

da Vinci[®] Si^{HD}™


SURGICAL SYSTEM



User Manual

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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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End of section

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](#).

- i 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.**
- i 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.

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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

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

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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).



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



Space reserved for unit identifiers
(on all system labels)

Figure 1.1 System labels: IEC 2nd Edition



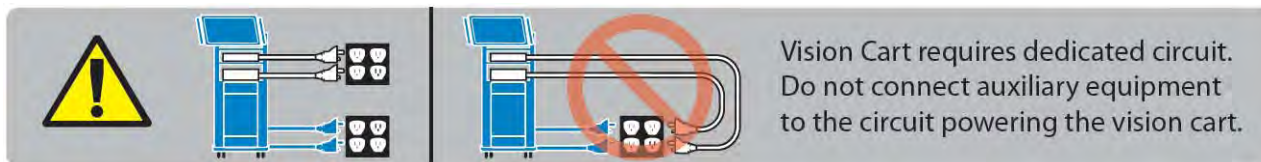
Figure 1.2 System Labels: IEC 3rd Edition

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.

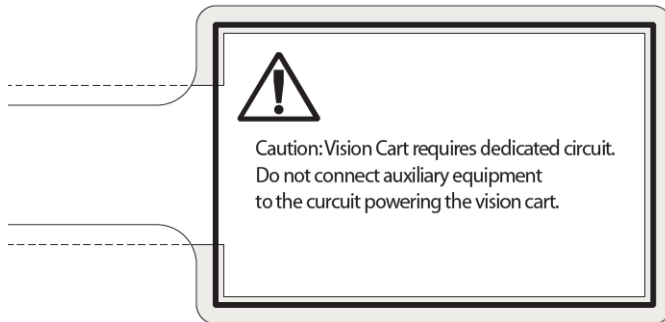
100/120/230V~

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 T1 and T2, general thoracoscopic surgical procedures, and thoracoscopically assisted cardiomy 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

i 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 electro-surgical 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 electro-surgical 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: Electro-surgery may produce interference with internal or external pacemakers. Electro-surgery may cause these devices to enter an asynchronous mode or may inhibit pacemaker operation entirely. Consult the pacemaker manufacturer for further information when using electro-surgery 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 Chapter 2 [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.

i 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

i 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.

**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
<p>Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3</p>	<p>3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz</p>	<p>3 Vrms 3V/m</p>	<p>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</p> $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P} \text{ 80 MHz to 800 MHz}$ $d = 2.3\sqrt{P} \text{ 800 MHz to 2.5 GHz}$ <p>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:</p> 

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.

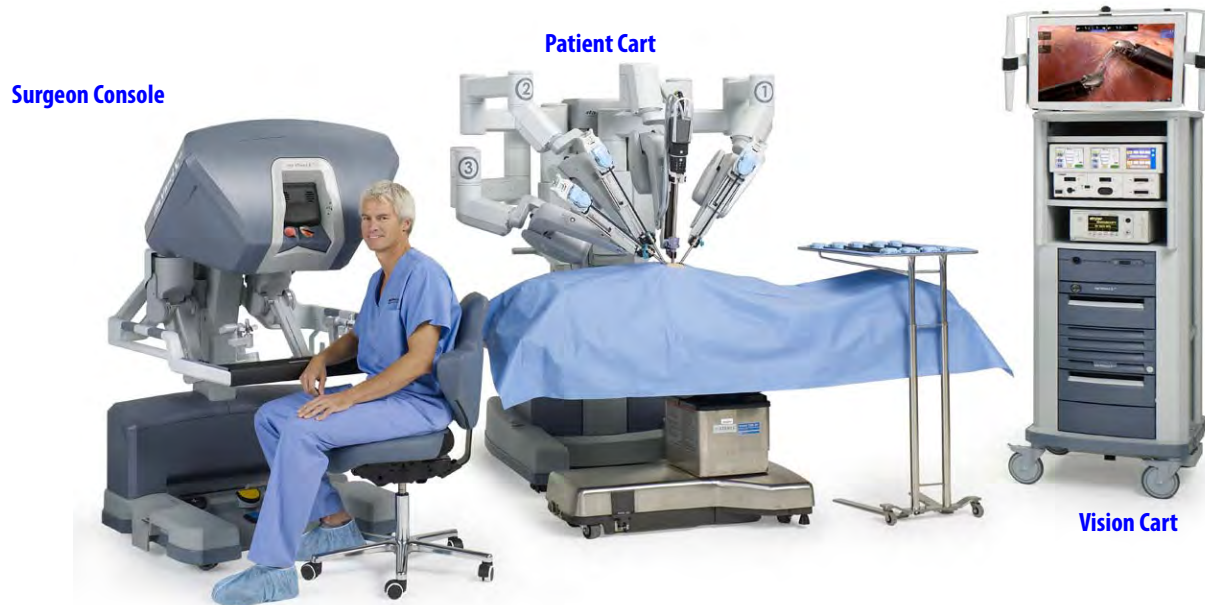


Figure 2.1 Main components of the *da Vinci Si* Surgical System

This chapter introduces the system components in the following sections:

- [2.1 The *da Vinci Si* System Main Components](#), page 2-2
- [2.2 The *da Vinci Si-e* Surgical System](#), page 2-4
- [2.3 Surgeon Console Overview](#), page 2-5
- [2.4 Patient Cart Overview](#), page 2-8
- [2.5 Vision Cart Overview](#), page 2-11

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.

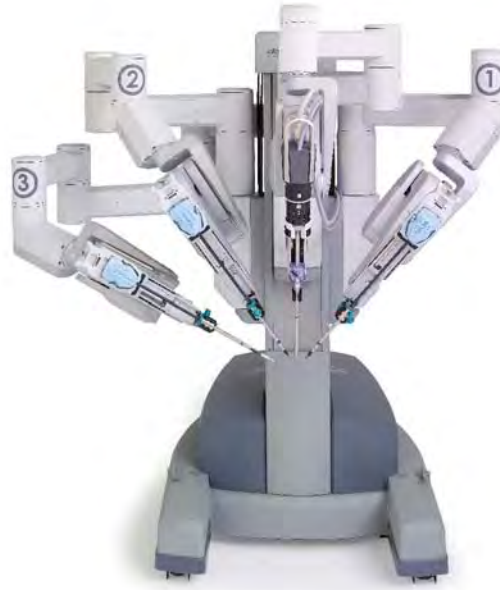


Figure 2.3 Patient Cart

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	<i>da Vinci Si</i>	<i>da Vinci Si-e</i>
<i>EndoWrist</i>® instrumentation	yes	yes
<i>Single-Site</i>™ 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.)

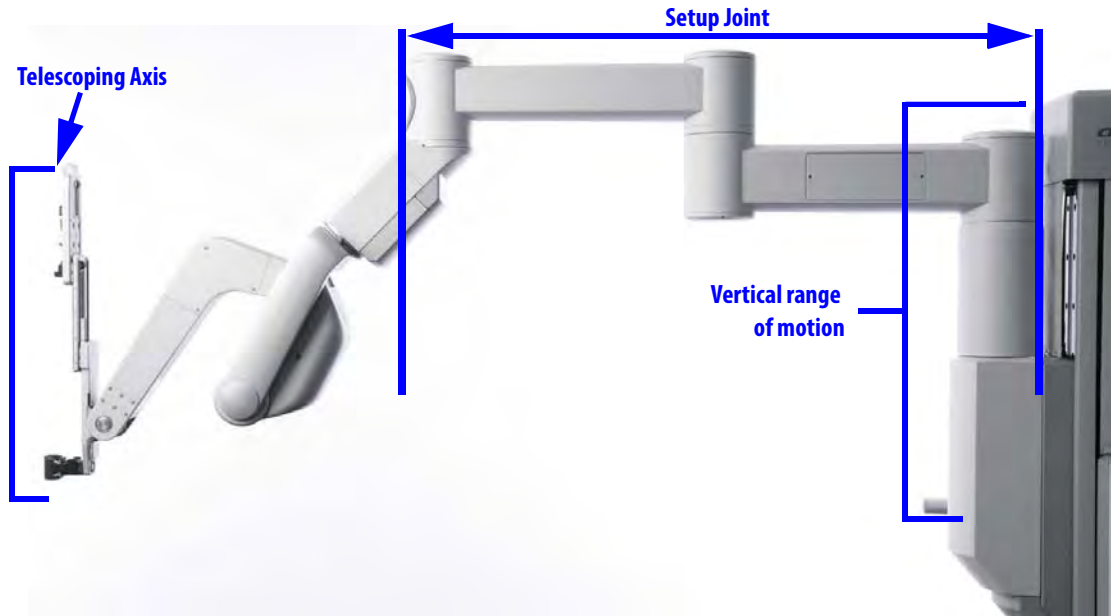


Figure 2.11 setup joint

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.)

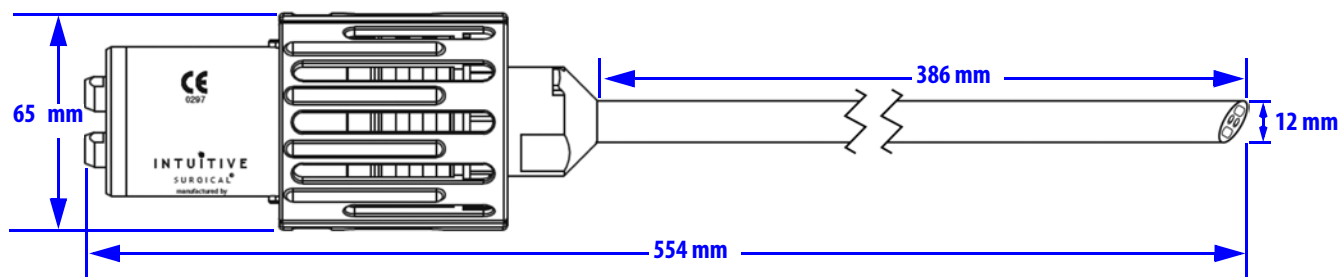
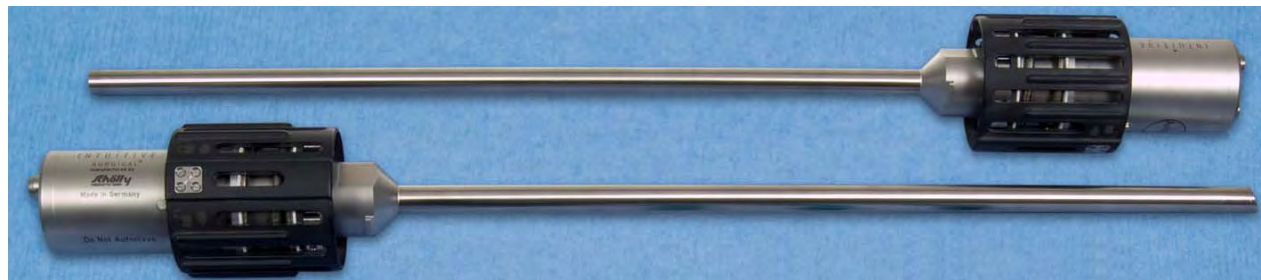


Figure 2.17 da Vinci Si HD 12 mm endoscopes, with dimensions

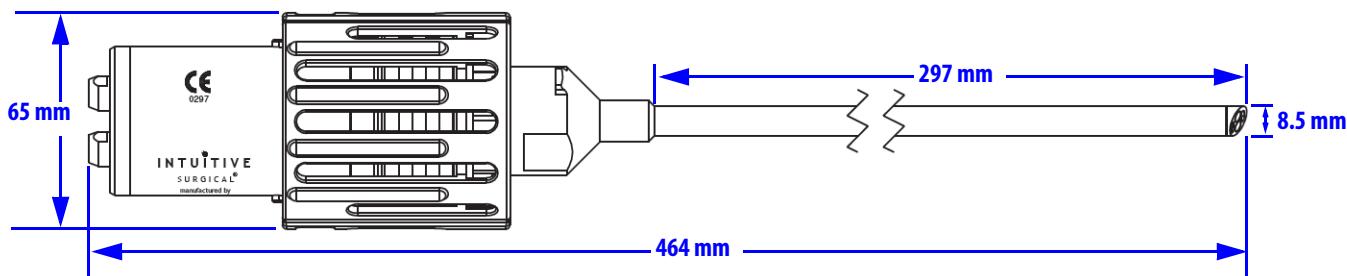


Figure 2.18 da Vinci Si HD 8.5 mm endoscopes (30° tip), with dimensions



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
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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.

