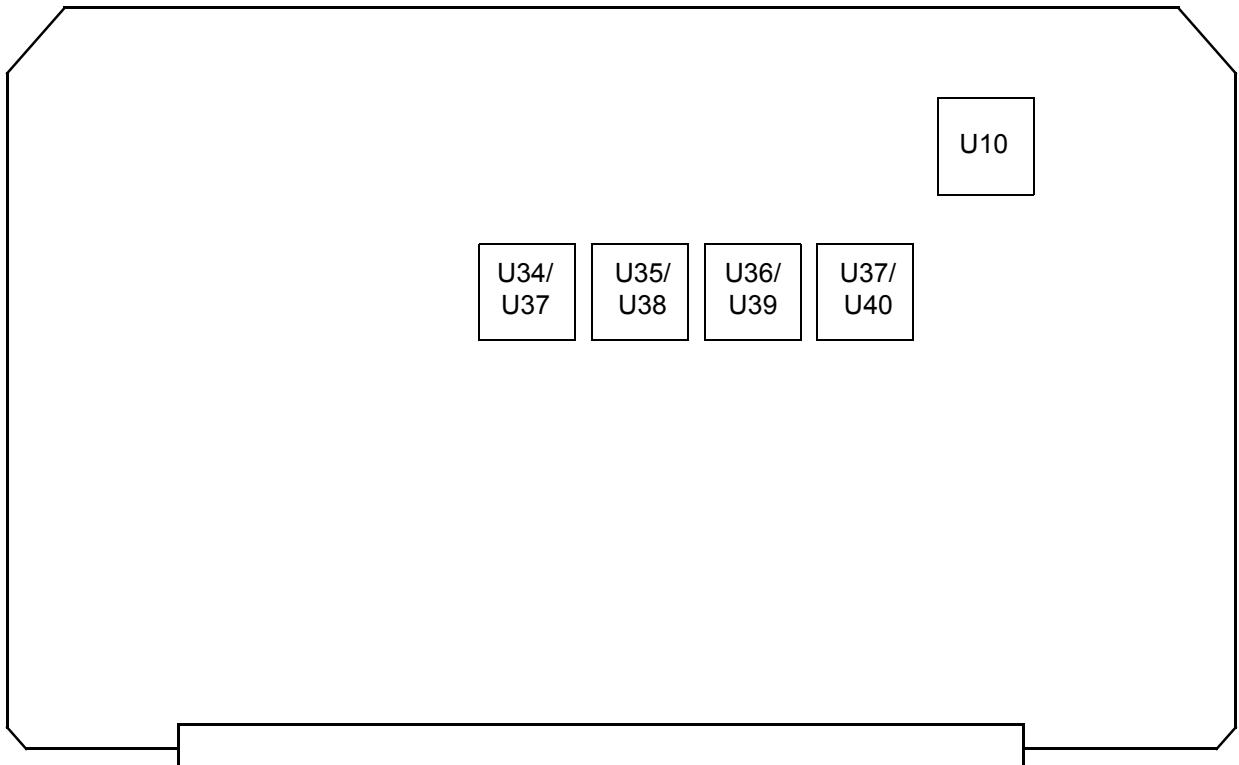
Part Number		Replacement Levels				Features		Notes
		107.10 thru 127.09	170.30 and up					
7500-0932	03	R	-					
7500-1567	03	-	R					

### 13-10.4 A4F FEC PROMs

Part Number		PROM Kit		Replacement Levels				Location, P/N, Dash		
		Part Number		107.10 thru 108.18	124.13 thru 127.05	170.30 and up				
7500-0932	03	8000-1317	02	R	-	-		U35	4201-1951	04
								U34	4201-1952	04
								U37	4201-1953	04
								U36	4201-1954	04
								U10	4201-1582	08
		8000-1504	01	R	-	-		U35	4201-1994	04
								U34	4201-1995	04
								U37	4201-1996	04
								U36	4201-1997	04
								U10	4201-1582	08
	03	8000-1575	01	-	-	R		U38	4201-2006	01
								U37	4201-2007	01
								U40	4201-2008	01
								U39	4201-2009	01
								U10	4201-1582	08

## 13-10.5 A4F FEC PROM Checksums and CRCs

PROM Part Number	Dash No.	Check -sum	CRC
4201-1951	04	A822	0000
4201-1952	04	2CD7	0000
4201-1953	04	73D4	0000
4201-1954	04	5A8A	0000
4201-1582	08	4C23	CCA3
4201-1994	04	6724	4CB0
4201-1995	04	524A	4CB0
4201-1996	04	9767	4CB0
4201-1997	04	83C3	4CB0
4201-1582	08	4C23	CCA3
4201-2006	01	F5DB	DB1A
4201-2007	01	701C	DB1A
4201-2008	01	95D9	DB1A
4201-2009	01	FE9C	DB1A
4201-1582	08	4C23	CCA3



**Figure 13-1 FEC Jumper and PROM Locations**

### 13-10.6      A5F Analog Interface Module Plus PCB (AIM+)

Part Number		Replacement Levels					Features		Notes
		107.10 thru 108.18	124.13 and up				3D Card		
7500-1026	04	L	L				N		1, 3, 4
	05	L	L				N		1, 3, 4
7500-1431	02	L	L				N		2, 3, 5
	03	L	L				Y		2, 3, 5

1. Use the 7500-1026-04 AIM+ only with the Regulator Module (7500-1421-01).
2. The 7500-1431-02 AIM+ incorporates circuitry of the 7500-1026-04 AIM+ and the 7500-1421-01 Regulator Module. Remove Regulator Modules from any system with a 7500-1431-02 AIM+.
3. On systems with CW or steered CW and 10X.XX software or below, if the Channel PCBs are removed or swapped, or if the AIM+, or hard drive are removed, run the CW Calibration Utility to prevent Doppler mirroring.
4. Disconnect L12-5 scanhead (4000-0396-01 only) before booting up systems with the 7500-1026-04 AIM+. If already booted up, reconnect and reselect scanhead. The -02 L12-5 has no issue with the 7500-1026 AIM+.
5. The 7500-1431-02 AIM+ does not have reconnect/reselect issues with either dash number L12-5 scanhead upon bootup.

## 13-10.7 A6F Regulator Module

Part Number	Replacement Levels				Features		Notes
	107.10 107.11	108.15 and up			# Chan PCBs		
7500-1421	01	R	-		8		<a href="#">1</a>

1. Do not use the 7500-1421-01 Regulator Module with the 7500-1431-01 AIM+. Use only with the 7500-1026-04 AIM+. The 7500-1431-02 AIM+ PCB incorporates the 7500-1421-01 Regulator Module and the 7500-1026-04 AIM+ circuitry.

## 13-10.8 A7F - A14F Channel Board PCBs (CB)

Part Number	Replacement Levels				Features		Notes
	107.10 and up				# Chan PCBs		
7500-0911	06, 07, 08, 09, 10	R			8		<a href="#">1, 2</a>

1. On systems with CW or steered CW, if the Channel PCBs are removed or swapped, or if the AIM+ or hard drive are removed, run the CW Calibration Utility to prevent Doppler mirroring.
2. Both the -08,-09, and -10 are identified as the -08 by the system diagnostic utilities.

## 13-10.9 A1B Internal Interface Module PCB (IIM)

7500-1291	Replacement Levels					Features		Notes
Dash Number	107.10 and up							
01	R							

## 13-10.10 A2B Peripheral Interface Module PCB (PIM)

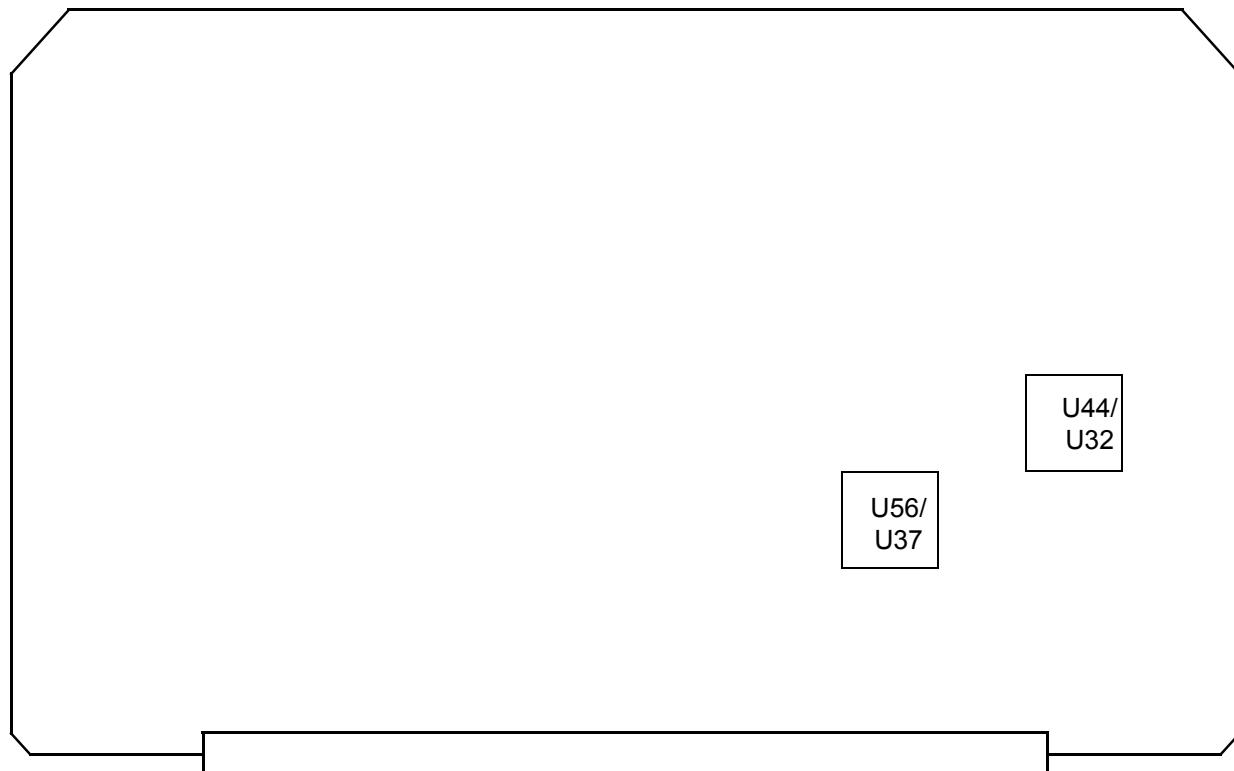
Part Number		Replacement Levels				Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 170.31	177.13 and up	3D Card	DVS	
7500-1316	04	R	R	-	-	N	N	
	05,06	R	R	R	R	Y	N	
7500-1398	03	-	C	-	-	N	N	
	04	-	R	R	R	Y	N	
	05	-	-	-	-	N	N	
	06	-	-	R	R	Y	Y	

## 13-10.11 A2B PIM PROMs

Part Number		PROM Kit		Replacement Levels				Location, P/N, Dash		
		Part Number		107.10 thru 108.18	124.13 and up					
7500-1316	All	8000-1375	02	R	-	-		U44	4201-1958	03
7500-1398	All							U56	4201-1959	06

## 13-10.12 A2B PIM PROM Checksums and CRCs

PROM Part Number	Dash No.	Check -sum	CRC
4201-1958	03	B398	0A8B
4201-1959	06	95FE	1E50



**Figure 13-2 PIM PROM Location**

### 13-10.13 A3B Pixel Conversion Module (PCM)

Part Number		Replacement Levels				Features			Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 170.31	177.13 and up	Frame grab	Disk Link	DVS	
7500-0683	10 11 12	R	R	R	R	Y	Y	N	
7500-1408	02	-	R	-	-	Y	Y	N	
	03	-	R	R	R	Y	Y	N	
	04	-	R	R	R	Y	Y	Y	

## 13-10.14 A3B PCM PROMs

Part Number		PROM Kit		Replacement Levels				Location, P/N, Dash		
		Part Number		107.10 and up						
7500-0683	All	8000-0991	03	R				U35	4201-1718	09
7500-1408	All									

## 13-10.15 A3B PCM PROM Checksums and CRCs

PROM Part Number	Dash No.	Check sum	CRC
4201-1718	09	CAD5	F557

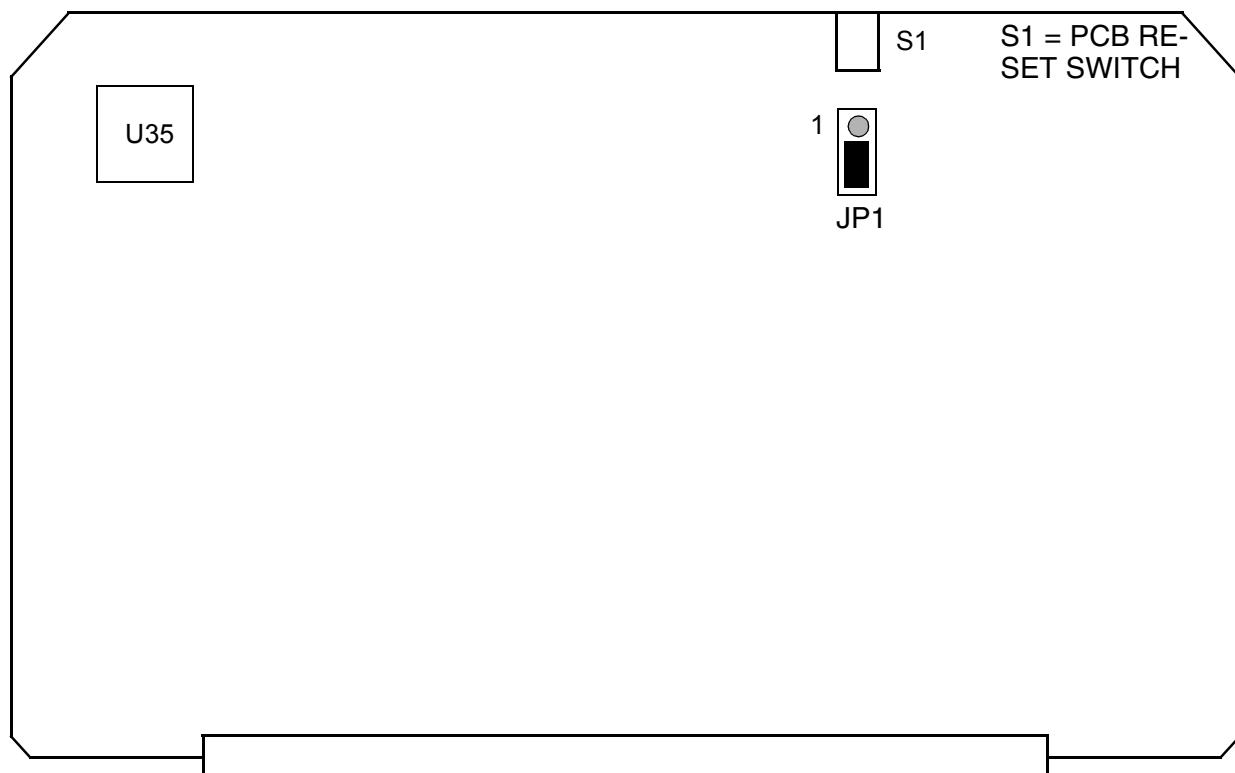


Figure 13-3 PCM Jumper and PROM Locations

## 13-10.16 A4B Pixel Space Processor 2 (PSP2)

7500-0714	Replacement Levels					Features		Notes
Dash Number	107.10 and up					Card .		
09	R					Y		No PROMs

## 13-10.17 A5B Pixel Space Processor 1 (PSP1)

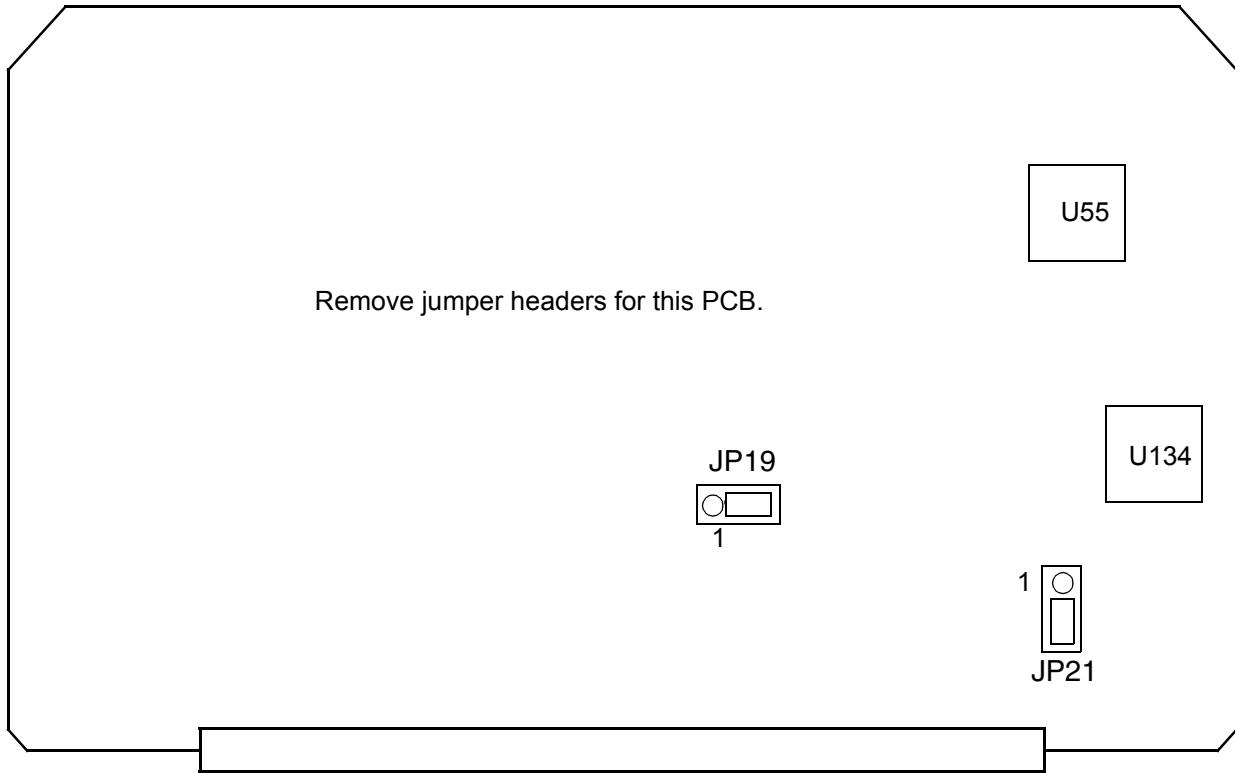
7500-0713	Replacement Levels					Features		Notes
Dash Number	107.10 and up					ST CW		
14	R					Y		

## 13-10.18 A5B PSP1 PROMs

7500-0713	PROM Kit		Replacement Levels				Location, P/N, Dash		
Dash Number	Part Number		107.10 and up						
14	8000-0992	04	R				U55	4201-1697	13
							U134	4201-1582	08

## 13-10.19 A5B PSP1 PROM Checksums and CRCs

PROM Part Number	Dash No.	Check sum	CRC
4201-1697	13	03E3	B4B9
4201-1582	08	4C23	CCA3



**Figure 13-4 PSP1 Jumper and PROM Locations**

## 13-10.20 A6B System CPU (CPU)

Part Number		Replacement Levels				Features		Notes
		107.10 thru 127.05	170.30 and up					
3500-2677	01 02 03	R	-					32 MB
3500-3070	01	-	R					48 MB

## 13-10.21 A6B CPU PROMs

Part Number		PROM Kit		Replacement Levels			Location, P/N, Dash		
		Part Number		107.10 thru 124.13	125.09 thru 127.05	170.30 and up			
3500-2677	01 02 03	8000-1308	01 <sup>1</sup>	R	R	-	U68	4201-1931	06
							U59	4201-1932	06
							U57	4201-1582	08
	02 03	8000-1688	02 <sup>2</sup>	-	R	-	U68	4201-2015	04
							U59	4201-2016	04
							U57	4201-1582	08
3500-3070	01	8000-1688	03 <sup>2</sup>	-	-	R	U68	4201-2015	05
							U59	4201-2016	05
							U57	4201-1582	08

1. Use the 7500-1026-04 AIM+ only with the Regulator Module (7500-1421-01).
2. Valid for systems with the older CPU ID chip (0000005xxxx).

## 13-10.22 A6B CPU PROM Checksums and CRCs

PROM Part Number	Dash No.	Check sum	CRC
4201-1931	06	3B0F	4BBB
4201-1932	06	29C3	4BBB
4201-1582	08	4C23	CCA3
4201-2015	04	EF4F	75D8
4201-2016	04	38A3	75D8
4201-1582	08	4C23	CCA3
4201-2015	05	3B6E	5D66
4201-2016	05	D8D3	5D66
4201-1582	08	4C23	CCA3

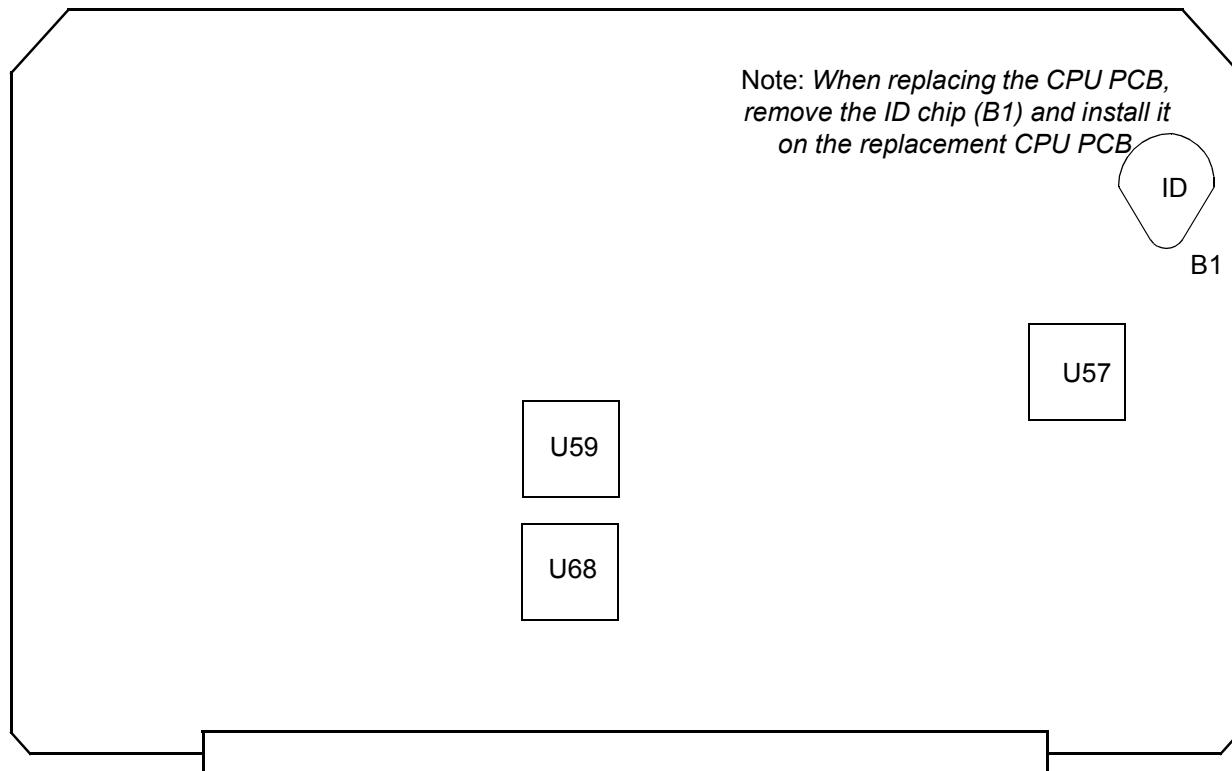


Figure 13-5 CPU PROM Locations

### 13-10.23 A8B Image Memory PCB (IMEM)

Part Number		Replacement Levels				Features		Notes
		107.10 and up				Disk Link	3D CPA	
3500-2757	01	R				Y	Y	64 MB with SIMMs

### 13-10.24 A9B Advanced Digital, Audio, Physio, and Translator)

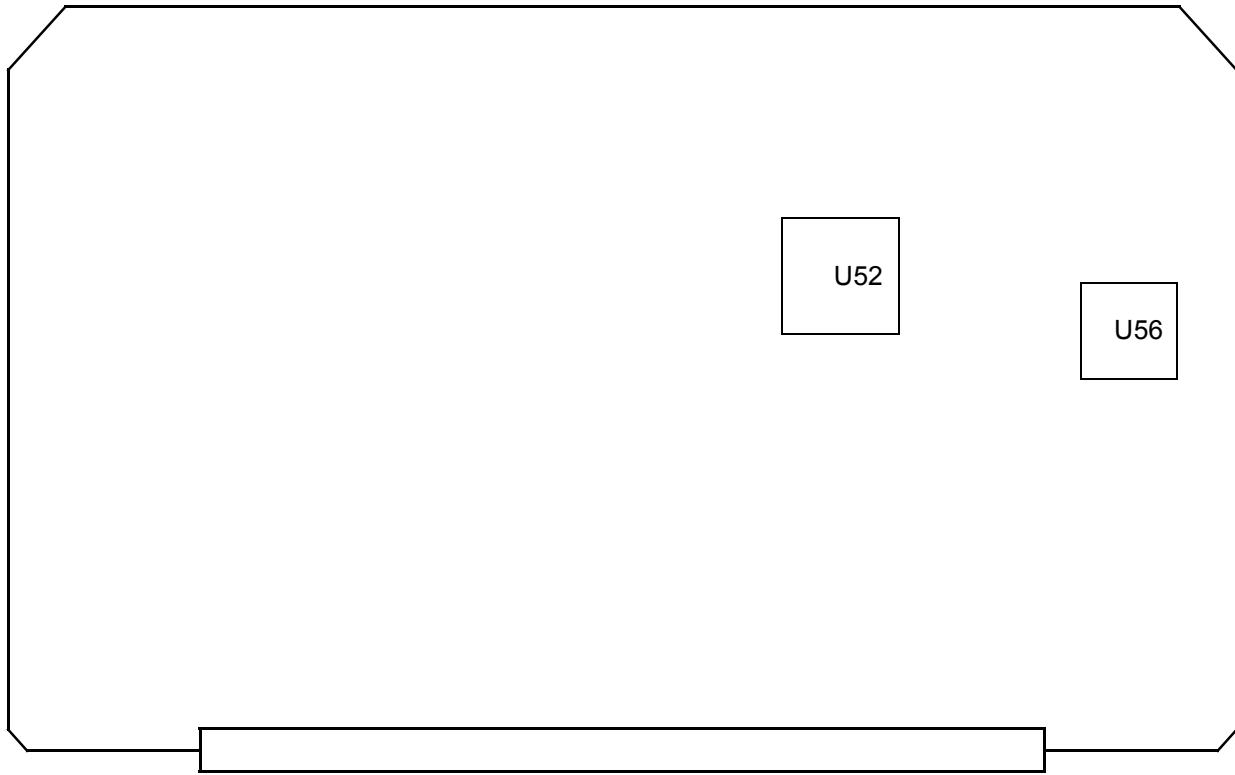
7500-1328		Replacement Levels				Features		Notes
Dash Number	107.10 thru 125.11	127.05 and up				ECG		
01, 02	R	R				Y		
03, 04	-	R				Y		

### 13-10.25 A9B ADAPTR PROMs

7500-1328		PROM Kit		Replacement Levels				Location, P/N, Dash		
Dash Number	Part Number	107.10 and up								
01, 02, 03, 04	8000-0995	R						U52	4201-1693	08
								U56	4201-1582	08

### 13-10.26 A9B ADAPTR PROM Checksums and CRCs

PROM Part Number	Dash No.	Check sum	CRC
4201-1693	08	71CB	63A5
4201-1582	08	4C23	CCA3



**Figure 13-6 ADAPTR Jumper and PROM Locations**

## 13-10.27 A11B Signal Processing Module (SPM)

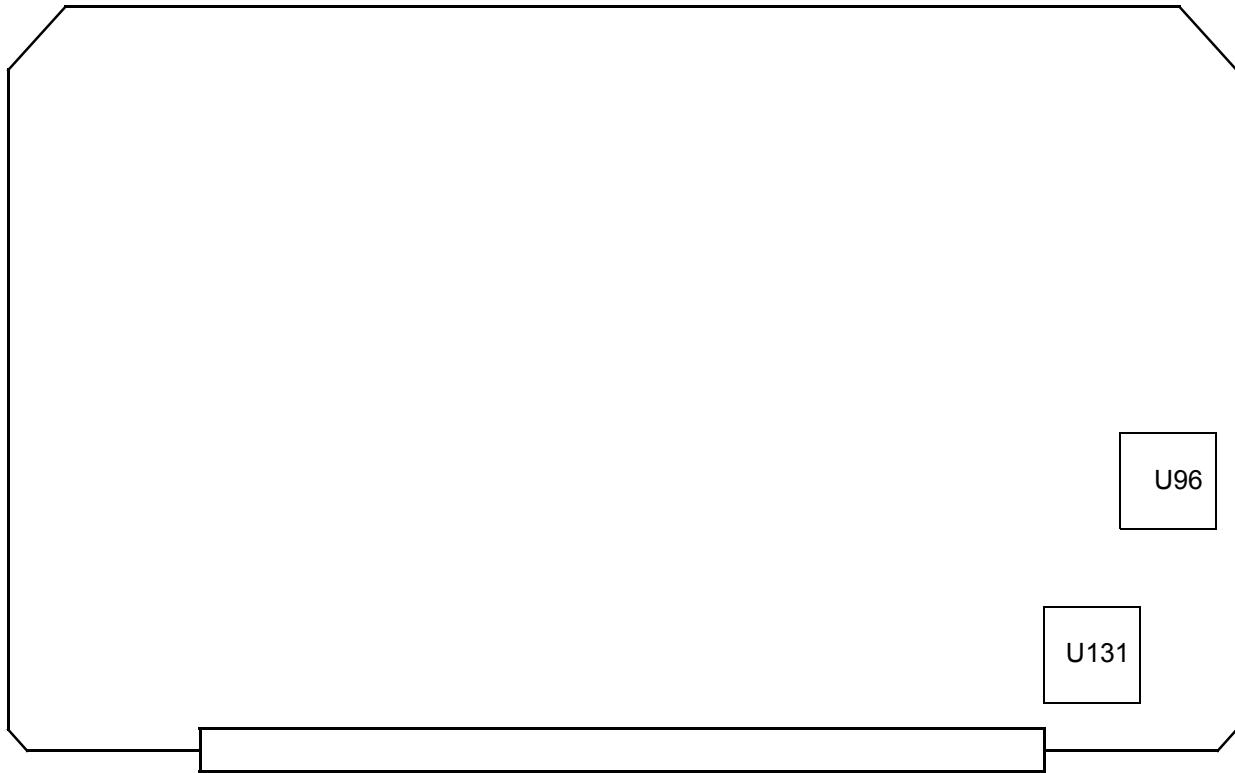
Part Number		Replacement Levels				Features		Notes
		107.10 thru 127.05	170.30 and up					
7500-1119	04 05	R	-					
3500-2988	01-05	-	C					Has daughterboards
	06,07 08,09	-	R					

## 13-10.28 A11B SPM PROMs

Part Number		PROM Kit		Replacement Levels				Location, P/N, Dash		
		Part Number		107.10 and up						
7500-1119	04 05	8000-1377	02	R				U96	4201-1963	03
3500-2988	All							U131	4201-1582	08

## 13-10.29 A11B SPM PROM Checksums and CRCs

PROM Part Number	Dash No.	Check sum	CRC
4201-1963	03	6694	E247
4201-1582	08	4C23	CCA3



**Figure 13-7 SPM PROM Locations**

### 13-10.30 A12B/A13B<sup>1</sup> Advanced IF Output Module (AIFOM)

Part Number		Replacement Levels				Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 and up				
7500-1272	04	L	L	-				
7500-1413	01	-	L	-				
	02	-	R	R				

1. A second AIFOM is installed in A13B only on systems with 170.30 and higher software (10.2 systems). The AIFOM in slot A12B is considered the “master” AIFOM, and the AIFOM in A13B the “slave”. The slave PCB must be the 7500-1413-02, although the 7500-1413-02 can also be used as the master PCB as detailed in the configuration table above.

### 13-10.31 A12B/A13B AIFOM PROMs

Part Number		PROM Kit		Replacement Levels			Location, P/N, Dash		
		Part Number		107.10 and up					
7500-1272	04	8000-1374	01	R			U28/U26	4201-1961	01
7500-1413	01 02						U22/U20	4201-1962	01
							U50/U49	4201-1582	08

### 13-10.32 A12B/A13B AIFOM PROM Checksums and CRCs

PROM Part Number	Dash No.	Check sum	CRC
4201-1961	01	0844	540C
4201-1962	01	67D0	540C
4201-1582	08	4C23	CCA3

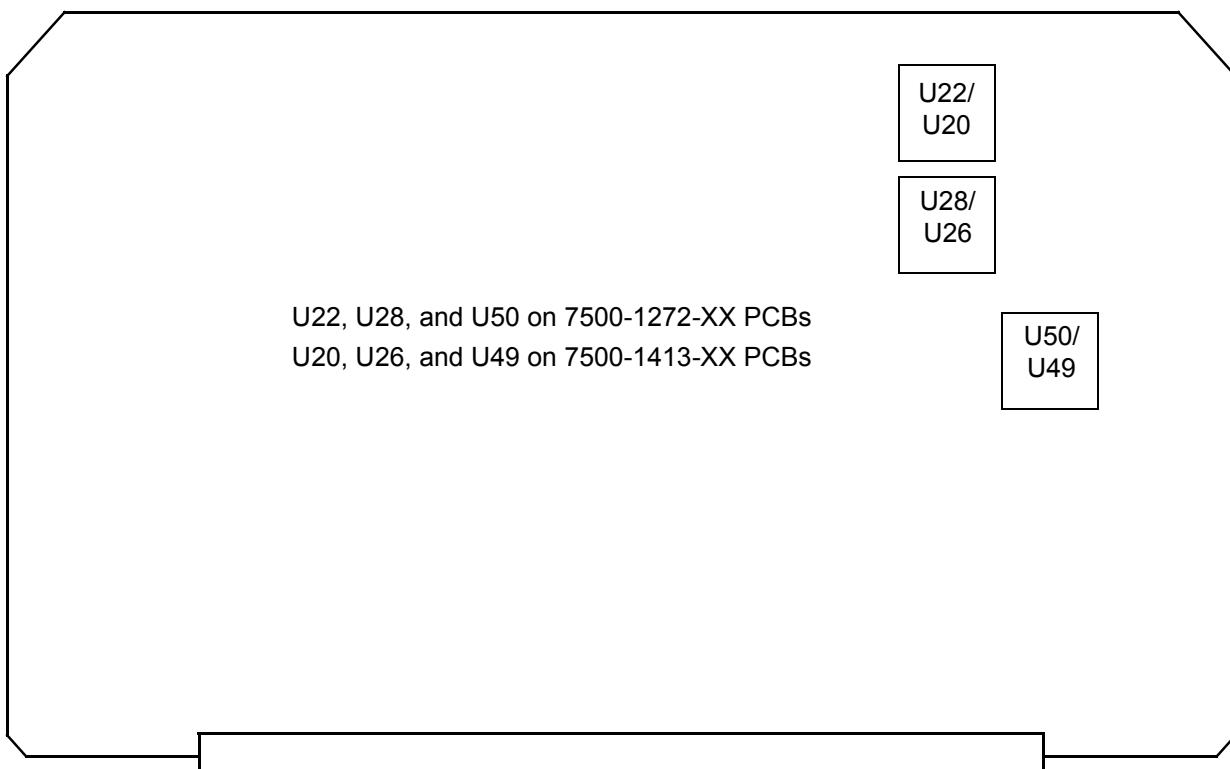


Figure 13-8 AIFOM PROM Locations

### 13-10.33 User Interface Module (UIM)

7500-1320	Replacement Levels					Features		Notes
Dash Number	107.10 and up							
03, 04	R							

### 13-10.34 PS4 AC Input Module (ACIM)

Part Number	Replacement Levels					Features		Notes
	107.10 and up							
3500-1577	01	R						100-120 Vac/50 Hz
3500-1578	05	R						100-120 Vac/60 Hz
3500-1579	03	R						240 Vac/50 Hz
3500-1580	01	R						230 Vac/60 Hz

### 13-10.35 Centerplane PCB (CTRBRD)

Part Number	Replacement Levels					Features		Notes
	107.10 thru 125.11	127.04 127.05	170.30 and up					
3500-1720	03	R	R	-				
	04	R	R	-				1
	05	-	R	R				2

1. Contains 7500-1006-04 Front and 7500-1008-04 Rear Centerplane PCBs.
2. Contains 7500-1006-05 Front and 7500-1008-05 Rear Centerplane PCBs.

