

Contents

- FluoroTrak (Surgical Navigation) Subsystem4**
- Circuit/Mechanical Description.....4
- Subsystem Description.....4
- Tools/Test Equipment.....5
- Major Assemblies and Controls Location5
- SNS Functional Sections.....7
- Subsystem Fault Isolation.....7
- Subsystem Functional Testing.....8
- Boot Process8
- Calibration and Verification Functional Test11
- Shutdown Test.....13
- Power Distribution (AC/DC)14**
- Circuit/Mechanical Description.....16
- Fault Isolation17
- Functional Testing19
- Navigation Computer Power Input Functional Test19
- FluoroTrak Unit Power Input Functional Test21
- UPS Functional Test.....21
- Adjustments21
- Tracking.....22**
- Circuit/Mechanical Description.....22
- Fault Isolation24
- Functional Testing25
- Adjustments25
- Network.....26**
- Circuit/Mechanical Description.....27
- Fault Isolation27

FluoroTrak Service Manual Update

- Functional Testing28
 - Local (Private) Network Communication28
 - External Network (DICOM) Communication28
- Navigation Computing.....29**
- Circuit/Mechanical Description.....30
 - Video Interface30
 - Touch Interface.....30
 - Audio30
 - Central Processing31
 - Maintenance Input/Output31
- Fault Isolation32
- Functional Testing35
- Adjustments35
- Mechanical36**
- Circuit/Mechanical Description.....36
- Fault Isolation37
- Functional Tests37
- Adjustments38
- Replacement39**
- Lower-Left Side, Lower-Right Side, and Front Covers42
- Flat Panel Display Monitor, Spacer Plate, and Monitor Mounting Plate.....43
- Monitor Handles.....45
- Monitor Handle Mounts.....47
- Monitor Pivot Mount.....49
- Secondary Arm51
- Articulated Arm (A-Arm).....56
- A-Arm Support63
- Interconnect Mounting Bracket65
- Arm Cable.....68
- Monitor Retention Bracket71
- Spring Clip74

FluoroTrak Service Manual Update

Upper Right Side Cover	76
Tracker Bezel.....	82
FluoroTrak Kit & Mounting Bracket	84
24V Power Supply (PS3)	87
Computer Box Asm.....	89
Computer Box Asm. Internal Components	92
Ethernet Card	101
Diagnostics	103
Error Messages	103
Calibration	104

FluoroTrak (Surgical Navigation) Subsystem

The FluoroTrak™ Surgical Navigation System (SNS) is an image guided surgery system based on the OEC Workstation. The SNS adapts the imaging technology of the 9800 C-Arm (both 9" and 12") and the Workstation to assist the surgeon in guiding the position of surgical instruments during surgery. SNS integrates with the Workstation for capturing, processing, archiving and displaying fluoroscopic images via the image chain.

Two fluoroscopic views of the surgical area of interest, displayed on the SNS monitor, show the instrument tip and trajectory. A fluoroscopic calibration registration process aligns the patient's position with the images.

In this Service Manual Update you will find information only about the SNS assemblies—those that provide the surgical navigation capabilities. For all other service-related instructions, refer to the OEC Workstation Service Manual.

Circuit/Mechanical Description

Subsystem Description

The SNS consists of the following major assemblies, all mounted inside of, or attached to the OEC Workstation.

- **FluoroTrak Unit**
The FluoroTrak Unit detects tool data—identity, position and orientation of the various instruments used during surgical navigation procedures. The FluoroTrak Unit is an OEM (Original Equipment Manufacturer) device, provided by VTI (Visualization Technology Inc.).
- **Navigation Computer**
The Navigation Computer processes workstation fluoroscopic information and instrument position and orientation data to create images and navigation information used during surgical navigation, and communicates them for display.
- **Articulating Arm**

FluoroTrak Service Manual Update

The Articulating Arm mounts to the workstation and positions the Flat Panel Display for ease of use during procedures using the SNS system. The arm also provides the necessary motion to place the Flat Panel Display in a stowed position on the workstation.

- Flat Panel Display

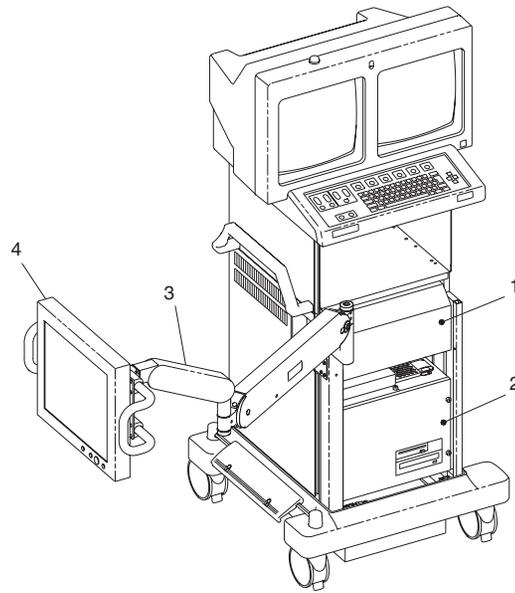
The Flat Panel Display displays images and navigation information used during guided surgery. The Flat Panel Display also has a touch screen with the controls and menus necessary for the setup and use of the SNS system.

Tools/Test Equipment

(This section is not applicable)

Major Assemblies and Controls Location

The 9800 Workstation is equipped with four major assemblies that provide the SNS capability (see SNS Major Assembly Locator, below).



SNS Major Assembly Locator

Item No.	Nomenclature
1	FluoroTrak Unit (9 Fluorotrak Kit, p/n 901914)—also called Tracker
2	Navigation Computer (Computer Box Assembly, p/n 882894)
3	Articulating Arm (Surgical Navigation A-Arm Assembly, p/n 881313)
4	Flat Panel Display (p/n 883544-01)

SNS Functional Sections

SNS system operation is divided into the following functional groups: Power Distribution, Tracking, Networking, Navigation Computing, and Mechanical. You can find circuit/mechanical descriptions, fault isolation charts, and functional testing for each functional group, in separate sections later in this document.

Subsystem Fault Isolation

The purpose of this section is to help you isolate a malfunction to a specific functional category. At the functional level, you can then isolate the problem to a replaceable unit, such as a cable or circuit card.

Problem	Possible Cause/Remedy
Workstation error message: Navigation Computer not responding, Power Off, wait 10 seconds, then Power On	Private Network is down. Refer to Network section.
Flat Panel Display assembly or arm positioning difficulties	Adjust support tension as shown in Mechanical, later in this document.
No image on Flat Panel Display. Screen is dark, or image distorted, or screen displays colors without image.	Faulty video interface (see Navigation Computing section).
Visualization screen did not appear, although initialization began.	Navigation Computer not initializing (see Navigation Computing section below).
No response to touch controls after Visualization screen appears.	Touch interface failure (see Navigation Computing section).

Problem	Possible Cause/Remedy
Error message after SNS boots to Visualization screen: <code>WARNING: Tracking Inactive. System can only be used to perform surgical planning.</code>	FluoroTrak Unit cable connections. Refer to Tracking section.
	Failure of FluoroTrak Unit
Flat Panel Display screen lost Visualization menu. Touch panel unresponsive.	Incorrect use of Main Menu button (see the Navigation Computing section).
Cannot send DICOM message	Internal or external Network is down (see Network section below).
	Improper Workstation setup of parameters.
Improper shutdown: Navigation Computer fans shut off immediately, or do not shut off 5-10 seconds after Workstation shutdown.	UPS failure (see Power Distribution section below)

Subsystem Functional Testing

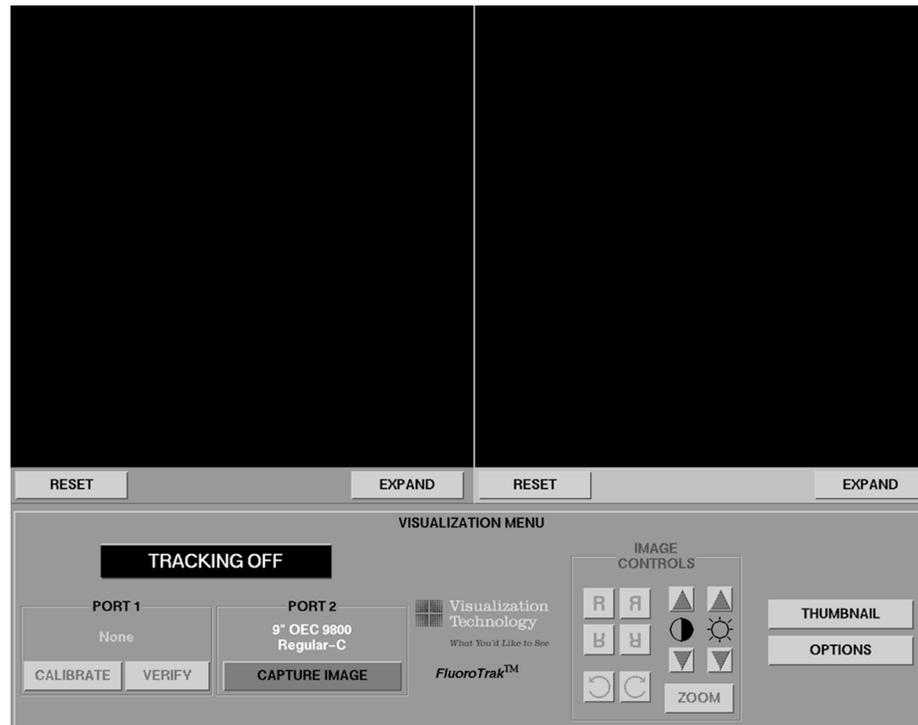
To assure the SNS is fully operational and ready for surgical procedures, perform the Boot Process and Receiver/Transmitter functional tests, as provided below.

Boot Process

All assemblies of the SNS system should power up when you turn on the Workstation. To assure proper SNS start up, do the following:

FluoroTrak Service Manual Update

1. Set up the Workstation for operation according to the Workstation Operator's Manual.
2. Set up the SNS for operation according to the SNS Operator's Manual.
3. Move the Flat Panel Display to a position where you can easily see messages.
4. Turn on the Workstation power switch, and verify that the Workstation boots properly with no error messages.
5. The SNS touch screen will display a brief series of startup diagnostic messages, then display the SNS Visualization screen similar to the one shown below.



SNS Visualization Screen

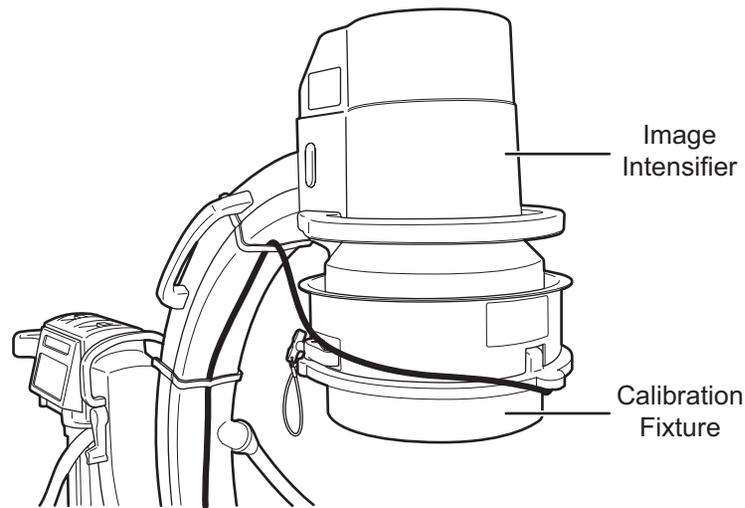
6. Verify that PORT 1 and PORT 2 indicate the desired tool connection. In the example above, PORT 1 indicates no tool is attached (None). PORT 2 indication (9 OEC 9800 Regular-C) means that the C-Arm with calibration fixture is connected.
7. Verify that the CALIBRATE, VERIFY, and CAPTURE IMAGE touch buttons are lighted orange.
8. Perform the Calibration and Verification function test, as directed below.

Calibration and Verification Functional Test

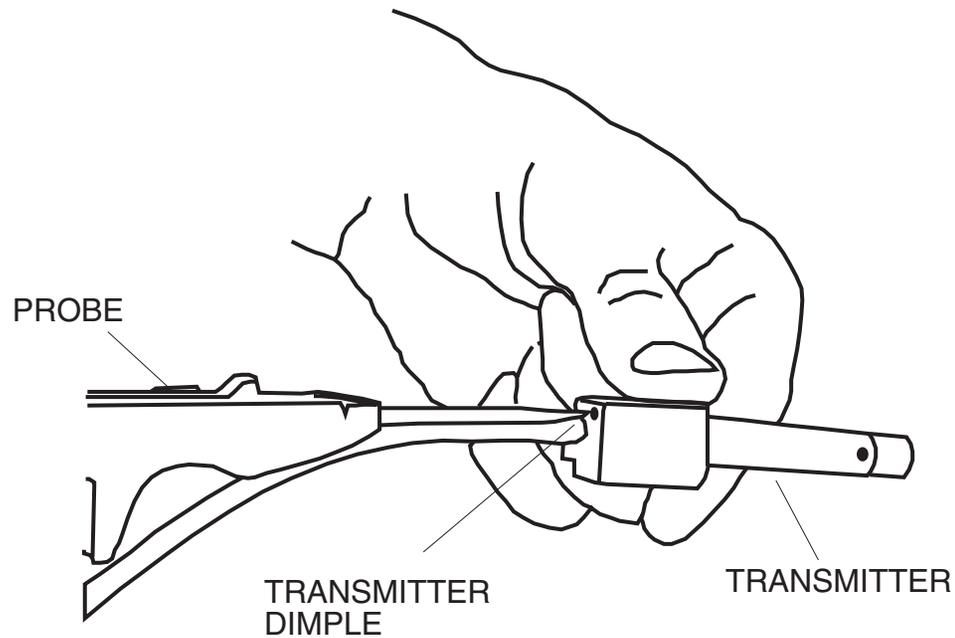
Perform the following test to check the functionality of the receivers and transmitter.

Note: Most problems you may encounter while performing this test will be indicated by operator error messages. Refer to the Error Message section of the SNS Operator's Manual.

1. Verify that the SNS booted successfully as described in the previous section.
2. Calibrate the SNS as follows:
 - A. Install the Calibration Fixture on the Image Intensifier (II) and position the C-arm with the II in the upper position, as shown in the following.



- B. Connect the Transmitter, and both receivers (Probe and Calibration Fixture) to the panel located on the left side of the Workstation.
 - C. Place the tip of the Probe in the Transmitter Dimple as shown in the following illustration:



D. Press the CALIBRATE button on the Flat Panel Display touch screen.

Note: If the calibration is accepted, the CALIBRATE button on the Visualization menu changes from orange to green.

3. Verify tracking by performing the following.

- A. Place the tip of the Probe in the Transmitter Dimple.
- B. Select the VERIFY button on the Visualization menu. The screen changes to the Visualization Option menu.
- C. Select the SET VERIFICATION REFERENCE POINT button and verify that the button turns green.
- D. Select the RETURN TO VISUALIZATION button.
- E. Using a book or some other **non-metallic** object, position the Transmitter approximately 4 inches from the top of the II.
- F. Press an X-ray switch and verify that an image is displayed on the left Workstation monitor.

FluoroTrak Service Manual Update

- G. Press the CAPTURE IMAGE button on the Flat Panel Display touch screen.
- H. Verify that the image displayed on the Workstation left monitor is also displayed on the Flat Panel Display.
- I. Touch the Probe to the Transmitter Dimple and verify that you can see the Probe's icon (green line with red dot) in the image on the Flat Panel Display.

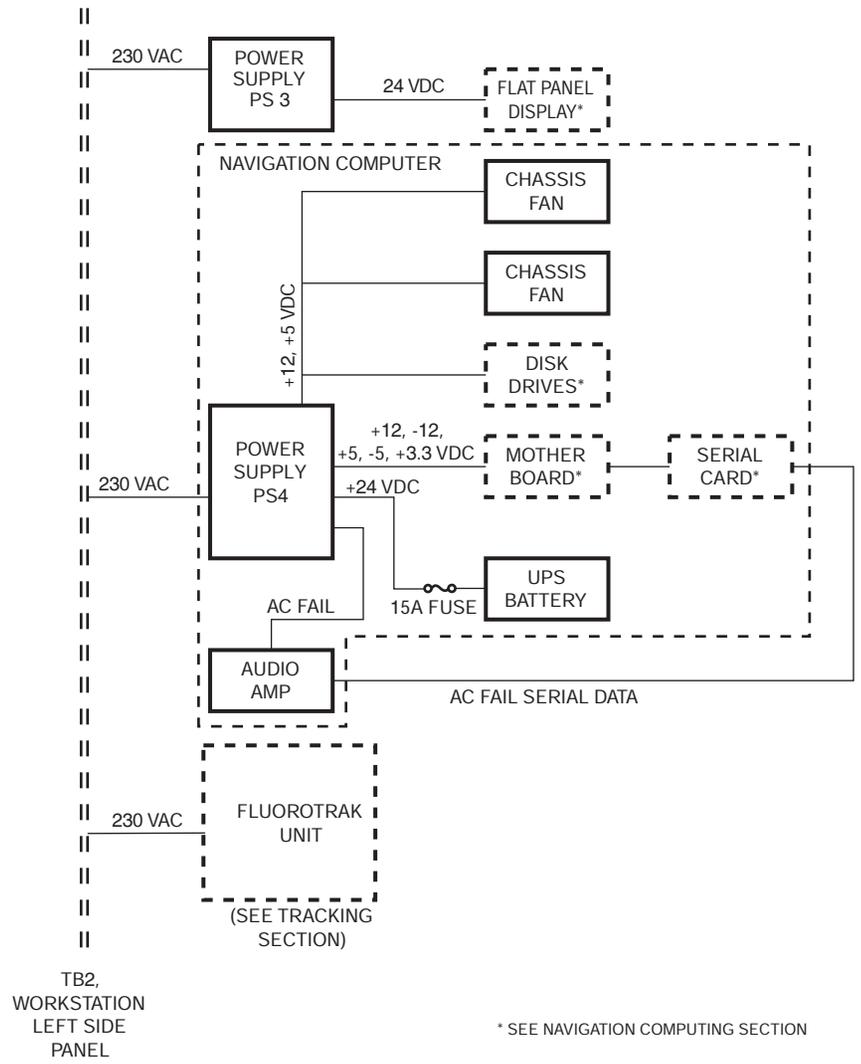
Shutdown Test

To verify proper SNS shut down, do the following:

1. Exit any open patient files, and save any patient information that you may wish to keep.
2. Shut the Workstation power switch off.
3. Listen for the sound of chassis fans running. After a short delay (5 to 10 seconds), the chassis fans shut off.

Power Distribution (AC/DC)

The SNS assemblies obtain all power from the workstation, as shown on the block diagram below.



Power Distribution Functional Block Diagram

Circuit/Mechanical Description

The SNS system connects directly to Terminal Board TB2 at the Workstation left side panel. Therefore, when you turn on the Workstation, all assemblies of the SNS receive operating power at the same time, without any separate power switches. If there is a power failure, or when you shut down the workstation, the SNS system will also shut down.