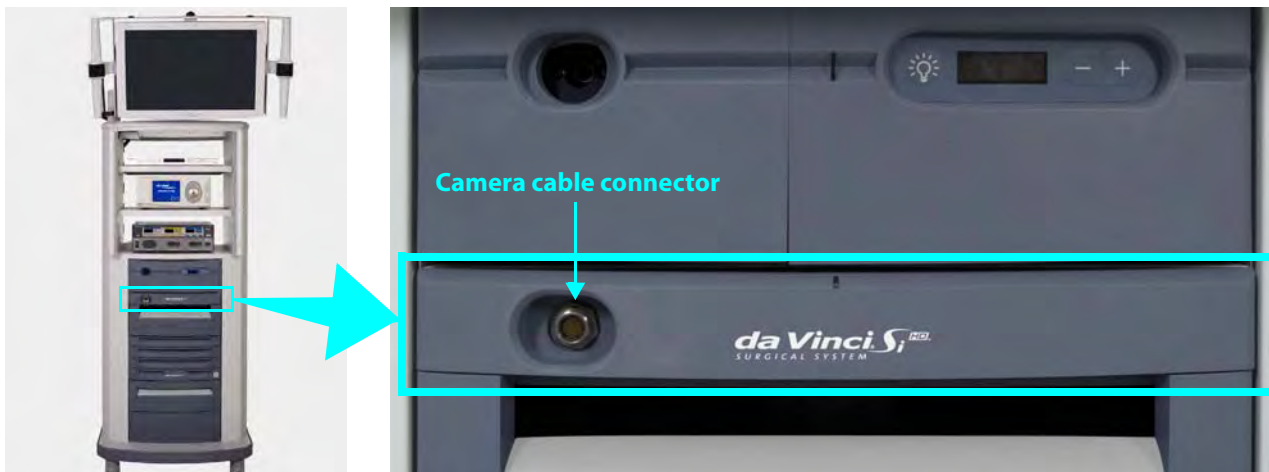


Figure 2.20 Camera Control Unit and Illuminator

Touchscreen

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

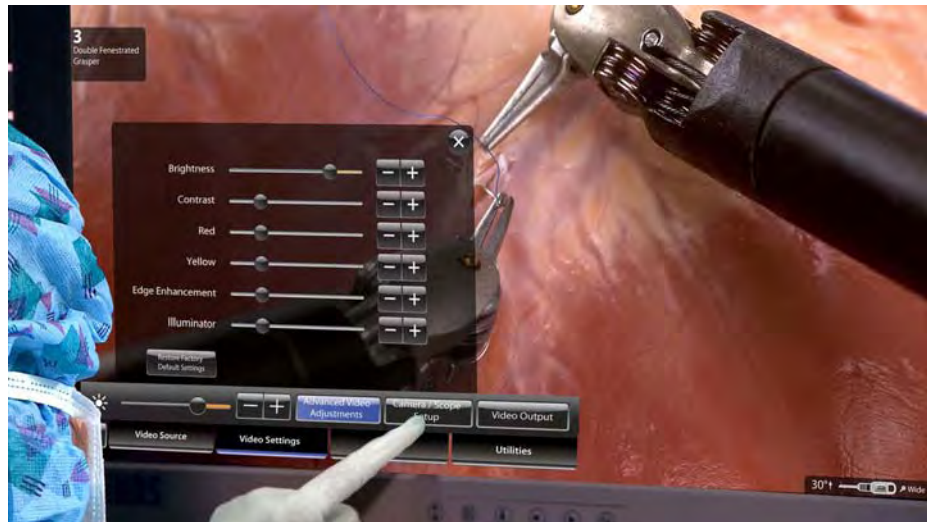


Figure 2.21 Assistant operating touchscreen

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, page 3-1
- 3.2 Patient Cart Positioning, page 3-2
- 3.3 Vision Cart Positioning, page 3-6

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.



Move Surgeon Console using handles on side



Do not move Surgeon Console from the back

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.

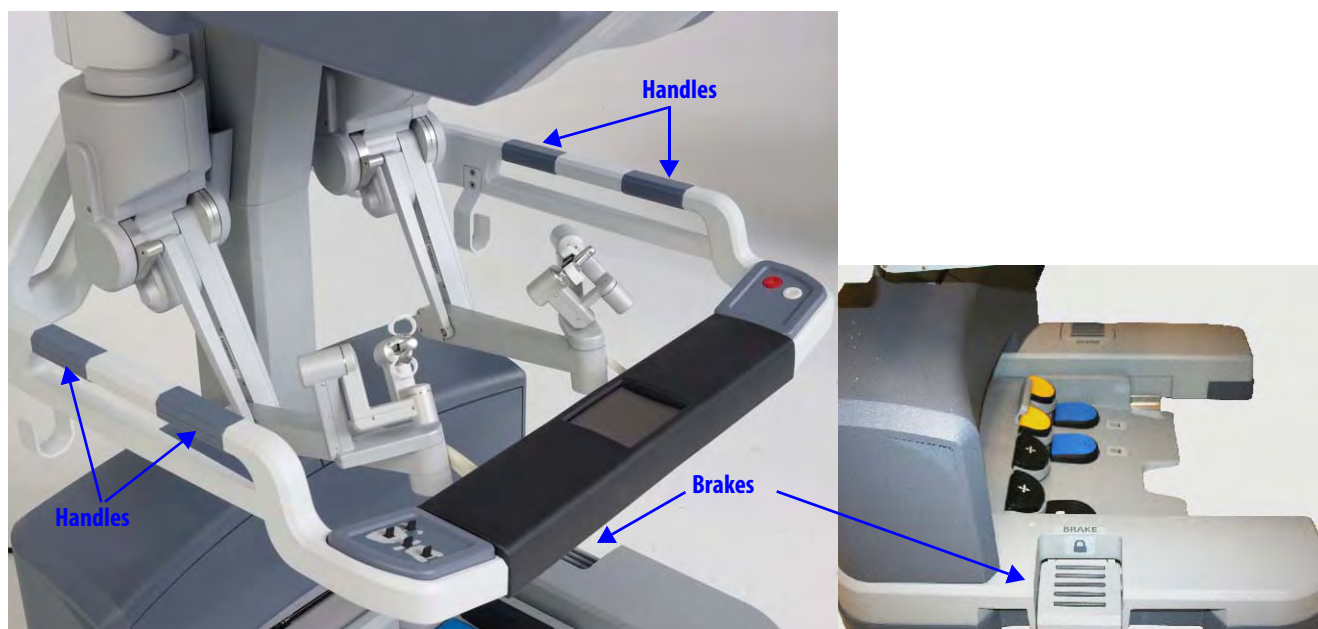


Figure 3.3 Surgeon Console handles and brakes



- 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.

- i 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

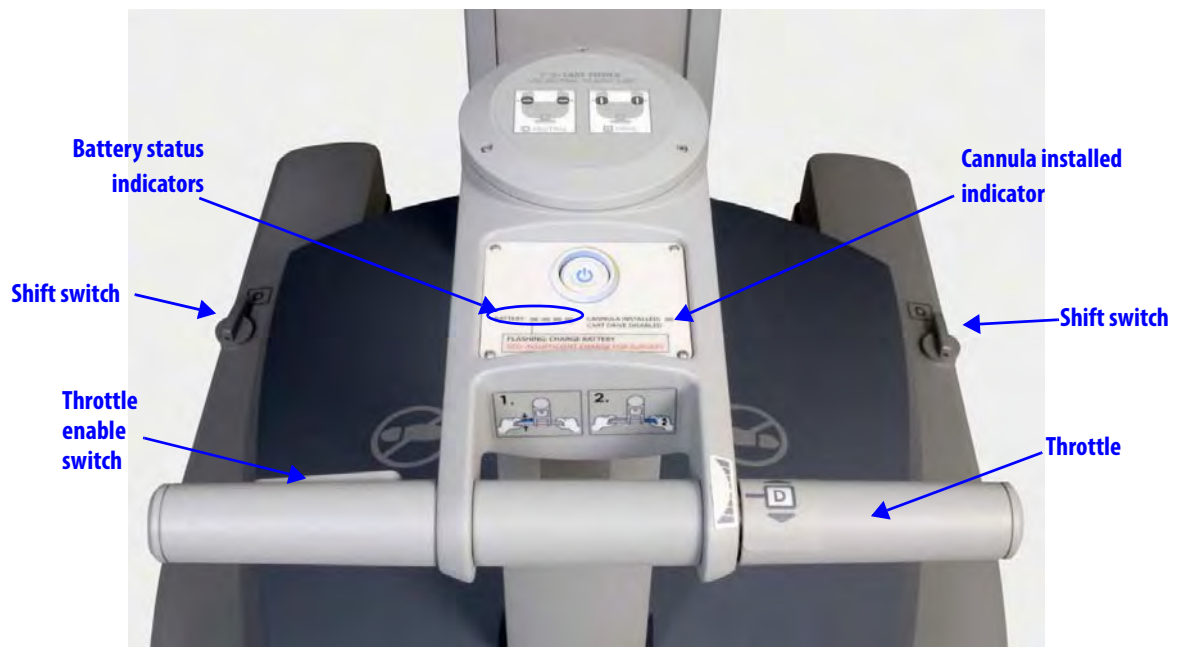


Figure 3.4 Patient Cart motor drive controls and indicators

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”.