### 13-10.36 Scanhead Select PCB (S/HSEL)

Part Number	Replacement Levels					Features		Notes
	107.10 and up				# Chan PCBs			
7500-1048	02 03	C R			8			

## 13-10.37 Upper User Interface Assembly (Control Panel), English

Part Number		Replacement Levels				Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 and up		A3DI		
3500-2635	04	R	-	-		N		
	05	-	R	-		Y		
	06	-	-	R		Y		
3500-3005	01	-	R	-		Y		Uses overlay 4100-1556-01
3500-3039	01	-	-	R		Y		Uses overlay 4100-1598-01

## 13-10.38 Lower User Interface Assembly (Control Panel), English

Part Number		Replacement Levels				Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 and up		A3DI		
3500-2636	05	R	-	-		N		
	07	-	R	R		Y		
	08	R	-	-		N		New trackball
	09	-	R	R		Y		New trackball/keycaps
	10	R	-	-		Y		New keycaps
3500-3045	01	-	-	R		Y		

## 13-10.39 Upper User Interface Assembly (Control Panel), French

Part Number		Replacement Levels				Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 and up		A3DI		
3500-2524	02	R	-	-		N		
	03	-	R	-		Y		
3500-3007	01	-	R	-		Y		Uses overlay 4100-1557-01
3500-3052	01	-	-	R		Y		Uses overlay 4100-1599-01

## 13-10.40 Lower User Interface Assembly (Control Panel), French

Part Number		Replacement Levels			Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 and up	A3DI		
3500-2525	02	R	-	-		N	
	03	-	R	-		Y	
	04	R	-	-		N	New trackball
	05	-	R	-		Y	New trackball/keycaps
	06	R	-	-		Y	New keycaps
	07	-	R	R		Y	
3500-3046	01	-	-	R		Y	

## 13-10.41 Upper User Interface Assembly (Control Panel), German

Part Number		Replacement Levels			Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 and up	A3DI		
3500-2526	02	R	-	-		N	
	03	-	R	-		Y	
3500-3006	01	-	R	-		Y	Uses overlay 4100-1558-01
3500-3053	01	-	-	R		Y	Uses overlay 4100-1600-01

## 13-10.42 Lower User Interface Assembly (Control Panel), German

Part Number		Replacement Levels				Features		Notes
		107.10 thru 108.18	124.13 thru 127.05	170.30 and up		A3DI		
3500-2527	02	R	-	-		N		
	03	-	R	-		Y		
	04	R	-	-		N		New trackball
	05	-	R	-		Y		New trackball/keycaps
	06	R	-	-		Y		New keycaps
	07	-	R	R		Y		
3500-3047	01	-	-	R		Y		

## 13-10.43 Upper User Interface Assembly (Control Panel), Italian

Part Number		Replacement Levels				Features		Notes
		125.09 thru 127.05	170.30 and up			A3DI		
3500-2858	01	R	-			Y		
3500-3008	01	R	-			Y		Uses overlay 4100-1559-01
3500-3054	01	-	R			Y		Uses overlay 4100-1601-01

## 13-10.44 Lower User Interface Assembly (Control Panel), Italian

Part Number		Replacement Levels				Features		Notes
		125.09 thru 127.05	170.30 and up			A3DI		
3500-2857	02	R	-			Y		
3500-3048	01	-	R			Y		

## 13-10.45 Lower User Interface Assembly (Control Panel), Danish

Part Number		Replacement Levels				Features		Notes
		124.13 thru 127.05	170.30 and up			A3DI		
3500-2933	01	R	-			Y		1
3500-3057	01	-	R			Y		

1. Use the 3500-2933-01 Danish lower user interface with the 3500-2635-05, 3500-3005-01, or the 3500-3039-01 English upper user interface.

## 13-10.46 Lower User Interface Assembly (Control Panel), Norwegian

Part Number		Replacement Levels				Features		Notes
		124.13 thru 127.05	170.30 and up			A3DI		
3500-2934	01	R	-			Y		1
3500-3058	01	-	R			Y		

1. Use the 3500-2934-01 Norwegian lower user interface with the 3500-2635-05, 3500-3005-01, or the 3500-3039-01 English upper user interface.

## 13-10.47 Lower User Interface Assembly (Control Panel), Swedish/Finnish

Part Number		Replacement Levels				Features		Notes
		124.13 thru 127.05	170.30 and up			A3DI		
3500-2935	01	R	-			Y		1
3500-3059	01	-	R			Y		

1. Use the 3500-2933-01 Swedish/Finnish lower user interface with the 3500-2635-05, 3500-3005-01, or the 3500-3039-01 English upper user interface.

# 13-11 Scanhead Matrix

Scanhead	Part Number	Dash Number			No. Elel.	Hardware Notes	S/W Comp. <sup>2</sup>
		Cur- rent	Bkwd Comp. <sup>1</sup>	EMC <sup>3</sup>			
<b>PHASED ARRAY</b>							
P3-2 20 mm	4000-0287	04	03	04	64		107.10
P4-2 20 mm	4000-0660	02	-	02	64	Biopsy guide avail.	124.13
P5-3 16 mm	4000-0316	05	-	05,04	64	Biopsy guide avail.	107.10
P6-3 mm	4000-0647	02	01	02	128	Biopsy guide avail.	107.10
P7-4 8 mm	4000-0322	02	-	02	64	Biopsy guide avail.	107.10
MPT7-4	4000-0317	16	11, 10	16, 11	64	-16 supports 3D on 170.30	107.10
BPT9-5	4000-0420	01	-	01	64		170.30
<b>BROADBAND LINEAR ARRAY</b>							
L7-4	4000-0318	05	03	05	128	Biopsy guide avail.	107.10
LAP L9-5	4000-0658	04	-		128		127.04
LI9-5	4000-0408	01	-		128		127.04
L10-5 38 mm	4000-0263	06	-		192	Biopsy guide avail.	170.30
L12-5 38 mm	4000-0396	02	01	01	192	Biopsy guide avail.	107.10
L12-5 50 mm	4000-0762	01	-	01	256	Biopsy guide avail.	127.04
CL10-5	4000-0315	05	04	05,04	128		108.15
<b>CURVED ARRAY</b>							
C4-2	4000-0320	05	04, 03	03-06	128	Biopsy guide avail.	108.15
C5-2 40R	4000-0574	03	02, 01	01	128	Biopsy guide avail.	107.10
C7-4 40R	4000-0301	06, 05	04	04-06	128	Biopsy guide avail.	107.10
C8-4v 11mm	4000-0409	02	-	02	128	Biopsy guide avail.	107.10
CT8-4 40mm	4000-0390	03	02	-	128	Biopsy guide avail.	127.04
C8-5 14R	4000-0676	02	-	03,02	128	Biopsy guide avail.	107.10
C9-5 ICT	4000-0280	14, 15 16	10	14,15 16	128	Biopsy guides avail.	107.10
<b>STATIC CW</b>							
D2 TC	4000-0310	02	-	02	1		107.10
D2 CW	4000-0307	03	-	03	2		107.10
D5 CW	4000-0308	02	-	02	2		107.10
D10 CW	4000-0309	02	-	02	2		107.10

1. The "Bkwd Comp." column lists dash numbers that are backward compatible with the listed scanhead.
2. The "S/W Comp." column lists the minimum software build level required for use of the listed scanhead.
3. The "EMC" column lists dash numbers of scanheads which may be ordered worldwide (must use EMC scanheads for Europe). Non-EMC scanheads may be ordered for domestic U.S. and other countries.

## 13-12 Scanhead Biopsy Guides

Biopsy Guide	Part Number	Dash No.	Bkwd. Comp. <sup>1</sup>	Fwd. Comp.	Hardware Notes	S/W Comp. <sup>2</sup>
Biopsy Guide Starter Kit, P4-2	8000-1622	01				124.13
Biopsy Guide Starter Kit, P5-3	8000-1526	01				124.13
Biopsy Guide Starter Kit, P6-3	2950-1219	01				107.10
Biopsy Guide Starter Kit, P7-4	8000-1527	01				124.13
Biopsy Guide Bracket, L7-4, 38 mm, 5 MHz	1065-1910	02				107.10
Biopsy Guide Bracket, L10-5, 38 mm, 7.5 MHz	1065-1908	02				108.15
Biopsy Guide Starter Kit, L12-5	2950-1211	01				107.10
Biopsy Guide Starter Kit, L12-5 50	8500-9089	02				127.04
Biopsy Guide Bracket, C4-2/C5-2/C7-4	1065-1909	02			<sup>3</sup>	107.10 108.15
Biopsy Guide, C8-4	1065-2731	01				107.10
Biopsy Guide Bracket, C8-5	1065-4585	01				107.10
Biopsy Guide Bracket, C9-5 ICT	1065-1811	02				107.10
Universal Biopsy Guide, C9-5 ICT	1065-2608	04				107.10

1. The "Bkwd Comp." column lists dash numbers that are backward compatible with the listed scanhead.
2. The "S/W Comp." column lists the minimum software build level required for use of the listed scanhead.
3. The 1065-1909-02 biopsy guide and the C7-4 scanhead were released with 107.10 software, however, the C4-2 scanhead was released with 108.15 software.

## 13-13 Disk Drive Jumper and Switch Positions

Jumper and switch positions for the hard drives and optical drives are listed in [Table 13-2](#) and [Table 13-3](#). The part numbers of the drives are listed for reference when checking or changing the jumper positions, however, these part numbers cannot be ordered.

**Table 13-2 Hard Drive Jumper/LED Status**

Drive Part Number	Drive Size (MB) <sup>2</sup>	Jumper/LED Status <sup>1</sup>							
		A0	A1	A2	A3	P0	PK <sup>3</sup>	TE	LED
2100-1324-01	1280	OFF	OFF	OFF	-	-	OFF	ON	-
2100-1445-01 <sup>4</sup>	2100	OFF	OFF	OFF	-	-	OFF	ON	OFF
2100-1636-01 <sup>5</sup>	9100	OFF	OFF	OFF	OFF	JP4-6 ON	JP4-5 ON	JP6-G ON	-

1. The dashes indicate that particular jumper does not exist on that particular drive.
2. All drives have been formatted to 2100 MB or less.
3. The Quantum 1280 Fireball TM does not have the PK jumper; however, the 1280 Fireball does.
4. The reserved jumper for the 2100-1445-01 hard drive is not installed. This other hard drives in this table do not have this jumper.
5. The 2100-1636-01 IBM hard drive requires the 3100-2867-01 68 to 50 pin adapter. Hard drive jumper positions are the same for DDEAs with or without MO drives installed. If no MO drive is installed, connect a terminator to the connector on the front of the DDEA module.

**Table 13-3 Magneto-Optical Drive Switch/Jumper Positions**

Drive Part Number	Drive Size (MB)	Switch/Jumper	Switch/Jumper Positions							
			1	2	3	4	5	6	7	8
2100-1416-01	540/640	SW1	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
		SW2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		CNH	OFF	OFF	OFF	-	-	-	-	-
2100-1512-01	640	SW1	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
		CNH	1-2 OFF	3-4 OFF	5-6 ON	-	-	-	-	-

# **14 Parts**

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## **14-1 Introduction**

This section lists the current recommended field replaceable parts for the HDI 5000 system. Replacement part selections that are dependent upon system features must be made from the replacement matrices in [Section 13, "Configuration"](#).

Use the figures and tables in this section to locate and identify system parts. The tables are keyed to the figures: The reference numbers in the tables correspond to the callouts on the figures. Use the part number and description provided to order a part. Verify the level of replacement for a given part is in accordance with current service philosophy before ordering the part.

## **14-2 Parts Ordering Information**

### **Customer Support Representatives**

For parts ordering procedures, FSEs should refer to their Standard Operating Procedures.

### **Customers**

Customers may order parts through a FSE or, if located in the United States, directly from the ATL Customer Service Order Processing Department. Customers ordering parts through a FSE will need to provide the following information:

- Shipping address
- Purchase order number of equipment
- Part numbers or sales order numbers
- Part descriptions
- Quantity

### **14-2.1 Table Definitions**

#### **Quick-Reference Illustrations and Figure Reference**

The column that contains the small illustrations is a quick-reference view of the parts found in the “exploded” parts-breakdown view. A figure reference at the top of the column points to the exploded view. Illustrations in this column are not to scale as a group. They have been individually sized for clarity.

#### **Reference Number**

The reference number (or locator number) cross-references a particular part or subassembly found in an illustration with its part number and description in the table.

## **Part Number**

This column lists the part number for each item. Use this number when ordering parts. If the part number ends in “-XX” instead of a dash number, the correct dash number must be located using [Section 13, "Configuration"](#).

If an item does not include a part number, this indicates that the item is included for reference but is not a field replaceable part.

## **Part Description**

The name of the item or part is listed in this column. The description column also provides a breakdown of the equipment into its assemblies, subassemblies, and individual component parts through use of bulleted indented items. The bulleted indented items show the relationship of parts to their next higher assemblies.

Attaching parts are listed following the assemblies, subassemblies, and component parts they attach. Attaching parts for the assemblies, subassemblies, and component parts are listed with an asterisk preceding the description of the attaching part. Attaching parts must be ordered separately (i.e. they are not provided with the assembly, subassembly, or component being attached).

Top assemblies (items with no replaceable parts) do not have a bullet. Top assembly components or subassemblies are indented by one bullet (•). Those parts are included in the next higher assembly, but may be ordered separately. Subassembly components are indented with two bullets (••). Those parts are included in the next higher subassembly, but also may be ordered separately. For example:

### Assembly

- Subassembly
- Lower-level subassembly or component
- \* Attaching part for assembly, subassembly, or component

Where appropriate, the description column also includes size, tolerance, type or model, and material data for the part.

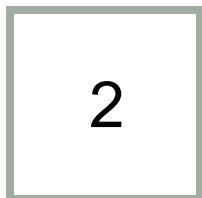
Additionally, miscellaneous information about the part may appear in parentheses in this column. The word “alternate” means that part is an alternate for the part listed above it. “Equivalent” indicates that the part number has changed, but the part is the interchangeable with the part listed above it.

## **Qty (Quantity)**

The Qty column lists the quantity of the part in the top-level assembly.

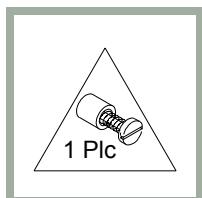
## 14-2.2 Figure Definitions

### Reference Number

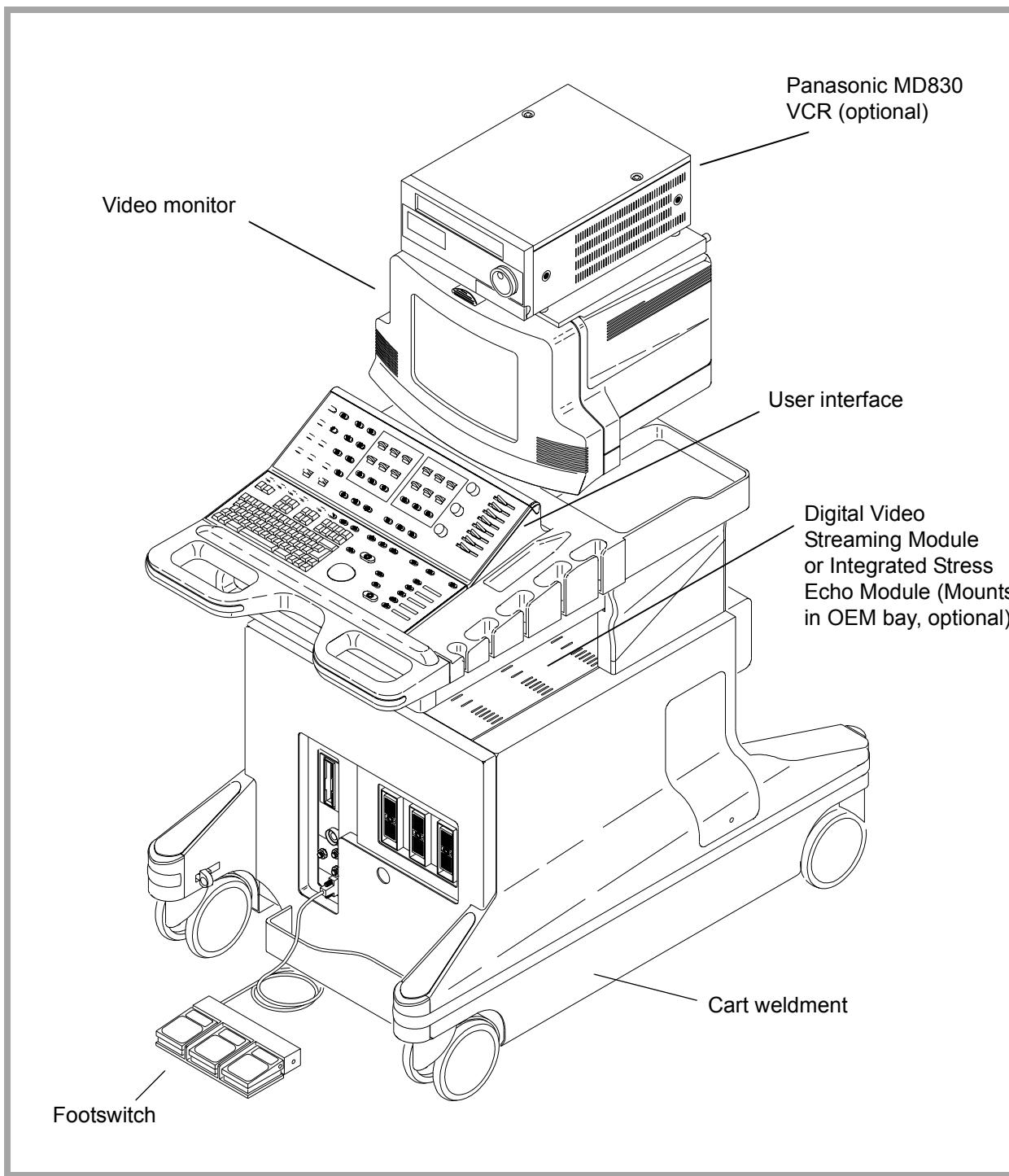


The reference number (or locator number) cross-references a particular part or subassembly shown in an illustration with its part number and description in the table.

### Triangle Symbol



A triangle symbol next to a part indicates the part attaches by means of captive screws. The number of captive screws per part is also shown within the triangle symbol. (“1 Plc” indicates the part is used in one place; “2 Plcs” indicates the part is used two places, and so on.)

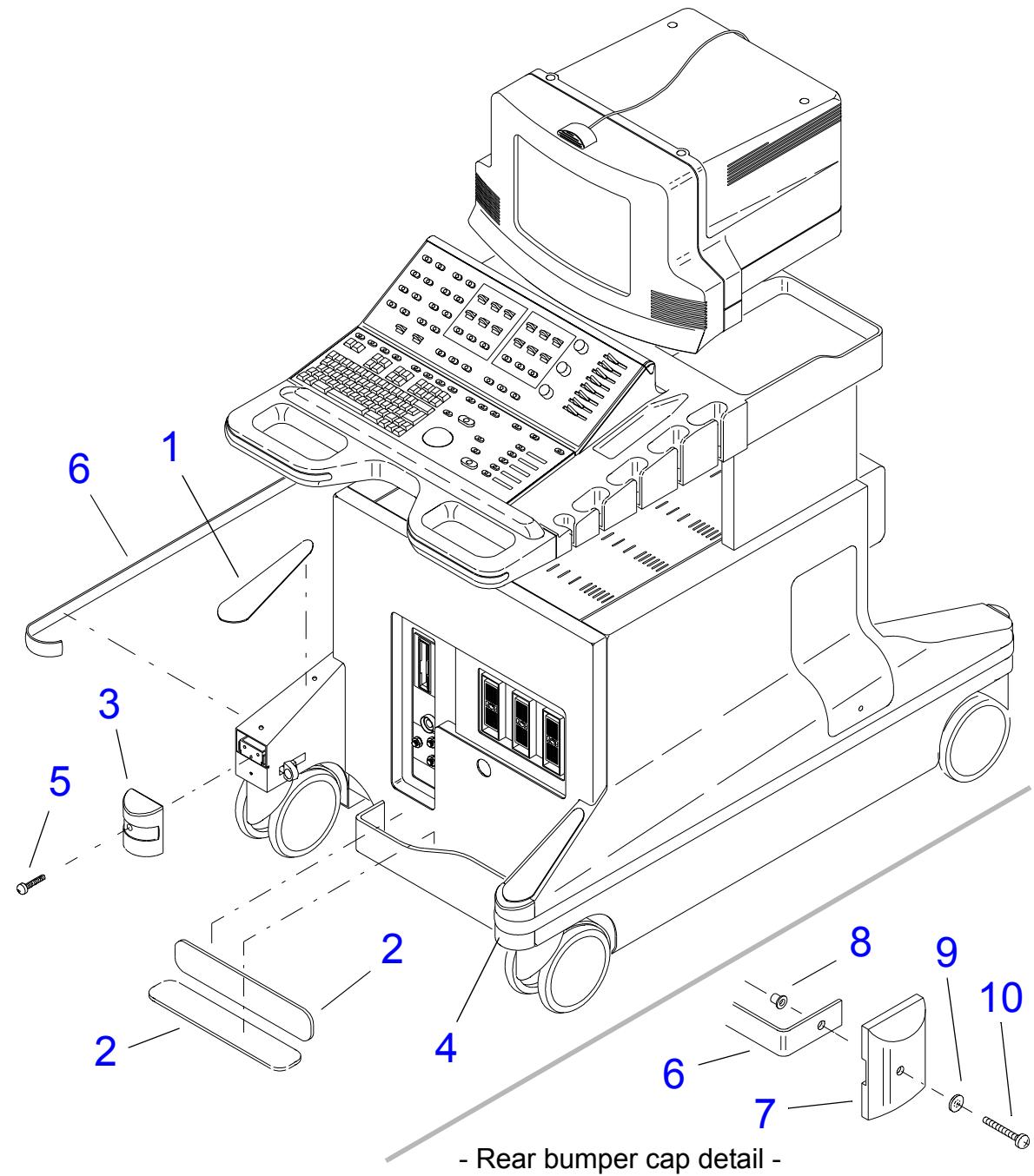


**Figure 14-1 HDI 5000 System Main Components and Options**

**Table 14-1 Pads and Bumpers**

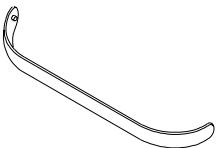
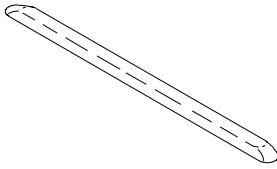
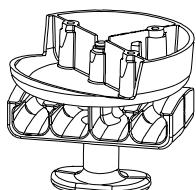
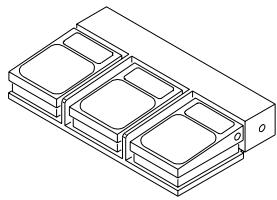
<b>Figure 14-2</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	1065-4638-01	Pad, Foot Rest (requires adhesive)	2
	2	1065-2973-01	Foam, Bottom, Footswitch Tray	2
	3	1065-4694-01	Bumper Cap, Front, Right (item 10 is attaching part)	1
	4	1065-4695-01	Bumper Cap, Front, Left (item 10 is attaching part)	1
	5	1518-0051	* Screw, 10/32 x 1/2, Pnh	2
	6	1065-4696-01	Strap, Bumper, Side	2
		1065-4705-02	Strap, Bumper, Side (equivalent)	2
	7	1065-4704-01	Bumper, Cap, Rear, Dark Gray	2
	8	1563-0345-01	* Insert, 8-32, Wellnut, 0.015-0.156 Grip	2
	9	1560-0050	* Washer, Fl, 0.17ID, 0.438OD, 032T, St, Zn	2
	10	1517-0012	* Screw, 8/32 x 1, Pnh, Pd, St, Zn	2
Not Illustrated	11	2301-0029-01	Adhesive, Bumper	-

**See Table 14-1**

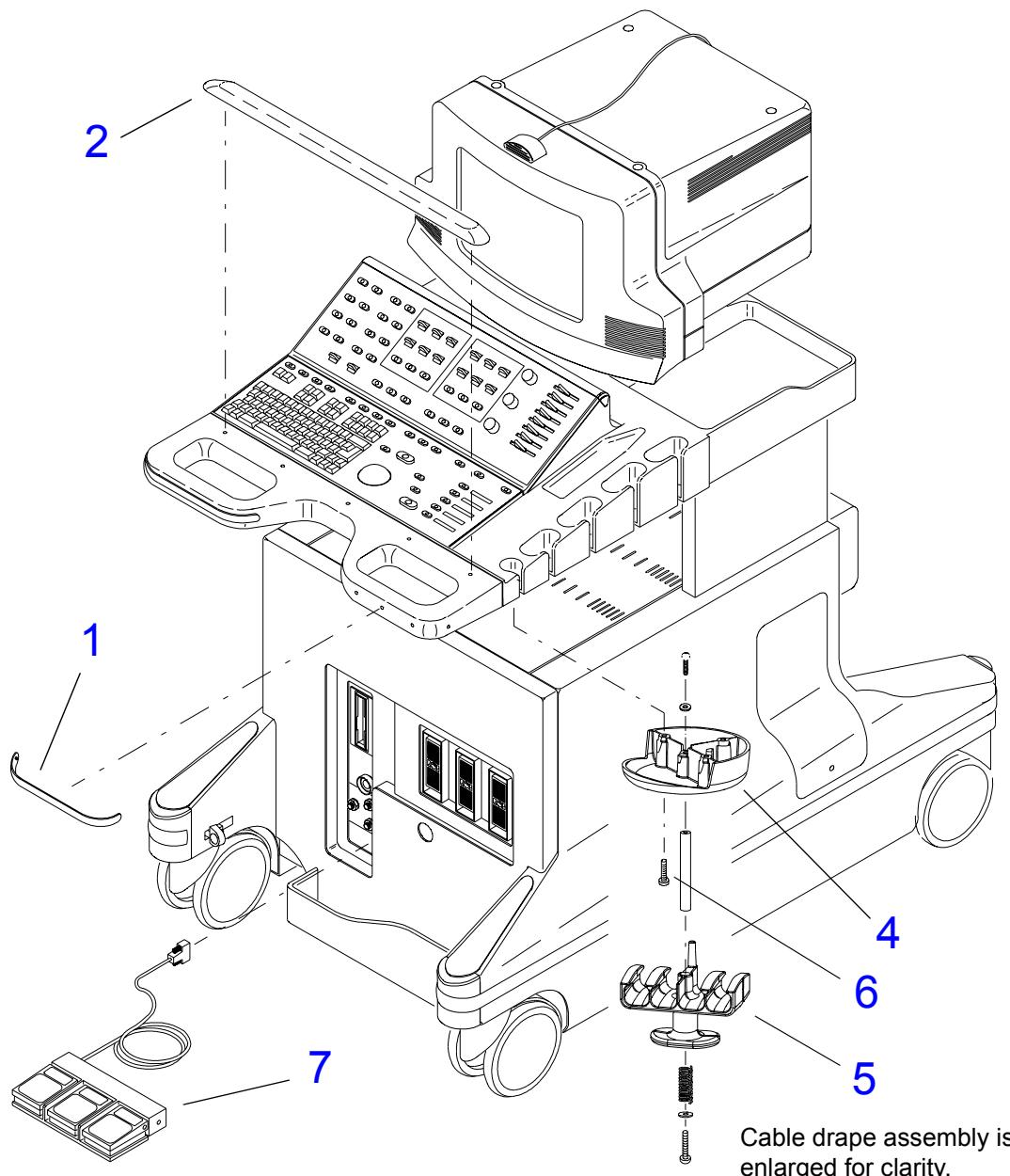


**Figure 14-2 Pads and Bumpers**

**Table 14-2 External Parts and Accessories**

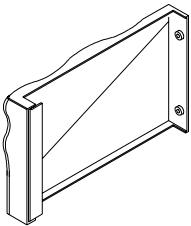
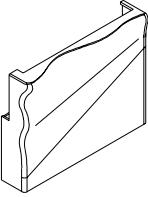
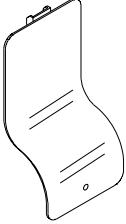
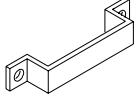
<b>Figure 14-3</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	1065-4637-02	Bumper, Handle	2
	2	3500-2739-01	Wrist Support Assy	1
	3	3500-1834-01	Cable Drape Assy	1
	4	1065-2901-01	• Support, Cable Manager	1
	5	1065-2899-01	• Rotor, Cable Manager	1
	6	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	3
	7	3300-0312-01	Footswitch, 3-Position	1

**See Table 14-2**



**Figure 14-3 External Parts and AccessoriesP**

**Table 14-3 Side Panels and Covers**

<b>Figure 14-4</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	1065-4685-03	Cover, Cable, Left (non-CV systems)	1
		1065-4751-03	Cover, Cable, Left (CV systems)	1
	2	1065-4684-03	Cover, Cable, Right, Notched (non-CV systems)	1
		1065-4750-03	Cover, Cable, Right, Notched (CV systems)	1
	3	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	4
	4	1560-0051	* Washer, Fl, #6, .312OD, .032T, St, Zn	4
	5	1065-2254-04	Panel, IIM Access	1
	6	1065-2370-02	Cable Keeper	2
	7	1541-0002	* Nut, 6-32, Keps	4

See Table 14-3

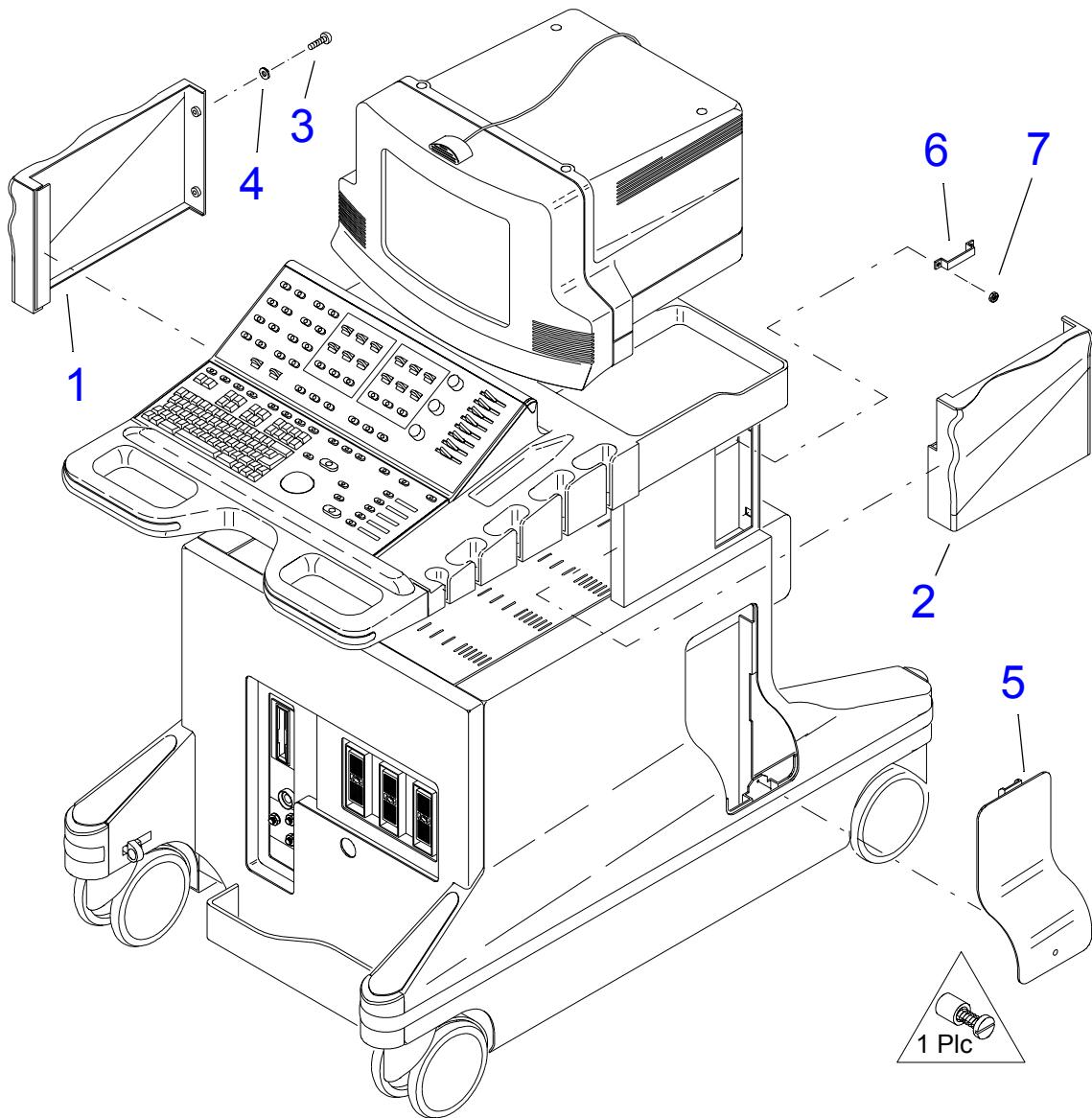
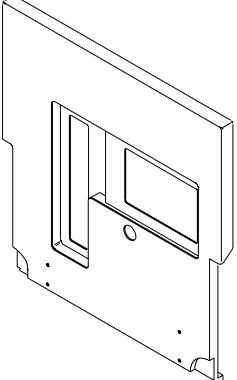
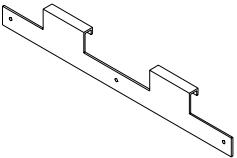
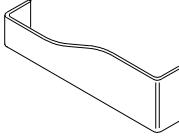
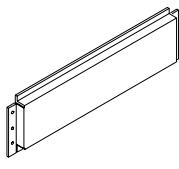
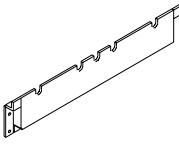
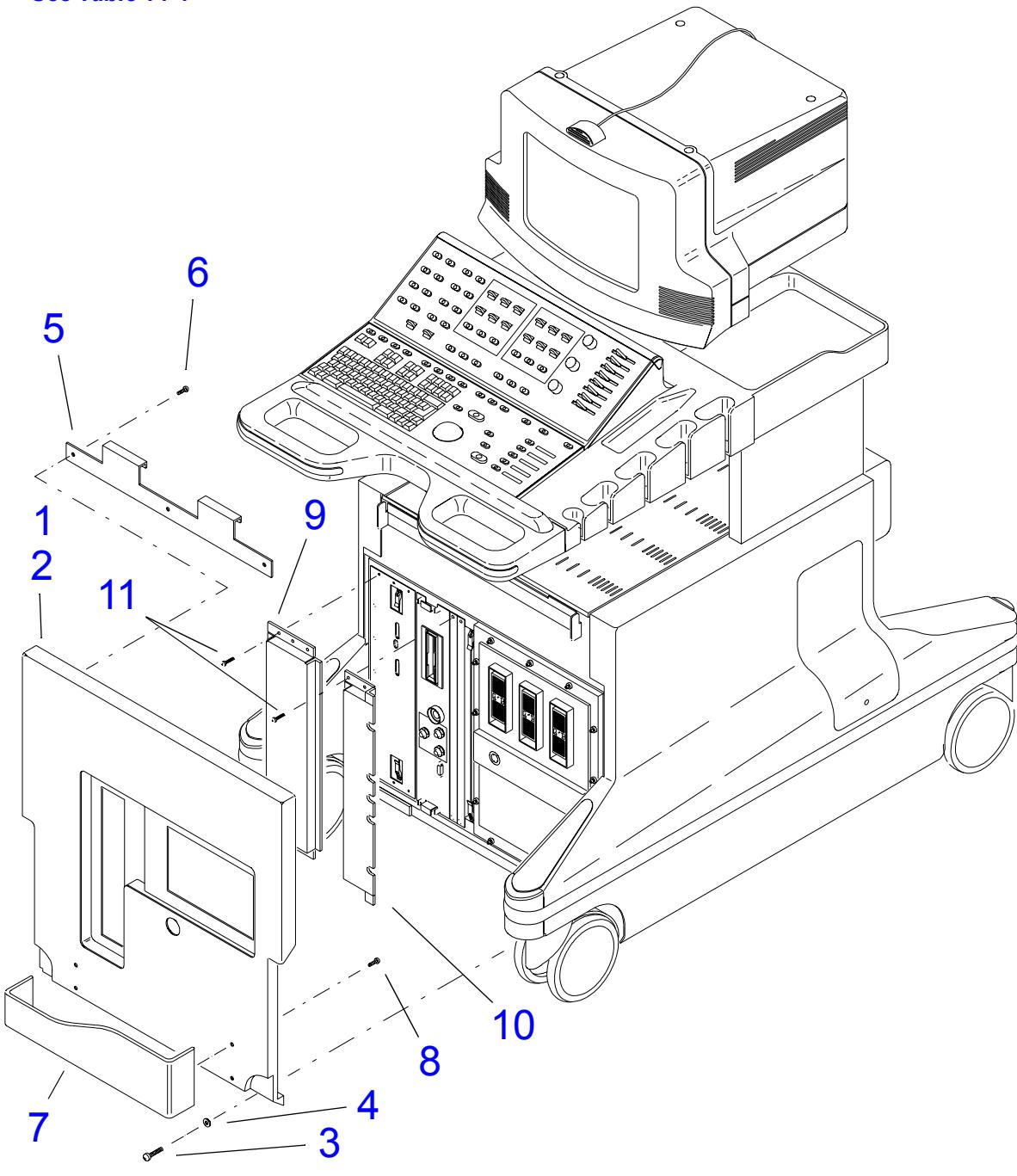


