

Endoscopic Surgical System
(SR-ENS-600)
User Manual



Medical Device



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Safety Information

Please read this User Manual carefully before using the Endoscopic Surgical System (later referred to as the SHURUI® System, the system, or the product). To ensure the safe operation of this product, please follow the instructions and safety information provided in this manual and keep it in its desired working environment.

This manual contains the following types of safety information.

 CAUTION	CAUTION symbol alerts reader to what needs attention when operating and using the product. Details of relevant scenarios are given in boxes similar to this one.
 WARNING	WARNING symbol alerts reader to a potentially hazardous situation that, if not avoided, may result in minor or moderate injury to user or patient or damage to the product or other property. Details of relevant scenarios are given in boxes similar to this one.
 HAZARD	HAZARD symbol alerts reader to a situation that, if not avoided, could result in serious injury or death to user or patient, or serious damage to the product or other property. Details of relevant scenarios are given in boxes similar to this one.
 PROHIBITION	PROHIBITION symbol alerts reader to actions that are prohibited. Details of relevant scenarios are given in boxes similar to this one.

Chapter 1 Precautions and Warnings

This product should be used following this manual. Any person who has not been trained and qualified by Surgerii Robotics should not move or use this product. This document is provided in printed form. Please read all instructions carefully before use.

This User Manual is to be used in conjunction with the Technical Description, Instruments Information, 3D Endoscope Information, Energy Instrument Cord Information, Instrument Reprocessing Instructions, 3D Endoscope Reprocessing Instructions, and Accessories Reprocessing Instructions.

Surgerii Robotics will continue to mitigate risks that may be identified in the future through technology advancements, continuous risk management, and regular user follow-up training. Any serious incident concerning this product should be reported to the manufacturer and the competent authority of the Member State in which the user and/or patient is established.

Fail to properly follow the instructions, notes, cautions, and warnings associated with this product may lead to serious injury or surgical complications for the patient. While these messages appear throughout the manual, this chapter provides some general precautions.

1.1 Training

Only trained and qualified operators may use this product.

The training provided by Surgerii Robotics is limited to using the system and does not replace the necessary medical training and experience required to perform surgery.

 CAUTION	1) Operators should have adequate medical expertise and surgical skills.
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1.2 Installation and Service

 WARNING	1) No modification of this product is allowed by users. 2) To avoid the risk of electric shock, this product must be connected to power supply with protective ground only.
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 CAUTION	1) This product may only be installed and serviced by Surgerii Robotics personnel. DO NOT attempt to install or service the product without the presence of Surgerii Robotics personnel. To reduce the risk of electric shock, DO NOT open or remove covers. 2) Intense ambient vibrations in buildings can impact the operation and use of this product. So it is important to avoid this possibility while deciding where and when to use it. 3) Please refer to the Technical Description when installing the system. 4) This products and its accessories should be used in combination. Using components or accessories that are not provided by Surgerii Robotics may result in improper use, damage to this product, and even danger.
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1.3 Product Use

 WARNING	1) Reprocessing or reusing the products intended for single use may result in degraded instrument performance, loss of functionality, or exposure to viral, bacterial, fungal, or prionic pathogens.
 CAUTION	1) The user should check that the current alarm preset (alarm volume) is appropriate for the usage environment before using the product and that the alarm volume is not too high or too low. 2) During use, the user should pay attention to the system undergoing unintended motions. If such a situation occurs, immediately press the emergency stop button on the Surgeon Console or Surgical Trolley, remove all components in contact with the patient, and then proceed with the corresponding treatment. If necessary, the system can be rebooted, and the surgical operation process can resume. Relevant information should be reported to Surgerii Robotics' customer service department in time after the surgery. Only after Surgerii Robotics confirms that the system is functioning properly, can it be used for future surgical operations. 3) In case of a serious system failure during the use of this product, the system should be stopped immediately and handled following the User Manual. The relevant information should be reported to the customer service department of Surgerii Robotics immediately. 4) This product is not suitable for use with movable multi-outlet sockets. 5) Unless otherwise specified, one button should not be pressed multiple times within a short period of time. 6) This User Manual should be strictly followed during surgery.