The Navigation Computer and the FluoroTrak Unit both connect directly to, and are powered by, 230 VAC at TB2.

For Flat Panel Display power, 230 VAC from TB2 is reduced to 24 VDC by Power Supply PS3, located below the FluoroTrak Unit. The power jack on the rear of the panel is compatible with Hoshiden Corporation plug TCP8927-63-1110

Power Supply PS4, located inside the Navigation Computer, reduces the 230 VAC to supply the chassis fans, disk drives, motherboard, and UPS.

Uninterruptible Power Supply

The 9800 system can be shut down at any time, removing AC power without notifying its own operating system of a shutdown. However, the Navigation Computer requires advance notice prior to shutdown, to prevent file corruption. The Navigation Computer has a built-in uninterruptible power supply (UPS) to hold power with battery backup while the Navigation Computer shuts down (see the UPS section below).

The components of the UPS are housed inside the Navigation Computer enclosure. The UPS functions in the following way:

1. During normal operation, PS4 keeps the UPS battery charged. PS4 also generates an AC FAIL signal that passes through the Audio Amplifier to the Navigation Computer. From there, the AC FAIL signal passes externally to a Navigation Computer connector, where it plugs into the serial card. The motherboard, via the PCI/UPS bus, continually monitors the state of the AC FAIL signal.
2. When the PS4 loses primary power, the AC FAIL signal state changes. PS4 automatically switches to battery power, and the software shuts down.

Fault Isolation

Navigation Computer Power Input	
Problem	Possible Cause/Remedy
No 230 VAC at Workstation TB2.	Workstation power problem. Perform applicable Workstation fault isolation procedures.
No 230 VAC at Navigation Computer P2/J2.	Faulty power cable from Workstation TB2 to Navigation Computer P2/J2. Replace power cable.
No +12 or +5 VDC at DRIVE PWR terminal of PS4	Faulty PS4 power supply in Navigation Computer. Replace power supply.
Improper delayed shutdown (UPS)	See UPS Functional test, below.

Flat Panel Display Power Input	
Problem	Possible Cause/Remedy
Flat Panel Display screen is blank.	Switches on Flat Panel Display not correctly set. Make correct switch settings.
No 230 VAC present at Workstation TB2.	Workstation power problem. Perform applicable Workstation fault isolation procedures.
No 230 VAC at P1J1 of FluoroTrak Unit power supply PS3.	Faulty power cable from Workstation TB2 to FluoroTrak Unit power supply PS3. Replace power supply.
No 24 VDC output of FluoroTrak Unit power supply PS3.	Faulty power supply. Replace.
No 24 VDC at Flat Panel Display J3/P3.	Replace cable in A-Arm.

Functional Testing

Navigation Computer Power Input Functional Test

To verify that the Navigation Computer is correctly connected to operating power, do the following:

1. Perform Boot Process (see above). Verify that the Workstation does not display this error message:
`Navigation Computer not responding, Power Off, wait 10 seconds, then Power On.`

If this message appears, power may not be available to the Navigation Computer.

2. Verify that the fans in the Navigation Computer are running (may be able to hear them).
3. Verify operation of UPS (see UPS Functional Test, below).
4. If Navigation Computer fans are not running, the Navigation Computer power supply (PS4) may be defective. To verify, measure the following:
 - A. 230 VAC at Workstation TB2.
 - B. Output of the Navigation Computer power supply PS4. Check voltages as follows:

Power Supply PS4 Output			
Connector	Pin	Color	Voltage*
Motherboard (P1)	1	Orange	+3.3
	2	Orange	+3.3
	4	Red	+5.0
	6	Red	+5.0
	9	Violet	+5.0VSB
	10	Yellow	+12.0
	11	Orange	+3.3
	12	Blue	-12.0
	18	White	-5.0
	19	Red	+5.0
20	Red	+5.0	
Connector	Pin	Color	Voltage*
Hard Disk Drive (P3) Chassis Fans (P4) CD ROM Drive (P5)	1	Yellow	+12.0
	4	Red	+5.0
Floppy Drive (P6)	1	Red	+5.0
	4	Yellow	+12.0
UPS Battery (P13)	1	Red	Battery +VE
	2	Black	Battery -VE
*Tolerance ± 0.5 VDC. Voltage with respect to chassis			

FluoroTrak Unit Power Input Functional Test

To verify that the FluoroTrak Unit is correctly connected to operating power, do the following:

1. Verify that the following connection message on the workstation **does not** appear (indicating that power to FluoroTrak Unit is not connected):
WARNING: Tracking Inactive. System can only be used to perform surgical planning.
2. Verify that the fans on the FluoroTrak Unit are running (listen/observe)
3. Measure AC input power to the FluoroTrak Unit

UPS Functional Test

To verify correct operation of the UPS, perform the following steps:

1. Perform the Boot Process (see above).
2. Let the boot process proceed until you see the *Initializing system...* message on the Flat Panel Display (about 30 seconds).
3. Before initialization finishes, shut off the Workstation, confirming that the Flat Panel Display shuts off immediately.
4. Listen for the sound of the chassis fans running in the Navigation Computer
5. If the UPS is functioning properly, the Navigation Computer chassis fans will shut off in about 2 minutes, the time needed for the Navigation Computer software system to interrupt the initialization and shut down safely.

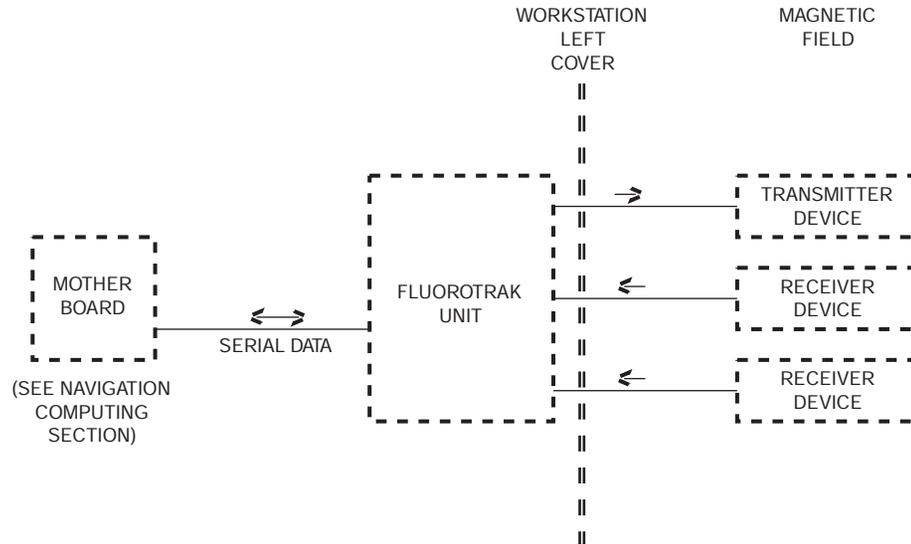
Adjustments

Not applicable.

Tracking

Circuit/Mechanical Description

The following block diagram represents the Tracking function:



Tracking Functional Block Diagram

FluoroTrak Service Manual Update

The Tracking function uses transmitter and receiver devices, and the FluoroTrak Unit. At least one transmitter and one or two receiver devices connect on separate cables to the FluoroTrak Unit. The FluoroTrak Unit in turn connects by serial data cable to the motherboard in Navigation Computer.

When SNS starts up, and as you perform the proper setup procedures in the OEC 9800 FluoroTrak Operator's Manual, the Navigation Computer sends configuration status requests and control commands to the FluoroTrak Unit. These consist of the following:

- Baud Rate Change
- Active Station State
- Transmitter Serial Number
- Receiver Sensor Serial Numbers
- Built-in Test (Clear errors)
- Reset
- Software version and ID string

The Navigation Computer also commands the FluoroTrak Unit to return tool movement data. When you acquire the X-ray image using the C-Arm, and select the Capture Image button on the Flat Panel Display, the FluoroTrak Unit sends a stream of serial data representing each movement of the receiver tool.

The FluoroTrak Unit generates a low-frequency signal that, when broadcast via the transmitter, sets up an electromagnetic field. With the transmitter attached to the patient's anatomy, variations in the field are detected by the receivers as they are moved around. Using the variations, the FluoroTrak Unit then creates and outputs to the Navigation Computer a data record of each receiver movement. Each tool data record consists of the following:

- Tool designator code
- A system error code if an error exists, or a blank space if no error exists (see Error Codes section, later in this Update)
- Tool position (x , y , and z coordinates)
- Tool orientation angle (Azimuth, Elevation, and Roll)

FluoroTrak Service Manual Update

- Carriage return as a line feed terminator

The data records travel to the Navigation Computer over a serial RS-232 link at a default rate of 38.4K baud.

Fault Isolation

Tracking Function Fault Isolation	
Problem	Possible Cause/Remedy
The following error message appears after SNS boots to the Visualization screen: WARNING: Tracking Inactive. System can only be used to perform surgical planning.	No power to FluoroTrak Unit (see Power Distribution section)
	Bad serial data cable connections. Check for loose connectors at the Navigation Computer and at the FluoroTrak Unit
	FluoroTrak Unit is defective. Replace the whole unit.

Functional Testing

*Note: Perform the following functional test if the SNS boots to the Visualization screen then displays this error message:
WARNING: Tracking Inactive. System can only be used to perform surgical planning.*

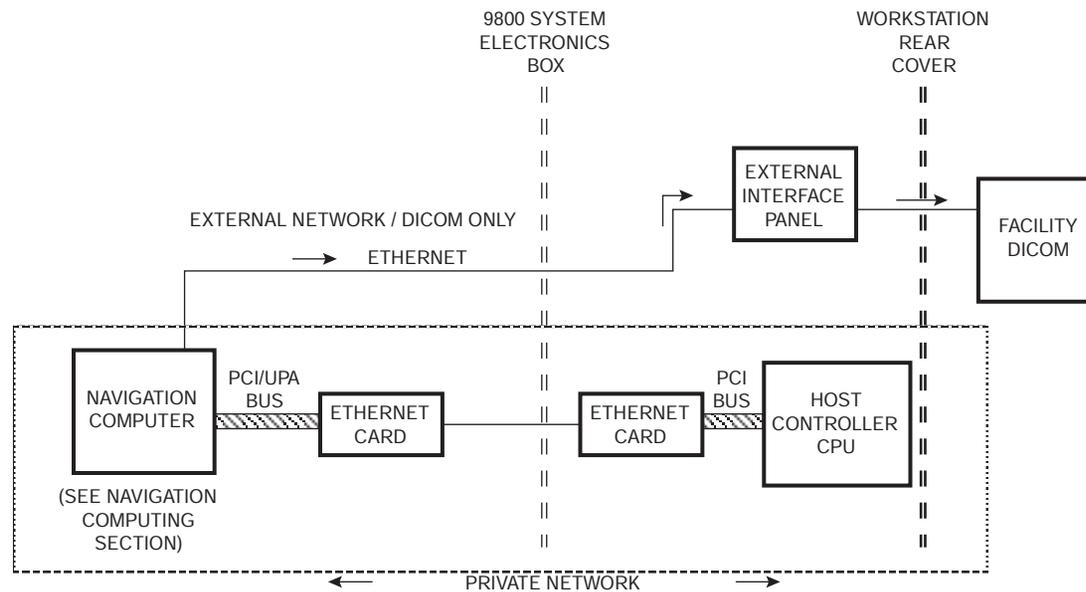
1. Verify correct Boot Process function (see the Subsystem Functional Testing section).
2. Verify correct power input to FluoroTrak Unit (see Power Distribution)
3. Verify connections of serial cable between FluoroTrak Unit and Navigation computer.
4. Verify correct Calibration and Verification Functional Test (see Subsystem Functional Testing.)

Adjustments

Not applicable.

Network

The Network function consists of the components required for the SNS system to exchange data with the 9800 system. The communication is by means of a socket-based TCP/IP command protocol via Ethernet cables, as illustrated in the following diagram.



Network Functional Block Diagram

Circuit/Mechanical Description

In the scheme shown above, Host Controller CPU communication is via PCI bus to the 9800 system Ethernet card. An Ethernet cable carries the data to the Navigation Computer Ethernet card. From there, the data passes to the Navigation Computer mother board on a PCI/UPI bus. This route is set up as a private network.

Note: Ignore references to Lenzar Camera connections when using the 9800 system Interconnect Drawing.

In addition, if the 9800 Workstation must communicate with the outside world (DICOM), that data also must travel to the Navigation Computer over the same private network path described above. Using a network address translation capability, the Navigation Computer separates the DICOM data from the normal SNS correspondence, and forwards the DICOM data over a second Ethernet cable, directly to the External Interface panel, where a cable can be connected from the Workstation rear panel to the facility DICOM panel. DICOM communication forwarded by the Navigation Computer is set up as an external network.

The private and external networks are defined by means of appropriate Internet Protocol (IP) addresses. The private network IPs (192.168.0.xxx, and so forth) are assigned by default. The external network IP is assigned by the system's network administrator.

The Navigation Computer also provides a firewall function to exclude unwanted external network traffic from the private network and allow external outbound traffic for the duration of the connection only.

Fault Isolation

not applicable.

Functional Testing

Local (Private) Network Communication

If the Workstation error message is

`Navigation Computer not responding, Power Off, wait 10 seconds, then Power On,`
test the local network function as follows:

1. Verify correct Navigation Computer Power input (see Power Distribution above)
2. Verify Navigation Computer function (see Navigation Computing section).
3. Check internal Ethernet cable connections at Navigation Computer (Ethernet board) and Workstation computer.

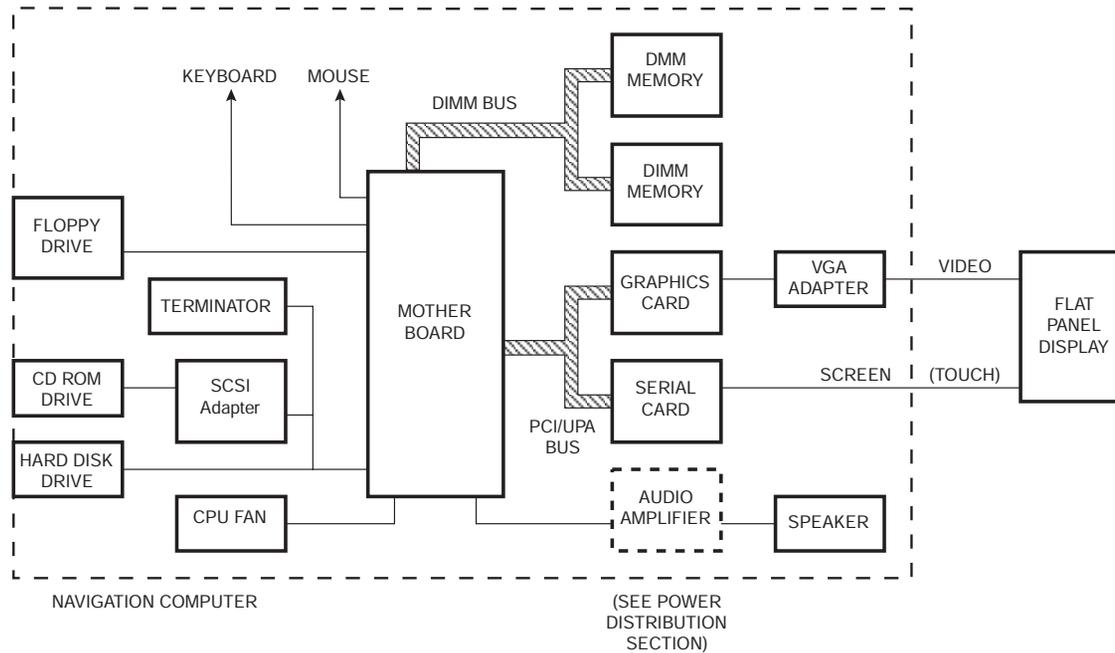
External Network (DICOM) Communication

1. Verify the Local Network is operational.
2. Watch boot up messages of Navigation Computer on flat panel. If the message `SUNW hme0 - Link down, Cable problems? appears, the external network is not active.`
3. Connect the external network cable directly to the Navigation Computer motherboard Ethernet port. If DICOM then works, replace the Navigation Computer to back-panel Ethernet cable or connector.
4. If DICOM is still inoperative, change the Navigation Computer motherboard.

Note: If SNS is not connected to DICOM, then the message `SUNW hme0 - Link down, Cable problems?` is a normal boot message. If this message is seen during boot and the system is connected to the building's DICOM, then there is a failure of the SNS external network connection (external DICOM server, external network cable and routing, interconnect cable/connector from Workstation back-panel to Navigation Computer, Ethernet adapter on Navigation Computer mother board).

Navigation Computing

The following block diagram illustrates the Navigation Computing function:



Navigation Computing functional block diagram

Circuit/Mechanical Description

The Navigation Computing function performs the following: Video Interface, Touch Interface, Audio, Central Processing, and Maintenance Input/Output. The following sections describe their operation.

Video Interface

Images and patient data received via Ethernet from the 9800 system (see Network Subsystem, described previously in this Update), are addressed from the motherboard over the PCI/UPA bus to the graphics card. The graphics card output mounts inside the Navigation Computer enclosure, and in turn directly plugs into the externally mounted VGA Adapter.

The Arches Arm cable carries the video to the Flat Panel Display. The video connectors from the VGA Adapter to the Flat Panel Display are industry standard 15-pin high-density male D type.

Touch Interface

This interface lets you manipulate, activate, and manage images appearing on the video display portion of the Flat Panel Display. When you press a button area on the touch screen a touch signal is sent by RS-232 cable to the Navigation Computer P8 connector. The touch signal is processed by a serial card and sent via PCI bus to the motherboard.

The cable connection is per RS-232 signaling protocol. The connector is a standard 9-pin female D type.

Audio

An audible sound is produced during system initialization. The UPS adapter board also includes an audio amplifier. The amplifier is driven by a signal from the motherboard, and in turn drives the speaker.

Central Processing

Central Processing is fully contained inside the Navigation Computer, and consists of motherboard with Central Processing Unit (CPU), DIMM memory, and the hard drive.

Maintenance Input/Output

The Navigation Computer is equipped to allow direct access to its operating system. This includes connectors for two types of keyboard---the Sun keyboard, and the PS-2 keyboard and mouse. Some Navigation Computers are also equipped with Floppy and CD ROM drives for loading software updates.

However, the software itself is proprietary to the manufacturer of the FluoroTrak Unit, and shall not be accessed except by OEC Field Service personnel.

Caution: Unauthorized access to the Navigation Computer operating system software may result in file corruption or other damage.

Fault Isolation

Use this fault isolation chart if it appears that SNS initialization began, but did not finish.

Navigation Computer Booting	
Problem	Possible Cause/Remedy
LED on Hard disk drive not ON.	Faulty PS4 DC output to disk drive. Perform Navigation Computer power input test (see Power Distribution section).
	Replace hard disk drive
During initialization, this message appears on the Flat Panel Display: Can't Open Boot Device.	Loose data cable connection from motherboard to hard disk drive.
	Defective data cable. Replace cable.
	File corruption on hard disk drive. Replace hard disk drive.
Note: For any other checks of Navigation Computer function, contact an OEC Field Service Engineering representative.	