Figure 14-4 Side Panels and Covers

**Table 14-4 Front Panel and Covers**

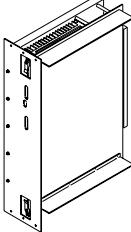
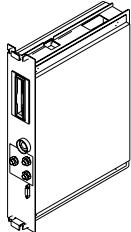
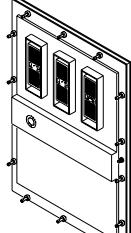
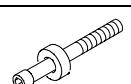
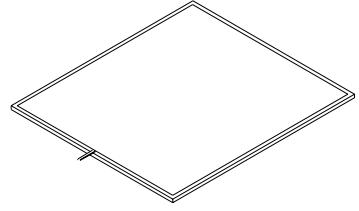
<b>Figure 14-5</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-2850-02	Cover, Assy Front	1
	2	1065-2882-03	• Cover, Front Enclosure	1
	3	1518-0043	* Screw, 10-32 x 3/4, Pnh, Pd, St, Zn	2
	4	1560-0051	* Washer, Fl, #10, 0.0203ID, 0.50OD, St, Zn	2
	5	1065-2954-02	• Bracket, Mounting, Front Panel	1
	6	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	3
	7	1065-2953-01	• Tray, Enclosure	1
	8	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	4
	9	3500-1877-01	Shield Assy, Card Cage, Front Left	1
	10	3500-1876-01	Shield Assy, Card Cage, Front Right	1
	11	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	4

**See Table 14-4**

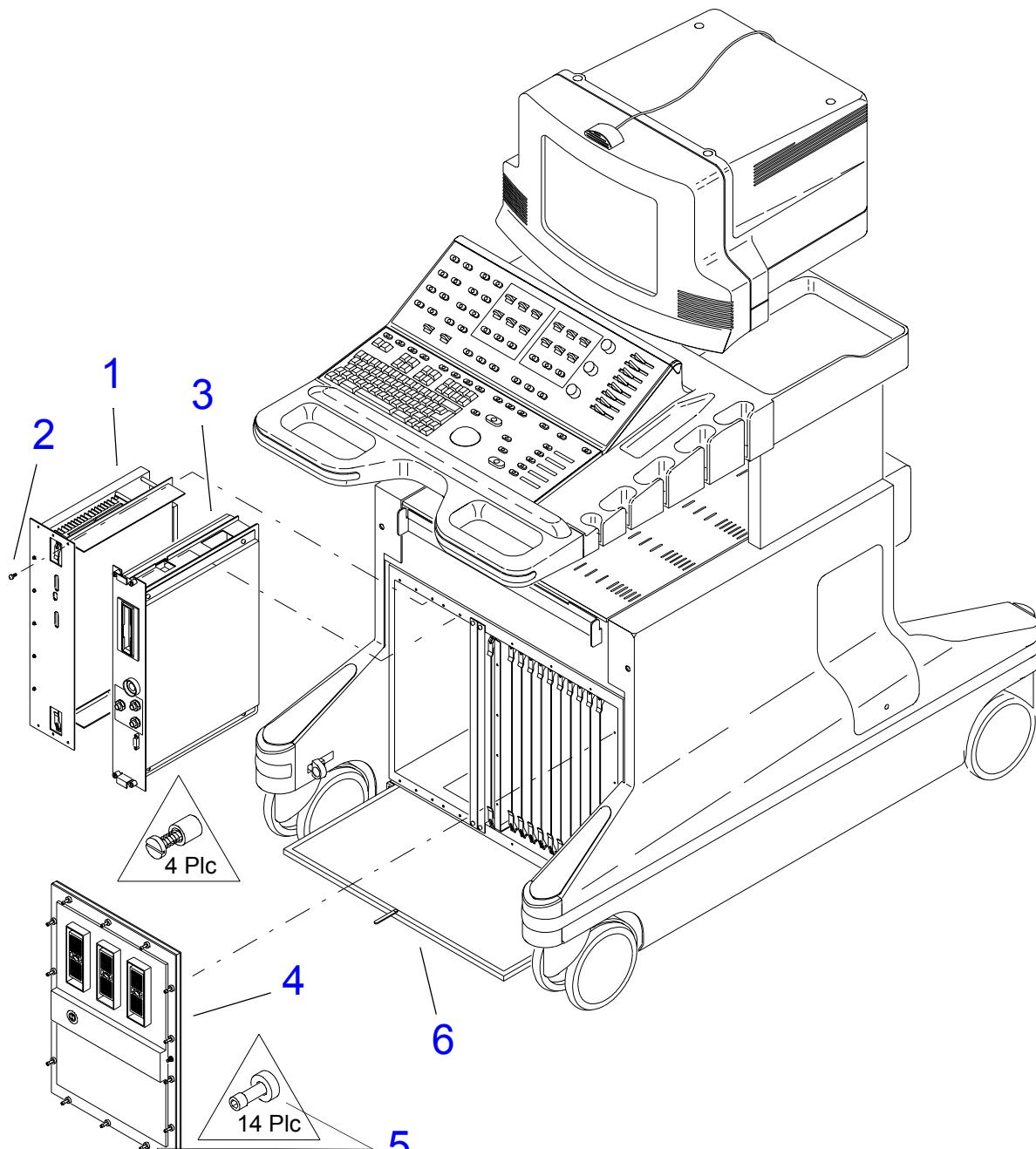


**Figure 14-5 Front Panel and Covers**

**Table 14-5 Front Card Cage Modules**

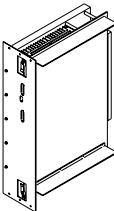
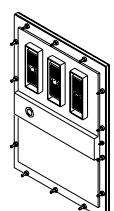
<b>Figure 14-6</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	<a href="#">Table 14-6</a>	PS1 PSM - Power Supply Module (Figure 14-7)	1
	2	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	4
	3	<a href="#">Table 14-7</a>	A1F DDEA - Disk Drive Module (Figure 14-7, Figure 14-8)	1
	4	<a href="#">Table 14-6</a>	S/HSEL - S/H Select MUX (Figure 14-7)	1
	5	1563-2863-01	* Screw, 6-32 x 1.0, Captive, HD, St, Zn	14
	6	2950-1148-01	Air Filter, Plastic	1

**See Table 14-5**



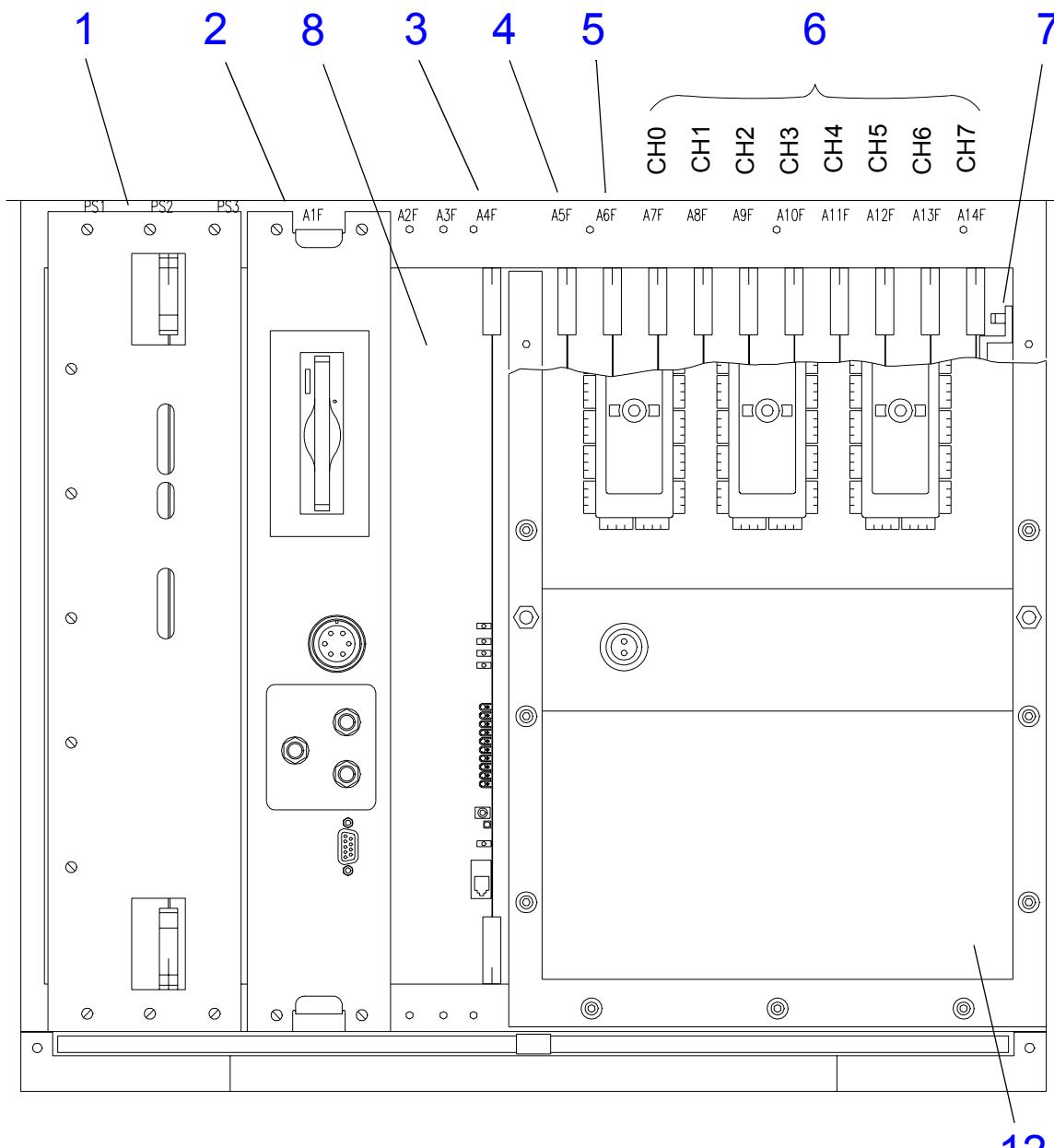
**Figure 14-6 Front Card Cage Modules**

**Table 14-6 Front Compartment, Card Cage**

<b>Figure 14-7</b>	<b>Ref. #</b>	<b>Part Number<sup>1</sup></b>	<b>Part Description</b>	<b>Qty</b>
	1	7500-1342-XX	PS1 PSM - Power Supply Module (Figure 14-6)	1
	2	Table 14-7	A1F DDEA - Disk Drive Module (Figure 14-6, Figure 14-8)	1
	3	7500-XXXX-XX	A4F FEC - Front End Controller	1
	4	7500-XXXX-XX	A5F AIM+ - Analog Interface Module Plus	1
	5	7500-1421-XX	A6F Regulator Module	1
	6	7500-0911-XX	A7F-A14F CB0-CB7 Boards	8
	7	1065-2381-01	Air Deflector, Card Cage	1
	8	3500-1720-XX	Centerplane Assy	1
		7500-1006-XX	• Centerplane PCB, Front	1
		7500-1008-XX	• Centerplane PCB, Rear	1
Not Illustrated	9	1560-0031	* Washer, Fl, #6, 0.156ID, 0.38OD, 0.015T, Ss, Zn	20
Not Illustrated	10	1516-0074	* Screw, 6-32 x 3/8, Pnh, Int, Sems, Pd, St, Zn	26
Not Illustrated	11	1065-4199-01	* Spacer/Shield, Centerplane	1
Not Illustrated		1065-2986-02	* Spacer/Shield, Centerplane, 170.XX systems	1
	12	7500-1048-XX	S/HSEL - S/H Select MUX (Figure 14-6)	1

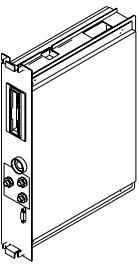
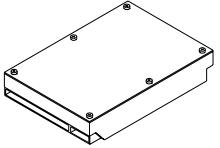
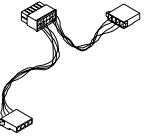
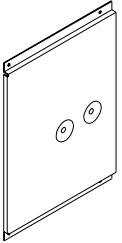
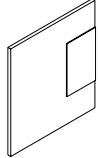
1. See [Section 13, "Configuration"](#), for part numbers that end in "-XX."

**See Figure 14-6**



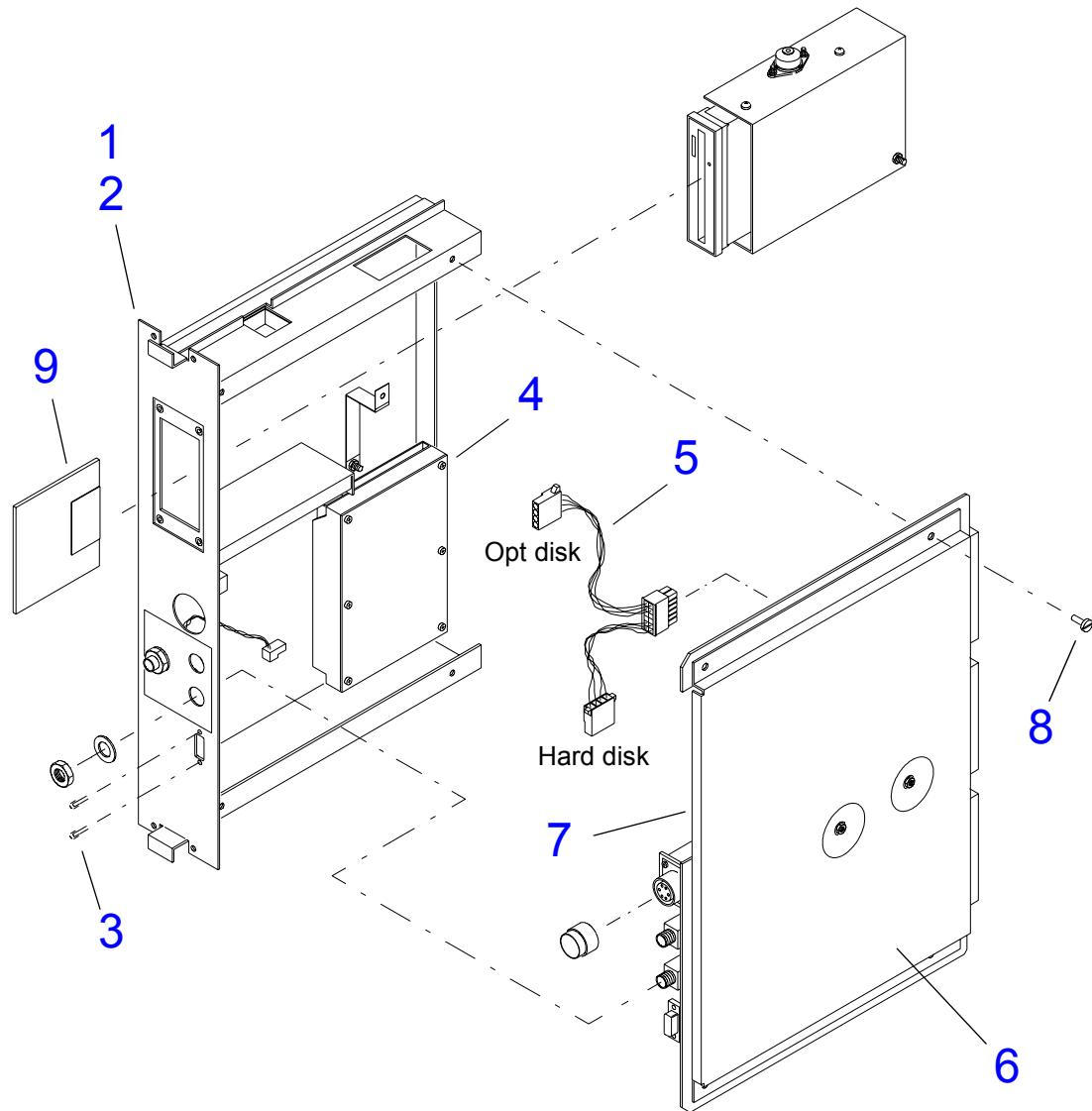
**Figure 14-7 Front Compartment, Card Cage**

**Table 14-7 Disk Drive Module (DDEA), Parts Common to All**

<b>Figure 14-8</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	<a href="#">Table 14-8</a> <a href="#">Table 14-9</a>	A1F DDEA-Disk Drive Module (Figure 14-6, Figure 14-7)	1
	2	1065-1946-05	• Panel, Mounting, Disk Drive Module	1
	3	3100-1387	* Screwlock, .18-25H, .31L Stud, Pair	2
	4	3500-2845-01	• Hard Drive, 3.5", SCSI, formatted • (with pre-loaded software)	1
	5	3500-1482-03	• Cable Assy, Disk Drive Power, DDEA	1
	6	1065-1947-03	• Cover, Disk Drive Module	1
	7	3600-0246-01	• Gasket, RFI, Finger Clip, BE-CU, 2.5"	1
	8	1516-0112	* Screw, 6-32 x 1/4, Pnh, Sem, Pd, St, Zn	4
	9	2100-0792-01	Optical Disk, 3.5" 128 MB (blank)	1
		2100-1410-01	Optical Disk, 3.5" 230 MB (blank)	
Not Illustrated	10	2100-1419-01	Kit, Cleaning, Optical Drive, Fujitsu	1
Not Illustrated	11	4500-5512-01	Cable Assy, External Disk Drive Test	1

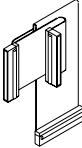
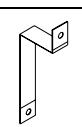
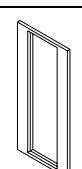
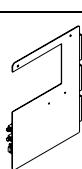
*See Table 14-7*

*See Figure 14-9 and  
Figure 14-10*

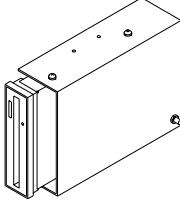


**Figure 14-8 Disk Drive Module (DDEA), Parts Common to All**

**Table 14-8 Disk Drive Module (DDEA) without ECG**

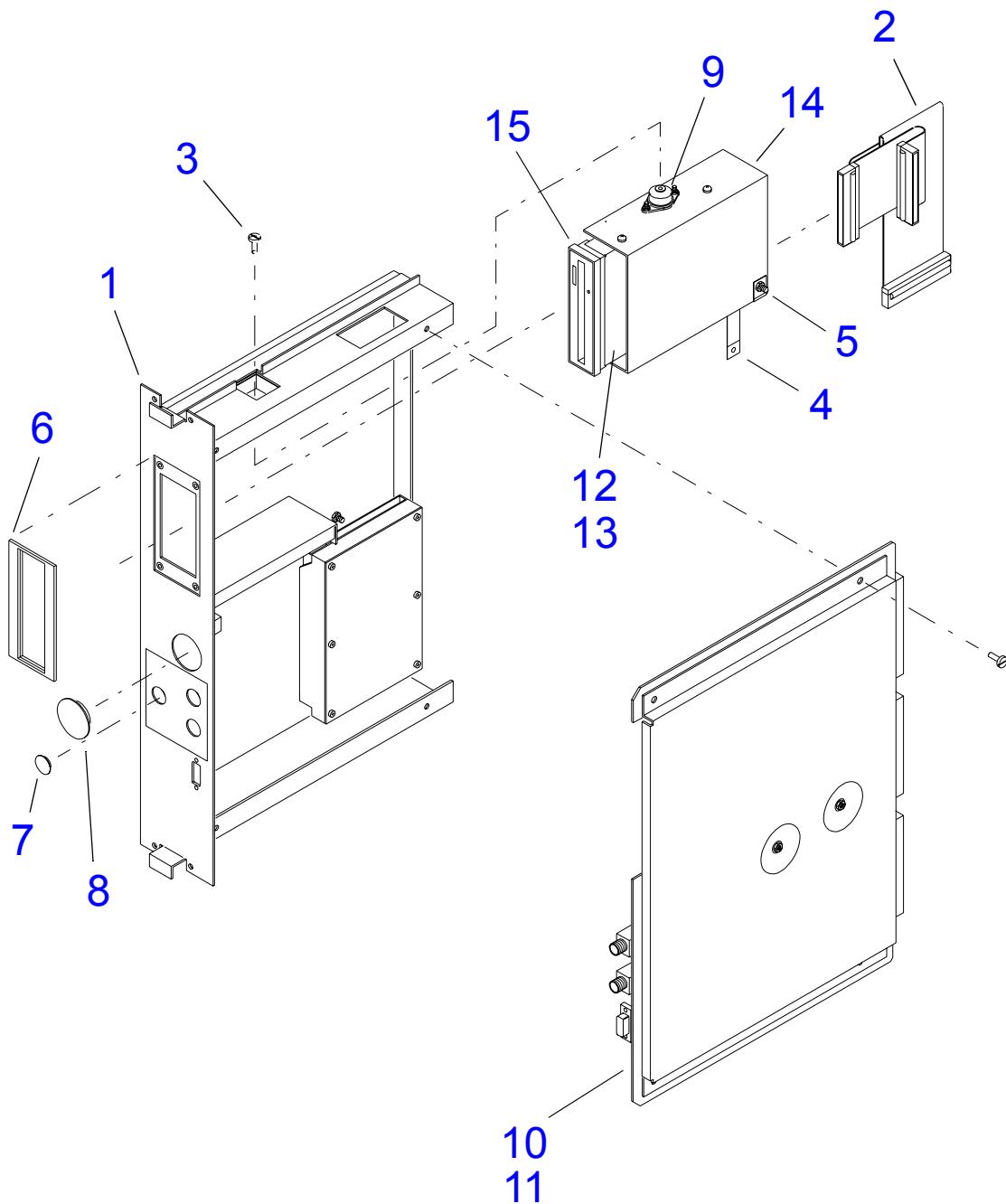
<b>Figure 14-9</b>	<b>Ref. #</b>	<b>Part Number<sup>1</sup></b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-2760-XX	Assy, Disk Drive Module (without ECG)	1
	2	3500-1483-03	• Cable Assy, Disk Drive Signal	1
	3	1514-0060	* Screw, 4-40 x 3/8, Pnh, Sem, Pd, St, Zn	3
	4	2275-0234-01	• Ground Strap, Insul, 6.01 x 0.5W	1
	5	1541-0002	* Nut, 6-32, Keps, St, Zn	2
	6	1065-4681-01	• Bezel, DDEA	1
	7	2950-1040-01	• Plug, Hole, Physio, Painted	1
	8	2950-1041-01	• Plug, Hole, ECG, Painted	1
	9	2950-1164-01	• Isolator, 3.1lb Min,5lb Max Load	3
	10	7500-0843-XX	• PCB Assy, Disk Drive Module (without ECG)	1
	11	3600-0242-01	• Shield, Strip, Finger, 1.13 x 4.0L	1

**Table 14-8 Disk Drive Module (DDEA) without ECG**

<b>Figure 14-9</b>	<b>Ref. #</b>	<b>Part Number<sup>1</sup></b>	<b>Part Description</b>	<b>Qty</b>
	12	8000-1682-01	• Dependency Kit, 1512 MO Drive (with Bracket)	1
	13	2100-1512-01 2100-1416-01	• • Disk Drive, 3.5", 640MB, Optical (2100-1416-01 - alternate)	1
	14	1065-5058-01 1065-2244-03	• • Bracket, Disk Drive, Optical (1065-2244-03 - alternate)	1
	15	1065-4682-01	• Seal, Support, MO Drive, DDEA	1

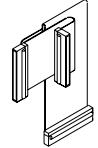
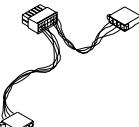
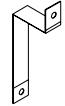
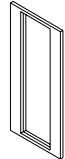
1. See Section 13, "Configuration", for part numbers that end in "-XX."

**See Table 14-8**

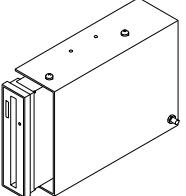


**Figure 14-9 Disk Drive Module (DDEA) without ECG**

**Table 14-9 Disk Drive Module (DDEA) Physio**

<b>Figure 14-10</b>	<b>Ref. #</b>	<b>Part Number<sup>1</sup></b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-2761-XX 3500-3115-XX	Assy, Disk Drive Module, Physio	1
	2	3500-1483-03	• Cable Assy, Disk Drive Signal	1
	3	3500-1835-01	• Cable Assy, Jack, Physio	1
	4	1514-0060	* Screw, 4-40 x 3/8, Pnh, Sem, Pd, St, Zn	3
	5	1065-0130-01	• Spacer, Connector, Plastic	1
	6	2275-0234-01	• Ground Strap, Insul, 6.01 x 0.5W	1
	7	1541-0002	* Nut, 6-32, Keps, St, Zn	2
	8	1065-4681-01	• Bezel, DDEA	1
	9	2950-1164-01	• Isolator, 3.1lb Min, 5 lb Max Load	3
	10	7500-1020-XX	• PCB Assy, Disk Drive Module (with Physio)	1

**Table 14-9 Disk Drive Module (DDEA) Physio**

<b>Figure 14-10</b>	<b>Ref. #</b>	<b>Part Number<sup>1</sup></b>	<b>Part Description</b>	<b>Qty</b>
	11	8000-1682-01	• Dependency Kit, 1512 MO Drive (with Bracket)	1
	12	2100-1512-01 2100-1416-01	• • Disk Drive, 3.5", 640MB, Optical (2100-1416-01 - alternate)	1
	13	1065-5058-01 1065-2244-03	• • Bracket, Disk Drive, Optical (1065-2244-03 - alternate)	1
	14	1065-4682-01	• Seal, Support, MO Drive, DDEA	1

1. See [Section 13, "Configuration"](#), for part numbers that end in "-XX."

See Table 14-9

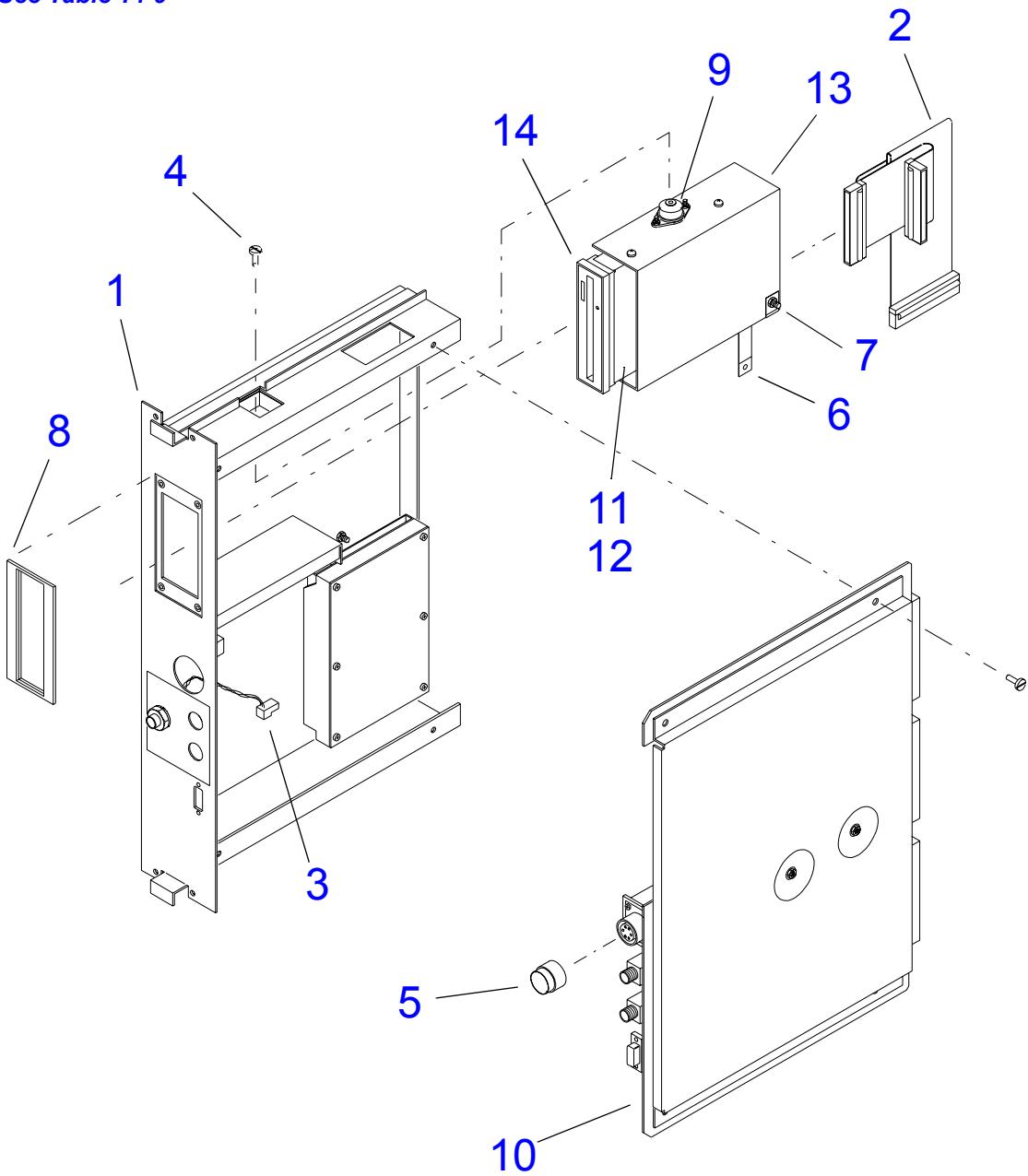
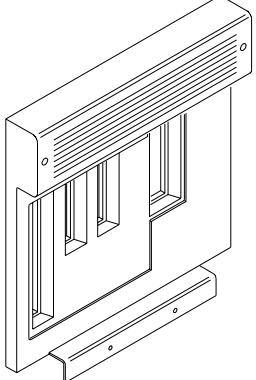
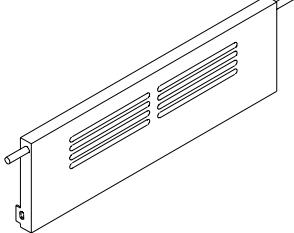
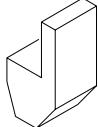
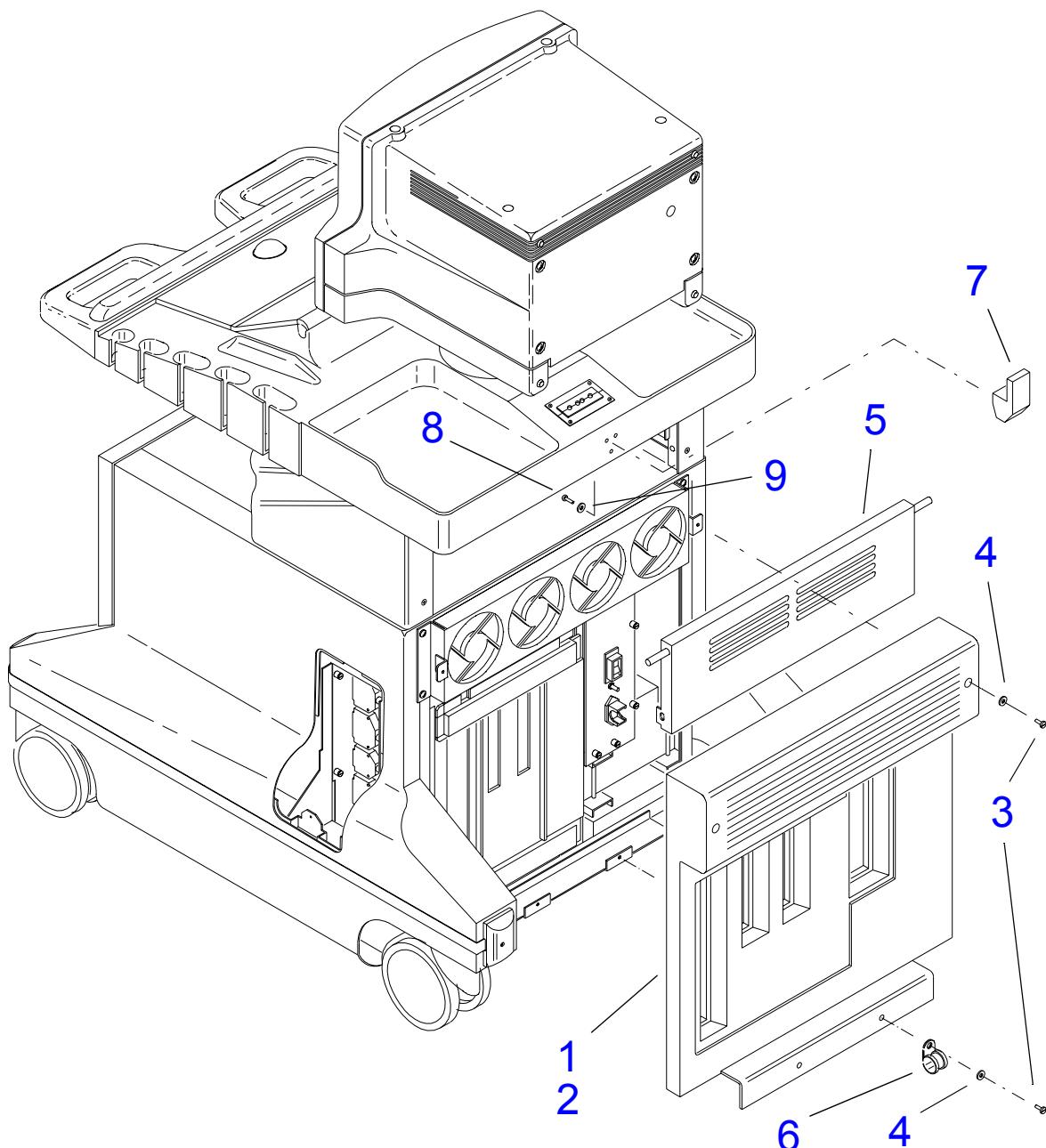


Figure 14-10 Disk Drive Module (DDEA) Physio

**Table 14-10 Rear Panel and Covers**

<b>Figure 14-11</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-2851-02	Rear Cover Assy	1
	2	1065-2892-02	• Cover, Rear Enclosure	1
	3	1518-0043	* Screw, 10-32 x 3/4, Pnh, Pd, St, Zn	4
	4	1560-0051	* Washer, Fl, #10, 0.0203ID, 0.50OD, St, Zn	4
	5	1065-4945-01	Panel, Rear	1
	6	2950-1179-01	Clamp, Cable, 3/8D, 1/2W, 1/4 Screw, Ins	1
		3600-0283-01	Shield, Strip, Finger, 0.34W 0.07H	1
		1065-4220-03	Foam, Rear Cover	1
	7	1065-3004-02	Bracket, Cord Wrap	1
	8	1517-0070	* Screw, 8-32 x 1/2, Pnh, Sems, Pd, St, Zn	3
	9	1560-0050	* Washer, Fl, 0.17ID, 0.438OD, 032T, St, Zn	3