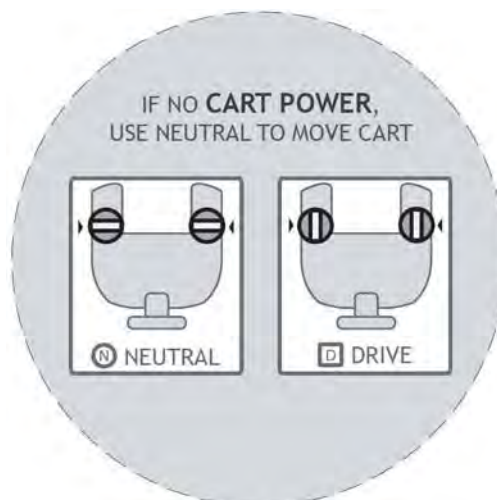


Figure 3.5 Label on top of motor drive tiller



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](#)).



- 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:

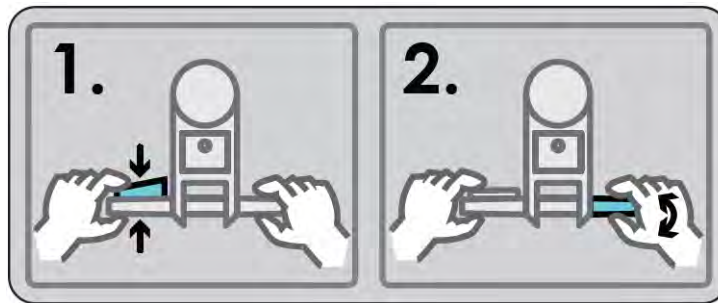


Figure 3.7 Label: How to drive the Patient Cart

- The Cart Power button flashes green when the throttle enable switch is activated.
 - Control the drive speed by how far you rotate the throttle.
- 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](#)).

i 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.

i 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.

i 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

i 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.

i 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.

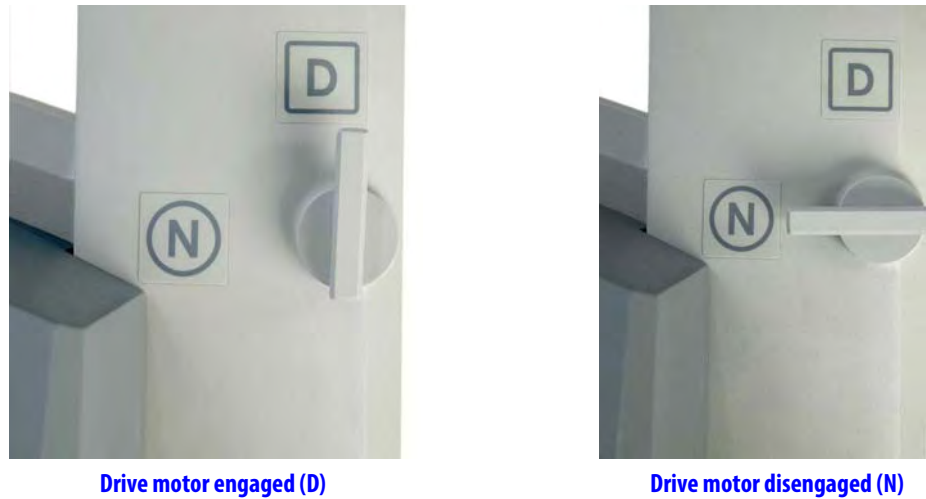


Figure 3.8 Patient Cart motor drive shift switches

3.3 Vision Cart Positioning

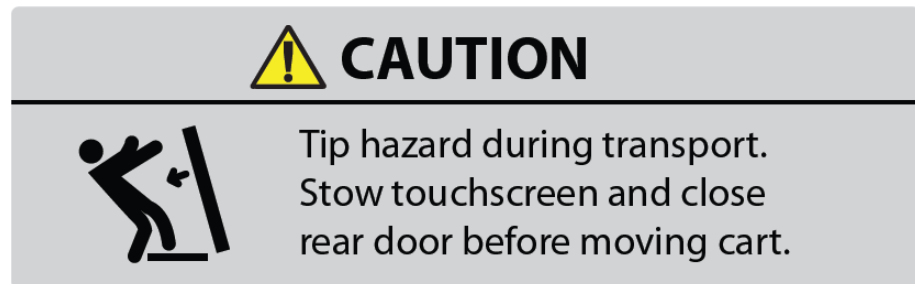


Figure 3.9 Tip hazard label on rear door of Vision Cart

⚠ 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:

- 4.1 Power Connections, page 4-2
- 4.2 System Cable Connections, page 4-3
- 4.3 Camera Head Cable Connections, page 4-6
- 4.4 Auxiliary Device Connections, page 4-9
- 4.5 Video and Audio Connections, page 4-11



Figure 4.1 Sample system cable and connections

- i 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~

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

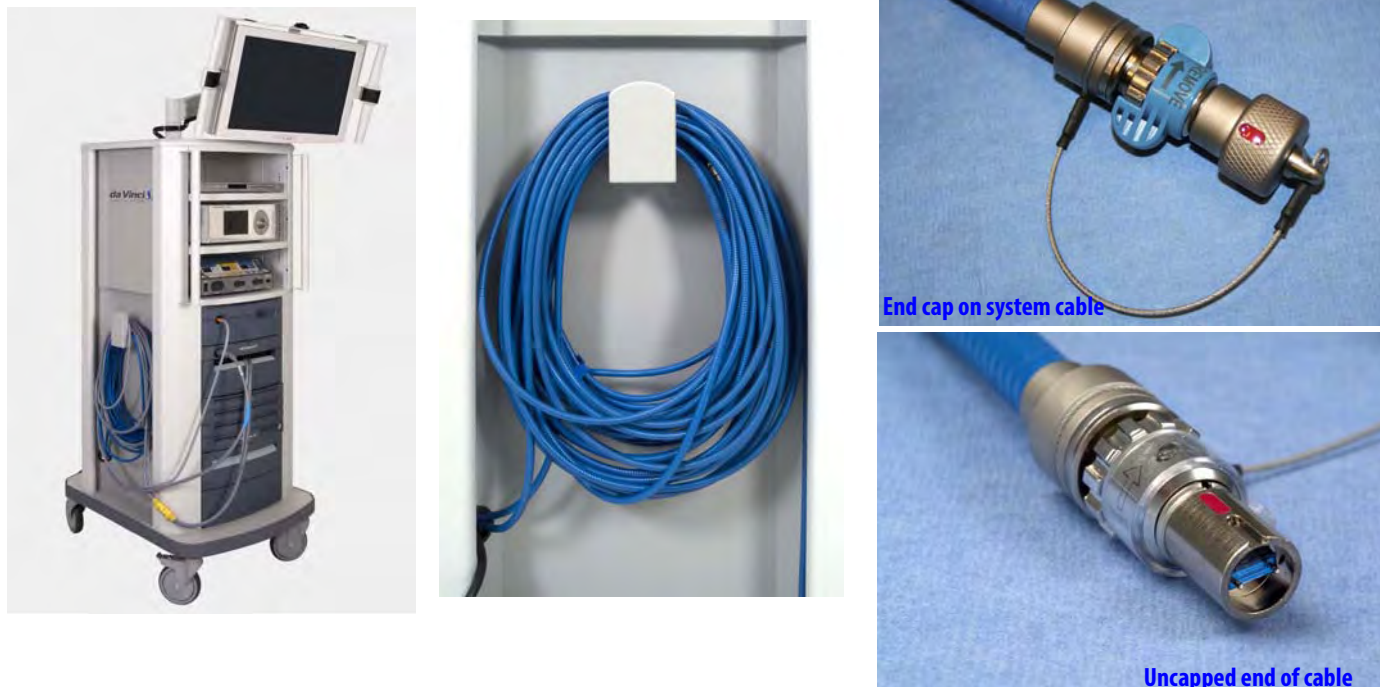


Figure 4.2 System cables

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

- i 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.)
- i 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.

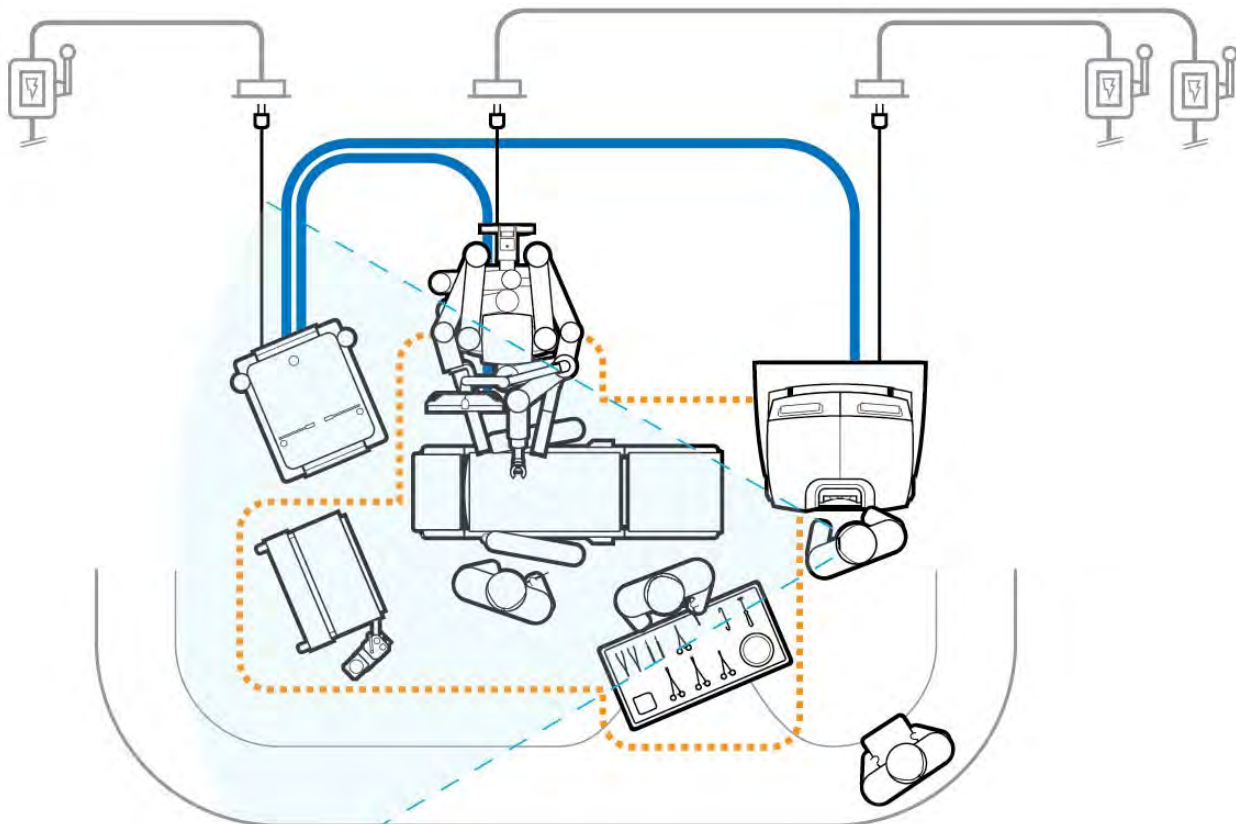


Figure 4.3 Laying out the system cables

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.

