da Vinci® Si HD™ SURGICAL SYSTEM

User Manual

PN 550650-09 Rev. A 2014.09

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INTUITIVE SURGICAL®

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Equipment and Software Version

This user manual provides technical information about the use and operation of the IS3000 *da Vinci® Si™* Surgical System. The equipment described herein is designed to work with the *da Vinci Si* Surgical System operating system version A6.0 P8 and later.

Rx only

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1 Introduction

1.1 User Manual Organization

This *da Vinci Si* Surgical System User Manual provides information specific to the use of the *da Vinci Si* Surgical System, also known as the Endoscopic Instrument Control System, Model IS3000, including the *da Vinci Si-e* Surgical System. The operating instructions and feature descriptions herein are specific to the software version listed on page ii.

Note: *da Vinci Si* System users must follow all instructions for use supplied with the system, its components, instruments and accessories, including the Instruments and Accessories User Manual (PN 550675), the Reprocessing Instructions (PN 550875) and any instructions for use (IFUs) provided with instruments or accessories.

Note: Certain features of the *da Vinci Si* System are not available on the *Si-e* System. If you are using an *Si-e* System, refer to Appendix B: da Vinci Si-e Surgical System for further explanation of the differences.

We organized this user manual for usability. First, to supply the steps you need to get things done, and later to provide detail that supports increasing expertise in specific tasks or components. The manual consists of the following sections.

Chapters

- Chapter 1 Introduction (the section you are reading now). Contains regulatory and safety information to be read by every user of the *da Vinci Si* System. Includes general precautions, precautions specific to procedures, power information and the like.
- Chapter 2 System Overview: Briefly describes system components and use, including features and benefits.
- Chapter 3 OR Configuration: Explains where to place the main components within the operating room.
- Chapter 4 System Connections: Explains how to connect power, system cables, auxiliary devices and supplemental video and audio devices to the system.
- Chapter 5 Startup: Gives instructions for starting all system components.
- Chapter 6 Draping: Explains how to drape the system components before surgery.
- Chapter 7 Vision System Use: Explains how to prepare the Vision Cart for use.
- Chapter 8 Patient Preparation, Port Placement, and Docking: Explains how to prepare the patient for surgery, including port placement and docking of the Patient Cart to the ports.
- Chapter 9 Patient Cart Use: Describes the Patient Cart in detail, gives instructions to use the Patient Cart arms, and the *EndoWrist*® instruments and 3D endoscope that attach to them.
- Chapter 10 Surgeon Console Use: Explains the capabilities of the Surgeon Console, including how to make pre-surgery adjustments and its different operating modes.
- Chapter 11 System Shutdown and Storage: Explains system shutdown, storage and inventory management.

- Chapter 12 Cleaning and Maintenance: Gives instructions to clean and maintain the system, instruments and accessories, and to change the Illuminator lamp module.

Appendices

Each appendix contains reference material as indicated by its title. Note that Appendix B: da Vinci Si-e Surgical System, Appendix D: VisionBoom™ Use Instructions and Appendix E: OnSite™ for da Vinci® Surgical System are applicable only if your system is configured with the required hardware and/or software.

- Appendix A: Error Handling
- Appendix B: da Vinci Si-e Surgical System
- Appendix C: Illuminator Information
- Appendix D: VisionBoom™ Use Instructions
- Appendix E: OnSite™ for da Vinci® Surgical System
- Appendix F: 8.5 mm Endoscope for the da Vinci Si System
- Appendix G: Symbols, Icons and Text Messages Reference
- Appendix H: System Specifications
- Appendix I: Natural Rubber Latex
- Appendix J: Glossary of Terms

The manual closes with an alphabetical Index of subjects and headings.

Note: For optimal visibility of system hardware, this manual usually presents photographs of the Patient Cart and Vision Cart without sterile drapes, except in Chapter 6 Draping, which explains how to drape the system for surgery.

1.2 General Information

Contact Information

For Customer Service and Reporting of Complaints or Adverse Events

Use the following information for customer service, including ordering, reporting complaints or adverse events, and general information regarding *Intuitive Surgical* or our products and services.

In the U.S.
Intuitive Surgical, Inc.
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Sunnyvale, CA 94086 USA
Toll free: 1.800.876.1310
Direct: 408.523.2100
Fax: 408.523.2377

In Europe:
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1, chemin des Mûriers,
1170 Aubonne, Switzerland
Toll free: +800.0821.2020
Direct: +41.21.821.2020
Fax: +41.21.821.2021

For Technical Support

If the system requires maintenance or service, please call our Technical Support line. In the US, call 1-800-876-1310, where phones are staffed 24 hours a day, seven days a week. In Europe, call +41.21.821.2020.

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Compliance and Classifications

CE
0543

The *Intuitive Surgical da Vinci Si* Endoscopic Instrument Control System, Model IS3000, is in conformance with the Medical Device Directive, 93/42/EEC.

The *da Vinci Si* System is designed to be in compliance with IEC 60601-1, with the following mode of operation, and type and degree of protection against electric shock.

- **Mode of Operation:** Continuous
- **Type of Protection:** Class I
- **Degree of Protection:** CF for all patient applied parts (inserted portion of instruments), except BF for PK Dissecting Forceps. Please see Instruments and Accessories User Manual (PN 550675) for additional details.
- **Ingress Protection:** Ordinary, except footswitch on the Surgeon Console, which is rated IPX8.

The *da Vinci Si* Endoscopic Instrument Control System (Model IS3000) is manufactured in the USA.

The system components may have labels as represented in Figure 1.1 and Figure 1.2.

For labels as represented in Figure 1.1 (IEC 2nd Edition) the *da Vinci Si* System Model IS3000 is classified with respect to electric shock, fire and mechanical hazards only in accordance with UL60601-1, CAN/CSA C22.2 No. 601.1, IEC and CAN/CSA C22.2 Nos. 60601-1, 60601-1-1, 60601-1-4, 60601-2-2, and 60601-2-18.

For labels as represented in Figure 1.2 (IEC 3rd Edition) the *da Vinci Si* System Model IS3000 is classified with respect to electric shock, fire and mechanical hazards only in accordance with ANSI/AAMI ES60601-1 (2005/(R) 2012), CAN/CSA-C22.2 Nos. 60601-1 (2014), 60601-2-2 (2009), 60601-2-18 (2011), and IEC publications 60601-1 (2012), 60601-2-2 (2009), and 60601-2-18 (2009).

CLASSIFIED C UL US 63MK

The *da Vinci Si* system, also referred to as the Endoscopic Instrument Control System Model IS3000, consists of a Surgeon Console, Model SS3000, Patient Cart, Model PS3000, and Vision Cart, Model VS3000; the Vision Cart contains the Core, Model CR3000, and Camera Control Unit (CCU), Model DC3000. The Surgeon Console, Model SS3000, the Patient Cart, Model PS3000, and the Vision Cart, Model VS3000, including the Core, Model CR3000, and Camera Control Unit (CCU), Model DC3000, have been evaluated for compliance with above referenced standards by a Nationally Recognized Test Laboratory (NRTL), Underwriters Laboratories, Inc. (UL). Accessories referenced in the Instruments and Accessories User Manual were not covered by the UL evaluation.

⚠ **CAUTION: The *da Vinci Si* is not suitable for use in the presence of a flammable anesthetic mixture of air, oxygen and/or nitrous oxide.**

System Labels

Note: This user manual identifies labels as they appear on systems configured for destinations in the USA. The languages supplied on labels may vary by the country or countries for which a system is configured.

Note: The unit identification label includes the serial number, electrical ratings, and date of manufacture. It may be necessary for the reader to be as close as 6 in (15 cm) from the label to read this information.

Model IS3000 system components have individual system labels as shown below, all of which repeat the same information except to specify the model (at upper right) and power requirements (at lower right). Components with these labels include the Surgeon Console, Model SS3000; Patient Cart, Model PS3000 Vision Cart, Model VS3000; Instrument Control Box, Model ICB3000; Core, Model CR3000; and Camera Control Unit (CCU), Model DC3000. The information supplied by these labels is repeated in this chapter

Figure 1.1 System labels: IEC 2nd Edition

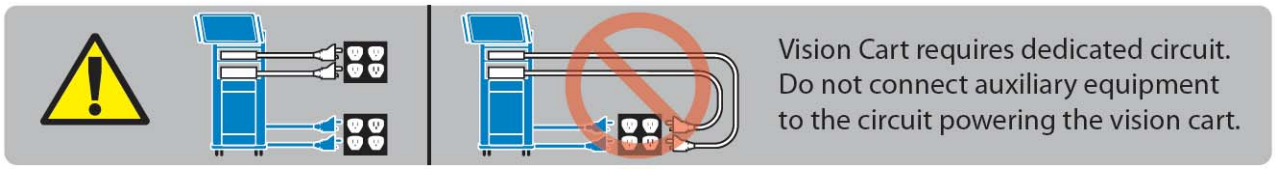
Figure 1.2 System Labels: IEC 3rd Edition

Power Requirements

The *da Vinci Si* System has three main components requiring electrical power: the Surgeon Console, the Patient Cart, and the Vision Cart. To ensure optimum performance, make sure each component of the *da Vinci Si* System is connected to a dedicated, noise-free and well-grounded AC power outlet.

⚠ **CAUTION: To avoid overloading circuits, all three components—Surgeon Console, Patient Cart and Vision Cart—must operate on separate, dedicated power circuits. *Do not connect ancillary devices such as insufflators or energy devices through any system component, particularly not through the Vision Cart because it has large power requirements.* Ancillary devices must be connected to wall outlets on separate circuits from all system components.**

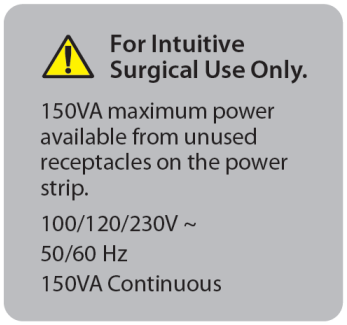
A label on the rear of the Vision Cart reinforces this caution. Its text appears below the label image.



"Vision Cart requires dedicated circuit. Do not connect auxiliary equipment to the circuit powering the Vision Cart."

Figure 1.3 Vision Cart power caution label

The integrated power strip in the Vision Cart also has the label below:

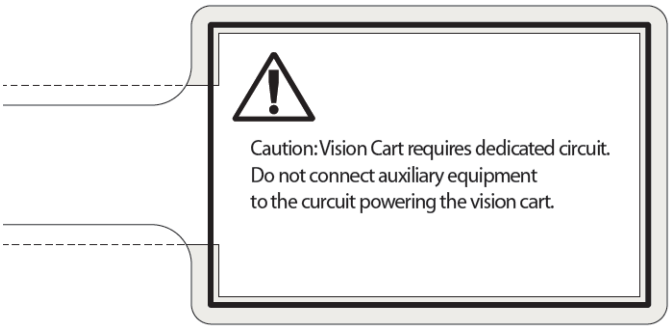


"**For Intuitive Surgical Use Only.**
150 VA maximum power available from unused receptacles on the power strip.

100/120/230V~
50/60 Hz
150 VA Continuous"

Figure 1.4 Vision Cart integrated power strip caution label

A label wrapped around the Vision Cart power cord also reinforces this point:



Caution: Vision Cart requires dedicated circuit. Do not connect auxiliary equipment to the circuit powering the Vision Cart.

Figure 1.5 Vision Cart power cord caution label

The Surgeon Console, Patient Cart, and Vision Cart automatically adapt to 100VAC, 120VAC, or 230VAC. (This is called "Auto Sense" in the table below.) Please refer to the electrical rating label located on the bottom rear panel of the *da Vinci Si* System components.

System Component	Voltage	Rating
Surgeon Console	100/120/230V~ 50/60Hz Auto Sense	1000VA Continuous
Patient Cart	100/120/230V~ 50/60Hz Auto Sense	1000VA Continuous
Vision Cart– includes Core and Camera Control Unit	100/120/230V~ 50/60Hz Auto Sense	1500VA Continuous
Core[a,b]	100/120/230V~ or 100-230V~ 50/60Hz Auto Sense	650VA Continuous
Camera Control Unit (CCU)[a]	100/120/230V~ 50/60Hz Auto Sense	100VA Continuous

a. Core and Camera Control Unit (CCU) power requirements are included in the Vision Cart. These are provided separately for reference only.
b. If the Core is powered separately from the Vision Cart, it must be powered from a center-tapped, 240V, single phase circuit. This applies to the US only.

Environmental Specifications

Environmental Conditions: Operating	
Temperature:	10 to 30 °C (50 to 86 °F)
Humidity:	10 to 85% non-condensing
Atmospheric Pressure – System:	The IS3000 shall function properly in atmospheric pressures ranging from 523 mm HG (10,000 ft) to 774 mm HG (-500 ft). For every 1000 feet above sea level, the 30 °C operational temperature limit specified above will be reduced by 1 °C. (For example, the maximum operating temperature at 5000 feet will be 25 °C, and the maximum operating temperature at 10,000 feet will be 20 °C.)
Atmospheric Pressure – Instrument Control Box (ICB):	The ICB shall function properly in atmospheric pressures ranging from 526 mm HG (3000 m) to 774 mm HG (-150 m). For every 300 m above sea level, the 30 °C operational temperature limit specified above will be reduced by 1 °C. (For example, the maximum operating temperature at 1500 m will be 25 °C, and the maximum operating temperature at 3000 m will be 20 °C.)

Environmental Conditions: Storage and Transport	
Temperature:	-10 to 55 °C (14 to 131 °F)
Humidity:	5 to 95% non-condensing for transport 10 to 85% non-condensing for storage

Note: Storage and transport of the system are not affected by atmospheric pressure.

1.3 Professional Instructions for Use

Essential Prescribing Information

- **Device Name:** *Intuitive Surgical® da Vinci® Si™* Endoscopic Instrument Control System and Endoscopic Instruments.
- **Rx only:** Federal Law (USA) restricts this device to sale by or on the order of a physician (or properly licensed practitioner).

Indications for Use

The *Intuitive Surgical* Endoscopic Instrument Control System is intended to assist in the accurate control of *Intuitive Surgical* Endoscopic Instruments including rigid endoscopes, blunt and sharp endoscopic dissectors, scissors, scalpels, ultrasonic shears, forceps/pick-ups, needle holders, endoscopic retractors, stabilizers, electrocautery and accessories for endoscopic manipulation of tissue, including grasping, cutting, blunt and sharp dissection, approximation, ligation, electrocautery, suturing, and delivery and placement of microwave and cryogenic ablation probes and accessories, during urologic surgical procedures, general laparoscopic surgical procedures, gynecologic laparoscopic surgical procedures, transoral otolaryngology surgical procedures restricted to benign and malignant tumors classified as TI and T2, general thoracoscopic surgical procedures, and thoracoscopically assisted cardiotomy procedures. The system can also be employed with adjunctive mediastinotomy to perform coronary anastomosis during cardiac revascularization. The system is indicated for adult and

pediatric use (except for transoral otolaryngology surgical procedures). It is intended to be used by trained physicians in an operating room environment in accordance with the representative, specific procedures set forth in the Professional Instructions for Use.

Representative Uses

The *Intuitive Surgical* Endoscopic Instrument Control System has been successfully used in the following procedures, among others:

- Radical prostatectomy, pyeloplasty, cystectomy, nephrectomy, ureteral reimplantation
- Hysterectomy, myomectomy, sacrocolpopexy
- Cholecystectomy, Nissen fundoplication, Heller myotomy, gastric bypass, donor nephrectomy, adrenalectomy, splenectomy, bowel resection and other colorectal procedures
- Internal mammary artery mobilization, cardiac tissue ablation
- Mitral valve repair, endoscopic atrial septal defect closure
- Mammary to left anterior descending coronary artery anastomosis for cardiac revascularization with adjunctive mediastinotomy

Note: For additional information and precautions related to cardiac tissue ablation, refer to the section on ablation probes in the Instruments and Accessories User Manual.

Representative Pediatric Uses

The *Intuitive Surgical* Endoscopic Instrument Control System has been successfully used in the following pediatric surgical procedures, among others;

- Pyeloplasty, ureteral reimplantation
- Cholecystectomy, Nissen fundoplication
- Aortic ring ligation, patent ductus arteriosus ligation
- Atrial septal defect closure

Training

The system should be used only by surgeons who have developed adequate robotic skills to perform the tasks associated with each procedure and who have received specific training provided by Intuitive Surgical, Inc. in the use of this device. Training provided by *Intuitive Surgical* is limited to the use of the *da Vinci Si* Surgical System and does not replace the necessary medical training and experience required to perform surgery.

WARNING: Performance characteristics for conduct of totally endoscopic coronary artery bypass surgery (CABG) have not been fully established. The system should only be used for CABG when there is direct surgical access to the surgical field.

WARNING: Performance characteristics of autologous venous coronary artery bypass surgery (CABG) using the *da Vinci Si* Surgical System have not been established.

⚠ CAUTION: **The clinical evaluation of the *da Vinci Si* Surgical System supporting its use for mitral valve repair was not performed totally endoscopically. Introduction and manipulation of the endoscopic instruments were controlled by the *da Vinci Si* Surgical System through port incisions (< 1 cm) while accessory technologies, e.g., atrial retractor and cardioplegia line, etc., were introduced through a mini-thoracotomy. Performance characteristics for conduct of totally endoscopic mitral valve repair using the *da Vinci Si* System have not been established.**

⚠ CAUTION: **The friable nature of pulmonary tissue enhances the risk of vascular, bronchiolar, or other injury that will be difficult to control when using this device. Published clinical experience as well as clinical studies performed to support this marketing clearance have demonstrated that even surgeons considered expert in laparoscopy/thoracoscopy have substantial learning curves of 10 to 12 cases (Falk 2000).[1]**

Additional Considerations for Pediatric Surgical Procedures

Precautions for Use in Smaller Patients

- Performance in pediatric surgical procedures is based on similarity of tasks performed in adult surgical procedures. As is appropriate with any surgical procedure, consideration must be given to patient size and workspace volume when using the system and instruments.
- As in any patient of smaller size, the possibility of misalignment of the remote center with the body exists. In order to minimize forces on the body wall, care must be taken to ensure the remote center is properly aligned with the body wall.

1.4 General Precautions, Warnings, and Contraindications

The *da Vinci Si* System is to be used in accordance with this manual and should not be moved or used by any person who has not been trained by an Intuitive Surgical, Inc. representative. Read all instructions carefully. Failure to properly follow instructions, notes, cautions, warnings and danger messages associated with this equipment may lead to serious injury or surgical complications for the patient. While these messages appear throughout the manual, this chapter provides some general precautions.

Any and all relative and absolute contraindications to endoscopic surgical technique applicable to the use of conventional endoscopic surgical instruments apply to the use of the *da Vinci Si* System. General, non-procedure specific, contraindications to endoscopic surgery include bleeding diathesis, morbid obesity and pregnancy.

1. Falk, et al., Total endoscopic computer enhanced coronary artery bypass grafting, Eur J Cardiothorac Surg 2000; 17: 38-45.

Conversion to Non-Minimally Invasive Technique

⚠ CAUTION: **Although the *da Vinci Si* System is safe and reliable, anatomical characteristics of a patient may preclude using minimally invasive techniques. Environmental or equipment failures may cause the *da Vinci Si* System to be unavailable. The surgical team should always have backup equipment and instrumentation available, and be prepared to convert to alternative surgical techniques. The potential risk of such conversion should be communicated to the patient.**

Endoscopic Procedure Precautions

Only physicians having adequate training and experience with endoscopic techniques should perform endoscopic procedures with the *da Vinci Si* System. Medical literature should be consulted regarding techniques, complications, and hazards before performing any endoscopic procedure.

⚠ **WARNING: Hazards may exist with over-insufflation, such as gas embolism.**

⚠ CAUTION: **When using the *da Vinci Si* System with insufflation, only CO2 should be used as the insufflating gas. Insufflation should only be performed by personnel having adequate training and experience with this technique.**

⚠ CAUTION: **Thermal hazards may exist from high temperatures. Eye hazards may exist from the high energy light radiated by the endoscopic camera and illumination system. Only personnel having adequate training and experience with the endoscopic camera and illumination system should operate such equipment. All WARNING and CAUTION messages provided with the endoscopic camera and illumination system must be followed.**

⚠ CAUTION: **The *da Vinci Si* is not suitable for use in the presence of a flammable anesthetic mixture of air, oxygen and/or nitrous oxide.**

⚠ CAUTION: **The force feedback associated with the *da Vinci Si* System is different from feedback experienced when using conventional instruments. As with any endoscopic procedure, the surgeon should rely on visual cues to enhance force feedback.**

⚠ CAUTION: **Do not clean instrument tips with another instrument intraoperatively. If an instrument tip requires cleaning, remove the instrument from the cannula and gently clean the tip.**

High Frequency Electrosurgery Precautions

The safe and effective use of endoscopic electrosurgery largely depends on factors solely under the control of the operating surgeon. Only surgeons having adequate training and experience with endoscopic electrosurgery should perform endoscopic procedures involving electrosurgery. The instructions, warnings and cautions provided with the Electrosurgical Generator Unit (ESU) must be followed or else serious injury or surgical complications may occur to the patient.

⚠ CAUTION: **Do not use electrosurgical equipment unless properly trained in the specific procedure being undertaken. Follow all instructions, warnings, and cautions provided with the ESU.**

⚠ CAUTION: **Inadvertent electrosurgical energy may cause serious injury or surgical complications to the patient. It is important to ensure a full understanding of the *da Vinci* Surgical System energy user interface and use caution when working near critical anatomy.**

⚠ CAUTION: **The *Intuitive Surgical* monopolar electrosurgical instruments are designed for use with a maximum peak voltage of 3kV (6kV peak-to-peak). Do not use settings on the ESU that exceed a 3kV peak. Do not attempt to use the footswitch on the Surgeon Console with ESUs that are not compatible with the *da Vinci Si* System. Consult with your *Intuitive Surgical* representative regarding compatible models. A table in the Instruments and Accessories User Manual lists compatible generators, modes and maximum power settings to stay below the 3kV peak limit.**

⚠ CAUTION: **Electrosurgery may produce interference with internal or external pacemakers. Electrosurgery may cause these devices to enter an asynchronous mode or may inhibit pacemaker operation entirely. Consult the pacemaker manufacturer for further information when using electrosurgery in patients with cardiac pacemakers.**

⚠ CAUTION: **Always check the cables, ESU, and instruments for insulation damage and proper function before use.**

⚠ CAUTION: **To avoid inadvertent thermal damage to surrounding tissue and other hazards, observe the following.**

- Ensure that the dispersive electrode is securely affixed to the patient, placed as close as possible to the operating field, and properly connected to the ESU.
- For monopolar instruments, always use the lowest output setting that achieves the desired surgical effect while staying within 3kV maximum peak voltage. Maximum power levels to stay below this limit are listed in a table in the Instruments and Accessories User Manual.
- Do not deliberately or unintentionally use one instrument to energize other endoscopic instruments. Energizing other endoscopic instruments may cause tissue damage inside or outside the field of view. This damage could occur at points near the tip or at the port site (cannula) of the energized instrument.
- Secure and route the ESU cable to the *Intuitive Surgical* Instrument to prevent cable damage and unintended disconnection.
- Keep patient from coming in contact with grounded metal parts.
- Place any monitoring electrodes as far as possible from the surgical electrodes or the dispersive electrode when high frequency (HF) surgical equipment and physiological monitoring equipment are used simultaneously on the same patient.
- Do not use flammable anesthetics or oxidizing gases such as nitrous oxide and oxygen.
- Use only non-flammable agents for cleaning and disinfecting. If flammable agents are used for cleaning or disinfecting or as solvents, they must be allowed to evaporate before application of HF energy.

⚠ CAUTION: **Make certain that the ESU audible output can be heard by the operating surgeon during ESU use with the *da Vinci Si* System.**

Installation and Service Precautions

⚠ **CAUTION: The *da Vinci Si* System may only be installed and serviced by *Intuitive Surgical* personnel. DO NOT attempt to install or service equipment without *Intuitive Surgical* personnel. To reduce risk of electric shock, DO NOT open or remove covers except as instructed in this user manual.**

⚠ **WARNING: No modification of this equipment is allowed.**

⚠ **WARNING: To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.**

Building Vibrations

It is possible for ambient vibrations in the building to be transmitted through the operating room floor to the instrument tips. When present, such vibrations may be more noticeable when using the *da Vinci* System in procedures where cannulae are not inserted through the patient body wall. Be aware of this possibility when deciding where to install and when to use the *da Vinci* System. The system has no specification for permissible levels of ambient vibration.

Floor Angle

The *da Vinci Si* System must be installed on a level floor.

Laser Safety

Class 1 Laser Product: The IS3000 circuit boards may be equipped with optical communication transmitters, which have been evaluated and found to be in compliance with requirements found within 21 CFR (FDA-CDRH) and EN 60825-1 for Class 1 laser devices.

⚠ **CAUTION: While Class 1 laser products are considered to be "eye safe" without the need for additional protection, when working around the circuit boards, the following general safety guidelines should be observed to reduce the risk of eye injury:**

- Do not look or stare at optical fiber ports or optical fibers that are connected to a light source.
- Do not examine with optical instruments optical fiber ports or optical fibers that are connected to a source. The use of optical instruments (for example, a magnifying glass) may increase eye hazard.
- Adjustments and settings, maintenance, operational parameters and procedures other than those specified and allowed herein and on the rating plate of the IS3000 may result in increased eye hazard.
- Do not attempt to perform any repair or maintenance on optical communications components. Repairs and maintenance outside that which is allowed herein must be performed only by an authorized repair facility.

Transportation and Storage Precautions

When transporting or storing the *da Vinci Si* System, the Patient Cart should have the instruments and camera removed and the setup joints folded-in toward the center column (see 11.4 Storing the System on page 11-4 for an example of what the Patient Cart looks like with the arms folded). To move the Surgeon Console, release both brakes. Always use the

handles on the sides of the Surgeon Console to move the console. Always use the handle on the Patient Cart to move the cart. See Chapter2 System Overview and Appendix J: Glossary of Terms for definitions. For instructions on moving the Patient Cart, see Motor Drive Operation on page 3-3.

Note: Use extreme care when moving or positioning the Patient Cart to ensure the arms do not hit any objects. If an arm hits an object while the Patient Cart is being moved or positioned, contact *Intuitive Surgical* Technical Support to have the Patient Cart inspected for damage.

CAUTION: The Surgeon Console and Patient Cart are heavy and may present a hazard if control is lost when moving. Only trained personnel should attempt to move the *da Vinci Si* System.

Instrument and Endoscope Isolation Precautions

The cannula mounts, sterile adapters and instrument insulation are isolation barriers to electrical current. These parts need to be maintained unmodified for patient safety.

CAUTION: Do not modify the cannula mounts, sterile adapters or instruments. Modifications can result in electrical hazards or performance degradation.

Arm Positioning Precautions

CAUTION: When activating the port clutch or instrument clutch buttons, keep fingers clear of the joints located on the camera and instrument arms to avoid injury.

- The label at left, which indicates a pinch or crush hazard, appears below the upper port clutch button and at the junction of setup joint and top of column on instrument and camera arms. It also appears on the Surgeon Console on the top of the column and rear and sides of the stereo viewer, and on the sides and top of the linkages connecting the stereo viewer to its supports.

CAUTION: Do not touch any wire harnesses or mechanical cables located on the camera or instrument arms while simultaneously touching the patient or when positioning the arms.

Accessory Equipment Interconnection

Accessory equipment connected to the analog and digital interfaces must be certified to the respective IEC standards (i.e. IEC 60950 for data processing equipment and IEC 60601-1 for medical equipment.) All configurations shall comply with the system standard IEC 60601-1-1. Anyone connecting additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible for ensuring that the system complies with requirements of the system standard IEC 60601-1-1. If you have any questions, please contact your *Intuitive Surgical* representative.

CAUTION: Leakage current from interconnected electrical equipment may exceed safe levels. In order to maintain patient and user safety, it is important to interconnect only with devices in compliance with IEC 60601-1-1 requirements. It is the responsibility of the user to ensure that any interconnected equipment not supplied by *Intuitive Surgical* maintains compliance with IEC 60601-1-1 requirements.

⚠ **CAUTION: Leakage currents from other endoscopic instruments may be additive. To ensure maximum safety for the patient, only Type CF endoscopic accessories should be used with the *da Vinci Si* System.**

Potential Equalization

Where required by national laws or local regulations, equipotential bonding of equipment may be accomplished by connecting an potential equalization conductor to the equipotential terminals located near the mains inlet on each sub assembly of the system. See the requirements for medical electrical systems in standard IEC 60601-1.

Viewing 3D Images Precaution

The following general caution derives from the general impact on some people of viewing 3D images, which is related to viewing certain flashing images or lights in video or television images. If you or your family has history of epilepsy or stroke, please consult with a medical specialist before viewing 3D images in the stereo viewer of the Surgeon Console, or on external third-party 3D monitors.

⚠ **CAUTION: Some users who view 3D images in the stereo viewer or external third-party 3D monitors may experience seizures; altered vision; lightheadedness; dizziness; involuntary movements such as eye or muscle twitching; confusion; nausea; loss of awareness; convulsions; cramps; and/or disorientation. Viewing 3D images in the stereo viewer or external third-party 3D monitors may also cause motion sickness, perceptual after effects, eye strain and decreased postural stability. If you have any of the above symptoms, immediately discontinue use of this device and do not resume until symptoms have subsided.**

1.5 Electromagnetic Compatibility

The IS3000 has been tested and found to be in compliance with **IEC 60601-1-2, International standard for Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests**. It is intended to be used in an operating room environment and operation of the IS3000 is unaffected when used in the electromagnetic environment as specified in Tables 2 – 4 below in this section 1.5 Electromagnetic Compatibility. Special precautions and installation information for the IS3000 for electromagnetic compatibility (EMC) are provided in this section.

The performance of the IS3000 system is unaffected when exposed to full range of electromagnetic environment as described in the IEC 60601-1-2 standard. There is no degradation of performance and therefore no risks to the patient or other devices due to Electromagnetic Interference (EMI) when used in the electromagnetic environment as specified in Tables 2 – 4 below in this section 1.5 Electromagnetic Compatibility.

Use only *Intuitive Surgical*-branded interconnection cables and accessories. Performance of cables or accessories other than those specified by *Intuitive Surgical* as replacement parts for internal components cannot be guaranteed. Any resulting damage to the system will not be covered under warranty.

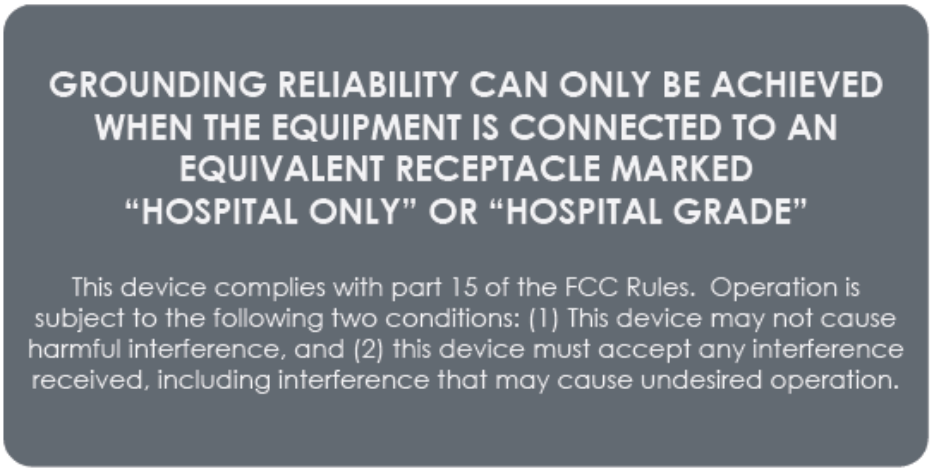
Equipment in the operating room, including the IS3000 and other portable or mobile communications equipment, can produce Electromagnetic Interference (EMI), which may affect the function of these devices. Such effects are prevented by use of equipment with EMI characteristics proven below recognized limits, as identified in the below tables.

In the event of suspected interference from other equipment, which prevents the proper functioning of the *da Vinci* Surgical System, contact *Intuitive Surgical* and/or discontinue use of the system until the problem can be remedied.

FCC Compliance

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

In regard to grounding reliability and electromagnetic interference, see the label below, which appears on the Surgeon Console and Patient Cart. Its text is repeated below the label image:



GROUNDING RELIABILITY CAN ONLY BE ACHIEVED WHEN THE EQUIPMENT IS CONNECTED TO AN EQUIVALENT RECEPTACLE MARKED "HOSPITAL ONLY" OR "HOSPITAL GRADE"

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

EMC Tables

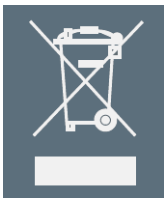
The following tables contain the Manufacturer's declaration and additional information required by IEC60601-1-2.

Table 1: Manufacturer's Declaration – Electromagnetic Emissions		
The IS3000 is intended for use in the electromagnetic environment specified below. The customer or the user of the IS3000 should assure that it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic Environment – Guidance**
RF emissions CISPR 11	Group 1	The IS3000 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic environment.
RF emissions CISPR 11	Class A	The IS3000 is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Table 2: Manufacturer's Declaration – Electromagnetic Immunity			
The IS3000 is intended for use in the electromagnetic environment specified below. The customer or the user of the IS3000 should assure that it is used in such an environment.			
Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment Guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for power supply lines ±1 kV for input/ output lines	Mains power quality should be that of a US commercial or hospital environment with highly reliable service.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a US commercial or hospital environment with highly reliable service.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec.	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec.	Mains power quality should be that of a US commercial or hospital environment with highly reliable service. If the user of the IS3000 requires continued operation during power mains interruptions, it is recommended that the IS3000 be powered from an uninterruptible power supply.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: UT is the AC mains voltage before application of the test level.			

Table 3: Manufacturer's Declaration – Electromagnetic Immunity			
The IS3000 is intended for use in the electromagnetic environment specified below. The customer or the user of the IS3000 should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidance**
Conducted RF IEC 61000-4-6 **Radiated RF IEC 61000-4-3**	3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 Vrms 3V/m	Portable and mobile RF communications equipment should be used no closer to any part of the IS3000, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 
Note 1: At 80 MHz and 800 MHz, the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people. a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the IS3000 is used exceeds the applicable RF compliance level above, the IS3000 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orientating or relocating the IS3000. b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Table 4: Recommended separation distances between portable and mobile RF communications equipment and the IS3000			
The IS3000 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the IS3000 can help prevent electromagnetic interferences by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the IS3000 as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter W	**Separation distance according to frequency of transmitter m**		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. Note 1: At 80 MHz to 800 MHz, the separation distance for the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			



1.6 Disposal Information

Dispose of in accordance with local regulations—particularly applies to electronic components.

Battery Disposal

The *da Vinci Si* System contains one non-spillable, lead acid battery pack module and several lithium batteries that are not user serviceable. These batteries must be disposed of in accordance with local regulations. Contact your local *Intuitive Surgical* representative for disposal information.

End of section

2 System Overview

The *da Vinci Si* Surgical System is a sophisticated robotic platform designed to enable complex surgery using a minimally invasive approach. The *da Vinci Si* System consists of three main components, shown in Figure 2.1 below, from left to right: the Surgeon Console, the Patient Cart and the Vision Cart.

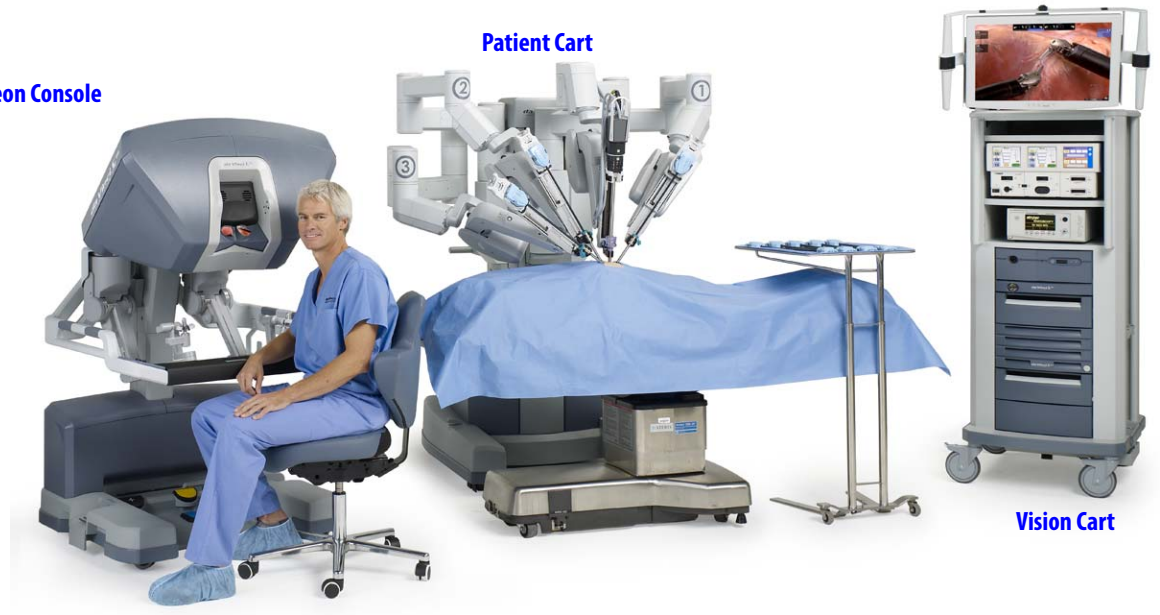


Figure 2.1 Main components of the da Vinci Si Surgical System

This chapter introduces the system components in the following sections:

2.1 The *da Vinci Si* System Main Components

Surgeon Console

The Surgeon Console (Figure 2.2) is the control center for the *da Vinci Si* System. The surgeon sits outside the sterile field at the Surgeon Console, using eyes, hands and feet to control a 3D endoscope and *EndoWrist*® instruments, by means of two master controllers and foot pedals.

Figure 2.2 Surgeon Console

As seen in the stereo viewer, instrument tips appear to align with the surgeon's hands at the master controllers. This design is intended to simulate the natural alignment of eye, hand and instrument of open surgery. Natural alignment, in turn, helps to optimize hand-eye coordination. This means that the *da Vinci Si* System enables dexterity comparable to open surgery in a minimally invasive procedure. Further control is provided by motion scaling and tremor reduction, which minimizes the impact of natural hand tremor or inadvertent movement. The Surgeon Console operator also has the option to change the view from full screen mode to a multi-image mode (TilePro™), which displays the 3D image of the operative field along with up to two additional images provided by auxiliary inputs. Lastly, the Surgeon Console has several ergonomic adjustments to accommodate a wide range of body types, providing optimal comfort while performing surgery.

Patient Cart

The Patient Cart (Figure 2.3) is the operative component of the *da Vinci Si* System, and its primary function is to support the instrument arms and camera arm.

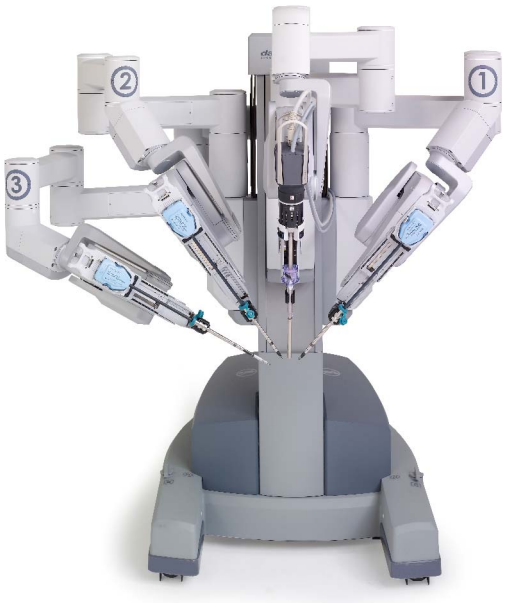


Figure 2.3 Patient Cart

The *da Vinci Si* System uses remote center technology. The remote center is a fixed point in space around which the Patient Cart arms move. Remote center technology enables the System to maneuver instruments and endoscopes in the surgical site while exerting minimal force on the patient's body wall.

The Patient Cart operator works in the sterile field, assisting the Surgeon Console operator by exchanging instruments and endoscopes, and by performing other patient-side activities. To help ensure patient-safety, the actions of the Patient Cart operator take precedence over actions of the Surgeon Console operator.

EndoWrist Instruments

Figure 2.4 Examples of EndoWrist Instruments

Intuitive Surgical designs *EndoWrist* instruments to give surgeons natural dexterity and more than natural range of motion, compared to unaided human hands. This allows for greater precision when operating in a minimally invasive environment. *EndoWrist* instruments, when used with the *da Vinci Si* System, are designed to support the most rapid and most precise suturing, dissection and tissue manipulation available with any surgical platform.

EndoWrist instruments are multi-use instruments available in 12 mm, 8 mm, and 5 mm diameters. For a complete listing of *EndoWrist* instruments, please refer to the current Instrument and Accessory Catalog (PN 871145).

Note: *da Vinci Si* is compatible with *da Vinci S EndoWrist* instruments.

Vision Cart

The Vision Cart (Figure 2.5) houses the system's central processing and vision equipment. It includes a 24" touchscreen monitor and provides adjustable shelves for optional ancillary surgical equipment such as ESUs and insufflators. It is operated by a non-sterile person during surgery.

Figure 2.5 HD Vision Cart

2.2 The *da Vinci Si-e* Surgical System

The *da Vinci Si-e* Surgical System is an upgradable configuration of the *da Vinci Si* System, visibly distinguished by a 3-arm Patient Cart. The *da Vinci Si-e* Surgical System includes an integrated monitor on top of the Vision Cart, as in the *da Vinci Si* System. However, the monitor does not have touchscreen functionality; it is a passive display system that provides OR personnel with the patient-side display only. The *da Vinci Si-e* System is designed to be upgradable at any time to a full-featured *da Vinci Si* System (single or dual console) – by *Intuitive Surgical* technicians. The table below summarizes the *Si-e* feature differences. These differences and others are further explained in Appendix B: da Vinci Si-e Surgical System.

Table 2-1 *da Vinci Si* vs. *Si-e* Comparison

Available Feature	da Vinci Si	da Vinci Si-e
***EndoWrist*® instrumentation**	yes	yes
***Single-Site*™ instrumentation**	yes	yes
Skills Simulator compatible	yes	yes

Table 2-1 *da Vinci Si* vs. *Si-e* Comparison

Available Feature	da Vinci Si	da Vinci Si-e
***OnSite*™ remote service**	yes	yes
3DHD Vision System	yes	yes
***Firefly*™ Fluorescence Imaging**	yes	yes
2-way audio system	yes	yes
VisionBoom™	yes	yes
Dual console	yes	no
***TilePro*™ multi-image display video input**	yes	no
Telestration	yes	no
Vision Cart interactive touchscreen	yes	no
Configurable video outputs	yes	no

2.3 Surgeon Console Overview

In this section, the following Surgeon Console components are described:

- Master Controllers, page 2-5
- Stereo Viewer, page 2-6
- Touchpad, page 2-7
- Left-Side Pod and Right-Side Pod, page 2-7
- Footswitch Panel, page 2-8

See Chapter 10 Surgeon Console Use for detailed instructions to use the Surgeon Console.

Master Controllers

The master controllers (Figure 2.6) provide the means for the surgeon to control the instruments and endoscope inside the patient. The master controllers are designed to allow natural range of motion and to provide ergonomic comfort, even during extended procedures.

To use the master controllers, the Surgeon Console operator grasps each controller with his/her index (or middle) finger and thumb. The operator activates and controls the *EndoWrist* instruments by bringing the finger and thumb together or apart; maneuvers the instruments

and endoscope inside the patient by moving the hands and/or arms. These movements are precisely and seamlessly replicated at the Patient Cart, thereby virtually extending the operator's hands into the surgical field. (See 10.4 Surgical Controls on page 10-22 for details.)

Figure 2.6 Master controllers

Stereo Viewer

The stereo viewer (Figure 2.7) provides the video image for the Surgeon Console operator. The ergonomically designed view port provides head and neck support for added comfort during extended procedures.

When the endoscope is activated, the stereo viewer's integrated left and right video channels provide the surgeon with continuous 3D video, extending the vision of the surgeon into the surgical field. The stereo viewer also displays messages and icons which convey status of the *da Vinci Si* System. (See Surgical Controls on page 10-22 for details.)

Figure 2.7 Stereo viewer

Touchpad

The touchpad (Figure 2.8) is located in the middle of the Surgeon Console armrest and provides the means for selecting various system functions. (See 10.3 Touchpad Controls on page 10-11 for details.)

Figure 2.8 Touchpad

Left-Side Pod and Right-Side Pod

The left-side and right-side pods (Figure 2.9) are located on either side of the Surgeon Console armrest. The left-side pod provides ergonomic controls while the right-side pod is the location for the **Power** button and **Emergency Stop** button. (See Ergonomic Setup on page 10-10 and 5.2 Powering On the System on page 5-2 for details.)

Figure 2.9 Left-side and right-side pods

Footswitch Panel

The footswitch panel (Figure 2.10) is located on the floor directly beneath the Surgeon Console operator and provides the interface for various surgical activities. (See Footswitch Panel Use on page 10-24 for details.)

Figure 2.10 Footswitch panel

2.4 Patient Cart Overview

This section provides overviews for the following Patient Cart components:

- Setup Joints, page 2-9
- Instrument Arms, page 2-9
- Camera Arm, page 2-10
- Motor Drive, page 2-11

See the following chapters for detailed instructions to use the Patient Cart:

- Chapter 3 OR Configuration for instructions to use the Patient Cart motor drive
- Chapter 6 Draping for instructions to drape Patient Cart components
- Chapter 8 Patient Preparation, Port Placement, and Docking for instructions to use the Patient Cart as you prepare for surgery
- Chapter 9 Patient Cart Use for detailed instructions to use the Patient Cart.

Setup Joints

Setup joints (Figure 2.11) are used to position the Patient Cart arms in order to establish the remote center in the surgical field. Setup joints are designed with limited freedom of movement to facilitate port placement. (See 9.2 Moving the Patient Cart Arms on page 9-3 for details.)

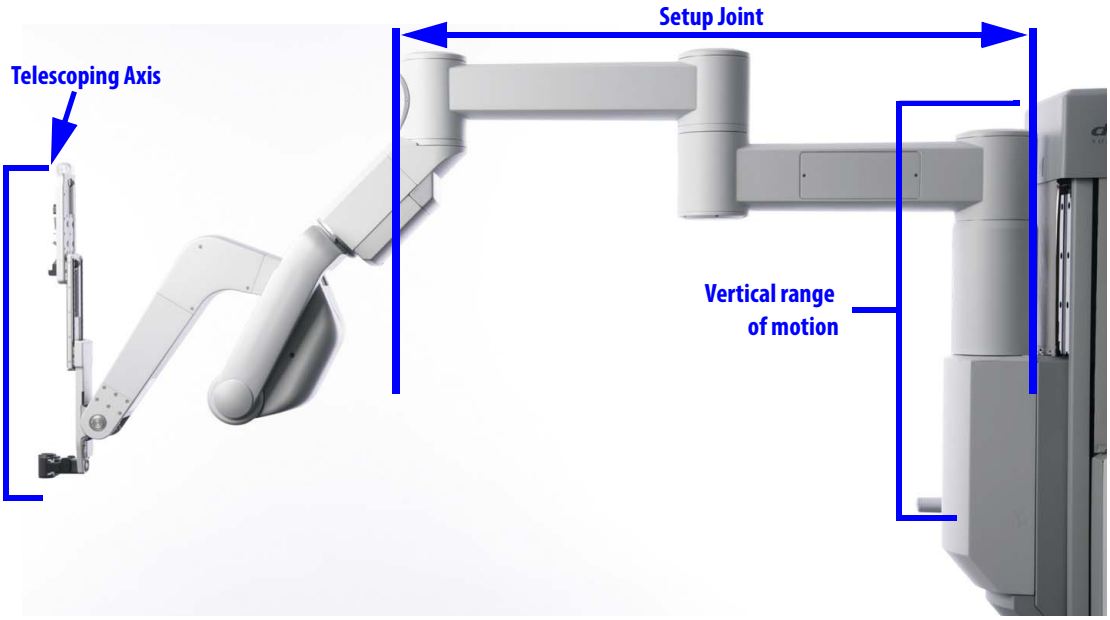


Figure 2.11 setup joint

Instrument Arms

Instrument arms (Figure 2.12), once sterile drapes are applied, provide the sterile interface for *EndoWrist* instruments. The Patient Cart operator initially positions the instrument arms in a neutral position before the procedure begins. The Surgeon Console operator moves the instrument arms using the master controllers.

Figure 2.12 Example of an instrument arm with attached instrument

A telescoping insertion axis is designed to minimize collisions and allow the Patient Cart operator to reposition instrument arms. *da Vinci Si* instrument arms also have a wide range of motion to help simplify port setup and provide greater reach into the patient anatomy.

The instrument arm remote center is indicated by the thick, center black band on the instrument cannula. When the Patient Cart is docked to a cannula inserted in the patient, the instrument arm remote center should be in the patient's body wall. This remote center location minimizes both port-site trauma and stress exerted on the *EndoWrist* instruments during surgery. The Surgeon Console operator cannot move the instrument arm remote center. However, the Patient Cart operator can reposition the remote center by pressing the port clutch button and repositioning the instrument arm.

At the top of the arms are LEDs which provide feedback on the status of each arm. For LED color interpretation, see Figure 9.2 LED Quick Reference on page 9-2.

Figure 2.13 Arm LED colors

Camera Arm

The camera arm (Figure 2.14) provides the sterile interface for the 3D endoscope. The Patient Cart operator initially positions the camera arm in a neutral position before the procedure begins. The Surgeon Console operator moves the camera arm using the Master Controls. The camera arm remote center is located near the tip of the camera cannula. At the top of the camera arm is an LED to provide feedback on the status of the arm.

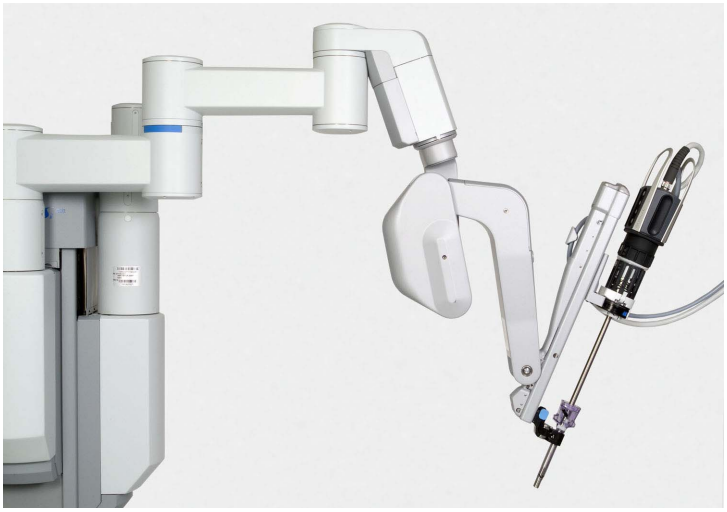


Figure 2.14 Camera arm with attached endoscope

Motor Drive

The *da Vinci Si* Patient Cart has a motorized drive (Figure 2.15), which is designed to provide faster and easier docking and OR re-configuration. The motor drive interface includes a steering column, throttle, throttle-enable switch and shift switches. (See Motor Drive Operation on page 3-3 for details.)

Figure 2.15 Motor drive steering column

2.5 Vision Cart Overview

The *da Vinci Si* System comes standard with a High Definition (HD) Vision System. This section provides details regarding the following Vision Cart components:

- Core, page 2-12
- Instrument Control Box (ICB), page 2-12
- Illuminator, page 2-12
- Endoscopes, page 2-12
- HD Stereo Camera Head, page 2-14
- HD Camera Control Unit (CCU), page 2-15
- Touchscreen, page 2-16
- Tank Holders, page 2-16

The Vision Cart has three shelves to hold auxiliary equipment. Each shelf can support up to 40 lbs. (18.2 kg) provided that the total loading of all shelves not exceed 60 lbs. (27.2 kg).

See Chapter 4 System Connections for instructions to connect system components to the Vision Cart. See Chapter 7 Vision System Use for detailed instructions to use the vision system.

Core

The *da Vinci Si* Core is the system's central connection point where all system, auxiliary equipment, and AV connections are routed. (See Chapter 4 System Connections for details.)

Instrument Control Box (ICB)

If installed, the following information is applicable. The ICB is a hardware upgrade installed by an *Intuitive Surgical* field engineer on the lower shelf of the Vision Cart. It powers certain functions of advanced *EndoWrist* instruments such as the Vessel Sealer. *Intuitive* supplies instructions to use the ICB as part of the instructions to use the applicable instrument.

Illuminator

Lighting for the surgical field is provided by the Illuminator (Figure 2.16). The light from the Illuminator is delivered to the endoscope via a fiber optic light-guide cable and projected onto the surgical site through the endoscope. The Illuminator has front panel controls for increasing or decreasing the light output and turning the lamp on or off. (See 7.3 Working with the Illuminator Controls on page 7-14 for details).

Figure 2.16 Illuminator and CCU

Endoscopes

The *da Vinci Si* HD Vision System uses a 12 mm or 8.5 mm 3D endoscope with either a straight ***(0°)*** or angled ***(30°)*** tip. (For more detail specific to the 8.5 mm endoscope, see Appendix F: 8.5 mm Endoscope for the da Vinci Si System.) Light from the Illuminator is sent down the shaft of the endoscope (Figure 2.17 and Figure 2.18) via fiber optics and projected onto the surgical site. Heat from the fiber optics helps to minimize fogging at the endoscope lens. The

video image of the surgical site captured by the endoscope is sent back through the left and right channels to the camera head. The camera head connects to the Camera Control Unit (CCU), as well as the Illuminator. (See 7.2 Setting Up the Vision System on page 7-5 for details.)

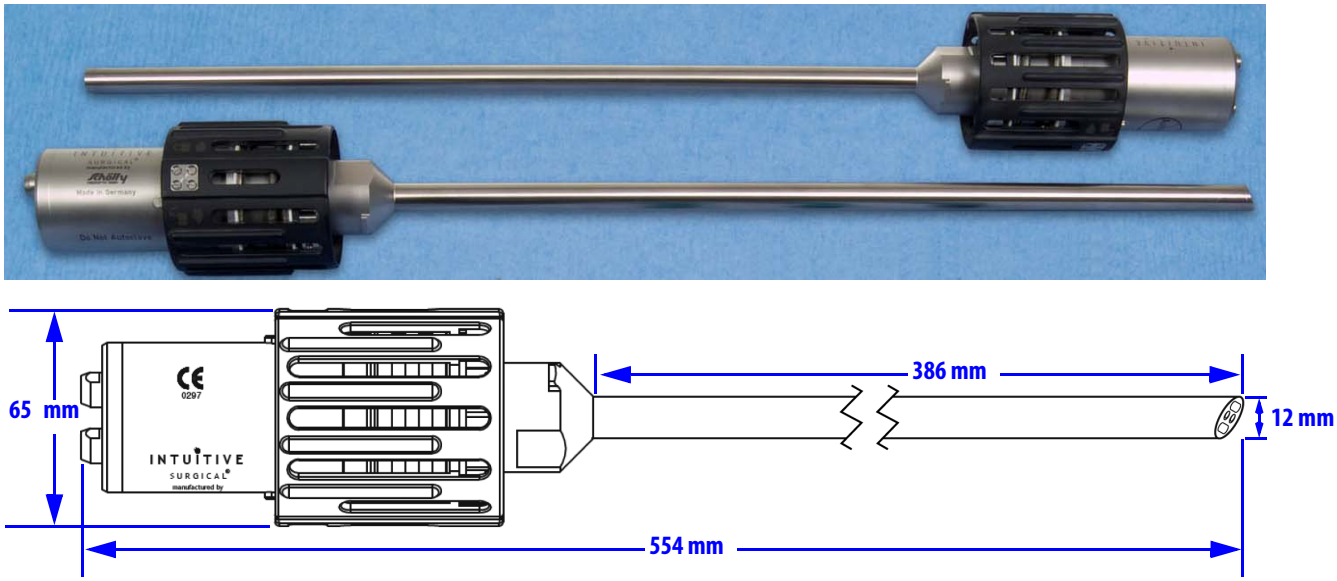


Figure 2.17 da Vinci Si HD 12 mm endoscopes, with dimensions

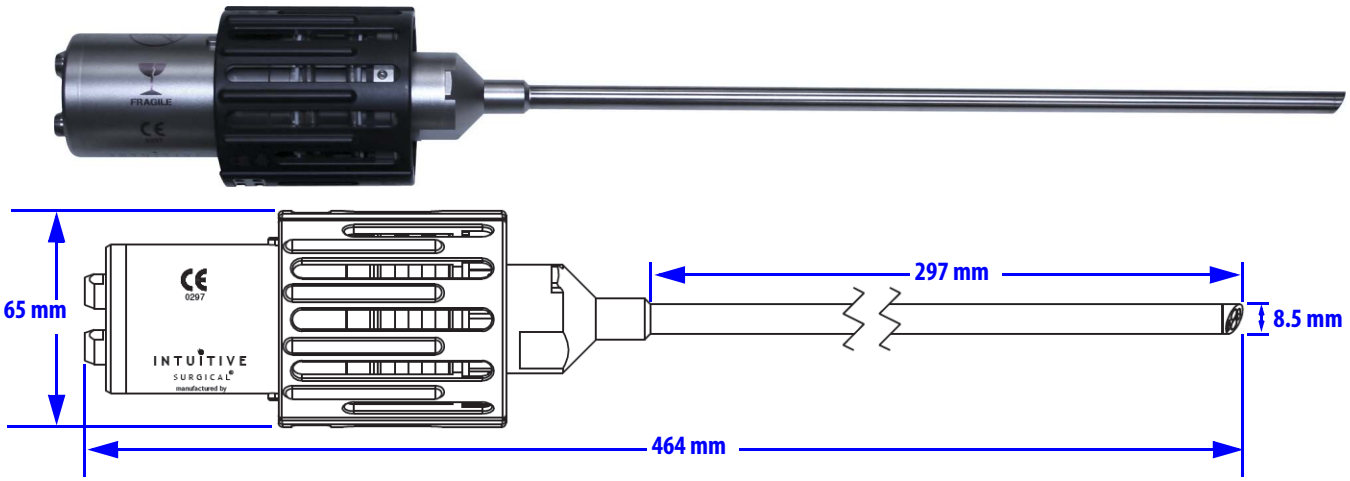


Figure 2.18 da Vinci Si HD 8.5 mm endoscopes (30° tip), with dimensions

CE 0297

Endoscope Information

Intuitive Surgical endoscopes (see list below) are made by Schoelly Fiberoptic and distributed by *Intuitive Surgical*.

Schoelly Fiberoptic GmbH
Robert-Koch-Str. 1-3
79211 Denzlingen
GERMANY

Distributed by:
Intuitive Surgical
1266 Kifer Road, Sunnyvale, California 94086 • USA
Intuitive Surgical Sàrl
1, chemin des Mûriers, 1170 Aubonne Switzerland
Customer Service from USA 1.800.876.1310
Customer Service from Europe +800.0821.2020
Manufactured in Germany.

Endoscopes

- 8.5 mm Endoscope (0° tip), PN 371938
- 8.5 mm Endoscope (30° tip), PN 371939
- 8.5 mm Fluorescence Endoscope (0° tip), PN 372010
- 8.5 mm Fluorescence Endoscope (30° tip), PN 372011
- 12 mm Endoscope (0° tip), PN 370890
- 12 mm Endoscope (30° tip), PN 370891
- 12 mm Fluorescence Endoscope (0° tip), PN 370892
- 12 mm Fluorescence Endoscope (30° tip), PN 370893

HD Stereo Camera Head

Figure 2.19 HD stereo camera head

The HD stereo camera head is designed with a 60-degree field-of-view (FOV). When combined with an *Intuitive Surgical* stereo endoscope, the vision system provides 6-10x magnification of what is seen during open surgery (without loupes). (See 7.2 Setting Up the Vision System on page 7-5 for details.)

Camera Head Information

Intuitive Surgical camera heads [Camera Head Assembly, PN 655859 (371952) and Camera Head Assembly, PN 655858 (372126)] are made by Schoelly Fiberoptic and distributed by *Intuitive Surgical*.

Schoelly Fiberoptic GmbH
Robert-Koch-Str. 1-3
79211 Denzlingen
GERMANY

Distributed by:
Intuitive Surgical
1266 Kifer Road, Sunnyvale, California 94086 • USA
Intuitive Surgical Sàrl
1, chemin des Mûriers, 1170 Aubonne Switzerland
Customer Service from USA 1.800.876.1310
Customer Service from Europe +800.0821.2020
Manufactured in Germany.

HD Camera Control Unit (CCU)

The CCU is connected to the camera by a single cable. The CCU controls the acquisition and processing of the image from the camera.

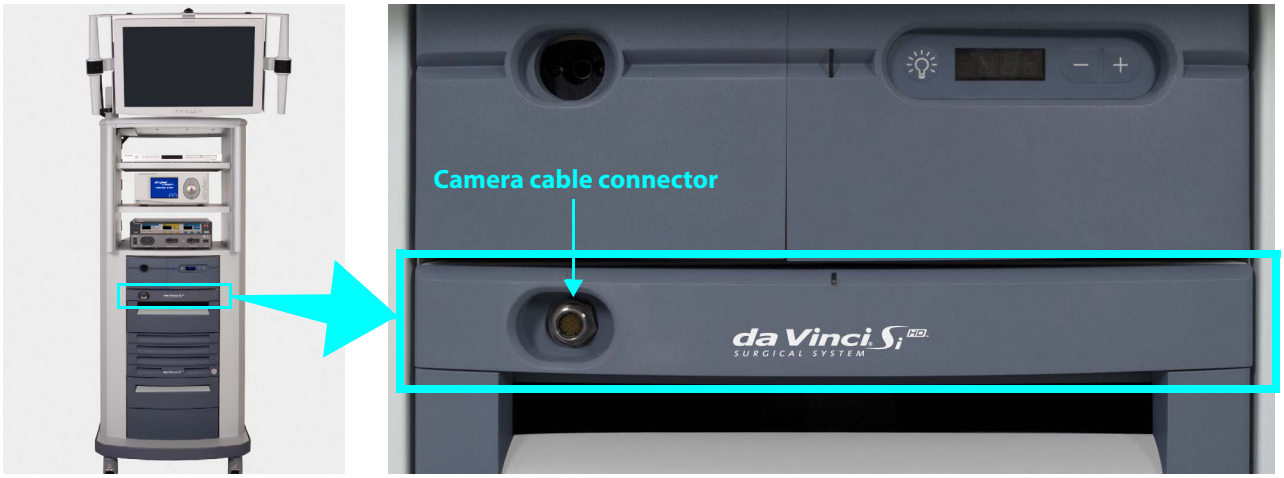


Figure 2.20 Camera Control Unit and Illuminator

Touchscreen

The Vision Cart includes a touchscreen that is used to control system settings and view the surgical image.

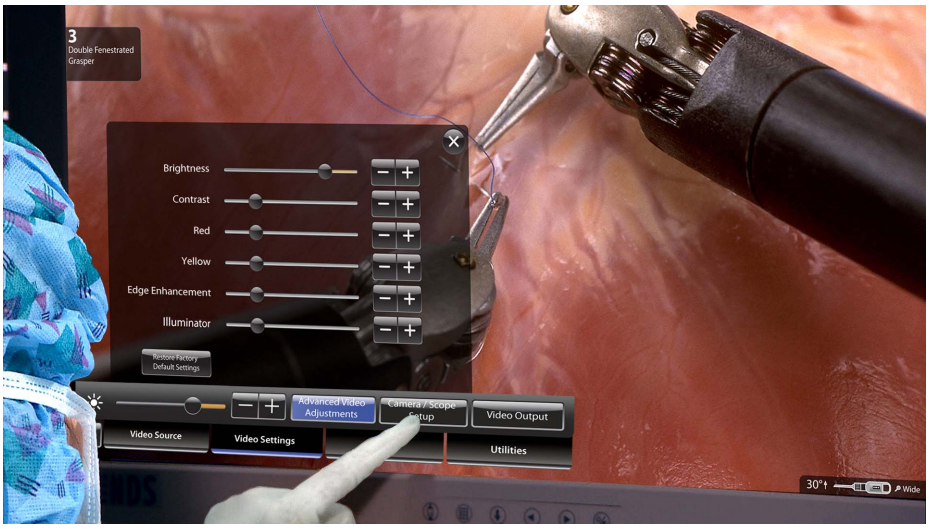


Figure 2.21 Assistant operating touchscreen

Tank Holders

The Vision Cart supports use of an insufflator with two tank holders on one side (Figure 2.22). To accommodate various size tanks, the tank holders have adjustable straps above and the lower bracket slides in and out after you loosen one screw on each side with a screwdriver. The tank holders can support two tanks, each weighing up to 50 lbs. (22.32 kg).

One tank installed

Tank strap adjustment

Figure 2.22 Tank holders

End of section

3 OR Configuration

This chapter explains how to arrange *da Vinci Si* System components in the operating room for maximum safety and ergonomic benefit. The following subjects are covered:

3.1 Surgeon Console Positioning

The Surgeon Console is placed outside of the sterile field. Use the handles on either side of the Surgeon Console (Figure 3.3) for moving or positioning. Labels say “PUSH” near the handles for pushing on both sides.

Figure 3.1 “PUSH” label near handles on sides of Surgeon Console

Never push or pull the console from the back or the front. A label near the top of the pillar on the back illustrates the correct way to move it. Separate “no hands” labels on both lateral supports discourage placing hands there to move it.

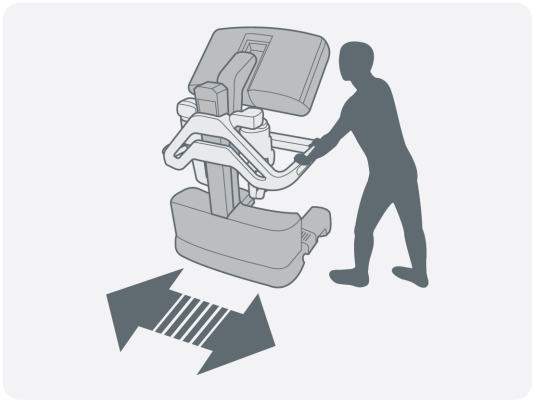


Figure 3.2 Labels on rear of Surgeon Console

- When possible, orient the Surgeon Console so the Surgeon Console operator will have a view of the operative field and a clear line of communication with the Patient Cart operator.

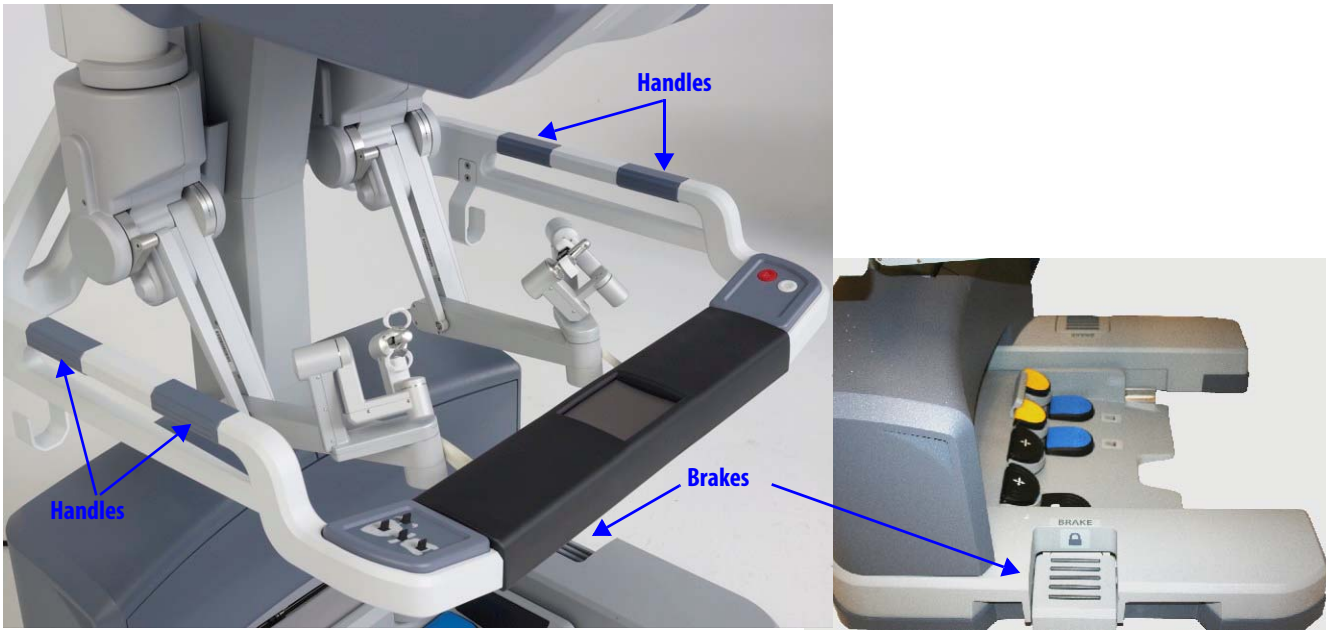
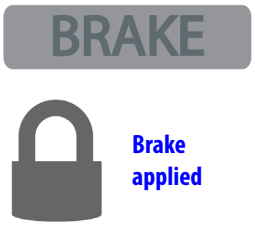


Figure 3.3 Surgeon Console handles and brakes



- Brakes (indicated by "BRAKE" label) are located on each side of the base on the Surgeon Console (Figure 3.3). The Surgeon Console should be locked once it is positioned for surgery. Step on the brake pedal to apply that brake; the lock symbol will become visible when the pedal is depressed, indicating the brake is applied. You need activate only one brake to lower the footswitch panel. When possible, apply both brakes for best stability. Step on the depressed brake to release it. Both brakes must be released to raise the footswitch panel and enable Surgeon Console transport.

3.2 Patient Cart Positioning

Place the Patient Cart in the sterile field. We recommend two people to safely move the Patient Cart: one to operate the motor drive (or push the cart when in neutral) and the other positioned opposite to ensure the arms and cart do not accidentally hit anything.

Note: Use extreme care when moving or positioning the Patient Cart to ensure the arms do not hit any objects. If an arm hits an object while the Patient Cart is being moved or positioned, contact *Intuitive Surgical* Technical Support to have the Patient Cart inspected for damage.

- You will need to dedicate a space in the room where the Patient Cart can be draped before moving it into place for surgery. This should be an area where it will not easily contact non-sterile objects nor impede traffic. Once the Patient Cart is draped and the patient is positioned, prepared and ports are placed, use the Patient Cart motor drive to move the cart into the sterile field (see Motor Drive Operation below).

- The Patient Cart brakes are designed to automatically engage when the motor drive is not in use, if the cart is not in neutral. When in neutral, the brakes do not engage automatically until a cannula is installed.