**See Table 14-10**

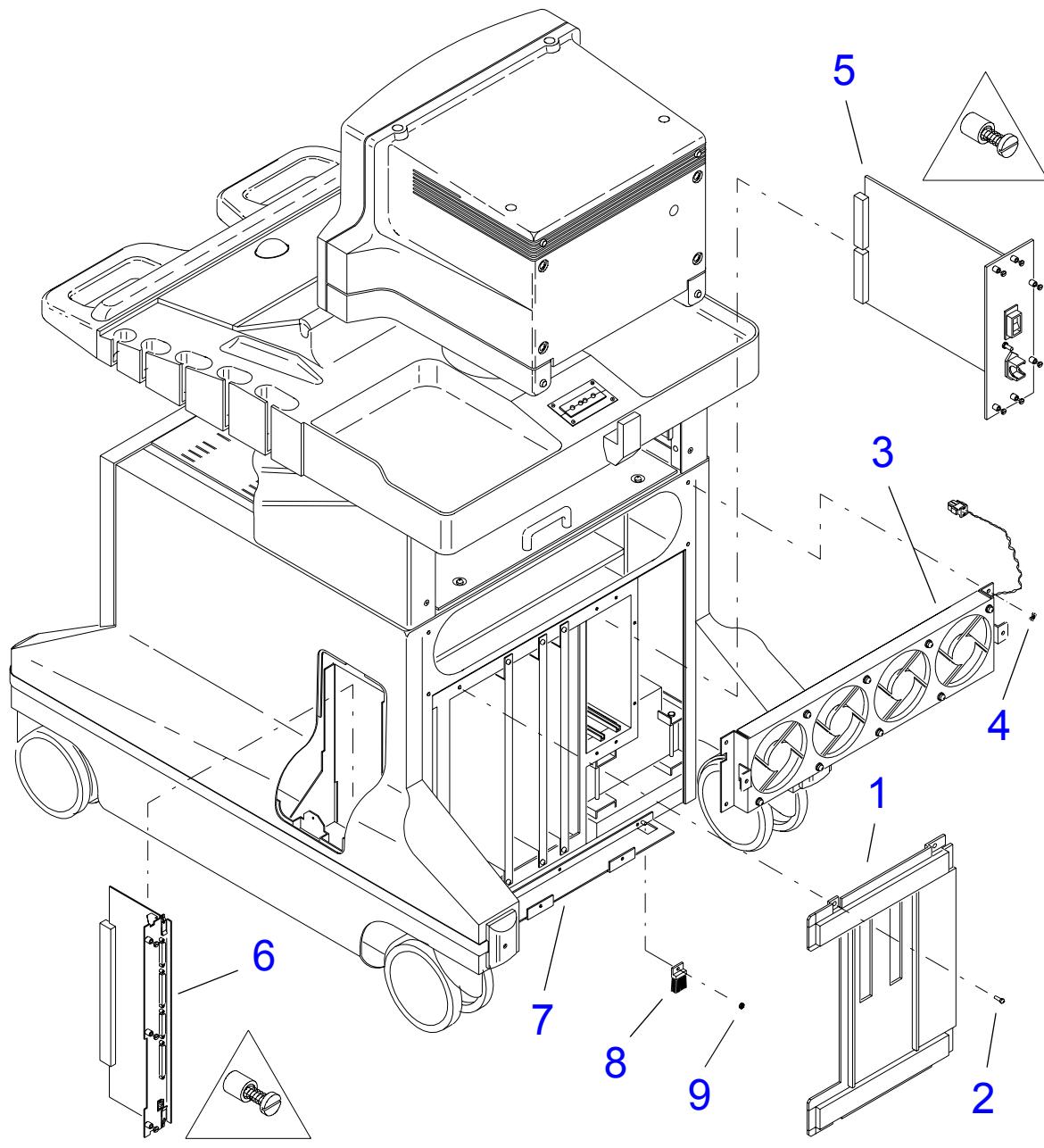


**Figure 14-11 Rear Panel and Covers**

**Table 14-11 Inside Rear Brackets and Modules**

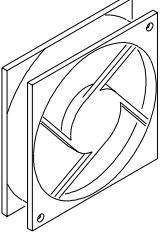
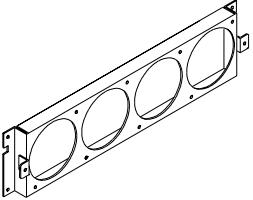
<b>Figure 14-12</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-1878-02 3500-1878-04	Shield Assy, Card Cage, Rear	1
	2	1516-0113	* Screw, 6-32 x 1	4
	3	<a href="#">Table 14-12</a>	Bracket, Fan (Figure 14-13)	1
	4	1541-0002	* Nut, 6-32, Keps, St, Zn	4
	5	<a href="#">Table 14-15</a>	PS4 ACIM - AC Input Module (Figure 14-15, Figure 14-16)	1
	6	<a href="#">Table 14-14</a>	A1B IIM - Internal Interface Module (Figure 14-15)	1
	7	1065-2255-05	Rear Cover Mounting Bracket	1
	8	2950-0782-01	Brush, Antistatic	1
	9	1541-0002	* Nut, 6-32, Keps, St, Zn	3

**See Table 14-11**

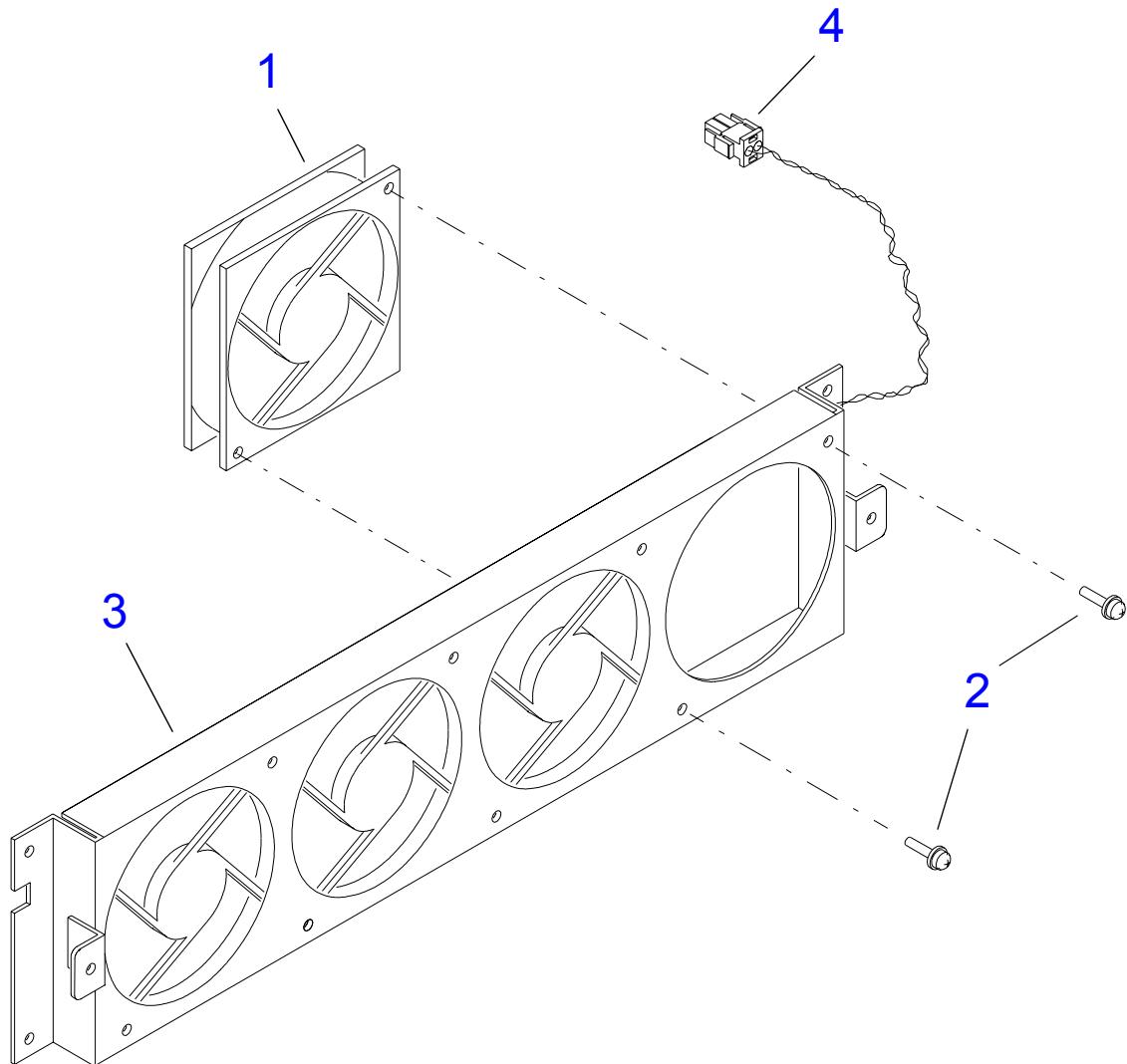


**Figure 14-12 Inside Rear Brackets and Modules**

**Table 14-12 24VDC Rear Fan Assembly**

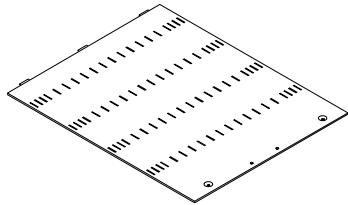
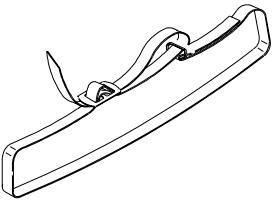
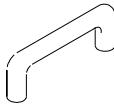
<b>Figure 14-13</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	2100-0856-01	Fan, 24 Vdc, 120 CFM, 4.7 Inch Square TB, w/6-32	4
		2100-0839-01	Fan, 24 Vdc, 120 CFM, 4.7 Inch Square UL/CSA (Alternate)	4
	2	1516-0074	* Screw, 6-32 x 3/8, Pnh, Int Sem, Pd, St, Zn	8
	3	1065-2365-03	Bracket, Fan <a href="#">(Figure 14-12)</a>	1
	4	3500-1514-03	Cable Assy, Fan, 24 Vdc	1

**See Table 14-12**

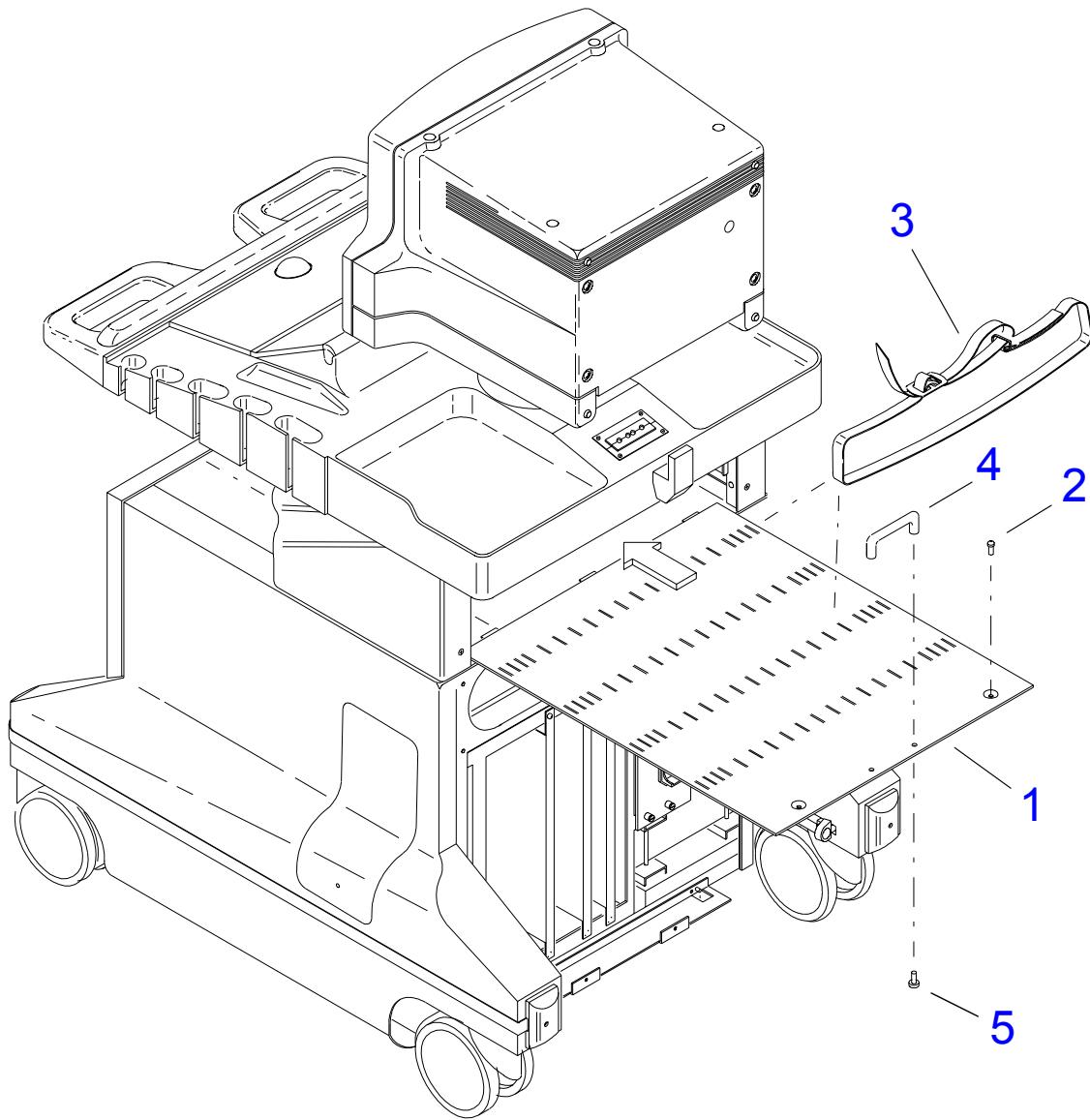


**Figure 14-13 24 Vdc Rear Fan Assembly**

**Table 14-13 Universal OEM Plate**

<b>Figure 14-14</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	1065-2385-04	Plate, Universal OEM	1
	2	1518-0060	* Screw, 10-32 x 1/2, Pnh, Pd, St, Wht	2
	3	1065-2386-01	OEM Strap, Universal	2
	4	2950-1236-01	Handle, 3.0LX, 0.5W, 0.87T, Int 8-32, Al, Anodz	1
	5	1517-0040	* Screw, 8-32 x 3/8, Pnh, Sem, Pd, St, Zn	2

**See Table 14-13**



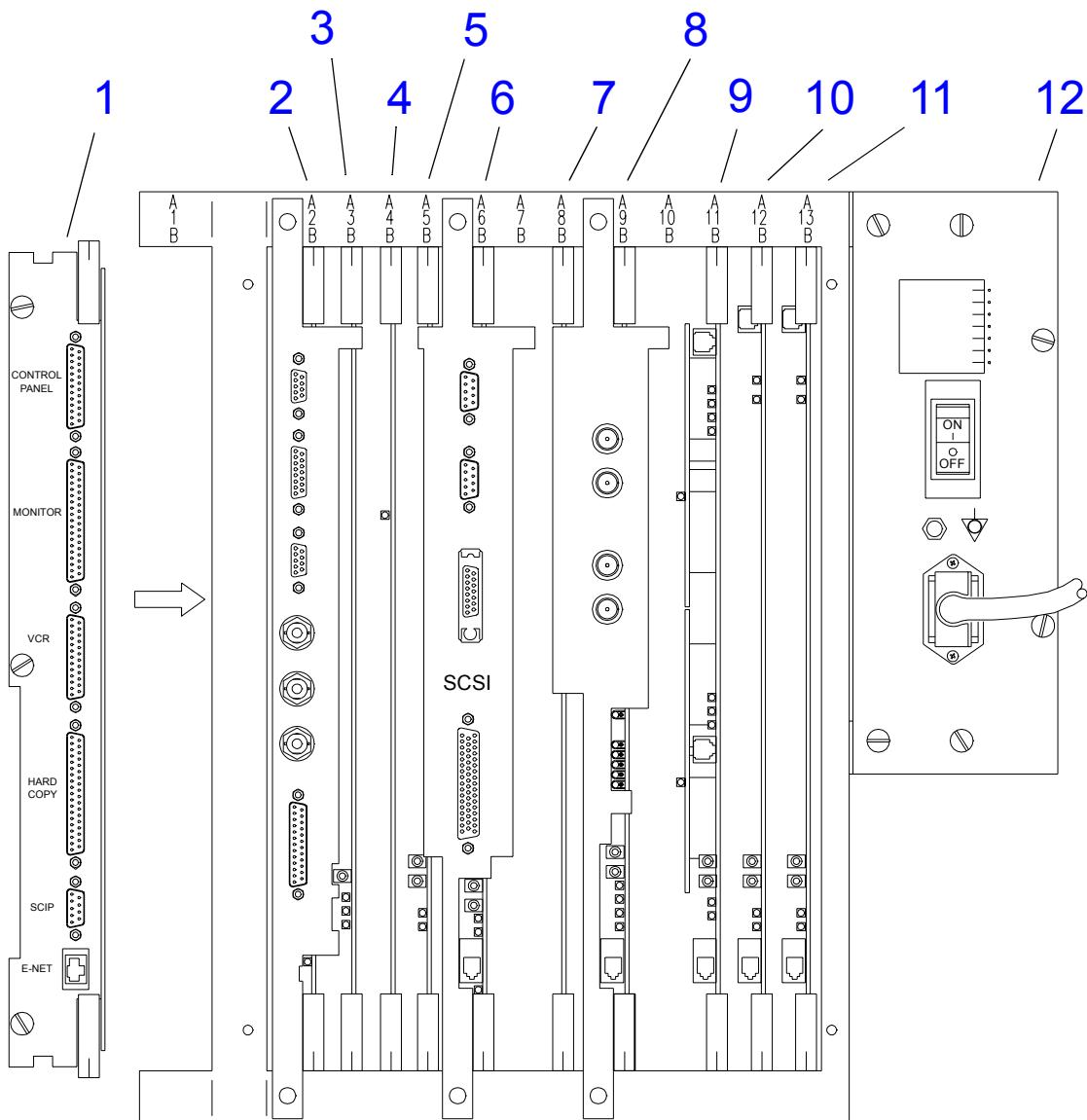
**Figure 14-14 Universal OEM Plate**

**Table 14-14 Rear Compartment, Card Cage**

Ref. #	Part Number <sup>1</sup>	Part Description (Figure 14-15)	Qty
1	7500-1291-XX	A1B IIM - Internal Interface Module (Figure 14-12)	1
2	7500-XXXX-XX	A2B PIM - Periph. Interface Module	1
3	7500-XXXX-XX	A3B PCM - Pixel Conversion Module	1
4	7500-0714-XX	A4B PSP2 - Pixel Space Processor 2	1
5	7500-0713-XX	A5B PSP1 - Pixel Space Processor 1	1
6	3500-XXXX-XX	A6B SYSCPU - System CPU	1
	2070-1188-01	SYSCPU ID Chip (requires specific MO files to reflect the machine ID number)	1
7	3500-2757-XX	A8B IMEM - Image Memory, 64 Mb (16 Mb x 4 Simms)	1
8	7500-1328-XX	A9B ADAPTER - Adv. Digital/Audio/Physio and Translator	1
9	7500-1119-XX	A11B SPM - Signal Proc. Module	1
	3500-2988-XX	A11B SPM - Signal Proc. Module (with daughterboards)	1
10	7500-1272-XX	A12B AIFOM - Adv. IF Output Module	1
11	7500-1413-XX	A12B/A13B AIFOM - Adv. IF Output Module	1/2
12	<a href="#">Table 14-15</a>	PS4 ACIM - AC Input Module (Figure 14-12, Figure 14-16)	1

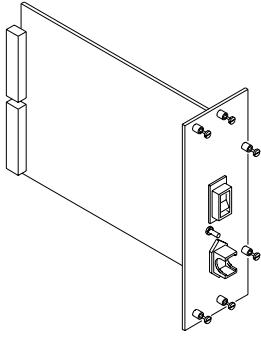
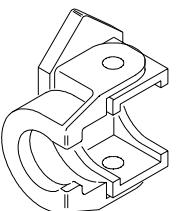
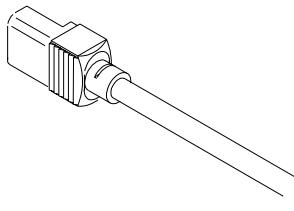
1. See [Section 13, "Configuration"](#), for part numbers that end in "-XX."

**See Table 14-14**



**Figure 14-15 Rear Compartment, Card Cage**

**Table 14-15 PS4 ACIM - AC Input Module**

<b>Figure 14-16</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>							
Not Illustrated	1		PS5 Spare Power Supply Slot (Behind PS4)	-							
	2	3500-1578-XX	PS4 ACIM - AC Input Module, 100-120V/60Hz	1							
		3500-1577-XX	PS4 ACIM - AC Input Module, 100-120V/50Hz	1							
		3500-1579-XX	PS4 ACIM - AC Input Module, 230V/50Hz	1							
		3500-1580-XX	PS4 ACIM - AC Input Module, 230V/60Hz	1							
	3	3100-2148-01	Receptacle, IEC, Male, 10A, Pnl/PCB	1							
	4	2208-0143-01	Plug Lock, Inside, Detach Power Cord (for 3100-2148-01)	1							
		3402-0026-01	Filter, Power, Line, 15A, 250V, Pnl Mt	1							
		2208-0144-01	Plug Lock, Outside, Detach Power Cord (for 3402-0026-01)	1							
<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>1</td></tr> <tr><td>2</td></tr> <tr><td>100-120 V~ 3</td></tr> <tr><td>50 Hz 4</td></tr> <tr><td>1450 VA 5</td></tr> <tr><td>6</td></tr> <tr><td>7</td></tr> </table>	1	2	100-120 V~ 3	50 Hz 4	1450 VA 5	6	7	5	4100-0942-02	Label, ACIM Voltage, 100-120V/60Hz	1
1											
2											
100-120 V~ 3											
50 Hz 4											
1450 VA 5											
6											
7											
	4100-0943-02	Label, ACIM Voltage, 100-120V/50Hz	1								
	4100-0944-02	Label, ACIM Voltage, 230V/50Hz, 7.5A	1								
	4100-0945-02	Label, ACIM Voltage, 230V/60Hz, 7.5A	1								
	6	2275-0391-01	Power Cord, Unshld, Hosp Plug, 15'L (120V)	1							
		2275-0324-01	Power Cord, Harmonized, CEE-22 & 7 (240V, 10A)	1							

See Table 14-15

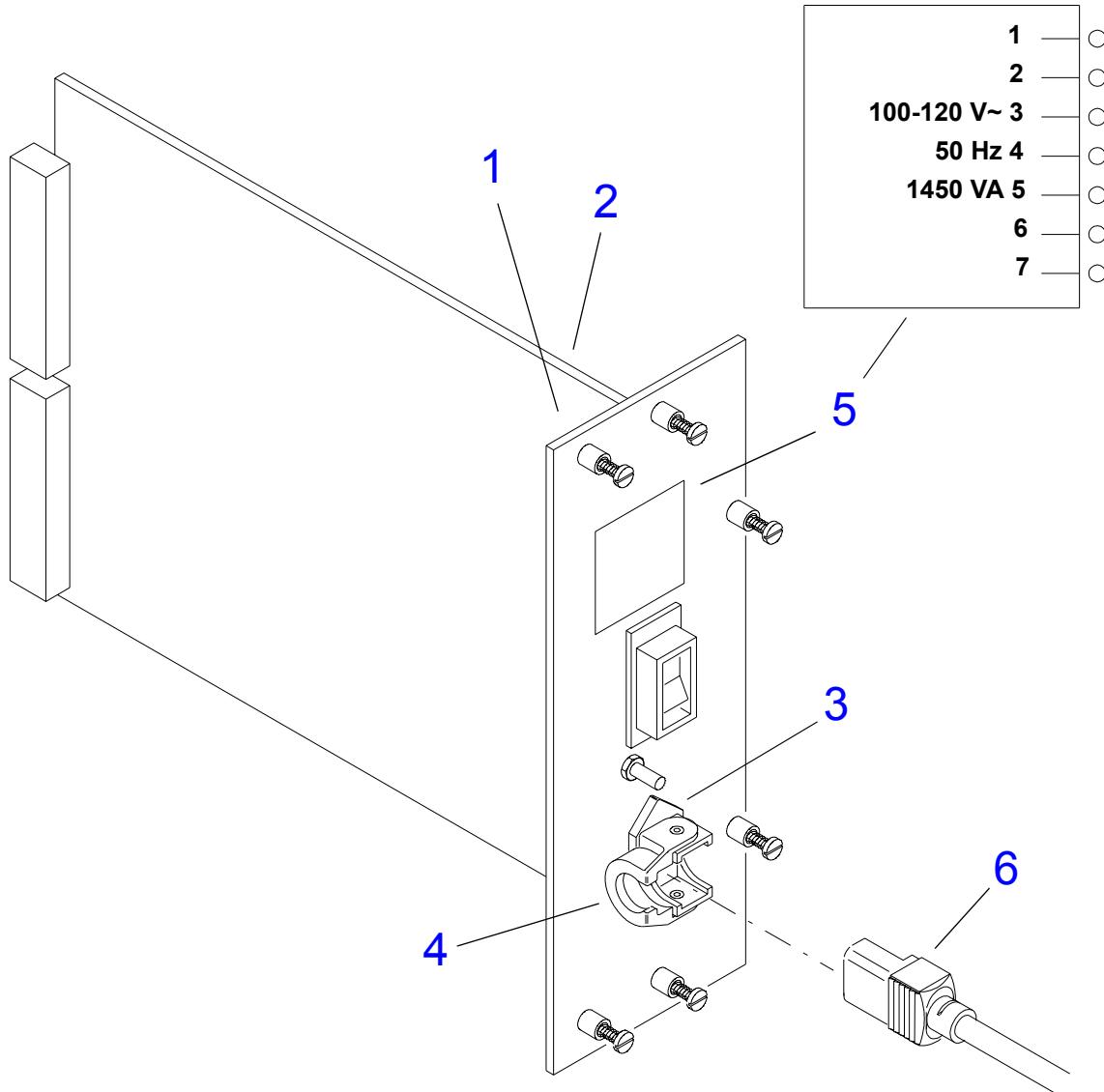
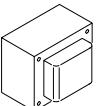
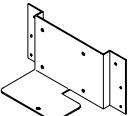
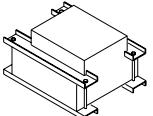
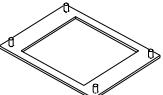


Figure 14-16 PS4 ACIM - AC Input Module

**Table 14-16 Power Transformer and OEM Power Transformer**

<b>Figure 14-17</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	2601-0071-01	OEM Power Transformer, 350VA, 1 Pri/2Sec, Shielded	1
	2	3700-0175-01	• Cap, 30 $\mu$ f, 660Vac 10%, Xfer Res Paper	1
	3	1065-2533-02	* Plate, Stud, Sinewave Transformer	2
	4	1543-0002	* Nut, 10-32, Keps, St	8
	5	1065-3019-02	• Mounting Bracket, Transformer	1
	6	2950-0513-01	* Bracket, Capacitor	1
	7	1516-0074	* Screw, 6-32 x 3/8, Pnh, Sem, Pd, St, Zn	2
	8	2601-0052-05	Power Transformer Assy, Ferro-Res, 1200VA, w/Shld (50-60 Hz)	1
	9	2950-0512-01	• Terminal Boot, Cap Insulator, Rubber	1
	10	1530-0145-01	• Bolt, 1/4-20 x 4-1/2, Hex, St, Zn	4
	11	1065-2498-02	• Bracket, Sinewave Xfmr	1
	12	2950-0613-01	• Isolator, Vibration, Xfmr	4
	13	2208-0003	• Cable Tie, 3-7/8"L, Ny	1

See Table 14-16

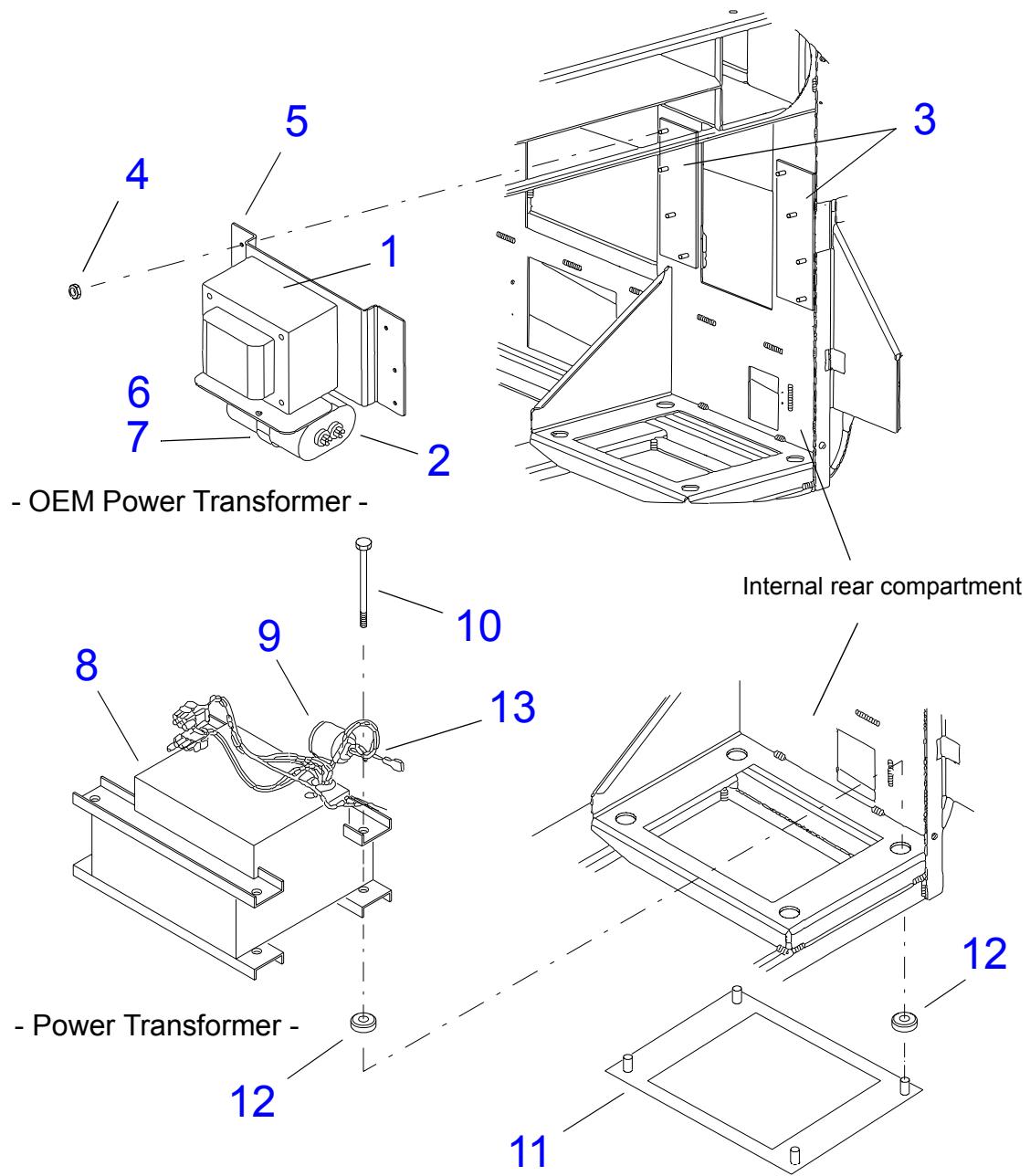
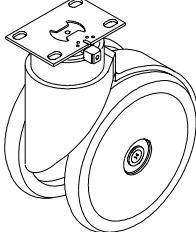
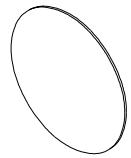
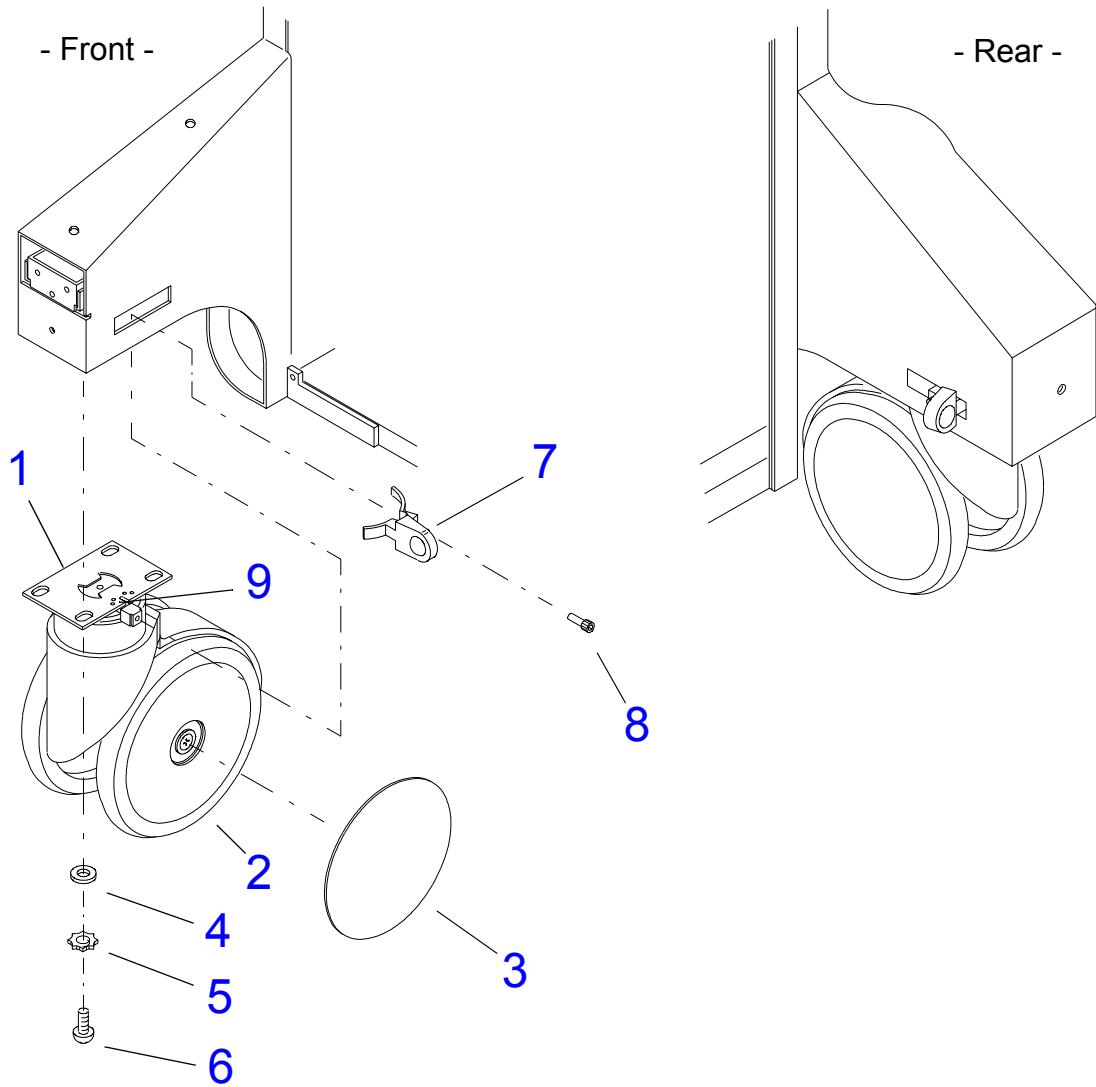


Figure 14-17 Power Transformer and OEM Power Transformer

**Table 14-17 System Casters, Swivel Type (Front and Rear)**

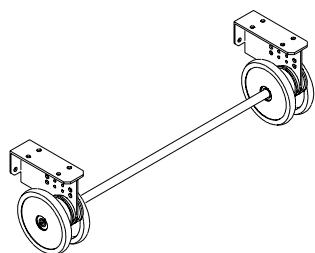
<b>Figure 14-18</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	2950-0657-06	Caster Assy, Swivel, Brake Shock Absorb (Front)	4
	2	2950-0857-01	• Wheel, Caster Assy (2 ea. caster)	8
	3	2950-0818-01	• Hubcap, Caster Assy (2 ea. caster)	8
	4	1560-0020	* Washer, Fl, 1/4, .625OD, .065T, St, Zn (4 ea. caster)	16
	5	1561-0001	* Washer, Int Lk, 1/4, .478OD, .025T (4 ea. caster)	16
	6	1519-0022	* Bolt, 1/4-20 x 3/4, Hex, St, Zn (4 ea. caster)	16
	7	1065-2611-02	Knob, Brake Lever	4
	8	1530-0157-01	* Screw, 10-32 x 5/8, Skh, Cap, Hd, Nylok, Zn	4
	9	1530-0360-01	* Screw, 8-32 x 3/8, Set, Hd, Flat, Pt, Zn (Requires a 5/64" allen wrench)	2