	7) This product is a delicate medical device. Do not apply force to the moving components or use these components to hang any object that does not belong to this product. 8) When using the system, avoid damaging the casing, which may cause electric shock and safety risks. 9) Fail to comply with the User Manual's requirements may damage the surgical instruments or the 3D endoscope. 10) This product should not be used near strong electromagnetic interference sources such as nuclear magnetic imaging equipment and high-voltage cables. 11) This product has not been tested in environments with specific electromagnetic safety requirements, such as computed tomography, diathermy therapy machines, and argon gas electro knives. 12) The uninterruptible power supply (UPS) inside the product cannot be used to complete a surgery but can be used for instrument removal and patient release. System alarms will not be affected by the UPS usage. 13) Excessive gas injection during pneumoperitoneum can be dangerous and may cause a gas embolism. 14) Only CO₂ should be used as the insufflating gas when using the system with insufflation. Insufflation should only be performed by personnel having adequate training and experience with this technique. 15) The haptic force feedback associated with the system differs from that in traditional laparoscopic surgical instruments. Similar to laparoscopic surgery, the operating surgeons should rely on visual feedback to guide their operation. 16) The system is not suitable for use in the presence of a flammable anesthetic mixture of air, oxygen, and nitrous oxide. 17) The demonstration of safety and effectiveness for the representative specific procedures did not include evaluation of the outcomes related to the treatment of cancer (overall survival, disease-free survival, local recurrence) or treatment of the patient's underlying disease/condition. Device usage in all surgical procedures should be guided by the clinical judgment of an adequately trained surgeon.
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1.4 Conversion to Non-Minimally Invasive Surgery

 CAUTION	1) Anatomical characteristics of a patient may preclude using the minimally invasive techniques. Environmental or equipment failures may cause the system to be unavailable. The surgical team should always have backup
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	devices available and be prepared to convert to alternative surgical techniques. The potential risk of such conversion should be communicated to the patient.
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1.5 Endoscopic Procedure Precautions

The safe and effective use of the 3D endoscope depends on the surgeon's proficiency in using this product.

 CAUTION	1) Thermal hazards may exist from high temperatures. Eye hazards may exist from the high-energy light radiated by the endoscope and illumination system. Only personnel having adequate training and experience with the endoscope and illumination system should operate such equipment. All warning and caution messages from the endoscope and illumination system must be followed. 2) After disconnecting the illuminating optical fiber, the user should avoid coming into contact with the hot optical fiber connector on the 3D endoscope. 3) The temperature of the 3D endoscope's tip surface may exceed 41°C due to prolonged use.
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1.6 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 with adequate training and experience with endoscopic electrosurgery should perform endoscopic procedures involving electrosurgery. The instructions, warnings, and cautions provided by the electrosurgical unit must be followed, or else serious injury or surgical complications may occur to patient.

 WARNING	1) Due to concerns about the carcinogenic and infectious potential of electrosurgical by-products (such as tissue smoke plumes and aerosols), protective eyewear, filtration masks, and effective smoke evacuation equipment should be used in both open and laparoscopic procedures. 2) This product's rated high-frequency repetitive peak voltage is 3448V for monopolar surgical instruments and 530V for bipolar instruments. Do not set the output mode to exceed these voltage limits when used with a high-frequency generator.
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CAUTION

- 1) High-frequency surgical instruments may interfere with the operation of pacemakers or other electronic devices in vivo or in vitro. High-frequency surgical instruments may cause these devices to enter asynchronous mode or completely inhibit their operation. Before using high-frequency surgical instruments on patients with pacemakers, consult the manufacturer of the pacemaker for more information.
- 2) Before use, please carefully check whether the monopolar energy instrument cord or bipolar energy instrument cord appears damaged to ensure their insulation characteristics and functionality are normal.
- 3) Ensure that the patient neutral pad is securely affixed to the patient, placed as close as possible to the operating field, and properly connected to the electrosurgical unit. Before using the patient neutral pads, it is important to read the instructions, such as the user guide provided by the equipment manufacturer.
- 4) Disposable sterile patient neutral pads should be used to avoid cross contamination.
- 5) Always use the high-frequency generator's lowest possible output power setting to achieve the expected surgical effect. Before using the high-frequency generator, it is important to read the instructions, such as the user guide provided by the equipment manufacturer.
- 6) Do not use one instrument to energize other endoscopic instruments. Energizing other endoscopic instruments may cause tissue damage inside or outside the field of view of the endoscope.
- 7) Do not use the end-effector of high-frequency surgical instruments to come into contact with the 3D endoscope. Interference from the high-frequency surgical instruments may lead to the loss of 3D endoscope and surgical field images. If this should happen, the 3D endoscope and Surgical Trolley shall be reconnected to recover vision.
- 8) Avoid patient contact with grounded metal parts.
- 9) Place any monitoring electrodes as far as possible from the surgical instruments or the patient neutral pad when high-frequency surgical instruments and physiological monitoring equipment are used simultaneously on the same patient.
- 10) 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 applying high-frequency energy.
- 11) The instrument energy cord should be placed so that contact with the patient or other leads is avoided. High-frequency surgical equipment not in use should be stored away from the patient.

