

HD3 Service Manual

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This manual supports the field service maintenance and repair of the HD3 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 in Portable Document Format (PDF), for viewing on a laptop computer with Acrobat Reader. A list of bookmarks functions as an additional table of contents. Those bookmarks, the table of contents, and cross-references use hypertext links to provide access to the referenced information.

Conventions in This Manual

The following conventions are used in this manual:

- Hypertext links are [blue](#).
- All procedures are numbered, and all subprocedures are lettered. You must complete steps in the sequence they are presented to ensure reliable results.

- Bulleted lists indicate general information about a function or procedure. They do not imply a sequential procedure.
- Control names and menu items or titles are spelled as they are on the system, and they appear in bold text.
- Symbols appear as they appear on the system.
- An English system is assumed.

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I General Information

Introduction

This section describes the contents of this manual and provides the following information:

- A general overview and physical description of the HD3 Ultrasound System (also referred to as the HD3 system or the system)
- A summary of system application, feature, and regulatory information

NOTES

- The information in this manual is based on the assumption that you are trained in the operation of this system and that you will operate it as intended.
 - For detailed user information and instructions for operating the system, refer to the *HD3 Getting Started* manual.
 - The instructions in this manual assume that the system language is set to English.
-

More About This Manual

This manual is organized as follows:

- [Section 1, “General Information”](#): Provides a general overview of the HD3 system and this document.
- [Section 2, “System Specifications”](#): Provides a summary of the system specifications.
- [Section 3, “Safety”](#): Identifies the safety information and is *required* reading.
- [Section 4, “Theory of Operation”](#): Provides a functional description of the system: A breakdown of the system functional elements and a description of their relationships and basic principles of operation (how the system works).
- [Section 5, “Installation”](#): Provides step-by-step initial delivery pre-installation and installation instructions for the system.

- [Section 6, “Performance Tests”](#): Provides tests that determine functional confidence and ensure that the system is operating as intended at initial installation and after upgrades or repairs.
- [Section 7, “Adjustments”](#): Provides brightness and position adjustment information for the system monitor. There are no calibration or alignment adjustments to make in the field for this system. There are no voltage adjustments to make in the field for this system.
- [Section 8, “Preventive Maintenance”](#): Identifies activities supporting the quality assurance audit (QAA) concept that you should perform in accordance with Customer Field Service policy.
- [Section 9, “Troubleshooting”](#): Provides information about troubleshooting, backing up and restoring, software and device driver loading, and managing system options.
- [Section 10, “Disassembly”](#): Provides specific information about system disassembly that may be required for the removal and installation of field-replaceable parts. If not covered by a detailed procedure, the means of removing a system part can be discerned from the illustrations in this section as well as from those in [Section 13, “Configuration”](#) and in [Section 14, “Parts”](#). Instructions for crating the system for shipment are also included.
- [Section 11, “Cabling”](#): Provides system signal and power interconnect information, cable part number information, and (sold-with-system) peripheral connection diagrams.
- [Section 12, “Change History”](#): Chronicles the software and hardware changes associated with specific software releases.
- [Section 13, “Configuration”](#): Lists all the released software version part numbers for the system, identifies the primary system electronics, and shows where each circuit board is located in the system. When applicable, additional circuit board reference information is provided.

System Overview

- [Section 14, “Parts”](#): Provides field-replaceable part numbers and information for the system parts that are not dependent upon system features and software versions (primary circuit boards and certain hardware assemblies). Call your Philips representative for the core information you need to determine the compatibility of primary system PCBs and certain hardware assemblies with respect to the system software releases.
- [Section 15, “Transducers”](#): Summarizes general and part number information for the transducers that can be used with the HD3 system.

The HD3 system, shown in [Figure I-1](#), is intended for general imaging. The cart is ergonomically designed to be both highly mobile and adjustable for a range of users and operating conditions. The HD3 system uses an embedded computer featuring the Linux operating system.

HD3 operators can measure anatomical structures and generate reports for health-care professionals. The system has a basic set of imaging modes and measurement tools and supports up to five transducers. There are optional modes and measurement tools that are available only when a specific mode or an analysis package is purchased and enabled for customer use. Options and upgrade security is controlled through the use of system-specific passwords and software.

- See [“Applications” on page 29](#).
- See [“Modes” on page 29](#).
- See [“Transducers” on page 30](#).
- See [“Options” on page 31](#).

Figure I-1 HD3 Ultrasound System



Applications

The following applications are available on the HD3 system. Refer to the *HD3 Getting Started* manual for detailed feature information regarding these applications:

- Abdominal
- Small parts and superficial
- Pediatric
- Musculoskeletal
- Obstetrical
- Gynecological and fertility
- Prostate
- Vascular
- Cardiac Adult

Modes

The following imaging modes are available on the HD3 system. Refer to the *HD3 Getting Started* manual for detailed feature information regarding these modes:

- 2D
- 3D
- M-mode
- Pulsed-wave (PW) spectral Doppler
- Color flow
- Color Power Angio (CPA) imaging
- Duplex mode and Simultaneous mode

Transducers

The system has two electronically-switched transducer connectors. The following five transducers are supported (also see [Section 15, “Transducers”](#)):

- C4-2
- C5-2
- C9-4ec
- C7-3
- L9-5

Languages

The system software supports the following languages at initial release:

- English
- French
- German
- Italian
- Spanish

Options

The HD3 system software contains all of the available software options. The same software is loaded into every system and because most of the system options are “software only” features, each system can have whatever software options the customer purchases enabled at the factory or, with the correct key-codes, on site. Purchased hardware options are shipped with the system.

The following options are available for this system at initial release:

Software Options

- Image Review
- DICOM networking
- Freehand 3D (shown on the system as an option, but is currently enabled in every system shipped)
- Harmonic Imaging (shown on the system as an option, but is currently enabled in every system shipped)
- Color Flow

Peripheral Options

See [“Peripherals” on page 32](#).

Peripherals

The HD3 system supports the following peripheral devices (these are optional unless noted as standard):

- Sony UP-895MD black-and-white (B/W) analog printer ([Figure I-2](#))
- Sony UP-21MD color analog printer ([Figure I-2](#))
- Mitsubishi HS-MD3000UA (NTSC) or HS-MD3000EA (PAL) VCRs ([Figure I-2](#))
- CD-RW Drive (this is standard on all systems [Figure I-3](#))
- MOD (magneto-optical disc drive [Figure I-3](#))
- Foot switch (2-pedal)
- Report printers: At initial release, print drivers for the following report printers are included in the system software, but these printers cannot be purchased from Philips. Print drivers may be added to support additional report printers as they are released:
 - HP DeskJet 880C
 - HP DeskJet 895cxi
 - HP DeskJet 6122
 - HP LaserJet 1200
 - HP DeskJet 5550
 - HP DeskJet 5650
 - HP DeskJet 6540
 - HP DeskJet 6840
 - HP Business Inkjet 1200
 - HP Laserjet 1320
- USB Flash Drive (supported, but cannot be purchased from Philips)

Figure I-2

HD3 Ultrasound System Image Printers and VCR



UP-21MD Sony Color Printer



UP-895MD Sony Graphic Printer
(Black and White)



HS-MD3000UA/EA Mitsubishi Video Cassette Recorder

Figure I-3 **HD3 Ultrasound System Data Media**

USB MOD Drive



CD-RW Drive



Figure I-4 **HD3 Ultrasound System Foot Switch**



Physical Description

The HD3 physical structure is made of fabricated sheet metal and molded plastic parts. The system ([Figure I-1](#)) consists of a cart, a user interface (control panel), a visual display (video monitor), and the ultrasound electronic components. Other important physical components are the power circuits, software and data storage devices, and the system input/output (I/O) connection panel.

See [Section 4, “Theory of Operation”](#) for a functional description of these system components.

Cart

The cart is made up of a base and framework that provides a chassis on which all system components are installed and interconnected.

Swivel-casters at the four corners of the cart base provide system maneuverability and braking. The front casters can be fixed straight and locked, or unlocked, by foot-operated wheel locks to mobilize or immobilize the system as needed.

System Control Panel

The control panel ([Figure I-5](#)) is a replaceable, self-contained module.

Figure I-5

HD3 Ultrasound System Control Panel

**System Monitor**

The video monitor ([Figure I-1](#)) is a non-interlace 26.4 cm (10.39-in) color TFT LCD display that is mounted on a mechanism that allows tilt and swivel positioning of the display.

Ultrasound Components

The physical components that comprise the primary ultrasound elements of the system are the Transducer Connector Assembly and the E-box circuit boards. See [Section 13, “Configuration”](#) for pictures and locations of these system components.

Transducer Connector Assembly

The Transducer Connector Assembly (TCA) has the transducer connectors (contained in metal shielding) that interconnect to the E-box Front End board.

E-box

The E-box is a card cage that houses the ultrasound signal generation and echo acquisition circuits. The following ultrasound system electronic circuits are contained in the E-box:

- E-box Motherboard (backplane)
- Front End (FE) Assembly
- Beamformer (BF) Board
- Beamformer-to-Front End Connector (BFC) (physically and electronically connects BF and FE boards)
- Digital Scan Converter (DSC) Board
- PCC Board (embedded computer)

System Power Components

The system electronic power components are the Isolation Transformer, Power Supply, and the Power I/O Assembly.

See [Section 14, “Parts”](#) for illustrations and locations of these system components.

Software and Data Storage Components

The software and data storage components ([Figure I-3](#)) are physically comprised of the hard disk drive (HDD), CD-RW drive, and when installed, the optional magneto-optical disk (MOD) drive.

I/O Panel

The I/O Panel, which provides connections for external devices, is installed into the rear of the cart framing (see [Figure 11-5](#) for connection descriptions).

Cables

Physical cables provide system signal interconnect and power distribution. Refer to [Section 11](#), “Cabling”, for detailed cable information.

Device Safety Requirements and Regulatory Compliance

The HD3 Ultrasound System complies with the following requirements for the International Electrotechnical Commission (IEC), the Canadian Standard Association (CSA), and the Underwriters Laboratories (UL).

- IEC60950/EN60950 for data processing equipment
- IEC 60601-1/EN 60601-1 for medical equipment
- IEC 60601-1-1/EN 60601-1-1 for medical equipment
- CSA22.2 No. 601.1
- UL 2601-1

For information about applicable safety standards and specifications, see the *HD3 Getting Started* manual shipped with the system.

Supplies and Accessories

Supplies and accessories are not available from Philips Ultrasound. The customer is directed to order biopsy guides by contacting their Philips representative or an authorized distributor.

Transducer covers and other supplies and accessories can be ordered from CIVCO Medical Instruments:

CIVCO Medical Instruments
102 First St. South
Kalona, IA 52247-9589

Phone: (800) 445-6741, Ex. 1 for Customer Service (USA)

+1 319-656-4447 (International)

Fax: (877) 329-2482 (USA)

+1 319-656-4451 (International)

E-mail: info@civcomedical.com

Internet: www.civco.com

Open Source Software License

The HD3 system uses an embedded computer featuring the Linux operating system, parts of which are *open source* software. The following notification is included in the customer's Operating Notes:

This Philips ultrasound system may contain “open source” software. According to the terms of the General Public License, a recipient may request a copy of any GPL-licensed source code modules present in the system, for the cost of shipping and handling. Please contact your local customer service representative for additional information.

The “additional information” is that the customer is entitled to a copy of the operating system software and that you can order it for them if they want it. The part number for the HD3 system Open Source Software is 453561228511.

2 System Specifications

Introduction

This section summarizes the system specifications for the HD3 Ultrasound System. For transducer specifications, see [Section 15, “Transducers”](#).

Physical Specifications

The physical dimensions and weight of the HD3 are as follows:

- Height:
 - Lowest position: 1,280 mm (50.4 in)
 - Highest position: 1,455 mm (57.3 in)
- Depth: With no peripherals: 798 mm (31.4 in)
- Width: With no peripherals: 505 mm (19.9 in)
- Weight: Less than 61.2 kg (135 lb.) including monitor, and without peripherals.

Electrical Specifications

The electrical specifications of the HD3 are as follows:

- AC input: 90 to 264 Vac, 47 to 63 Hz
- Ground impedance: 100 mΩ maximum
- Load: 1,150 VA maximum.
- AC output (including PC): non-sinusoidal 120 VRMS, 350 VA maximum

Environ- mental Specifications

- The environmental specifications for the HD3 system are as follows:
- Operational:
 - Temperature range: 10°C to +40°C (+50°F to +104°F)
 - Relative humidity: 15% to 95% non condensing
 - VCR and printers temperature limit: 10°C to +40°C (+50°F to +104°F) at 80% RH
 - Altitude: 697 hPa to 1013 hPa (0 to 10,000 feet) at 35°C (95°F)
 - Storage:
 - Temperature range: –20°C to +60°C (–4°F to +140°F)
 - Relative humidity: 15% to 95%, non condensing
 - Altitude: 572 hPa to 1013 hPa

System PC Specifications

Table 2-1 lists the PCC hardware specifications.

Table 2-1 Embedded PC Hardware Specifications

Component	Specification
OS	Linux
Memory	128 Synchronous DRAM
Hard drive	80 GB
VGA	640x480
ROM	2 Mbit Flash BIOS
Network Interface	10/100 Mb/s Tx
Keyboard	PS/2

Table 2-1 Embedded PC Hardware Specifications (Continued)

Component	Specification
Mouse	PS/2
IDE port	Enhanced IDE interface

Monitor Specifications

The monitor specifications are:

- Type: TFT LCD
- Size: 10.4 inch
- Pixel Pitch: 0.33mm x 0.33mm
- 640 x 480 VGA at 60 Hz
- Color Depth: 8-bit, 262,144 colors
- Power Consumption: Total 3.5 Watt

Image Formats

The following image storage formats are supported by each HD3 storage device ([Table 2-2](#)):

Table 2-2 Supported Image Formats

Device	Format			
	BMP	JPEG	TIF	DICOM
Hard Drive	X	X	X	X
Flash Memory	X	X	X	X
CD R/W	X	X	X	X
MOD	X	X	X	X

3 Safety

Introduction

This section summarizes the safety information for the HD3 Ultrasound System.

About Safety Information

Please read this and related information before using or servicing a Philips ultrasound system. It applies to the ultrasound system, transducers, recording devices, and any optional equipment.

This system 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, **WARNING** is used to indicate the presence of a hazard that can cause personal injury, death, or substantial property damage if the warning is ignored.

In this manual, **CAUTION** is used to indicate the presence of a hazard that can cause equipment damage if the caution is ignored.

In this manual, **NOTE** is used when additional comment or explanation is required about installation, operation, or maintenance information that is important but not necessarily hazard-related.

General Operating Safety

Read the *HD3 Getting Started* for detailed safety and standards information for the HD3 Ultrasound System. This guide includes critical information about the intended uses of the HD3 system, patient and operator safety, and device standards. This is information that maintenance personnel should be aware of.

Electrical Safety

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

WARNINGS

-
- Do not connect the ultrasound system to the same circuit used for life-support devices.
 - Shock hazards may exist if this system, including all externally mounted recording and monitoring devices, is not properly grounded. Protection against electrical shock is provided by grounding the chassis with a three-wire cable and plug. The system must be plugged into a grounded outlet. The grounding wire must not be removed or defeated.
 - To avoid risks of electrical shock and fire hazards, inspect the system power cord and plug on a regular basis. Ensure that they are not damaged in any way.
 - 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 Philips Ultrasound field service engineer.
 - Do not operate this system in the presence of flammable gases or anesthetics. Explosion can result from electrical ignition.
 - To avoid risk of electrical shock hazards, always disconnect the system from the wall outlet before cleaning the system.
-

WARNINGS

-
- To avoid risk of electrical shock hazards, always inspect transducers before use: Check the face, housing, and cable before use. Do not use if the face is cracked, chipped, or torn; the housing is damaged; or the cable is abraded.
 - To avoid risk of electrical shock, do not use any transducer that has been immersed beyond the specified cleaning or disinfection level.
 - All patient-contact devices, such as transducers, pencil probes, and ECG leads must be removed from the patient contact prior to application of a high-voltage defibrillation pulse.
 - Connection of optional devices not supplied by Philips Ultrasound could result in electrical shock. When such optional devices are connected to your ultrasound system, ensure that the total system earth leakage current does not exceed 300 μ A.
 - Avoid placing the system in an environment that may produce electrostatic discharges (ESD) that could affect the ultrasound system performance. (Electrostatic discharges can cause the ECG heart rate display to increase by 10% to 15% for a few seconds after the discharge, even though the ECG heart rate display returns to normal within a few seconds. See [“About Electrostatic Discharge” on page 51.](#))
 - Avoid placing the system in an environment that may produce electromagnetic interference (EMI) that could impact the diagnosis of a patient. (Only a physician can determine if an artifact caused by radiated interference has a negative impact on image quality and the subsequent diagnosis.) See [“Avoiding EMI and RF” on page 48.](#)
-

Avoiding EMI and RF

Although the system has been manufactured in compliance with existing EMI/EMC requirements, use of this system in the presence of an electromagnetic field can cause momentary degradation of the ultrasound image. If this occurs often, review the environment in which the system is being used, to identify possible sources of radiated emissions. These emissions could be from other electrical devices used within the same room or an adjacent room. Communication devices such as cellular phones and pagers can cause these emissions. The existence of radio, TV, or microwave transmission equipment located nearby can cause emissions. In cases where EMI is causing disturbances, it may be necessary to relocate your system.

Electrosurgical units (ESUs) and other devices intentionally introduce radio frequency (RF) electromagnetic fields or currents into patients. Because imaging ultrasound frequencies are also in the RF range, ultrasound transducer circuits are susceptible to RF interference. While an ESU is in use, the noise generated can severely interfere with the black-and-white image and completely obliterate the color image.

CAUTION

Avoid placing the system in an environment that may produce electrostatic discharges (ESD) that could damage the ultrasound system. (See [“About Electrostatic Discharge” on page 51.](#))

Mechanical Safety

Although the system is designed to be mobile, remember that it is *very heavy*, and that you must take precautions when moving it. The physical aspects of this system present a hazard that can cause injury, property damage, or equipment damage if the following information is ignored:

WARNINGS.

-
- Before moving the system, be sure to power it off, remove any loose equipment from the top of the system, disconnect the system power cord, and disconnect all external devices. Move and secure external devices away from the system.
 - Make sure the control top is locked, to prevent its up/down movement and unlock the caster locks before moving the system. Push with the handle at the front of the cart. After the system is in position, engage the caster locks to immobilize the system.
 - Be aware of the casters as well as the extremities of the system when moving it. The system is heavy enough in any configuration that it can cause injury to you or others. Exercise additional caution when going up or down inclines.
 - When attempting to overcome an obstacle, do not push the system with enough force to cause it to tip over. Do not exceed 10 degrees of incline.
 - Never park the system on an incline.
 - For transport, make sure the control top is locked and secure the system so that it cannot roll or tip. Engage the caster locks and use wheel chocks and restraining straps. Do not attempt to hold the system in place manually. Never strap or secure the system at any point on the control top or monitor.
-

CAUTIONS

-
- Ensure that the cables for all patient-applied parts are secure before moving the system. Use the cable management system to ensure that transducer cables are protected from damage.
 - Do not roll the system over transducer cables or power cables.
 - If the system behaves abnormally after moving or transporting, contact Philips Ultrasound Customer Service immediately. The components can withstand considerable shock, but excessive shock can cause a system failure.
-

General Equipment Protection

Follow these additional precautions to protect the system from damage:

CAUTIONS

-
- For optimal performance, the ultrasound system should be connected to a power circuit dedicated solely for the ultrasound system.
 - Verify system and peripheral power sources are appropriate before connecting to them.
 - Avoid placing the system in an environment that may produce electrostatic discharges (ESD) that could damage the ultrasound system. See [“About Electrostatic Discharge” on page 51](#).
-

CAUTIONS

- Excessive bending or twisting of cables on patient-applied parts may cause failure or intermittent operation of the system. Take care not to run over cables with the system, which may damage them.
- In general, only the area of the transducer acoustic window is watertight. Except where specified in specific transducer cleaning instructions, do not immerse the remainder of a transducer in any liquid.
- Practice proper cleaning or sterilization of a patient-applied part to avoid damage.
- Do not submerge the cables of patient-applied parts in solution. The cables are not liquid-tight beyond the applied part/cable or cable/connector interfaces.
- Do not use solvents such as thinner or benzine or abrasive cleaners on the system, transducers, video monitor, touch screen, or any printer.

About Electrostatic Discharge

Electrostatic discharge (ESD), commonly referred to as a static shock, is a naturally occurring phenomenon. ESD is most prevalent during conditions of low humidity, which can be caused by heating or air-conditioning. During low-humidity conditions, electrical charges naturally build up on individuals and can create static shocks.

An ESD condition occurs when an individual with an electrical energy buildup comes in contact with objects such as metal doorknobs, file cabinets, computer equipment, and even other individuals. The static shock or ESD is a discharge of the electrical energy buildup from a charged individual to a lesser or non-charged individual or object.

The level of electrical energy discharged from a system user or patient to the ultrasound system can be significant enough to cause damage to the system or transducers. The following precautions can help to reduce ESD: antistatic spray on carpets; antistatic spray on linoleum; antistatic mats; or a ground wire connection between the system and the patient table or bed.

ESD Safeguards




Follow these general ESD guidelines to minimize deterioration or destruction of ESD-sensitive electronic components:






- Avoid working in carpeted areas.
- If you use a vacuum cleaner to clean the interior of any part of the system sensitive to static electricity, take the necessary ESD precautions to avoid static buildup and discharge.
- Use a properly grounded wrist strap.
- Use a grounding mat for assembly work on sensitive areas.









Symbols




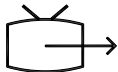

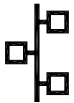



The International Electrotechnical Commission has established a set of symbols for medical electronic equipment that classify a connection or warn of potential hazards. The classifications and symbols are shown below.




Symbols on the System

	Isolated patient connection. (Type BF)
	Isolated patient connection for applied parts in direct contact with major vessels. (Type CF)
	Identifies the On/Off button on the system control panel.



	On the system AC Mains power switch, “ I “ represents on and “O” represents off.
	This symbol identifies a safety note. Ensure you understand the function of this control before using it. Refer to the appropriate section of the system documentation for an explanation of the control.
	The patient-applied part provides a degree of protection from electrical shock. This symbol indicates that the patient-applied part is defibrillator-proof. The patient-applied part is suitable for all patient applications including direct cardiac applications.
	Identifies fuse location. For continued protection from fire or shock, replace only with the same type and rating fuse.
	Identifies equipotential ground.
IPx-I	Indicates that this device is protected against vertically falling water drops.
IPx-7	Indicates that this device is protected against the effects of fluid immersion. This degree of protection can apply to transducers and the foot switch.

	The connector near this symbol receives alternating voltages.
AUX POWER ISOLATE OUTPUT 	This isolated output auxiliary power is provided for connection of the Philips-approved remote accessories.
	Indicates that interference may occur in the vicinity of equipment marked with this symbol.
	ESD (electrostatic discharge): The product is marked with this symbol to warn the user not to touch exposed pins. Touching exposed pins can cause electrostatic discharge, which can damage the product.
	This product consists of devices that may contain lead or mercury, which must be recycled or disposed of in accordance with local, state, or federal laws.
 	Indicates separate collection for electrical and electronic equipment in compliance with the Waste Electrical and Electronic Equipment (WEEE) Directive.
	Do not throw away. Dispose of in accordance with local, state, or federal laws.

	Right and left audio output.
	Color composite video output.
	Microphone input.
	S-Video connection.
	Black-and-white composite video output.
	Ethernet connection.
	Universal Serial Bus (USB) input/output port.
	Foot switch connection.
	ECG input.




	External VGA connection.
	Print trigger.
	Date of manufacture.

The following symbols are used inside the system:

	Dangerous voltages: This symbol appears adjacent to high-voltage terminals. It indicates the presence of voltages greater than 1,000 Vac (600 Vac in the United States).
	Identifies the point where the safety system ground is fastened to the chassis. Protective earth ground.

The following symbols appear on the product packaging to indicate environmental considerations:

Symbols on the Product Packaging

	Atmospheric pressure range of 700 to 1,060 hPa for transport and storage.
	Relative humidity range of 20% to 90% (noncondensing) for transport and storage.
	Ambient temperature range -20°C to +60°C (-4°F to +140°F) (noncondensing) for transport and storage. (Does not apply to media).

4 Theory of Operation

Introduction

This section provides a functional overview of the HD3 Ultrasound System by breaking down the system into functional elements and describing their relationships and basic principles of operation.

System Architecture

The HD3 system architecture is made up of the following basic functional elements:

- Physical assemblies comprising the mobile cart and system components
- Electrical power functions
- Ultrasound signal generation and control functions
- Echo acquisition and control functions
- Signal and image data processing and analysis functions
- Image display and audio presentation functions

Operating System

A Linux operating system (OS) provides an integrated range of resources: drivers and handlers for storage, video, serial and parallel ports, and support of file system services and graphical user interfaces. The OS is resident on the hard drive. The system software performs these tasks:

- Processes requests from the control panel
- Sets up beamforming parameters
- Processes acquired ultrasound echoes into digital visual representations for conversion into analog signals
- Performs measurements and calculations on acquired data
- Stores acquired data (such as images and user-entered data) for subsequent retrieval

Functional Description

The HD3 system produces ultrasound images using transducers, digital beamforming, and Doppler processing. The central processing unit of the system is the PCC Board. The ultrasound components comprise digital beamformer technology that combines with the operating system to support the system functions.

The HD3 system stores the ultrasound images and patient data on the hard drive and can copy that data to the removable media, such as magneto-optical drive (MOD) disks, CD-R and CD-R/W disks, and USB flash memory sticks for off-system review. The system can send the images to a black-and-white printer, color printer, or to a VCR. It also generates reports that can be printed.

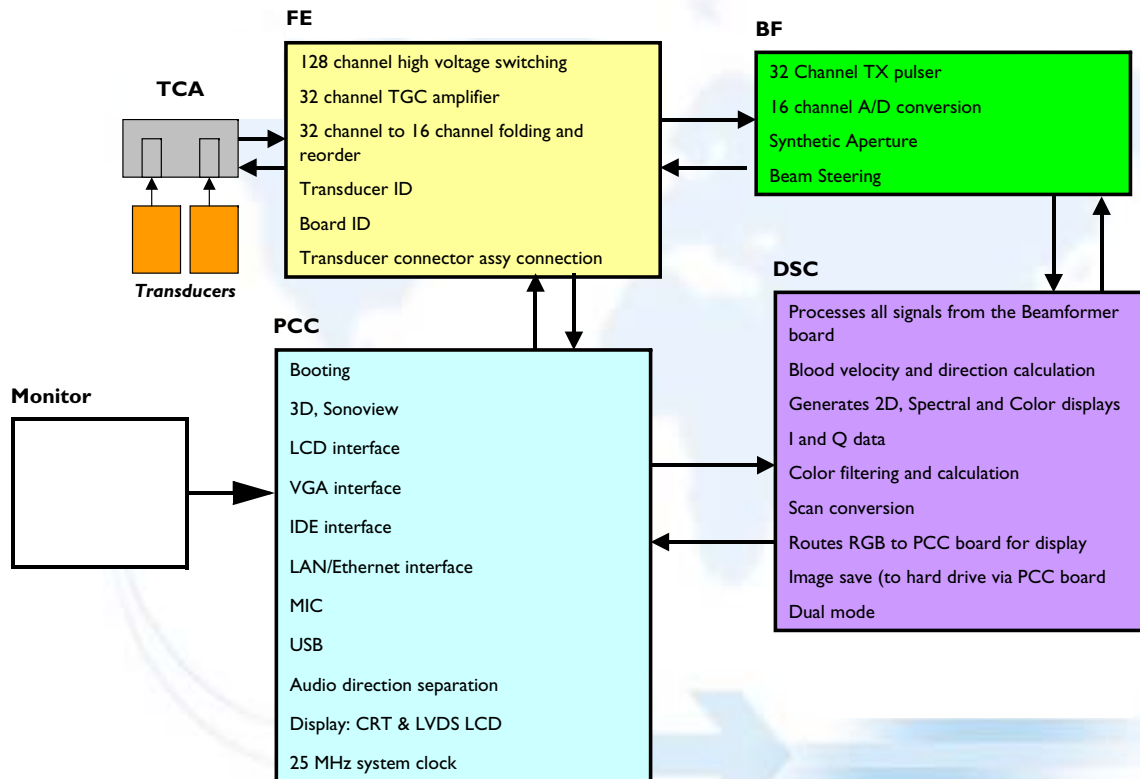
After operating power is applied, the major functional elements combine to produce ultrasound images. The user interface allows system control and viewing of the results.

The overall system functional flow is power development and distribution, analog signal processing, beamforming, continuous-wave and color Doppler processing, scan conversion, digital signal processing, and video and audio presentation.

The HD3 system ultrasound engine physically and functionally comprises five primary circuit boards, the TCA ([page 63](#)), the FE ([page 63](#)), the BF ([page 63](#)), the DSC ([page 63](#)), and the PCC ([page 64](#)). Most of the ultrasound signal processing, image processing, analysis, and display functions are performed by software using the native processing power of the embedded computer of the PCC Board.

[Figure 4-1](#) is a simplified block diagram of the HD3 system, showing the relationship between the primary circuit boards and indicating the major functional tasks performed by each.

Figure 4-1 HD3 System Functional Block Diagram



Physical Functions

The HD3 physical structure is made of fabricated sheet metal and molded plastic parts. The system consists of a cart, a user interface (control panel), a visual display (video monitor), and the ultrasound electronic components. Other important physical components are the power circuits, software and data storage devices, and the system input/output (I/O) connection panel.

The location and identification of the physical parts of the system are described in the General Information, Cabling , Configuration, and Parts sections of this document. The functional nature of each is described in the following paragraphs.

System Power

System power development and distribution is provided by the installation site source voltage, the system isolation transformer, power supply, backplane power bus, and power interconnect cables.

System Power Supply

- Input Voltage: (auto sensing)
 - 100-120 Vac $\pm 10\%$
 - 200-240 Vac $\pm 10\%$
 - 50/60 Hz

- Output Voltage:
 - + 3.3 Vdc
 - + 5 Vdc
 - - 5 Vdc
 - + 12 Vdc
 - + 12 Vdc
 - + 97 Vdc
 - - 97 Vdc
 - + HV (+ 20 to + 80 Vdc)
 - - HV (- 20 to - 80 Vdc)

The system power supply has these features:

- Fault Protection: The AC outputs are fault-protected from an overload condition (including turn-on surges). The AC input may be cycled to restore power.
- Overcurrent Protection: All outputs have overcurrent protection to protect damage to the power supply from overcurrent load or short circuit conditions. Latched AC outputs will be reset once the input power is cycled. The latched DC output will be reset if the input power is cycled.

Power Distribution

System power distribution diagrams are shown in [Figure 11-2](#).

**Transducer
Connector
Assembly (TCA)**

The Transducer Connector Assembly (TCA) is the transducer select module, providing the system interface for two transducers (see [Section 15, “Transducer Information”](#)). It works with the FE Board for transducer detection and identification, engaging the appropriate number of relays to accommodate transmitting and receiving pulses and echoes.

**Front End (FE)
Board**

The Front End Board provides the physical and electrical interface to the TCA, the transducer identification and enable function, and downloads operational parameters from the PCC, providing real-time control of the transmit, receive, and beamforming functions.

**Beamformer
(BF)**

The Beamformer Board is responsible for generating and transmitting pulses for the transducer elements. When the returning echoes come back into the system, they are sent in analog form through the FE to the Beamformer (via the Beamformer Connector Board that bridges and interconnects the FE and the BF boards) for processing, where they are filtered prior to being converted into digital data. Once the data is digitized, specialized circuits perform the beam forming and steering.

The signal processing functions of digital beamforming that determine the real image quality of the system include dynamic apodization, multiplication, coefficient loading, variable sample clock generation, and dynamic gain control.

**Digital Scan
Converter
(DSC)**

The DSC Board is multi-functional, performing functions supported by separate circuit boards in larger systems. The DSC performs the functions of a digital signal processor, digital scan converter and real time clock, and video manager.

- DSP functions:
 - Receives all signals from BF board
 - Calculates blood velocity and direction

- Generates the 2D image, spectral Doppler spectrum and audio, Color and Power Doppler image, and transmits these signals to the DSC part of the board and the I/O panel
- DSC and RTC functions:

When the DSC circuits receive ultrasound digital data from the DSP circuits, they perform 2D scan conversion and then transmit the video signals to the video management circuits.
- Video management functions:
 - From DSC output to Main Monitor
 - Image Save (save image at HDD by PC)
 - Color Keying (VGA data + image data)
 - Post Mapping (control image curve)
 - Dual Mode
 - Edge Enhancement

PCC Board

The PCC Board is similar to the motherboard used in a personal computer. The PCC acts as a central processing unit, performing further processing of the image data, including the generation of the image display to the screen. The PCC also serves as the main controller of the other boards and as the organizer of all of the image management functionality.

The PCC determines system functionality and coordinates the overall communication between the user and the system, which includes storing and saving images. The PCC communicates continually with the hard drive for operating parameters and hosts the following functions:

- USB
- Battery
- VGA

- 25 MHz system clock
- COM port
- LCD Interface
- PCI Interface
- Non-interlace to VGA conversion
- Non-interlace to interlace conversion
- Doppler sound

E-box Backplane

The Backplane (Motherboard) is the physical and functional “backbone” of the ultrasound engine. It is connected to the power supply, from which it receives DC operating voltages to distribute to the system components via a power bus and power cabling. The Backplane also provides control and signal interconnection between the system components via buses and signal cabling. The FE, BF, DSC, and PCC boards are all plugged into connectors on the Backplane.

Input/Output Panel

The I/O Panel at the rear of the system includes a circuit board that accomplishes the interconnection between system components and peripheral devices (see [Figure 11-5](#) for connection descriptions).

User Interface

The user interface comprises the controls, indicators, and output devices of the system.

The control panel (in conjunction with the monitor displays) is the primary operating interface with the ultrasound system. The footswitch, with freeze and display change functions, is an extension of the control panel.

The control panel consists of TGC slide pot controls, trackball, additional system control knobs and buttons, and a QWERTY keyboard. An internal interface PCB reads all of the control inputs, determines the function that has been selected, and transmits that information to the PCC for processing.

Hard Disk Drive (HDD)

The HDD, housed inside the system enclosure and connected to the PCC by an EIDE cable, contains the Linux embedded operating system, ultrasound application software, and COTS software. The HDD stores AP&I data and ultrasound images.

CD-RW

The CD-RW drive, housed in the system enclosure and connected to the PCC by an EIDE cable, is a removeable-media device used for image and report archiving and system upgrading.

Magneto-optical Disk (MOD) Drive

The MOD drive, an external device that connects to the PCC via one of the I/O panel USB connectors, is a removeable-media device used for image and report archiving.

Flash Memory Stick

The flash memory stick, an external device that connects to the PCC via one of the I/O panel USB connectors, is a removeable-media device used for image and report archiving.

5 Installation

Introduction

This section contains pre-installation and installation information for an FSE-install of the HD3 Ultrasound System. FSE installation consists of a pre-installation site check, uncrating and unpacking the system, physically installing the VCR or color printer if purchased, and verifying that the system is configured properly. Read this section completely before starting the system installation. The instructions in this section assume that the system language is set to English.

NOTE Some customers may be offered the option to install their own system. Customers electing to install their own system will be provided with an *HD3 Ultrasound System Installation User Guide*, which starts with the assumption that all pre-installation actions are complete, that the system and system accessories have been uncrated and unpacked, and that the system does not have the DICOM option enabled.

Installation Checklist

Use the following checklist to review what steps are necessary for proper system installation and to verify that you have performed them all.

- Perform a pre-installation site check (page 68)..... ☐
 - Check physical access for delivery and installation (page 68)..... ☐
 - Perform electrical and environmental checks (page 69)..... ☐
 - If applicable, gather site network (DICOM) information (page 69)..... ☐
- Uncrate and unpack the system (page 70)..... ☐
- Inspect the system (page 71)..... ☐
- Assemble the system (page 72)..... ☐
 - Install the peripherals (page 72)..... ☐

Install the system power cord (page 72).	<input type="checkbox"/>
Start up and configure the system (page 72).	<input type="checkbox"/>
Set or verify the institution name, user language, and time and date settings (page 73 through page 75).	<input type="checkbox"/>
Verify system options (page 76).	<input type="checkbox"/>
Configure the DICOM/connectivity network, if required (page 77).	<input type="checkbox"/>
Configure other system settings (optional) (page 87).	<input type="checkbox"/>
Prepare the peripherals (page 87).	<input type="checkbox"/>
Perform a system functional check (page 87).	<input type="checkbox"/>
Present the system (page 88).	<input type="checkbox"/>

Inspecting the Installation Site

Conduct an inspection of the site prior to system installation to ensure a trouble-free installation and to assist the customer in providing an environment that supports reliable performance of the system.

Checking Physical Access for Delivery and Installation

Check that the installation site is physically acceptable as follows:

- With the customer, evaluate site access for delivery. Consider the availability of a loading dock, elevators, ramps, and the width of passageways and doors.
- Verify that there is adequate space available for system uncrating and installation.
- At each location where the system will be operated, verify that there is enough space for the system and any external peripherals.
- Check adjacent rooms for activity and types of equipment that might negatively affect the ultrasound system.

Checking Electrical and Environmental Requirements

Gathering Site Network (DICOM) Information

Verify that the system is to be installed and operated in a room or rooms that meet the electrical and environmental requirements given in [Section 2, “System Specifications”](#).

If the system DICOM feature will be used, it will be necessary to have the following connectivity information before entering the DICOM settings as described in [“Configuring the DICOM Feature” on page 78](#).

NOTE If the system is to communicate over a network, the customer site network administrator must be available to supply configuration data.

The customer or their contractor shall install 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.

Determine and record the following network information for later DICOM configuration:

- Identify the system administrator (and backup person, if possible).
- 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, and so forth.
 - Locations of equipment.
 - Locations of all DICOM Connectivity 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.
- IP address, subnet mask, Port number, and DICOM AE Title for the HD3 system.
- IP Address, Port number, and AE Title for each DICOM server.
- Determine the type of network cabling installed.
- Identify OEM equipment installers and contact them regarding the installation.
- Check device compatibility prior to connecting new devices (such as, printers or archive devices) to the network.

Uncrating and Unpacking the System

Inspect the shipping container and uncrate the system as described in the following sections.

Inspecting the Crate

Inspect the shipping crate before unpacking the system:

- Examine the shipping crate for damage. Look for evidence that the crate was opened.
- Verify that the Shockwatch and Tiltwatch indicators on the outside of the carton have not been activated. If the indicators are red, report this fact to the carrier and to the Philips Ultrasound traffic department. Be sure to check the system for damage when it is uncrated.
- Report any damage or missing inventory to the carrier and to the Philips Ultrasound traffic department.

NOTE Before uncrating the system, ensure the area in front of the shipping crate ramp is clear for at least 2.74 m (9 ft). (The ramp is the front side and is labeled “OPEN THIS END.”)

Uncrating

Uncrate the system by following the instructions in [“Uncrating the HD3 Ultrasound System” on page 90](#). (Instructions for re-crating the system for shipment are provided in [Section 10, “Disassembly”](#).)

Inspecting the System

After the system is uncrated ([“Uncrating the HD3 Ultrasound System” on page 90](#)), conduct the following inspections. Report any damage or missing inventory to the carrier and to the Philips Ultrasound traffic department.

WARNING

Dangerous voltages are present inside the system. Do not install the system power cord or connect it to AC line voltage until correct line voltage has been verified, a thorough inspection of the system has been performed, and the system has been properly assembled.

► To inspect the system after uncrating

1. Inventory the shipment against the packing list.
2. Inspect the outside surfaces of the system, monitor, and peripherals for damage.
3. Unlatch and rotate the control panel to verify that proper left and right swivel and up/down movement.
4. Verify that the system rolls and turns smoothly on its casters.
5. Verify that proper caster brake and swivel operation.
6. Remove the system covers.
7. Remove any loose packing material, dust, or debris from the interior of the system.
8. Verify that there is good continuity between the power supply and system ground.

Assembling the System

Installing the Printers, VCR, and Footswitch

Assemble the HD3 system by installing the following components.

If the system is ordered with a B/W printer, it will come installed from the factory in the B/W printer bay ([Figure I-1](#)) .

If the system comes with a color printer or VCR, you will need to install it on the adjustable universal peripheral mounting plate, which is installed on the cart from the factory. Follow the color printer or VCR installation instructions ([“To install the color printer” on page 105](#), or [“To install the VCR” on page 111](#)).

If the system comes with a footswitch, you will need to connect it. Follow the footswitch installation instructions ([“To install the foot switch” on page 119](#)).

NOTE The peripherals come from the factory already configured with the Philips-recommended settings (refer to [“Peripheral Settings” on page 266](#)).

Installing the System Power Cord

After the system has been inspected and properly assembled, if the system power cord is not already installed, install the system power cord by following the instructions in [“To install the system power cord” on page 121](#).

Powering On and Configuring the System

When physical installation is complete, it is necessary and important to verify that the system is properly configured.

After the system has been inspected and properly assembled as instructed in this section, verify that the green AC Mains power switch ([Figure I1-6](#)) is in the off position (“O” label on rocker switch is pushed in) and then plug the system power cord into a proper AC outlet. Push the AC Mains power switch to the on position (“I” label on rocker switch is pushed in) and then press,

for approximately 3 seconds, the power On/Off button on the control panel to power on the system.

Basic initial configuration is addressed in the following sections. For detailed user information and instructions for configuring and operating the system, refer to the *HD3 Getting Started* manual.

Verifying the Local Settings

► To check or set the institution name

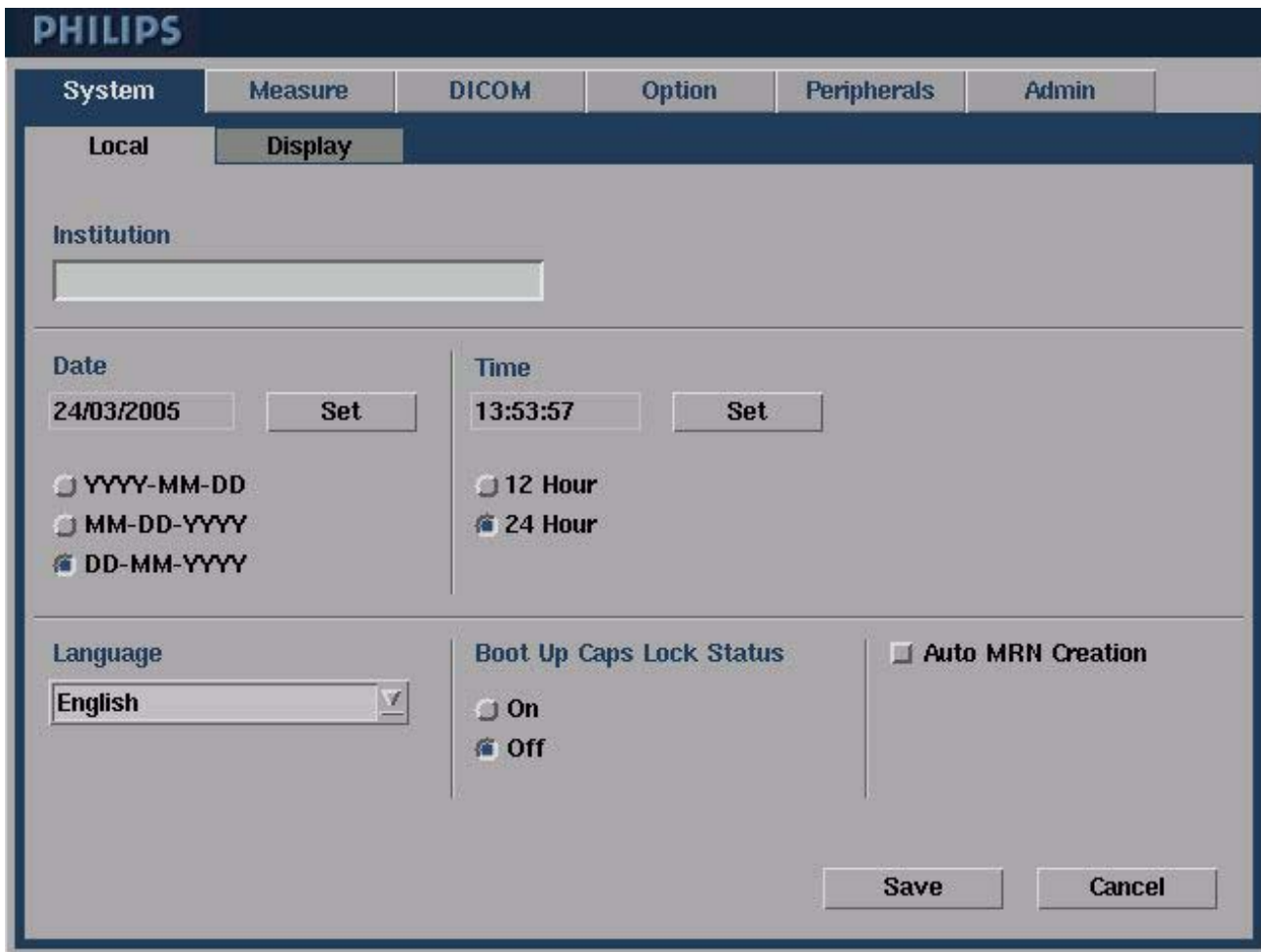
1. Press **Setup (F10)**.

The Setup window opens ([Figure 5-1](#)).

2. In the Setup window, click **Local**.

Type in, verify, or change the name of the institution.

At this (or a later time) you can also specify whether or not the Caps Lock setting is to be on or off at startup and whether or not to have the system automatically create a medical record number for new patients. See [“Configuring Other System Settings” on page 87](#).

Figure 5-1 Setup Window (System)

The screenshot shows the Philips Setup Window (System) interface. The window has a dark blue header with the Philips logo. Below the header is a tabbed interface with tabs for System, Measure, DICOM, Option, Peripherals, and Admin. The System tab is selected, and within it, the Local sub-tab is active, with the Display sub-tab also visible. The main content area is divided into several sections: Institution (with a text input field), Date (with a date input field showing 24/03/2005 and a Set button), Time (with a time input field showing 13:53:57 and a Set button), Language (with a dropdown menu showing English), Boot Up Caps Lock Status (with On and Off radio buttons), and Auto MRN Creation (with a checkbox). The bottom right corner contains Save and Cancel buttons.

PHILIPS

System Measure DICOM Option Peripherals Admin

Local Display

Institution

Date 24/03/2005 Set

Time 13:53:57 Set

☐ YYYY-MM-DD
☐ MM-DD-YYYY
☒ DD-MM-YYYY

☐ 12 Hour
☒ 24 Hour

Language English

Boot Up Caps Lock Status

☐ On
☒ Off

☐ Auto MRN Creation

Save Cancel

➤ **To verify or set the system time and date**

1. Press **Setup (F10)**.

The Setup window opens ([Figure 5-1](#)).

2. In the Setup window, click **Local**.
3. In the Date and Time segments, select the desired date and time format.
4. In either the Date or Time segment, click **Set**.

The Date and Time setup window opens.

5. In the Date and Time setup window, click the up or down arrows to specify the current year, month, day, hour, and minute.
6. Click **OK**.
7. Click **Save**.

➤ **To change the user interface language**

1. Press **Setup (F10)**.

The Setup window opens ([Figure 5-1](#)).

2. In the Setup window, click **Local**.
3. In the Language segment, select the desired language.

The selected language will not take effect until the system is rebooted.

Verifying the System Options

HD3 systems leave the factory with all available software options onboard. All purchased options are activated, those that haven't been purchased are not. Verify that the activated options are those that the customer ordered. You must have the correct authorization code (password) to activate system options in the field.

► To verify or activate system software options

1. Press **Setup**.

The Setup window opens ([Figure 5-1](#)).

2. Click the **Option** tab.

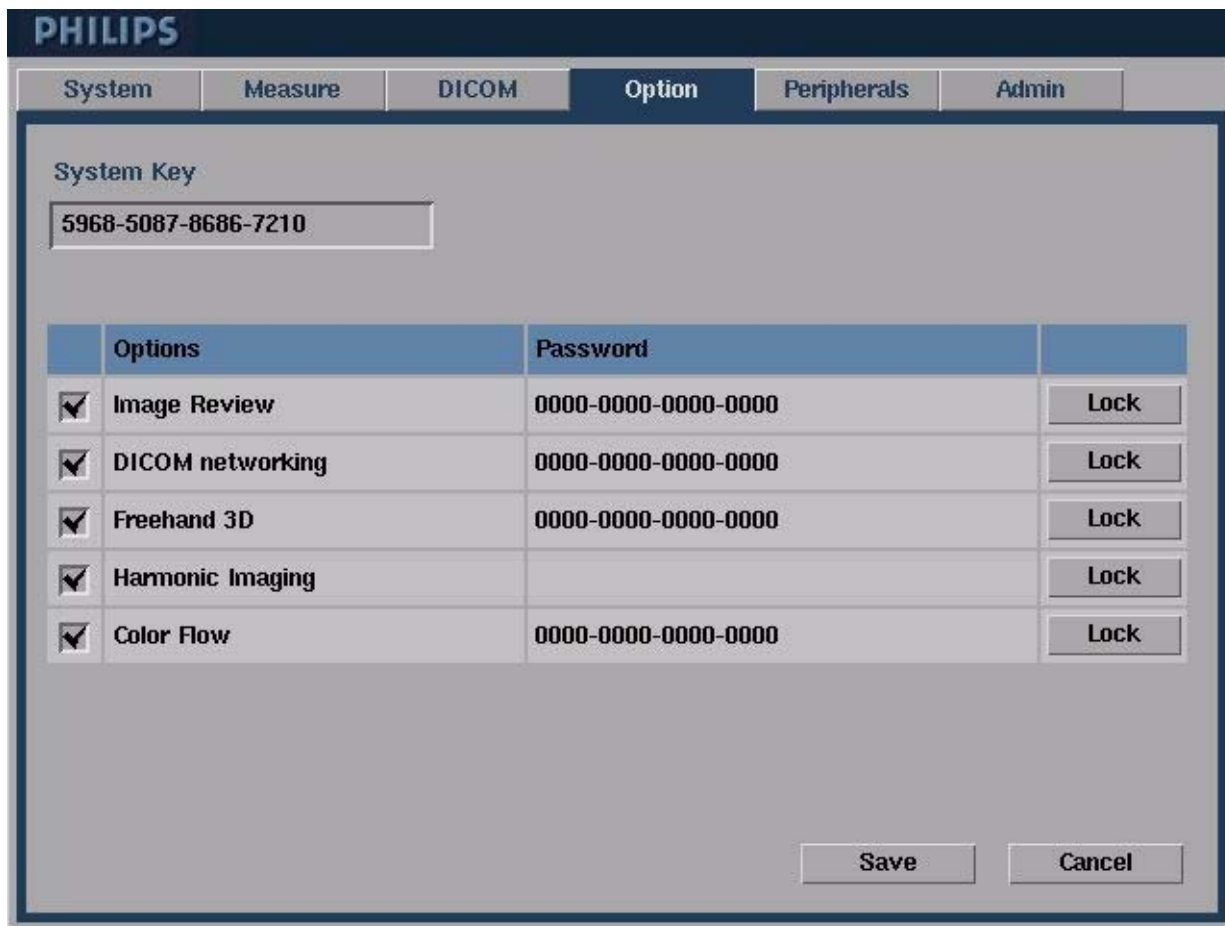
The Option setup window opens ([Figure 5-2](#)).

3. Option rows showing a checkmark and a **Lock** button, indicate that the option is active. Verify that these options correspond to those that the customer is entitled to according to the sales order.
4. Option rows without a checkmark and having an **Unlock** button, are not yet activated (option must be purchased to obtain an Unlock code from the factory). Perform the following to activate an option:
 - a. Click the corresponding **Unlock** button and enter the option code in the Unlock Code dialog box that opens. It is necessary to have the System Key (based on the hard drive identifier), from the top left corner of the Option window, when requesting option authorization codes).

CAUTION

If an incorrect password is entered and okayed, the available option becomes unavailable.

- b. Click **OK**.
- c. Click **Save**.

Figure 5-2 Setup Window (Option)

The screenshot shows the Philips Setup Window with the 'Option' tab selected. The window has a dark blue header with the Philips logo. Below the header is a tabbed interface with tabs for System, Measure, DICOM, Option, Peripherals, and Admin. The 'Option' tab is active, displaying a 'System Key' field with the value '5968-5087-8686-7210'. Below this is a table with five rows of options, each with a checked checkbox, a description, a password field, and a 'Lock' button. At the bottom right are 'Save' and 'Cancel' buttons.

	Options	Password	
<input checked="" type="checkbox"/>	Image Review	0000-0000-0000-0000	Lock
<input checked="" type="checkbox"/>	DICOM networking	0000-0000-0000-0000	Lock
<input checked="" type="checkbox"/>	Freehand 3D	0000-0000-0000-0000	Lock
<input checked="" type="checkbox"/>	Harmonic Imaging		Lock
<input checked="" type="checkbox"/>	Color Flow	0000-0000-0000-0000	Lock

Save Cancel

Configuring the DICOM Feature

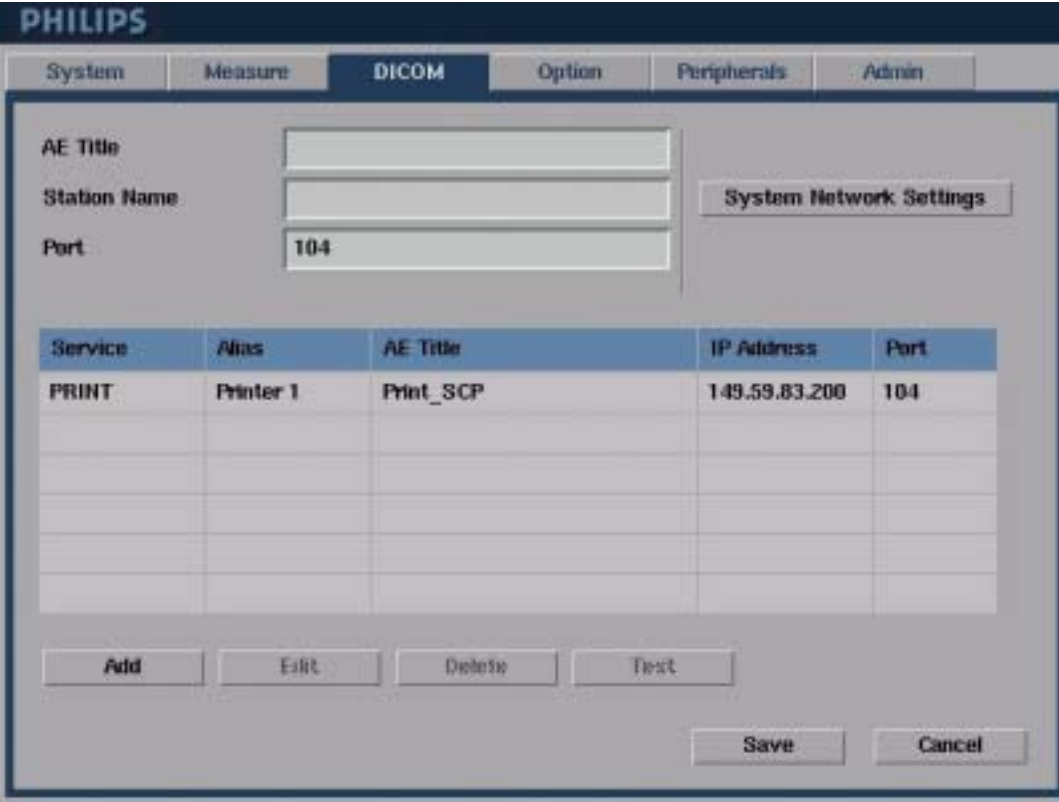
If the system you are installing has the DICOM option, you or the customer will need to configure the system DICOM feature. Since configuring the system for DICOM operation requires specific information from the customer network administrator (see [“Gathering Site Network \(DICOM\) Information” on page 69](#)), Philips recommends that you work with the customer to configure the DICOM feature with the specific values that need to be entered. At initial installation, refer the customer to the *HD3 Getting Started* manual, which has instructions for viewing, setting, or changing DICOM information and gives a description of each field in the "Glossary." The basic steps for initially configuring the system for DICOM communications over a network are as follows:

1. Enter the system DICOM parameters:
 - Enter the AE Title, Station Name, and Port number for the HD3 system ([page 78](#)).
 - Enter the network settings for the HD3 system ([page 80](#)).
2. Identify the DICOM storage devices (servers) that the system will use ([page 80](#)).
3. Identify the DICOM printers that the system will use ([page 80](#)).
4. After the DICOM feature has been configured, you may want to test the communication between the system and a server or a printer that was entered. ([page 83](#)).
5. Configure the DICOM Log file settings ([page 83](#)).

► To configure the system DICOM parameters

1. Press **Setup**.
The Setup window opens ([Figure 5-1](#)).
2. Click the **DICOM** tab.
The DICOM setup window opens ([Figure 5-3](#)).

3. Enter the AE Title, Station Name, and Port number for this HD3 system. You will need to re-boot the system in order for the AE Title change to take effect.

Figure 5-3**Setup Window (DICOM)**

The image shows the PHILIPS DICOM Setup Window. It has a title bar with the PHILIPS logo and a menu bar with tabs: System, Measure, DICOM (selected), Option, Peripherals, and Admin. Below the menu bar, there are three input fields: AE Title, Station Name, and Port. The Port field contains the value 104. To the right of these fields is a button labeled "System Network Settings". Below these fields is a table with five columns: Service, Alias, AE Title, IP Address, and Port. The table contains one row of data: PRINT, Printer 1, Print_SCP, 149.59.83.200, and 104. Below the table are four buttons: Add, Edit, Delete, and Test. At the bottom right are two buttons: Save and Cancel.

Service	Alias	AE Title	IP Address	Port
PRINT	Printer 1	Print_SCP	149.59.83.200	104

4. Click **System Network Settings**.

The System Network Settings window opens (Figure 5-4).

5. View or enter the Network properties for this HD3 in the corresponding fields. If you enter properties, click **Apply** when finished, otherwise click **Close**.

► **To identify the DICOM storage devices that the system will use**

1. Click **Add** in the DICOM setup window (Figure 5-3).

The Server Configuration window opens (Figure 5-5).

2. Select STORE from the **Service** menu.
3. Enter all of the parameters for the storage device.
4. Click **OK**.
5. Repeat [step 1](#) through [step 4](#) for each storage device the system will use.

NOTE You can configure multiple storage devices and printers, but the system will send only to the storage device and the printer selected.

► **To identify the DICOM printers that the system will use**

1. Click **Add** in the DICOM setup window (Figure 5-3).

The Server Configuration window opens (Figure 5-5).

2. Select PRINT from the **Service** menu.
3. Enter all of the parameters for the printer.
4. Click **OK**.
5. Repeat [step 1](#) through [step 4](#) for each storage device the system will use.