FluoroTrak Service Manual Update

Use the following fault isolation chart if the Visualization screen appears, but there is no response on the touch panel.

Touch Interface	
Problem	Possible Cause/Remedy
Touch screen cursor (x) does not appear where you touch.	The screen needs to be calibrated. Calibrating the touch screen can be done only by a factory trained service engineer.
No response to touch controls, after Visualization screen appears	Faulty serial data cable between touch screen and Navigation Computer enclosure.
	Faulty serial card in Navigation Computer.
	Faulty Flat Panel Display. Replace cable, serial card, or Flat Panel Display as required.

FluoroTrak Service Manual Update

Use this fault isolation chart if the Flat Panel Display screen is dark, image distorted, or shows a solid color.

Video Interface	
Problem	Possible Cause/Remedy
Image on screen is distorted	Check and adjust settings of monitor controls
Display area is all one color	Defective Video cable or connections to Flat Panel Display
	Faulty graphics card or motherboard in Navigation Computer. Substitute or replace as necessary.
Screen is completely dark	Monitor power switch was inadvertently shut off, or other monitor switches in wrong state.
	Faulty power input to Flat Panel Display. Perform Flat Panel Display power input test (see Power Distribution section).
	Defective Video cable or connections to Flat Panel Display
	Faulty graphics card or motherboard in Navigation Computer. Substitute or replace as necessary.
	Failure of Flat Panel Display. Replace.

Functional Testing

Not applicable.

Adjustments

Not applicable.

Mechanical

Circuit/Mechanical Description

The mechanical function of SNS is provided by the following:

- Flat Panel Display Monitor
- Monitor Pivot Mount
- Monitor Support Arm
- Monitor Support Arm Rotation Pin
- Articulated Arm (A-Arm)

Note: For visual reference to the information in this section, refer to Figure 1 in the Replacement section of this document.

Fault Isolation

Problem	Possible Cause/Remedy
Display monitor movement	Adjust monitor pivot mount nuts, one each for horizontal or vertical movement.
	Replace monitor pivot mount.
Monitor Support arm movement	Adjust friction brake of rotation pin set screws, located at upper end of A-Arm.
	Replace monitor support arm.
A-Arm movement	Adjust set screws located at lower end of A-Arm.
	Replace entire A-Arm assembly.

Functional Tests

Functional tests for the mechanical function consist of the following:

1. Set Workstation wheel brakes.
2. Use the monitor handles for testing each motion.
3. Move each mechanical pivot mechanism through its full range. Each pivot mechanism shall move smoothly to its mechanical stops using a reasonable amount of force.

Note: Reasonable force means your judgement of the amount of effort that would be appropriate under operating room conditions.

4. Verify that in all positions, each pivot mechanism provides a slight resistance to gentle pressure before movement.
5. Press the touch screen area as if you were actually operating the SNS. The display monitor shall not change its position when you apply the pressure needed to actuate a touch screen button.

6. Verify that the display monitor can be placed in its stowed position, and held securely by the monitor retention bracket when you release wheel brakes and move the Workstation.

Adjustments

Note: Figure references below apply to the Replacement section of this document.

All five motions are adjusted using an allen or open end wrench. Adjust according to the functional test previously described above. The location of those adjustment points are the following:

- Monitor Pivot Mount, directly behind the flat panel display monitor (open end wrench) see Figure 5.
- Rotation Pin, between the Monitor Support Arm and the A-Arm (allen wrench) see Figure 7.
- Lower end of the A-Arm, where it connects to the A-Arm Support bracket. (allen wrench) see Figure 8

Replacement

Observe all safety policies outlined in the Introduction section of the Service Manual. Read all “Dangers,” “Warnings,” and “Cautions” before removing any FluoroTrak components from the Workstation.

The FluoroTrak subassemblies which can be removed and replaced are listed below. See Figure 1 (next page) which calls out these subassemblies.

- Lower-Left Side Cover
- Lower-Right Side Cover
- Front Cover
- Flat Panel Display Monitor
- Monitor Handles & Handle Mounts
- Monitor Mtg. Plate & Spacer Plate
- Monitor Pivot Mount
- Secondary Arm
- Articulated Arm (A-Arm)
- A-Arm Support
- Interconnect Mounting Bracket
- Arm Cable
- Monitor Retention Bracket & Spring Clip
- Upper-Right Side Cover
- Tracker Bezel
- FluoroTrak Kit & Mounting Bracket
- 24V Power Supply
- Computer Box Asm.
- Computer Box. Asm. Internal Components
- Ethernet Card

FluoroTrak Service Manual Update

Note: Any call-out numbers in the Figures correspond to the same-numbered steps in the numbered procedures. Some cables, labels, connections, PCB components, hardware, and other parts are not shown for clarity. The system being serviced may differ slightly from what is illustrated.

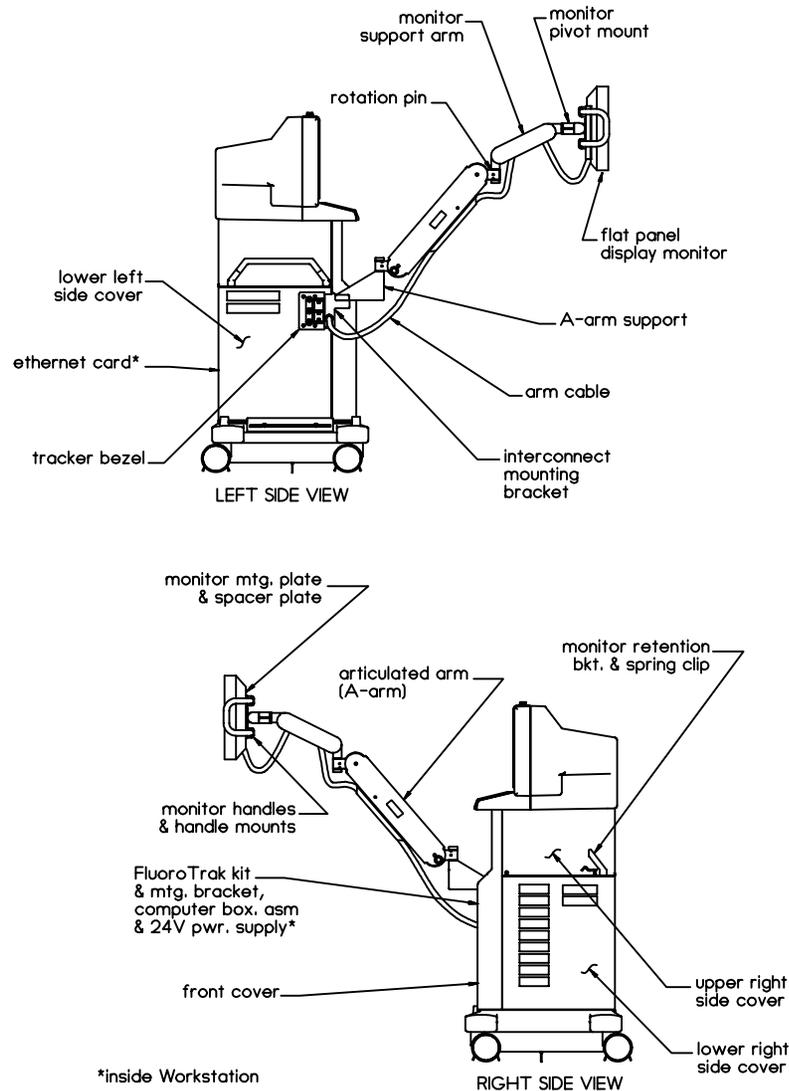


Figure 1

Note: Unless otherwise stated, references to left, right, front, and rear are designated from the position of facing the front of the Workstation (the Workstation monitor screens/keyboard side).

Lower-Left Side, Lower-Right Side, and Front Covers

A Workstation with the FluoroTrak option has different lower-left, lower-right, and front covers than those on a standard Workstation, and thus the covers are part of what defines the overall FluoroTrak system. However, their removal (and Installation) procedures are the same as those for their standard counterparts. Refer to the “Cover Removal” section in the Workstation Service Manual for a detailed description of cover removal. The order of their removal is outlined below for reference.

Note: Many find it easier to remove the rear and front covers by first removing the Workstation monitor cover. Though this is usually not necessary, monitor cover removal is included below (and in other FluoroTrak Removal/Installation procedures) for reference; use your own preference.

Removal

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Remove the Workstation lower-right side cover.
5. Remove the Workstation front cover.

Installation

Install the Workstation’s lower-left, lower-right, and front covers by performing the previous removal steps in reverse.

Flat Panel Display Monitor, Spacer Plate, and Monitor Mounting Plate

Removal

1. Position the monitor onto a table or similar surface so it's supported when the 4 torx screws are removed.

CAUTION: *Be aware that removing the 4 torx screws from the Monitor Pivot Mount releases all three components at once: the Monitor, Spacer Plate, and Monitor Mtg. Plate/Handles unit.*

2. Remove the 4 torx screws (with their washers) that attach the Monitor and Monitor Mtg. Plate to the Monitor Pivot Mount, then detach the Monitor, Spacer Plate, and Monitor Mounting Plate. See Figure 2 (next page).
3. From the rear of the monitor, remove the rectangular cover which is attached over the area of the 3 Arm Cable connections. See Figure 2 (next page).
4. Disconnect the 3 Arm Cable connectors (J1, J2 & J3) from the rear of the monitor. See Figure 2 (next page).

Installation

Install the Flat Panel Display Monitor, Spacer Plate, and Monitor Mtg. Plate by performing the previous removal steps in reverse.

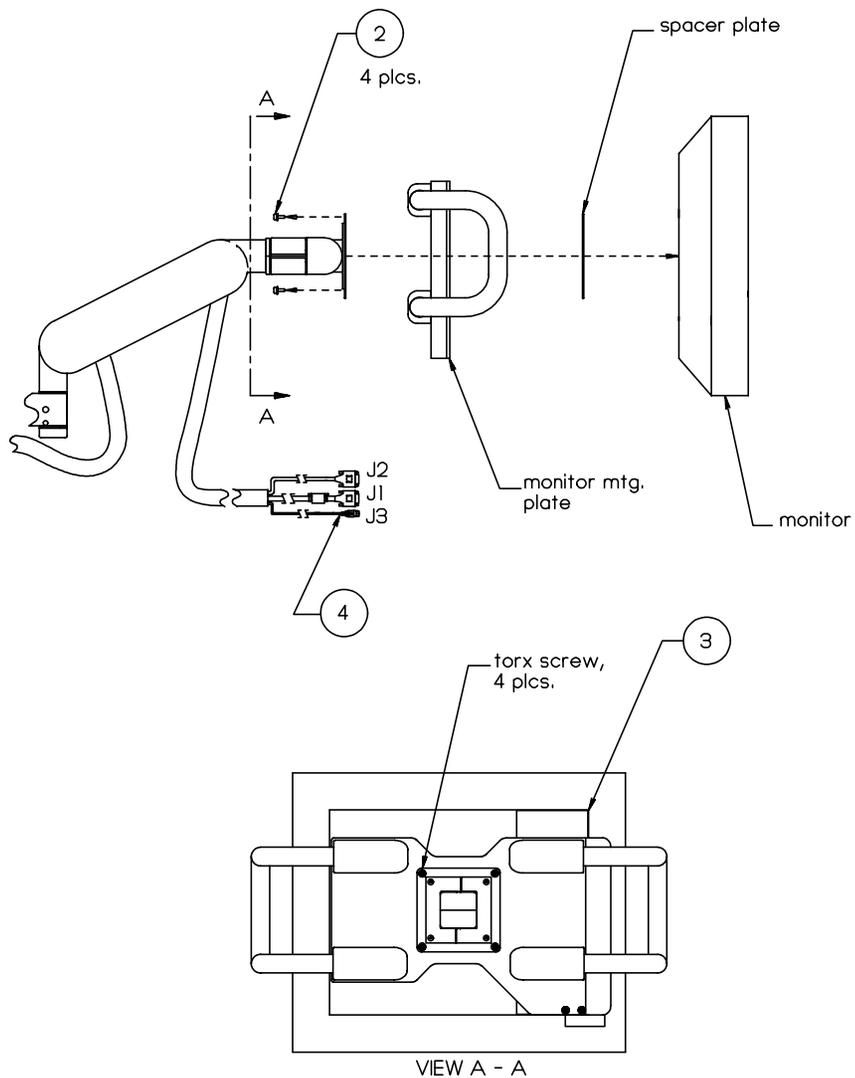


Figure 2

Monitor Handles

Removal

1. Remove the Flat Panel Display Monitor, Spacer Plate, and Monitor Mtg. Plate as outlined in their previous removal section.
2. From the front surface of the Monitor Mounting Plate, remove the screw that secures each handle end to a Handle Mount, 4 screws total. See Figure 3.
3. Pull outward on the handles and remove the handles from the Handle Mounts. See Figure 3.

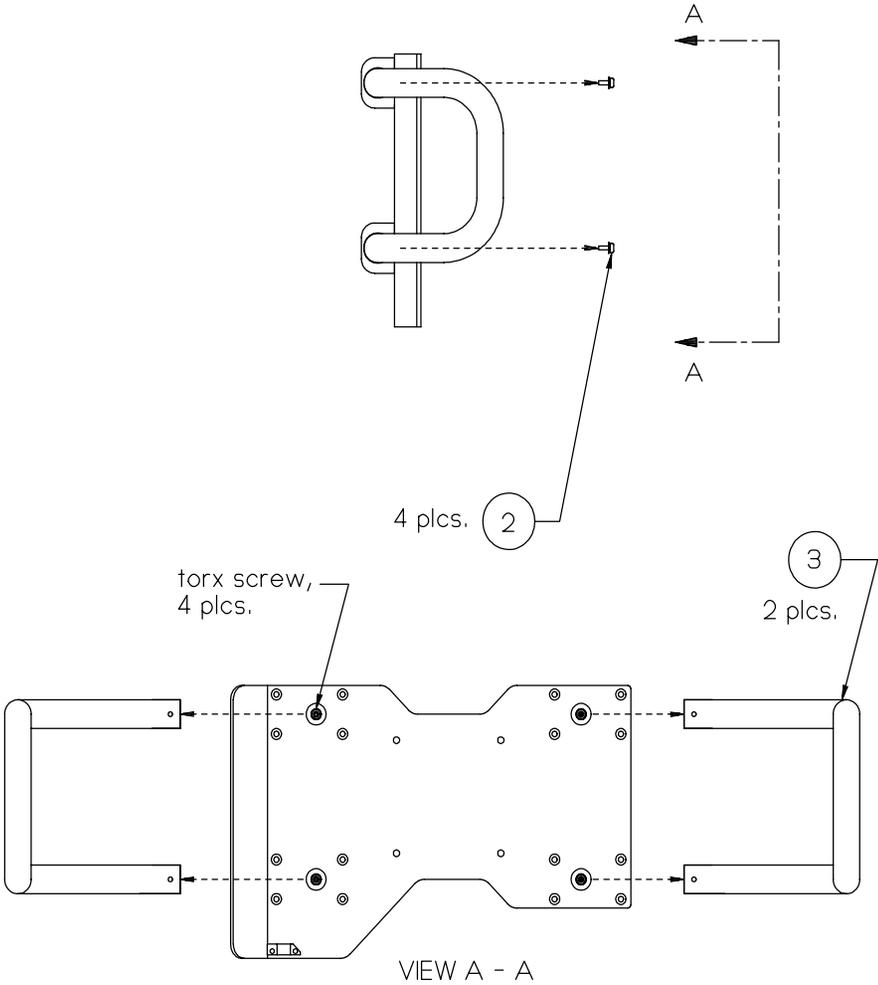


Figure 3

Installation

Install the Monitor Handles by performing the previous removal steps in reverse.

Monitor Handle Mounts

Note: The Monitor Handle mounts can be removed with the handles still attached. If the Handle Mounts need to be separate from the handles, then remove the handles as outlined in the previous section. Figure 4 shows the handles removed.

Removal

1. Remove the Flat Panel Display Monitor, Spacer Plate, and Monitor Mtg. Plate as outlined in their previous removal section.
2. From the front surface of the Monitor Mounting Plate, remove the flat-head screws that secure each Handle Mount to the Monitor Mounting Plate, 4 screws for each Handle Mount, 16 screws total. See Figure 4 (next page).
3. Remove the Handle Mounts from the Monitor Mounting Plate. See Figure 4 (next page).

Installation

Install the Monitor Handle mounts by performing the previous removal steps in reverse.

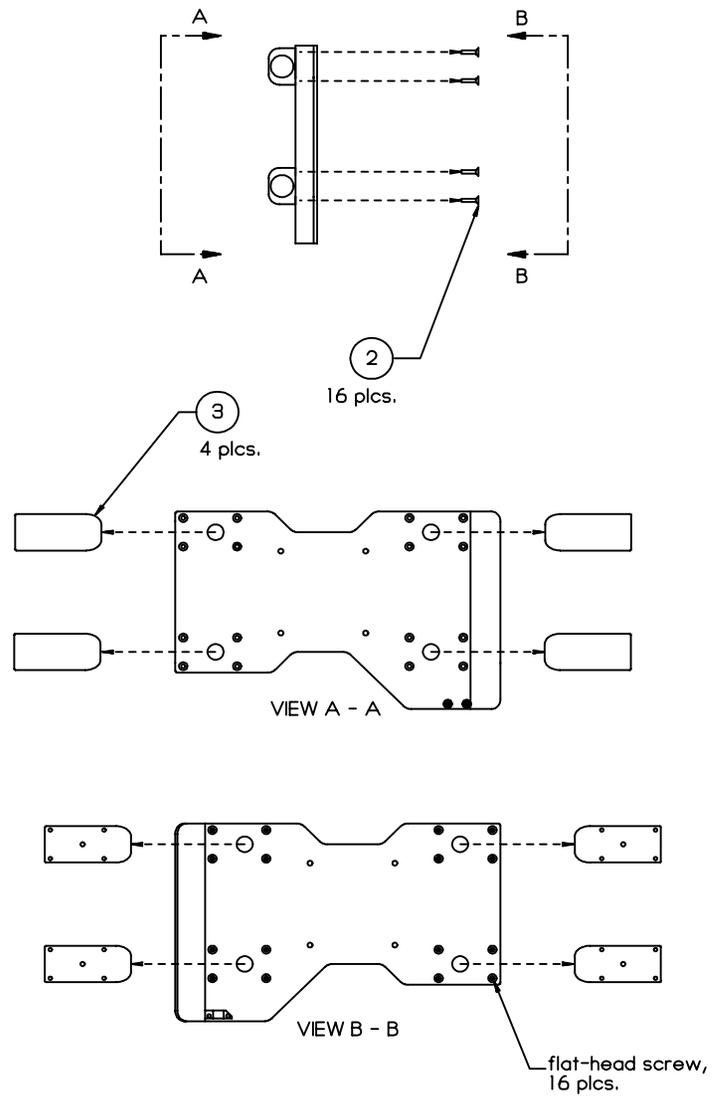


Figure 4

Monitor Pivot Mount

Removal

1. Remove the Flat Panel Display Monitor, Spacer Plate, and Monitor Mtg. Plate as outlined in their previous removal section.
2. Remove the 4 screws that attach the Pivot Mount to the Secondary Arm, then remove the Pivot Mount. See Figure 5.