Motor Drive Operation

⚠ **CAUTION: Always use caution when moving large equipment.**

The motor drive interface consists of the following:

- Throttle
- Throttle enable switch
- Shift switches
- Battery status indicators
- Cannula installed indicator

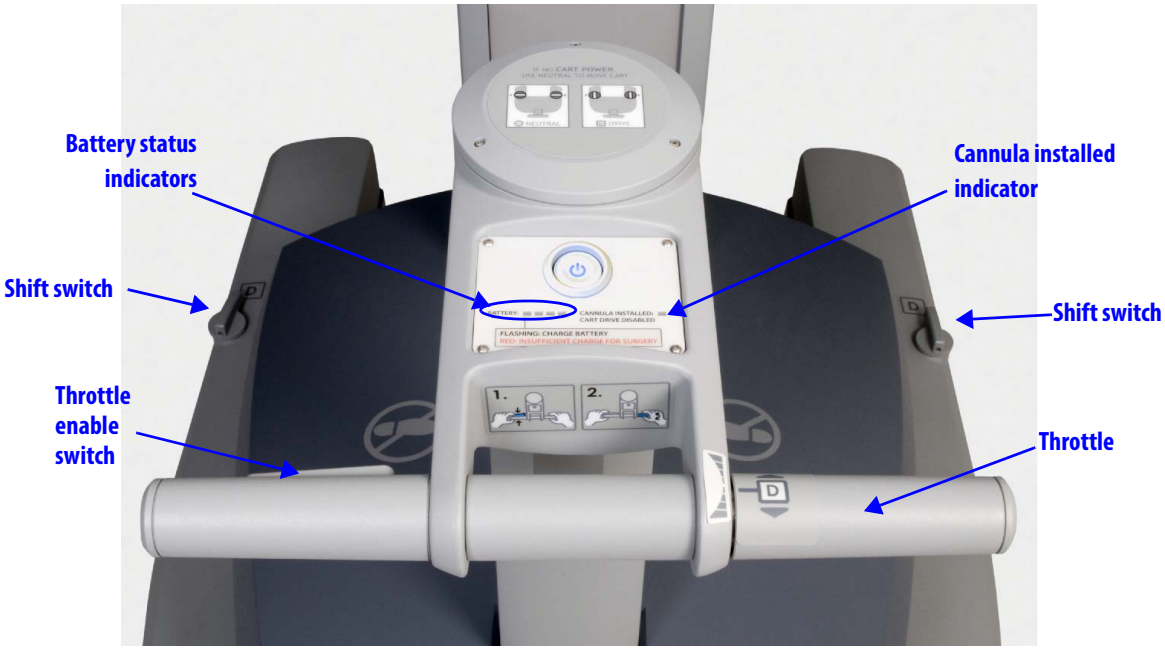


Figure 3.4 Patient Cart motor drive controls and indicators

The top of the motor drive tiller has the label below (Figure 3.5). This label explains and shows the N=Neutral and D=Drive positions for the motor drive shift switches. It includes the text, "IF NO **CART POWER**, USE NEUTRAL TO MOVE CART".

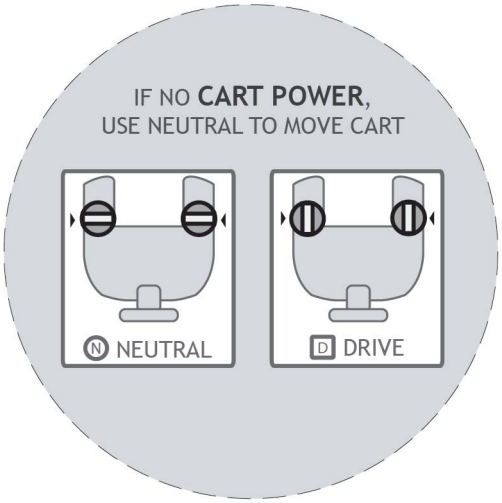


Figure 3.5 Label on top of motor drive tiller

Figure 3.6 Patient Cart power panel

To operate the motor drive:

1. First, make sure the Patient Cart is powered on. See 5.2 Powering On the System on page 5-2. See 5.1 Stand-Alone Mode on page 5-1, for instructions to power up only the Patient Cart, when it is not connected to the Surgeon Console or Vision Cart.

2. Ensure the shift switches are in the drive position (see Figure 3.8).

3. Hold the throttle enable switch and rotate the throttle away from you or towards you to move in that direction. A label illustrates this two-part step:

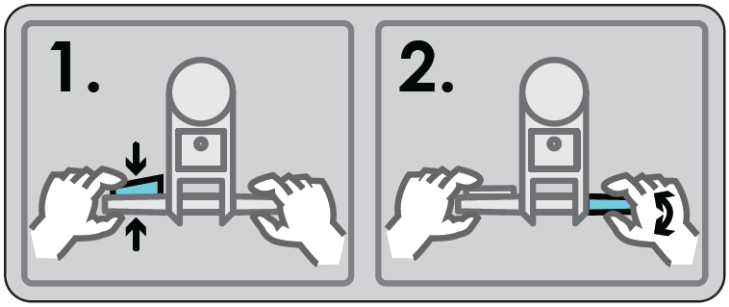


Figure 3.7 Label: How to drive the Patient Cart

   - The Cart Power button flashes green when the throttle enable switch is activated.
   - Control the drive speed by how far you rotate the throttle.
4. To stop motorized movement, release the throttle enable switch.

WARNING: For patient safety, both shift switches must be kept in the drive (D) position so that the motor drive remains engaged during surgery (see Figure 3.8).

Note: Use extreme care when moving or positioning the Patient Cart to ensure the arms do not hit any objects. If an arm hits an object while the Patient Cart is being moved or positioned, contact *Intuitive Surgical* Technical Support to have the Patient Cart inspected for damage.

Note: For safety reasons, the motor drive will not engage whenever cannulae or instruments are installed on the system. A yellow LED on the motor drive interface labeled "Cannula Installed: Cart Drive Disabled" will indicate when cannulae or instruments are installed and motor drive is non-operational.

Note: When operating on battery, the motor drive does not work if battery power is too low. The battery status indicators show the amount of battery power. The lower part of the motor drive interface explains the meaning of flashing or red BATTERY LEDs:

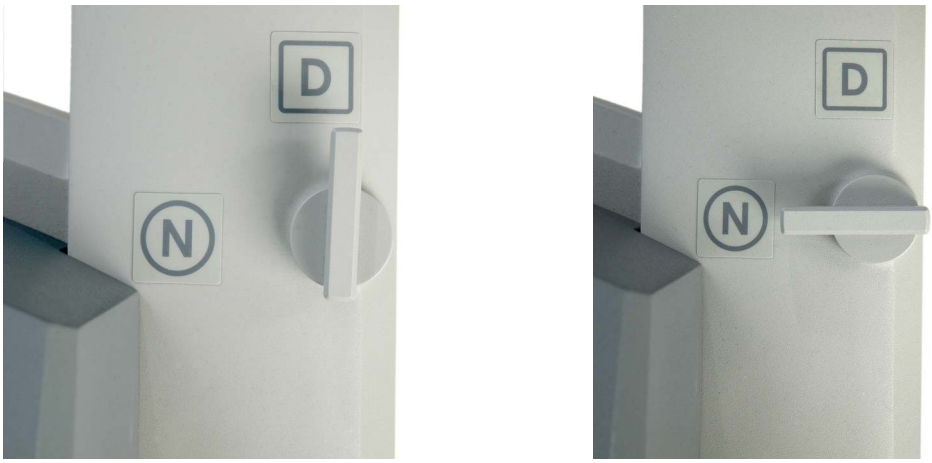
FLASHING: CHARGE BATTERY
RED: INSUFFICIENT CHARGE FOR SURGERY

Note: The Patient Cart battery should be adequately charged. If not, an error message appears on the monitors. You can override the error if the Patient Cart is plugged into AC power.

Shift Switches

In the event the Patient Cart should need to be moved without use of the motor drive (for example, during a power loss), rotate both shift switches (Figure 3.8) to the neutral **(N)** position. The cart can then be moved manually. Once you have finished moving the cart, place both shift switches in the drive **(D)** position to set the Patient Cart brakes.

Note: The cart is capable of passing over thresholds of up to 10 mm high by 80 mm wide. If a threshold is high enough that the motor drive is not able to drive over it, the cart can be manually pushed over the threshold. Put the shift switches (Figure 3.8) in "N" for neutral, and manually push the cart over the threshold.



Drive motor engaged (D) Drive motor disengaged (N)

Figure 3.8 Patient Cart motor drive shift switches

3.3 Vision Cart Positioning

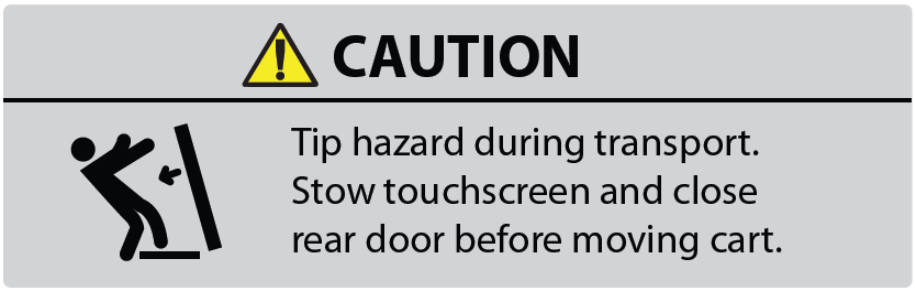


Figure 3.9 Tip hazard label on rear door of Vision Cart

⚠ **CAUTION: Tip hazard during transport. Stow touchscreen and close rear door before moving cart.**

The Vision Cart is placed adjacent to the Patient Cart, just outside of the sterile field. Room is provided on the Vision Cart shelves to place ancillary equipment (e.g. ESUs, insufflators). Position ancillary equipment to allow the Patient Cart operator to easily view and access the Vision Cart components and touchscreen.

- The Vision Cart should be close enough to the Patient Cart to allow unrestricted camera cable movement during surgery.

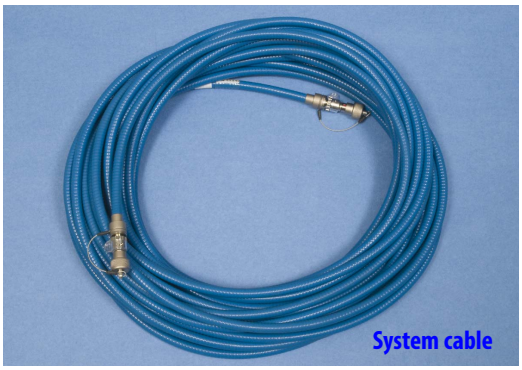
- Wheel locks are located on all wheels of the Vision Cart (Figure 3.10). These should be locked after the cart is positioned for surgery.

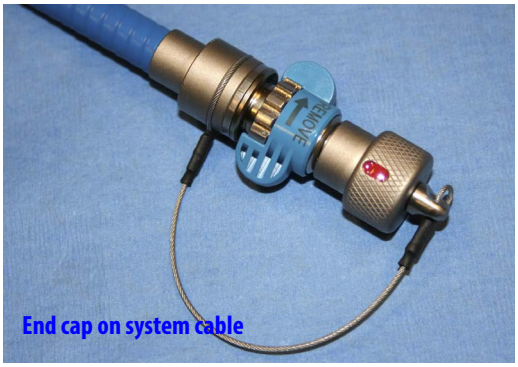
Figure 3.10 Vision Cart wheel lock

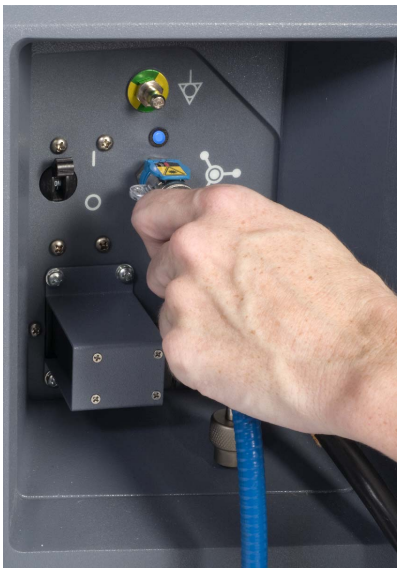
End of section

4 System Connections

This chapter explains how to connect the individual *da Vinci Si* System components, including:







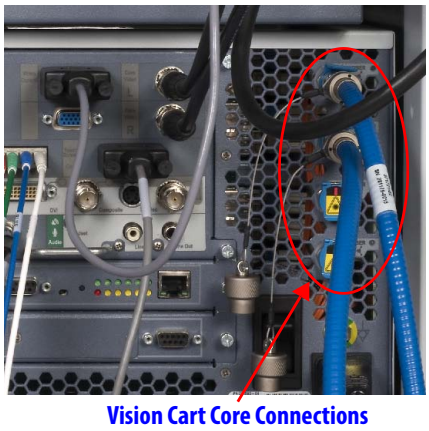


Figure 4.1 Sample system cable and connections

Note: The only connections you should access on the back of the Vision Cart are the power cords, blue system cables, auxiliary device cables, and audio/video cables as described in this chapter. Other cables on the back of the Vision Cart should remain connected at all times and should only be accessed by authorized ISI personnel.

4.1 Power Connections

Connect the AC power cords of the Surgeon Console, Patient Cart, and Vision Cart to wall outlets. (To support continued use of the *da Vinci* System in case of a site power failure, use wall outlets [often red] supported by backup power.) Ensure adequate power is available at each wall outlet according to the table below:

Table 4-1 System Power Cords and Power Requirements

System Component	Cord Length	Power Requirement	Standby Power Draw
Surgeon Console	15 ft/4.6 meters	1000VA Continuous 8.4A at 115V~ 4.2A at 230V~	95VA 0.8A at 115V~ 0.4A at 230V~
Patient Cart	15 ft/4.6 meters	1000VA Continuous 8.4A at 115V~ 4.2A at 230V~	75VA 0.6A at 115V~ 0.3A at 230V~
Vision Cart	15 ft/4.6 meters	1500VA Continuous 12A at 115V~ 6A at 230V~	145VA 1.1A at 115V~ 0.55A at 230V~

Note: Before first use, connect the Patient Cart to a wall outlet for at least 14 hours to allow the backup battery to fully charge.

Note: The Patient Cart should remain plugged in when not in use to ensure that the backup battery stays fully charged.

Note: Cooling fans on the Patient Cart and the Core (Vision Cart) run continually when either is plugged into AC. This is part of normal operation.

Note: The power cord plug of each cart provides isolation from the supply mains. Position equipment so that the power cord plugs can be accessed to isolate mains power from the system.

CAUTION: **Do not use an extension cord with any of the system components.**

4.2 System Cable Connections

The *da Vinci Si* System cables (see Figure 4.2) are 20 m (65.6 ft) in length and should be kept attached to the Vision Cart.

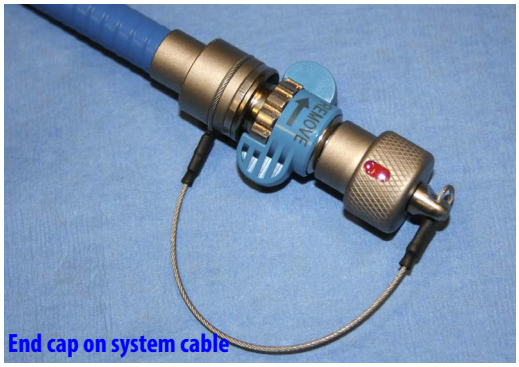


Figure 4.2 System cables

The system cables:

- Are identical and can connect to either the Surgeon Console or Patient Cart
- Pass video, audio, and data during system operation
- Are stored on the cable hook located on the side of the Vision Cart

Note: Once the system is connected and powered on, the system cables should not be unplugged until the system has completely powered down. If the system cables become unplugged during use, a non-recoverable fault will occur. To restore system functionality, plug in the cable, remove all instruments, and restart the system. (See page A-3 for more information on Restarting the System During a Procedure due to a non-recoverable fault.)

Note: The system cables have a fiber-optic core. Care should be taken to avoid bending the cable, as kinks can damage the cable and may prevent system operation. The minimum safe bend radius is 1 inch (2.54 cm). Take care to avoid stepping on the cable, since this can damage it.

System Cable Layout

The cables should be arranged so that they are out of the path of OR traffic, including other equipment, to avoid damaging the cables or creating an obstacle or hazard. The location of the cables should also facilitate easy movement of the Patient Cart between its preoperative (draping) and intraoperative locations.

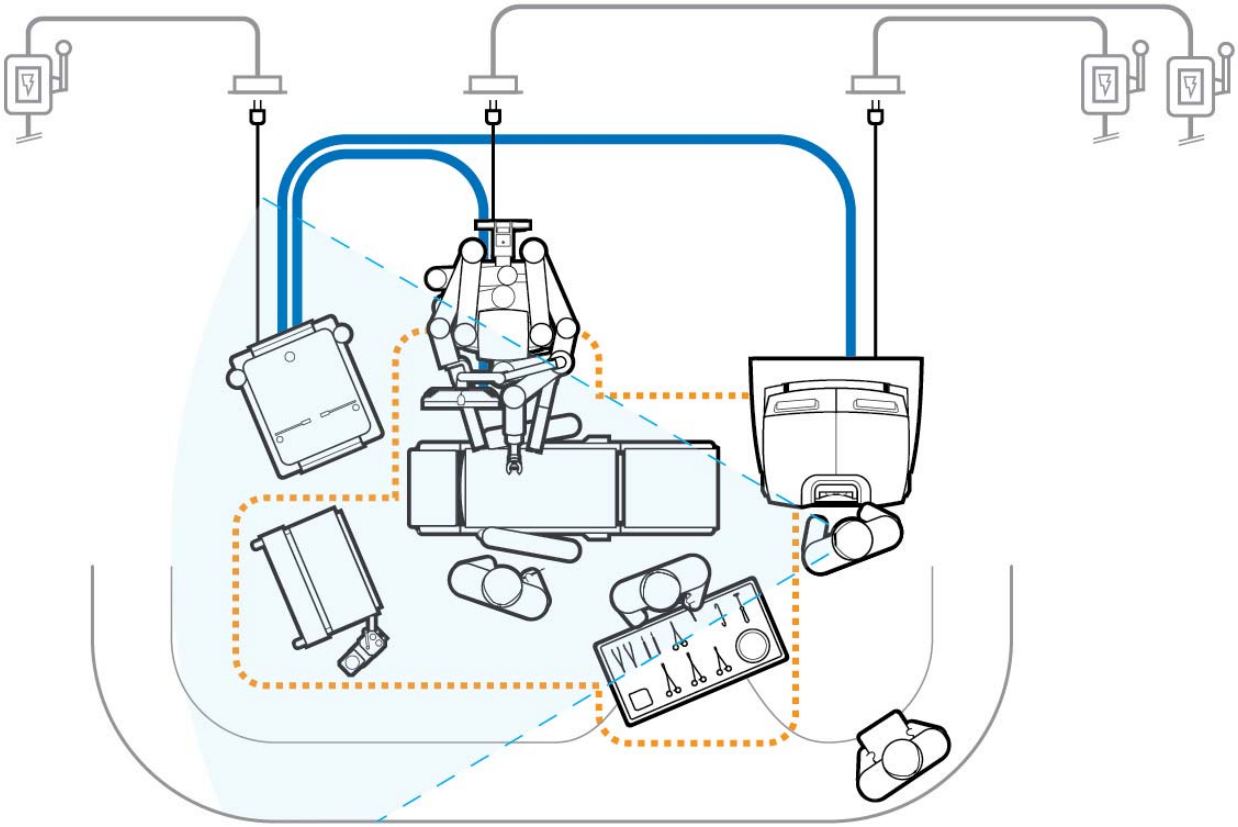


Figure 4.3 Laying out the system cables

How to Connect System Cables

1. Remove the cables' protective caps, inspect the cable connectors and system receptacle for debris or bent pins. The system receptacles have protective covers you must open.
2. Connect the system cables between the components as shown in Figure 4.3. To connect the cables, line up the red dot on the cable connector with the red dot on the matching receptacle, flip up the receptacle cover and insert the connector. You should hear an audible click when the cable engages properly. Gently pull on the connector to verify the cable is fully seated.

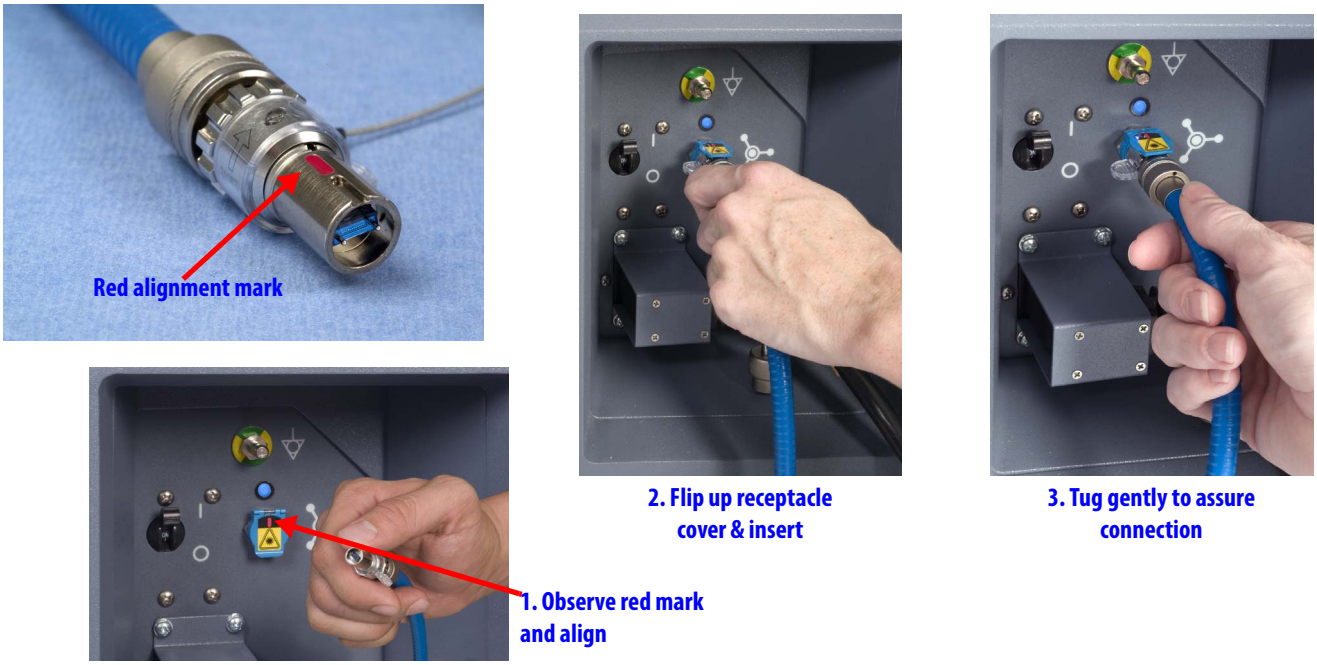


Figure 4.4 Connecting system cable to Surgeon Console

Note: The protective metal caps attached to each system cable should be installed on cable ends at all times when not connected to the system.

Figure 4.5 System connections

4.3 Camera Head Cable Connections

The camera head has two cables: one for video and one for illumination. Both the camera head video cable and the light guide cable are 5.75 m (18 ft 6 in) long.

Note: *Intuitive* has shipped *da Vinci Si* Systems with two different kinds of camera head video cable, which can be readily distinguished by having either black ends or gray ends. This section addresses use of both kinds of cable. The cables and their connectors on the camera head and CCU are not cross-compatible, that is, a cable with black ends will not work with a system designed to work with a cable that has gray ends. Users must not attempt to switch camera cables to an incompatible system.

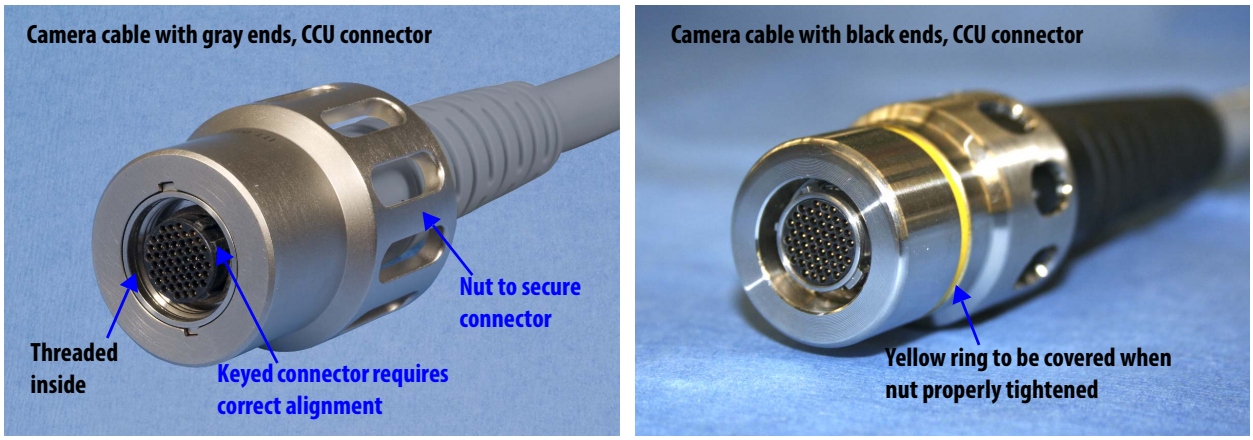


Figure 4.6 Ends and connectors of each kind of camera cable

Connecting the Camera Cable

Although the steps are basically the same for the two kinds of camera cable, note the distinguishing details that pertain to cables with black or gray ends called out in this section.

Note: The camera cable with black ends has a yellow ring on the (male) CCU connector that must be paired only with the (female) receptacle on the CCU, which has a blue ring.

Follow these steps to connect the camera cable (see Figure 4.7).

1. Attach the camera cable to the receptacle on the Camera Control Unit (CCU). The connector is keyed. Therefore, to successfully insert the connector, you must match the alignment arrows on the cable connector and the top of the CCU receptacle as shown.

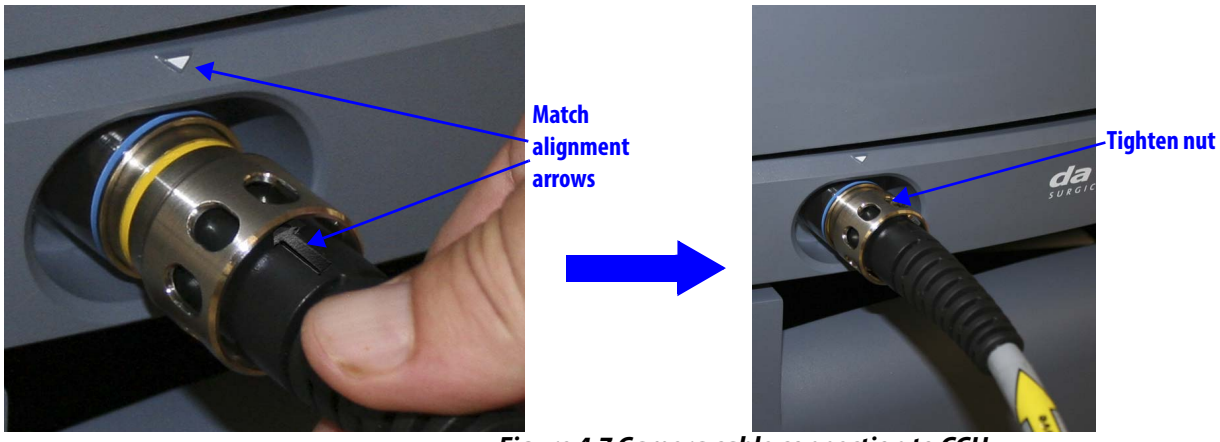


Figure 4.7 Camera cable connection to CCU

2. Carefully align and direct the connector straight in; begin to tighten the nut only when you are certain it is not cross-threaded.
3. Once started properly, tighten (clockwise) the large metal nut around the inserted cable end. It is threaded so you can hand tighten the connector and secure it. For the cable with black ends, to ensure a good connection, tighten the nut until you can no longer see any part of the yellow ring around the base of the nut.

Connecting the Light Guide Cable

4. Insert the light guide cable connector into its receptacle on the Illuminator as shown. You will hear a click when the connector is fully inserted. Gently pull on the light guide connector to confirm that the connector is fully inserted into the receptacle.

Figure 4.8 Connecting the light guide cable

Care of Camera Cables

The fiber optic light guide cable and camera cable are susceptible to damage from kinking or crushing or contamination to their connectors if disconnected, all of which degrades light transmission, and could diminish video quality or even lead to cable failure. To preserve the life of your cables, follow these guidelines to care for them.

- Leave both camera cables connected at both ends when not in use. This protects the connectors and receptacles from contamination.

- Use the S-hooks provided with the camera cables to bind the light guide and camera head video cable together, as shown below. The S-hooks keep both cables together and untangled, which helps you to handle and store them without coiling them too tightly or kinking them.

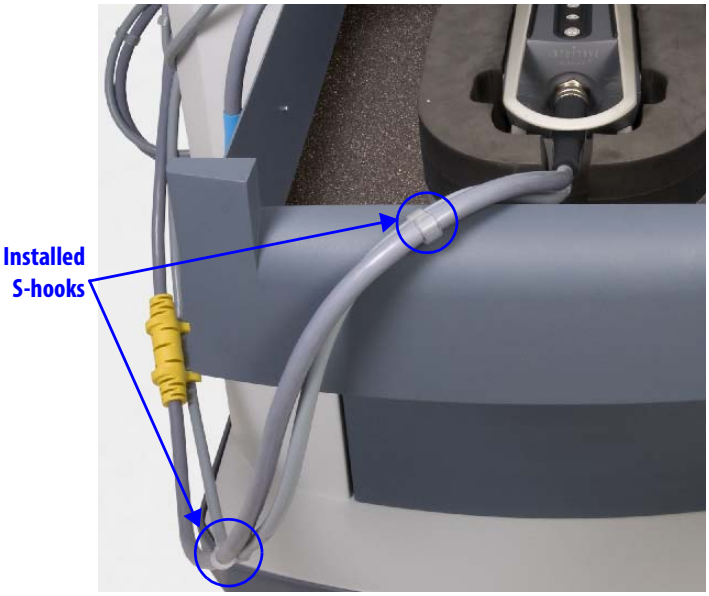


Figure 4.9 S-hooks to hold camera cables together

Note: If you need additional S-hooks, you can acquire them from *Intuitive Surgical* and install them yourself. Contact *Intuitive Surgical* Customer Service.

- Store the camera head in its custom cutout in the Vision Cart drawer below the CCU, and coil the camera cable pair loosely, and hang the excess cable on the hook on the side of the Vision Cart. The hook on the side is large enough to accommodate both the blue system cable and the camera cables. See Figure 4.10 for an example.

Connected camera head in storage drawer

Figure 4.10 Store camera cables connected

4.4 Auxiliary Device Connections

WARNING: Do not plug additional equipment into the same wall outlet as the Vision Cart. This could potentially overload the circuit.

Note: If combinations of the installed energy instruments or connected ESUs make mapping of energy pedals ambiguous, the system will not map nor activate the pedals for that energy type. For instance, you cannot be in simultaneous energy control of two energized instruments of the same type (for example, bipolar and bipolar). This means that if a surgeon is actively controlling two bipolar instruments at the same time with the right and left master controllers, then he/she will not be able to activate energy.

Compatible electrosurgical units (ESUs) can be actuated after connecting the appropriate energy activation cable to any of the auxiliary connectors on the back of the Core. You can attach up to 3 ESUs at a time. Cables are color-coded by ESU model. See the Instruments and Accessories User Manual (PN 550675) for a complete list of cables.

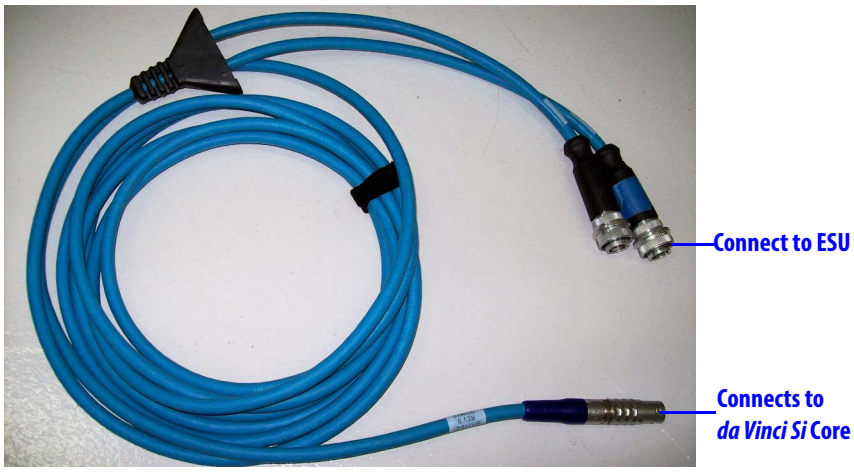


Figure 4.11 Representative Auxiliary Device Cable

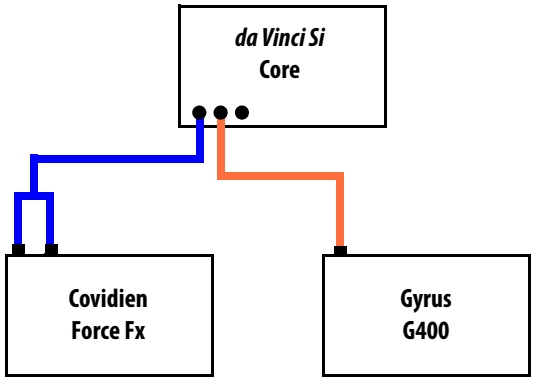


Figure 4.12 Representative ESU setup

CAUTION: Ensure that only compatible ESUs are connected to the *da Vinci Si* System. Refer to the Instruments and Accessories User Manual (PN 550675) for a complete list of compatible ESUs. Performance of cables or accessories other than those specified in the Instruments and Accessories User Manual cannot be guaranteed. Any damage to the system resulting from using an incompatible ESU will not be covered under warranty.

To connect an auxiliary device (for example, an ESU) to the system:

1. Plug the auxiliary device end of the cable into the corresponding channel(s) on the device. Tighten the screw lock completely to ensure that the cable is fully connected.

Figure 4.13 Auxiliary device connection (back of ESU)

2. Plug the system end of the cable into any of the three **Energy** receptacles on the back of the Core (Figure 4.14). Align the red dot on the cable connector with the red dot to the right of the receptacle. You should hear an audible click when the cable engages properly. Gently pull on the cable connector to verify that the cable is fully seated. When the ESU and system are turned on, the corresponding LED indicator will turn on.

Figure 4.14 Auxiliary device connections (back of Core)

Note: If the energy activation cable is unavailable or non-functional, the generator manufacturer's footswitch may be used. In this case, the system will not provide any feedback to the user in the Surgeon Console viewer.

Troubleshooting: *EndoWrist* Cautery not Responding to Footswitch

1. Check cable connections between the instrument and the generator.
   a. Check the patient return electrode (if necessary).
   b. Check AC power connection to the generator.
   c. Check cable connection between the generator and the *da Vinci Si* System to ensure proper cable orientation.
2. Power on the generator.
3. If the problem persists, power off the generator.
   a. Attach the generator to the manufacturer's external footswitch.
   b. Power on the generator.
4. If the problem persists, contact customer service for assistance: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.

4.5 Video and Audio Connections

Note: The four Core video in and out bays shown on the left in Figure 4.15 (in green box, the *TilePro* Inputs and Video Out bays 1 and 2) are not available by default; they are made available in conjunction with optional upgrades, for example, with purchase of a second console to support dual console surgery. Video Out bay Aux and the Audio In/Out bay, at lower right, are available by default. The default *TilePro* Inputs are available on the back of the Surgeon Console.

Note: Each input and output bay supports only one video format at a time.

The back of the Core supports up to 6 auxiliary connection bays: 2 for video input, 3 for video output and 1 for audio input/output. Each bay has 3-4 connectors, but supports use of only one connection at a time. A connection panel on the back of the Surgeon Console supplies the default *TilePro* Inputs. Additionally, the back of the Camera Control Unit has two component video outputs. For additional information, see the Core Connections Diagram on page H-5.

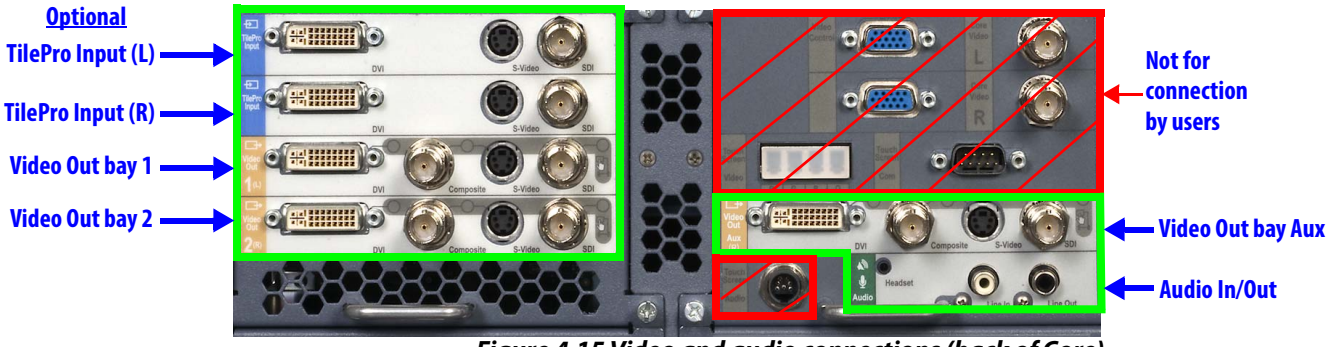


Figure 4.15 Video and audio connections (back of Core)

Note: See H.5 Video Patch Panels in Appendix H: System Specifications for detailed information regarding video connections.

Note: Connectors on the Core (and other components on the Vision Cart) labeled with gray text on a dull background, as those indicated by red boxes in Figure 4.15 above, are connected as necessary by authorized ISI personnel when they install and/or service the system. Therefore no instructions are provided for connecting them in this user manual, although the labels themselves are described in Appendix G: Symbols, Icons and Text Messages Reference. Do not unplug any of these connections.

CAUTION: To avoid an electrical hazard, do not touch the patient while touching any connectors at the same time.

Surgeon Console Connections (*TilePro*)

Two video input bays (Figure 4.15) are provided on the back of the Surgeon Console to enable multi-image mode (*TilePro*) in the Surgeon Console. Each video input bay is capable of accepting a single DVI, HD-SDI, or S-Video signal.

Figure 4.16 Connections on back of Surgeon Console

- The **Video Out L** and **Video Out R** bays on the Surgeon Console support transmission of the left and right eye video seen in the Surgeon Console via DVI connection. These bays operate independently from the optional Video Out 1 and Video Out 2 bays on the Core. The latter are available only with optional upgrades and support video output that the user can program via the touchscreen (see Video Output on page 7-19).
- The **Audio** bay supports transmission of Surgeon Console audio with connectors for RCA output (**LIne Out**), RCA input (**Line In**) and a 2.5 mm input/output headset jack (**Headset**).

***TilePro*, 2D and 3D**

TilePro multi-image mode enables the surgeon to see up to two additional video inputs in the stereo viewer of the Surgeon Console, along with the live endoscopic video image. Most video sources connect using only one input connector, which yields a two-dimensional (2D) image.

- **3D *TilePro***: To display a 3D *TilePro* video source in the stereo viewer, connect a compatible (stereo) video source to both the **TilePro** (L) and (R) connectors at once and select **3D** on the touchpad (see Figure 10.18 Display Preferences on page 10-15).

- If an upgrade has been installed that makes available the optional **TilePro Input** bays on the Core (see Figure 4.15), you can use either set of *TilePro* inputs, but not more than two. The system automatically checks for *TilePro* connections in order: first on the Core (if present), then on the Surgeon Console. The Core *TilePro* inputs take precedence if they are in use.

Core Video Outputs

The Core supports up to three video output bays (Figure 4.15). Video output from all three includes the icons and text messages displayed in the Surgeon Console. Each video output bay supports a single DVI, HD-SDI, S-Video, or Composite signal.

Note: Video Out bays 1 and 2 are not available by default; they are made available in conjunction with optional upgrades, for example, with purchase of a second console to support dual console surgery. Only the Video Out Aux bay is available by default.

Core Audio Inputs and Outputs

Three connectors are provided on the audio bay (Figure 4.15).

- 2.5 mm input/output headset jack
- RCA input
- RCA output

Camera Control Unit Video Outputs

Two video outputs are available on the back of the Camera Control Unit. The left-eye (L) and right-eye (R) video outputs provide the surgical image without icons or text messages. This is component video, made up of Y (green port), P_R (red port) and P_B (blue port).

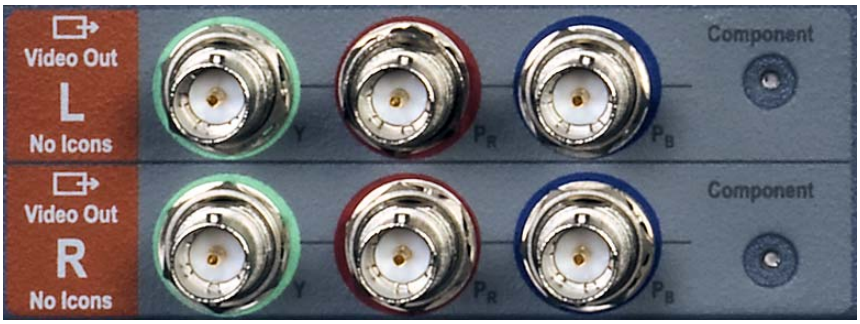


Figure 4.17 Video connections (back of CCU)

Troubleshooting: Audio not Functioning

1. Power off the system.
2. Check audio cables for debris or bent pins.
3. Reconnect all audio cables.
4. Power on the system.
   a. Check audio on the Vision Cart and Surgeon Console. Adjust volume if needed.
5. If the problem persists, contact customer service for assistance: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.

End of section

5 Startup

This chapter explains how to power up the *da Vinci Si* System components. It will cover the following topics:

5.1 Stand-Alone Mode

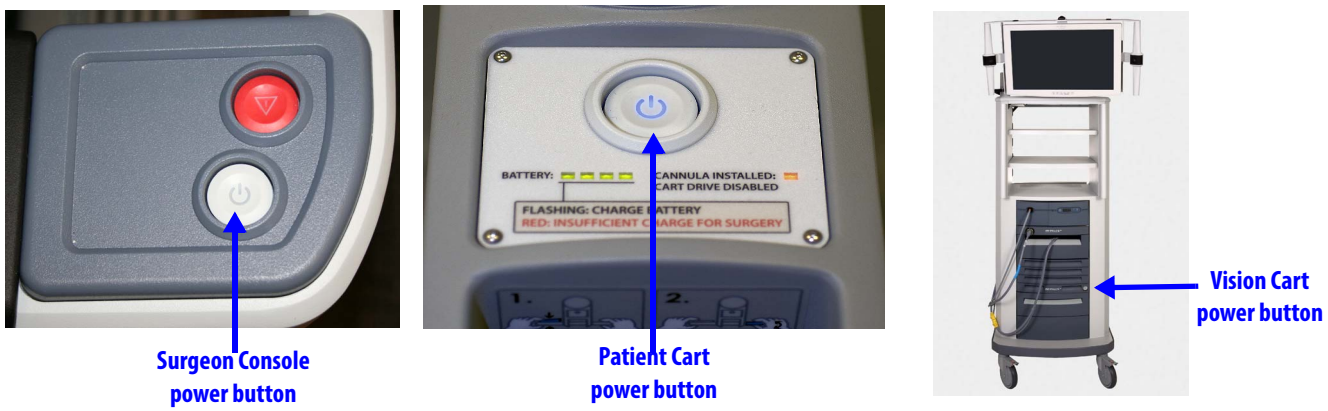


Figure 5.1 System power buttons

The **Power** buttons on the Vision Cart, Patient Cart and Surgeon Console are lit amber when in standby mode (connected to AC power but not powered on), blue when powered on. The **Power** buttons are not lit at all when not connected to AC power.

The Surgeon Console, Patient Cart and Vision Cart can all be powered on individually, known as stand-alone mode.

While the Surgeon Console is in stand-alone mode, you can adjust the ergonomic controls. No touchpad functions are available.

Note: To operate in dual console mode (using a second Surgeon Console--see 10.5 Dual Console Surgery), simply plug the second console's system cable in one of the available Fiber ports on the back of the Core. No other connection is necessary, except of course to plug in the Surgeon Console to a dedicated AC power outlet. The second Surgeon Console behaves just as the first with respect to power operations, as described in this section.

While the Patient Cart is in stand-alone mode and not connected to the Vision Cart, the arm LEDs do not provide any feedback and system accessories do not engage. You can use the Patient Cart motor drive and clutch buttons when not connected to the Core nor to AC power.

While the Vision Cart is in stand-alone mode, all vision system functions are available (for example, video sources, auto-calibration, white balance, etc.).

1. To power on the Surgeon Console or Vision Cart in stand-alone mode, make sure the power cord is plugged in, and press the **Power** button (Figure 5.1).
2. To power on the Patient Cart in stand-alone mode, press the **Power** button on the Patient Cart (Figure 5.1). The Patient Cart does not need to be plugged in for stand-alone mode.

Note: Each of the Surgeon Console, Patient Cart and Vision Cart has a mains circuit breaker switch on its rear that must be in the on position (indicated by "I" near each switch) for that subsystem to power on. The Core, Illuminator and Camera Control Unit (CCU) each also has its own component power switch on the back that must be in the on position for that component to power on. All of these subsystem and component power switches are intended to be left in the on position, and used only in special circumstances like those described below under Addressing Anomalous Power Behavior, page 5-2.

5.2 Powering On the System

When the Surgeon Console, Patient Cart, and Vision Cart are fully connected and plugged into AC power, you can power on all of them by pushing any of the system **Power** buttons.

Note: If any of the individual components are in stand-alone mode and you connect the system cables, the system will power itself on.

Note: System cables may be connected at any time, but once connected, cannot be unplugged until the system has been completely powered down.

Note: The Patient Cart battery should be adequately charged. If not, an error message appears on the monitors. You can override the error if the Patient Cart is plugged into AC power.

Addressing Anomalous Power Behavior

Anomalous and rare circumstances may result in the *da Vinci* System as a whole, or one of the Patient Cart, Vision Cart or Surgeon Console separately, to fail to power on normally, or to undergo an automatic, controlled power-down sequence when running. The former can happen, for example, due to faulty power connections. The latter can happen, for example, when a system component overheats. This section explains what to do in such situations.

Check AC Power Connections

In all cases of anomalous power behavior, first check AC power connections, as follows:

1. Confirm that the power cord for each of the Surgeon Console, Patient Cart and Vision Cart is properly connected to a dedicated AC power outlet.

2. Confirm that the mains circuit breaker switch on each of the Surgeon Console, Patient Cart and Vision Cart is correctly set to the on position (indicated by "I" near each switch). These switches are found on the rear of each component near the power cord inlet.

Figure 5.2 Circuit breaker switches on ("I") for main components

- On the Patient Cart, make sure that the **EPO** button is not depressed, since it requires a second press after use to reset it once it is used. See "Hard-Cycle" Power below.

3. On the Vision Cart, confirm that each of its component power switches—for the Core, Camera Control Unit and Illuminator—is correctly set to the on position (indicated by "I" on the switch). These components are not intended to be turned off or disconnected at any time unless you are directed to do so by *Intuitive Surgical* Product Support. Also confirm that each Vision Cart component power cord is plugged into the integrated Vision Cart power strip.

Figure 5.3 Vision Cart component switches on ("I")

Check Connection of System Cables

Check that the blue system cables are properly connected between the Core and the Surgeon Console and Patient Cart. See section 4.2 System Cable Connections on page 4-3.

"Hard-Cycle" Power

If the entire system or one of the Patient Cart, Vision Cart or Surgeon Console fails to power on normally by pressing one of the **Power** buttons, first check the AC power connections as described above. If all AC power connections are complete, follow these steps to "hard-cycle" power on the whole system:

1. Remove AC power from the Surgeon Console and Vision Cart by flipping each of their mains circuit breaker switches to off (indicated by "O" near each switch). Leave them off until the step in this sequence (below) that instructs you to switch them on again.
2. Because the Patient Cart will operate on battery even if you switch off its mains circuit breaker, you must use the **EPO** (Emergency Power Off) button—the large red button on the rear of the Patient Cart. The EPO button both disconnects the Patient Cart from AC power and exits the default standby or sleep mode. Press the **EPO** button once to remove all power; it will remain partially depressed. After at least 2 seconds, press the **EPO** button again to reset it; it will rebound to its fully extended ready position, as it was before.
3. Switch on the mains circuit breaker switches on the Surgeon Console and Vision Cart. (The Patient Cart circuit breaker should already be in the on position; make sure it is.) After about 30 seconds, all three system components should be back in their default standby power state, indicated by their **Power** buttons being lit amber.
4. Power on the system normally, by pressing the **Power** button on one of the Surgeon Console, Vision Cart or Patient Cart.

- To address anomalous power behavior when trying to power a single system component in stand-alone mode, "hard-cycle" power as described above for the applicable component.

Restart from Automatic High Temperature Power Down

The entire *da Vinci* System is designed to undergo an automatic, controlled power-down sequence in case a component or subsystem overheats while in normal operating mode (as opposed to maintenance mode or stand-alone mode), thereby preventing system damage. When the system detects overheating, it automatically initiates a 60-second power down sequence and displays a message announcing it and showing the countdown. The power down sequence cannot be interrupted. When it is complete, all three system **Power** buttons will be lit amber, indicating the systems are in their default standby or sleep state.

- We recommend that you wait 5 minutes for the overheated portion of the system to cool, and if possible, address situations that may be causing the system to overheat. For example, make sure that all vented system covers are not blocked, and move systems away from objects that may obstruct air flow in and out of system covers.

Follow the usual steps to restart the system from standby:

1. Press one of the system **Power** buttons. This powers on the system as normal; the **Power** button LED flashes amber as normal during the power-up sequence, and lights solid blue when power-up is complete.

- If overheating recurs, you can repeat the restart to recover, but we recommend that you seek assistance from ISI Technical Support to address the cause of overheating.

"Cool Mode" Restart from Stand-Alone Mode

If overheating of a single component results in automatic power-down when it is operating in stand-alone mode, it requires three Power button presses to recover that component to normal operation. This is called "cool mode," the mode in which the system component is cooling from an overheated state. The button press behavior is as follows:

1. First **Power** button press has no noticeable effect.
2. Second **Power** button press returns the system component to standby state, as indicated by its **Power** button lighting amber after several seconds.

3. Third **Power** button press powers on the component normally.

- This restart behavior also applies if overheating occurs when a component or system is in maintenance mode. Maintenance mode is reserved for use by *Intuitive Surgical* service personnel, so users generally do not encounter this situation.

5.3 Startup Sequence

During the startup sequence, a system integrity test is performed. As part of this test, the master controllers and all Patient Cart arms that are not stowed perform a self-test. The masters move to their start position and must arrive there for the system to work. If a master is impeded somehow, simply move it by hand to free it and it will move to its start position. The instrument arms of the Patient Cart fully extend and perform a short mechanical integrity test, if no cannula is installed and they are not in stow position (see 5.5 Stow Position on page 5-7). If an arm bumps into something during the test, use the port clutch button to move the arm clear of the obstacle. When clear, press and release the port clutch button to enable the test to resume.

Once the system integrity test is successfully completed, the arm LEDs (of all arms not stowed) will be lit white.

Note: During the startup sequence, do not put your head or other objects in the stereo viewer. Do not activate any of the *da Vinci Si* System controls, including the clutch buttons, footswitches, etc. While most button-presses will be ignored during the startup sequence, some may cause a non-recoverable fault, which will mean that you will have to restart the system. The Emergency Stop feature is available during startup if needed. Once the system beeps, you may interact with the system controls.

Note: If the system detects a mounted sterile adapter, instrument, or cannula before startup, the Patient Cart arms will not move during startup. This is a feature that is designed to allow the system to stay safely connected to a patient during the startup sequence.

Note: Instruments should be removed when starting the system, as long as this is clinically acceptable.

5.4 Preparing the Patient Cart for Draping

Prepare the Patient Cart arms for draping by moving each arm's insertion axis to a vertical position (90º). If draping instrument arm 3, ensure it is in front of the Patient Cart tower (Figure 5.4).

Figure 5.4 Instrument arms extended for draping

1. To move instrument arm 3 from one side of the Patient Cart to the other, release the latch on the setup joint link (see Figure 5.5) closest to the Patient Cart tower.

Figure 5.5 Moving instrument arm 3

2. Then use the port clutch button to move the arm to the opposite side of the Patient Cart.
   - Ensure the setup joint axis re-latches when the arm is moved completely to the other side. To enhance flexibility for adjustments, the setup joint axis can be left unlatched. If instrument arm 3 is not to be used during the procedure, leave the arm in stow position (see Stow Position on page 5-7.)

5.5 Stow Position

The instrument arms are designed to be stowed, either for transport or when not in use. While in stow position, the instrument arms will not move during the startup sequence. When an instrument arm is in stow position, it cannot be activated and only clutching and fault state LEDs function.

Note: Use extreme care when moving or positioning the Patient Cart to ensure the arms do not hit any objects. If an arm hits an object while the Patient Cart is being moved or positioned, contact *Intuitive Surgical* Technical Support to have the Patient Cart inspected for damage.

To put instrument arm 1 or 2 in stow position:

1. Move the instrument arm close to the Patient Cart tower.
2. Once instrument arm 1 or 2 is close to the Patient Cart tower, the instrument arm insertion axis may be collapsed entirely and pitched into the full back position.

To put instrument arm 3 in stow position:

1. Ensure the first setup joint link of instrument arm 3 is directed toward instrument arm 2 (to the right when looking from the rear).
2. Arrange the setup joint links as pictured in Figure 5.6.

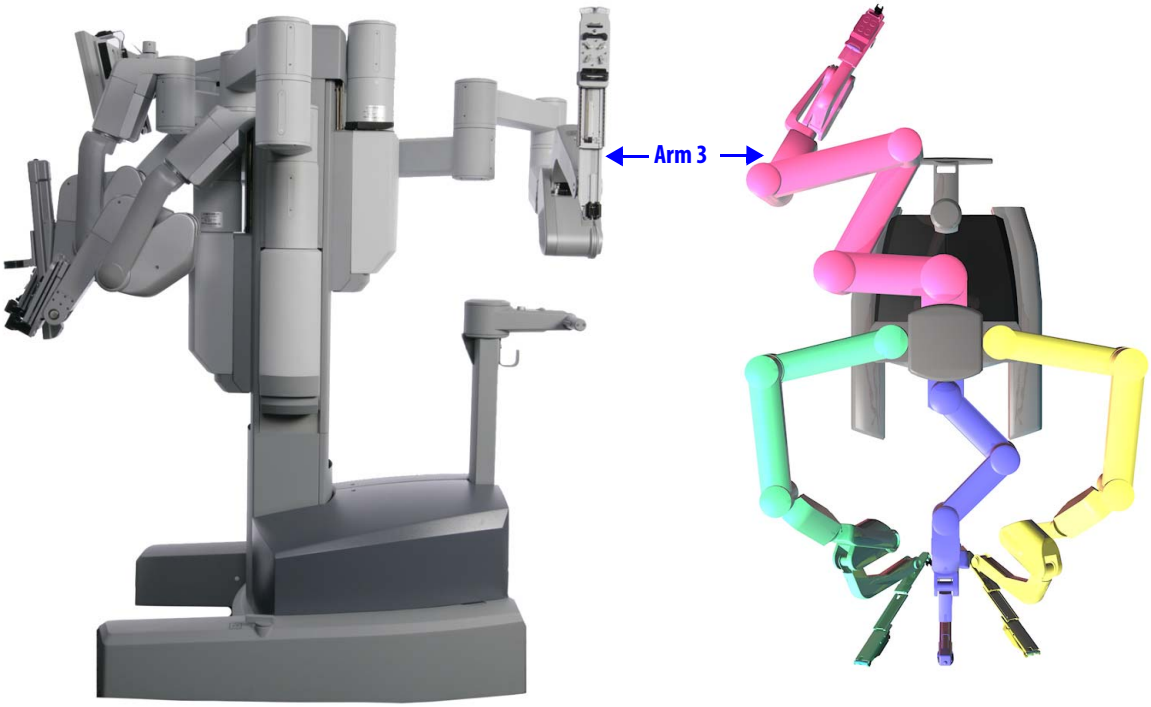


Figure 5.6 Arranging instrument arm 3 for stow position

3. Move the insertion axis to its fully collapsed and pitched back position, making sure the instrument arm tucks under the bottom-most link (as shown in Figure 5.7). Move the setup joint links as close to the Patient Cart tower as possible.

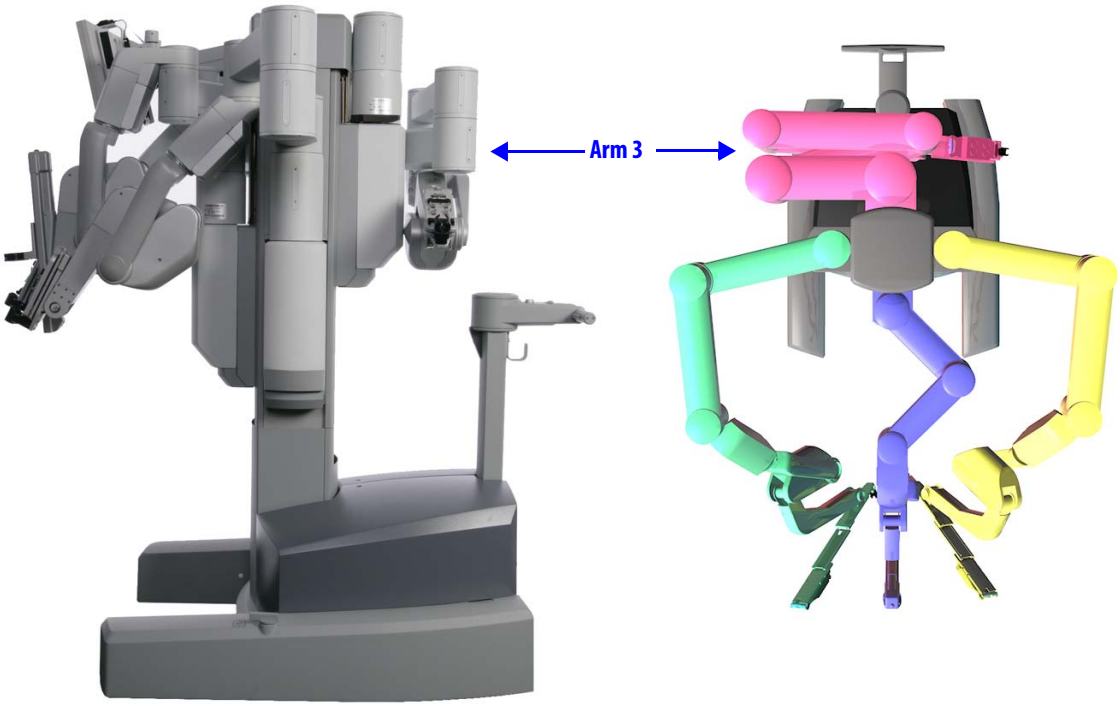


Figure 5.7 Instrument arm 3 in position to be stowed

4. Once instrument arm 3 is behind the Patient Cart tower (as shown in Figure 5.7), it can be stowed. Move the entire setup joint to the bottom of its vertical range of motion.

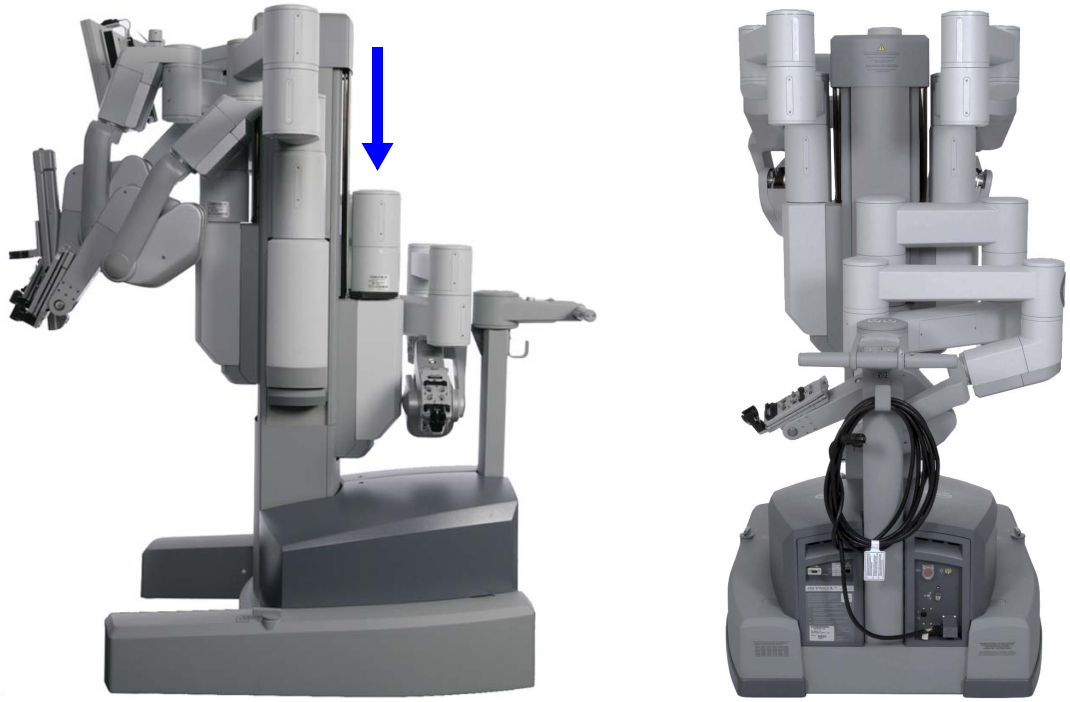


Figure 5.8 Setup joint at bottom of vertical range of motion

You can take Instrument arm 3 out of stow-position at any time using its port clutch button to move the arm. As soon as you release the port clutch button in front of the Patient Cart tower, the arm is enabled and the insertion axis extends in preparation for draping.

_____End of section_____

6 Draping

Draping makes the Patient Cart arms sterile and suitable for surgery. This chapter will outline how to drape the column, instrument arms, the camera arm, the camera head, and, optionally, the touchscreen. It contains the following sections.

Figure 6.1 Examples of draping

CE 0044

Drape Accessories Information

Drapes (see list below) are made by Microtek Medical and distributed by *Intuitive Surgical*.

Microtek Medical, Inc.
512 Lehmberg Road
Columbus, MS 39704
www.microtekmed.com

EC REP
Microtek Medical B.V.
Hekkenhorst 24
7207 BN Zutphen
THE NETHERLANDS

Distributed by:
Intuitive Surgical
1266 Kifer Road, Sunnyvale, California 94086 • USA
Intuitive Surgical Sàrl
1, chemin des Mûriers, 1170 Aubonne Switzerland
Customer Service from USA 1.800.876.1310
Customer Service from Europe +800.0821.2020
Manufactured in the U. S. A.

Drapes

- Instrument Arm Drape, PN 420015
- Camera Arm Drape, PN 420279
- Camera Head Drape, PN 420273
- Monitor Drape, PN 420281

6.1 Draping Guidelines

- For speed, sterility and safety, draping should be done by a two-person team: a scrub nurse or surgical assistant and a circulating nurse who can handle non-sterile components.
- Drape the arms systematically, moving from left to right or right to left.
- First drape the column. You should then drape instrument arm 3 (if it will be used).
- Using the clutch buttons, the circulating nurse should move each straightened arm to provide plenty of room to maneuver around the arm.
- Once an arm is draped, the scrub nurse should move the draped arm away from the undraped arms and prepare to drape the next arm.

To drape the *da Vinci Si*, you need a three-quarter drape for the column, two or three instrument arm drapes, a camera arm drape, and a camera head drape. Draping the touchscreen is optional. Drapes are available for order as complete kits and as individual items. Before beginning a procedure, make sure that you have sufficient draping supplies – at least one backup of each required drape – to account for inadvertent contamination while setting up the system, and have the endoscope laid out and ready for use.

WARNING: If the drape packaging is torn or open, do not use the drape, as the drape may be unsterile.

Note: Never substitute generic drapes for *Intuitive Surgical* drapes. Drapes are available from *Intuitive Surgical* or your distributor. Each piece of the custom draping has been designed to maintain sterility and to make the draping process easy and efficient.

6.2 Column Covering Procedure

Intuitive Surgical recommends covering the Patient Cart column with a three-quarter drape for procedures where fluid may splash onto the column. You should cover the column before draping the instrument arms and camera arm.

- Minimum length and width for three-quarter drape: 75" x 50" (190.5 cm x 127 cm)
- Maximum length and width for three-quarter drape: 80" x 60" (203.2 cm x 152.4 cm)

1. Prepare the Patient Cart for draping by exposing the column as shown below.

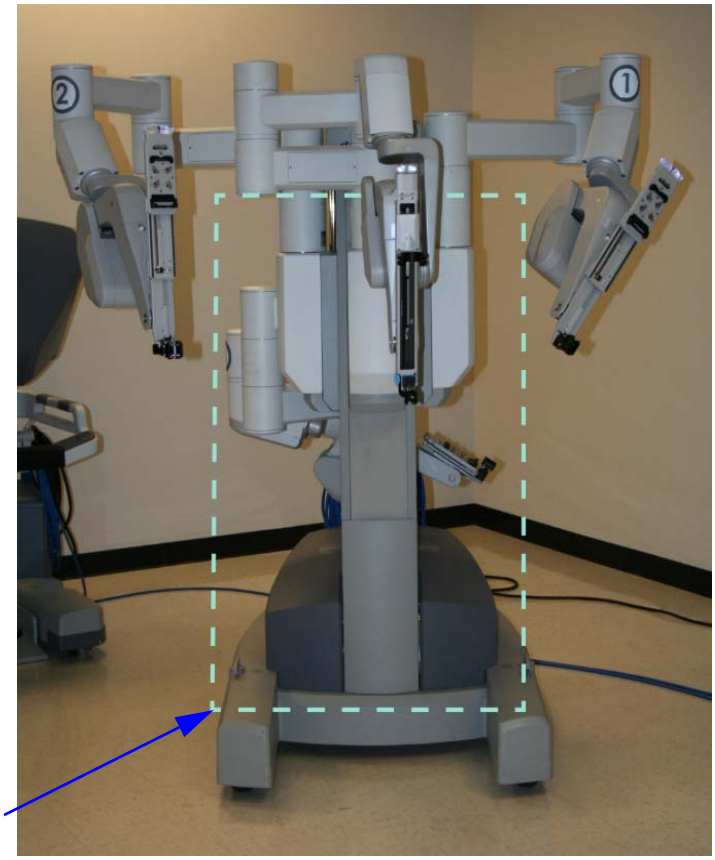


Figure 6.2 Patient Cart prepared for draping

2. Wrap a three-quarter drape around the Patient Cart column. Use the drape in landscape orientation (Landscape). Place the drape in the following areas:
   - Over the setup joint ledge for instrument arms 1, 2, and the camera arm.

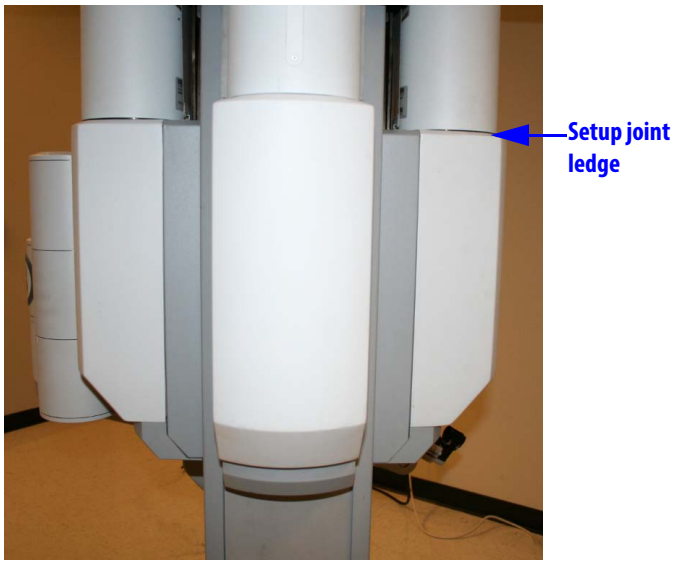


Figure 6.3 Setup joint ledge

- Between instrument arm 3 setup joint and the Patient Cart column. This configuration allows for a mid-procedure third arm deployment if the arm is stowed.

Figure 6.4 Seen from rear right

3. Tighten and secure the drape behind the Patient Cart column.
   - Roll the drape ends together to tighten

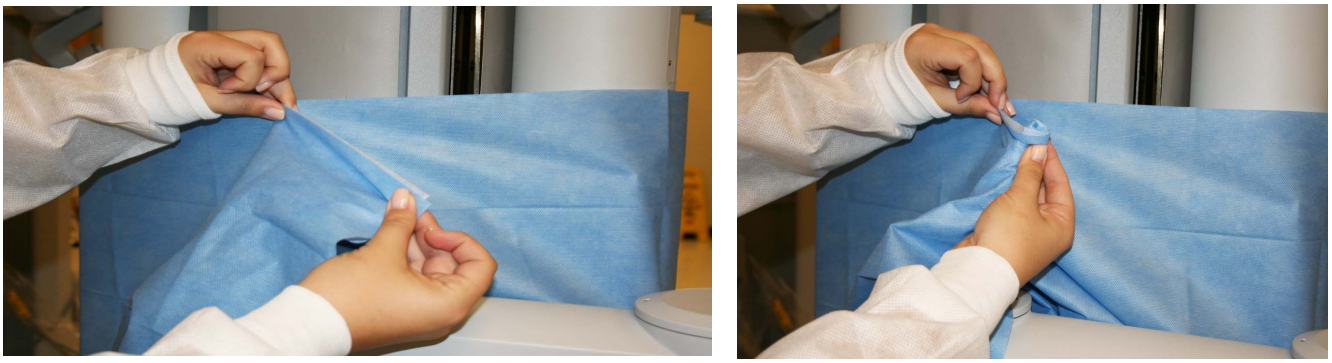


Figure 6.5 Rolling the drape ends together

- Secure with a towel clamp. Place the rolled drape (with towel clamp) on the opposite side of the instrument arm 3 setup joint

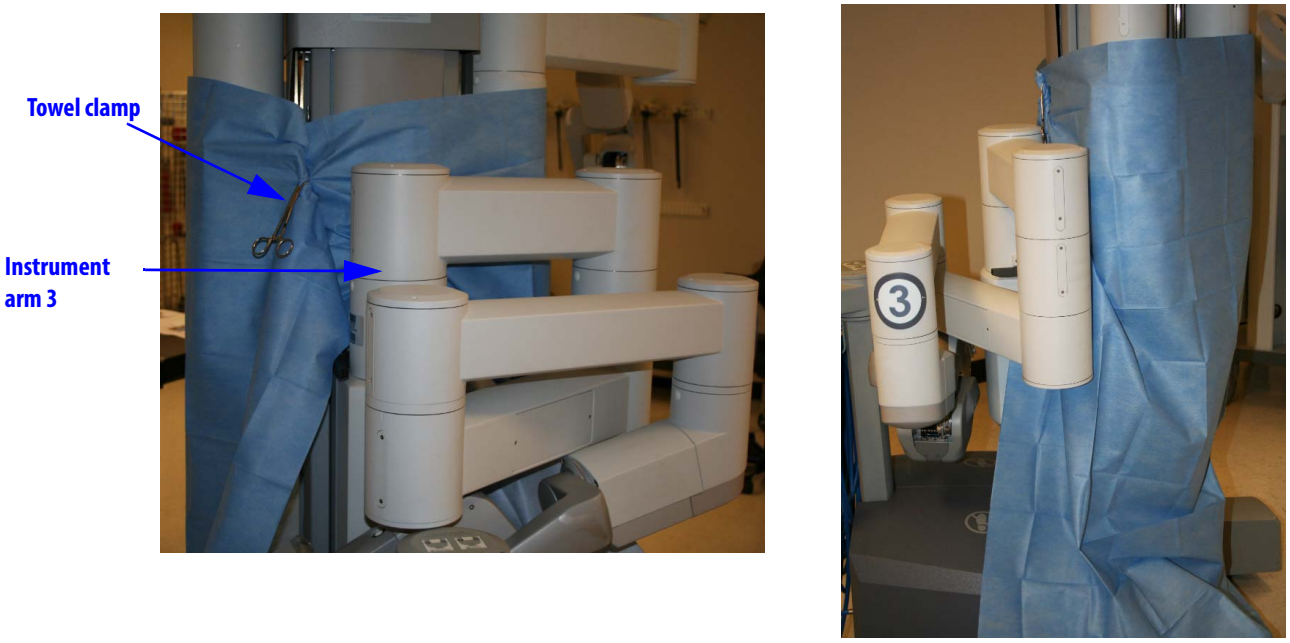


Figure 6.6 Secure with towel clamp | Clamp opposite of instrument arm 3

4. After moving any instrument or camera arm setup joint up or down, you should readjust the three-quarter drape. Always ensure the drape remains tight and secure *above the setup joint ledge* for instrument arms 1, 2, and the camera arm.
5. Straighten out the drape so that it neatly covers the base of the cart.