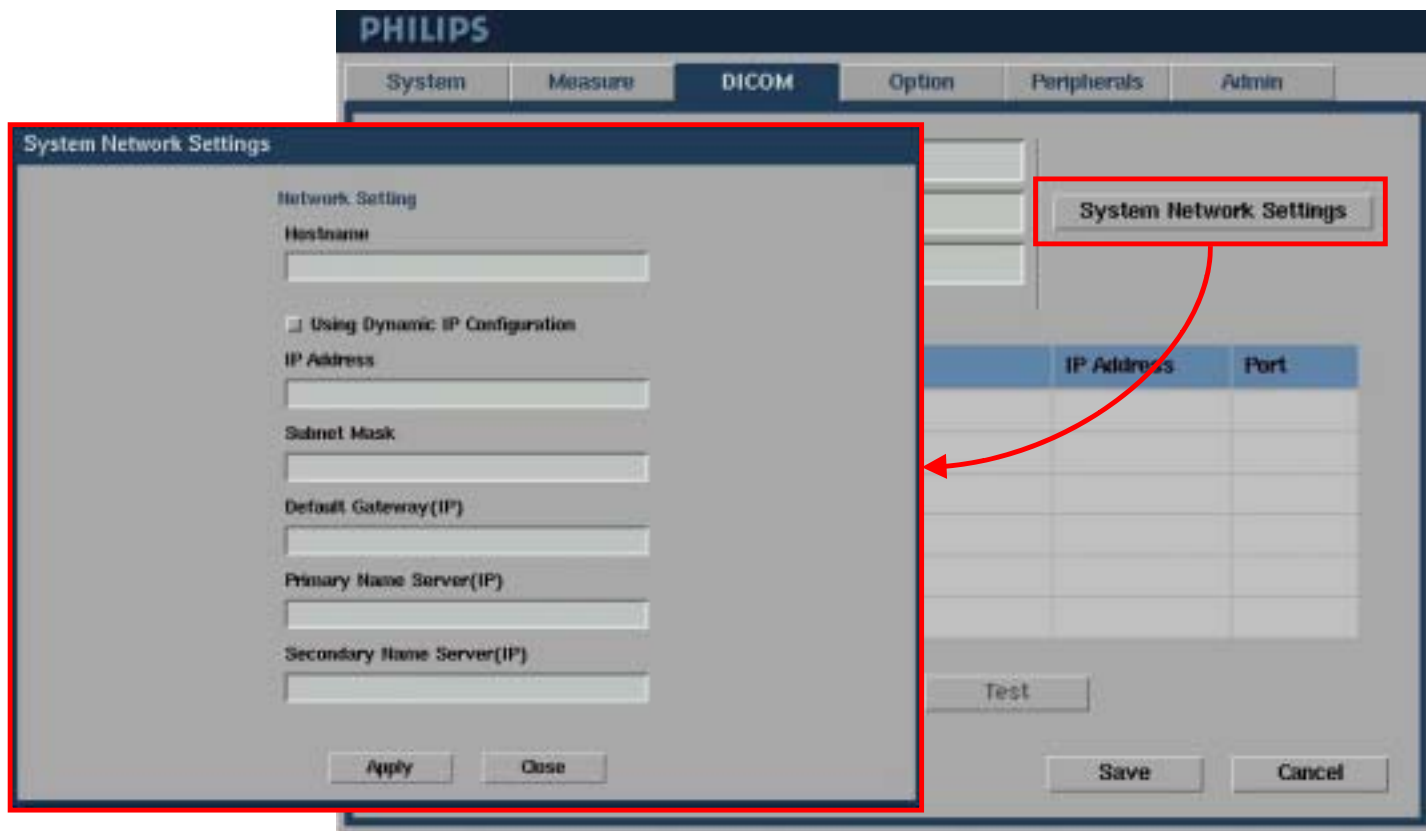
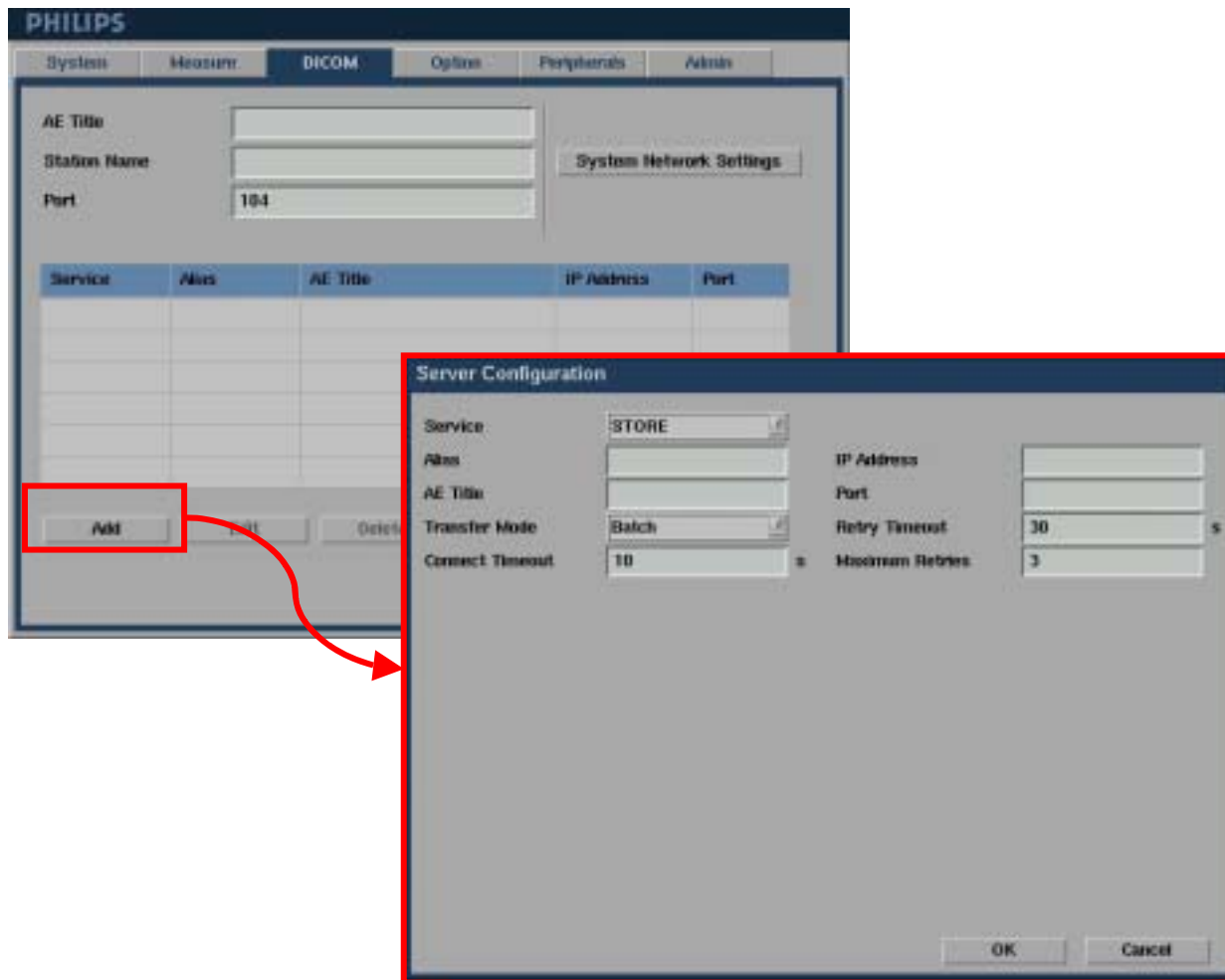
Figure 5-4 **System Network Settings Window (DICOM)**

Figure 5-5 Server Configuration Window (DICOM)

➤ **To test the communication between the system and a server or a printer**

1. Press **Setup**.

The Setup window opens (Figure 5-1).

2. Click the **DICOM** tab.

The DICOM setup window opens (Figure 5-3).

3. Highlight the device that you want to test.

4. Click **Test** to initiate a DICOM verify (“ping”) test signal from the system to the device.

The test will produce a results message similar to one of the examples shown in Figure 5-6.

➤ **To configure the DICOM Log file**

NOTE The defaults for the DICOM logging parameters are reasonable for most circumstances. Do not change the settings unless you have a specific troubleshooting need.

1. Press **Setup**.

The Setup window opens (Figure 5-1).

2. Click the **Admin** tab.

The Admin setup window opens (Figure 5-7).

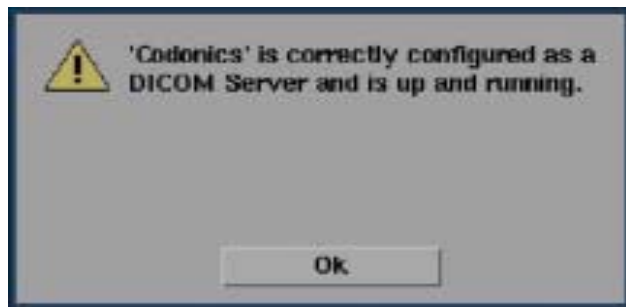
3. Click (DICOM Log) **Open**.

The DICOM Log window opens (Figure 5-8).

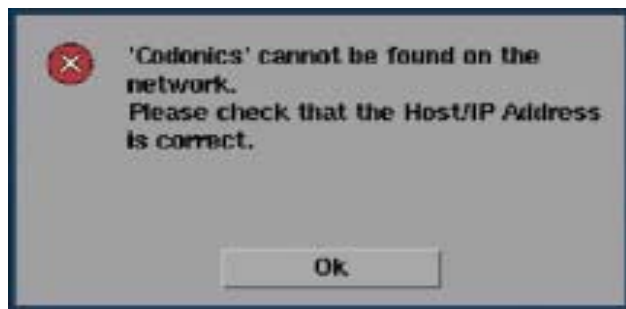
4. Enter the DICOM Log parameters and click **Close**.

5. Click **Save** on the the **Admin** tab.

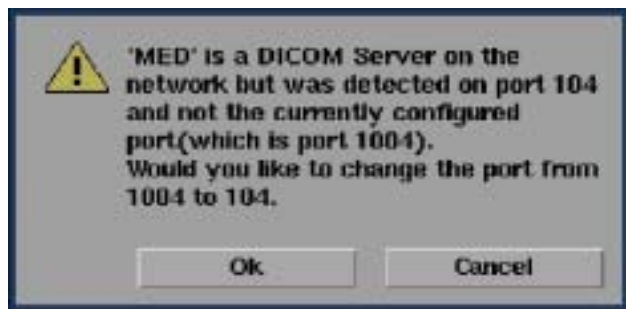
Figure 5-6 **DICOM Device Test Results Message Examples (DICOM)**



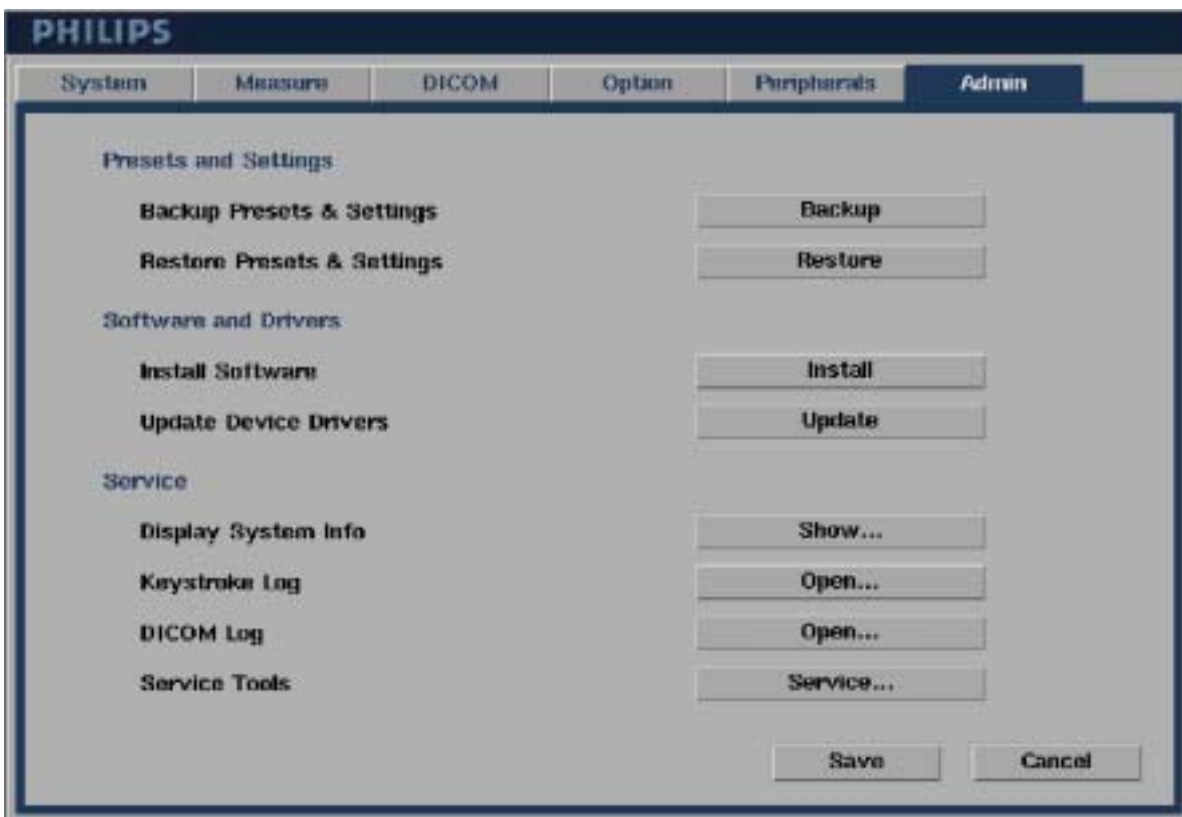
= Setup is correct



= Physical connection problem or wrong IP address



= Wrong port number

Figure 5-7 Setup Window (Admin)

Configuring Other System Settings

If appropriate for this installation, work with the customer and follow the respective instructions in the *HD3 Getting Started* manual to initially configure the system settings not yet set to the customer's preference. There are several categories of user setups:

- System
- Measure
- DICOM
- Option
- Peripherals
- Admin

► To configure other system settings

Refer to Section 6, “Customizing Your System,” in the *HD3 Getting Started* manual.

Preparing the Peripherals

As applies, correctly load paper and ribbon in the printers and insert a tape cassette in the VCR. Confirm that the system settings are appropriate for the installed peripherals.

NOTE HD3 peripherals are shipped and installed with their device settings set to the manufacturer's default values. Printer and VCR device settings can be checked as described in [“Peripheral Settings” on page 266](#).

Checking System Functionality

Verify system functionality using the information in [Section 6, “Performance Tests”](#). If system testing reveals any problems, troubleshoot, repair, and retest the system before presenting it to the customer for use.

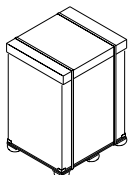
Presenting the System

When the system is ready, present it to the operators:

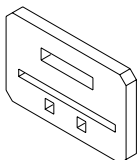
- Review the customer order with the customer to familiarize them with the system as purchased and its options.
- Review the “*Read This First*” section of the *HD3 Getting Started* manual with the customer. Show them the important safety and operating information that it contains and that it itemizes what user information has been provided for their system and peripherals.
- Review any Operating Notes with the customer.
- Show the operators how to turn the system and any external peripherals on and off. Explain the importance of letting the system shut down completely before disconnecting the power cord.
- Explain the importance of cycling the power at least once a week on systems that are left on permanently.
- Instruct the customer how to back up and restore presets. Make a backup disk of the customer’s presets and configurations, and store it where service staff and the customer can find it readily.
- Explain why it is important for them to never remove covers from the system because of ESD and warranty considerations.
- Review with the customer, procedures for placing service calls or calling for technical assistance.

Physical Installation Procedures

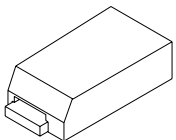
Figure 5-1 Installation Procedure List



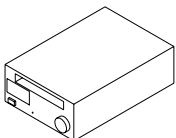
**Uncrating the HD3
Ultrasound System**



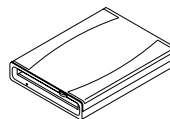
**Monitor Support
Shipping Foam**



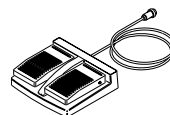
**Top-Mounted
Color Printer**



**Top-Mounted
VCR**



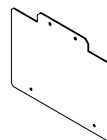
MOD Drive



Foot Switch



System Power Cord



**B/W Printer Plate
(No-Printer Systems)**

NOTE The numbers in the installation illustrations correspond to the steps in the installation procedure.

Uncrating the HD3 Ultrasound System

Figure 5-2 Cutting the Poly Strapping Bands

Poly strapping bands



► To uncrate the HD3 Ultrasound System

NOTES

- Instructions for re-crating the system for shipment are provided in Section, [“Disassembly \(Removal\) Procedures”](#).
- Estimated time to uncrate the system is 10 minutes.

- I. Remove (cut) the two poly strapping bands from around the corrugated container.

Figure 5-3 **Removing the Corrugated Top Cover**



2. Remove the top cover from the corrugated crate.

Figure 5-4 **Removing the Corrugated Wrap**



3. Remove the one-piece corrugated wrap by lifting it straight up and over the crate ramp.

Figure 5-5 **Removing the Ramp Bolts**



4. Remove the four bolts securing the ramp to the pallet.

Figure 5-6 **Placing the Ramp**

5



6



5. Lift the ramp off the pallet.
6. Turn the ramp around and place the ramp in front of the system with the beveled edge facing up.

Figure 5-7 **Removing the System Hold-down Brace**



7. Remove the hold-down brace securing the rear of the system.

Figure 5-8 **Removing the Wheel Chock**



8. Remove the wheel chock from the open (ramp side) of the crate.

Figure 5-9 **Rotating the Rear Casters**



9. Rotate the rear casters 180 degrees.

Figure 5-10 **Rolling the System Off the Pallet**



10. Ensure the ramp is properly aligned in front of the crate.
11. Unlock the front casters.
12. Lift the antistatic bag and position yourself on one side of the crate toward the front of the ultrasound system.
13. Grasp the control panel handle and carefully guide the system down the ramp and onto the floor.

Figure 5-1 I **Removing the Shipping Materials (Antistatic Bag and Monitor Support)**



14. Remove the antistatic bag.
15. Remove the foam monitor support by sliding it toward the front of the system and off the control panel.
16. Tilt the monitor up to its vertical position.

Figure 5-12 **Removing the Shipping Materials (Yoke Support)**



17. Engage the handle trigger and raise the control panel to its highest point.
18. Remove the foam yoke support from around the lift column.
19. Inspect the system as described in [“Inspecting the System” on page 71](#).
20. Dispose of the crate and packing materials properly.

NOTE Do NOT return the crate or packing materials to Philips.

Return to [Installation Procedure List](#).

Monitor Support Shipping Foam

Figure 5-13 Locking the Front Casters



► To install the monitor support shipping foam

NOTE The monitor support shipping foam is used to protect the video monitor from shake stress during transport of the HD3 system in vans or by other means of transportation.

- I. Lock both front casters by pressing down on each caster lock lever to prevent the system from moving while installing the foam shipping support.

Figure 5-14 **Tilting the Video Monitor**



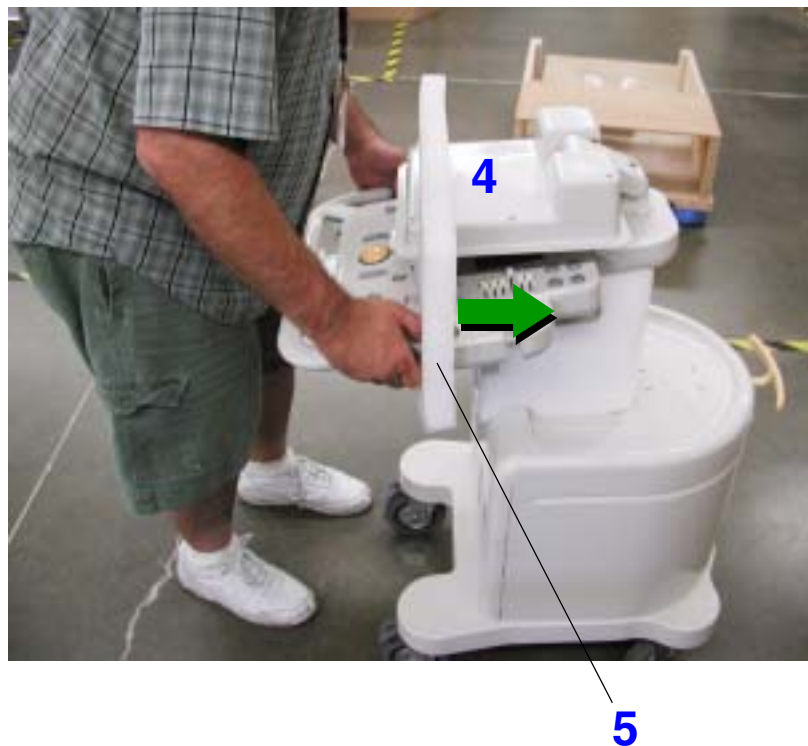
2. Grasp both sides of the video monitor and tilt it toward the front of the system until it is in a horizontal position above the control panel.

Figure 5-15 **Placing the Foam Monitor Support**



3. Carefully slide the foam monitor support over the control panel. Ensure that the opening in the foam for the monitor is at the top.

Figure 5-16 **Securing the Video Monitor**

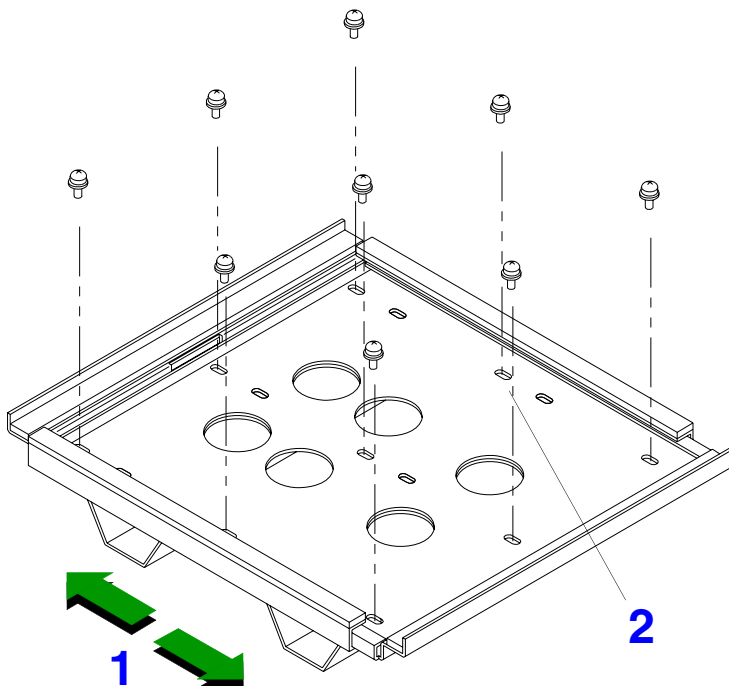


4. Align the video monitor with the cut-out in the foam support.
5. Slide the foam support further up the control panel allowing the monitor to slide through the upper cut-out.

Return to [Installation Procedure List](#).

Top-Mounted Color Printer

Figure 5-17 Adjusting the Universal Peripheral Mounting Plate for the Color Printer

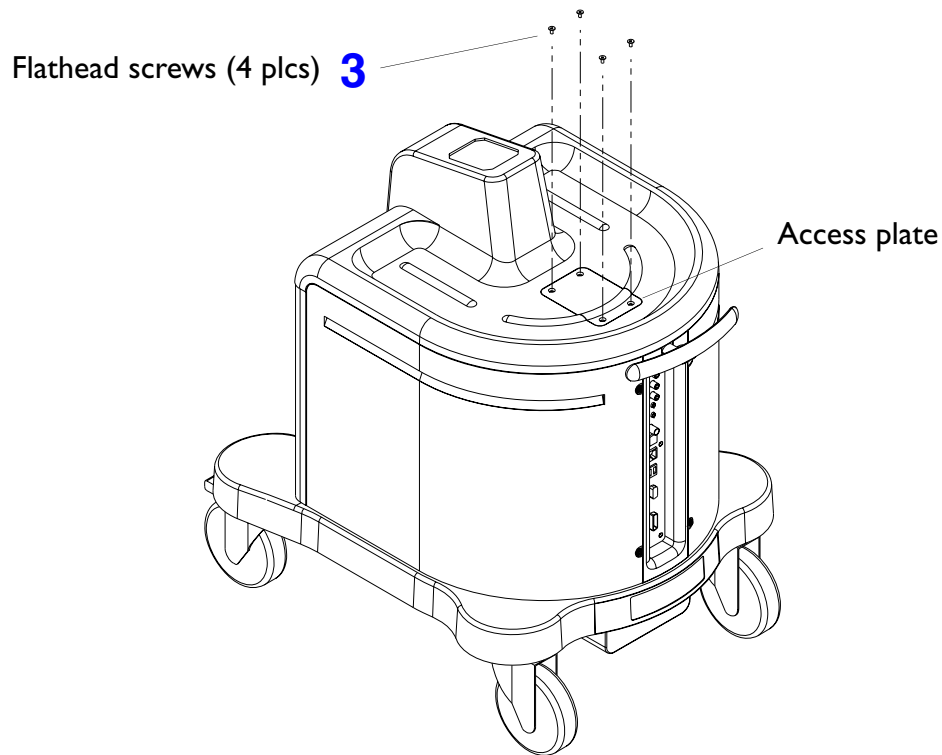


➤ To install the color printer

NOTE Perform [step 1](#) through [step 5](#) only if the peripheral mounting plate is not already installed and sized correctly.

1. Adjust the universal peripheral mounting plate to the correct size for the color printer.
2. Line-up the mounting holes so the screws fit through the proper holes shown.

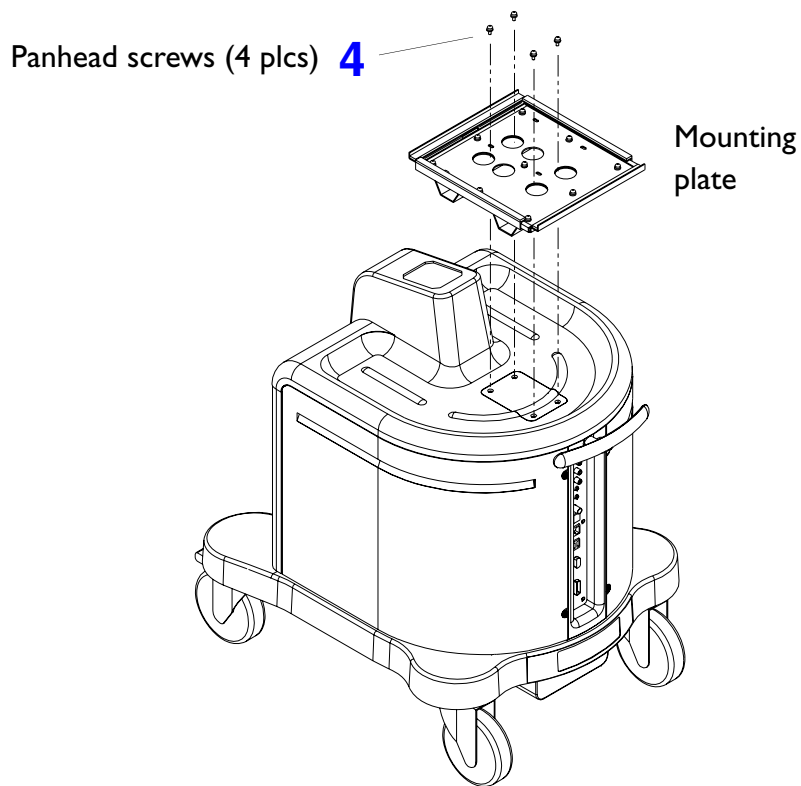
Figure 5-18 **Removing the Top Cover Access Plate Screws**



3. Remove the four screws securing the top cover access plate. Do not remove the plate.

Figure 5-19

Installing the Universal Peripheral Mounting Plate



4. Install the universal peripheral mounting plate to the HD3 system top cover using four screws.

Figure 5-20 **Installing the Mounting Strap on the
Universal Peripheral Mounting Plate**

Mounting strap **5**



5. Thread the mounting strap through the appropriate slots in the universal peripheral mounting plate.

Figure 5-21 **Placing and Strapping the Color Printer to the Universal Peripheral Mounting Plate**

6

Placement



7

Strapped



6. Decide which side you want the color printer to face and place it centered on the mounting plate.
7. Strap the color printer to the mounting plate, tighten the straps, and secure the straps with the Velcro end.

Figure 5-22 **Cabling the Color Printer to the HD3 System**



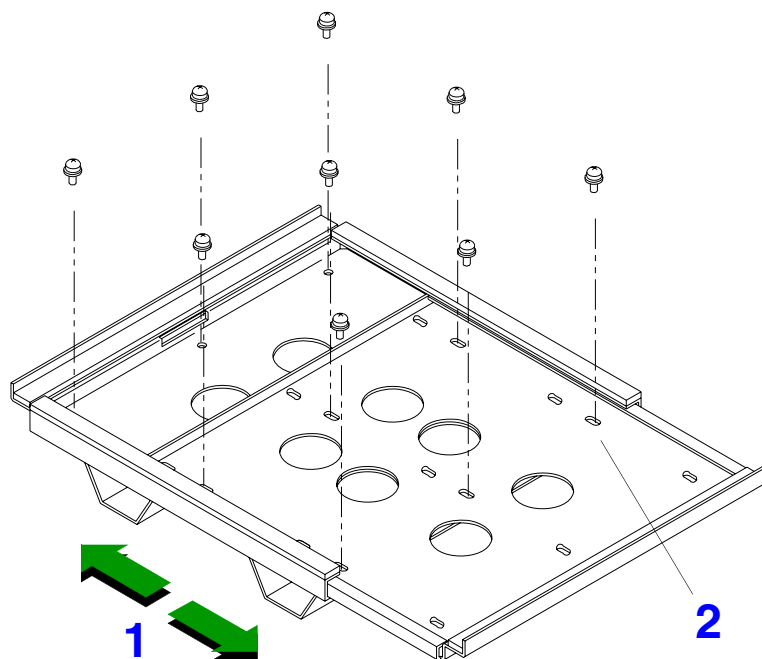
8. Install the color printer cables. Refer to [Figure 11-2](#) for the top-mounted color printer cabling diagram.

Return to [Installation Procedure List](#).

Top-Mounted VCR

Figure 5-23

Adjusting the Universal Peripheral Mounting Plate for the VCR

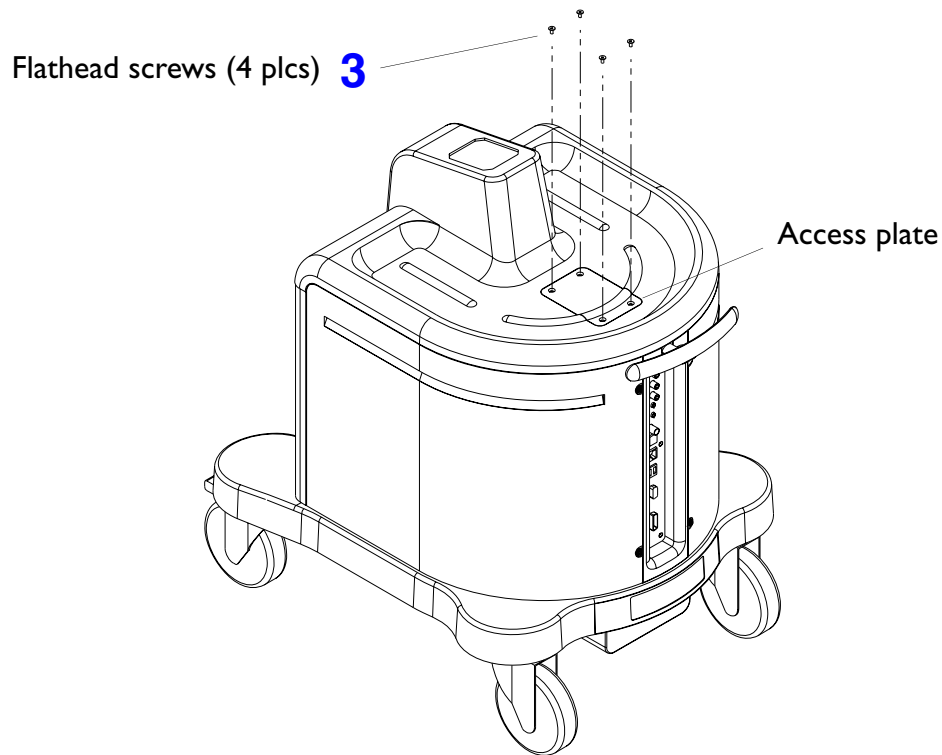


► To install the VCR

NOTE Perform [step 1](#) through [step 5](#) only if the peripheral mounting plate is not already installed and sized correctly.

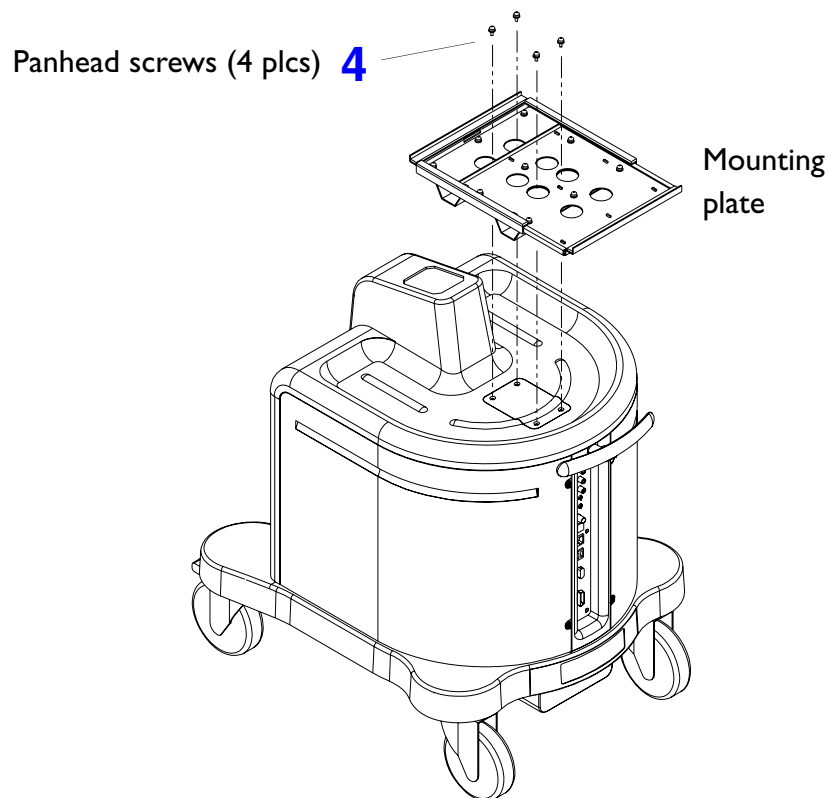
1. Adjust the universal peripheral mounting plate to the correct size for the VCR.
2. Line-up the mounting holes so the screws fit through the proper holes shown.

Figure 5-24 **Removing the Top Cover Access Plate Screws**



3. Remove the four screws securing the top cover access plate. Do not remove the plate.

Figure 5-25 **Installing the Universal Peripheral Mounting Plate**



4. Install the universal peripheral mounting plate to the HD3 system top cover using four screws.

Figure 5-26 **Installing the Mounting Strap on the
Universal Peripheral Mounting Plate**

Mounting strap **5**



5. Thread the mounting strap through the appropriate slots in the universal peripheral mounting plate.

Figure 5-27 **Placing and Strapping the VCR to the
Universal Peripheral Mounting Plate**

6

Placement



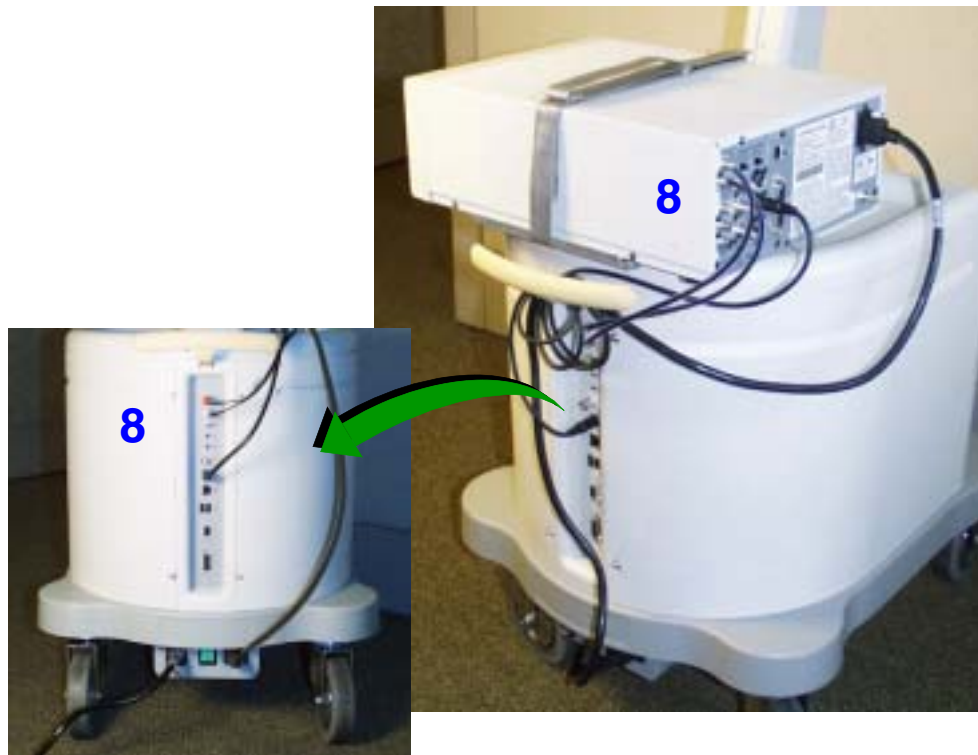
7

Strapped



6. Decide which side you want the VCR to face and place it centered on the mounting plate.
7. Strap the VCR to the mounting plate, tighten the straps, and secure the straps with the Velcro end.

Figure 5-28 **Cabling the VCR to the HD3 System**



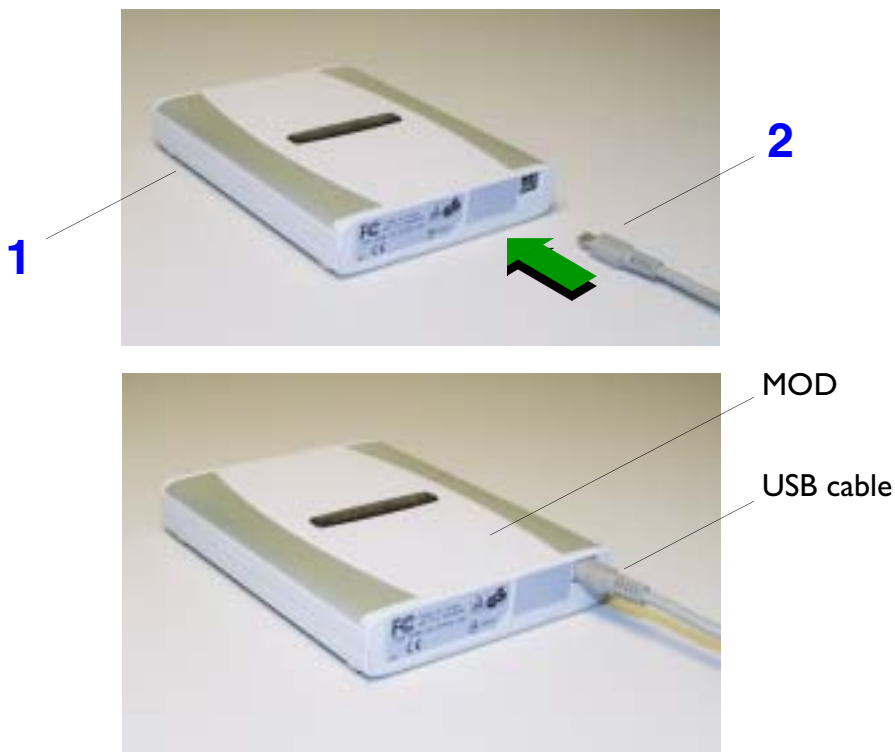
8. Install the VCR cables. Refer to [Figure 11-3](#) for the top-monuted VCR cabling diagram.

Return to [Installation Procedure List](#).

MOD Drive

Figure 5-29

Connecting the USB Cable to the MOD Drive



► To install the MOD drive

1. Place the MOD drive on the HD3 system in a place that is preferable for your use. It is recommended that the MOD drive be mounted on a horizontal surface. Attach it with the velcro strips supplied with the MOD drive.
2. Connect the small connector end of the USB cable to the USB port on the rear of the MOD drive.

Figure 5-30



USB cable

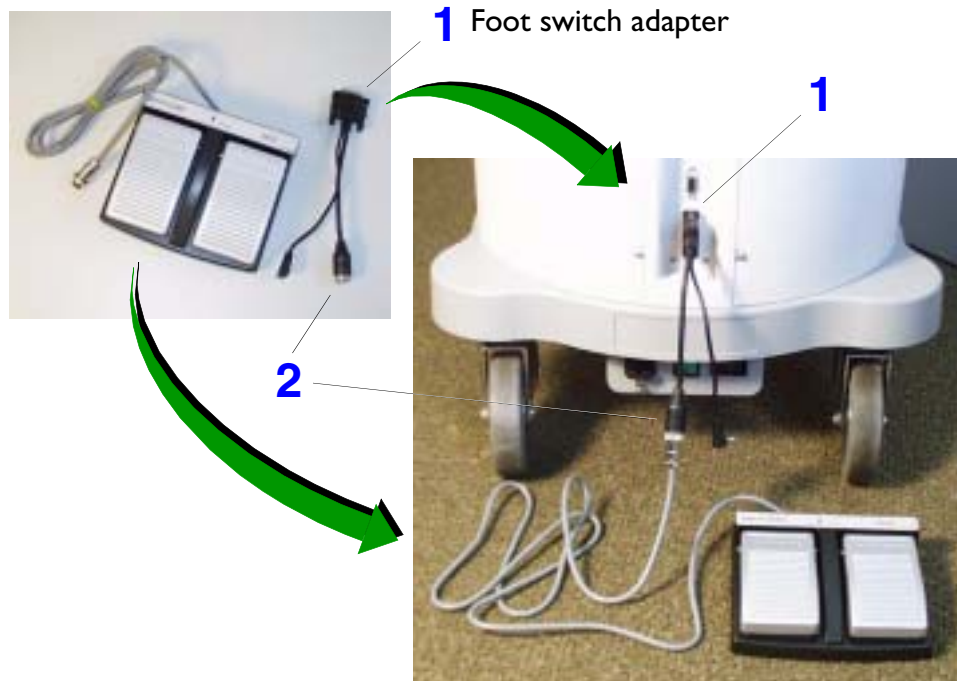
3 USB ports

- Return to [Installation Procedure List](#).

Foot Switch

Figure 5-31

Foot Switch Cabling



► To install the foot switch

1. Connect the foot switch adapter to the lower foot switch serial port on the Rear I/O panel.
2. Connect the foot switch adapter round connector to the foot switch assembly cable.

Figure 5-32 **Foot Switch Placement**



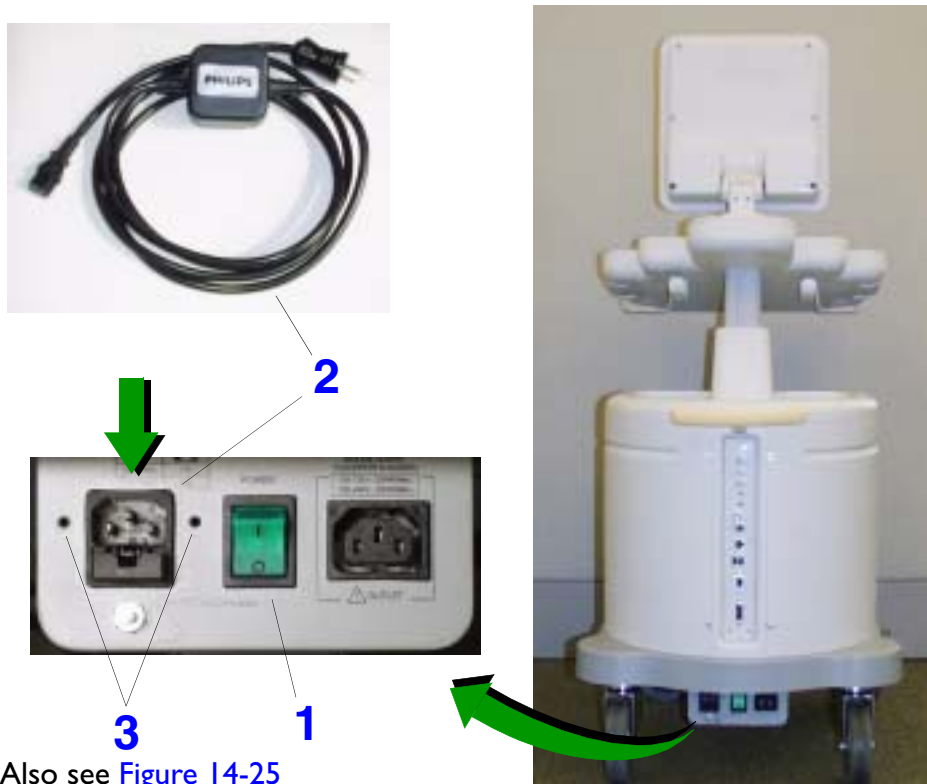
Front of system

3. Place the foot switch assembly in front of the system where suitable.

Return to [Installation Procedure List](#).

System Power Cord

Figure 5-33 Connecting the System Power Cord (Power Cord with Inline Filter)



Also see [Figure 14-25](#)

► To install the system power cord

For installing a power cord with an inline filter, see [Figure 5-33](#).

For installing a power cord with an additional inline filter power adapter cable, see [Figure 5-34](#).

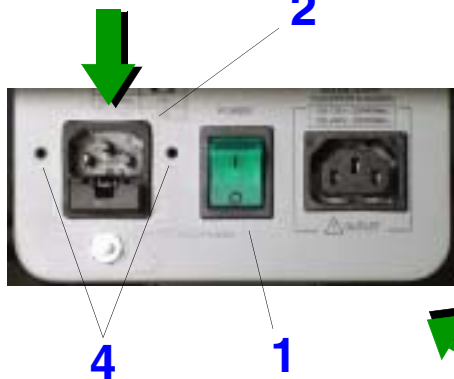
1. Verify that the AC Mains power switch is in the off position (down: "O" is pushed in).
2. Insert the system power cord that came supplied with the system into the power I/O box receptacle located at the lower rear of the system.
3. Install the power cord retainer bracket using two screws.
4. Connect the system power cord to the AC supply source.

Return to [Installation Procedure List](#).

Figure 5-34 Connecting the System Power Cord (Power cord with Separate Inline Filter Power Adapter)

“adapter with inline filter”
photo to be added here

power cord photo to be
added here



Also see [Figure 14-25](#)



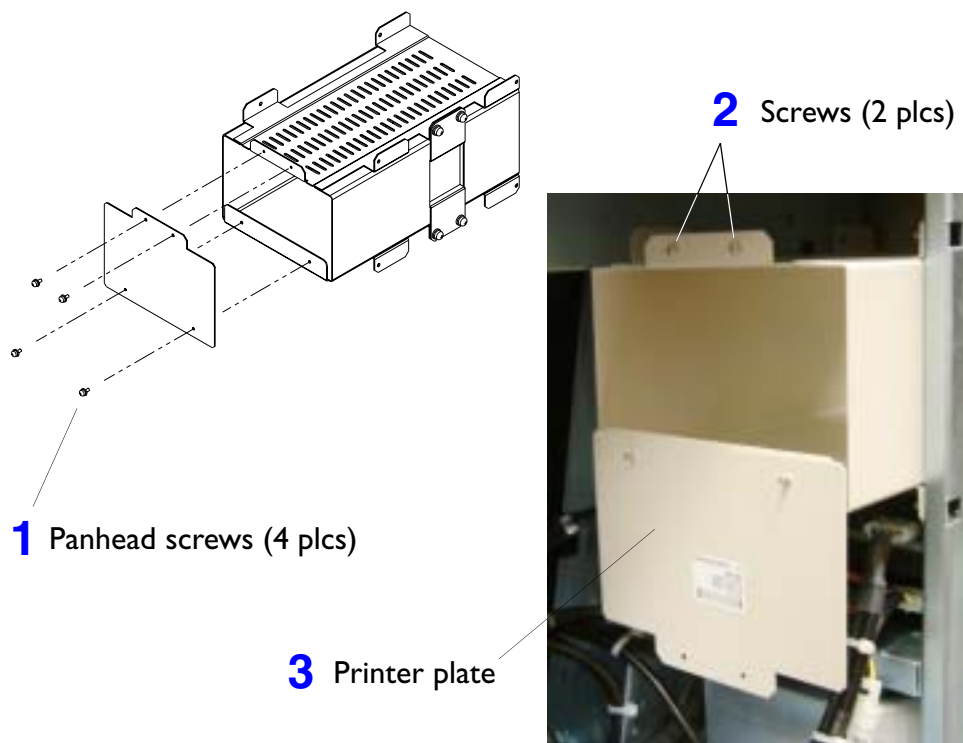
➤ **To install the system power cord**

1. Verify that the AC Mains power switch is in the off position (down: “O” is pushed in).
2. Insert the inline filter power adapter that came supplied with the system into the power I/O box receptacle located at the lower rear of the system.
3. Connect the system power cord to the inline filter power adapter.
4. Install the power cord retainer bracket using two screws.
5. Connect the system power cord to the AC supply source.

Return to [Installation Procedure List](#).

B/W Printer Plate (No-Printer Systems)

Figure 5-35 B/W Printer Plate Storage



NOTE Most HD3 systems will be delivered with a B/W printer installed. Use these instructions if a B/W printer needs to be installed and you don't have the upgrade instructions.

1. Remove the four screws securing the printer plate at the back of the printer bay.
2. Replace the two screws to the top of the printer bay.
3. Turn the plate upside-down and remount it to the printer bay so that it hangs below the bay and allows access for cabling the B/W printer. Install the two remaining plate screws from inside the printer bay.

Refer to [Figure 11-1](#) for B/W printer cabling diagram.

Return to [Installation Procedure List](#).

6 Performance Tests

Introduction

This section calls for examinations that determine functional confidence and ensure that the system is operating as intended at initial installation and after upgrades or repairs.

The goal here is to verify system functionality. If system testing reveals any problems, troubleshoot, repair, and retest the system before presenting it to the customer for use.

Warnings and Cautions

Review [Section 3, "Safety"](#) before continuing. Also follow any additional warnings and cautions contained in this section.

Visual Inspection for Mechanical Integrity

At initial installation and after upgrades or repairs, inspect the systemcart, controls, cables, power cord, connectors, and transducers for outward signs of wear or physical damage that would suggest the system may not be able to function correctly and safely:

- Check the system for abnormalities or conditions that do not meet as-manufactured specifications.
- Ensure mechanical moving parts are functional and operate correctly:
 - Caster wheels all roll smoothly, both front wheel brakes lock.
 - User Interface Control Panel up/down movement can be actuated via the front handle latch mechanism. Movement in both directions is smooth.
 - The moveable controls operate smoothly.
 - Video Monitor can be tilted up or down and with the neck assembly can be rotated left and right or up/down while being able to hold position without sagging when the desired adjustment is completed.

System Functionality

Operate the system as Philips intended (refer to the *HD3 Getting Started* manual as required) all the time observing and verifying that the following is true while checking system modalities and basic operations:

Ongoing Observations

- The image is correctly positioned on the video display.
- The indicators and backlighting associated with the controls on the control panel indicate correctly.
- The system responds correctly to all controls, including the foot switch if applicable.

System Modalities and Basic Operations to Check

- Every HD3 transducer purchased for the system can be connected and initialized in both transducer ports.
- 2D
- Color
- CPA
- PW Doppler
- M-mode
- 3D
- Connectivity
- Review
- Annotations
- Body Markers
- Analysis

- Peripherals
 - The image printers, if installed, make a print of the system screen: Print images are correctly positioned horizontally and vertically and contain all the information being displayed on the system monitor. The color of the printed image, if applicable, is accurate.
 - The VCR, if installed, records clear video and audio (check by playing back on a review station).
 - The report printer, if installed, prints and that all report information is present and legible.
- Image and patient data transfer to removeable media
- DICOM print and export (send)

Electrical Safety

Perform these tests after any service or maintenance to detect abnormalities that could prove dangerous to a patient or operator and to assure that system safety and functions have not been compromised:

NOTE No safety testing of the system is needed upon installation. Also, the system power supply is a self-contained unit that is safety-tested by its manufacturer, so no safety testing is needed when the power supply or system power cord is replaced. Safety testing need only be performed during the yearly Preventive Maintenance.

- The Chassis to Ground Resistance test checks the entire system for electrical resistance between the chassis and ground. See [“Chassis to Ground Resistance Test” on page 127.](#)
- The Ground Wire Leakage Current test checks the entire system for leakage on ground leads. See [“Ground Wire Leakage Current Test” on page 129.](#)

- The Transducer Leakage Current test checks a transducer for electrical leakage while it is connected to the ultrasound system. The system sends normal operating voltages to the transducer, which is tested for leakage. See [“To test transducer leakage current” on page 133](#).
- The Transducer Isolation Leakage Current test applies AC mains voltage to the leads to check a transducer for electrical leakage. See [“Transducer Isolation Leakage Current Test” on page 134](#).

The limits referenced in these tests are prescribed by UL, CSA, and IEC. Local regulations may require additional tests.

Chassis to Ground Resistance Test

This test checks the entire system for electrical resistance between the chassis and ground. [Figure 6-1](#) shows the basic electrical concept of the ground resistance test. Use a safety analyzer and complete [“To test the system for resistance between chassis and ground” on page 129](#).

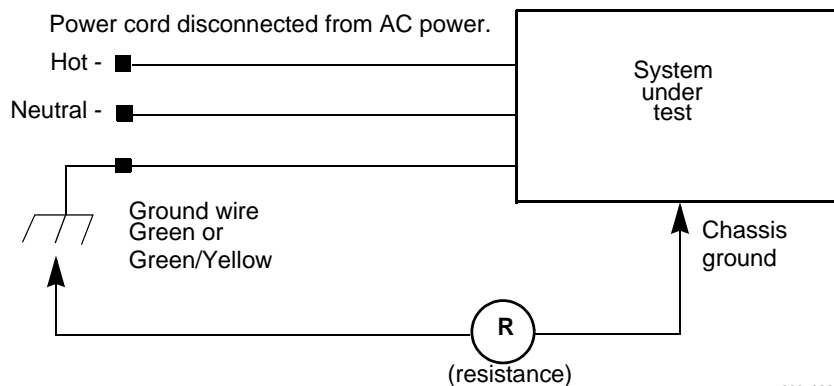
WARNING

Some users routinely perform a safety-earth or ground-bonding test at currents in excess of 10 A. Test currents in excess of 1 A will likely exceed the impedance limit specification, and can damage the RFI protection finger contacts. Exposed metal on the transducer assembly, including the connector, are for RFI and are not safety grounds.

CAUTION

Do not use automated test equipment that will interrupt power to the ultrasound system without allowing the user to power down normally. Interrupting the system power while the system is powered-on can result in corrupted files and could render the system inoperative.

Figure 6-1 Chassis to Ground Resistance Test Diagram



300e036

LIMIT: UL, CSA and IEC: $R = 200$ milliohms maximum

➤ **To test the system for resistance between chassis and ground**

1. Inspect the power cord for cracks and wear.
2. Set the mode on the analyzer to measure resistance in the power cord.
3. Plug the analyzer into an available AC wall outlet. Plug the ultrasound system power plug into the test receptacle on the analyzer.
4. Make the appropriate connections between the analyzer and the ground lug on the ultrasound system's I/O panel.
5. Read chassis ground resistance in milliohms. Flex the ultrasound power cord during the test to detect intermittent changes in resistance value.
6. Record the highest resistance value measured in [step 5](#). Check that the highest resistance value is within the limit specified in [Figure 6-1](#). If the reading exceeds the specified limit, check the power cord and the associated primary wiring.

A comprehensive ground impedance measurement can be performed using the safety analyzer. The impedance test drives a load current through the ground wire while measuring the AC voltage drop across the entire length of the power cord and to the system chassis. The reading will be in milliohms.

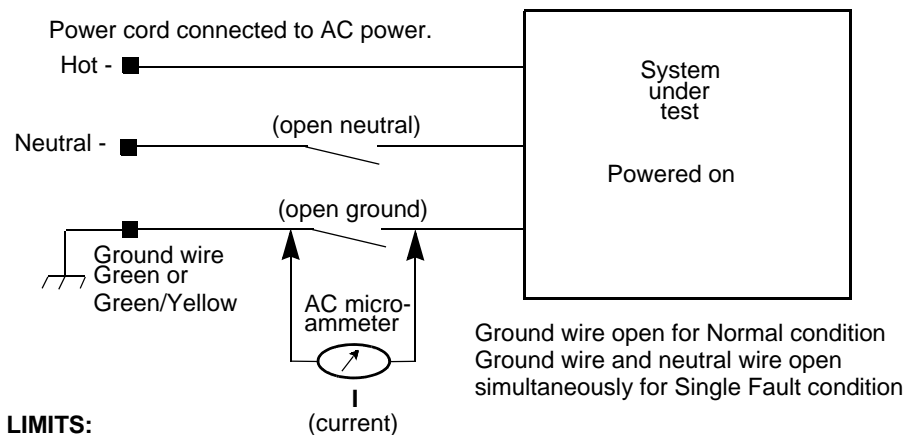
This test checks the entire system for leakage on chassis ground wires. [Figure 6-2](#) shows the basic electrical concept of the test. Use a safety analyzer and complete [“To test the system ground wiring for leakage” on page 131](#).

Ground Wire Leakage Current Test

WARNING

This test can be hazardous. Avoid any contact with line voltage. Any time during the test that the ground connection is open, do not touch the chassis or the patient cable.

Figure 6-2 Ground Wire Leakage Current Test Diagram



LIMITS:

UL: $I = 300$ microamperes Normal condition,
1000 microamperes Single Fault condition

CSA and IEC: $I = 500$ microamperes Normal condition,
1000 microamperes Single Fault condition

7ASW025

➤ **To test the system ground wiring for leakage**

1. Set the mode on the analyzer to detect leakage.
2. Plug the analyzer into an available wall outlet. Plug the ultrasound system power plug into the test receptacle on the analyzer. Turn on the ultrasound system's power by starting the internal PC.
3. Take ground wire leakage current measurements in an open ground condition, with both normal and reverse polarity. Record the highest value, and compare it to the limit specified for Normal condition in [Figure 6-2](#).
4. Take ground wire leakage current measurements in an open ground and open neutral condition, with both normal and reverse polarity. Record the highest value, and compare it to the limit specified for Single Fault condition in [Figure 6-2](#).