Installation

Install the Monitor Pivot Mount by performing the previous removal steps in reverse.

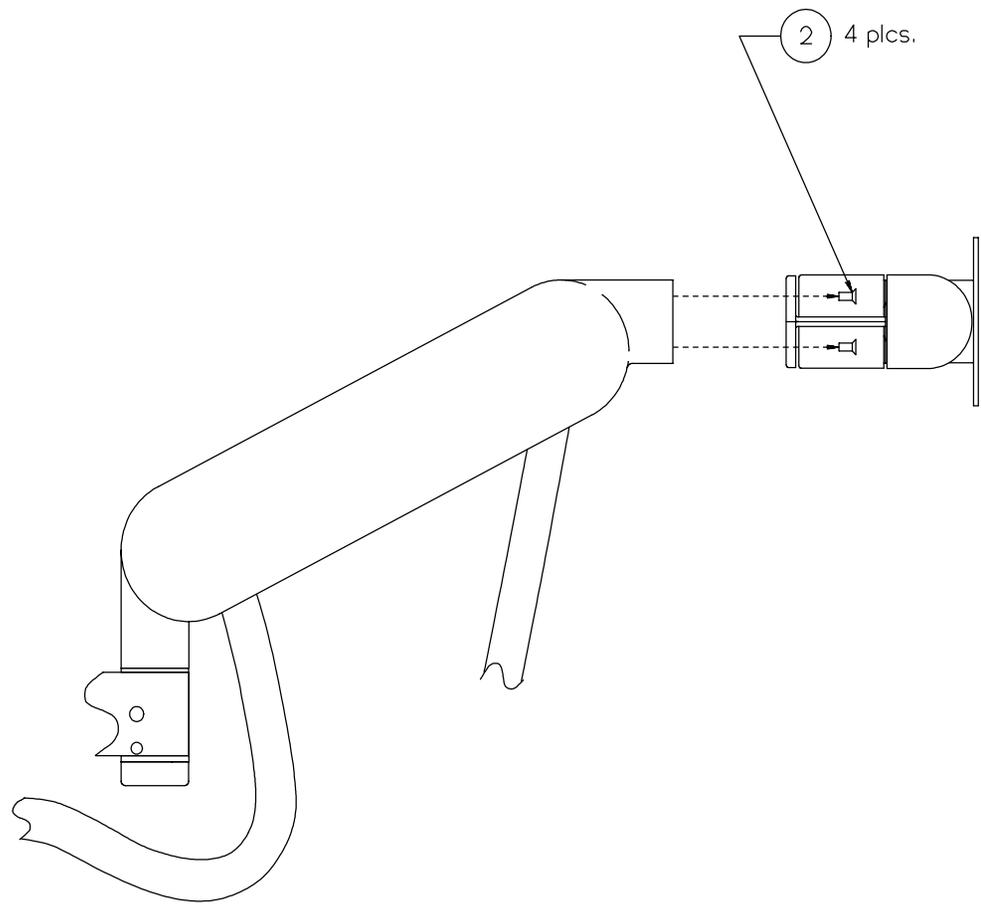


Figure 5

Secondary Arm

Removal

1. Remove the Flat Panel Display Monitor, Monitor Mounting Plate, and Spacer Plate as outlined in their previous removal sections.
2. Detach the Arm Cable from the 4 nylon cable clamps on the underside of the Secondary Arm. See Figure 6 (next page).
3. Pull the Arm Cable out from the underside of the Secondary Arm. See Figure 6 (next page).

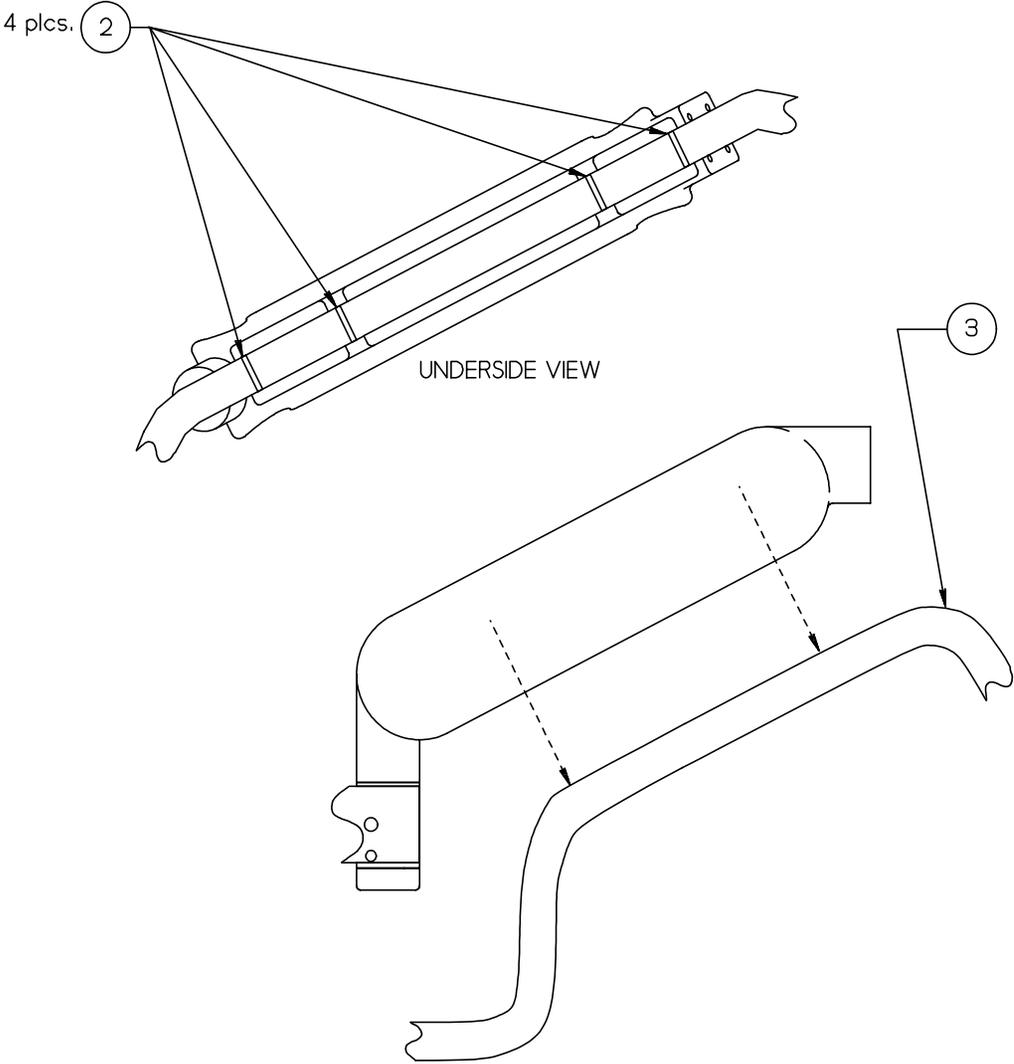


Figure 6

FluoroTrak Service Manual Update

4. Position the Articulated Arm (A-Arm) so you can access underneath the A-Arm mount to which the Secondary Arm attaches.
5. Using a blade screw driver or similar tool, remove the molded hole plug from the shaft cap, located on the bottom end of the A-Arm mount. See Figure 7 (next page).

CAUTION: *Be aware that when the Secondary Arm's hex screw is removed from underneath the A-Arm mount (next step), the shaft cap and other hardware (washers, bearing, O-ring) become loose and tend to fall out.*

6. Remove the 1-inch long hex screw from underneath the end of the A-Arm mount. (This hex screw installs up through the Secondary Arm's Rotation Pin to secure the Secondary Arm to the A-Arm mount.) See Figure 7 (next page)
7. From underneath the end of the A-Arm mount, remove the:
 - A. shaft cap,
 - B. bottom bearing thrust washer,
 - C. needle roller bearing,
 - D. O-ring, and
 - E. top bearing thrust washer. See Figure 7 (next page).
8. Lift up the Secondary Arm, slide its Rotation Pin up through the A-Arm mount and remove Secondary Arm from the A-Arm mount. See Figure 7 (next page).
9. From the top end of the A-Arm mount, remove the:
 - A. top bearing thrust washer,
 - B. needle roller bearing,
 - C. O-ring, and
 - D. bottom bearing thrust washer. See Figure 7 (next page).

Installation

Install the Secondary Arm by performing the previous removal steps in reverse, and make sure to use Loctite-242 when installing the 1-inch long hex screw.

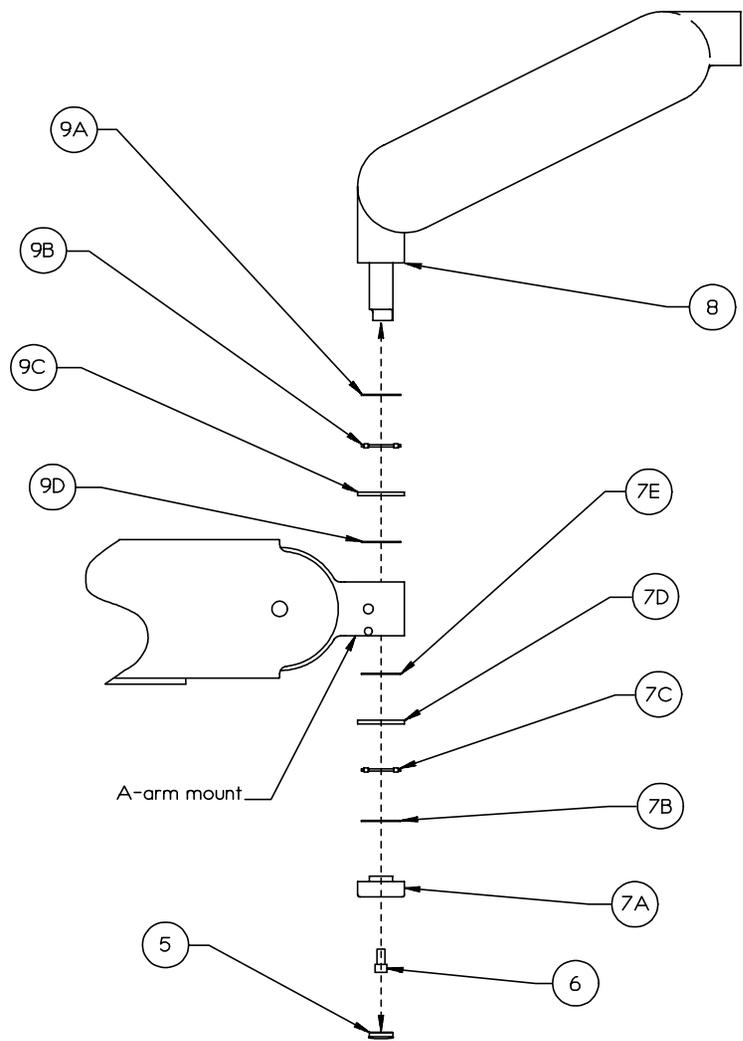


Figure 7

Articulated Arm (A-Arm)

Note: The internal gas spring of the A-Arm is not field-replaceable. If problems occur with the gas spring, the entire A-Arm will be replaced.

Removal

1. Remove the Flat Panel Display Monitor, Monitor Mounting Plate, Spacer Plate, Monitor Pivot Mount, and Secondary Arm as outlined in their previous removal sections.
2. Grasp the A-Arm and rotate it upward the maximum distance so the underside of the A-Arm is easily accessible when removing Cable Cover (next step). See Figure 8.
3. Locate the plastic Cable Cover attached to the track on the underside of the A-Arm. Using both hands, grasp the Cable Cover and squeeze its top edges together to free its inside top edge from the track, then pull out and downward and detach the Cable Cover (and cable) from the A-Arm. See Figure 8.

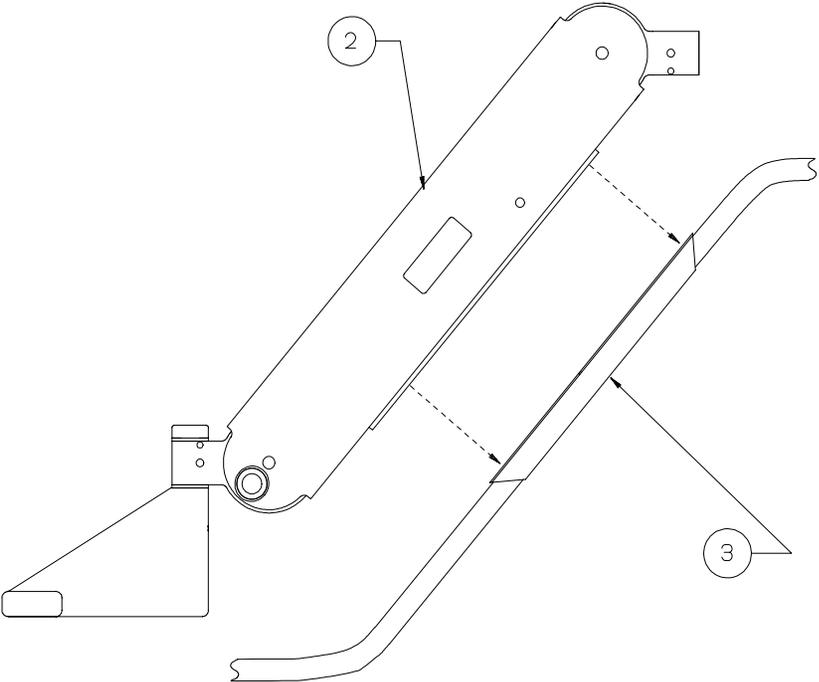


Figure 8

FluoroTrak Service Manual Update

4. Using a blade screw driver or similar tool, remove the molded hole plug from the shaft cap, located on the top end of the A-Arm mount. See Figure 9 (next page).
5. Remove the 1-inch long hex screw from the top end of the A-Arm mount. (This hex screw installs down through the A-Arm Support's shaft to secure the A-Arm mount to the A-Arm Support.) See Figure 9 (next page).
6. From the top end of the A-Arm mount, remove the:
 - A. shaft cap,
 - B. top bearing thrust washer,
 - C. needle roller bearing,
 - D. O-ring, and
 - E. bottom bearing thrust washer. See Figure 9 (next page).
7. Lift up the A-Arm. slide its mount up over the support's shaft and remove the A-Arm from the support. See Figure 9 (next page).
8. From the bottom of the A-Arm Support's shaft, remove the:
 - A. top bearing thrust washer,
 - B. O-ring,
 - C. needle roller bearing, and
 - D. bottom bearing thrust washer. See Figure 9 (next page).

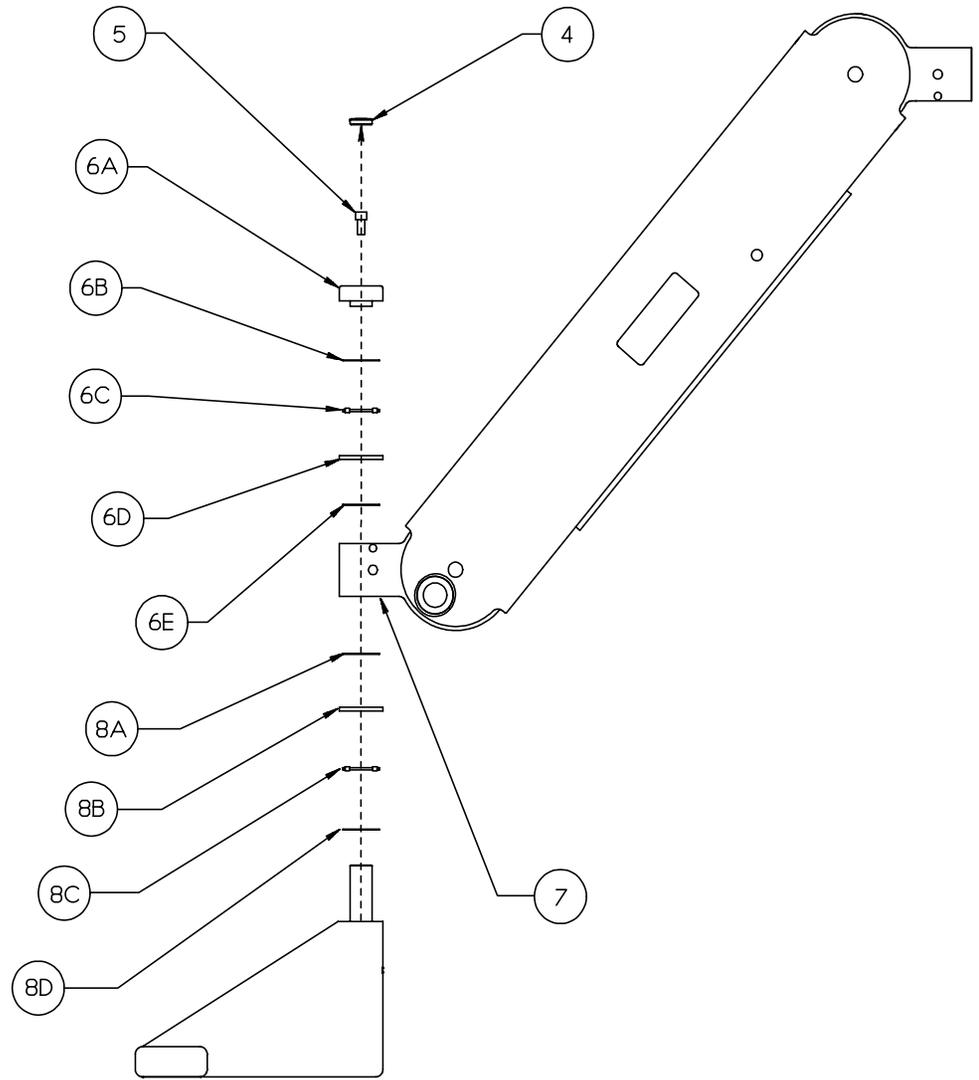


Figure 9

Installation

Install the A-Arm by performing the previous removal steps in reverse, up to and including installing the molded hole plug onto the shaft cap (refer to step 4 in removal section), and use Loctite-242 when installing the 1-inch long hex screw.

Then, after re-attaching the molded hole plug:

1. Grasp the A-Arm and rotate it upward the maximum distance so the underside of the A-Arm is easily accessible (if not done already).

Note: The following steps assume the Cable Cover is already attached to the cable.

2. Place the section of cable extending immediately out from the front end of the Cable Cover into the track on the underside of the A-Arm. See Figure 10 (next page).