	12) For some surgical procedures, where high-frequency current may flow through human tissues with small cross-sectional areas, bipolar surgical instruments are recommended to prevent unexpected tissue damage. 13) For high-frequency surgical instruments that operate under correct operation settings, when the output decreases or interrupts, it may be caused by incorrect application of the neutral pad or poor contact with the connector. Therefore, the neutral pad connector application should be checked before selecting a higher output power.
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1.7 Instrument and 3D Endoscope Precautions

 CAUTION	1) Do not modify the 3D endoscopes or instruments. Modifications can result in electrical hazards or performance degradation. 2) Before using the surgical instruments and 3D endoscopes, their sterility should be checked to ensure the sterility of the surgical instruments or 3D endoscopes used in surgery. 3) Before use, check whether the surgical instruments or 3D endoscope have abnormal conditions such as stem bending, grip not closed, sharp edges, cracks, dents, corrosion, or mechanical defects, and avoid using surgical instruments or 3D endoscope with abnormal conditions. 4) Before inserting the surgical instruments and the 3D endoscope into the trocar channels, adequate lubrication should be applied using lubricant that is in a sterile condition. 5) Do not clean the surgical end-effector or vision module with other instruments during the operation. Otherwise, the surgical end-effector or vision module may be damaged. If the surgical end-effector or vision module needs cleaning, remove the surgical instruments or 3D endoscope from the patient's body, carefully clean the surgical end-effector or vision module with iodophor, and wipe it dry with gauze. 6) During the surgical procedure, special attention should be paid to preventing any sharp objects, including auxiliary instruments, from damaging human tissues or the stem covers of surgical instruments and the 3D endoscope. 7) Leakage currents from other endoscopic instruments may be additive. To ensure maximum patient safety, only Type CF endoscopic instruments from other manufacturers should be used with the system.
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1.8 Laser Safety

The Surgical Trolley's horizontal laser, height indicator, and positioning indicator

have been tested and meet the safety requirements of IEC 60825-1:2014, “Safety of laser products - Part 1: Equipment classification and requirements.” Laser specifications are demonstrated in the table below.

Table 1.1 Laser classification, radiation and source characteristics

Feature/light source	Laser class	Wavelength	Maximum power	Specification
Horizontal laser	Class 1	517nm	0.224mW	IEC 60825-1:2014
Height indicator	Class 1	517nm	0.179mW	IEC 60825-1:2014
Positioning indicator	Class 1	517nm	0.038mW	IEC 60825-1:2014

 CAUTION	1) Controls, adjustments, or performance of procedures not specified in this manual may result in the risk of radiation exposure. 2) When working around the Surgical Trolley horizontal laser, height indicator, and positioning indicator, the following general safety guidelines should be followed to reduce the risk of eye injury: a) Do not look or stare at the laser emission port. b) Do not inspect the laser emission port with optical instruments. Optical instruments (such as magnifying glasses) may increase the risk of eye injury. c) Do not attempt to repair or maintain the laser component. Repairs and maintenance outside the scope permitted in this manual should only be performed by authorized service engineers.
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Figure 1.1 shows the warning sign of laser radiation, indicating that this product is a Class 1 laser product with a risk of laser radiation. Safety guidelines should be followed when using it.

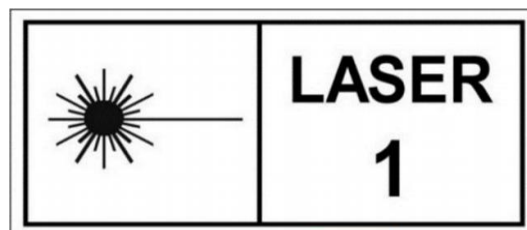


Figure 1.1 Warning laser radiation sign

1.9 Robotic Arm Positioning Precautions

 WARNING	1) Check for distance between the patient and the Surgical Trolley robotic arms. The robotic arms must not contact the patient's body surface.
 CAUTION	1) Do not place endoscope cables or any other cables over the robotic arms of the Surgical Trolley. This can restrict the movement of the robotic arms and may cause damage to the cables due to compression.

Figure 1.2 shows the warning sign of hand pinch, indicating a risk of hand pinch in this movement area. Users should pay attention to avoid being pinched by the system's moving parts.