A reading higher than acceptable limits can indicate a problem with the power cord, with its associated connections, or with the power transformer.

Transducer Tests

This section describes two electrical leakage current tests for transducers. To ensure patient safety, it is very important to verify the integrity of the insulating layers of all transducers.

When you perform the safety tests, use saline solution in a container as a conductive medium. The solution penetrates any cracks or holes in the transducer insulation and provides an electrical path between the submerged lead wire and the inner transducer shield.

The following tools are required for these transducer safety tests:

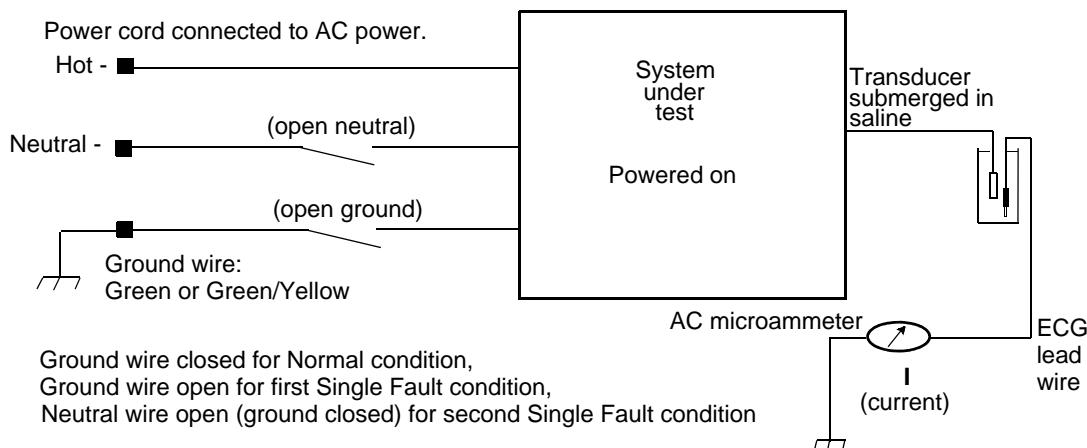
- Safety analyzer
- Saline holder
- ECG lead wire
- Saline solution. If saline is not available, mix 27 grams of table salt in 3 liters of tap water.

Transducer Leakage Current Test (Source)

This test checks a transducer for electrical leakage while it is connected to the ultrasound system. The system sends normal operating voltages to the transducer, and leakage is measured using a safety analyzer. [Figure 6-3](#) shows the basic electrical concept of the Transducer Leakage Current test. Complete the procedure “[To test transducer leakage current](#)” on [page 133](#).

Figure 6-3

Transducer Leakage Current Test Diagram



LIMITS: UL, IEC, and CSA:



For type transducers:

I = 10 microamperes Normal condition,
50 microamperes Single Fault condition



For type transducers:

I = 100 microamperes Normal condition,
500 microamperes Single Fault condition

➤ **To test transducer leakage current**

1. Set the analyzer mode to test ECG leads.
2. Plug the analyzer into an available AC wall outlet. Plug the ultrasound system power plug into the test receptacle on the analyzer.
3. Turn on the ultrasound system.
4. Plug the transducer to be tested into the ultrasound system. Connect an ECG lead wire to the appropriate jack on the analyzer.
5. Fill a test container with enough saline to completely cover the appropriate parts of the transducer. Insert the exposed end of the ECG lead into the saline, and carefully insert the transducer. For transthoracic and endocavity transducers, submerge the head and 5 cm (2 in) of the cable. Be careful not to submerge the connector.
6. Set the analyzer to read leakage current in microamperes.
7. Read the current in both normal and reverse polarity, and record the highest value. Check that the highest value is within the limit specified for Normal condition in [Figure 6-3](#). (Match the transducer type symbol on the transducer connector or cable with the symbol in the figure.)
8. Read the current with an open ground condition imposed, in both normal and reverse polarity. Write down the highest value; this is the value for the first Single Fault condition.
9. Read the current with an open neutral condition imposed, in both normal and reverse polarity. Write down the highest value; this is the value for the second Single Fault condition.

10. Check that the highest current value measured in [step 8](#) and [step 9](#) is within the limit specified for Single Fault condition in [Figure 6-3](#). Values exceeding the limits may indicate a fault in the transducer housing or the cable sheath. To locate a fault precisely, repeat the measurement while slowly inserting the transducer into the saline. The aberrant reading appears when the fault in the cable enters the saline.

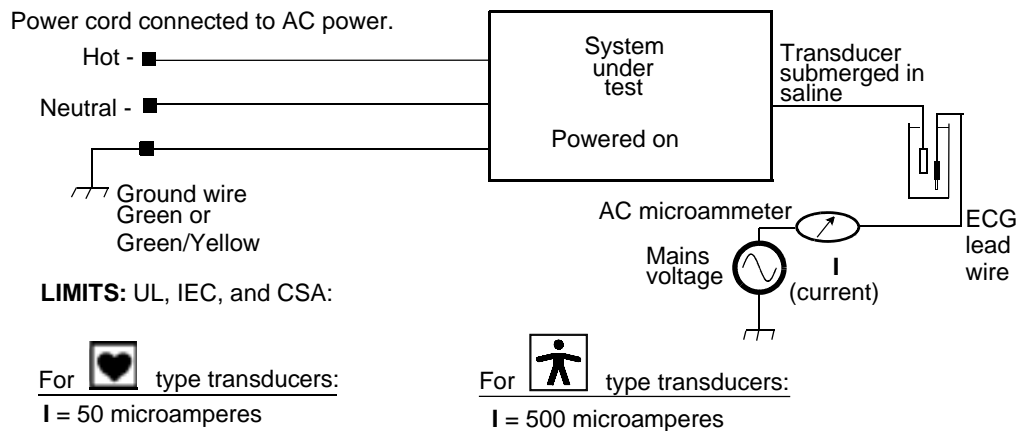
NOTE Endocavity transducers have a grounded jacket just under the outer plastic skin of the cable. Their leakage currents can measure within the specified limits even if there is a fault in the outer skin. [Step 11](#) tests for this condition.

11. In normal polarity with an open ground condition imposed, measure ground wire leakage (see [“Ground Wire Leakage Current Test”](#) on [page 129](#)). Compare this to the highest value for transducer leakage current, Single Fault condition obtained in [step 10](#). If the transducer leakage is greater than 80% of the chassis leakage, there is a fault in the transducer. To locate the fault, slowly insert the transducer in the saline, as in [step 10](#).

Transducer Isolation Leakage Current Test

[Figure 6-4](#) shows the basic electrical concept of the Transducer Isolation Leakage Current test. The transducer is submerged in a container of saline solution. AC Mains voltage is introduced into the saline solution, and leakage current in the transducer is measured using a safety analyzer. Complete the procedure [“To test transducer isolation leakage current”](#) on [page 136](#).

Figure 6-4 Transducer Isolation Leakage Current Test Diagram



1101e30

Transducer Isolation Leakage Current Test Procedure

WARNING

This test is hazardous. It applies line voltage to the ECG and transducer cables. Avoid accidental contact with the line voltage. Do not touch the chassis or the ECG or transducer cables while performing the test. Keep the ECG and transducer cables at least 20 cm (8 in) from any grounded or conductive surfaces.

► To test transducer isolation leakage current

NOTE During this test, select only *normal* polarity. Do *not* impose open ground or open neutral conditions.

1. Set the analyzer to test ECG.
2. Plug the analyzer into an available AC wall outlet. Plug the ultrasound system power plug into the test receptacle on the analyzer.
3. Turn on the ultrasound system.
4. Plug the transducer to be tested into the ultrasound system.
5. Fill a test container with enough saline to completely cover the appropriate parts of the transducer.
6. Insert the exposed end of the ECG lead wire into the saline, and then carefully insert the transducer. For transthoracic and endocavity transducers, submerge the head and 5 cm (1.96 in) of the cable. Be careful not to submerge the connector.
7. Measure the isolation leakage current of the transducer. Record the value, and check that it is within the limit specified in [Figure 6-4](#).

7 Adjustments

Introduction

This section contains information for adjusting the system monitor. Except for the monitor, there are no other calibration or alignment adjustments to make in the field for this system. There are no voltage adjustments to make in the field for this system.

Adjusting the Monitor

You can adjust the brightness of the monitor image to compensate for ambient light.

The only monitor adjustment is the video brightness, there are no adjustments for contrast, brightness range, or contrast range. Use the brightness controls on the control panel to set the brightness.

► To adjust the monitor brightness

Do either of the following to adjust the brightness:

- To increase the brightness, press **F12**.
- To decrease the brightness, press **F11**.

Positioning the Monitor

You can adjust the position of the monitor to suit different operating positions and operator heights. The monitor can be tilted up and down, swiveled left and right. To position the monitor, grasp it by the sides and adjust the tilt and swivel to suit the operator.

8 Preventive Maintenance

Introduction

This section identifies activities supporting the quality assurance audit (QAA) concept that you should perform in accordance with Customer Field Service policies and schedules. Refer to the *HD3 Getting Started* manual for additional information on the general care and preventive maintenance of the HD3 system. QAA activities include, but are not necessarily limited to, the following types of concerns:

- System Mechanical Integrity
- System Performance
- System Electrical Safety
- System Cleaning

See [Section 6, “Performance Tests”](#) for information about checking mechanical integrity, system performance, and electrical safety.

Warnings and Cautions

Review [Section 3, “Safety”](#) before continuing. Also follow any additional warnings and cautions contained in this section.

Cleaning

Clean the system components and peripherals as circumstances or Customer Field Service policies and schedules require.

CAUTION

To avoid damaging the system, do not use acetone, methyl ethyl ketone (MEK), paint thinner, or other strong solvents to clean plastic surfaces.

Exterior and Interior Assemblies

Use a vacuum cleaner, compressed air, or soft-bristle brush to remove any lint and dust from the airflow passages and components associated with the fan assemblies, PCBs, and any other system components and peripherals that may have accumulated dust or dirt. Use mild, nonabrasive, standard computer-cleaning products to clean the monitor, keyboard, system, and peripheral surfaces.

CAUTION

When cleaning the system keyboard and monitor, take care not to get any solution inside the housings. Also, take care not to scratch the face of the monitor while cleaning it.

Trackball

Clean or replace the trackball as its condition warrants.

► To clean the trackball

1. Unscrew and remove the bezel that surrounds the trackball on the system control panel.
2. Push the trackball up from the underside of the control panel to remove it.
3. Clean the trackball with an alcohol-dampened pad.
4. Clean the two encoder shafts and the bearing surface with an alcohol-dampened pad.
5. Reinstall the trackball and bezel.

Transducers

Refer to the *HD3 Getting Started* manual for information on the general care, handling, cleaning, and storing of Philips transducers for the HD3 ultrasound system.

Exterior Surfaces

Use a rag with mild soap and water to clean exterior surfaces, including those on the system, monitor, and peripherals. Also clean the control panel and knobs. Ink or stubborn stains should be removed with rubbing alcohol or a stronger detergent and immediately washed with mild, soapy water.

9 Troubleshooting

Introduction

This section provides information about the following topics:

- Troubleshooting ([page 141](#))
- Backing up and restoring system information ([page 151](#))
- Loading application and device driver software ([page 151](#))
- Managing system options ([page 151](#))
- Viewing system information and logs ([page 152](#))

Warnings and Cautions

Review [Section 3, “Safety”](#) before continuing. Also follow any additional warnings and cautions contained in this section. Before taking any action that might cause data to be lost, back up data as described in [“Backing Up and Restoring” on page 151](#).

All Trouble-shooting Starts Here

Reviewing and applying the following basic guidelines can produce effective troubleshooting and responsible call resolution. Even an experienced and successful troubleshooter who can solve problems without stepping through the Effective Problem-Solving Checklist ([Table 9-1](#)), might find it beneficial to review it. Always make notes as you troubleshoot; if properly communicated, some or all of the information you discover can help you or others in the future.

Table 9-1 Effective Problem-Solving Checklist

Basic Troubleshooting Step	Link to Detailed Guidelines
Identify the symptom	“Clarifying Symptoms” on page 142
Re-create the problem	“Re-creating a Problem” on page 143
Isolate the cause	“Isolating Causes” on page 143
Develop a solution	“Developing a Solution” on page 145
Perform a corrective action	“Implementing a Solution” on page 145
Verify that the system works	“Verifying Corrective Actions” on page 146
Put system in service and close the call	“Returning the System to Service” on page 147

Clarifying Symptoms

These actions and considerations can help to clearly describe a symptom, which is useful in isolating the cause and can also be useful later when documenting the problem and the solution. Make notes about the problem you are investigating as you read through this section:

- Have the user restate problem and verify that you are checking the correct system.
- Are there any other systems exhibiting this symptom or is it exclusive to one system?
- Is this the symptom of a real problem, or is it possibly an unrealistic expectation of the system features and options set?
- Clarify the symptom: Is it a hang, a crash, a shutdown, an image artifact, an error code, not booting, or other symptom? Write down a clear statement of what the symptom is and how it manifests itself:
 - How does it happen: What keystrokes, what modality, what preset, what transducer?

- When does it happen: Time of day, during boot-up, during scan, image review, sending to a network, during a calculation, during a measurement, playing/recording VCR, printing, acquiring an image, annotating, other?
- How often does it happen: Intermittently, predictably, all of the time?
- Categorize/localize the problem:
 - Is it a printing problem, an image quality or viewing problem, a data export or import problem, or other?
 - Consider if the symptom indicates an operating procedural error or a system failure. If it is a system failure, determine whether it seems to be a hardware or software problem. If it is a software problem, determine if it is an operating system or ultrasound problem.
- If possible, make hardcopy prints of the system displays that shows the first and subsequent indications of the failure. Do this as soon as possible to ensure this type of data is not lost. (Relevant data is often lost when the system is rebooted.)
- What, if anything, does the user do to recover from the problem?

Re-creating a Problem

Successfully re-creating a problem that doesn't damage the system can produce information that is useful to troubleshooting and solution verification. But, before you try, be sure that you have noted all the useful information you can. Before changing anything, consider if the attempt will cause the loss of information or will change a circumstance that is better than re-creating the problem. If you decide to attempt to re-create the problem, try to do so several times.

Isolating Causes

Remember that, sometimes, more than one cause can produce similar symptoms. Try to identify as many causes for the given symptom as your experience and research allows and then prioritize them in order of most likely root cause of the problem. Attempt to eliminate them one-by-one, starting with the most likely cause.

Checking for Obvious Causes

Check for the following obvious causes:

- Check for correct voltage at electrical outlets, “tripped” circuit breakers, blown fuses, and disconnected or damaged wires. Always check that power cords are plugged in, and inspect them for wear.
- Consider the situation: Was there a system option or hardware change recently? When was the last time the system was working correctly and what, if any, influencing circumstances have occurred since?
- Check if the symptom and probable cause may already be documented.

Investigating and Testing

If you haven’t discovered the cause of the problem yet, more in-depth analysis is necessary:

- Take a moment to review the data you’ve collected about the problem so far. Hopefully, you have been able to categorize the symptom as a hardware, software, operator-induced, or environmental failure.
 - Hardware failure: Cause usually determined through use of troubleshooting tools (RST, Device Manager, Debug Info, and Event Logs). A fix is typically realized by replacing suspect/candidate hardware until the problem is resolved.

NOTE Consider the value against the difficulties of swapping (suspect) hardware components with good ones. Do *not* cause additional problems or confuse your search. Never swap parts if a known good item might be damaged.

- Software failure or corruption: Even if a fix is realized by reloading software, the cause of the failure or corruption needs to be investigated: Is there a system architecture failure, is the user doing anything to cause the problem?
 - Operator-induced: Is the user expecting more than the system is designed to deliver, exceeding the capability of the system, or mis-operating it (over-filling the hard drive, pulling the plug, or other)? A solution can be more user training or a work-around. Investigate to see if an option ought to be enabled or if there is an enhancement scheduled in a future release that might solve the problem.
 - Environmental: Are there any electrical power, EMI/RFI, or network connectivity difficulties external to the system affecting its performance?
- Verify more easily checked factors first, such as system setup/configuration.
 - If you haven't already, verify that all system voltages are present and within tolerance.
 - Conduct tests from [Section 6, "Performance Tests"](#) as required to determine if and how the system is failing.

Developing a Solution

When think you know what the problem is, decide what changes you need to make to correct the problem and write down the steps you want to take to make the repair, especially if the sequence of your actions is important. Even if you don't think you need to do this for yourself, it can be useful to others when you properly document the problem and its resolution. You may benefit from this yourself in the future.

Implementing a Solution

Implement your solution by performing the corrective actions you developed. Proceed cautiously and systematically. Make only one change at a time, and verify that the change you made brings about the result you expected before making any other change.

It is not unusual for another problem to surface when you are applying changes to fix what you thought was the problem. If the change didn't bring about the result you expected, consider if

that unexpected result brings you closer to the actual cause of the problem. If it doesn't, consider returning the system to the known condition it was in before your last change and verify its condition before proceeding.

Review your solution and any "discovery" that your change produced. Decide if you should proceed with your original solution or go back to investigating and testing. To avoid producing confusing and conflicting data, do not deviate too far from the methodical approach that allows you to isolate the failure by eliminating possible causes along the way.

Once the system fault has been identified and you have performed (authorized) corrective actions to repair the failure, conduct whatever tests are necessary to ensure that the problem is fixed and that the system meets its optimum level of performance. Typically, it will be the same testing that led you to isolating the cause of the specific problem (refer to your notes) and then additional tests that give you confidence that the system is generally performing as it should.

Verifying Corrective Actions

Returning the System to Service

Once the reported problem is fixed and the system tests are successful, return the system to the customer and close the call:

- Formally document the problem and the solution: Write down exactly what problems you discovered and what corrections you made.
- Provide feedback: Communicate to all affected parties what problems you discovered, how you arrived at that conclusion, and what corrections you made. Include this information with parts that are returned for repair and, if appropriate, send e-mail with this information to ISS personnel who could find it useful.

Symptoms, Causes, and Corrective Actions

Some problem considerations are documented here.

Disk is Full

In this release, the system does not automatically manage hard drive disk space. That is, studies are not automatically deleted as the hard drive disk becomes full. If the disk space allotted for studies is filled, the system may behave erratically or generate errors.

Checking for EMI and RFI

Electromagnetic interference (EMI) and radio frequency interference (RFI) can degrade the performance of the HD3. For example, a transducer placed close to an ECG cable can increase interference. Moving the ECG cable or other medical equipment away from the transducer can reduce interference. EMI and RFI can conceivably cause image noise or monitor distortion if the system EMI shielding has been compromised. EMI and RFI can be generated by a variety of electrical devices. The interference can be transmitted over power lines or radiated through the air. Answering the following questions can help locate the source of interference and help determine whether the problem is with the system or with the scanning environment.

- Is the interference intermittent or constant?
- Does the interference appear with only one transducer or with several transducers?
- Do two different transducers operating at the same frequency have the same problem?
- Is the interference present if the system is moved to a different location in the facility?
- Can the EMC coupling path be attenuated?
- Does operating an AM radio tuned between stations around 1,600 Hz (thus using it as an EMI/RFI source tester) identify interference, which would be noticeable as audible static noise on the radio while walking it around the room. Sometimes EMI/RFI sources are not constant, but are temporary or surge situations that may only occur at certain times.
- Considering and locating the source/cause is important, but regardless of the source, since the system is shielded against EMI and RFI, troubleshoot the system to determine if the EMI/RFI shielding has been compromised. One place to start is to verify that all the system panels are appropriately secured with all of the factory-approved fasteners.

System Hangs or Crashes

Often the terms “hang” and “crash” are used interchangeably to describe the same symptom. However, these two terms describe two different behaviors. It is important to understand the difference between these terms because the causes are different, the troubleshooting techniques are different, and the information available to the FSE is different.

A “hang” is when the system stops responding to the keyboard. There is a normal image on the monitor and the system may continue to be working (updated data in the image area, clock is correct and continues changing), but the system does not respond to hard keys, soft keys, or the trackball.

There is not any specific data associated with a “hang” (because from the software point of view, everything is behaving normally. The best source of information is to ask the customer about the keystrokes prior to a “hang.” Also check the Keystroke Log.

A “crash” occurs when the system detects an abnormal condition in either the hardware or the software. A crash is an unexpected software event that causes the system to display an error message and forces the user to re-boot the system.

NOTE Cycle power at least once a week if a system is left on permanently. (As the user presses buttons and different parts of the software are used, different segments of “virtual memory” are acquired and released. Virtual memory is handled on the hard drive and as it is used and released, it is subject to fragmentation. After a while, the virtual memory area can become fragmented into small pieces, so that there is no longer a large enough “chunk” for the system to do what is needed. If this happens, the system can crash.)

DICOM/ Network Failures

Verify that the DICOM option is enabled ([See “Verifying the System Options” on page 76.](#)). If the DICOM option is enabled, verify that it has been configured correctly ([See “Configuring the DICOM Feature” on page 78.](#)), including the DICOM network test. When you test a network setting, the system performs two tests, “TCP/IP Ping” to verify that it can connect to the specified IP address and “DICOM Verify” (C-ECHO command) to verify that it can connect to the specified DICOM server.

If the TCP/IP Ping test fails, make sure the IP address and port number specified for the system and for the DICOM server are correct. If the DICOM Verify test fails, make sure the AE Title specified for the system and for the DICOM server are correct. The AE Title is case-sensitive; make sure it has been entered correctly.

If the DICOM server is using high-security settings, you may need to add the system AE Title and IP address to the server’s list of systems that are authorized to access it.

In addition to the messaging presented to you during Setup and Export, the HD3 has a DICOM log that records DICOM network activity. The DICOM log contains the following information:

- Service & Transfer Type
- The Called and Calling devices and their communication parameters
- Status of the export operation
- The number of images expected to be sent
- The number of images successfully sent
- The number of images that failed

You may want to view or copy the DICOM log (see [“To display the keystroke or DICOM log” on page 153.](#))

Backing Up and Restoring

Before you begin installing software, replacing a hard drive, or taking any service action that might cause data to be lost, perform the following tasks:

- Ensure that the customer has saved any important studies. If they have the Review option, back up patient exams as described in Section 12, “Review,” of the *HD3 Getting Started* manual.
- Make a system backup as described in Section 16, “System Administration,” of the *HD3 Getting Started* manual. System settings, DICOM (network) settings, and options are saved when you perform a backup.

Loading Software and Drivers

Subsequent releases of the ultrasound application software will be available on CD ROM. Installation is accomplished by inserting the CD into the CD-RW drive and accessing the Admin screen as described in Section 16, “System Administration,” of the *HD3 Getting Started* manual.

The HD3 has the capability of updating device drivers without the need to upgrade or Ghost the application software. This is also described in Section 16, “System Administration,” of the *HD3 Getting Started* manual.

Managing System Options

To manage system options, [See “Verifying the System Options” on page 76.](#)

Viewing System Information and Logs

The HD3 has some software tools that are accessible to all users:

- Display System Info - Displays system model number, serial number, and software version.
- Keystroke Log – There is a keystroke log file that records the keystrokes made during operation. (In the first release, only “hard key” presses are recorded; Softkey presses and “mouse clicks” in Review mode are not recorded). Any user can view keystroke logs, as well as copy the log files to a CD, MOD, or USB flash memory drive. The keystroke log is always running, and as the current file becomes full, it is closed, renamed with a date-time stamp, and a new current keystroke log file is started.
- DICOM Log – There is a log that records DICOM network activity. The DICOM log contains the following information:
 - Service & Transfer Type
 - The Called and Calling devices and their communication parameters
 - Status of the export operation
 - The number of images expected to be sent
 - The number of images successfully sent
 - The number of images that failed

As with the keystroke logs, you can view the DICOM logs, or copy them to CD, MOD, or USB flash memory drive.

Use the **Admin** tab in setups to display system information, and to view the keystroke and DICOM activity logs. Use **Keystroke Log** and **DICOM Log** to specify log settings and to view log files, copy log files onto removable media, and to delete log files.

➤ **To display system information**

1. Press **Set Up (F10)**.
2. Click the **Admin** tab.
3. In the Service area, click **Show** to display system information.
4. Use the scroll bars to view the system information.
5. Click **Close** when done.

➤ **To display the keystroke or DICOM log**

NOTE You can view only one keystroke log at a time. However, you can copy or delete multiple keystroke logs.

1. Press **Set Up (F10)**.
2. Click the **Admin** tab.
3. In the Service area, click **Open** to open the keystroke or DICOM log.
4. In the dialog box, do the following:
 - Enter the number of days a log file should be active. For example, if you enter 31 days, the log file is deleted when it becomes older than 31 days.
 - Enter the maximum size of the log file in kilobytes.
5. To view a log file, select the log file and click **View selected file**.
6. To copy a log file or files, select the file or files, select the removable media destination, and click **Copy selected files**.
7. To delete a file after copying, select the **Delete files after copy** check box.
8. Click **Close**.

I0 Disassembly

Introduction

This section provides specific information about system disassembly that may be required for the removal and installation of field-replaceable parts. If not covered by a detailed procedure, the means of removing a system part can be discerned from the illustrations in this section as well as from those in [Section 13, “Configuration”](#) and [Section 14, “Parts”](#). Instructions for crating the system for shipment are also included.

Warnings and Cautions

Review [Section 3, “Safety”](#) before continuing. Also follow any additional warnings and cautions contained in this section.

WARNING

Always turn the 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.

CAUTION

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.

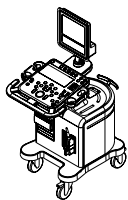
NOTE The batteries inside this product contain mercury and must be recycled or disposed of according to local, state, and federal laws. Do not replace individual batteries in the field. Return all products containing mercury to Bothell for disposal.

Refer to [Figure 10-1](#) for links to disassembly procedures by specific part.

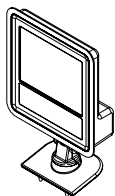
Disassembly (Removal) Procedures

Figure 10-1 Disassembly Procedure List (1 of 2)

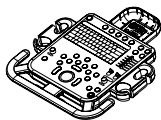
NOTE Unless otherwise noted, reassembly is essentially the reverse of the disassembly procedure.



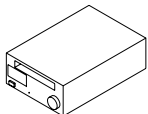
System Enclosures



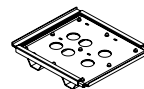
Video Monitor



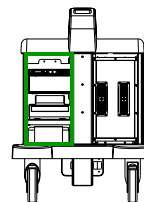
Control Panel



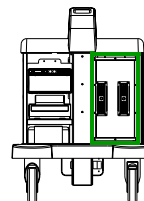
VCR or Color Printer



Universal Peripheral Mounting Plate



Peripheral Bay (B/W Printer, Printer Bay, CD/Hard Drive Rack, and Power Transformer)

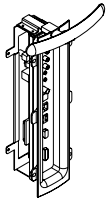


E-box Bay (E-box Assembly, Transducer Connector Assembly, E-box Boards, Power Supply and Cooling Fans)

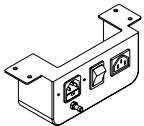
NOTE The numbers in the installation illustrations correspond to the steps in the disassembly procedure.

List Continued

Figure 10-2 Disassembly Procedure List (2 of 2)



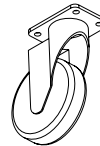
Rear I/O Panel



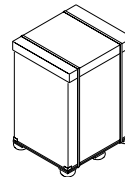
Power I/O Box



Lift Column Gas Strut



System Casters



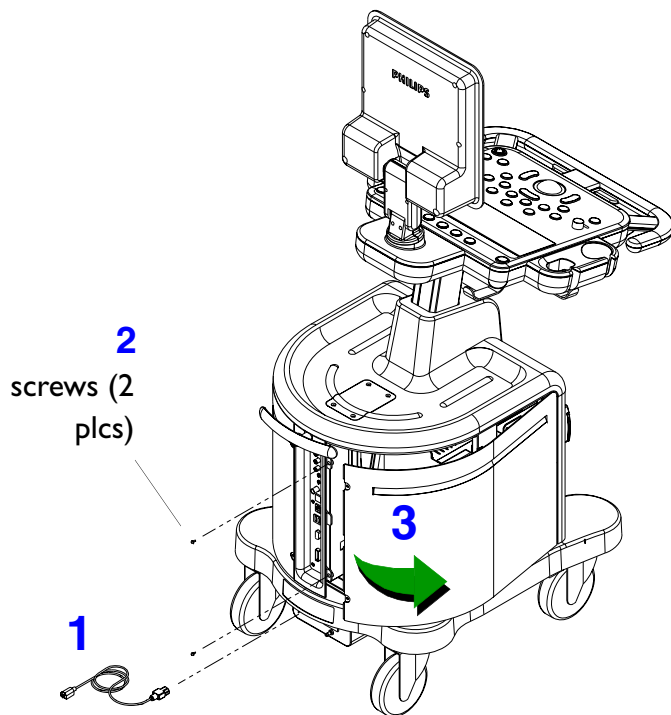
**Crating the HD3
Ultrasound System**

NOTE The numbers in the installation illustrations correspond to the steps in the installation procedure.

[Previous List](#)

System Enclosures

Figure 10-3 Removing the Left Side Enclosure

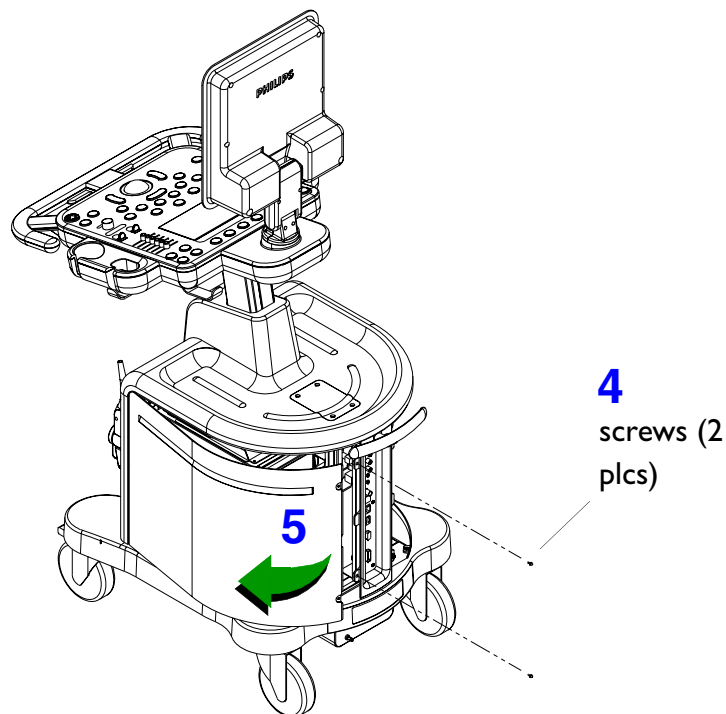


NOTE The two side enclosures must be removed before removing the front enclosure or top cover.

➤ **To remove the system enclosures**

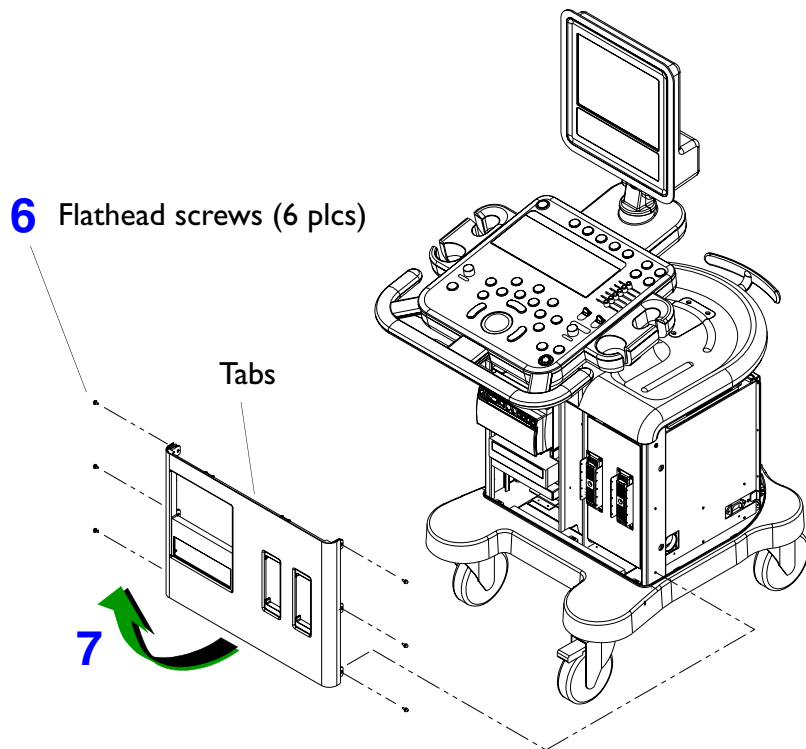
1. Properly power off the system and then disconnect the system power cord from the main AC supply.
2. Remove the two screws securing the left side enclosure. Removing this enclosure allows access to the B/W printer, hard drive, CD drive, and transformer.
3. Pivot the back side of the enclosure away from the system and then gently slide the enclosure toward the rear to remove it. Proceed to [step 4](#).

Figure 10-4 **Removing the Right Side Enclosure**



4. Remove the two screws securing the right side enclosure. Removing this enclosure allows access to the E-box and power supply assemblies.
5. Pivot the back side of the enclosure away from the system, and then gently slide the enclosure toward the rear to remove it. Proceed to [step 6](#).

Figure 10-5 **Removing the Front Enclosure**

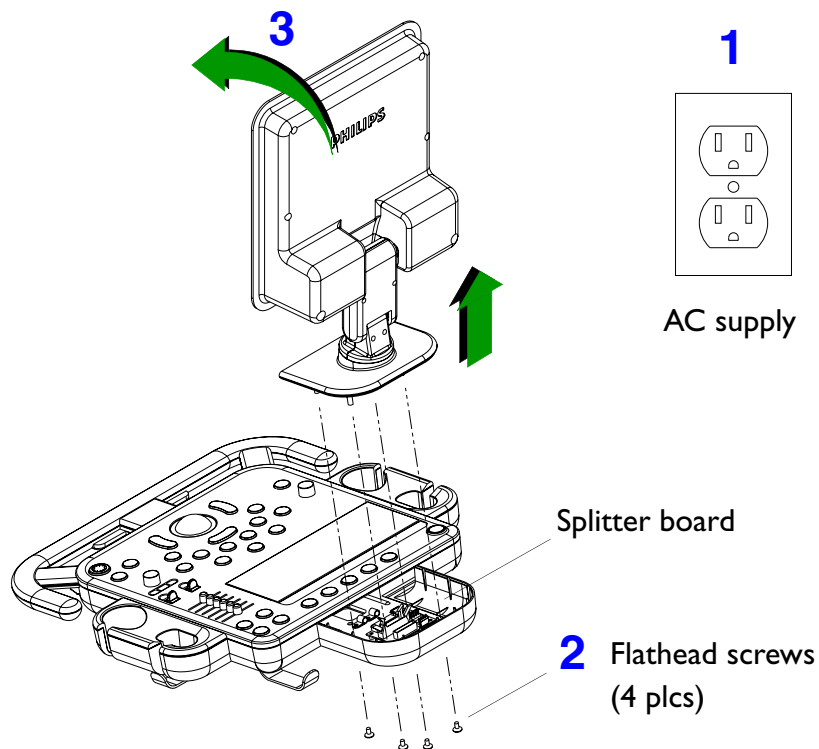


6. Remove the six screws securing the front enclosure.
7. Pull the bottom side of the enclosure outward so the tabs at the top of the front panel slide out of the top cover slots.

Return to [Disassembly Procedure List \(1 of 2\)](#).

Video Monitor

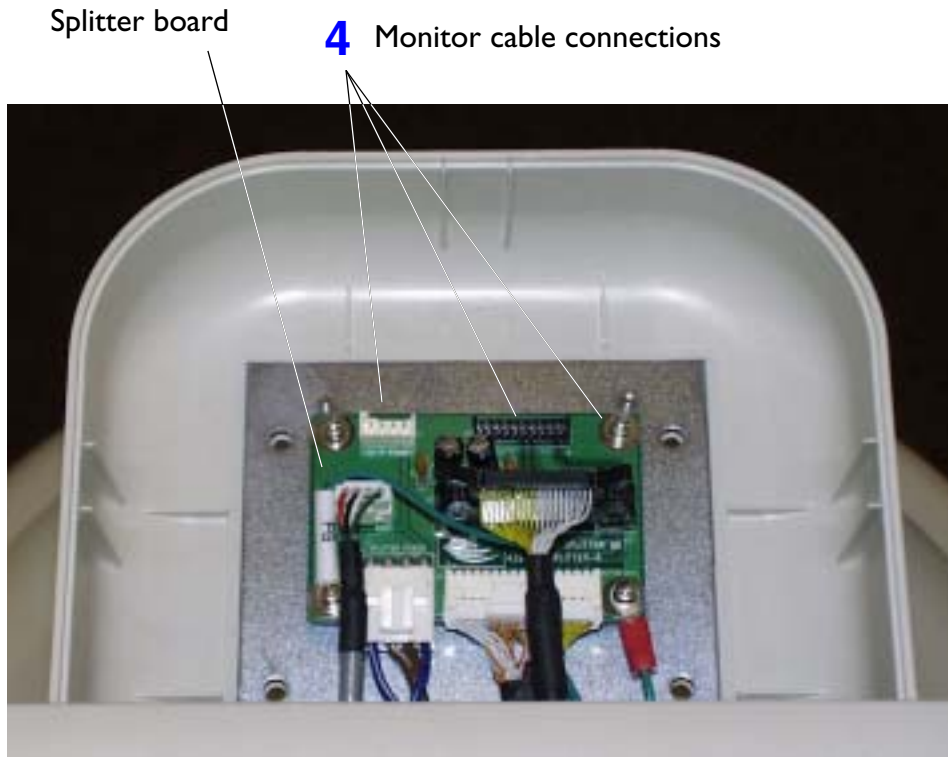
Figure 10-6 Removing the Video Monitor



➤ To remove the system monitor

1. Properly power off the system and then disconnect the system power cord from the main AC supply.
2. From the underside of the control panel housing, remove the four screws securing the monitor assembly to the control panel.
3. Lift the monitor slightly and tilt it toward the keyboard. Proceed to [step 4](#).

Figure 10-7 **Disconnecting the Video Monitor Cables**



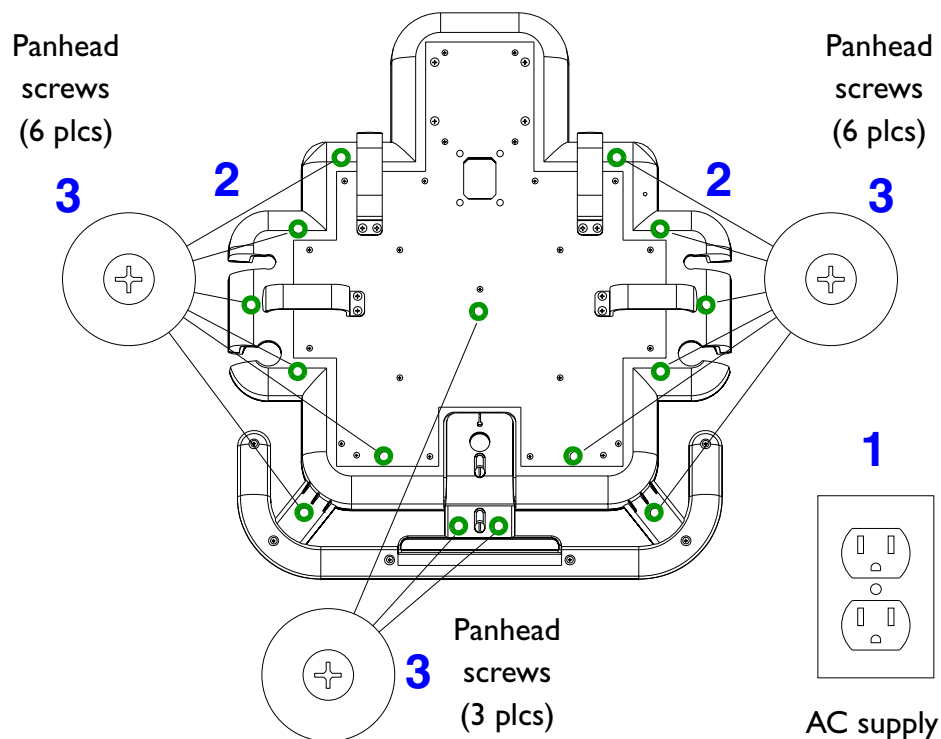
4. Disconnect the three monitor cable connections from the control panel splitter board.

This completes the video monitor removal procedure.

Return to [Disassembly Procedure List \(1 of 2\)](#).

Control Panel

Figure 10-8 Removing the Top Control Panel Enclosure

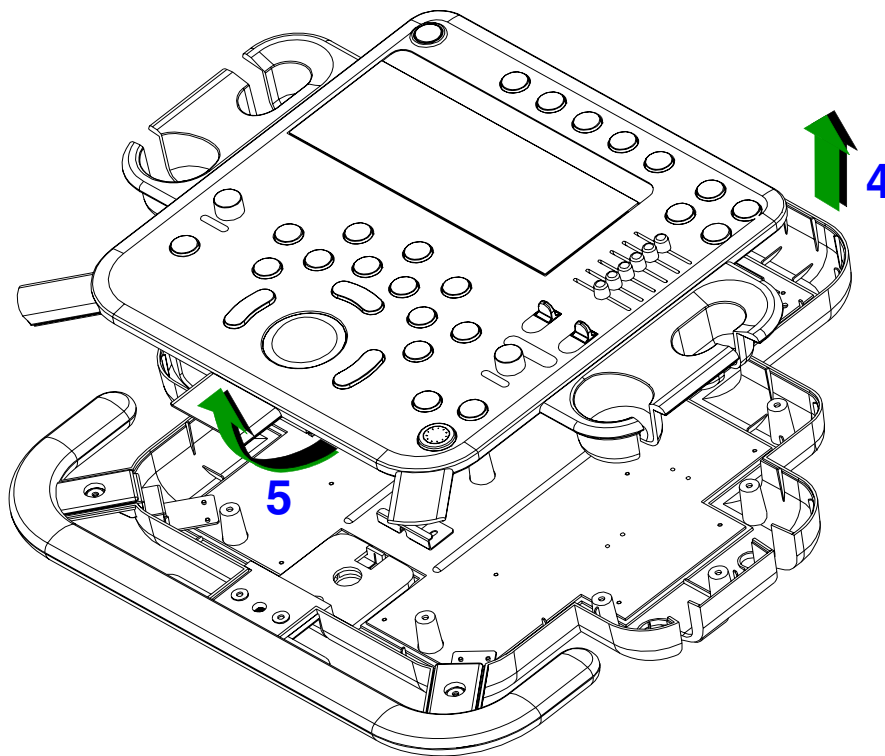


➤ **To remove the control panel, trackball assembly, keyboard assembly, and splitter board**

1. Properly power off the system and then disconnect the system power cord from the main AC supply.
2. Remove all transducers from the transducer holders and place them in a safe location.
3. From the underside of the control panel, remove the 15 screws (recessed holes) securing the top control panel enclosure to the control panel housing. Remove only these 15 screws. Proceed to [step 4](#).

NOTE To access the control panel splitter board you must first remove the video monitor. Refer to [Figure 10-6](#).

Figure 10-9 **Tilting the Top Control Panel Enclosure**

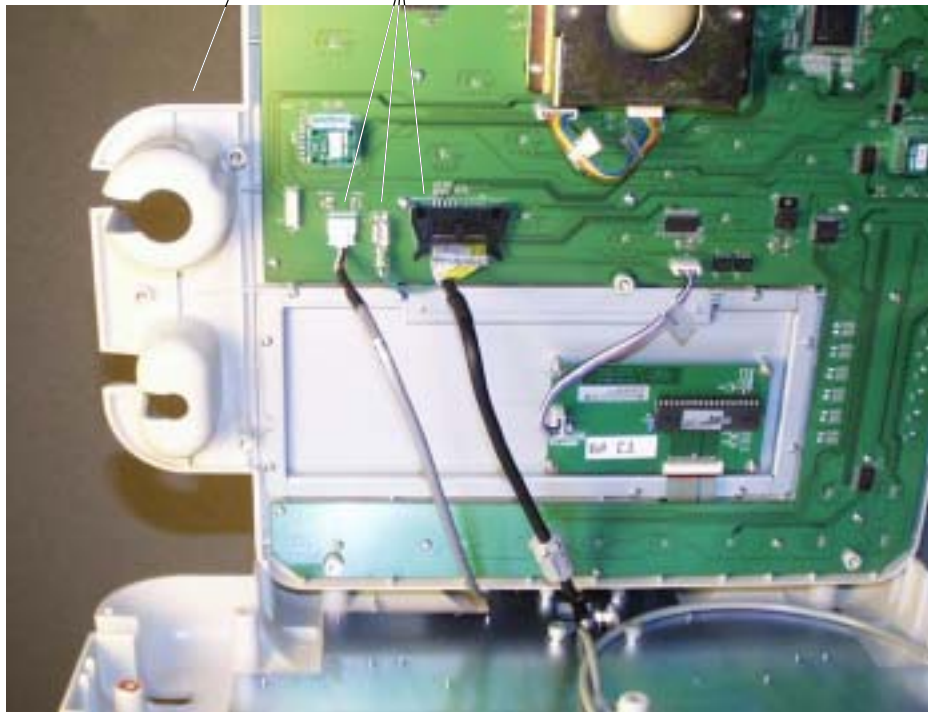


4. Lift the control panel enclosure slightly upward.
5. Carefully tilt it up from the front side to the vertical position. Proceed to [step 6](#).

Figure 10-10 **Disconnecting the Control Panel Cables**

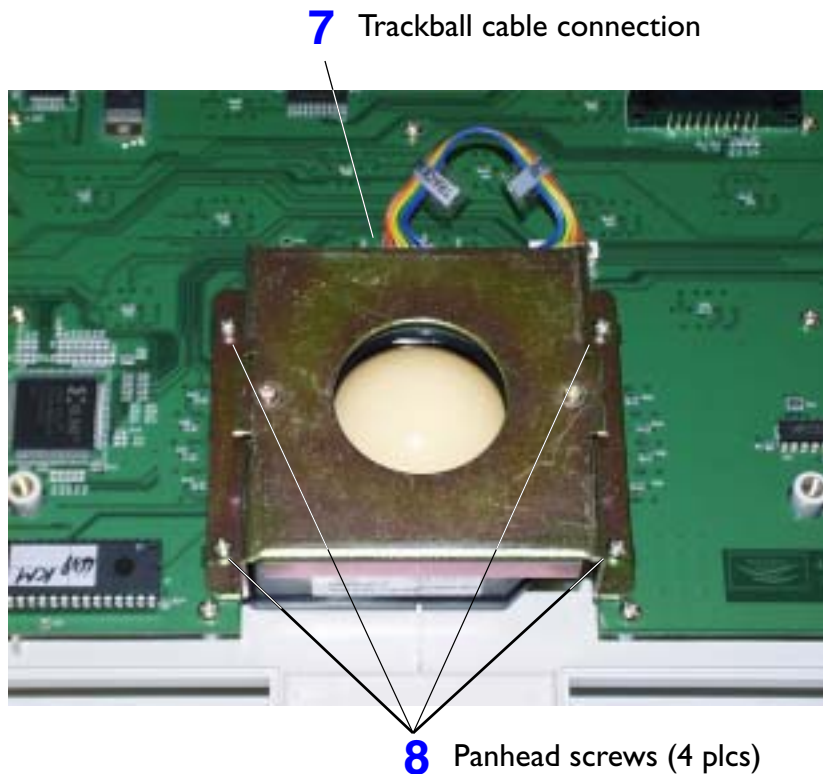
Control panel enclosure

6



6. While holding the control panel enclosure up, disconnect the three cable connections from the control panel board.

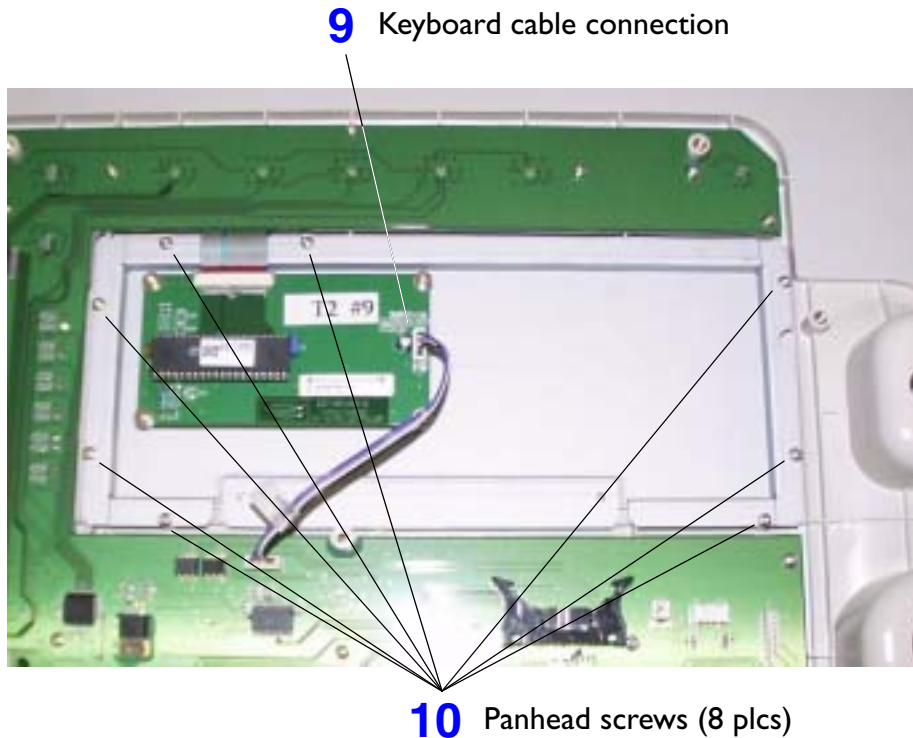
Figure 10-11 Removing the Trackball Assembly



7. Disconnect the cable from the trackball assembly. Leave the other end of the cable connected to the control panel board.
8. Remove the four screws securing the trackball assembly to the control panel board.

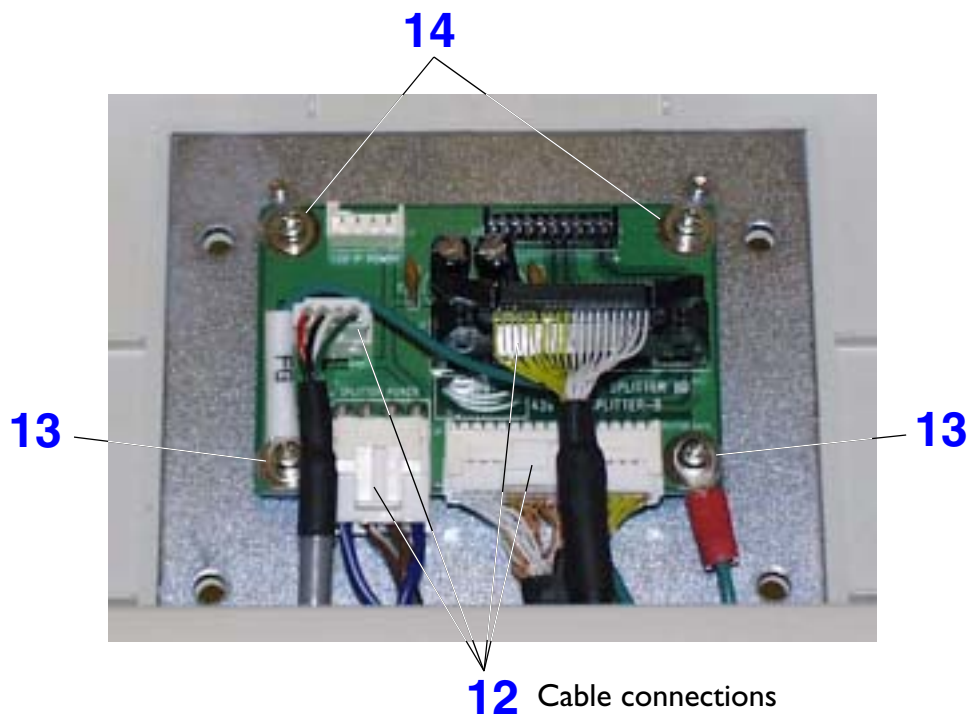
This completes the trackball removal procedure.

Figure 10-12 **Removing the Keyboard Assembly**



9. Disconnect the cable from the keyboard assembly. Leave the other end of the cable connected to the control panel board.
10. Remove the eight screws securing the keyboard assembly to the control panel board.

Figure 10-13 **Removing the Splitter Board**



11. Refer to [Video Monitor](#) for video monitor removal before proceeding with the following procedure.
12. Disconnect the four cable connections from the control panel splitter board.
13. Remove the two screws securing the two ground wires and the splitter board.
14. Remove the two remaining screws securing the splitter board to the control panel housing.

Return to [Disassembly Procedure List \(1 of 2\)](#).

VCR or Color Printer

Figure 10-14 Removing the VCR or the Color Printer



VCR



Color printer

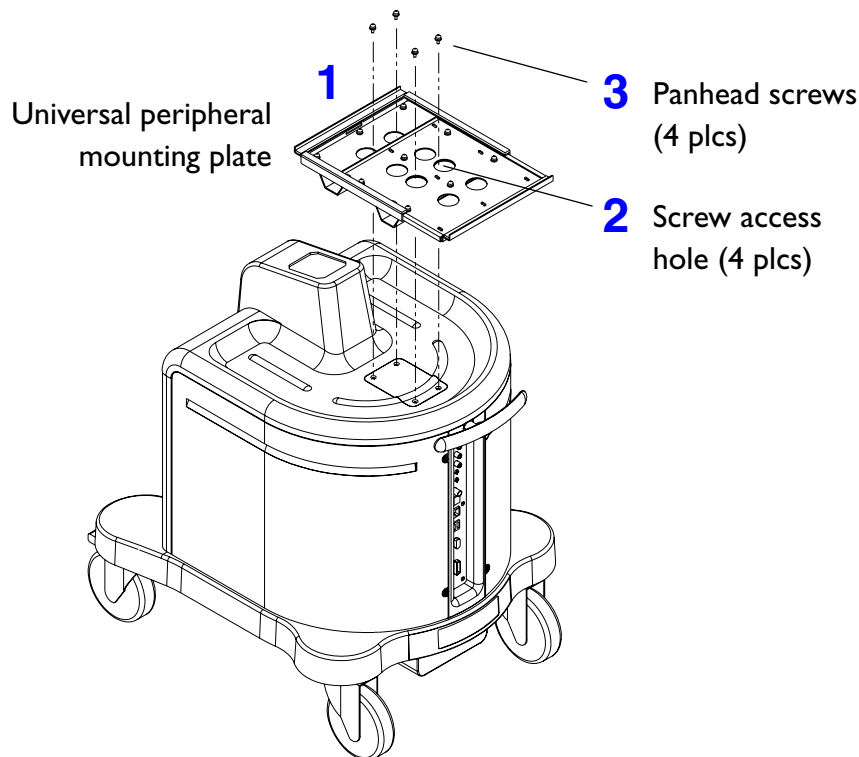
► To remove the VCR or the color printer

1. Turn the peripheral off and disconnect the cables on the rear of the peripheral.
2. Unstrap the unit and remove it from the system.

Return to [Disassembly Procedure List \(1 of 2\)](#).

Universal Peripheral Mounting Plate

Figure 10-15 Removing the Universal Peripheral Mounting Plate



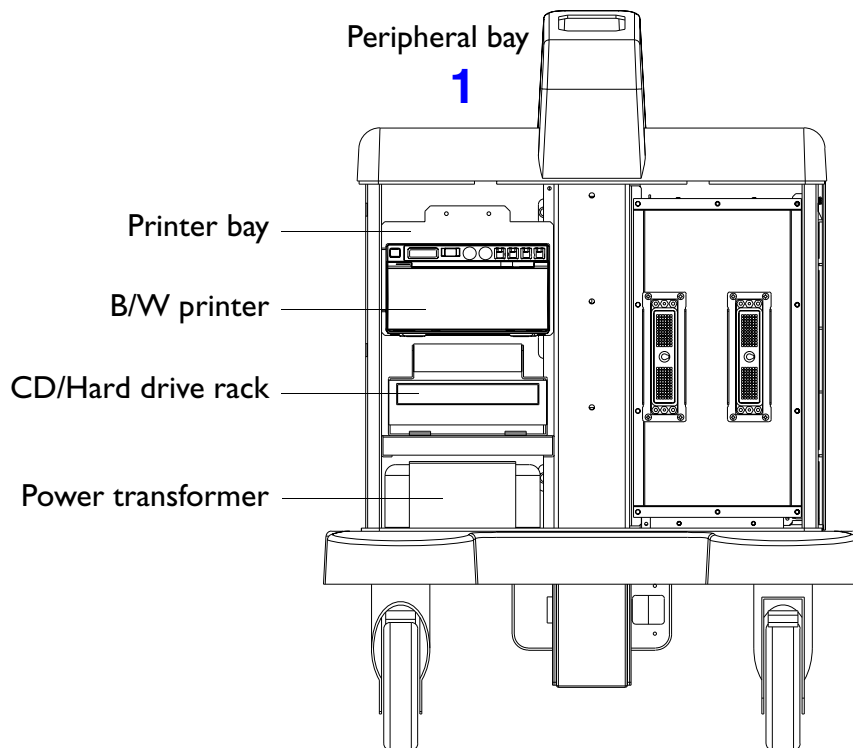
➤ **To remove the universal peripheral mounting plate**

1. Refer to [VCR or Color Printer](#) for VCR or color printer removal before proceeding with the following procedure.
2. Locate the four screw access holes in the mounting plate.
3. Remove the four screws securing the universal peripheral mounting plate to the HD3 system top cover.

Return to [Disassembly Procedure List \(1 of 2\)](#).