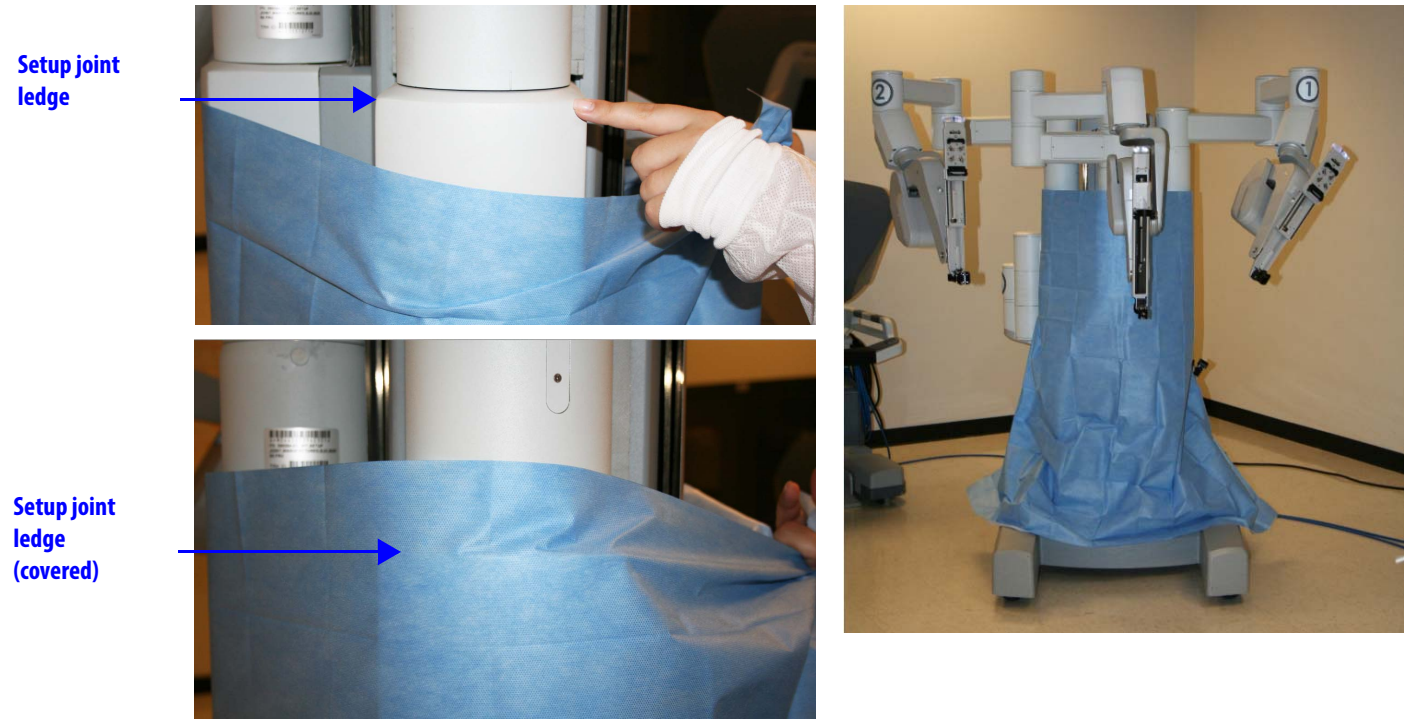


Figure 6.7 Setup joint ledge | Completed Patient Cart with drape

6.3 Instrument Arm Draping Procedure

Note: The blue band on the drape indicates the sterility barrier. If a non-sterile person is assisting in installation of the drape, he/she must not grasp the drape anywhere beyond the blue band.

1. **Circulating Nurse:** Deliver the instrument arm drape to the scrub nurse in sterile fashion, with the instrument arm sterile adapter facing the ceiling.
2. **Scrub Nurse:** Unfold the drape on a sterile table.

Figure 6.8 Unfolding instrument arm drape

3. Tent the opening of the drape and grip the outside with your finger and thumb. Hold the top of the drape with the other hand. Lower the drape over the instrument arm insertion axis.

Figure 6.9 Lowering the drape over the insertion axis

4. Insert the base of the sterile adapter into the black molded piece into which it fits. Using both thumbs, push the sterile adapter into the instrument arm until it clicks into place (Figure 6.10). If sterile adapter does not engage, remove and re-seat the sterile adapter. Confirm proper engagement using the steps under Sterile Adapter Engagement Verification on page 6-11.

Figure 6.10 Insert base, press top to install sterile adapter

The wheels on the sterile adapter will spin, and you will hear three beeps, indicating that the system recognizes the sterile adapter.

5. Remove the two tear-aways on the front of the drape.

6. Using the cuff of the drape, move it back along the instrument arm toward the Patient Cart tower (Figure 6.11).

Figure 6.11 Stretching the drape along the arm

7. Seat the cannula mount molding. Make sure the molding snaps over the cannula mount (Figure 6.12).

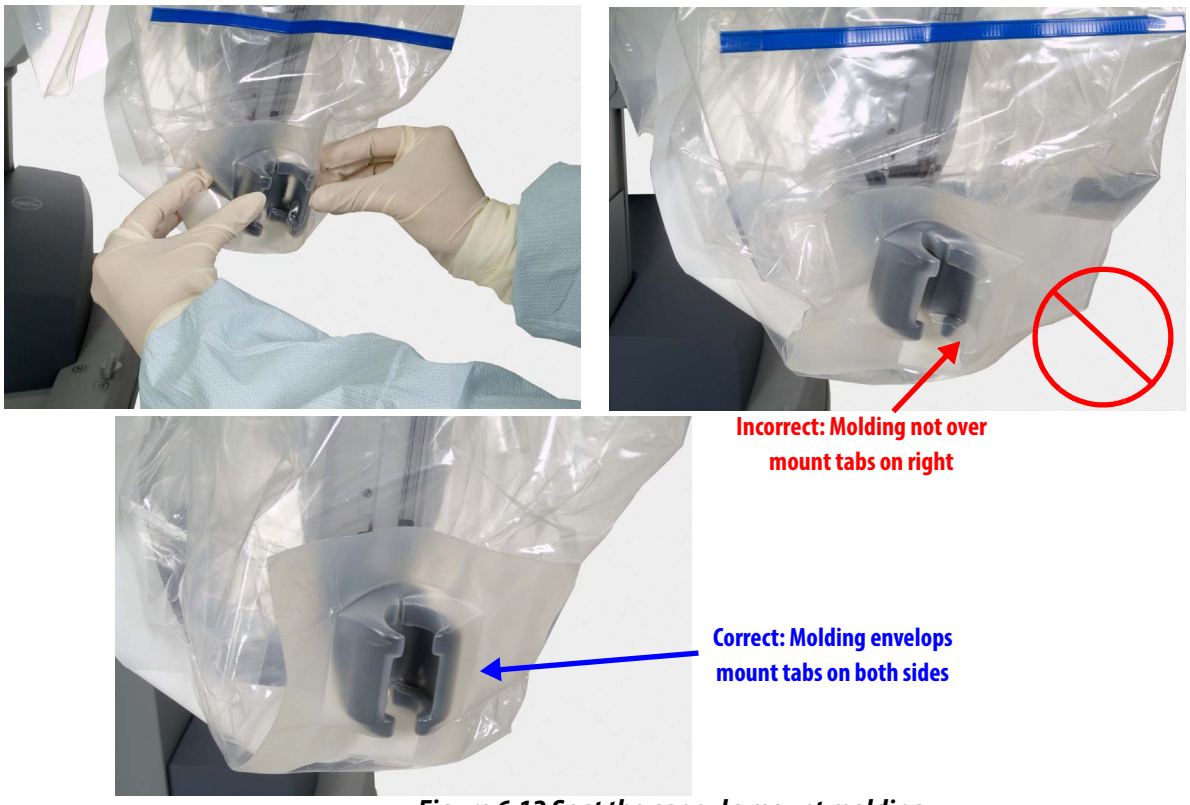


Figure 6.12 Seat the cannula mount molding

8. Wrap all white drape straps snugly around the instrument arm, and attach each strap to itself (Figure 6.13). You may wish to confirm that the arm moves without tearing the drapes or straps.

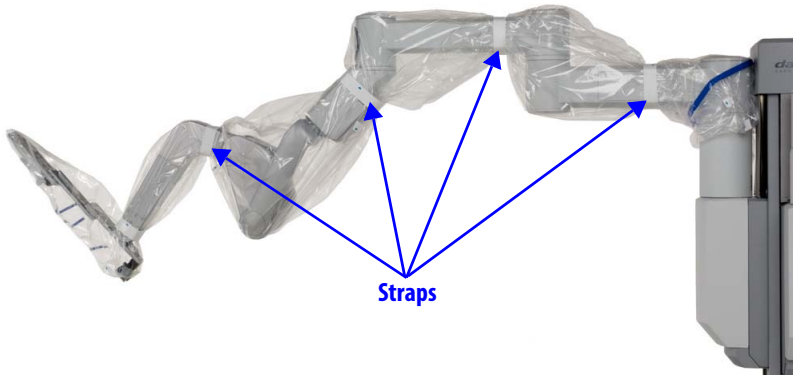


Figure 6.13 Securing the drape with the drape straps

9. Bend the blue flex-strips to create a clear instrument insertion path along the axis of the instrument arm.

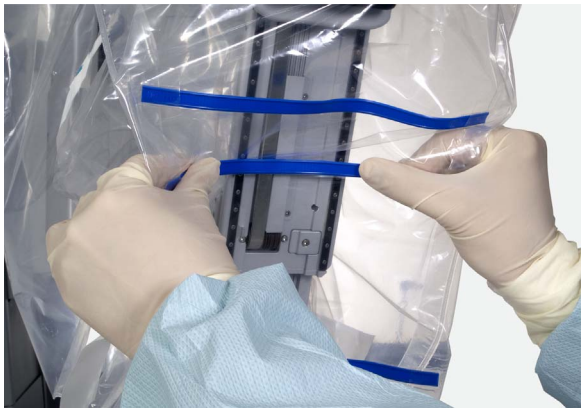
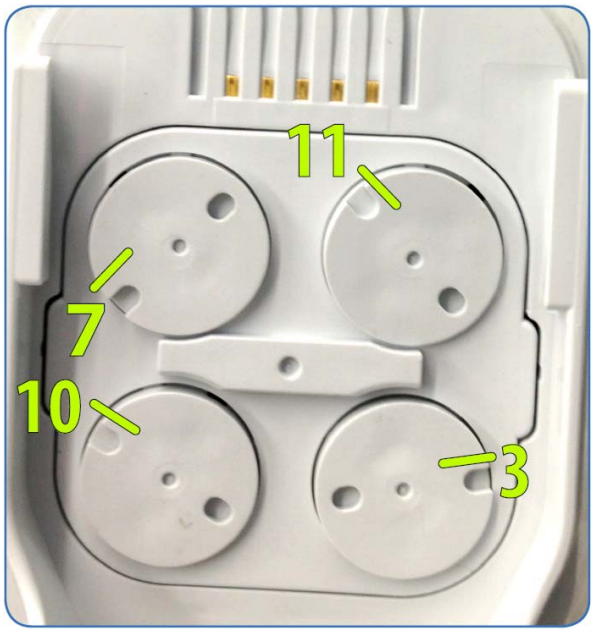


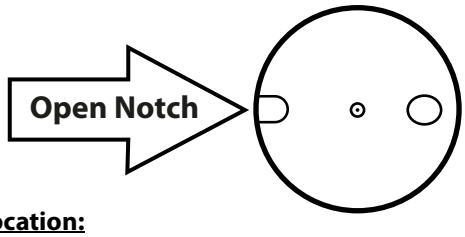
Figure 6.14 Bend the blue flex-strips

Sterile Adapter Engagement Verification

It is important to ensure the sterile adapter built into the drape is properly engaged with the instrument arm, so the instrument works properly when installed. Follow these steps and best practices to ensure engagement.



After the Sterile Adapter is attached and the discs rotate back and forth, verify the position of the open notch on each disc.



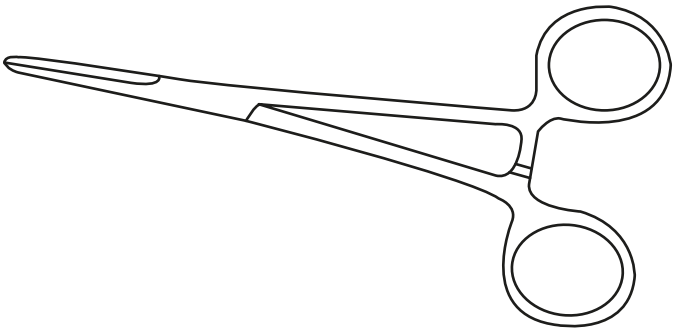
Open Notch Location:
Top Left disc – 7 o'clock
Top right disc – 11 o'clock
Bottom right disc – 3 o'clock
Bottom left disc – 10 o'clock

Clockwise from top left:
"7, 11, 3, 10"

The discs should be in this alignment after draping and before installation of an instrument.

Note: Once a sterile adapter is successfully engaged on the arm, it should not need to be removed or reseated until the end of the procedure.

If any open notch does not match the position above, use the closed tip of a sterile Kelly Forceps or Hemostat instrument to manual rotate the disc.



Rotate the disc in either direction until it clicks into place. The disc should no longer rotate once it is fully engaged. If the sterile adapter does not engage properly, remove and reseat the instrument arm drape.

6.4 Camera Arm Draping Procedure

Before you begin draping the camera arm, the sterile person should move the draped instrument arms away from the camera arm, to provide plenty of room to walk between the arms.

Note: Before draping the camera arm, make sure you install the correct endoscope cannula mount based on which endoscope cannula will be used during the procedure. Refer to the Instruments and Accessories User Manual for more information.

Note: The blue band on the drape indicates the sterility barrier. If a non-sterile person is assisting in installation of the drape, he/she must not grasp the drape anywhere beyond the blue band.

To begin draping the camera arm:

1. **Circulating Nurse:** Deliver the camera arm drape to the scrub nurse in sterile fashioning the arrow-side facing up.
2. **Scrub Nurse:** Unfold the drape on a sterile table and remove the white retainer from the sterile adapter.

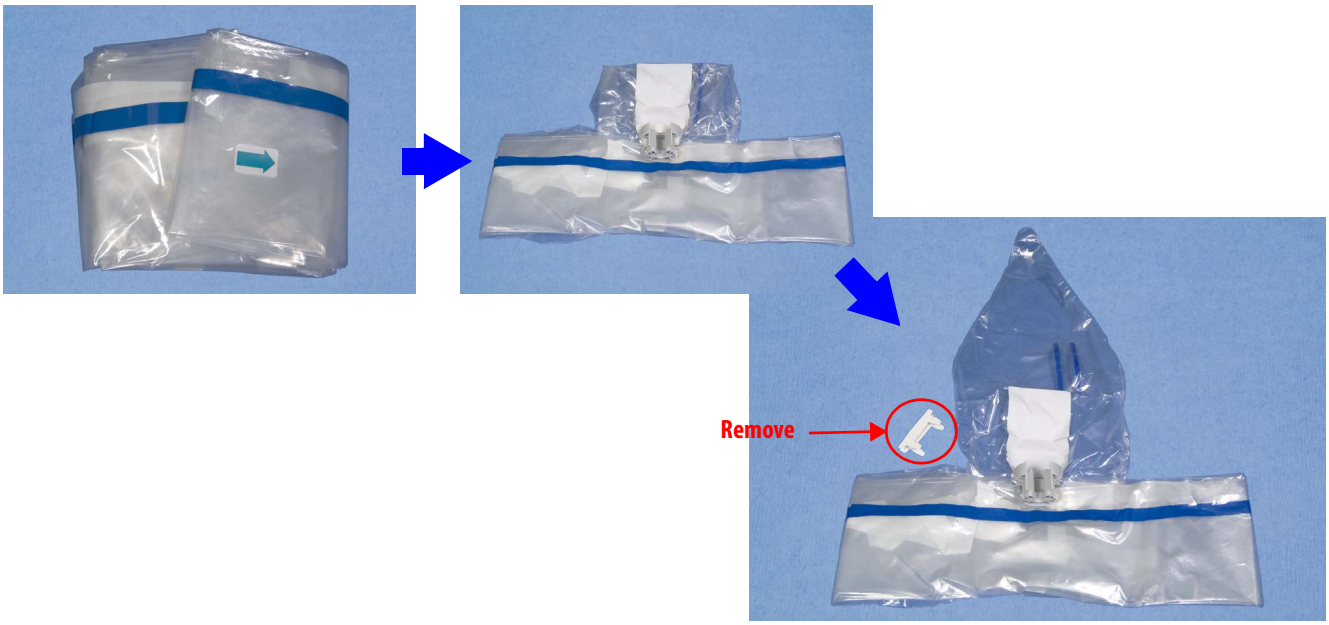


Figure 6.15 Unfold camera arm drape and remove white retainer

3. Insert one hand into the bottom opening of the drape and hold the top of the drape with the other hand. Lower the drape over the insertion axis and then lift the top of the drape over the top of the arm's insertion axis.

Figure 6.16 Lower over insertion axis, install sterile adapter

4. Now install the camera arm sterile adapter into the carriage on the camera arm. Using the side of one hand as shown above, make a trough in the drape through the carriage to create room for the endoscope to pass through. Then firmly push the camera arm sterile adapter into place (Figure 6.16). To check if it is properly seated, pull up on the camera arm sterile adapter, which should remain attached to the camera arm. Re-seat and re-check as necessary.
5. Using the cuff of the drape, move the drape down along the camera arm setup joint to the center column of the Patient Cart (Figure 6.17).

Figure 6.17 Extend drape to the center column and secure

6. Use your hands inside the drape cuff to engage the opposing Velcro strips near the center column.
7. Seat the cannula mount molding. Make sure the molding snaps over the cannula mount (see Figure 6.18 below and Figure 6.12 on page 6-9).

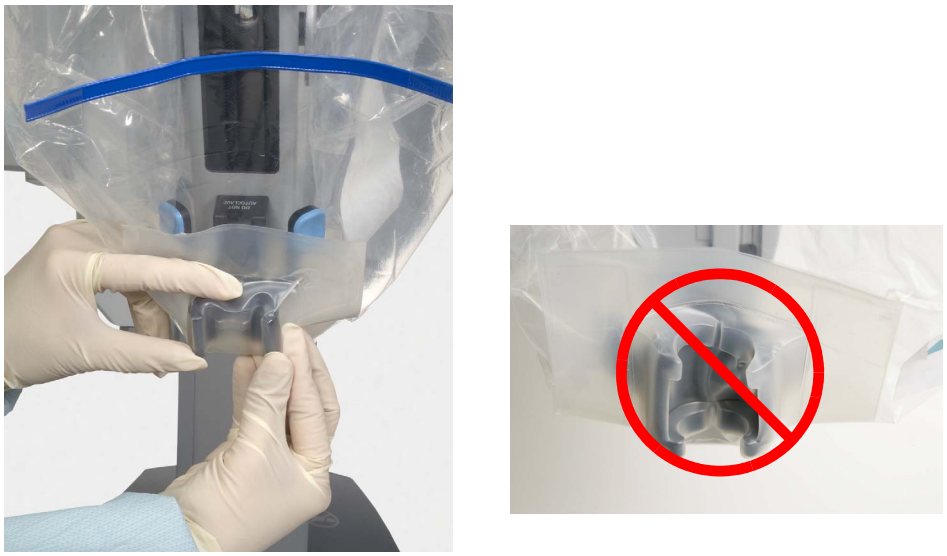


Figure 6.18 Seating the cannula mount molding

8. Wrap the white drape straps snugly all the way around the camera arm and tape each strap's end to itself.

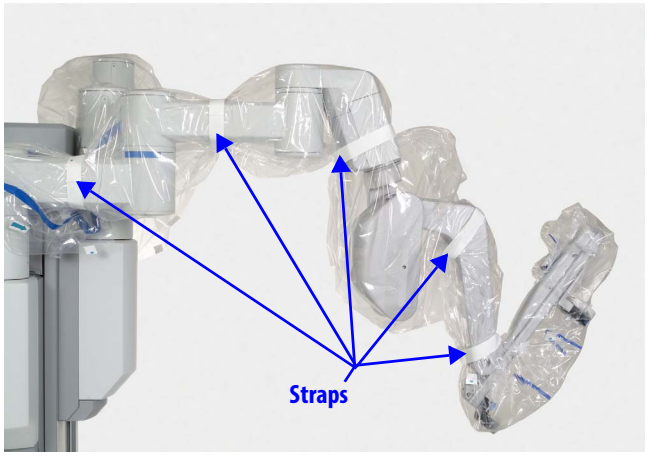


Figure 6.19 Camera arm drape secured with straps

9. Bend the blue flex-strips to create a clear path for the endoscope along the arm's insertion axis, and to ensure the camera arm drape does not stretch or tear during system operation.

Figure 6.20 Bend the blue flex-strips around the insertion axis

6.5 Camera Head Draping Procedure

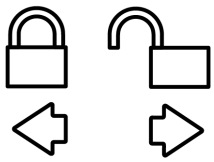
Note: Before draping the camera head, wipe the lenses to remove any debris or smudges.

Since the Vision Cart and cables are not sterile, a non-sterile person (circulating nurse below) must assist a sterile person (scrub nurse below) with draping and connecting the camera head. (The camera head itself is not sterile and must not be autoclaved.)

To drape the camera head:

1. **Circulating nurse:** Deliver the camera drape to the scrub nurse in sterile fashion.
2. **Scrub nurse:** Unfold the drape. Then insert a hand into the open end of the drape, and grab the camera head sterile adapter firmly.

Figure 6.21 Attaching camera head to sterile adapter



3. **Circulating nurse:** Attach the camera head to the camera head sterile adapter. You must align the pins in the camera head with the channels in the sterile adapter, push down and turn until the camera head locks into place. You will hear a click once it locks into place. Icons on the camera head ring-nut (shown at left) indicate the direction you must turn to lock or unlock the sterile adapter in the camera head.
4. **Scrub nurse:** Invert the drape over the camera head.

Figure 6.22 Invert drape over camera head, pull along cables

5. **Circulating nurse:** Pull the drape along the cables.

Note: To avoid contamination, arrange the draped assembly and cables on the table in an "S" shape, or coil into a sterile basin.

6.6 Touchscreen Draping Procedure (Optional)

Note: The blue band on the drape indicates the sterility barrier. If a non-sterile person is assisting in installation of the drape, he/she must not grasp the drape anywhere beyond the blue band. Due to the size of the touchscreen drape, a second sterile person may be needed to assist with touchscreen draping. To begin draping the touchscreen monitor:

1. **Circulating Nurse:** Remove the monitor drape from the sterile packaging.

2. **Scrub Nurse:** Place the drape on a sterile table with the label facing up. Remove and discard the paper insert.

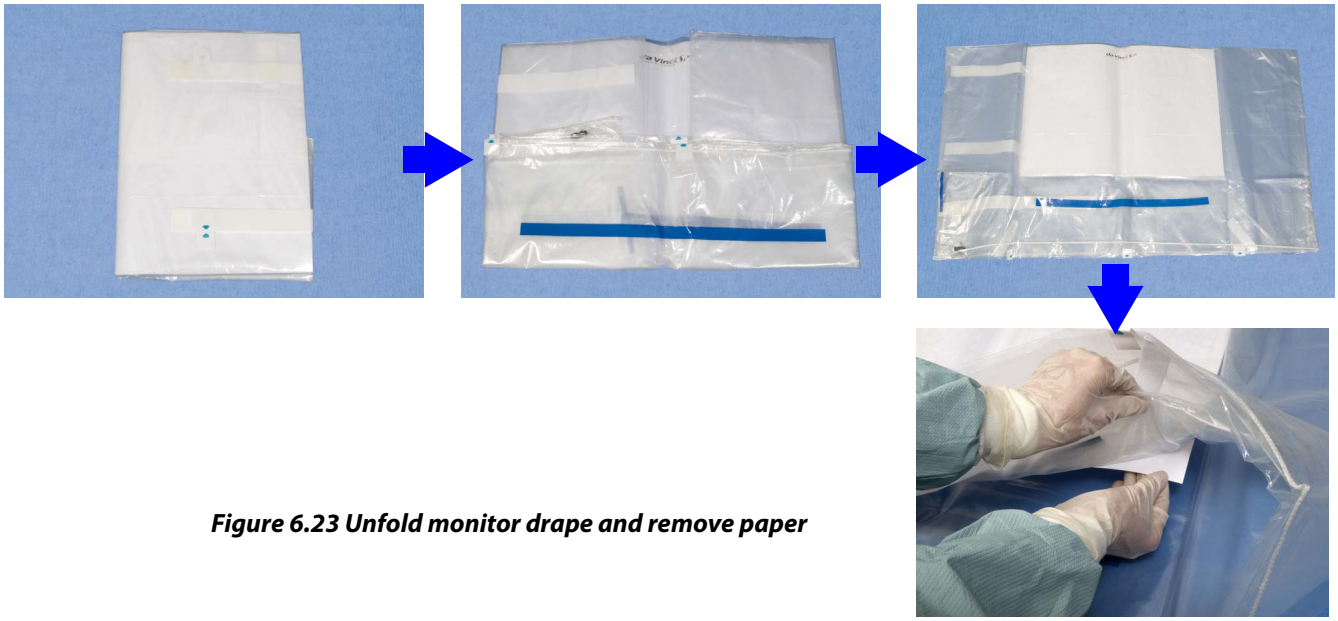


Figure 6.23 Unfold monitor drape and remove paper

3. Place one hand in the bottom opening of the drape and hold the top of the drape with the other hand. Lower the drape over the monitor with the label facing towards you.

Figure 6.24 Lower the drape over the monitor

4. Use the cuff of the drape to move the drape all the way down to the base of the monitor arm.

Figure 6.25 Push drape back with cuff

5. Secure the tape around the arm and then tighten the drawstring around the base of the monitor arm, using the fastener to keep it secure (Figure 6.26). Tuck any extra drawstring inside the pouch located near the cuff of the drape (Figure 6.26).

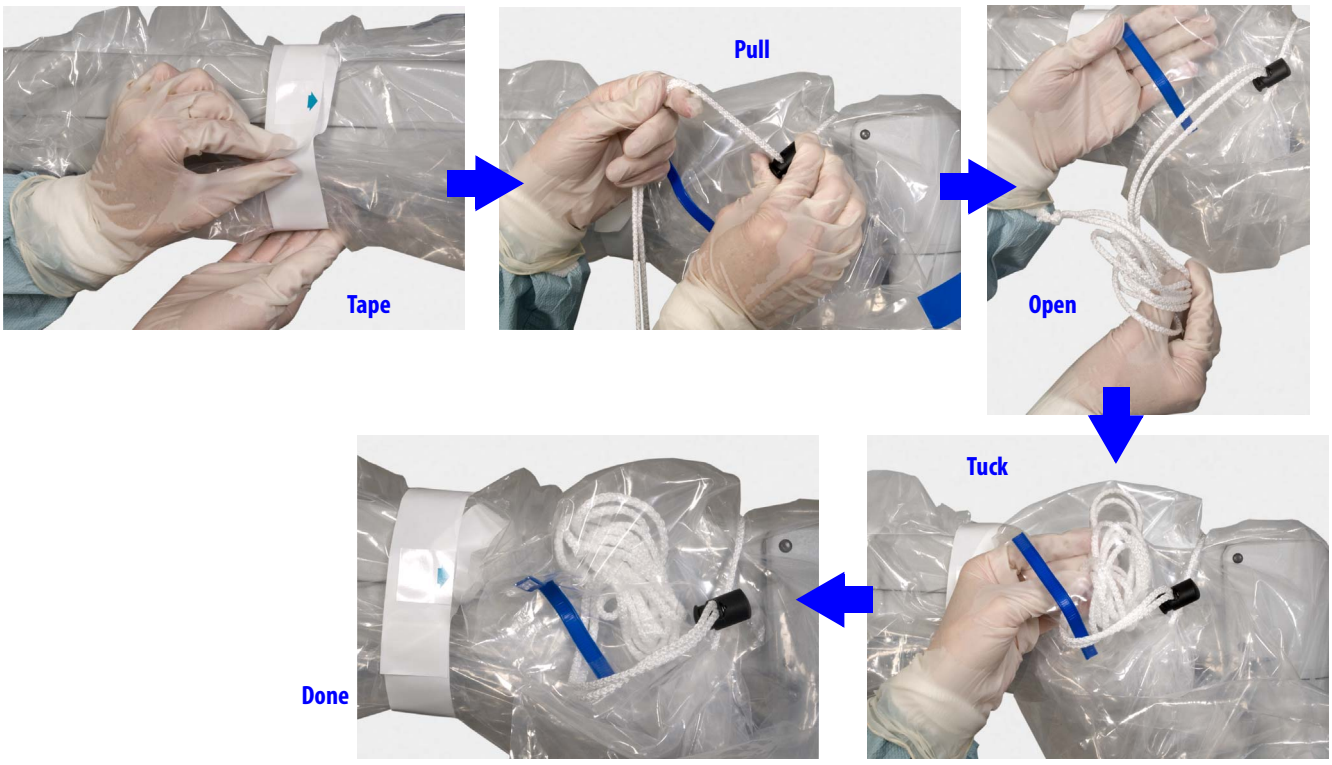


Figure 6.26 Secure tape, tighten drawstring, tuck extra inside

6. Align the drape window to the monitor. Press the drape so that it clings smoothly to the monitor surface.

Figure 6.27 Smoothing the drape on the monitor

7. Secure the Velcro straps on the sides and rear of the monitor.

Figure 6.28 Secure Velcro straps on sides and rear

When you finish draping, tuck the arms against the column and stow the Patient Cart for surgery.

When draping is complete, the Vision System is ready for setup, which is covered in the next chapter.

_____End of section_____

7 Vision System Use

This chapter explains the setup and use of the *da Vinci® Si* ™ HD Vision System. The following subjects are covered:

7.1 Vision System Overview

The 3DHD Vision System provides a high resolution image for the surgeon (at the 3D viewer) and the patient-side assistant (at the touchscreen). The 3DHD endoscope assembly (endoscope and camera head) can be used manually (that is, handheld, as with a traditional endoscopy cart) or can be mounted on the camera arm to assist with preoperative exploration.

Figure 7.1 Vision system components

Note: The *da Vinci Si* System must be used only with ISI approved or supplied cameras, endoscopes, accessories and image processing equipment. This ensures optimal image quality and *da Vinci Si* System performance.

CAUTION: Surgery should be performed with the *da Vinci Si* System only when the vision system provides sufficient visualization to safely perform surgical tasks.

Illuminator

The Illuminator provides lighting for the surgical field. The Illuminator monitors the life left on the lamp module and notifies you when replacement is recommended. For replacement instructions, see Illuminator Lamp Module Replacement on page 12-2. For additional, general information and specifications regarding the Illuminator, see Appendix C: Illuminator Information.

Endoscopes

⚠ **CAUTION: Do not autoclave the endoscope. The endoscope should be cleaned and sterilized before each procedure and does not require sterile draping during surgical use. Clean and sterilize the endoscope prior to each use. Refer to Reprocessing Instructions User Manual (PN 550875) for reprocessing methods and parameters.**

⚠ **CAUTION: Handle endoscope with care. Dropping the endoscope may result in damage and loss of functionality. Inspect endoscope for damage prior to use.**

The endoscope provides a left and right optical channel to capture the surgical image. Light from the Illuminator is projected on the surgical field through integrated fiber optic channels. Heat from the fiber optic channels helps to minimize fogging at the endoscope lens.

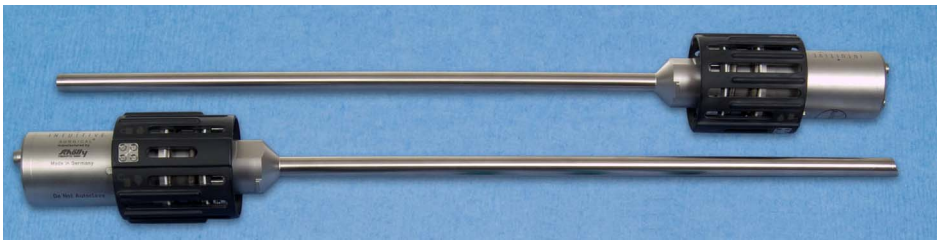


Figure 7.2 Examples of endoscopes

Endoscope Information

CE 0297

Intuitive Surgical endoscopes (see list below) are made by Schoelly Fiberoptic and distributed by *Intuitive Surgical*.

Schoelly Fiberoptic GmbH
Robert-Koch-Str. 1-3
79211 Denzlingen
GERMANY

Distributed by:
Intuitive Surgical
1266 Kifer Road, Sunnyvale, California 94086 • USA
Intuitive Surgical Sàrl
1, chemin des Mûriers, 1170 Aubonne Switzerland
Customer Service from USA 1.800.876.1310
Customer Service from Europe +800.0821.2020
Manufactured in Germany.

Endoscopes

- 8.5 mm Endoscope (0° tip), PN 371938
- 8.5 mm Endoscope (30° tip), PN 371939
- 8.5 mm Fluorescence Endoscope (0° tip), PN 372010
- 8.5 mm Fluorescence Endoscope (30° tip), PN 372011
- 12 mm Endoscope (0° tip), PN 370890
- 12 mm Endoscope (30° tip), PN 370891
- 12 mm Fluorescence Endoscope (0° tip), PN 370892
- 12 mm Fluorescence Endoscope (30° tip), PN 370893

Camera Head

The 3D camera head contains two HD video cameras. One camera is used for the right optical path and one for the left optical path. The high definition vision system provides both a widescreen (16:9) and a magnified view through the use of digital zoom.

Figure 7.3 Camera head

CAUTION: Handle the camera head carefully. Dropping the camera head may result in damage and loss of camera functionality.

Note: Damage to the camera cable can occur through repetitive actions during use in surgical procedures. These failures usually occur near the camera head.

CAUTION: Handle the light guide cable carefully. If the cable is bent sharply or kinked, it can damage the fiber optic material enclosed in the light guide cable. Such damage can substantially reduce the amount of light transmitted through the light guide cable (Figure 7.4).

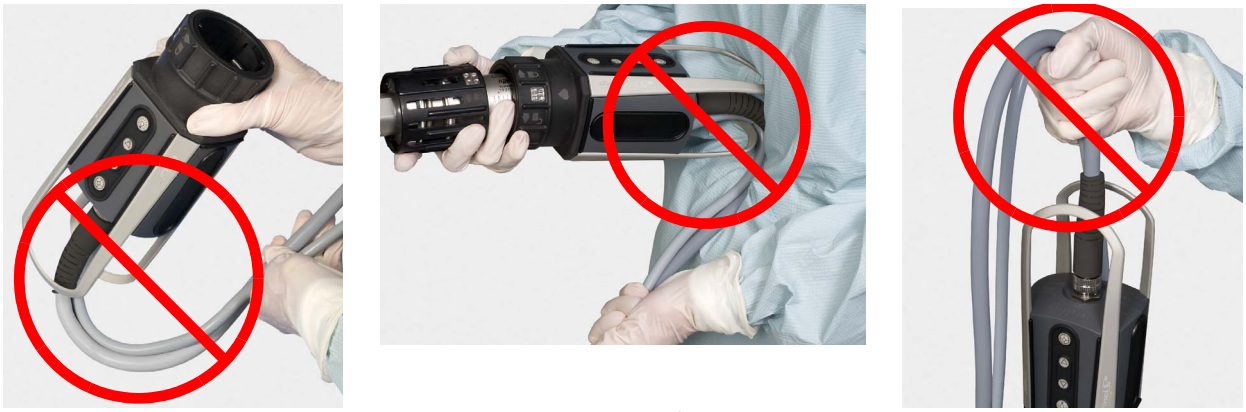


Figure 7.4 Examples of mishandling camera head cables

Camera Head Information

Intuitive Surgical camera heads [Camera Head Assembly, PN 655859 (371952) and Camera Head Assembly, PN 655858 (372126)] are made by Schoelly Fiberoptic and distributed by *Intuitive Surgical*.

Schoelly Fiberoptic GmbH
Robert-Koch-Str. 1-3
79211 Denzlingen
GERMANY

Distributed by:
Intuitive Surgical
1266 Kifer Road, Sunnyvale, California 94086 • USA
Intuitive Surgical Sàrl
1, chemin des Mûriers, 1170 Aubonne Switzerland
Customer Service from USA 1.800.876.1310
Customer Service from Europe +800.0821.2020
Manufactured in Germany.

Touchscreen Monitor

The touchscreen enables you to view and telestrate on the surgical field (and/or optional video inputs), and to adjust vision and system settings. A microphone and speaker on the touchscreen facilitate communication between the surgeon and the patient-side assistant.

7.2 Setting Up the Vision System

This section explains how to prepare the vision system for use.

⚠ CAUTION: **Failure to adhere to approved operating practices may result in damage to the endoscope. Examples of improper practices include: dropping of equipment, collisions, and improper cleaning and sterilization techniques. A damaged endoscope may result in fragments falling into the patient.**

Pre-operative Inspection

The endoscope and corresponding endoscopic equipment and accessories should be thoroughly inspected for any mechanical or optical defects before each procedure. The glass surfaces in the light ports at the distal tip and those located at the camera end should be clean and free of any deposits and residues to ensure a bright and clear image. Inspect surfaces carefully for any irregularities or damage, such as sharp edges, cracks, dents, mechanical and/or thermal defects due to inadequate application of electrosurgery or other instruments. Careful inspection and assembly as described in this section can prevent loss of any components during use.

⚠ WARNING: **Do not use endoscopes with any defects or signs of damage, including damage to the light ports or fiber surfaces, as serious injury or surgical complications may occur to the patient.**

⚠ WARNING: **Do not look into the light at the tip of a fiber-optic bundle when the lamp is on. As with any bright light, permanent eye injury can result.**

Inspecting Glass and Endoscope Surfaces

Follow these steps to inspect endoscope light ports and fiber surfaces:

1. Hold the distal endoscope tip toward a bright ceiling lamp.
2. Inspect the light ports. The individual fibers should appear bright.
3. Move the distal endoscope tip held toward the lamp slightly to observe a noticeable change in brightness of the fibers within the light port surface. Some fibers will remain dark without any impact on quality, but if the majority of the fibers appear dark then the resulting limited illumination may restrict adequate operation.

Install Endoscope on Camera Head

Before you can install the endoscope on the camera head, you must install the camera head sterile adapter, as described in 6.5 Camera Head Draping Procedure on page 6-15.

Endoscope Orientation on the Camera Head and Calibration

The endoscope has pins in its base that help you to align it easily with the corresponding channels on the camera head sterile adapter.

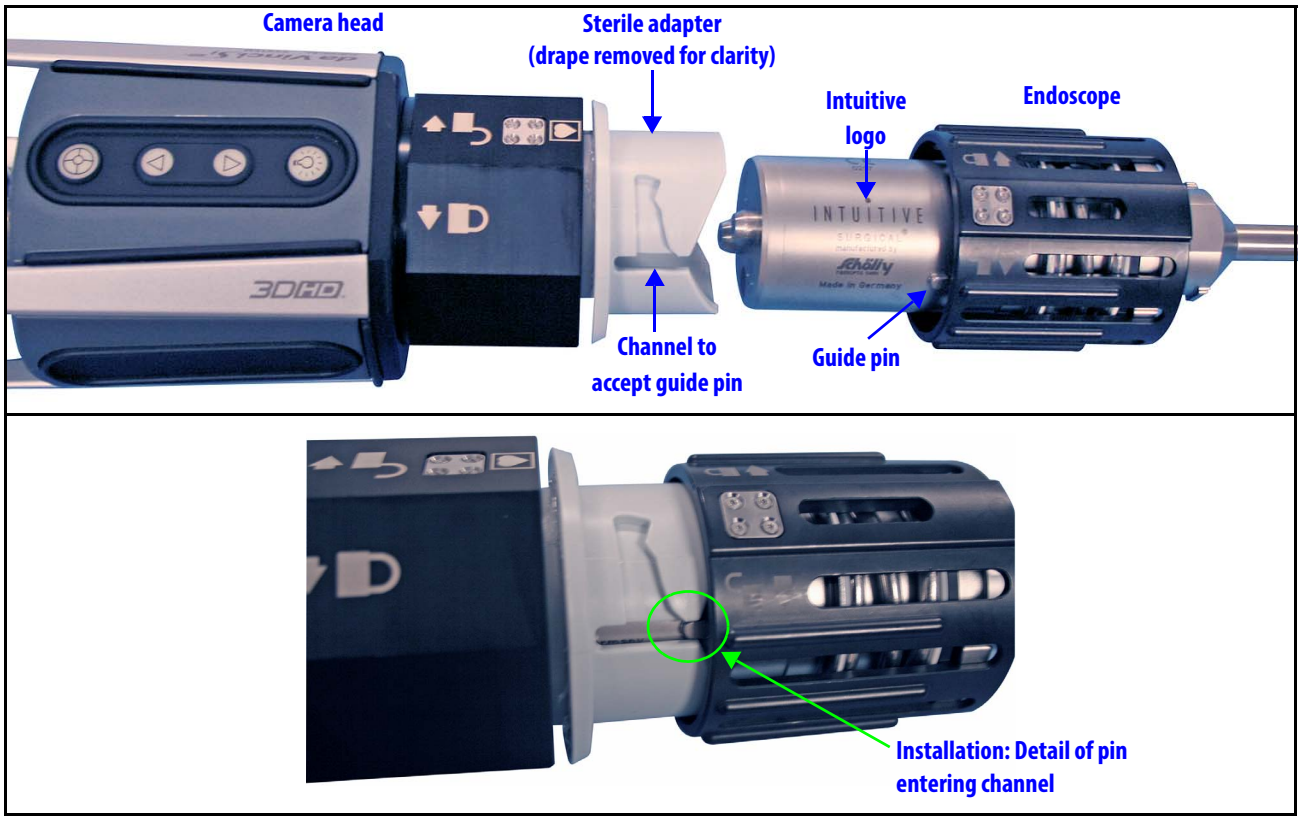


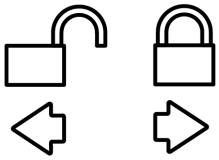
Figure 7.5 Installing endoscope in camera head

The pins support installing the endoscope on the camera head in two orientations 180 degrees opposite. The calibration process is sensitive to the orientation of the endoscope with respect to the camera head. You must successfully calibrate the endoscope in each orientation in which you will use it. For an angled endoscope, you must calibrate the scope in both orientations to make sure it is ready for use as a 30 degrees up scope and as a 30 degrees down scope.

30°↑
30°↓

- For angled endoscopes, the orientation with which you install it determines whether the scope is 30 degrees up or down. (The system automatically detects and displays it, whichever way it is installed.) For 30 degrees up, orient the scope so that the angled tip is on the same side as the camera head buttons; do the opposite for 30 degrees down. The scope base also indicates which side is which with marking that says **30°↑** on one side and **30°↓** on the other.
- For flat endoscopes (0 degrees), we recommend you install the endoscope on the camera head consistently in the same orientation: with the “Intuitive Surgical” logo on the base of endoscope on the same side as the camera head buttons, as shown above in Figure 7.5.

Follow these steps to install the scope:



1. Hold the endoscope and camera head with attached sterile adapter firmly in each hand – avoid dropping either part.
2. Place the endoscope base over the sterile adapter, turning the scope as necessary until the scope slides down over the camera head sterile adapter.
3. Push down the scope until it bottoms and turn until it locks into place. You will hear a click when the endoscope is locked into the sterile adapter. Icons on the endoscope base (shown at left) indicate the direction you must turn to lock or unlock the scope over the sterile adapter.

Camera / Scope Setup from the Camera Head

The *da Vinci Si* System supports camera / scope setup, including white balance and automatic 3D calibration, completely via the camera head buttons. Using only the camera head buttons as explained below, a single sterile person can select options presented on the touchscreen. There is no need to touch the touchscreen, although it is still possible to perform manual calibration at the touchscreen, as described under Manual 3D Calibration, page 7-13.

Three buttons are provided on the camera head for quick vision system setup.

Control	Adjustment	Description
	**Vision Setup**	Use the **Vision Setup** button to open and make selections within the **Camera/Scope Setup** menu.
	**Focus In & Out / Navigate menu**	Press the **Focus In** or **Out** buttons to adjust the focus of the surgical image, and to navigate the Camera/Scope Setup menu.
	**Lamp On/Off**	Press and hold **Lamp On/Off** for 1 second to turn the lamp on or off.

Figure 7.6 shows the camera head buttons.

Figure 7.6 Camera head buttons, shown draped on right

Press and hold 1 s to open menu

Invoke Camera / Scope Setup and Navigate

As long as no instruments are in following mode, you can open the **Camera / Scope Setup** menu on the touchscreen by pressing and holding for 1 second the **Vision Setup** button on the camera head. When you do, the following menu appears.

Figure 7.7 Camera / Scope Setup on touchscreen via camera head

Navigate

Select

This menu is navigable only by means of the **Focus In** and **Out** arrow buttons on the camera head. You cannot select these options by touching them directly on the touchscreen (except for the **X** button to close the menu). For orientation, the up arrow is the one nearer the **Lamp On/Off** button. Press up or down to move up or down the list. Press the **Vision Setup** button to "click" your selection like a mouse button.

The message **"Auto-calibration in progress..."** appears continually in the stereo viewer until you exit the menu.

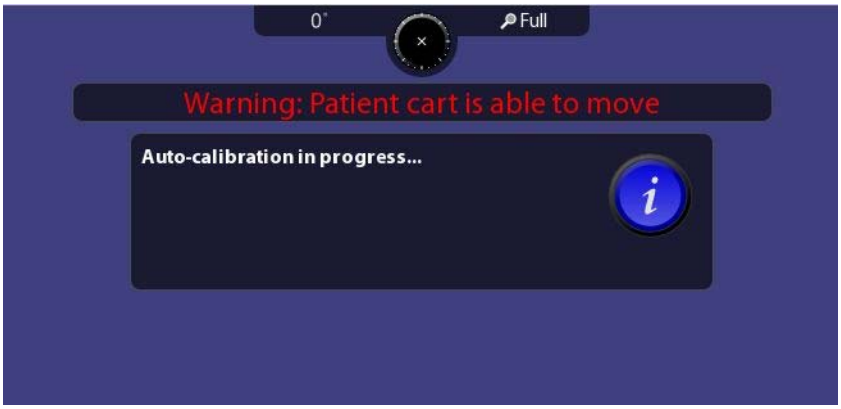


Figure 7.8 Auto-calibration in progress (appears in stereo viewer only)

To exit the **Camera / Scope Setup** menu completely, select **Exit** in the menu (see Figure 7.7 above) or touch the **X** button on the touchscreen. The surgeon cannot enter following mode until calibration is complete and you exit this menu.

Setting the White Balance

You must white balance the camera at the start of each procedure and any time a camera head, endoscope, lamp module, or Illuminator is changed. White balance sets a white color benchmark for the vision system.

To set the white balance, follow these steps:

1. Turn on the lamp by pressing the **Lamp On/Off** button on the camera head or Illuminator front panel. (The Illuminator must be powered on. When Illuminator power is on but lamp is off, the display reads **"OFF"** and the LED on the front panel is lit amber.)

   The display flashes **"OFF"** while the lamp ignites. When the lamp is on, the LED on the front panel turns blue, and the display indicates intensity as a percentage of maximum. Use the **–** and **+** buttons to adjust intensity in 10% increments. Make sure the intensity is set to **100%** before proceeding.
2. Point the endoscope at a white object so the object covers the entire field of view. The white object should be 4 in. (10 cm) from the endoscope tip.

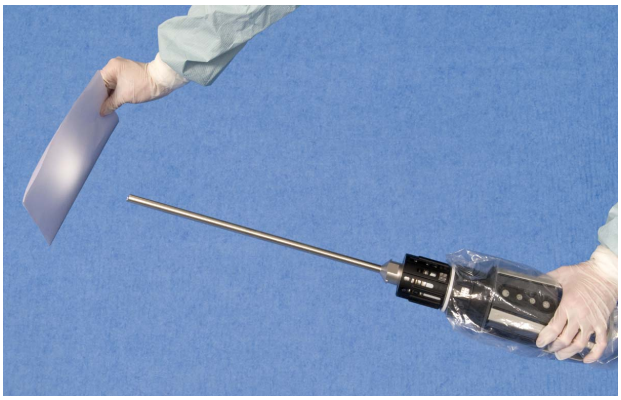


Figure 7.9 Using paper to set the white balance

Note: Do not use gauze. Gauze does not provide an appropriate background for white balancing.

3. If the **Camera / Scope Setup** menu is not already open, press and hold for 1 second the **Vision Setup** button on the camera head to open it.

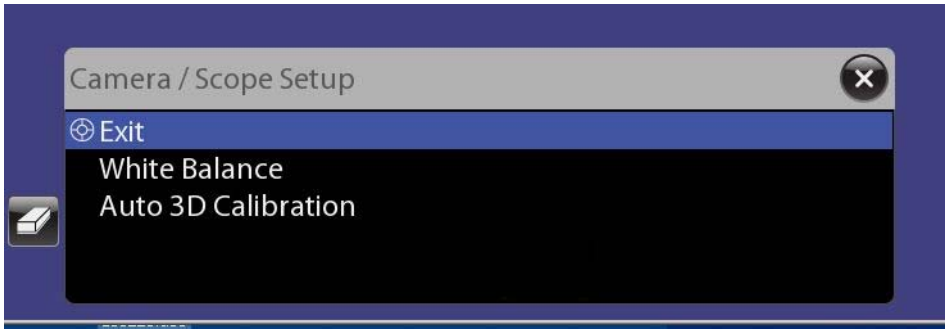
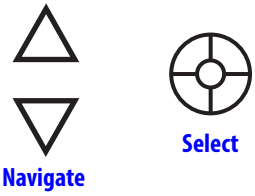
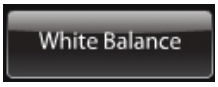


Figure 7.10 Camera / Scope Setup on touchscreen via camera head



4. Select **White Balance.** (Navigate with the **Focus In** and **Out** buttons, and press the **Vision Setup** button to make a selection.) It runs to completion automatically.



- Alternatively, you can start white balance by touching the **White Balance** button on the **Camera / Scope Setup** screen on the touchscreen or touchpad. To access the **White Balance** button from the touchscreen, select **Camera / Scope Setup** from the **Video Settings** tab; from the touchpad, select **Camera / Scope Setup** from the **Video** tab.

A message appears briefly on the screen indicating when white balance is complete, and then you return to the menu and a check mark appears next to **White Balance**.

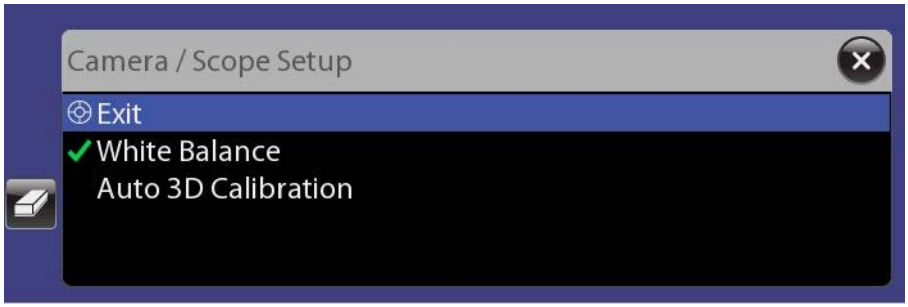


Figure 7.11 White Balance marked complete

3D Calibration of the Endoscope Assembly

3D Calibration adjusts the 3D image for mechanical variances in the assembly comprised of the endoscope, sterile adapter and camera head.

- The *da Vinci Si* System automatically detects the scope angle, which is necessary to perform calibration. If the system does not detect the scope angle, the touchscreen enables you to manually select the scope angle.
- We recommend you perform calibration at the start of each procedure for all endoscopes and angles you expect to use with the current camera head and its sterile adapter. The system saves the last calibration for every combination of endoscope, angle and camera

head, so if you follow this recommendation, it enables you to change angles (and scopes when using both a 0 degree and 30 degree up/down scope) during a procedure without having to recalibrate.

- If during surgery you change to use a camera head, sterile adapter or endoscope you did not use for calibration before surgery, recalibrate all the endoscope angles you plan to use with the new equipment.

Auto 3D Calibration

Auto 3D Calibration is driven exclusively by the camera head buttons. Follow these steps to perform Auto 3D Calibration:

1. Insert the endoscope tip fully inside the endoscope alignment target, using the proper hole and orientation, which depends on the tip angle, so that the target crosshairs are visible on the center of the touchscreen.

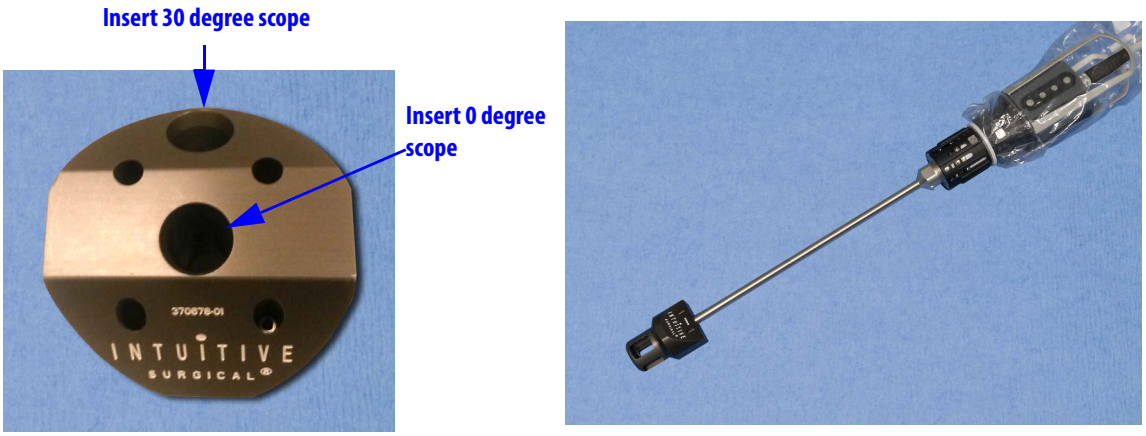


Figure 7.12 Using the alignment target

Note: For 3D calibration to be successful, the crosshairs must be well centered on screen and the target must be kept as still as possible on the endoscope.

2. If the Camera / Scope Setup menu is not already open, press and hold for 1 second the **Vision Setup** button on the camera head to open it.

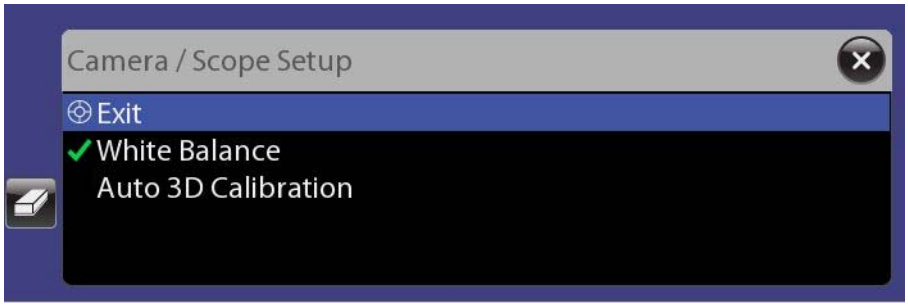
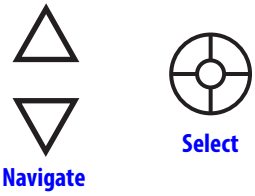


Figure 7.13 Camera / Scope Setup on touchscreen via camera head



3. Select **Auto 3D Calibration**. (Navigate with the **Focus In** and **Out** buttons, and press the **Vision Setup** button to make a selection.) The process starts, the touchscreen shows calibration in progress, and the process runs to completion in a few seconds. (You cannot stop or cancel it once started.)

When complete, the system asks you, **"Does this calibration look correct?"**

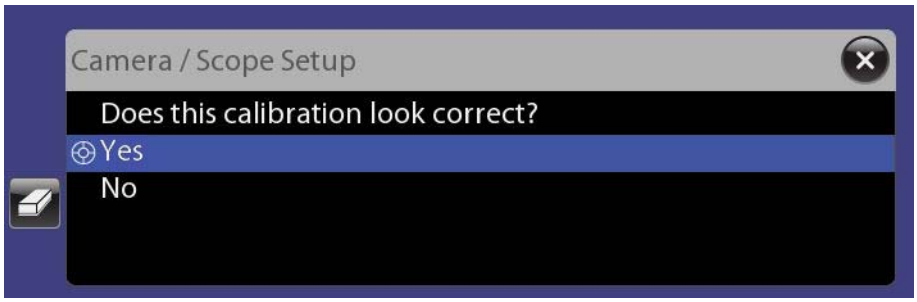


Figure 7.14 Verify calibration (appears on touchscreen only)

If you select **Yes**, you return to the previous menu and a check mark appears next to **Auto 3D Calibration**.

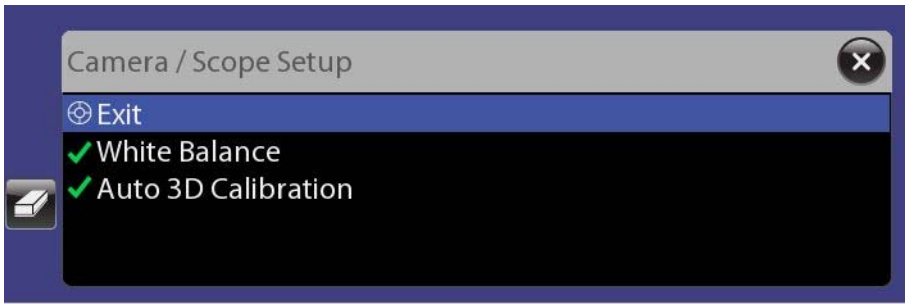


Figure 7.15 Check mark indicates action complete (appears on touchscreen only)

No check mark will appear if you select **No**, but the calibration setting will be kept, since it is the system's best estimate of calibration. If you are not satisfied, you have the option to run Auto 3D Calibration again, or to run it manually via the touchscreen or touchpad menus. You always can access **Camera / Scope Setup**, including manual **3D Calibration**, via the touchscreen **Video Settings** tab or touchpad **Video** tab.

To exit the **Camera / Scope Setup** menu completely, select **Exit** in the menu (see Figure 7.15 above) or touch the **X** button on the touchscreen. The surgeon cannot enter following mode until calibration is complete and you exit this menu.

Note: To avoid having to calibrate endoscopes during a procedure, repeat calibration for all endoscopes and angles you expect to use with the current camera head and its sterile adapter.

Manual 3D Calibration

Follow these steps to perform manual3D calibration:

1. Touch **3D Calibration** on the touchscreen or touchpad. (If you are not there already, go to **Camera / Scope Setup** on the **Video** or **Video Settings** tab.) The system shifts into calibration mode: both the touchscreen and the Surgeon Console viewer present the left and right eye images in distinct colors, using green and magenta.

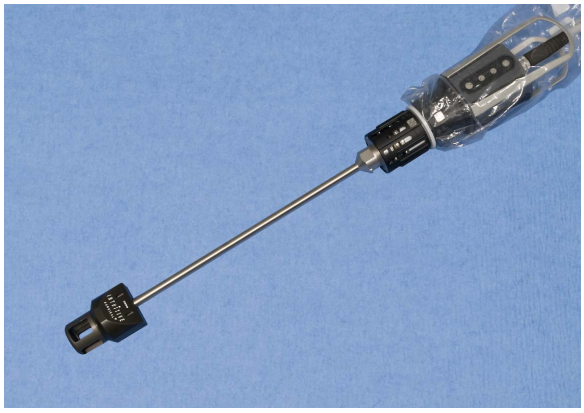


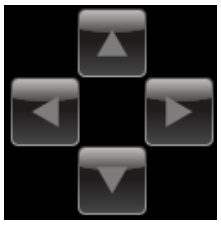
Figure 7.16 Alignment target and scope tip inserted, target centered on screen

2. Insert the endoscope tip fully inside the endoscope alignment target, using the proper hole and orientation, which depends on the tip angle, so that the target crosshairs are visible on the center of the touchscreen.

Note: For 3D calibration to be successful, the crosshairs must be well centered on screen and the target must be kept as still as possible on the endoscope.

3. Use the **Focus In** and **Out** buttons on the camera head to focus the image.

4. Touch the arrows on the touchscreen or touchpad to move the green crosshairs until aligned with the magenta crosshairs.



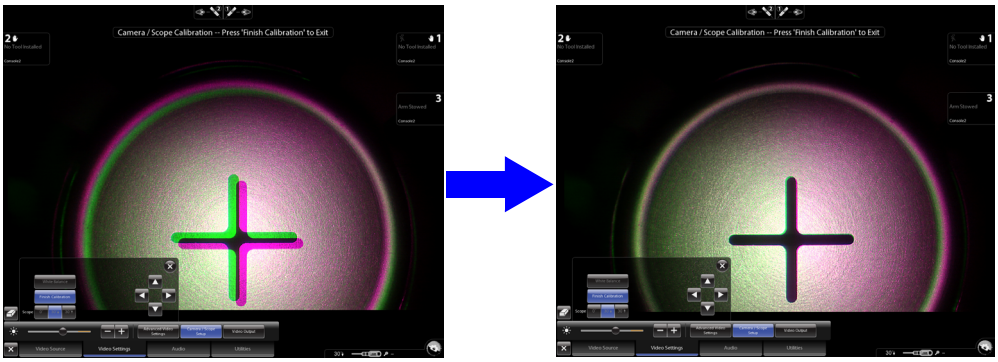
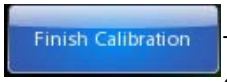


Figure 7.17 Aligning crosshairs



Touch **Finish Calibration** on the touchscreen or touchpad to save the calibration setting and exit calibration mode.

Note: To avoid having to calibrate endoscopes during a procedure, repeat calibration for all endoscopes and angles you expect to use with the current camera head and its sterile adapter.

Preoperative and Intraoperative Endoscope Care

Before use, ensure the endoscope tip is adequately heated to minimize fogging when entering the surgical site. To heat the endoscope tip, dip it in a canister of heated sterile water. Place a piece of sterile gauze at the bottom of the canister to prevent damage to the delicate endoscope tip.

Intraoperative Endoscope Cleaning

As necessary due to fogging or smudging of the tip, remove the endoscope and wipe the tip with moistened sterile gauze.

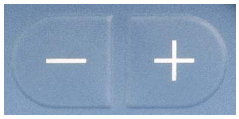
Confirm Live Image in Stereo Viewer

Each time you install an endoscope, and after changing view modes or settings during a procedure, look in the stereo viewer to confirm a live image is present and has the desired orientation. Adjust endoscope orientation as necessary. If no image is present, confirm the lamp is on and at 100% intensity, as shown below. See section C.3 Basic Troubleshooting, page C-5, for further troubleshooting if no image is present.

7.3 Working with the Illuminator Controls

Figure 7.18 Illuminator controls and intensity display

Table 7-1 Illuminator Controls and Adjustments

Control	Adjustment	Description
	**Lamp On/Off**	Press **Lamp On/Off** to turn the lamp on and off. Use **Lamp On/Off** when the Illuminator is temporarily not in use. Press and hold **Lamp On/Off** when the lamp is on to turn off the lamp at the Illuminator.
	**Intensity Control Decrease (–) Increase (+)**	Press **Intensity Control** decrease (–) and increase (+) buttons to adjust Illuminator output in 10% increments. Press and hold both (–) and (+) at the same time to display the current lamp hour usage.

Note: To minimize fogging, maintain heating of the endoscope tip by setting the Illuminator brightness to 100% and use the brightness controls through the touchscreen or touchpad to adjust the brightness of the surgical image.

WARNING: The temperature of the distal tip of the endoscope may exceed 41°C during use. Avoid contact with skin, tissue and clothing when the Illuminators are turned on and the endoscope is outside the camera cannula, as damage may occur to skin, clothing and equipment. Do not attempt to clean the tip of the endoscope by dipping it in tissue. The tissue can be damaged because of the heat, and the tip of the endoscope may develop baked-on deposits which can decrease light throughput.

7.4 Working with the Touchscreen Vision Controls

The touchscreen monitor provides the ability to adjust vision system functions as described in this section. The following figure illustrates arrangement of overlaid elements in the touchscreen display. Note that many overlaid elements appear only when needed, and others are usually or always present. For a complete list of icons and text messages, please refer to Appendix G: Symbols, Icons and Text Messages Reference.

Touchscreen Display

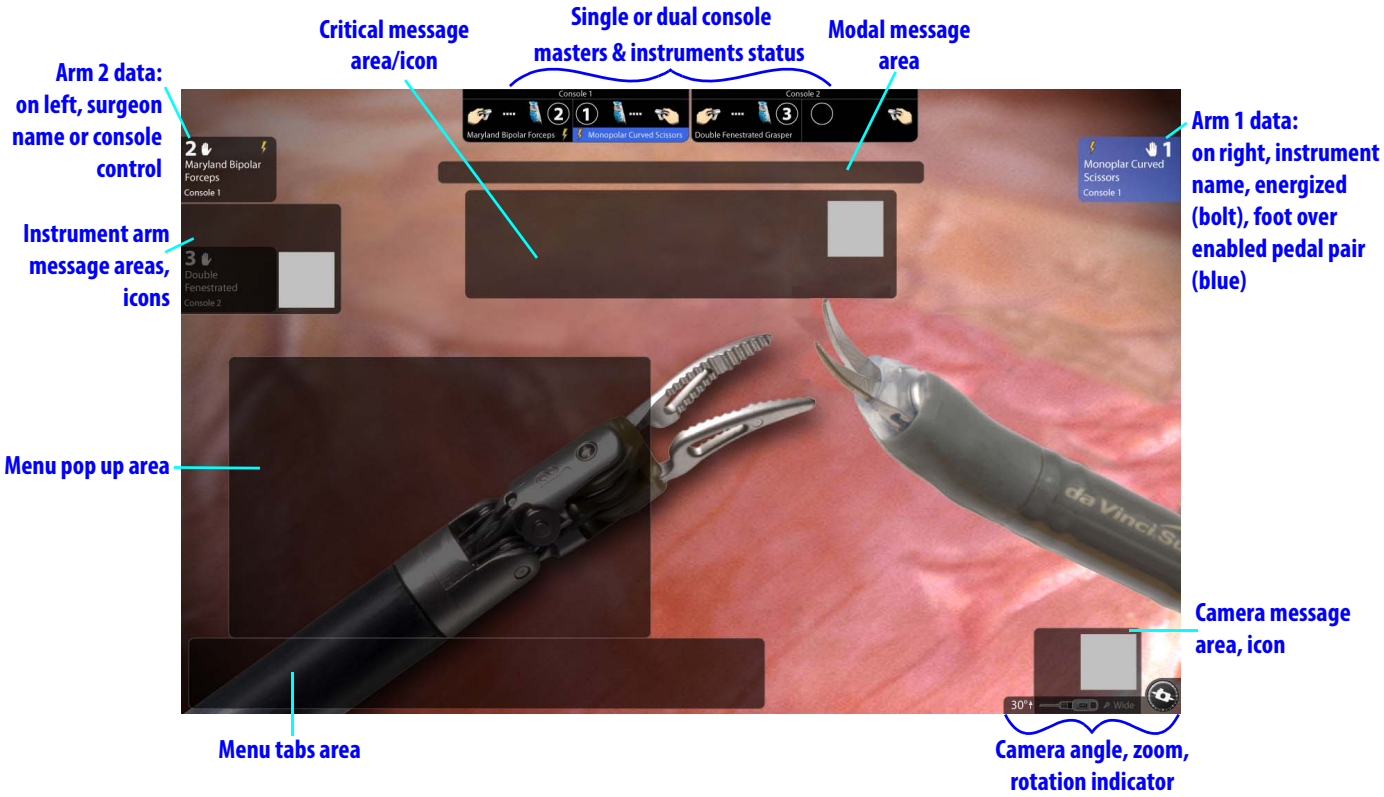


Figure 7.19 Touchscreen display

Single or Dual Console Masters & Instruments Status Area

When one Surgeon Console is in use, the touchscreen shows masters and instruments status at top center with a single status area like the one shown in Figure 7.20 below. When in dual console mode, two small status areas (as below in Figure 7.20) appear side by side at top center of the touchscreen.

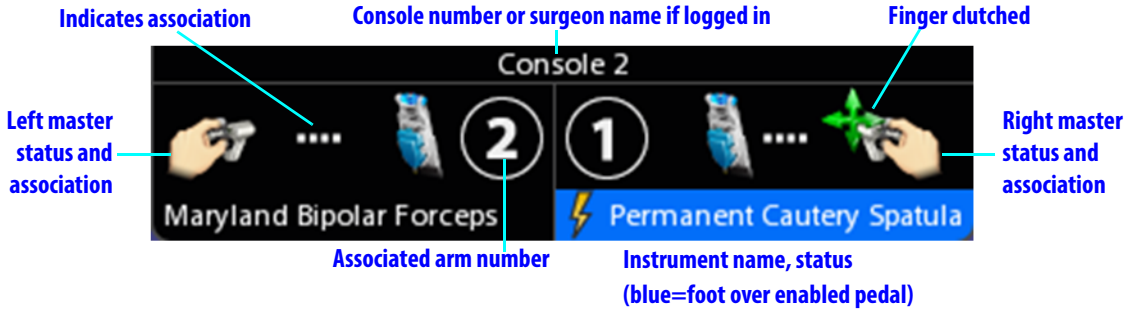


Figure 7.20 Masters and instruments status area for consoles in use

This area provides masters and instruments status for consoles in use, showing:

- The console number at the top, or the user name of the surgeon if logged in
- For left and right masters, the associated instrument name, arm number and energy status, including turning orange when firing
- The same status icons as appear elsewhere, and the additional icon showing that the master is clutched (finger clutched) as seen on the right above. For a complete list of icons and text messages, please refer to Appendix G: Symbols, Icons and Text Messages Reference.

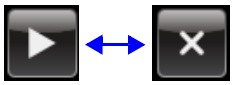
Note: On the stereo viewer when in dual console mode, only one of these status areas appears, at upper left, showing the instrument status of the other Surgeon Console. If you select the Surgeon View from the Video Source Tab (see page 7-17), you will have the further choice of which console's view and icons to see on the touchscreen.

Touchscreen Menu Access

Touch the **Open** button in the bottom left corner to access the following menu tabs to make adjustments:

Figure 7.21 Touchscreen menu tabs: Video Source, Video Settings, Audio, Utilities

Note: Items highlighted blue are currently selected. Grayed-out items are not available in the current context.