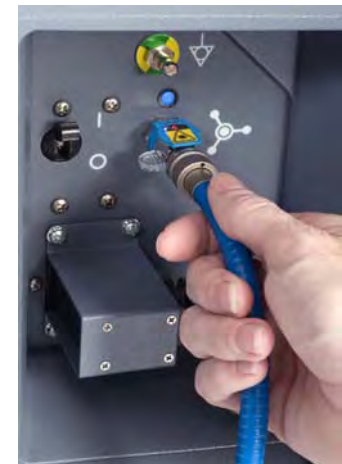
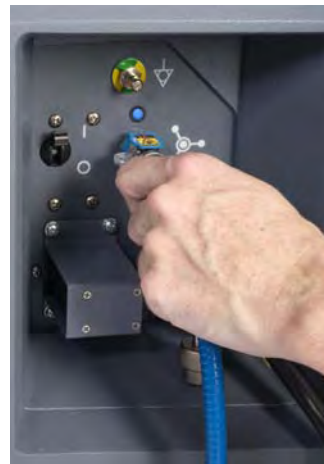


Figure 4.4 Connecting system cable to Surgeon Console

- 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.

- i 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.

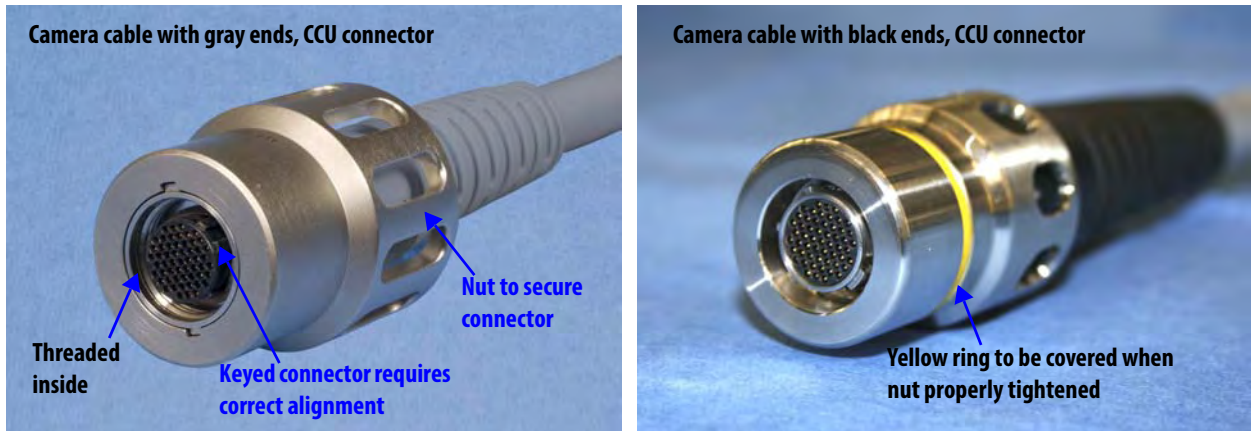


Figure 4.6 Ends and connectors of each kind of camera cable

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.

- i 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.

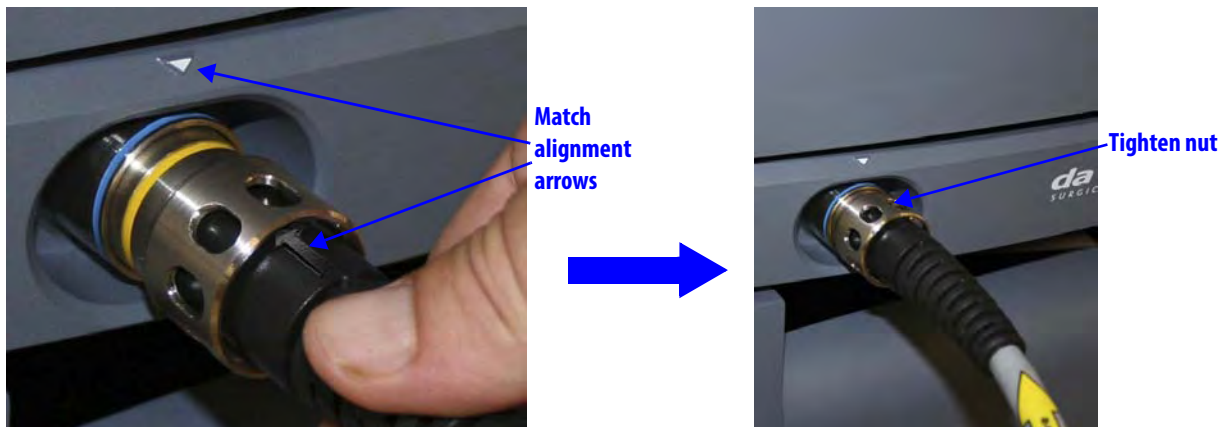


Figure 4.7 Camera cable connection to CCU

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.

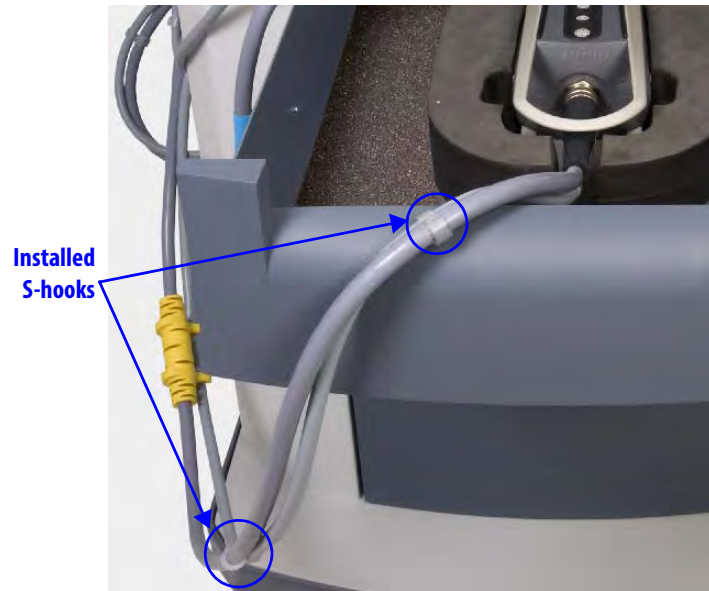


Figure 4.9 S-hooks to hold camera cables together

i 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.

i 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

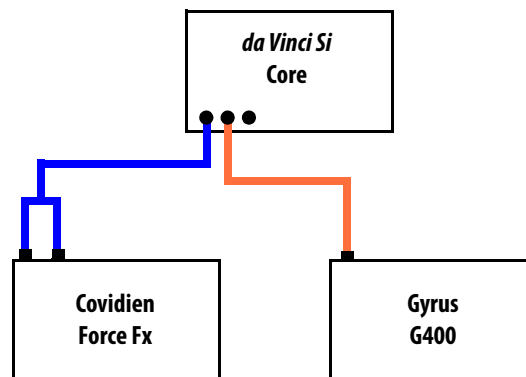


Figure 4.12 Representative ESU setup

⚠ 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)

- i 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

i 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.

i 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.

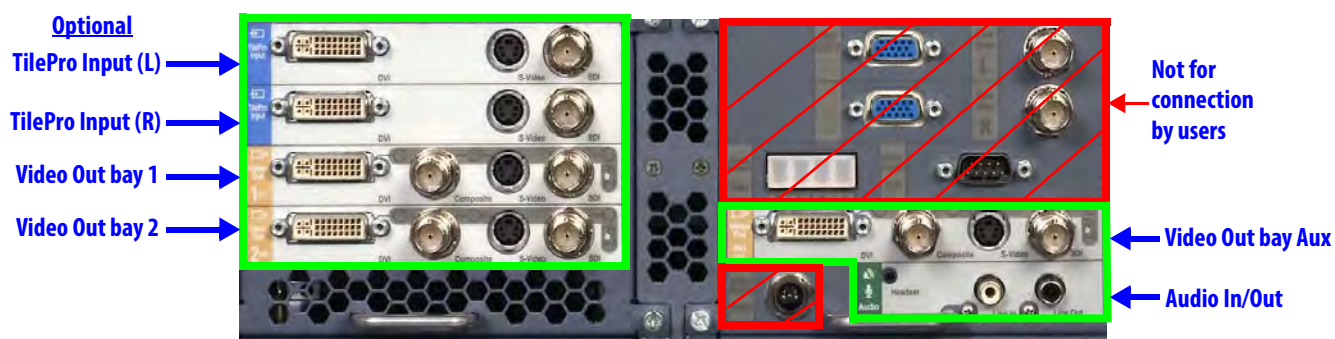


Figure 4.15 Video and audio connections (back of Core)

i 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.



TilePro Input (L), (R) Video Out L, R Audio

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).

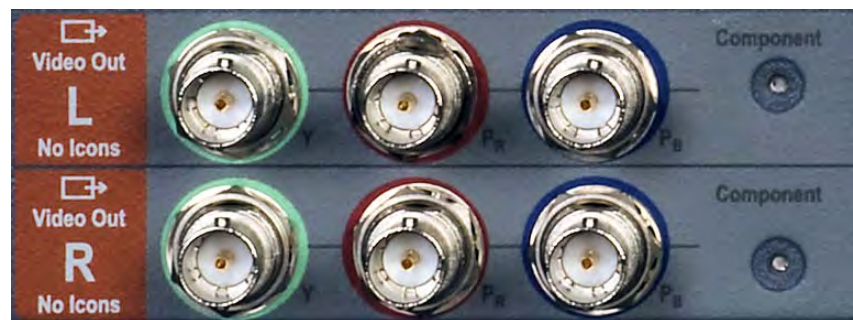


Figure 4.17 Video connections (back of CCU)

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, page 5-1
- 5.2 Powering On the System, page 5-2
- 5.3 Startup Sequence, page 5-5
- 5.4 Preparing the Patient Cart for Draping, page 5-6
- 5.5 Stow Position, page 5-7

5.1 Stand-Alone Mode

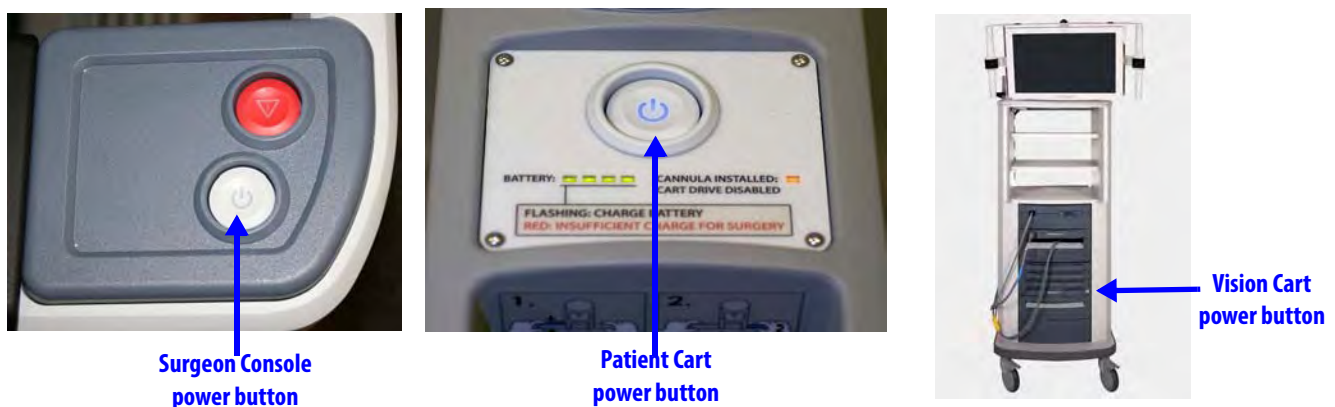


Figure 5.1 System power buttons

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.

i 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.

i 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.