Peripheral Bay (B/W Printer, Printer Bay, CD/Hard Drive Rack, and Power Transformer)

Figure 10-16 Peripheral Bay Components

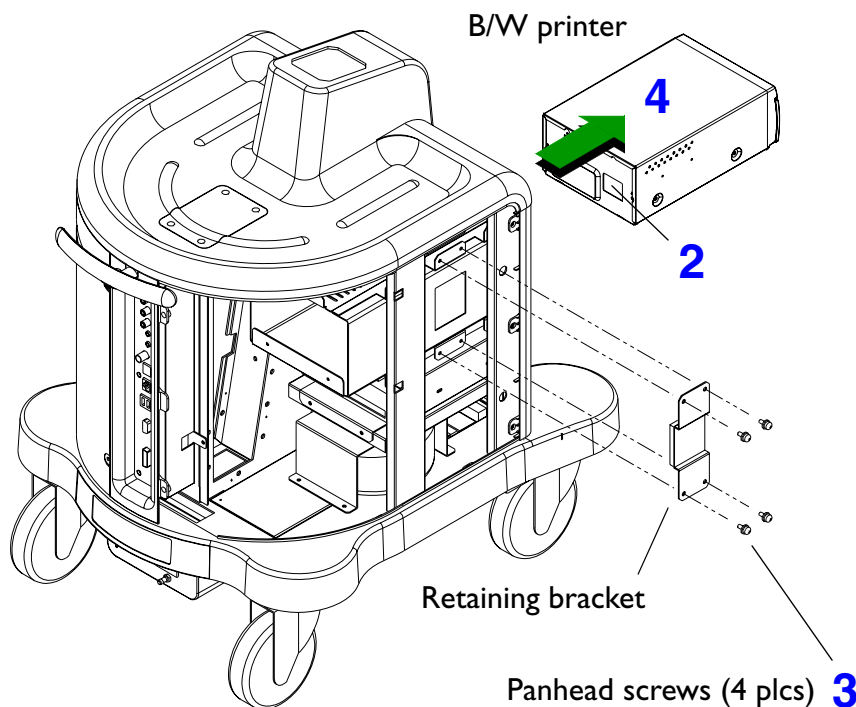


➤ To remove the B/W printer, CD/ Hard drive rack, power transformer, and printer bay

1. Refer to [System Enclosures](#) for system enclosures removal and perform all the steps before proceeding with the following procedures.

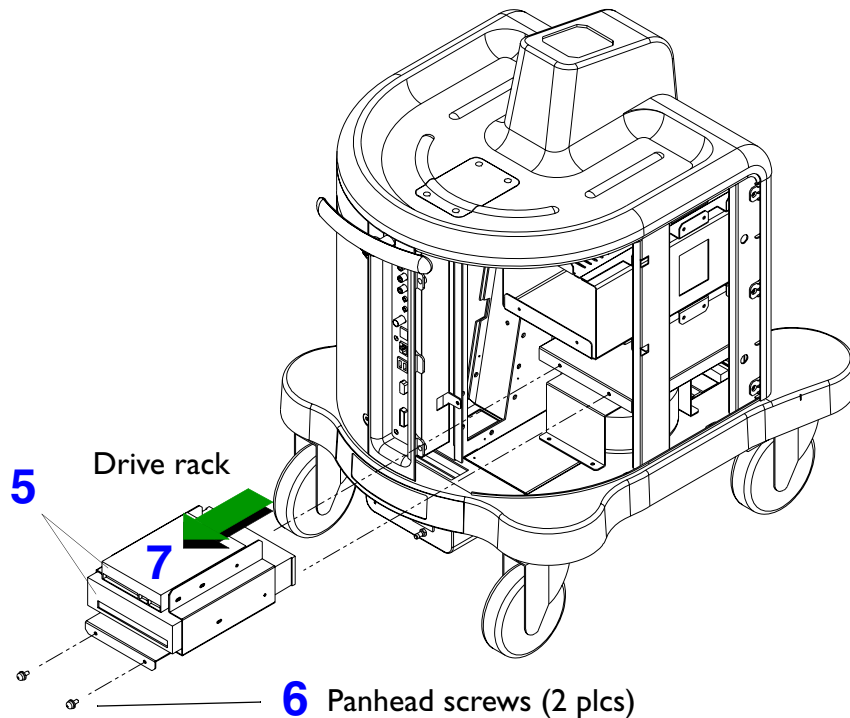
NOTE Only the left side enclosure [Figure 10-3](#) needs to be removed if you are only removing either the B/W printer or the CD/Hard drive rack, otherwise follow the entire procedure in the sequence presented to remove the printer bay or power transformer.

Figure 10-17 **Disconnecting the B/W Printer Cables and
Removing the Printer Retaining Bracket**



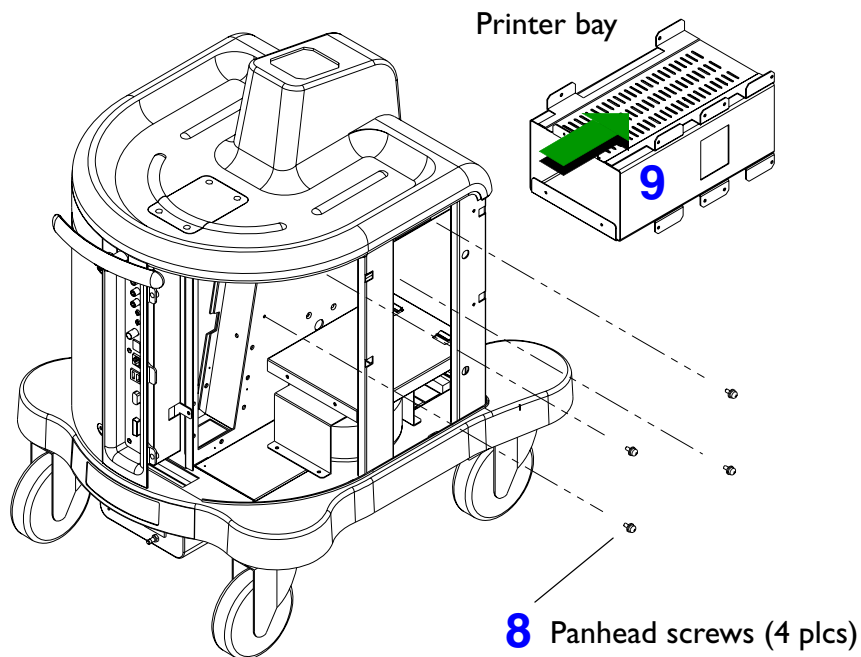
2. With the black and white printer in place, disconnect all the cables from the rear of the unit.
3. Remove the four screws securing the printer retaining bracket to the printer bay.
4. Slide the printer out of the printer bay through the front of the system.

Figure 10-18 **Disconnecting the Drive Cables and
Removing the Drive Rack Assembly**



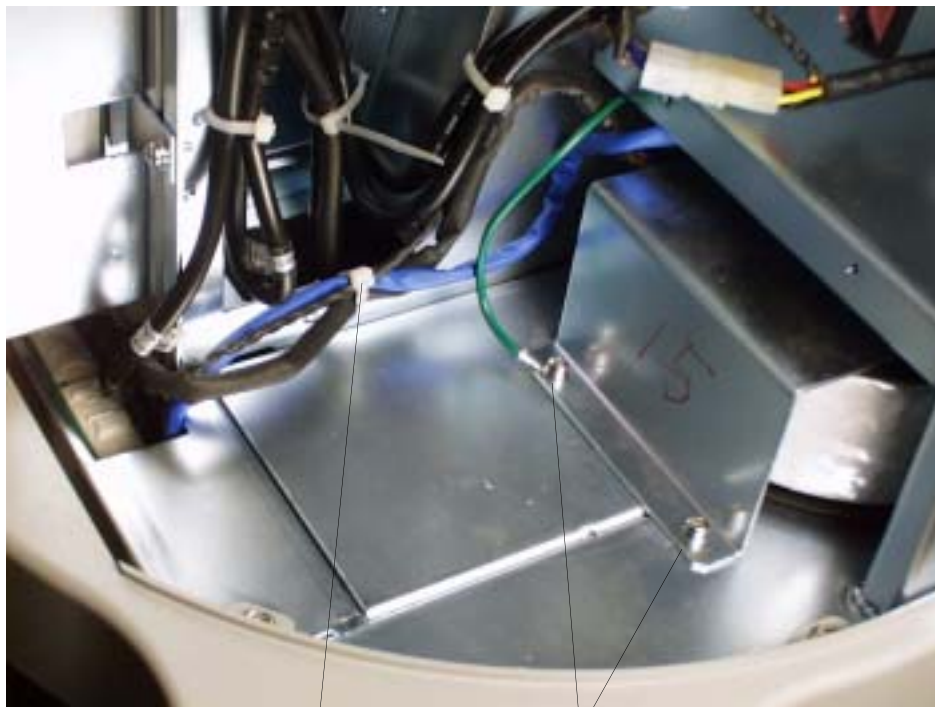
5. With the CD/Hard drive rack in place, disconnect all the cables from the rear of the two units.
6. Remove the two screws securing the drive rack to the cart frame.
7. Slide the drive rack out of the peripheral bay through the rear of the system.

Figure 10-19 **Removing the B/W Printer Bay**



8. Remove the four screws securing the printer bay to the cart frame.
9. Slide the printer bay out of the peripheral bay through the front of the system.

Figure 10-20 Power Transformer Cable Tie

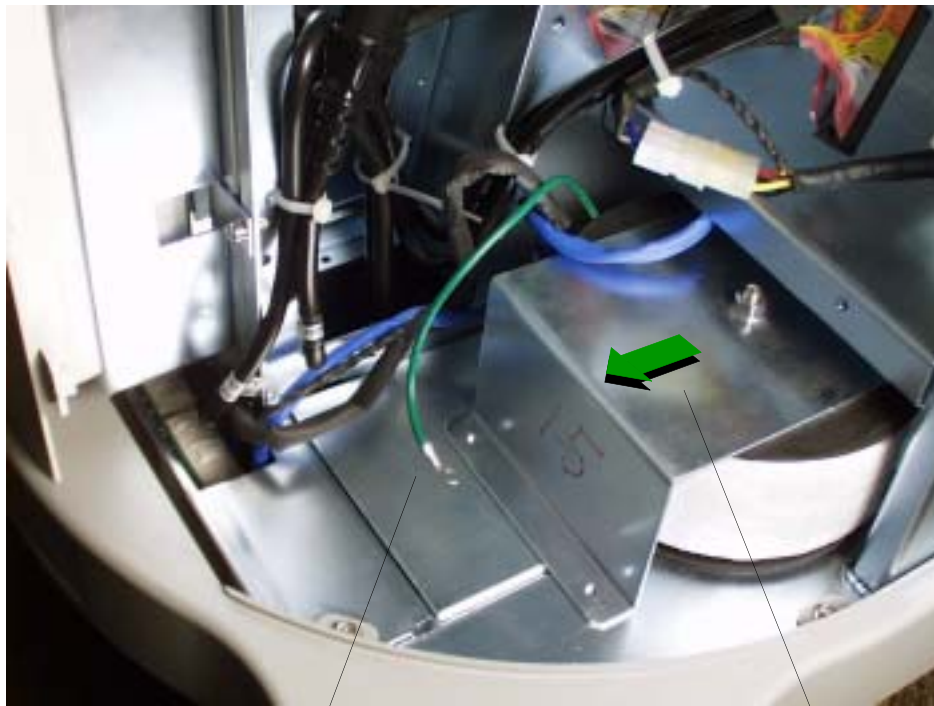


Cable tie **10**

11 Panhead screws (2 plcs)

10. Cut the cable tie that binds the transformer and CD cables together.
11. Remove the two screws securing the power transformer to the cart frame.

Figure 10-21 **Sliding the Transformer Back**

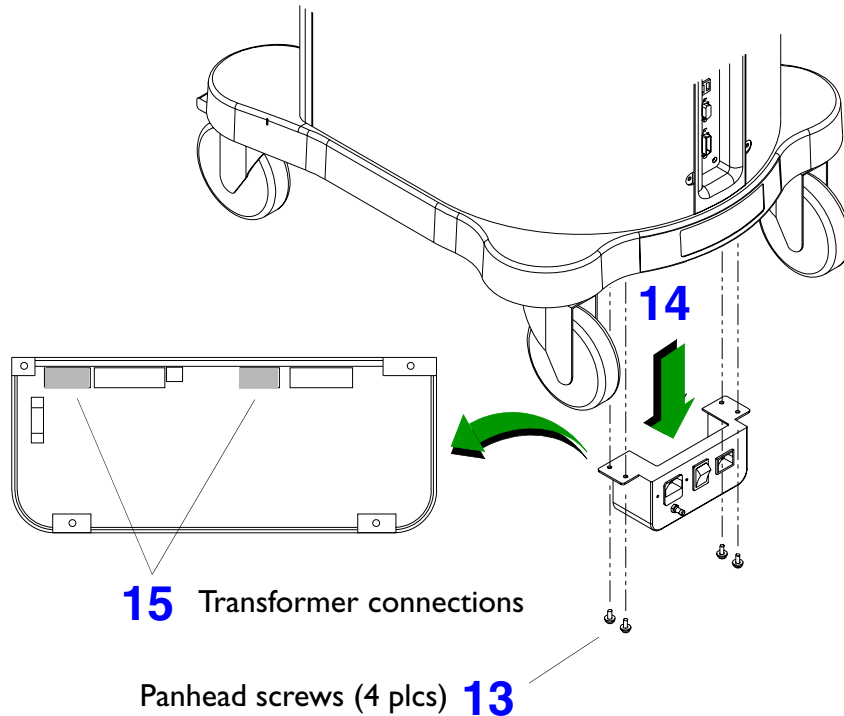


Ground cable

12

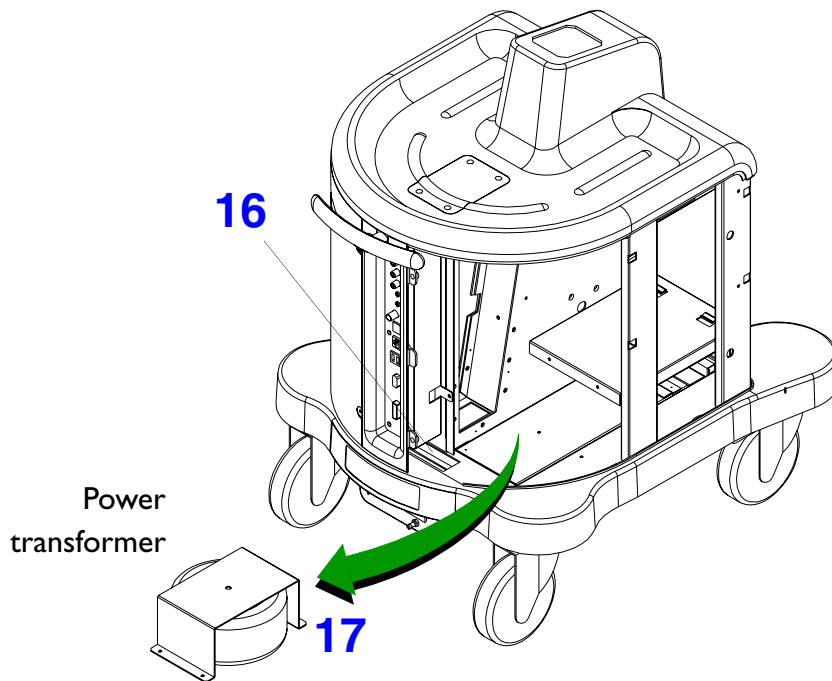
12. Pull the transformer out of the retaining slot and slide it back approximately three inches toward the rear of the system.

Figure 10-22 **Removing the Power I/O Box**



13. Remove the four screws securing the power I/O box to the cart frame.
14. Slide the transformer back as you lower the power I/O box away from the underside of the system.
15. Disconnect the two transformer cable connections from the backside of the power I/O box. Only disconnect these two cables.

Figure 10-23 **Removing the Power Transformer**

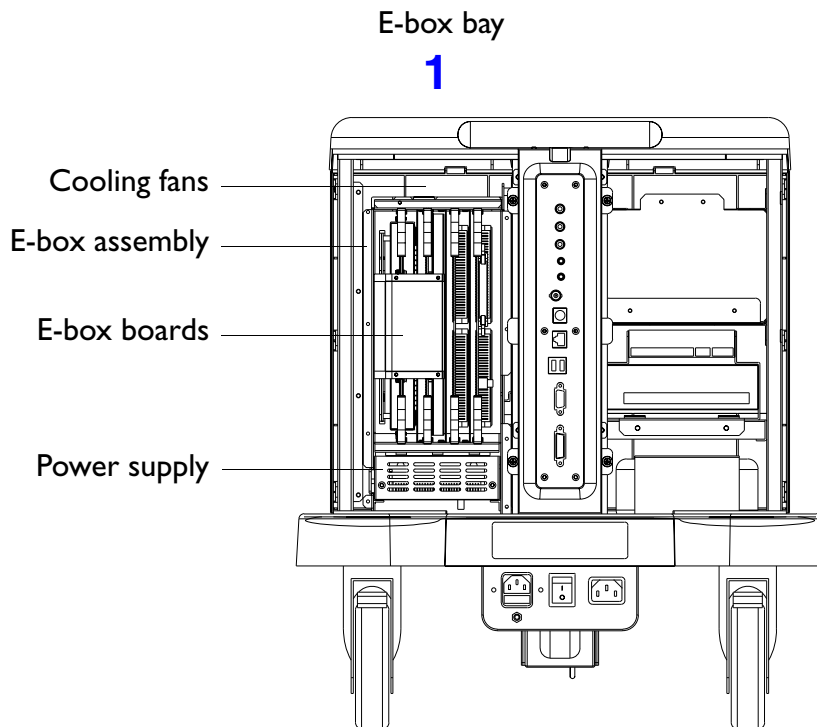


16. Pull the transformer cables up through the cart housing.
17. Lift the transformer out of the peripheral bay through the rear of the system.

Return to [Disassembly Procedure List \(1 of 2\)](#).

E-box Bay (E-box Assembly, Transducer Connector Assembly, E-box Boards, Power Supply and Cooling Fans)

Figure 10-24 E-box Bay Components



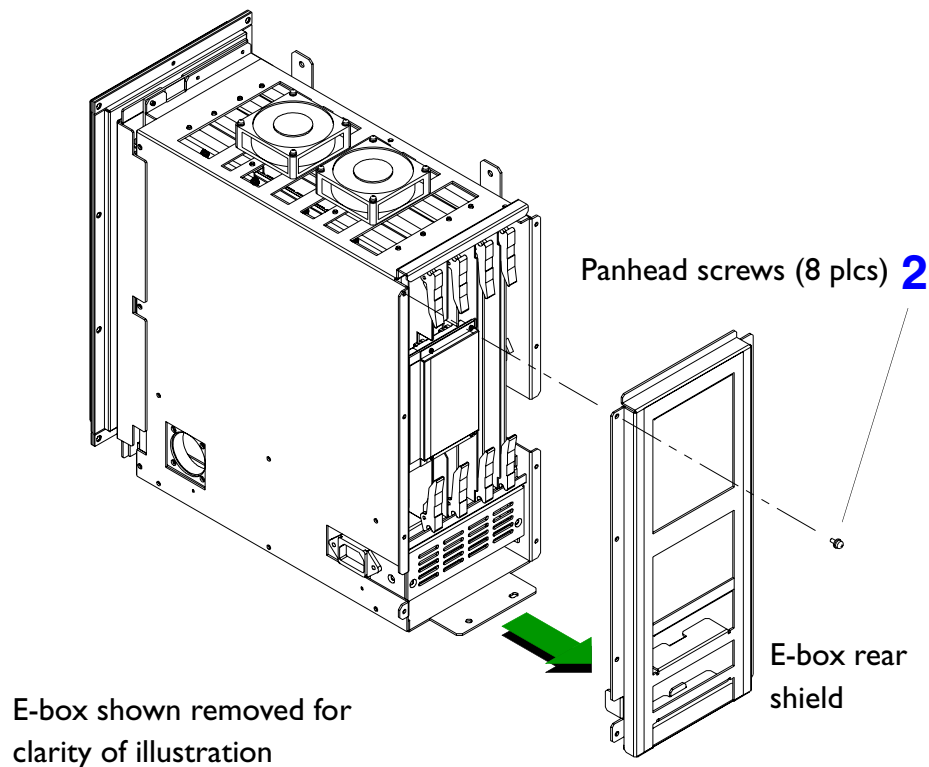
- To remove the E-box assembly, transducer connector assembly, E-box boards, power supply and cooling fans

NOTE You can perform most E-box service without removing the E-box from the system.

1. Refer to [Figure 10-3](#), [Figure 10-4](#), and [Figure 10-5](#) for system enclosure removal before proceeding with the following procedures. To remove the transducer connector assembly, proceed to [step 14](#).

NOTE Only the right side enclosure [Figure 10-4](#) needs to be removed if you are only removing the power supply.

Figure 10-25 Removing the E-box Rear Shield



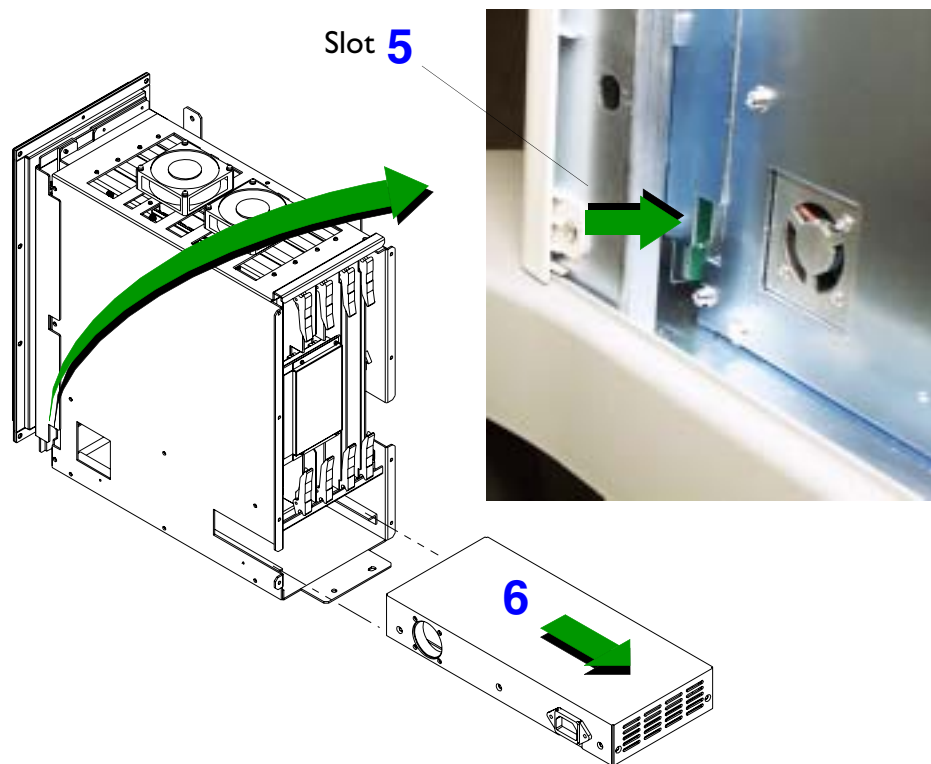
2. Remove the eight screws securing the E-box rear shield to the E-box case.
3. To remove the power supply, E-box assembly, cooling fans or Backplane board, proceed to [step 4](#). To remove the E-box boards, proceed to [step 8](#).

Figure 10-26 **Disconnecting the Power Supply Power Cord**



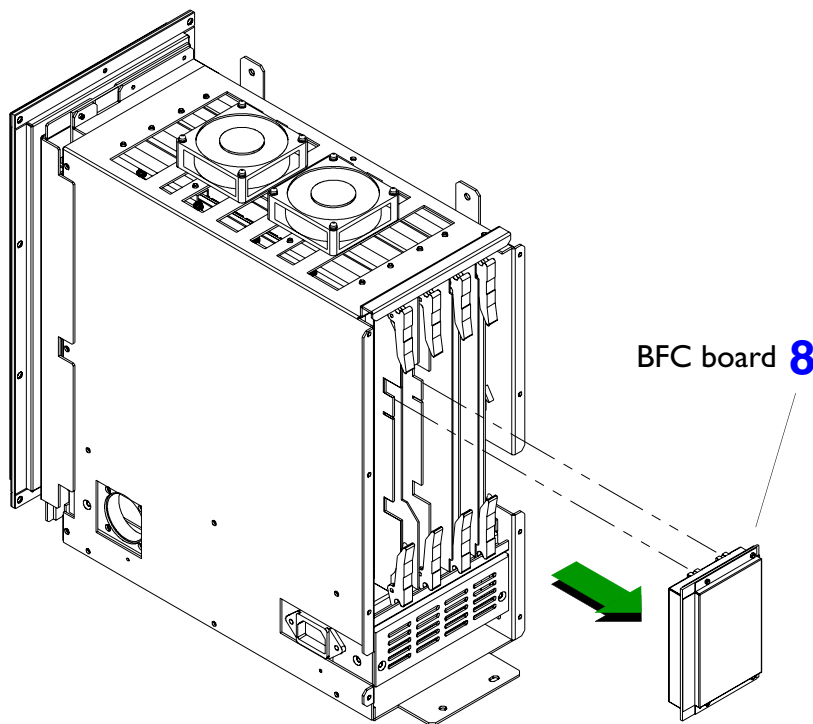
4

4. Disconnect the power supply power cord from the right side of the E-box.

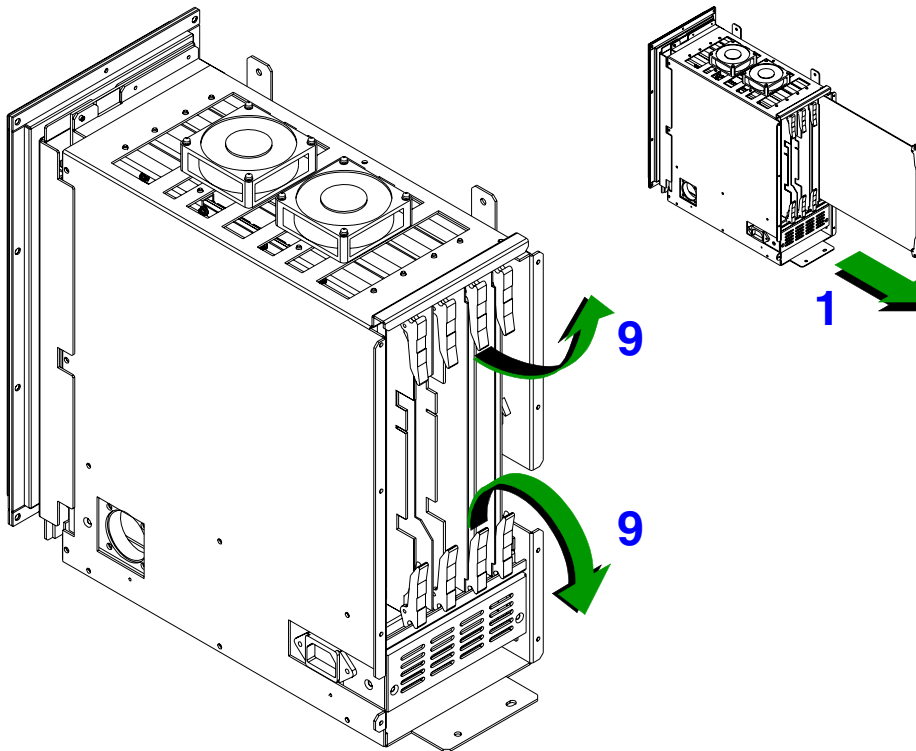
Figure 10-27 Removing the Power Supply

5. Disengage the power supply by placing a slotted screwdriver into the slot at the rear side of the E-box case. Gently pry the screwdriver toward the front of the system until you feel the power supply release. It does not take much pressure to do this.
6. Slide and remove the power supply out from the rear of the E-box.
7. Either proceed to [step 8](#), or to remove the E-box assembly, cooling fans or Backplane board proceed to [step 11](#).

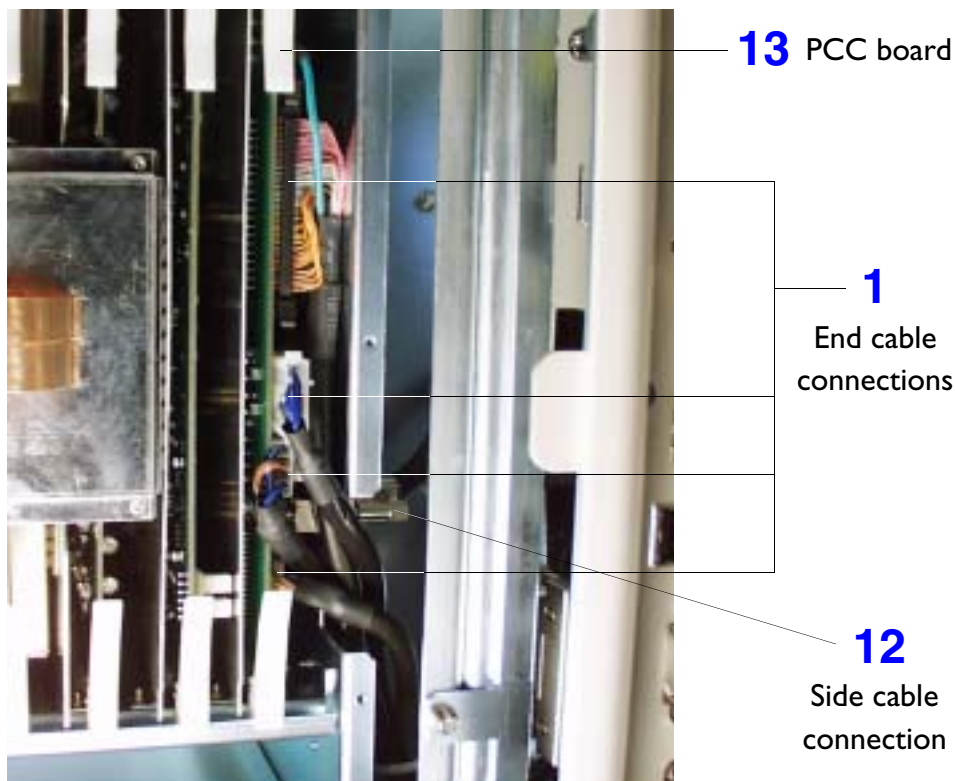
Figure 10-28 **Removing the BFC Board**



8. Grasp the top and bottom side of the BFC board and gently pull it off the FE and BF boards.

Figure 10-29 Removing the FE, BF and DSC Boards

9. To remove the FE, BF, or DSC boards, pull out on the card retainers to release the board from the Backplane board.
10. Slide the board out of the card cage and place it on an anti-static mat.

Figure 10-30 Removing the PCC Board

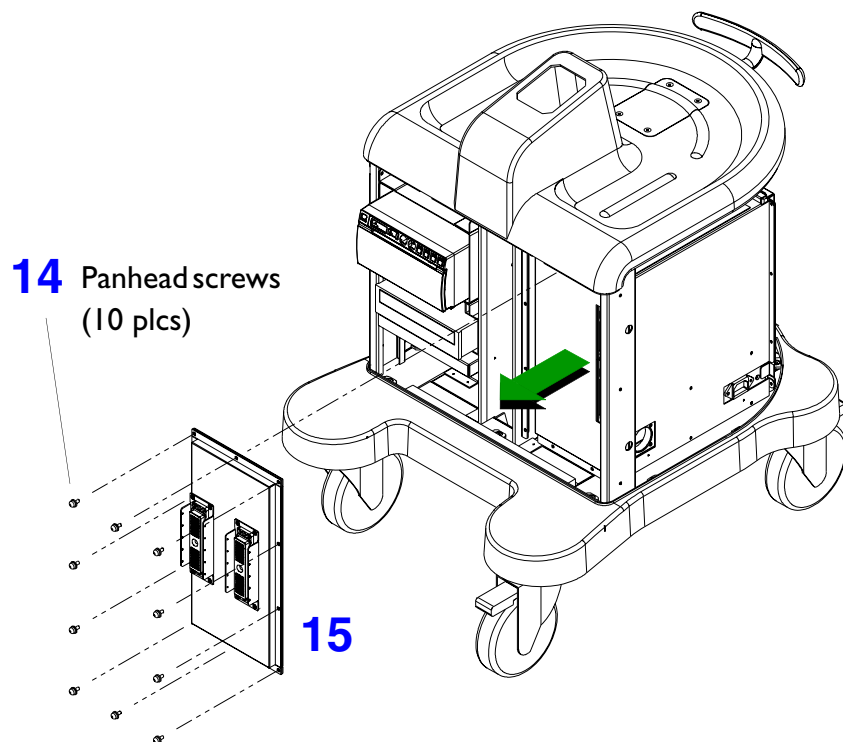
11. To remove the PCC board, disconnect the four main cables and two ground lugs (green wires) connected on the end of the board and the one cable connected on the side of the board.

NOTE The left side panel must be removed in order to access the one cable that connects to the side of the PCC board.

12. Reach in from the left side of the system, through to the connector, and loosen the two connector screw lugs. Pull the connector off the board.

13. Pull out on the card retainers to release the board from the Backplane board and slide the board out of the card cage and place it on an anti-static mat.

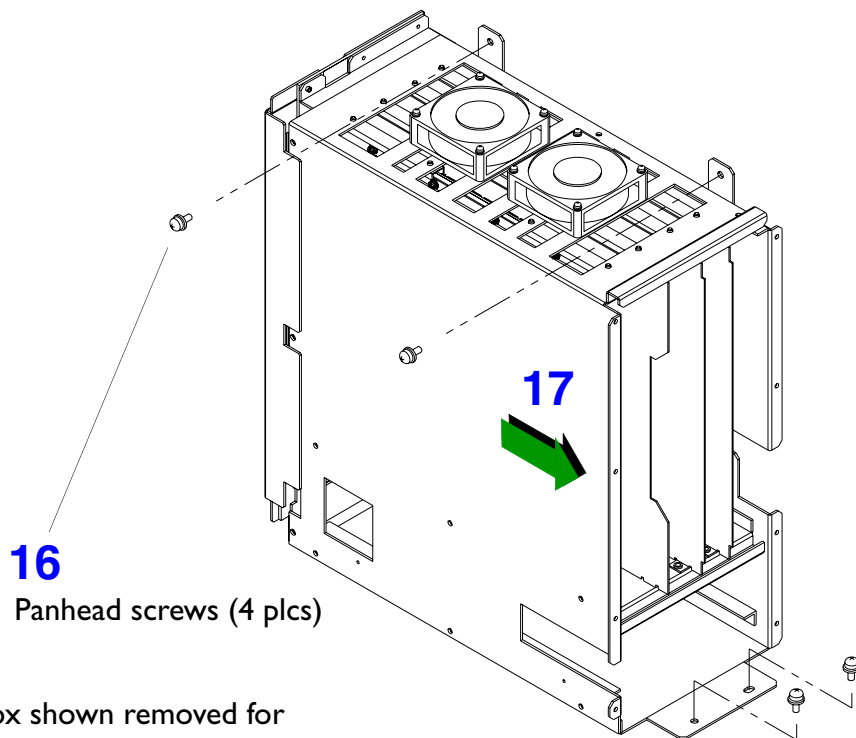
Figure 10-31 **Removing the Transducer Connector Assembly (TCA)**



14. Remove the ten screws securing the transducer connector assembly to the E-box and cart chassis.
15. Gently pull the transducer connector assembly off the front of the E-box assembly.

NOTE To reinstall the transducer connector assembly, the E-box rear shield must first be installed to prevent the E-box boards from moving out of position. Refer to [step 2](#) for reinstalling the E-box rear shield.

Figure 10-32 **Removing the E-box Assembly**

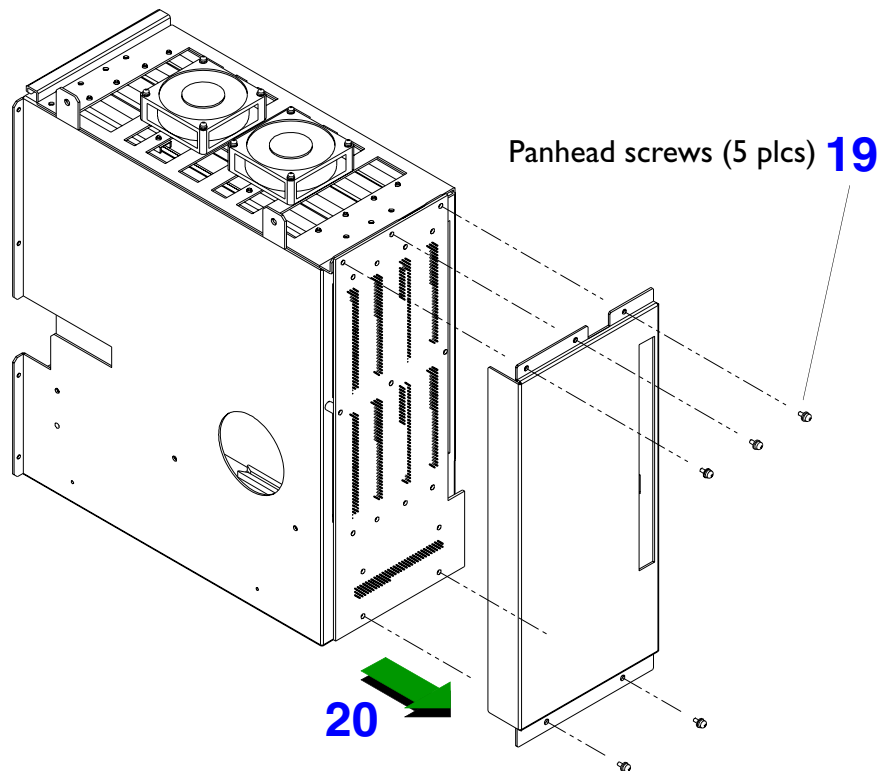


16
Panhead screws (4 plcs)

E-box shown removed for
clarity of illustration

16. Remove the four screws securing the E-box assembly to the cart chassis.
17. Slide the E-box towards the rear of the system and lift it out of the E-box bay.
18. To remove the Backplane board proceed to [step 19](#). To remove the cooling fans proceed to [step 24](#).

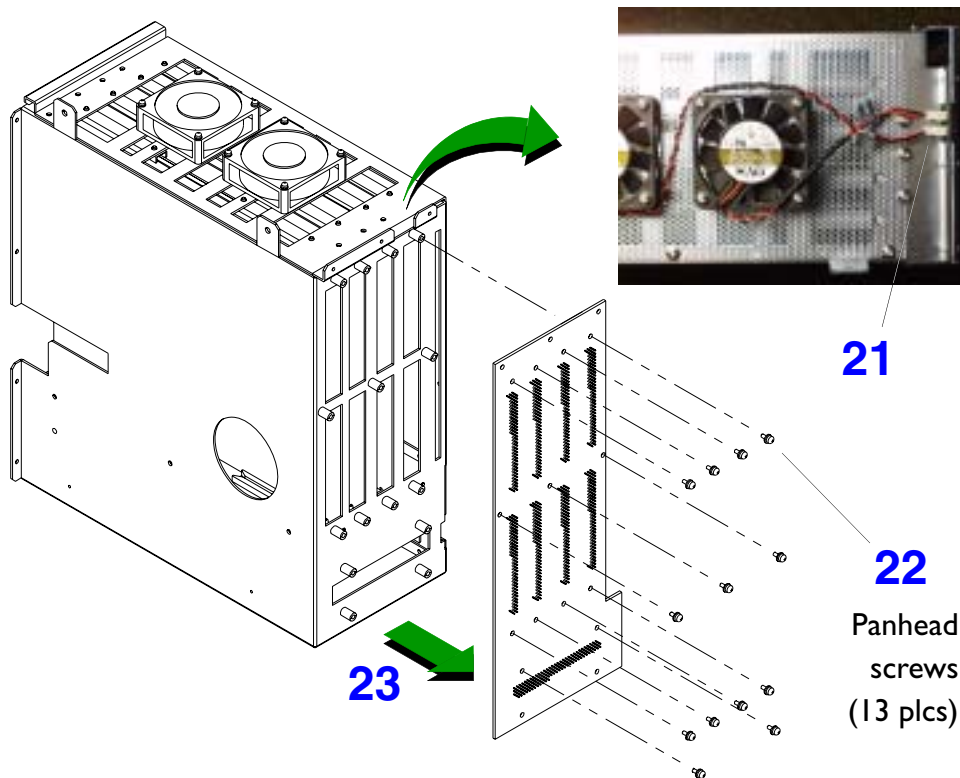
Figure 10-33 Removing the Backplane Board Shield



19. Remove the five screws securing the Backplane board shield to the E-box case.

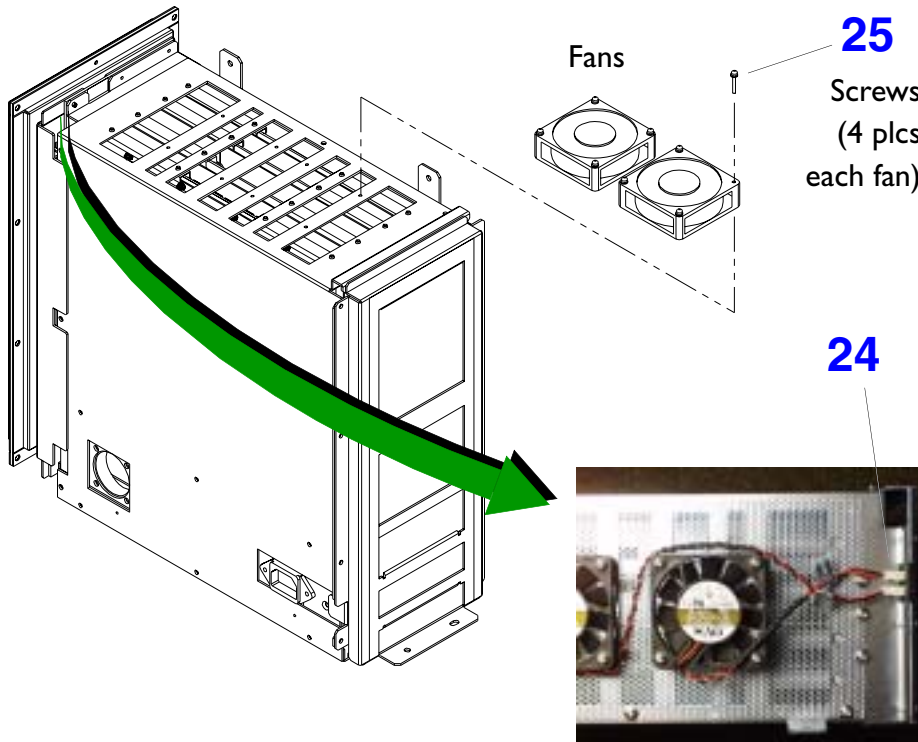
20. Pull the shield off the E-box and set it aside.

Figure 10-34 Removing the Backplane Board



21. Disconnect the two speaker cables from the top of the Backplane board.
22. Remove the 13 screws securing the Backplane board to the E-box case.
23. Pull the Backplane board off the box.

Figure 10-35 Removing the E-box Cooling Fans

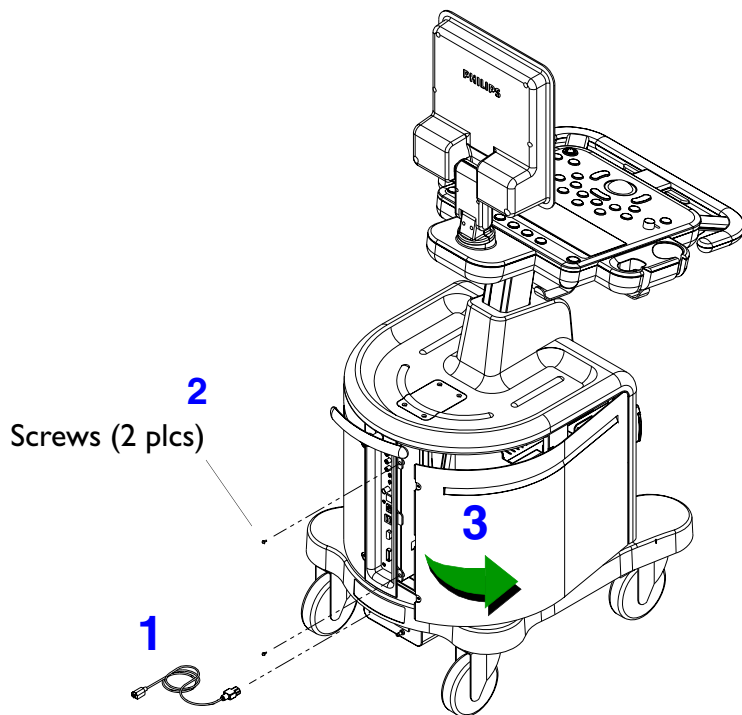


24. Disconnect the two speaker cables from the top of the Backplane board.
25. Remove the four screws securing each cooling fan to the top of the E-box case.

Return to [Disassembly Procedure List \(1 of 2\)](#).

Rear I/O Panel Assembly

Figure 10-36 Removing the Left and Right Side Enclosures

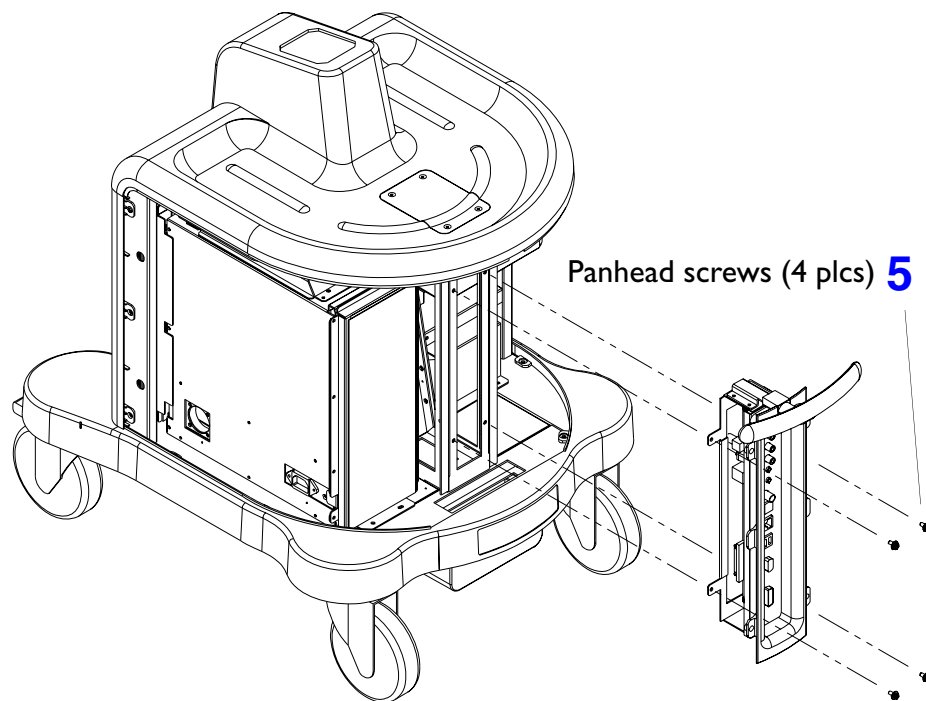


NOTE Both side enclosures must be removed before removing the Rear I/O assembly.

➤ **To remove the Rear I/O panel assembly**

1. Disconnect the system power cord from the main AC supply.
2. Remove the two screws securing the left side enclosure.
3. Pivot the back side of the enclosure away from the system, and then gently slide the enclosure toward the rear to remove it.
4. Repeat [step 2](#) and [step 3](#) for right side enclosure removal.

Figure 10-37 **Removing the Rear I/O Panel**



5. Remove the four screws securing the Rear I/O panel to the cart frame.

CAUTION When removing any of the four Rear I/O panel assembly screws, ensure that the screws don't drop into the Power I/O box opening below. If this happens you will have to remove the Power I/O box to retrieve them, [Figure 10-40](#).

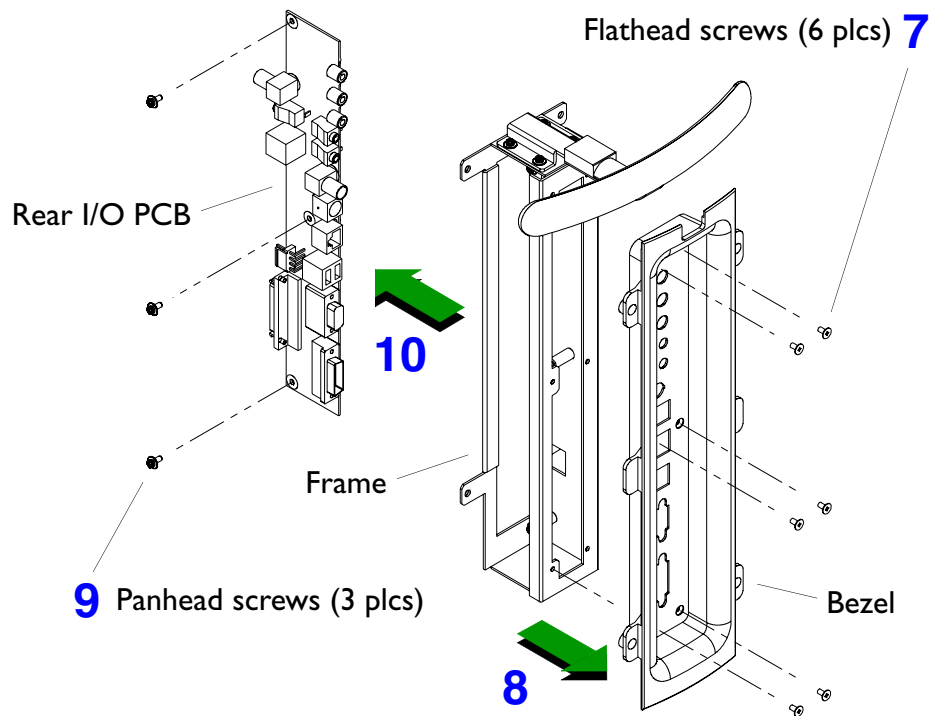
Figure 10-38 **Disconnecting the Rear I/O Panel Assembly PCB Cables**

6 PCC interface cable

6 B/W printer cables (if used)



6. Pull the Rear I/O panel assembly out of the cart frame enough to disconnect all the cables connected to the Rear I/O panel assembly board.

Figure 10-39 Removing the Rear I/O Panel Assembly PCB

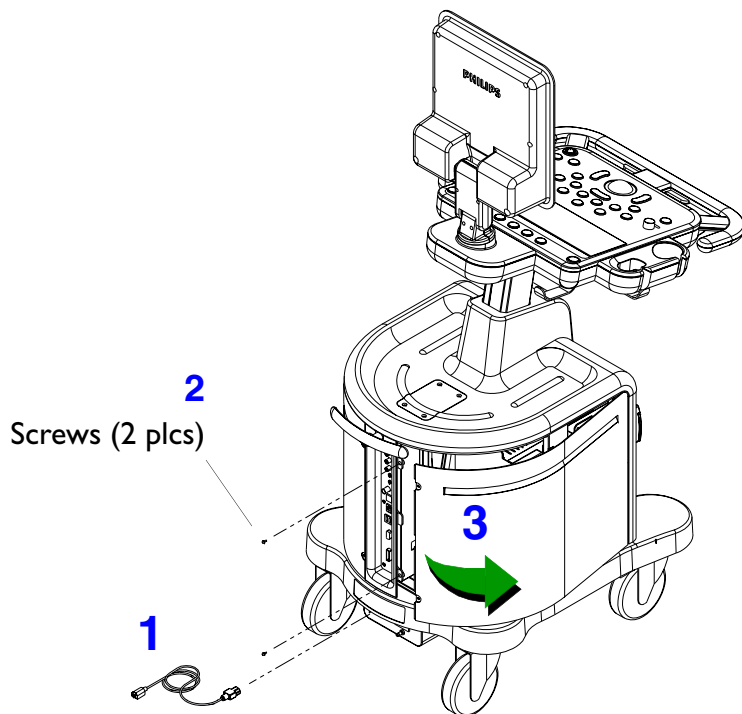
7. Remove the six screws securing the Rear I/O panel bezel to the Rear I/O panel assembly frame.
8. Slide the bezel off the front of the Rear I/O panel assembly frame.
9. Remove the three screws securing the Rear I/O panel PCB to the Rear I/O panel assembly frame.
10. Slide the PCB out the backside opening of the frame.

Return to [Disassembly Procedure List \(2 of 2\)](#).

Power I/O Box

Figure 10-40

Removing the Left and Right Side Enclosures



NOTE Both side enclosures must be removed before removing the Power I/O box.

► To remove the Power I/O box

1. Disconnect the system power cord from the main AC supply.
2. Remove the two screws securing the left side enclosure.
3. Pivot the back side of the enclosure away from the system, and then gently slide the enclosure toward the rear to remove it.
4. Repeat [step 2](#) and [step 3](#) for right side enclosure removal.

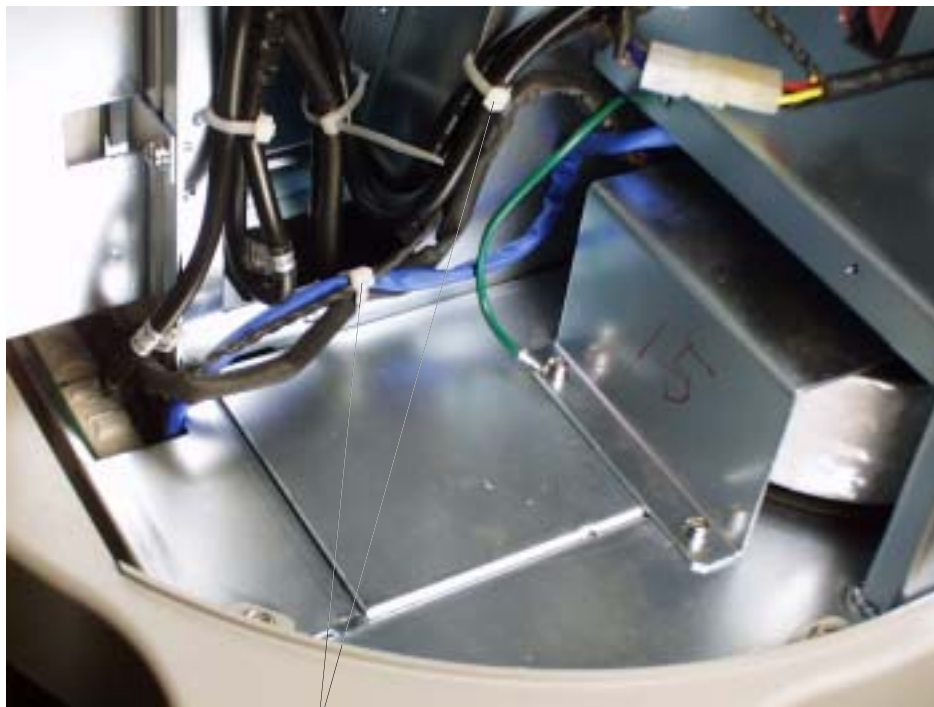
Figure 10-41 **Disconnecting the Power Supply Power Cord**



5

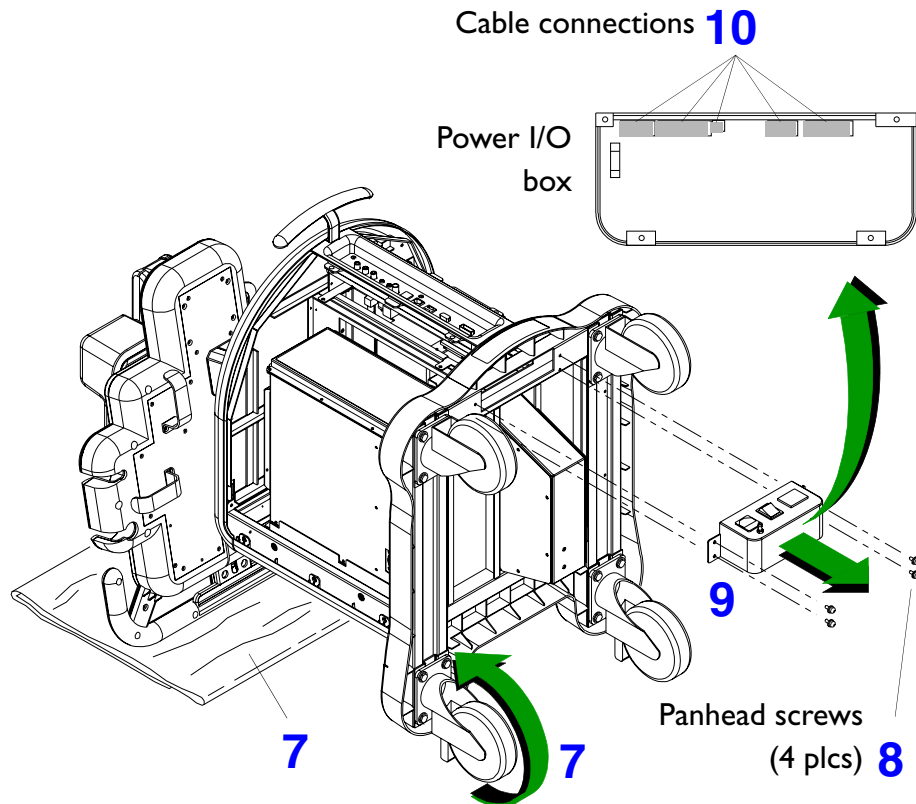
5. Disconnect the power supply power cord from the right side of the E-box.

Figure 10-42 **Cutting the Cable Ties on the Power Cables**



Cable ties **6**

6. Cut the two cable ties that bind the transformer and CD cables together.

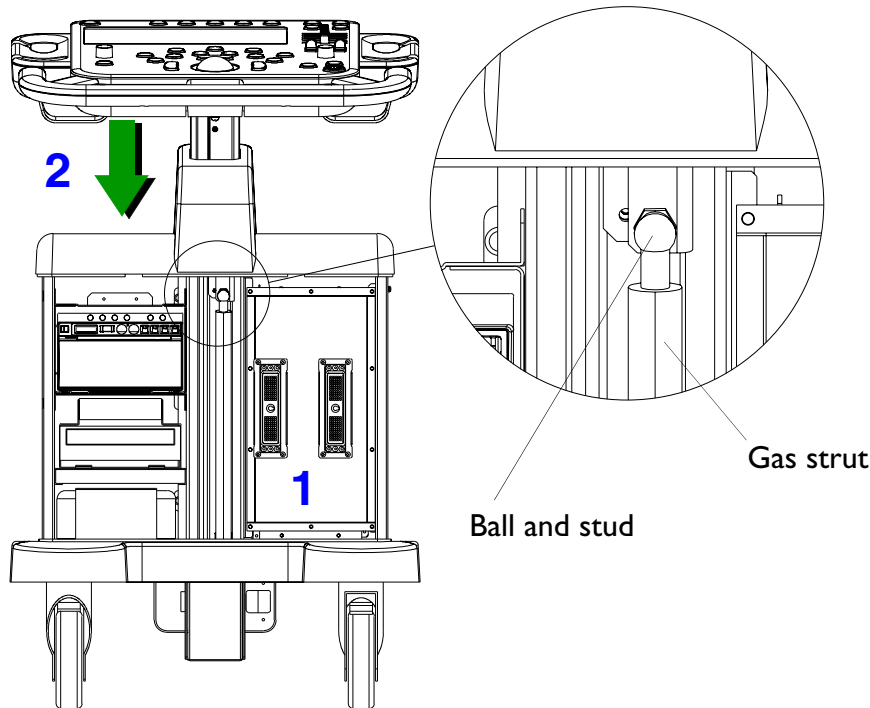
Figure 10-43 Removing the Power I/O Box

7. Place a soft material protector pad on the floor and carefully rotate the system over on its front casters so that the control panel handle rests on the protector pad.
8. Remove the four screws securing the Power I/O box to the cart frame.
9. Pull the Power I/O box away from the underside of the system.
10. Disconnect all five power cable connections from the backside of the Power I/O box PCB.

Return to [Disassembly Procedure List \(2 of 2\)](#).