**See Table 14-17**

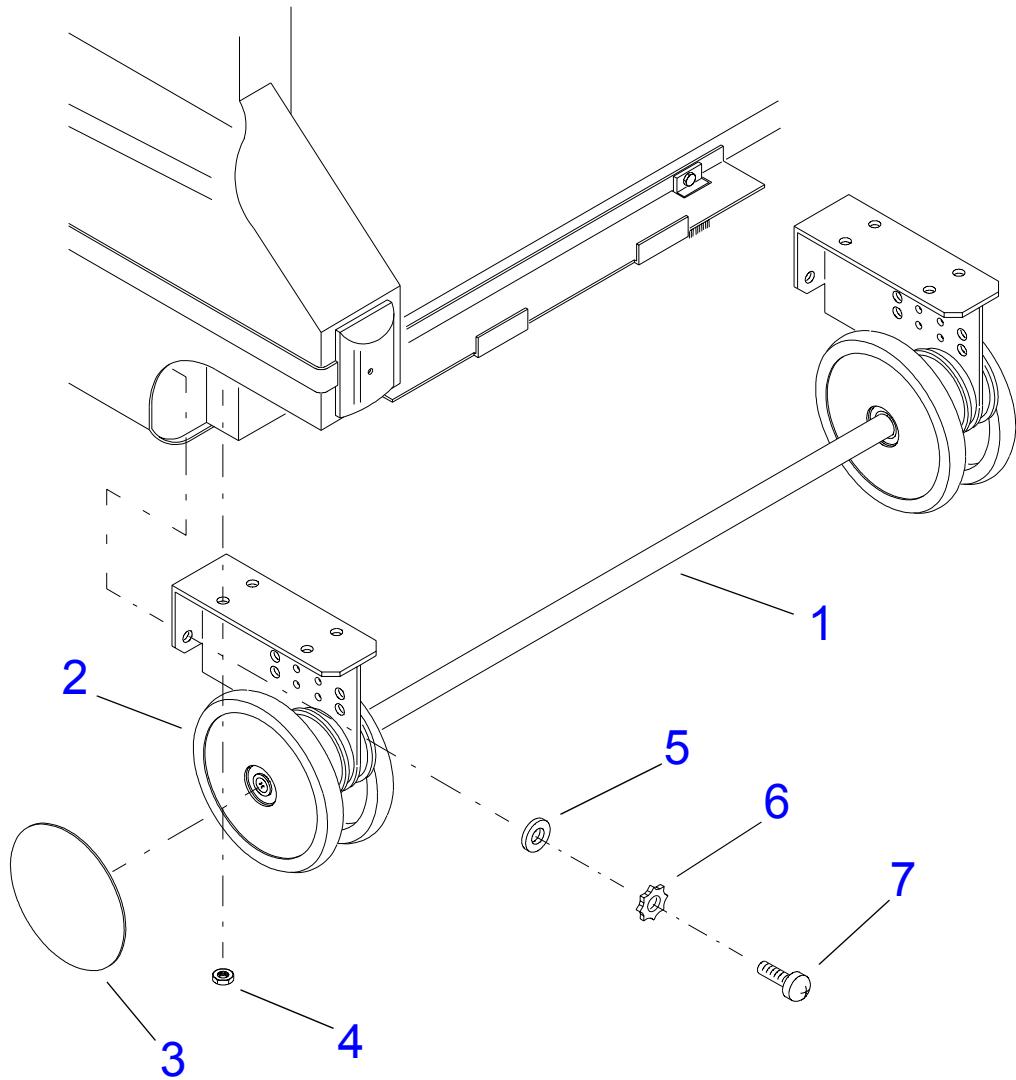


**Figure 14-18 System Casters, Swivel Type (Front and Rear)**

**Table 14-18 System Casters, Axle Type (Rear)**

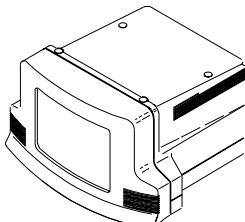
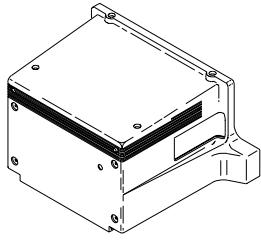
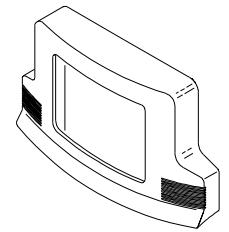
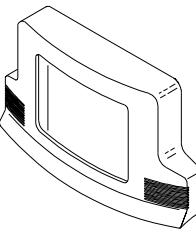
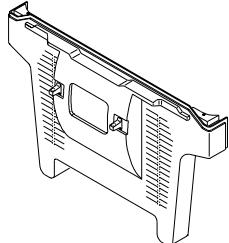
<b>Figure 14-19</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	2950-1278-01	Caster Assy, Axle, Shock Absorbing	1
	2	2950-0857-01	• Wheel, Axle Assy (2 ea. side)	4
	3	2950-0818-01	• Hubcap, Rear, Axle Assy (1 ea. side)	2
	4	1544-0012	* Nut, 1/4-20, Keps, St, Zn	8
	5	1560-0020	* Washer, Fl, 1/4, .625OD, .065T, St, Zn	4
	6	1561-0001	* Washer, Int Lk, 1/4, .478OD, .025T	4
	7	1519-0022	* Bolt, 1/4-20 x 3/4, Hex, St, Zn	4

**See Table 14-18**



**Figure 14-19 System Casters, Axle Type (Rear)**

**Table 14-19 Video Monitor**

<b>Figure 14-20</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-2532-11 3500-2532-14 3500-2971-01 3500-3040-01	Video Monitor Assy, HDI 15"	1
	2	<a href="#">Table 14-21</a>	<ul style="list-style-type: none"> <li>• Monitor, 15", Color, Open Chassis, HDI (<a href="#">Figure 14-22</a>)</li> </ul>	1
	3	1065-4691-02	<ul style="list-style-type: none"> <li>• Cover, 15", Color Monitor (w/o rear panel cover, use with 1065-4314-03 controls bracket)</li> </ul>	1
		1065-4691-01	<ul style="list-style-type: none"> <li>• Cover, 15", Color Monitor (with rear panel cover, use with 1065-4314-02 controls bracket)</li> </ul>	
	4	<a href="#">Table 14-20</a>	<ul style="list-style-type: none"> <li>• Bezel, Monitor, 15", Color (<a href="#">Figure 14-21</a>)</li> </ul>	1
	5	1065-1789-08	<ul style="list-style-type: none"> <li>• Base, HDI Color Monitor (use with 3500-2532-11 monitor)</li> </ul>	1
		1065-5131-01	<ul style="list-style-type: none"> <li>• Base, Monitor (use with 3500-2532-14, 3500-1589-01, and 3500-3040-01 monitors)</li> </ul>	
	6	2950-0587-01	<ul style="list-style-type: none"> <li>• Hole Plug, 0.562D, 1/8 Max, Pnl, Wht, Nylon (without VCR)</li> </ul>	4
	7	2950-0586-01	<ul style="list-style-type: none"> <li>• Bumper, 5DX.14H, Clr Vinyl, Adhesive back</li> </ul>	4

**Table 14-19 Video Monitor**

<b>Figure 14-20</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	8	1065-4676-01	Panel, Cover, Monitor (use with 1065-4691-01 cover)	1
	9	1560-0051	* Washer, Fl, #10, .203ID, .500D, .04T, St, Zn	2
	10	1630-0098-01	* Screw, M5 x 12, Pnh, Pd, Int Sems, St, Bo	4

See Table 14-19

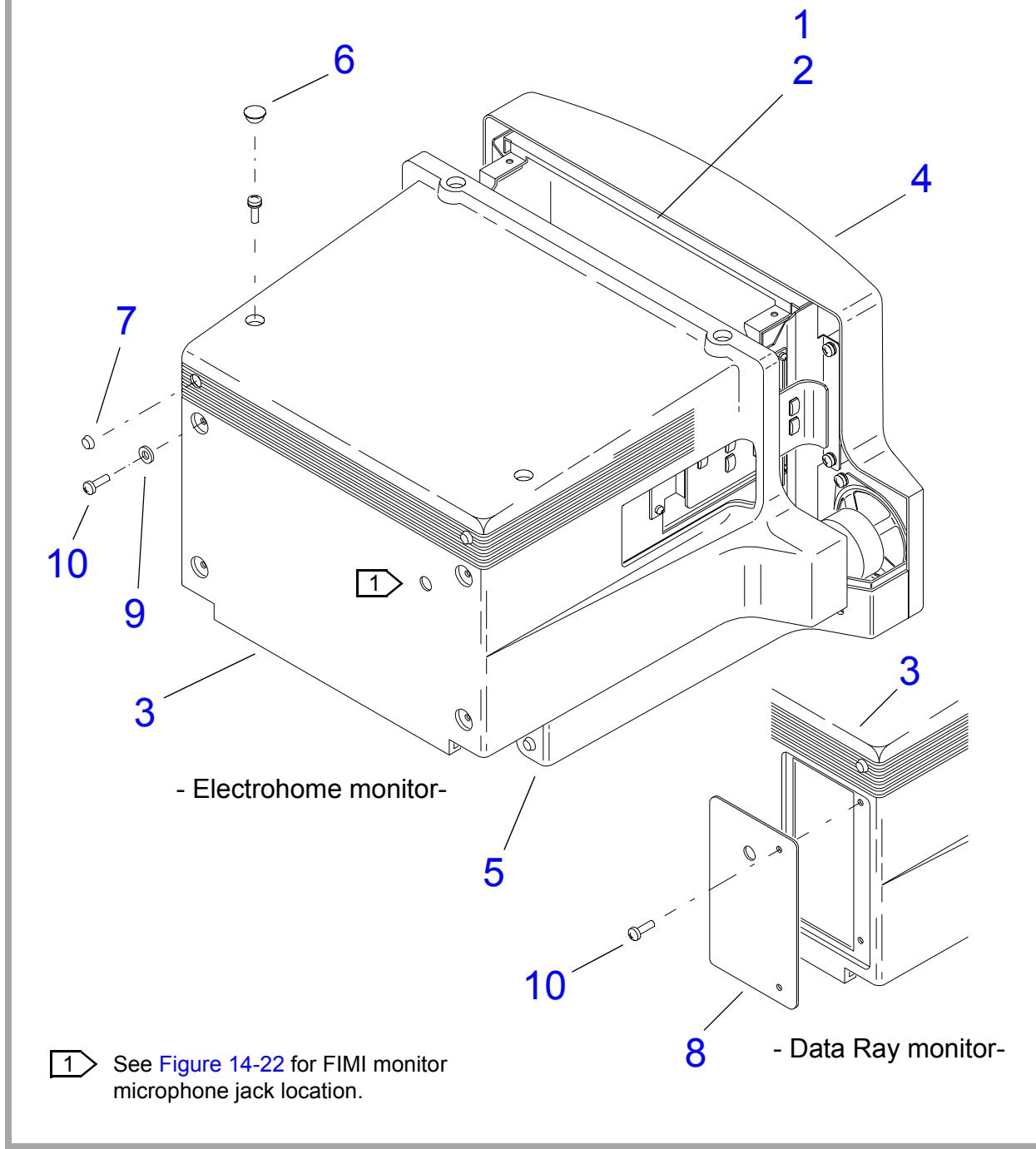
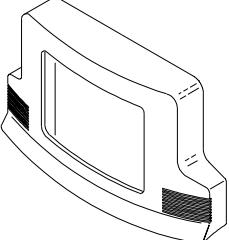
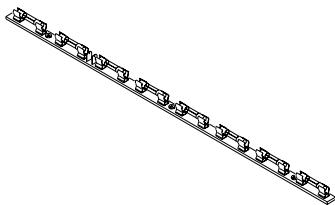
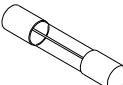
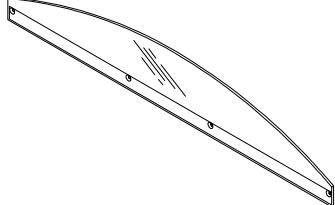
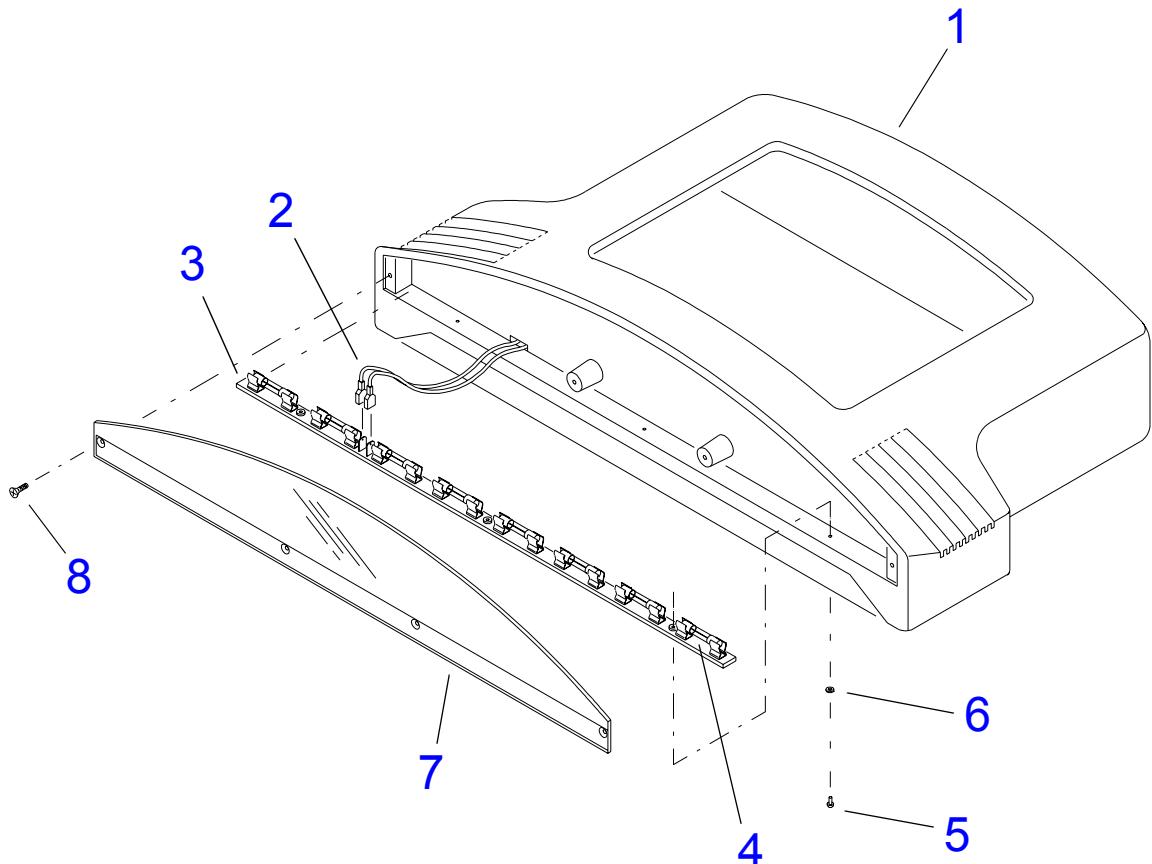


Figure 14-20 Video Monitor

**Table 14-20 Video Monitor Bezel**

<b>Figure 14-21</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	1065-4317-02	Bezel, Monitor, 15", Color (Figure 14-20)	1
	2	3500-2614-02	• Cable Assy, Monitor, Lower Bezel	1
	3	7500-1313-02	• PCB Assy, Monitor Light Bar	1
	4	3900-0032-01	• Bulb, Light Bar, T2, GF710, 12V, 0.1A, 1/4"D x 1-1/4"L	8
	5	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	3
	6	1560-0061	* Washer, Fl, #6, .31200, .032T, St, Zn	3
	7	1065-4233-03	• Diffuser, Light, Monitor	1
	8	1516-0014	* Screw, 6-32 x 3/8, Flh, Pd, 100D, Ss	4

**See Table 14-20**

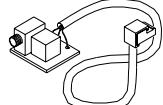


**Figure 14-21 Video Monitor Bezel**

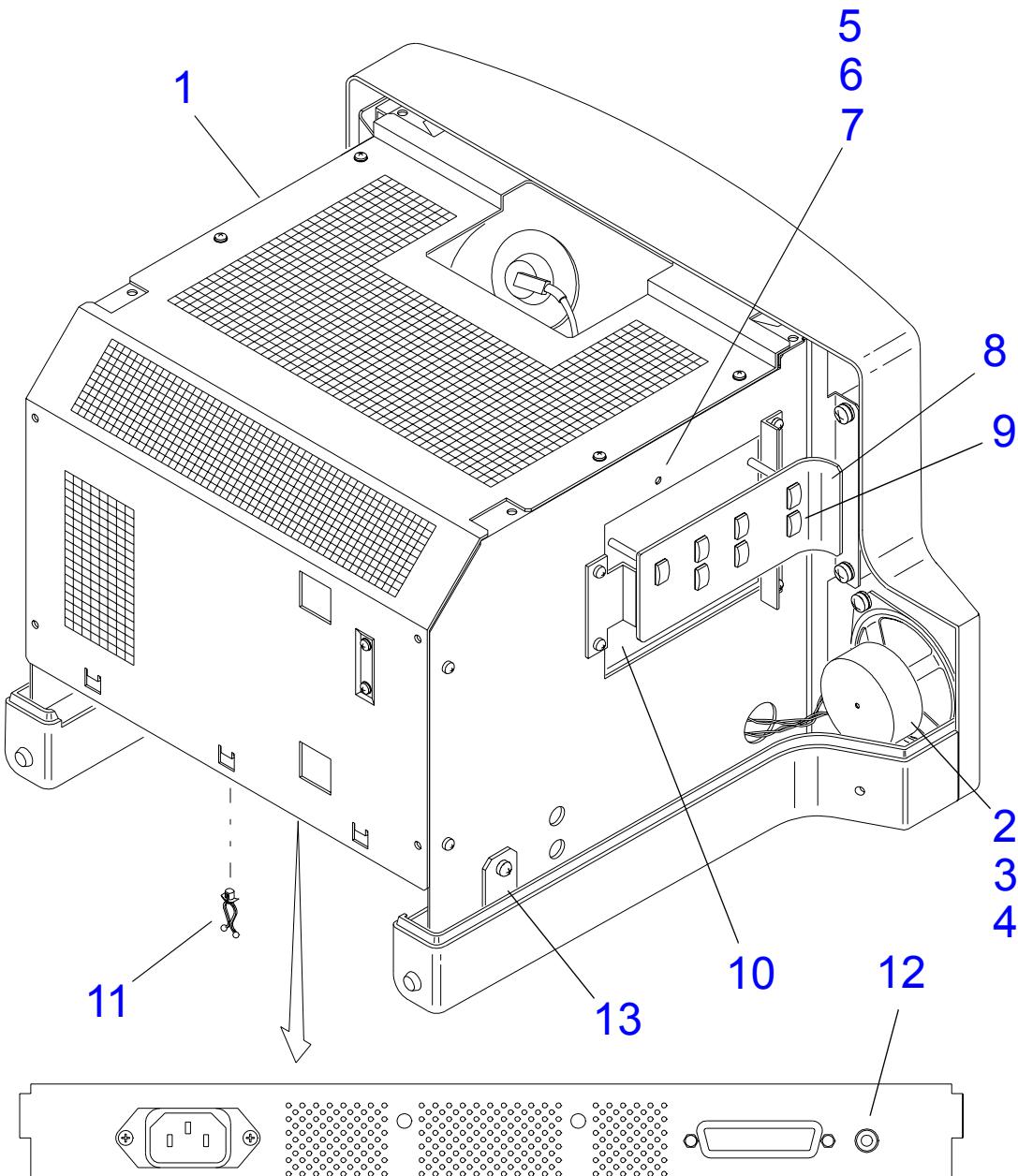
**Table 14-21 Video Monitor Chassis**

<b>Figure 14-22</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	2100-1346-08 2100-1346-09 2100-1471-01 2100-1589-01	Monitor, 15", Color, Open Chassis, HDI (use 2100-1346-08 with 3500-2532-11 monitor assy, 2100-1346-09 with 3500-2532-14, 2100-1471-01 with 3500-2971-01, and 2100-1589-01 with 3500-3040-01)	1
	2	2100-1235-01	• Speaker, 3.5", 80hm, Shld, 8W, Ex, Rng	2
	3	1065-4501-01	• Isolator, Speaker, Monitor	2
	4	1065-4502-01	• Washer, Isolation, Speaker, Monitor	4
	5	2275-0393-01	• Cable Assy, LED, 3MM Conn, 8" L (3500-2532-XX monitor only)	1
	6	2405-0124-01	• LED, Green, T1, 4MCD, Clear, PCB (3500-2532-XX monitor only)	1
	7	2950-1161-01	• Lens, LED, 3MM, Green, Low Profile (3500-2532-XX monitor only)	1
	8	1065-4314-03  1065-4314-02	• Bracket, Controls, Monitor, 15" Color (use only with 1065-4691-02 cover)  • Bracket, Controls, Monitor, 15" Color (use only with 1065-4691-01 cover)	1
	9	1065-4548-01	• Button, Push, Monitor Control	7
	10	7500-1312-02 7500-1667-03 7500-1582-01	• PCB Assy, Monitor Control (Use 7500-1312 for 3500-2532-XX monitor, 7500-1667 for 3500-3040-XX, and 7500-1582 for 3500-2971-XX.)	1

**Table 14-21 Video Monitor Chassis**

<b>Figure 14-22</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	11	2208-0147-01	• Standoff, Wire, 3/16, Push-in, Twist, Ny	2
	12	3500-2752-01	• Cable Assy, Microphone, Internal, Monitor	1
Not Illustrated	13	1065-4345-02	• Beam, Mounting, Rear, Monitor	1

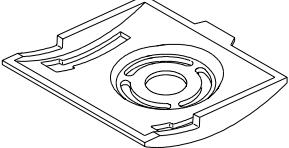
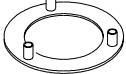
**See Table 14-21**



FIMI monitor shown; Data Ray and Electrohome monitors are similar.

**Figure 14-22 Video Monitor Chassis**

**Table 14-22 Video Monitor Base**

<b>Figure 14-23</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-2812-03	Tilt Base Assy with Adapter	1
	2	1065-2682-02	• Base, Tilt Mechanism, Fog (Figure 14-24)	1
	3	1065-2438-01	• Ring, Clamping, Monitor Swivel	1
	4	1065-2866-01 <sup>1</sup>	• Adapter, Monitor Height	1
	5	1065-4584-02 <sup>1</sup>	• Rod, Spacer, Monitor Installation	3
	6	1065-2439-01	• Bearing, Monitor Swivel	2
	7	1065-2372-04	• Plate, Monitor Swivel	1
	8	1518-0043-01	* Screw, 10-32 x 1, Pnh, Pd, Sems, St, Zn	3
	9	1560-0051	* Washer, Fl, #10, 0.203ID, 0.50OD, St, Zn	3
	10	1543-0002	* Nut, 10-32, Keps, St, Zn	3

1. Items **4** and **5** are on older systems and system upgrades only. The new monitor collar on the cart weldment is taller on newer systems and replaces these parts.

See Table 14-22

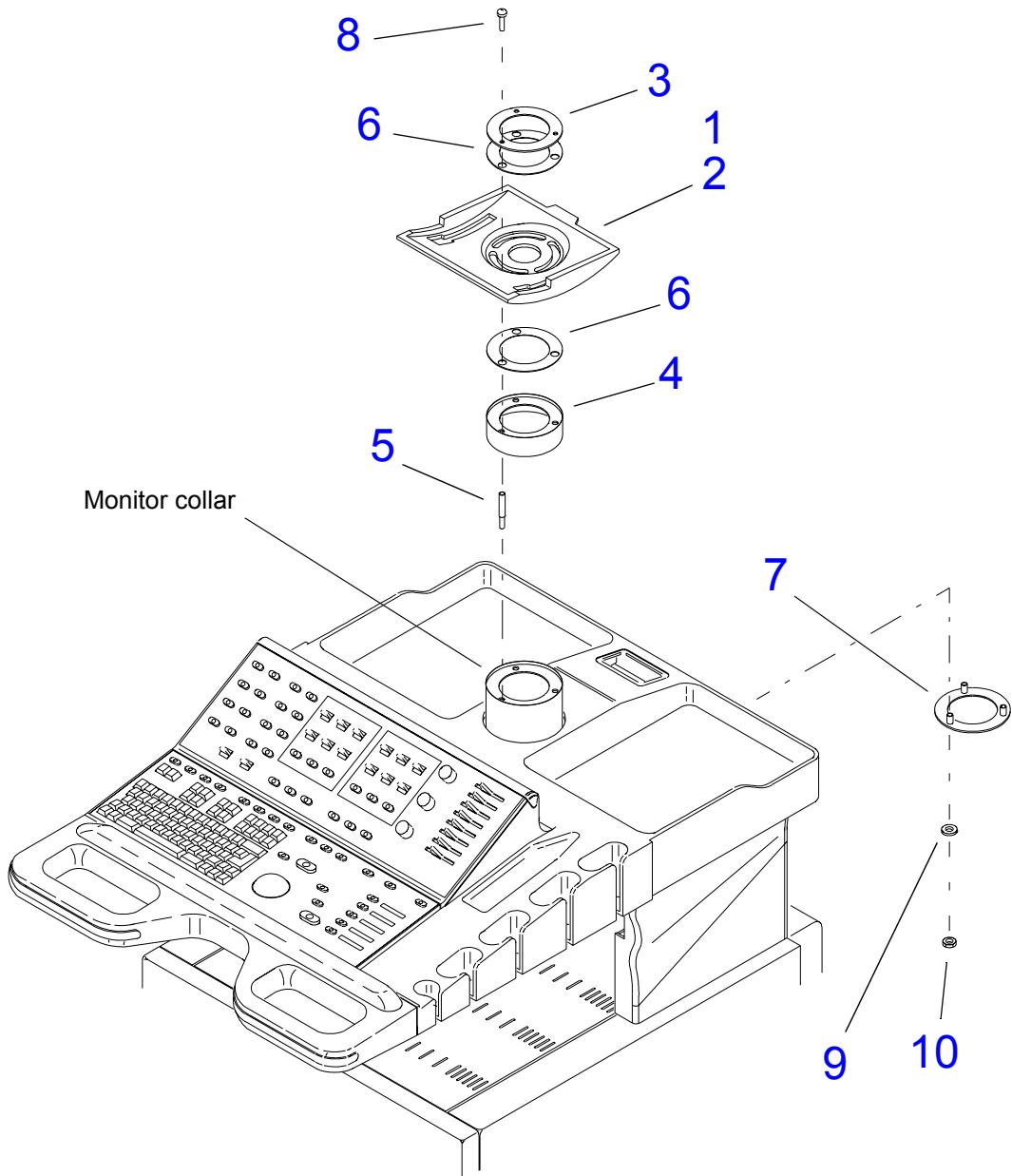
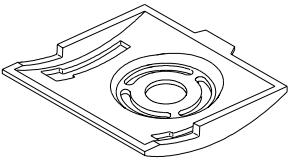
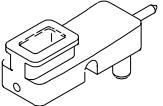


Figure 14-23 Video Monitor Base

**Table 14-23 Video Monitor Base Lock**

<b>Figure 14-24</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	<a href="#">Table 14-22</a>	Base, Tilt Mechanism, Fog (Figure 14-23)	1
	2	4100-1568-01	• Label, Warning, Monitor lock	2
	3	3000-0363-04	Clamp Lock Assy, Monitor	2

See Table 14-23

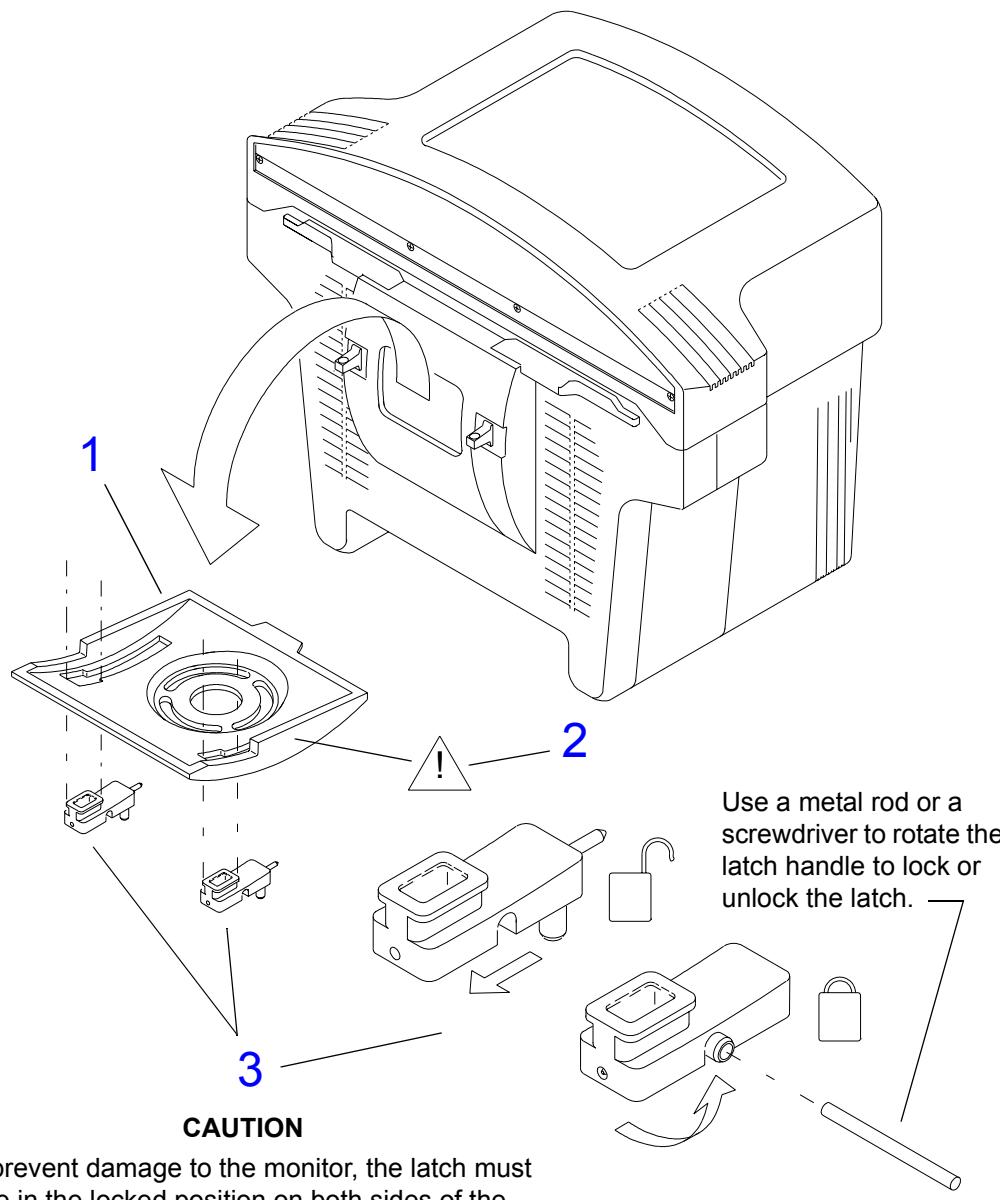
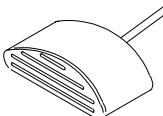
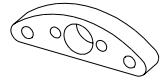
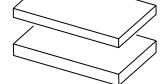
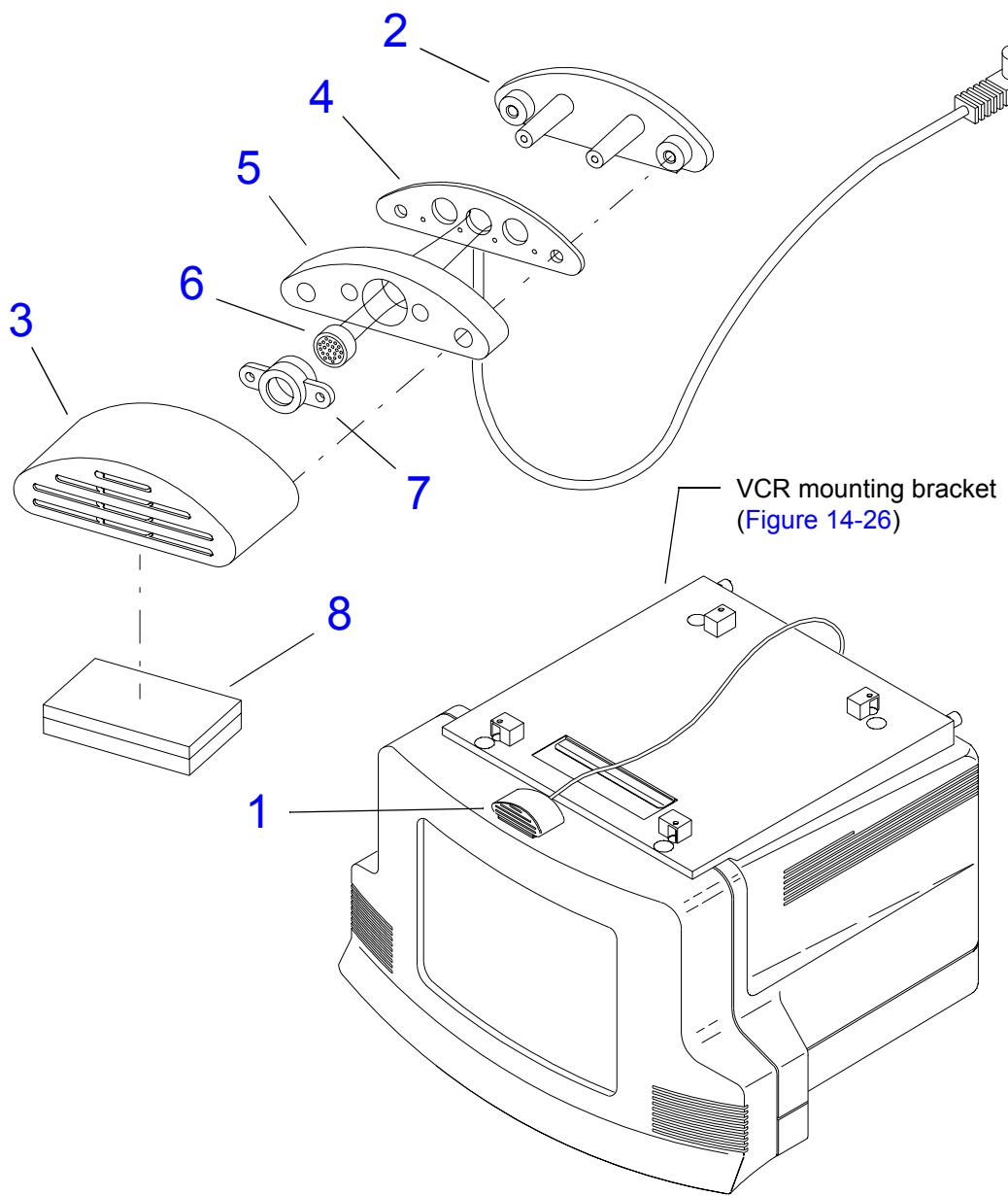


Figure 14-24 Video Monitor Base Lock

**Table 14-24 Microphone Module Assembly**

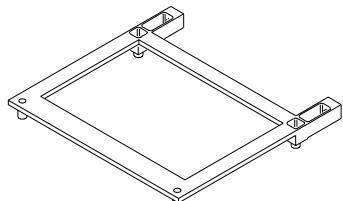
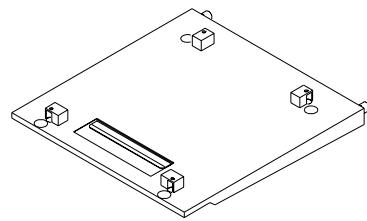
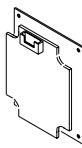
<b>Figure 14-25</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-2631-02 3500-2631-03	Microphone Module Assy (-03 is used for FIMI monitor)	1
	2	1065-4503-01	• Base, Microphone Module	1
	3	1065-4504-01	• Cover, Microphone Module	1
	4	3500-2632-02 3500-2632-03	• Cable Assy, Microphone (-03 is 6" longer for FIMI monitor)	1
	5	1065-4671-01	• Insert, Foam, Forward, Mic Module	1
	6	2100-1403-01	• Microphone Cartridge, Cond., Electret	1
	7	2950-1155-01	• Holder, Microphone	1
	8	9901-0035	• Velcro, Hook & Loop, Wht, 1" W"	1

**See Table 14-24**



**Figure 14-25 Microphone Module Assembly**

**Table 14-25 Video Monitor VCR Support**

<b>Figure 14-26</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	1065-2683-01	Support, VCR	1
	2	1630-0098-01	* Screw, 10-32 x 1/2, Pnh, Sem, Pd, St, Zn	4
	3	1065-1803-05	Bracket, VCR Mounting	1
		1065-3021-01	Bracket, VCR Mounting, for Sony SVO-9500MD VCR (Hitachi systems)	1
	4	1630-0058-01	* Screw, M4 x 10, Pnh, Pd, Sems S/R Lk, St, Zn	4
	5	2208-0147-01	Standoff, Wire, 3/16, Push-in, Twist, Ny	2
	6	2100-0843-01	Adapter, Serial Interface, RS-232C (Panasonic MD830 VCR only)	1
	7	-	* Screw	4