- i Note:** If any of the individual components are in stand-alone mode and you connect the system cables, the system will power itself on.
- i Note:** System cables may be connected at any time, but once connected, cannot be unplugged until the system has been completely powered down.
- i 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.

- 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.



Surgeon Console

EPO button not depressed



Patient Cart



Vision Cart (at base)

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.
- 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.



Core



Illuminator



Camera Control Unit

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.

- i 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.
- i 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.
- i 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 (90°). 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.

Release latch

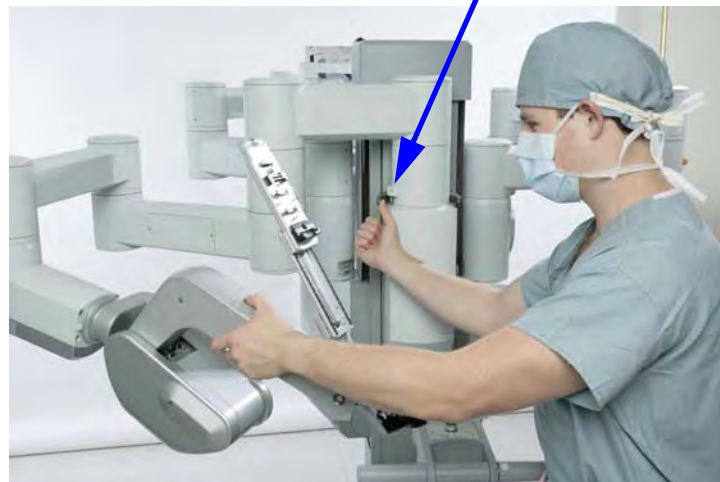


Figure 5.5 Moving instrument arm 3

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.

i 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](#).

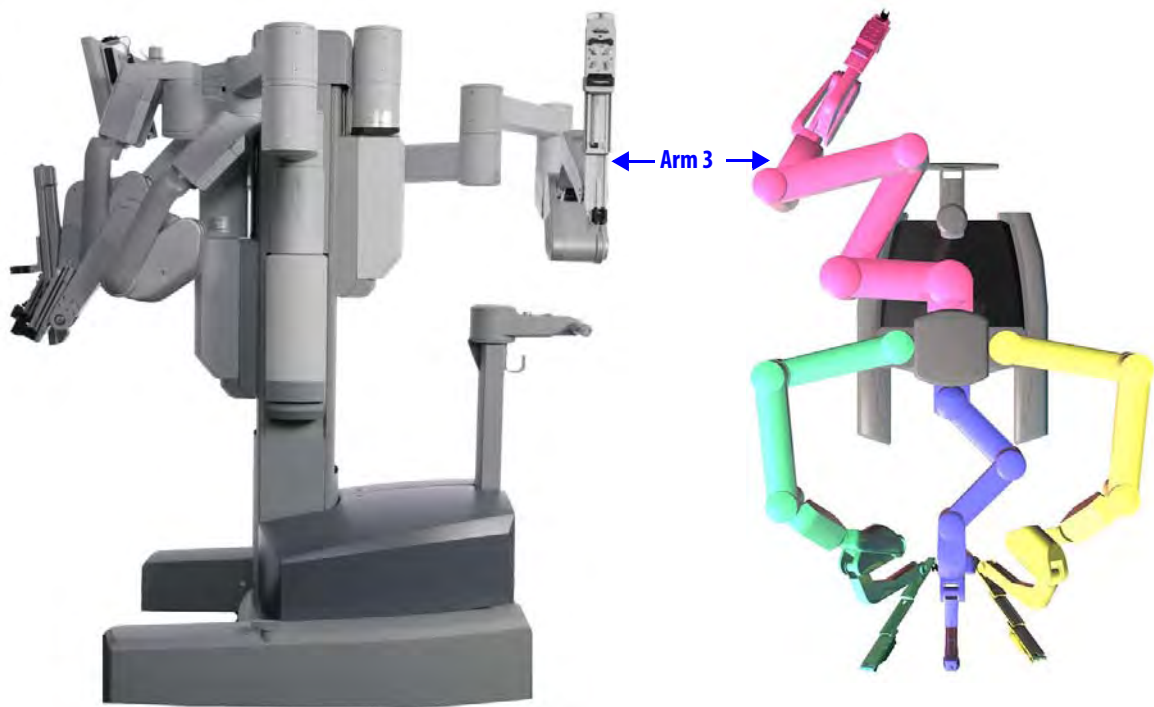


Figure 5.6 Arranging instrument arm 3 for stow position

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.

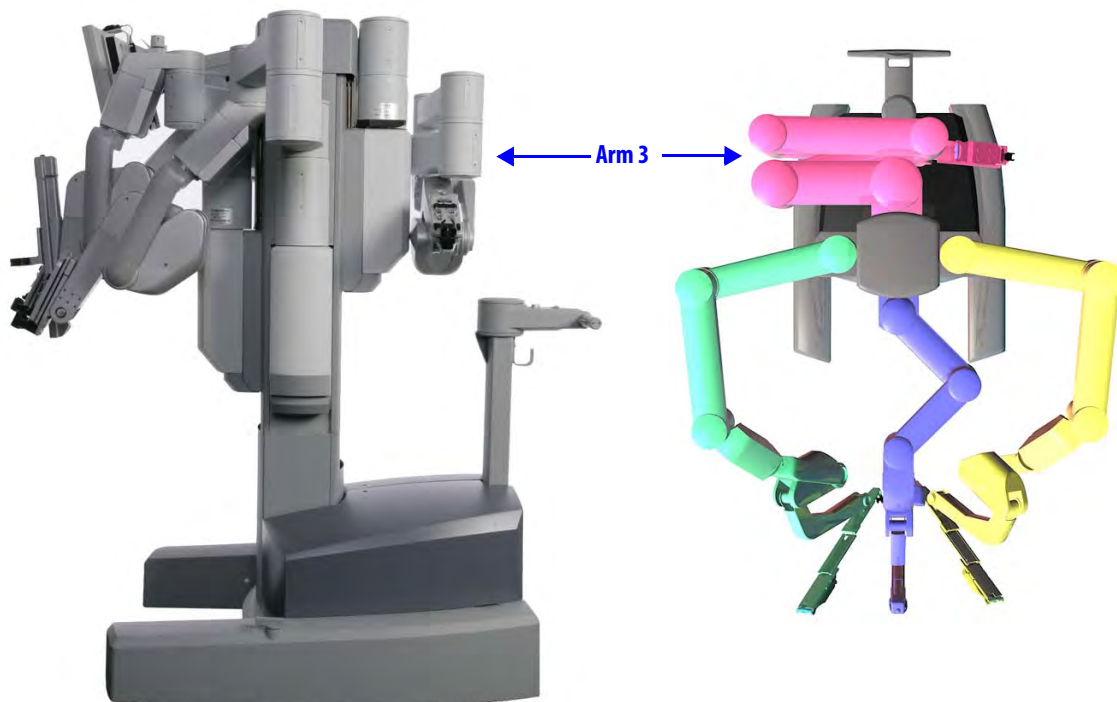


Figure 5.7 Instrument arm 3 in position to be stowed

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.

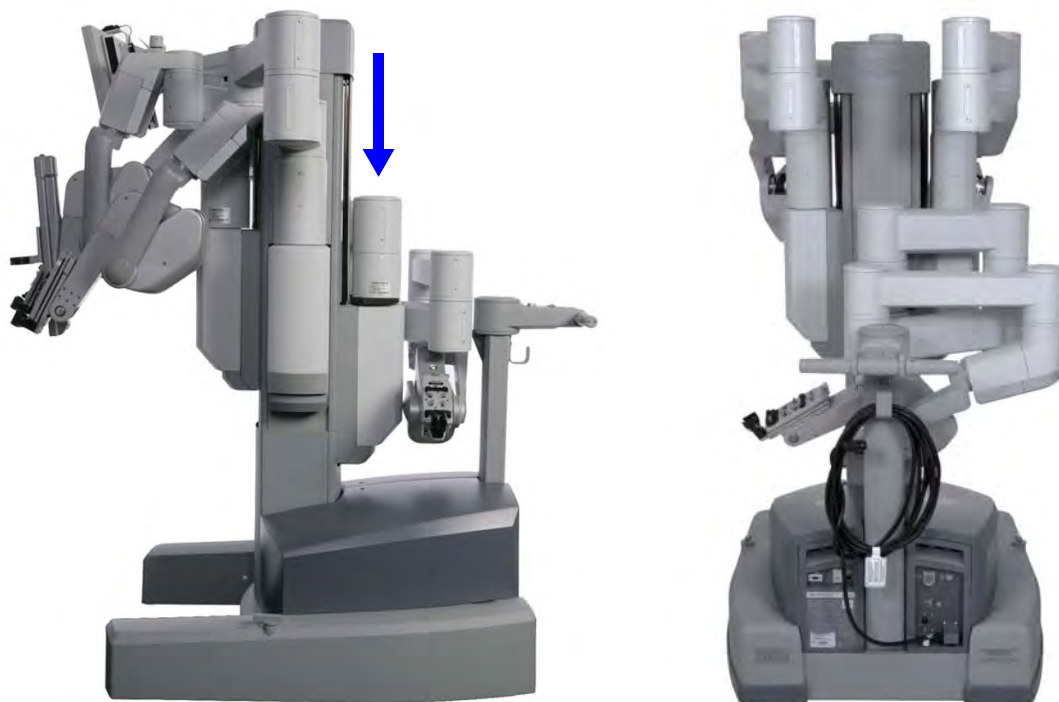


Figure 5.8 Setup joint at bottom of vertical range of motion

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.