Lift Column Gas Strut

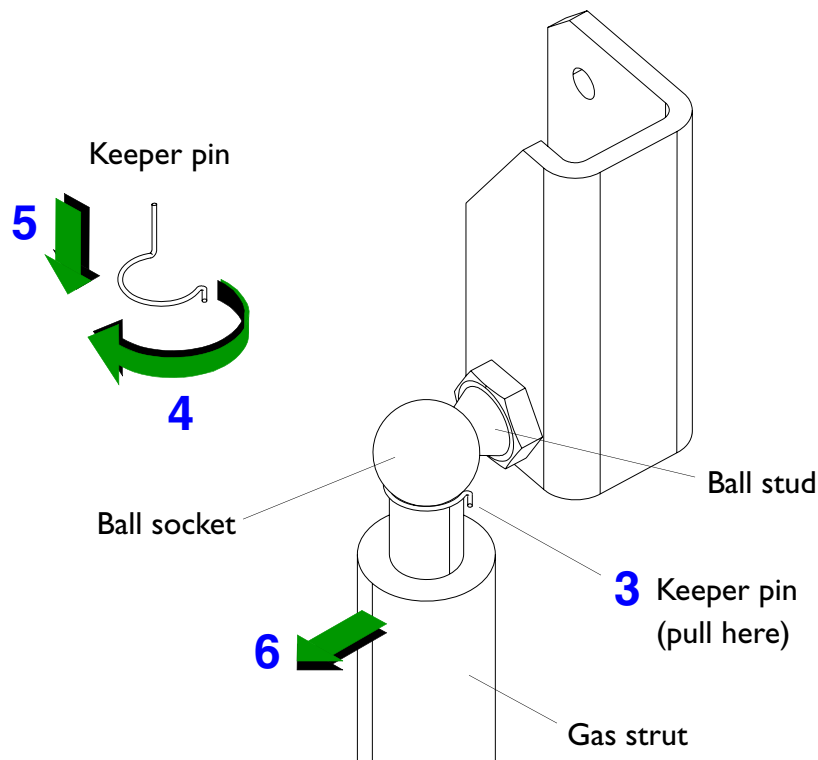
Figure 10-44 Lowering the Control Panel



➤ **To remove the lift column gas strut**

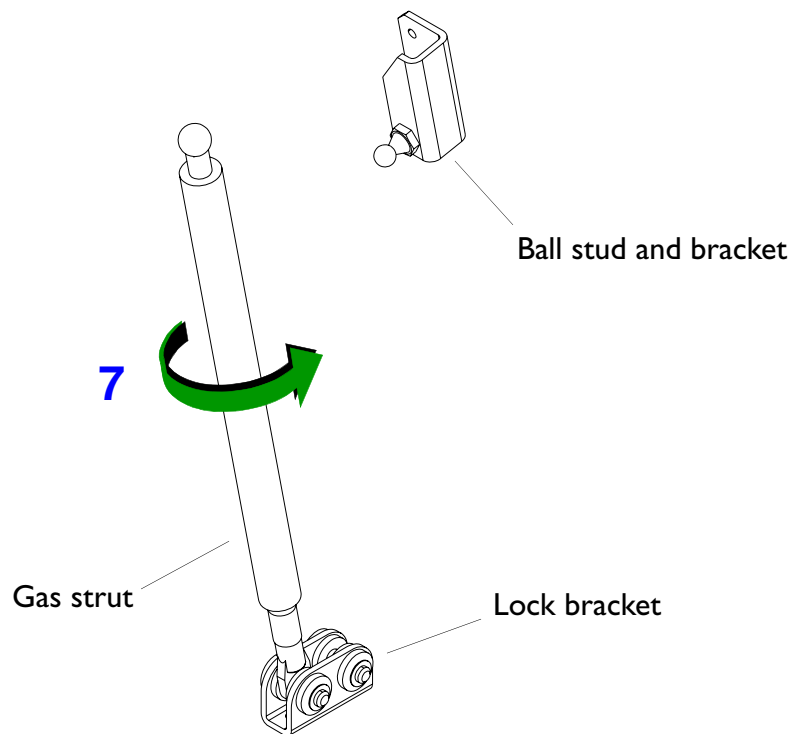
1. Refer to [“System Enclosures” on page 157](#) for system enclosures removal and perform all the steps before proceeding.
2. Lower the control panel until the ball and ball stud end of the gas strut is visible and accessible.

Figure 10-45 Removing the Gas Strut from the Ball Stud



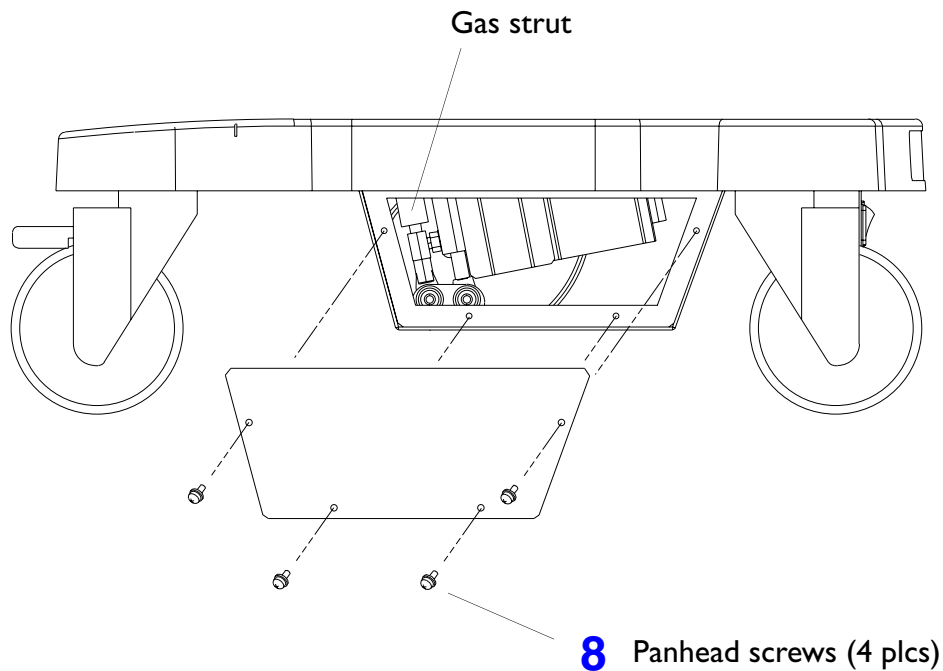
3. Pull the end of the keeper pin outward (right side of gas strut ball socket).
4. Rotate the keeper pin (counterclockwise).
5. Slide the pin down until it comes out of the ball socket holes.
6. Pull the gas strut off of the ball stud.

Figure 10-46 **Removing the Gas Strut from the Lock Bracket**



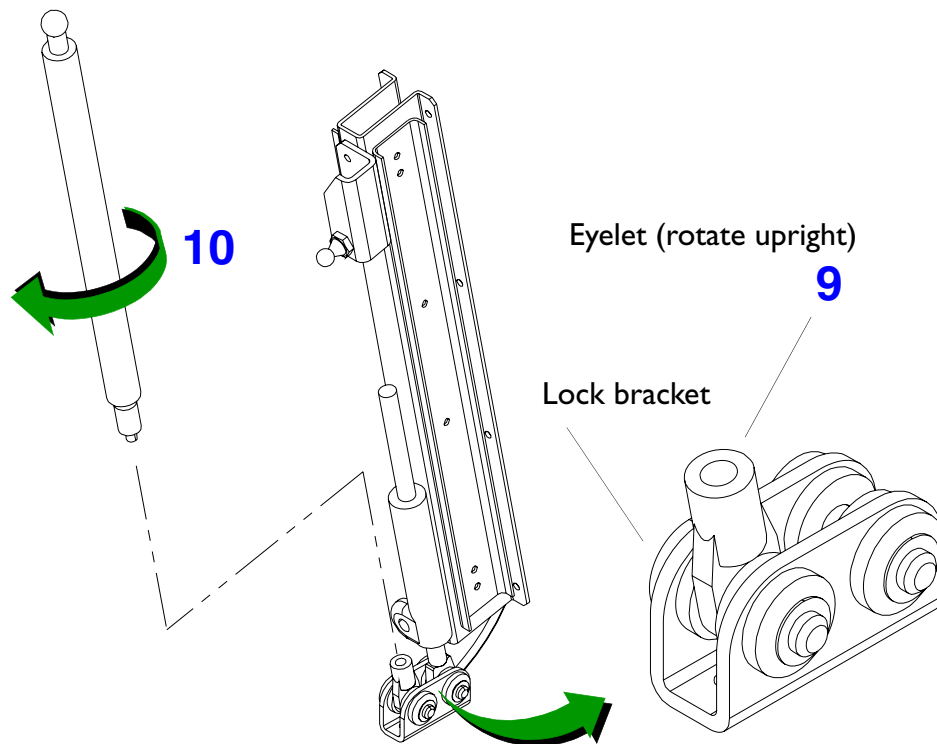
7. Unscrew the gas strut (counter-clockwise) until it releases from the eyelet on the lock bracket. The gas strut is now removed.

Figure 10-47 **Removing the Gas Strut Mount Access Panel**



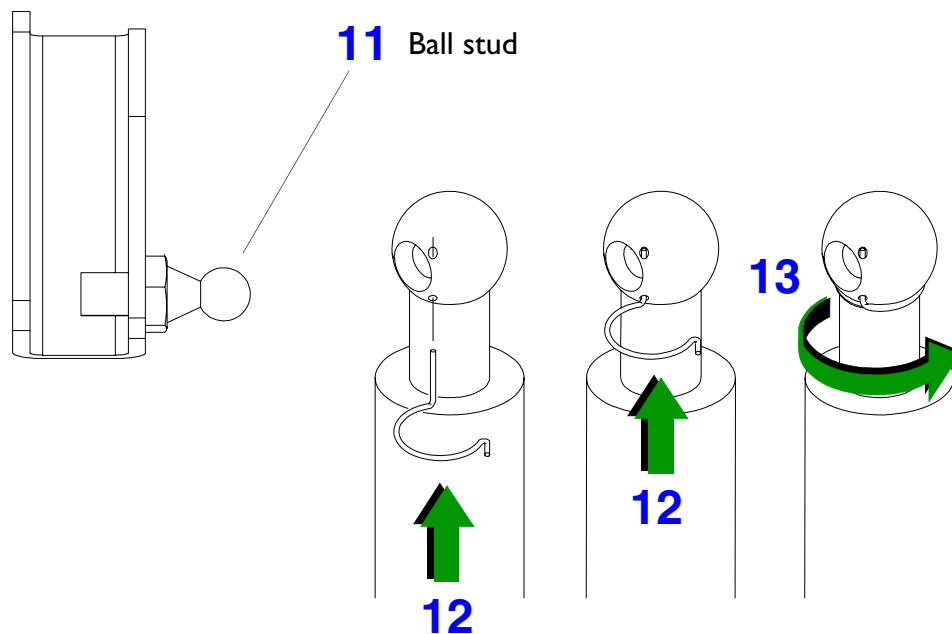
8. Remove the four screws securing the gas strut mount access plate to the lower cart frame.

Figure 10-48 **Installing the Gas Strut into the Lock Bracket**



9. Reach in through the gas strut mount access opening and rotate the lock bracket eyelet upward until you see the screw hole. Hold it in that position.
10. Screw the gas strut (clockwise) into the lock bracket eyelet until it is snug.

Figure 10-49 **Inserting the Gas Strut onto the Ball Stud**

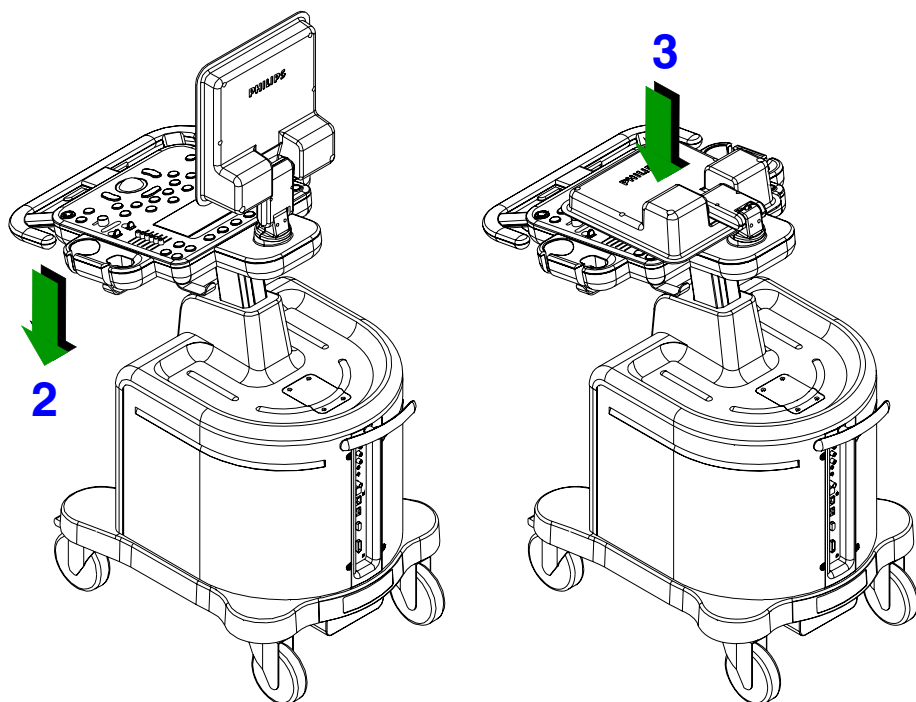


11. Press the gas strut ball socket onto the ball stud.
12. Insert the keeper pin through the two holes in the ball socket.
13. Rotate the keeper pin (clockwise) around the shaft and snap it into place.

Return to [Disassembly Procedure List \(2 of 2\)](#).

System Casters

Figure 10-50 Preparing the System for Caster Replacement



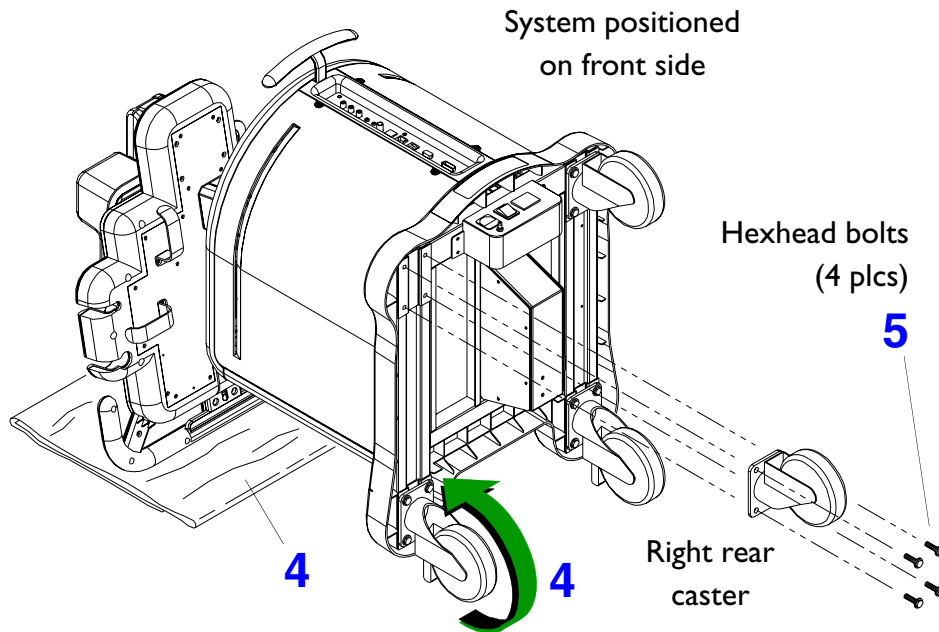
► To remove a system casters

1. Disconnect the system power cord from the main AC supply.

WARNING The following steps require that the system be tipped over to the floor. To reduce the risk of injury or system damage from toppling, tilt the monitor down onto the control panel surface and lower the control panel to its lowest position.

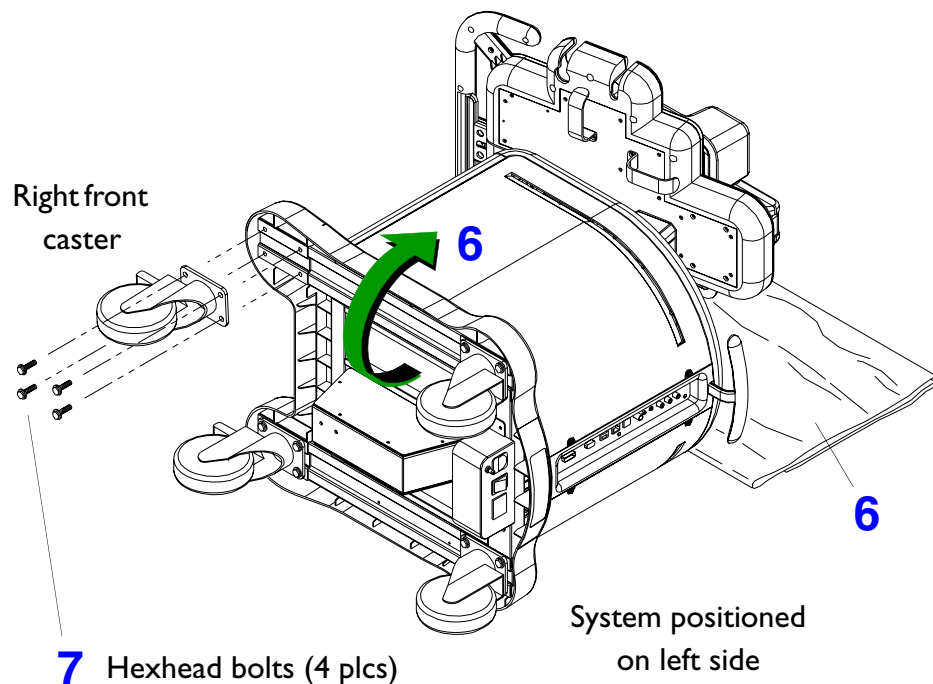
2. Lower the control panel to its lowest position.
3. Tilt the monitor down onto the control panel.

Figure 10-51 **Tipping the System to Remove the Rear Casters**



4. Place a soft material protector pad on the floor and carefully rotate the system over on its front casters so that the control panel handle rests on the protector pad.
5. Remove the four bolts securing the rear caster to the cart weldment.

Figure 10-52

Tipping the System to Remove the Front Casters

6. Place a soft material protector pad on the floor and carefully rotate the system over on its right side (for left front caster removal) or on its left side (for right front caster removal). Orient the system so that the control panel transducer holder rests on the protector pad.
7. Remove the four bolts securing the front caster to the cart weldment.

Return to [Disassembly Procedure List \(2 of 2\)](#).

Crating the HD3 Ultrasound System

Figure 10-53 Locking the Front Casters



► To crate the HD3 Ultrasound System

NOTE You must have the shipping crate package to be able to perform this procedure. This package contains all the hardware necessary for proper shipping.

1. Lock both front casters by pressing down on each caster lock lever to prevent the system from moving during the crating procedure.

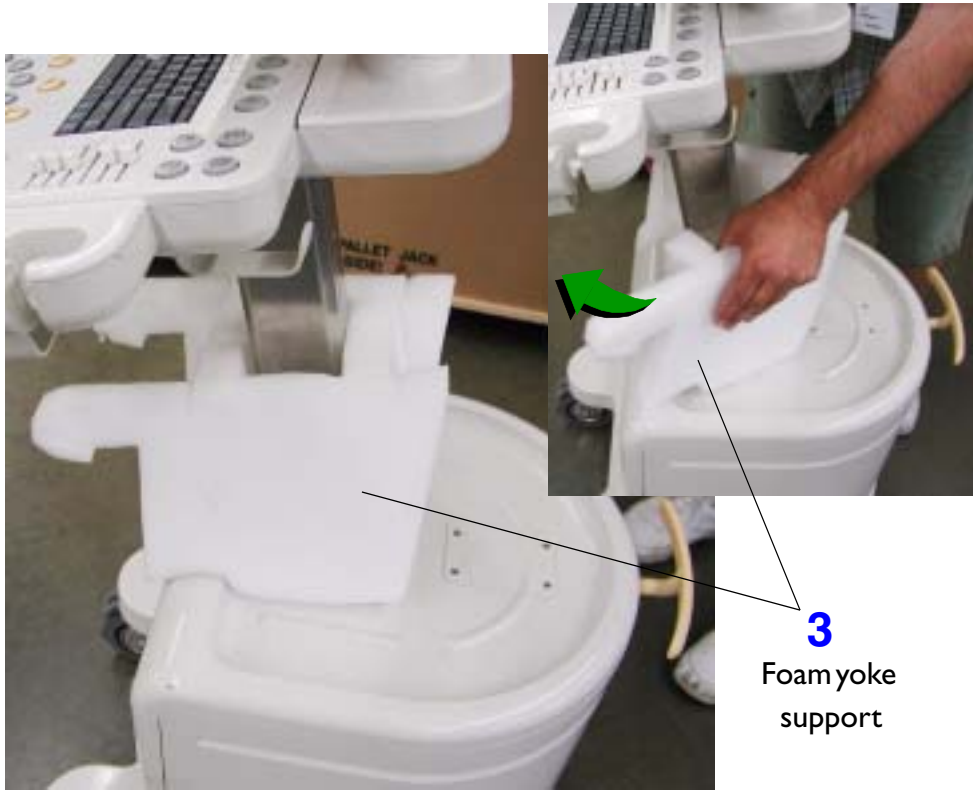
Figure 10-54 **Raising the Control Panel**



2

2. Grasp the control panel handle; engage the trigger release, and raise the control panel to its highest position.

Figure 10-55 **Placing the Foam Yoke Support**



3. Spread apart the foam yoke support and place it on top of the system top cover and then fold it around the lift column.

Figure 10-56 Lowering the Control Panel



4. Grasp the control panel handle; engage the trigger release, and lower the control panel until it rests firmly against the foam yoke support.

Figure 10-57 **Tilting the Video Monitor**



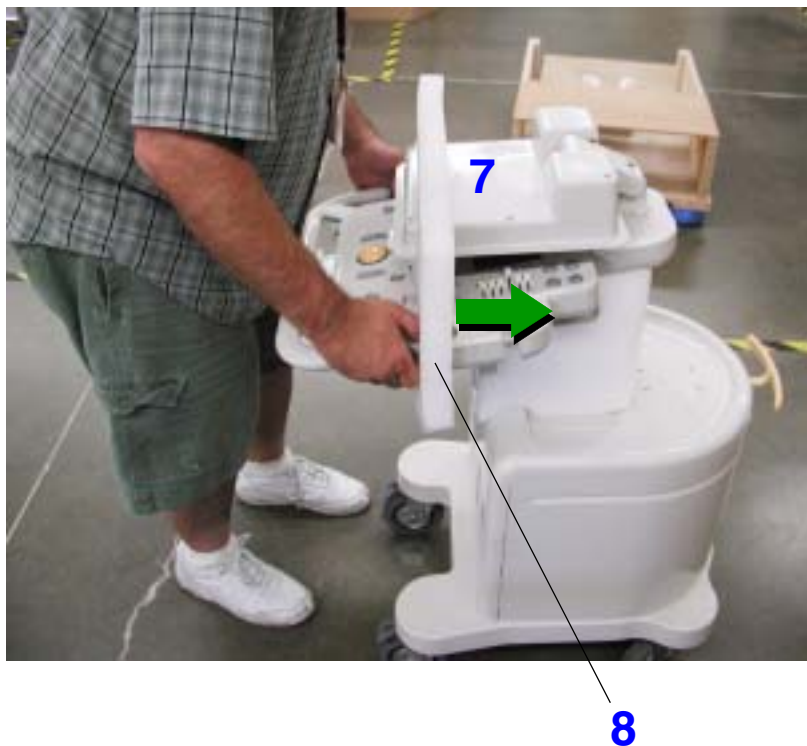
5. Grasp both sides of the video monitor and tilt it toward the front of the system until it is in a horizontal position above the control panel.

Figure 10-58 **Placing the Foam Monitor Support**



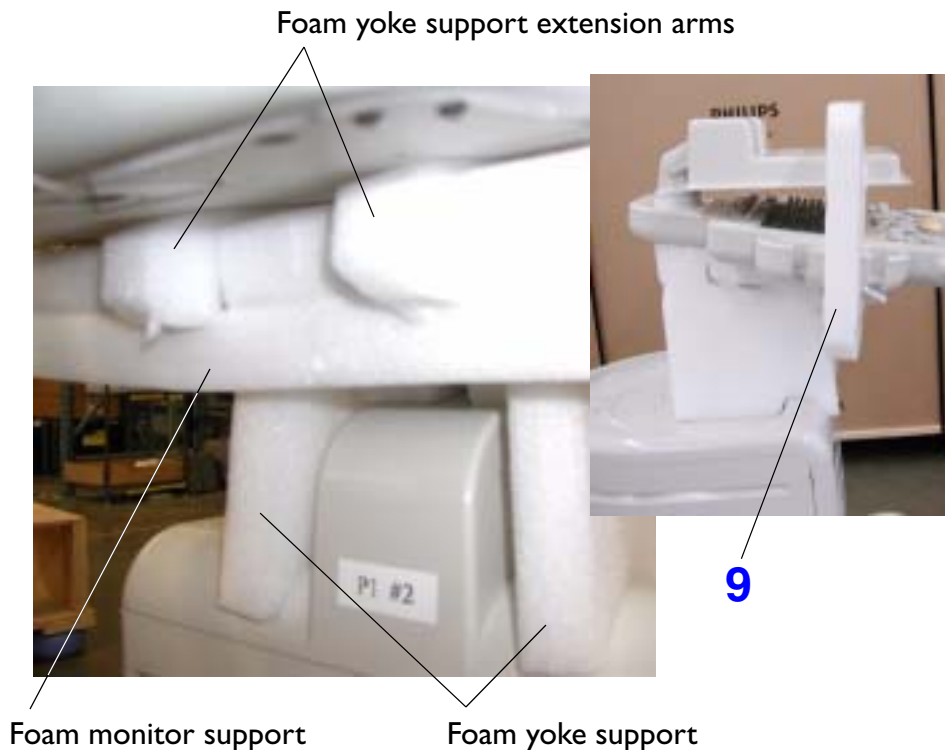
6. Carefully slide the foam monitor support over the control panel. Ensure that the opening in the foam for the monitor is at the top.

Figure 10-59 **Securing the Video Monitor**



7. Align the video monitor with the cut-out in the foam support.
8. Slide the foam support further up the control panel allowing the monitor to slide through the upper cut-out.

Figure 10-60 Fastening the Two Foam Supports Together



9. Below the control panel, slide the foam monitor support back so that the two foam arms extending from the foam yoke support come through the holes. Push until both foam arm extensions hook and hold the foam monitor support in place.

Figure 10-61 **Covering the System with an Antistatic Bag**



10. Place an antistatic bag over the system.

NOTE With the exception of the casters, the antistatic bag must cover every part of the system that contacts the crate.

Figure 10-62 **Placing the Ramp**



11. Place the crate ramp in front of the crate opening with the beveled edge positioned at the lower end and facing up.

Figure 10-63 Loading the System onto the Crate



12. Unlock both front casters by pressing down on each caster tab lock release.
13. Slightly lift the antistatic bag and position yourself on one side of the crate toward the front of the system.
14. Grasp the control panel handle and carefully pull the system up the ramp and onto the crate, guiding the underside of the system into the crate floor support. The rear of the system should be facing the ramp side of the crate.

Figure 10-64 **Rotating the Rear Casters**



15. Rotate the rear casters 180 degrees.

Figure 10-65 **Placing the Wheel Chock**



16. Place the wheel chock so that the beveled side seats against the wheels of the casters.

Figure 10-66 **Placing the System Hold-Down Brace**



17. Place the system hold-down brace over the rear wheels.

Figure 10-67 **Mounting the Ramp to the Crate**



18. Turn the ramp around and place the ramp into the pallet with beveled edge up and facing outward.
19. Secure the ramp to the crate using four bolts.

Figure 10-68 **Placing the Corrugated Wrap**



20. Place the one-piece corrugated wrap over the ramp and onto the pallet. The corrugated wrap should be set so that the wrap fits on the inside of each corner retainer bracket.

Figure 10-69 **Placing the Corrugated Top Cover**



21. Place the corrugated top cover on the crate container and press it into place at each corner.

Figure 10-70 **Banding the System Crate**

Poly strapping bands



22. Band the crated system container from the side with two poly strapping bands.

Return to [Disassembly Procedure List \(2 of 2\)](#).

II Cabling

Introduction

This section contains system cabling and connector information. Use the illustrations (figures) and parts tables in this section to locate and identify system cables and their part numbers. Part numbers are shown on the illustrations and are listed and described in the corresponding tables.

NOTE Cable part numbers are located on at least one end of the cables.

System Cabling Diagrams

System signal interconnect and power distribution cabling diagrams are shown in [Figure 11-1](#) and [Figure 11-2](#). For reference, system-to-peripheral connection diagrams are provided in [Figure 11-1](#) through [Figure 11-3](#).

Cable Part Numbers

[Table 11-1](#) is a parts list of the interconnect cables shown in [Figure 11-1](#) and the power distribution cables shown in [Figure 11-2](#). Refer to [Table 14-2](#) for additional information on peripherals and applicable cables.

System Connectors

[Figure 11-4](#) through [Figure 11-11](#) are illustrations of the system primary connector assemblies.

Figure 11-1 HD3 Ultrasound System Signal Interconnect Diagram

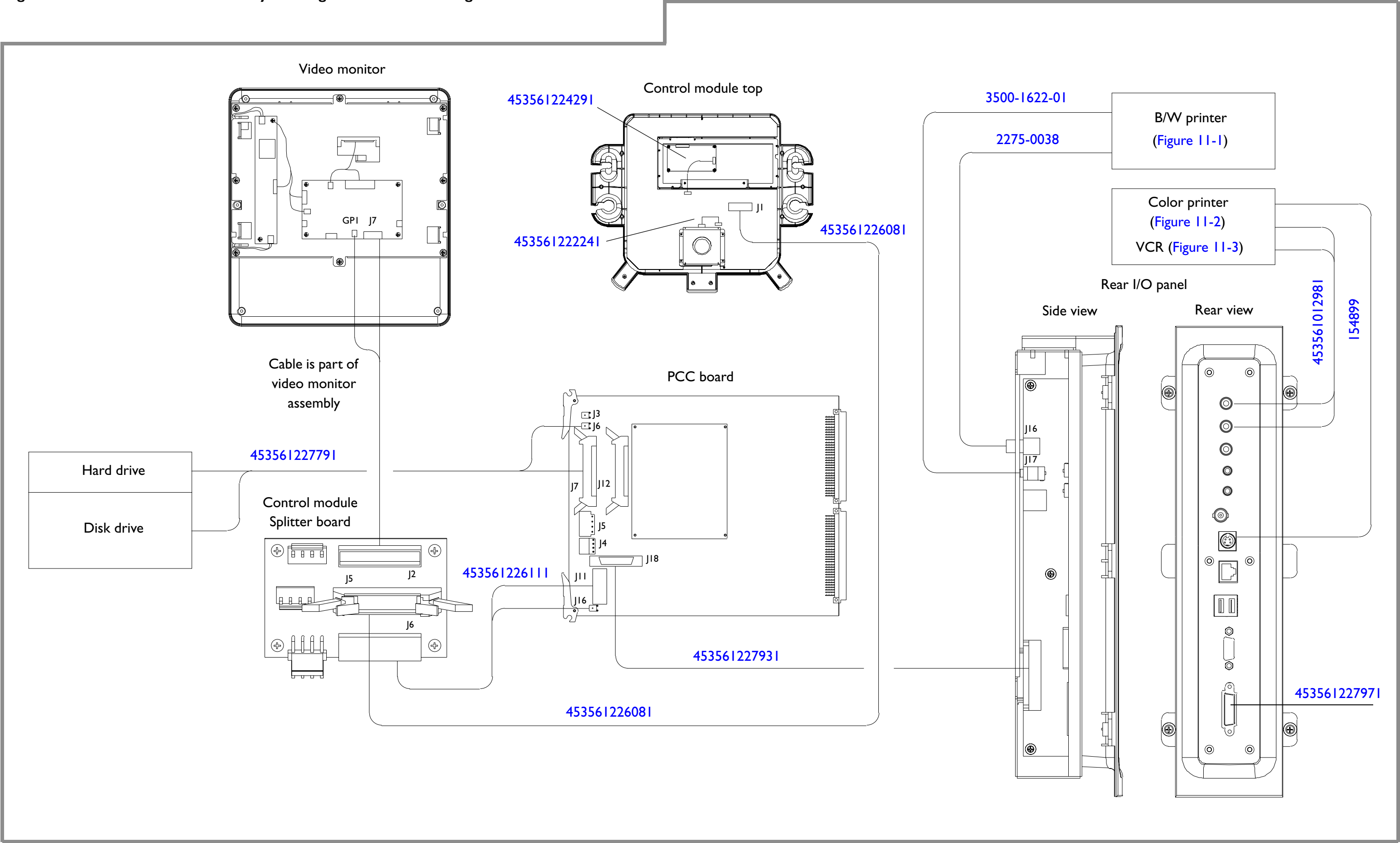
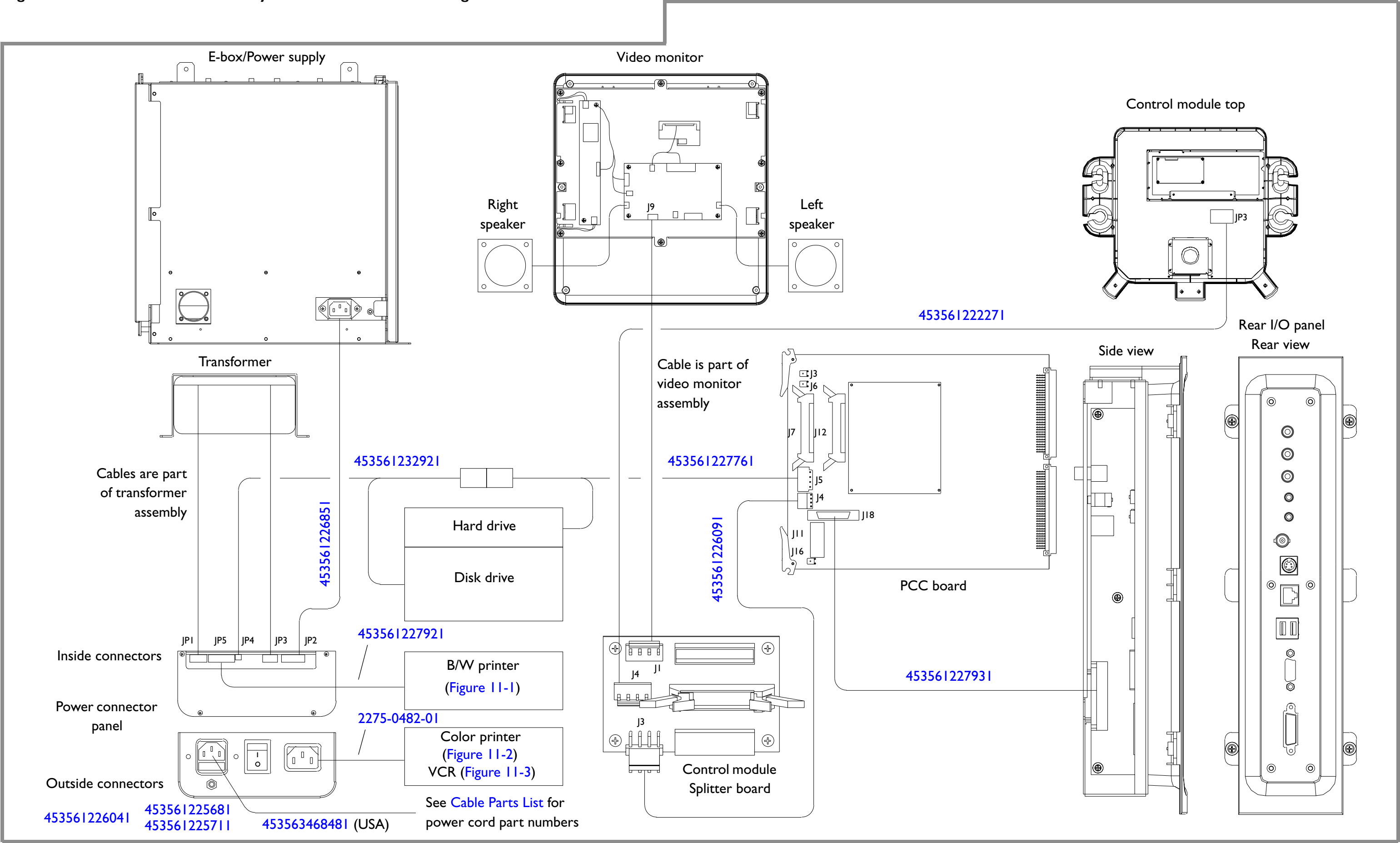


Figure 11-2 HD3 Ultrasound System Power Distribution Diagram



Cable Parts List

Table 11-1 HD3 System Signal and Power Cable Part Numbers

Part Number	Cable Description	Notes/Reference
453561227921	Cable Assy, Black and White Printer, Power	Manufacturing No: WH-439-PWR-05-00 Diagram: Figure 11-2 and Figure 11-1
2275-0038	Cable Assy, BNC, Rear I/O Panel to B/W Printer, 36-In	Alias No: 453561129851 Diagram: Figure 11-1 and Figure 11-1
453561227791	Cable Assy, CD/Hard Drive, Data	Manufacturing No: WH-439-SIG-08-00 Diagram: Figure 11-1
453561227761	Cable Assy, CD/Hard Drive, Power	Manufacturing No: WH-439-PWR-04-00 Diagram: Figure 11-2
453561232921	Cable Assy, CD-RW, External Power	Manufacturing No: WH-439-PWR-07 Diagram: Figure 11-2
3500-1622-01	Cable Assy, Print Trigger	Alias No: 453561018331 Diagram: Figure 11-1 and Figure 11-1
453561226851	Cable Assy, E-Box Power	Manufacturing No: WH-439-PWR-06 Diagram: Figure 11-2
453561227971	Cable Assy, Foot Switch Adapter	Manufacturing No: WH-339-PWR-03 Diagram: Figure 11-1 Parts Info: Figure 14-31
453561226081	Cable Assy, Keyboard Data	Manufacturing No: WH-439-SIG-07-00 Diagram: Figure 11-1

Table 11-1 HD3 System Signal and Power Cable Part Numbers (Continued)

Part Number	Cable Description	Notes/Reference
453561222271	Cable Assy, Keyboard, Power	Manufacturing No: WH-439-PWR-03-00 Diagram: Figure 11-2
453561224291	Cable Assy, QWERTY Keyboard	Manufacturing No: WH-439-SIG-05-00 Diagram: Figure 11-1
453561227931	Cable Assy, PCC to Rear I/O Panel	Manufacturing No: WH-439-SIG-03-00 Diagram: Figure 11-1
453561226041	Cable Assy, Power Adapter with Filter	Manufacturing No: ADAPTOR-FILTER Diagram: Figure 11-2

Table 11-1 HD3 System Signal and Power Cable Part Numbers (Continued)

Part Number	Cable Description	Notes/Reference
453561225681	Cable Assy, Power Cord, 110 Vac with Filter	<p>Initial shipments of HD3 systems shipped with power cords have integrated line filters (453561225681 or 453561225711).</p> <p>All remaining shipments of HD3 systems use the Cable Assy, Power Adapter with Filter. With this "universal filter", power cords without an integrated line filter can be used.</p> <p>If the HD3 system does not have the power adapter with filter, you should use ONLY one of the two power cords with integrated line filter.</p> <p>Manufacturing No: CORD-110-FILTER</p> <p>Diagram: Figure 11-2</p> <p>Parts info: Figure 14-25</p>

Table 11-1 HD3 System Signal and Power Cable Part Numbers (Continued)

Part Number	Cable Description	Notes/Reference
453561225711	Cable Assy, Power Cord, 220 Vac with Filter	<p>Initial shipments of HD3 systems shipped with power cords have integrated line filters (453561225681 or 453561225711).</p> <p>All remaining shipments of HD3 systems use the Cable Assy, Power Adapter with Filter. With this "universal filter", power cords without an integrated line filter can be used.</p> <p>If the HD3 system does not have the power adapter with filter, you should use ONLY one of the two power cords with integrated line filter.</p> <p>Manufacturing No: CORD-220-FILTER</p> <p>Diagram: Figure 11-2</p> <p>Parts info: Figure 14-25</p>
2275-0482-01	Cable Assy, Power Cord, Peripheral	<p>Alias No: 453561013471</p> <p>Used for top-mounted OEM's</p> <p>Diagram: Figure 11-2, Figure 11-2, and Figure 11-3</p>
453563468451	Cable Assy, Power Cord, System, UK/Singapore/Hong Kong	<p>Main AC system power cord</p> <p>Legacy No: M2540-60900</p>

Table 11-1 HD3 System Signal and Power Cable Part Numbers (Continued)

Part Number	Cable Description	Notes/Reference
453563468461	Cable Assy, Power Cord, System, Australia/New Zealand	Main AC system power cord Legacy No: M2540-60901
453563468471	Cable Assy, Power Cord, System, Continental Europe	Main AC system power cord Legacy No: M2540-60902
453563468481	Cable Assy, Power Cord, System, USA/Canada/Japan	Main AC system power cord Legacy No: M2540-60903 Diagram: Figure 11-2
453563468491	Cable Assy, Power Cord, System, Switzerland/Lietenstein	Main AC system power cord Legacy No: M2540-60906
453563468501	Cable Assy, Power Cord, System, Denmark/Greenland	Main AC system power cord Legacy No: M2540-60912
453563468511	Cable Assy, Power Cord, System, Africa/India	Main AC system power cord Legacy No: M2540-60917
453563468521	Cable Assy, Power Cord, System, Israel	Main AC system power cord Legacy No: M2540-60919
453563468531	Cable Assy, Power Cord, System, Argentina	Main AC system power cord Legacy No: M2540-60920
453563468541	Cable Assy, Power Cord, System, China	Main AC system power cord Legacy No: M2540-60922
453561012981	Cable Assy, RCA-RCA, Stereo, Molded, 6-Ft	Used for top-mounted VCR Diagram: Figure 11-1 and Figure 11-3

Table 11-1 HD3 System Signal and Power Cable Part Numbers (Continued)

Part Number	Cable Description	Notes/Reference
453561226111	Cable Assy, Splitter Board Data	Manufacturing No: WH-439-SIG-02-00 Diagram: Figure 11-1
453561226091	Cable Assy, Splitter Board Power	Manufacturing No: WH-439-PWR-01-00 Diagram: Figure 11-2
154899	Cable Assy, S-VHS, Shielded, 6-Ft	Alias No: 453561000921 Used for top-mounted OEMs Diagram: Figure 11-1 , Figure 11-2 and Figure 11-3
453561222241	Cable Assy, Trackball	Manufacturing No: WH-439-SIG-01-00 Diagram: Figure 11-1

Peripheral Cabling Diagrams

Figure 11-1

Sony UP-895MD B/W Printer Cabling Diagram

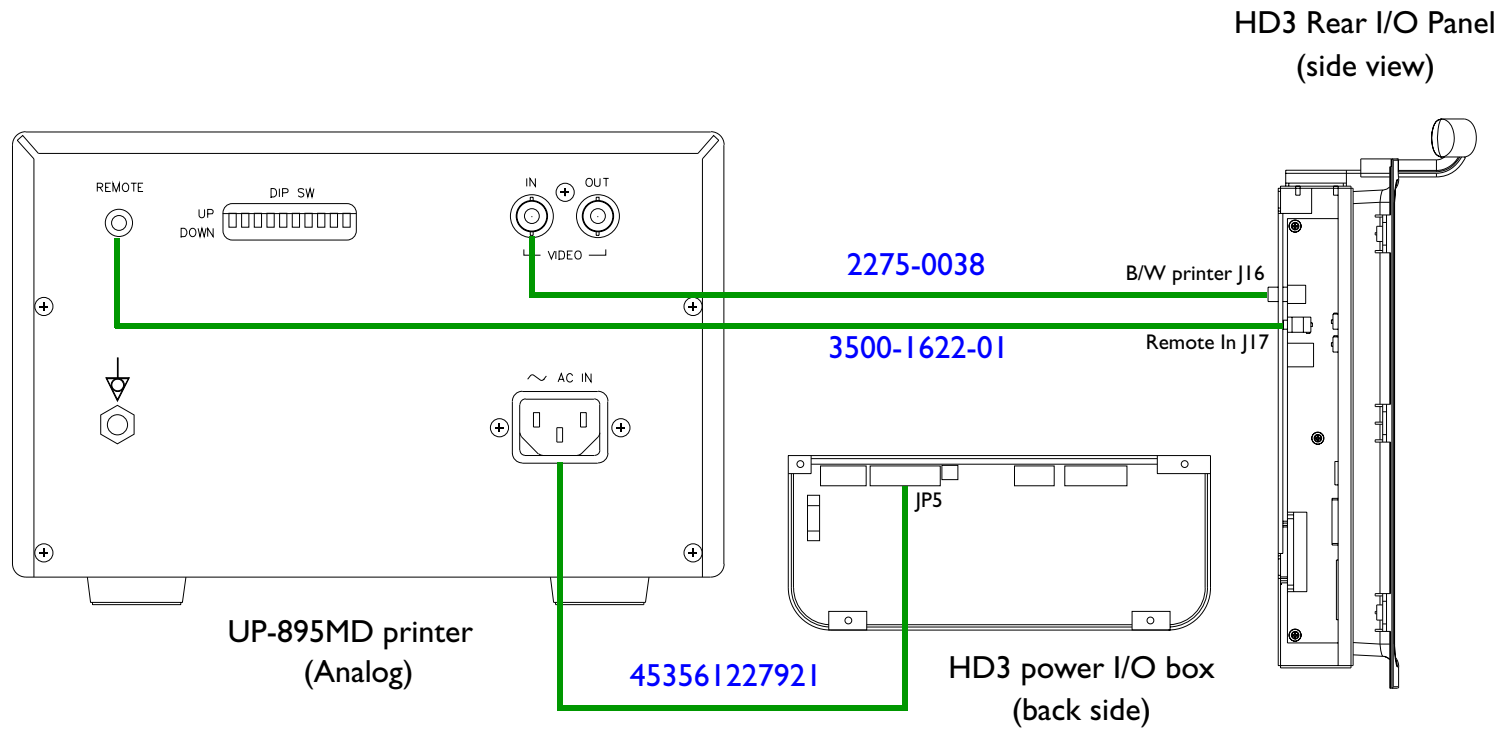


Figure 11-2

Sony UP-21MD Color Printer Cabling Diagram

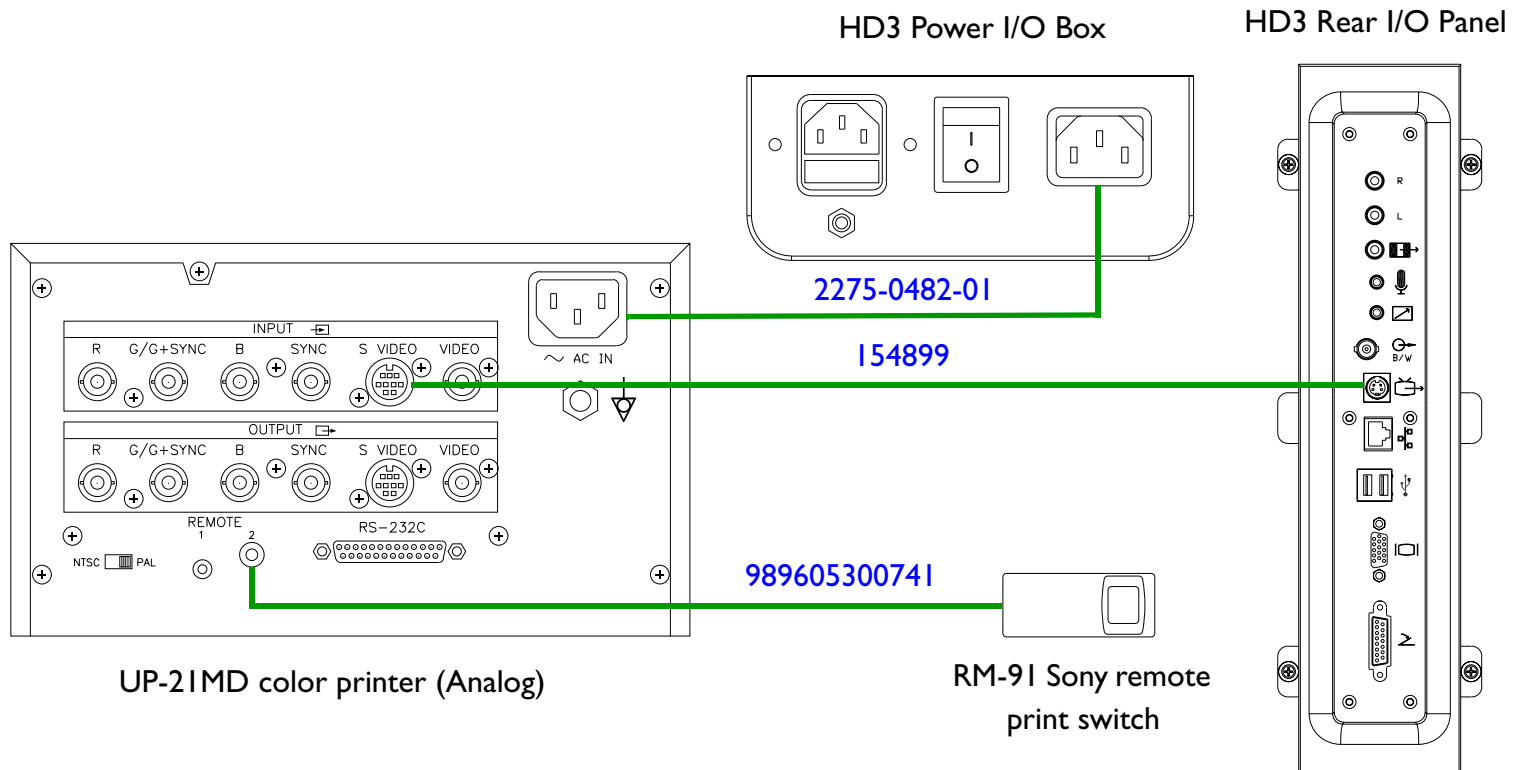
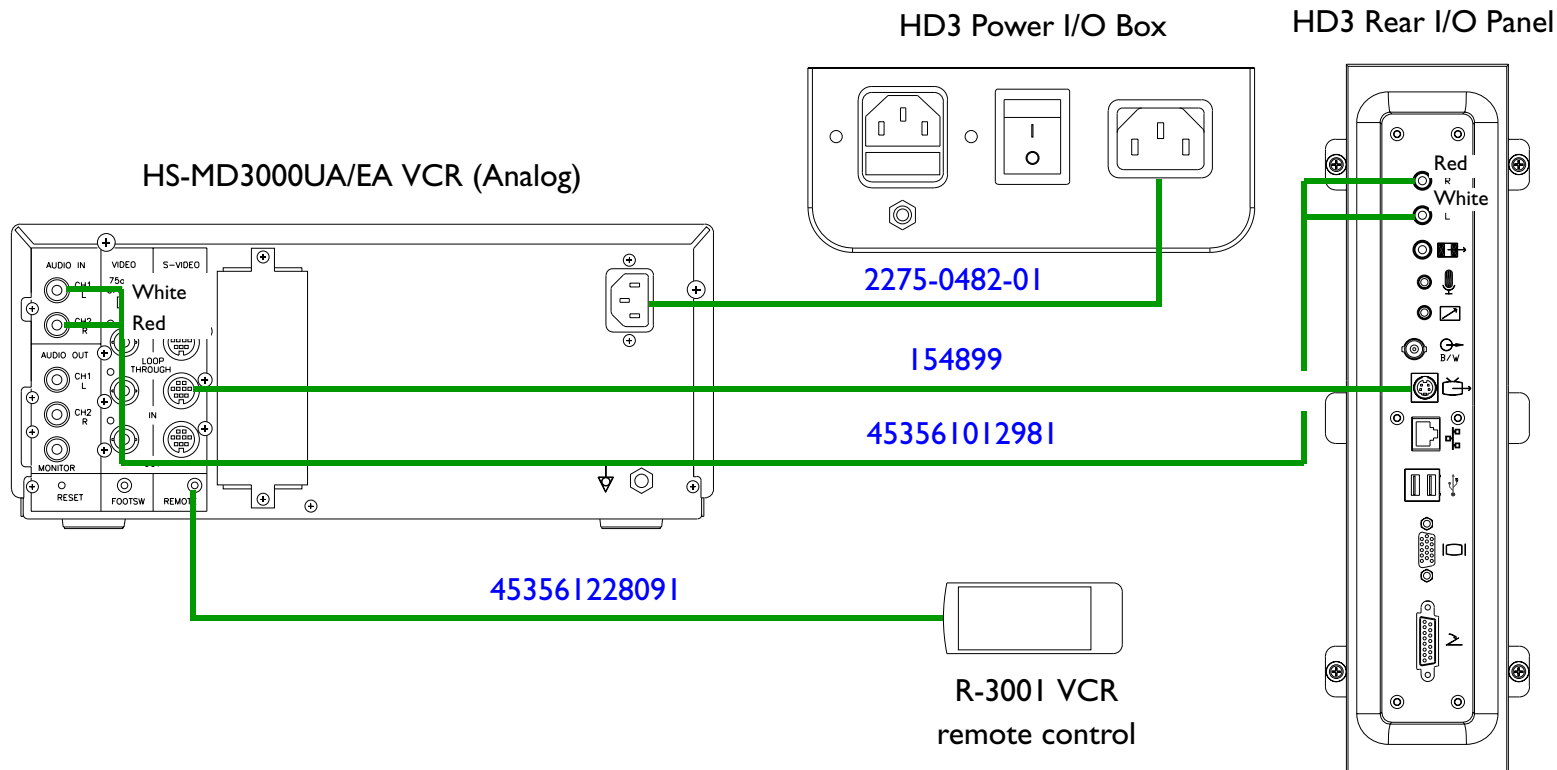


Figure 11-3

Mitsubishi HS-MD3000UA/EA VCR Cabling Diagram



System Connector Illustrations

Figure 11-4 HD3 System Connector Locations (Front Panel)

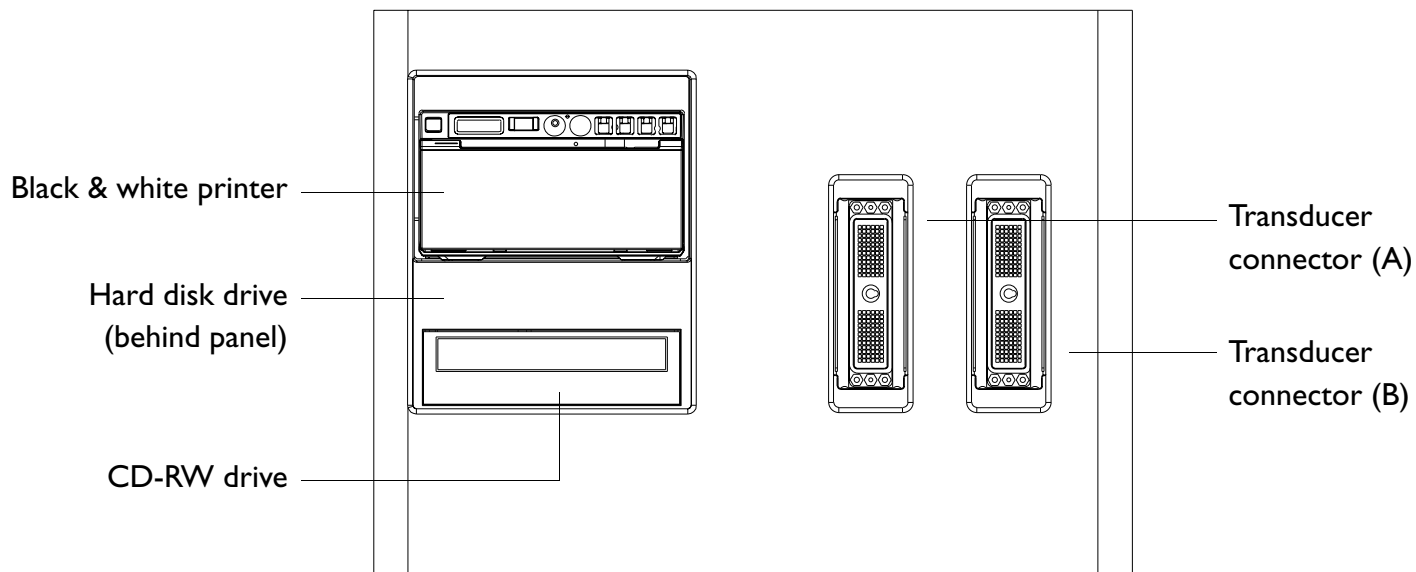


Figure 11-5 HD3 System Connector Locations (Rear I/O Panel)

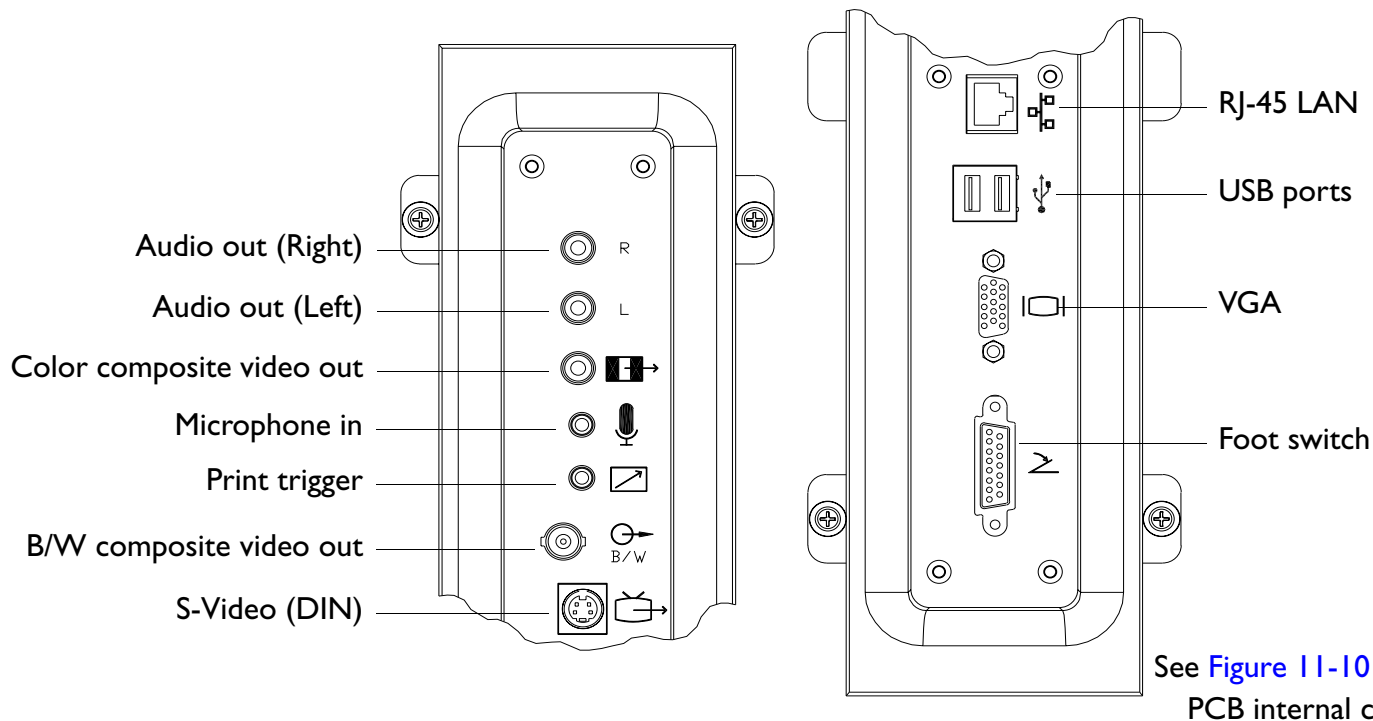


Figure 11-6 HD3 System Connector Locations (Power Connectors)