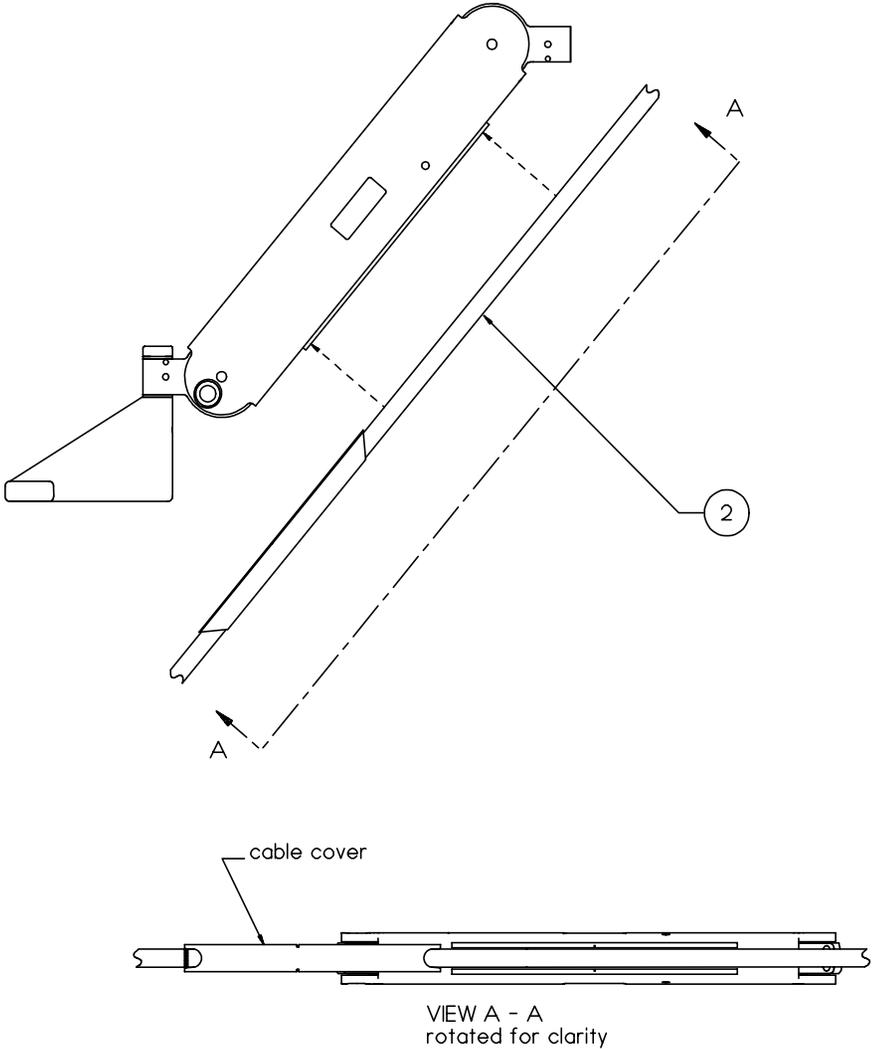


Figure 10

FluoroTrak Service Manual Update

- 3. While holding the Cable Cover with one hand to guide it, pull the cable up through the track with the other hand and slide the Cable Cover up into the track until you hear the “click” of the cover’s notches locking into the track’s 2 pins. Make sure the Cable Cover stays at the same position on the cable itself. See Figure 11.

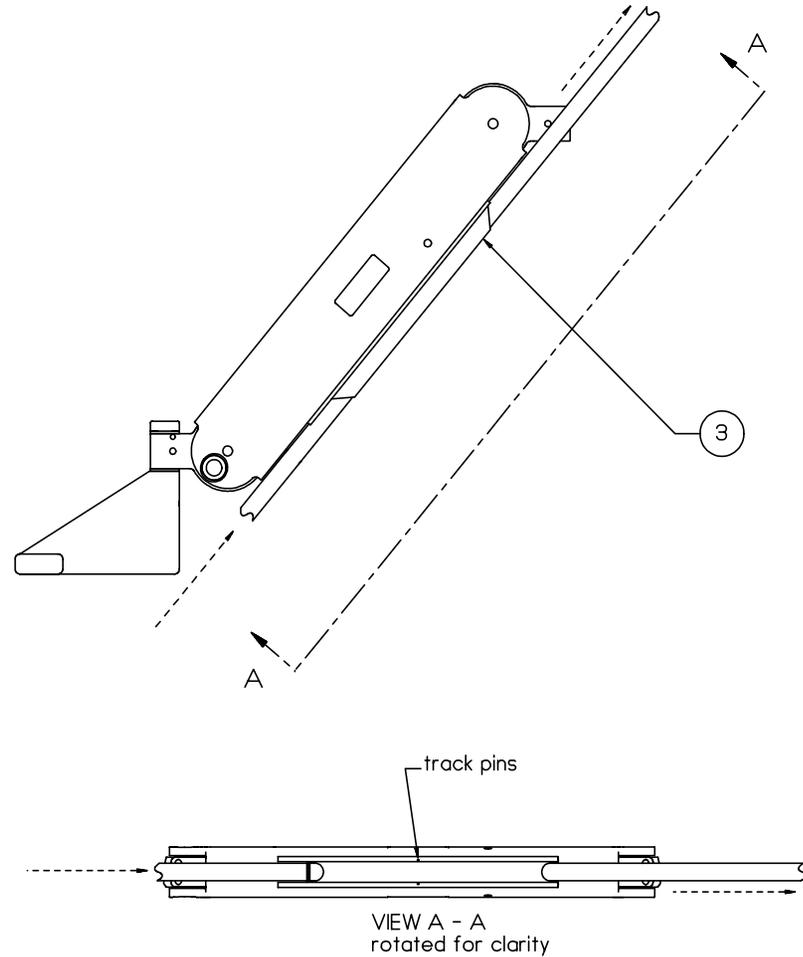


Figure 11

A-Arm Support

Removal

1. Remove the Flat Panel Display Monitor, Monitor Mounting Plate, Spacer Plate, Monitor Pivot Mount, Secondary Arm, and A-Arm as outlined in their previous removal sections.
2. Remove the Workstation front cover.
3. Remove the four hex screws (& their washers) from the front side of the Workstation frame's front-left support post. See Figure 12.

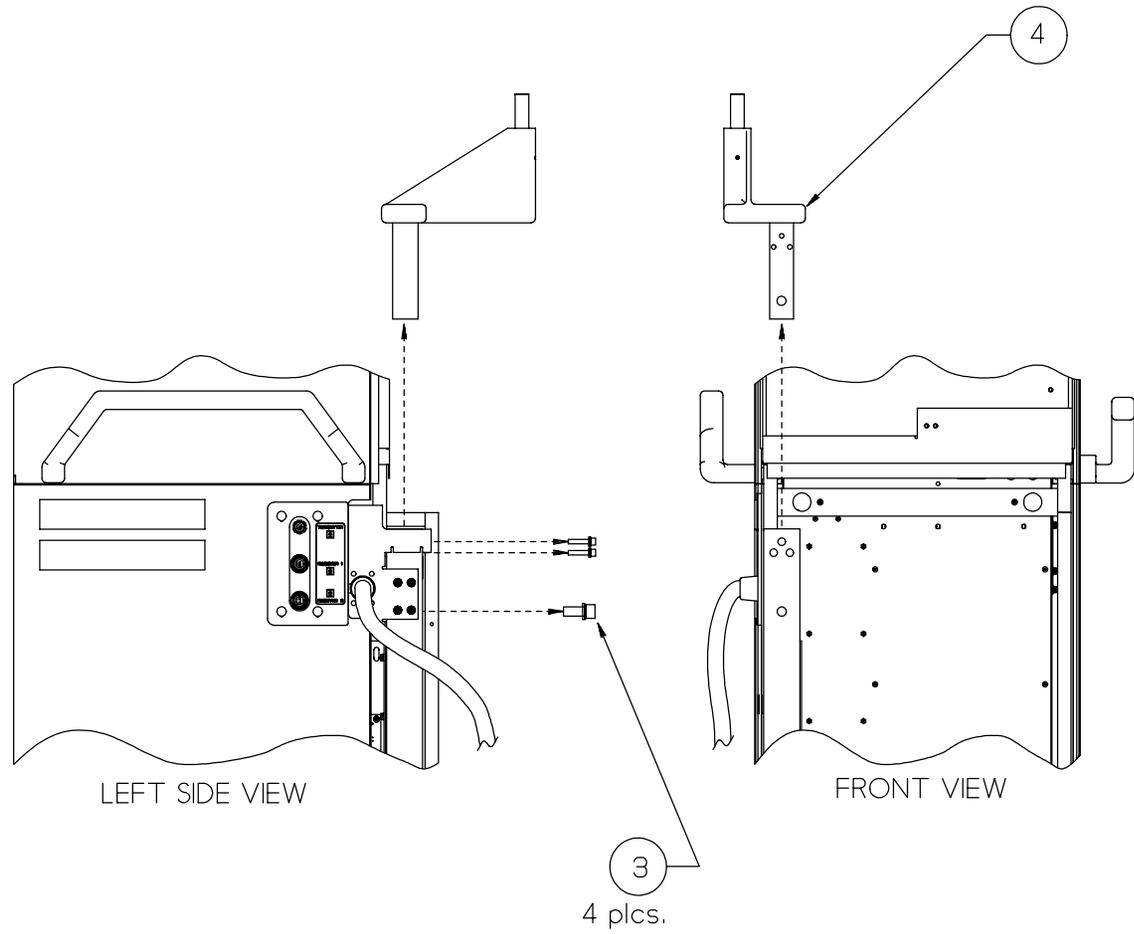


Figure 12

4. Lift up the A-Arm Support, slide its mtg. block out of the front-left support post and remove the A-Arm Support from the Workstation. See Figure 12.

Installation

Install the A-Arm Support by performing the previous removal steps in reverse.

Interconnect Mounting Bracket

Removal

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Remove the Workstation front cover.
5. From the outside, remove the 4 torx screws that secure the Mtg. Bracket to the left side of the front-left support post. See Figure 13 (next page).
6. Remove the Mtg. Bracket, with the Arm Cable’s strain relief still attached. See Figure 13 (next page).
7. On the Mtg. Bracket’s inside face, locate the 2 cable mtg. clamps which fit into the slot of the Arm Cable’s rubber strain relief, and note the hex nuts (on the threaded studs) which secure these cable mtg. clamps. Remove the hex nuts (4 total) from the threaded studs. See Figure 14.
8. Remove the 2 mtg. clamps. See Figure 14.
9. Remove the Arm Cable’s strain relief from the circular notch in the Mtg. Bracket and detach the cable from the Mtg. Bracket. See Figure 14.

Installation

Install the Interconnect Mtg. Bracket by performing the previous removal steps in reverse.

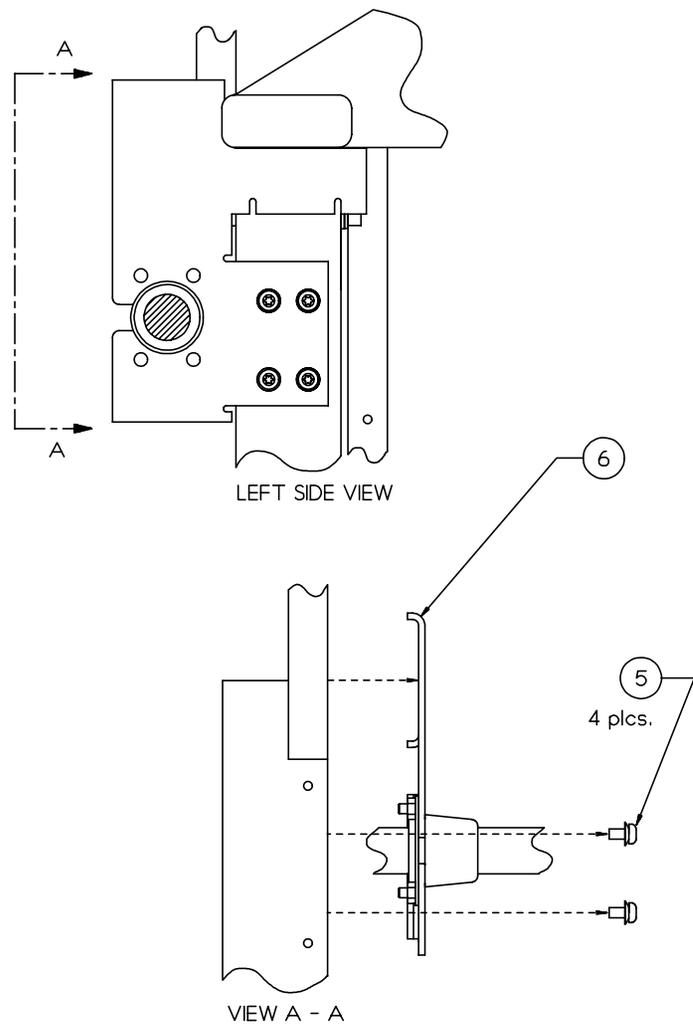


Figure 13

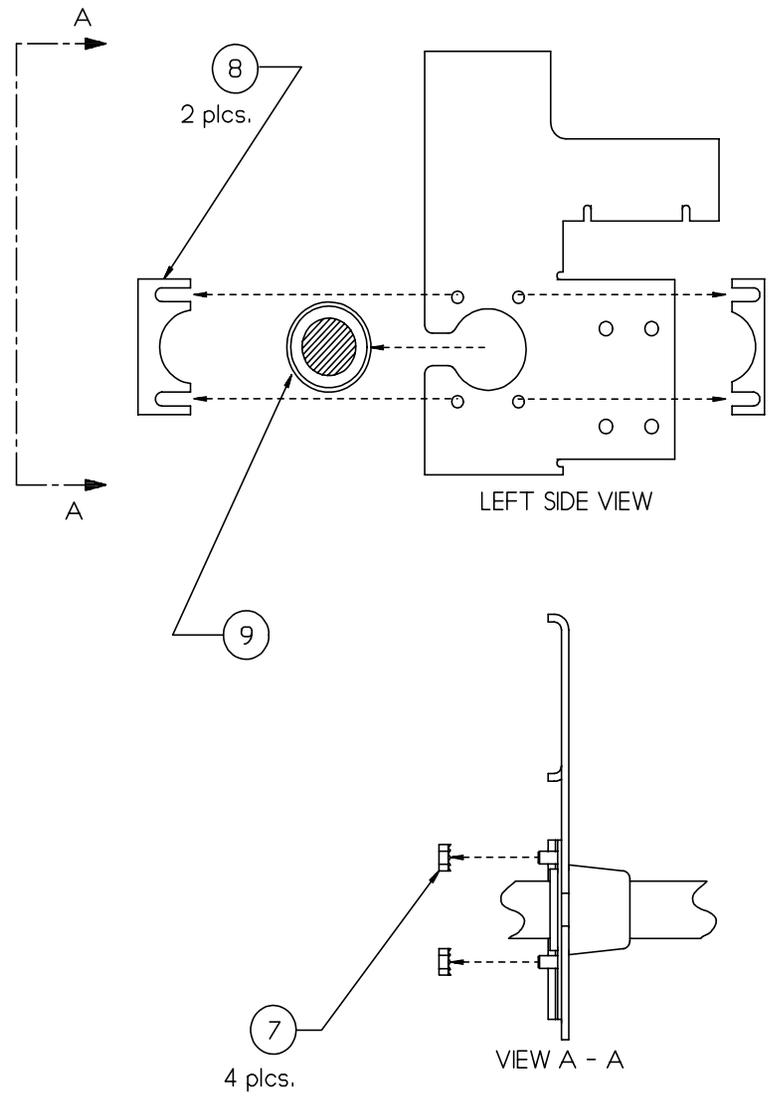


Figure 14

Arm Cable

Removal

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Remove the Workstation lower-right side cover.
5. Remove the Workstation front cover.
6. Position the Flat Panel Display Monitor onto a table or similar surface so it's supported when the 4 torx screws are removed (next step).
7. Remove the 4 torx screws (with their washers) that attach the Monitor and Monitor Mtg. Plate to the Monitor Pivot Mount, then detach the Monitor, Spacer Plate, and Monitor Mounting Plate from the Pivot Mount, as shown in Figure 2 previously.
8. From the rear of the Monitor, remove the rectangular cover which is attached over the area of the 3 Arm Cable connections, as shown in Figure 2 previously.
9. Disconnect the 3 Arm Cable connectors (J1, J2 & J3) from the rear of the monitor, as shown in Figure 2 previously.
10. Detach the Arm Cable from the 2 circular nylon cable clamps on the underside of the Secondary Arm, as shown in See Figure 6 previously. Then, detach the cable from any other clamps and remove any plastic tie-wraps that secure the cable to the Secondary Arm.
11. Pull the Arm Cable out from the underside of the Secondary Arm, as shown in Figure 6 previously.
12. Locate the plastic Cable Cover attached to the track on the underside of the A-Arm. Using both hands, grasp the Cable Cover and squeeze its top edges together to free its inside top edge from the track, then pull out and downward and detach the Cable Cover (and cable) from the A-Arm, as shown in Figure 8 previously.
13. Remove the Interconnect Mtg. Bracket, with the Arm Cable's strain relief still attached, as shown in Figure 13 previously.

FluoroTrak Service Manual Update

14. On the inside face of the Interconnect Mtg. Bracket, locate the 2 cable mtg. clamps which fit into the slot of the Arm Cable's strain relief, and note the hex nuts (on the threaded studs) which secure these cable mtg. clamps. Remove the hex nuts (4 total) from the threaded studs, then remove the 2 mtg. clamps, as shown in Figure 14 previously.
15. Remove the Arm Cable's strain relief from the circular notch in the Mtg. Bracket, as shown in Figure 14 previously.
16. Disconnect the 4 cable connections from inside the Workstation (J6, J7, PS3P2, and E20), then remove the cable.

Installation

Install the A-Arm cable by performing the previous removal steps in reverse, with these modifications with attaching the Cable Cover to the underside of the A-Arm, and for leaving a cable service loop:

Cable Cover

1. Grasp the A-Arm and rotate it upward the maximum distance so the underside of the A-Arm is easily accessible (if not done already).
2. Place the section of cable extending immediately out from the front end of the Cable Cover into the track on the underside of the A-Arm, as shown in Figure 9 previously.
3. While holding the Cable Cover with one hand to guide it, pull the cable up through the track with the other hand and slide the Cable Cover up into the track until you hear the "click" of the cover's notches locking into the track's 2 pins, as shown in Figure 11 previously. Make sure the Cable Cover stays at the same position on the cable itself.

Service Loop

1. After re-attaching the monitor (with the cable connected), but before re-attaching the cable to the clamps & tie-wraps on the underside of the Secondary Arm, leave enough of a cable service loop (or slack) between the monitor and top end of the Secondary Arm so the monitor can rotate the maximum ranges of vertical and horizontal motions. See Figure 15 (next page).
2. Re-attach the cable using the tie-wraps (4 places) on the underside of the Secondary Arm.