- 6.1 Draping Guidelines, page 6-2
- 6.2 Column Covering Procedure, page 6-2
- 6.3 Instrument Arm Draping Procedure, page 6-6
- 6.4 Camera Arm Draping Procedure, page 6-12
- 6.5 Camera Head Draping Procedure, page 6-15
- 6.6 Touchscreen Draping Procedure (Optional), page 6-16



Figure 6.1 Examples of draping

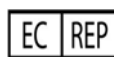


Drape Accessories Information

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



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



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.

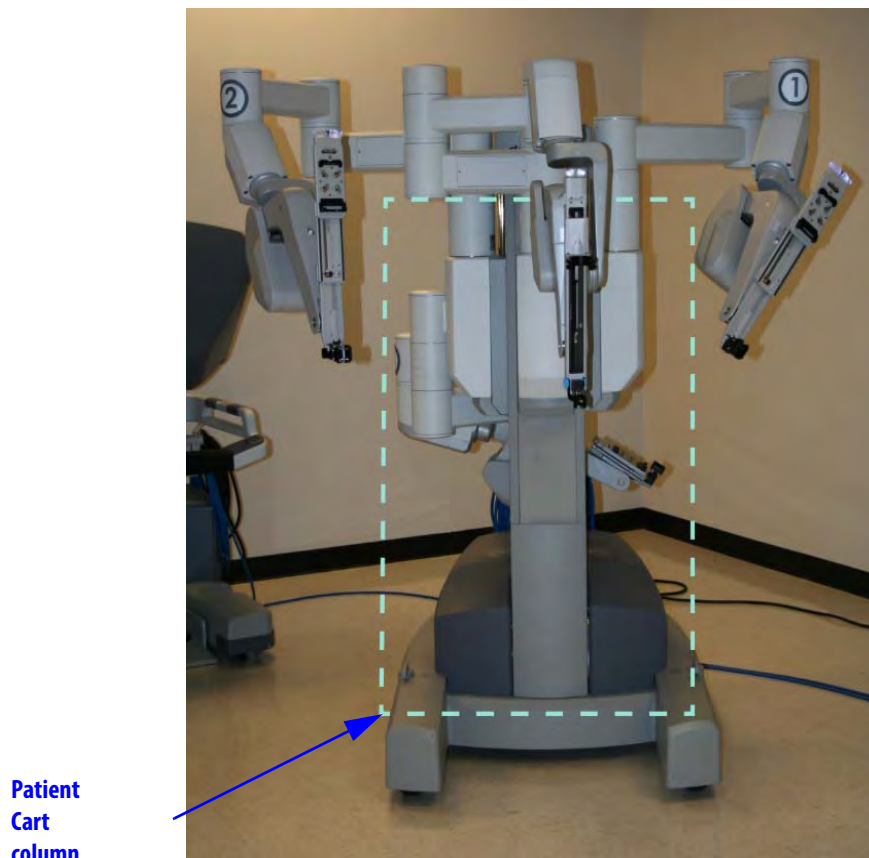


Figure 6.2 Patient Cart prepared for draping

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.

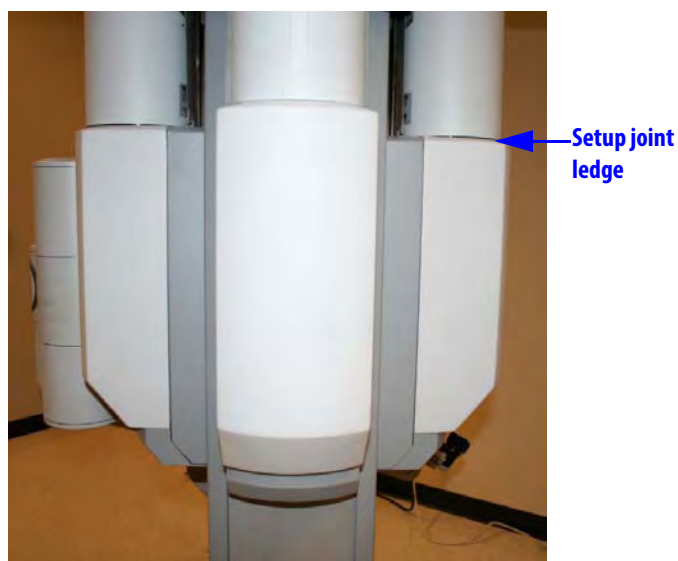


Figure 6.3 Setup joint ledge

- 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.

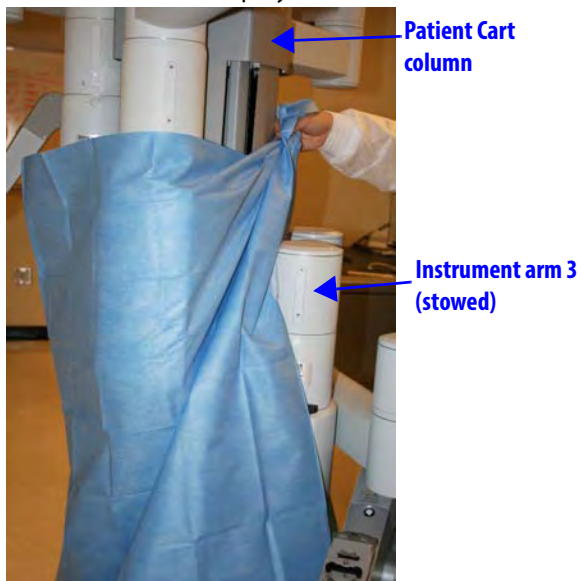


Figure 6.4 Seen from rear right

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

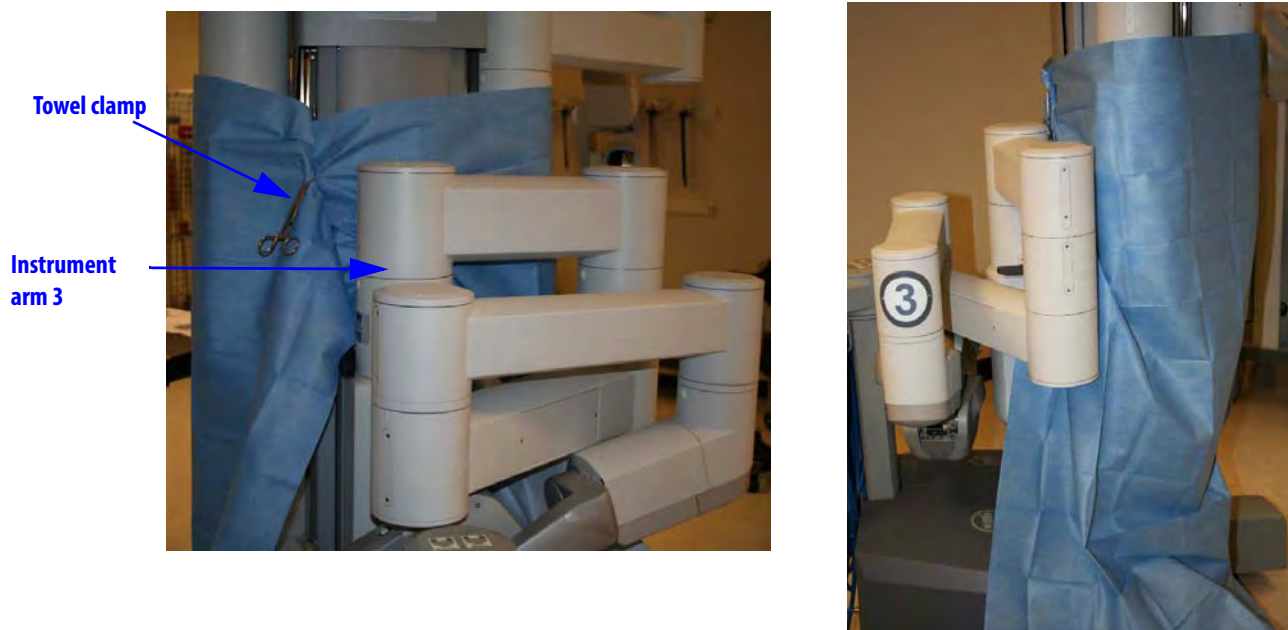


Figure 6.6 Secure with towel clamp | Clamp opposite of instrument arm 3

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.

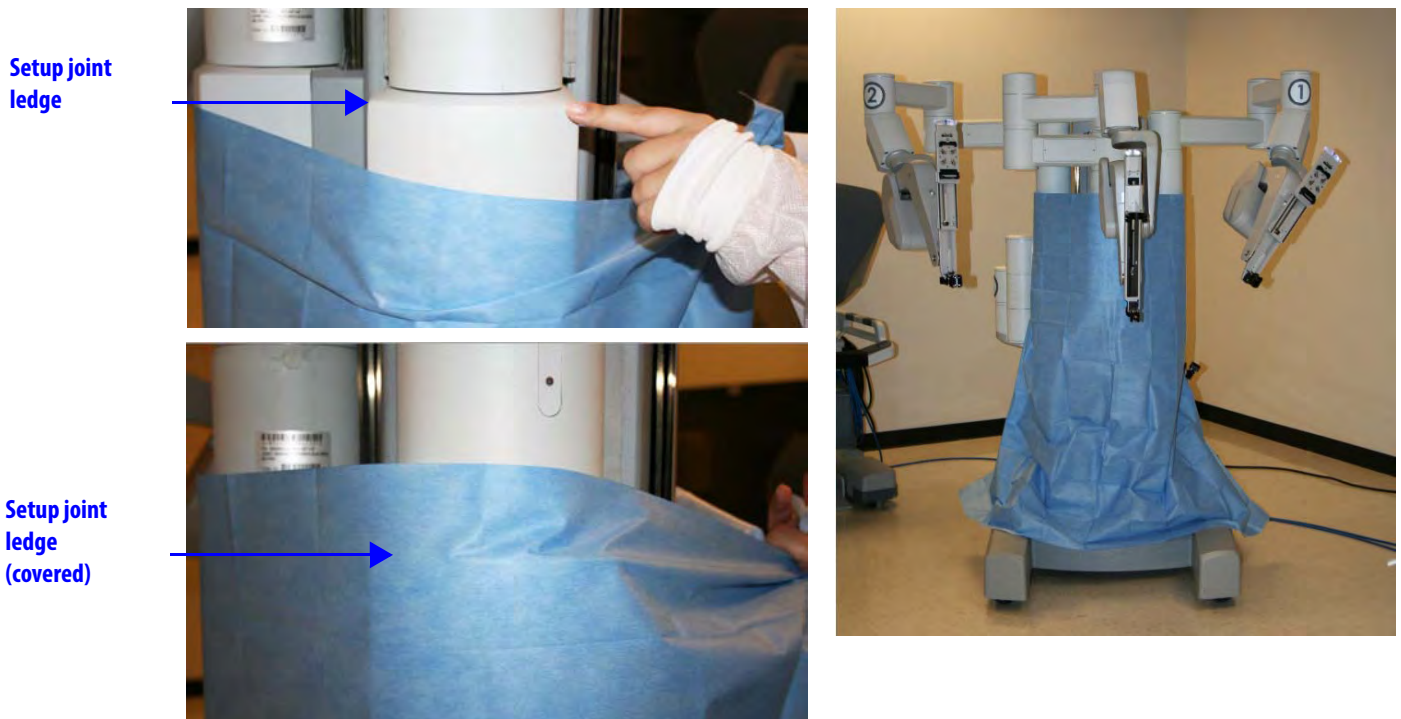


Figure 6.7 Setup joint ledge | Completed Patient Cart with drape

6.3 Instrument Arm Draping Procedure

i 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.