See Table 14-25

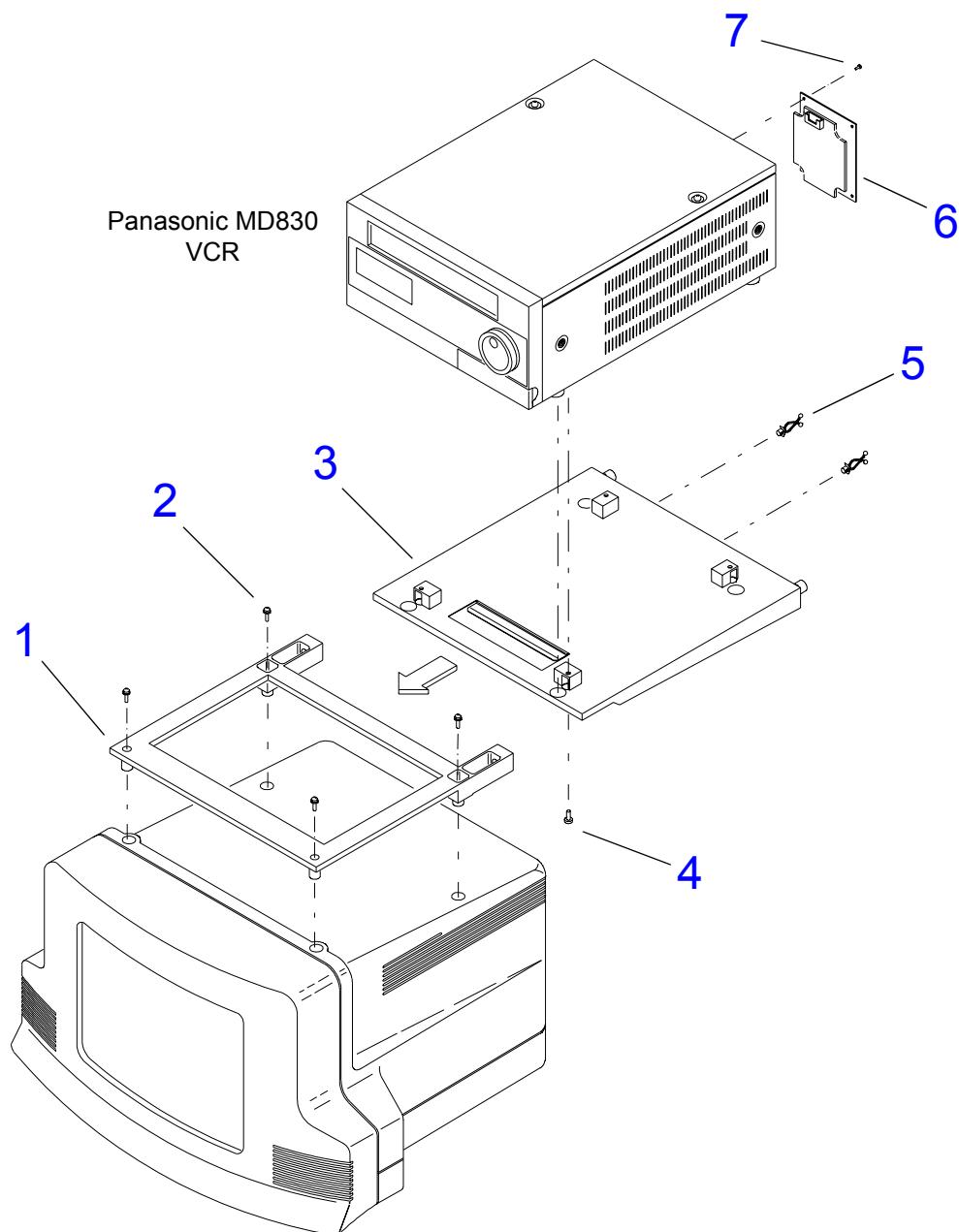
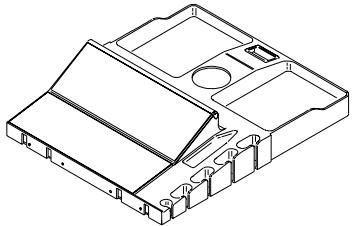
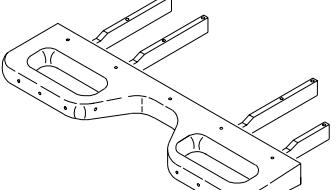
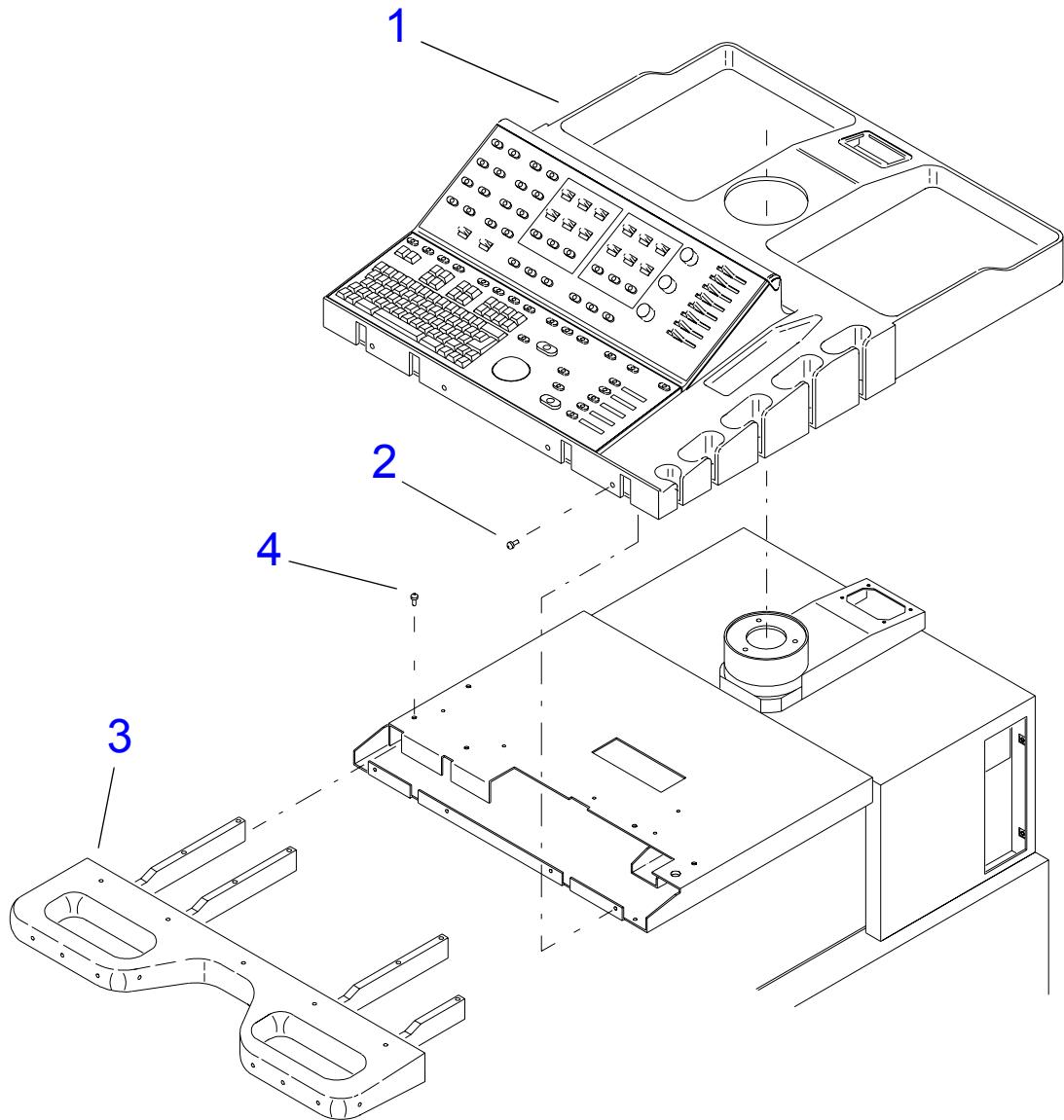


Figure 14-26 Video Monitor VCR Support

**Table 14-26 Command Module**

<b>Figure 14-27</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	1065-4489-01	Housing, Command Module (Figure 14-28)	1
	2	1518-0051	* Screw, 10-32 x 1/2, Pnh, Sem, Pd, St, Zn	4
	3	1065-4592-01	Handle Casting	1
	4	1518-0051	* Screw, 10-32 x 1/2, Pnh, Sem, Pd, St, Zn	8

**See Table 14-26**

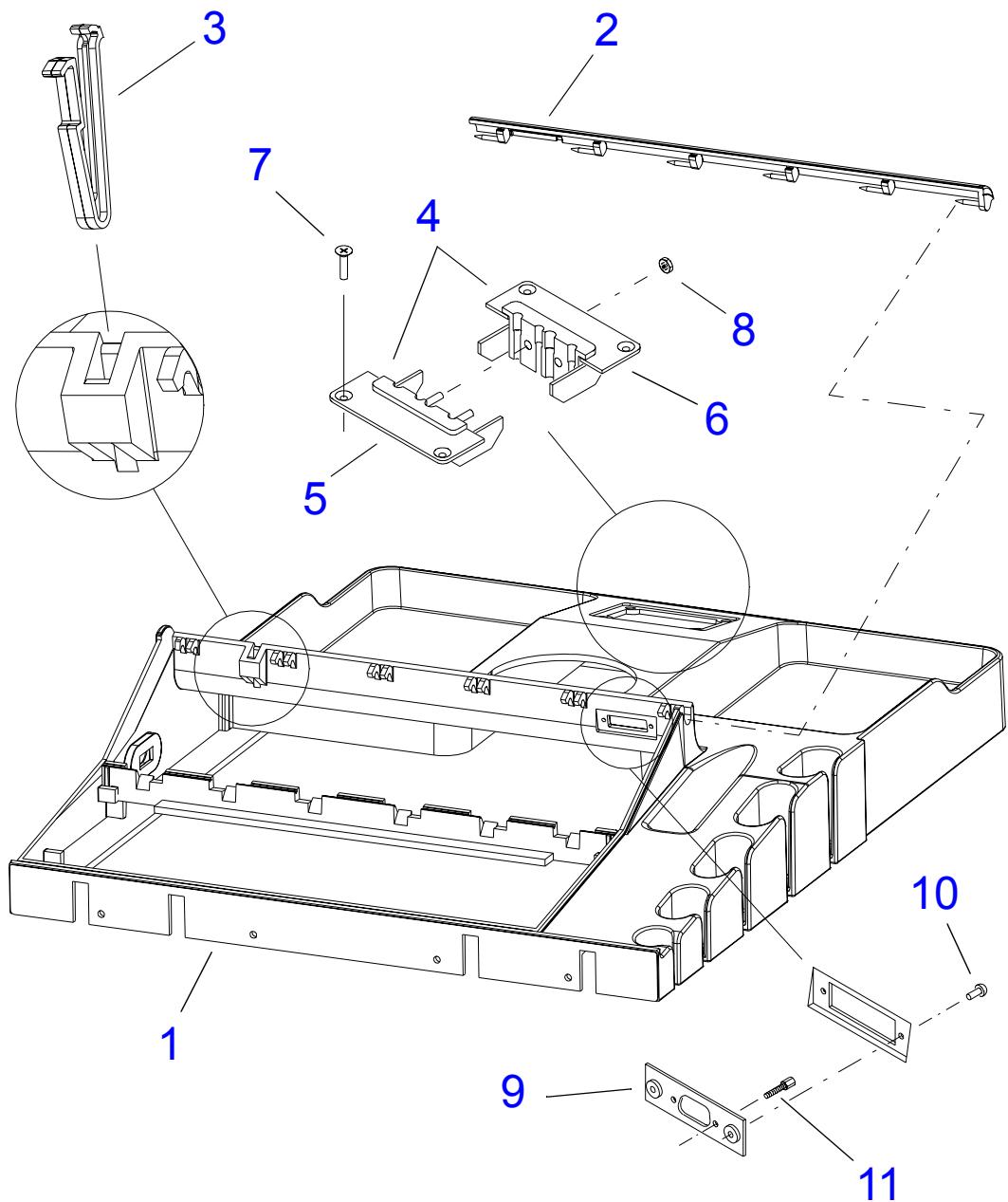


**Figure 14-27 Command Module**

**Table 14-27 Command Module Details**

<b>Figure 14-28</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	<a href="#">Table 14-26</a>	Housing, Command Module (Figure 14-27)	1
	2	1065-4263-01	Lock Bar, Control Panel	1
	3	1065-4264-02	Latch, Locking Bar	1
	4	3500-2721-02	Cable Clamp Assembly	1
	5	1065-2576-02	• Plate, Cable Clamp, Left	1
	6	1065-2577-02	• Plate, Cable Clamp, Right	1
	7	1530-0156-01	* Screw, 10-32 x 1, Flh, Pd, Fog White	4
	8	1543-0002	* Nut, 10-32	2
	9	1065-4626-03	Bracket, Remote D-SUB	1
	10	1530-0027-01	* Screw, 4-40 x 1/2, Flh, Pd, 82D, St, White	2
	11	3100-1387	Screwlock, .18-25H, .31L Stud, Pair (attaches 3500-2741-XX cable to bracket)	1

**See Table 14-27**

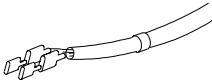


**Figure 14-28 Command Module Details**

**Table 14-28 User Interface (Control Panel) Assemblies**

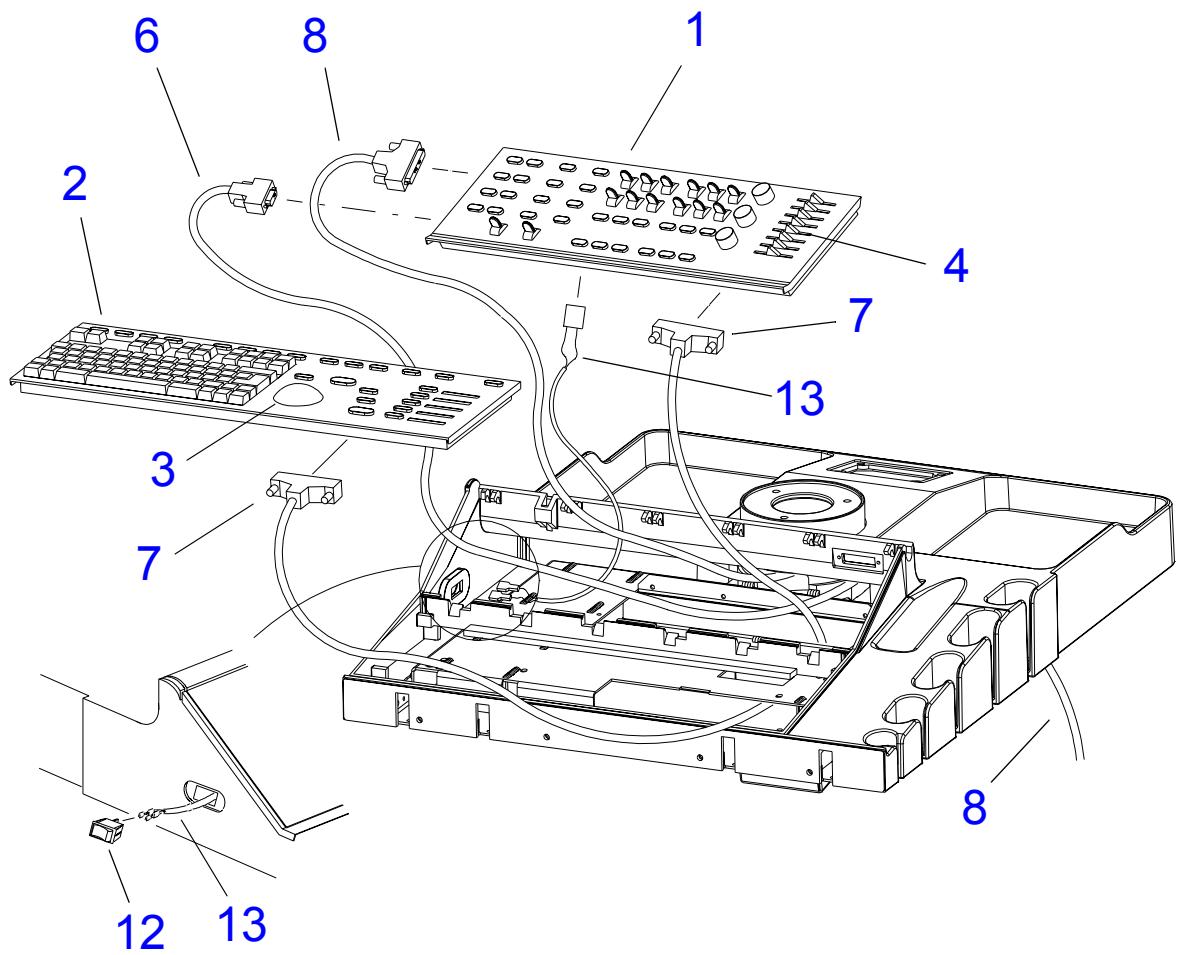
<b>Figure 14-29</b>	<b>Ref. #</b>	<b>Part Number<sup>1</sup></b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-XXXX-XX	Upper User Interface Assembly (Control Panel)	1
	2	3500-XXXX-XX	Lower User Interface Assembly (Control Panel)	1
	3	2100-1480-01	Trackball, 480C/Rev, 2IN, Sealed, Pnl	1
	4	-	Slidepot Assy	1
Not illustrated	5	4400-0092-02	Keycap Set, English (Use with 3500-2636-xx keyboard)	1
		4400-0093-02	Keycap Set, French (Use with 3500-2525-xx keyboard)	1
		4400-0094-02	Keycap Set, German (Use with 3500-2527-xx keyboard)	1
		4400-0096-01	Keycap Set, Scandinavian (Use with 3500-2527-xx keyboard)	1
	6	3500-2741-01	Cable Assy, Com. Mod. DSUB/UCP-P3	1
	7	3500-2770-01	Cable Assy, LCP-J1/UCP-P1	1
	8	3500-2771-01	Cable Assy, IIM/UCP-P2	1
Not Illustrated	9	7500-1320-XX	PCB Assy, User Interface Module	1
Not Illustrated	10	1560-0065	Washer, Fl, #4, 0.122ID, 0.28OD, 0.03T, St, Zn	9

**Table 14-28 User Interface (Control Panel) Assemblies**

<b>Figure 14-29</b>	<b>Ref. #</b>	<b>Part Number<sup>1</sup></b>	<b>Part Description</b>	<b>Qty</b>
Not Illustrated	11	1514-0083	Screw, 4-40 x 1/4, Pnh, Sems, Pd, Ss	9
	12	3300-0307-01	Switch, Rkr, Spst, .1A, 28V, Blk/Blk, Pnl	1
	13	3500-2639-01	Cable Assy, On/Standby Switch/UCP-J1	1
Not Illustrated	14	8000-1668-01	Kit, UIF Cable Clamps	1
Not Illustrated	15	1065-4980-01	Bracket, UIF Ferrite	1
Not Illustrated	16	2208-0198-01	• Clamp, CA, 0.187ID, 0.218 Mtg Hole, ST	1
Not Illustrated	17	2208-0199-01	• Clamp, CA, 0.25ID, 0.218 Mtg Hole, ST	1
Not Illustrated	18	1065-4800-01	Clamp, Cable	1

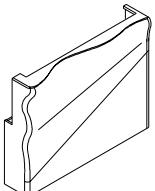
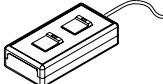
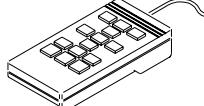
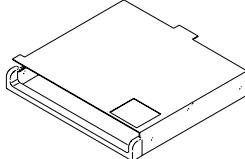
1. See Section 13, "Configuration", for part numbers that end in "-XX."

**See Table 14-28**

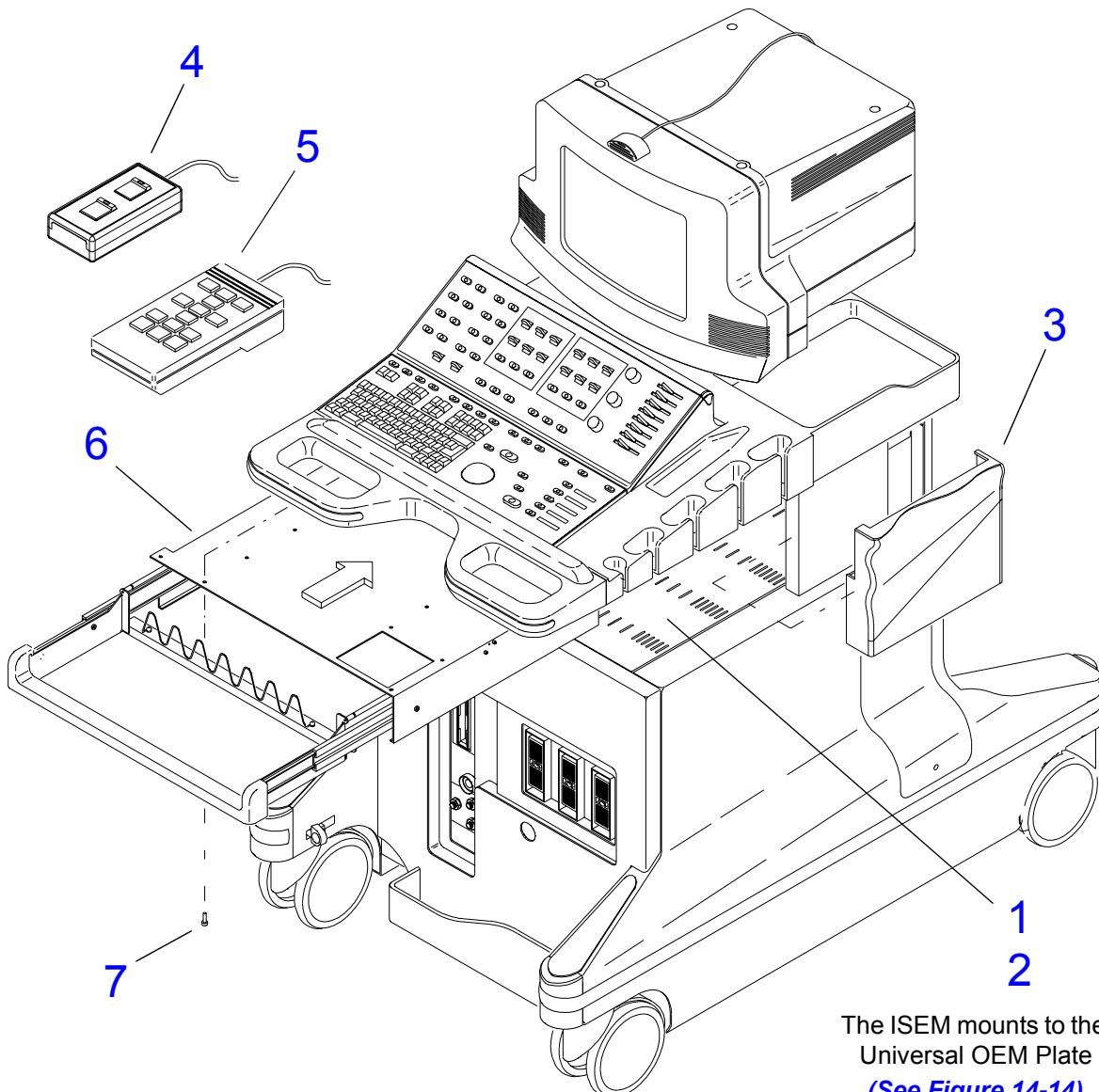


**Figure 14-29 User Interface (Control Panel) Assemblies**

**Table 14-29 Integrated Stress Echo Module (ISEM)**

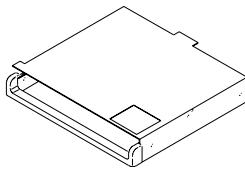
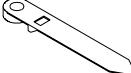
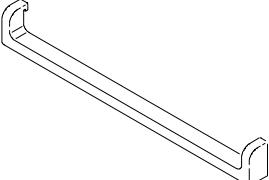
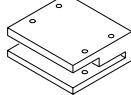
<b>Figure 14-30</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
Not Illustrated	1	2100-1434-02	ISEM, 2.0 Software, 3.5" MO Drive, 64 MB, NTSC	1
		2100-1435-02	ISEM, 2.0 Software, 5.25" MO Drive, 64 MB, NTSC	1
		2100-1434-02	ISEM, 3.5" MO Drive, 64 MB, NTSC	1
		2100-1435-02	ISEM, 5.25" MO Drive, 64 MB, NTSC	1
Not Illustrated	2	3500-2828-01	ISEM Assy, EMI PAL, 3.5" MO Drive, 32 MB	1
		2100-1370-03	• ISEM, 1.61 Software, 3.5" MO Drive, 32 MB, PAL	1
		1065-4843-01	• Filter Frame, ISEM	1
		3500-2829-01	ISEM Assy, EMI PAL, 5.25" MO Drive, 32 MB	1
		2100-1369-02	• ISEM, 1.61 Software, 5.25" MO Drive, 32 MB, PAL	1
		1065-4843-01	• Filter Frame, ISEM	1
	3	1065-4596-01	Panel, Right Side, Notched	1
	4	3500-1857-01	Video Switch Assy (Fits on OEM Remote Tray)	1
	5	4400-7006-11	Hand Controller (Fits on OEM Remote Tray)	1
	6	Table 14-30	OEM Remote Tray Assy (Figure 14-31)	1
	7	1518-0051	* Screw, 10-32 x 1/2, Pnh, Sem, Pd, St, Zn	8

**See Table 14-29**

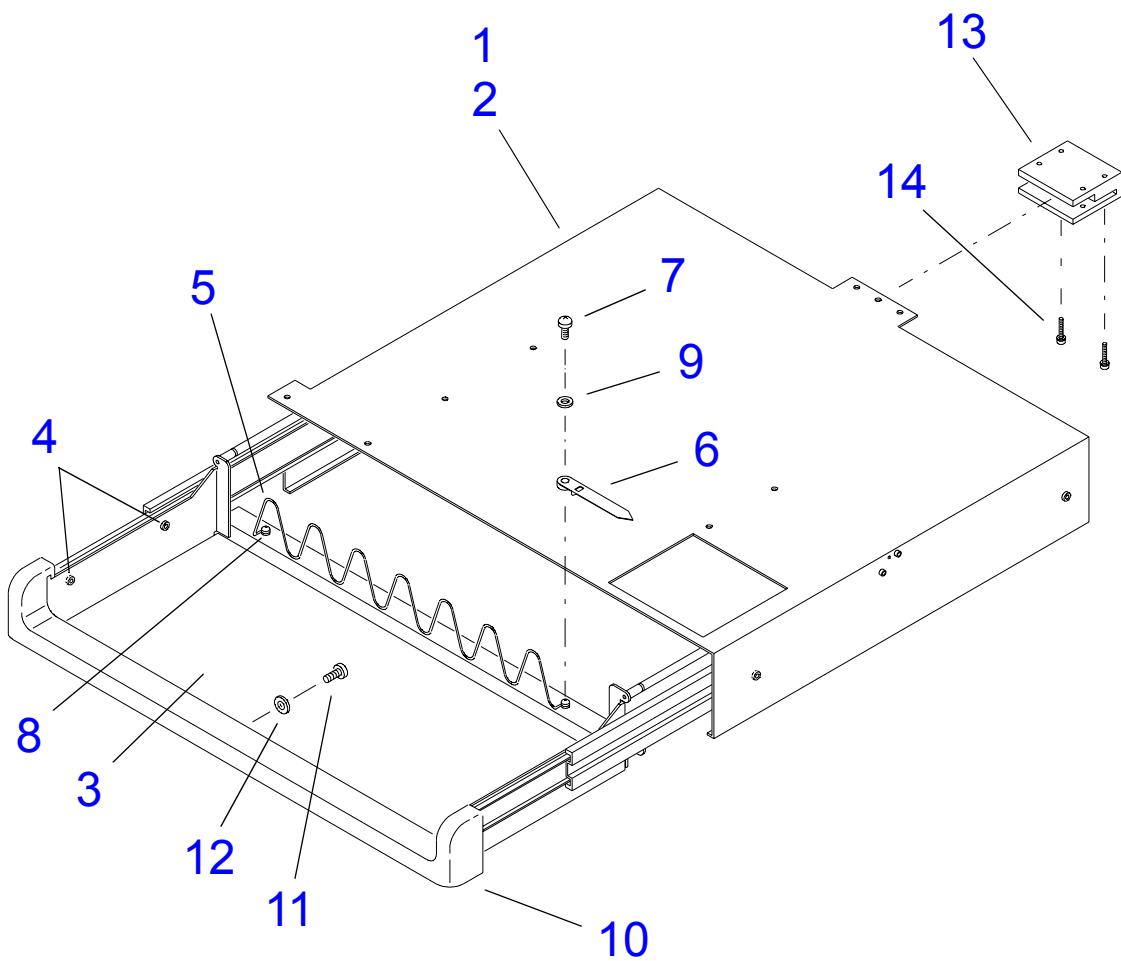


**Figure 14-30 Integrated Stress Echo Module (ISEM)**

**Table 14-30 OEM Remote Tray Assembly (ISEM)**

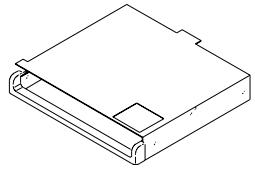
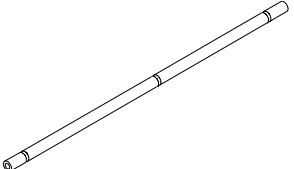
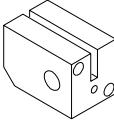
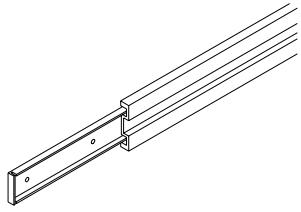
<b>Figure 14-31</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	3500-1856-03	OEM Remote Tray Assy	1
	2	1065-2903-06	• Bracket, Mounting Tray	1
	3	1065-2907-04	• Tray, OEM Remote (Figure 14-32 shows mounting hardware)	1
	4	1517-0014	* Screw, 8-32 x 1/4, Pnh, Pd, St, Zn	4
	5	1065-2991-02	• Cable Retainer, OEM Remote Tray	1
	6	2208-0073	• Cable Strap, #8 Mount, 6-inch Long	1
	7	1516-0113	* Screw, 6-32 x 1/2, Pnh, Sem, Pd, St, Zn	1
	8	1516-0074	* Screw, 6-32 x 3/8, Pnh, Int Sem, Pd, St, Zn	1
	9	1560-0046	* Washer, Fl, #6, 0.156ID, 0.375OD, 0.049T, St, Zn	2
	10	1065-2992-03	• Handle, OEM Remote Tray	1
	11	1530-0046-02	* Screw, 10-32 x 5/16, Pnh, Pd, St, Zn	3
	12	1561-0015	* Washer, Int Lk, #10, 0.38OD x 0.025T, St, Zn	3
	13	1065-2975-01	Clamp, Retaining, OEM Remote Tray	1
	14	1518-0043	* Screw, 10-32 x 3/4, Pnh, Sem, Pd, St, Zn	2

**See Table 14-30**

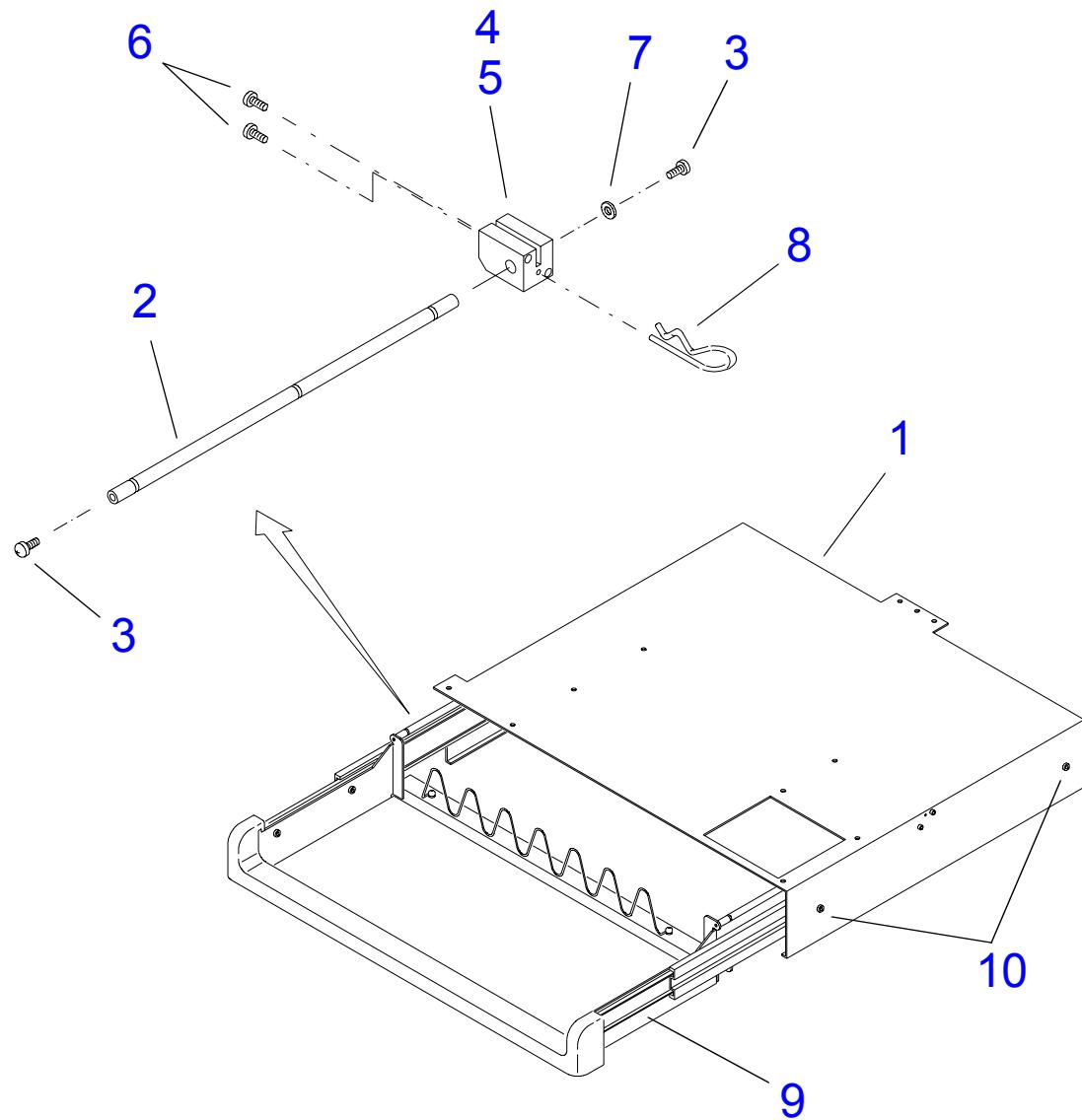


**Figure 14-31 OEM Remote Tray Assembly (ISEM)**

**Table 14-31 OEM Remote Tray Mounting Hardware**

<b>Figure 14-32</b>	<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description</b>	<b>Qty</b>
	1	<a href="#">Table 14-30</a>	OEM Remote Tray Assy (Figure 14-31)	1
	2	1065-2904-05	• Rod, Detent, Tray	2
	3	1516-0074	* Screw, 6-32 x 3/8, Pnh, Int Sem, Pd, St, Zn	2
	4	1065-2905-02	• Block, Detent, Left	1
	5	1065-2906-02	• Block, Detent, Right	1
	6	1516-0119	* Screw, 6-32 x 1/4, Pnh, Sem, Pd, St, Zn	4
	7	1560-0073	* Washer, Fl, #8, 0.185ID, 0.437OD, 0.062T, Ny	2
	8	2950-0851-01	• Pin, Hitch, 0.07 Wire, 0.38/0.5 Shaft, St	2
	9	2950-1066-01	• Slides, No Lock, 3-Section, 17" Travel, Left/Right (One pair)	1
	10	1517-0061	* Screw, 8-32 x 1/4, Pnh, Sems, Pd, St, Zn	4

*See Table 14-31*



**Figure 14-32 OEM Remote Tray Mounting Hardware**

**Table 14-32 DVS Module Assembly**

Ref. #	Part Number	Part Description ( <a href="#">Figure 14-33</a> )	Qty
1	3500-2940-05	DVS Module Assy, with 3.5" MO Drive	1
2	1065-5021-05	• Cover, Chassis, MISEM	1
	1065-5021-04	• Cover, Chassis, MISEM (alternate)	
3	1516-0074	* Screw, 6-32x3/8, Pnh, Int Sem, Pd, St, Zn	19
4	2950-1236-01	• Handle, 3Lx0.5Wx0.87T, Al, Anodized	1
5	1517-0005	* Screw, 8-32x3/8, Flh, Pd, 100D, St, Zn	2
6	1065-5022-02	• Retainer, PCB, MISEM	1
7	1541-0002	* Nut, 6-32, Keps, St, Zn	2
8	1065-5067-05	• Connector Panel, Motherboard, MISEM	1
9	1539-0003	* Nut, 4-40, Keps, St, Zn	6
10	2100-1554-01	• Fan Assy, 12V, 27CFM, 2.36", Bb, with Connector	1
11	1560-0061	* Washer, Fl, #6, .3120D, .032T, St, Zn	4
12	1516-0119	* Screw, 6-32x1-1/4, Pnh, Sem, Pd, St, Zn	4
13	2100-1438-01	• Hard Drive, IDE, 2.1 GB, Quantum	1
	2100-1520-01	• Hard Drive, IDE, 2.5 GB, Quantum	1
	2100-1525-01	• Hard Drive, IDE, 3.2 GB, Quantum	1