The **Open** button toggles to **Close** when the menu is open; touch it to close the menu. Below we address the adjustments available in each menu tab. Before that, we explain telestration, since it is always available.

Telestration

Telestration is available by default. You can telestrate on the touchscreen monitor no matter what video source is displayed. To telestrate, drag your finger on the monitor, pressing slightly, to draw a colored line on the video image. The telestration drawn also appears in the Surgeon Console viewer, overlaid on whichever video channel (left or right) is being used at the touchscreen. The surgeon cannot block the appearance of telestration, but can remove it by pressing the camera pedal.

- **Erase Button:** The **Erase** button is always present when telestration is available. Touch it to erase all telestration marks from the touchscreen and Surgeon Console. The following actions also erase telestration marks:
  - Pressing the camera footpedal
  - Clutching the camera arm or camera arm setup joint
  - Change in endoscope
  - Change in video source selection

WARNING: Telestration is an educational tool and should be used to assist in communication during surgery. Telestration should not be used as a tool for performing surgery (for example, making telestration marks to indicate where to cut).

Video Source Tab

When you touch the **Video Source** tab, you can select which video source to display on the touchscreen. You can also select which eye's video image to display, right or left, and use telestration. Select from the following options:

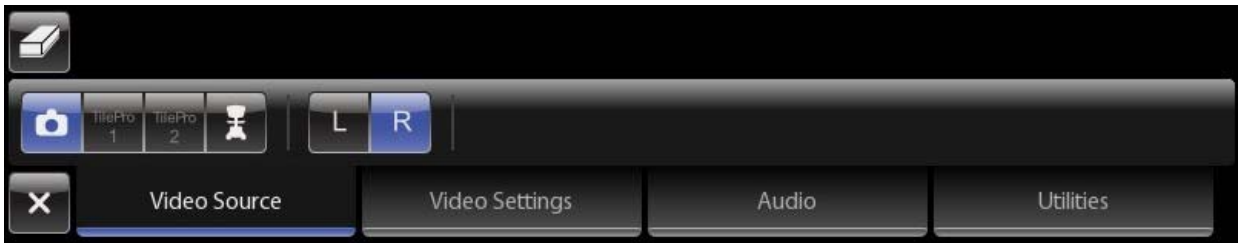


Figure 7.22 Video Source tab

- **Endoscope:** Touch this camera icon to display the endoscope video image. The touchscreen displays either the left or right eye video, and you can select which eye using the **L** (left) or **R** (right) button. This **L / R** option is useful when something impairs video from one or the other eye.

- **TilePro 1** or **TilePro 2:** Touch either to display the video input from the TilePro 1 or TilePro 2 connection on the back of the Core or Surgeon Console.

- **Surgeon View:** Touch to display the surgeon's view, including overlays. (Among these are those that show energy status of instruments.) When selected, you have the further option to select the surgeon's left or right eye video image using the **L** (left) or **R** (right) button. This **L / R** option is useful when something impairs video from one or the other eye. When two Surgeon Consoles are in use, another option becomes available to select which console view to display. Select either to display that console's view and icons. To exit the surgeon view and access the menu tabs, you must touch the **X** button.

Video Settings Tab

The **Video Settings** tab enables you to adjust the brightness of the surgical image, and gives access to Advanced Video Adjustments, Camera / Scope Setup and Video Output.

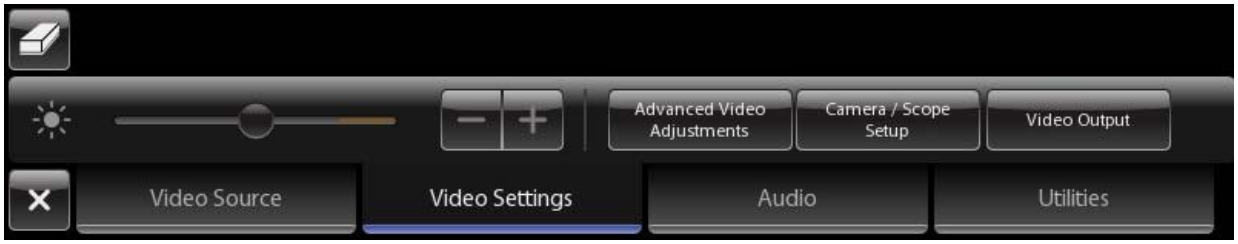


Figure 7.23 Video Settings tab

Advanced Video Adjustments

Enables adjustment of **Brightness, Contrast, Red, Yellow, Edge Enhancement,** and **Illuminator**. You can also revert to factory default settings by touching **Restore Factory Settings**.

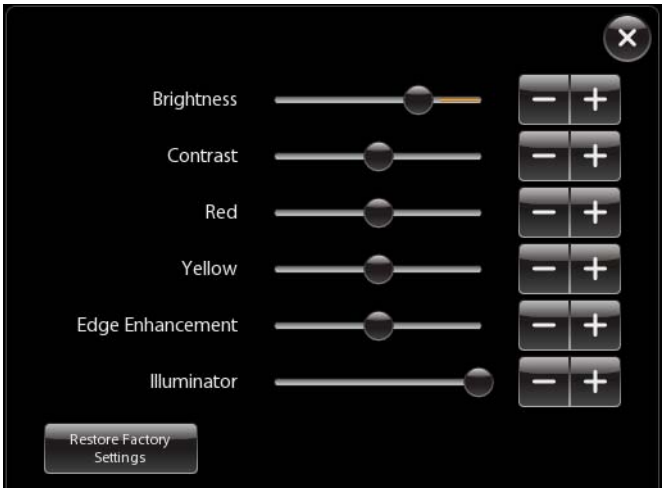


Figure 7.24 Advanced Video Adjustments

Note: The specific adjustment of these settings is a matter of surgeon preference. Like any adjustable video image, you may observe that some settings affect others, with the result that a specific combination of settings may represent a tradeoff, for example, between glare in one part of the image and enhanced visibility in another part. Keep in mind that you can readjust these settings at any time.

- **Brightness:** Drag the slider to adjust the brightness of the surgical image. This is video brightness, as opposed to actual illumination.
- **Contrast:** Drag the slider to adjust the contrast of the surgical image.
- **Red:** Drag the slider to adjust the red of the surgical image.
- **Yellow:** Drag the slider to adjust the yellow of the surgical image.
- **Edge Enhancement:** Drag the slider to adjust the edge enhancement of the surgical image. Increasing edge enhancement (slider to the right) may also increase noise.
- **Illuminator:** Drag the slider to adjust the actual light output transmitted to the surgical field in 10% increments.
- **Restore Factory Settings:** Touch to restore all advanced video adjustments to default values, which should be appropriate for most clinical scenarios.

Note: Both the Brightness slider (video brightness) and the Illuminator slider (lamp intensity) will affect the brightness of the image seen in the stereo viewer. To minimize fogging, maintain heating of the endoscope tip by setting the Illuminator slider to maximum and then adjust image brightness using the Brightness slider. If working close to tissue, decrease the Illuminator intensity using the Illuminator slider, and increase image brightness as necessary using the Brightness slider. If the image is too dark, check both the Illuminator and Brightness sliders, making sure each is far enough to the right, given the working distance of the endoscope tip from tissue.

Camera / Scope Setup

Provides the ability to perform white balance, scope calibration, and to manually set the scope angle when the system does not detect it automatically. See the interface and instructions for this tool under Vision System Overview on page 7-1.

Video Output

Enables you to specify the video output format and graphics source for up to three video outputs. (Video Out Aux available by default; Video Out 1 and 2 available as part of optional upgrades.) See the example below.

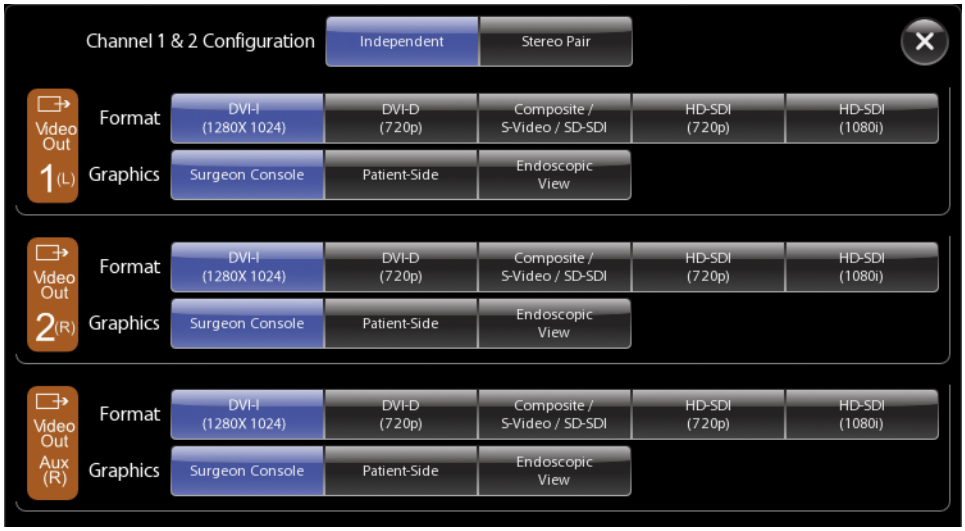


Figure 7.25 Example of video output option selections

Note: One video output is standard. Optional upgrades can provide up to two additional video outputs.

The software buttons on this screen correspond to the applicable Video Out connector bay as explained in Table H-1 Video Output Connections – Core, page H-2.

Audio Tab

The **Audio** tab enables you to adjust touchscreen speaker volume and mute the touchscreen microphone.

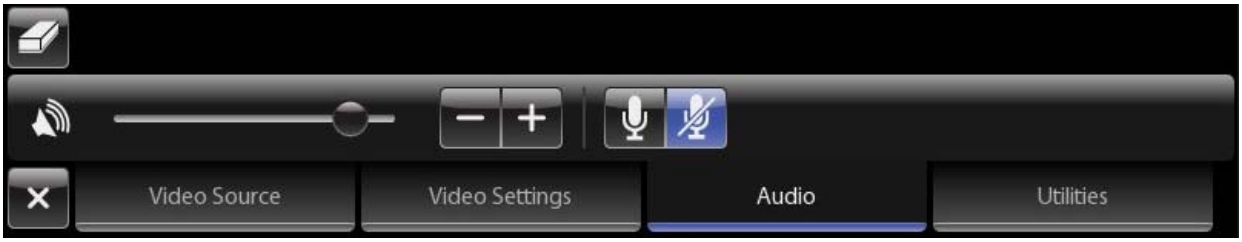


Figure 7.26 Audio tab

- **Microphone On and Off:** On by default, select  to mute the touchscreen microphone.

- **Volume Adjustment:** Use the slider—volume increases to the right—or the **Volume Decrease (–)** or **Increase (+)** buttons.

Utilities Tab

The **Utilities** tab provides access to Inventory Management, Event Logs and Troubleshooting.

Figure 7.27 Utilities tab

- **Inventory Management:** Provides an overview of the accessories used during the procedure.
  - **Viewing Lamp Hours**: To view usage hours of the lamp module, select **Inventory Management** (on the touchscreen or touchpad). You can also view the lamp hours on the Illuminator by pressing the decrease (**–**) and increase (**+**) buttons simultaneously, as described in Appendix C: Illuminator Information.

- **Event Logs:** Provides access to the system event logs, including error logs.

- **Troubleshooting:** Displays the system name and system software version, and provides **L** (left) and **R** (right) buttons to display the color bar test pattern in the left or right video channel independently.

7.5 Adjusting the Touchscreen Monitor

The hardware controls to adjust the touchscreen monitor image are locked. We recommend you make video settings adjustments through the Video Settings tab on the touchscreen (see page 7-17). If you wish to change the video settings of the monitor, contact *Intuitive Surgical* Technical Support.

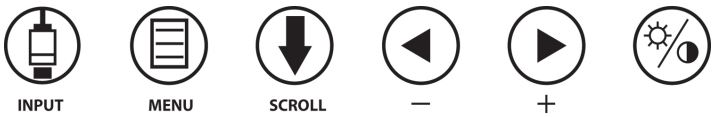


Figure 7.28 Touchscreen monitor hardware controls

7.6 Troubleshooting Image Quality

Missing Image (One or Both Eyes)

1. Re-do white balance.
2. Ensure camera cable connections are tightly connected.
3. Replace the camera head and camera cable.

Image Poor

Two scenarios may be encountered intra-operatively where adjustments may be required: 1. a condition where the image appears too bright, or 2. a condition where the image appears too dark or the color is poor. We provide specific recommendations to optimize each scenario.

Overly Bright Image

1. From the Video Settings tab of the touchscreen or touchpad, decrease the brightness to the desired level.

⚠ CAUTION: **If the endoscope is working close to tissue, reduce the light source output by adjusting the Illuminator to a lower light output setting. This will prevent tissue damage due to excessive heat. Note that decreasing the light output will result in a more grainy image.**

Note: Do not use the Illuminator to control image brightness as this may result in increased fogging.

Dark Image or Poor Color

1. Restore factory settings from the touchscreen or touchpad: **Video Settings**> **Advanced Video Adjustments**> **Restore Factory Settings**.
2. Increase video brightness from the touchscreen or touchpad: **Video Settings**> **Advanced Video Adjustments.**

Note: Increasing the brightness may cause the image to look noisier and reduce image quality.

3. Perform white balance.
4. Check the light guide connection to the Illuminator to ensure it is secure.
5. If the problem persists, replace the endoscope.
6. If the problem persists, replace camera head and camera cable.
7. Perform white balance.
8. If possible, clean the tip of the endoscope with a piece of moistened sterile gauze. Blood or other protein may have accumulated on the tip, diminishing light throughput.

Flickering Image

If the image is flickering in one or both eyes:

1. Power off the system.
2. Check and reseat the vision cable connections, including the camera cable at the CCU.
3. Power on the system.
   a. If the image in the Surgeon Console is clear, continue with normal use.
   b. If flickering continues and is constant: contact customer service for assistance: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.
   c. If flickering happens only when applying cautery, proceed to Step 4:
4. Remove the ESU from the Vision Cart.
   a. If the image quality in the Surgeon Console is clear, continue with normal use.
   b. If the problem persists, contact customer service for assistance: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.

"Soft" Image

1. Try adjusting the focus by pressing the camera pedal and rotating the masters on the Surgeon Console or using the **Focus In** and **Out** buttons on the camera head.

2. If possible, clean the tip of the endoscope with a piece of moistened sterile gauze. Blood or other protein may have accumulated on the tip, diminishing light throughput.
3. Adjust the edge enhancement setting to increase the sharpness of the image. Edge Enhancement is found under Advanced Video Adjustments (see page 7-18 or page 10-13).

Blurry Image

1. Remove endoscope and detach from camera head. Clean both the endoscope tip and the end where it connects to the camera head. If possible, wipe the camera head lenses.
   a. Check the image quality in the Surgeon Console. If the image is clear, continue with normal use.
2. Focus the image.
3. If one eye is in focus and one eye is not in focus, change the endoscope.
   a. Check the image quality in the Surgeon Console. If the image is clear, continue with normal use.
   b. If the problem persists, proceed to Step 3:
4. Power off the system and replace the camera.
5. Power on the system.
   a. Perform white balance and 3D calibration.
   b. Check the image quality in the Surgeon Console. If the image is clear, continue with normal use.
   c. If the problem persists, contact customer service for assistance: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.

Unable to Focus

1. Clean the tip of the endoscope with a piece of moistened sterile gauze.
   a. Check the image quality in the Surgeon Console. If the image is in focus, continue with normal use.
   b. If the image in the Surgeon Console is not in focus:
2. Focus the image. (From the camera head, use the **Focus In** and **Out** buttons. From the Surgeon Console, press the camera pedal and rotate one master controller.)
   a. If the image is in focus in one eye only, change the endoscope and then check the image quality in the Surgeon Console. If the image is in focus, continue with normal use.
   b. If the image is not in focus:
3. Power off the system.
4. Change the camera head and camera cable.
5. Power on the system.
   a. Focus the image. (From the camera head, use the **Focus In** and **Out** buttons. From the Surgeon Console, press the camera pedal and rotate one master controller.)
   b. Perform white balance and 3D calibration.

6. Check the image quality in the Surgeon Console.
   a. If the image is in focus, continue with normal use.
   b. If the problem persists, contact customer service for assistance: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.

Replacing the Lamp Module

If the lamp does not turn on or the illumination seems faint even when illumination is set at 100%, the lamp module may require replacement. For further instructions, see Illuminator Lamp Module Replacement on page 12-2.

End of section

8 Patient Preparation, Port Placement, and Docking

This chapter provides instructions for the following:

8.1 Patient Preparation Guidelines

Patient positioning is procedure-specific and is at the discretion of the surgeon. System positioning guidelines, specific to the *da Vinci Si* Surgical System, are as follows:

- Arrange Patient Cart arms to avoid contact with the patient.

Note: The patient should be positioned before docking. Table movements are most easily performed before driving the Patient Cart into position.

8.2 Port Placement and Cannula Insertion

Port Placement Guidelines

Port placement is key to a successful *da Vinci Si* procedure. The goals of port placement are to avoid Patient Cart arm collisions and to maximize instrument and endoscope range of motion. Port placement varies by procedure and patient and should be thoroughly discussed with an experienced surgeon, since improper port placement may cause difficulty performing *da Vinci* Surgery. For procedure-specific port placements, see published *Intuitive Surgical* Procedure Guides. Contact your local ISI representative for available Procedure Guides. An example of the basic port placement philosophy is provided in Figure 8.1.

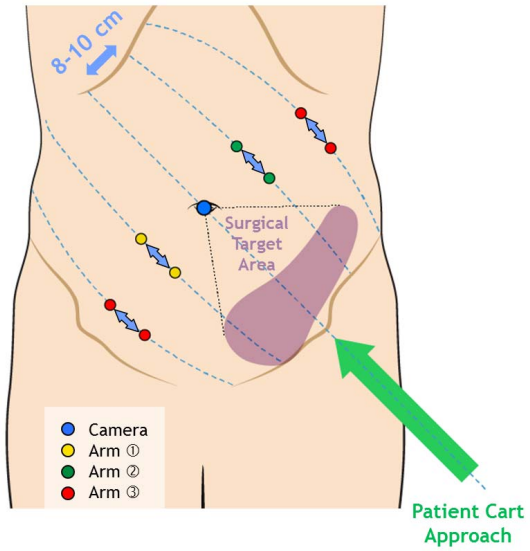


Figure 8.1 Port placement philosophy example

The following are generic guidelines for choosing port placement. Anatomical restrictions may necessitate an alternate setup.

Determine port placement based on a parallel line pattern:

- Insufflate before measuring.
- Use the camera location as the center point (maintain 10-20 cm from target anatomy).
- Based on line from target anatomy to camera port, draw parallel lines with 8-10 cm line spacing.
- Place *da Vinci* ports along lines, maintaining 10-20 cm from target anatomy, and 8-10 cm from other *da Vinci* ports.
- Triangulate *da Vinci* ports toward or away from the target anatomy as necessary for the procedure.
- Do not place ports within surgical target area (maintain 10-20 cm from target anatomy).
- For accessory ports, maintain at least 5 cm from the other ports, with a clear trajectory to the target anatomy.
- If working in more than two quadrants, re-dock the Patient Cart.

Placing Ports and Inserting Cannulae

Note: Follow the instructions in the Instrument and Accessories User Manual to inspect cannulae before use, including use of a gage pin for 8 mm cannulae.

Initial port location should be selected giving consideration to the procedure, specific anatomy, and the type of components being used (such as endoscope and camera combination, cannula length, etc.). For procedure specific port placements, see published *Intuitive Surgical* Procedure Guides. Contact your local ISI representative for available Procedure Guides.

The patient should be prepped, draped and positioned in standard fashion. Following insufflation, mark the desired location of all instrument and accessory ports. Place all ports using a standard surgical technique. The camera head and endoscope assembly can be used manually (not connected to the Patient Cart) during port placement.

Note: Hold the body of the camera head during manipulation to avoid potential damage to the wiring harness.

da Vinci instrument cannulae may be placed with either blunt or bladeless obturators.

Note: It is recommended that obturator tips remain in view at all times during cannula insertion (under endoscopic video visualization).

Specific applications may warrant placement of the cannula while connected to the instrument arm (for example, Cardiac and Thoracic procedures). In this application, the Patient Cart will need to be positioned before cannula insertion. As with all port placement, this should be done only under endoscopic video vision.

Note: When inserting cannulae into the patient while the cannulae are attached to the instrument arms, ensure that Patient Cart is positioned with instruments arms and setup joints near the center of their range of motion.

WARNING: **Once the *da Vinci Si* System is connected to the patient, the surgical table MUST NOT BE MOVED in any way. Serious injury could result.**

If intraoperative OR table movement is necessary, remove all instruments and the endoscope, undock the *da Vinci Si* System, move the OR table and re-dock the system.

Remote Center

The instrument arms and the camera arm on *da Vinci* Surgical Systems use remote center technology. Remote center technology enables the System to maneuver instruments and endoscopes in the surgical site while exerting minimal force on the patient's body wall. The remote center is the fulcrum point around which the *da Vinci* System moves the instrument and camera arms. When the cannula's remote center is placed correctly in the patient's body wall, moving the Patient Cart arms around the remote center exerts minimal pull and tug at the port site, which lends itself to reduced pain and faster healing of the incision.

Instrument Cannula Remote Center Setup

The instrument arm remote center is indicated by the thick, center black band on the instrument cannula.

- To correctly place the remote center, the thick black line on the *da Vinci* cannula (which indicates the remote center) should be inserted within the boundaries of the patient's body wall. Correct placement allows instruments to pivot through the incision with less friction and greater precision, which reduces tissue trauma (Figure 8.2 a).

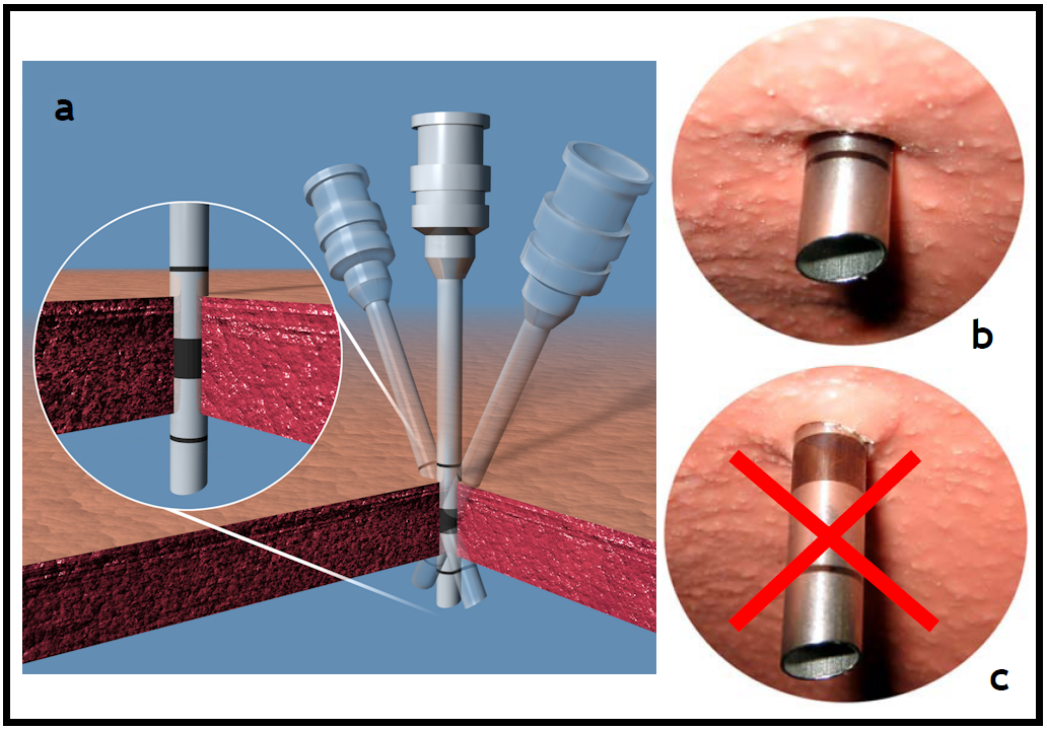


Figure 8.2 Proper placement of instrument cannula remote center

- Correct placement of the cannula should be verified by looking at the cannula tip with the endoscopic camera (cannulae should always be placed under endoscopic visualization). Only the first thin line at the distal cannula tip should be visible. This indicates that the remote center is placed correctly within the boundaries of the patient's body wall (Figure 8.2 b).
- If the thick black line on the cannula is seen in the endoscopic view, this means that the remote center is inserted too deeply. Moving the arms with the remote center incorrectly placed increases friction, reduces precision and increases tissue trauma at the port site (Figure 8.2 c).

The Surgeon Console operator cannot move the instrument arm remote center. However, the Patient Cart operator can reposition the remote center by pressing the port clutch button and repositioning the instrument arm.

Endoscope Cannula Remote Center Setup

Endoscope cannulae used with the *da Vinci* System do not have a ring or other mark to indicate the remote center. Therefore, it is vital to attach the endoscope cannula correctly in the endoscope cannula mount.

- To ensure the remote center of the cannula is properly positioned, the cannula should be attached at a point immediately below the cannula housing (see Figure 8.3 below).

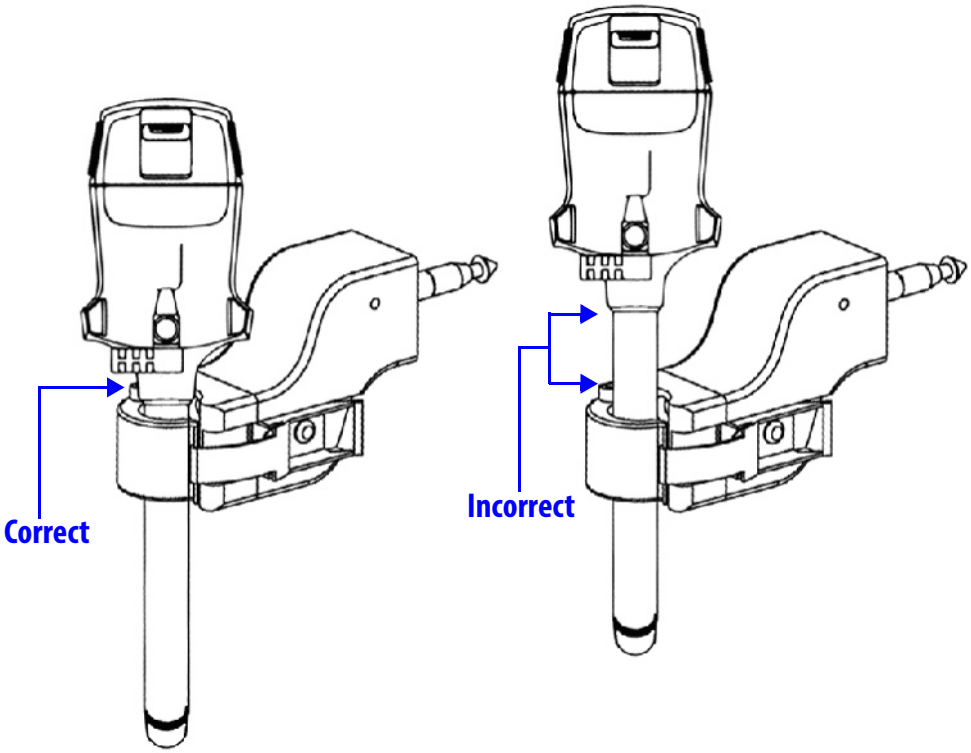


Figure 8.3 Proper attachment of the endoscope cannula

8.3 Docking

Docking is the process of moving the Patient Cart up to the OR table and connecting the Patient Cart arms to the patient.

Patient Cart Positioning

Once cannulae are inserted in the patient, a non-sterile person operates the Patient Cart motor drive to move the Patient Cart into the sterile field. Communication is critical when docking the Patient Cart. Only one person should give directions to the non-sterile person to advise of potential collisions and to direct him/her when approaching the patient. Use anatomical or room references (such as “toward the head,” or “away from the Vision Cart”) to direct the non-sterile person as they move the cart. Avoid using relative terms such as left or right.

1. Make sure the camera arm remote center is sufficiently away from the Patient Cart tower to facilitate adequate range of motion for the Patient Cart arms. This is known as setting the “sweet spot.” To set the “sweet spot,” move the camera arm so that the blue arrow lines up between the limits of the blue bar located in the middle of the camera arm setup joint (left or right side).

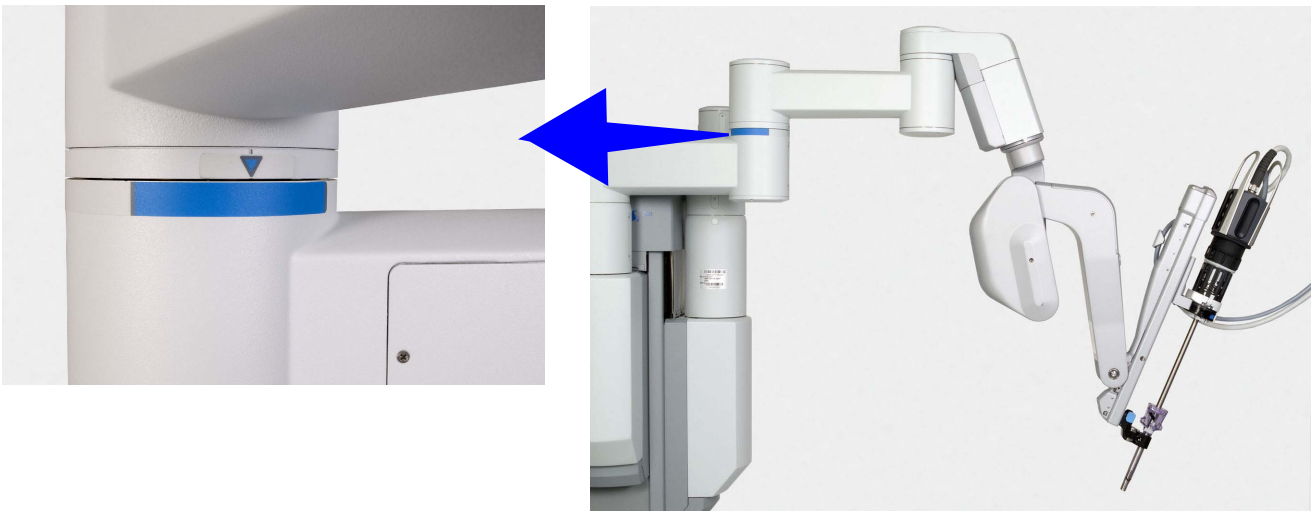
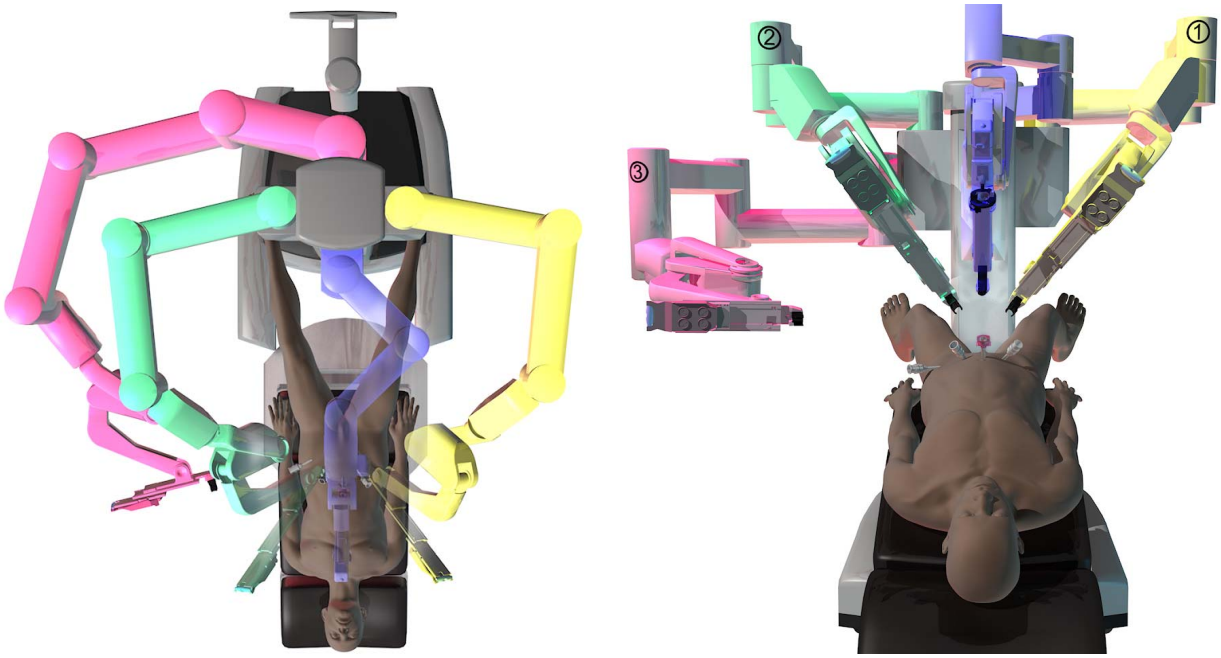


Figure 8.4 “Sweet spot” label

2. Move the Patient Cart towards the patient using the motor drive. See Motor Drive Operation on page 3-3 for details. The Patient Cart should approach the patient with the tower of the Patient Cart lined up in a straight line with the camera cannula and the target anatomy.



Align Patient Cart tower, camera cannula and camera port

Figure 8.5 Patient Cart positioned over patient model

3. Position the Patient Cart so the camera arm cannula mount is just above the camera cannula.

Camera Arm Docking

1. Once the camera cannula mount is above the camera cannula, use the camera arm port clutch button to bring the cannula mount toward the cannula.

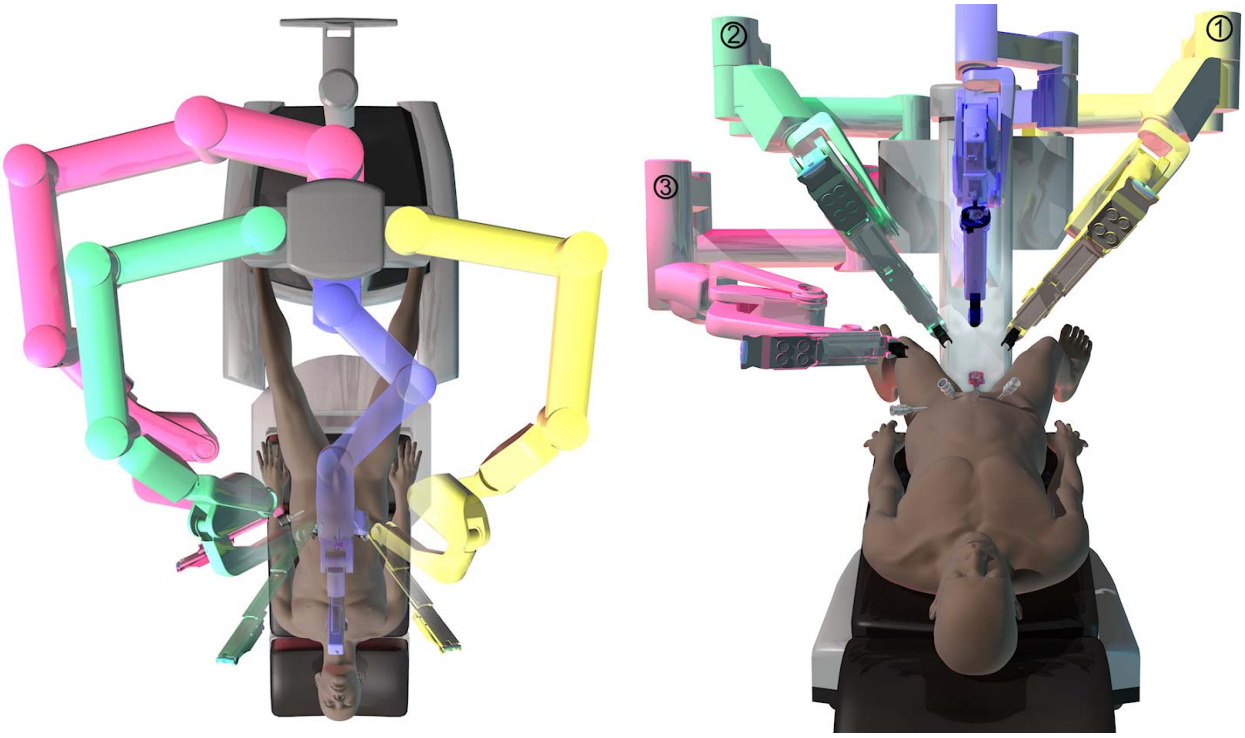


Figure 8.6 Clutch arms to move into docking position

Note: Refer to section 9.2 Moving the Patient Cart Arms on page 9-3 for detailed instructions on instrument arm, camera arm and port clutching.

2. Align the cannula mount to the cannula by using the camera arm clutch button. Be sure to un-clutch the camera arm afterwards.
3. Ensure the drape boot is properly aligned with the cannula mount. Connect the cannula mount to the cannula by using the latches located on the cannula mount. Make sure that both latches are closed.

Note: To prevent the cart from moving during a procedure, the Patient Cart will automatically engage the motor drive brakes when any cannula is docked.

Instrument Arm Docking

1. Use the instrument arm port clutch button to bring the cannula mount to the cannula.
2. Align the cannula mount to the instrument cannula by using the instrument arm clutch button. Be sure to un-clutch the instrument arm afterwards to lock the arm in place.
3. Ensure the drape boot is properly aligned with the cannula mount. Connect the cannula mount to the cannula by using the latches located on the cannula mount. Make sure that both latches are closed.
4. Ensure the back end of the instrument arm is rotated away from the camera arm. If there are two instrument arms on one side, ensure the instrument arm closest to the camera arm has adequate range of motion while minimizing collisions.

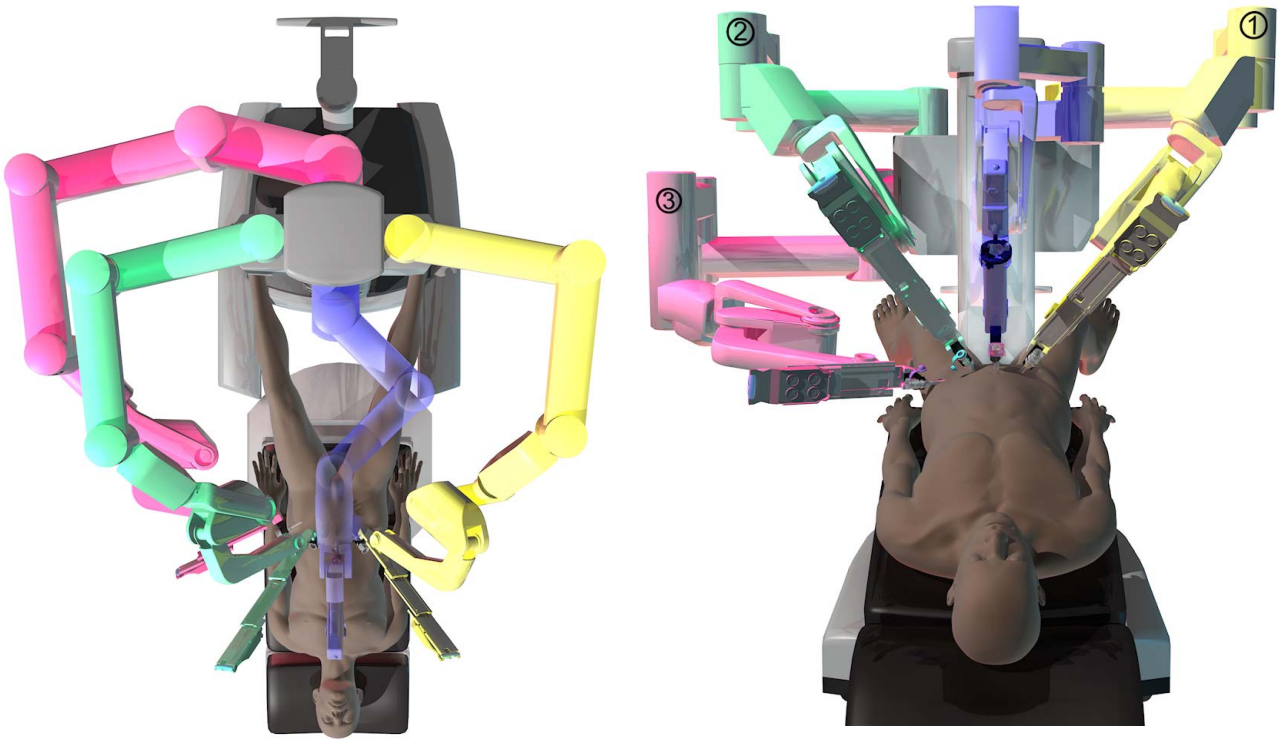


Figure 8.7 Docking complete

Note: Once the Patient Cart arms are docked, the port clutch button should only be used to reposition the remote center. If the port clutch button is used, use care to prevent sliding the cannula out of the port site.

WARNING: **Once the *da Vinci Si* System is positioned, cannulae are placed in the patient and Patient Cart arms are attached to the cannulae, the surgical table MUST NOT BE MOVED in any way. Serious injury could result.**

If intraoperative OR table movement is necessary, undock the *da Vinci Si* System, move the OR table and re-dock the system.

CAUTION: **Unexpected motion can occur when instruments collide. Ensure there is adequate room for instruments to move inside the patient.**

⚠ CAUTION: **Make sure there is adequate room for the arms to move without contacting the patient during the procedure. Ensure that the patient-side assistant can see all arms during the procedure and can alert the surgeon when the arms are close to contacting the patient.**

Note: If, while operating, you move the masters and no instrument motion occurs, there may be a collision between instruments or instrument arms, or between an arm and the patient. Resolve the collision before proceeding with the surgery.

Note: If collisions between the arms occur, it may be possible to slightly adjust the position of setup joints using the port clutch button to create more space between arms. Remove the instruments before pressing the port clutch button and use care to prevent sliding of the cannula out of the port site while you adjust the set up joint positions.

Note: If collisions between the arms occur, ensure that the instruments are still fully engaged on the instrument arm.

End of section

9 Patient Cart Use

This chapter explains the use of the Patient Cart during surgery. The following subjects are covered:

Figure 9.1 Instruments installed on the insertion axes

9.1 Patient Cart Overview

The Patient Cart has five main components with which users interact:

- Setup Joints
- Instrument Arms
- Camera Arm
- *EndoWrist* Instruments
- Endoscope Assembly

Note: Some Patient Cart functions are not used during surgery. Functions used outside of surgery (such as system setup and teardown) are explained in their respective sections.

CAUTION: Do not touch any wire harnesses or mechanical cables located on the camera or instrument arms while simultaneously touching the patient or when positioning the arms.

LED Status Indicators

Indications of the status of the instrument and camera arms are provided by LEDs on the top of the insertion axis of each instrument and camera arm. The meanings of the colors are as follows:

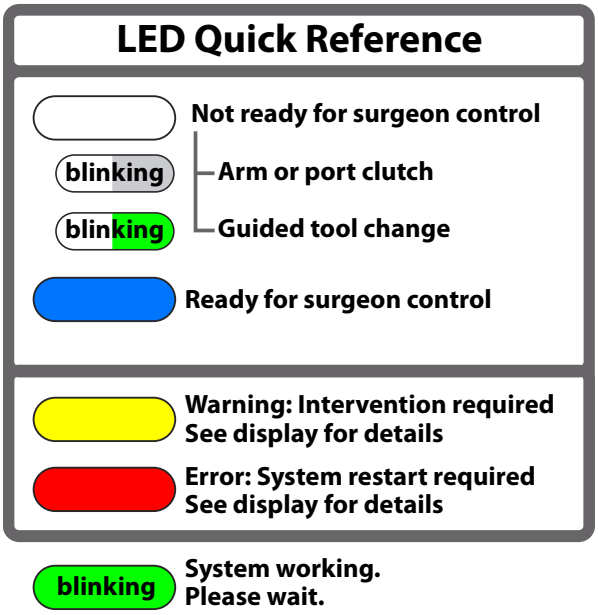


Figure 9.2 LED Quick Reference

Corresponding LED icons—graphics that reproduce the LED status—appear simultaneously on the touchscreen and stereo viewer.

9.2 Moving the Patient Cart Arms

Arm Clutch and Port Clutch Buttons

Use the arm clutch and port clutch buttons (Figure 9.3) to position the instrument and camera arms.

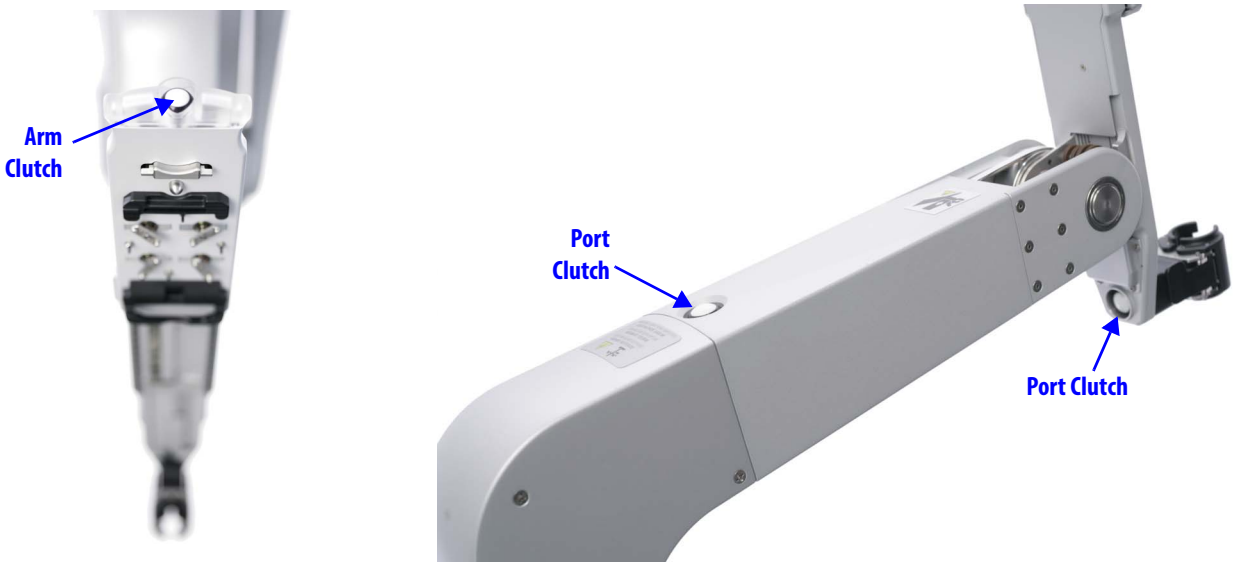


Figure 9.3 Arm clutch and port clutch buttons

⚠ CAUTION: **When using setup joint or clutch buttons, keep your fingers clear of the joints located on the camera and instrument arms to avoid injury.**

Arm Clutch to Move Arms Manually

You can manually position instruments and endoscopes in the surgical field using their arm clutch buttons (Figure 9.3). While you clutch an arm, you can move the arm around the remote center, but the remote center does not move. When clutched, the arm LED blinks white, alternating side to side.

You can clutch the arm in two ways:

- **Press and hold:** Press and hold the arm clutch button to free the arm and move it. When you release the button, the arm exits clutch mode and the brakes are reapplied.
- **Quick click:** Quick click the arm clutch button to free the arm and move it. Quick click the arm clutch button again to exit clutch mode.

Note: For instrument arms, the telescoping insertion axis extends fully when you remove an instrument, and remains fully extended until an instrument is re-installed.

⚠ CAUTION: **To prevent movement of the insertion axis while clutching, hold the instrument or camera arm steady by grasping the top of the insertion axis whenever you press the arm clutch button.**

Port Clutch to Move Setup Joints Manually

Note: The term "port clutch" is used interchangeably with "set-up arm clutch"; both refer to the button and to the action that results from pressing it, which is to free the setup joint so you can reposition the setup arm manually.

You can move Patient Cart setup joints manually using the port clutch button. Both instrument and camera arms have two port clutch buttons on the lower part of the arm, one behind the cannula mount and one on the middle of the arm. (See Figure 9.3 above.) When you move the setup joint, it changes the position of the remote center (port position). While you clutch the setup joint, the associated arm LED blinks white, alternating side to side.

To move a setup joint, first hold the arm and then apply the port clutch in this way:

- **Press and hold.** Press and hold the port clutch button to free the setup joint and move it. When you release the button, the setup joint exits port clutch mode and the brakes are reapplied.

The label at left appears near the upper port clutch buttons. It includes the following text in English, and translations of the same in German and French:

"BRAKE RELEASE
HOLD ARM BEFORE RELEASING"

Note: It may be necessary for the reader to be as close as 6 in (15 cm) from the label to read this information.

Notes on Clutching

Note: You can apply the arm clutch and port clutch simultaneously. On an instrument arm, if you clutch arm and port simultaneously, it locks the instrument arm insertion axis; this does not apply to the camera arm.

Note: Clutching an instrument arm prevents control of that arm at the Surgeon Console. Clutching the camera arm prevents control of *all* arms at the Surgeon Console.

Unexpected Setup Joint Motion

Unexpected setup joint motion occurs when the setup joint brakes are overpowered. Multiple factors can cause this, including excessive force on the patient and collisions of Patient Cart components (arms, setup joints, nearby objects). If the system detects unexpected setup joint motion, the arm LED for the associated setup joint turns yellow and a message appears on screen.

- To clear the error, press the port clutch button for that arm. This also relieves any potential excessive force on the patient.

Note: If collisions between the arms occur, it may be possible to slightly adjust the position of setup joints using the port clutch button to create more space between arms. Remove the instruments before pressing the port clutch button and use care to prevent sliding of the cannula out of the port site while you adjust the setup joint positions.

Note: If collisions between the arms occur, ensure that the instruments are still fully engaged on the instrument arm.

EPO (Emergency Power Off)

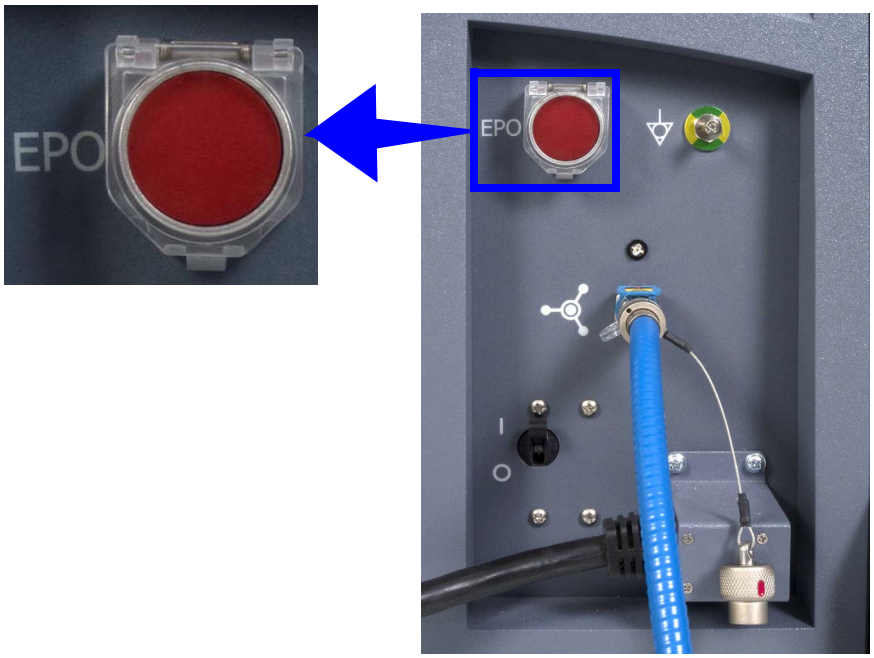


Figure 9.4 EPO button on rear of Patient Cart

The **Emergency Power Off (EPO)** button is on the back of the Patient Cart. Press this button to completely remove power to the Patient Cart. The system classifies this a non-recoverable fault. The system must be restarted.

9.3 Working with *EndoWrist* Instruments

⚠ CAUTION: **Only use instruments and accessories approved by *Intuitive Surgical* for use with the *da Vinci® Si™* Surgical System. *Intuitive Surgical* performs extensive testing to ensure compatibility of approved instruments and accessories. Compatibility of the system with non-approved instrumentation cannot be guaranteed. Any damage to the *da Vinci Si* Surgical System as a result of using non-approved instruments and accessories is not covered under warranty.**

EndoWrist instruments consist of five main components (illustrated in Figure 9.5):

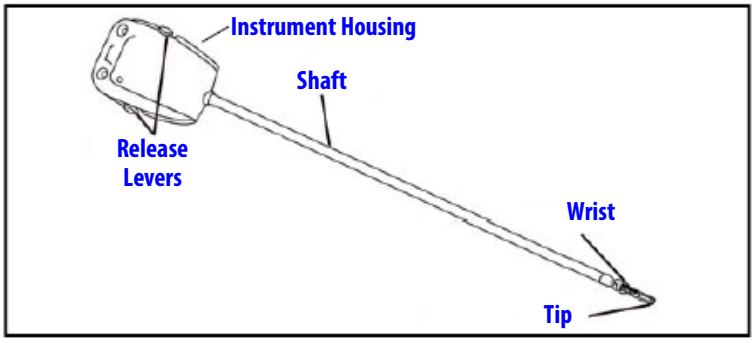


Figure 9.5 EndoWrist instrument components

1. **Tip:** The end effector of the instrument (such as graspers, cautery hooks, scalpels, etc.)
2. **Wrist:** The articulating wrist designed to mimic the wrist of the human hand

3. **Shaft:** The rotating "arm" of the instrument
4. **Release Levers:** The mechanism for removal of the instrument
5. **Instrument Housing:** The portion of the instrument that engages with the sterile adapter of the instrument arm

On the bottom of the instrument housing, you'll see a series of discs, which connect to the instrument wrist via cables that run through the instrument shaft. The movement of the master controllers on the Surgeon Console is translated through the pulleys to the *EndoWrist* instrument wrist. You also can rotate these disks by hand (when not attached to the sterile adapter) to verify the cable functionality, or to align the wrist for tool insertion.

Figure 9.6 Discs located in the instrument housing

The instrument interface of the instrument arm consists of three parts (Figure 9.7):

1. Insertion Axis
2. Instrument Sterile Adapter
3. Cannula

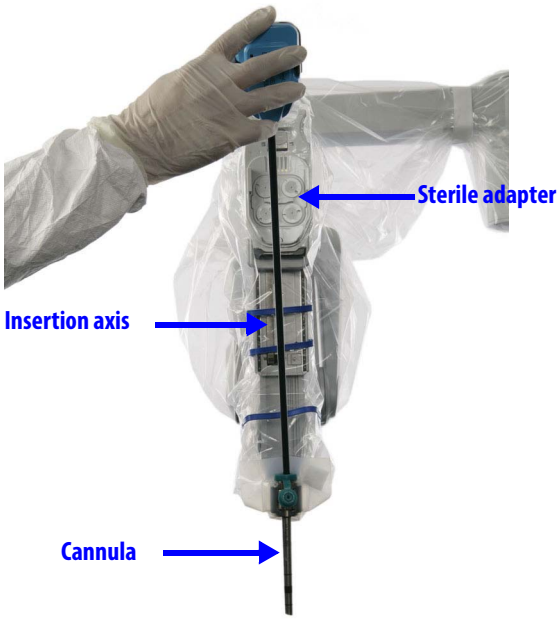


Figure 9.7 Insertion axis, sterile adapter and cannula with instrument being loaded

Insertion Axis

The telescoping insertion axis delivers the instrument to the surgical site. When no instrument is present, the insertion axis is fully retracted.

Instrument Sterile Adapter
The instrument sterile adapter is part of the instrument arm drape and provides the point of connection between the instrument and the instrument Arm.

Cannula
The cannula provides the port through the body wall of the patient.

Note: Follow the instructions in the Instrument and Accessories User Manual to inspect cannulae before use, including use of a gage pin for 8 mm cannulae.

9.4 Instrument Installation, Insertion, Removal and Intraoperative Care

Installation

1. Inspect the instruments for broken, cracked, chipped, or worn parts and discontinue the use of instruments if any damage is noticed.
2. Straighten the instrument wrist—by rotating the discs on the back of the instrument housing, ***not*** by manipulating the wrist directly—to ensure easy insertion into the cannula and to prevent damage to the instrument.
3. Insert the instrument tip into the cannula and slide the instrument housing into the sterile adapter. You will hear three beeps when the instrument is engaged.

Figure 9.8 Inserting the instrument into the cannula and sterile adapter

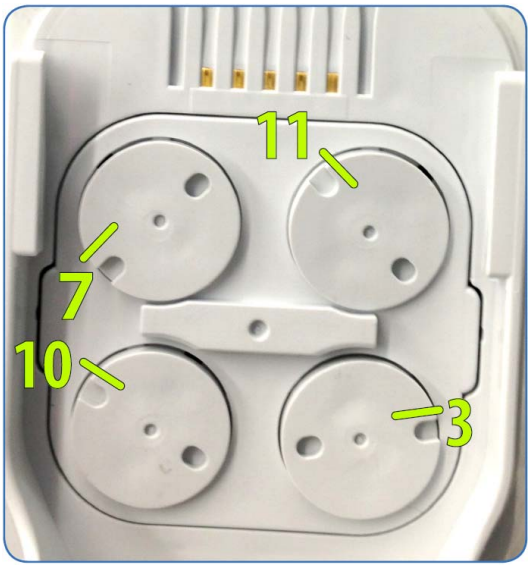
CAUTION: **When inserting the instrument tip into the cannula, be careful not to puncture the instrument arm drape with the tip of the instrument.**

CAUTION: **Ensure all installed instruments are visible in the Surgeon Console view before proceeding to prevent inadvertent harm to the patient.**

Note: One instrument life is used whenever the instrument is used via the Surgeon Console (following mode). The number of uses left on the instrument may be queried without using a "life" by removing the instrument before entering following mode. When an instrument has no remaining uses, it will not engage on the system and a message on the touchscreen says the instrument has expired.

Instrument Installation Best Practices

1. Verify the sterile adapter discs are aligned using the process above before installing an instrument.



2. Do not squeeze the release levers while installing the instrument onto the Sterile Adapter.

3. Do not apply excessive force when installing the instrument.

4. Verify pins on the back of the arm are flush on the arm and not protruding.

Troubleshooting

Sequence:

1. If the instrument does not engage properly, reseat the instrument.
2. If the problem is not resolved, reseat the sterile adapter using the Sterile Adapter Engagement Verification process on page 6-11.
3. If the problem is not resolved, re-drape the arm.

For assistance, contact Technical Support: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.

Plug and Play

Newly released instruments may need to download their new parameters to the *da Vinci Si* System. This process is only required once for each new type of instrument, and will take up to 15 seconds. During this download period, the arm LED will rapidly flash green and a message is displayed. Progress is shown as a percentage of completion. If an error occurs during plug and play, re-install the instrument.

Insertion

⚠ **CAUTION: Make sure the Surgeon Console operator is ready to resume control of the instrument before inserting an instrument into the sterile field.**

Once the system recognizes an instrument installed on an arm, you can insert it into the patient's body either manually or by using Guided Tool Change.

Manually

For the first instrument you install on an arm for this procedure, you must manually insert the instrument by pressing an arm clutch button (see Figure 9.9). The LEDs will blink alternating white during arm clutch. The Surgeon Console operator cannot control the instrument until it is moved out of the cannula and is no longer being clutched. Note that if you press and release the arm clutch button, instead of holding it down continuously as you insert the instrument, you must press and release the arm clutch button again after insertion through the cannula, to give control of the instrument to the surgeon.

Figure 9.9 Using arm clutch to insert an instrument manually

⚠ **WARNING: The instrument may not be immediately visible when being moved from the cannula into the patient. Move the endoscope to visualize the instrument and use appropriate caution when inserting instruments into the patient.**

Guided Tool Change

To provide an efficient and safe method for instrument insertion, the system can assist the patient-side assistant by guiding an instrument into the patient. Guided Tool Change only works when you replace an instrument. When you install the next instrument, the insertion axis unlocks and guides the instrument tip to a location just short of the last position of the previously installed instrument tip (Figure 9.10).

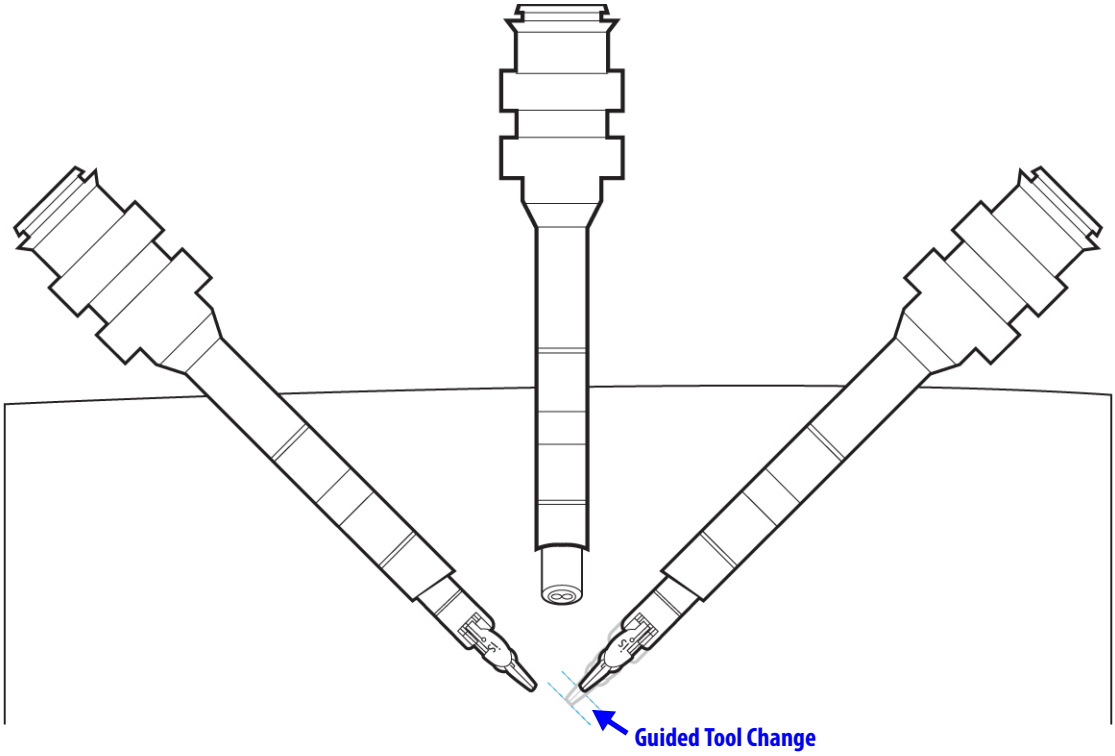


Figure 9.10 Illustration of Guided Tool Change

- If Guided Tool Change is enabled, the instrument arm LED blinks side-to-side, alternating white and green.

WARNING: During an instrument exchange, including using Guided Tool Change, the surgeon must not remove his/her hands from the masters until he/she has removed his/her head from the stereo viewer.

Note: For Guided Tool Change, the surgeon should remove their head from the stereo viewer to take all instruments out of following before removing and installing an instrument.

WARNING: Use appropriate caution when inserting instruments into the patient by visualizing the instrument on the touchscreen as it is being inserted.

- If Guided Tool Change is not enabled, the instrument arm LED is white and does not blink. Also, the system will display an icon and message instructing you to insert the instrument past the cannula tip.

The following occurrences disable Guided Tool Change:

- Pressing an instrument arm or port clutch button
- Any errors
- Instrument tip too close to cannula

After successful instrument insertion (using either Guided Tool Change or manual clutching), the arm LED turns blue, which means that now the surgeon can control the arm.

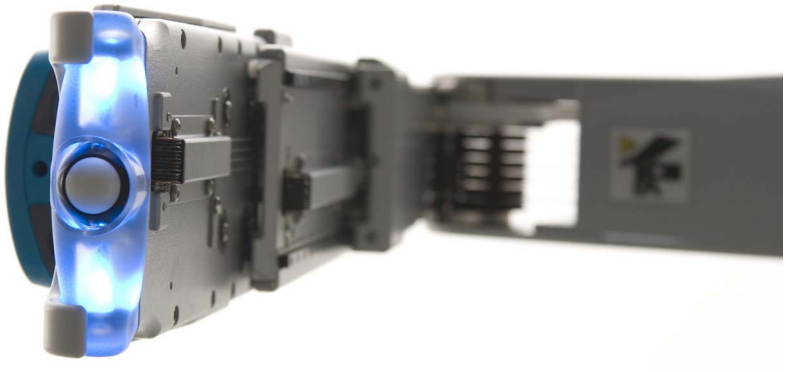


Figure 9.11 Blue arm LED indicates successful instrument insertion

Note: When certain instruments are installed, the instrument arm provides extra holding force to ensure the instrument does not move during operation. If an outside force is acting on the arm for more than 300 milliseconds, the system will prevent following on that arm and will give error beeps until the force is removed.

Note: If Guided Tool Change is disabled or does not initiate, use the arm clutch button to insert the instrument Manually, as described on page 9-9.

Troubleshooting: Guided Tool Change Does not Initiate

1. Remove and reseat the instrument and the instrument arm sterile adapter.
2. Use the arm clutch button to insert the instrument manually, under visualization, as described on page 9-9**.**
3. On the next instrument exchange, pull the instrument straight out and reinsert a new instrument without touching the clutch buttons.

   If the problem persists, contact customer service for assistance: U.S. 800-876-1310, International +800 0821 2010 or +41 21 821 2020.

Fluid Leakage Precautions

The *EndoWrist* instruments are designed so that they may be positioned horizontally or inclined upwards during surgery according to the requirements of the procedure. As with any laparoscopic instrument, these positions can allow blood or other fluids to migrate through the instrument shaft towards its proximal end in such instrument positions. The *EndoWrist* instruments are designed to resist fluid migration of this nature and minimize fluid leakage from the proximal end.

However, in the event that blood or other fluid is noticed leaking out of the instrument and onto the instrument arm drapes or sterile adapter during the surgery, please take following actions:

1. Remove the instrument from the instrument arm and hold it vertically (tip down) to drain any fluids.
2. Thoroughly wipe any fluid off of the sterile adapter and drape before inserting any other instrument.

3. After surgery, thoroughly clean the instrument following the cleaning instructions from the IFU before reuse.

In addition, if any blood or other fluid is observed on the inside of the drapes (on the instrument arm), contact *Intuitive Surgical* Technical Support as soon as possible and before any future use. *Intuitive* personnel will provide guidance in adequately cleaning the instrument arm.

Instrument Removal

Before attempting to remove an instrument, make sure the surgeon is ready for it.

⚠ CAUTION: **Removal of instruments during a procedure should be done very carefully and only with the knowledge of and full view of the Surgeon Console operator. Do not remove the instrument if it is not in view.**

1. Before instrument removal, the Surgeon Console operator should do the following:
   a. Ensure that the instrument tip is in view and is free of any patient anatomy.
   b. Straighten the instrument wrist.
   c. Clearly communicate to the patient-side assistant which instrument to remove. Identify the name of the instrument or the number of the instrument arm (for example, instrument arm 1, 2, 3).
2. Once the instrument is positioned for removal, the patient-side assistant should squeeze the release levers on the sides of the instrument and pull the instrument out.

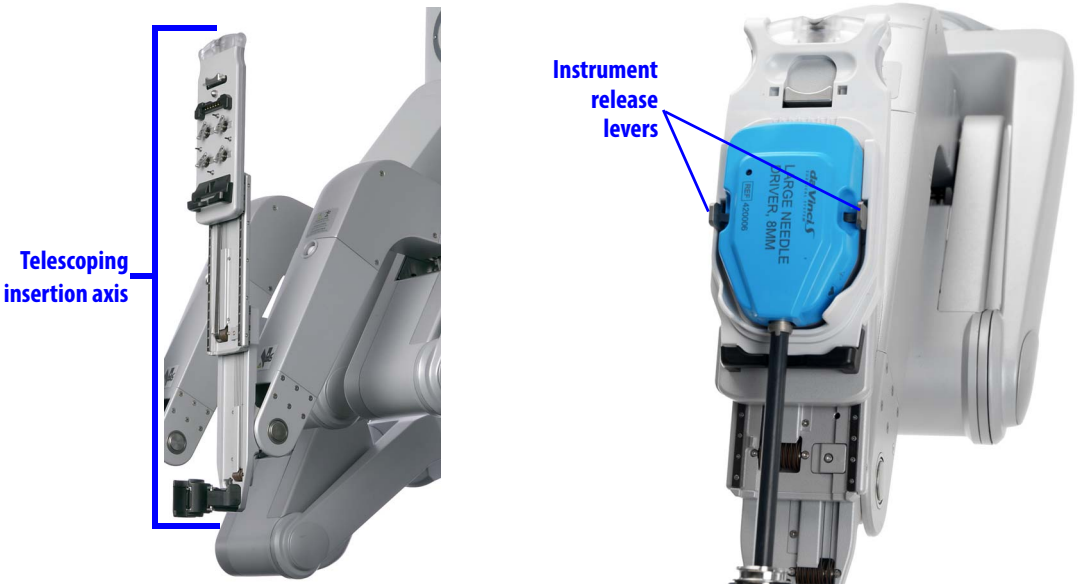


Figure 9.12 Telescoping axis and instrument release levers

ℹ **Note: The instrument arm insertion axis will automatically retract when the instrument is removed. If the instrument is not removed in time, the instrument sterile adapter may re-engage the instrument during the insertion axis retraction. If this happens, simply remove the instrument from the instrument arm.**

⚠ CAUTION: **Any lateral pressure on the instrument during removal may damage the instrument.**

Grip Release

WARNING: Do not perform grip release on a non-faulted system without first pressing the Emergency Stop button. Failure to observe this warning may result in unintended instrument motion or damage to the grip release mechanism.

For additional information regarding the Emergency Stop button, see Right-Side Pod – Power and Emergency Stop, on page 10-4 (Chapter 10, Surgeon Console Use).

WARNING: Rotating the grip release tool too far and/or in the incorrect direction can cause unintended instrument motion or damage to the grip release mechanism.

Note: Whenever possible, use Surgeon Console control to release the instrument grips.

Note: The *EndoWrist* instrument release kit (PN 381199) includes a grip release tool attached to illustrated instructions for quick-reference. Be sure to keep a sterile instrument release kit in an accessible location.

The grip release mechanism facilitates removal of an instrument in the event of a system fault or power failure. For example, if the instrument tips are gripping tissue, the grip release tool allows the patient-side operator to manually open the grips.

To release the instrument grips manually, perform these steps while visualizing the surgical site:

1. Press Emergency Stop on the right-side of the Surgeon Console.
2. Insert the grip release tool into the grip release socket on the instrument housing (Figure 9.13). Ensure that the tool engages with the socket. Once engaged, you will feel slight resistance when you gently rotate the tool.
3. For 8 mm Clip Appliers and *Harmonic* instruments, carefully turn the grip release tool ***clockwise*** (approximately 1/4th turn) to open the instrument grips. For other instruments, carefully turn the grip release tool ***counter-clockwise*** (approximately 1/4th turn).
4. Under visualization, clear tissue from the grips. If needed, adjust the instrument arm to position the instrument away from tissue: support the instrument arm before clutching, to prevent unintended instrument motion.
5. Once tissue is cleared from the grips, remove the grip release tool from the instrument.
6. Squeeze the release levers on the sides of the instrument housing and pull the instrument out. Do not reuse the instrument.