- 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

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

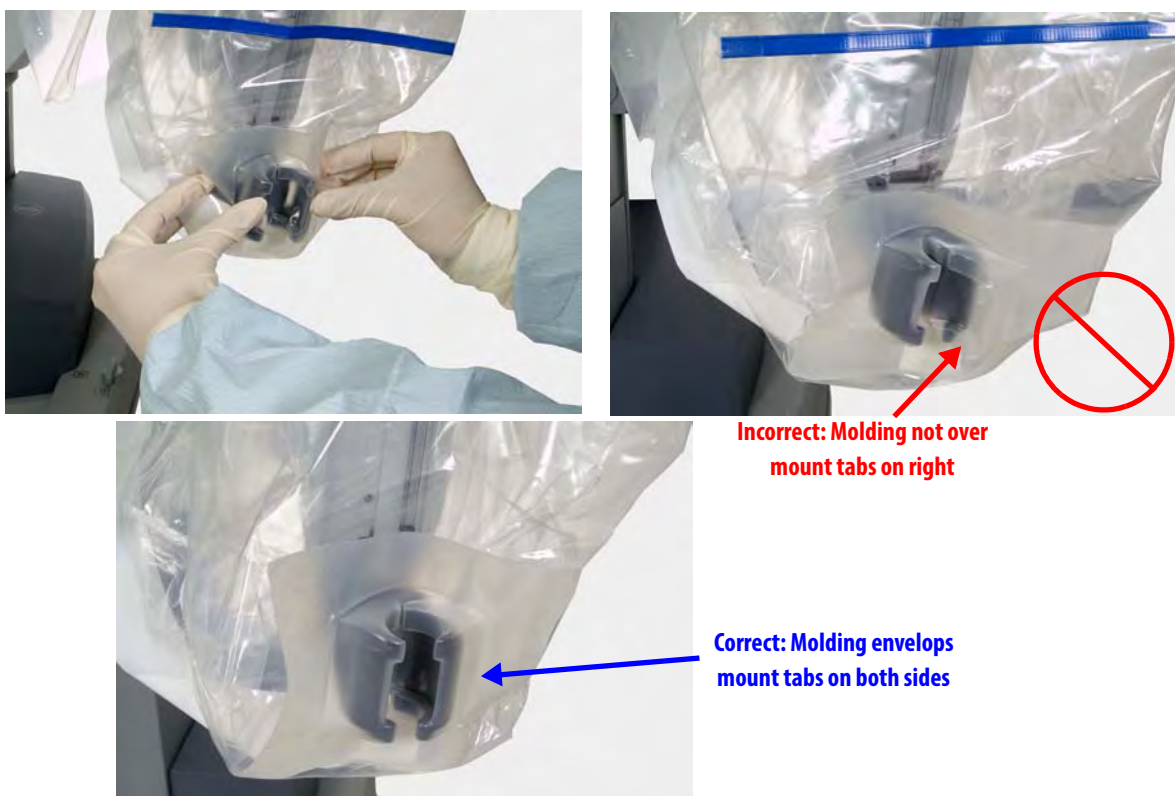


Figure 6.12 Seat the cannula mount molding

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.

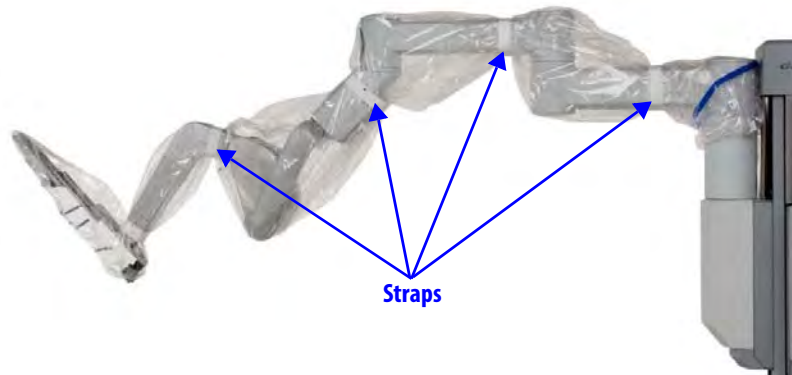


Figure 6.13 Securing the drape with the drape straps

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

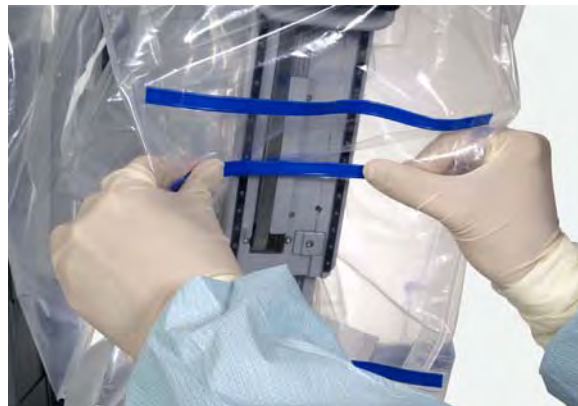
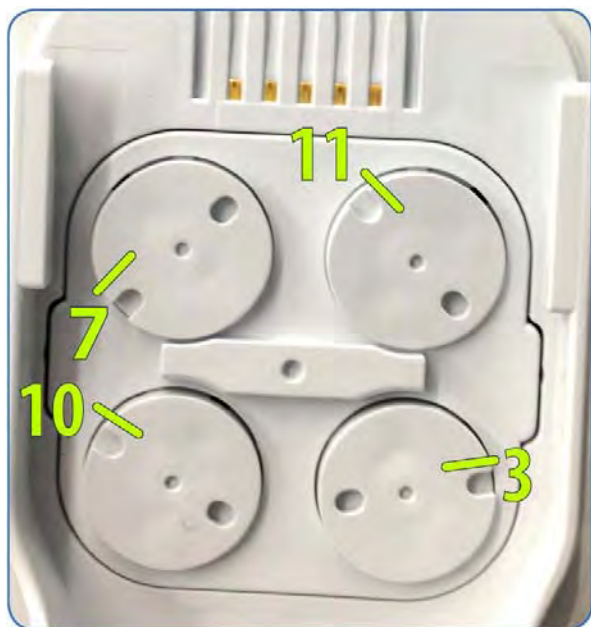


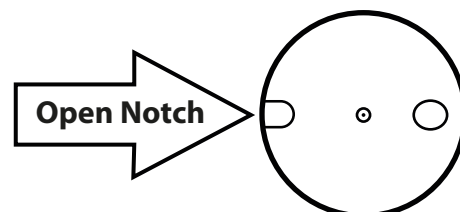
Figure 6.14 Bend the blue flex-strips

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:

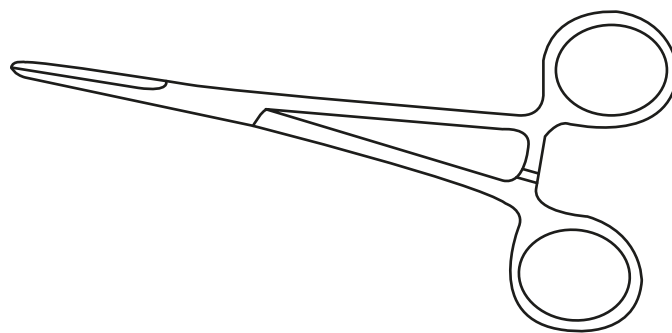
"7, 11, 3, 10"

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.

- i 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.
- i 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.

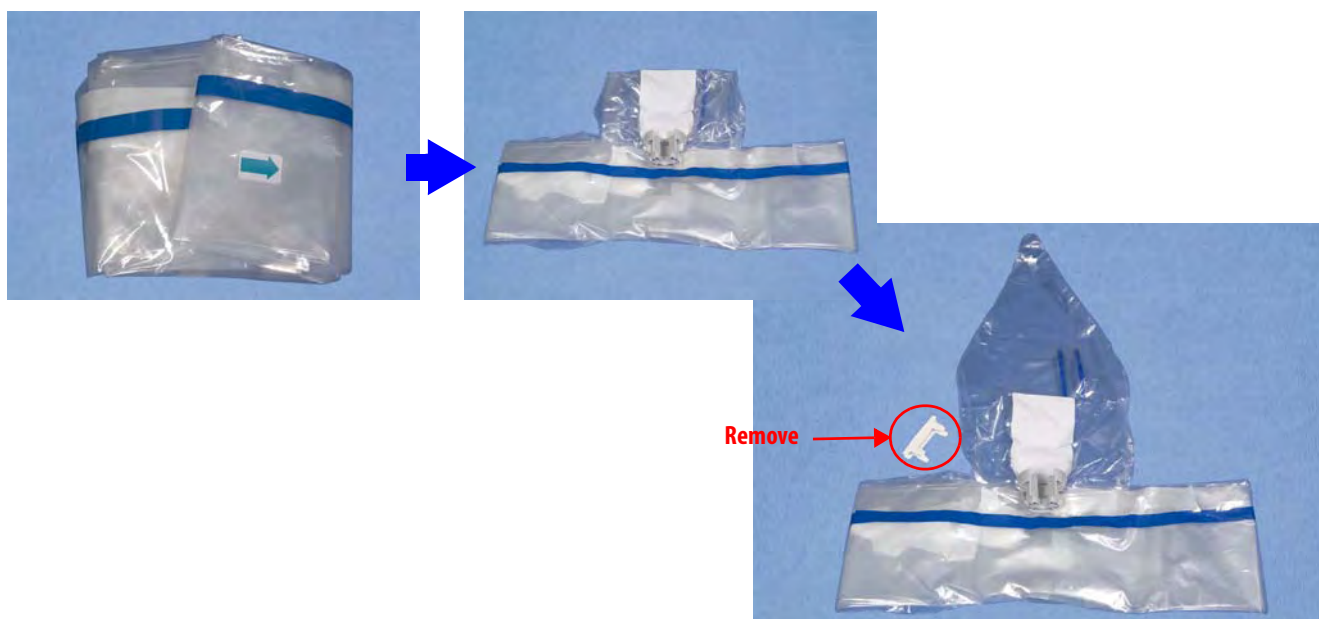


Figure 6.15 Unfold camera arm drape and remove white retainer

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.