See Table 14-32

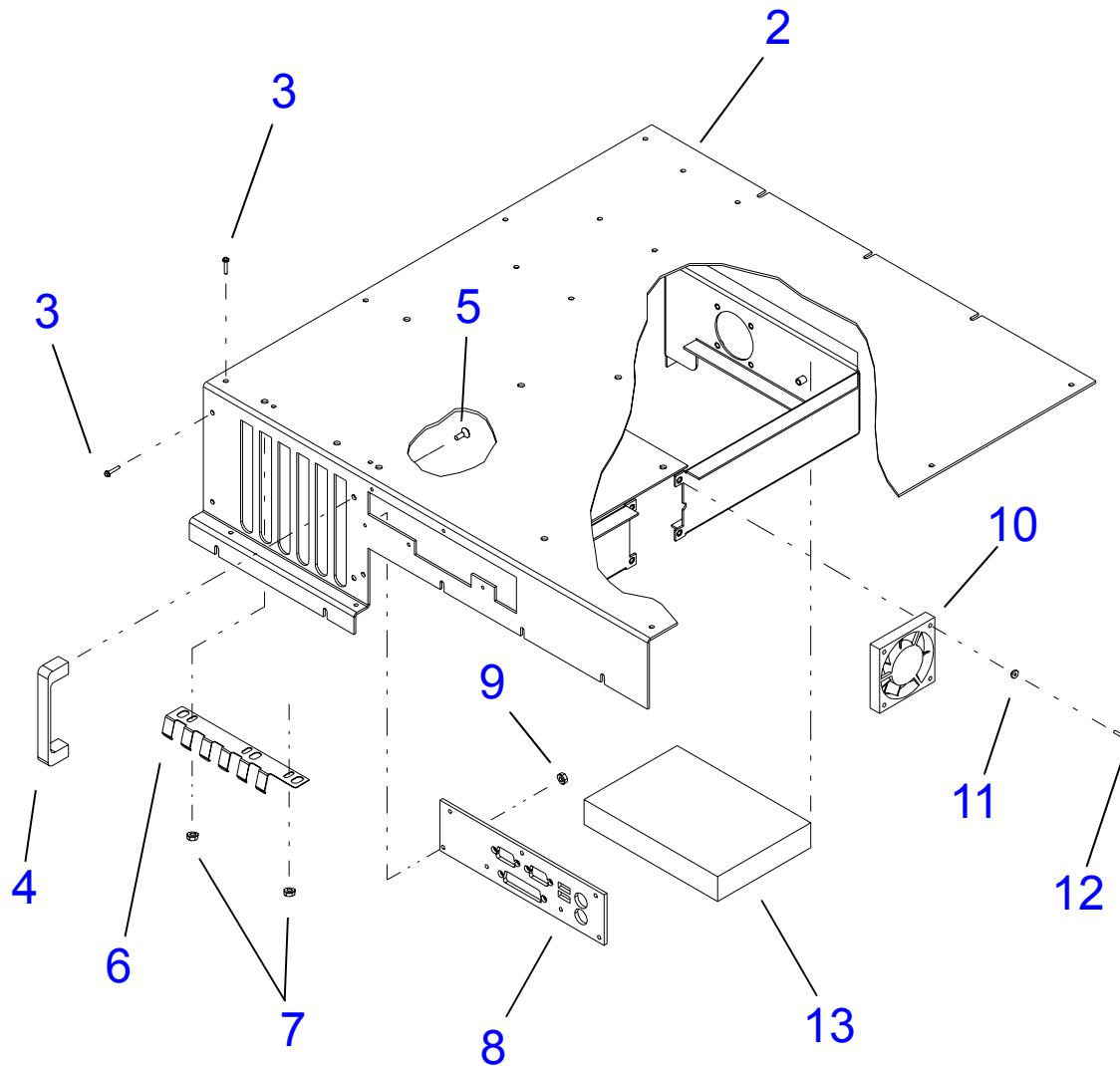
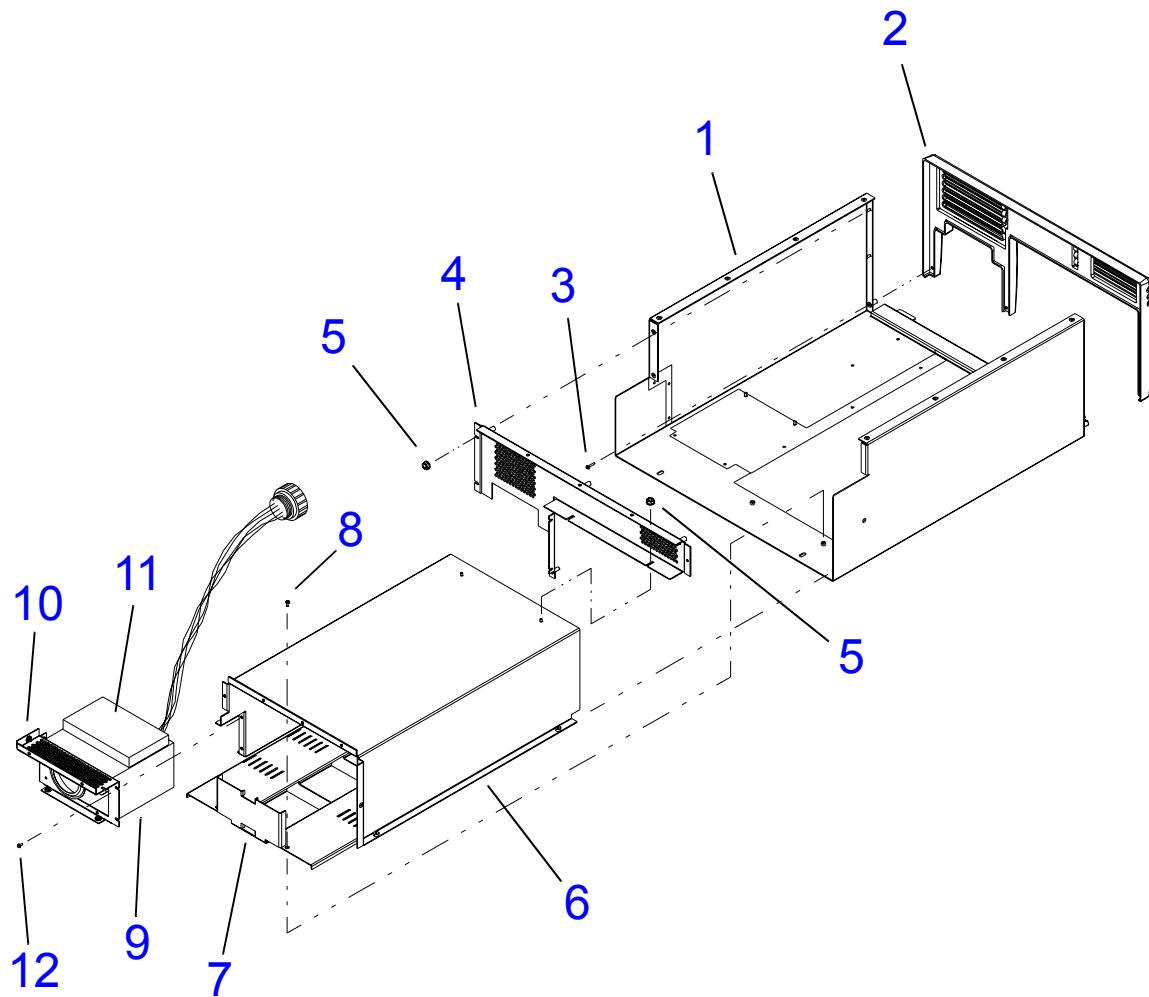


Figure 14-33 DVS Module Assembly (Chassis Cover)

**Table 14-33 DVS Module Assembly (Chassis)**

Ref. #	Part Number	Part Description ( <a href="#">Figure 14-34</a> )	Qty
1	1065-5013-03	Chassis, MISEM	1
2	1065-4826-04	Bezel Rework, Front, MISEM	1
3	1516-0121	* Screw, 6-32x7/8, Pnh, Sems, Pd, St, Zn	6
4	1065-5014-04	Mount Panel, Front Bezel, MISEM	1
5	1541-0002	* Nut, 6-32, Keps, St, Zn	7
6	1065-5015-02	OEM Housing, MISEM	1
7	1065-5016-03	OEM Tray	1
8	1516-0074	* Screw, 6-32x3/8, Pnh, Int Sem, Pd, St, Zn	2
9	1700-0111-02	Power Supply	1
10	1065-5017-02	Bracket, Power Supply, MISEM	1
11	1065-5092-01	PCB Snubber	1
12	1516-0112	* Screw, 6-32x1/4, Pnh, Sems, Pd, St, Zn	7

**See Table 14-33**



**Figure 14-34 DVS Module Assembly (Chassis)**

**Table 14-34 DVS Module Drive Assembly**

Ref. #	Part Number	Part Description (Figure 14-35)	Qty
1	1065-5019-02	Bracket, Disk Drive, MISEM	1
2	1065-5020-02	Adapter Bracket, Disk Drive	1
3	1065-5087-01	EMI Shield, Disk Drive, MISEM	1
4	1065-5262-01	Blanking Panel, 5.25" Drive	1
5	2100-1531-01	Hard Drive, SCSI, 18.2 GB, IBM	1
	2100-1633-01	Hard Drive, SCSI, 18.2 GB, IBM	1
6	2100-1515-01	Disk Drive, 3.5", FDD, Sony, Dr Sel 1	1
7	2100-1416-01	MO Drive, SCSI, 3.5"	1
	2100-1512-01	MO Drive, SCSI, 3.5"	1
	2100-1646-01	MO Drive, SCSI, 3.5"	1
8	2100-1591-01	MO Drive, SCSI, 5.25"	1
9	1560-0061	* Washer, Fl, #6, .3120D, .032T, St, Zn (8 ea side of item 1)	16
10	1516-0112	* Screw, 6-32x1/4, Pnh, Sems, Pd, St, Zn (8 ea side of item 1)	16
11	2100-1555-01	Fan Assy, 12V, 60CFM, 3.6", Bb, with Connector	1
12	1560-0061	* Washer, Fl, #6, .3120D, .032T, St, Zn	4
13	1516-0074	* Screw, 6-32x3/8, Pnh, Int Sem, Pd, St, Zn	4

See Table 14-34

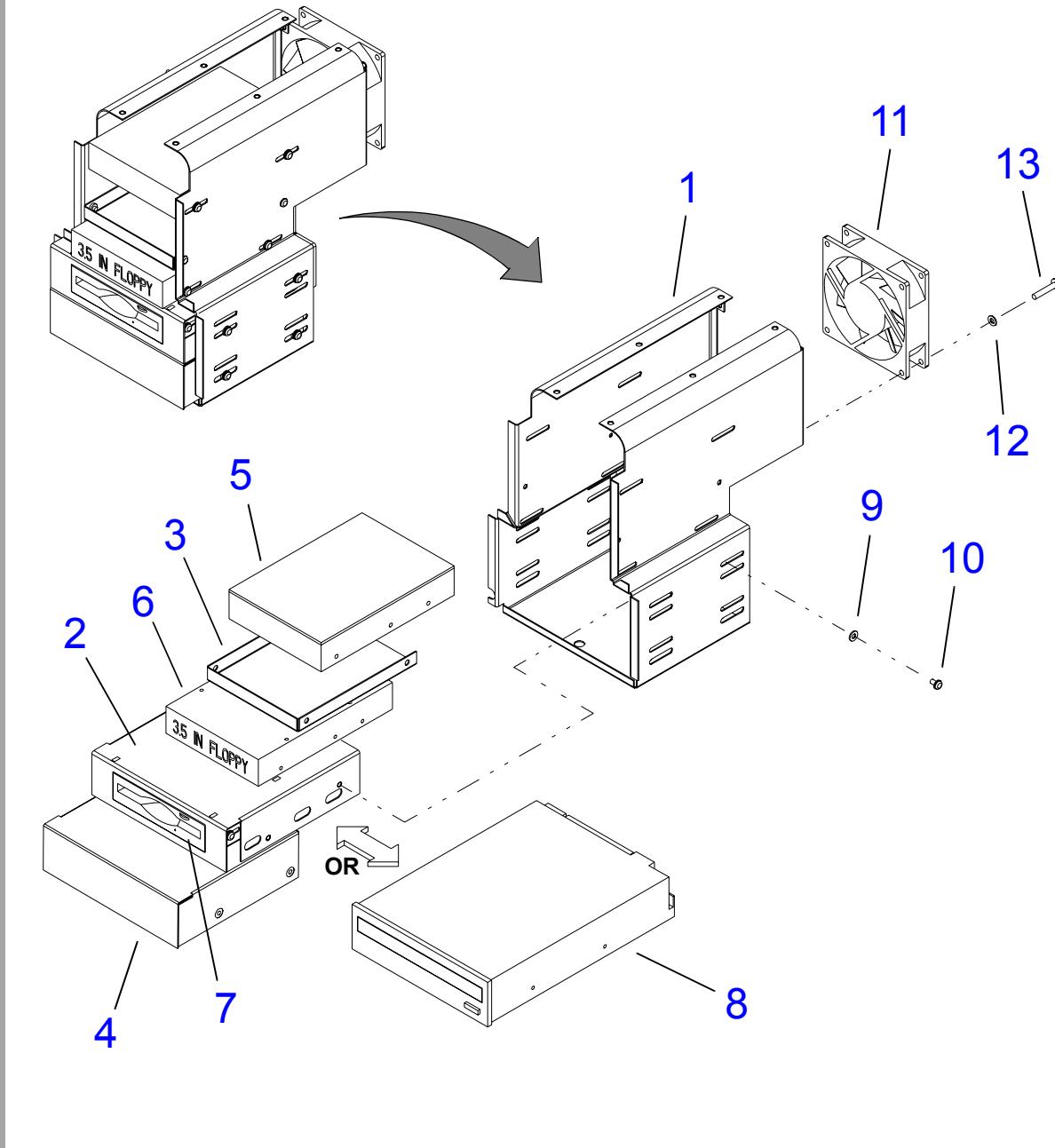
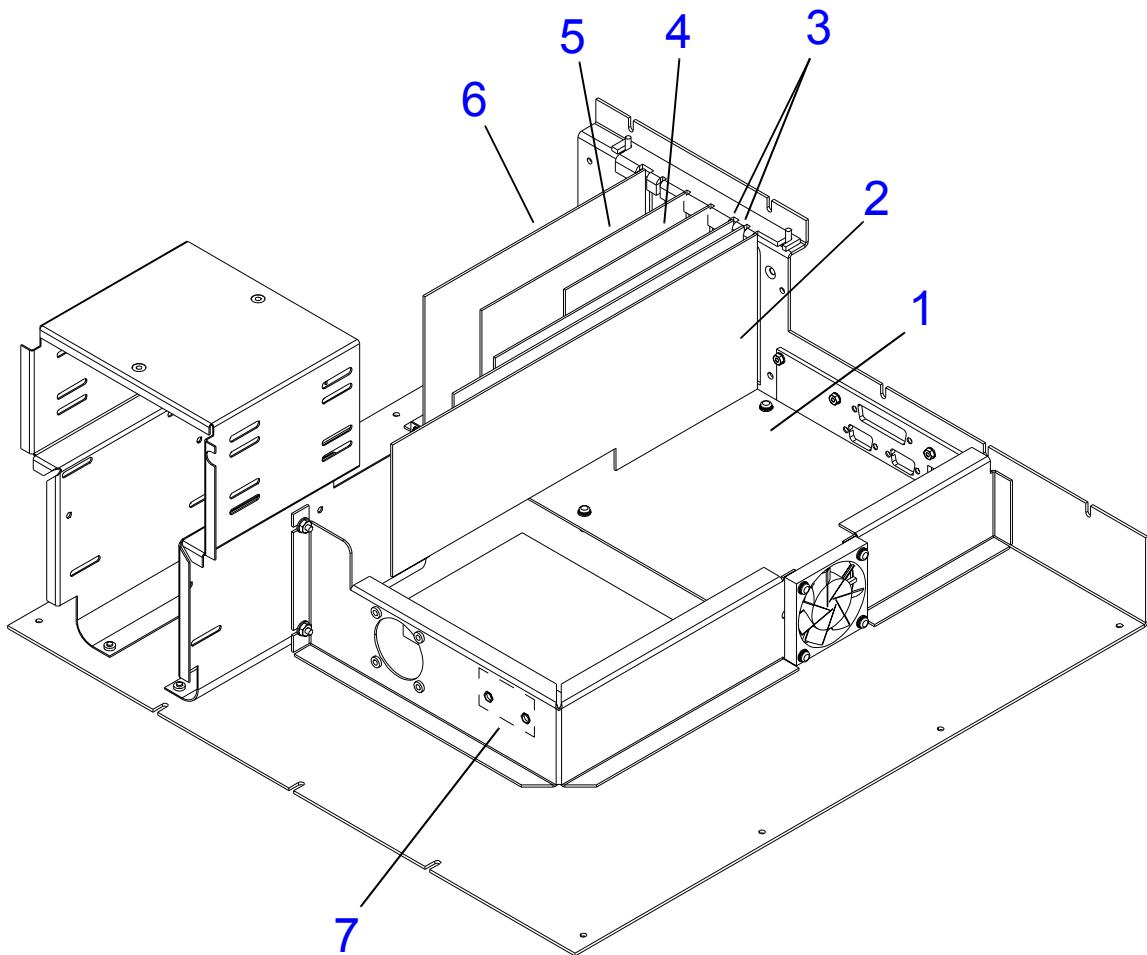


Figure 14-35 DVS Module Drive Assembly

**Table 14-35 DVS Module PCBs**

Ref. #	Part Number	Part Description (Figure 14-36)	Qty
1	3500-3032-03	DVS Motherboard Assy, with 450MHz Processor	1
	3500-3032-02	DVS Motherboard Assy, with 450MHz Processor (alternate)	
2	1065-4798-04	Face Panel, PCB, CODEC	1
	1065-4798-03	Face Panel, PCB, CODEC (alternate)	
3	3500-2819-05	CODEC Combo Module, with Digital Interface	1
	3500-2819-04	CODEC Combo Module, with Digital Interface (alternate)	
	7500-1391-04	PCB Assy, CODEC Module	1
	7500-1392-02	PCB Assy, MISEM Digital Interface	1
	1065-4925-01	Standoff, MOD	2
4	2100-1590-01	Ethernet Board, 10/100 Base TX	1
5	2100-1432-01	Video/Ethernet Board	1
6	2100-1433-01	SCSI Controller	1
7	7500-1645-01	PCB Assy, DVS Power-ON	1

**See Table 14-35**

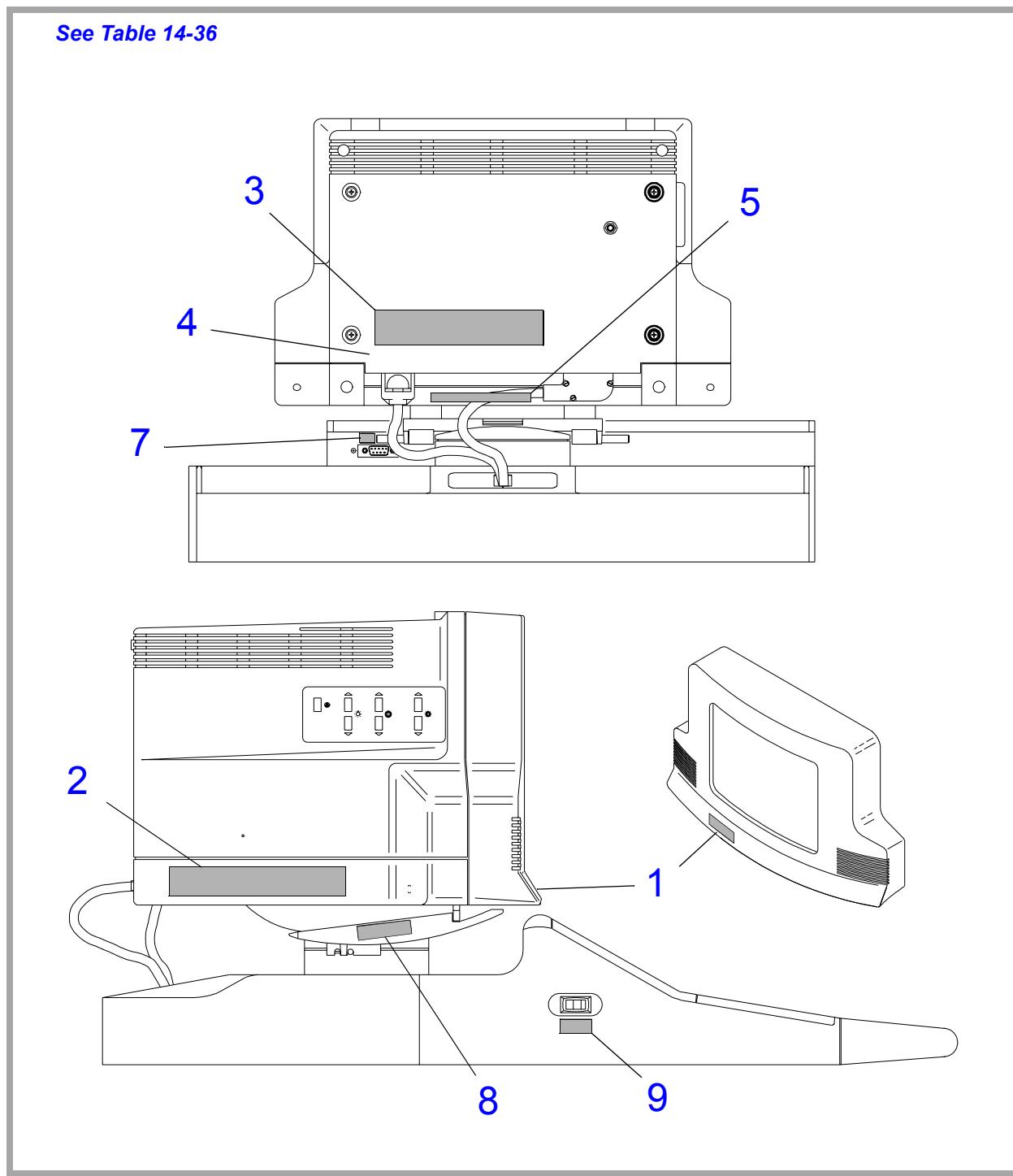


**Figure 14-36 DVS Module PCBs**

**Table 14-36 Upper System Labeling**

Ref. #	Part Number	Part Description ( <a href="#">Figure 14-37</a> )	Qty
1	4100-0966-02	Label, System ID	1
2	4100-1260-01	Label, Monitor Latch Warning	2
3	4100-1393-01	Label, Warning, High Voltage	1
4	9903-0338-02	Label, 1.0 x 0.5, Plystr, Wht, Ammo-pak (Behind monitor panel)	1
	9903-0538-01	Label, DHHS Radiation Compliance, 1-7/8" x 5/8", Domestic Systems Only	1
5	4100-0960-01	Label, Power Input, Monitor	1
6	4100-1607-01	Label, Microphone Symbol	1
7	4100-1431-01	Label, MISEM Connector, Remote	1
8	4100-1041-01	Label, Latching Monitor, Right-Hand	1
	4100-1042-01	Label, Latching Monitor, Left-Hand	1
	<a href="#">Table 14-23</a>	Label, Warning, Monitor Lock ( <a href="#">Figure 14-24</a> )	2
9	4100-0959-01	Label, SBY-ON, System	1
10	4100-1560-01	Label, System, Year 2000, Compliance	1

**See Table 14-36**

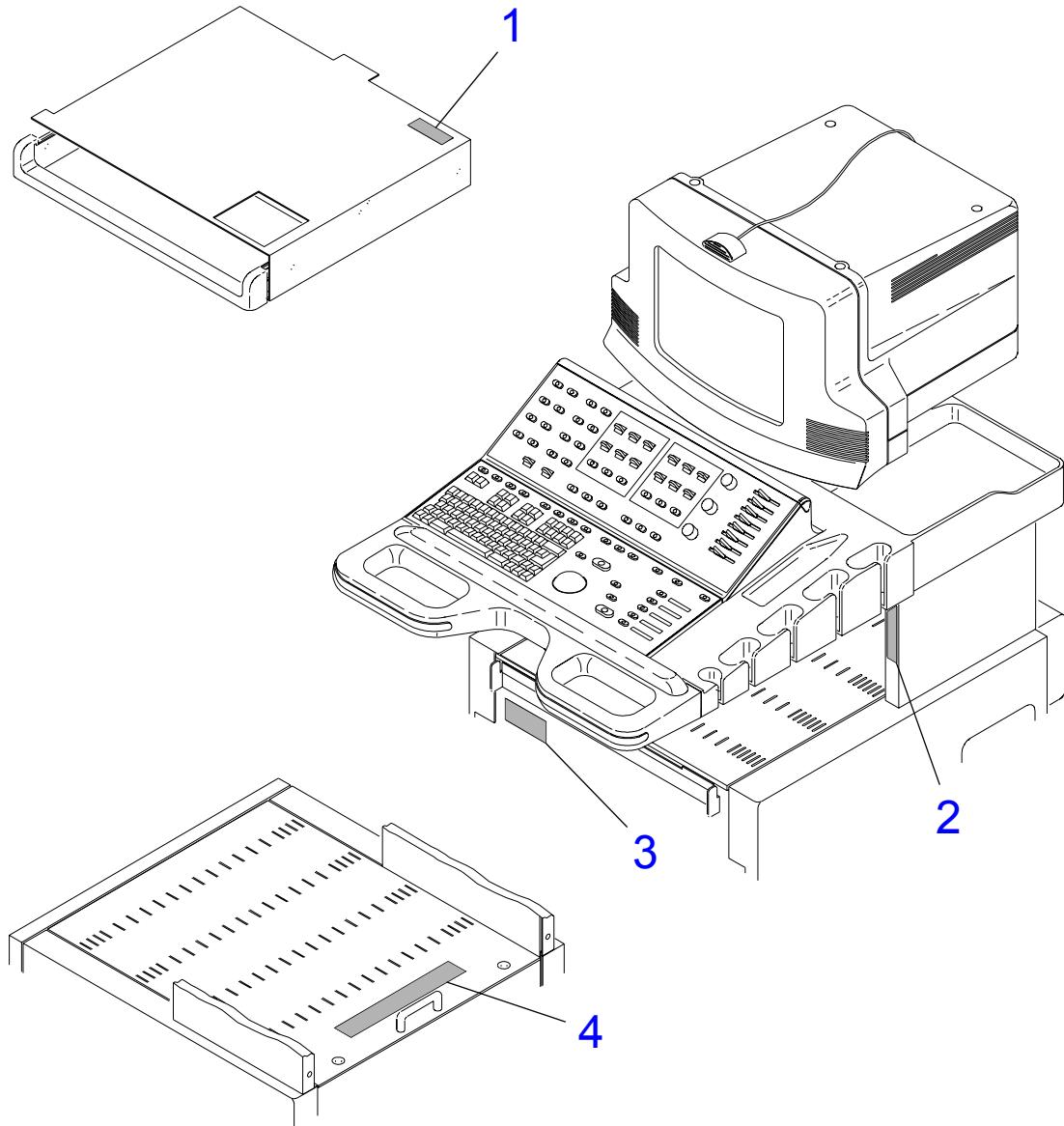


**Figure 14-37 Upper System Labeling**

**Table 14-37 Mid System Labeling**

<b>Ref. #</b>	<b>Part Number</b>	<b>Part Description (Figure 14-38)</b>	<b>Qty</b>
1	9903-0338-02	Label, 1.0 x 0.5, Plystr, Wht, Ammo-pak	1
2	4100-1238-01	Label, Right Side Cover (Alternate)	1
	4100-1399-01	Label, Frame OEM Upright, Dark Grey	1
3	4100-0993-01	Label, Caution, PCB Removal	1
4	4100-0958-01	Label, OEM Baseplate	1

**See Table 14-37**

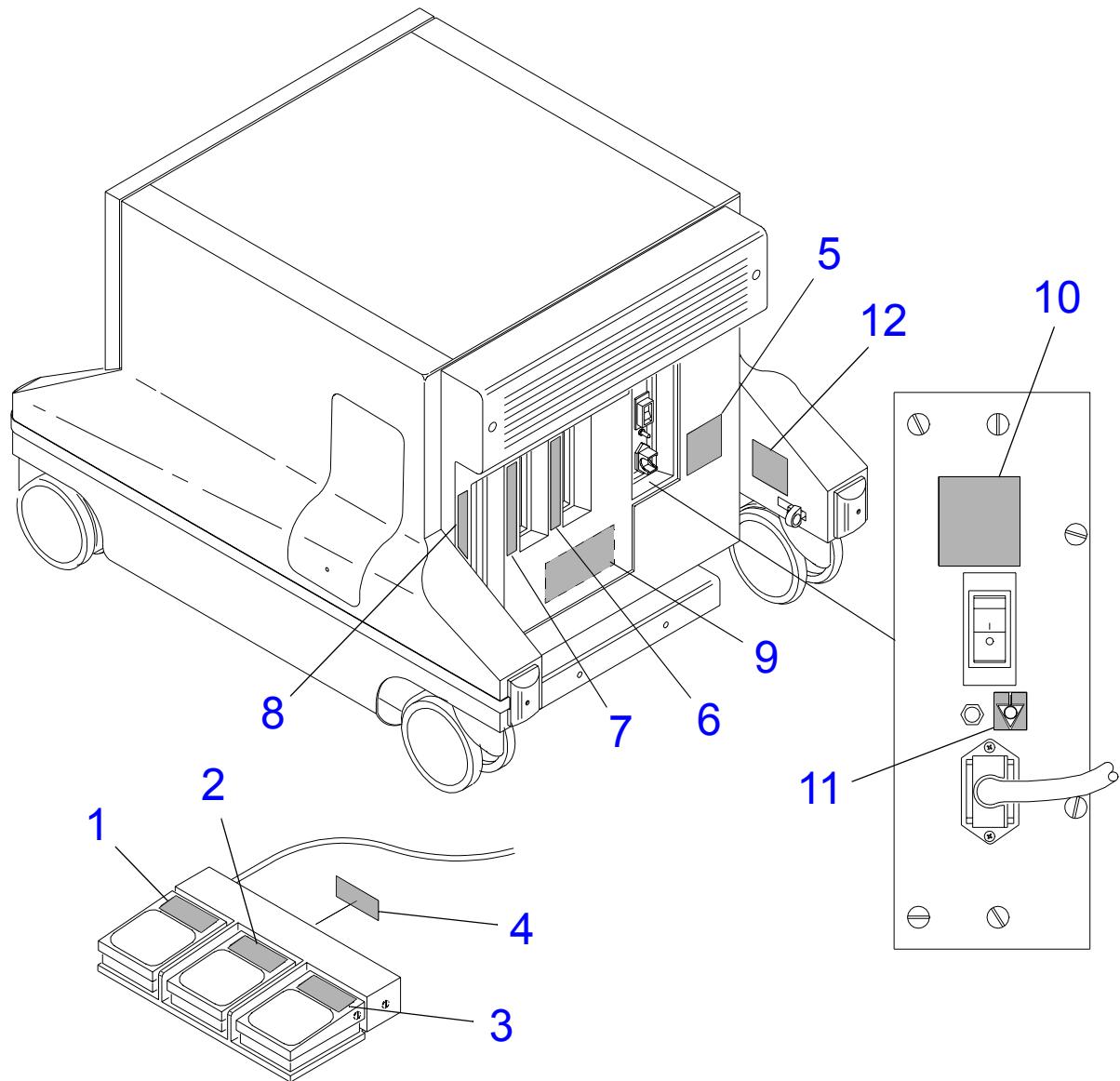


**Figure 14-38 Mid System Labeling**

**Table 14-38 Lower System Labeling**

Ref. #	Part Number	Part Description ( <a href="#">Figure 14-39</a> )	Qty
1	4100-0299	Label, 2D/TM, 4000B, Footswitch	1
2	4100-0297	Label, VCR, 4000B, Footswitch	1
3	4100-0296	Label, Freeze Frame, 4000B, Footswitch	1
4	4100-0757-01	Label, Footswitch, Water-resistant	1
5	4100-1387-01	Label, Warning, Power Cord	1
6	4100-1255-01	Label, ADAPTR	1
7	4100-1256-01	Label, CPU	1
8	4100-0961-02	Label, PIM	1
9	4100-1433-01	Label, PCB Slot ID (Inside of rear cover)	1
	4100-1433-02	Label, PCB Slot ID, 170.XX systems and above (inside of rear cover)	1
10	4100-0942-02	ACIM Voltage, 100-120V/60 Hz ( <a href="#">Figure 14-16</a> )	1
	4100-0943-02	ACIM Voltage, 100-120V/50 Hz ( <a href="#">Figure 14-16</a> )	1
	4100-0944-02	ACIM Voltage, 230V/50 Hz, 7.5A ( <a href="#">Figure 14-16</a> )	1
	4100-0945-02	ACIM Voltage, 230V/60 Hz, 7.5A ( <a href="#">Figure 14-16</a> )	1
11	4100-0968-01	Label, Ground and AC Input	1
12	4100-1531-02	Label, Chinese ID	1

**See Table 14-38**



**Figure 14-39 Lower System Labeling**

**Table 14-39 OEMs and OEM Cables (Not Illustrated)**

<b>OEM Description</b>	<b>Part Numbers</b>		
	<b>OEM</b>	<b>Power Cable</b>	<b>Signal Cable</b>
Printer, Codonics NP1660MD, NetLink, North America	2100-1566-01	-	2275-0335-01
Printer, Codonics NP1660MD, NetLink, International	2100-1567-01	-	2275-0335-01
Color Printer, Mitsubishi, CP700, 120V (3500-3071-01 is printer with feet)	3500-3071-01 2100-1327-01	3500-1873-02	3500-2641-02
Color Printer, Mitsubishi, CP700, 240V (3500-3072-01 is printer with feet)	3500-3072-01 2100-1328-01	3500-2397-03	3500-2641-02
Color Printer, Mitsubishi, CP800, 120V (3500-3063-01 is printer with feet)	3500-3063-01 2100-1535-01	3500-1873-02	3500-2641-02
Color Printer, Mitsubishi, CP800, 240V (3500-3064-01 is printer with feet)	3500-3064-01 2100-1536-01	3500-2397-03	3500-2641-02
Color Printer, Mitsubishi, CP50E, 240V	-	3500-1547-05	3500-2643-01
Color Printer, Sony UP5600-60Hz, 155Vac, NTSC	2100-0847-01	3500-1873-02	3500-2641-02
Color Printer, Sony UP5600-60Hz, 120Vac, NTSC (Domestic US use only)	2100-1476-01	3500-1873-02	3500-2641-02
Color Printer, Sony UP5600-50Hz, 155Vac, PAL	3500-1694-01	3500-2397-03	3500-2641-02
B&W Printer, Sony UP890, 120/230V, NTSC/PAL (use either power cable)	2100-0862-01	3500-1873-02 3500-2397-03	3500-1540-04
B&W Printer, Sony UP910CE, Large Format, 240V, 50Hz, PAL	2100-0759-01	3500-2397-03	3500-1540-04
B&W Printer, Sony UP910MD, 120V, NTSC	2100-0701-01	3500-1873-02	3500-1540-04
Aspect MIC Camera, 120V, NTSC, English	3500-1664-01	3500-1873-02	3500-1539-03
Aspect MIC Camera, 240V, PAL, English	3500-1665-01	3500-2397-03	3500-1539-03
Aspect MIC Camera, 240V, PAL, French	3500-1671-01	3500-2397-03	3500-1539-03
Aspect MIC Camera, 240V, PAL, German	3500-1667-01	3500-2397-03	3500-1539-03

**Table 14-39 OEMs and OEM Cables (Not Illustrated) (Continued)**

OEM Description	Part Numbers		
	OEM	Power Cable	Signal Cable
VCR, SVHS, NTSC, HIFI, 120V, RS-232	3500-1662-02	3500-2780-01	3500-1404-06
VCR, SVHS, PAL, HIFI, 230V, RS-232	3500-1663-01	3500-2781-01	3500-1404-06
VCR, w/RS232 Interface, AGMD830P, 120V	3500-1662-02	3500-2780-01	3500-1404-06
VCR, Sony SVO-9500MD	3500-1875-01	3500-2780-01	3500-1404-06
Video Monitor (power cable is 115V with right angle connector on monitor end)	3500-2532-02	3500-2616-01	2275-0325-03
Any external OEM with coax connector (P/N is for NI-RGB cable).	-	-	2275-0326-01
Any external OEM with coax connector (P/N is for I-RGB cable).	-	-	3500-2644-01
Any external OEM with coax connector (P/N is for BNC cable, 6 ft length).	-	-	2275-0176
Access Acquisition Module, 115V, NTSC, Internal Installation.	2100-7071-01	3500-1517-05	2275-0327-01 2275-0395-01
Access Acquisition Module, 115V, NTSC, External Installation.	2100-7071-01	3500-1517-05	2275-0394-01 2275-0396-01
ISEM, 3.5"/64 MB, NTSC	2100-1434-02	3500-1873-02	3500-2641-02 3500-2633-01
ISEM, 5.25"/64 MB, NTSC	2100-1435-02	3500-1873-02	3500-2641-02 3500-2633-01
ISEM, 3.5"/32 MB, PAL	2100-1370-03	3500-2397-03	3500-2641-02 3500-2633-01
ISEM, 5.25"/32 MB, PAL	2100-1369-02	3500-2397-03	3500-2641-02 3500-2633-01
DVS Module	3500-2940-05	3500-3030-01	3500-2921-01 2275-0402-01

**Table 14-40 Miscellaneous System Accessories (Not Illustrated)**

Part Number	Part Description	Qty
8500-9116-01	Accessory Tool Kit (Hitachi systems)	1
9905-0396-01	• Screwdriver, #1 Phillips, 3-1/8" Shaft (Hitachi systems)	1
9905-0397-01	• Screwdriver, 7/64 Ball Hex, 6" Shaft (Hitachi systems)	1
9903-0517-01	• Bag, Zipper, Ring Binder, 9.5" x 6" (Hitachi systems)	1
2301-0700-01	Paint, Touch Up, Fog White, 1 oz. Bottle	1
2301-0701-01	Paint, Touch Up, Fog White, 16 oz. Aerosol	1

# 15 Operating Notes

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## OPERATING NOTES

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4252-0851-26

November 10, 1999

### Controls

Before performing such non real-time functions as selecting setups, on-screen programming, viewing patient reports, or VCR playback, press **FREEZE**.