Figure 9.13 Grip release socket

WARNING: Do not reuse an instrument that has had its grip released with the instrument release kit. Reusing an instrument after use of the instrument release kit could result in critical failure of the instrument and injury to the patient.

After use of the instrument release kit, return the affected instrument to *Intuitive Surgical* by contacting Technical Support. In the US, call 1-800-876-1310. International, call +800.0821.2010 or +41 21.821.2020.

Intraoperative Instrument Care

Please follow these recommendations to ensure the *EndoWrist* instruments are kept at their highest level of functionality:

- Clean the tips of instruments between instrument exchanges
- Do not use instruments to clean other instruments while inside the body

Instrument Usage

EndoWrist instruments are valid for a predetermined number of uses. We designed this feature to help ensure reliable and consistent performance throughout the *EndoWrist* instrument life. The system decrements one use from an instrument the first time it is installed and taken into following mode during a procedure. While we design most instruments to be used for a predetermined number of procedures, a few (such as the Large and Small Clip Appliers) we design to be used for a predetermined number of activations.

Note: When an instrument's life is based on activations, it usually has a relatively large number of activations compared to instruments whose life is based on the number of procedures it is used in. For these instruments, the system decrements one use from the instrument each time it is installed on the system and goes into following mode.

View Remaining Uses

You can view the number of uses left for all instruments used during the current procedure by accessing Inventory Management on the **Utilities** tab of the touchscreen (see page 7-20) or the touchpad (see page 10-18).

- If an installed instrument is taken into following mode, the system decrements one use for that instrument. If an installed instrument does not enter following mode, it may be removed without reducing the number of uses remaining.

When you start to use an instrument that is on its last use, the system displays the message, **"Instrument will expire after procedure."** In this case, and when the Inventory Management screen reports **"0"** remaining uses for an installed instrument, you still can use that instrument during the current procedure, but not for a new procedure.

Expiration and Disposal

When instruments expire, they are automatically inactivated and can no longer be used. Expired instruments must be properly disposed of following all applicable national and local laws and guidelines.

9.5 Working with the Endoscope at the Patient Side

The Endoscope Assembly

The patient-side assistant is responsible for endoscope installation, insertion, removal and intraoperative camera head maintenance. The operator must ensure that the endoscope is handled with great care, as the instrument is very delicate and can be easily broken if dropped or struck. For instructions to assemble and prepare the endoscope for use, see Setting Up the Vision System on page 7-5.

The endoscope assembly consists of two main components:

- **Endoscope:** The interchangeable sterile endoscope

- **Camera Head:** The draped video capture device

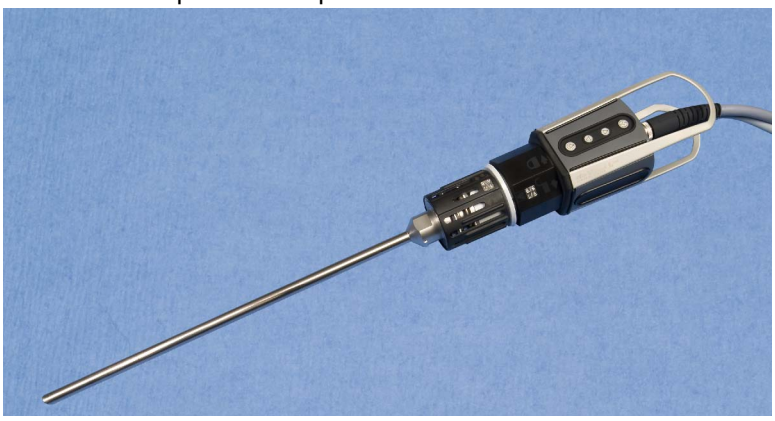


Figure 9.14 Endoscope assembly

The endoscope interface of the camera arm consists of four parts:

- **Insertion Axis:** Delivers the endoscope to the surgical site.
- **Camera Arm Sterile Adapter:** Provides the point of connection for the endoscope to the camera arm.
- **Cannula Mount:** Designed to hold the cannula securely in place
- **Cannula:** Provides the port through the body wall of the patient, through which the endoscope is inserted.

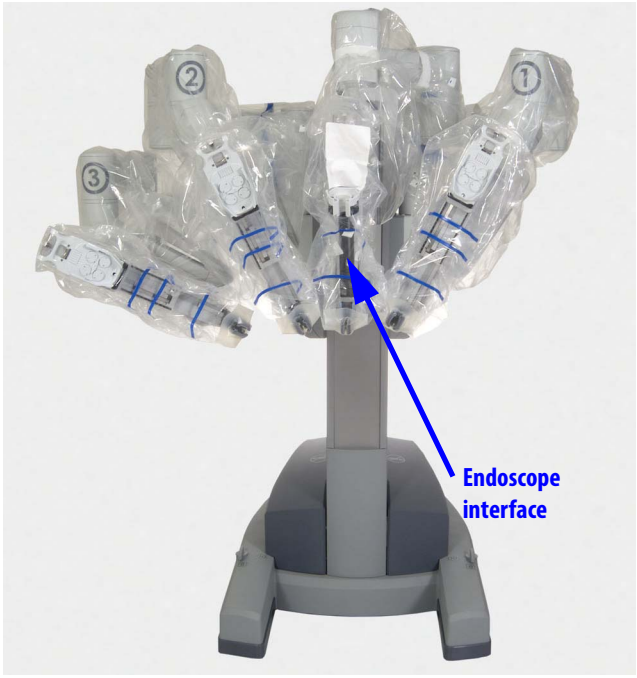


Figure 9.15 Patient Cart showing endoscope interface location

9.6 Endoscope Installation, Insertion, Removal and Intraoperative Care

Preoperative Endoscope Care

Before use, ensure the endoscope tip is adequately heated to minimize fogging when entering the surgical site. To heat the endoscope tip, dip it in a canister of heated sterile water. Place a piece of sterile gauze at the bottom of the canister to prevent damage to the delicate endoscope tip.

Installation

When the endoscope is ready to install on the camera arm, follow these steps:

1. Make sure the camera control buttons on the camera head are facing the tower of the Patient Cart. Carefully insert the endoscope tip through the camera cannula.

Figure 9.16 Installing the endoscope on the camera arm

2. Align the scope with the insertion axis as you pass it through the camera cannula and press the endoscope body into the camera arm sterile adapter. You will hear a click when the endoscope body is pressed into the sterile adapter. Make sure the endoscope body is fully engaged by gently pulling up on the endoscope. If properly engaged, the endoscope will not disengage from the sterile adapter. Re-seat as necessary.

⚠ CAUTION: **If not fully engaged, the endoscope may fall out.**

⚠ CAUTION: **To avoid possible thermal damage to the cannula, do not leave the endoscope tip inside a plastic endoscope cannula for a prolonged period of time while the lamp is on.**

Confirm Live Image in Stereo Viewer

Each time you install an endoscope, and after changing view modes or settings during a procedure, look in the stereo viewer to confirm a live image is present and has the desired orientation. Adjust endoscope orientation as necessary. If no image is present, confirm the lamp is on and at 100% intensity, as shown below. See section C.3 Basic Troubleshooting, page C-5, for further troubleshooting if no image is present.

3. Connect the yellow portion of the camera cable to the strain relief support on the camera arm.

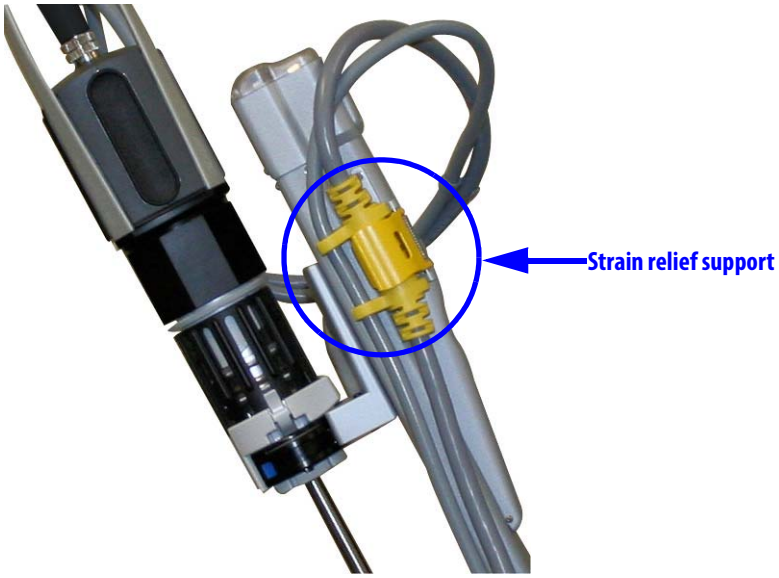


Figure 9.17 Camera cable in strain relief support shown without sterile drapes

Note: Leave the cable attached to the strain relief support when working with the camera head or endoscope assembly.

WARNING: The temperature of the distal tip of the endoscope may exceed 41°C during use. Avoid contact with skin, tissue and clothing when the Illuminator is turned on and the endoscope is outside the camera cannula, as damage may occur to skin, clothing and equipment. Do not contact tissue with the endoscope nor attempt to clean the tip of the endoscope by dipping it in tissue. The tissue can be damaged because of the heat, and the tip of the endoscope may develop baked-on deposits which can decrease light throughput.

Insertion

Once the endoscope is installed, use the camera arm clutch to manually guide it into the patient's body.

Intraoperative Endoscope Cleaning

As necessary due to fogging or smudging of the tip, remove the endoscope and wipe the tip with a piece of moistened sterile gauze.

Removal

1. Release the camera head cables from the strain relief support.
2. Squeeze the release levers on either side of the camera arm sterile adapter and gently pull the endoscope straight up and out of the cannula.

Note: *Intuitive* recommends you wipe clean the tip of the endoscope immediately after removing it, to prevent hardening of deposits that may be present.

Changing the Endoscope

WARNING: The connection point between the camera head and the endoscope can become hot. Exercise caution when handling the endoscope.

The endoscope may be changed during a procedure. To change the endoscope, perform the following steps:

1. Remove the endoscope from the camera arm as instructed above.
2. Remove the endoscope from the camera head.
3. Assembly is the opposite of disassembly. If using an angled endoscope, ensure the tip is oriented correctly.

End of section

10 Surgeon Console Use

This chapter explains use of the da *Vinci Si* Surgeon Console during surgery. The following subjects are covered:

Figure 10.1 Surgeon Console

10.1 Surgeon Console Overview

The Surgeon Console has six main components:

- Master Controllers (left and right), page 10-2
- Stereo Viewer, page 10-2
- Touchpad, page 10-3
- Left-Side Pod – Ergonomic Controls, page 10-4
- Right-Side Pod – Power and Emergency Stop, page 10-4
- Footswitch Panel, page 10-5

Master Controllers

The master controllers (masters) enable the Surgeon Console operator to control the Patient Cart instruments and endoscope. The masters have two main parts, an orientation platform and a positioning arm.

- The orientation platform (Figure 10.2) rotates the instrument tips and opens and closes the grips of the instruments.
- The positioning arm (Figure 10.2) moves the instrument in the surgical environment. Positioning movements can be scaled to a 3:1 (Fine), 2:1 (Normal), or 1.5:1 (Quick) ratio.

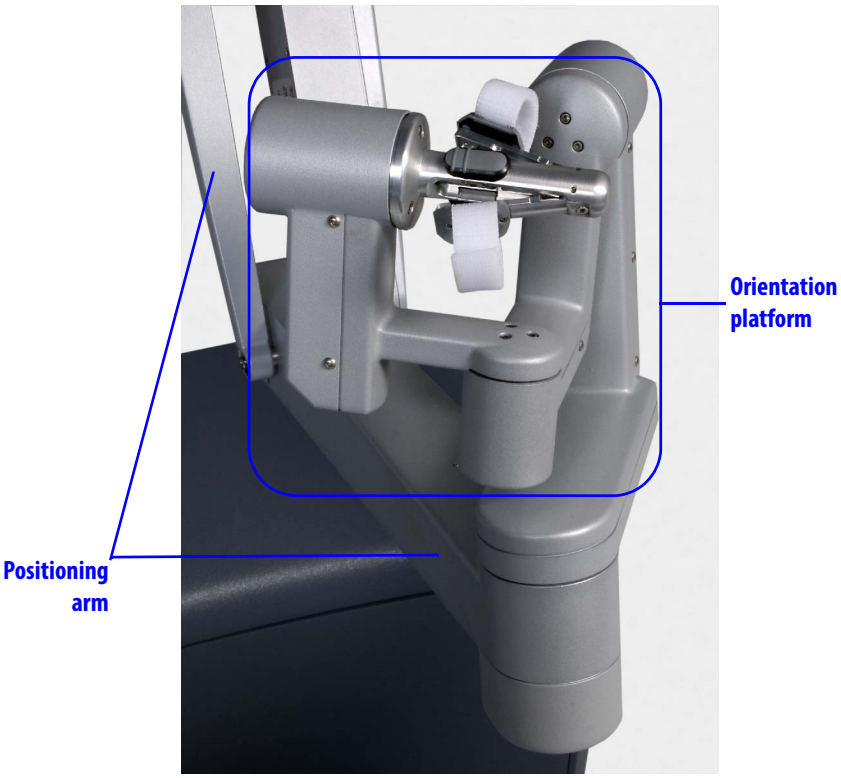


Figure 10.2 Master controller

Note: If instruments cannot be manipulated in a precise and controlled manner contact *Intuitive Surgical* Technical Support.

Note: If instrument motion appears to be non-intuitive, contact *Intuitive Surgical* Technical Support immediately. In the US, call 1-800-876-1310, where phones are staffed 24 hours a day, seven days a week. In Europe, call +41.21.821.2020.

For more information on use of the masters, see Matching Grips (page 10-22), Finger Clutch (page 10-23), and the Surgical Controls section starting on page 10-22.

Stereo Viewer

The stereo viewer provides the video image to the Surgeon Console operator, the surgeon. With his or her head in the viewer, the surgeon can view the 3D image in full-screen mode or can choose to swap to *TilePro*™ mode, which displays the 3D image along with up to two auxiliary images. Icons and text messages are overlaid on the video to provide extended information to the surgeon. The system provides 2-way audio communications with the

Patient Cart operator by a microphone located under the viewport and a pair of speakers located in the head rest. See Video (page 10-12) and Audio (page 10-17) for more information on use and adjustment of the stereo viewer.

Figure 10.3 Stereo viewer

Touchpad

The touchpad is the main control interface of the Surgeon Console. Functional descriptions of the specific controls are provided in the following section.

Figure 10.4 Touchpad (home screen)

For more information on use of the touchpad, see 10.3 Touchpad Controls on page 10-11.

Left-Side Pod – Ergonomic Controls

The left-side pod provides the ergonomic adjustment controls for the Surgeon Console, as indicated below.

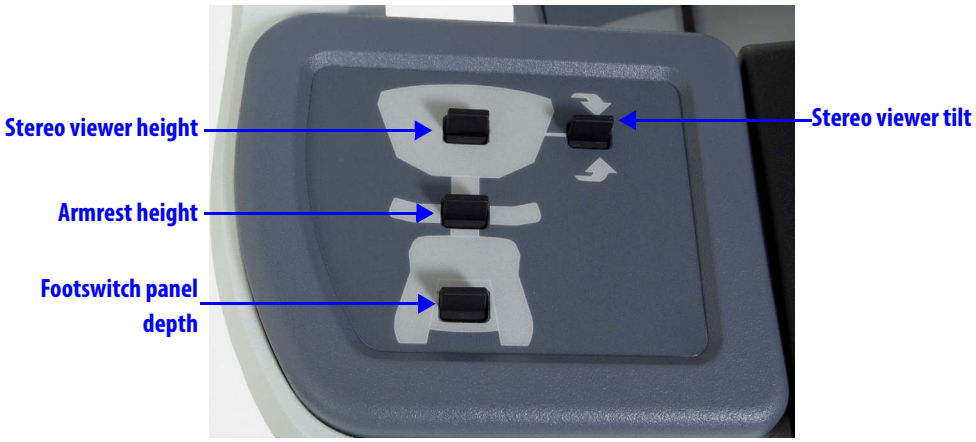


Figure 10.5 Left-side pod – ergonomic controls

For more detail on ergonomic adjustments, see Ergonomic Setup on page 10-10.

Right-Side Pod – Power and Emergency Stop

The right-side pod on the Surgeon Console provides **Power** and **Emergency Stop** buttons (Figure 10.6).

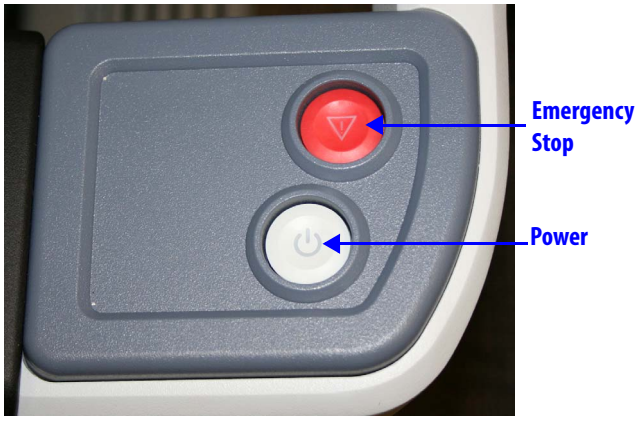


Figure 10.6 Right-side pod

Press the red **Emergency Stop** button should it be necessary to stop system operation at any time. The Emergency Stop button will cease robotic control of the instruments and endoscope. The instruments and endoscope will stay in their last commanded position.

If the instrument grips are closed when the Emergency Stop button is pressed, the grips will remain closed. However, the gripping force of the instrument may decrease.

Pressing Emergency Stop generates a recoverable fault, which can be cleared by pressing **Recover** on the touchscreen or touchpad. The Emergency Stop button illuminates until the fault is recovered.

Footswitch Panel

The footswitch panel allows the surgeon to control the camera, instruments, and ESU without removing his or her head from the stereo viewer

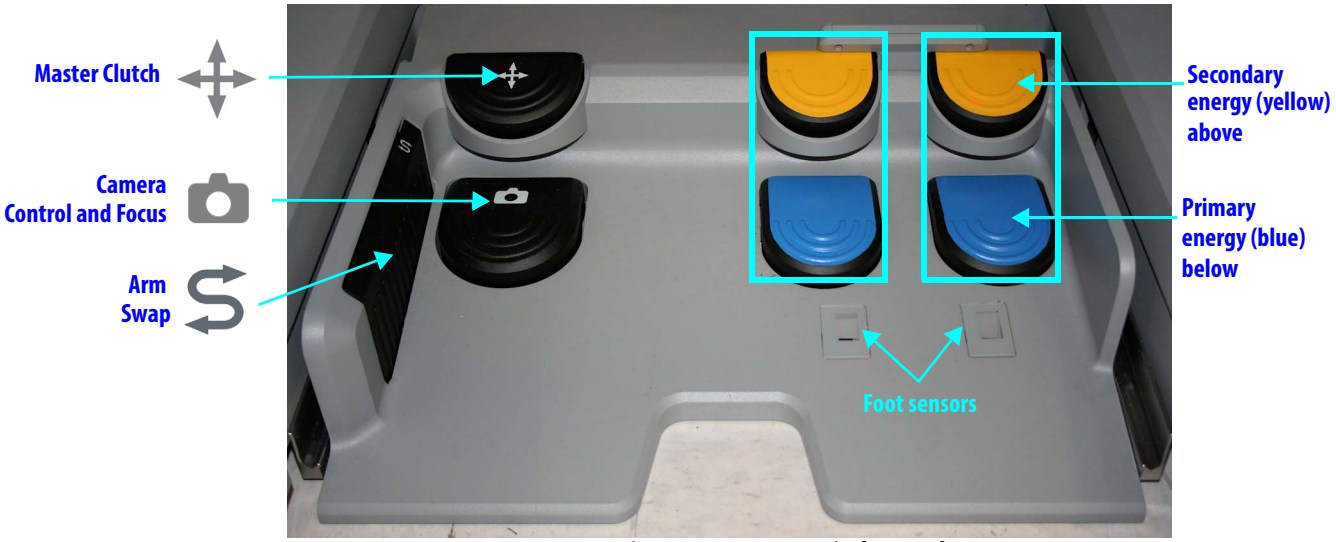


Figure 10.7 Footswitch panel

For instructions to use the footswitch panel, see Footswitch Panel Use on page 10-24.

10.2 Setting up the Surgeon Console

This section explains how to set up the Surgeon Console for use.

Login and Settings

The *da Vinci Si* System provides enhanced ease of use by automatically saving your last set of user-adjustable settings, such as your ergonomic settings, with your user name, and then applying your preferences automatically when you log in. To enjoy this benefit, we recommend you log in with your user name each time you use the Surgeon Console. (It is possible to bypass login, in which case your preferences cannot be saved.)

For each of the settings in Table 10-1 below, the system saves the last selection made to the current user profile, when a user is logged in. Table 10-2 lists settings not saved to a user profile, but applied until changed again. For all settings, the second column reports whether changes made on one Surgeon Console affect the other console when changes are made while in dual console mode.

Table 10-1 Settings Saved to the User Profile

Setting (options, default bold)	Change affects other console when made in dual console mode[a]	For details, see this section, on page
Ergonomic Settings	No, local effect only	Ergonomic Setup, page 10-10
Video Brightness (0-100)	Yes, affects other console[a]	Video, page 10-12
Video Contrast (0-100)	Yes, affects other console[a]	Advanced Video Adjustments, page 10-13
Video Saturation, Red & Yellow (0-100)	Yes, affects other console[a]	Advanced Video Adjustments, page 10-13

Table 10-1 Settings Saved to the User Profile

Setting (options, default bold)	Change affects other console when made in dual console mode[a]	For details, see this section, on page
Video Edge Enhancement (0-100)	Yes, affects other console[a]	Advanced Video Adjustments, page 10-13
Digital Zoom (Wide/**Full**/2x/4x)	No, local effect only	Display Preferences, page 10-15
TilePro (**Off**/2D/3D, and *TilePro* window sizing slider)	No, local effect only	Display Preferences, page 10-15
Telestration Eye (L/**R**)	Yes, affects other console[a]	Display Preferences, page 10-16
Image Depth (**Normal**/Far)	No, local effect only	Display Preferences, page 10-16
Image Enhancement (**On**/Off)	Yes, affects other console[a]	Display Preferences, page 10-16
Finger Clutch (**On**/Off)	No, local effect only	Control Preferences, page 10-20
TilePro QuickClick (On/**Off**)	No, local effect only	Control Preferences, page 10-20
Haptic Zoom (On/**Off**)	No, local effect only	Control Preferences, page 10-20
Motion Scaling (from masters to instruments, Quick/**Normal**/Fine)	No, local effect only	Control Preferences, page 10-20
Disable *SmartPedal* Notification screen (**present on login and unlock**)	No, local effect only	On *SmartPedal* Notification screen, before surgeon login

a. Changes that affect video image display also affect video output to the touchscreen and to the Video Out Aux bay of video output ports on the Core.

Table 10-2 Settings Not Saved to a User Profile

Setting (options, default bold)	Change affects other console when made in dual console mode	For details, see this section, on page
Illuminator Light Output (0-100)	Yes, affects other console	Advanced Video Adjustments, page 10-13
Scope Angle (0 degrees/30↑/30↓)	Yes, affects other console	Camera / Scope Setup, page 10-14
Stereo Viewer Mode (2D/**3D**)	No, local effect only	Display Preferences, page 10-16
Master Associations (Configure)	Yes, affects other console	Control Preferences, page 10-21

Follow these steps to log in:

Repeat User

If you already have a user name, touch it to log in. Scroll using the arrow keys if necessary.

Figure 10.8 Login screen

When you select the user name, the touchpad notifies you by the following screen that the ergonomic adjustment axes of the Surgeon Console will move:

Figure 10.9 Restore ergonomic settings

Make sure persons and objects are clear of the Surgeon Console and, as the button says, **Press and Hold to Restore Settings**. A blue bar indicates progress as the Surgeon Console applies the last ergonomic settings for this user. If you press and hold the **Reverse** button, the Surgeon Console reverses its movement, and the progress bar backs up. If you release either button, movement stops, as does the progress bar. Press and hold the desired button again to resume movement in that direction. When you finish restoring settings, the Restore Settings screen closes automatically and the touchpad home screen appears (see Figure 10.13, page 10-11). (Touch **Cancel** at any time to login with the current ergonomic settings.)

New User

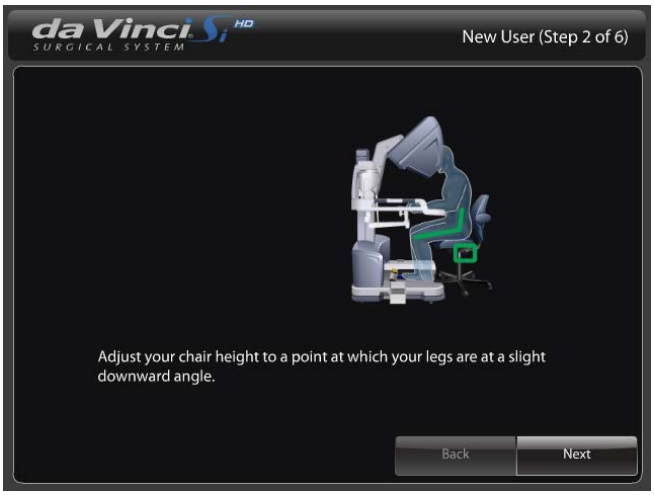
If you have not logged in to the system before, setup a user account like this:

1. Touch the **New User** button located on the login screen of the touchpad. The New User (Step 1 of 6) screen appears.

Figure 10.10 New User (Step 1 of 6) screen

2. Enter your name using the touchpad keyboard and touch **OK**.

Now the system walks you through ergonomic setup. This is required only one time, when creating a new account. The following New User screens appear in order.



Step 2: Adjust chair height

Step 3: Adjust armrest height

Step 4: Adjust viewer height

Step 5: Adjust viewer tilt

Step 6: Adjust foot switch panel depth

Figure 10.11 New User ergonomic setup screens

You are now logged in. Once logged in, the system saves to your profile any changes you make to the system configuration, like ergonomic settings, and then applies your profile automatically each time you log in again. To logout, touch the **Logout** button in the lower left corner of the home screen.

Manage Users
Touch **Manage Users** to access the Manage Users screen, where you can delete users.

Ergonomic Setup

⚠ **CAUTION: Before adjusting ergonomic controls on the Surgeon Console, make sure there is adequate room for the components to move.**

Once logged in, the system saves to your profile any changes you make to the system configuration, like ergonomic settings, and then applies your profile automatically each time you log in again. To adjust the Surgeon Console ergonomics to your preference, perform the following steps:

1. Adjust the chair height so your thighs are at a slightly downward angle relative to the floor. This ensures easy movement of the legs to activate the footswitches.
2. Adjust the armrest height so your forearms rest comfortably on the armrest with your shoulders relaxed (Figure 10.12).
3. Adjust the stereo viewer height to your preference (Figure 10.12).
4. Adjust the stereo viewer tilt according to your preference (Figure 10.12). Tilting up allows for a more comfortable neck angle. Tilting down allows for more alignment of your hands and the instruments in the stereo viewer.
5. Adjust the footswitch panel depth to your preference (Figure 10.12).

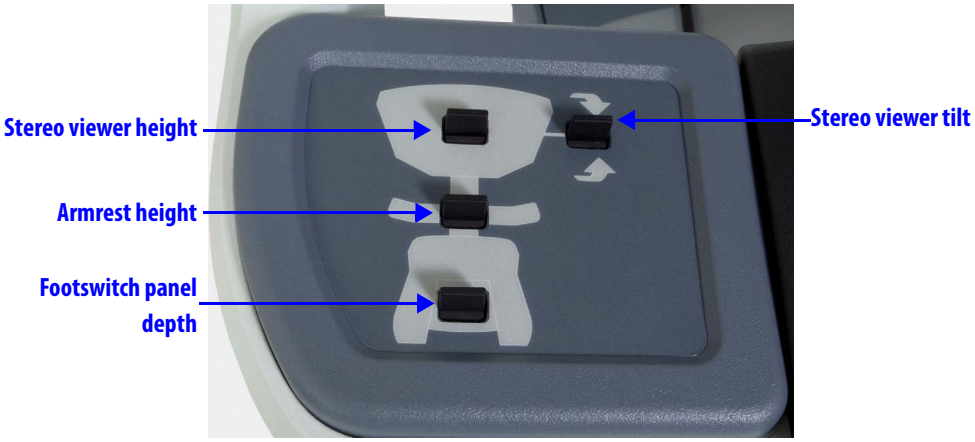


Figure 10.12 Left-side pod adjustments

10.3 Touchpad Controls

Overview

The touchpad home screen provides system status, including instrument arms, camera arm, and energy controls. In dual console mode, it also enables you to give or take control of instrument arms (see Dual Console Surgery on page 10-39).

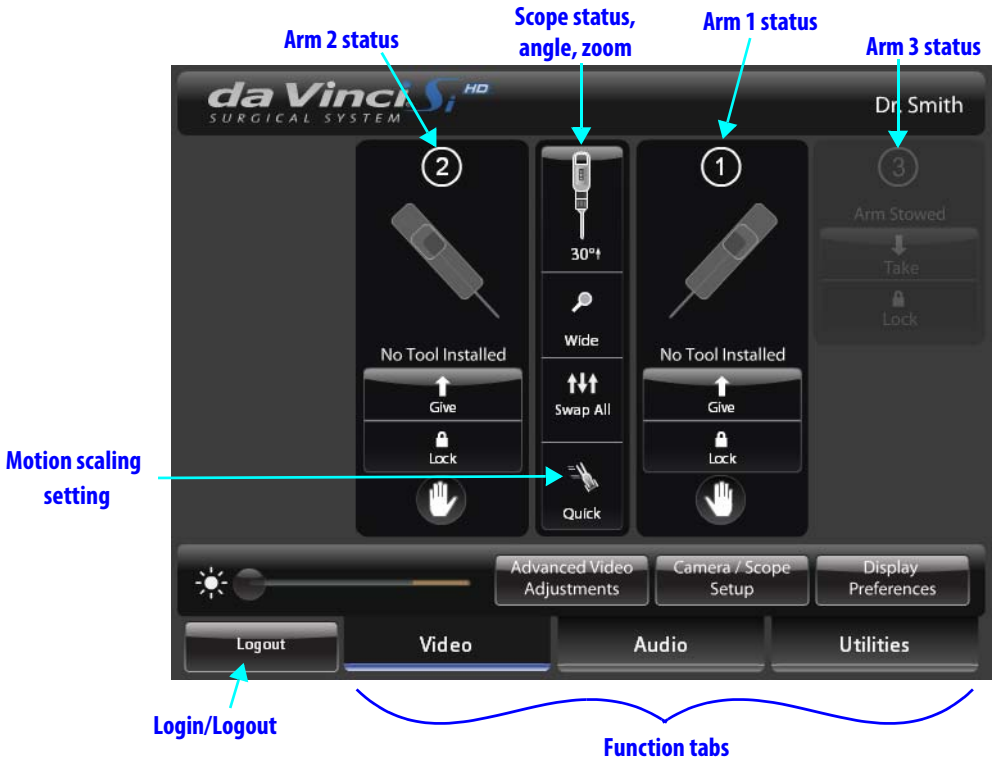


Figure 10.13 Touchpad home screen

- In general, as for the touchscreen menus:
  - Grayed-out items are not active or unavailable in the current context. Observe that Arm 3 is stowed and not available for use in Figure 10.13.
  - Items highlighted blue are selected.

- **Quick Settings Buttons:** Three quick settings buttons run down the center of the screen. From top to bottom, the buttons indicate current settings for scope angle, zoom level (in the stereo viewer) and motion scaling. Touching these opens the associated settings screen, where you can adjust:
  - Camera / Scope Setup, see page 10-14
  - Zoom level, as in Display Preferences, see page 10-15
  - Control Preferences, see page 10-20
- **Lock:** Touch **Lock** to lock an arm's position and prevent accidental switching to an instrument arm that is performing a static function (for example, retracting or stabilizing tissue). When an instrument arm is locked, it maintains its position. The lock button is highlighted blue when selected, indicating it is locked. You must touch **Lock** again to enable control of the arm.

Unlock Touchpad

When the surgeon takes instruments into following mode, the touchpad automatically locks, to prevent inadvertent actions.

Figure 10.14 Touchpad locked

Touch **Unlock** to access the touchpad again.

Video

The **Video** tab provides quick access to the brightness adjustment as well as Advanced Video Adjustments, Camera/Scope Setup and Display Preferences.

Figure 10.15 Video tab

- **Brightness:** Drag the **Brightness** slider (sun icon at lower left) to adjust video brightness (not actual illumination) in the stereo viewer. Brightness increases to the right.

Advanced Video Adjustments

Touch **Advanced Video Adjustments** to adjust the Advanced Video settings of the surgical image.

Figure 10.16 Advanced Video Adjustments

Note: The specific adjustment of these settings is a matter of surgeon preference. Like any adjustable video image, you may observe that some settings affect others, with the result that a specific combination of settings may represent a tradeoff, for example, between glare in one part of the image and enhanced visibility in another part. Keep in mind that you can readjust these settings at any time.

- **Brightness:** Drag the slider to adjust the brightness of the surgical image. This is video brightness, as opposed to actual illumination.
- **Contrast:** Drag the slider to adjust the contrast of the surgical image.
- **Red:** Drag the slider to adjust the red of the surgical image.
- **Yellow:** Drag the slider to adjust the yellow of the surgical image.
- **Edge Enhancement:** Drag the slider to adjust the edge enhancement of the surgical image. Increasing edge enhancement (slider to the right) may also increase noise.
- **Illuminator:** Drag the slider to adjust the actual light output transmitted to the surgical field in 10% increments.

Note: To minimize fogging, maintain heating of the endoscope tip by setting the Illuminator intensity to 100% and adjust the brightness of the surgical image using the Illumination slider on the touchpad or touchscreen under Advanced Video Adjustments.

Camera / Scope Setup

Touch **Camera / Scope Setup** to setup the camera head and endoscope from the Surgeon Console. This is equivalent to setup using the touchscreen and/or camera head (see Camera / Scope Setup from the Camera Head on page 7-7)

Figure 10.17 Camera / Scope Setup

- **Scope Angle:** You can specify the scope angle by touching the corresponding button: **0** (degrees, for straight endoscopes), **30↑** (degrees up) or **30↓** (degrees down) for angled endoscopes.

Note: When a new scope angle is selected, the system realigns the master controllers to match the instrument tip orientation and position.

WARNING: **If the wrong scope angle is manually selected, instrument motion may appear non-intuitive.**

- **White Balance:** Touch to perform white balance.
- **3D Calibration:** Touch to calibrate the camera/scope assembly from the Surgeon Console. For further instructions, see 3D Calibration of the Endoscope Assembly on page 7-10.

Display Preferences

Touch **Display Preferences** to configure the stereo viewer display.

Figure 10.18 Display Preferences

- **Zoom:** Also known as digital zoom, this allows you to zoom in on the image without changing the position of the endoscope tip. Zoom has four settings (**Wide, Full, 2x, 4x**). The current setting appears below the scope status icon on the touchpad.

  When you change the Zoom setting, a navigation window appears in the bottom right corner of the Surgeon Console image. The navigation window represents the widescreen (16:9) image. The blue rectangular outline indicates the zoom level.

- **TilePro:** Selecting **2D** or **3D** switches the stereo viewer display from full endoscope view to *TilePro* (multi-image) mode. *TilePro* allows display of up to two auxiliary video inputs (PACS, ultrasound, room camera, etc.) along with the operative image. When *TilePro* is active, the system detects auxiliary video inputs and arranges the *TilePro* display accordingly. While in *TilePro* mode, you can use the slider to scale the endoscopic image relative to the auxiliary images. As the operative image size changes, the auxiliary images will scale to fill in the remaining display area.

  - **3D *TilePro***: To display a 3D *TilePro* video source in the stereo viewer, connect a compatible (stereo) video source to both the **TilePro** (L) and (R) connectors at once and select **3D** on the touchpad.

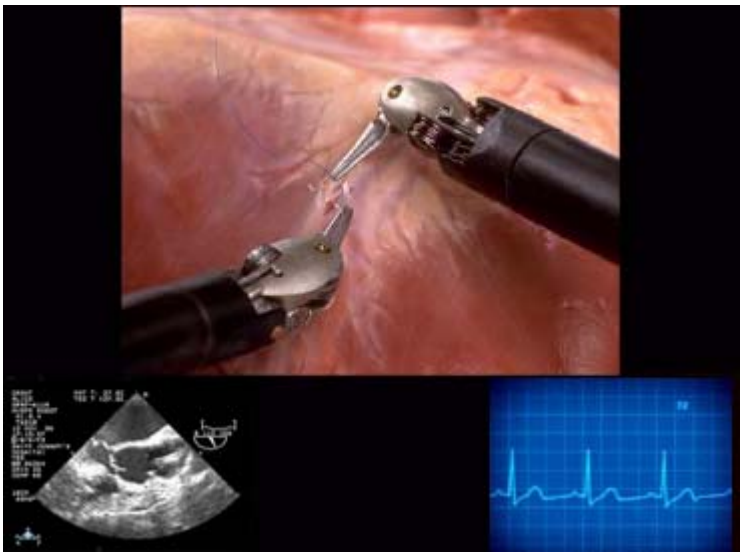


Figure 10.19 Sample TilePro layout in stereo viewer

Note: *TilePro* is disabled unless the system senses auxiliary video input(s).

- **Viewer Mode:** Toggles the stereo viewer between **2D** and **3D** mode.
- **Telestration Eye:** Toggles display of telestration overlay between the left-eye **(L)** and right-eye **(R)** image.
- **Image Depth:** Optimizes the surgeon's ability to see a fused 3D image at **Normal** or **Far** distances. The system defaults to **Normal**.
- **Image Enhancement:** Default is **On**. When on, it optimizes sharpness of the video image display in most situations. Turning it off may reduce noise in the image.

Note: For details regarding icons and text messages overlaid on the stereo viewer display see Appendix G: Symbols, Icons and Text Messages Reference.

Audio

The **Audio** tab enables volume adjustments and microphone mute.

Note: If you experience difficulty in communicating with the patient side assistant, check the audio settings.

Figure 10.20 Audio tab

- **Volume:** Drag the slider to adjust volume in the Surgeon Console speakers; volume increases left to right.

- **Mute:** Touch to mute the Surgeon Console microphone.

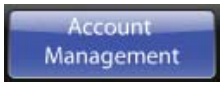
Addressing Audio Feedback

To address audio feedback, attempt the following mitigations:

- Reduce speaker volume in the Surgeon Console and/or at the touchscreen.
- Orient the Surgeon Console(s) and touchscreen so that microphones and speakers do not point toward each other.
- Increase the distance between the Surgeon Console(s) and touchscreen.
- Mute either the Surgeon Console or touchscreen microphone to allow amplified audio in one direction only.
- Use an external speaker connected to the Surgeon Console Audio Line Out to amplify the audio output from that Surgeon Console only.

Utilities

The **Utilities** tab provides access to Account Management, Inventory Management, Event Logs and Control Preferences.



Account Management

Provides access to user account information. Users may change information regarding their profile or delete their account.

Figure 10.21 Account Management

Inventory Management

Reports usage status for instruments used during the procedure. When the surgeon selects **Inventory Management**, the inventory list appears in the stereo viewer, not the touchpad. The list also displays the usage hours of the lamp module. Press **Page Up** or **Page Down** to scroll the inventory list.

Figure 10.22 Inventory Management

Event Logs

Provides access to system event logs, including error logs. When the surgeon selects **Event Logs**, the event logs appear in the stereo viewer, not the touchpad. The touchpad notifies you that the information is displayed in the stereo viewer.

Figure 10.23 Event Logs

Troubleshooting

Displays the system name and system software version, and provides **L** (left) and **R** (right) buttons to display the color bar test pattern in the left or right video channel independently. The functionality is the same as found on the touchscreen **Troubleshooting** screen.

Figure 10.24 Troubleshooting on touchpad

Control Preferences

Allows the surgeon to configure the system controls.

Figure 10.25 Control Preferences

- **Scaling:** Scales master controller positioning movements to **Quick** (1.5:1), **Normal** (2:1) and **Fine** (3:1) ratios. The system defaults to **Fine**.
- **Finger Clutch:** Turn finger clutching on or off. The finger clutch buttons on the masters are on by default, when no one is logged in to the Surgeon Console. However, note that finger clutch on or off is saved to a user's profile. So if you change the setting while logged in to the Surgeon Console, that setting will be saved to your profile and apply automatically whenever you log in.
- ***TilePro* QuickClick:** Turn *TilePro* QuickClick on or off. When on, the surgeon can switch into *TilePro* mode by quickly clicking the camera pedal.
- **Haptic Zoom:** Turn haptic zoom on or off. Off by default, haptic zoom is a method to apply digital zoom using the masters, while in camera control mode. Recall that digital zoom does not move the endoscope tip. To use haptic zoom, press the camera pedal to enter camera control mode and:
  - Push the masters closer together to zoom in (digitally).
  - Pull the masters apart from each other to zoom out (digitally).

Note: You may feel a slight detent (pushback) on the masters as the levels are adjusted.

- **Master Associations:** Touch **Configure** to open the Master Association screen, which enables you to manually associate either master with any instrument arm.

Figure 10.26 Master Associations

- You can press **Auto** to apply master associations automatically, or use the arrow buttons to manually switch masters association by instrument arm. When instruments are reassigned, the system takes the instruments out of following, notifies and prompts you with the icon and associated message below:

Your instruments have been reassigned. Tap 'Arm Swap' pedal to acknowledge and continue.

Figure 10.27 Icon and message when instruments reassigned

Note: In dual console mode, either surgeon can use the Master Associations screen to reassign instruments to different masters – even while the other surgeon has control of the instruments. The new instrument assignment applies on both consoles and persists when instruments are swapped. The system notifies the surgeons as usual when reassignment occurs.

- The system does not allow you to associate all 3 arms with one master, and notifies you if you attempt it: **"Maximum of two arms per side."**

Figure 10.28 Maximum of two arms per side

10.4 Surgical Controls

This section describes the interface for controlling the instruments, camera and stereo viewer display via the masters and footswitch panel.

To begin using the surgical controls, the surgeon must first put his or her head in the stereo viewer. The stereo viewer uses a pair of infrared head sensors to determine whether the system is in use or not. If the surgeon's head is out of the viewer, he or she cannot take control of the instruments or camera.

⚠ **CAUTION: The infrared head sensors performs a safety function by preventing movement of the Patient Cart arms when the surgeon's head is not in the viewer. Do not defeat this safety feature by intentionally blocking the sensors.**

Matching Grips

Before taking control of instruments, the surgeon must first "match grips." Matching grips is a safety feature designed to prevent inadvertent activation of instruments. It also ensures that items being held by inactive instruments are not accidentally dropped when activated.

To enable surgeon control, matching grips requires two steps:

1. **Satisfy Intended Motion:** Satisfy intended motion by using the master to partially close or open the grips, or slightly rotate the grips.
2. **Match Grip Angle:** After satisfying intended motion, you must match the master grip angle to the instrument grip angle.

Once you match grips, you can control the instruments. You cannot match grips until the instrument tip moves past the cannula tip. When the instrument is ready to match grips, an icon and text message prompt you to match grips.

Note: Clip appliers must match grips and be open more than 90% before they will be allowed to close.

WARNING: For patient safety, the surgeon *must not* match grips nor move instruments whose tips are not visible in the stereo viewer. Failure to observe this warning can cause serious harm to the patient.

Note: To ensure patient safety, the Patient Cart operator's actions take precedence over Surgeon Console control. Any movement of the arms by the Patient Cart operator takes all instruments out of following.

WARNING: Once in following, the Surgeon Console operator must not remove his or her hands from the masters until removing his or her head from the Surgeon Console viewer—thereby taking the system out of following mode. Failure to do so may result in uncontrolled movement of the masters, resulting in serious harm to the patient.

CAUTION: To avoid an electrical hazard, the Surgeon Console operator must not touch the patient while using the master controllers.

Maintain a light grip on the masters when taking or retaking control of the masters (for example, when a new instrument is installed, when the Patient Cart operator moves the Instrument or camera arms, after instrument arm swapping, etc.). This allows the system to align the master grips relative to the tips of the instruments in the stereo viewer.

Finger Clutch

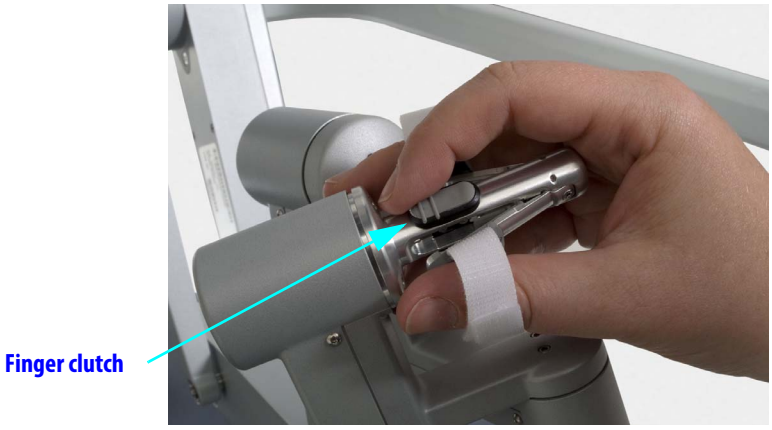


Figure 10.29 Finger clutch

Slide the finger clutch to decouple the master from control of its instrument. While you hold the finger clutch, you can move the master and the instrument will not move. Unlike the master clutch pedal, the finger clutch applies only to its own master controller. So when you apply one finger clutch, the other master's instrument remains in following. Applying the finger clutch enables you to reposition the master for comfort, and to reclaim space to maneuver when the master reaches its limits. To resume control, release the finger clutch and match grips as usual (see Matching Grips on page 10-22).

- You can turn off finger clutching using the Control Preferences screen on the touchpad (see page 10-20).

Footswitch Panel Use

The footswitch panel features two groups of footswitches. The three switches on the left control system functions (camera control, master clutch, and arm swap). The four pedals on the right side of the footswitch panel control energy activation for devices connected to the **Energy** connectors on the Core (for example, electrosurgical units or ESUs). The energy control pedals are arranged as a left pair of pedals and a right pair of pedals.

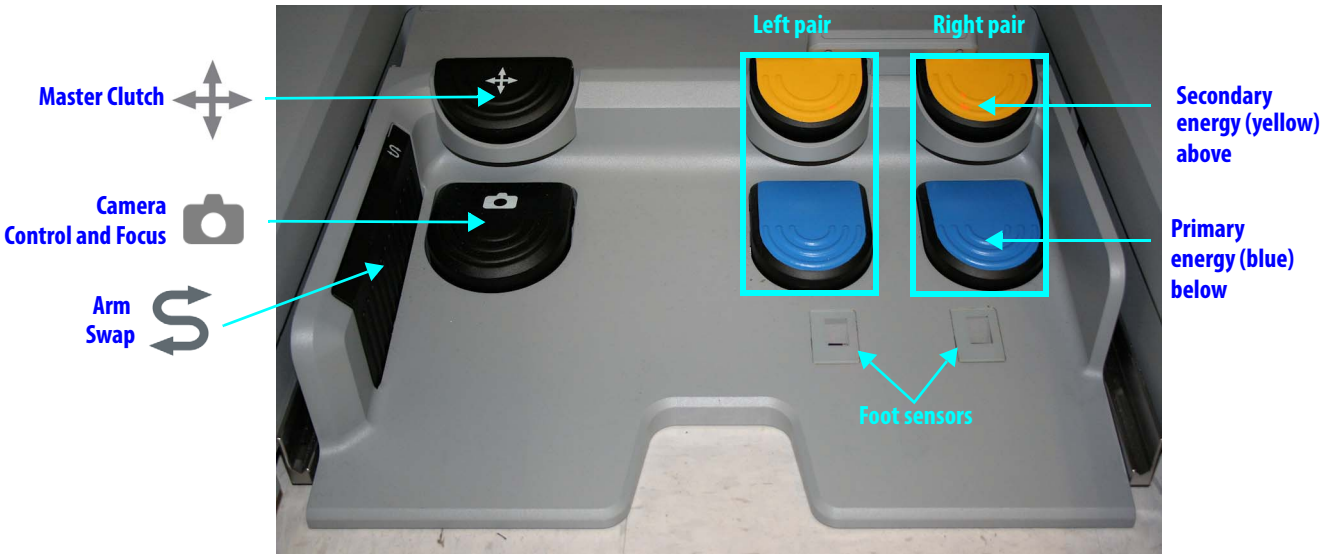


Figure 10.30 Footswitch panel controls

- **Camera Control and Focus:** Press the camera pedal to switch the masters from instrument control to camera (endoscope) control. In camera mode, the surgeon's movement of both masters together – such as moving in or out, side to side, or rotating – translates into endoscope movements. To move the scope in, pull the image toward you: pull both masters toward your eyes. To rotate the image clockwise, rotate the two masters together clockwise, like a steering wheel. To adjust focus, rotate your wrists in either direction while holding the masters.

Note: Pressing the camera pedal takes all instruments out of following and also stops firing of energy instruments on the other console when operating in dual console mode (see section 10.5 Dual Console Surgery). When you release the camera pedal, the masters resume control of the instruments.

CAUTION: **Instrument tips should be kept in the view of the surgeon at all times.**

- **Master Clutch:** Pressing the master clutch pedal decouples both masters from control of their instruments and enables you to move the masters easily while all instruments remain immobile. (You cannot use the footpedal to clutch masters independently.) Pressing the master clutch pedal allows the surgeon to reposition the masters for ergonomic comfort, and to reclaim space to maneuver the masters when they run out of working space. All instruments remain immobile until the surgeon resumes control by releasing the pedal and then matching grips as usual (see Matching Grips on page 10-22).

- **Arm Swap (left kick-plate):** Swaps control between two instrument arms associated with the same master.

Primary (Blue) and Secondary (Yellow) Pedals

Each pair has a blue pedal below for primary activation, and a yellow pedal above for secondary activation.

- **Primary Pedal (blue):** Activates the primary function of a pedal-linked instrument (for example, **Coag** for monopolar instruments).
- **Secondary Pedal (yellow):** Activates the secondary function of a pedal-linked instrument (for example, **Cut** for monopolar instruments).

For information about the user interface associated with pedal activation, see Footswitch Panel Use on page 10-24.

Identify System Configuration: *SmartPedal*™ Technology or Not

The *da Vinci Si* System may be equipped with *SmartPedal* technology or not. This manual provides instructions for both configurations, in consecutive sections. It is important to distinguish which configuration is present to use the energy pedals correctly.

The following things indicate the presence of *SmartPedal* technology on the system:

- "L" and "R" pedal labels on the blue and yellow pedals
- Orange *SmartPedal* Quick Reference Guide hanging on Surgeon Console
- User interface differences, particularly in the footswitch map at bottom center of stereo viewer display. These differences are shown in the following sections on each configuration.

SmartPedal notification screen (Figure 10.31) appears on touchpad, upon startup, and at the login and unlock screens. Note that this message can be permanently disabled for each user when logging in by pressing "Don't show this message again." Once disabled, the message will not be displayed at the login and unlock screens.

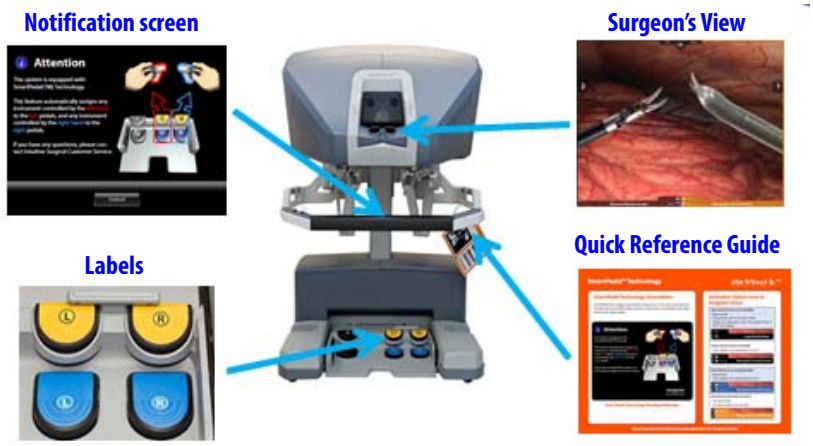


Figure 10.31 SmartPedal Indicators

The following things indicate that *SmartPedal* technology is ***not*** present on the system:

- No "L" and "R" pedal labels on the blue and yellow pedals
- User interface differences, particularly in the footswitch map at bottom center of the stereo viewer display.

If your system is configured with *SmartPedal* technology, follow the instructions immediately below. If your system is configured without *SmartPedal* technology, follow the instructions starting on page10-32 with the section Non-SmartPedal: Energy Control Pedals.

SmartPedal Technology: Stereo Viewer Display

The high resolution stereo viewer displays the surgical site and provides extended system information via icons and text messages. The following figure illustrates arrangement of overlaid elements displayed in the stereo viewer monitor. Note that many overlaid elements appear only when needed, and others are usually or always present. For a complete list of icons and text messages, please refer to Appendix G: Symbols, Icons and Text Messages Reference.

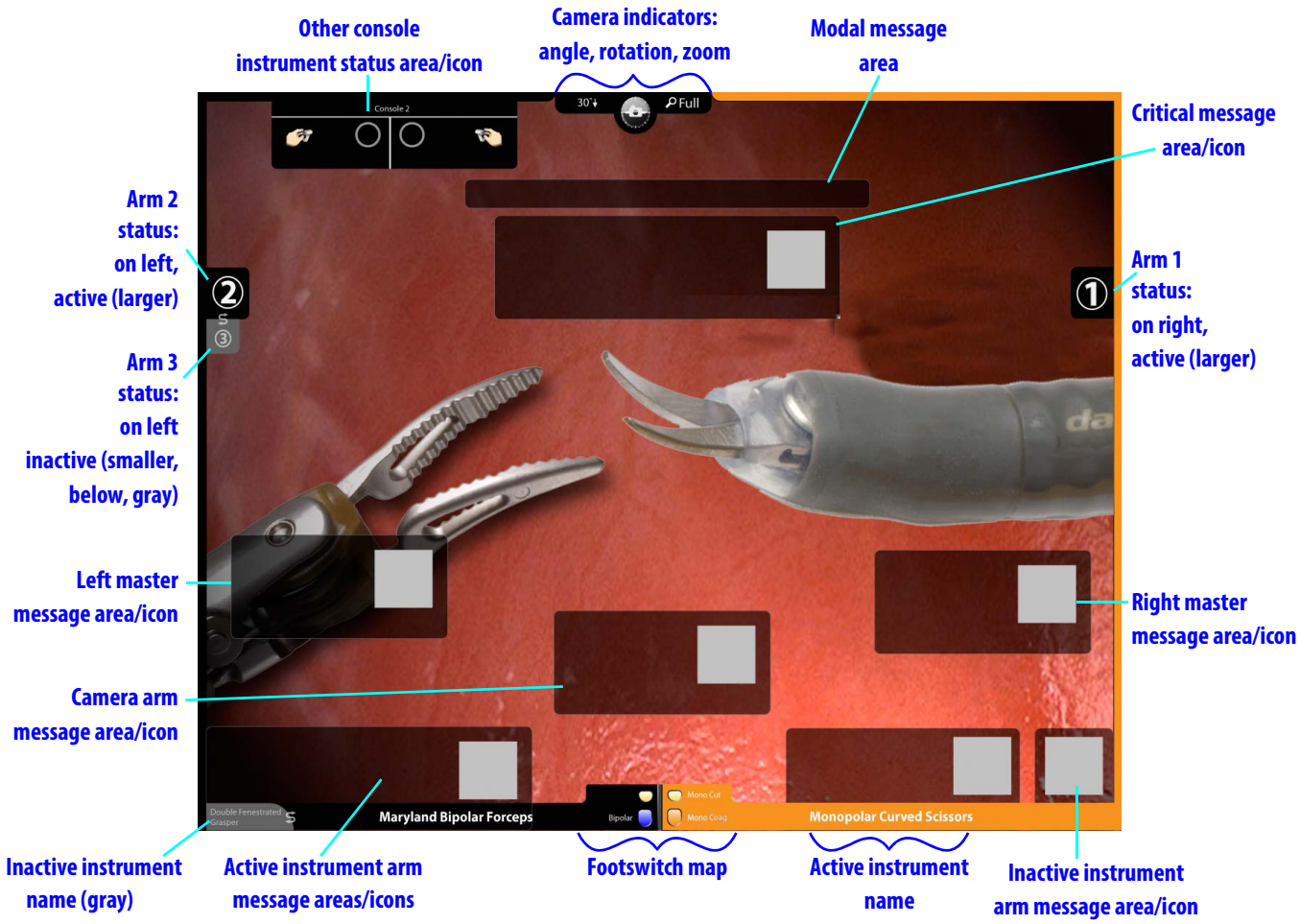


Figure 10.32 Stereo viewer display

- **Instrument Arm Indicator:** Provides the instrument arm number on the same side as the master that controls the instrument arm. When two arms are associated with the same master, the top number represents the active arm.
- **Background colors on instrument names, arm numbers:** The background colors on instrument names and arm numbers, which extend around the screen border on that side, have the following meanings:
  - **Blue:** Foot detected over an enabled pedal pair
  - **Orange:** Instrument activated

- **Camera Indicators:** At top center of stereo viewer display, they include:
  - **Camera Angle:** Displays **0°, 30°↑** or **30°↓**.
  - **Camera Rotation:** Provides information regarding the rotation of the endoscope relative to ground. This feature is useful for understanding the frame of reference of the video relative to the anatomy.

  - **Zoom:** Shows current zoom level (**Wide, Full, 2x, 4x**) of the viewer.
- **Footswitch Map:** Provides a reference for understanding the available function and status of the instrument activation pedals.
- **Message Areas:** Provide extended information regarding the state of the system.

***SmartPedal* Technology: Other Console Instrument Status Area**

When in dual console mode, a small status area as in Figure 10.33 appears at upper left of the stereo viewer.

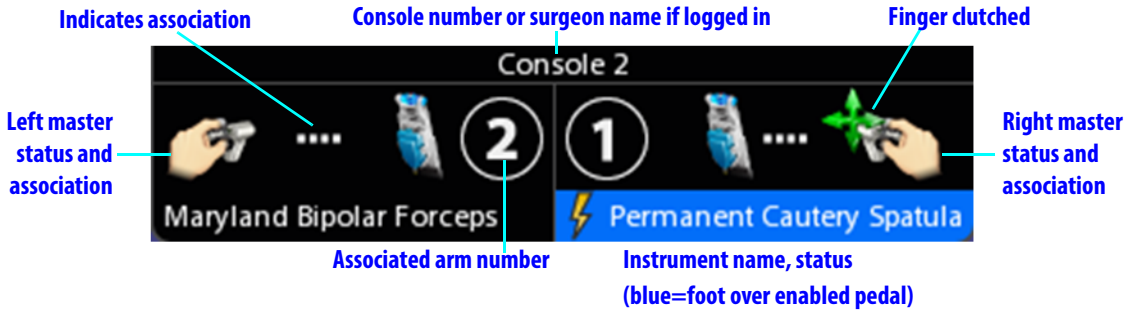


Figure 10.33 Dual console status area

This area provides the instrument status for the ***other*** console, showing:

- The console number at the top, or the user name of the surgeon if logged in
- For left and right masters, the associated instrument name, arm number and activation status, including turning orange when activated
- The same status icons as appear elsewhere, and the additional icon showing that the master is clutched (finger clutched) as seen on the right above. For a complete list of icons and text messages, please refer to Appendix G: Symbols, Icons and Text Messages Reference.

Note: On the touchscreen, two of these status areas appear side by side at top center when in dual console mode.

SmartPedal Technology: Left Controls Left, Right Controls Right

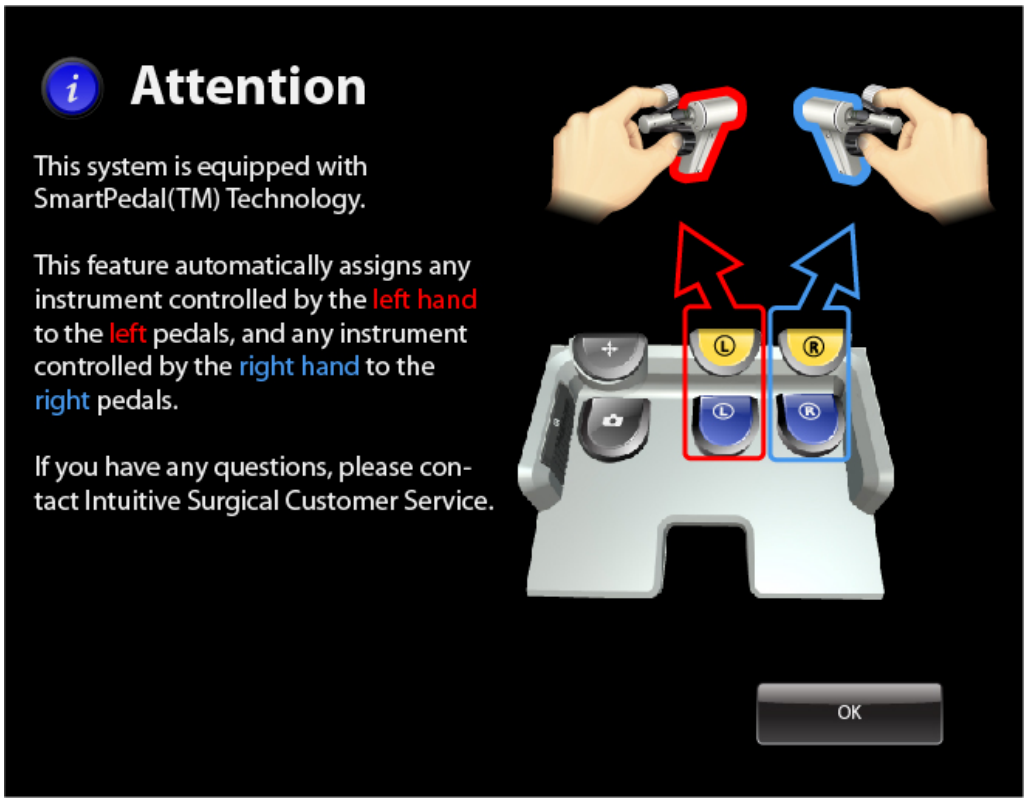


Figure 10.34 SmartPedal Technology touchpad message: Pedal to instrument associations

SmartPedal Technology expresses a simple association of pedals with instruments: The left pair of pedals activate the instrument associated with the left master; likewise, the right pair of pedals activate the instrument associated with the right master. These automatic associations for pedals cannot be changed.

Note: This message can be permanently disabled for each user when logging in by pressing "Don't show this message again". Once disabled, the message will not be displayed upon login or in the unlock screen.

SmartPedal Technology: Footswitch Map (Stereo Viewer)

The footswitch map in the bottom center of the stereo viewer displays the available function and status for each pedal, when a pedal-linked instrument is installed and an ESU supporting that function is connected to the system Core.

Pedal color meaning:
gray = disabled pedal
blue or yellow= enabled pedal
orange = activated pedal
orange pedal outline = disabled pedal being pressed

Background colors:
blue = foot over enabled pedal
orange = activated

Available function

Figure 10.35 Footswitch map example

- When no pedal function is available, the pedal is disabled and its icon is gray and lacks accompanying text that would list an available function. When a disabled pedal is pressed, its outline is highlighted orange, though it is not activated.
- When a pedal function is available, the pedal is enabled and its icon is blue or yellow, and has accompanying text showing the available function.

SmartPedal Technology: Stereo Viewer Border Colors

The activation status colors in the stereo viewer extend around the screen border for the instrument on that side. A blue border means that a foot is over (close to or touching) an enabled pedal on that side. An orange border means a pedal function is activated on that side.

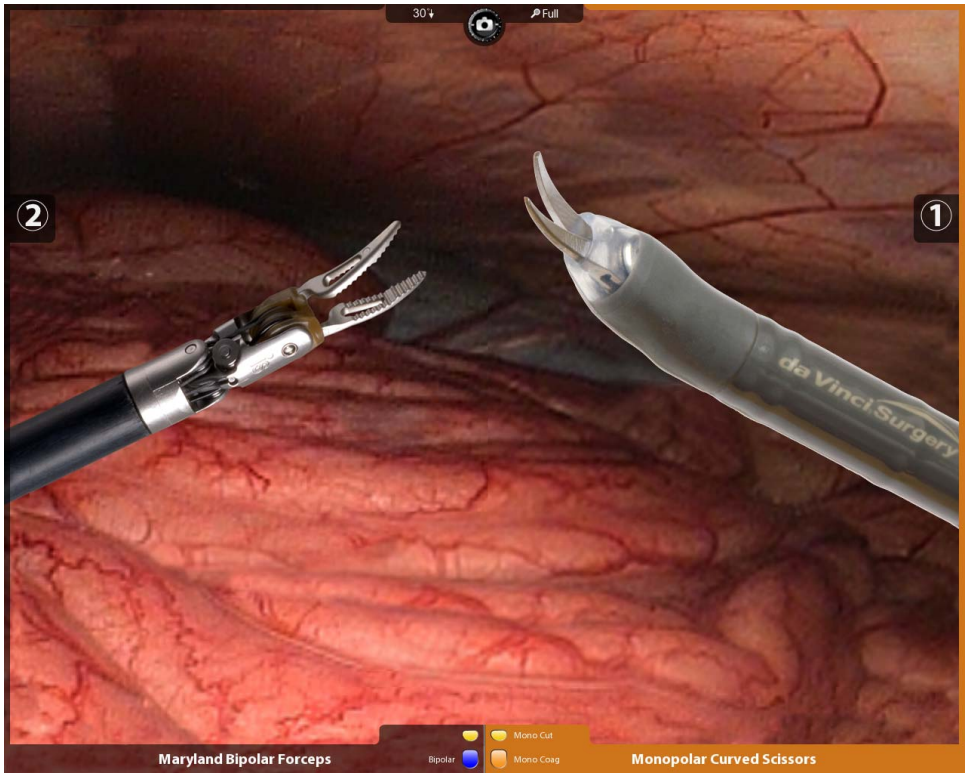
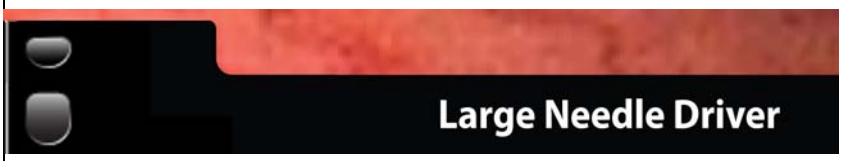


Figure 10.36 Example of orange border on right

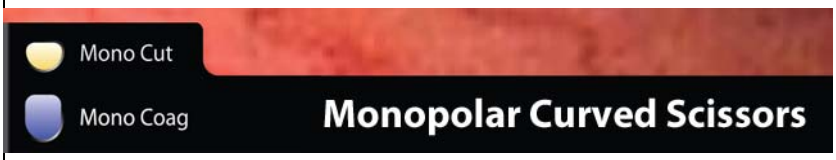
SmartPedal Technology: Activation Status Indicators in Surgeon's View

Instrument Function Not Available



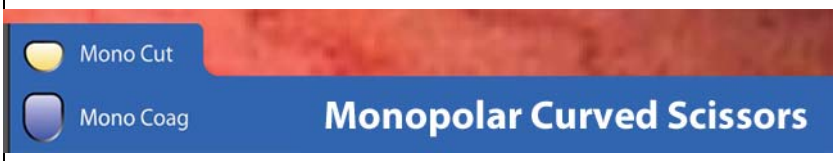
- Black border
- Gray pedals with no function listed
- Pedals turn light gray when the surgeon's foot is held over a pedal

Instrument Function Available



- Color pedals with associated function

Foot Held Over an Enabled Pedal



- Blue border
- Color pedals with associated function

Activating Instrument Function

- Orange border
- Activated pedal turns orange

SmartPedal Technology: Pedal Activation Behavior

- The system can activate only one energy instrument at a time: pressing a second pedal on a single console makes the first stop firing, and neither can fire until both pedals are released. The lone exception to this behavior regards the Suction/Irrigator, which can be activated at the same time as other energy instruments.
- In dual console mode, if each surgeon controls an energy instrument, the first press of an energy pedal activates the associated instrument, and other presses are locked out until the first is ended. When the first press ends, a blocked press must be released and re-applied before it is effective.

- In single and dual console mode, pressing the camera control pedal stops all energy firing (and instrument motion).
- The system beeps if you press a pedal while the instrument cannot be activated.

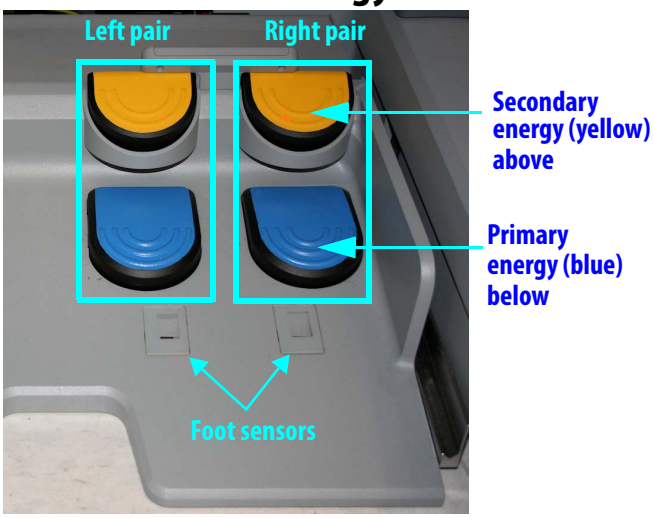
SmartPedal Technology – Troubleshooting: Activation Not Available

Activation is disabled in any of the following situations:

- The associated generator is not connected to the *da Vinci* System, or not powered on.
- Two generators with the same energy type are connected to the system, for example, two monopolar ESUs.
- Two energy instruments of the same type are installed on the system, for example, two bipolar instruments as shown below. Observe that:
  - Red text near the top of the screen reports, **Bipolar energy disabled; only one Bipolar device is allowed**.
  - The pedals of the footswitch map are grayed out, meaning the pedals are disabled.

Figure 10.37 Example of energy device conflict

Non-*SmartPedal*: Energy Control Pedals



Right Pair Controls Monopolar, Harmonic, Vessel Sealer and Stapler Instruments
The right pair of pedals controls energy activation for monopolar, harmonic, Vessel Sealer and Stapler energy instruments.

Left Pair Controls Bipolar Instruments (Standard or PK) and Suction/Irrigator
The left pair of pedals controls energy activation for bipolar energy instruments, either standard or PK, and the Suction/Irrigator instrument.

Primary (Blue) and Secondary (Yellow) Pedals
Each pair has a blue pedal below for primary energy control, and a yellow pedal above for secondary energy control.

- **Primary Energy (blue):** Activates the primary energy mode of an energized instrument (for example, **Coag** for monopolar instruments).
- **Secondary Energy (yellow):** Activates the secondary energy mode of an energized instrument (for example, **Cut** for monopolar instruments).

For information about the user interface associated with energy control, see Footswitch Panel Use on page 10-24.

Non-*SmartPedal*: Stereo Viewer Display

The high resolution stereo viewer displays the surgical site and provides extended system information via icons and text messages. The following figure illustrates arrangement of overlaid elements displayed in the stereo viewer monitor. Note that many overlaid elements appear only when needed, and others are usually or always present. For a complete list of icons and text messages, please refer to Appendix G: Symbols, Icons and Text Messages Reference.