Figure 1.2 Warning hands pinching sign

1.10 Interconnections with other Medical Devices

Medical devices connected to the system must be certified to IEC 60601-1. All configurations shall comply with the requirements for medical electrical equipment in standard IEC 60601-1. Please contact Surgerii Robotics if you have any questions.

 CAUTION	1) Leakage current from interconnected medical electrical equipment may exceed safe levels. For the patient's and user's safety, it is important to only connect devices in compliance with IEC 60601-1 requirements. It is the responsibility of the user to ensure that any interconnected equipment that is not supplied by Surgerii Robotics maintains compliance with IEC 60601-1 and the clinical usage requirements.
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1.11 Viewing 3D Images Precaution

People with a history of epilepsy or stroke (including family history) should consult with a medical specialist before viewing the 3D images in the 3D viewer of

the Surgeon Console. The following general caution warning is from the possible impact of viewing 3D images on some people.

 WARNING	1) Some users viewing 3D images may experience seizures, vision loss, dizziness, nausea, involuntary movements (such as eye or muscle twitches), loss of consciousness, convulsions, cramps, and disorientation. It can also cause motion sickness, eye strain, and reduced postural stability. If you experience any of the above symptoms, stop using the product immediately and do not continue until the symptoms subside.
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1.12 Transportation and Storage Precautions

When transporting or storing the system, the instruments and endoscope should be removed from the Surgical Trolley, and the robotic arm should be positioned in the “shipping pose” or “stowed pose.” During transportation, the Surgeon Console and Surgical Trolley shall be properly fixed. The haptic masters of the Surgeon Console, 3D viewer, robotic arms of the Surgical Trolley, and the status touchscreen shall be properly fixed.

After releasing the wheel brakes on the Surgeon Console and Surgical Trolley, use the handles of the Surgeon Console and Surgical Trolley to move the trolley and the console. During movement, pay attention to avoid collisions between the trolley and the console and surrounding obstacles. It should be noted that the wheels on the Surgeon Console and Surgical Trolley are intended solely for mobility within the working environment and are not intended for the transportation of the product.

 CAUTION	1) The Surgeon Console and Surgical Trolley are heavy and may present a hazard (such as tipping or collision) if control is lost when moving. Only trained and qualified personnel should attempt to move the system. 2) The Surgeon Console and Surgical Trolley shall move on a plane with a slope not more than 10°. 3) The system should be placed in a clean, non-corrosive room to avoid reducing the system’s service life. 4) This product should be regularly wiped according to its storage and usage environment. If it has not been used for a long time, it should be powered on once a month for 2-3 hours each time. 5) Pay attention to dust prevention when using and storing the system.
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1.13 Environmental Protection Precautions



WARNING

- 1) To prevent environmental pollution and ensure the safety of the person handling this product, it is important to carefully clean and disinfect it before disposing. Please dispose of all components following local regulations. This rule particularly applies to electronic components.

Chapter 2 System Overview

2.1 Components and Models

The system (Model SR-ENS-600) is a software-controlled, electro-mechanical system designed for assisting surgeons to perform safe and precise operations in single-port minimally invasive surgery (MIS). The system consists of a Surgeon Console and a Surgical Trolley.

Table 2.1 System components

Surgeon Console	SR-ENS-600-SC
Surgical Trolley	SR-ENS-600-ST

The system (Model SR-ENS-600) is used with a 3D endoscope, surgical instruments, and accessories.

Table 2.2 3D Endoscope, instruments and accessories

3D endoscope		SR-ENP-SP1001
Surgical instruments	Curved bipolar dissector	SR-ENT-SP0801
		SR-ENT-SP0801S
	Maryland bipolar forceps	SR-ENT-SP0802
		SR-ENT-SP0802S
	Monopolar curved scissors	SR-ENT-SP0803
		SR-ENT-SP0803S
	Monopolar cautery hook	SR-ENT-SP0805
		SR-ENT-SP0805S
	Bipolar forceps	SR-ENT-SP0806
		SR-ENT-SP0806S
	Needle driver	SR-ENT-SP0807
		SR-ENT-SP0807S
	Tissue forceps	SR-ENT-SP0808
		SR-ENT-SP0808S
	Large tissue forceps	SR-ENT-SP0809