The monitor locking latches secure the monitor to the system. Only unlock the latches during monitor removal. Do not unlock the latches to position the monitor. Unlocking the monitor latches could result in the monitor and VCR (if attached) falling from the system. Unless the monitor is being removed from the system, the monitor latches must remain locked.

Keeping the number of images and exams stored on the hard drive to a minimum will reduce power-up time. Several minutes can be added if the disk is full of stored images. Delete stored patient exams frequently.

When using the Flash feature during cardiology exams, turning **Flash** to **Off** causes a loss of 2D gain. It recovers when you adjust the **2D GAIN** control or the **TGC** slide controls.

### Setups

Copying presets from a system with one software level to a system with a different software level corrupts the presets database of the destination system. Corrupting the presets database degrades system performance and can make the system unusable. Verify software levels of the source and destination systems by performing the Show Machine Configuration test using the system diagnostics. See “Diagnostics Setups” in the “Setups” section of your *Reference Manual* for information about using the system diagnostics.

Triple mode can cause the system to lock up. Avoid using triple mode.

### Peripherals (Printing and Recording)

To record stereophonic Doppler audio and to ensure optimal Doppler audio quality, ensure the microphone (**Microphone** key) is off when recording Doppler audio.

When you use the **Video Superkey** to review an image, the system resumes real-time imaging when you exit your review.

After playing a videotape, press **STOP** before rewinding or fast forwarding the videotape.

When you press **Blank Search** on the VCR, the VCR freezes. Press and hold **Blank Search** (1-2 seconds) until Blank Search begins, or press Blank Search twice.

When the Body Surface Area (BSA) value is less than 1.00 square meter, it will not appear on the printed report or in data transfer for serial devices. However, all of the BSA values are correctly entered for index calculations such as the Stroke Volume Index (SI), Cardiac Index (CI), and Mass Index (MI) for any BSA value.

If a loss of Doppler steering function occurs after stopping a VCR playback, you must re-select the scanhead to clear the condition.

## Measurements

The lowest calibration value for a Doppler image is 20 cm/sec. TDI (Tissue Doppler Imaging) display velocities can be less than 20 cm/sec. To calibrate a low-velocity TDI display, from VCR frame grab or DiskLink images, select a point on the velocity scale below the baseline to get the required 20 cm/sec calibration value.

Do not perform an area measurement of spectral data before beginning a High Q automatic Doppler measurement: the High Q feature will not work.

## Calculations

### French and German Only

Calculations derived from user-defined equations for EFW will not appear in the patient report.

Calculations derived from the investigators Campbell or Shepard for EFW will not appear in the patient report.

When you input measurement values into a protocol on Performance 2000 demo systems, the displayed value will be an *average* of all successive inputs. Pre-Performance 2000 systems display the *last* value entered. On Performance 2000 systems, enter a single velocity value into the **ICA** and **CCA** ratio fields.

## Scanheads

Ensure that you select another scanhead before you disconnect a multi-plane transesophageal scanhead (MPT7-4); otherwise, system update will be uncharacteristically slow.

During VCR playback, image review, and calculations ensure a scanhead is selected. Erratic system behavior results if you perform these activities without a scanhead selected.

Do not turn on power to the system when an L12-5 38 mm scanhead with part number 4000-0396-01 is connected. The system will appear to stop 2D imaging. If the 2D image becomes faint or disappears, disconnect the L12-5 scanhead and then reconnect it. An L12-5 scanhead with any other part number can be connected to the system before turning on power.

On Performance 2000 systems, if you reduce the depth setting and then press **COMP IMAG** right after selecting the L12-5 38mm scanhead, the system will generate a blue banner alert message, “**There is a problem** with the system, re-select scanhead.” The system will also freeze imaging and the displayed clock will stop. You can avoid this problem by selecting another mode, like Doppler, and then returning to 2D before you reduce the depth setting. You can clear the problem by selecting another scanhead and then return to your original selection. You can clear the banner alert message by holding down **Superkey** and pressing **FR RATE**.

## BPT9-5

Transesophageal echocardiography in pediatric patients can be performed safely, but attention must be paid to possible airway obstruction or hemodynamic compromise. For additional information see the following references:

Gilbert, T.B., Panico, F.G., McGill, W.A., Martin, G.R., Halley, D.G., and Sell, J.E. “Bronchial Obstruction by Transesophageal Echocardiography Probe in a Pediatric Cardiac Patient.” *Anesth Analg*, Vol. 74: 156-158, 1992.

Muhiudeen, I., and Silverman, N. “Intraoperative Transesophageal Echocardiography Using High Resolution Imaging in Infants and Children with Congenital Heart Disease.” *ECHOCARDIOGRAPHY: A Jrnl. of CV Ultrasound & Allied Tech.*, Vol. 10, No. 6: 599-608, November 1993.

Muhiudeen, I.A., Silverman, N.H., and Anderson, R.H. “Transesophageal Transgastric Echocardiography in Infants and Children: The Subcostal View Equivalent.” *Journal of the American Society of Echocardiography*, Vol. 8, No. 3: 231-244, May-June, 1995.

Stevenson, J.G., “Role of intraoperative transesophageal echocardiography during repair of congenital cardiac

defects." *Acta Paediatric Suppl*, 410: 23-33, 1995.

Stevenson, J.G., and Sorensen, G.K. "Proper Probe Size for Pediatric Transesophageal Echocardiography." *THE AMERICAN JOURNAL OF CARDIOLOGY*, Vol. 72: 491-492, August 15, 1993.

## Image Management

To ensure that all images are stored to the optical disk at the completion of an exam, press the **END EXAM** control. If you eject an optical disk without pressing the **END EXAM** control, the last image stored on the hard disk will not be stored to the optical disk. The optical disk is always one image behind the hard disk, even when spooling is enabled.

When you change the patient information-the patient name and ID-existing images on the optical disk retain the original patient information. Subsequent images will be stored on the optical disk under the new patient information. All images stored on the hard disk will reflect the new patient information.

Ensure that you select **New** or **Edit** on the **Patient Data Entry** screen before you enter a patient name into the patient data form. If you enter a patient name and do not select **New** or **Edit**, a patient file will not be created, and images cannot be stored. If you attempt to review images that do not actually exist, a system diagnostic alert will result; close **Review Images** to recover from the situation, and enter the correct patient data.

When storing exams to a magneto-optical disk, some disk defects or failures can cause the system to lock up and require a power off-on cycle (re-boot) to restore imaging.

Systems may experience slow-downs and eventual lock-ups when CPU system memory is fully loaded. This occurs during extensive exams requiring multiple scanheads and calculations on a single patient. Entering a new patient will clear the memory.

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## OPERATING NOTES

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**Hard Disk Software: 4252-0867-05****December 1, 1999**

### 3D

Using the CAPTURE softkey to save Cineloop data to the hard drive during 3D rendering will lock up the system. If the system locks up, cycle the system power.

### Controls

Before performing such non real-time functions as selecting setups, on-screen programming, viewing patient reports, or VCR playback, press FREEZE.

The monitor locking latches secure the monitor to the system. Only unlock the latches during monitor removal. Do not unlock the latches to position the monitor. Unlocking the monitor latches could result in the monitor and VCR (if attached) falling from the system. Unless the monitor is being removed from the system, the monitor latches must remain locked.

### Setups

Copying presets from a system with one software level to a system with a different software level corrupts the presets database of the destination system. Corrupting the presets database degrades system performance and can make the system unusable. Verify software levels of the source and destination systems by performing the "Show Machine Configuration" test using the system Diagnostics. See "Diagnostics Setups" in the "Setups" section of your Reference Manual for information about using the system Diagnostics.

### Peripherals (Printing and Recording)

To record stereophonic Doppler audio and to ensure optimal Doppler audio quality, ensure the microphone (MIC control) is off when recording Doppler audio.

When you use the Video Superkey to review an image, the system resumes real-time imaging when you exit your review.

After playing a videotape, press STOP before rewinding or fast forwarding the videotape.

When you press Blank Search on the VCR, the VCR freezes. Press and hold Blank Search (1 - 2 seconds) until Blank Search begins, or press Blank Search twice.

### Measurements

The lowest calibration value for a Doppler image is 20 cm/sec. TDI (Tissue Doppler Imaging) display velocities can be less than 20 cm/sec. To calibrate a low-velocity TDI display, from VCR frame grab or DiskLink images, select a point on the velocity scale below the baseline to get the required 20 cm/sec calibration value.

Do not perform an area measurement of spectral data before beginning a High Q automatic Doppler measurement: the High Q feature will not work.

When the Body Surface Area (BSA) value is less than 1.00 square meter, it will not appear on the printed report or in data transfer for serial devices. However, all of the BSA values are correctly entered for index calculations such as the Stroke Volume Index (SI), Cardiac Index (CI), and Mass Index (MI) for any BSA value.

When using the High Q automatic trace, review the trace to ensure it is acceptable for your use. If you are dissatisfied with the trace, retrace the spectral waveform using the manual method.

## **Calculations**

### **French and German Only**

Calculations derived from user-defined equations for EFW will not appear in the patient report.

Calculations derived from the investigators Campbell or Shepard for EFW will not appear in the patient report.

## **Scanheads**

Ensure that you select another scanhead before you disconnect a multi-plane transesophageal scanhead (MPT7-4); otherwise, system update will be uncharacteristically slow.

During VCR playback, image review, and calculations ensure a scanhead is selected. Erratic system behavior results if you perform these activities without a scanhead selected.

Do not turn on power to the system when an L12-5 38 mm scanhead with part number 4000-0396-01 is connected. The system will appear to stop 2D imaging. If the 2D image becomes faint or disappears, disconnect the L12-5 scanhead and then reconnect it. An L12-5 scanhead with any other part number can be connected to the system before turning on power.

## **Image Management**

To ensure that all images are stored to the optical disk at the completion of an exam, press the END EXAM control. If you eject an optical disk without pressing the END EXAM control, the last image stored on the hard disk will not be stored to the optical disk. The optical disk is always one image behind the hard disk, even when spooling is enabled.

When you change the patient information—the patient name and ID-existing images on the optical disk retain the original patient information. Subsequent images will be stored on the optical disk under the new patient information. All images stored on the hard disk will reflect the new patient information.

Ensure that you select New or Edit on the Patient Data Entry screen before you enter a patient name into the patient data form. If you enter a patient name and do not select New or Edit, a patient file will not be created, and images cannot be stored. If you attempt to review images that do not actually exist, a system diagnostic alert will result; close Review Images to recover from the situation, and enter the correct patient data.



4707-0027-27 Rev A

December 17, 1999

## Controls

Before performing such non real-time functions as selecting setups, on-screen programming, viewing patient reports, or VCR playback, press **FREEZE**.

The monitor locking latches secure the monitor to the system. Only unlock the latches during monitor removal. Do not unlock the latches to position the monitor. Unlocking the monitor latches could result in the monitor and VCR (if attached) falling from the system. Unless the monitor is being removed from the system, the monitor latches must remain locked.

To improve an unsatisfactory image from low power output, while in M-mode and using HD Zoom, use the **OUTPUT** control to increase output power.

## Setups

Copying presets from a system with one software level to a system with a different software level corrupts the presets database of the destination system. Corrupting the presets database degrades system performance and can make the system unusable. Verify software levels of the source and destination systems by performing the Show Machine Configuration test using the system diagnostics. See "Diagnostics Setups" in the "Setups" section of your *Reference Manual* for information about using the system diagnostics.

## Peripherals (Printing and Recording)

To record stereophonic Doppler audio and to ensure optimal Doppler audio quality, ensure the microphone (**Microphone** key) is off when recording Doppler audio.

When you press **Superkey+Video** to review an image, the system resumes real-time imaging when you exit your review.

After playing a videotape, press **STOP** before rewinding or fast forwarding the videotape.

When you press **Blank Search** on the VCR, the VCR freezes. Press and hold **Blank Search** (1-2 seconds) until Blank Search begins, or press Blank Search twice.

When the Body Surface Area (BSA) value is less than 1.00 square meter, it will not appear on the printed report or in data transfer for serial devices. However, all of the BSA values are correctly entered for index calculations such as the Stroke Volume Index (SI), Cardiac Index (CI), and Mass Index (MI) for any BSA value.

## Measurements

The lowest calibration value for a Doppler image is 20 cm/sec. TDI (Tissue Doppler Imaging) display velocities can be less than 20 cm/sec. To calibrate a low-velocity TDI display, from VCR frame grab or DiskLink images, select a point on the velocity scale below the baseline to get the required 20 cm/sec calibration value.

Do not perform an area measurement of spectral data before beginning a High Q automatic Doppler measurement: the High Q feature will not work.

## **Calculations**

### **French and German Only**

Calculations derived from user-defined equations for EFW will not appear in the patient report.

Calculations derived from the investigators Campbell or Shepard for EFW will not appear in the patient report.

## **Scanheads**

Ensure that you select another scanhead before you disconnect a multi-plane transesophageal scanhead (MPT7-4); otherwise, system update will be uncharacteristically slow.

During VCR playback, image review, image transfer, and calculations, ensure a scanhead is selected. Erratic system behavior results if you perform these activities without a scanhead selected.

Do not turn on power to the system when an L12-5 38 mm scanhead with part number 4000-0396-01 is connected. The system will appear to stop 2D imaging. If the 2D image becomes faint or disappears, disconnect the L12-5 scanhead and then reconnect it. An L12-5 scanhead with any other part number can be connected to the system before turning on power.

## **BPT9-5**

Transesophageal echocardiography in pediatric patients can be performed safely, but attention must be paid to possible airway obstruction or hemodynamic compromise. For additional information see the following references:

Gilbert, T.B., Panico, F.G., McGill, W.A., Martin, G.R., Halley, D.G., and Sell, J.E. "Bronchial Obstruction by Transesophageal Echocardiography Probe in a Pediatric Cardiac Patient." *Anesth Analg*, Vol. 74: 156-158, 1992.

Muhiudeen, I., and Silverman, N. "Intraoperative Transesophageal Echocardiography Using High Resolution Imaging in Infants and Children with Congenital Heart Disease." *ECHOCARDIOGRAPHY: A Jnl. of CV Ultrasound & Allied Tech.*, Vol. 10, No. 6: 599-608, November 1993.

Muhiudeen, I.A., Silverman, N.H., and Anderson, R.H. "Transesophageal Transgastric Echocardiography in Infants and Children: The Subcostal View Equivalent." *Journal of the American Society of Echocardiography*, Vol. 8, No. 3: 231-244, May-June, 1995.

Stevenson, J.G., "Role of intraoperative transesophageal echocardiography during repair of congenital cardiac defects." *Acta Paediatric Suppl*, 410: 23-33, 1995.

Stevenson, J.G., and Sorensen, G.K. "Proper Probe Size for Pediatric Transesophageal Echocardiography." *THE AMERICAN JOURNAL OF CARDIOLOGY*, Vol. 72: 491-492, August 15, 1993.

## **Image Management**

To ensure that all images are stored to the optical disk at the completion of an exam, press the **END EXAM** control. If you eject an optical disk without pressing the **END EXAM** control, the last image stored on the hard disk will not be stored to the optical disk. The optical disk is always one image behind the hard disk, even when spooling is enabled.

When you change the patient information—the patient name and ID—existing images on the optical disk retain the original patient information. Subsequent images will be stored on the optical disk under the new patient information. All images stored on the hard disk will reflect the new patient information.

Ensure that you select **New** or **Edit** on the **Patient Data Entry** screen before you enter a patient name into the patient data form. If you enter a patient name and do not select **New** or **Edit**, a patient file will not be created, and images cannot be stored. If you attempt to review images that do not actually exist, a system diagnostic alert will result; close **Review Images** to recover from the situation, and enter the correct patient data.



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# Operating Notes

HDI® 5000 Ultrasound System  
Hard-Disk Software: 4252-0811-13

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4707-0027-26 Rev A

December 17, 1999

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## Controls

Before performing such non real-time functions as selecting setups, on-screen programming, viewing patient reports, or VCR playback, press FREEZE.

## Setups

Copying presets from a system with one software level to a system with a different software level corrupts the presets database of the destination system. Corrupting the presets database degrades system performance and can make the system unusable. Verify software levels of the source and destination systems by performing the "Show Machine Configuration" test using the system Diagnostics. See "Diagnostics Setups" in the "Setups" section of your Reference Manual for information about using the system Diagnostics.

After you create a new table in the OB Calculations setups, the Delete selection in the Annotation setups will be inoperable until the system power is cycled.

## Peripherals (Printing and Recording)

To record stereophonic Doppler audio and to ensure optimal Doppler audio quality, ensure the microphone (MIC control) is off when recording Doppler audio.

When you use the Video Superkey to review an image, the system resumes real-time imaging when you exit your review.

## Measurements

A measurement offset occurs when measuring across a dual image where one side is obtained using harmonics and the other side is obtained using fundamental ultrasound. Do not measure across a dual image obtained in this manner.

## Calculations

### French and German Only

Calculations derived from user-defined equations for EFW will not appear in the patient report.

Calculations derived from the investigators Campbell or Shepard for EFW will not appear in the patient report.

## Scanheads

Ensure that you select another scanhead before you disconnect a multi-plane transesophageal scanhead (MPT7-4); otherwise, system update will be uncharacteristically slow.

During VCR playback, image review, and calculations ensure a scanhead is selected. Erratic system behavior results if you perform these activities without a scanhead selected.

Do not turn on power to the system with an L12-5 scanhead connected. The system will appear to stop 2D imaging. If the 2D image becomes faint or disappears, disconnect the L12-5 scanhead and then reconnect it. ATL recommends connecting the L12-5 scanhead after power has been turned on.

When changing from a phased array scanhead to a static continuous-wave (CW) probe, make sure you are in a 2D only mode. A blue banner Run-time Alert may occur if you switch from steered CW to a static CW probe while in duplex mode.

### **Image Management**

To ensure that all images are stored to the optical disk at the completion of an exam, press the END EXAM control. If you eject an optical disk without pressing the END EXAM control, the last image stored on the hard disk will not be stored to the optical disk. The optical disk is always one image behind the hard disk, even when spooling is enabled.

When you change the patient information—the patient name and ID-existing images on the optical disk retain the original patient information. Subsequent images will be stored on the optical disk under the new patient information. All images stored on the hard disk will reflect the new patient information.

When you enter a patient name into the patient data form, ensure that you also enter Y in response to the New Patient query. If you enter a patient name and do not indicate that it is a new patient, then a patient file will not be created, and images cannot be stored. If you attempt to review images that do not actually exist, a system diagnostic alert will result; close Review Images to recover from the situation, and enter the correct information in the patient data form.



## Controls

Before performing such non real-time functions as selecting setups, on-screen programming, viewing patient reports, or VCR playback, press **FREEZE**.

To improve an unsatisfactory image from low power output, while in M-mode and using HD Zoom, use the **OUTPUT** control to increase output power.

Do not attempt to unfreeze the system when in Cine play of a 3D uncalibrated image. If this occurs, a “power supply warning banner” appears. Do not attempt to select a scanhead. Set the **ON/STANDBY** switch to **STANDBY**, and turn off the system using the circuit breaker; wait several seconds, set the circuit breaker to **ON**, and then turn on the **ON/STANDBY** switch.

## Imaging

In Tissue Doppler Imaging (TDI), with an M-mode display, if you see a corrupted 2D image, change the depth or the display format size; the 2D image anomalies will disappear.

## Peripherals (Printing and Recording)

To record stereophonic Doppler audio and to ensure optimal Doppler audio quality, ensure the microphone (**Microphone** key) is off when recording Doppler audio.

When you press **Superkey+Video** to review an image, the system resumes real-time imaging when you exit your review.

After playing a videotape, press **STOP** before rewinding or fast forwarding the videotape.

When you press **Blank Search** on the VCR, the VCR freezes. Press and hold **Blank Search** (1-2 seconds) until blank search begins, or press **Blank Search** twice.

When the Body Surface Area (BSA) value is less than 1.00 square meter, it will not appear on the printed report or in data transfer for serial devices. However, all of the BSA values are correctly entered for index calculations such as the Stroke Volume Index (SI), Cardiac Index (CI), and Mass Index (MI) for any BSA value.

## Measurements

The lowest calibration value for a Doppler image is 20 cm/sec. TDI (Tissue Doppler Imaging) display velocities can be less than 20 cm/sec. To calibrate a low-velocity TDI display, from VCR frame grab or DiskLink images, select a point on the velocity scale below the baseline to get the required 20 cm/sec calibration value.

Do not perform an area measurement of spectral data before beginning a High Q automatic Doppler measurement: the High Q feature will not work.

## **Calculations**

Only use velocity distance measurements to obtain accurate results for Peak E, Peak A, and E/A ratio in the Cardiology Inflow measurement protocols. Use of High Q automatic Doppler analysis or the **AREA** control will assign the highest peak in the traced Doppler envelope to Peak E. If these results are used in combination with the distance results, where the user has measured Peak E and A, an inappropriate E/A ratio can be calculated.

If the OB graph data does not appear, select **LMP** or **EDD** to refresh the display.

## **French and German**

Calculations derived from user-defined equations for EFW will not appear in the patient report.

Calculations derived from the investigators Campbell or Shepard for EFW will not appear in the patient report.

## **Scanheads**

Ensure that you select another scanhead before you disconnect a multi-plane transesophageal scanhead (MPT7-4); otherwise, system update will be uncharacteristically slow.

During VCR playback, image review, image transfer, and calculations, ensure a scanhead is selected. Erratic system behavior results if you perform these activities without a scanhead selected.

Do not turn on power to the system when an L12-5 38 mm scanhead with part number 4000-0396-01 is connected. The system will appear to stop 2D imaging. If the 2D image becomes faint or disappears, disconnect the L12-5 scanhead and then reconnect it. An L12-5 scanhead with any other part number can be connected to the system before turning on power.

Do not disconnect the active scanhead while you are storing images.

## **Image Management**

To ensure that all images are stored to the optical disk at the completion of an exam, press the **END EXAM** control. If you eject an optical disk without pressing the **END EXAM** control, the last image stored on the hard disk will not be stored to the optical disk. The optical disk is always one image behind the hard disk, even when spooling is enabled.

When you change the patient information—the patient name and ID—existing images on the optical disk retain the original patient information. Subsequent images will be stored on the optical disk under the new patient information. All images stored on the hard disk will reflect the new patient information.

Ensure that you select **New** or **Edit** on the **Patient Data Entry** form before you enter a patient name. If you enter a patient name and do not select **New** or **Edit**, a patient file will not be created, and images cannot be stored. If you attempt to review images that do not actually exist, a system diagnostic alert will result; close review to recover from the situation, and enter the correct patient data.

When using the Worklist feature, storing a **Patient Data Entry** form with **Study Data** may result in the **Patient Data Entry** form with **Study Data** being stored in the previous patient's file. The following control sequence causes this problem:

- 1 . Press the **Patient Data** key.
- 2 . Select **New Patient**.

3 . Select a patient from the worklist.

4 . Select **Study Data**.

5 . Press the **PRINT** control.

Use the following control sequence to preclude this problem:

1 . Press the **Patient Data** key.

2 . Select **New Patient**.

3 . Select a patient from the worklist.

4 . Select **Edit**.

5 . Select **Study Data**.

6 . Press the **PRINT** control.

Do not select **Study Data** from the first page of the **Patient Data Entry** form. First, select **Edit**, if you intend to store the **Study Data**.

### **Digital Video Streaming (DVS) Option**

Before attempting to print a VCR frame-grab image or a captured image, ensure that you press the **FREEZE** control.

Do not turn off power during a DVS freeform acquisition. Doing so may result in a corrupted patient directory.

In the **Patient Directory**, you can display only 150 exams from an optical disk.

During protocol acquisition, use of VCR controls other than **RECORD**, on either the VCR control panel or the system, may cause a system error. The only recovery from this system error is to cycle power. To avoid this system error, suspend the protocol before using the VCR.

#### **Italian**

With the DVS option, there are several words and phrases that are not translated into Italian.

#### **French, German, and Italian**

With the DVS option, French characters are not accepted in several of the fields in the **Acquisition Parameters - Protocols** display.



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# Operating Notes

HDI® 5000 Ultrasound System  
Hard-Disk Software: 4252-0899-03

4707-0027-34 Rev A

August 24, 2000

## Controls

Before performing such non real-time functions as selecting setups, on-screen programming, viewing patient reports, or VCR playback, press **FREEZE**.

To improve an unsatisfactory image from low power output, while in M-mode and using HD Zoom, use the **OUTPUT** control to increase output power.

Do not attempt to unfreeze the system when in Cine play of a 3D uncalibrated image. If this occurs, a “power supply warning banner” appears. Do not attempt to select a scanhead. Set the **ON/STANDBY** switch to **STANDBY**, and turn off the system using the circuit breaker; wait several seconds, set the circuit breaker to **ON**, and then turn on the **ON/STANDBY** switch.

## Setups

When using the L12-5 scanhead with Tissue Doppler Imaging (TDI), performing a Quick Save to make a custom preset displays the **Scanhead Reselect** banner. When using the P4-2 scanhead with TDI, performing a Quick Save does not save the settings to the custom preset.

## Imaging

In Tissue Doppler Imaging (TDI), with an M-mode display, if you see a corrupted 2D image, change the depth or the display format size; the 2D image anomalies will disappear.

In 3D imaging, there is the potential for data corruption when the system reconstructs the acquired 3D data set. Acquiring a 3D data set in CPA mode with any linear array scanhead, or when the CPA color box is not in a “steered” position, may cause the system to reconstruct only a portion of the data. To avoid data corruption during reconstruction, ensure the CPA color box is in a “steered” position during acquisition of the 3D data set.

## Peripherals (Printing and Recording)

To record stereophonic Doppler audio and to ensure optimal Doppler audio quality, ensure the microphone (**Microphone** key) is off when recording Doppler audio.

When you press **Superkey+Video** to review an image, the system resumes real-time imaging when you exit your review.

Do not perform any VCR functions during system initialization (after turning on system power, before the 2D display appears). Doing so may cause erratic system operation.

After playing a videotape, press **STOP** before rewinding or fast forwarding the videotape.

When you press **Blank Search** on the VCR, the VCR freezes. Press and hold **Blank Search** (1-2 seconds) until blank search begins, or press **Blank Search** twice.

When the Body Surface Area (BSA) value is less than 1.00 square meter, it will not appear on the printed report or in data transfer for serial devices. However, all of the BSA values are correctly entered for index calculations such as the Stroke Volume Index (SI), Cardiac Index (CI), and Mass Index (MI) for any BSA value.

## Measurements

The lowest calibration value for a Doppler image is 20 cm/sec. TDI (Tissue Doppler Imaging) display velocities can be less than 20 cm/sec. To calibrate a low-velocity TDI display, from VCR frame grab or DiskLink images, select a point on the velocity scale below the baseline to get the required 20 cm/sec calibration value.

Do not perform an area measurement of spectral data before beginning a High Q automatic Doppler measurement: the High Q feature will not work.

## Calculations

Only use velocity distance measurements to obtain accurate results for Peak E, Peak A, and E/A ratio in the Cardiology Inflow measurement protocols. Use of High Q automatic Doppler analysis or the **AREA** control will assign the highest peak in the traced Doppler envelope to Peak E. If these results are used in combination with the distance results, where the user has measured Peak E and A, an inappropriate E/A ratio can be calculated.

### French and German

Calculations derived from user-defined equations for EFW will not appear in the patient report.

Calculations derived from the investigators Campbell or Shepard for EFW will not appear in the patient report.

## Scanheads

Ensure that you select another scanhead before you disconnect a multi-plane transesophageal scanhead (MPT7-4); otherwise, system update will be uncharacteristically slow.

During VCR playback, image review, image transfer, and calculations, ensure a scanhead is selected. Erratic system behavior results if you perform these activities without a scanhead selected.

Do not turn on power to the system when an L12-5 38 mm scanhead with part number 4000-0396-01 is connected. The system will appear to stop 2D imaging. If the 2D image becomes faint or disappears, disconnect the L12-5 scanhead and then reconnect it. An L12-5 scanhead with any other part number can be connected to the system before turning on power.

Do not disconnect the active scanhead while you are storing images.

## Image Management

To ensure that all images are stored to the optical disk at the completion of an exam, press the **END EXAM** control. If you eject an optical disk without pressing the **END EXAM** control, the last image stored on the hard disk will not be stored to the optical disk. The optical disk is always one image behind the hard disk, even when spooling is enabled.

When you change the patient information—the patient name and ID—existing images on the optical disk retain the original patient information. Subsequent images will be stored on the optical disk under the new patient information. All images stored on the hard disk will reflect the new patient information.

Ensure that you select **New** or **Edit** on the **Patient Data Entry** form before you enter a patient name. If you enter a patient name and do not select **New** or **Edit**, a patient file will not be created, and images cannot be stored. If you

attempt to review images that do not actually exist, a system diagnostic alert will result; close review to recover from the situation, and enter the correct patient data.

## **Digital Video Streaming (DVS) Option**

Before attempting to print a VCR frame-grab image or a captured image, ensure that you press the **FREEZE** control.

Do not turn off power during a DVS freeform acquisition. Doing so may result in a corrupted patient directory.

In the **Patient Directory**, you can display only 150 exams from an optical disk.

During protocol acquisition, use of VCR controls other than **RECORD**, on either the VCR control panel or the system, may cause a system error. The only recovery from this system error is to cycle power. To avoid this system error, suspend the protocol before using the VCR.

The system displays an error message and locks up when you press **PRINT** after you enter data on the first page of the **Patient Data Entry** form before you have entered the patient name into the DVS database. To avoid this situation, close and reopen the **Patient Data Entry** form, or proceed to the second page of the form, before you press **PRINT**.

### **Italian**

With the DVS option, there are several words and phrases that are not translated into Italian.

### **French, German, and Italian**

With the DVS option, French characters are not accepted in several of the fields in the **Acquisition Parameters - Protocols** display.

# **16 Service Bulletins**

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Insert your hard copies here.

# **17 Glossary**

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## **17-1 Abbreviations**

4V <sup>2</sup>	Peak Pressure Gradient
A	Amps
A1B	A1B - A13B and PS1 - PS4 identify card cage slot positions
AC	Alternating Current
ACIM	AC Input Module (main power input panel)
A/D	Analog-to-Digital Conversion
ADAPTR	Advanced Digital, Audio, Physio and Translator (module)
AIFOM	Advanced IF Output Module
AIM+	Analog Interface Module Plus
AI	Aluminum
AP&I	Acoustical Power and Intensity
AQ	Acquisition (bus)
AQ Bus	Acquisition Bus
Assy	Assembly
AT	Acceleration Time; Averaging Time
Blk	Black
CB, Ch Bd	Channel Board
CFM	Cubic Feet per Minute
Conn	Connector
CPI	Control Panel Interface (module)
CPU	System CPU (system controller module)
D	Diameter
DAC	Digital to Analog Converter
D/A	Digital-to-Analog Conversion
DC	Direct Current
DDEA	Disc Drive, ECG and Audio (module)
DHHS	Department of Health and Human Services (U.S.)
DT	Deceleration Time
ECG	Electrocardiograph

ESP	Extended Signal Processing
FI / FIh	Flat / Flathead
FEC	Front End Controller (module)
FOOTSW	Footswitch
F/W	Firmware
GB	Gigabyte
H	High
Hd	Hex drive
Hosp	Hospital
HR	Heart Rate
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
H/W	Hardware
Hz	Hertz
ID	Inside diameter (screws or hardware) or system identification number
IF	Intermediate Frequency
IIM	Internal Interface Module
IMEM	Image Memory (module)
Ins	Inside
Int	Internal
ISEM	Integrated Stress Echo Module
L	Long
lb	Pound
lb/min	Pounds per minute
LCP	Lower Control Panel (module)
Lk	Lock
LED	Light Emitting Diode
LEP	List of Effective Pages
LUT	Look-Up Table
Max	Maximum
MB	Megabyte
MDF / EDF	Minimum / End Diastolic Velocity and Frequency

MO	Magneto-Optical (drive) or Machine Option (files)
MON	Monitor
Mt	Mounting
Mux	Multiplexer
NTSC	National Television Standard Committee (video standard)
Ny	Nylon
OD	Outside diameter
OEM	Original Equipment Manufacturer, peripheral device such as a printer, VCR, or camera
Oz	Ounces
PAL	Phased Alteration by Line (European video standard)
PCM	Pixel Conversion Module
PD / Pd	Processed Data (bus) / Phillips drive (screw)
PI	Pulsatility Index
PIM	Peripheral Interface Module
PLL	Phase Loop Locking
Pnh	Panhead
Pnl	Panel
Plystr	Polyester
PS1	A1B - A13B and PS1 - PS4 identify card cage slot positions
PSM	Power Supply Module
PSP1, PSP2	Pixel Space Processor (module)
PSV/PSF	Peak Systolic Velocity and Frequency
RF	Radio Frequency
RFI	Radio Frequency Interference
RI	Resistive Index
Rkr	Rocker (Switch)
Rx	Receive, Receiver
SBY	Standby
SCSI	Small Computer Serial Interface
S/D	Systolic/Diastolic Ratio
S/H	Scanhead
Shld	Shield or shielded

S/HSEL	Scanhead Select (module)
Skh	Socket head
SPM	Signal Processing Module
Spst	Single pole, single throw (switch)
Ss	Stainless Steel
St	Steel
S-VHS	Super VHS, a VCR video format
Sw	Switch
S/W	Software
T	Thick
TAF	Time-Averaged Frequency
TAM	Time-Averaged Mean Velocity
TAP	Time-Averaged Peak Velocity
TGC	Time Gain Compensation
TOC	Table of Contents
TTag	Time Tag (bus)
Tx	Transmit, Transmitter
UCP	Upper Control Panel (module)
UIF	User Interface (LCP, UCP and CPI)
UIM	User Interface Module
Unshld	Unshielded
VA	Volt amps
Vac	Volts AC
Vdc	Volts DC
VTI	Velocity-Time Integral
W	Wide (refers to a distance measurement) or Watt (unit of electrical power)
w	with
Wht	White
w/o	without
Xfmr	Transformer
Zn	Zinc

Artifact	An undesirable imaging anomaly created as the result of acoustic effects or system processing.
Box	An image made up of a sequential set of columns that is usually smaller than the sector size would allow. Most commonly refers to the color flow image color box.
Burst	The transmitted waveform.
Drain	Usually a wire included in a coaxial or shielded cable which is in contact with the shield's braid or foil for the length of the cable. It is used to make the mechanical attachment and consequently the electrical path from the shield to the connector or plug.
FFT	Fast Fourier transformation - a mathematical method used with Doppler shift data to calculate the frequency spectrum which results in the Doppler display.
Interlaced	Video format where two fields make up one 30 Hz frame. Video rows (scan lines) of the raster are interlaced, that is, field one provides rows 1, 3, 5, . . . , then field two fills in rows 2, 4, 6, . . . See "non-interlaced".
MOP	Module Operations Processor - a board-level microprocessor dedicated to carrying out the functions of its hardware module. Communicates with the system CPU via a SCIP bus. Typically runs tasks such as initialization of registers, self-test, interpreting commands from the System CPU, and orchestrating real-time tasks on the hardware module.
Noise band	Any level of random background noise when the system speaker (not headphone) volume is set for a typical user setting (generally just above a mid-range setting). Also, any regular line or trace that clearly appears in the scrolling display (as three pixels/inch or more) at a level that is greater than the background noise.
Non-interlaced	Video format where the video rows are processed in sequence (1, 2, 3, 4, 5, 6, . . . ) and updated at a 60 rate. See "interlaced".
NTSC	National Television Standards Committee - 525-line, 60Hz, composite video, usually color.
OEM	Original Equipment Manufacturer; A peripheral device (VCR, printer, camera)

PAL	Phased Alteration by Line - 625-line, 50Hz composite video, usually color.
PRI	Pulse repetition interval - the time between ultrasound pulses. This time determines how much processing can take place and still keep up with the data acquisition.
PRF	Pulse Repetition Frequency - rate at which ultrasound pulses are sent into the tissue. Based primarily on depth desired, but also depends on other variables such as dead time.
SCIP, SC	System Control Interface Processor - a set of processors that reside on all modules that communicate with the CPU PCB. SCIP refers to the communication system which includes protocol, firmware, and hardware.
UART Port	Universal Asynchronous Receiver Transmitter - a serial communication port located on the card edge of the FEC. Also called Debug Port or Diagnostic Port.
Watchdog	A level detector, a comparator circuit, or a time-out circuit, which ensures the proper functioning of a supply, a regulator, or other circuitry, and disables the monitored circuit if it is out of specification or the timer is not reset.

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