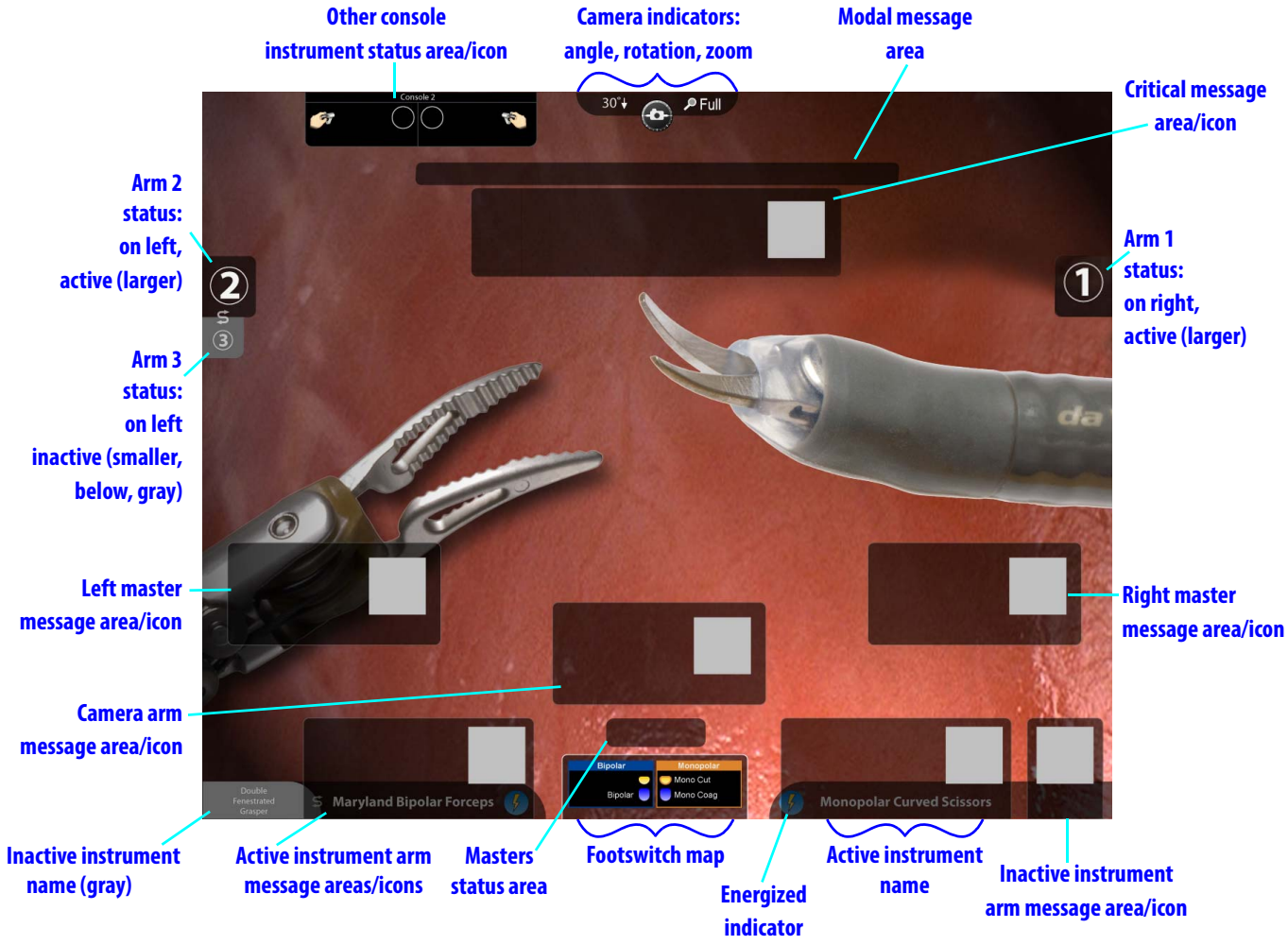
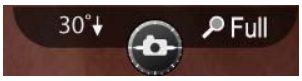


Figure 10.38 Stereo viewer display

- **Energized indicator:** This lightning bolt icon, filled with yellow, appears next to the name of instruments that are energized and ready to fire. When an energy instrument is not ready to fire for some reason, the lightning bolt icon is crossed out and empty .
- **Instrument Arm Indicator:** Provides the instrument arm number on the same side as the master that controls the instrument arm. When two arms are associated with the same master, the top number represents the active arm.

- **Background colors on instrument names, arm numbers:** The background colors on instrument names and arm numbers have the following meanings:
  - **Black**, partially transparent (default): Foot sensors detect nothing
  - **Gray:** Foot detected over a disabled pedal pair
  - **Blue:** Foot detected over an enabled pedal pair
  - **Orange:** Energy firing



- **Camera Indicators:** At top center of stereo viewer display, they include:
  - **Camera Angle:** Displays **0°, 30°↑** or **30°↓**.
  - **Camera Rotation:** Provides information regarding the rotation of the endoscope relative to ground. This feature is useful for understanding the frame of reference of the video relative to the anatomy.

  - **Zoom:** Shows current zoom level (**Wide, Full, 2x, 4x**) of the viewer.
- **Footswitch Map:** Provides a reference for understanding the locations and status of the footswitch panel pedals. See Footswitch Panel Use on page 10-24.
- **Message Areas:** Provide extended information regarding the state of the system.

Other Console Instrument Status Area

When in dual console mode, a small status area as in Figure 10.39 appears at upper left of the stereo viewer.

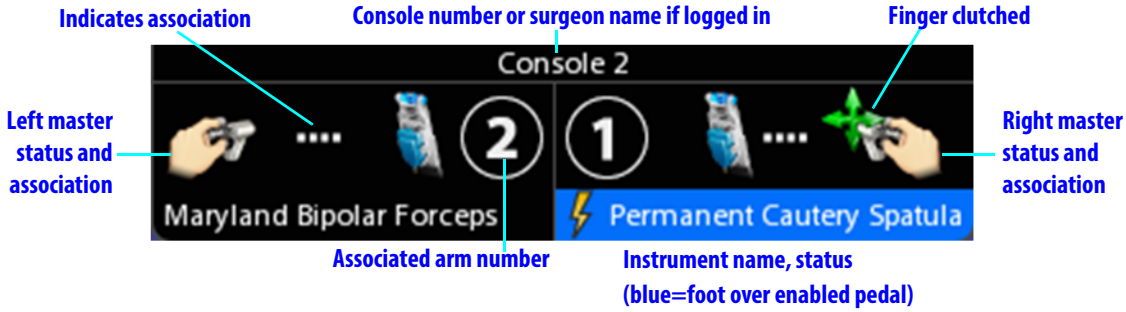


Figure 10.39 Dual console status area

This area provides the instrument status for the ***other*** console, showing:

- The console number at the top, or the user name of the surgeon if logged in
- For left and right masters, the associated instrument name, arm number and energy status, including turning orange when firing
- The same status icons as appear elsewhere, and the additional icon showing that the master is clutched (finger clutched) as seen on the right above. For a complete list of icons and text messages, please refer to Appendix G: Symbols, Icons and Text Messages Reference.

Note: On the touchscreen, two of these status areas appear side by side at top center when in dual console mode.

Non-*SmartPedal*: Footswitch Map (Stereo Viewer)

The footswitch map in the bottom center of the stereo viewer displays the type of energy instrument and the available primary and secondary energy modes, when an energy instrument is installed and an ESU supporting that energy type is connected to the system Core.

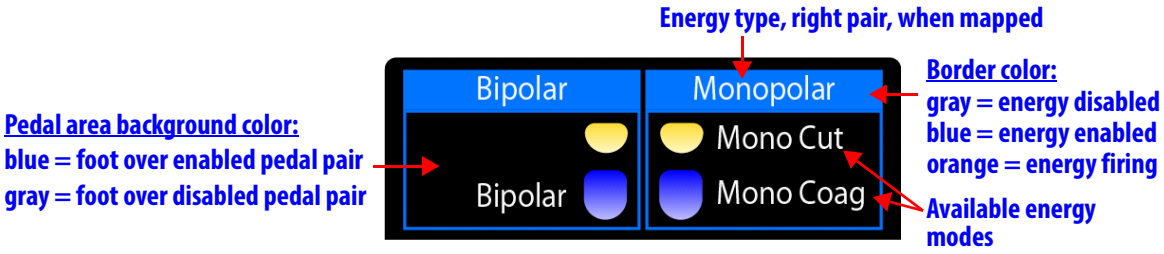


Figure 10.40 Footswitch map example

Note: If combinations of installed energy instruments or connected ESUs make mapping of energy pedals ambiguous, the system will not map nor enable the pedals for that energy type. The system will prompt the user to resolve the ambiguity by either disconnecting or powering down one of the ESUs, or by removing one of the conflicting instruments.

- For example, if two monopolar instruments are installed at the same time, the system cannot determine which should be mapped to the right pair of pedals, so both monopolar instruments will be unable to fire until one is removed. For ESUs, if two powered ESUs that support monopolar energy instruments, for example, are connected to the Core at the same time, both ESUs will be disabled until one is powered down or disconnected. For more explanation, see Non-SmartPedal – Simultaneous Energy Control: Disallowed Combinations on page 10-37.
- If the system can map an instrument to either the left or right pair of pedals, the mapped energy type appears above the pedals on that side, and the associated energy mode appears next to each pedal icon. The table below shows energy types and associated pedal modes that can appear in the footswitch map.

Table 10-3 Left Pedal Pair: Energy Types and Associated Pedal Modes

Instrument	Primary Energy (blue)	Secondary Energy (yellow)
Bipolar	Bipolar	Not available
PK	PK	Not available
Suction/Irrigator	Suction	Irrigation

Table 10-4 Right Pedal Pair: Energy Types and Associated Pedal Modes

Instrument	Primary Energy (blue)	Secondary Energy (yellow)
Monopolar	Mono Coag	Mono Cut
Harmonic	Max	Min
Vessel Sealer	Seal	Cut
Stapler	Clamp	Fire

Border Color

The color of the border on each side can be blue, gray or orange: gray signifies that energy is disabled, or not ready to fire; blue signifies that energy is enabled, or ready to fire; and orange signifies that energy is firing.

gray border = energy disabled

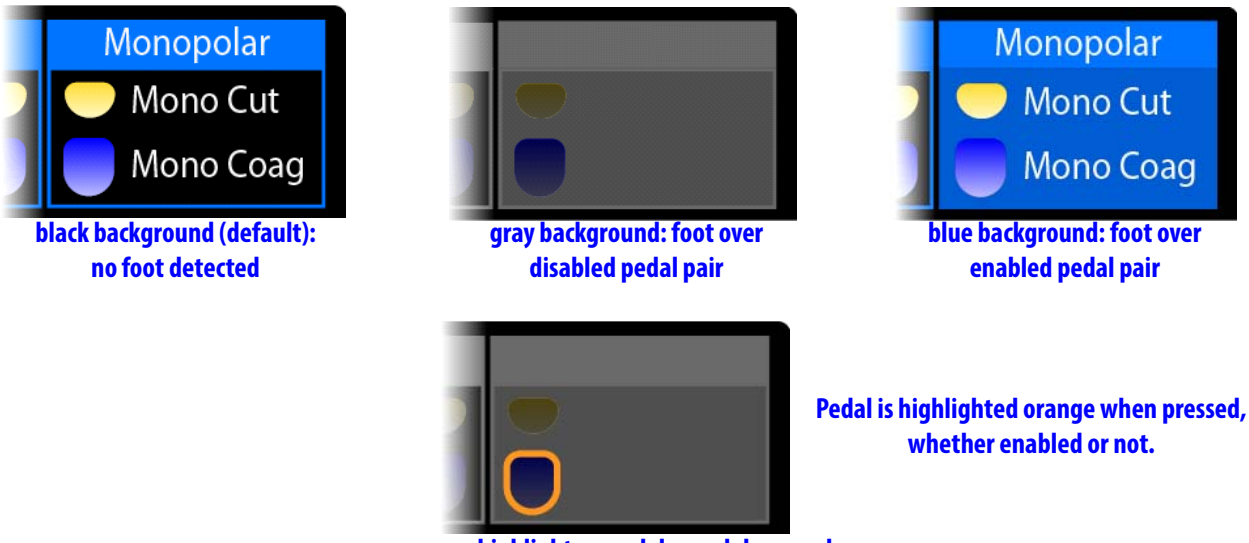
blue border = energy enabled

orange border = energy firing

Figure 10.41

Pedal Area Background Colors

Besides the default black, the pedal area background color turns blue when a foot is over (close to or touching) a pedal pair ready to fire, or gray when over a pedal pair not ready to fire. When a pedal is pressed, its outline is highlighted orange, whether energy is actually firing or not.



black background (default): no foot detected

gray background: foot over disabled pedal pair

blue background: foot over enabled pedal pair

Pedal is highlighted orange when pressed, whether enabled or not.

orange highlight on pedal = pedal pressed

Figure 10.42 Pedal area background colors

- **Black**, partially transparent (default): Foot sensors detect nothing
- **Gray:** Foot detected over a disabled pedal pair
- **Blue:** Foot detected over an enabled pedal pair
- **Orange:** Energy firing

Non-*SmartPedal*: Energy Activation Behavior

The *da Vinci Si* System displays the following energy activation behavior:

- The system does not support combinations of ESUs or energy instruments that make pedal controls ambiguous; you cannot be in simultaneous energy control of two energized instruments of the same type (for example, bipolar and bipolar). The system

indicates a disallowed configuration in different ways, depending on the source of ambiguity. In all cases, the system grays out the energized indicator and does not map a pedal whose function would be ambiguous.

- The system can activate only one energy instrument at a time: pressing a second pedal makes the first stop firing, and neither can fire until both pedals are released.
  - In dual console mode, if each surgeon controls an energy instrument, the first press of an energy pedal activates the associated instrument, and other presses are locked out until the first is ended. When the first press ends, a blocked press must be released and re-applied before it is effective.
- In dual console mode, pressing the camera control pedal stops firing of energy instruments on the other console, but not on your own. (It also takes all instruments out of following mode on both consoles, which means they do not move.)
- The system beeps if you press an energy pedal while energy cannot be activated.

Non-*SmartPedal* – Simultaneous Energy Control: Disallowed Combinations

If combinations of the installed energy instruments or connected ESUs make mapping of energy pedals ambiguous, the system will not map nor activate the pedals for that energy type. For instance, you can not be in simultaneous energy control of two energized instruments of the same type (for example, bipolar and bipolar): if a surgeon has bipolar energy instruments active on both the left and right masters, then he or she will not be able to activate energy on either instrument.

Disallowed Combinations for Simultaneous Energy Control

On the *da Vinci Si* system, simultaneous energy control is not allowed for the following combinations of energy instrument types and ESUs:

- Two of the same type of energy instruments, for example:
  - Bipolar and Bipolar
  - Monopolar and Monopolar
- Two energy instruments activated by the same pedals, for example:
  - Bipolar and PK (both use left pedals)
  - Monopolar and Harmonic (both use right pedals)
- Two of the same type of ESU generators

Example: Controlling Two of Same Type of Energy Instrument

When a surgeon has simultaneous control of two of the same type of energy instrument, neither instrument is mapped to pedals, the energy indicator (lightning bolt icon) is grayed out, and so are the borders of the footswitch map, as shown:

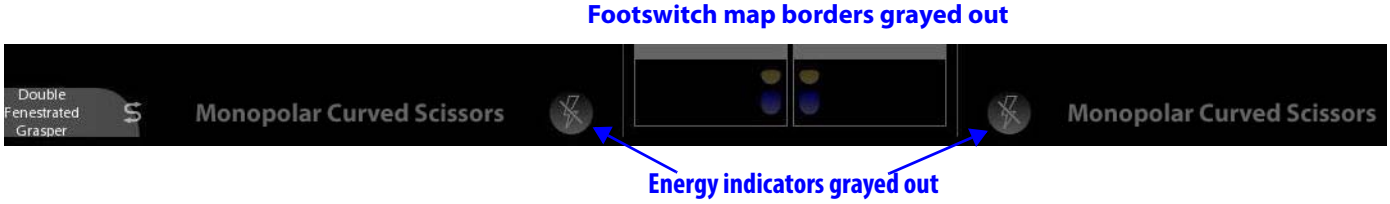


Figure 10.43 Example: Controlling two of same type of energy instrument

Example of Pedal Conflict

When a surgeon has simultaneous control of energy instruments that use the same pedals, the system reports a pedal conflict, as in the example shown below.

Figure 10.44 Example of pedal conflict

In Figure 10.44, the PK Dissecting Forceps is installed and active on instrument arm 1, and the Maryland Bipolar Forceps is installed and active on instrument arm 2. Since the system would map both instruments to the left pair of energy pedals, the system does not allow either instrument to fire, because which instrument should fire on a left energy pedal press is ambiguous. The system disables energy and displays the message shown in Figure 10.44: **"Pedal Conflict. Remove conflicting instrument to enable."**

Two of Same Type of ESU Generators Connected

The system displays an analogous message in red text near the top center of the screen if pedal mapping is ambiguous due to two of the same type of ESU generators being connected to the system. The message instructs you to disconnect or power down an ESU.

Non-*SmartPedal* – Swapping Energy Control: Allowed Combinations

It is possible to swap between the following combinations of energy instruments, but ***only if both instruments are associated with the same master controller***:

- between monopolar and Harmonic
- between a bipolar and PK instrument

Note: It is never possible to swap between two monopolar or two bipolar instruments because they require the same ESU cord.

These combinations permit swapping energy control because the two instruments can never be in simultaneous control, when they are associated with the same master. An example is shown in Figure 10.45.

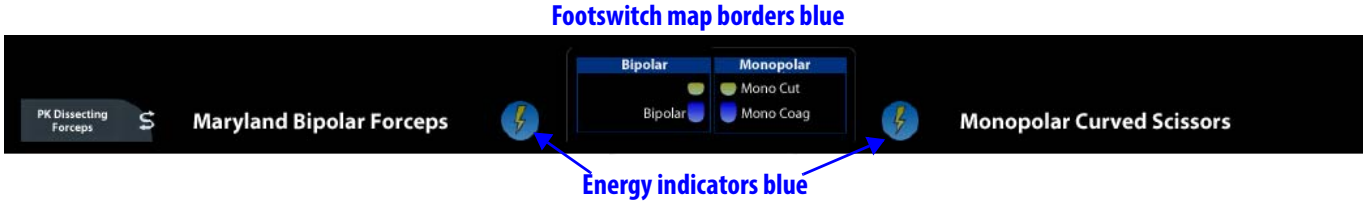


Figure 10.45 Example of an allowed configuration

Here a Maryland Bipolar Forceps is installed on instrument arm 2, a PK Dissecting Forceps is installed on instrument arm 3, and both arms are associated with the left master. Since both are on the left master, the surgeon can never simultaneously control both energy instruments. Therefore energy control ambiguity is impossible. The surgeon can swap control between these two energy instruments and avoid simultaneous control of a disallowed combination.

The system indicates an allowable combination by highlighting blue the energy indicators and the borders of the footswitch map.

10.5 Dual Console Surgery

This section describes the interface for working with two Surgeon Consoles.

Dual Console Connection and Startup

To operate in dual console mode (using a second Surgeon Console), simply plug the second console's system cable in one of the available Fiber ports on the back of the Core. No other connection is necessary, except of course to plug in the Surgeon Console to a dedicated AC power outlet. The second Surgeon Console behaves just as the first with respect to power operations, as described in Chapter 5 Startup.

Comparison Between Consoles

This section describes the relationships between the touchpads, stereo viewers and instrument controls when two Surgeon Consoles are in use.

Touchpads

Except for the availability of the **Give/Take** and **Swap All** buttons, the arm status area functions the same as usual, reporting arm status to both consoles. Each surgeon controls independently the touchpad settings that affect only their console and viewer. For example, one surgeon can apply digital zoom and TilePro in their viewer without affecting the other surgeon's viewer.

Stereo Viewers

The stereo viewers act independently except that they share the endoscopic video source and its associated video settings for view of the surgical field, and the overlays associated with shared elements like the endoscope (for example, the camera rotation indicator). Each stereo viewer presents the overlays for instruments that the surgeon controls in the usual places, and shows information about the instruments the other surgeon controls near the top center of the stereo viewer. Each surgeon can adjust their view independently, both content and settings. For example, one surgeon can apply digital zoom and use *TilePro* in their viewer without affecting the other surgeon's viewer. See Comparison Between Consoles on page 10-39 for additional details on what surgeons can see about the instrument status of the other console.

Instrument Control

The instrument control settings, in particular motion scaling, operate independently for each Surgeon Console. When instrument control is transferred, the instrument goes out of following until the surgeon assuming control matches grips in the usual way (see Matching Grips on page 10-22). When she takes control, she does so using the control settings selected at her console.

Master Associations

The system gives both surgeons the ability to reassign instruments to different masters, and this feature continues to operate in dual console mode. The new instrument assignment applies on both consoles and persists when instruments are swapped. For details, see Master Associations on page 10-21.

Instrument Control

When the system detects two Surgeon Consoles in use, the **Give/Take** and **Swap All** buttons on the touchpad home screen appear.

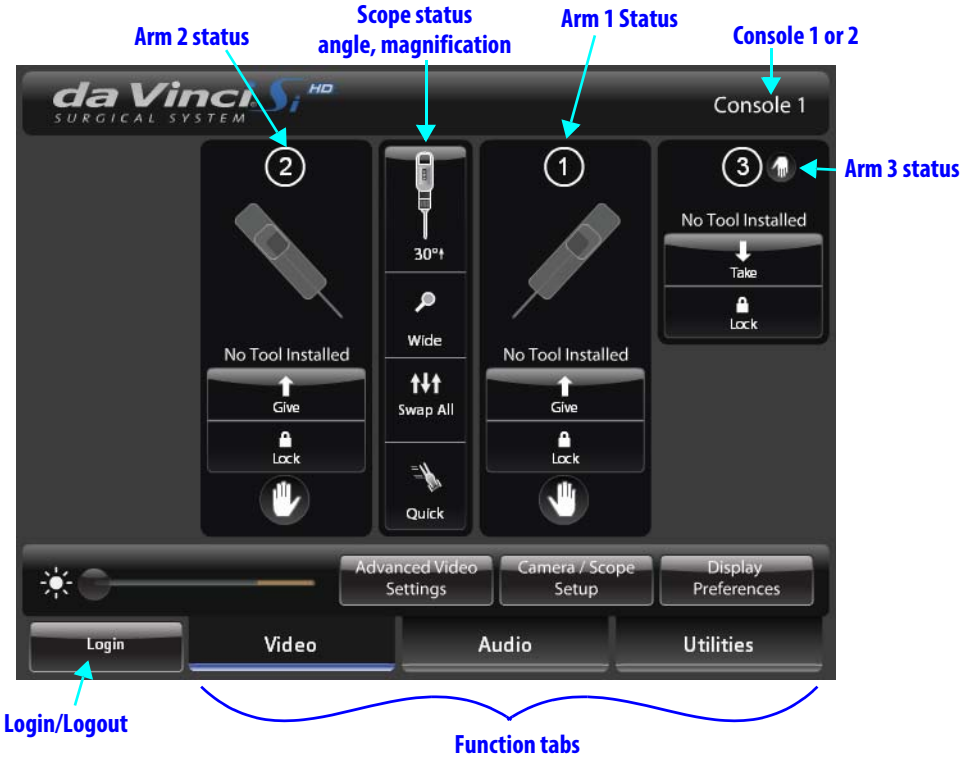


Figure 10.46 Dual console home screen

- **Give/Take button:** This button says **"Give"** when you have control and **"Take"** when you do not have control at your console. Either surgeon can **Give** or **Take** control of a specific instrument arm by touching its **Give** or **Take** button. When control is transferred by touching **Give** or **Take**, the instrument goes out of following until the surgeon assuming control matches grips in the usual way (see Matching Grips on page 10-22).

Note: During dual console surgery, you can give or take a locked instrument arm using the Give/Take button on the touchpad home screen. Instrument arms remain locked when transferred until unlocked at the touchpad in the usual way.

- **Swap All:** Either surgeon can change control of all (instrument) arms by touching **Swap All**. Energy control follows the instrument arm. All instruments go out of following after **Swap All** is touched until the surgeon assuming control matches grips as usual (see Matching Grips on page 10-22).

  Swap All affects all 3 instrument arms (not the endoscope). However, if Surgeon A controls no arms before the swap, Surgeon A can control only up to two arms when he matches grips after the swap. He or she must first match grip on the two instruments that were in following with the other surgeon before the swap; the third arm will remain out of following as it was. To take control of the third instrument, he or she must press the arm swap pedal (left kick-plate) as usual.

- **Lock:** The surgeon with control can use the **Lock** button to lock the instrument in place as usual, and unlock a locked arm to enable control of it. The current lock status shows on both Surgeon Consoles.

Note: In dual console mode, either surgeon can use the Master Associations screen (see page 10-21) to reassign instruments to different masters – even while the other surgeon has control of the instruments. The new instrument assignment applies on both consoles and persists when instruments are swapped. The system notifies the surgeons as usual when reassignment occurs.

- When instruments are reassigned via the Master Associations screen, the system takes the instruments out of following, notifies and prompts you with the icon and associated message below:

Your instruments have been reassigned. Tap 'Arm Swap' pedal to acknowledge and continue.

Figure 10.47 Icon and message when instruments reassigned

Camera Control

Either surgeon can take control of the camera arm by pressing the camera pedal as usual; the first one to do so has camera control and, as usual, all instrument arms go out of following while the camera arm is under control, and energy instruments on the other Surgeon Console will stop firing.

Video Control

While in dual console mode, video settings are shared between the two Surgeon Consoles as well as the touchscreen monitor on the Vision Cart. Video settings are not saved while in dual console mode.

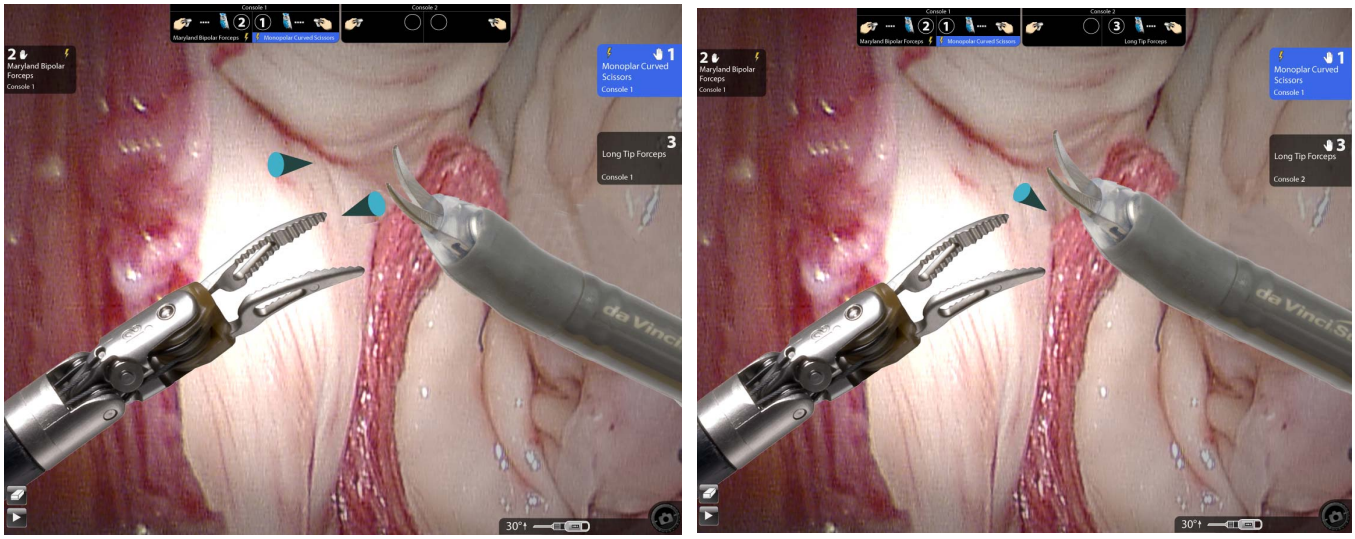
Virtual Pointer (Dual Console Teaching Aid)

The virtual pointer is a software tool designed as an instructional aid, typically for use during dual console surgery. The pointer is a three-dimensional (3D) graphical object, light blue and conical in shape, which appears overlaid on the live video image when activated. It enables a surgeon to point and refer to specific anatomical features on the live video image intraoperatively. The surgeon can activate and control one pointer with each master that is not associated with an instrument arm. Normally, an unassociated master is available only during dual console surgery. It is possible to activate two pointers simultaneously, as described in the usage scenarios below.

Virtual Pointer Usage Scenarios

Since a pointer can be activated only by a master not associated with an instrument arm, you can arrange the usage scenarios below by setting master associations and giving or taking instrument arm control on a given Surgeon Console. Set master associations by going to **Utilities > Control Preferences** and touching **Configure** next to **Master Associations**. Give or take instrument arm control using the **Give/Take** button on the dual console home screen.

Typical Usage Scenario



Dual console, 2 pointers

Dual console, 1 pointer

Figure 10.48 Typical dual console usage for proctoring

In the typical usage scenario, a proctor surgeon at Surgeon Console 2, which controls either one or no instrument arms, is providing guidance to a surgeon being proctored at Surgeon Console 1, which controls 2 or 3 instrument arms. The proctor surgeon would use one or two unassociated masters to activate one or two pointers, and then use each pointer to refer to anatomical features while speaking with the surgeon being proctored.

One Pointer Controlled at Each Console

In a less typical scenario, both Surgeon Console 1 and Surgeon Console 2 can have one unassociated master and therefore each surgeon can activate one pointer as desired. In this scenario, one surgeon would have control of two instrument arms associated with the same master, and the other surgeon would have control of the other instrument arm, so that one master on each console is not associated with an instrument arm.

Note: It is possible to activate the pointer when using a single Surgeon Console if the third arm is stowed. For example, if arm 3 is stowed and you associate arms 1 and 2 with the left master, the right master can be used to activate the pointer.

Use Characteristics

The virtual pointer has the following use characteristics:

- By closing the grips of an unassociated master, the surgeon activates a virtual pointer. Its initial position is vertically centered and slightly offset right or left in correspondence with the master used. At a console having neither master associated with an instrument arm, the surgeon can activate two pointers simultaneously by closing the grips of both masters.
- While a pointer is activated, the master controlling it is free to move. The surgeon manipulates the position and orientation of the pointer using the master while holding the grips closed. The pointer's tip corresponds to the fingertips closing the grips.
  - As part of the 3D effect, the pointer is shaded as if the light comes from where you are looking, and it gets smaller as you move it away from you, and larger as you move it back towards you. It has vanishing points left and right, near and far, past which you can bring it back on screen if you do not release the grips. If you do release the grips while past a vanishing point, the pointer reappears in its default position when you close the grips again.
- If telestration marks are on screen, they are erased when the pointer is activated, and telestration is not available while the pointer is activated.
- You can clutch the master while the pointer is active to reposition the master without moving the pointer.
- The pointer disappears when the surgeon releases the grips and while a surgeon presses the camera pedal (during camera control mode). The master that controlled the pointer is not free to move when the pointer is not present, except by clutching the master as usual.
- On subsequent activations, the pointer appears in its last position, unless that position is such that it would be off screen. In that case, it reappears in its initial position.

End of section

11 System Shutdown and Storage

This chapter explains the following:

Figure 11.1 Patient Cart in stow position, ready for storage

11.1 Preparing the System for Shutdown

1. Remove the instruments and endoscope from the Patient Cart.
2. Disconnect the cannulae from the instrument and camera arms.
3. Use the port clutch buttons to move the instrument and camera arms away from the patient.
4. Move the Patient Cart away from the OR table.

5. Remove all sterile system accessories for cleaning.

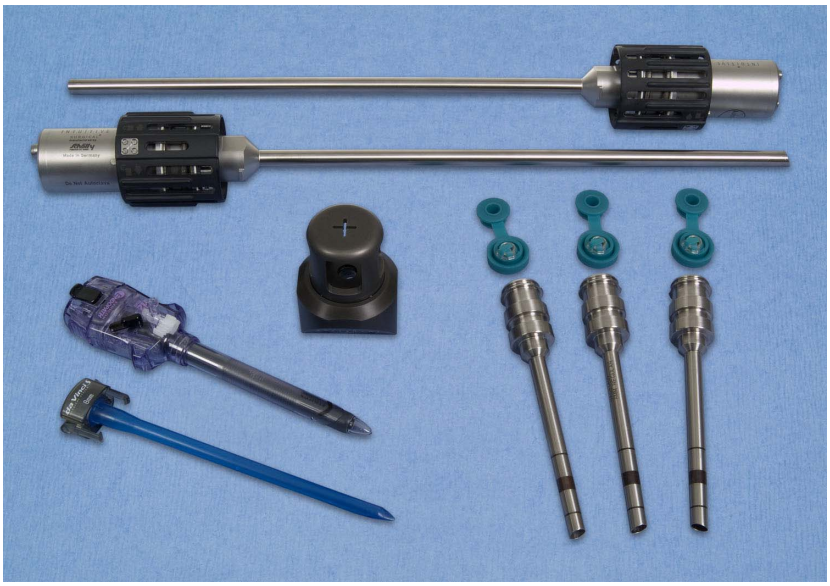


Figure 11.2 System accessories

For instructions on cleaning system components, see 12.2 System Cleaning on page 12-1.

6. Remove and properly dispose of all drapes.

Note: Users will find it easier to separate the camera head from the sterile adapter by first cutting off the camera head drape, as indicated by the label on the drape itself, shown here.

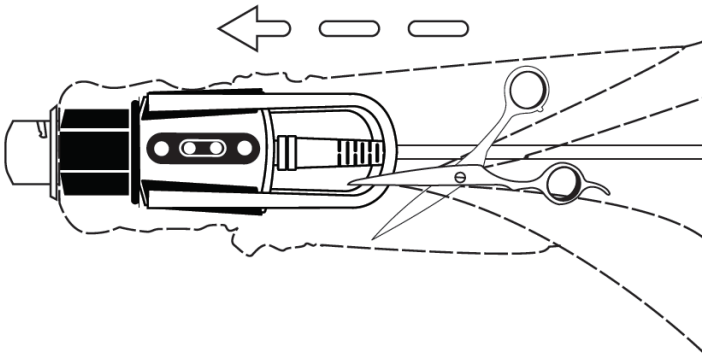


Figure 11.3 Cut off camera head drape to remove sterile adapter

11.2 Inventory Management

You can view the number of uses left for all instruments used during the current procedure by accessing Inventory Management on the **Utilities** tab of the touchscreen (see page 7-20) or the touchpad (see page 10-18).

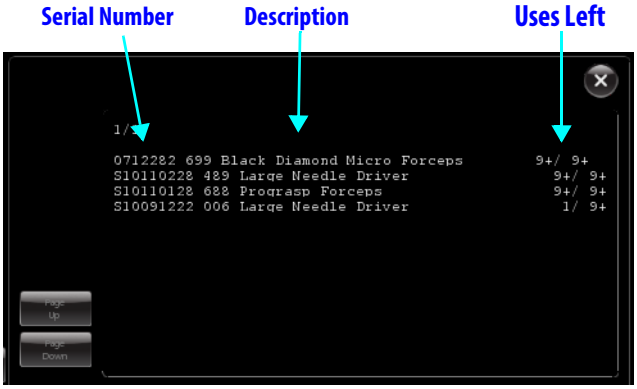


Figure 11.4 Usage Summary

For instruments that expire after a certain number of procedures, the system displays the number of uses or activations left out of uses allowed in the right column. See Instrument Usage on page 9-14 for details on how the system tracks usage.

11.3 Shutting Down the *da Vinci Si* System

1. Prepare the Patient Cart for storage by folding the setup joints against the cart as shown in Figure 11.5. Instrument arm 3 should be placed in the stow position. (See Stow Position on page 5-7 for details on preparing the Patient Cart for stow position.)

Figure 11.5 Patient Cart in the stow position

2. Press any system **Power** button. The system will begin the ten second shutdown process and displays the following message:

   Preparing to shutdown.

   Press Power to reverse within 10 seconds.

Note: If the system is not restarted within ten minutes after power down, the system will view any restart as a new procedure and instrument uses will be decremented accordingly.

Note: Cooling fans on the Patient Cart and the Core (Vision Cart) run continually when either is plugged into AC. This is part of normal operation. Do not use the Patient Cart Emergency Power Off (EPO) button to turn off the cooling fans. This will prevent the Patient Cart battery from charging.

3. It is now safe to disconnect all system cables, although we recommend that you leave them connected to minimize exposure of the connectors to contaminants.

Note: If possible, the system cables should be left connected to minimize exposure to contaminants.

Should you need to detach system cables, follow these steps:

1. Remove non-system connections as necessary (such as auxiliary video and audio cables, ESUs, insufflators, etc.)
2. Disconnect system cables from the Surgeon Console and Patient Cart by twisting counter-clockwise and pulling back on the metal collar.

Note: Immediately attach the protective cap to protect the connectors from contamination and physical damage.

3. Store the system cables on the side of the Vision Cart.

11.4 Storing the System

Follow these steps to store the *da Vinci Si* System:

1. Ensure the storage room meets the following specifications:
   a. Room temperature between -10 to 55 °C (14 to 131 °F).
   b. Relative humidity between 10 to 85% non-condensing
2. Place the Patient Cart near a wall outlet and plug it into AC power.

Note: To maintain battery backup charge, it is important to keep the Patient Cart plugged into AC power while stored. Failure to do so will drain the batteries. The Surgeon Console and Vision Cart do not need to be plugged into AC power.

Note: A cooling fan continues to run on the Patient Cart when plugged into AC power. Do not use the Patient Cart Emergency Power Off (EPO) button to turn off the cooling fan. This will prevent the Patient Cart battery from charging.

End of section

12 Cleaning and Maintenance

This chapter covers the following subjects:

12.1 System Maintenance

Preventive maintenance is required and must be performed by an authorized *Intuitive Surgical* Service Representative. There are no user-serviceable parts on the main system components, with the exception of the Illuminator.

WARNING: Do not service or perform maintenance on the *da Vinci Si* System while in use with a patient unless noted otherwise.

For Technical Support

If the system requires maintenance or service, please call our Technical Support line. In the US, call 1-800-876-1310, where phones are staffed 24 hours a day, seven days a week. In Europe, call +41.21.821.2020.

12.2 System Cleaning

Surgeon Console, Patient Cart, Vision Cart, System Cables

Use a soft, lint-free cloth and a surface disinfectant product (or a pre-moistened disinfectant wipe product) to wipe the exterior surfaces of the system components and cabling at the frequency required by individual hospital policy. Examples of these products include Envirocide®, CaviCide®, deconex® S-WIPES, neodisher® neoform MED rapid and 70% isopropyl alcohol or the corresponding pre-moistened disinfectant wipe product. Allow components to dry before use. If any liquids – including bodily fluids – get inside the system, contact ISI Technical Support.

CAUTION: Equipment on the Vision Cart, Patient Cart and Surgeon Console is not designed for exposure to liquids. Care should be taken to ensure liquids do not come into contact with electronic equipment on the system components.

Note: In particular, do not submerge the camera and camera cables. They are not designed to be submerged and could be damaged if fluid gets inside them.

Note: Pay particular attention to areas where the Surgeon Console operator comes into contact with the system (such as the master controller grips, the stereo viewer, and the armrest).

Note: The system cables and their receptacles contain fiber-optics. Only when requested by *Intuitive Surgical* personnel, clean both cable and receptacles by blowing the fiber ends with a generic dry and oil-free canned air duster.

Cleaning the Touchscreen Display

Follow your hospital protocol for the handling of blood and body fluids. Clean the display with a diluted mixture of mild detergent and water. Use a soft towel or swab. Use of certain cleaning agents may cause degradation to the labels and plastic components of the product. Consult cleanser manufacturer to see if agent is compatible with it. Do not allow liquid to enter the display.

Instrument Release Kit

Clean and sterilize the instrument release kit in the same way as the grip release tool. For grip release tool cleaning and sterilization instructions, refer to the Reprocessing Instructions (PN 550875).

12.3 Illuminator Lamp Module Replacement

WARNING: During operation, the lamp gets very hot, even if lit only for a short time. After turning off the lamp, allow the internal fans to cool the lamp for 5 minutes before removing power to the Illuminator.

WARNING: Use ONLY approved lamp modules. Use of a non-approved lamp may result in premature failure or severe damage.

CAUTION: The Illuminator lamp module should be replaced every 1000 hours.

The Cermax VQ Xenon Lamp module typically provides more than 1000 hours of service. It should be replaced every 1000 hours to avoid periods of diminished light output or lamp failure during a procedure. The symptoms indicating the need for replacement are:

- Repeated ignition attempts without lamp going into operation.
- Evident low light output at maximum light level setting.

When the lamp requires changing, you must replace the complete lamp module. The lamp and heat sinks are installed as a complete unit as shown below.

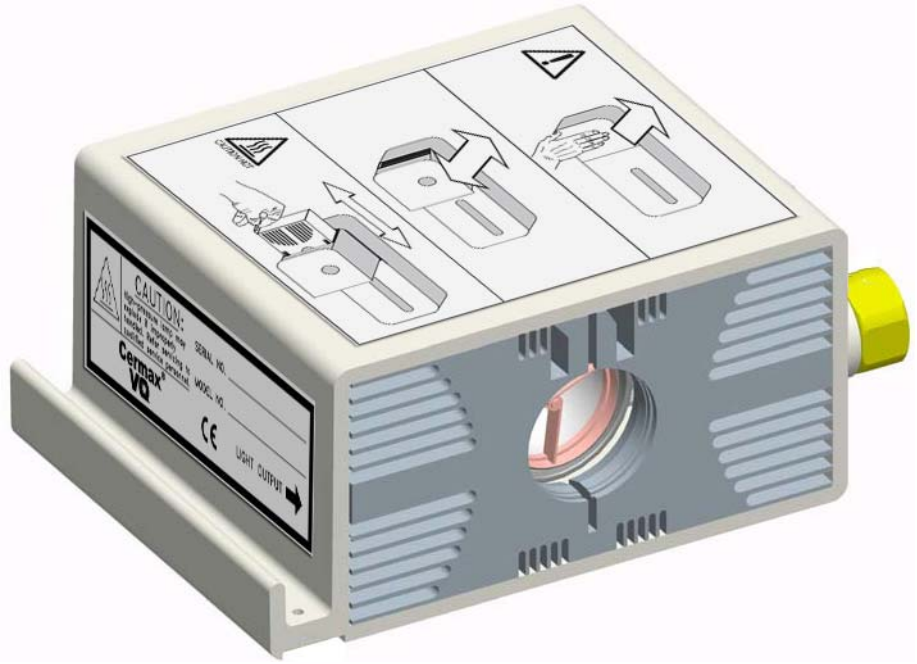


Figure 12.1 Cermax VQ Xenon Lamp Module

The module is designed for simple and quick changing, but should be performed by qualified personnel.

The following image shows the label affixed to the lamp module itself, and explains pictorially the steps to replace the lamp module.

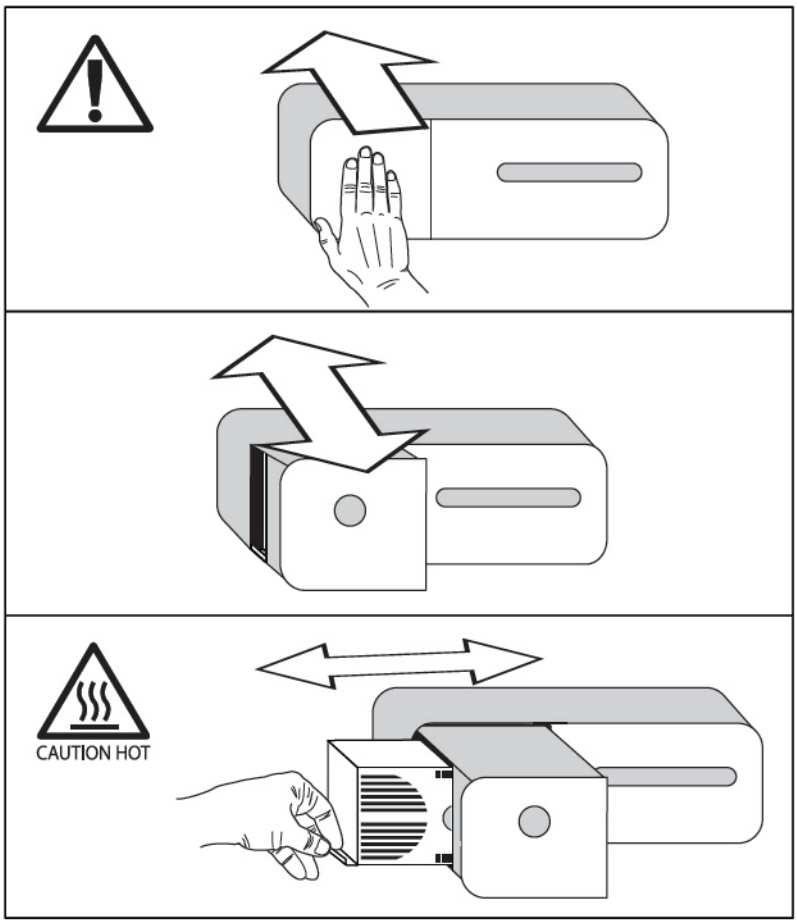


Figure 12.2 Lamp module replacement label—on lamp module

To remove the old lamp module:

1. Turn the Illuminator off by pressing the **Lamp On/Off** button.

CAUTION: Hot. Wait 10 minutes while system is cooling with internal fan operation.

2. Push inward to open the access drawer on the left side (front) of the Illuminator.

Figure 12.3 Open the access drawer

3. Grasp the handle and pull the entire lamp module out as shown.

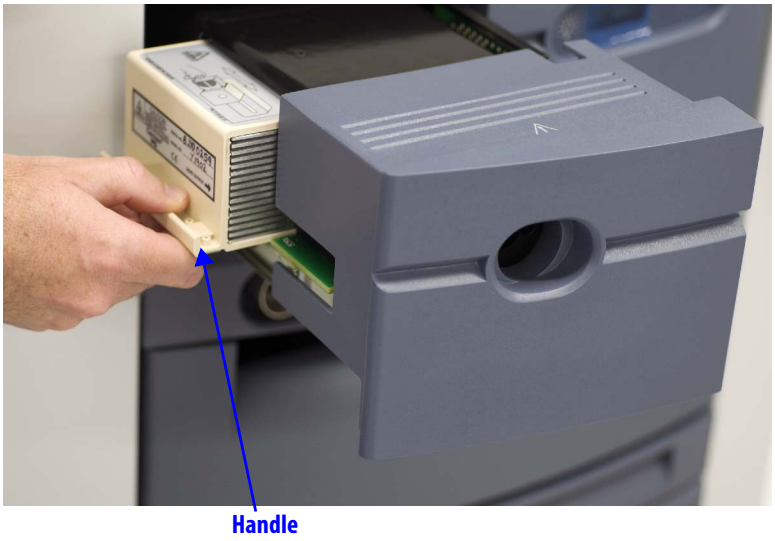


Figure 12.4 Grasp handle and remove module

To insert new lamp module:

1. Orient the new lamp module so the lamp window faces the front of the Illuminator, handle on the bottom.
2. Carefully align the sides of the module and place in the receiver channel (see Figure 12.5). To ensure proper connection, firmly push the module as far as it will insert. The edge of the module will be flush with the sides of the drawer once connected.

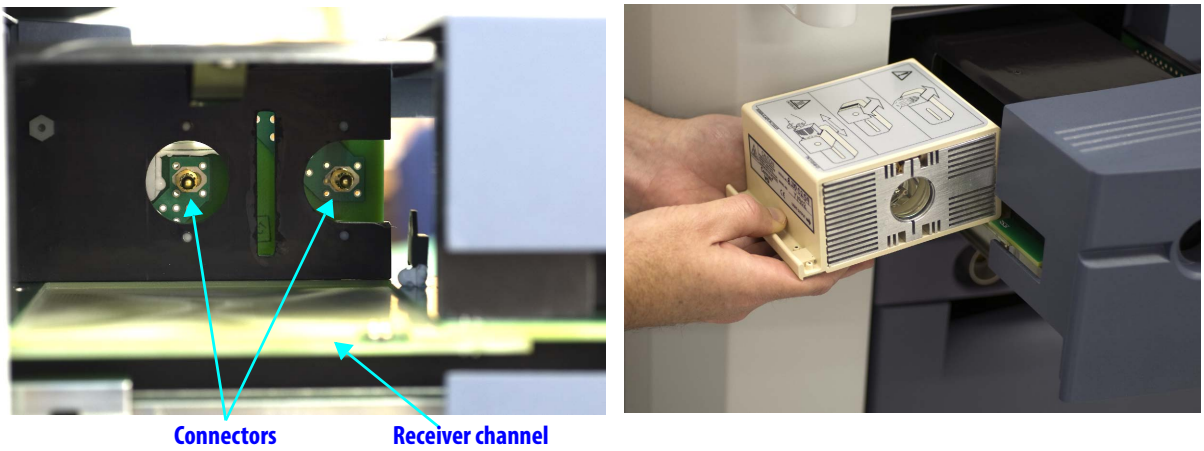


Figure 12.5 Installing new lamp module

3. Close the drawer firmly so it is fully engaged.

For assistance replacing the lamp, call our Technical Support line. In the US, call 1-800-876-1310, where phones are staffed 24 hours a day, seven days a week. In Europe, call +41.21.821.2020.

12.4 CCU Fuse Replacement

This section contains instructions to replace the fuse in the Camera Control Unit (CCU).

Note: *Intuitive* designed the CCU fuse not to blow during normal operation over the life of the system. A blown CCU fuse is a likely indicator of a technical issue that requires maintenance by *Intuitive Surgical* personnel. Therefore, if you have a problem powering on the CCU, we strongly recommend you do not attempt fuse replacement without first calling *Intuitive Surgical* Technical Support. The following instructions are provided as reference material.

Troubleshooting a CCU Power Problem

If the CCU appears not to be powered on while the rest of the system is powered on, first check that the CCU power switch, next to the power cord inlet on the back of the CCU, is switched on. Then check that the mains circuit breaker of the Vision Cart is in the on position (indicated by "I" near the switch). Finally, check that the Vision Cart is connected to a dedicated, working AC power outlet, and that the system is powered on. CCU fuse replacement may be warranted only when the rest of the system and other Vision Cart components power on normally, while only the CCU does not. Again, if this is the case, we recommend you contact *Intuitive Surgical* Technical Support for assistance. The following instructions are provided as reference material.

CCU Fuse Replacement Instructions

To replace the fuse on the Camera Control Unit, follow these steps:

1. For safety, remove power from the *da Vinci Si* Surgical System as follows:
   a. With the system already in standby (sleep) mode, switch off the mains circuit breaker of the Vision Cart.
   b. Unplug the Vision Cart and other main system components from their AC wall outlets.
   c. Switch off the CCU power switch next to the power cord inlet.
2. Remove the CCU power cord from the power inlet next to the CCU power switch and fuse housing. The fuse housing latches on the power cord when it is in place, preventing removal of the fuse housing unless the power cord is removed first.
3. The fuse housing is located between the power cord inlet and the CCU power switch on the back of the CCU. To remove the fuse housing with the fuses inside, use one or two very small, flat-bladed screwdrivers. If you use one screwdriver, you must pry inward on each of the thin latching tabs on the top and bottom of the fuse housing in succession. If you use two screwdrivers, one in each hand, you can pry the tabs at each end inward at the same time to clear the latches.
4. When you clear the latches on top and bottom, the fuse housing will be loose and you can remove it carefully with your fingers. Both fuses will be retained in the housing you remove.
5. Inspect both fuses and replace any blown fuse. A blown fuse has a broken wire filament. For continued protection against fire hazard, replace the CCU fuse only with the same type, specified here:
   - **Manufacturer**: Schurater AG
   - **Fuse Type**: FST, Time Lag
   - **Ratings**: 2 A, 250 V
6. Replace the fuses in the fuse housing and re-install it in the same orientation. The housing is keyed and will prevent you from installing it in the wrong orientation. Push the housing in all the way until it clicks in place audibly, and is flush with the surrounding surface.
7. Switch on the power switch on the back of the CCU; switch on the mains circuit breaker of the Vision Cart and plug the Vision Cart and all other system components into their dedicated AC power outlets.

For Technical Support

If the system requires maintenance or service, please call our Technical Support line. In the US, call 1-800-876-1310, where phones are staffed 24 hours a day, seven days a week. In Europe, call +41.21.821.2020.

End of section

A Appendix A: Error Handling

Intuitive Surgical is committed to safety. Every effort has been made to ensure the system will not only be reliable, but in the event an error occurs, the system will handle the error in the safest and most efficient manner possible. This appendix explains the following:

A.1 Obtaining Technical Support

If the system requires maintenance or service, please call our Technical Support line. In the US, call 1-800-876-1310, where phones are staffed 24 hours a day, seven days a week. In Europe, call +41.21.821.2020.

Accessing the Event Logs

To assist your ISI support representative in diagnosing the system, it may be necessary to access the event logs.

From Surgeon Console Touchpad

To access the event logs from the Surgeon Console touchpad, perform the following steps:

1. Touch the **Utilities** tab on the Surgeon Console touchpad.
2. Touch the **Event Logs** button. The system log appears in the stereo viewer.
3. Touch **Page Up** or **Page Down** to scroll up or down the error log.
4. Touch **Previous Log** or **Next Log** to go to the previous log or next log.

From Vision Cart Touchscreen

To access the event logs from the Vision Cart touchscreen, perform the following steps:

1. Touch the **Utilities** tab on the Vision Cart touchscreen.
2. Touch the **Event Logs** button. The system log appears on the touchscreen.
3. Touch **Page Up** or **Page Down** to scroll up or down the error log.
4. Touch **Previous Log** or **Next Log** to go to the previous log or next log.

A.2 Error Handling

System Faults

When a fault occurs, the system determines whether the fault is recoverable or non-recoverable. The system takes the following actions when a fault occurs:

- Locks all the Patient Cart arms. In this state the Patient Cart arms and setup joints can be clutched but are slightly harder to move and will not be able to be left in clutch mode.
- Sounds a series of error beeps. You can silence the beeps by touching **Silence** on the touchpad or touchscreen.

- Displays a text message on the monitors to describe the error.

Figure A.1 Fault message on touchpad

- If the fault is arm-specific, the system displays an error icon and lights the arm LED yellow or red. If the fault is not arm-specific, all arm LEDs light yellow or red.

Figure A.2 Arm LEDs in fault states

Recoverable Faults

If the fault is recoverable, you can override it by touching **Recover** on the touchpad or touchscreen, which enables the system to continue. Touching **Recover** also silences the alarm if no one has yet touched **Silence**.

Note: After a recoverable fault, the system does not recover until two seconds elapse after you touch Recover.

Note: Using Recover does not diminish the system's fault detection capability in any way. Thus, if the fault condition remains, the system immediately faults again. If the fault condition is removed, then the system is fully functional.

CAUTION: **The Recover button should be used only with a thorough understanding of the fault's cause. Overriding a fault without understanding its cause may result in uncontrolled movement of the Patient Cart arms up to 2 cm, or uncontrolled motion of the master controllers up to 5 cm.**

Disabling Instrument Arms and Master Controllers

The *da Vinci Si* System allows users to disable an instrument arm or master controller in the event of arm-specific error. *Intuitive Surgical* designed this feature to allow a user to complete a procedure with the remaining arms.

In the event of an arm-specific error, the system presents the option to disable the arm on the touchscreen and touchpad. Once the arm has been disabled, it can not be re-enabled until the next power cycle.

If you question whether or not you should disable an arm, please contact ISI Technical Support.

After Disabling a Master Controller

You cannot control the camera arm from a Surgeon Console with a disabled master controller.

After Disabling an Instrument Arm

After you disable an instrument arm, you still can use the arm clutch and port clutch buttons to move the arm out of the way.

Disabling the Instrument Control Box (ICB)

In the event of an error specific to the ICB, the system presents the option to disable the ICB on the touchscreen and touchpad. Once the ICB has been disabled, it can not be re-enabled until the next power cycle. *Intuitive Surgical* designed this feature to allow a user to complete a procedure without use of the *EndoWrist* instruments that employ the ICB, such as the Vessel Sealer.

Non-Recoverable Faults

If a fault is non-recoverable, the system must be restarted. The following message is displayed:

Non-recoverable fault: XXXX

Restart System to continue.

Restarting the System During a Procedure

If a non-recoverable fault occurs during a procedure, you must completely remove all instruments from the system. The endoscope does not need to be removed. Follow these steps to restart the system:

1. Completely remove all instruments from the system. The endoscope does not need to be removed. If an instrument is grasping tissue, follow the grip release instructions in Chapter 9, Grip Release, on page 9-13.

WARNING: If it is not clinically possible to remove an instrument, closely monitor the instrument arm during restart to ensure that no motion occurs.

2. Power off the system: Press the **Power** button on any system component.

   The system takes several seconds to shut down. When complete, all system **Power** buttons will be lit amber, indicating standby mode, and readiness for restart.
3. Restart the system: Press the **Power** button on any system component.
4. After the system has restarted successfully, then the instruments can be reinserted.

Note: During system restart, video is temporarily unavailable at the Surgeon Console viewer and touchscreen monitor.

Note: If the fault cannot be cleared by a system restart, call *Intuitive Surgical* Technical Support.

Emergency Stop

Press the red **Emergency Stop** button should it be necessary to stop system operation at any time. The **Emergency Stop** button will cease robotic control of the instruments and endoscope. The instruments and endoscope will stay in their last commanded position.

If the instrument grips are closed when the **Emergency Stop** button is pressed, the grips will remain closed. However, the gripping force of the instrument may decrease.

Pressing **Emergency Stop** initiates a recoverable fault, which you can override by pressing Recover on the touchscreen or touchpad. The **Emergency Stop** button illuminates when pressed and remains illuminated until the fault is recovered.

EPO (Emergency Power Off)

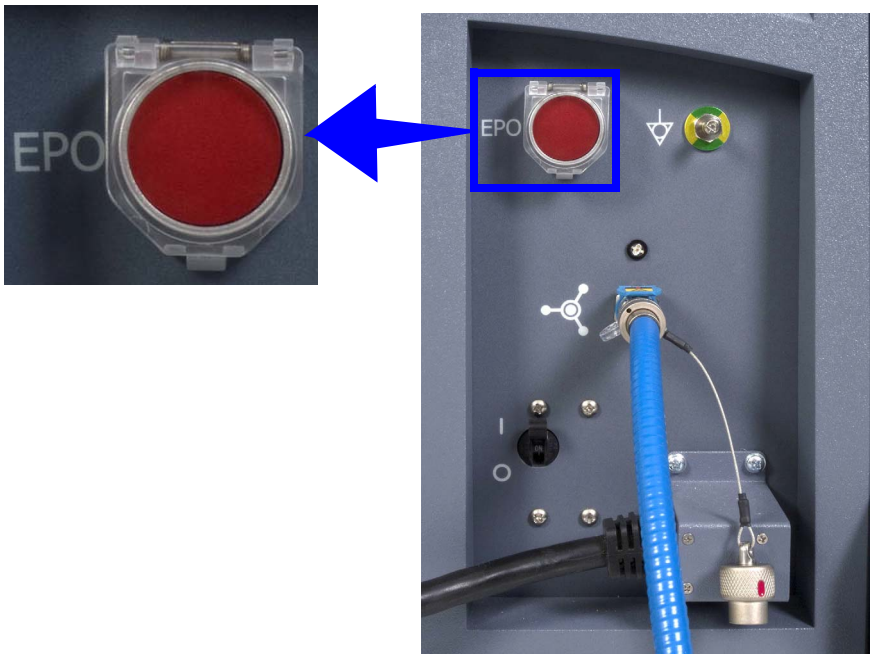


Figure A.3 EPO button on rear of Patient Cart

The **Emergency Power Off (EPO)** button is on the back of the Patient Cart. Press this button to completely remove power to the Patient Cart. The system classifies this a non-recoverable fault. The system must be restarted.

Battery Backup

Should the Patient Cart be unplugged, the system will generate a recoverable fault that must be addressed to continue a procedure. System operation will be allowed to continue on reserve power, but with basic functionality only.

Note: Battery backup is only intended for safe removal of the system components from the patient and is not intended for continuing the procedure.

Battery Low Condition

If there is insufficient battery backup power on the Patient Cart, cart drive is disabled and the user will have to wait for the battery backup to charge.

- To move the cart manually, move the shift switches on the base of the cart to the neutral position. When finished moving the cart, be sure to move the shift switches back to the drive position.

Note: The backup battery is not user-serviceable, and must be replaced by authorized personnel only. Contact *Intuitive Surgical* Technical Support for details.

Note: The Patient Cart battery should be adequately charged. If not, an error message appears on the monitors. You can override the error if the Patient Cart is plugged into AC power.

A.3 Conversion to Open Surgery

If a situation arises where a conversion to open surgery is required, perform the following steps to remove the system from the patient:

1. Remove the instruments and endoscope from the patient. Note the following:

Note: Whenever possible, use Surgeon Console control to release the instrument grips.

   a. In case of system failure while the instrument is grasping tissue, the grips can be manually opened by following the grip release instructions, see Grip Release on page 9-13 (Chapter 9, Patient Cart Use).

WARNING: Do not perform grip release on a non-faulted system without first pressing the Emergency Stop button. Failure to observe this warning may result in unintended instrument motion or damage to the grip release mechanism.

WARNING: Rotating the grip release tool too far and/or in the incorrect direction can cause unintended instrument motion or damage to the grip release mechanism.

2. Disconnect the cannulae from the instrument and camera arms.
3. Move the instrument and camera arms away from the patient.

Note: If the system is in a fault state while converting to open surgery, the Patient Cart will still allow use of the port clutch buttons. If the system loses all power, the arms and setup joints may be overpowered to move the arms as necessary.

End of section

B Appendix B: *da Vinci Si-e* Surgical System

This appendix provides detailed information and specifications for the *da Vinci Si-e* Surgical System, an upgradable configuration of the *da Vinci Si* System, visibly distinguished by a 3-arm Patient Cart. The *da Vinci Si-e* System is designed to be upgradable anytime to a full-featured *da Vinci Si* System (single or dual console) – by *Intuitive Surgical* technicians. This section describes the characteristics that distinguish it from the *da Vinci Si* System.

B.1 System Component Compatibility

The *da Vinci Si-e* System uses the same Surgeon Console, which is interchangeable with any *da Vinci Si* System. In contrast, the 3-arm Patient Cart and the Vision Cart of the *da Vinci Si-e* System are *not* interchangeable with the 4-arm Patient Cart and Vision Cart of a *da Vinci Si* System; the specific *da Vinci Si-e* System components must be used together for the *da Vinci Si-e* System to work. The system software recognizes when you connect an incompatible combination of Patient Cart and Vision Cart, notifies you on screen and prevents use of the disallowed combination.

Note: The *da Vinci Si-e* System does not support dual console surgery.

Use of Third-Party Monitors

The *da Vinci Si-e* System supports use of external monitors in high definition or standard definition, by means of the standard video out connectors on the back of the Core, the Surgeon Console, and the Camera Control Unit (CCU). The table below describes the available video output options on the back of the Core. These are not user-configurable: you cannot select the video output format of the Video Out bay Aux connectors (back of the Core). The *da Vinci Si-e* System selects the appropriate output format based on the device connected to the Aux connector. See section 4.5 Video and Audio Connections and section H.5 Video Patch Panels for more details.

Table B-1 *Si-e* Video Connections

Component	Connector Output Format	Resolution	Overlay
Video Out bay Aux, back of Core	DVI (analog and digital)	XGA, SXGA, WXGA+ or 720p, automatically configured	Surgeon's view
	Composite (analog)	NTSC or PAL[a]	Surgeon's view
	S-Video (analog)	NTSC or PAL[a]	Surgeon's view
	SD-SDI (digital)	NTSC or PAL[a]	Surgeon's view

a. NTSC or PAL is standard definition and is determined by country.

The **Video Out** bay **Aux** supports only one video format at a time.

Note: Video outputs make available only the surgeon's view overlays. No external monitor used with the *da Vinci Si-e* System can support the touchscreen overlays nor functionality of the *da Vinci Si* System.

Note: If the system has *OnSite* installed, the *OnSite* status icons will be present on the Vision Cart monitor even though the touchscreen function is not available. All other *OnSite* features are supported on the *Si-e* System.

B.2 *da Vinci Si-e* Differences

Users of the *da Vinci Si-e* System should note the following differences in features and behavior compared to the *da Vinci Si* System.

Two Instrument Arms

The *da Vinci Si-e* System has only two instrument arms, as reflected on the touchpad display:

Figure B.1 Two instrument arms appear on touchpad

Audio System

Since the monitor includes a microphone and speakers, it provides support for two-way audio communication between the surgeon and patient-side assistant. For the *da Vinci Si-e* System, the volume control slider for the Vision Cart speakers is found on the **Audio** tab of the touchpad, to the right of the Surgeon Console speaker control. Note that there is no microphone mute button; to mute the microphone, drag the slider all the way to the left, as shown.

Figure B.2 Speaker volume control is on touchpad Audio tab

TilePro Not Available

TilePro (multi-image) mode is not available with the *da Vinci Si-e* System, and thus the option is not present on the Display Preferences screen of the touchpad.

Figure B.3 TilePro not present

Furthermore, the QuickClick option for *TilePro* activation is not offered on the touchpad Control Preferences screen.

Figure B.4 TilePro QuickClick option not present

Telestration Not Available

Since telestration is done on the touchscreen, telestration is not possible with the *da Vinci Si-e* System. However, note that the selected **Display Eye** option on the Display Preferences screen (Figure B.3) does still determine whether the surgeon's left (**L**) or right (**R**) eye image from the stereo viewer passes out of the video connectors of the Core's **Video Out** bay **Aux**.

Camera / Scope Setup via Touchpad Only

On the *Si-e* System, no touchscreen dictates that camera / scope setup must be done via the touchpad. This circumstance also requires two people to perform calibration: one sterile person to handle the endoscope and a second non-sterile person to work the touchpad at the Surgeon Console.

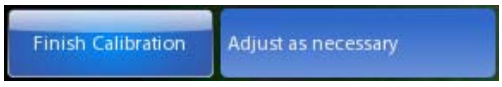
Figure B.5 Camera / Scope Setup on the touchpad

Follow these steps to calibrate the endoscope assembly from the touchpad of a *da Vinci Si-e* System:

1. The sterile person should insert the endoscope tip fully inside the endoscope alignment target, using the proper hole, which depends on the tip angle, so that the target crosshairs are visible on the center of the stereo viewer.

Note: For 3D calibration to be successful, the crosshairs must be well centered on screen and the target must be kept as still as possible on the endoscope.

2. The non-sterile person at the touchpad: From the **Video** tab, go to **Camera / Scope Setup** and then touch the **3D Calibration** button. The button name changes to **Finish Calibration** and **"Adjust as necessary"** appears next to it, and the button and all arrow buttons flash to prompt your input.



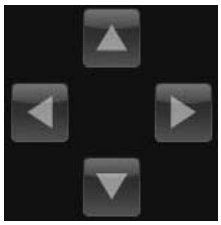
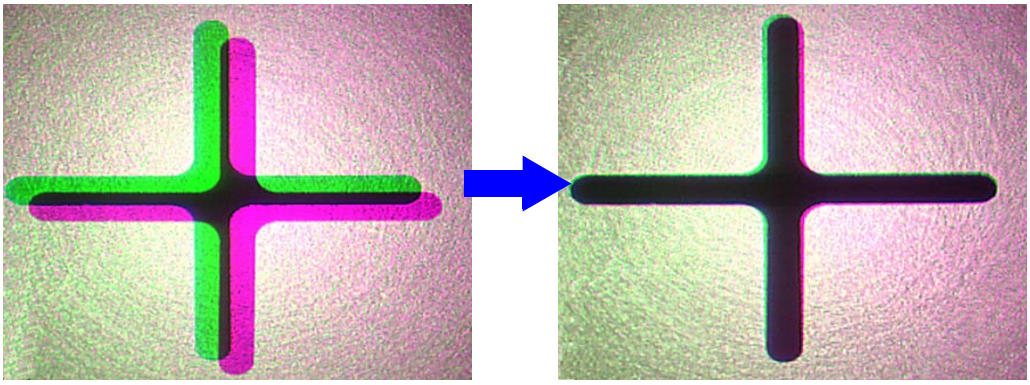
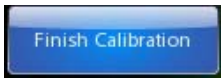


Figure B.6 3D Calibration in progress

3. Touch the arrows on the touchpad to move the green crosshairs until aligned with the magenta crosshairs, as seen in the stereo viewer.





4. **To save the calibration setting and exit calibration mode**, **touch Finish Calibration.**

3D Calibration and Camera Head Button Functionality

For the *da Vinci Si-e* System, the camera head buttons do not support 3D calibration. Without a touchscreen, you must perform 3D calibration from the touchpad, as described above. The **Vision Setup** button, in particular, supports no functionality at all; when you press it the system gives an error beep, but does not display a message. Nothing happens except the error beep. The **Focus In** and **Out** arrow buttons still support focusing of the surgical image from the camera head, and the **Lamp On/Off** button still functions.

End of section

C Appendix C: Illuminator Information

This appendix provides detailed information and specifications for the integrated Illuminator, also known as the Y1903 Xenon Fiber-Optic Light Source.

C.1 General Safety Precautions

Before operating, read all safety instructions. See Endoscopic Procedure Precautions on page 10 for additional safety instructions regarding use of the Illuminator. The Illuminator is a source of high electrical voltage, intense light and heat. When used properly and with normal precautions, it is a safe and effective light source.

CAUTION:

Third party light guides may not withstand light output levels of this light source.

Do not operate the light source without lamp module in place.

Disconnect power supply cord before servicing to avoid electric shock.

To reduce risk of electric shock, do not remove cover. Refer servicing to *Intuitive Surgical* personnel.

CAUTION HOT. Do not remove lamp immediately after operation. Allow lamp to cool 5 minutes with fans running before removing power to the Illuminator.

The end of the light guide may be hot.

Keep cooling vents free from obstructions.

To prevent overheating, replace only with the same type and rating of lamp module. Read instructions before replacing lamp module. (See 12.3 Illuminator Lamp Module Replacement on page 12-2.)

The following label appears on the side of the lamp module above the removal handle.

Note: It may be necessary for the reader to be as close as 6 in (15 cm) from the label to read this information.

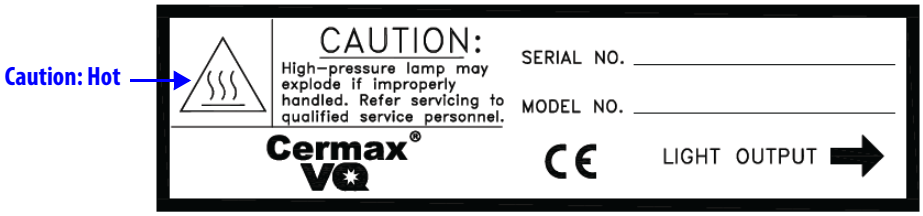


Figure C.1 Lamp module label

Observe the caution statement on the label: "CAUTION: High-pressure lamp may explode if improperly handled. Refer servicing to qualified service personnel."

The label provides space to indicate the "SERIAL NO." and "MODEL NO." of the lamp module. "LIGHT OUTPUT ➡ " indicates that the lamp light emits from the side indicated by the arrow.

Refer to Figure 12.2 on page 12-4 to see an image of the lamp module replacement label affixed to the top of the lamp module.