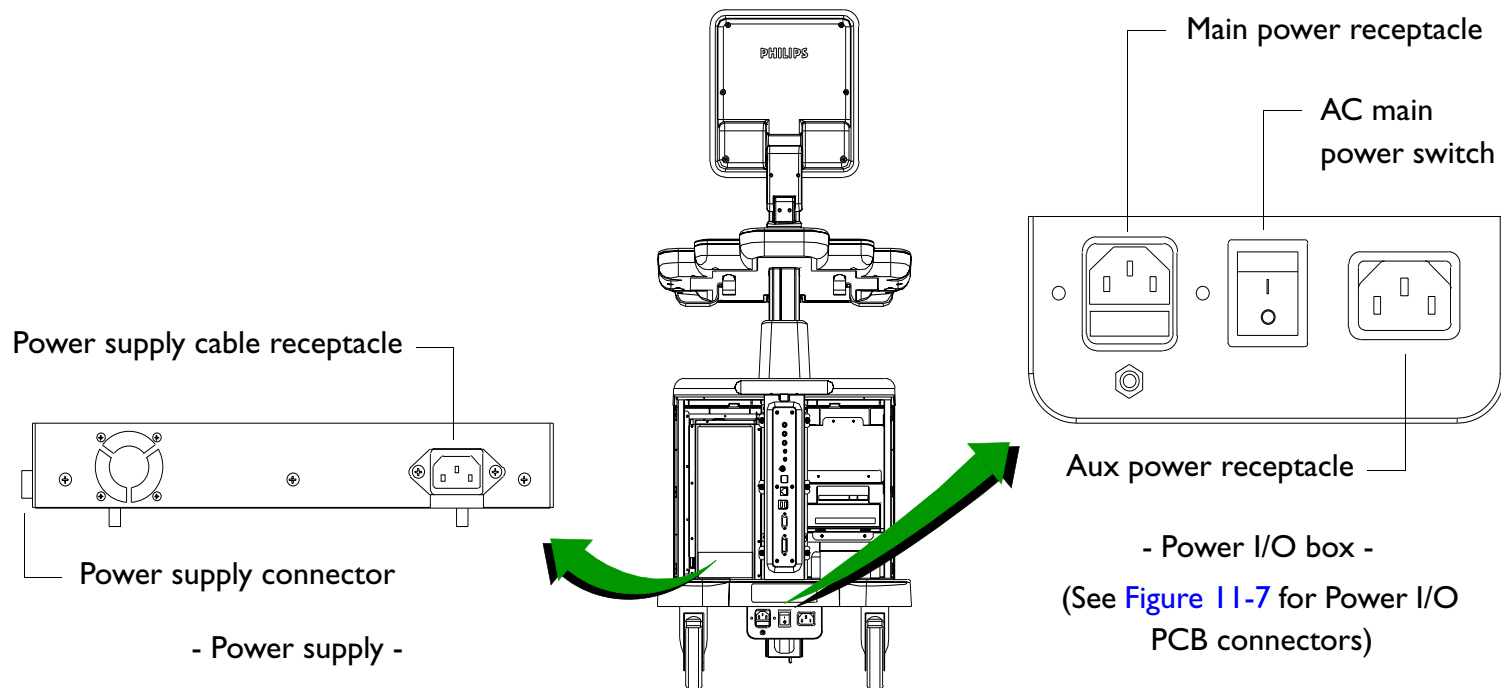
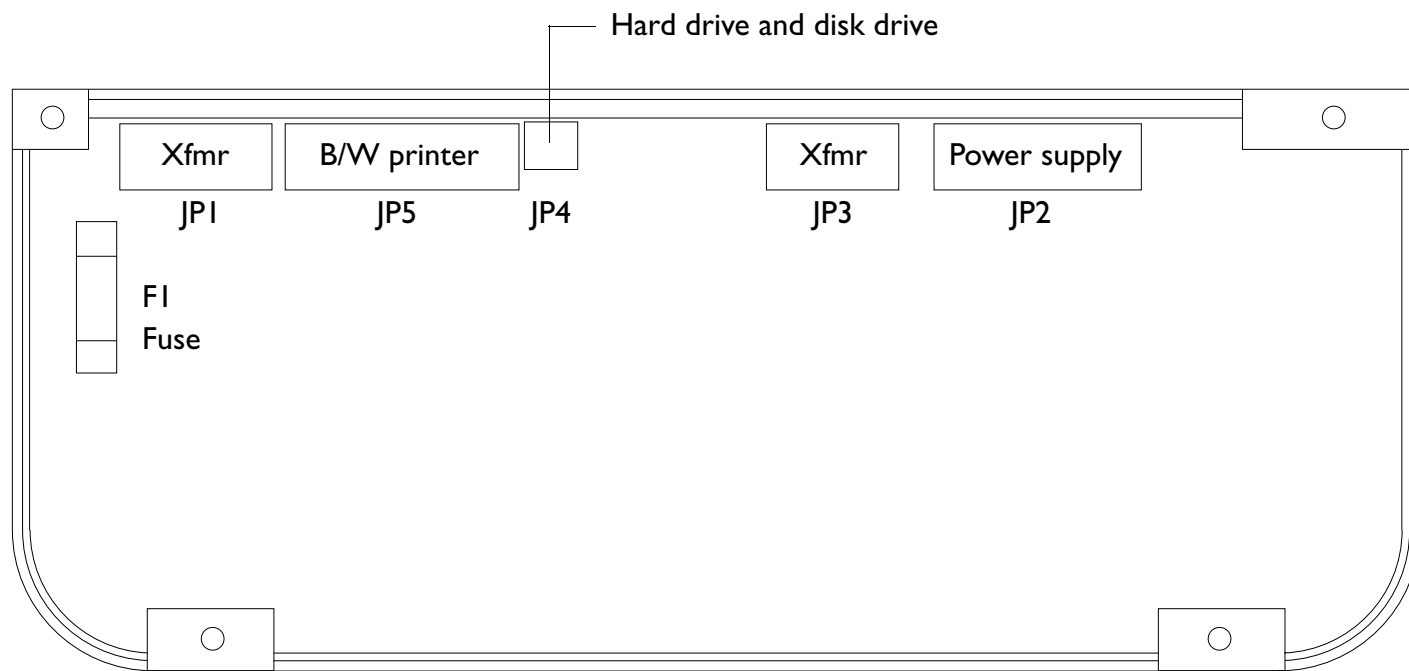


Figure 11-7 HD3 System Connector Locations (Power I/O Box Connectors)



- Rear view with cover removed -

Figure 11-8

HD3 Video Monitor PCB Cable Connector Locations

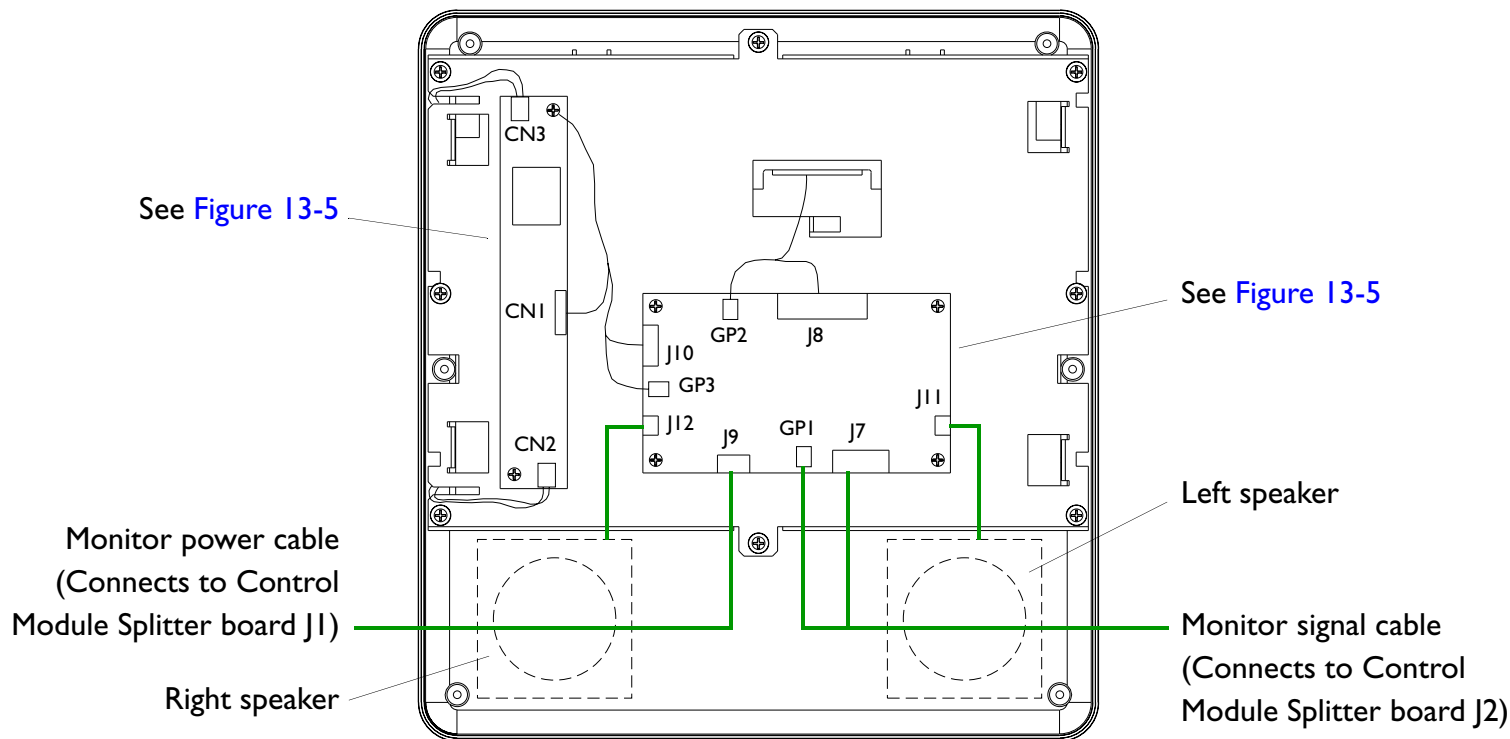


Figure 11-9 HD3 Control Panel PCB Cable Connector Locations (Splitter Board)

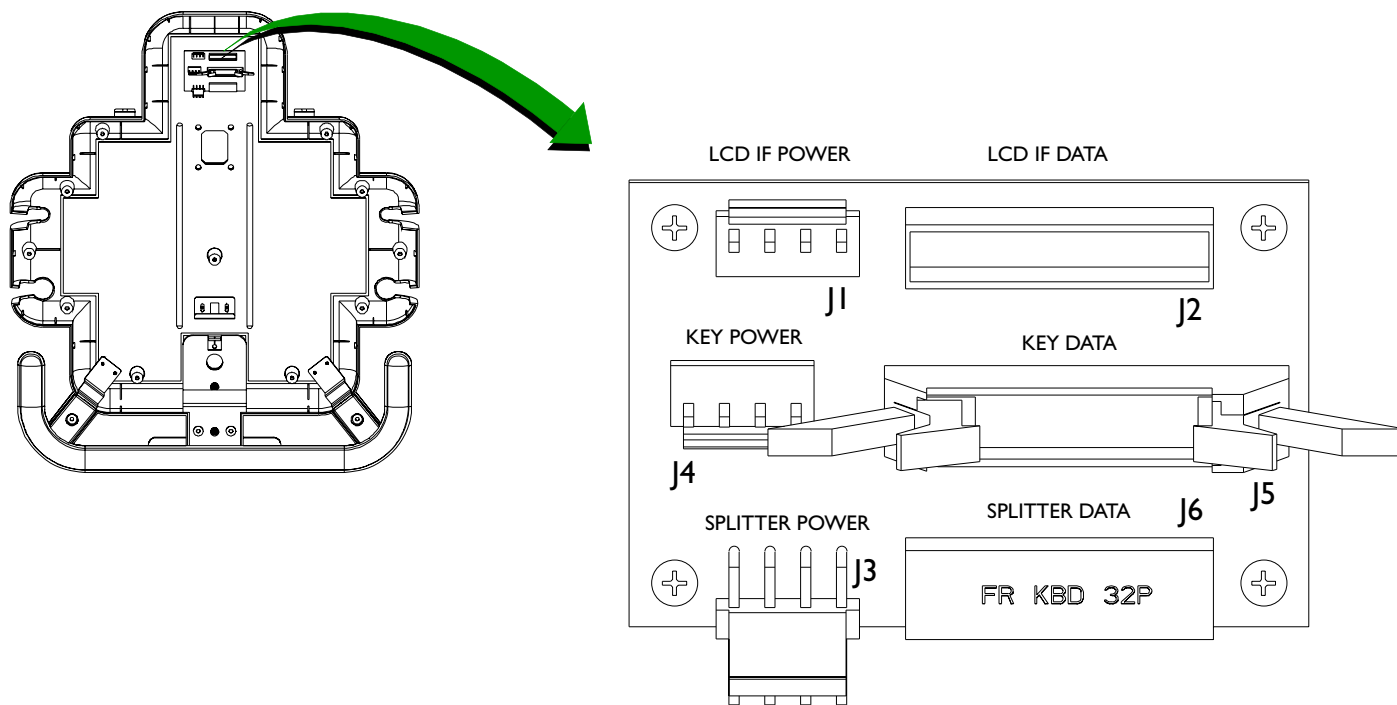
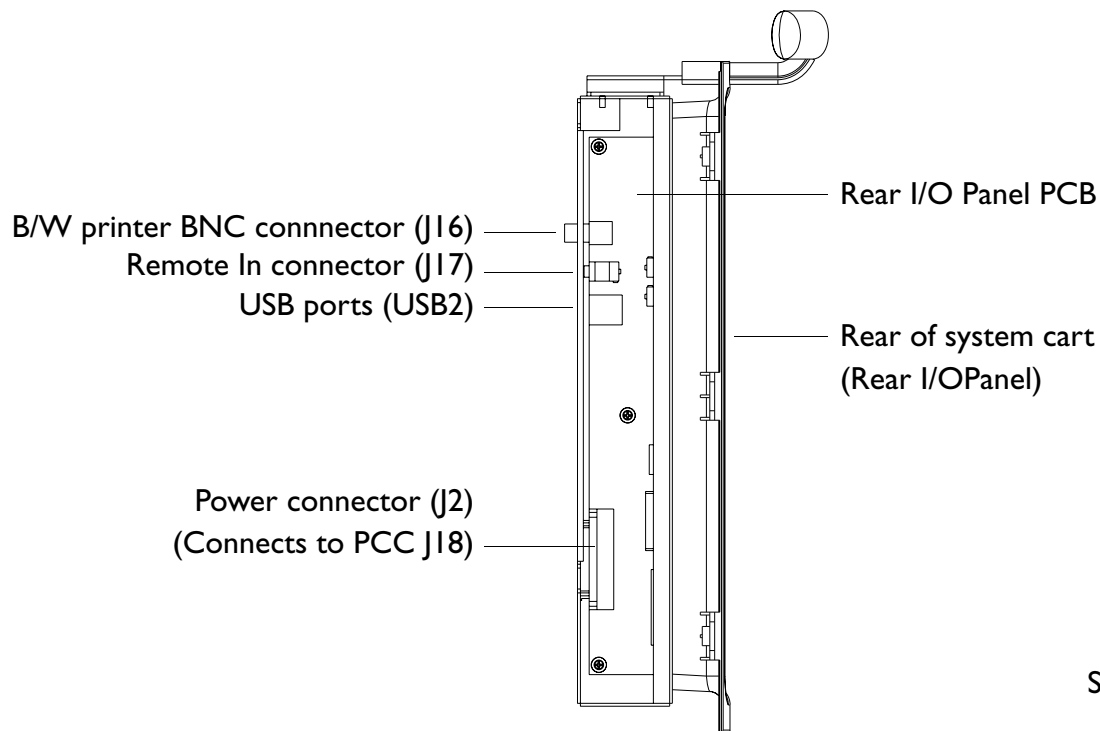
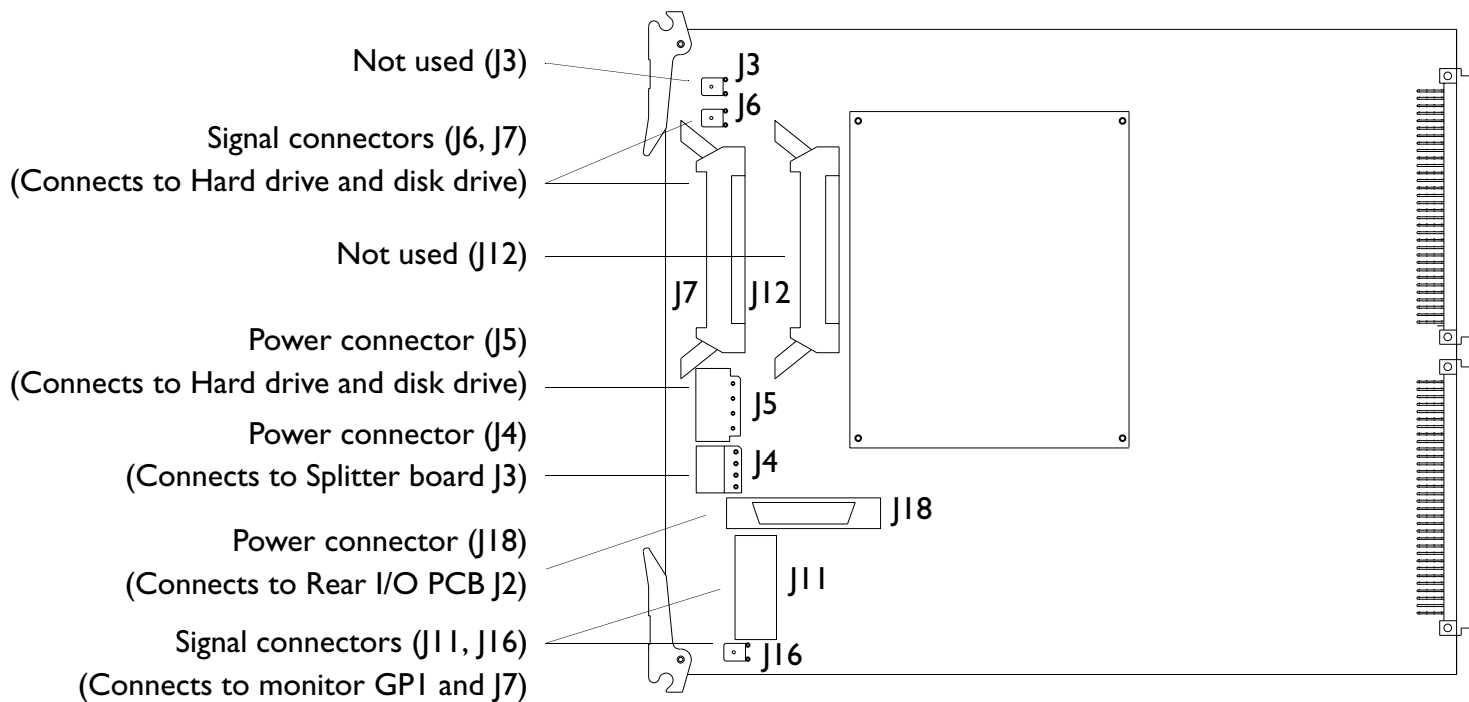


Figure 11-10 HD3 Rear I/O PCB Internal Cable Connector Locations (Side View)



See [Figure 11-5](#) for Rear I/O
PCB external connectors

Figure 11-11 HD3 PCC PCB Cable Connector Locations



12 Change History

Introduction

This section summarizes the software and hardware changes associated with specific software releases. Unless noted under “Hardware Changes,” hardware changes do not always accompany a software release. See [Section 13, “Configuration”](#) for part numbers of the released software versions. Contact your Philips representative for the core information you need to determine the compatibility of primary system PCBs and certain hardware assemblies with respect to the system software releases. Any hardware part number additions or changes that accompany these releases are incorporated into the respective sections of this manual.

Initial System Release (v1.00.00 Build 085)

Philips Ultrasound released the HD3 Ultrasound System for customer orders in August 2005.

I3 Configuration

Introduction

This section lists all of the released software version part numbers for the system, identifies the primary system PCBs, and shows where these PCBs are located in the system. When applicable, additional PCB reference information is provided.

This section also contains configuration information such as the as-shipped system BIOS settings, hard drive jumper positions, and the Philips-recommended settings for the optional OEM peripherals sold with the system.

Compatibility Information

Contact your Philips representative for the core information you need to determine the compatibility of primary system PCBs and certain hardware assemblies with respect to the system software releases.

System Software

Software release levels and corresponding part numbers are listed in [Table 13-1](#). See [for a summarized history of the software and hardware changes associated with specific software releases.](#)

Table 13-1 System Software CD Part Numbers

Released Software Version	Build No.	Disk Part No.	Notes
v1.00.00	.085	453561228661	System software initial release

Locating and Identifying Primary PCBs

The HD3 primary PCB names and locations are shown in [Figure 13-1](#) through [Figure 13-4](#). These figures provide linked references to the corresponding PCB illustration.

PCB Reference Information

The following conventions apply to the PCB reference information provided in this section:

- PCB illustrations are provided as an aid to verifying physical integrity or matching the physical configuration of new PCBs.
- Any configurable jumpers and switches found on PCBs do not require configuration by field service representatives at installation. All configurable devices may not be shown.
- On line art, the positions of components and test points shown are relative locations only, not necessarily to scale. Not all components and test points are shown.
- Any potentiometers found on PCBs shall *not* be adjusted by field service representatives unless an authorized procedure instructs otherwise. Not all potentiometers are shown.

Figure 13-1 HD3 Primary System PCB Names and Locations (E-box)

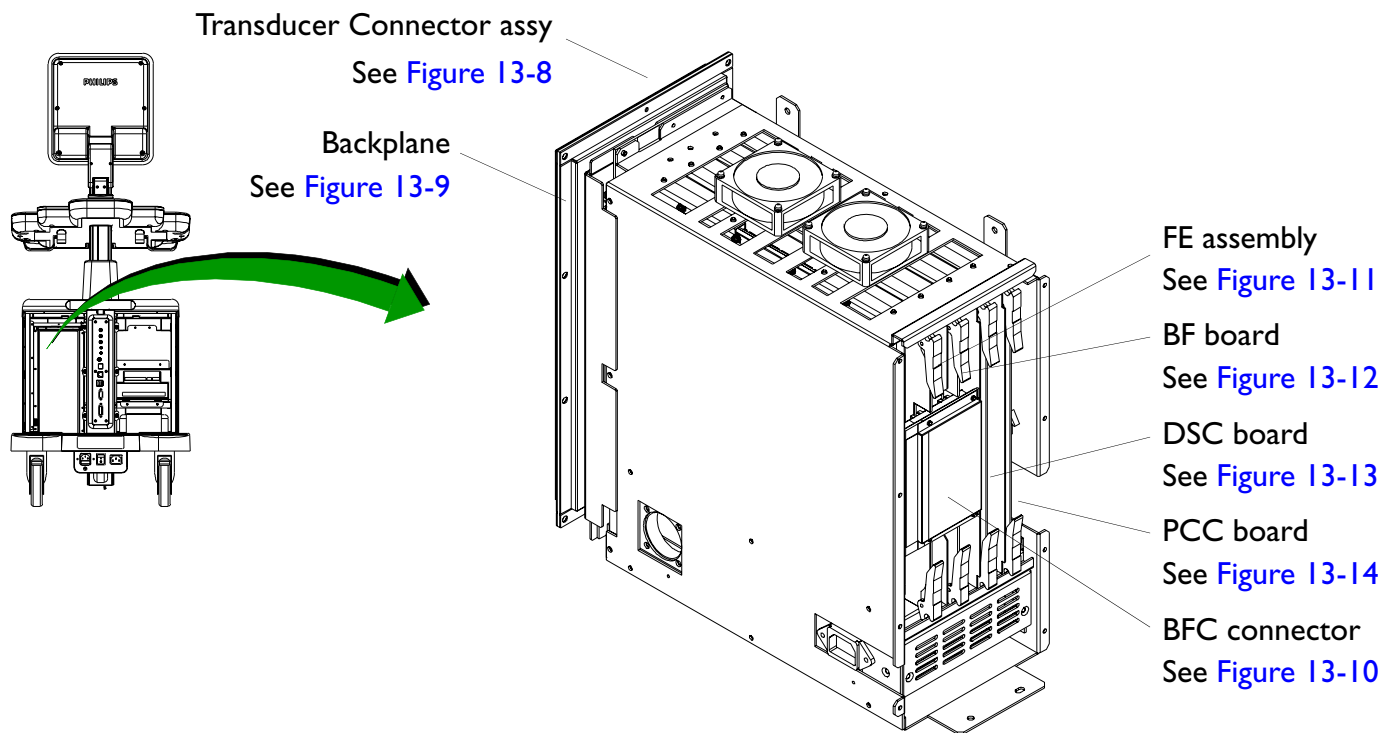


Figure 13-2 HD3 Primary System Board Names and Locations (Rear I/O Panel)

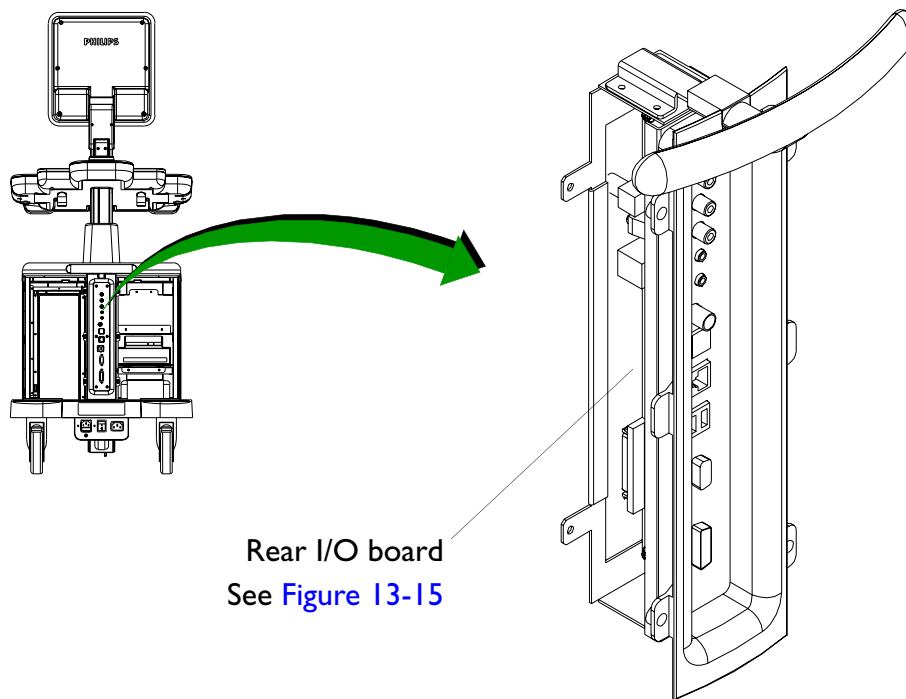


Figure 13-3 HD3 Primary System PCB Names and Locations (Power I/O Box)

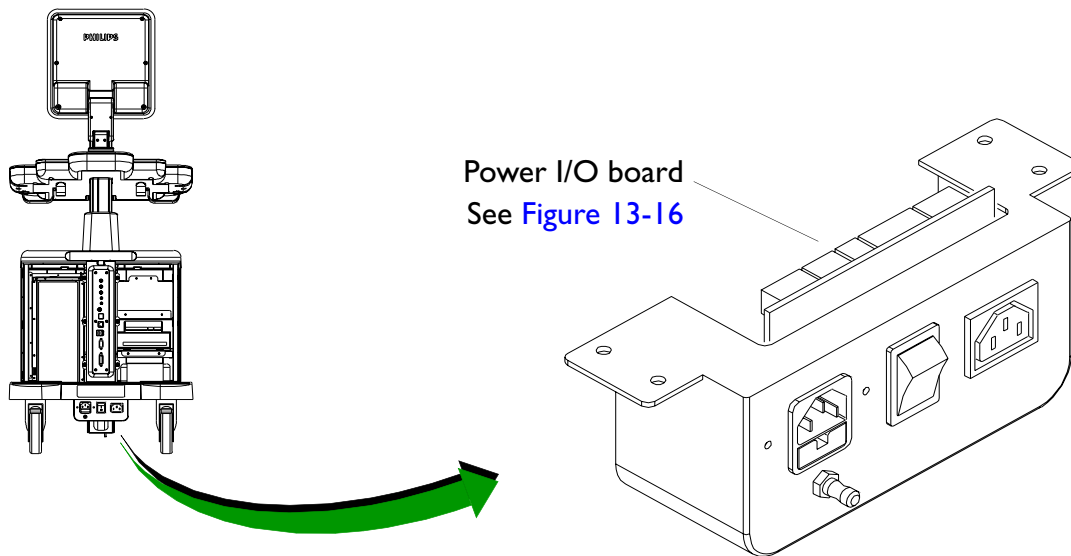
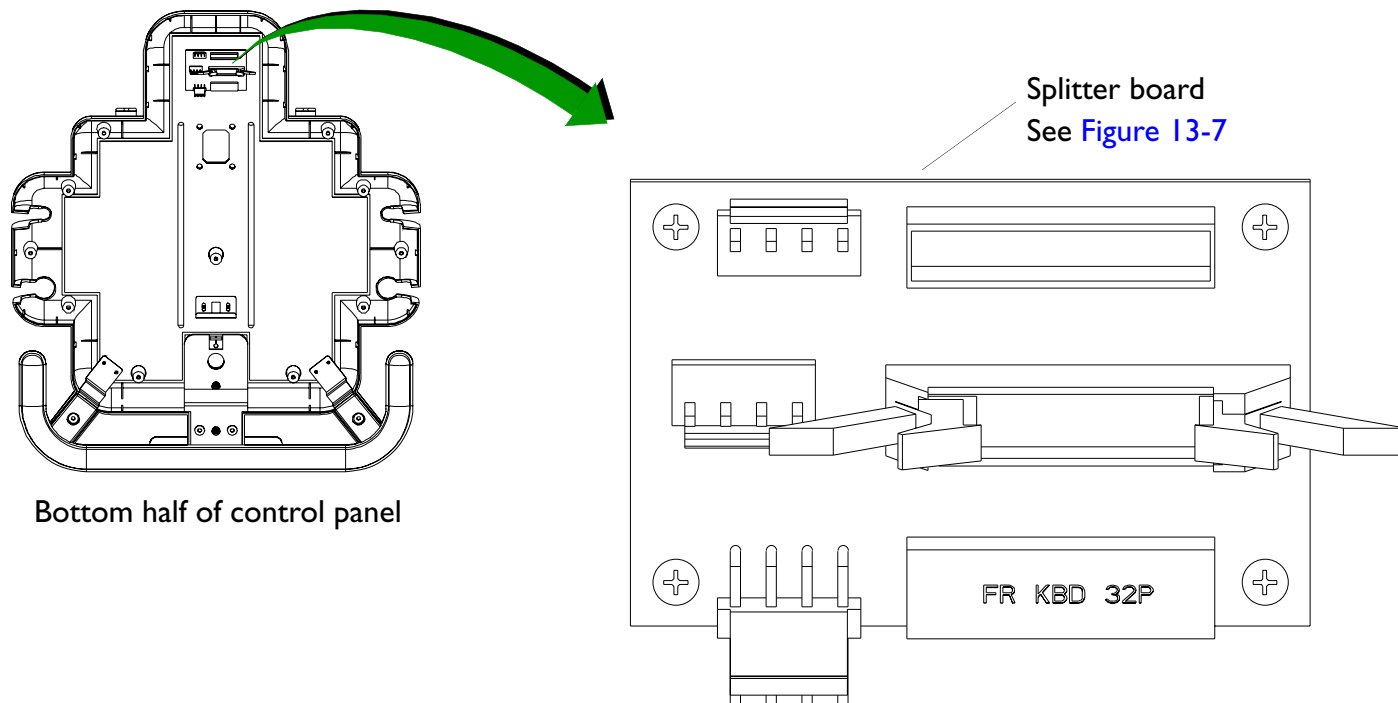


Figure 13-4 HD3 Primary System PCB Names and Locations (Control Panel)



Video Monitor PCBs

Figure I3-5 Video Monitor PCBs (Back of Monitor LCD)



Control Panel PCBs

Figure 13-6 Control Panel Interface and Keyboard PCBs (Top Half of Control Panel)

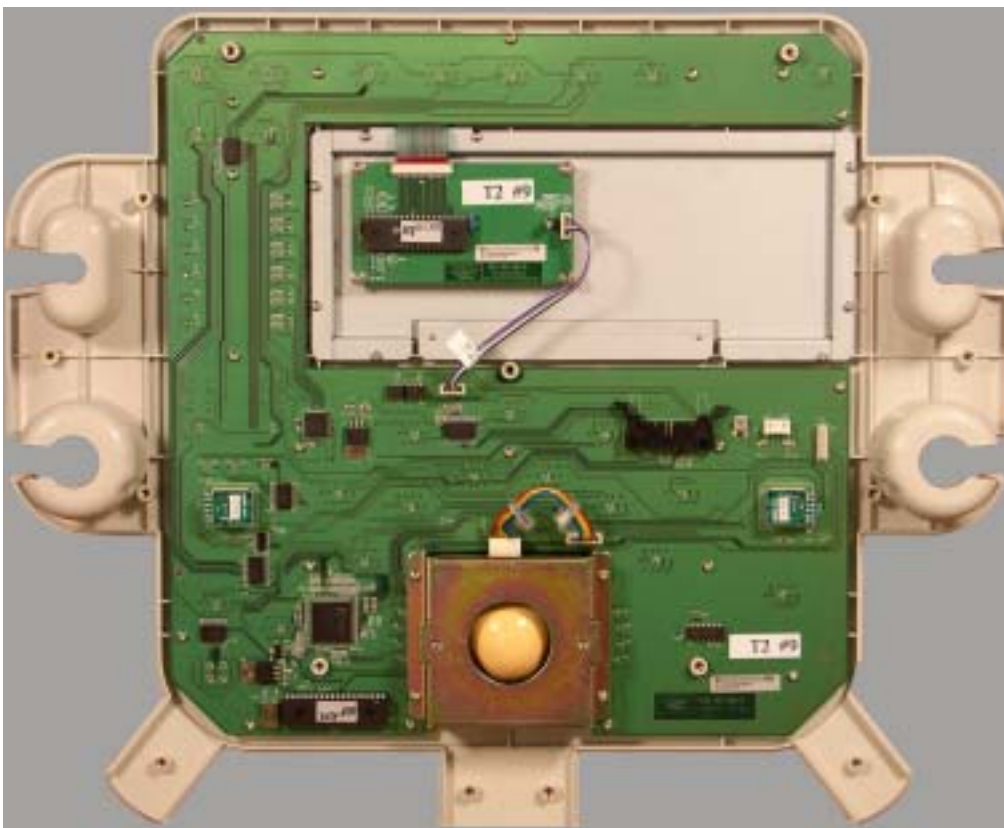
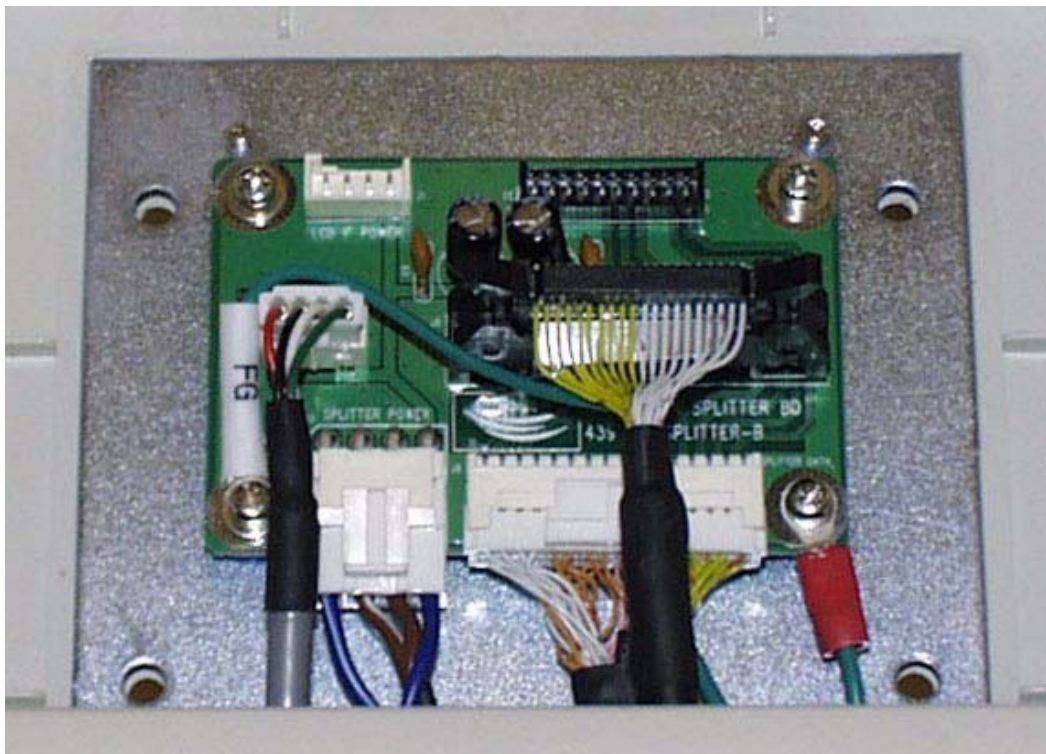


Figure 13-7

Control Panel Splitter Board (Bottom Half of Control Panel)



Compatibility
Information

Figure 13-4

E-box PCBs

Figure 13-8

Transducer Connector Assembly (TCA)



- Front -



- Back -

Compatibility
Information

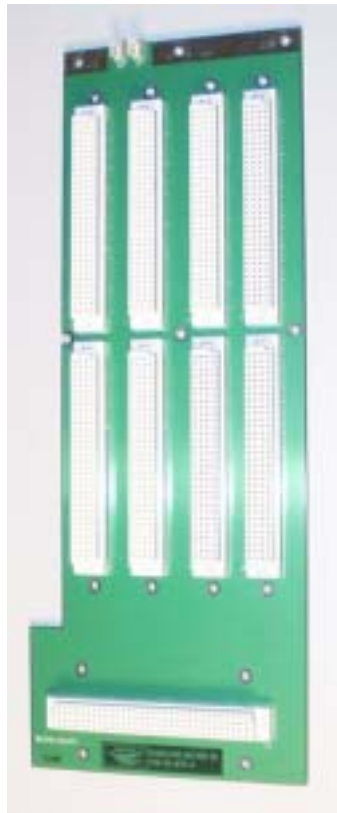
Figure 13-1

Figure 13-9 Backplane Assembly

Assembly



Board

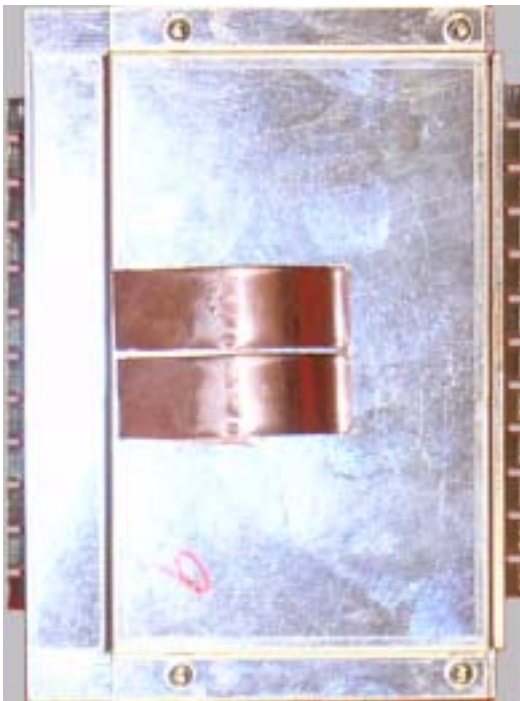


Compatibility
Information

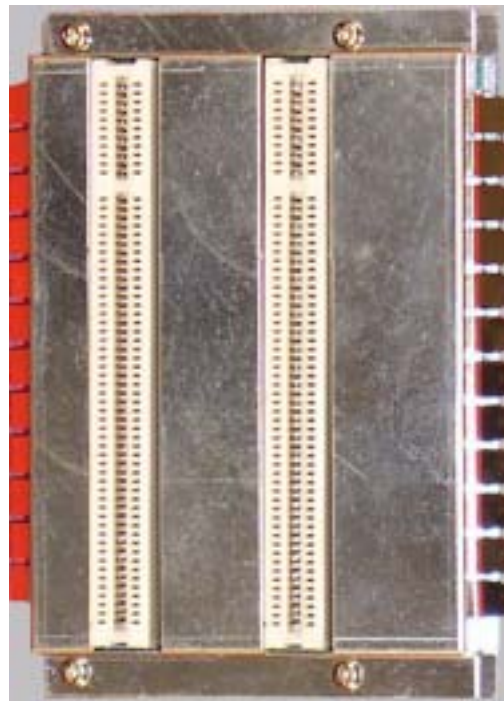
Figure 13-1

Figure 13-10

Beamformer - to - Frontend Connector (BFC)



- Front -



- Back -

Figure 13-1

Figure 13-11 Front End (FE) Assembly

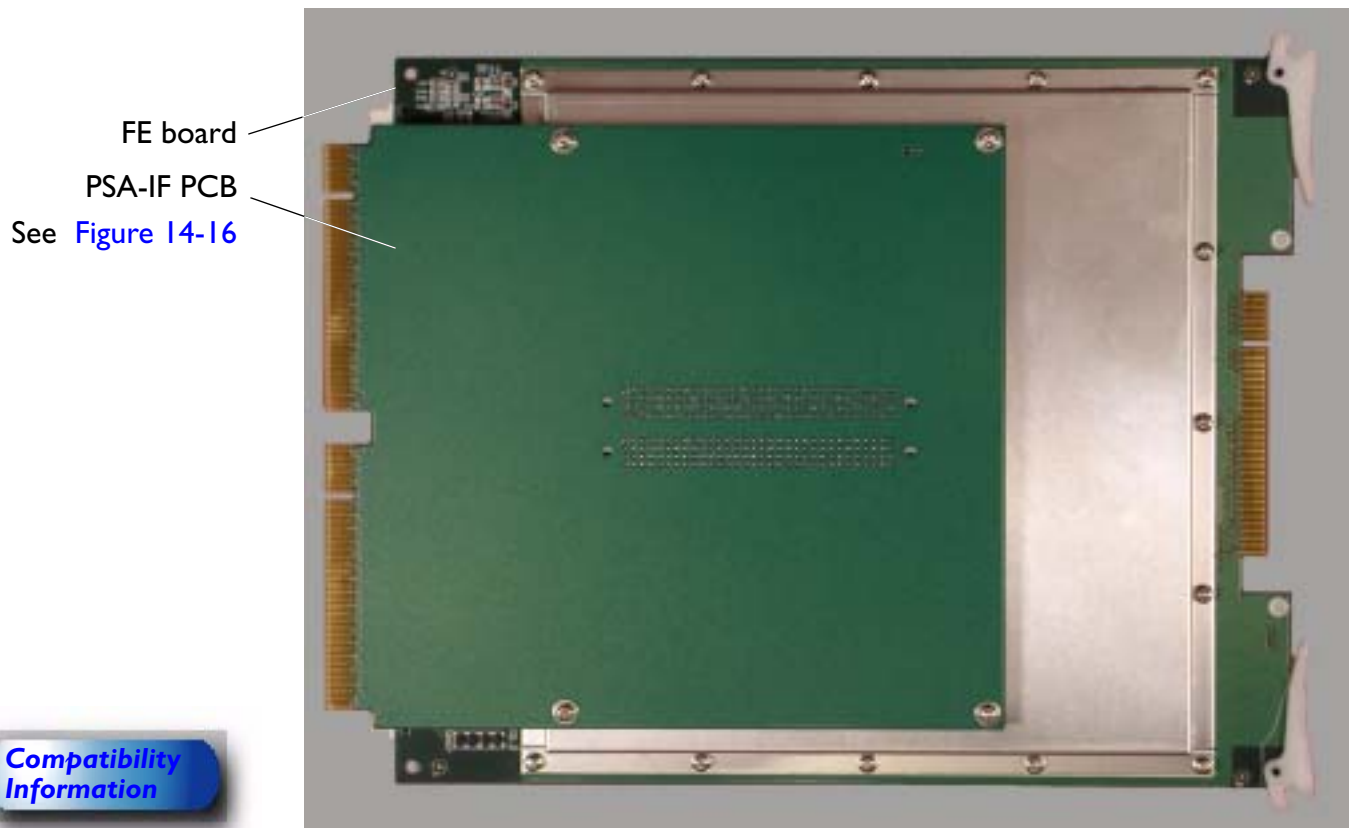


Figure 13-1

Figure I3-12 Beamformer (BF) Board



Compatibility
Information

Figure I3-1

Digital Scan Converter (DSC) Board

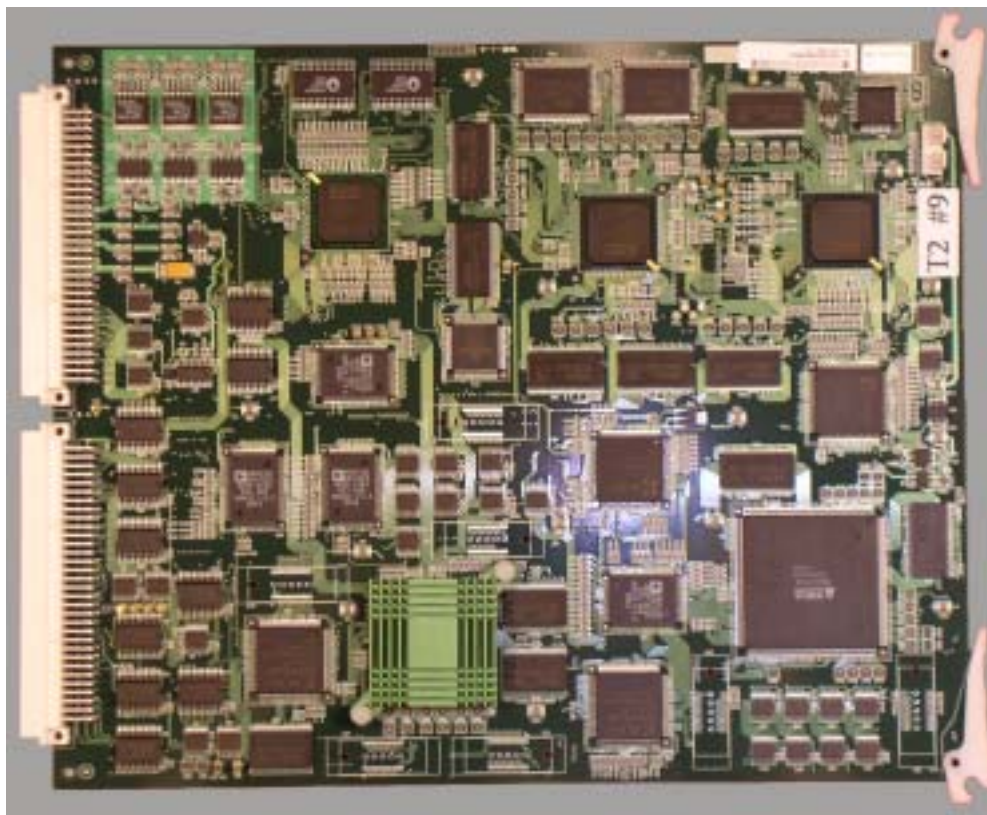


Figure 13-1

Figure 13-14

PCC Board

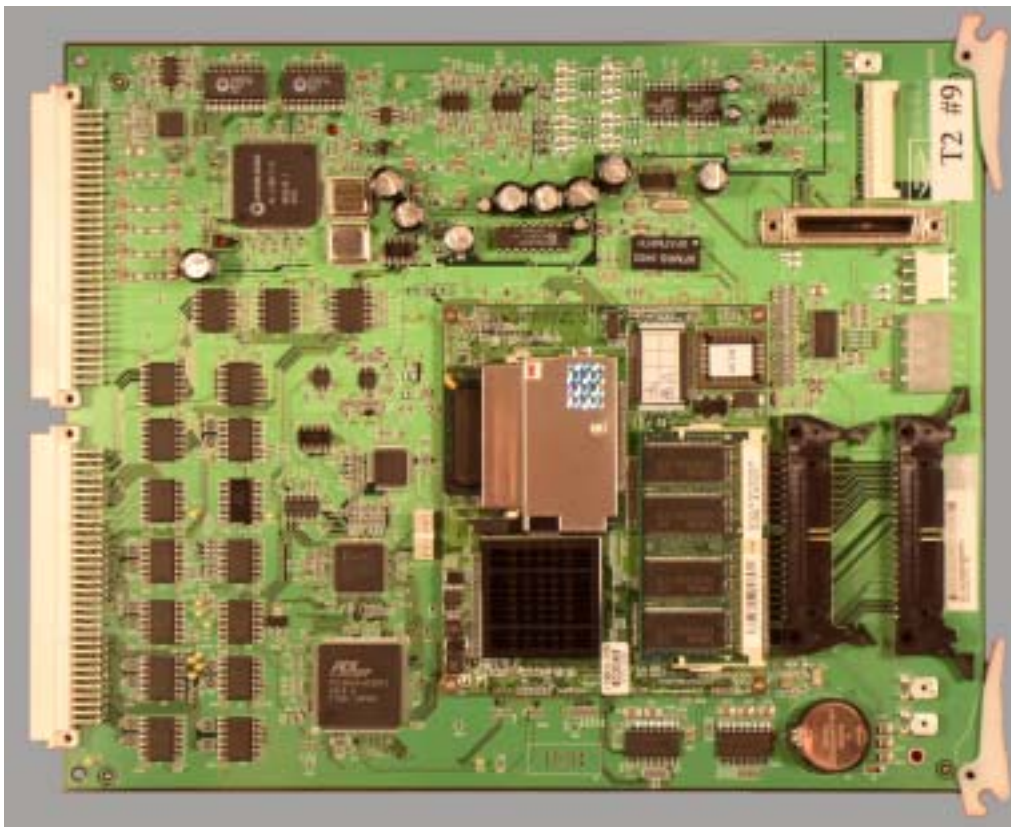


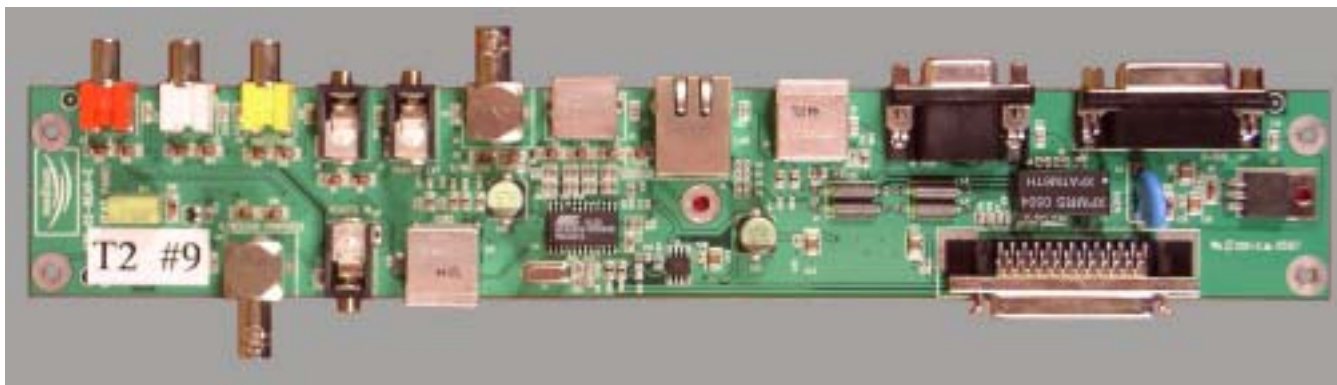
Figure 13-1

Compatibility
Information

Rear I/O Panel PCB

Figure 13-15

Rear I/O Panel PCB



Compatibility
Information

Figure 13-2

Power I/O Box PCB

Figure 13-16

Power I/O Box PCB



Compatibility
Information

Figure 13-3

Disk Drive Settings

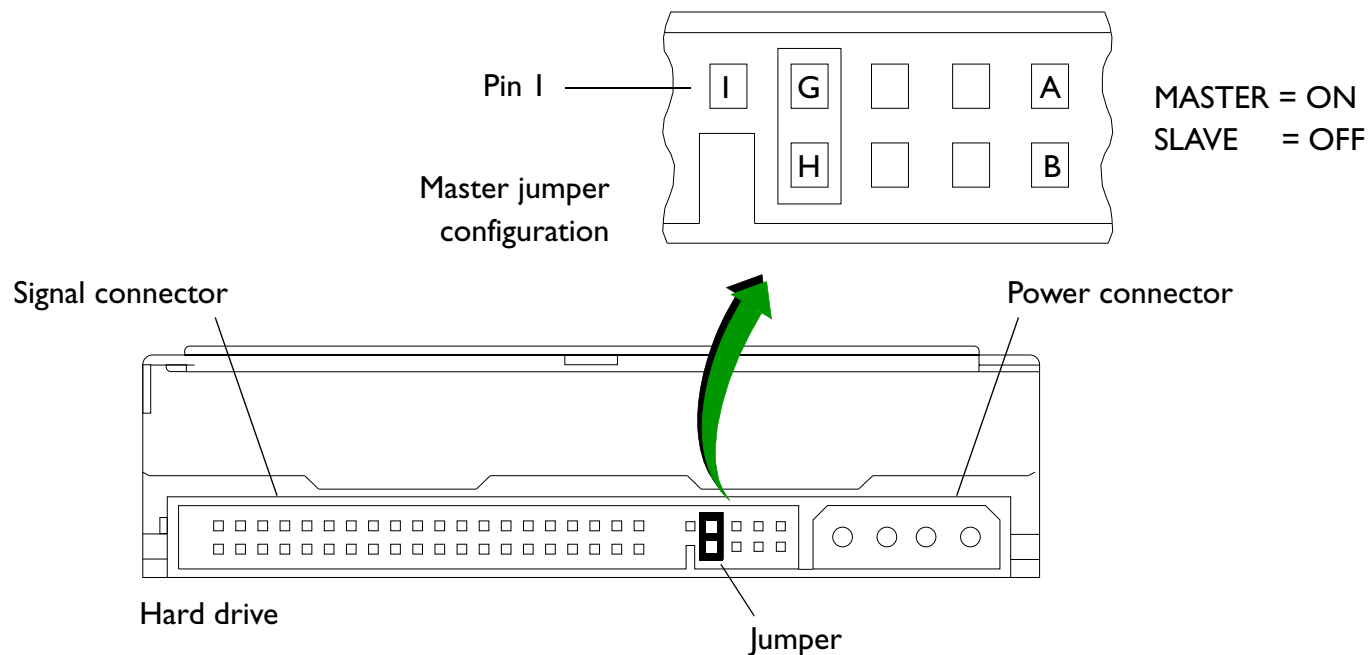
Hard Drive Jumpers

The jumper positions and switch settings of the drives in the HD3 system depend on the manufacturer of the drives.

Figure 13-17 shows typical hard drive jumper positions. Examine the drive itself for information on the correct settings. The hard drive is the only device on the primary IDE, and is usually set to MASTER or SINGLE.

Figure 13-17

Hard Drive Jumper Settings

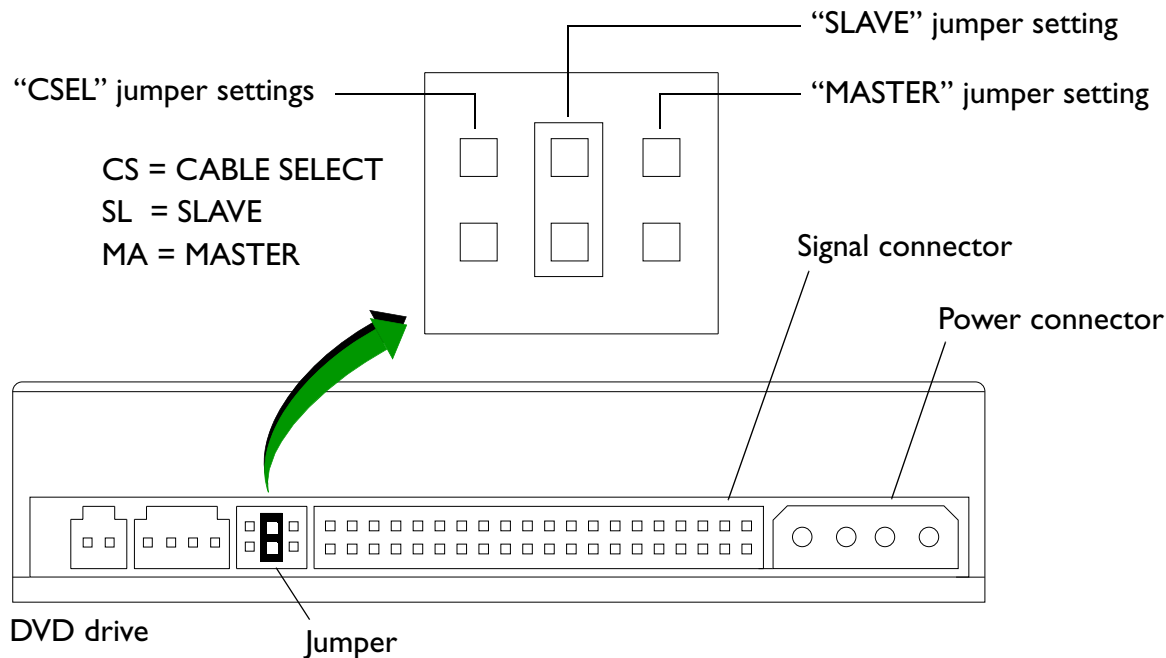


CD-RW Drive Jumpers

Figure 13-18

Figure 13-18 shows typical CD-RW drive jumper positions. Set the jumper to the MASTER position on the secondary IDE.