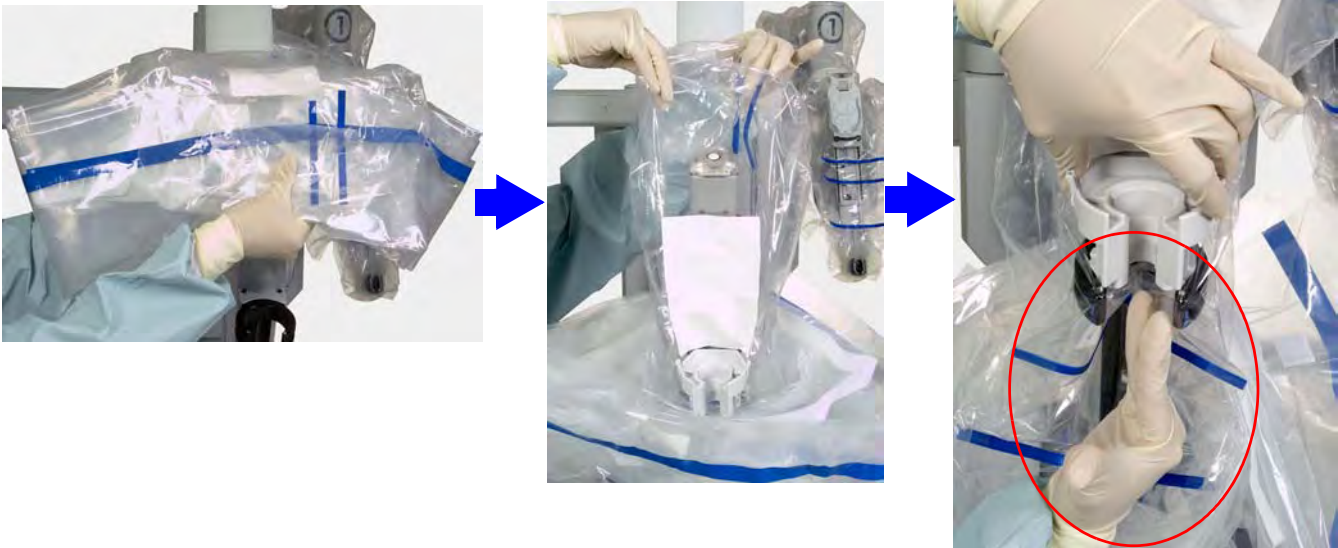


Figure 6.16 Lower over insertion axis, install sterile adapter

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

- Use your hands inside the drape cuff to engage the opposing Velcro strips near the center column.
- 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

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

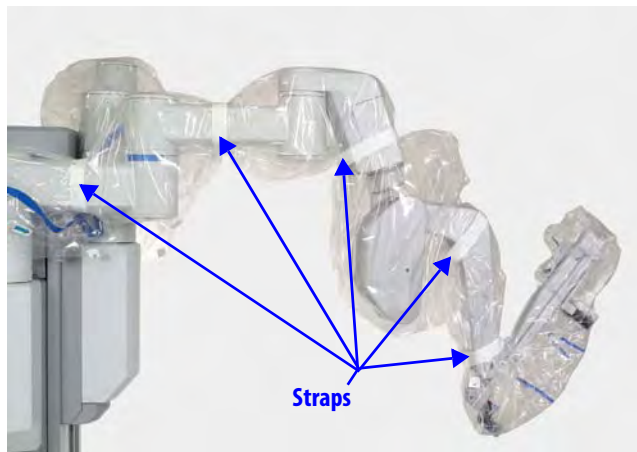


Figure 6.19 Camera arm drape secured with straps

- 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

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



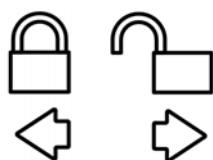
Since the Vision Cart and cables are not sterile, a non-sterile person (circulating nurse below) must assist a sterile person (scrub nurse below) with draping and connecting the camera head. (The camera head itself is not sterile and must not be autoclaved.)

To drape the camera head:

- Circulating nurse:** Deliver the camera drape to the scrub nurse in sterile fashion.
- 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.

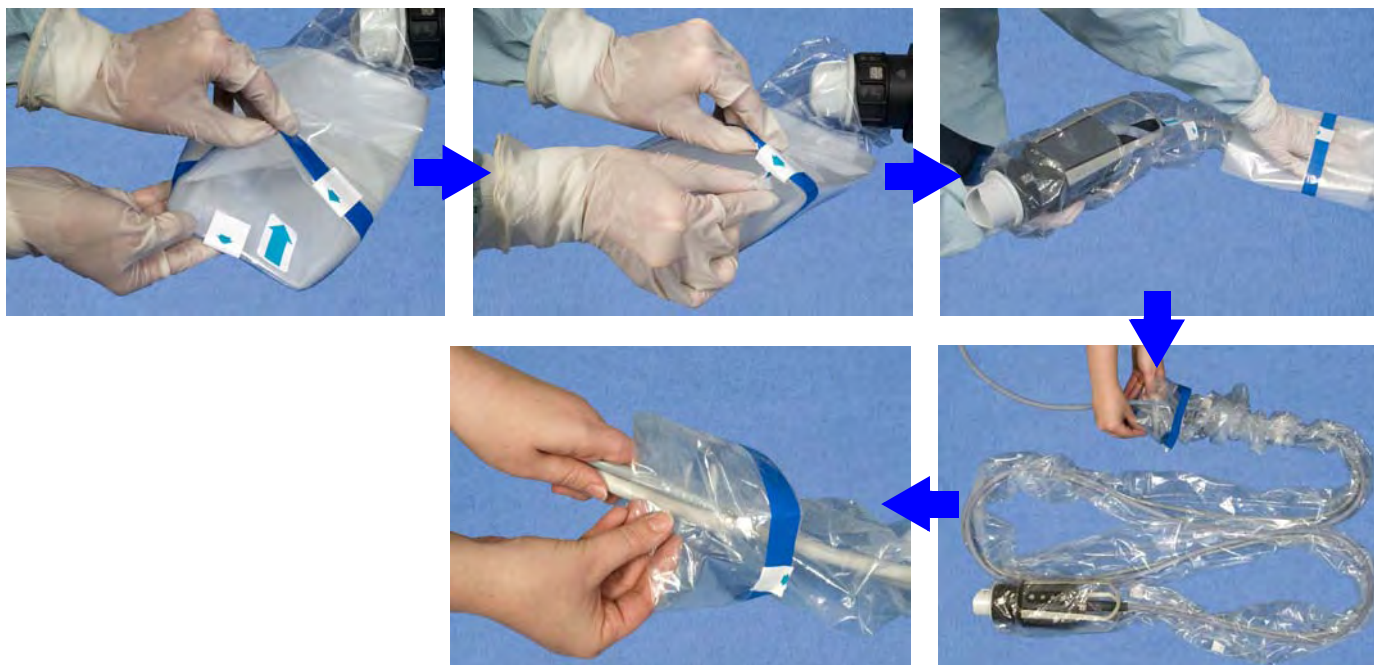


Figure 6.22 Invert drape over camera head, pull along cables

5. **Circulating nurse:** Pull the drape along the cables.
- i 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)

- i 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*

- 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

- 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).

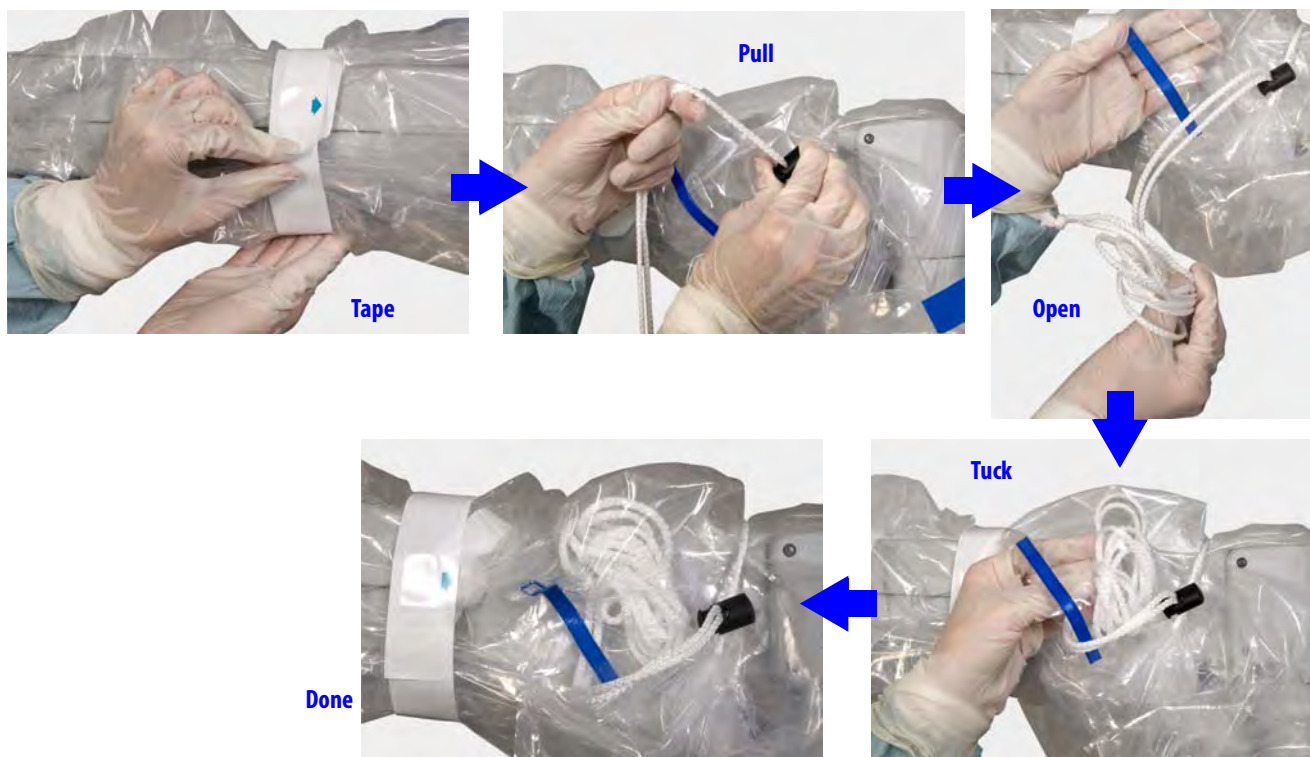


Figure 6.26 Secure tape, tighten drawstring, tuck extra inside

- 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

- 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, page 7-1
- 7.2 Setting Up the Vision System, page 7-5
- 7.3 Working with the Illuminator Controls, page 7-14
- 7.4 Working with the Touchscreen Vision Controls, page 7-15
- 7.5 Adjusting the Touchscreen Monitor, page 7-20
- 7.6 Troubleshooting Image Quality, page 7-20

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

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.

ℹ 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:

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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.