C.2 Illuminator Features

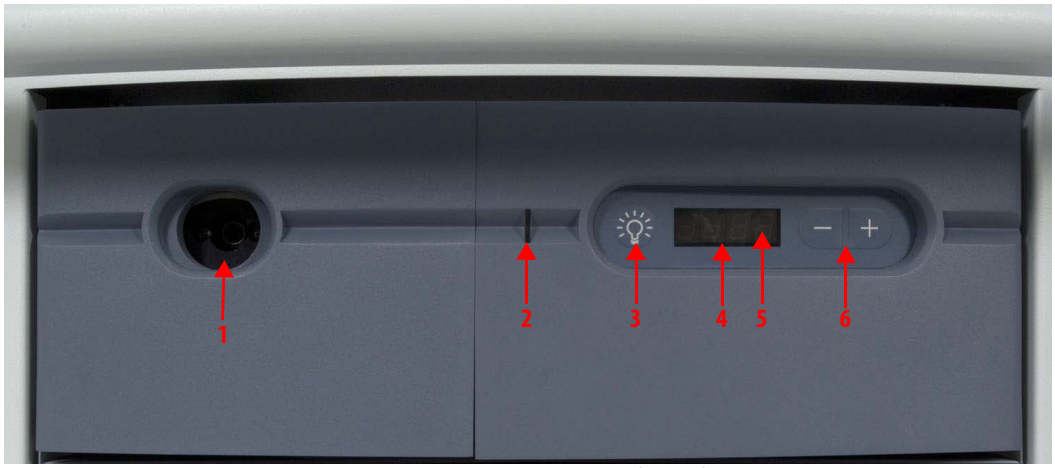


Figure C.2 Illuminator front features

1. **Optic Adapter:** Accepts Olympus™ fiber-optic light cables.
2. **LED Indicator:** Shows the lamp status. Amber: Lamp off; Blue: Lamp on; Blue blinking: No scope selected or detected.
3. **Lamp On/Off Switch:** Toggles the lamp on/off once the system has been powered up. This button switch on the front panel is symbolized by an incandescent lamp. When pushed, the blue **"OFF"** flashes on the display until lamp ignition occurs.
4. **Display Window:** Displays light output level from 0-100 in 10% increments when lamp is on, and will read OFF when lamp is off.
5. **Lamp Hours:** Displays number of usage hours on the lamp module. To read the lamp hours, press the decrease (**–**) and increase (**+**) buttons simultaneously, and read the number displayed on the display window. You may also view lamp hours by selecting **Utilities** > **Inventory Management** on the touchscreen or touchpad, as described in sections 7.2 and 10.3.
6. **Intensity Control (– +):** Control buttons to increase or decrease light output levels in 10% increments.

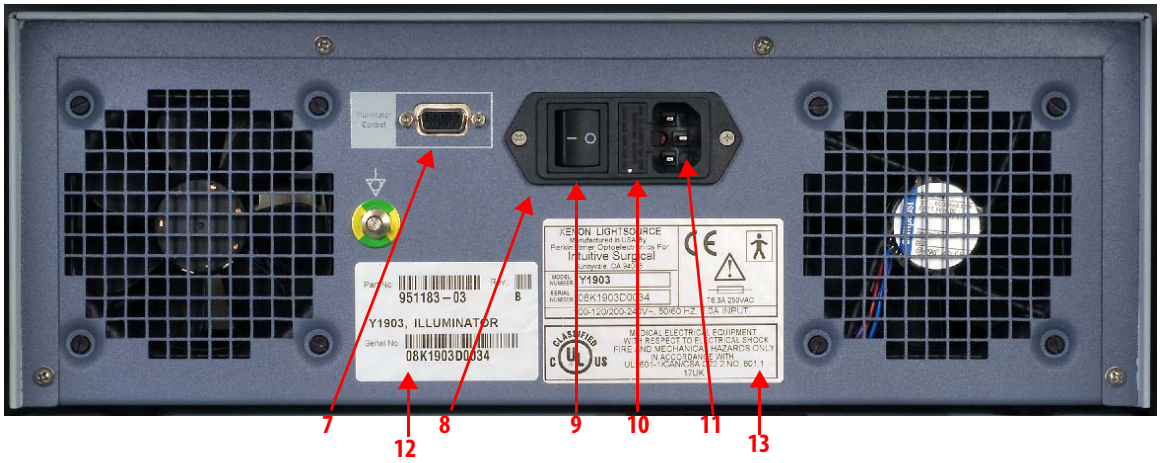


Figure C.3 Illuminator rear features

7. **RS232 I/O Serial Port:** 9-pin D Sub-Miniature interface for RS232 control features. Labeled "Illuminator Control."
8. **Input Power Module:** Consists of the Power On/Off switch, fuse drawer, and AC input power receptacle.
9. **Power On/Off Switch:** The Power On/Off Switch is located on the back panel. When switched ON, the system is energized and initiates standby mode, while the LED indicator (on front) illuminates amber. In addition, the cooling fans run, and the display reads OFF. When switched OFF, the system is de-energized, the LED indicator (on front) is not illuminated, and the display is dark. Energizing the system does not automatically turn the lamp on.
10. **Fuse Drawer:** The fuse drawer is located on the back panel beside the AC input power receptacle. The fuse drawer contains two 6.3 amps main fuses.
11. **AC Input Power Receptacle:** The AC input power receptacle, located on the back panel, is a three-prong receptacle that accepts a detachable AC power cord.
12. **Unit Identifier Label**
13. **Light Source Label:** Shown below.

Note: It may be necessary for the reader to be as close as 6 in (15 cm) from the label to read this information.

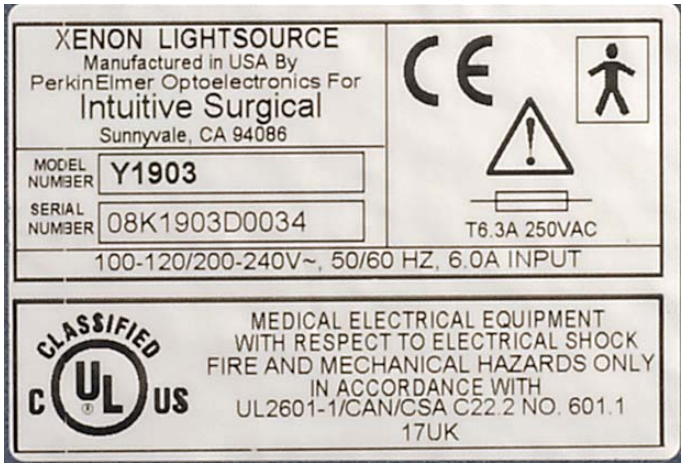


Figure C.4 Light source label example

14. **Lamp Module Access Drawer:** Allows service technician access to the lamp module for replacement. (See 12.3 Illuminator Lamp Module Replacement on page 12-2.) By pushing in on the drawer, the latch mechanism will release, and the drawer will slide forward. To close the drawer, push it in until the latch catches.

Figure C.5 Lamp module access drawer open

C.3 Basic Troubleshooting

Table C-1 Basic Troubleshooting

Symptom	Possible Problems	Remedy
No power to Illuminator	• Vision Cart not connected or not powered on. • Fuse is blown. • Internal power supply not operating. • AC input power receptacle unplugged.	• Connect and power on system. • Replace fuse. • Contact *Intuitive Surgical* Technical Support.
No light emits from unit	• Lamp module access drawer open. • Lamp burned out. • Internal power supply not operating. • Fiber-optic cable not connected.	• Close drawer. • Replace lamp module. • Contact *Intuitive Surgical* Technical Support. • Connect fiber-optic cable correctly.
Lamp flickers or dims	Lamp is getting old.	Replace lamp module.
Field of view is dim	Incorrect settings.	Adjust Brightness controls
Illuminator turns off after a few minutes of operation.	• Obstructed air intake leads to overheating, causes thermal switch to trip. • Fan not running; overheating causes thermal switch to trip.	• Allow unit to cool 10 minutes. Remove obstructions. • Contact *Intuitive Surgical* Technical Support.

C.4 Fuse Replacement

1. Switch power off on the back of the Illuminator and remove the power cord from the back of the Illuminator.
2. Check for blown fuses by removing the fuse cover, located next to the three-prong power receptacle. Carefully pull out the cover using a flat blade screwdriver (medium size) or equivalent, as shown in Figure C.6.

Figure C.6 Remove fuse cover

3. Replace blown fuse(s) with the same size and rating: 6.3A time delay: T6.3A fuses, size 5x20mm.

4. Re-install the fuse cover.
5. Reconnect the power cord
6. On the back of the Illuminator, turn the power switch on. The Illuminator should be operative again.

Contact *Intuitive Surgical* Technical Support if the unit fails to operate properly again.

C.5 Specifications of Y1903 Light Source

Note: The specifications in this section apply to the Y1903 Illuminator only and not the *da Vinci Si* System.

Table C-2 Y1903 Light Source Specifications

Category	Specification	Comments
Electrical Input		
Input Voltage	100 - 240 VAC, 50/60Hz universal, 6.0A input	
AC Power Connector	Located on rear panel, dual fuses	
Line Cord	IEC320, 6' (1.83m), configured for locale	
Performance and Features		
Light Output	• 2450 Lumens nominal initial output using Olympus™ fiber. • Spectral output 386 - 733nm nominal • <10% instability p-p through 6 mm glass rod @ 0-100Hz • Beam profile to have "smooth" distribution with no shadows or sharp peaks	All light output specifications refer to "system only" performance. Light output via optical fibers or other optical components may vary.
Over-temperature Protection	Automatic shutdown in the event of overheating	
Overheat Recovery / Auto Cool	Unit to become fully operational <3 minutes (target) after thermal shutdown and all obstructions to air flow removed at environmental temperature of <22 °C (72 °F)	Fans will remain on in the event of thermal shutdown when power is on. Lamp must be switched on by using **Lamp On/Off** switch located on front panel.
Fiber-Optic Connection Safety Feature	• Lamp will not ignite unless a fiber-optic cable is fully inserted into the active port on the turret • Lamp power is cut or blocked if fiber-optic cable is removed from active port to prevent accidental light leakage	Fans will remain on in the absence of a fiber-optic cable inserted into active port when power is on
Lamp Power Supply	PS300-12 type	
Lamp Module	Cermax VQ (300 Watt)	*Intuitive Surgical* PN 950093
Lamp Module Replacement	By easy access to lamp module via drawer. No tools required.	Lamp replacement drawer "interlocked" for safety. Lamp power will be cut when drawer is opened
Lamp Life	• 1000 hours to 50% of initial output specification measured through 6 mm glass rod • >1000 hours at a minimum output of 1225 Lumens	

Table C-2 Y1903 Light Source Specifications

Category	Specification	Comments
User Interface / Control		
User instructions	In this system user manual	
Lamp On/Off Switch	Located on front panel	User controlled lamp on/off. Fan operation independent of lamp status.
Fiber-Optic Adapter	Olympus™ port to fit Olympus fiber	
Light Attenuation Shutter	• Controlled by membrane buttons on front panel • **(+)** and **(–)** buttons for relative intensity increments • Relative level of illumination indicated by a digital numeric display (blue numerals)	
Lamp Hour Counter	Displays number of elapsed hours of lamp operation when you press **(+)** and **(–)** buttons at same time	
Mechanical & Environmental		
Dimensions	Height 5.5" (Without Feet) x Width 15.5" x Depth ≤17" (without front bezel) (14 x 39.4 x 43.2cm)	Designed for modular expansion
Weight	≤28 lbs.	
Touch Temperature	Per UL60601 -1	
Ground Bound	Per UL60601 –1	
Sterilization	The light source may be wiped-down with hospital approved disinfectants (for example, 10% bleach + 90% water solution) applied with a damp cloth (must not be wet)	
Operating Temperature	6 °C to 35 °C	
Storage Temperature	–20 °C to 75 °C	
Operating & Storage Humidity	10 - 80% relative humidity, non-condensing	
Operating Pressure	1 Atmosphere	
Audible Noise	≤ 40dB	
Shipping, Shock & Vibration	per ISTA 3A	
Cooling	Vents to direct airflow toward the back of the unit	
Regulatory Approvals		
Compliance to standards	• IEC 60601-1:1988+A1:1991+A2:1995+A1.3:1997 • UL 60601-1:2003 • EN 60601-1:1990+A1:1993+A2:1995+A1.3:1997 • EN 60601-1-2:2001 • CAN / CSA C22.2 No. 601.1/M90(R1997),B/98,S1-94 • ANSI/AAMI ES60601-1: 2005 • CAN/CSA-22.2 No. 60601-1 (2008) • EN 60601-1-2: 2007 • CE mark	

C.6 Classification of the Y1903 Light Source

- Class I: The light source relies on connection to the protective earth conductor to prevent shock hazards.
- Type BF: The Y1903 light source is classified as a BF equipment. The optic adapter is grounded and only BF or CF applied parts should be used with the Y1903.

Note: The *da Vinci Si* camera head provides isolation in accordance with a CF applied part and is acceptable for use with the Y1903 Illuminator.

- Provides no protection against ingress of liquids.
- Mode of Operation: Suitable for continuous operation.
- Not suitable for use in the presence of a flammable anaesthetic mixture with air or with oxygen or with nitrous oxide.

C.7 Electromagnetic Compatibility

The Y1903 has been tested and found to comply with the limits for medical devices to the IEC 60601-1-2:2001(E). These limits are designed to provide reasonable protection against harmful interference in a typical medical installation. The Y1903 generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. It can be determined if this equipment causes interference by turning the power to the light source off and on. The user is encouraged to try to alleviate interference problems by one or more of the following measures:

- Re-orient or relocate the receiving device
- Increase the separation between the equipment.
- Connect the equipment into an outlet on a separate electrical circuit from that of other devices.

Warnings

- AC power cords other than those provided with the instrument may result in increased emissions or decreased immunity.
- The Y1903 should not be used adjacent to or stacked with other equipment. However, if adjacent or stacked use is necessary, the Y1903 should be observed to verify normal operation in the configuration in which it is used.

Manufacturer's declaration – electromagnetic immunity			
The Y1903 is intended for use in the electromagnetic environment specified below. The customer or the user of the Y1903 should assure that it is used in such an environment.			
Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment Guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	Complies	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	Complies	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line(s) to line(s) ±2 kV line(s) to earth	Complies	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec.	Complies	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Y1903 requires continued operation during power mains interruptions, it is recommended that the Y1903 be powered from an uninterruptible power supply or battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	Complies	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: UT is the AC mains voltage before application of the test level.			

Manufacturer's Declaration – Electromagnetic Emissions		
The Y1903 is intended for use in the electromagnetic environment specified below. The customer or the user of the Y1903 should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment guidance**
RF emissions CISPR 11	Group 1	The Y1903 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The Y1903 is suitable for use in all establishments, including domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

End of section

D Appendix D: *VisionBoom*™ Use Instructions

This appendix provides instructions to use the *da Vinci Si* Surgical System installed in the *VisionBoom* configuration. Integrators seeking installation instructions should refer to the *VisionBoom*™ Installation Guide (PN 550539).

Note: This appendix provides only those instructions specific to the *VisionBoom* configuration. Refer to relevant portions of this manual for instructions to use the surgical system.

The *da Vinci Si VisionBoom* configuration eliminates clutter and improves efficiency in operating room (OR) surgical environments by replacing the *da Vinci* Vision Cart, and its associated cords and cables, with a convenient ceiling-mounted system.

Figure D.1 Recommended side by side (left) and stacked (right) VisionBoom configurations

Note: The *VisionBoom* upgrade supports dual console surgery.

The ceiling-mounted equipment boom is the primary platform for OR integration and, depending on the model selected, the typical boom can provide the support and space to position most necessary clinical devices. The equipment boom is not a product sold by ISI but by manufacturers such as Berchtold™, Steris™, Skytron™, etc., to name just a few vendors that sell such equipment.

D.1 General Notes and Cautions

Note:

- **Air flow sufficient to support adequate cooling of *da Vinci* vision components is critical to their proper function. The entire *da Vinci System* is designed to undergo an automatic, controlled power-down sequence in case a component or subsystem overheats while in normal operating mode, thereby preventing system damage. (See Chapter 5 Startup for details.) To avoid overheating, do not place anything on or near any *da Vinci* vision component on the boom, especially if it might impede air flow. Do not route cables behind the Illuminator on the boom shelf, to avoid blocking air flow behind it.**
- **ISI recommends that the boom be oriented during surgery so that air flow from the components is directed away from the sterile field.**
- **ISI recommends that *da Vinci* vision components be left permanently in the configuration in which they are transferred to the boom by ISI service personnel. Rearrangement of *da Vinci* vision components could result in a configuration that does not support adequate cooling or otherwise may result in an increased risk of damage to or improper function of the components.**
- ***da Vinci* vision components are not designed to support external loads, and therefore ISI discourages placement of any equipment on top of *da Vinci* vision components mounted on the boom shelf.**

CAUTION: **To avoid overloading circuits, do not connect ancillary devices such as insufflators or energy devices in common circuits with any system component, particularly not with the vision components because they have large power requirements. Ancillary devices must be connected to boom outlets on separate circuits from all system components.**

CAUTION: **After a few minutes of use, the rear of *da Vinci* vision components may become hot, particularly the Illuminator. Avoid touching the rear of these units during use and for 10 minutes after use while components cool with internal fan operation.**

D.2 *da Vinci Si* System Connections

In a *VisionBoom* configuration, Surgeon Consoles and the Patient Cart connect to the Core via fiber interface wall plates. These wall plates connect via cabling inside the wall that terminates in the fiber boom plates, which connect via their blue cables (1 m) directly to the back of the Core. Surgeon Consoles and the Patient Cart can connect to any *da Vinci* wall plate in the room. The Core recognizes the units connected to its fiber input ports automatically. Figure D.2 illustrates how the system connections are made.

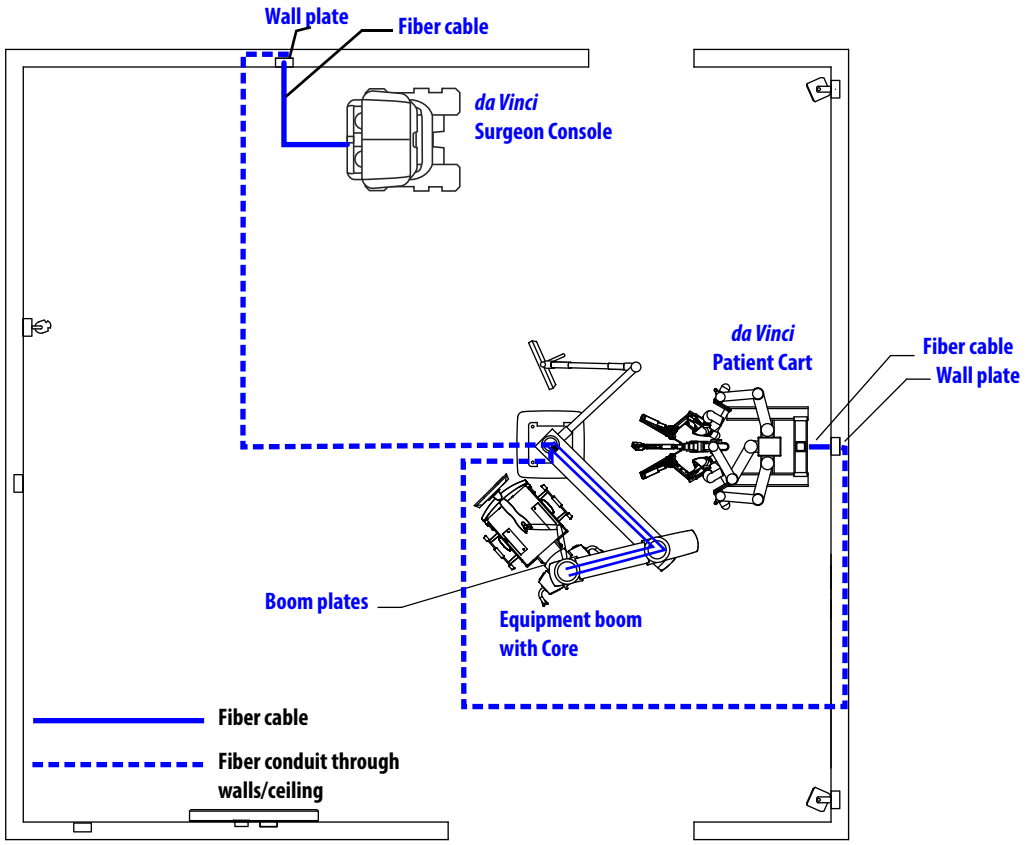


Figure D.2 Fiber cables and conduits connect Core to Patient Cart and Surgeon Consoles

Figure D.3 shows where to find the fiber optic cable connectors on the rear of the Patient Cart and Surgeon Console.

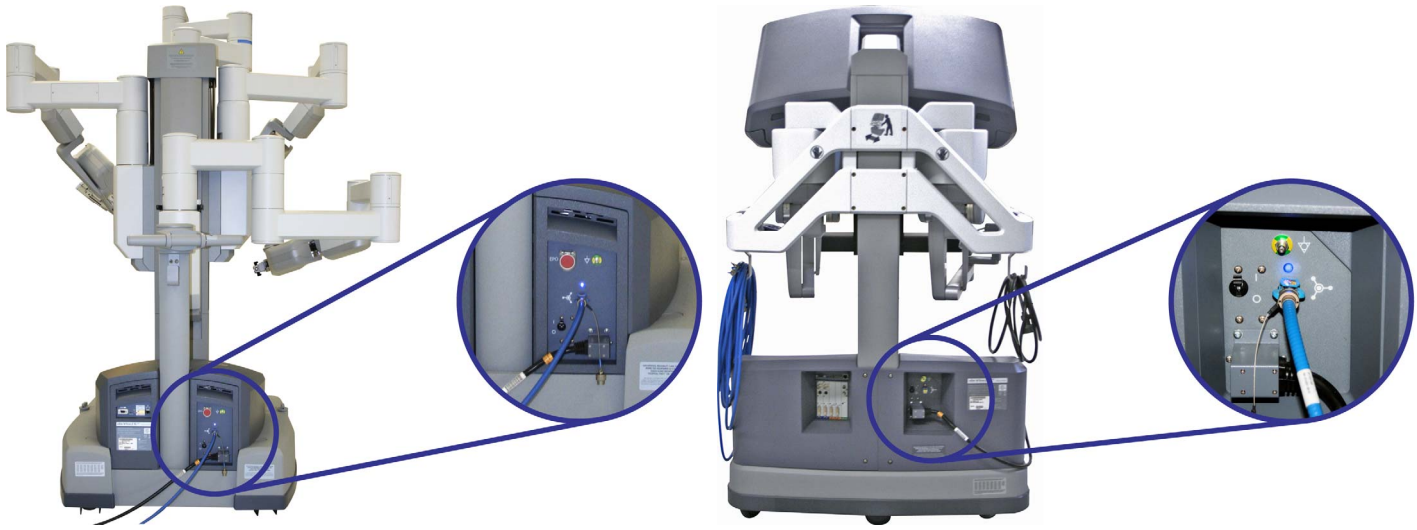


Figure D.3 Fiber connectors on Patient Cart and Surgeon Console

Connecting the Fiber Cables

Note: The connections on the back of the Core (in Step 4: Connect Core, page 5) generally are made only once and left connected unless the Core is removed from the boom.

Follow these steps to connect the Patient Cart and one or two Surgeon Consoles to the Core in the *VisionBoom* configuration.

Step 1: Remove Cap

Before connecting the blue *da Vinci Si* fiber cables, pull to remove the protective cap at each end of the cable (Figure D.4). Note the position of the red alignment mark on the uncapped cable end, which you must align with a similar mark on the fiber cable port for successful insertion.

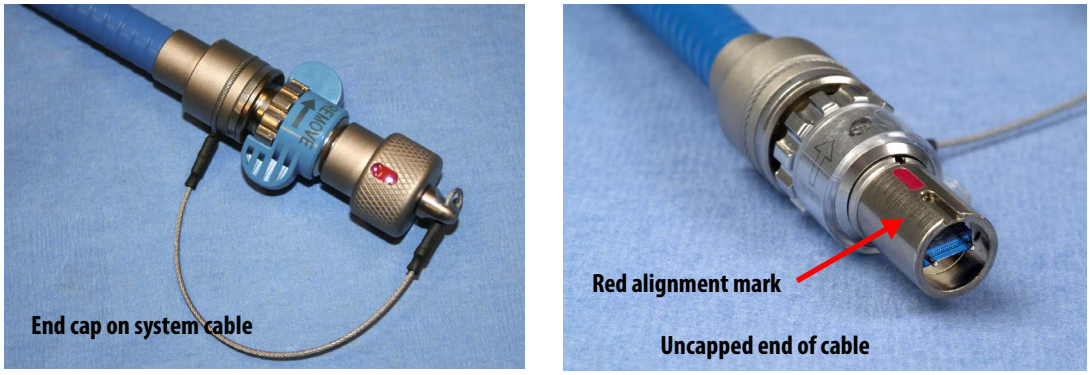


Figure D.4 Remove the cable end cap

Step 2: Connect Patient Cart

Connect a blue fiber cable (20 m) to the back of the Patient Cart (Figure D.5) and to the desired fiber interface wall plate (Figure D.6). When lit solid blue, the LED above the fiber port indicates a good connection to the Core. (It will not light blue until you complete the connection from the boom plate to the Core – see Step 4: Connect Core, page 5.)

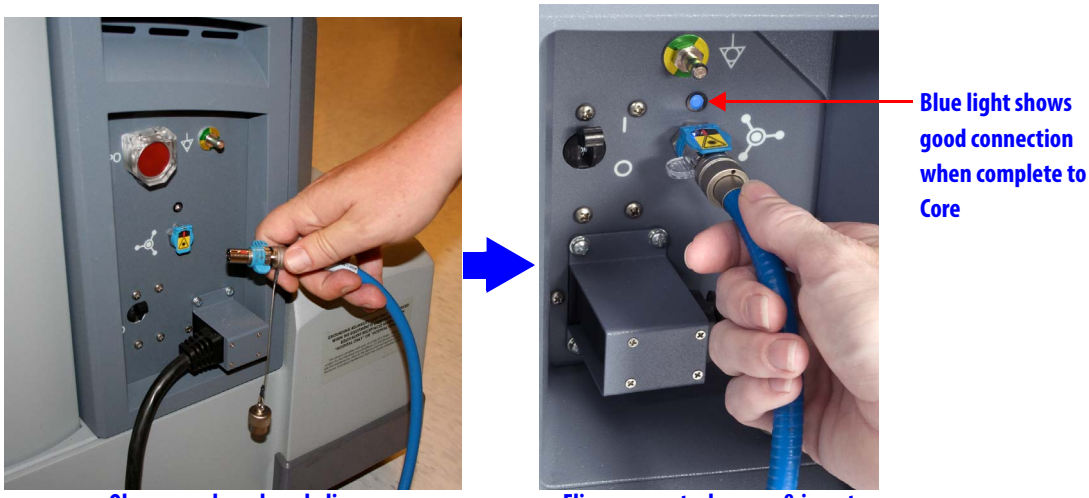


Figure D.5 Connect fiber cable to Patient Cart

Figure D.6 Connect other end of fiber cable to fiber wall plate

Step 3: Connect Surgeon Consoles

For each Surgeon Console you will use, connect a fiber cable to the fiber connector on the back of the console (Figure D.7) and to an available fiber wall plate (as in Figure D.6). Again, a blue LED indicates a good connection to the Core when connections in next step are complete.

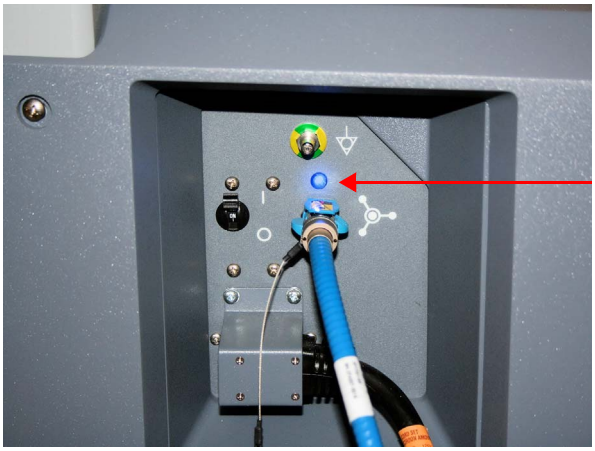


Figure D.7 Connect fiber cables to each Surgeon Console

Step 4: Connect Core

Connect each 1 m (3'-3") cable being used from its boom plate to the back of the Core to complete the connections for each Surgeon Console and the Patient Cart (Figure D.8).

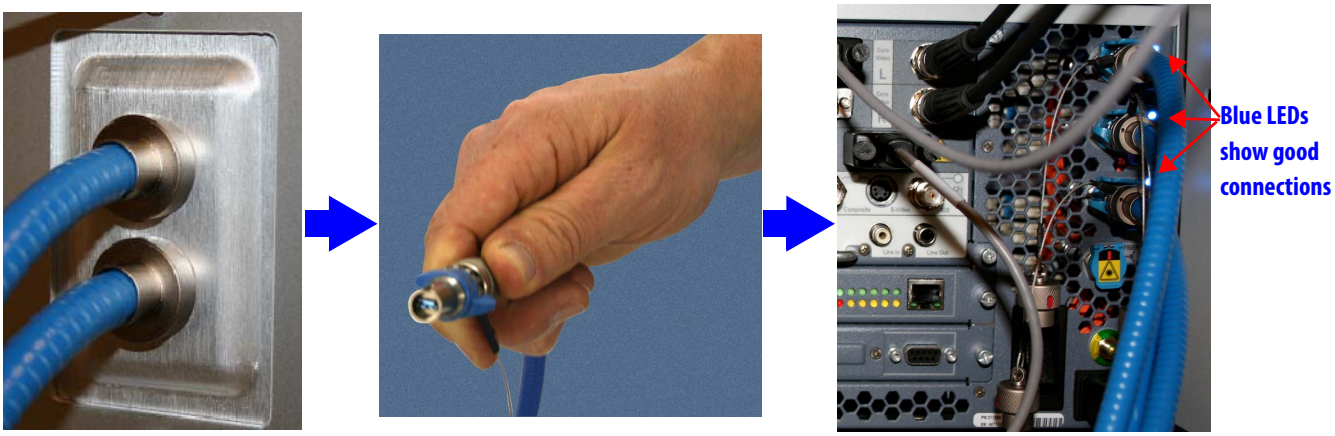


Figure D.8 Connect the boom plate fiber cables to the Core on the boom

Note: If, after connecting all cables as shown in steps 1 through 4, you still do not have a good connection (no blue light) connect the long (20 m) blue fiber cables directly to the core. These blue fiber cables are of sufficient length (20 m) to bypass the wall cabling and connect directly to the core from the surgeon console and patient cart, as illustrated in Figure D.9 below.

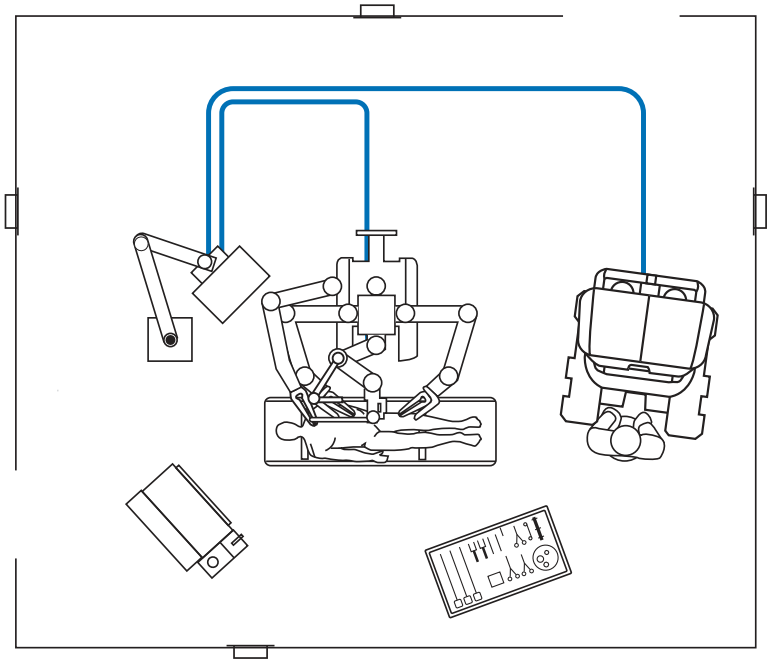


Figure D.9 Bypassing wall cabling

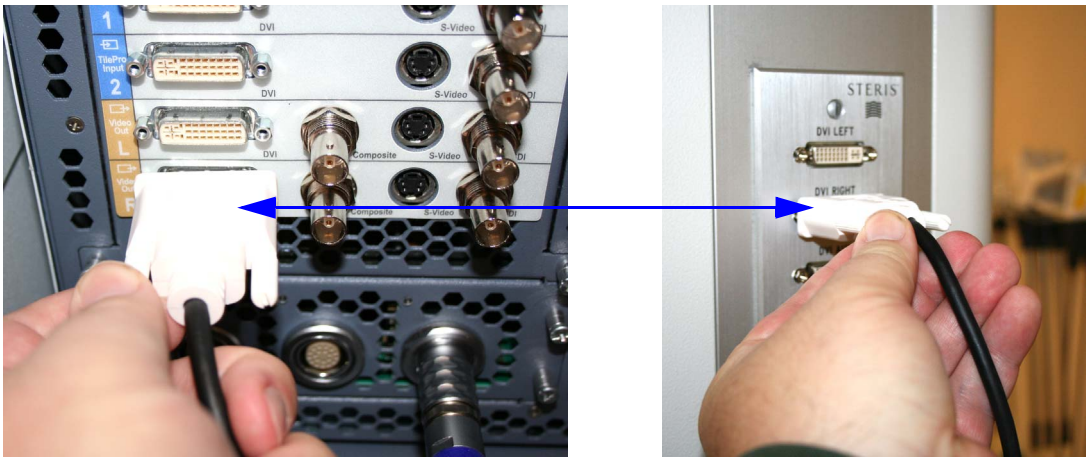
D.3 Optional Core Connections

This section describes the additional, optional connections you can make between the Core and third party devices.

Core Video Connections

Perform this step for each video connection you wish to make between the *da Vinci Si* System and external monitors, recorders or other third party devices.

1. Connect each video output or *TilePro* input on the back of the Core to the desired interface plate, monitor, or third party device. Figure D.10 shows a typical connection from the DVI output to a DVI boom interface plate that supports connection to an OR video switching system.



Core DVI output DVI boom plate

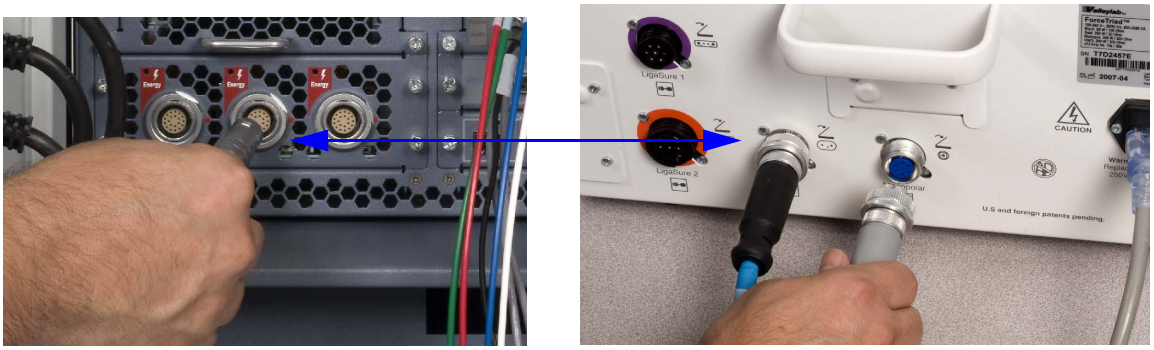
Figure D.10 Example of DVI connection from Core to boom plate

Electrosurgical Unit (ESU) Connections

Note: Refer to 4.4 Auxiliary Device Connections, page 4-9, for detailed instructions.

To connect one or more electrosurgical units (ESU), perform this step:

1. Connect the appropriate energy activation cable between any of the **Energy** receptacles on the back of the Core and the appropriate connectors on the ESU.

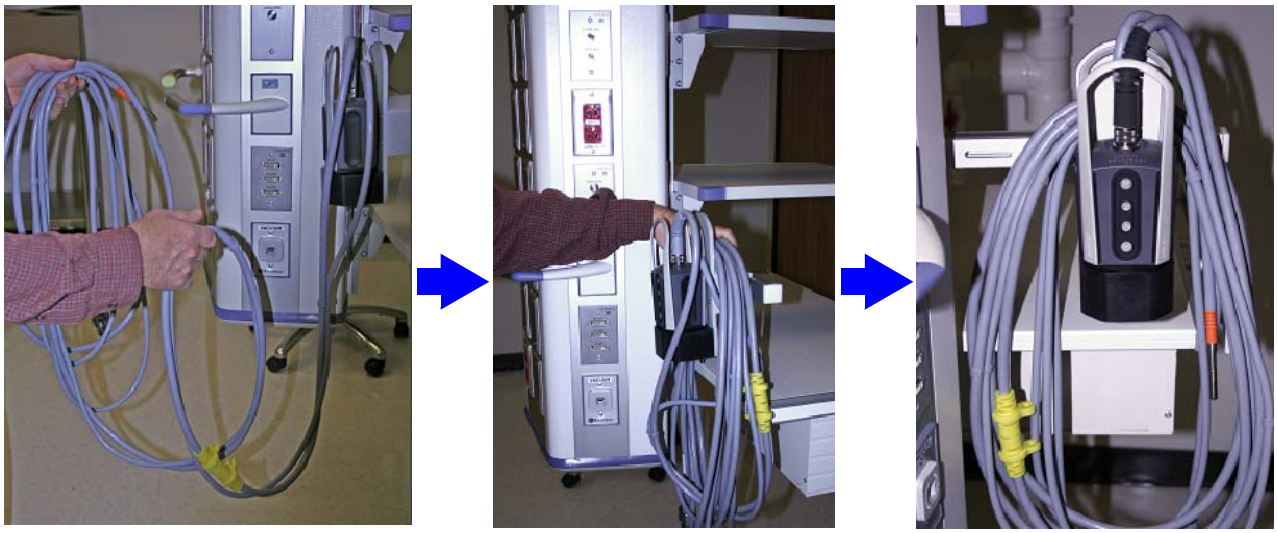


Core Energy connection Sample ESU connections

Figure D.11 Example of ESU connection to Core

D.4 Camera Head and Cable Storage

The camera holster is installed on the boom to provide a convenient location for storing the camera head (without endoscope attached) when not in use. Figure D.12 illustrates how to coil the cables and store the camera head.



Coil camera cables | Hang cables over holster | As when finished

Figure D.12 Camera and cable storage using the boom-mounted holster

D.5 Touchscreen Positioning

The *da Vinci Si* touchscreen mounted on the boom can be positioned to either side of the boom or directly off the front (Figure D.13). Position it according to the needs of the surgical staff. Unless a sterile monitor drape is used, a sterile assistant requires a change of surgical gloves after touching the touchscreen; alternatively, non-sterile surgical staff may operate an undraped touchscreen.

Figure D.13 You can position touchscreen

Note: Refer to 7.4 Working with the Touchscreen Vision Controls, page 7-15, for instructions to use the touchscreen.

D.6 Boom Positioning

Similar to the positioning of the Vision Cart in relationship to the patient, the vision boom needs to be positioned to a location that is convenient to the surgical staff to have access to the equipment. The vision boom positioning also must take into consideration the location of the third *da Vinci* instrument arm during the specific procedure performed. The boom must be placed within reach of the 5.75 m (18'-6") camera cable attached to the front of the Core.

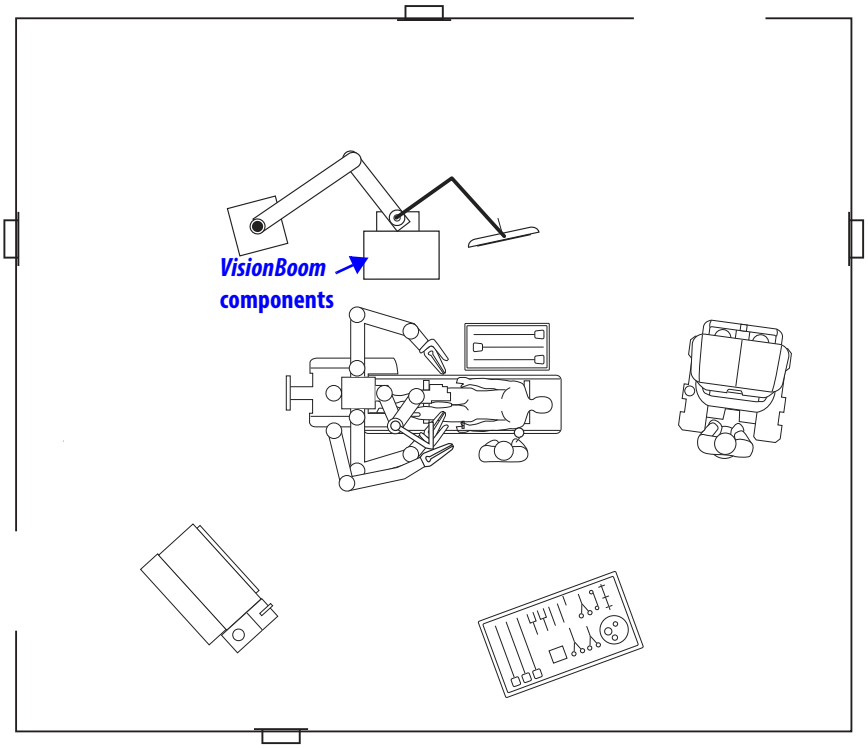


Figure D.14 Typical boom positioning

End of section

E Appendix E: *OnSite*™ for *da Vinci*® Surgical System

E.1 General Information

The following appendix is applicable only if your *da Vinci Si* System has *da Vinci OnSite* enabled.

Contact Information

For Customer Service and Reporting of Complaints or Adverse Events

Use the following information for customer service, including ordering, reporting complaints or adverse events, and general information regarding *Intuitive Surgical* or our products and services.

In the U.S.

Intuitive Surgical, Inc.
1266 Kifer Road
Sunnyvale, CA 94086 USA
Toll free: 1.800.876.1310
Direct: 408.523.2100
Fax: 408.523.2377

In Europe:

Intuitive Surgical Sàrl
1, chemin des Mûriers,
1170 Aubonne, Switzerland
Toll free: +800.0821.2020
Direct: +41.21.821.2020
Fax: +41.21.821.2021

For Technical Support

If the system requires maintenance or service, please call our Technical Support line. In the U.S., call 1-800-876-1310, where phones are staffed 24 hours a day, seven days a week. In Europe, call +41.21.821.2020.

Manufacturer

Intuitive Surgical, Inc.
1266 Kifer Road
Sunnyvale, CA 94086 USA
www.intuitivesurgical.com

Intuitive Surgical Sàrl
1, chemin des Mûriers,
1170 Aubonne Switzerland

General Precautions, Warnings, and Contraindications

Note: All *da Vinci* Surgical System users must follow all instructions for use supplied with the system, its components, instruments, and accessories. This includes the following documents: Instruments and Accessories User Manual (PN 550675), Reprocessing Instructions (PN 550875), and any instructions for use (IFUs) provided with instruments or accessories.

WARNING: **Be sure to read and understand all information, particularly the caution and warning information, found in the applicable user manuals before using these products. Failure to properly follow all instructions, including those in the *da Vinci* Surgical System user manual, and instructions supplied with accessory devices such as generators, may lead to injury and result in improper functioning of the device.**

⚠ CAUTION: ***OnSite*** **components may be installed and serviced only by** ***Intuitive Surgical*** **personnel. Do not attempt to install or service equipment without** ***Intuitive Surgical*** **personnel.**

⚠ CAUTION: **Leakage current from interconnected electrical equipment may exceed safe levels. To maintain the safety of patients and users, interconnect only with devices in compliance with IEC 60601-1-1. It is the user's responsibility to ensure that any interconnected equipment not supplied by** ***Intuitive Surgical*** **maintains compliance with IEC 60601-1-1.**

⚠ CAUTION: **Ethernet networks (both wired and wireless) are subject to losses of connectivity that could disrupt use of** ***OnSite*** **or make data unreliable when it is received at a remote location. Such disruptions, if they occur, have no effect on the performance or functionality of the** ***da Vinci*** **Surgical System.**

E.2 Indications for Use – *OnSite*

OnSite for *da Vinci* Surgical Systems is an accessory indicated for use by trained *Intuitive Surgical* Field Service personnel to: (1) obtain system information for the purpose of diagnosing faults, (2) remotely enable/disable features including configuration updates through either a wired or wireless Ethernet connection between the *da Vinci* Surgical System and the hospital's Internet Protocol (IP) infrastructure.

E.3 Network Connections

OnSite requires a wired RJ45 Ethernet 10bT/100bT and/or wireless 802.11 network connection with Internet access where the *da Vinci* Surgical System will be used.

E.4 Transmitter Module Label

When the optional wireless bridge is installed, the following Federal Communications Commission (FCC) identification label will be affixed to the Surgeon Console.

Contains Transmitter Module FCC ID: SWX-NS2

Figure 1 Transmitter Module Label

E.5 Introduction

OnSite provides connectivity that enables *Intuitive Surgical* service personnel to remotely service the *da Vinci* Surgical System pre-operatively and intra-operatively. It enables the following capabilities.

1. Automated log retrieval, where *da Vinci* Surgical System uploads logs to an *Intuitive Surgical* server when idle
2. Remote system status monitoring
3. Remote diagnostics and servicing
4. Remote configuration changes
5. Enable/disable device features

The monitoring capability enables a faster response time from the *da Vinci dVSTAT*™ (*da Vinci* Surgery Technical Assistance Team) for problem resolution, real time diagnosis, and increased diagnostic accuracy.

To implement remote service capabilities, the *da Vinci* Surgical System must have access to the Internet. *OnSite* is designed to accomplish this using existing hospital networks.

E.6 *OnSite* System Requirements and Connections

The remote servicing features of *OnSite* are designed to be highly secure and to function transparently. The *da Vinci* Surgical System communicates with an *Intuitive Surgical* server via outgoing network connections to enable *Intuitive Surgical* service personnel to remotely monitor and service the system while in use.

In summary, *OnSite* consists of three major components, namely the *da Vinci* Surgical System with installed networking components, the *Intuitive Surgical* server, and the remote user (*Intuitive Surgical* Field Service personnel). The block diagram below illustrates the *OnSite* networking infrastructure.

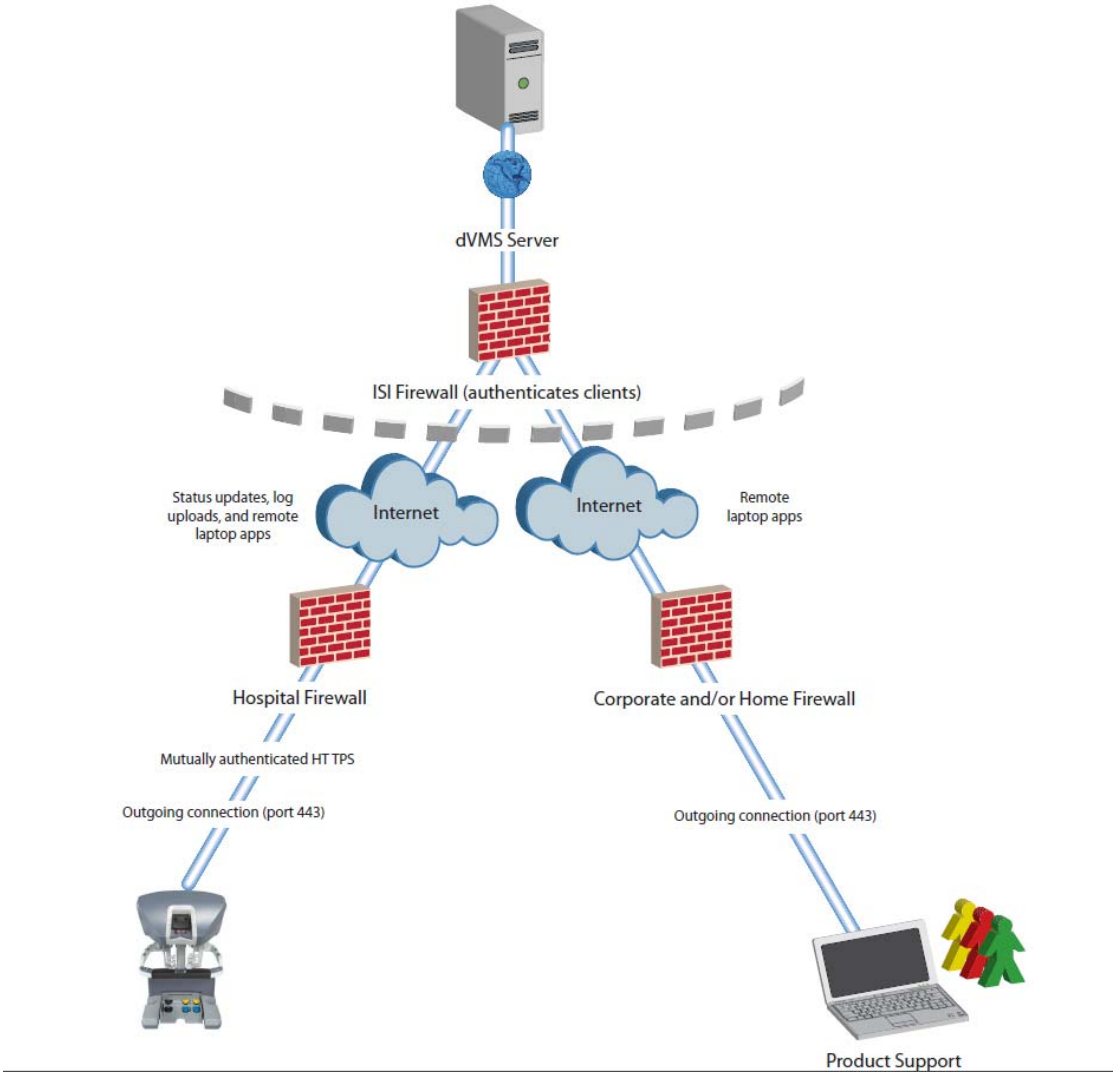


Figure 2 OnSite Networking Infrastructure

Note: To take advantage of the full potential of *OnSite*, the system must remain connected to the network.

Wired Network Connection

Intuitive Surgical field service personnel install a network security device inside the *da Vinci* Surgical System, along with necessary cables and panels to enable a wired network connection for *OnSite*.

Figure 3 Network Security Device

To establish a wired connection:

Connect the *da Vinci* Ethernet connection to the hospital network (wall plate) using a CAT5e industrial style network cable.

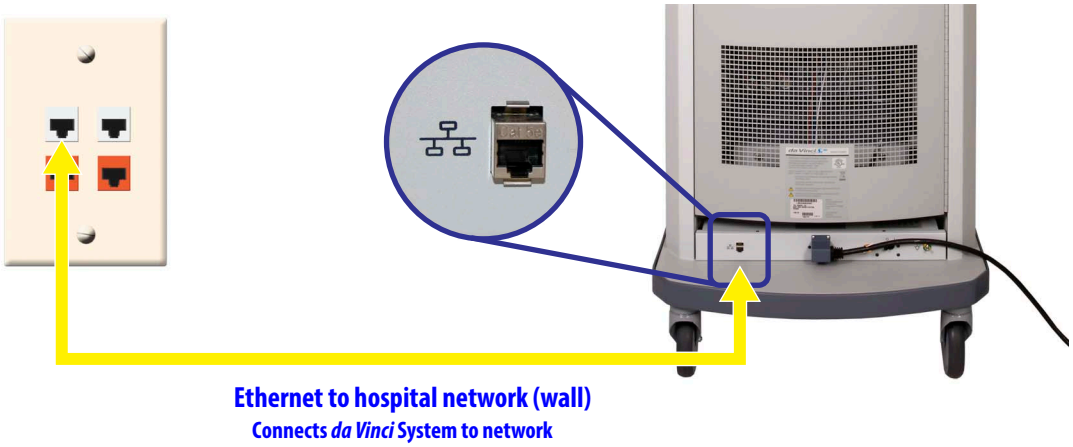


Figure 4 Network Cable Connections (da Vinci Si)

Optional Wireless Connection

There is an optional wireless connection available using the Network Security device and a Wireless Bridge. See Section E.10 Wireless Connectivity Option and section E.13 OnSite Appendix C: Wireless Bridge Data for details on wireless connectivity.

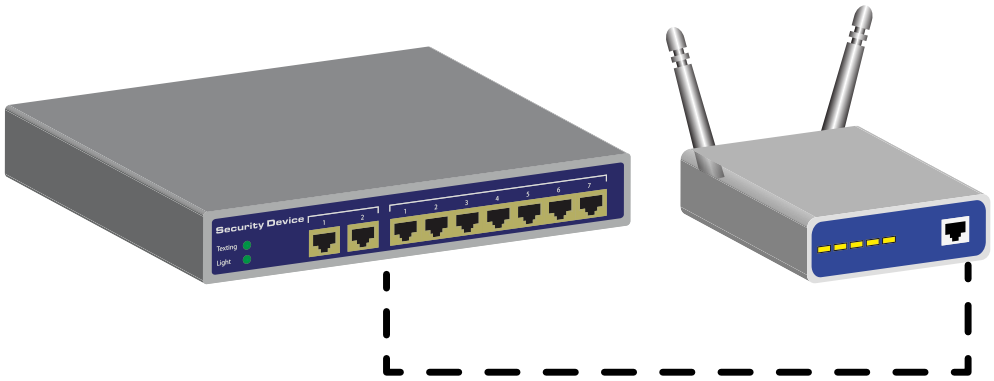


Figure 5 Network Security Device with Wireless Bridge

Note: External connections are not required for the *da Vinci Si* Surgical System.

5.7 Disabling All Network Connectivity

If there is a need to disable all network connectivity for the *da Vinci Si* System, open the back of the Vision Cart and disconnect the RJ-45 (Ethernet) connector at bottom center of the Core, indicated below.

Figure 6 RJ-45 Connector – Core (da Vinci Si)

Note: This action disables all network connectivity for the *da Vinci Si* System, but it does not power off the wired or wireless networking equipment.

Note: To re-establish network connectivity, you must re-connect the indicated RJ-45 connector on the back of the Core.

E.8 Automatic Status and System Log Retrieval

OnSite provides real-time system status monitoring and post-procedure upload of system logs, for the support team to service the *da Vinci* System. When *Intuitive Surgical* field service personnel enable the *OnSite* functionality, the *da Vinci* Surgical System can:

1. Connect to an *Intuitive Surgical* server for these purposes:
   A. Provide status updates – typically every 10 seconds but can be configured for different intervals
   B. Upload all system logs to the *Intuitive Surgical* server after each procedure
2. Connect to field service diagnostic applications running on a remote laptop

E.9 *OnSite* Servicing and Diagnostics

OnSite enables remote servicing using current diagnostic applications that *Intuitive Surgical* Field Service personnel normally use when the technician visits on site. When physically present, the technician troubleshoots the system using a local connection between the laptop and the *da Vinci* System hardware. *OnSite* enables the technician to troubleshoot remotely, using the same set of diagnostic tools. Through a remote *OnSite* connection, the technician can interact with the system in either Normal Mode or Maintenance Mode.

Normal Mode

In Normal Mode, *OnSite* can only enable remote monitoring of system status. This allows *dVSTAT* to passively monitor information transmitted, with no ability to perform any activity that impacts the movement or performance of the surgical system.

In Normal Mode, *dVSTAT* can:

- Receive system logs
- Check the condition of system switches and buttons
- Verify surgical instrument functionality.

Normal Mode – *OnSite* Mode Indications

While in Normal Mode, the *da Vinci Si* System indicates the status of the network connection.

***da Vinci* Network Offline**

***da Vinci* Network Online**

***OnSite* Session In Progress**

Figure 7 OnSite Connection Status Indicators

Note: Once the Ethernet cable is connected, it can take up to two minutes to detect the *da Vinci* network and update the status on the touchscreen.

Maintenance Mode

Note: *Intuitive Surgical* personnel can use Maintenance Mode only when they request it and are granted verbal permission by OR staff present with the *da Vinci* Surgical System.

Maintenance Mode is a state where *Intuitive Surgical* technical support personnel can connect remotely to the *da Vinci* System to perform diagnostic and troubleshooting operations.

When in Maintenance Mode, the *da Vinci* Surgical System ***is not for human use.***

Intuitive Surgical technician requests for this service requires facility staff to place the system in Maintenance Mode at an agreed-upon time.

Putting the System into Maintenance Mode

To put the system into Standby Mode, make sure the following conditions are met:

- All system components are connected to AC power
- Surgeon Console and Patient Cart system cables are connected to the Core

When the system is in Standby Mode, the power buttons on the Surgeon Console, Vision Cart, and Patient Cart are lit amber. When an Intuitive technician connects to the system, they have the option to power on the system in Maintenance Mode.

During an *OnSite* session in Maintenance Mode, the system displays:

Maintenance Mode - Not for Human Use

Remote Session in Progress

System Servicing/ Diagnostics

An example of an *OnSite* servicing capability that requires assistance and feedback from hospital personnel is when remotely testing the control and motion of the manipulators and robotic arms. Refer to the following illustration.

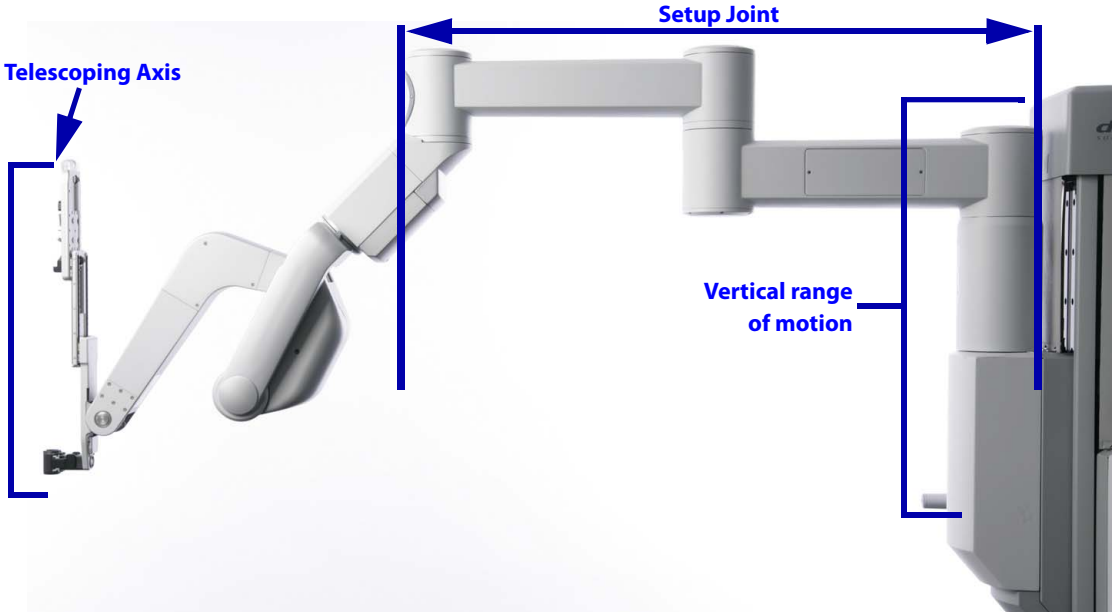


Figure 8 Setup Joint and Instrument Arm

The following list shows several diagnostic capabilities that an *Intuitive Surgical* field service technician can execute remotely when connected in Maintenance Mode via *OnSite*:

1. Test joints, internal sensors, and positioning potentiometers
2. Check condition of system switches and buttons
3. Check synchronization of system configuration
4. Modify system configurations
5. Perform arm motion and other diagnostic tests

6. Verify surgical instrument functionality
7. Check usage hour meter data

E.10 Wireless Connectivity Option

Wireless Overview

A wireless bridge is installed on the *da Vinci* Surgical System to enable the Wireless Connectivity Option. A hospital-supplied Wireless Access Point with Internet access is required to establish wireless connectivity.

Wireless Network Requirements

Intuitive Surgical field service personnel will install and configure the Wireless Connectivity Option. Below are the details of a suitable wireless network to support *da Vinci* wireless applications.

Specifications

- The Wireless Connectivity Option utilizes the IEEE 802.11 wireless standard using either 802.11b or 802.11g at 2.4 GHz Industrial, Scientific, and Medical (ISM) band.
- The Wireless Bridge operates as a client to the hospital-supplied Wireless Access Point, transmitting data back and forth between the hospital network and *da Vinci* applications.
- The Wireless Access Point must be located within 75 feet of the *da Vinci* Surgical System.

Security

- Wireless Network Infrastructure
  - *Intuitive* has tested the Wireless Connectivity Option in WPA2 pre-shared key mode with AES encryption, and recommends that the Wireless Connectivity Option is integrated into the hospital network using this security configuration.
- *OnSite* Software Application
  - The *OnSite* Software Application uses a Secure Socket Layer (SSL) session based on unique certificates on the *da Vinci* System and the *OnSite* server.
  - Data being transmitted from the *da Vinci* Surgical System to the server is 128-bit encrypted.

Quality of Service

- Wireless Bridge
  - Maximum latency of 50 ms between the Wireless Bridge and the hospital-supplied Wireless Access Point
  - Wireless Channel that has 20% or less utilization
- Overall Network
  - Maximum end-to-end packet loss of less than 10%
  - Network latency should not exceed 300 ms

Once successfully installed and configured, *Intuitive Surgical* field service personnel conduct an end-to-end functional test to ensure that *OnSite* functions as expected.

Note: After installation, *Intuitive Surgical* recommends that the hospital routinely monitor to ensure that the Wireless Channel does not exceed 20% utilization, and the latency between the Wireless Access Point and the Wireless Bridge does not exceed 50 ms. If either exceeds the specified levels, contact *Intuitive Surgical* Technical Support.

It is possible that the wireless network conditions might degrade over time or experience periods of disturbance; *da Vinci* applications have been designed to be robust to typical network disturbances, but if an issue persists, contact Technical Support for assistance to resolve the issue.

Note: *Intuitive Surgical* recommends that an active wired port be available when using the Wireless Connectivity Option. The configuration for the Wireless Connectivity Option provides a wired backup that the router will automatically activate when plugged in. Refer to E.11 OnSite Appendix A: IT Requirements for details on how to establish a wired connection.

Note: It is important to note that if the wireless network is modified or updated after the Wireless Connectivity Option is installed, its suitability to support the wireless applications should be re-assessed. In particular, contact Technical Support if any of the following changes are planned or have occurred.

- If the Wireless Access Point or *da Vinci* Surgical System is moved from the location where it resided during installation
- If the Wireless Access Point is replaced with a new make or model

Wireless Coexistence

Wireless coexistence with other devices that transmit in the 2.4 GHz range is a concern since it can impact the reliability of the wireless link. This section summarizes testing conducted by *Intuitive Surgical* in an environment with other wireless devices representative of a typical Operating Room to demonstrate that the Wireless Connectivity Option functioned as expected. The test setup represented the worst case *da Vinci* Surgical System setup, and the position of the common wireless devices was defined to ensure that they were located near the Wireless Connectivity Option or the Wireless Access Point, and the path between the transmitter and receiver for most paired devices passed through the signal path between the Wireless Connectivity Option and the Wireless Access Point. Testing was conducted with a wireless network that satisfied the characteristics identified in Wireless Overview, page 9.

The Wireless Access Point used during the testing was the Cisco Aironet 1240AG Series. The Aironet 1240AG Series was configured to operate as a typical Access Point, and therefore Wireless Access Points from other vendors should result in the same performance. Note that the characteristics for a suitable wireless network are summarized in Wireless Overview, and *Intuitive Surgical* field service personnel will confirm the wireless network is functioning as expected after installation. A complete list of the common wireless devices used during the testing (along with details on position, orientation, and type of data transmission) is summarized in the table in Common Wireless Devices Tested, page 11.

Note: If different types of wireless devices will be used in the Operating Room, or if the wireless devices are used in different locations than what is described below, then *Intuitive* recommends that performance is tested with the wireless devices active, before use. If you encounter issues using the Wireless Connectivity Option in the presence of other wireless devices in the Operating Room, contact *Intuitive Surgical* Technical Support.

Note: The wireless coexistence testing conducted by *Intuitive* does not cover use in the presence of MRI or diathermy machines. The Wireless Connectivity Option should not be used in the vicinity of these devices.

Common Wireless Devices Tested

Common Wireless Devices	Disturbance Details	Test Setup
Wireless Monitor	IOGear Model: GUW2015V (receiver) GUWA200 (transmitter) 3.1 GHz to 4.8 GHz Certified wireless USB RF Modulation: QPSK/DCM; Data Rate: 480 Mbps	Transmitter attached to a desktop PC located 50 inches away from the wireless bridge, and receiver attached to a monitor on the boom. Desktop PC oriented so the transmitter has clear line of sight to the receiver attached to the monitor, and PC streaming 720p video.
Smart Phone/Device	2 iPhone4 (3G and 2.4 GHz wireless) Samsung (2.4GHz wireless)	One iPhone4 sitting on the arm rest of the Surgeon Console paired with a Bluetooth headset with a phone call in progress. The iPhone is also connected to the WAP. The second iPhone4 is paired with the Bluetooth speaker. Samsung phone in the room 72 inches away from a paired Bluetooth headset worn by someone at the patient side.
Laptops with wireless	802.11 b; 2.4 GHz	Two Dell laptops connected to the WAP on the same channel as the Wireless Bridge, with one laptop streaming a video over the network from YouTube. The laptops are approximately 90 inches away from the Wireless Bridge.
Wireless keyboard and mouse	Microsoft Wireless Desktop – Keyboard and Mouse 7000: 2.4 GHz range(2,400 – 2,483.5 MHz) FCC IDs C3K1345, C3K1142 and C3K1123	Wireless keyboard and mouse interfaced with one of the desktop computers, and physically sitting on top of the Vision Cart, 55 inches apart.
Bluetooth keyboard	Microsoft Bluetooth Mobile Keyboard 6000 2.4 GHz range(2,400 – 2,483.5 MHz) FCC ID C3K1390	Keyboard interfaced with one of the desktop computers, and physically sitting on top of the Vision Cart, 55 inches apart.
Bluetooth headset #1	2.402-2.480 GHz range	Jawbone headset paired with the iPhone4, worn by the surgeon at the Surgeon Console and used during the phone call.

Common Wireless Devices	Disturbance Details	Test Setup
Bluetooth headset #2	2.402-2.480 GHz range	Bluetooth headset paired with a Samsung phone, located on the operating room bed, 72 inches apart, with a call active.
Bluetooth Speaker	Creative D100 Wireless; FCC ID IBAMF8090 2.402-2.480 GHz range	iPhone4 paired with the Bluetooth speaker playing music located on the operating room bed, 72 inches apart.
Cordless Telephone	Uniden 2.4 GHz Amplified Cordless Phone System (Clarity-4205)	Phone base is on the desk, and the phone is on the other side of the room, with the base and phone continuously communicating.
Microwave Oven	MagicChef Model MCD11E3W Output Frequency 2450 MHz; FCC ID C5F7NF1AMO100N	In the coexistence test, the microwave oven is placed in the signal path between the Wireless Bridge and the WAP, 20 feet away from the WAP. The Wireless Bridge and WAP are operating at maximum distance in this test. In the isolated test with the microwave oven, it is placed in the signal path between the Wireless Bridge and the WAP at a distance where no impact is observed, and then the Wireless bridge is moved closer until the connection is dropped. Wired connection is then established. In both test cases, the microwave oven is oriented such that the seams in the door are pointing toward the Wireless Bridge and the Wireless Access Point.
RFID tags	Reader: TagMaster LR-3 Pro (PN 154400) 2.435 to 2.465 GHz range ID-Tags: TagMaster S1255 MarkTag and S1240 MarkTag MeM 2.435 to 2.465 GHz range	RFID was tested by placing the Reader and the ID-tags on each side of the signal path, between the Wireless Bridge and the Wireless Access Point. In the coexistence test case, the tags and reader were 30 inches apart. During the isolated test with the RFID setup, they were 36 inches apart in the worst case configuration.
Electrosurgical Unit	Covidien (formerly ValleyLab) Force FX (GSTElectro02) 390 kHz	Located in the Vision Cart, which is placed as close to the Surgeon Console as possible.

Devices Known to Interfere

Microwave Oven

Testing conducted by *Intuitive Surgical* determined that microwave ovens can disrupt wireless communication in certain configurations:

- *Intuitive Surgical* recommends keeping microwave ovens (1000 Watt) at least 25 feet from the Wireless Bridge or Wireless Access Point, especially if it is located in the signal path. Higher wattage microwaves should be placed at larger distances.
- If a microwave oven causes interference, use the wired backup to correct the problem.

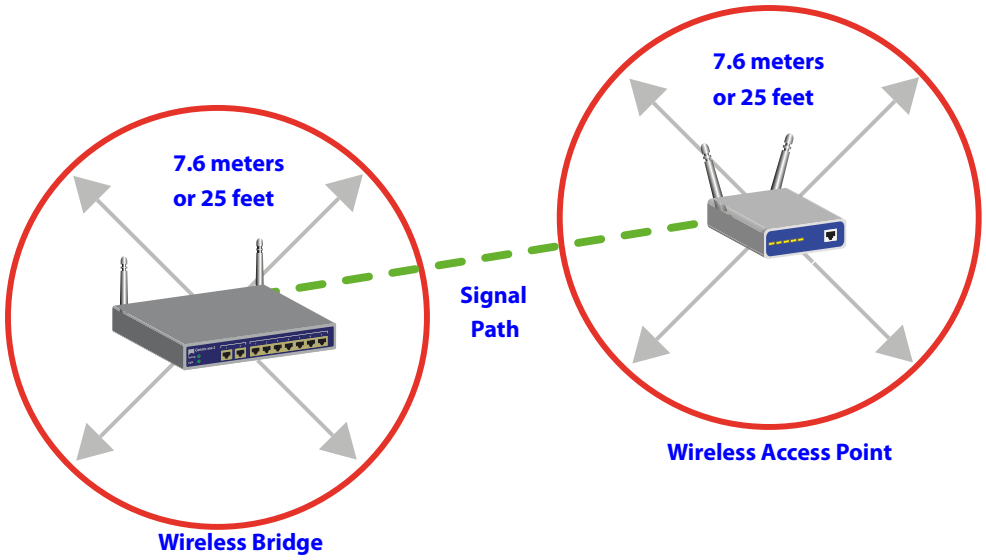


Figure E.1 Placement boundaries for microwave ovens

RFID Reader (2.4 GHz)

Testing conducted by *Intuitive Surgical* determined that RFID readers operating in frequency hopping mode, or configured to operate at a frequency that overlaps the channel being used by the wireless bridge and the WAP, will cause minor network disturbances.

To eliminate the interference, *Intuitive Surgical* recommends the following:

- The RFID reader not operate in frequency hopping mode if it is being used in the same room as the Wireless Connectivity Option.
- A separation of a least 4 MHz exists between the frequency range of the channel being used by the wireless bridge/WAP and the operating frequency of the RFID reader. For example, a wireless bridge/WAP operating on channel 10 spans 2.446 – 2.468 GHz; therefore, to avoid disturbances from the RFID reader, its operating frequency should be less than or equal to 2.442 GHz or greater than or equal to 2.472 GHz.

Figure 6 Valid RFID Reader Operating Frequencies

Note that RFID devices can operate outside the frequency range of what was included in the testing summarized above. If RFID devices operating outside the range shown above exist in the operating room, *Intuitive Surgical* recommends that performance is tested with the RFID device active, before use.