CD-RW Drive Jumper Position



MOD Drive Jumpers

Set the MOD drive jumpers to **SLAVE** on the secondary IDE.

Peripheral Settings

The initial Philips-recommended peripheral settings for use with the HD3 system are provided in this section (“[B/W Printer](#)” on page 266, “[Color Printer](#)” on page 267, and “[VCR](#)” on page 271).

B/W Printer

The Sony UP-895MD has DIP switches on the back of the printer. The Philips-recommended DIP switch settings for use with the HD3 system are given in [Table 13-2](#).

Table 13-2 **UP-895MD Printer Switch Settings**

CONTROL	SETTING
Front of Printer	
NOR/SML	NOR
STD/SIDE	SIDE
POSI/NEGA	POSI
BRIGHT	6
CONT	7
Inside the Paper Tray	
(The power must be turned on to access the switches inside the paper tray: Press OPEN and remove the paper roll.)	
SHARPNESS	III
GAMMA	II
PAPER TYPE	V (UPP-110HG)
SMOOTHING	OFF

Table 13-2 UP-895MD Printer Switch Settings (Continued)**Rear of Printer**

DIP Switches 1-12	Down
-------------------	------

Color Printer

The Philips-recommended UP-21MD settings are listed in [Table 13-3](#).

Table 13-3 UP-21MD Printer Settings

Menus and Parameters	HD3 Default Settings ¹	
	NTSC Settings	PAL Settings
COL:		
Load Color:	1	1
CYN – RED:	0	0
MAG – RGB:	0	0
YEL – BLU:	0	0
Dark:	1	1
Light:	-3	-3
Sharpness:	8	8
Interpol:	OFF	OFF
Save Color:	1 [EXEC]	1 [EXEC]
LAY:		
Memory:	Frame	Frame
Multi Pix:	1	1
Separate:	OFF	OFF

Table 13-3 UP-21MD Printer Settings (Continued)

Menus and Parameters	HD3 Default Settings¹	
	NTSC Settings	PAL Settings
Window:		
H Start:	-20 Dots	12 Dots
V Start:	-4 Dots	-14 Dots
H Width:	976 Dots	912 Dots
V Width:	476 Dots	548 Dots
Save:	Press [EXEC]	Press [EXEC]
Caption:	OFF	OFF
PRN:		
Print QLT:	I	I
GAMMA:	NORMAL	NORMAL
PRN Speed:	HIGH	HIGH
Load user:	I	I
System Setup:		
LCD. Center:	7	7
Baud Rate:	4800	4800
Beep:	ON	ON
IRE.:	100	100
Save User:	I	I

Table 13-3 UP-21MD Printer Settings (Continued)

Menus and Parameters	HD3 Default Settings ¹	
	NTSC Settings	PAL Settings
Function:		
Auto Live:	OFF	OFF
Immed. Cap.:	OFF	OFF
RM2 Func.:	C&Print	C&Print
Clear:	ALL	ALL
Color Balance:		
BAL X:	50	50
BAL Y:	50	50
BAL Step:	5	5
IN:		
INPUT SEL:		
Video:	N/A	N/A
S – Video:	N/A	N/A
RGB:		
Hue:	0	0
Color:	0	0
Gain:	0	0
Offset:	0	0
AGC:	OFF	OFF

Table 13-3 UP-21MD Printer Settings (Continued)

Menus and Parameters	HD3 Default Settings^I	
	NTSC Settings	PAL Settings
OUT:		
Display:	OFF	OFF
RBN Remain:	OFF	OFF
Source:	THRU	THRU
Sync on G:	OFF	OFF
Moni C–R:	0	0
Moni M–G:	0	0
Moni Y–B:	0	0

- I. The NTSC/PAL switch on the rear of the printer is set to the video format designated on the customer order.

VCR

The VCR has front/rear panel switches, displayed menu settings, and hidden menu settings. Mitsubishi HS-MD3000U/E VCR settings for use with the HD3 are given in [Table 13-4](#), [Table 13-5](#), and [Table 13-6](#).

NOTE All switches and internal menu settings should be set properly at the factory on VCRs shipped with new systems. However, when a replacement VCR is ordered, you will need to check the switch settings and menu settings

The displayed menu settings are listed in [Table 13-5](#). To verify or reset these settings, see “[To change the VCR displayed menu settings](#)” on page 275. Enter the numerical code from [Table 13-5](#) to enter the settings listed. (Only the numerical code that corresponds to setting is displayed. You will not see the setting titles.)

The hidden menu settings are listed in [Table 13-6](#). To verify or reset these settings, see “[To change the VCR hidden menu settings](#)” on page 276.

Table I3-4 HS-MD3000U/E VCR Control and Switch Settings

Parameter	NTSC Setting (MD3000U)	PAL Setting (MD3000E)
Front Panel Controls		
Monitor	MIX	MIX
Audio	HIFI	HIFI
Keylock	OFF	OFF
Rear Panel Controls		
75 Ohm Video	ON	ON
75 Ohm S-Video	ON	ON

Table 13-5 HS-MD3000U/E VCR Displayed Menu Settings

Parameter	NTSC Setting (Not Displayed)	PAL Setting (Not Displayed)	Numeric Code (Displayed)
Menu 1			
Rec Tape End	Stop	Stop	101:00
Tape End	Stop	Stop	102:00
Tape In	Stop	Stop	103:00
Tape Length	T-120	E-180	104:00
VISS	REC	REC	105:01
Time Code Rec.	OFF	OFF	106:00
Time Code Disp	OFF	OFF	107:00
Foot Switch	L.E.	L.E.	108:00
Dimmer	OFF	OFF	109:00
Menu 2			
S-VHS/S-ET	ON/OFF	Auto	201:01
Y-NR	ON	ON	202:01
C-NR	ON	ON	203:01
Y-Enhancer	ON	ON	204:01
TBC	ON	ON	205:01
Color Filter	OFF	OFF	206:00
Freeze Mode	Frame	Frame	207:00

Table 13-5 HS-MD3000U/E VCR Displayed Menu Settings

Hi-Fi Audio	ON	ON	208:01
Normal Audio In	MIX	MIX	209:00
Menu 3¹			
Daylight Savings	OFF (No time/date set)	OFF (No time/date set)	301:00
Month	01	01	Do not set
Day	01	01	Do not set
Year	2004	2004	Do not set
Time	00:00:00	00:00:00	Do not set
Language Menu²			
Language	English (displayed)	English (displayed)	001:00

1. VCRs are shipped with the Menu 3 (“clock”) functions left at the factory defaults shown because the system also provides these functions and the VCR clock is not likely to be used. If the VCR clock is set, it will cause the normal (standby) display of the VCR to display the time of day rather than tape location time, which may be confusing to some users. Pressing **RESET** restores these settings to the factory defaults shown, but also resets the Language setting (see ²).
2. VCRs are shipped with the Language set to English. If you want to change the Language setting, press **RESET** and cycle through the languages displayed on the VCR display. Remember, pressing **RESET** also restores the VCR clock settings to the factory defaults (see ¹).

➤ **To change the VCR displayed menu settings**

1. Power up the VCR.
2. Press and hold **Menu** for at least 2 seconds to initiate the VCR display.
3. Select items with **JOG/ADJUST**. Refer to [Table 13-5](#) for displayed menu settings.
4. Select settings with **FRAME/FIELD ENTER**.
5. Change the settings with **JOG/ADJUST**.
6. Exit and save changes by pressing **MENU**.

Table 13-6 Mitsubishi HS-MD3000E/U VCR Hidden Menu Settings

Setting/Item	Display	NTSC Setting	PAL Setting
Picture Control (Sharpness)	PC	0	0
(Head) Switching Point	SP	65	65
Position Up/Down	Ud	0	0
Position Left/right	Lr	0	0
Chroma Amplitude	CA	2	2
Hue (Color Phase)	CP	0	0
Color Delay	Cd	2	2
	bC	-1	-1
	CC	1	1
	bd	ON	ON

➤ **To change the VCR hidden menu settings**

1. Power up the VCR.
2. Press and hold **Stop** and **Play** simultaneously for at least 10 seconds to initiate the VCR display item corresponding to the functions.
3. Select settings with **FRAME/FIELD ENTER**. Refer to [Table 13-6](#) for hidden menu settings.
4. Change the settings with **JOG/ADJUST**.
5. Exit and save changes by pressing **STOP**

I 4 Parts

Introduction

This section contains general and specific parts information for the HD3 Ultrasound System.

How and Where to Find a Part Number

In this manual, system field-replaceable parts and cables are shown in illustrations and are listed in tables.

Use the parts and cable illustrations to visually locate and identify the part you are looking for. The part number is included in the figure and is linked to the corresponding parts table where a part description is provided.

Or, to find a part number by its description, look in the parts tables [Table I 4-1](#), which are alphabetized by the part descriptions.

Parts Locator Map

Go to the “HD3 Ultrasound System Parts Locator Map” [Figure I 4-1](#) to start your search or one of the other applicable parts information links as follows:

- For signal interconnect cable part numbers, see [Figure I 1-1](#) and [Table I 1-1](#).
- For power distribution cable part numbers, see [Figure I 1-2](#) and [Table I 1-1](#).
- For transducer part numbers, see [Section I 5, “Transducers”](#).
- For accessories and options part numbers, see [Table I 4-2](#).
- For peripheral part numbers and applicable cables, see [Table I 4-2](#).

[1, 2, 3, etc](#)

See [Figure 14-X](#)

Figure Conventions

Item Number The item number for each part or subassembly shown in an illustration is a hypertext cross-reference linking to the parts/cable tables containing parts descriptions and additional information.

See Figure “See Figure” is a hypertext cross-reference link to a detail (subassembly) figure. In the subassembly figure you will find either the part number, a reference to another detail figure, or a reference to the table containing parts descriptions and additional information.

System View Illustration Label The “SYSTEM VIEW” (System Parts Locator Map), [Figure 14-1](#) contains links to “PARENT VIEW” illustrations.

Parent View Illustration Label “PARENT VIEW” indicates an illustration that provides links to additional parts breakdown, indicated with a “See Figure” reference.

System View Button The “System View” button is a hypertext cross-reference link to the “SYSTEM VIEW” (System Parts Locator Map). You can return to the “SYSTEM VIEW” (System Parts Locator Map) by clicking the “System View” button in the lower left corner of any figure in this section.

Parent View Button The “Parent View” button is a hypertext link to the parent-part or “PARENT VIEW” illustration.

Parts List Button The “Parts List” button (located on the “System Parts Locator Map” only) is a hypertext cross-reference linking to the “Parts Table” containing parts descriptions and additional information. The “Parts List” can also be accessed by clicking one of the blue part numbers in any of the figures in this section.

Installation Button The “Installation” button is a hypertext link to a figure’s corresponding installation/removal procedure.

SYSTEM VIEW

PARENT VIEW

System View

Parent View

Parts List

Installation

Disassembly

Disassembly Button The “Disassembly” button is a hypertext link to figures corresponding to a disassembly/assembly procedure.

Green Arrow The green arrows found throughout the parts illustrations are used to indicate movement (direction, rotation), or point to a specific area (details, breakdowns).

Parts Table Definitions

Item No. This column lists the item numbers that correspond to parts in the parts illustrations.

Located On This column lists all of the figures on which the part is found.

Legacy Part Number This column lists the legacy part number for an item. Use this column only if you are in North America or Canada, or you order directly from Bothell. These numbers correspond to the PRI SAP system. If a table is referenced in this column, the part number is on that table.

I2NC Part Number This column lists the I2NC part number for an item. Use this column if you are ordering from an APEC, an EMEA, or an LATAM country. I2NC numbers can be used for parts orders worldwide. These numbers correspond to the MIP SAP system used by the SLIs and Miami. If a table is referenced in this column, the part number is on that table.

Part Description The name or common description of the item is listed here. Where appropriate, the description column also includes size, tolerance, type or model, and material data for the part. Parts tables are alphabetized by this column.

Attaching parts must be ordered separately. They are not provided with the assembly, the subassembly, or the component being attached.

Parts Ordering Information

Notes/Reference Manufacturer's part numbers, sometimes alternate part numbers, special applications, and other information pertaining to a specific part are listed in the Notes/Reference column. For top assemblies containing many replaceable parts, the applicable figure or table for further breakdown of parts is listed here.

Field Service Engineers

For parts ordering procedures, FSEs should refer to their standard operating procedures.

Customers

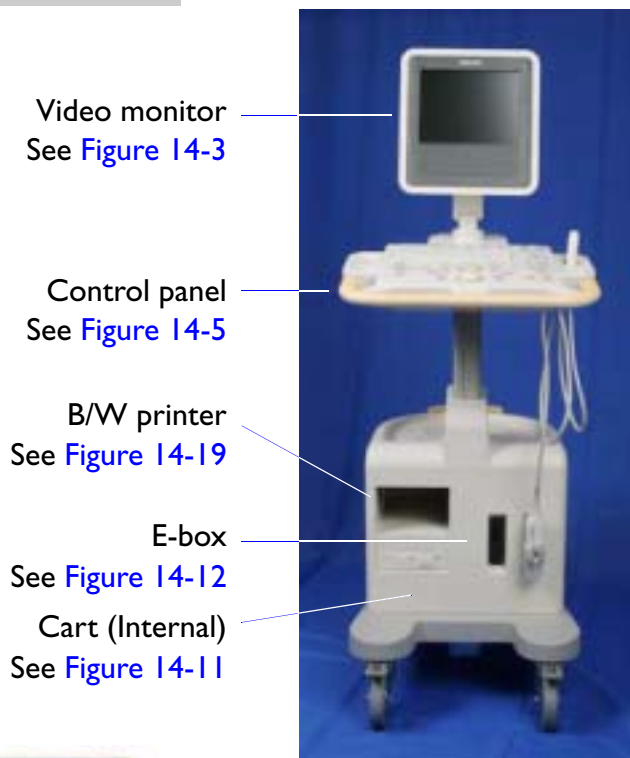
Customers can order parts through an FSE or directly from the Customer Service Order Processing Department. Customers ordering parts through an FSE will need to provide the following information:

- Shipping address
- Purchase order number of equipment
- Part numbers or sales order numbers
- Part descriptions and quantity needed

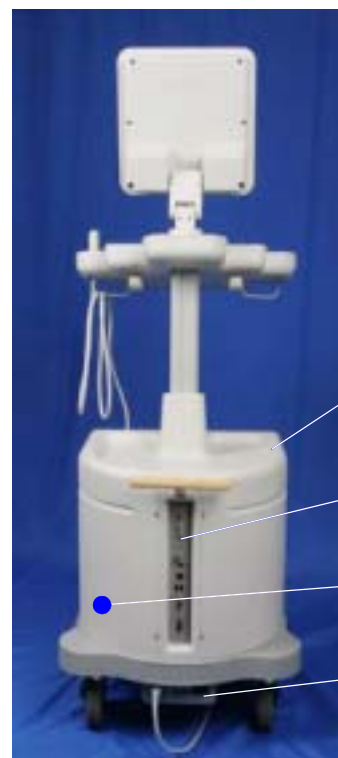
Illustrations

Figure 14-1 HD3 Ultrasound System Parts Locator Map (Front and Rear Views)

SYSTEM VIEW



- Front -



- Rear -

System labeling
Nameplate, Figure 14-34

Parts List

Side View

Figure I4-2 HD3 Ultrasound System Parts Locator Map (Right Side)

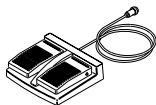
SYSTEM VIEW

System labeling

Nameplate, [Figure I4-34](#)

System enclosures
See [Figure I4-10](#)

Foot switch assembly
See [Figure I4-31](#)



Lift mechanism
See [Figure I4-26](#)

Peripheral top deck
See [Figure I4-27](#)

System Casters
See [Figure I4-29](#)

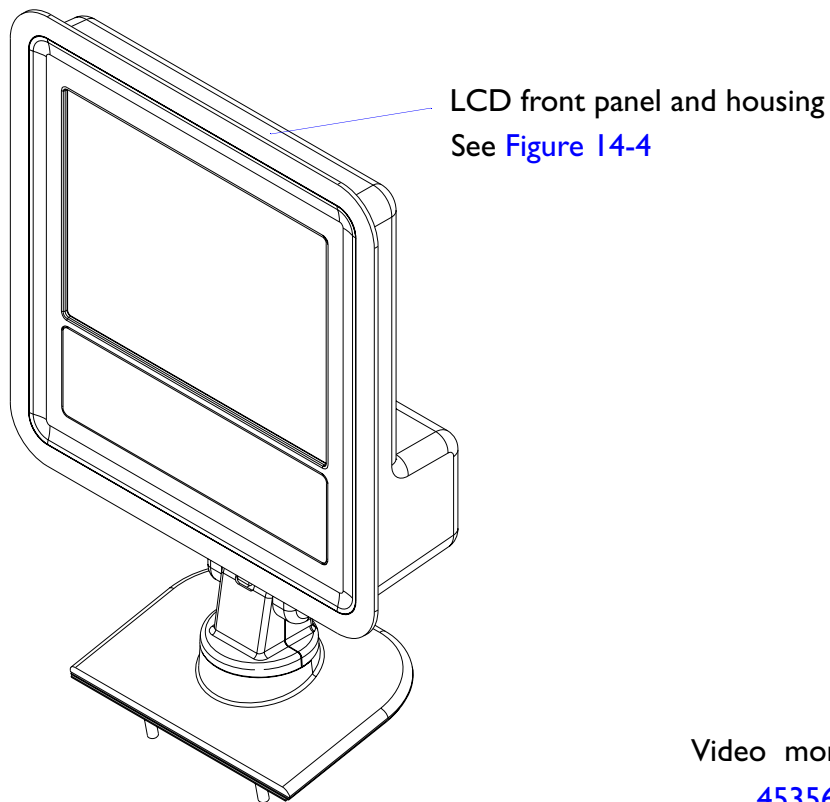
- Right side -

[Parts List](#)

[End Views](#)

Figure I4-3 Video Monitor Assembly

PARENT VIEW



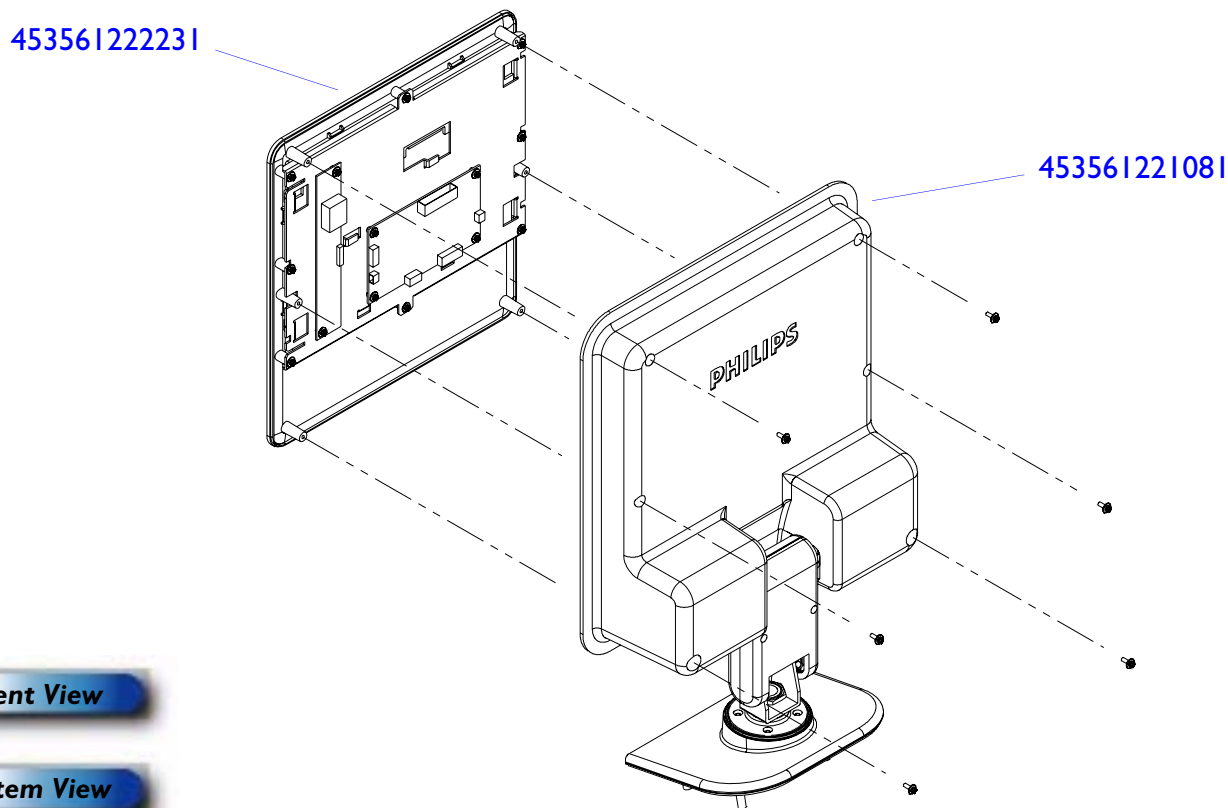
Disassembly

System View

Video monitor assembly
[453561221061](#)

Figure 14-4

Video Monitor Assembly (LCD Front Panel and Housing)

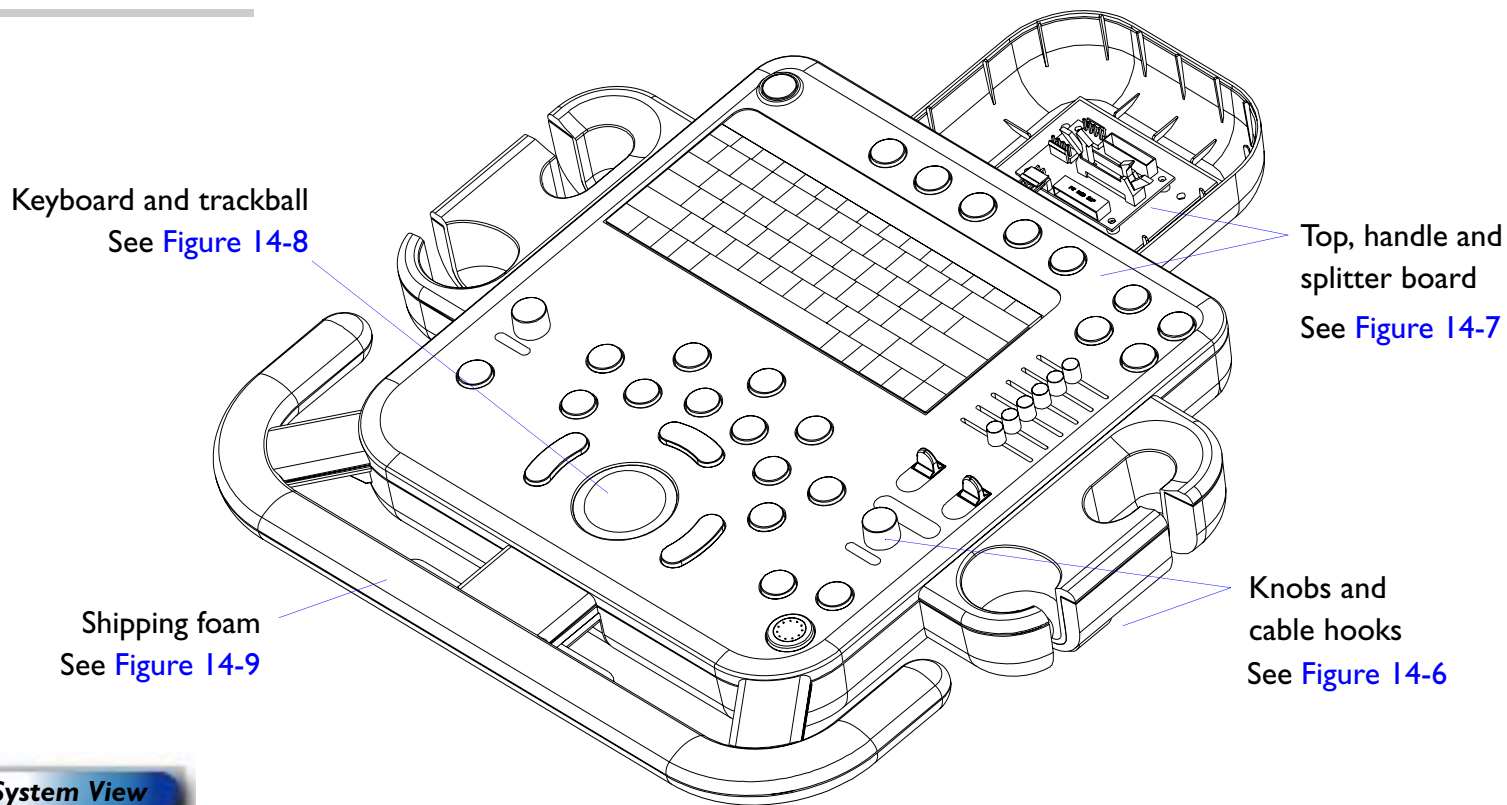


Parent View

System View

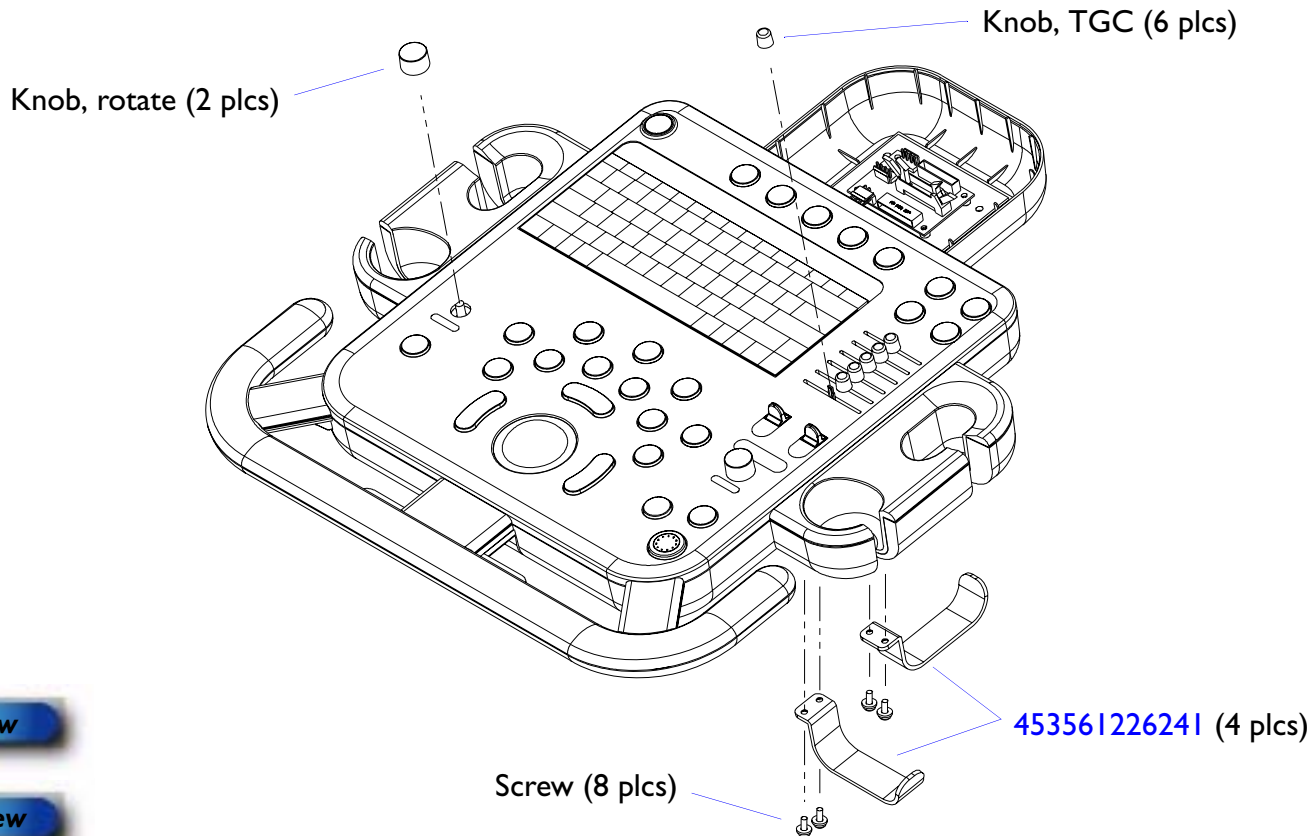
Figure 14-5 Control Panel

PARENT VIEW



System View

Figure 14-6 Control Panel (Knobs and Cable Hooks)



Parent View

System View

Figure 14-7 Control Panel (Top, Handle and Splitter Board)

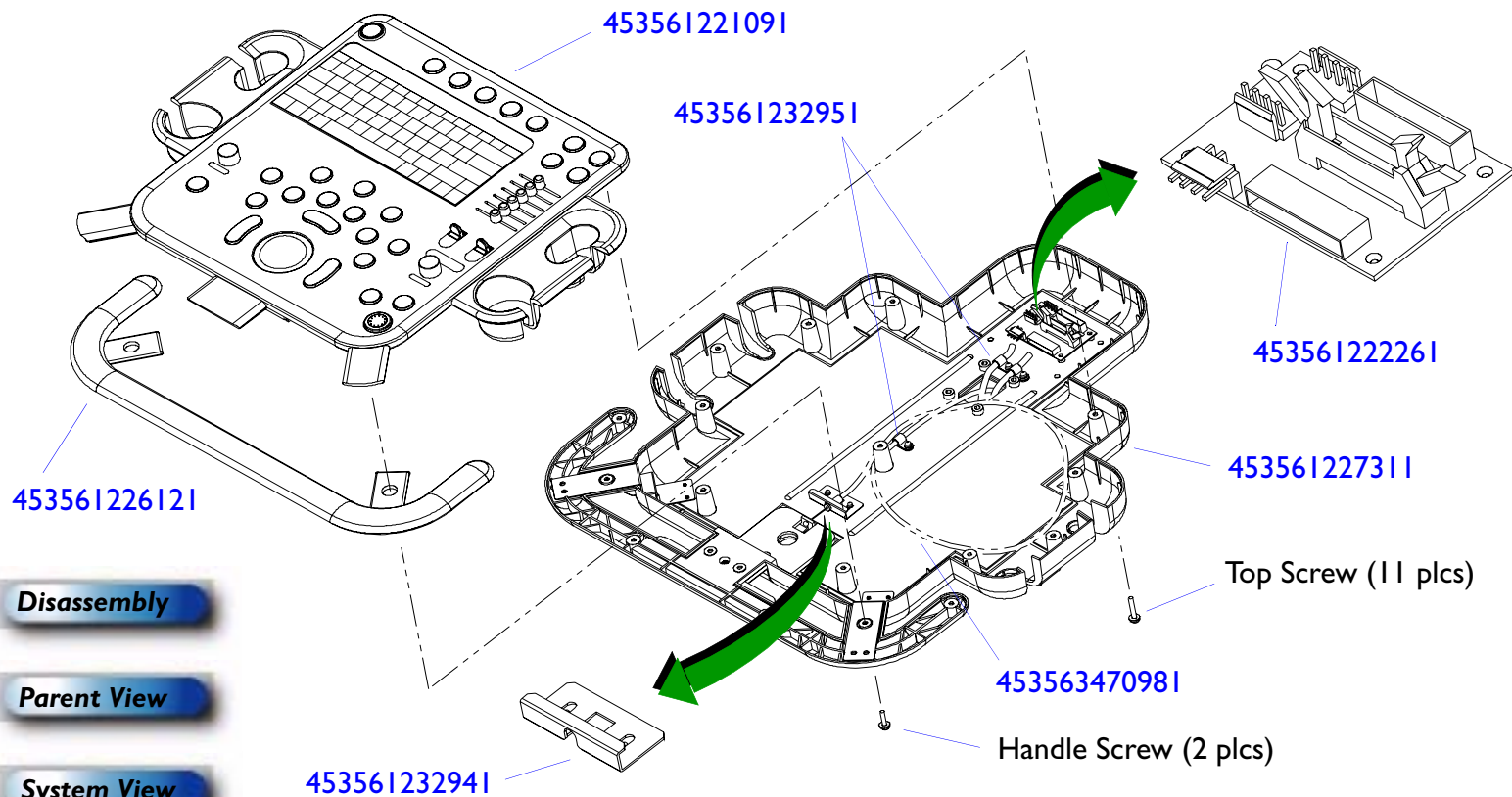
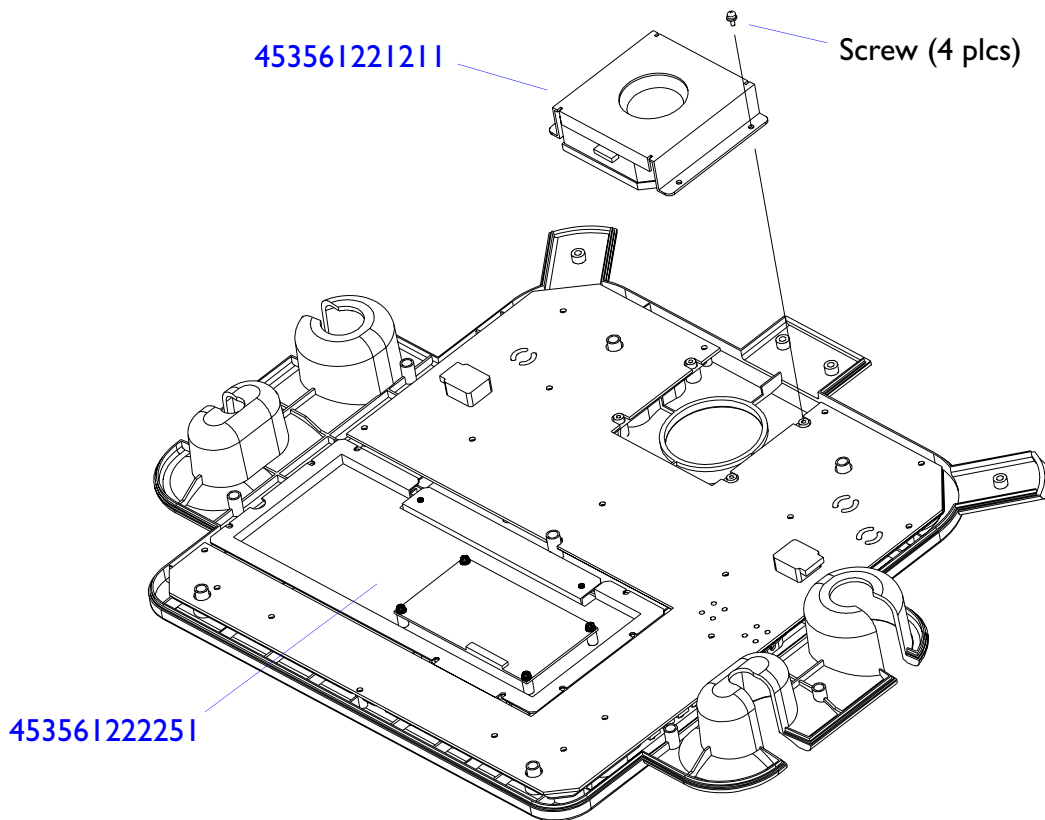


Figure I4-8

Control Panel (Keyboard and Trackball)



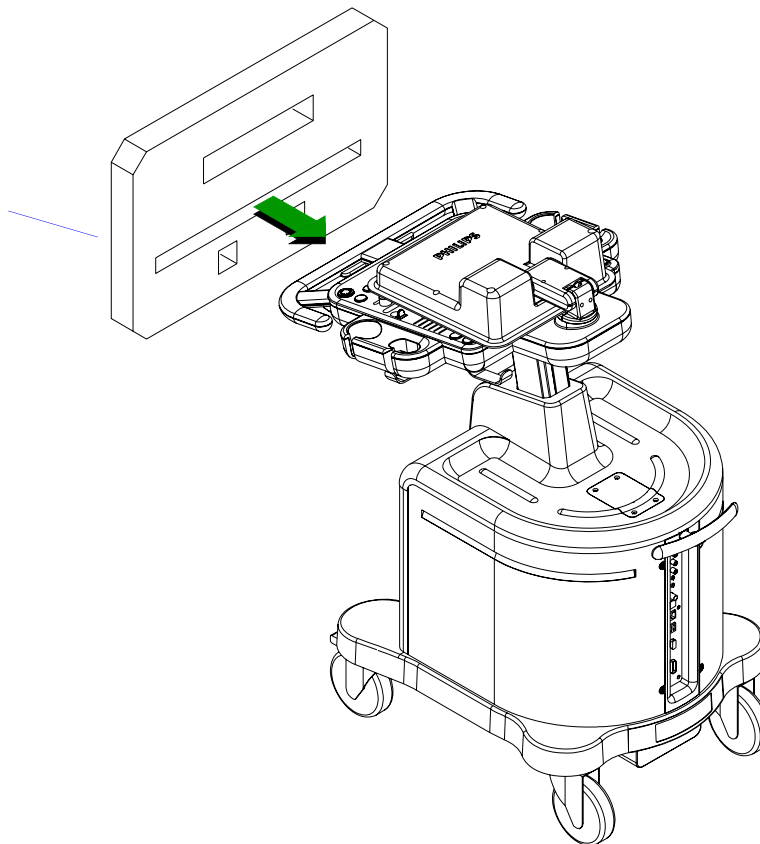
Disassembly

Parent View

System View

Figure I4-9

Control Panel (Monitor Support Shipping Foam)



Installation

Parent View

System View

Figure 14-10 System Enclosures

PARENT VIEW

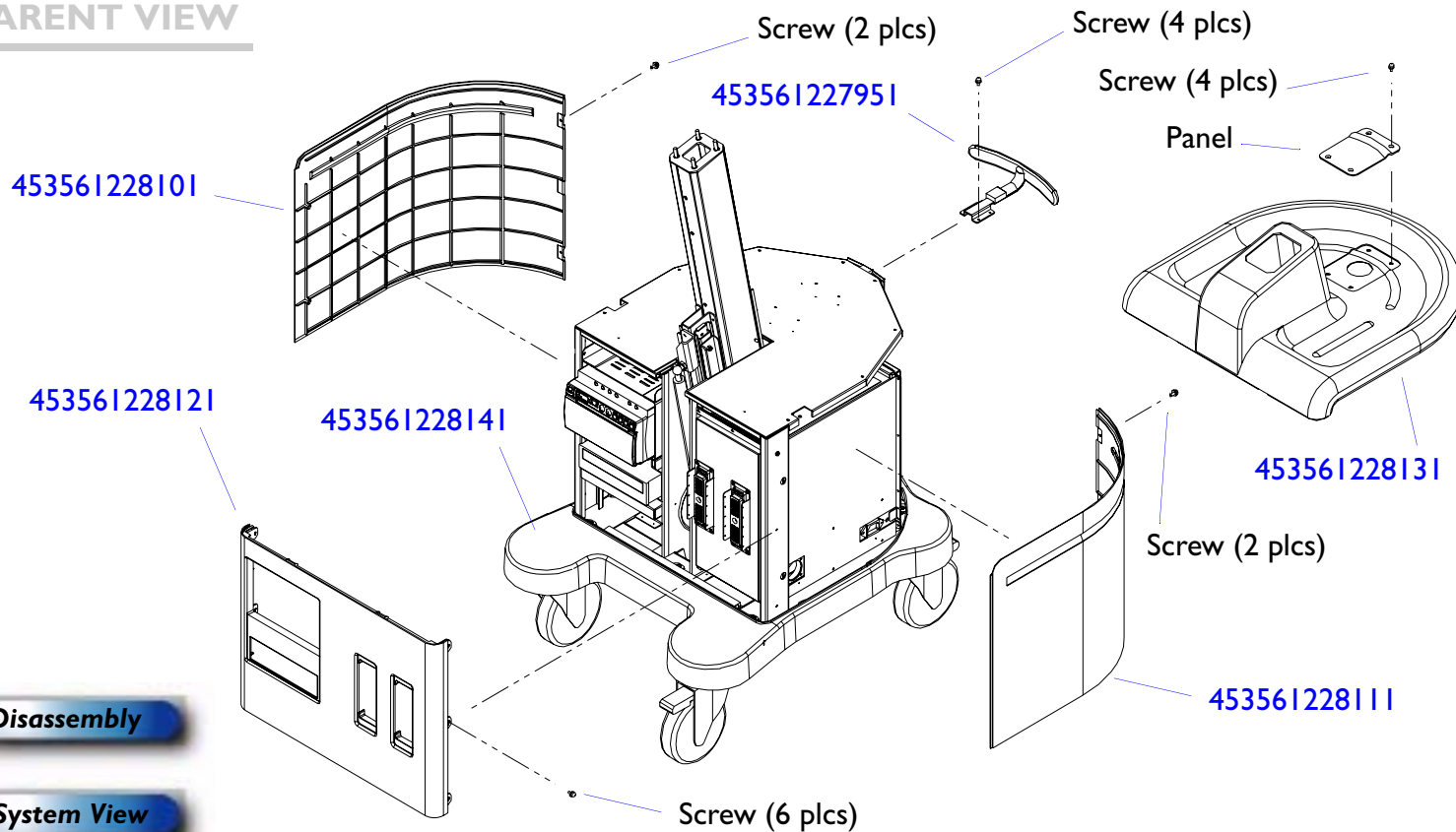
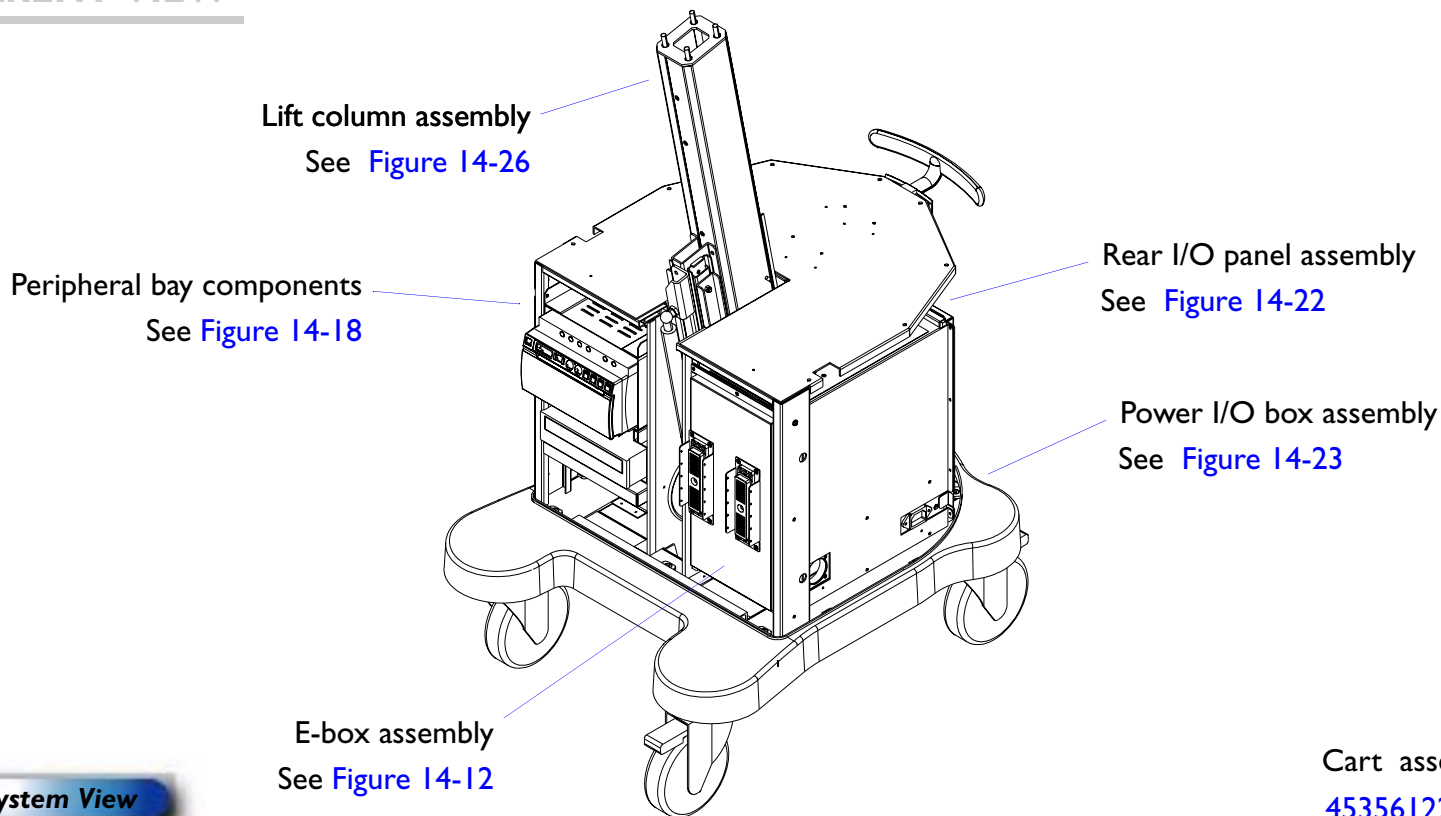


Figure 14-11 **Cart (Internal)**

PARENT VIEW

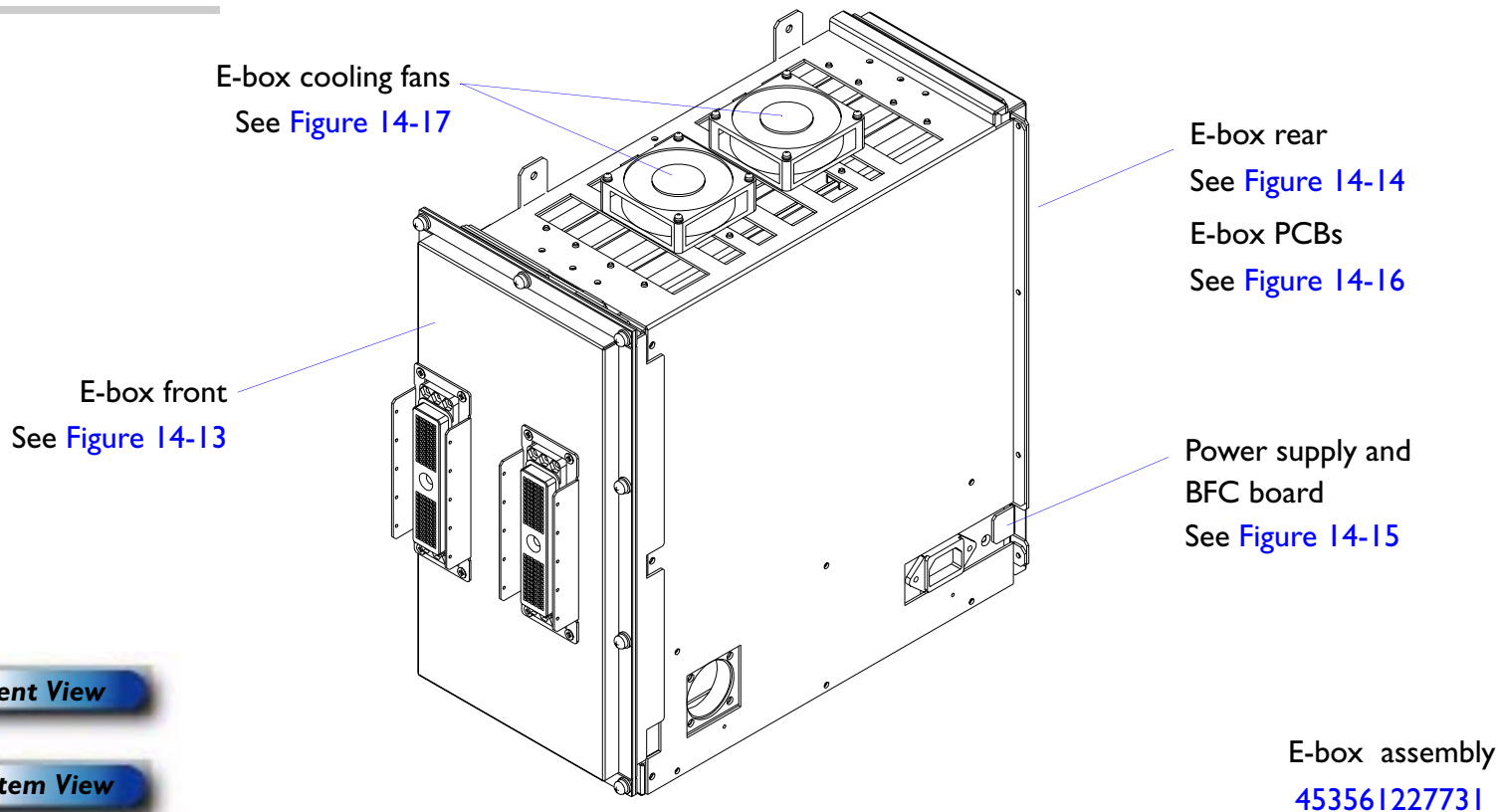


System View

Cart assembly
[453561228081](#)

Figure 14-12 E-box Assembly

PARENT VIEW

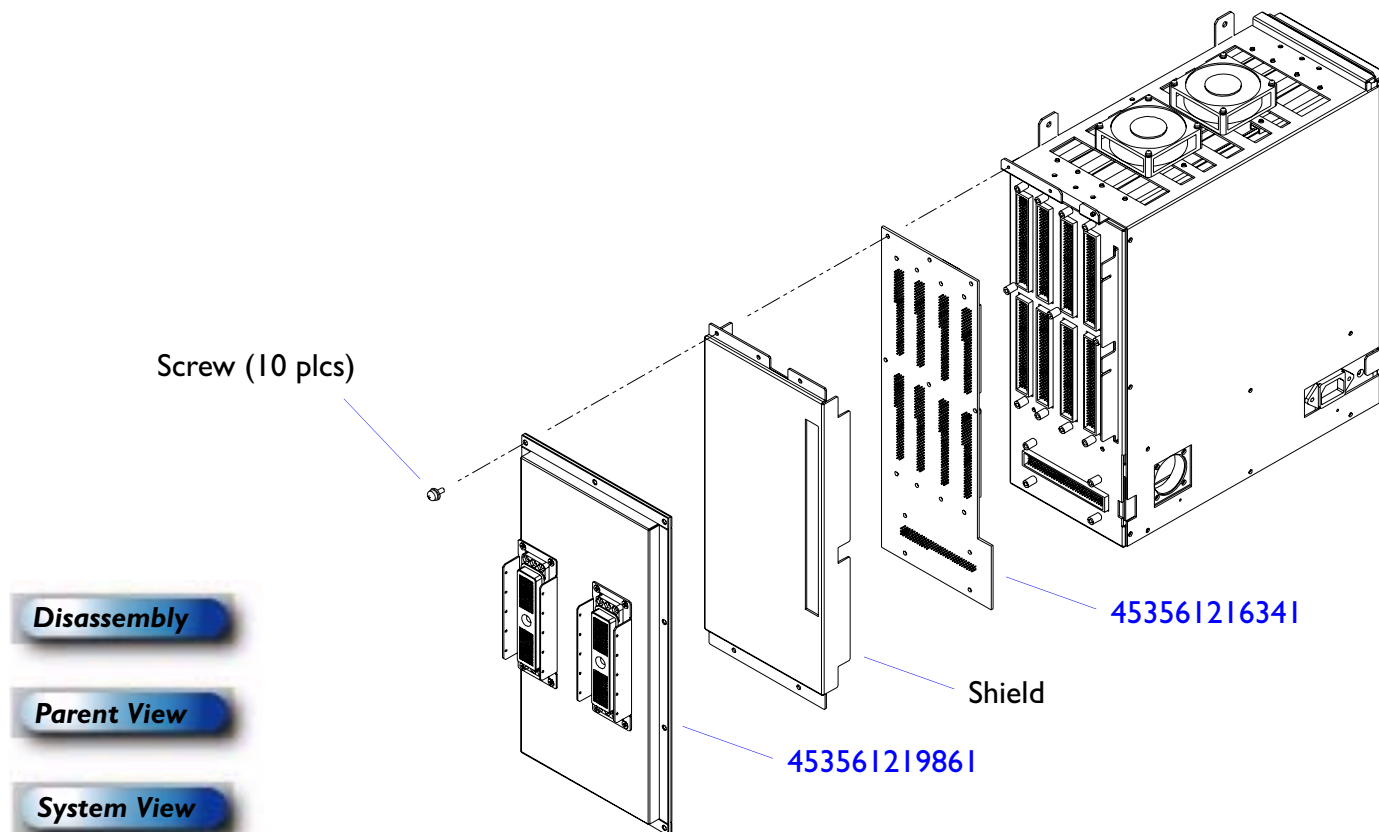


Parent View

System View

E-box assembly
453561227731

Figure 14-13 **Transducer Connector Assembly (TCA) and E-box Motherboard**
(Front Side of E-box)

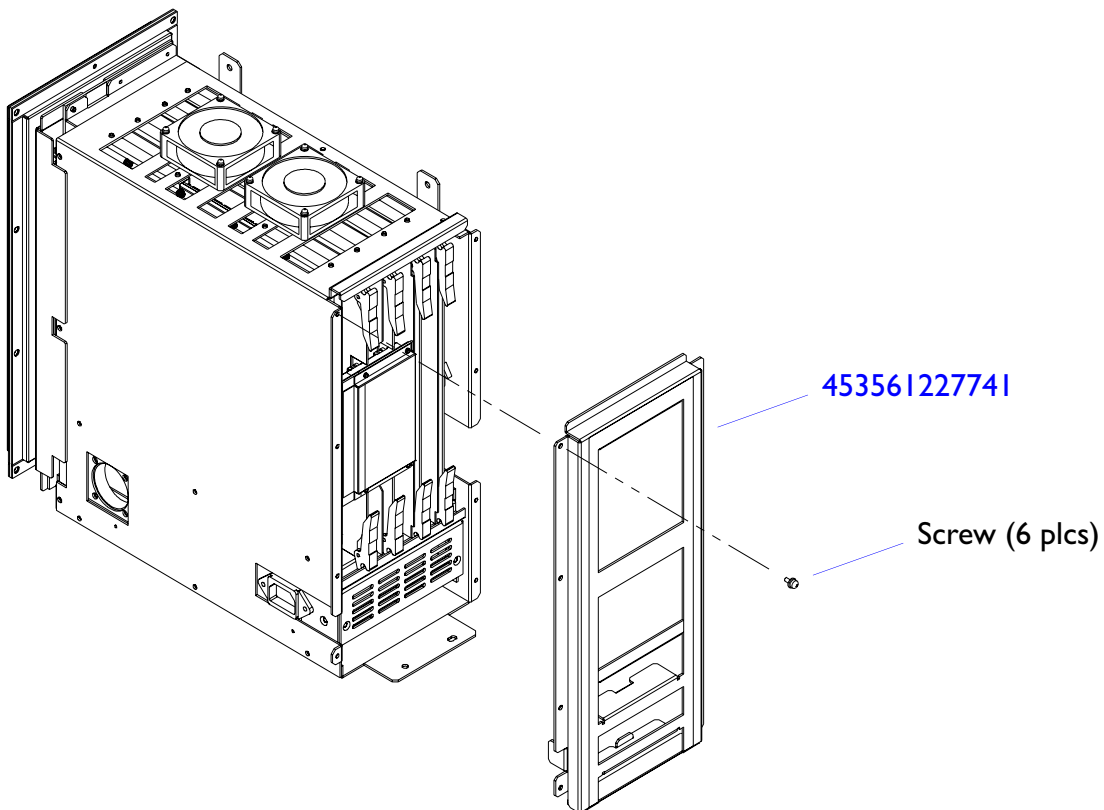


Disassembly

Parent View

System View

Figure 14-14 E-box Boards and Power Supply Access Panel (Rear-side of E-box)