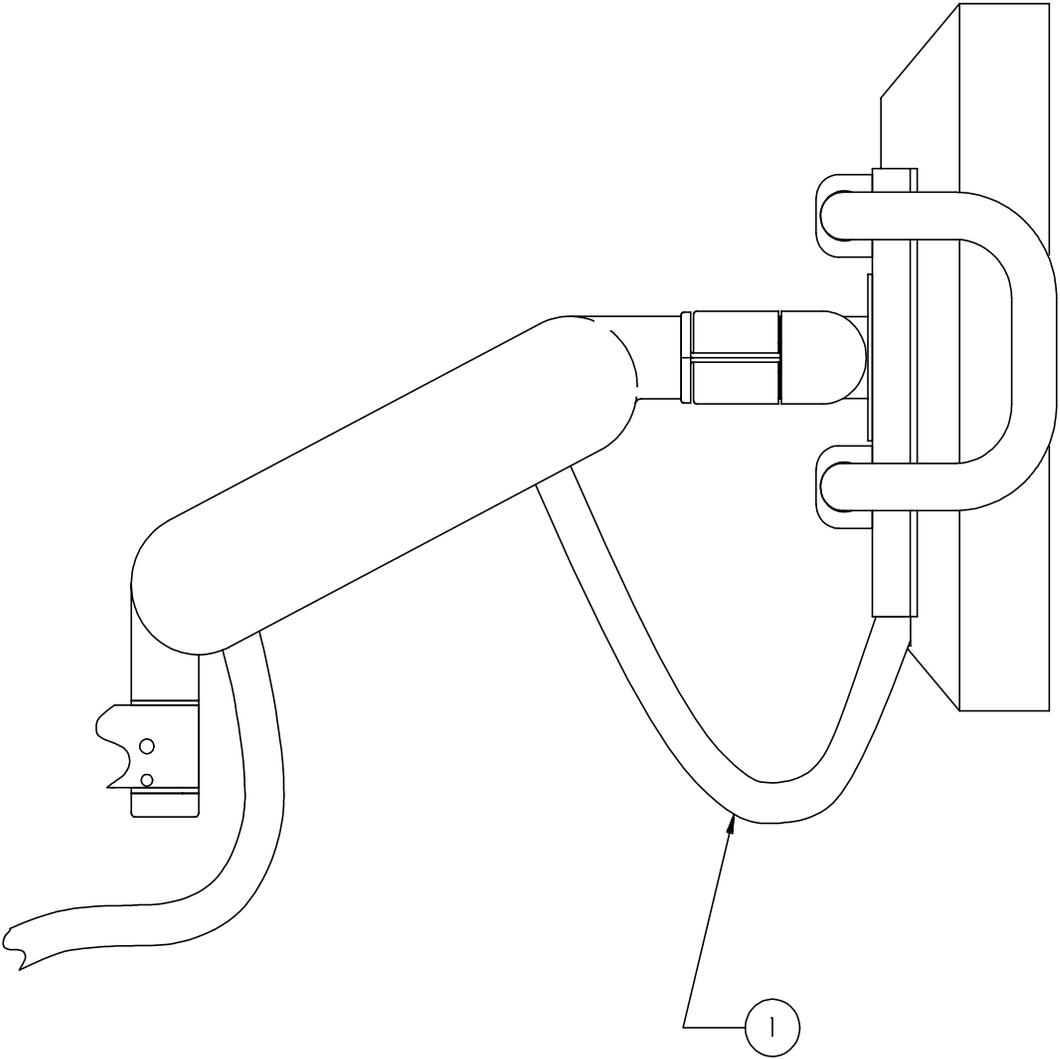


Figure 15

Monitor Retention Bracket

Removal

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-right side cover.
4. Detach the Flat Panel Display Monitor from the Retention Bracket (if not already done).
5. Remove the two hex nuts (& their washers) from the Retention Bracket's threaded studs. (These hex nuts secure the Retention Bracket to the upper-right frame brace.) See Figure 16.

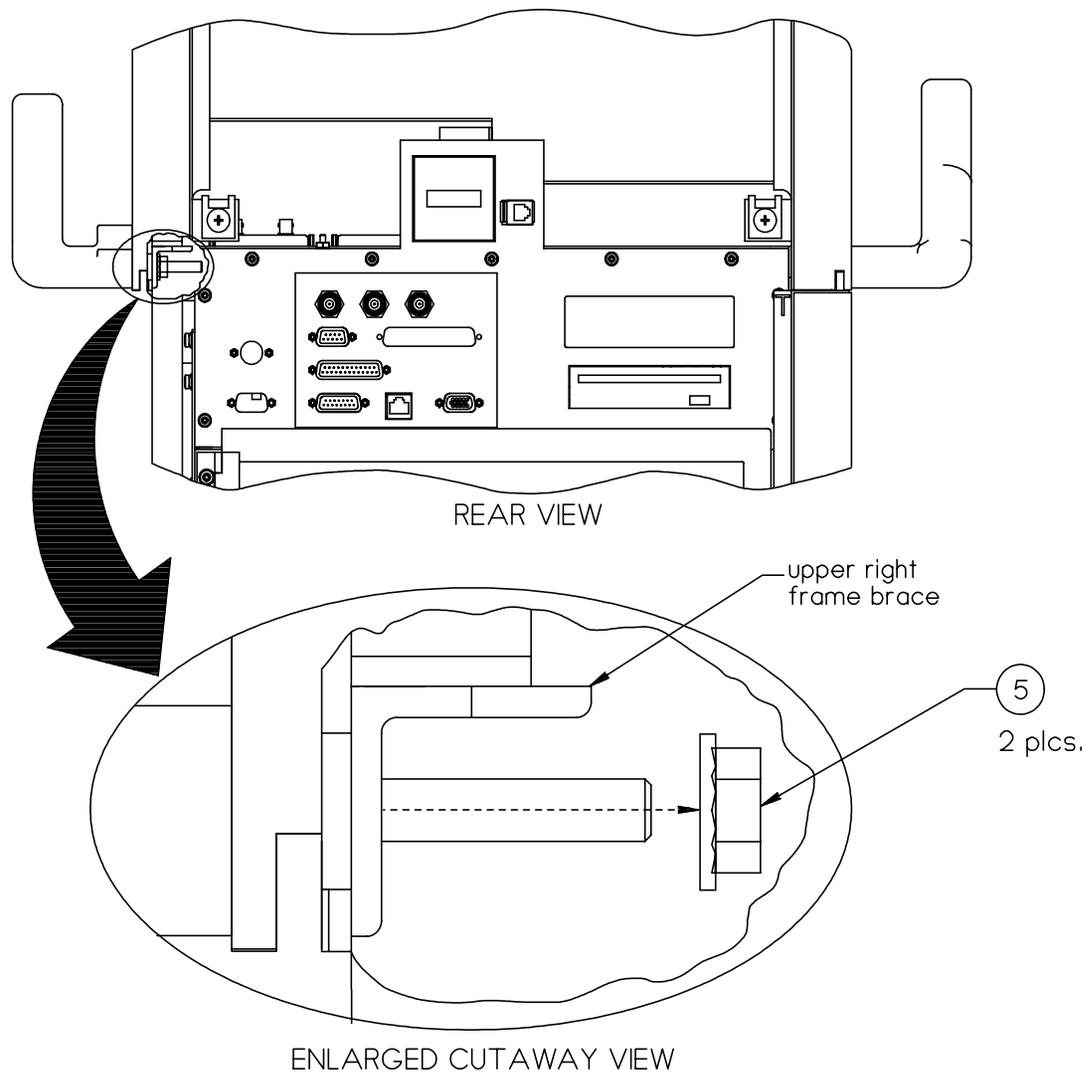


Figure 16

6. Remove the Retention Bracket from the Workstation. See Figure 17.

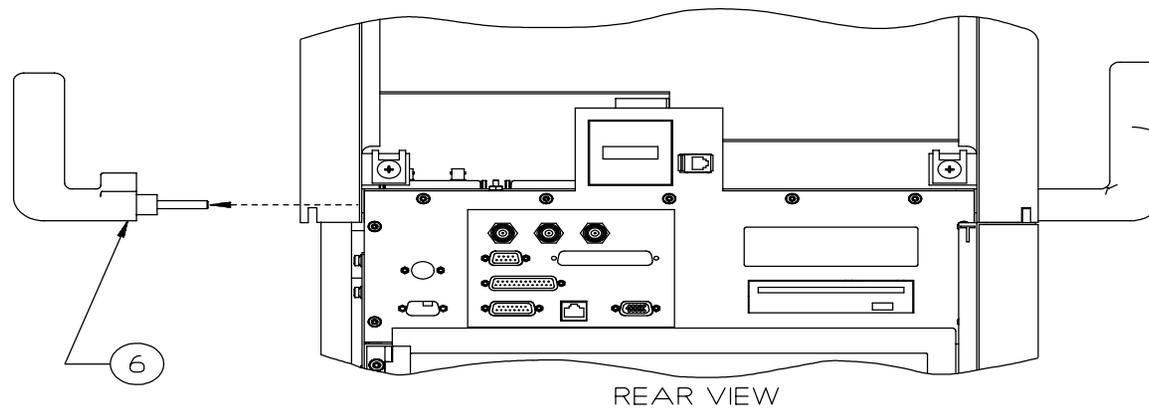


Figure 17

Installation

Install the Monitor Retention Bracket by performing the previous removal steps in reverse.

Spring Clip

Note: The Spring Clip can be removed from the Monitor Retention Bracket without the Retention Bracket being removed from the Workstation. Figure 18 shows the Retention Bracket removed from the Workstation.

Removal

1. Remove the 2 torx screws that attach the Spring Clip to the Monitor Retention Bracket. See Figure 18.
2. Remove the Spring Clip from the Retention Bracket. See Figure 18.

Installation

Install the Spring Clip by performing the previous removal steps in reverse.

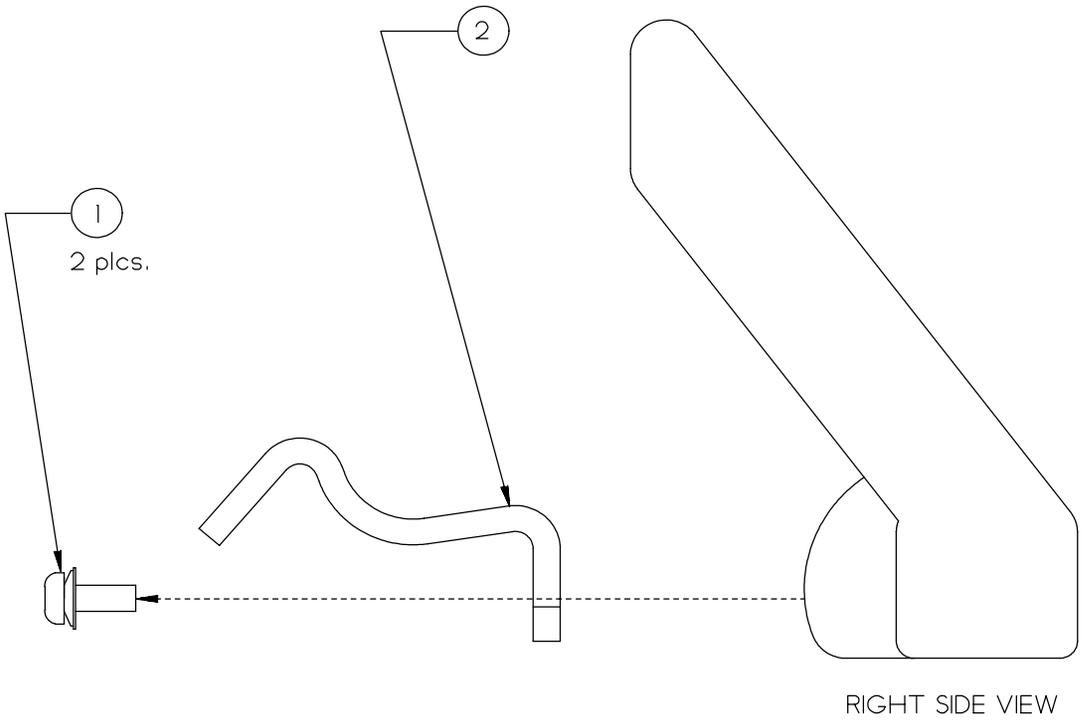


Figure 18

Upper Right Side Cover

Removal

1. Remove the Monitor Retention Bracket as outlined in its previous removal section.
2. Remove the Workstation front cover.
 3. Locate the flat-head hex screw at the lower-front corner of the upper-right side cover. See Figure 19 (next page).

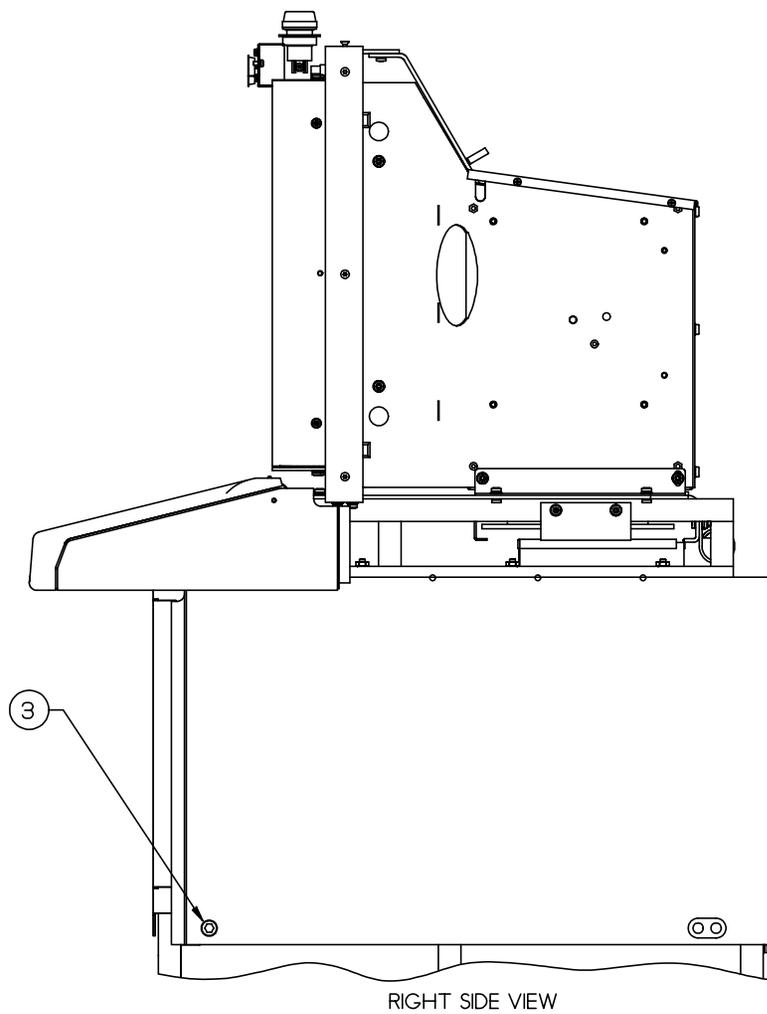


Figure 19

FluoroTrak Service Manual Update

- 4. On the inside of the Workstation, locate the hex nut attached to the flat-head hex screw (the screw's end extends through the upper-right frame brace). Remove this hex nut (& its washer). See Figure 20.

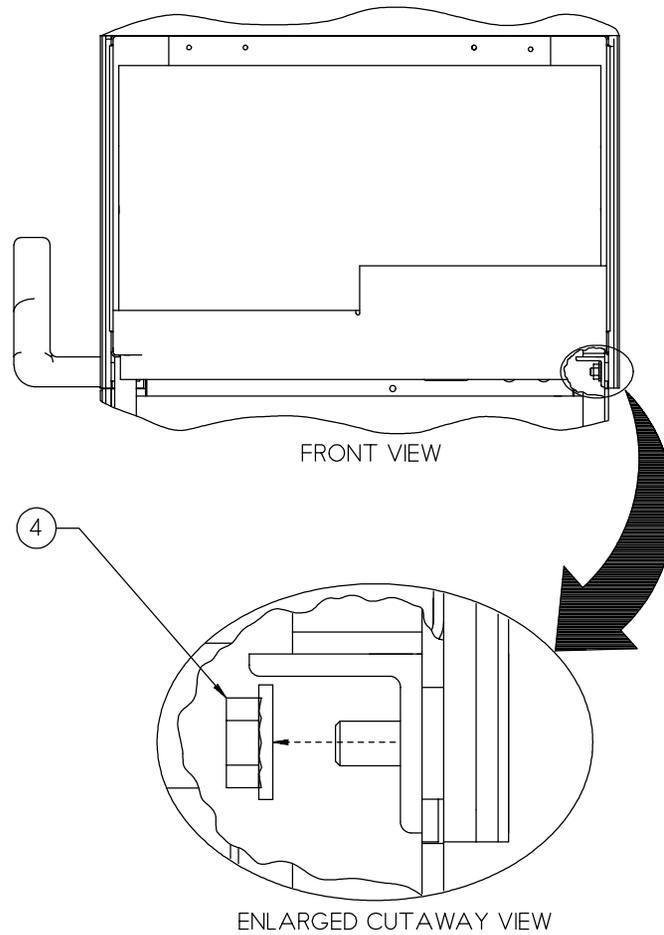


Figure 20

FluoroTrak Service Manual Update

5. Remove the flat-head hex screw from the side cover. See Figure 21.
6. Remove the cylindrical nylon spacer which fits over the flat-head hex screw. See Figure 21.