Addressing Wireless Connectivity Problems

If you encounter connectivity problems while using the Wireless Connectivity Option, *Intuitive* recommends you do the following:

- Determine if a device transmitting in the 2.4 GHz range is in the room, and if so, disable the device to see if it resolves the connectivity problems.
- If you experience several disconnections, and the above step did not resolve the issue, or if the interfering device must be used, then establish a wired network connection with the *da Vinci* Surgical System (see Wired Network Connection for more information).

E.11 OnSite Appendix A: IT Requirements

Internet Access

The network security device that will be integrated into the *da Vinci* Surgical System requires Internet access to contact servers at *Intuitive Surgical*.

Intuitive Surgical requires a wired RJ45 Ethernet 10bT/100bT network drop and/or a wireless 802.11 network with Internet access in the OR where the facility's *da Vinci* Surgical System is used. If your *da Vinci* Surgical System is used in multiple locations, then *Intuitive Surgical* requests that be made available in each location.

OnSite is compatible with both DHCP and static networking addresses.

Proxy Server

OnSite is compatible with most proxy servers. In some instances proxy authentication maybe required to be by-passed.

Firewall

OnSite requires outbound port 443 open.

Network Topology

OnSite requires a minimum amount of bandwidth to post log files (generally less than 1 MB per day).

E.12 OnSite Appendix B: Electromagnetic Compatibility

The essential performance for *da Vinci* Wireless Connectivity during EMC testing was defined as follows during any of the required tests:

- No component failures
- Video quality exceeded pre-defined metric demonstrating that the video quality was not impacted
- Audio script test passed demonstrating that the audio link was not impacted
- No changes in programmable parameters
- No resets to factory defaults
- No change in operating mode
- No false alarms
- No initiation of any unintended operation
- No cessation or interruption of any intended operation

Exception: For Voltage Dips and Interrupts, acceptance criteria is no component failures and is restorable to the pre-test state with operator intervention. For Radiated Immunity in the band 2.0 - 2.5GHz, acceptance criteria is no component failures and is restorable to the pre-test state with operator intervention, and restorable during test with a hard-wired connection.

The *da Vinci* Surgical System complies with IEC60601-1-2:2001, General Requirements for safety – Collateral standard: Electromagnetic compatibility. Special precautions and installation information for the *da Vinci* Surgical System for electromagnetic compatibility (EMC) are provided in the following section.

Use only *Intuitive Surgical*-branded interconnection cables and accessories. Performance of cables or accessories other than those specified by *Intuitive Surgical* as replacement parts for internal components cannot be guaranteed. Any resulting damage to the system will not be covered under warranty.

Equipment in the operating room, including the *da Vinci* Surgical System and other portable or mobile communications equipment, can produce Electromagnetic Interference (EMI), which may affect the function of these devices. Such effects are prevented by use of equipment with EMI characteristics proven below recognized limits, as identified in the below tables.

In the event of suspected interference from other equipment, which prevents the proper functioning of the *da Vinci* Surgical System, contact *Intuitive Surgical* and/or discontinue use of the system until the problem can be remedied.

The following Tables contain the Manufacturer's declaration and additional information required by IEC60601-1-2:2001.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Table 1: Manufacturer's Declaration – Electromagnetic Emissions

The *da Vinci* Surgical System is intended for use in the electromagnetic environment specified below. The customer or the user of the *da Vinci* Surgical System should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment – Guidance
RF emissions CISPR 11	Group 1	The *da Vinci* Surgical System uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic environment.
RF emissions CISPR 11	Class A	The *da Vinci* Surgical System is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Table 2: Manufacturer's Declaration – Electromagnetic Immunity			
The *da Vinci* Surgical System is intended for use in the electromagnetic environment specified below. The customer or the user of the *da Vinci* Surgical System should assure that it is used in such an environment.			
Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment Guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for power supply lines ±1 kV for input/ output lines	Mains power quality should be that of a U.S. commercial or hospital environment with highly reliable service.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a U.S. commercial or hospital environment with highly reliable service.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec.	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec.	Mains power quality should be that of a U.S. commercial or hospital environment with highly reliable service. If the user of the *da Vinci* Surgical System requires continued operation during power mains interruptions, it is recommended that the *da Vinci* Surgical System be powered from an uninterruptedly power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: UT is the AC mains voltage before application of the test level.			

Table 3: Manufacturer's Declaration – Electromagnetic Immunity			
The *da Vinci* Surgical System is intended for use in the electromagnetic environment specified below. The customer or the user of the *da Vinci* Surgical System should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidance**
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 Vrms 3V/m	Portable and mobile RF communications equipment should be used no closer to any part of the *da Vinci* Surgical System, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 
Note 1: At 80 MHz and 800 MHz, the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people. a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the *da Vinci* Surgical System is used exceeds the applicable RF compliance level above, the *da Vinci* Surgical System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orientating or relocating the *da Vinci* Surgical System. b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Table 4: Recommended separation distances between portable and mobile RF communications equipment and the *da Vinci* Surgical System			
The *da Vinci* Surgical System is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the *da Vinci* Surgical System can help prevent electromagnetic interferences by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the *da Vinci* Surgical System as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter W	**Separation distance according to frequency of transmitter m**		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. Note 1: At 80 MHz to 800 MHz, the separation distance for the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.			

Table 5: Compliance Information	
Network Router:	CAN/CSA-C22.2 No 60950-1-03 ANSI/UL Std No 60950-1 1st Ed.
Wireless Bridge: * Wireless Data Rate	802.11b/g: 2.4-2.4835 GHz 802.11b/g: 2.4-2.4835 GHz
* See OnSite Appendix C: Wireless Bridge Data on page 20 for more information	

E.13 OnSite Appendix C: Wireless Bridge Data

UBIQUITI NETWORKS

NanoStation loco

NS2L DATASHEET

SYSTEM INFORMATION	
Processor Specs	Atheros MIPS 4KC, 180MHz
Memory Information	16MB SDRAM, 4MB Flash
Networking Interface	1 X 10/100 BASE-TX (Cat. 5, RJ-45) Ethernet Interface

REGULATORY / COMPLIANCE INFORMATION	
Wireless Approvals	FCC Part 15.247, IC RS210, CE
RoHS Compliance	YES

RADIO OPERATING FREQUENCY 2412-2462 MHz

TX SPECIFICATIONS			
	DataRate	TX Power	Tolerance
802.11b	1Mbps	20 dBm	+/-1dB
	2Mbps	20 dBm	+/-1dB
	5.5Mbps	20 dBm	+/-1dB
	11Mbps	20 dBm	+/-1dB
802.11g OFDM	6Mbps	20 dBm	+/-1dB
	9Mbps	20 dBm	+/-1dB
	12Mbps	20 dBm	+/-1dB
	18Mbps	20 dBm	+/-1dB
	24Mbps	20 dBm	+/-1dB
	36Mbps	18 dBm	+/-1dB
	48Mbps	16 dBm	+/-1dB
	54Mbps	15 dBm	+/-1dB

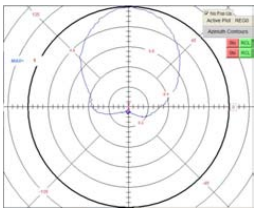
RX SPECIFICATIONS			
	DataRate	Sensitivity	Tolerance
802.11b	1Mbps	-95 dBm	+/-1dB
	2Mbps	-94 dBm	+/-1dB
	5.5Mbps	-93 dBm	+/-1dB
	11Mbps	-90 dBm	+/-1dB
802.11g OFDM	6Mbps	-92 dBm	+/-1dB
	9Mbps	-91 dBm	+/-1dB
	12Mbps	-89 dBm	+/-1dB
	18Mbps	-88 dBm	+/-1dB
	24Mbps	-84 dBm	+/-1dB
	36Mbps	-81 dBm	+/-1dB
	48Mbps	-75 dBm	+/-1dB
	54Mbps	-72 dBm	+/-1dB

ADJUSTABLE CHANNEL SIZE SUPPORT		
5MHz	10MHZ	20MHz

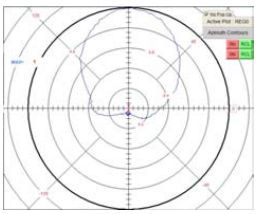
RANGE PERFORMANCE	
Outdoor (BaseStation Antenna Dependent):	Over 5km

ANTENNA

Gain	8dBi (2400-2500MHz)	Surival Wind	216 km /hr
Polarization	Multi-Polarized	3dB Beamwidth Elevation	60 degrees
Polarization Selection	Software Controlled	3dB Beamwidth Azimuth	60 degrees



Azimuth



Elevation

PHYSICAL / ELECTRICAL / ENVIRONMENTAL	
Enclosure Size	16.3 cm. length x 3.1 cm. height x 8cm. width
Weight	0.18kg
Enclosure Characteristics	Outdoor UV Stabalized Plastic
Mounting Kit	Pole Mounting Kit included
Max Power Consumption	4 Watts
Power Supply	12V, 1A (12 Watts). Supply and injector included
Power Method	Passive Power over Ethernet (pairs 4,5+; 7,8 return)
Operating Temperature	-20C to +70C
Operating Humidity	5 to 95% Condensing
Shock and Vibration	ETSI300-019-1.4

SOFTWARE

AirOS™ by Ubiquiti Networks

visit www.ubnt.com/airos

UBIQUITI NETWORKS 495-499 Montague Expwy. Milpitas, CA 95035 CA 95035 T(408)-942-3085 F (408)-351-4973 http://www.ubnt.com

End of Section

F Appendix F: 8.5 mm Endoscope for the *da Vinci Si* System

This section provides details specific to the 8.5 mm 3D endoscope system designed to be used with the *da Vinci Si* Surgical System. It augments the information within this manual regarding endoscopes, especially under Endoscopesin section 7.1 Vision System Overview. Users should consider the following:

- Users should have a thorough understanding of the use of the 12 mm endoscope system in conjunction with the *da Vinci Si* Surgical System before using the 8.5 mm endoscope and components. This section contains important information about the differences between the 8.5 mm and 12 mm endoscopes and components.

WARNING: Be sure to read and understand all caution and warning information found in this manual before using this product.

Indications for Use

The *Intuitive Surgical* 8.5 mm Endoscopic System is intended for endoscopic viewing of internal surgery sites during minimally invasive surgery in the peritoneal cavity, thoracic cavity, and peritoneum. It is designed for use with the *Intuitive Surgical da Vinci Si* Instrument Control System during laparoscopic and thoracoscopic surgical procedures.

F.1 Overview

The 8.5 mm endoscope provides a 3D view of the operative field when used with the *da Vinci Si* High Definition Vision System. The small diameter of the 8.5 mm endoscope enables the *da Vinci Si* Surgical System to be used with a smaller endoscope port. While the system is not docked, you can use the 8.5 mm endoscope for laparoscopy through a *da Vinci* 8 mm instrument cannula.

Figure F.1 Using the 8.5 mm endoscope manually

The 8.5 mm endoscope uses a three-piece system concept (endoscope, adapter and camera). The 8.5 mm endoscope is compatible with the High Definition cameras, illuminators and light guides provided with the *da Vinci Si* Surgical System. The 8.5 mm endoscope is available in straight (0°) and angled (30°) tip configurations.

Special considerations for the 8.5 mm endoscope include:

- While the system is docked, the 8.5 mm endoscope requires use of the 8.5 mm Endoscope Cannula or a validated third-party endoscope cannula. Refer to the list of Validated 3rd Party Products for *da Vinci*® Surgical Systems (PN 871770).
- The 8.5 mm endoscope requires use of the 8.5 mm Alignment Target.
- The 8.5 mm endoscope is approximately 90 mm shorter than the 12 mm endoscope.
- The 8.5 mm endoscope tip is not heated.
- The 8.5 mm endoscope is more flexible than the 12 mm endoscope. Therefore, special care in the setup and handling of the 8.5 mm endoscope is required.
- To prevent damage during reprocessing, we strongly recommend you place the endoscope in a properly designed sterilization tray or case, like those we identify in the list of Suggested 3rd Party Products for *da Vinci*® Surgical Systems (PN 871771)
- The 8.5 mm endoscope has lower resolution and less brightness than the 12 mm endoscope.

⚠ **CAUTION: The 8.5 mm endoscope should only be used in cases where the image quality of the 12 mm endoscope is not required. A 12 mm endoscope should be available for use if an increase in image quality is preferred.**

F.2 Working with the 8.5 mm Endoscope

The 8.5 mm endoscope uses the same camera arm and camera head drapes as the 12 mm endoscope. However, the 8.5 mm endoscope requires a specific alignment target and endoscope cannula. The 8.5 mm endoscope, alignment target and cannulae are clearly marked **"8.5 mm"** (see Figure F.2 for examples below).

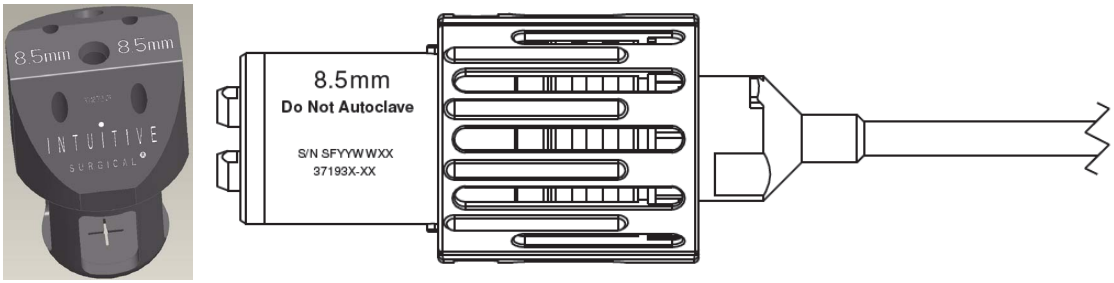


Figure F.2 "8.5 mm" marking on alignment target and endoscope

The following table provides the compatible combinations of reusable cannula, cannula mount and alignment target for use with the 8.5 mm endoscope on *da Vinci Si* Surgical Systems. For a list of disposable endoscope cannulae validated by Intuitive Surgical, refer to the list of Validated 3rd Party Products for *da Vinci*® Surgical Systems (PN 871770).

Table F-1 Compatible combinations of reusable cannula

Alignment Target	Endoscope Cannula Mount	Reusable Endoscope Cannula
371679	371521 (ETH/TAUT)	420260

Refer to appropriate sections of this user manual for general instructions regarding endoscope alignment and setup, including connections to the other components of the Vision System and to the camera arm of the Patient Cart. Refer to the Reprocessing Instructions for compatible sterilization methods and parameters for the 8.5 mm endoscopes.

_____End of section_____

G Appendix G: Symbols, Icons and Text Messages Reference

G.1 Overview

This appendix provides a reference for symbols, LEDs (colored lights), icons and text messages you may see on system components or monitors.

Symbols

Symbols appear on system components and serve these purposes:

- Identification of important system connections and functions
- Provide caution and warning information

LED Status Indicators

Indications of the status of the instrument and camera arms are provided by LEDs on the top of the insertion axis of each instrument and camera arm. The meanings of the colors are as follows:

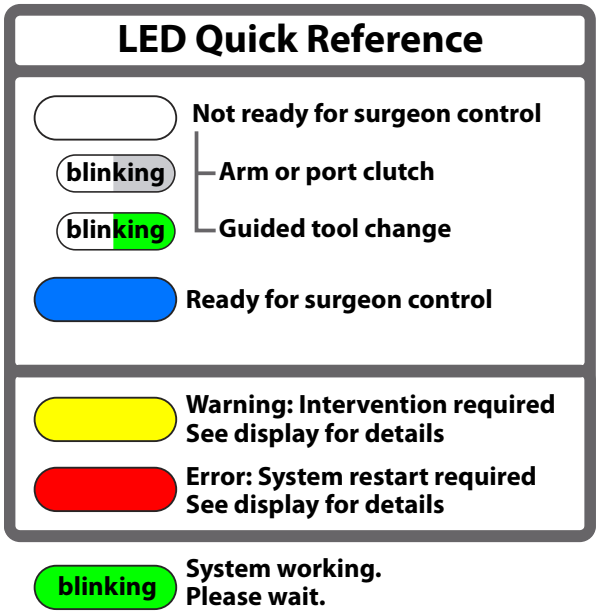


Figure G.1 LED Quick Reference

Corresponding LED icons—graphics that reproduce the LED status—appear simultaneously on the touchscreen and stereo viewer.

On-Screen Icons and Text Messages

Icons and text messages are overlaid on the video displays to provide information regarding the status of the system. The following figures illustrate arrangement of overlaid elements in the stereo viewer and touchscreen displays. Note that many overlaid elements appear only when needed, and others are usually or always present.

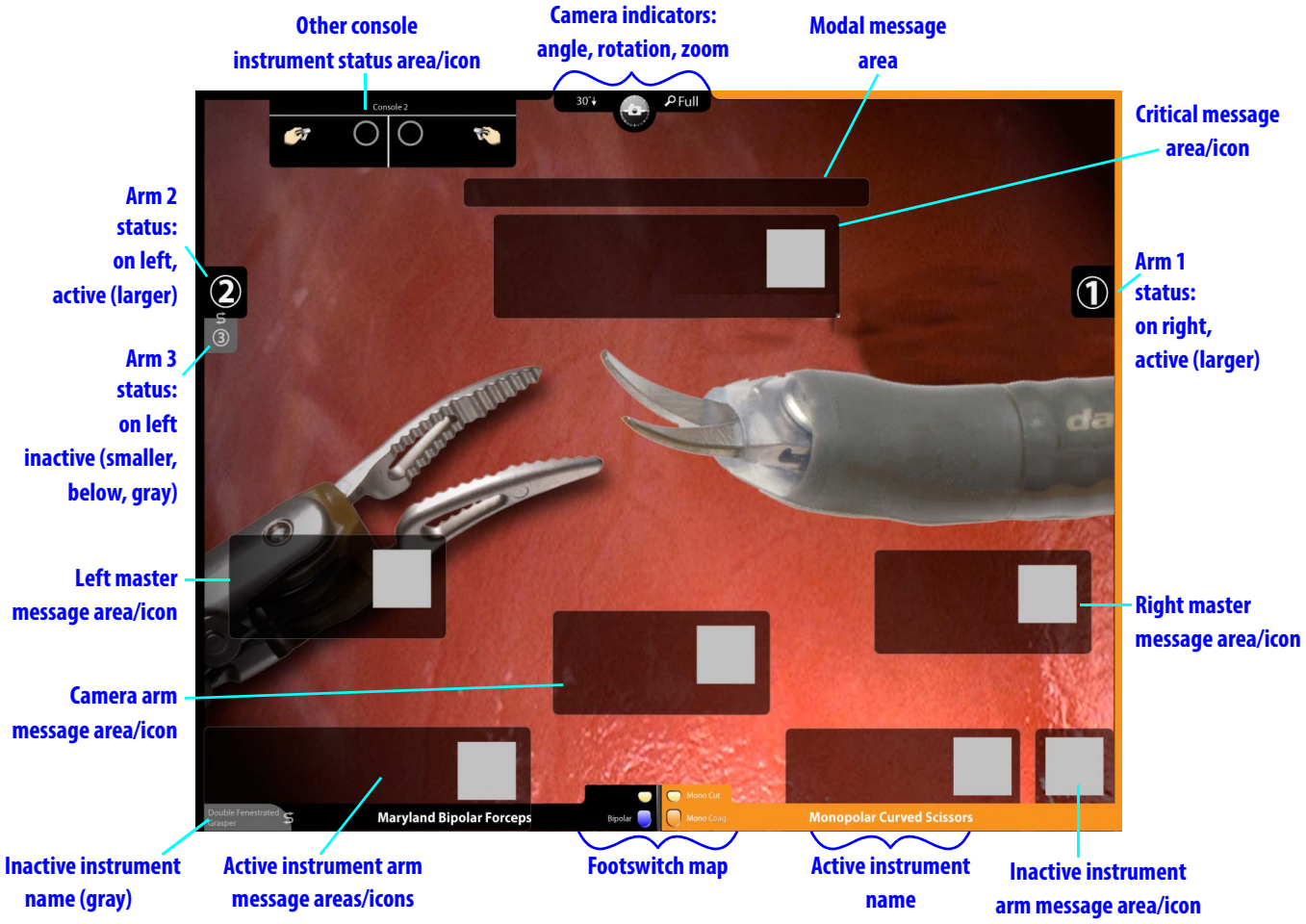


Figure G.2 Stereo viewer display (SmartPedal technology)

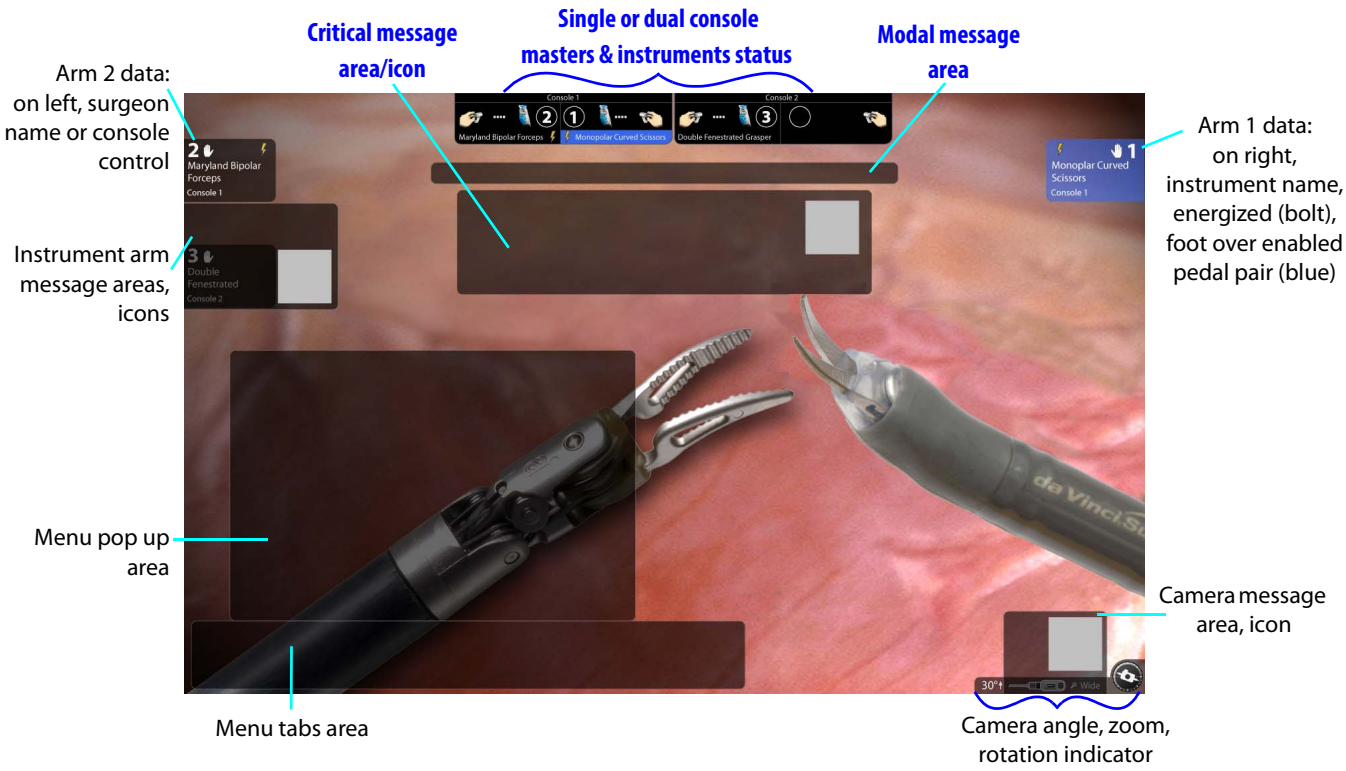


Figure G.3 Touchscreen display

G.2 Symbols and Icons Reference Table

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
 or 	Read the operating instructions.	System component labels
	Type CF Applied Part	On camera head and instruments
	Type BF Applied Part	On Illuminator. Note: The *da Vinci Si* camera head provides isolation in accordance with a CF applied part and is acceptable for use with the Y1903 Illuminator.
	Caution: Hot	Illuminator lamp module

Table G-1 Symbols and Icons

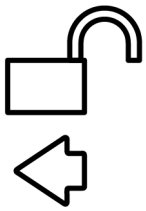
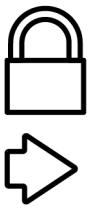
Symbol or Icon	Meaning	Where Found
	Protective ground	Inside (not visible to users) the Camera Control Unit, Core, Vision Cart, Patient Cart and Surgeon Console
	Vision Setup button	Camera head
	Focus In, Focus Out buttons	Camera head
	Lamp On/Off button	Camera head
	Flush Port	On instruments adjacent to flush port
	30 degrees up, indicates which side of scope should be on same side as camera head buttons to achieve this scope orientation.	On one side of endoscope base
	30 degrees down, indicates which side of scope should be on same side as camera head buttons to achieve this scope orientation.	On one side of endoscope base
	Turn as indicated to unlock.	Camera head and endoscope
	Turn as indicated to lock.	Camera head and endoscope

Table G-1 Symbols and Icons

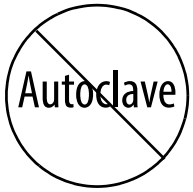
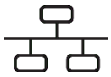
Symbol or Icon	Meaning	Where Found
	Do not autoclave.	Endoscope and camera head
	Fragile, handle with care	Endoscope
	Ethernet Connection	Inside Surgeon Console service panel and rear of Patient Cart
	Alternating Current	On product labels containing rating information on rear of Patient Cart, Surgeon Console and Vision Cart
	Equipotential Terminal	Rear of Surgeon Console, Patient Cart, Vision Cart, Camera Control Unit, Illuminator and Core. Note: The terminal is not required for operation. It is provided for convenience to allow for other equipment to be at the same equalization potential as the *da Vinci* Surgical System.
	Serial Port Connection	Inside Surgeon Console service panel and rear of Patient Cart
	Standby—found on **Power** buttons of Vision Cart, Patient Cart and Surgeon Console, lit amber when in standby mode (connected to mains but not powered on), blue when powered on.	Power buttons on Patient Cart, Vision Cart, Surgeon Console and Core
	Off (power: disconnection from mains)	Rear of Patient Cart, Vision Cart and Surgeon Console, Illuminator, Camera Control Unit and Core
	On (power: connection to mains)	Rear of Patient Cart, Vision Cart and Surgeon Console, Illuminator, Camera Control Unit and Core
DVI	DVI video port	Back of Core and back of Surgeon Console

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
Composite	Composite video ports	Back of Core
S-Video	S-Video port	Back of Core and back of Surgeon Console
SDI	SDI video port	Back of Core and back of Surgeon Console
Audio	Audio bay, green	Back of Core and back of Surgeon Console
L	Left	Back of Core and back of Surgeon Console
R	Right	Back of Core and back of Surgeon Console
Core Video	Core Video port	Back of Core and back of CCU
Illuminator Control	Illuminator control ports	Back of CCU
Core Control	Core control ports	Back of CCU
Video Control	Video control ports	Back of Core
Touch Screen Audio	Touchscreen audio connection port	Back of Core
Touch Screen Video	Touchscreen video connection ports	Back of Core
Touch Screen Com	Touchscreen communication ports	Back of Core
SERVICE	Service connection ports	Back of Core
Headset	Headset connection port	Back of Core and back of Surgeon Console
Line In	Audio line in port	Back of Core and back of Surgeon Console
Line Out	Audio line out port	Back of Core and back of Surgeon Console
Video Out	Video out bay, orange, labeled either "**Aux**" for auxiliary (on Core); **L** (left) and **R** (right) (on Surgeon Console); or **1** and **2** (optional bays on Core)	Back of Core and back of Surgeon Console
TilePro Input	Video in bay, blue	Back of Core and back of Surgeon Console

Table G-1 Symbols and Icons

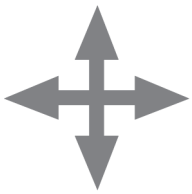
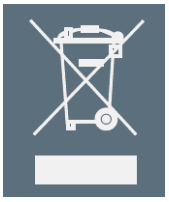
Symbol or Icon	Meaning	Where Found
FIBER	Fiber cable (system cable) receptacle	Next to fiber cable receptacles on back of Core
BRAKE	Indicates the brakes on the Surgeon Console, applied by stepping down.	Both sides of Surgeon Console, near floor
PUSH	Indicates where to push the Surgeon Console.	Both sides of Surgeon Console, near handles
	Master clutch	Clutch pedal on footswitch panel
	Instrument arm swap	Arm swap kick-plate (left side) on footswitch panel
	Do not step here.	On Patient Cart base
	Tip hazard during transport. Stow touchscreen and close rear door before moving cart.	On label on rear door of Vision Cart
	Do not move Surgeon Console from the back.	Back of Surgeon Console
	Dispose of in accordance with local regulations—particularly applies to electronic components.	System labels

Table G-1 Symbols and Icons

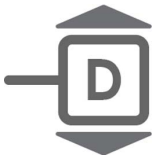
Symbol or Icon	Meaning	Where Found
	Fiber cable (system cable) receptacle	Next to system cable receptacles on back of Core, Surgeon Console and Patient Cart
	Caution: Laser hazard	On blue covers of system cable receptacles on Core, Surgeon Console and Patient Cart
	Video output format of associated output ports is configurable via the touchscreen. On Video Settings tab, select Video Output button.	Back of Core, with connection bays
	Energy activation cable connection port	Back of Core
	Video out bay, left video channel; video has no overlays. This is component video, made up of Y (green port), P_R (red port) and P_B (blue port). A similar label appears for the right video channel.	Back of Camera Control Unit (CCU)
	Surgeon head-in sensor	Surgeon Console viewer
	Indicates forward and reverse for the Patient Cart motor drive	Right tiller handle
	Indicates range of speed for the Patient Cart motor drive	Right tiller handle

Table G-1 Symbols and Icons

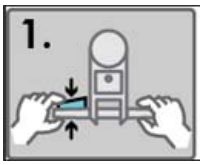
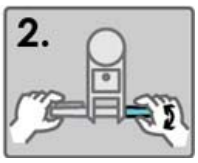
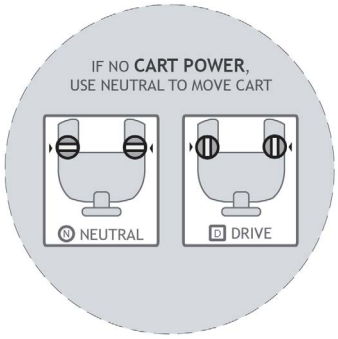
Symbol or Icon	Meaning	Where Found
	Shows use of throttle enable switch	Between the tiller handles
	Shows use of throttle	Between the tiller handles
	Explains N=Neutral and D=Drive positions for the motor drive shift switches. Includes text, "IF NO **CART POWER**, USE NEUTRAL TO MOVE CART"	Top of Patient Cart motor drive tiller.
	"Sweet Spot" label: Its limits indicate recommended distance range of Camera Arm remote center from Patient Cart tower	Camera Arm setup joint
	"Drive" position: Patient Cart drive motor engaged	Patient Cart base near motor shift switches
	"Neutral" position: Patient Cart drive motor disengaged	Patient Cart base near motor shift switches
	Brake release	Near upper port clutch button on instrument and camera arms

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Pinch/Crush Hazard	On Patient Cart, below upper port clutch button and at junction of setup joint and top of column on instrument and camera arms; on Surgeon Console
EPO	Emergency Power Off	Rear of Patient Cart
	Interference may occur in the vicinity of equipment marked with this symbol.	Not used on IS3000 system but may appear on other equipment in the OR
	Speaker connection port	Back of Core
	Microphone connection port	Back of Core
	The system is preparing to shut down. A message indicating the number of seconds until shut down appears in the body text area.	Critical message area
	General information icon. Appears when the system is providing information that is not fault-related.	Critical message area Camera arm message area
	General warning / recoverable fault. Appears when the system detects a recoverable fault somewhere within the system not associated with a particular arm or master.	Critical message area Touchpad popup dialog Touchpad error handling area

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	General critical warning / non-recoverable fault. Appears when the system detects a non-recoverable fault somewhere within the system not associated with a particular arm or master.	Critical message area Touchpad error handling area Can also appear by itself on the touchscreen and touchpad when a critical startup error has occurred
	Scope not detected. Appears when the system does not detect an endoscope and the user is attempting to go into following.	Critical message area Touchpad popup dialog
	Guided tool change in progress	Instrument arm message area
	The system has detected a problem with the instrument. This can appear when the instrument is expired, when the instrument is incompatible with the system, when the system is not prepared to have an instrument installed on it, or when the system is having difficulty communicating with the instrument.	Instrument arm message area
	General informational icon related to the instrument. This can appear when the system is downloading new instrument information from a plug-and-play instrument.	Instrument arm message area
	Camera arm is currently clutched and is free to be moved by OR staff around its remote center.	Camera arm message area

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Instrument arm is currently clutched and is free to be moved by OR staff around its remote center.	Instrument arm message area
	The system has detected a non-recoverable fault on the left master.	Left master message area
	The system has detected a non-recoverable fault on the right master.	Right master message area
	The system has detected a non-recoverable fault on an instrument arm.	Instrument arm message area
	The system has detected a non-recoverable fault on the camera arm.	Camera arm message area
	Move the right master grips to match the instrument grips (i.e., “Follow on matching grip”).	Right master message area

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Move the left master grips to match the instrument grips (i.e., "Follow on matching grip").	Left master message area
	The system has detected a recoverable fault or other resolvable problem on the left master.	Left master message area
	The system has detected a recoverable fault or other resolvable problem on the right master.	Right master message area
	The system has detected a recoverable fault or other resolvable problem on an instrument arm.	Instrument arm message area
	The system has detected a recoverable fault or other resolvable problem on the camera arm. In dual console mode, appears when camera control pedal is pressed on other console, explaining why instruments stop moving and firing.	Camera arm message area Above footswitch map when camera control pedal is pressed on other console.
	The instrument tip is still inside the cannula. To continue, you must clutch the instrument arm and advance the tip into the body.	Instrument arm message area

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	The system has detected excessive force on an instrument arm. This normally means that some external object is pushing on an arm.	Instrument arm message area
	This instrument arm is locked; unlock it via the touchpad to use.	Instrument arm message area
	Hit the arm swap pedal to use the instrument in question.	Instrument arm message area
	The system has detected a problem with a cannula.	Instrument arm message area
	Relax your grip on the left master so that it can self-align.	Left master message area
	Relax your grip on the right master so that it can self-align	Right master message area

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Roll the left master grip to proceed.	Left master message area
	Roll the right master grip to proceed.	Right master message area
	Your instruments have been reassigned. Tap 'Arm Swap' pedal to acknowledge and continue.	Critical message area Touchscreen instrument arm status area Dual console instrument status area (touchpad and touchscreen)
	The instrument arm is conducting its self test.	Instrument arm message area
	The camera arm is conducting its self test.	Camera arm message area
	The left master is conducting its self test.	Left master message area

Table G-1 Symbols and Icons

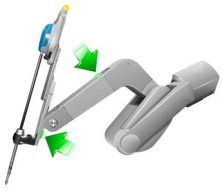
Symbol or Icon	Meaning	Where Found
	The right master is conducting its self test.	Right master message area
	Select the desired motion scaling level.	Touchpad popup menu
	The ergonomic settings are being adjusted.	Critical message area
	Setup arm has been moved unexpectedly; press one of the port clutch buttons to continue.	Instrument or camera arm message area
	Energy activation is currently unavailable. Energy may be unavailable because the instrument installed is not an energy instrument or because no compatible ESU for the installed instrument is detected.	Touchscreen instrument arm status area 3D viewer instrument arm status area
	Energy activation is currently available.	Touchscreen instrument arm status area 3D viewer instrument arm status area

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	No scope is detected.	Touchscreen camera status area Touchpad central column on main page (shown vertically)
	Scope detected. This icon is accompanied by 30°↑, 30°↓, or 0°.	Touchscreen camera status area Touchpad central column on main page (shown vertically)
	Digital Zoom. This icon is accompanied by one of the following zoom levels: • Wide • Full • 2x • 4x	Touchscreen camera status area. Touchpad central column on main page
	Indicates which manipulator is currently associated with the surgeon's right hand.	Touchscreen instrument arm status area Touchpad instrument arm status area
	Indicates which manipulator is currently associated with the surgeon's left hand.	Touchscreen instrument arm status area Touchpad instrument arm status area
TilePro 1	Indicates TilePro input 1.	Button on touchscreen display
TilePro 2	Indicates TilePro input 2.	Button on touchscreen display

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Camera	Button on touchscreen display (for selecting endoscopic camera view) Camera control foot pedal Touchscreen master status area (shown when Surgeon Console is in camera control)
	Surgeon Console	Button on touchscreen display (for selecting "surgeon's TilePro view")
	Electronic brightness control (does not affect Illuminator light output).	Touchscreen and touchpad displays
	Increase setting.	Touchscreen display buttons; can be used as an alternative to sliders
	Decrease setting.	Touchscreen display buttons; can be used as an alternative to sliders
	Close tab menu.	Touchscreen display; used to close the tab menu
	Mute microphone.	Touchscreen and touchpad displays; used to mute the local microphone (touchpad version mutes the Surgeon Console microphone and touchscreen version mutes the Vision Cart microphone)
	Enable microphone.	Touchscreen and touchpad displays; used to enable the local microphone (touchpad version enables the Surgeon Console microphone and touchscreen version enables the Vision Cart microphone)

Table G-1 Symbols and Icons

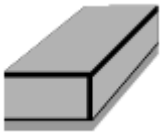
Symbol or Icon	Meaning	Where Found
	Speaker volume	Touchscreen and touchpad displays; labels the slider that controls the local speaker volume
	Erase telestration marks.	Touchscreen display
	Instrument arm locked (when on screen). Brake applied (when brake pedal is depressed on Surgeon Console).	Instrument arm message area on touchscreen. Touchpad instrument arm lock button Above applied brakes on Surgeon Console
	Adjust right.	Touchscreen / touchpad displays for camera calibration
	Adjust left.	Touchscreen / touchpad displays for camera calibration
	Adjust up.	Touchscreen / touchpad displays for camera calibration
	Adjust down.	Touchscreen / touchpad displays for camera calibration
	Secondary Energy Pedal	3D viewer footswitch map

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Secondary Energy Pedal (when pressed)	3D viewer footswitch map
	Primary Energy Pedal	3D viewer footswitch map
	Primary Energy Pedal (when pressed)	3D viewer footswitch map
	Arm Swap Pedal	3D viewer footswitch map
	Arm Swap Pedal (when pressed)	3D viewer footswitch map
	Master Clutch Pedal	3D viewer footswitch map

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Master Clutch Pedal (when pressed)	3D viewer footswitch map
	Camera Control Pedal	3D viewer footswitch map
	Camera Control Pedal (when pressed)	3D viewer footswitch map
	Masters status	3D viewer footswitch map
	Masters status: left finger clutch activated	3D viewer footswitch map
	Masters status: right finger clutch activated)	3D viewer footswitch map
	Masters status during camera control: indicates that roll-to-focus is available	3D viewer footswitch map
	Masters status during camera control, when master roll is causing camera to focus in the + direction	3D viewer footswitch map
	Master controls status during camera control, when master roll is causing camera to focus in the – direction)	3D viewer footswitch map

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	Camera rotation indicator	3D viewer (top center) Touchscreen (lower right)
	Camera rotation indicator when angle is indeterminate; this can happen when no scope is selected or when scope is looking straight up or straight down.	3D viewer (top center) Touchscreen (lower right)
	Left and right master are not associated with an instrument arm.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	Left master is associated with an instrument on arm 2 and right master is associated with an instrument on arm 1.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	Cautery instrument on arm 1 with right master is not energized for some reason.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	Energized instrument on arm 1 with right master is locked.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	There is a problem with the cannula on arm 1 with the right master.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	The instrument on arm 1 with right master is experiencing excessive external force.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode

Table G-1 Symbols and Icons

Symbol or Icon	Meaning	Where Found
	System reports "No instrument installed" on instrument arm 1 with right master.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	Right master is finger clutched.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	Recoverable problem with right master.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	Instrument arm 1 clutched.	Touchscreen masters & instruments status area (top center) 3D viewer (upper left) in dual console mode
	***da Vinci* Network Offline**.	Touchscreen lower right
	***da Vinci* Network Online**.	Touchscreen lower right
	***OnSite* Session In Progress**.	Touchscreen lower right

G.3 Text Messages Reference Table

Table G-2 contains a list of text messages that can appear on screen, sorted alphabetically. The text messages can appear in one or several contexts and locations and are written so as to be understood in each context on screen, and therefore not explained further. Variables are shown in italics inside angled brackets, like this: <*variable*>. This table is provided as a reference and to support translation into languages not supported in the system software.

Table G-2 Text Messages

Message
A B C P1 P2 P3 P4 T
<*button name*> Button Stuck During Self-Test.
<*ESU name*> is currently connected to your system. Would you like to continue or disconnect?
<*Left master, Right master*> switches have been disabled by system. [This is repeated in table for optional “Left” and “Right” starting letters.]
<*Monopolar, Bipolar, etc.*> energy disabled; only one <*Monopolar, Bipolar, etc.*> device is allowed
<*Monopolar, Bipolar, etc.*> and <*Monopolar, Bipolar, etc.*> energy disabled during simultaneous control
<*Surgeon Console, Patient Side*> Overlay [This is repeated in table for optional “Surgeon” and “Patient” starting letters.]
<*User name*> has connected.
<*User name*> has disconnected.
<*User name*> has invited you to join a conference. Would you like to accept?
0
2D
2x
30
3-arm Patient Cart not supported. Power down, connect 4-arm Patient Cart, and restart.
3D
3D Calibration
3D Viewer Blocked
4-arm Patient Cart not supported. Power down, connect 3-arm Patient Cart, and restart.
4x
A fault has occurred.
A remote user
Accept
Account Info
Account Management
Adjust as necessary
Adjust the 3D viewer height until it is in a comfortable position.

Table G-2 Text Messages

Message
Adjust the 3D Viewer tilt until it is in a comfortable position.
Adjust the foot switch panel depth until the controls are easily accessible.
Adjust your chair height to a point at which your legs are at a slight downward angle.
Adjusting Ergonomics
Advance instrument to return to previous location.
Advanced Video Adjustments
Aligning...
Are you sure you want to disable <*manipulator name; e.g., Instrument arm 1, camera arm, left master, etc.*>?
Are you sure you want to disable <*manipulator name; e.g., left master, instrument arm 2, camera arm, etc.*>?
Are you sure you want to disable the master switches for <*left master, right master*>?
Are you sure you want to disable the master switches?
Are you sure you want to swap control of all instrument arms?
Are you sure you want to unlock instrument arm <*1, 2, or 3*>?
Arm clutched at patient cart.
Arm locked.
Arm not ready. Remove instrument to continue.
Arm Stowed
Attention
Audio
Audio Fault - System May Have Reduced or No Audio Feedback
Auto
Auto 3D Calibration
Auto-calibration
Auto-calibration in progress...
Auto Fluorescence Calibration (Part 1)
Auto Fluorescence Calibration (Part 2)
Back
Blue
Both master switches have been disabled by system.
Both surgeon consoles must have same foot tray type.
Brightness
Button Stuck During Self-Test
Calibration
Camera / Scope
Camera / Scope Calibration – Press 'Finish Calibration' to Exit
Camera / Scope Setup
Camera and set-up arm clutched at patient cart.

Table G-2 Text Messages

Message
Camera Arm
Camera arm clutched at patient cart.
Camera arm not free to move.
Camera control pedal pressed
Cancel
Canceled
Cannula is invalid, please remove.
Caution: Instrument motion may be non-intuitive
Channel 1 & 2 Configuration
Check video connections. Press 'Recover Fault' to continue.
Check view port for obstructions.
Click 'New User' to create an account.
CLOSE
Close grip to allow cutting.
Clutching
Composite / S-Video / SD-SDI
Conference in Progress
Configure
Confirm
Connect
Connected to Conference
Connection Status
Console
Console *<1 or 2>*
Contact customer service.
Contact ISI Technical Support for additional information.
Contact ISI Technical Support for assistance.
Contact ISI Technical Support if you require technical assistance.
Continue
Contrast
Control Preferences
Cut complete. Release grip to disable.
Cut is enabled. Press again to cut. Release grip to disable.
Data Collection in Progress...
da Vinci Network Offline
da Vinci Network Online
Delete Users
Disable

Table G-2 Text Messages

Message
Disable <*name of manipulator; e.g., instrument arm 1, camera arm, right master, etc.*> or restart system to continue.
Disable Arm
Disable Node
Disable Switches
Disconnect
Disconnect one console and reset system to continue.
Disconnect one surgeon console and press 'Recover Fault' to continue.
Disconnect or unpower <*ESU name*> or <*ESU name*> to resolve. [Note: This message appears when two ESUs have conflicting features. Both are listed by name, so one example would be: "Disconnect or unpower Conmed or ValleyLab to resolve."]
Display Eye
Display Name is required.
Display name must be unique.
Display Name: <*Name*>
Display Preferences
Does this calibration look correct?
Done
Don't show this message again
Downloading data, please wait: <*#*>
Dr. <*Name*>
Dual Console Mode Not Supported
Dual console not supported. Power down, disconnect Surgeon Console, and restart.
DVI-D (720p)
DVI-I
DVI-I (1024x768)
DVI-I (1280x1024)
DVI-I (1440x900)
Edge Enhancement
Edit
Edit <*user name*> Account
Edit User
Emergency Stop Activated
Enable
Endoscopic View
Energy Device Conflict
Ensure the network cable is properly connected.
<*ESU name*> is currently connected to your system. Would you like to continue or disconnect?

Table G-2 Text Messages

Message
Event Logs
Excessive force detected. Examine arm.
Experimental instrument – Not for human use
Experimental scope – Not for human use
Exit
Failed
Failed: Not white
Failed: Possible dirty scope
Failed: Scope may be damaged
Failed self-check. Remove instrument.
Failed: Target not found
Failed: Too bright
Failed: Too dim
Far
Fault Code: <#####>
Fiber cable connectors require cleaning.
Fiber optic connectors require cleaning.
Fine (3:1)
Finger Clutch
Finish assigning masters at touchpad and press 'OK' to continue.
Finish Calibration
First Name is required.
First Name: <*Name*>
Fluorescence
Fluorescence Calibration (Part 1)
Fluorescence Calibration (Part 2)
Fluorescence Finger Switch
Focusing...
Foot position sensors blocked. Check for obstructions.
Foot position sensors have been disabled by the system.
Footswitch
Format
Full
Give
Graphics
Haptic Zoom
HD-SDI (1080i)

Table G-2 Text Messages

Message
HD-SDI (720p)
Illuminator
Illuminator bulb expired; Power down system and replace when possible.
Illuminator door is open. Close door and press 'Recover Fault' to continue.
Illuminator lamp module error: Please reseat or replace lamp module
Image Depth
Image Enhancement
Image Quality
Information displayed in 3D viewer
In progress.
Incoming Call
Independent
Insertion axis not free to move. Check for obstructions.
Instrument and set-up arm clutched at patient cart.
Instrument arm <*1,2, or 3*> is currently associated with a master on the other console. Are you sure you want to take control of it?
Instrument Arm 1
Instrument Arm 2
Instrument Arm 3
Instrument arm not free to move.
Instrument is expired. Remove.
Instrument not compatible with cannula, please resolve.
Instrument not fully connected. Check all cable connections.
Instrument not fully connected. Check all cable connections and re-install instrument.
Instrument not recognized. Remove and reinstall.
Instrument not supported. Remove.
Instrument tip in cannula; clutch and advance.
Instrument too long for cannula. Remove instrument.
Instrument will expire after procedure.
Instruments Reassigned
Insufficient Battery Charge
Interface Options
Invalid Instrument Installed
Inventory Management
Invited to Conference
L
Large
Last Name is required.
Last Name: <*Name*>

Table G-2 Text Messages

Message
Left Master
<*Left master, Right master*> switches have been disabled by system. [This is repeated in table for optional “Left” and “Right” starting letters.]
Left video lost. Check video connections and power.
Lock
Login
Logout
Maintenance Mode – Not for human use
Maintenance Mode – Not for human use (Console 1)
Maintenance Mode – Not for human use (Console 2)
Manage Users
Manual
Master Associations
Master Associations Incomplete
Master Controller Assignments Incomplete
Master not free to move.
Master Scaling
Master Switch Error
Maximum of two arms per side.
Move master grip to match instrument.
Networking hardware fault. OnSite and Connect functionality no longer available. Press 'Recover Fault' to continue.
Network Detected
Network Unavailable
New User
New User (Step <*step number*> of <*total number of steps*>)
Next
Next Log
No
No battery backup.
No battery backup. Contact customer service.
No cannula detected. Remove instrument and check cannula.
No Instrument Installed
No Scope Detected
No user logged in.
No video signal. Check video connections and power.
Non-recoverable Fault
Non-recoverable Fault <*fault number*> Restart system to continue.
Non-recoverable Subsystem Fault

Table G-2 Text Messages

Message
Non-recoverable Subsystem Fault <*fault number*>
Non-recoverable Subsystem Fault <*fault number*>. Disable arm or restart system to continue.
Normal
Normal (2:1)
Not available
Not connected to Vision Cart.
Off
OK
On
OnSite Session in Progress
Page Down
Page Up
Patient cart and surgeon console either not connected or not powered.
Patient cart battery is charging. Please wait.
Patient Cart Disconnected
Patient cart either not connected or not powered.
Patient cart running on battery. Check AC power.
Patient-Side
Patient-Side Touchscreen Failed Self-Test
<*Surgeon Console, Patient Side*> Overlay [This is repeated in table for optional “Surgeon” and “Patient” starting letters.]
Pedal Conflict. Remove conflicting instrument to enable.
Pending
Please wait. Self-test in progress
Preparing to Shut Down
Press and Hold to Restore Settings
Press 'Arm Swap' pedal to activate arm.
Press 'OK' to continue
Press 'Recover Fault' or disable <*name of manipulator; e.g., instrument arm 1, right master, etc.*> to continue
Press 'Recover Fault' or 'Disable Switches' to continue.
Press 'Recover Fault' to continue
Press 'Recover Fault' to continue. Contact customer service.
Preventive maintenance recommended. Contact customer service.
Previous Log
Quick (1.5:1)
R
Recover
Recover Fault

Table G-2 Text Messages

Message
Recoverable Fault
Recoverable Fault <*fault number*> Press 'Recover Fault' to continue
Red
Reject
Relax hold on master so it can self-align.
Remote Session in Progress
Remove Instrument
Restart system to continue.
Restart system to continue. Contact customer service.
Restore Factory Settings
Restore Settings
Reverse
<*Left master, Right master*> switches have been disabled by system. [This is repeated in table for optional “Left” and “Right” starting letters.]
Right Master
Right video lost. Check video connections and power.
Roll master grip.
Rotate master to match instrument.
Scaling
Scope
Scope Angle
Select a motion scaling level.
Select a scope
Select a zoom level
Select scope angle to continue.
Service recommended. Contact customer service.
Session Available
Session Enabled
Session Ended
Session in Progress
Session Unavailable
Set-up arm clutched at patient cart.
Set-up arm moved unexpectedly. Press port clutch button to clear.
Shutting down in <#> seconds. Press power button to cancel.
Silence
Silence Alarm
Size
Skip Login
Slide to unlock

Table G-2 Text Messages

Message
Small
Some ergonomic adjustments are unavailable.
Start Calibration
Step <*step number*> of <*total number of steps*>: Press the center of the cursor.
Stereo Pair
Successful
Surgeon Console
Surgeon console either not connected or not powered.
<*Surgeon Console, Patient Side*> Overlay [This is repeated in table for optional “Surgeon” and “Patient” starting letters.]
Surgeon Console Touchpad Is Not Functional
Surgeon monitor tilt sensor error.
Swap All
Switch Error
System communication failure. Restart system to continue.
System Diagnostic Mode – Not for human use.
System is overheating. Ensure adequate ventilation.
System overheating. Shutting down in <#> seconds. Restart not possible; contact customer service.
System shutting down.
Take
Telestration Eye
Test was run. Restart system for normal use.
TFO Mode – Not for human use.
the other console's left master
the other console's right master
TilePro
TilePro QuickClick
Touchscreen Calibration: <*step number*>/<*total number of steps*>
Touchscreen is not available, but other system functions are unaffected. Press 'Recover Fault' to continue.
Training instrument – Not for human use
Training scope – Not for human use
Trial Software – Not for human use
Troubleshooting
Unknown
Unlock
Unsupported Parts Installed on System
Use the da Vinci ergonomic controls on the left side pod to adjust the arm rest until your arms can rest comfortably with your shoulders relaxed.

Table G-2 Text Messages

Message
Utilities
Verify 3D Calibration
Video
Video Fault: Ensure auxiliary video device is powered, then clear fault. If necessary, restart da Vinci system.
Video Output
Video Settings
Video Source
Video Sync Error
Video System Not Ready
Viewer Mode
Visualization
Warning: Ensure proper scope selection (0 degree scope selected).
Warning: Ensure proper scope selection (30 degree down scope selected).
Warning: Ensure proper scope selection (30 degree up scope selected).
Warning: Ensure proper scope selection (No Scope selected).
Warning: No scope detected. Ensure proper scope selection.
Warning: Patient cart is able to move
White Balance
White balance failed.
White balance failed: image not close enough to white.
White balance failed: image too bright.
White balance failed: image too dim.
White balance failed: possible dirty scope.
White balance in progress.
White balance successful.
Wide
Working Distance
Would you like to connect?
Would you like to connect to a conference?
Would you like to continue?
Yellow
Yes
You are about to reassign instruments in use at the other console. Are you sure?
You are the only member of this conference. Would you like to continue waiting?
Your instruments have been reassigned. Tap 'Arm Swap' pedal to acknowledge and continue.
Zoom

End of section

H Appendix H: System Specifications

H.1 Power Specifications

	Surgeon Console	Patient Cart	Vision Cart
Voltage	100/120/230 VAC 50/60Hz Auto Sense	100/120/230 VAC 50/60Hz Auto Sense	100/120/230 VAC 50/60Hz Auto Sense
Rating and Typical Current	1000VA Continuous 8.4A at 115V~ 4.2A at 230V~	1000VA Continuous 8.4A at 115V~ 4.2A at 230V~	1500VA Continuous 12A at 115V~ 6A at 230V~
Backup Power	NA	5 min	NA
Surge Protected	Yes	Yes	No

H.2 Physical Dimensions

	Surgeon Console	Patient Cart	Vision Cart
Height	70 in. (178 cm)	69 in. (175 cm)	76 in. (193cm) with touchscreen stowed
Width	38 in. (97 cm)	36 in. (91 cm)	26.6 in. (67.6cm)
Depth	34 in. (86 cm)	50 in. (127 cm)	36.5 in. (92.7cm)
Weight	~580 lbs. (264 kg)	~1200 lbs. (544 kg)	446 lbs. (202.3kg)
Ground Clearance	1.9 in. (48 mm)	1.9 in. (48 mm)	4 in. (10.2cm)

H.3 Environmental Specifications

See specifications listed on page 1-7.

H.4 Crate Dimensions

	L x W x H	Weight
Surgeon Console	47.5" x 48" x 65.5″ (1.21m x 1.22m x 1.66m)	793 lbs (360 kg)
Patient Cart	67.3″ x 47.3″ x 77.3″ (1.71m x 1.20m x 1.96m)	1540 lbs (698.5 kg)
Vision Cart	44" x 43" x 83″ (1.12m x 1.09m x 2.11m)	720 lbs (326.6 kg)

H.5 Video Patch Panels

Figure H.1 Video and audio connections (back of Core)

Note: One video output is standard. Optional upgrades can provide up to two additional video outputs.

Selecting Core Video Output

To select the video output format used at each output bay, from the touchscreen, touch **Video Output** on the **Video Settings** tab, which gives access to the following user interface.

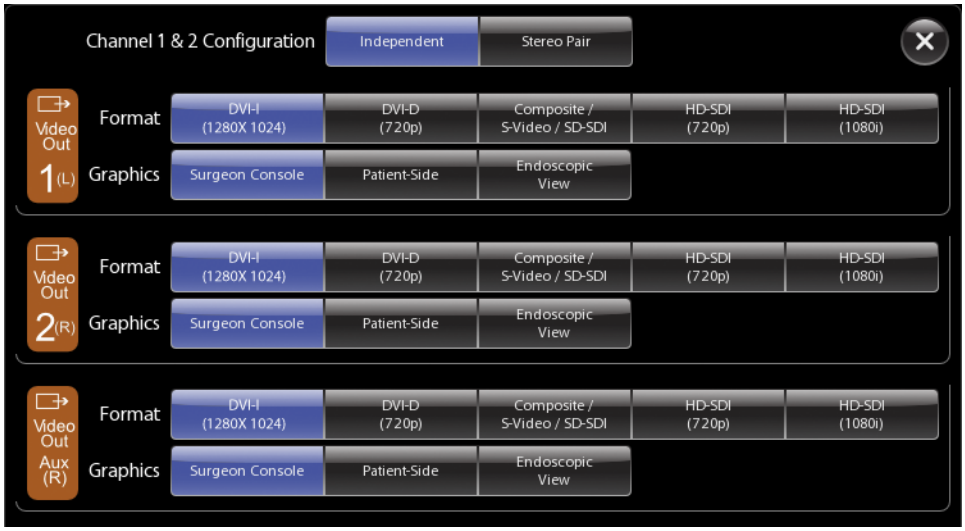


Figure H.2 Example of video output option selections

The software buttons on this screen correspond to the applicable Video Out connector bay as explained below in Table H-1 Video Output Connections – Core.

Core Video Connections

Table H-1 Video Output Connections – Core

Connector Label	Connector Type	Software Button(s)	Output Format	Resolution
DVI	DVI-I	DVI-I (1280x 1024)	DVI (analog and digital)	Automatically configured[a]
		DVI-D (720p)	DVI (digital)	720p (720 x 1280 x 59.94Hz)

Table H-1 Video Output Connections – Core

Connector Label	Connector Type	Software Button(s)	Output Format	Resolution
Composite	BNC	Composite / S-Video / SD-SDI	Composite (analog)	NTSC (720 x 486 x 29.97Hz) or PAL (720 x 576 x 25Hz)[b]
S-Video	4-pin mini-DIN	Composite / S-Video / SD-SDI	S-Video (analog)	NTSC (720 x 486 x 29.97Hz) or PAL (720 x 576 x 25Hz)[b]
SDI	BNC	Composite / S-Video / SD-SDI	SD-SDI (digital)	NTSC (720 x 486 x 29.97Hz) or PAL (720 x 576 x 25Hz)[b]
		HD-SDI (720p)	HD-SDI (digital)	720p (720 x 1280 x 59.94Hz)
		HD-SDI (1080i)	HD-SDI (digital)	1080i (1920 x 1080 x 29.97Hz)

a. Automatically configured video format supports XGA, SXGA, WXGA-Plus analog and digital; 720p digital only. Not all DVI receiving devices support automatic configuration. To assure format 720p video output, select the **DVI-D (720p)** button instead.
b. NTSC or PAL is determined by country.

Table H-2 Video Input Connections – Core

Connector Label	Connector Type	Input Format	Resolution
DVI	DVI-I	DVI (analog and digital)	Automatically configured[a]
S-Video	4-pin mini-DIN	S-Video (analog)	NTSC (720 x 486 x 29.97Hz) and PAL (720 x 576 x 25Hz)
SDI	BNC	SDI (digital)	NTSC (720 x 486 x 29.97Hz) and PAL (720 x 576 x 25Hz)
		HD-SDI (digital)	1080i (1920 x 1080 x 29.97Hz) and 720p (720 x 1280 x 59.94Hz)

a. Automatically configured video format supports XGA, SXGA, WXGA-Plus analog and digital; 720p digital only.

Note: Each input and output bay supports only one video format at a time.

Surgeon Console Video Connections

TilePro Inputs Video Out L, R Audio

Figure H.3 Connections on back of Surgeon Console

Table H-3 Video Output Connections – Surgeon Console

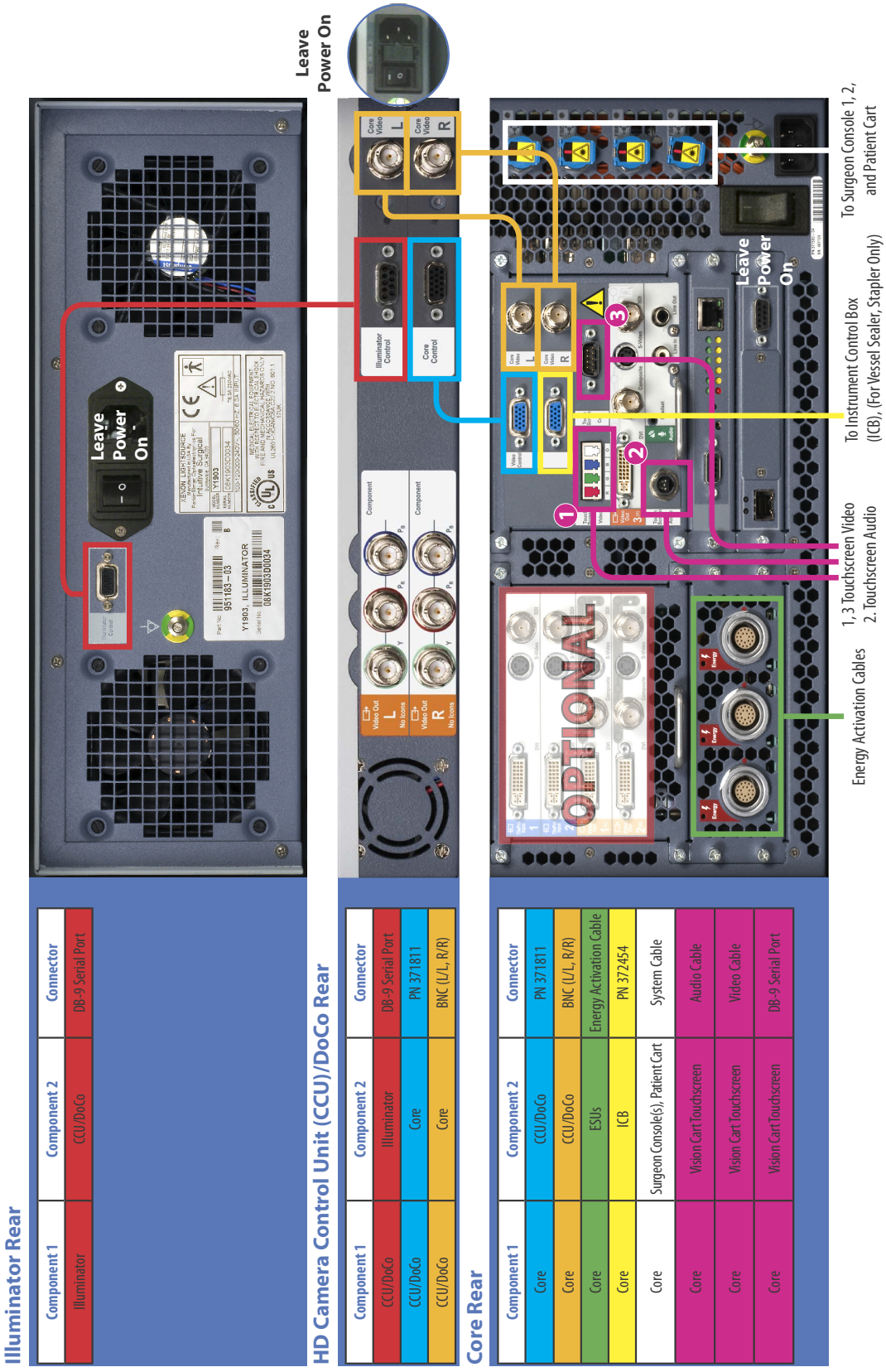
Connector Label	Connector Type	Output Format	Resolution
DVI (SXGA)	DVI-I	DVI (analog and digital)	SXGA

Table 9: Video Input Connections – Surgeon Console

Connector Label	Connector Type	Input Format	Resolution
SDI	BNC	SDI (digital)	NTSC (720 x 486 x 29.97Hz) and PAL (720 x 576 x 25Hz)
		HD-SDI (digital)	1080i (1920 x 1080 x 29.97Hz) and 720p (720 x 1280 x 59.94Hz)
S-Video	4-pin mini-DIN	S-Video (analog)	NTSC (720 x 486 x 29.97Hz) and PAL (720 x 576 x 25Hz)
DVI	DVI-I	DVI (analog and digital)	Automatically configured[a]
a. Automatically configured video format supports XGA, SXGA, WXGA-Plus analog and digital; 720p digital only.			

Note: Each input and output bay supports only one video format at a time.

Core Connections Diagram



End of section

Appendix I: Natural Rubber Latex

The following *Intuitive Surgical* products referenced in this manual are not made with natural rubber latex:

- Camera Arm Drape, PN 420279
- Camera Head Drape, PN 420273
- Disposable Accessory Kit, 3-Arm, PN 420290
- Disposable Accessory Kit, 4-arm, PN 420291
- *EndoWrist One* Suction/Irrigator, PN 410299
- *EndoWrist One* Vessel Sealer, PN 410322
- Instrument Arm Drape, PN 420015
- Monitor Drape, PN 420281

_____End of section_____

J Appendix J: Glossary of Terms

Table J-1 Glossary

Term	Meaning
3D	Three-dimensional.
3D Display	The three dimensional image created by two cameras. You view this image via the stereo viewer on the Surgeon Console.
AC	Alternating Current, also represented by the AC symbol: ~. "AC" or "AC power" refers to electrical connection via a wall outlet, as opposed to battery power.
Arms	The part of the *da Vinci Si* system that holds a grip, instrument or camera. There are six arms on the *da Vinci Si* System. Two master arms with master grips are located on the Surgeon Console. The Patient Cart has four arms, one for the camera and three for the instruments.
Camera Arm	The arm on the center setup joint of the Patient Cart that controls the camera/endoscope according to the surgeon's movements of the masters.
Camera Rotation Indicator	Shows the orientation of the camera with respect to the floor. It appears in the lower right corner of the touchscreen display, and top center of the stereo viewer display.
CF or Type CF	An IEC 60601-1 classification for patient applied parts. Type CF is the most stringent classification, being required for those applications where the applied part is in direct conductive contact with the heart or other applications as considered necessary.
Endoscope Cannula Mount	The accessory that attaches a camera cannula to the camera arm.
Carriage	The portion of the instrument arm to which an instrument sterile adapter attaches. The carriage moves up and down under control of the system, or manually by using the instrument arm clutch.
CAUTION	An important level of concern. Failure to heed a CAUTION may result in unintended motion of the *da Vinci Si* System that may result in injury to a patient.
Circulating nurse vs. scrub nurse	A scrub nurse is prepared to work within the sterile surgical field while a circulating nurse is not.

Table J-1 Glossary

Term	Meaning
Clutch (verb)	1. To master clutch is the act of disengaging the masters from the instrument arms and camera arm so the masters can be repositioned in a more comfortable working space for the surgeon. This action is similar to lifting a computer mouse off the mouse pad and repositioning it. A clutch is also used at the Patient Cart to position the instruments and the camera/endoscope. 2. To finger clutch is to disengage the one master from control of its associated instrument so the master can be repositioned. 3. To arm clutch allows the instrument or camera to float, allowing manual adjustment of the instrument or camera arms. 4. To port clutch allows repositioning of the remote center of a Patient Cart arm by disengaging the brakes on the setup joint.
Clutch (noun)	1. As in arm clutch button, which allows clutching of the instrument arm, or port clutch button, which allows clutching an arm setup joint. 2. As in master clutch pedal, the footswitch pedal used to control master clutching. 3. As in the finger clutch (sliding button on each master), which allows clutching that master separately.
Console	See **Surgeon Console.**
DANGER	The highest level of concern. Failure to heed a DANGER warning can result in injury to a patient.
ESU	Electrosurgical Unit or Electrosurgical Generator Unit.
Endoscope	An instrument used for the examination of the interior of a canal or a hollow space; also called a "scope."
***EndoWrist*® Instruments**	Instruments with a wrist located near the tip.
Emergency Stop State	A state where the motors of are turned off and a screen message is sent to the user.
Faulting	The transition from a working state to either a soft-locked or brake-locked state.
Footswitch	A pedal or switch located on the footswitch assembly of the Surgeon Console.
Footswitch Assembly	Located at the base of the Surgeon Console, containing all of the foot controls.
Head Sensor	Infrared sensor on either side of the view port of the Surgeon Console, located above the stereo viewer.
Illumination System or Illuminator	See **Light Source.**

Table J-1 Glossary

Term	Meaning
Instrument	Any one of several tools used to effect the procedure in the patient once attached to an instrument arm and inserted into the patient. Instruments include, for example, Large Needle Drivers, DeBakey Forceps and Round Tip Scissors.
Instrument Arms	The arms on the outer setup joints of the Patient Cart that manipulate the instruments according to surgeon's movement of the masters.
Left-Side Pod	The appendage on the left end of the Surgeon Console armrest that provides ergonomic adjustment controls.
LED	Light emitting diode.
Light Source	Endoscopic illumination system. The *da Vinci Si* System has a single light source integrated in the Vision Cart and attached to the endoscope assembly by the light guide cable. It provides illumination inside the body for vision.
Master	The control arms and grips in the Surgeon Console that the surgeon grasps and moves. The surgeon's movements are translated to the instruments and camera attached to the Patient Cart arms.
MIS	Minimally Invasive Surgery.
Notes	User information to emphasize an important point.
Patient Cart	The part of the *da Vinci Si* System that is located on the patient side and consists of the column that supports the setup joints that in turn support the instrument and camera arms.
Patient Cart Arms	The arms that are components of the Patient Cart: three instrument arms and one camera arm.
Remote Center	A fixed point in space around which the Patient Cart arms move, indicated by the thick black band on instrument cannulae. Remote center technology enables the System to maneuver instruments and endoscopes in the surgical site while exerting minimal force on the patient's body wall.
Right-Side Pod	The appendage on the right end of the Surgeon Console armrest that provides power buttons.
Scope	Endoscope.
Screen	The monitor display, located in the stereo viewer and/or the touchscreen display.
Setup Joint	The joints on the Patient Cart that support the instrument arms and the camera arm. These joints are used to set up the initial positions of the arms on the Patient Cart.

Table J-1 Glossary

Term	Meaning
Stereo Viewer or 3D Viewer	The viewing system that comprises the upper portion of the Surgeon Console, where the surgeon looks to see the 3D image.
Sterile Adapter	Interface device that allows the sterile barrier to be maintained between the camera arm and the endoscope or the instrument arm and the instrument attached to the arm. There are various types of sterile adapters: a sterile endoscope adapter, camera arm sterile adapter and an instrument sterile adapter. They are not interchangeable.
Surgeon Console	The part of the *da Vinci Si* System consisting of a structure that supports the masters and the stereo 3D viewer.
TilePro®	A feature which allows display of the 3D image of the operative field and up to two additional images provided by auxiliary inputs.
Touchpad	The touchpad in the center of the Surgeon Console armrest.
Touchscreen	The touchscreen monitor mounted on the Vision Cart.
View Port	The recessed area near the top of the Surgeon Console where the surgeon inserts his or her head to view the stereo viewer display. It includes the fixed eyepieces of the stereo viewer, infrared head sensors, speakers and contoured headrest.
Vision Cart	The *da Vinci* System component that houses the central processing and vision system, including the Core, Camera Control Unit (CCU) and Illuminator. It includes a touchscreen monitor and provides adjustable shelves for optional ancillary surgical equipment such as ESUs and insufflators.
WARNING	High level of concern. Failure to heed a WARNING could result in harm to a patient.

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