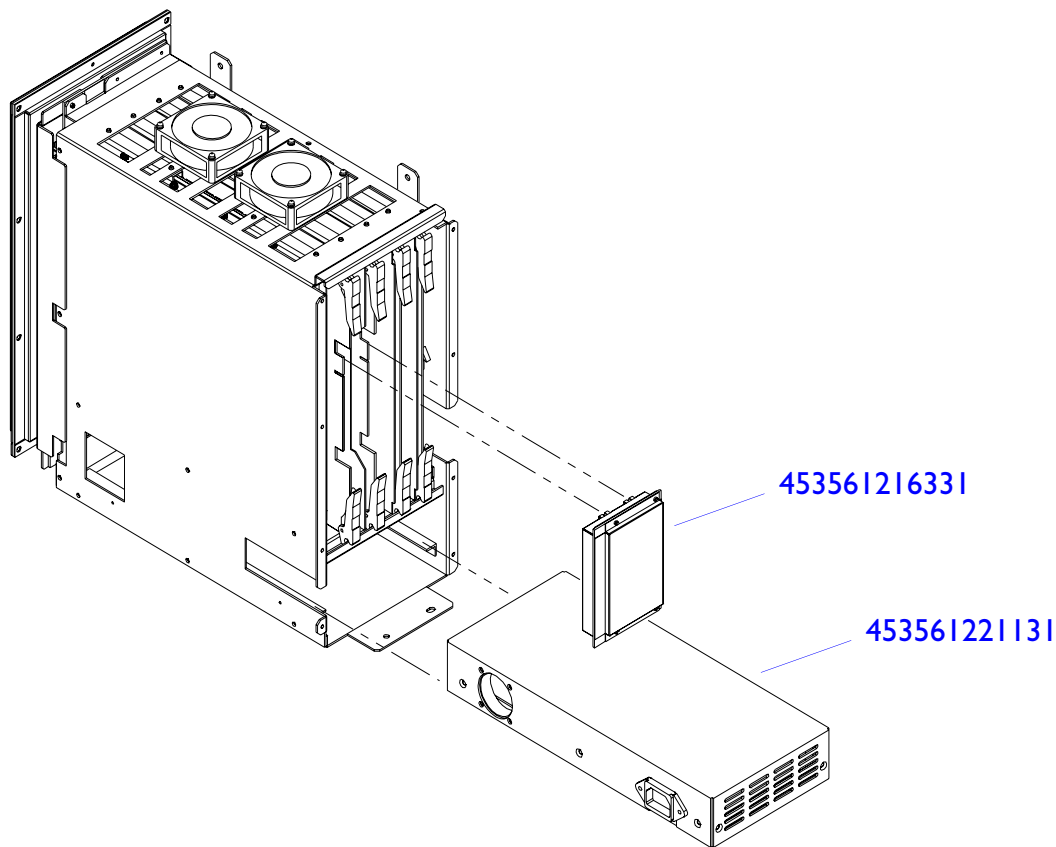


Disassembly

Parent View

System View

Figure 14-15 Power Supply and BFC Board

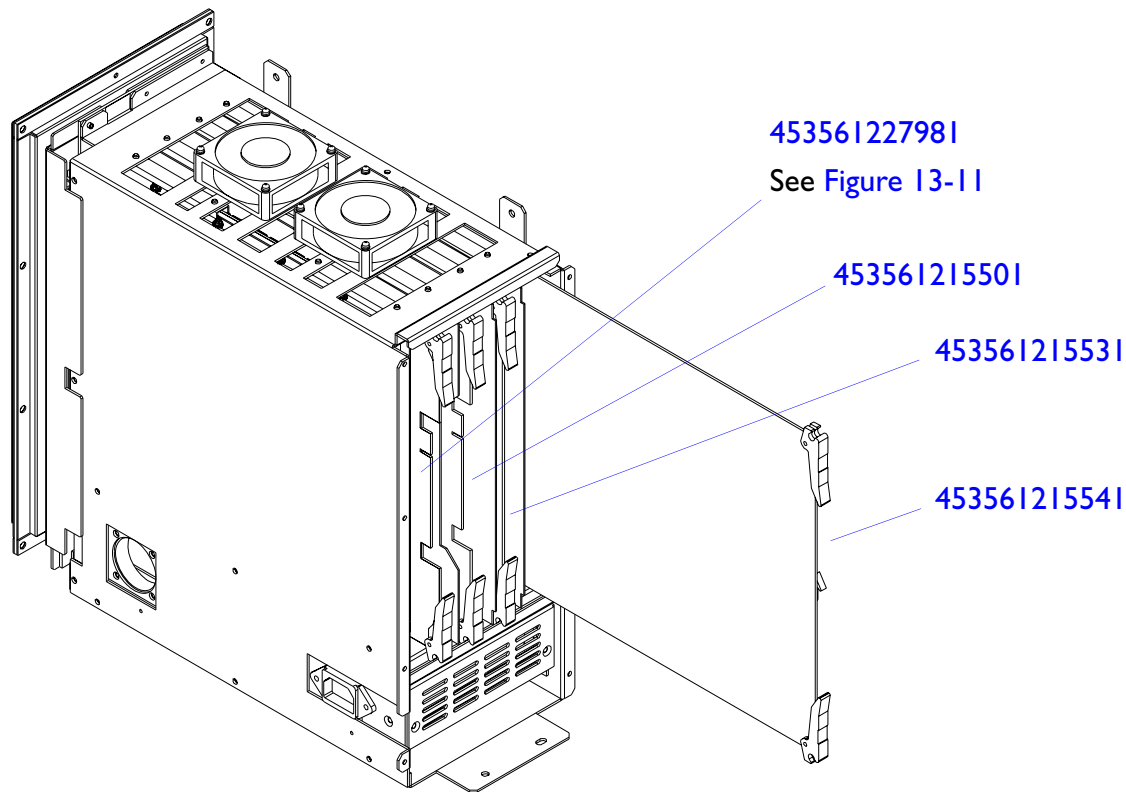


Disassembly

Parent View

System View

Figure 14-16 E-box Boards



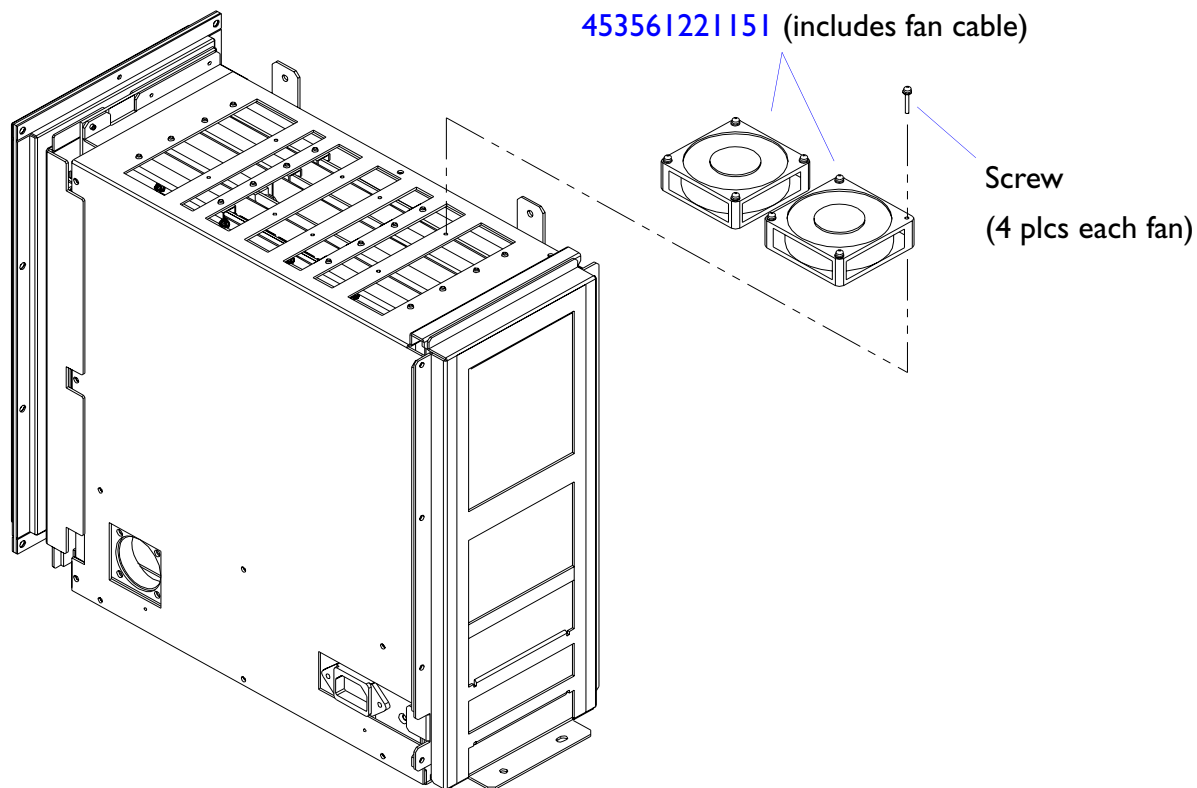
Disassembly

Parent View

System View

Figure 14-17

E-box Cooling Fans



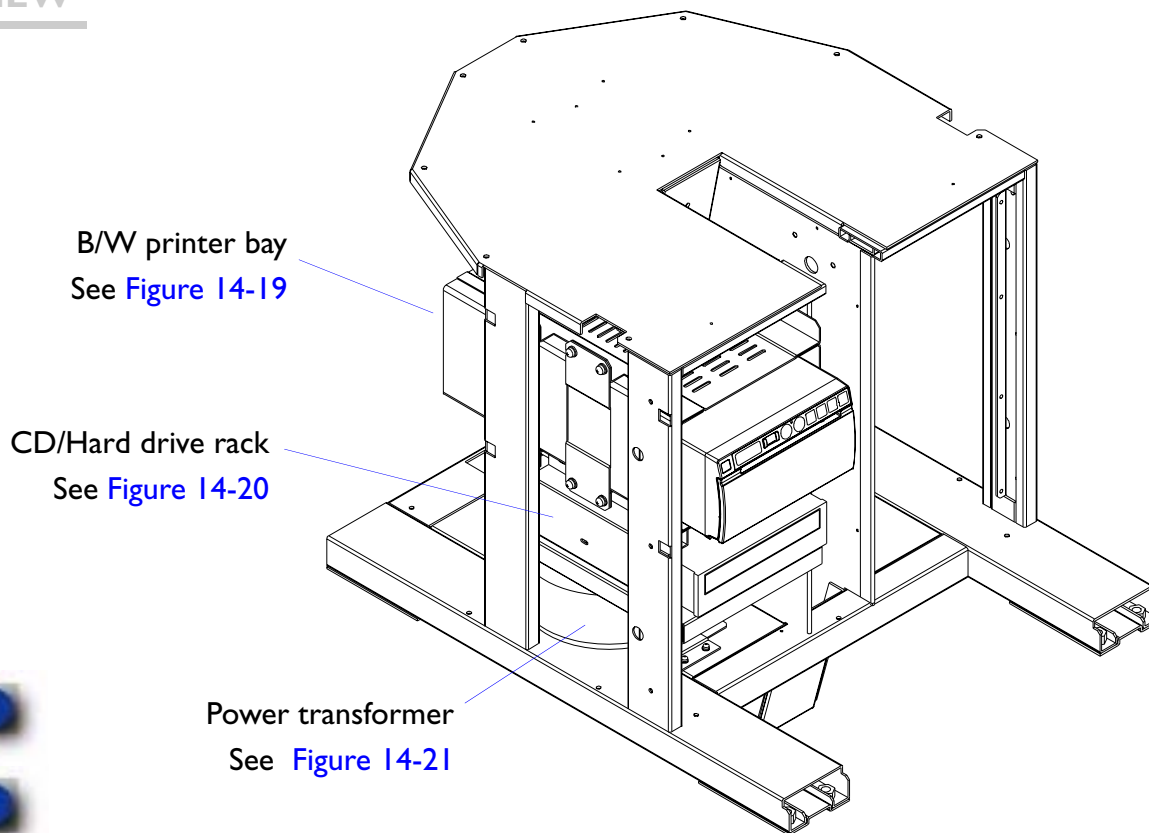
Disassembly

Parent View

System View

Figure 14-18 **Peripheral Bay Components**

PARENT VIEW

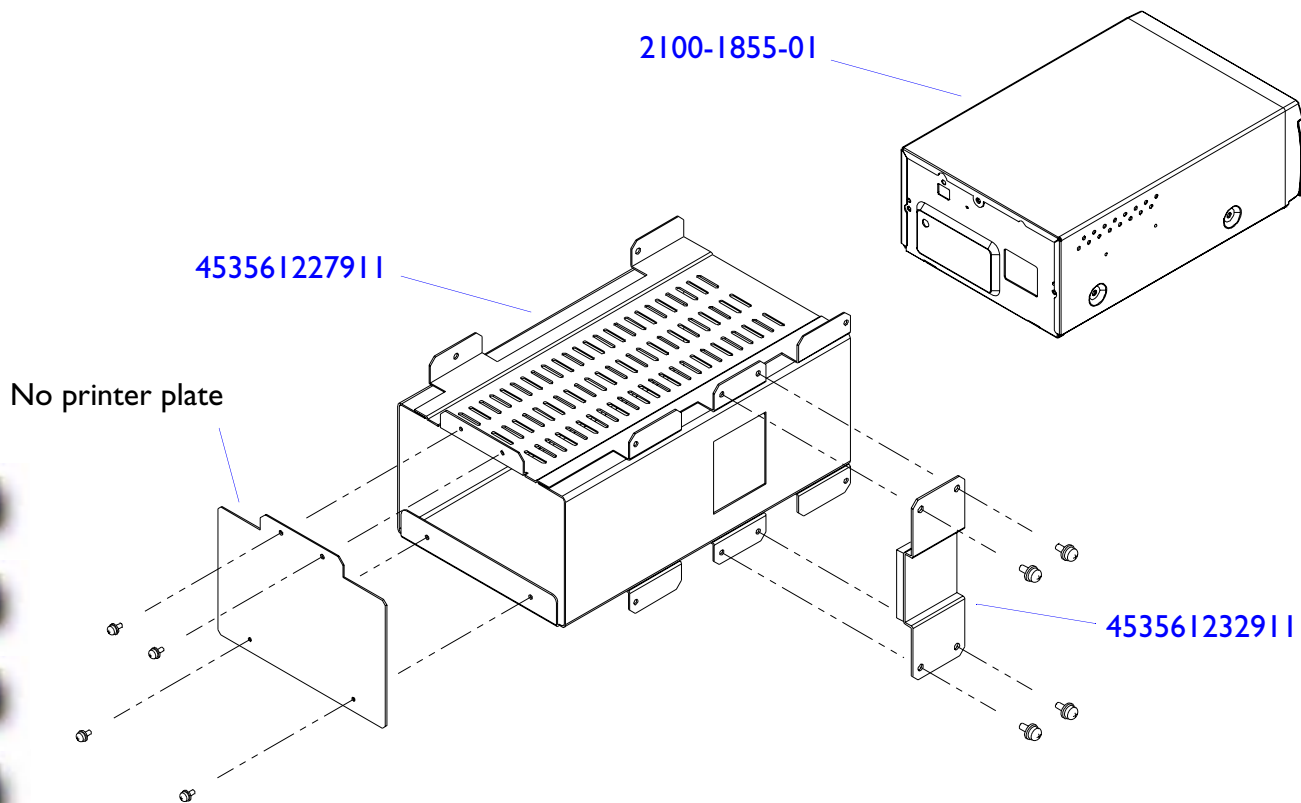


Parent View

System View

Figure 14-19

B/W Printer Bay



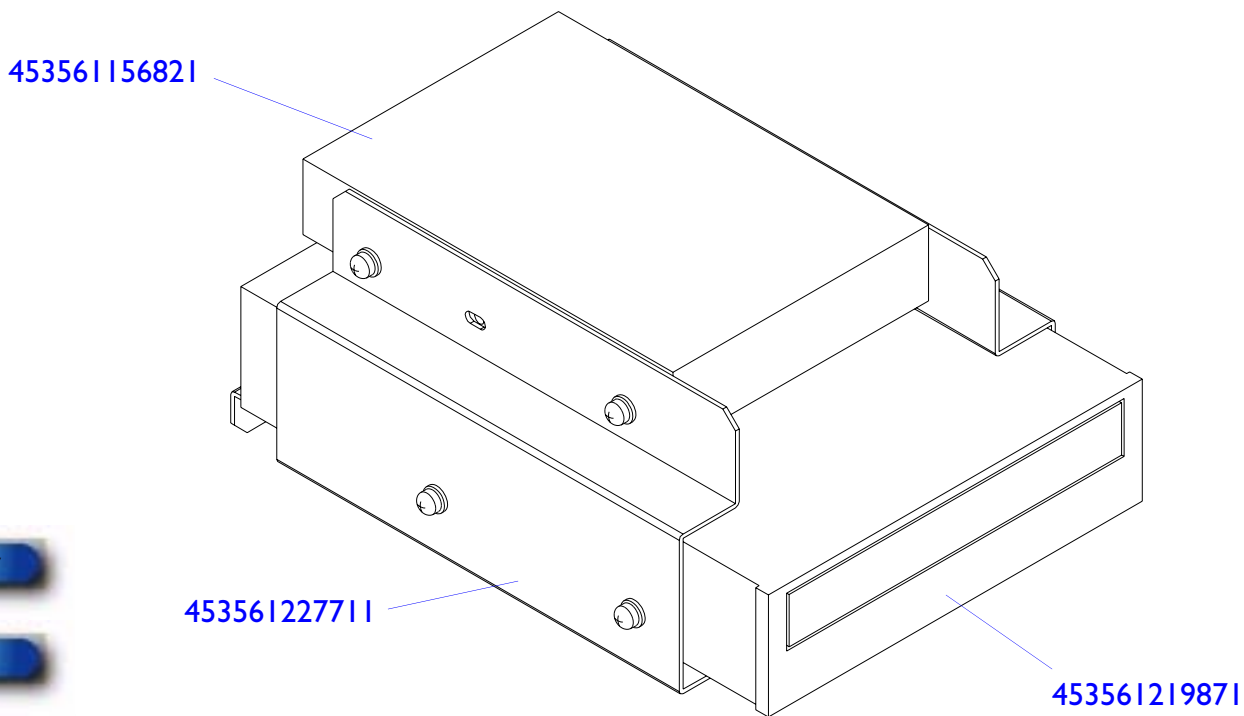
Installation

Disassembly

Parent View

System View

Figure 14-20 Hard Drive and CD Drive Rack

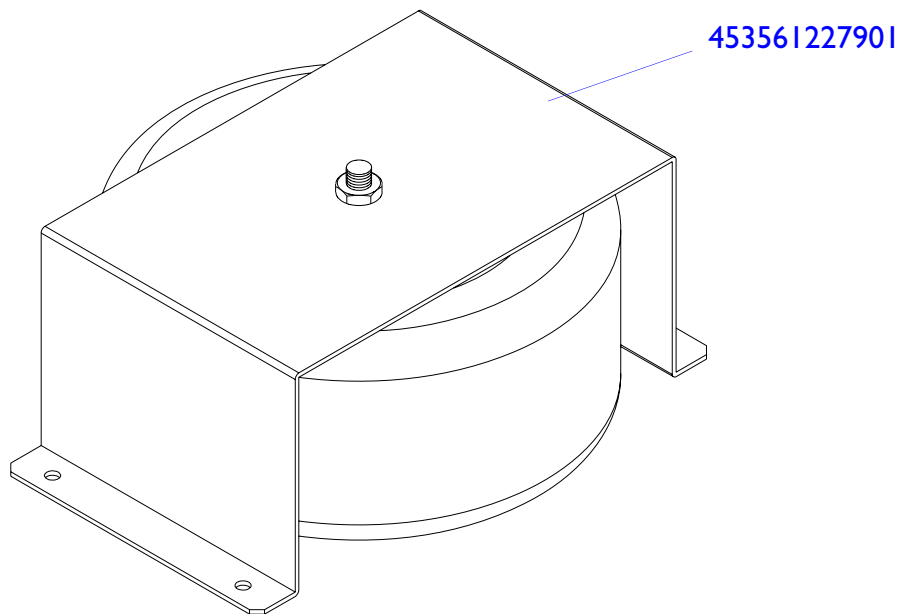


Disassembly

Parent View

System View

Figure 14-21 **Power Transformer**



Disassembly

Parent View

System View

Figure 14-22 Rear I/O Panel Assembly

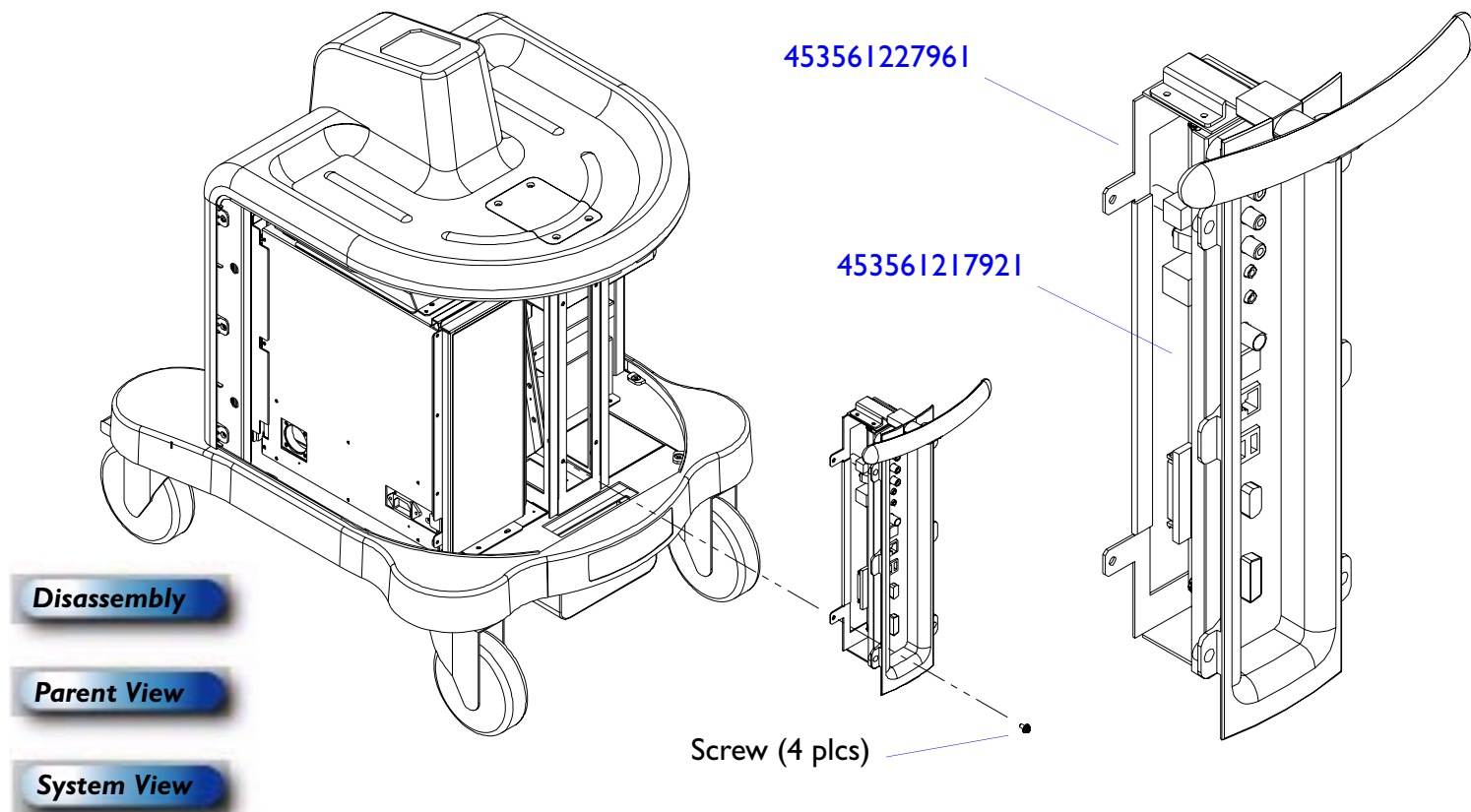
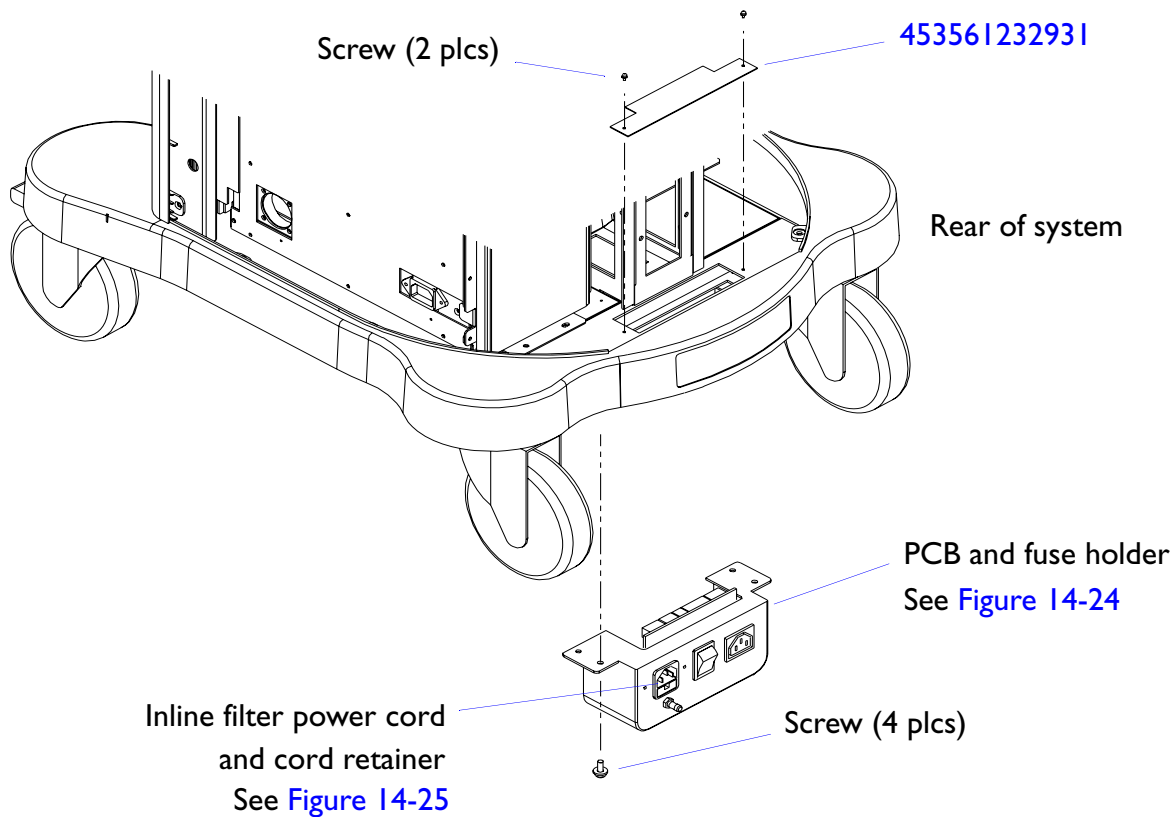


Figure I4-23 Power I/O Box Assembly

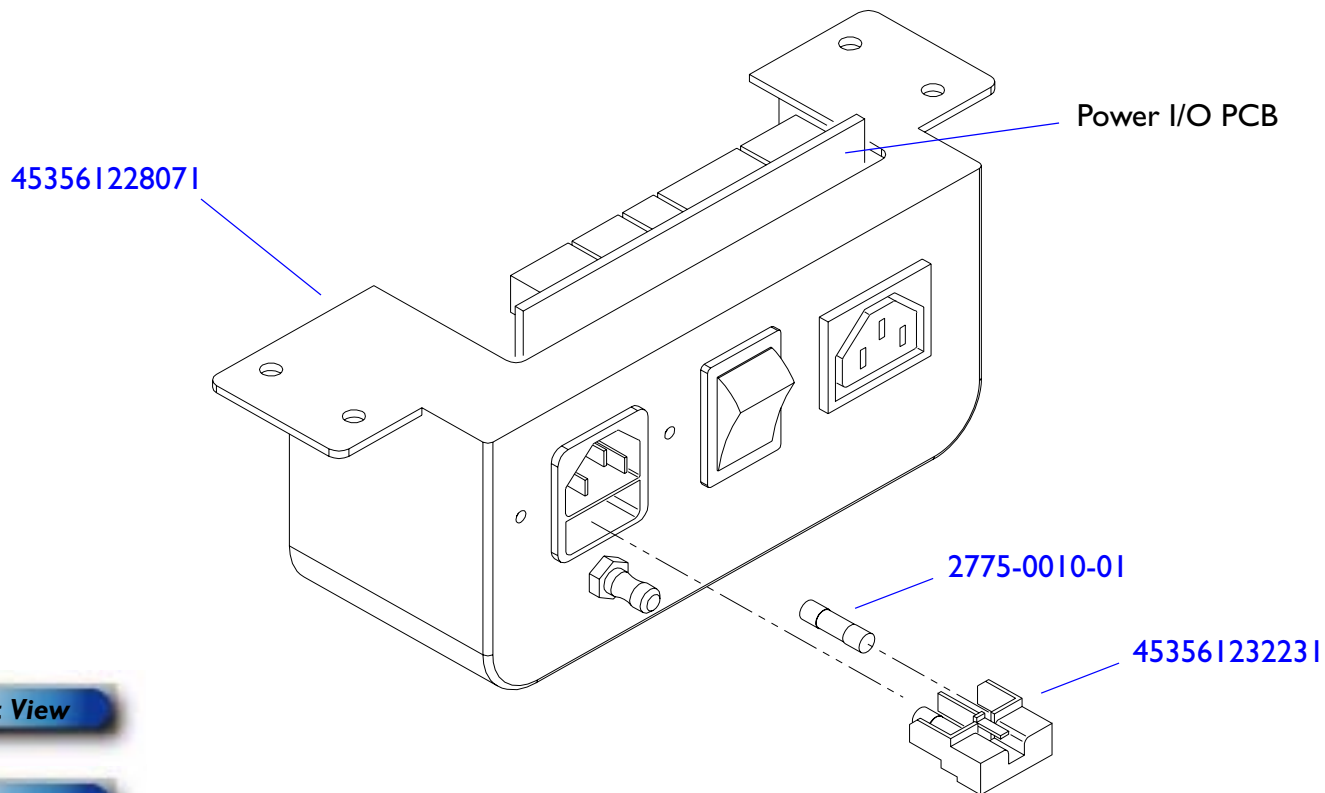


Disassembly

Parent View

System View

Figure I4-24 Power I/O Box (PCB and Fuse Holder)



Parent View

System View

Figure 14-25 Power I/O Box (Inline Filter Power Cord and Cord Retainer)

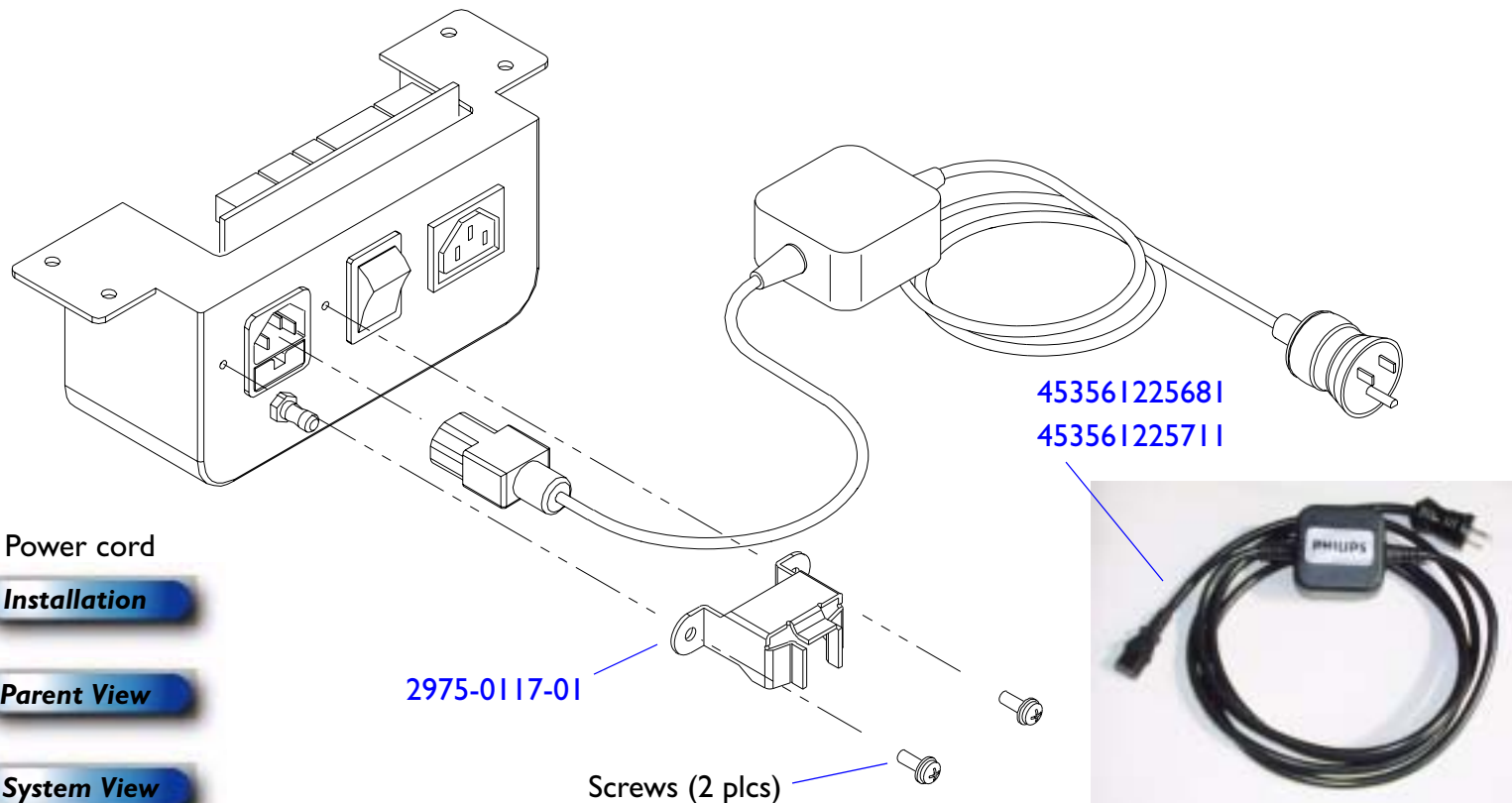
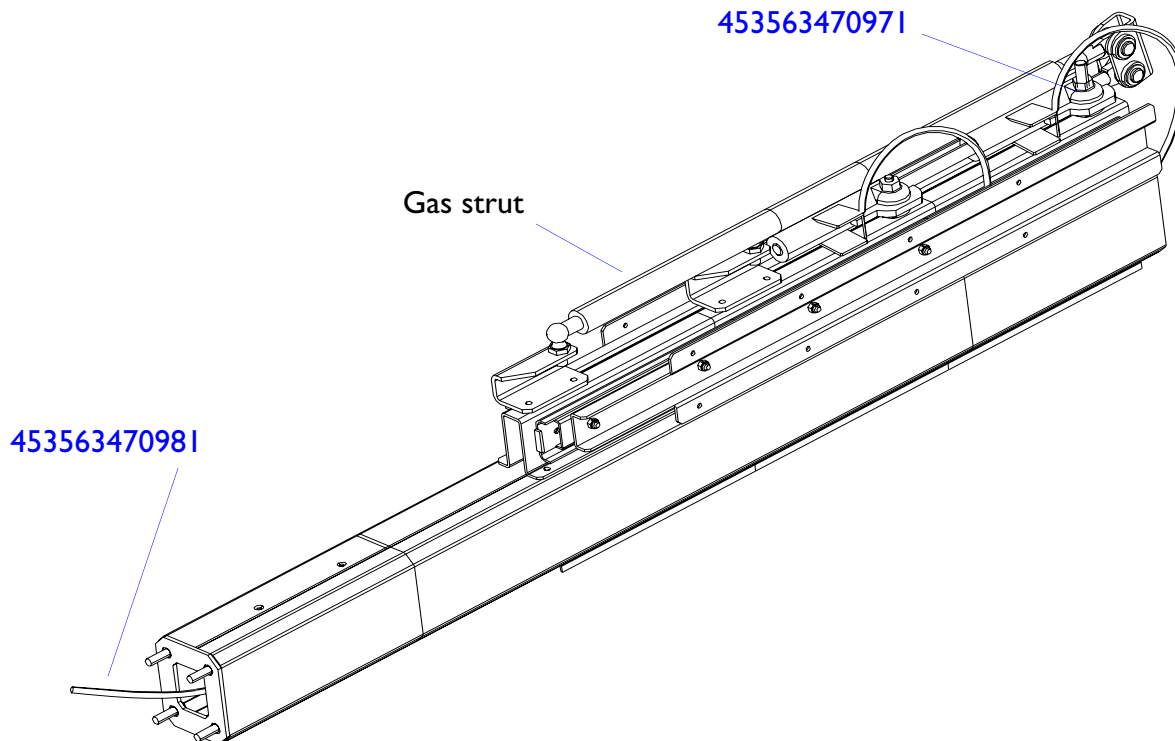


Figure 14-26

Lift Mechanism (Mechlok Assembly and Gas Strut)



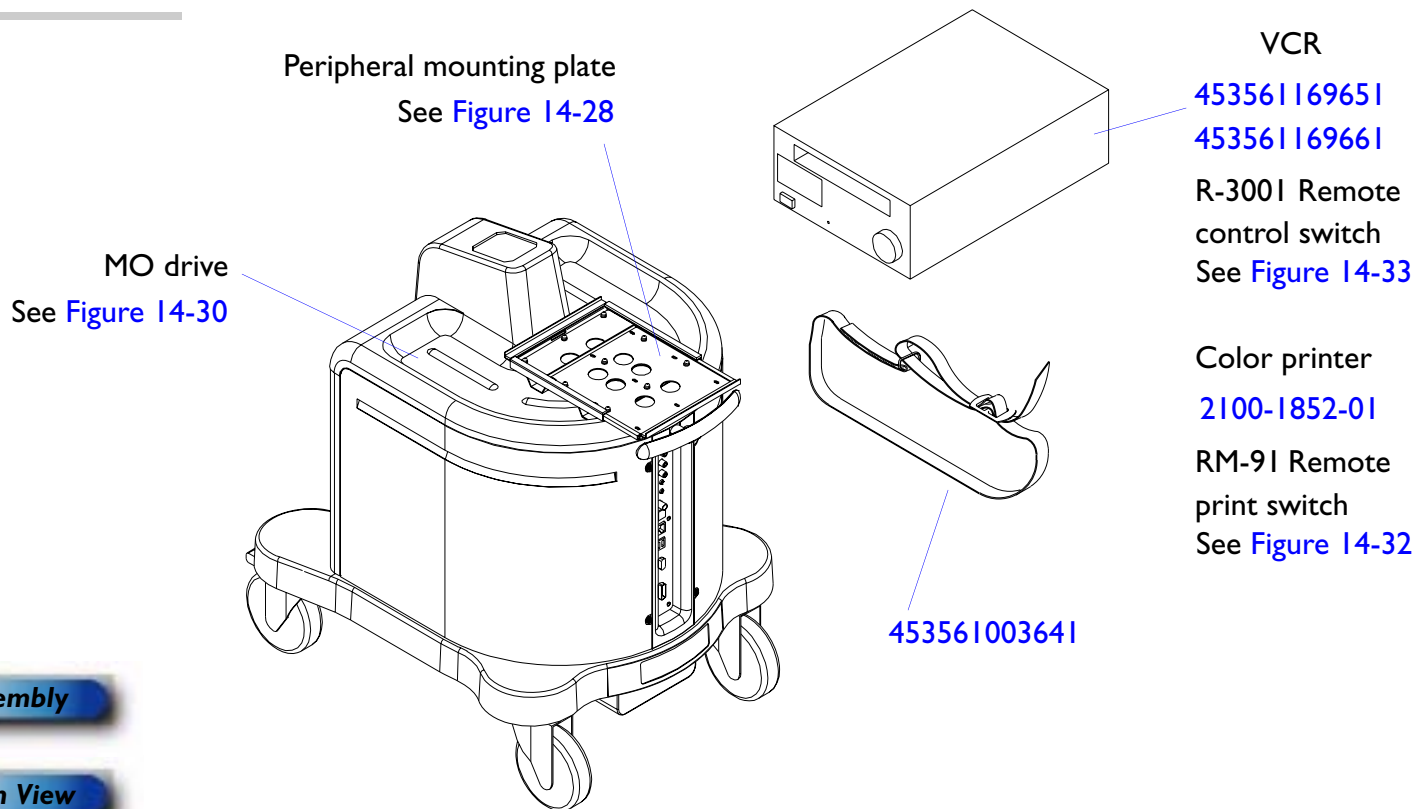
Disassembly

Parent View

System View

Figure 14-27 **Peripheral Top Deck (VCR or Color Printer and MO drive)**

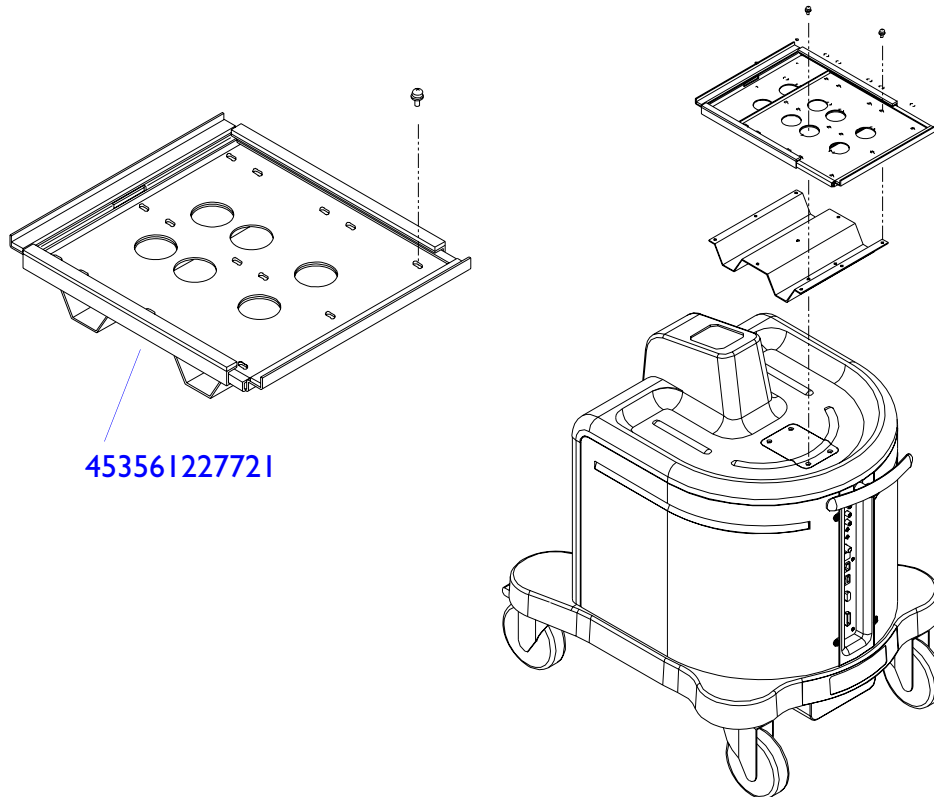
PARENT VIEW



Disassembly

System View

Peripheral Mounting Plate (Uni-mount)



Color printer

Installation

VCR

Installation

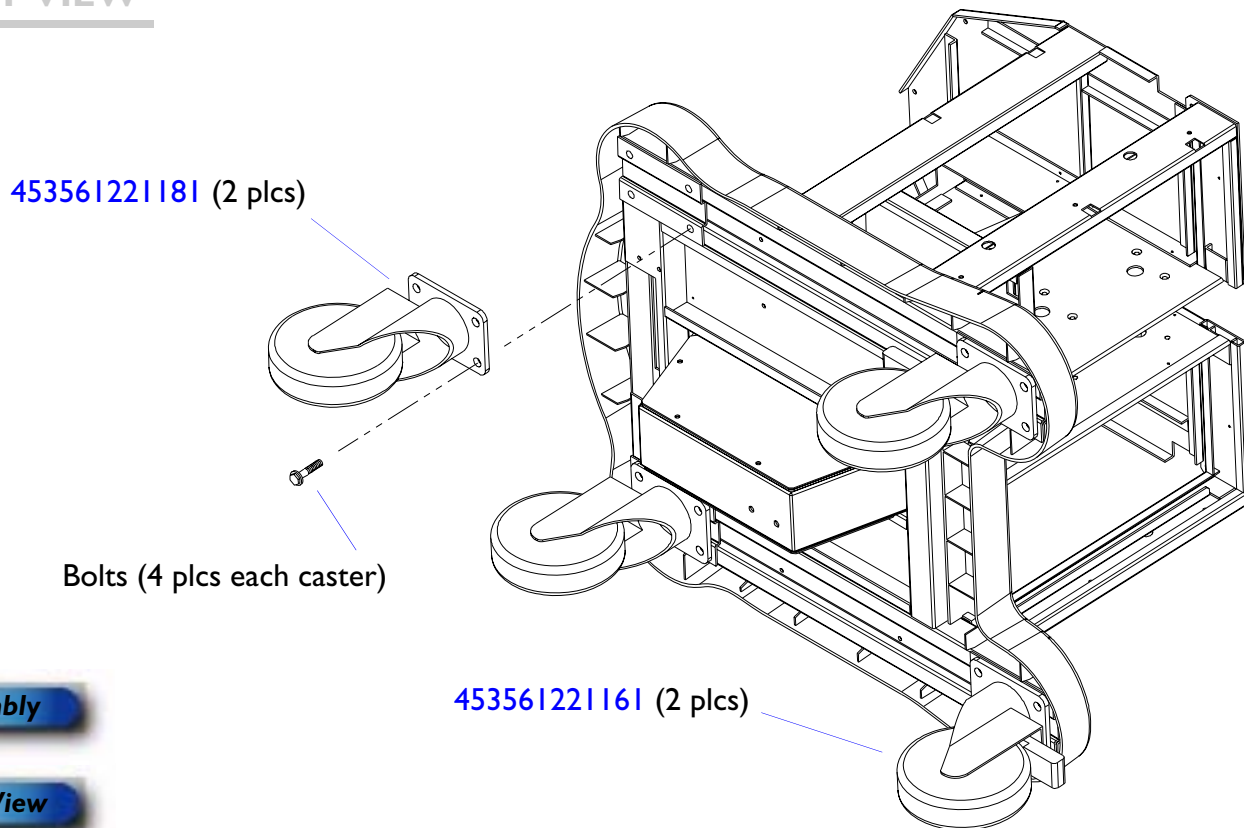
Disassembly

Parent View

System View

Figure 14-29 System Casters

PARENT VIEW



Disassembly

System View

Figure 14-30

MO Drive



Installation

Parent View

System View

MO drive assembly
453561217871

Figure 14-31 **Foot Switch Assembly and Adapter Cable**



453561217911

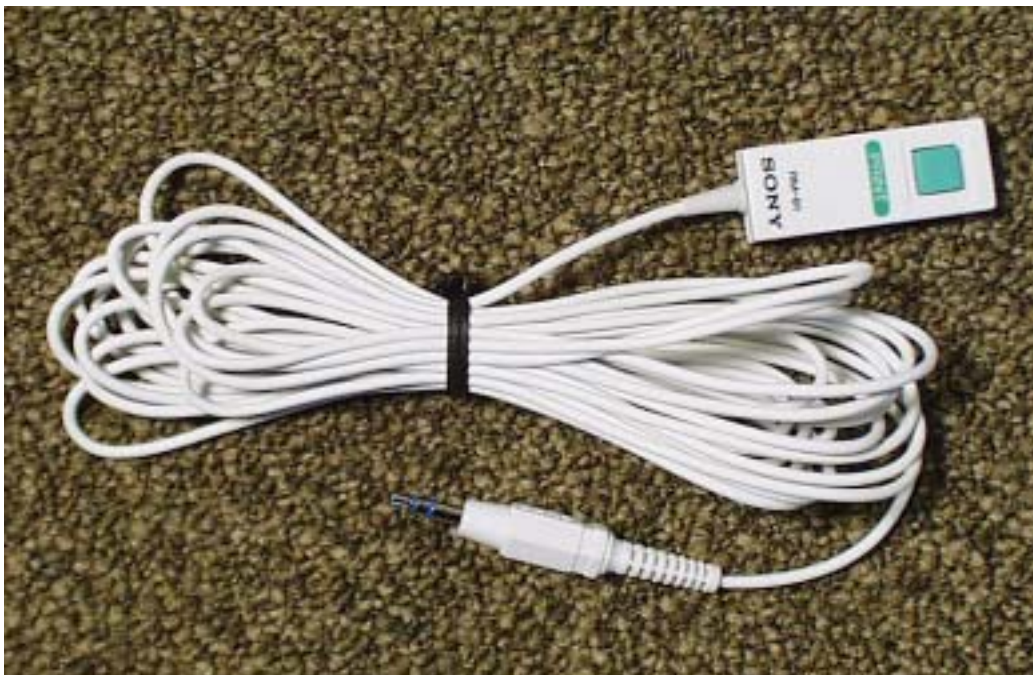
453561227971

Installation

System View

Figure 14-32

RM-91 Sony Color Printer Remote Control Print Switch



Parent View

System View

RM-91 remote print switch
[989605300741](#)

Figure 14-33

R-3001 Mitsubishi VCR Wired Remote Control

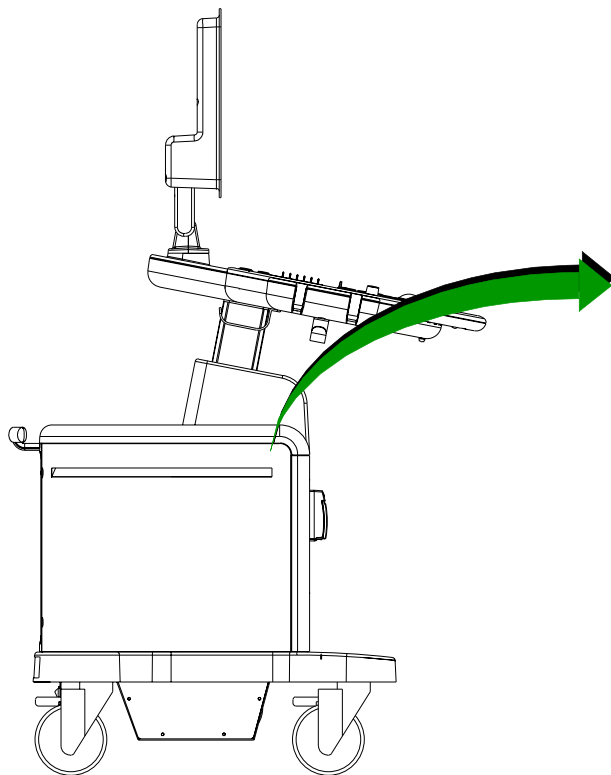


Parent View

System View

R-3001 VCR remote control
[453561228091](#)

Figure I4-34 **System Labeling (HD3 System Nameplate)**



453561233541 (2 plcs)

System View

Parts List

Table 14-1 HD3 Ultrasound System Parts List

Located On	Part Number	Part Description	Notes/Reference
Figure 14-7	453561232941	Bracket, Cable Adjustment	Control panel mechanical cable bracket Manufacturing No: 235-P-320A
Figure 14-20	453561227711	Bracket, CD/Hard Drive	Manufacturing No: 235-P-317A-00
Figure 14-25	2975-0117-01	Bracket, Plug, HDI 4000	AC power cord retainer bracket Manufacturing No: 235-P-149D
Figure 14-7 Figure 14-26	453563470981	Cable Assy, MechLok	Mechanical cable used on the MeckLok assembly Legacy No: M2540-80035
Figure 11-2	Table 11-1	Cables, Power Distribution	
Figure 11-1	Table 11-1	Cables, Signal Interconnect	
Figure 14-11	453561228081	Cart	Manufacturing No: ASP-439-CART
Figure 14-29	453561221161	Caster, Front (Wheel)	Manufacturing No: 333-Z-701-1
Figure 14-29	453561221181	Caster, Rear (Wheel)	Manufacturing No: 333-Z-015A
Figure 14-7	453561232951	Clamp, Cable, P-Clip	Manufacturing No: CLA-N5-01
Figure 14-7	453561221091	Control Panel Assembly	Manufacturing No: ASP-439-KBD Includes: Trackball
Figure 14-7	453561227311	Control Panel Lower Housing	Manufacturing No: A215-169A
Figure 14-14	453561227741	Cover, E-box	Manufacturing No: ASP-439-ECOVER

Table 14-1 HD3 Ultrasound System Parts List (Continued)

Located On	Part Number	Part Description	Notes/Reference
Figure 14-20	453561219871	Drive, CD-RW	Manufacturing No: PC-CD/ RW-GCE-8526B-00
Figure 14-20	453561156821	Drive, Hard Disk, Seagate, 80GB	Manufacturing No: HDD-80G-SEAGATE-00
Figure 14-30	453561217871	Drive, MO, 1.3GB	Manufacturing No: PC-MO-MDK3130UK Includes: USB cable
Figure 14-12	453561227731	E-box Assembly	Manufacturing No: ASP-439-EBOX Includes: Fans, all E-box PCBs, BFC, and power supply
Figure 14-17	453561221151	Fan Assembly, E-box	Manufacturing No: AY-FAN-439-TOP-00 Includes: One fan with cable
Figure 14-19	453561232911	Fastener, Printer Bay	Manufacturing No: ASP-439-SPRBAY B/W printer retainer bracket
Figure 14-31	453561217911	Foot Switch Assembly	Manufacturing No: FOOT-S/W UNIT-00 See “ Cable Assy, Foot Switch Adapter ”
Figure 14-24	2775-0010-01	Fuse, 50T10L250V, Schuter, OEM Service	Alias No: 453561096111 Used in fuse holder located on power I/O box
Figure 14-24	453561232231	Fuse Holder, 2 Pole, Snap-In Mount	Part of power I/O box
Figure 14-26		Gas Strut	Lift mechanism

Table 14-1 HD3 Ultrasound System Parts List (Continued)

Located On	Part Number	Part Description	Notes/Reference
Figure 14-7	453561226121	Handle, Front, Top	Manufacturing No: 252-M-035A-00
Figure 14-10	453561227951	Handle, Rear, Power Cable	Manufacturing No: A255-008A
Figure 14-6	453561226241	Hanger, Cable, Control Panel	Manufacturing No: 255-P-009A-00
Figure 14-19	453561227911	Housing Assy, Printer Bay, Black and White	Manufacturing No: ASP-439-PRBAY-00
Figure 14-23	453561232931	Insulator, Power I/O Assembly	Manufacturing No: 323-Z-008A
Figure 14-8	453561222251	Keyboard Assembly, QWERTY	Manufacturing No: ASP-439-ANK
Figure 14-34	453561233541	Label, Nameplate, System	Manufacturing No: 275-K-A244A HD3 Badge One on each side of system
Figure 14-4	453561222231	LCD Panel Assembly	Manufacturing No: ASP-439-LCD-00 Includes: LCD, front panel, and LCD circuit boards
Figure 14-26	453563470971	MechLok Assembly	Lift mechanism Legacy No: M2540-80030
Figure 14-28	453561227721	OEM Tray Assembly	Universal peripheral mounting plate
Figure 14-10	453561228141	Panel, Bottom	Manufacturing No: 215-M-315A-00
Figure 14-10	453561228121	Panel, Front	Manufacturing No: 215-M-327A-00
Figure 14-10	453561228101	Panel, Left Side	Manufacturing No: 215-M-328A-00
Figure 14-10	453561228111	Panel, Right Side	Manufacturing No: 215-M-329A-00
Figure 14-10	453561228131	Panel, Top	Manufacturing No: 215-M-316A-00

Table 14-1 HD3 Ultrasound System Parts List (Continued)

Located On	Part Number	Part Description	Notes/Reference
Figure 14-16	453561215501	PCB Assy, Beamformer (BF)	Manufacturing No: BD-439-BF-0B
Figure 14-15	453561216331	PCB Assy, Beamformer Connector (BFC)	Manufacturing No: BD-439-BFC-0A Connects BF and FE PCBs
Figure 14-16	453561215531	PCB Assy, Digital Scan Converter (DSC)	Manufacturing No: BD-439-DSC-0A
Figure 14-13	453561216341	PCB Assy, Motherboard (Backplane)	Manufacturing No: BD-439-MTH-0A
Figure 14-16	453561227981	PCB Assy, Front End	Manufacturing No: ASP-439-FE Front End Assembly
Figure 14-16	453561215541	PCB Assy, Processor (PCC)	Manufacturing No: BD-439-PCC-0A
Figure 14-22	453561217921	PCB Assy, Rear I/O Panel	Manufacturing No: BD-439-RP-0A
Figure 14-7	453561222261	PCB Assy, Splitter Board	Manufacturing No: BD-439-SPLITTER-0A
Figure 14-24	453561228071	Power I/O Assembly	Manufacturing No: AY-439-I/O-Box-00
Figure 14-15	453561221131	Power Supply Assembly, E-box	Manufacturing No: AY-439-POWER-00
Figure 14-22	453561227961	Rear I/O Housing	Manufacturing No: ASP-439-RH
Figure 14-32	989605300741	Remote Control, Sony, RM-91	Remote print switch used for color printer installations Diagram: Figure 11-2
Figure 14-33	453561228091	Remote Control, VCR Wired, R-3001	Remote control used for VCR installations Diagram: Figure 11-3

Table 14-1 HD3 Ultrasound System Parts List (Continued)

Located On	Part Number	Part Description	Notes/Reference
Figure 14-9		Shipping Foam, Keyboard	Manufacturing No: 364-Z-094A Slides over control panel for support of the video monitor. For use when transporting the system in vans or other mobile units.
Figure 14-27	453561003641	Strap, Universal OEM	One strap required to secure OEM to peripheral mounting plate
Figure 14-8	453561221211	Trackball Assembly	Manufacturing No: 335-C-007A-00
Figure 14-13	453561219861	Transducer Connector Assembly	Transducer Select Assembly (TCA) Manufacturing No: ASP-439-PSA-0A
Figure 14-21	453561227901	Transformer	Manufacturing No: ASP-439-TRANS-00 Includes: Shield and cables
Figure 14-3	453561221061	Video Monitor Assembly	Manufacturing No: ASP-439-MNT-00
Figure 14-4	453561221081	Video Monitor Housing	Manufacturing No: ASP-439-RMNT-00 Includes: Speakers, cables, and hinge

Peripherals Parts List

Table 14-2 Peripherals and Applicable Cables

Item No.	Part Description	Part Number	Power Cable	Signal Cable	References
1	Printer, Black-and-White, UP-895MD, Sony	2100-1855-01	453561227921	2275-0038	Alias No: 453561059841 Photo Figure 1-2 Cabling diagram Figure 11-2 Parts Illustration Figure 14-19
2	Printer, Color, UP-21MD, Sony	2100-1852-01	2275-0482-01	154899	Alias No: 453561059831 Photo Figure 1-2 Cabling diagram Figure 11-2

Table 14-2 Peripherals and Applicable Cables (Continued)

Item No.	Part Description	Part Number	Power Cable	Signal Cable	References
3	VCR Assy, HS-MD3000UA, NTSC, Mitsubishi	453561169651	2275-0482-01	154899 (Signal) 453561012981 (Audio)	Photo Figure 1-2 Cabling diagram Figure 11-3 NTSC version supports NTSC-M format
4	VCR Assy, HS-MD3000EA, PAL, Mitsubishi	453561169661	2275-0482-01	154899 (Signal) 453561012981 (Audio)	Photo Figure 1-2 Cabling diagram Figure 11-3 PAL version supports PAL-B format

I5 Transducers

Introduction

This section summarizes general and parts information for the transducers that can be used with the HD3 system:

- C4-2 ([Table I5-1](#))
- C5-2 ([Table I5-2](#))
- C7-3 ([Table I5-3](#))
- C9-4ec ([Table I5-4](#))
- L9-5 ([Table I5-5](#))

NOTE The customer is directed to order biopsy guides by contacting their Philips representative or an authorized distributor. Transducer covers and other supplies and accessories can be ordered from CIVCO Medical Instruments: [See “Supplies and Accessories” on page 40.](#)

Table 15-1 C4-2 Information

Parameter	Specification
Transducer Type	Curved linear array
Center Frequency	3.0 MHz
Radius of Curvature	26mm
Number of Elements	128
Element Pitch	0.328 mm
Elevation Aperture	12 mm
Elevation Focus Depth	70.0 mm
Applications	Abdominal; pediatric; cardiac adult
Philips Part Number	453561201051

Table 15-2 C5-2 Information

Parameter	Specification
Transducer Type	Curved linear array
Center Frequency	3.0 MHz
Radius of Curvature	38.7 mm
Number of Elements	128
Element Pitch	0.401 mm
Elevation Aperture	15.75 mm
Elevation Focus Depth	83.0 mm
Applications	Abdominal; pediatric; obstetrical; gynecological and fertility
Philips Part Number	453561201041

Table 15-3 C7-3 Information

Parameter	Specification
Transducer Type	Curved linear array
Center Frequency	4.5 MHz
Radius of Curvature	50 mm
Number of Elements	128
Element Pitch	0.474 mm
Elevation Aperture	11 mm
Elevation Focus Depth	80.0 mm
Applications	Abdominal; pediatric; obstetrical; gynecological and fertility
Philips Part Number	453561201061

Table 15-4 C9-4ec Information

Parameter	Specification
Transducer Type	Endocavity curved linear array
Center Frequency	6.5 MHz
Radius of Curvature	1.0 mm
Number of Elements	128
Element Pitch	0.205 mm
Elevation Aperture	6 mm
Elevation Focus Depth	38.0 mm
Applications	Obstetrical; gynecological and fertility; prostate
Philips Part Number	453561201081

Table 15-5 L9-5 Information

Parameter	Specification
Transducer Type	Linear array
Center Frequency	7.5 MHz
Radius of Curvature	38.4 mm
Number of Elements	128
Element Pitch	0.3 mm
Elevation Aperture	6 mm
Elevation Focus Depth	20.0 mm
Applications	Small parts and superficial; pediatric; musculoskeletal; vascular
Philips Part Number	453561201071