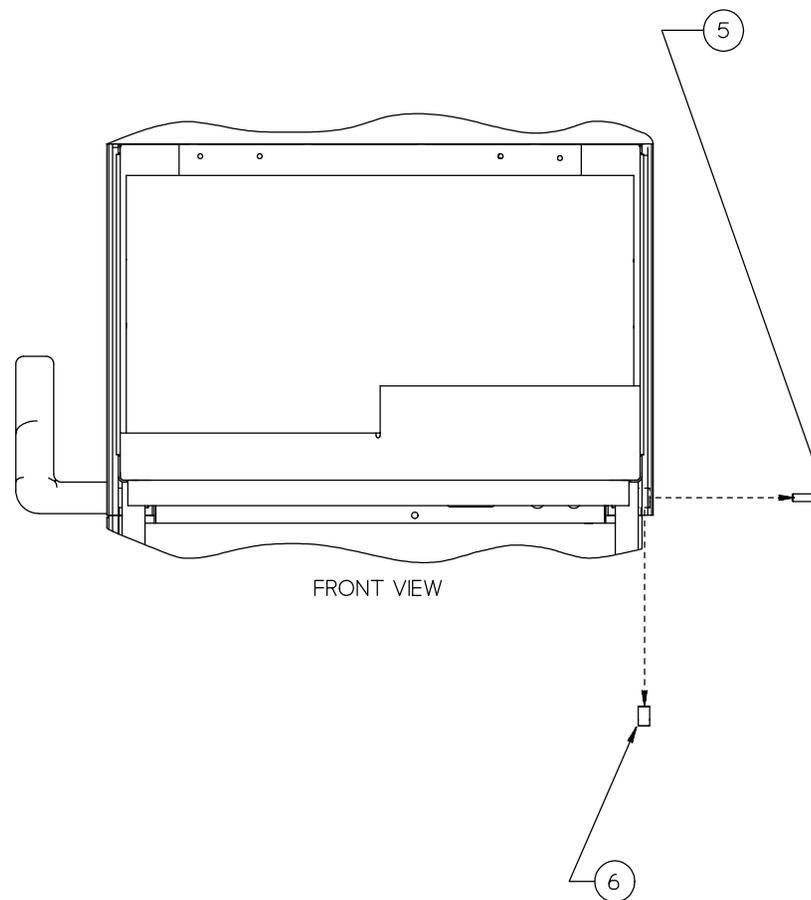


Figure 21

7. Remove the upper-right side cover. See Figure 22.

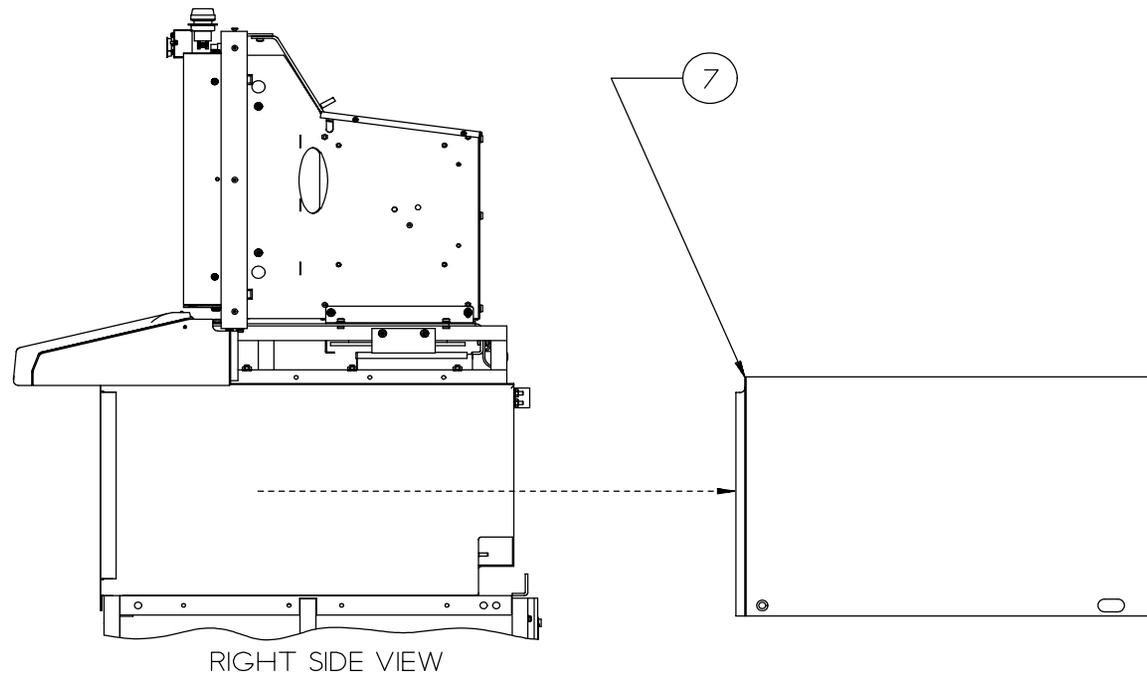


Figure 22

Installation

Install the upper-right side cover by performing the previous removal steps in reverse, but with these additional steps:

1. Leave the hex nut and the retainer bracket's 2 hex bolts loose after placing the upper-right side cover onto the Workstation.
2. Position the lower-right side cover between the upper cover and into the slot in the base cover, then slide it onto the Workstation, pushing it all the way to the front.

FluoroTrak Service Manual Update

3. Align the front edges of the upper- and lower-right side covers.
4. With the covers aligned, tighten the hex nut and the 2 hex bolts.

Tracker Bezel

Removal

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Using a small flat-blade screw driver or similar tool, remove the 4 screw hole plugs from the Tracker Bezel. See Figure 23.
5. Remove the 4 screws that secure the Tracker Bezel to the Connector Box of the FluoroTrak Kit, then remove the Tracker Bezel.

Installation

Install the Tracker Bezel by performing the previous removal steps in reverse.

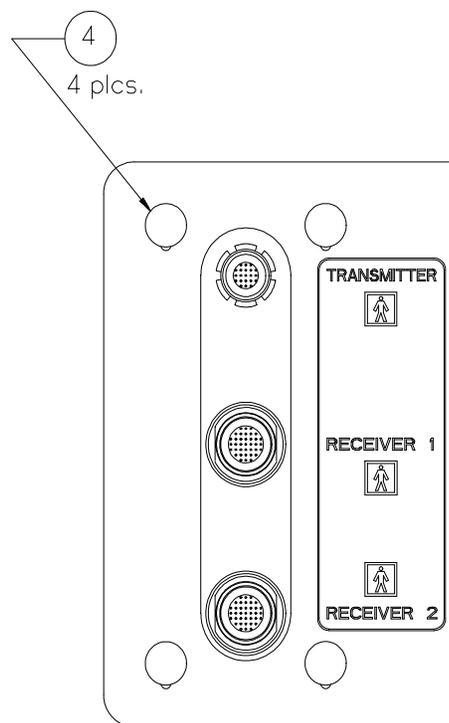


Figure 23

FluoroTrak Kit & Mounting Bracket

Removal

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Remove the Workstation lower-right side cover.
5. Remove the Workstation front cover.
6. Remove the Tracker Bezel as outlined in the previous removal section.
7. Unscrew and remove the 3 Retaining Rings which mount over the connectors on the Connector Box. See Figure 24 (next page).
8. Remove the screws that attach the Connector Box to the FluoroTrak Kit, then remove the Connector Box. See Figure 24 (next page).
9. Carefully place the 3 connectors from the Connector Box into the opening on the left side of the FluoroTrak Kit so they don't interfere with removal of the FluoroTrak Kit from the Workstation.
10. Disconnect the FluoroTrak's signal cable J3 connector from the Computer Box.
11. Disconnect the FluoroTrak's AC power cable TB2 connectors (AC1/AC2) and its ground connector (E6). TB2 is the terminal block located on the left side of the Workstation, near the top edge of the Electronics Mount.
12. Remove the screws (and the shock mounts) that attach the FluoroTrak Kit to its Mounting Bracket, then remove the FluoroTrak Kit from the Workstation. See Figure 24 (next page).
13. Remove the 4 torx screws and the 2 hex screws (with their washers) that attach the Mounting Bracket to the Workstation frame, then remove the Mounting Bracket. See Figure 24 (next page).

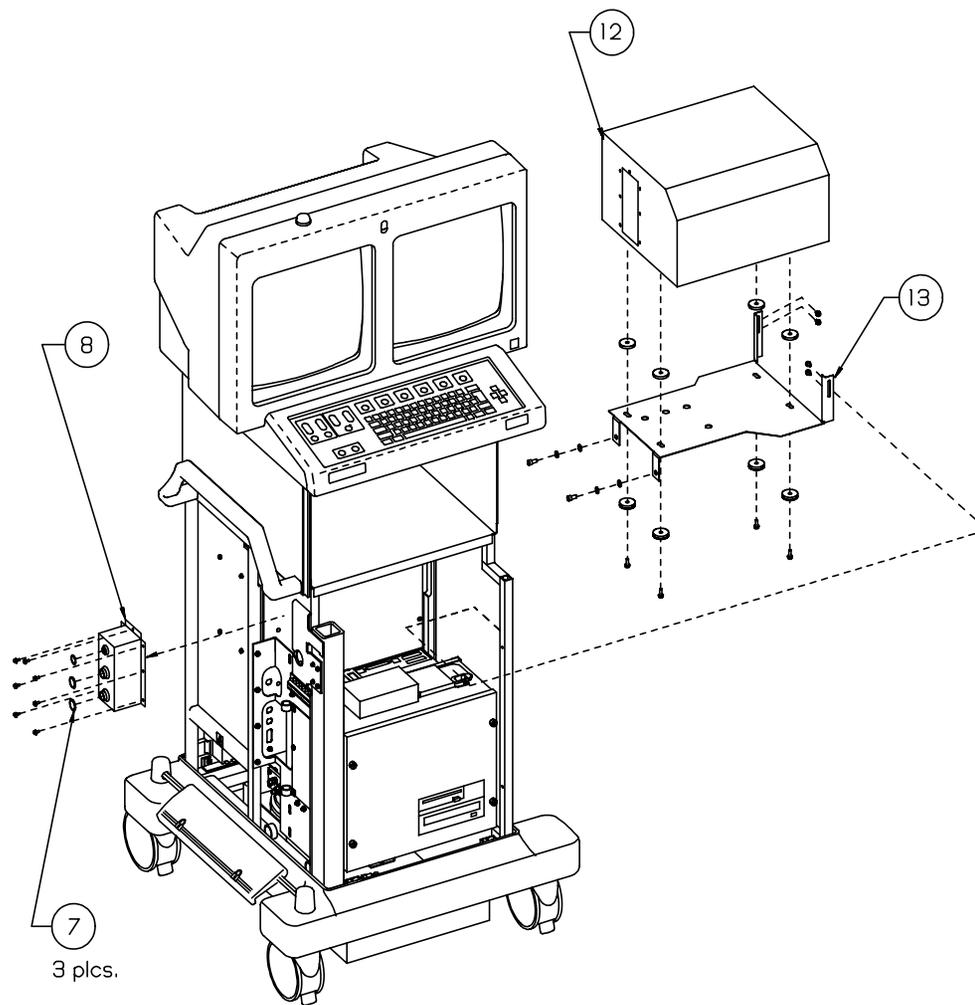


Figure 24

Installation

Install the FluoroTrak Kit and its Mounting Bracket by performing the previous removal steps in reverse.

24V Power Supply (PS3)

Removal

Note: The FluoroTrak Kit and its Mounting Bracket, and the Computer Box Asm. do not need to be removed to remove the 24V Power Supply. Figure 25 (next page) shows the Computer Box Asm. removed from the Workstation frame for clarity.

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Remove the Workstation lower-right side cover.
5. Remove the Workstation front cover.
6. Disconnect P1 of the AC power cable from the Power Supply.
7. Disconnect P2 of the Arm Cable from the Power Supply.
8. Loosen the 2 thumbscrews that attach the Power Supply mtg. plate to the top of the Computer Box. See Figure 25 (next page).
9. Remove the Power Supply. See Figure 25 (next page).

Installation

Install the 24V Power Supply by performing the previous removal steps in reverse.

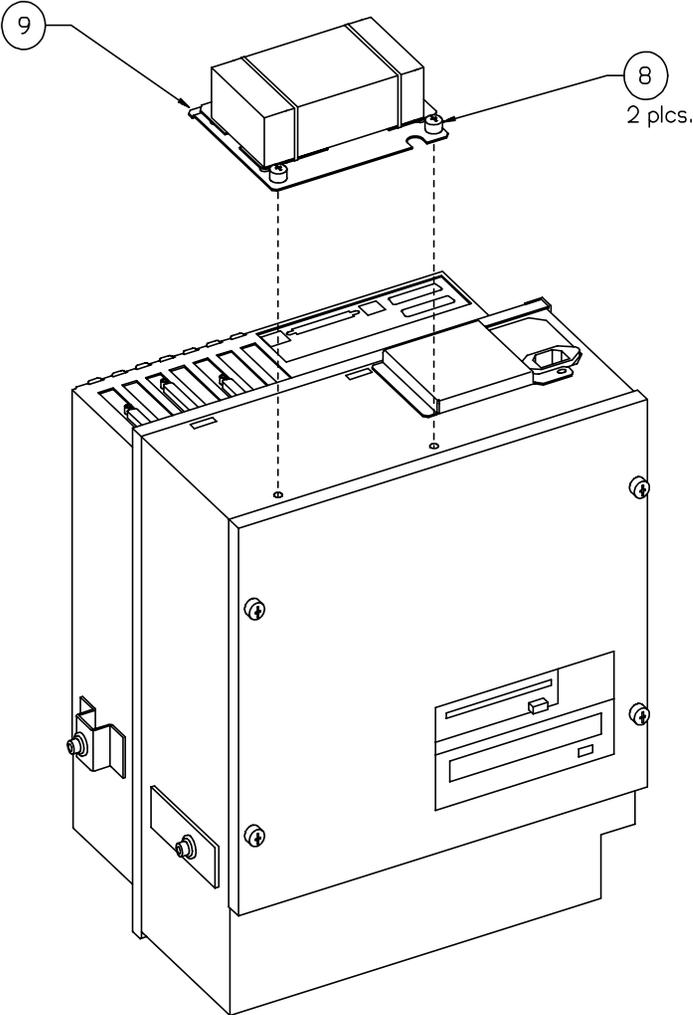


Figure 25

Computer Box Asm.

Removal

Note: Figure 26 shows the Computer Box Asm. with the 24V power supply removed.

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Remove the Workstation lower-right side cover.
5. Remove the Workstation front cover.
6. Remove the Tracker Bezel as outlined in its previous removal section.
7. Remove the FluoroTrak Kit & its Mounting Bracket as outlined in their previous removal section.
8. Disconnect P1 of the AC power cable from the 24V Power Supply.
9. Disconnect P2 of the Arm Cable from the 24V Power Supply.
10. Disconnect J1 of the Serial Breakout Cable from P1 on the Computer Box.
11. Disconnect J8 of the Serial Breakout Cable from the serial card on the Computer Box.
12. Disconnect J2 of the Nav. Comp. AC cable from the UPS on the Computer Box.
13. Disconnect J4 of the Ethernet Cable from the ethernet connection on the Computer Box.
14. Disconnect J5 of the Ethernet Cable from the Ethernet Card on the Computer Box.
15. Disconnect the shield clamp connector of the Ethernet Cable from the Computer Box chassis.
16. Disconnect J6 of the Arm Cable from the VGA adapter on the Computer Box.

FluoroTrak Service Manual Update

17. Remove the 2 hex screws (and their washers) that attach the Computer Box to the Electronics Mount, located on the left, near the lower edge of the Electronics Mount. See Figure 26.
18. Remove the 2 hex screws (and their washers) that attach the Computer Box to the Computer Mounting Bracket, located on the lower-right side. See Figure 26.
19. Carefully remove the Computer Box from the Workstation. See Figure 26.

Installation

Install the Computer Box Asm. by performing the previous removal steps in reverse, using Loctite 242 on the hex screws.

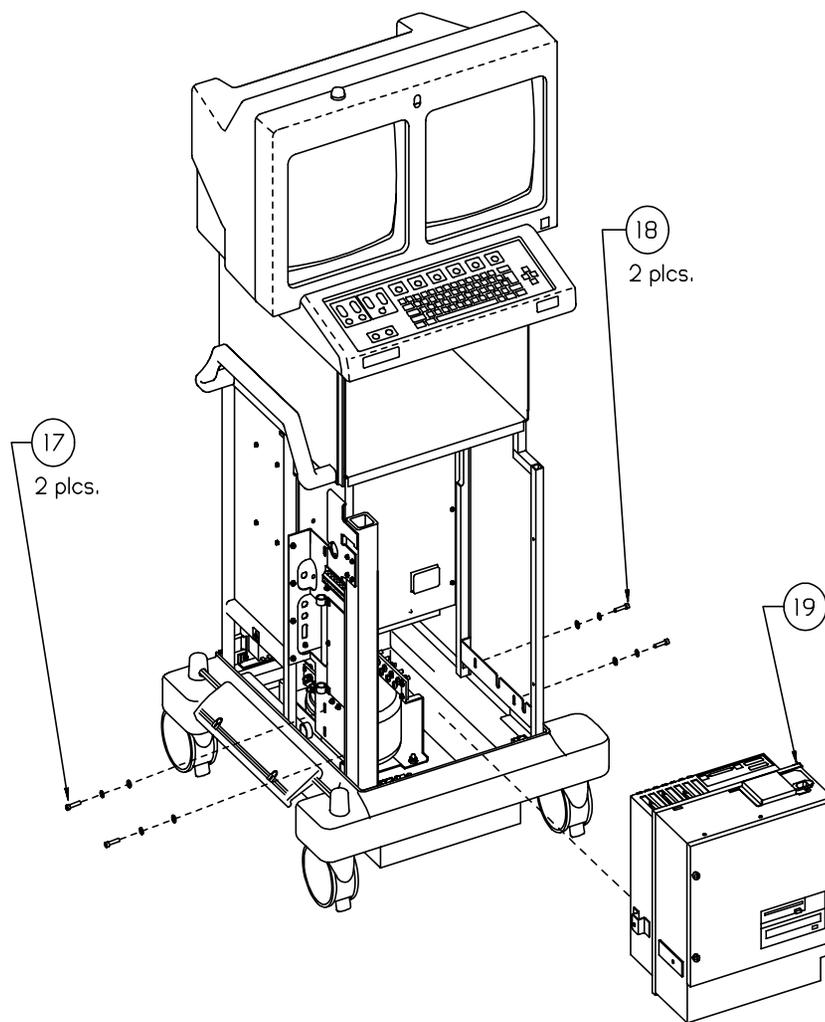


Figure 26

Computer Box Asm. Internal Components

The following sections outline removal of the main internal subassemblies inside the Computer Box, from start to finish, and thus the steps run consecutively, with no numerical brake between subsections. In general, most parts can only be accessed and removed if the parts cited in the preceding removal steps have been removed.

Figures 27A and 27B show exploded views for clarity, which may not represent the actual position of the components during and after separation and removal. Also for clarity, these Figures usually do not show all the smaller pieces of hardware involved, such as screws. As in previous Figures, the call-out numbers correspond to the same-numbered steps in these procedures.

Figures 27A and 27B are at the end of this “Removal” section.

Refer also to the FluoroTrak Interconnect Diagram, 00-882913, for aid in component removal, especially with cable disconnections.

Removal

1. Remove the Computer Box. Asm. from the Workstation as outlined in the previous removal section.
2. Remove the 12 pan-head torx screws that connect the Front and Rear Enclosure Housing, then separate the two Enclosure Housings as far as the length of the cables (still connected at this point) will allow. See Figure 27A.
3. Loosen the 4 thumb screws that attach the Enclosure Cover to the Front Enclosure Housing, then remove the Enclosure Cover. See Figure 27B.

CAUTION: *Record the cable connection designations somewhere for correct cable re-connection later.*

SCSI Wide Cable Disconnections

4. Disconnect P1 from J1001 on the Motherboard.
5. Disconnect P2 from the Hard Disk Drive (HDD) data port.

6. Disconnect P4 from the CD-ROM Drive.
7. Disconnect P5 from the Terminator.

FDD (Floppy Disk Drive) Signal Cable Disconnections

8. Disconnect A1 from J1902 on the Motherboard.
9. Disconnect J2 from the FDD data port.

Power Supply (PS4) Cable Disconnections

10. Disconnect P4 from J4 on the Fan Power Split Cable.
11. Disconnect DB10A from P3.
12. Disconnect P1 from J1901 on the Motherboard.
13. Disconnect the Wht. 2-Pin (P3) Connector from the UPS Battery.
14. Disconnect P3 from the HDD.
15. Disconnect P5 from the CD-ROM Drive.
16. Disconnect P6 from the FDD.

HDD (Hard Disk Drive) Asm.

17. Loosen the 2 thumb screws on the HDD Mtg. Bracket. See Figure 27B.
18. Remove the HDD Asm. from the Front Enclosure Housing. See Figure 27B.
19. To remove the individual HDD from the HD Mtg. Plate (if necessary): remove the 4 pan-head torx screws that mount the HDD to the HD Mtg. Plate, then remove the HDD. See Figure 27B.
20. To remove HD Mtg. Plate from the HD Mtg. Bracket (if necessary): remove the 4 pan-head torx screws that mount the HD Mtg. Plate to the HD Mtg. Bracket, then remove the HD Mtg. Plate from the HD Mtg. Bracket. See Figure 27B.

UPS Battery

21. Loosen the 2 thumb screws on the Battery Mtg. Bracket. See Figure 27B.
22. Remove the UPS Battery (with its Mtg. Bracket) from the Front Enclosure Housing. See Figure 27B.
23. To remove the UPS Battery from its Mtg. Bracket (if necessary): remove the 8 pan-head torx screws that mount the Battery to its Mtg. Bracket, then remove the Battery. See Figure 27B.

UPS Power Supply

24. Remove the 4 pan-head torx screws that attach the UPS Power Supply to the Front Enclosure Housing, then remove Power Supply PS4. Note that the Fan Guard, which mounts over the Power Supply (on top of the Front Enclosure Housing) becomes loose and thus is also removed with the Power Supply. See Figure 27B.

Drives Mtg. Bracket, Floppy Disk Drive, and SCSI CD-ROM Drive

25. Remove the 5 pan-head torx screws that attach the Drives Mtg. Bracket to the Front Enclosure Housing, then remove the Drives Mtg. Bracket from the Front Enclosure Housing. See Figure 27B.
26. Remove the 4 pan-head torx screws that mount the FDD to the Drives Mtg. Bracket, then remove the FDD from the Drives Mtg. Bracket. See Figure 27B.
27. Remove the 8 pan-head torx screws that mount the CD-ROM Drive to the Drives Mtg. Bracket, then remove the CD-ROM Drive from the Drives Mtg. Bracket. See Figure 27B.

CAUTION: *Record the “J” slot on the Motherboard from which each PCB was removed for correct PCB re-installation later.*

Ancillary Power PCB

28. Disconnect J5 of the Computer Pwr./Audio cable from P5 on the Ancillary Pwr. PCB.
29. If not already done, disconnect DB10A of the UPS from P3 on the Ancillary Pwr. PCB.
30. Disconnect the Speaker cable from P4 on the Ancillary Pwr. PCB.
31. Remove the pan-head torx screw that attaches the Ancillary Pwr. PCB's top mtg. bracket to the Rear Enclosure Housing. See Figure 27A.
32. Unplug the Ancillary Pwr. PCB from the J2001 slot on the Motherboard and remove it from the Rear Enclosure Housing. See Figure 27A.

Serial PCB

33. Remove the pan-head torx screw that attaches the Serial PCB's top mtg. bracket to the Rear Enclosure Housing. See Figure 27A.
34. Unplug the Serial PCB from the J2003 slot on the Motherboard and remove it from the Rear Enclosure Housing. See Figure 27A.

Graphics PCB

35. Remove the pan-head torx screw that attaches the Graphics PCB's top mtg. bracket to the Rear Enclosure Housing. See Figure 27A.
36. Unplug the Graphics PCB from the J0601 slot on the Motherboard and remove it from the Rear Enclosure Housing. See Figure 27A.

Ethernet PCB

37. Remove the pan-head torx screw that attaches the Ethernet PCB's top mtg. bracket to the Rear Enclosure Housing. See Figure 27A.

FluoroTrak Service Manual Update

38. Unplug the Ethernet PCB from the J2103 slot on the Motherboard and remove it from the Rear Enclosure Housing. See Figure 27A.

Mouse & Keyboard Connectors Plate & Cables Asm.

39. Locate the Mouse/Keyboard Connectors Plate's top mtg. bracket, immediately to the right of where the Ethernet PCB's mtg. bracket was removed. See Figure 27A.
40. Remove the pan-head torx screw that attaches the Plate's top mtg. bracket to the Rear Enclosure Housing. See Figure 27A.
41. Disconnect P2501 of the Keyboard Cable from J2501 on the Motherboard.
42. Disconnect P2500 of the Mouse Cable from J2500 on the Motherboard.
43. Remove the Mouse/Keyboard Connectors Plate & Cables Asm. from the Rear Enclosure Housing.

128MB Memory Modules

44. Unplug the Memory Modules from horizontal slots J0403 and J0404 on the Motherboard and remove them from the Rear Enclosure Housing. See Figure 27A.

Speaker

45. Remove the 2 pan-head torx screws that attach the Speaker to the right side of the Rear Enclosure Housing. See Figure 27A.
46. If not already done, disconnect the Speaker plug from P4 on the Ancillary Pwr./Control PCB.
47. Remove any plastic tie-wraps from the Speaker's connector wire, then remove the Speaker from the Rear Enclosure Housing. See Figure 27A.

Motherboard CPU Fan Asm.

48. Locate the Motherboard CPU Fan's P3603 connector near the upper-right corner of the Motherboard, then disconnect it from J3603 on the Motherboard. For re-installation, note the correct pin configuration: pin 1 of the Fan connector corresponds to

the white wire, and pin 1 on the Motherboard connector is to the left, in from the outside edge of the Motherboard. Also for re-installation, add a dab of silicon (p/n 88-299676-00) at the seam of the connectors to secure the connection.

49. Remove the 2 pan-head torx screws that secure the Fan's Hold-Down Bar to the standoffs, then remove the CPU Fan Asm. from the Motherboard.

Motherboard CPU Module Asm.

CAUTION: *Remove (and re-install) the CPU Module by grasping its Heat Sink or its upper and/or lower plastic finger indentations **only**.*

50. Locate the Motherboard CPU Module's Heat Sink, immediately below from where the CPU Fan Asm. was removed. Grasp the CPU Module's Heat Sink, then slowly and evenly pull up and remove the CPU from the Motherboard. For re-installation, note the CPU's position on the Motherboard. And when re-installing the CPU, press down slowly on the CPU until it seats **evenly** on the Motherboard.

Motherboard

51. Remove from the Motherboard the two 7/8-inch long standoffs used to mount the CPU Fan's Hold-Down Bar to the Motherboard. For standoffs' re-installation: note their correct position on the Motherboard, and use Loctite 425 (p/n 88-299319-00) on them.
52. Remove the 7 pan-head torx screws that secure the Motherboard to the Rear Enclosure Housing. For re-installation, note the Motherboard's position in the Rear Enclosure Housing. See Figure 27A.

Motherboard Port Plate

- 53. Remove the 6 standoffs that attach the Port Plate to the upper-right area of the Motherboard. See Figure 27A.
- 54. Remove the Port Plate from the Motherboard. For re-installation: use Loctite 425 (p/n 88-299319-00) on the standoffs.

Chassis Fans Asm.

- 55. Note there are 2 fans to be removed. If not done already, disconnect P21 and P22 of the Fans from J21 and J22 of the Drive Power Split Cable.
- 56. Remove the 8 pan-head torx screws that mount the Fans to the bottom of the Rear Enclosure Housing, then remove the Fans and their gaskets from the Rear Enclosure Housing. For re-installation: make sure the arrow stamped on the side of the Fans points **up** for proper air flow, and use Loctite 525 (p/n 88-299319-00) on the 8 torx screws and torque them to 5 in.-lbs. See Figure 27A.

Installation

- 1. Install the Computer Box. Asm. internal components by performing the previous removal steps in reverse, and be sure to perform any specific re-installation guidelines included with the removal steps, such as using Loctite, adding silicon, and torque specifications for mtg. screws.

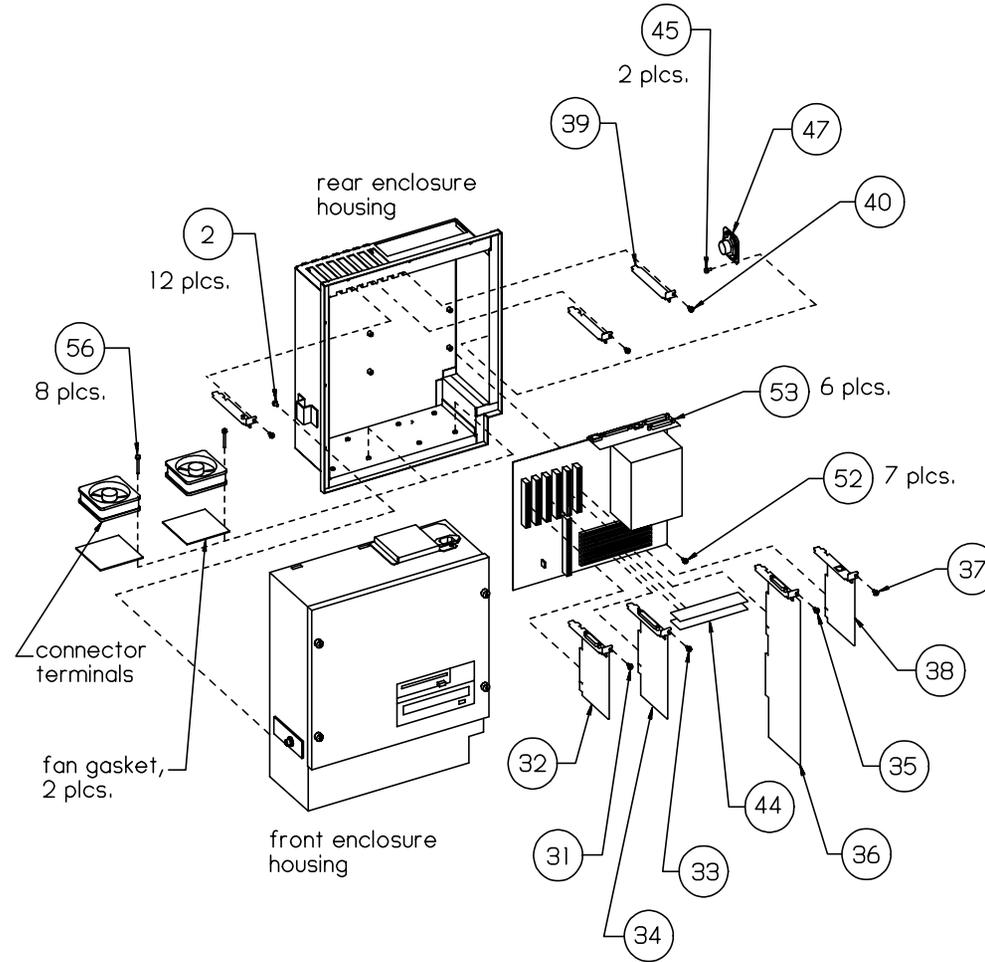


Figure 27A

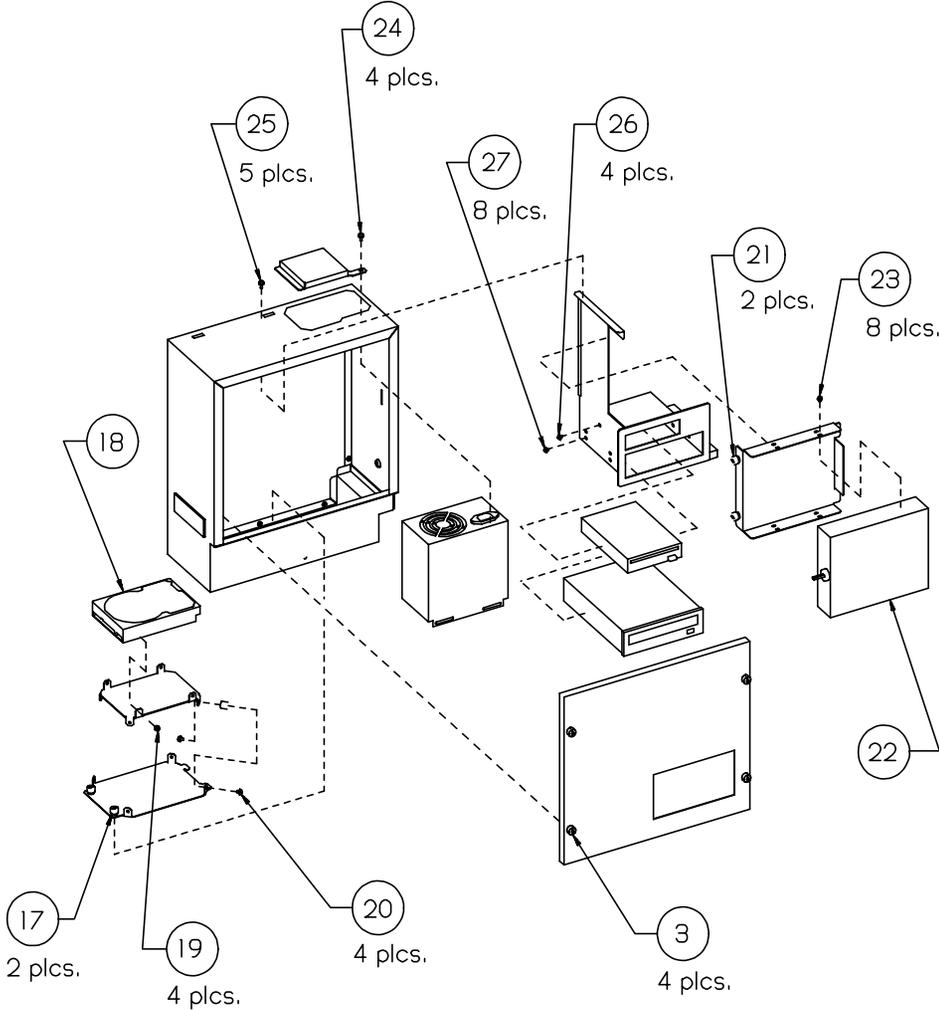


Figure 27B

Ethernet Card

Removal

1. Remove the Workstation monitor cover.
2. Remove the Workstation rear panel cover.
3. Remove the Workstation lower-left side cover.
4. Remove the Workstation lower-right side cover.
5. Loosen the 2 retainer screws on the rear door of the Electronics Box, then open the door.
6. Loosen the 2 retainer screws on the side door of the Electronics Box, then open the door.
7. Locate the Ethernet Card PCB, typically plugged into PCI slot 4 on the passive backplane motherboard.
8. Disconnect the Dual Ethernet Cable's J7 connector from the top of the Ethernet Card.
9. Remove the torx screw that attaches the Ethernet Card's mounting bracket to the motherboard mount. See Figure 28 (next page).
9. Unplug the Ethernet Card from the motherboard and remove it from the Electronics Box. See Figure 28 (next page).

Installation

Install the Ethernet Card by performing the previous removal steps in reverse.

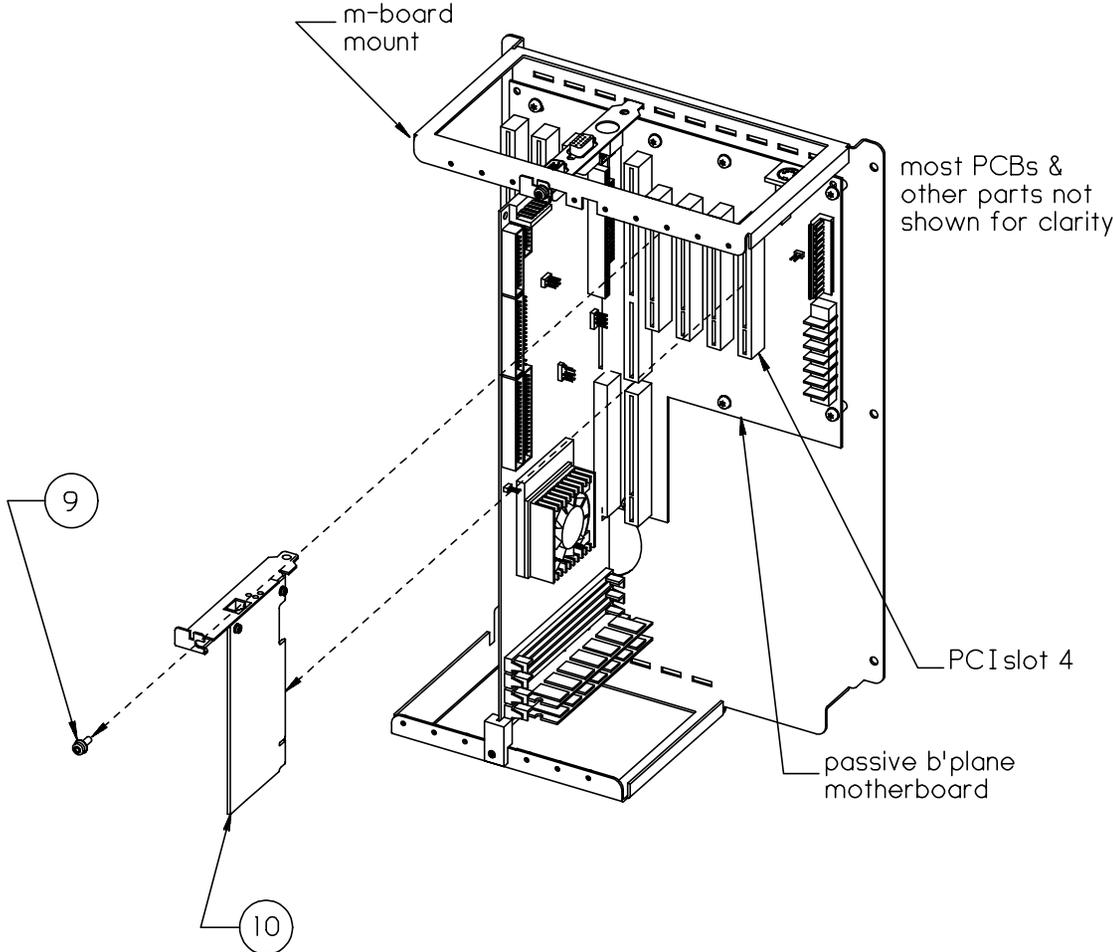


Figure 28

Diagnostics

Error Messages

Work Station Error Messages	
Message	Possible Problem
Navigation Computer not responding, Power Off, wait 10 seconds, then Power On	Navigation Computer power input (see Power Distribution, earlier in this document)
	Private (Local) network (see Network, earlier in this document)
	Navigation Computer booting (see Navigation Computer, earlier in this document)

SNS Error Messages	
Message	Possible Problem
"SUNW hme0 - Link down, Cable problems?"	DICOM functionality. See External Network, in the Navigation Computing section.
ZNB (0) : 100 Mbps Full-Duplex	Initialization trouble. This message must appear during the normal boot process. If it does not, refer to Navigation Computer Booting fault isolation chart.
WARNING: Tracking Inactive. System can only be used to perform surgical planning.	FluoroTrak Unit power input (see Power Distribution, earlier in this document).
	FluoroTrak Unit function (see Tracking, earlier in this document).

Calibration

Not applicable.