		SR-ENT-SP0809S
	Large needle driver	SR-ENT-SP0810
		SR-ENT-SP0810S
Accessories	Monopolar energy instrument cord	SR-ENT-MPC1000
	Bipolar energy instrument cord	SR-ENT-BPC1000
	Trocars incision protector	SR-TCIP-4-1
		SR-TCIP-4-2
		SR-TCIP-4-3
		SR-TCIP-4-4
		SR-TCIP-3-2
		SR-TCIP-3-3
	Sterile drape	SR-ENS-600-D1
		SR-ENS-600-D2

2.2 Intended Purpose/Indications for Use

2.2.1 Intended Purpose

The SHURUI® Endoscopic Surgical System is intended to assist in the accurate control of the SHURUI® instruments during urologic laparoscopic surgical procedures, gynecologic laparoscopic surgical procedures, general laparoscopic surgical procedures, and thoracoscopic surgical procedures. It is intended for use by trained surgeons in an operating room environment in accordance with the representative, specific procedures set forth in the User Manual.

The SHURUI® Instruments are controlled by the SHURUI® Endoscopic Surgical System, and include flexible endoscopes, blunt and sharp endoscopic dissectors, scissors, forceps, needle drivers, endoscopic retractors, electrocautery and accessories for endoscopic surgical operations, including grasping, cutting, blunt and sharp dissection, approximation, ligation, electrocautery, and suturing through a single port. They are intended for use by trained surgeons in an operating room environment in accordance with the representative, specific procedures set forth in the User Manual.

2.2.2 Indications for Use

The system is indicated for adult and pediatric patients eligible for minimally invasive surgeries, indicated for benign or malignant conditions, performed intra-thoracically or intra-abdominally in specialties such as urological, gynecological, general and thoracic surgical procedures.

2.3 Intended Users

The system is intended to be used by trained surgeons in the operating room environment in accordance with the representative, specific procedures set forth in the User Manual.

2.4 Intended Patients

The system is indicated for adult and pediatric use and applicable to people who need laparoscopic or thoracoscopic surgery.

2.5 Complications and Side-effects

Common complications, side-effects and residual risks associated with the use of robotically assisted surgical devices, such as the SHURUI® system, includes, but is not limited to, the followings:

- Bleeding
- Tissue damage
- Infection
- Abdominal pain/wound pain
- Nausea and vomiting
- Ileus
- Ascties / Pleural effusion
- Incision hernia / Impaired healing
- Anastomotic leak
- Urinary retention / Obstruction / Occlusion
- Urine leak
- Delayed gastric emptying / Abdominal distention
- Pneumonia / Respiratory tract infection
- Atelectasis / Respiratory failure
- Pneumothorax
- Deep vein thrombosis

2.6 Benefit-risk

When used as indicated, the SHURUI® system is safe and effective in urological laparoscopic surgical procedures, gynecologic laparoscopic surgical procedures, general laparoscopic surgical procedures, and thoracic surgical procedures, for both adult and pediatric use. The potential clinical benefits to patients undergoing surgical procedures with the SHURUI® system include the benefits of minimally invasive surgery such as lower blood loss, reduced complication rates, lower postoperative pain, improved cosmesis, and shorter length of hospital stay, during normal conditions of use. These clinical benefits are similar to those expected with traditional laparoscopic surgical techniques or other commercially available robotic systems. Clinical risks, including intraoperative and postoperative complications, have been identified and reviewed against the available clinical evidence and treatment alternatives. The risks associated with the use of the SHURUI® system are acceptable when weighed against the evaluated benefits to the patient, during normal conditions of use.

2.7 Contraindications

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 SHURUI® system. Generally, non-procedure specific contraindications to endoscopic surgery include bleeding diathesis, morbid obesity and pregnancy. Do not use the SHURUI® system for procedures involving the circulatory system or central nervous system.

2.8 Working Conditions

Temperature: 15°C – 35°C

Humidity: 30% – 70%

Atmospheric Pressure: 700 hPa – 1060 hPa

2.9 Principle of Operation

The system is used to conduct minimally invasive surgery under the surgeon's control, based on the principle of master-slave teleoperation. During the operation, the operator maneuvers the two haptic masters to control the surgical instruments or the 3D endoscope while viewing the surgical site from the 3D viewer. The surgeon could

also activate electric cutting and coagulation or switch the control between different surgical instruments or the 3D endoscope using footswitch pedals and buttons.

Chapter 3 System Structure Composition and Performance

3.1 System Structure Overview

The system consists of a Surgeon Console and a Surgical Trolley, and is used with a 3D endoscope, surgical instruments, and accessories.

As shown in Figure 3.1, Surgical Trolley can be loaded with 3D endoscope and surgical instruments, along with accessories (see Table 2.1 and Table 2.2).

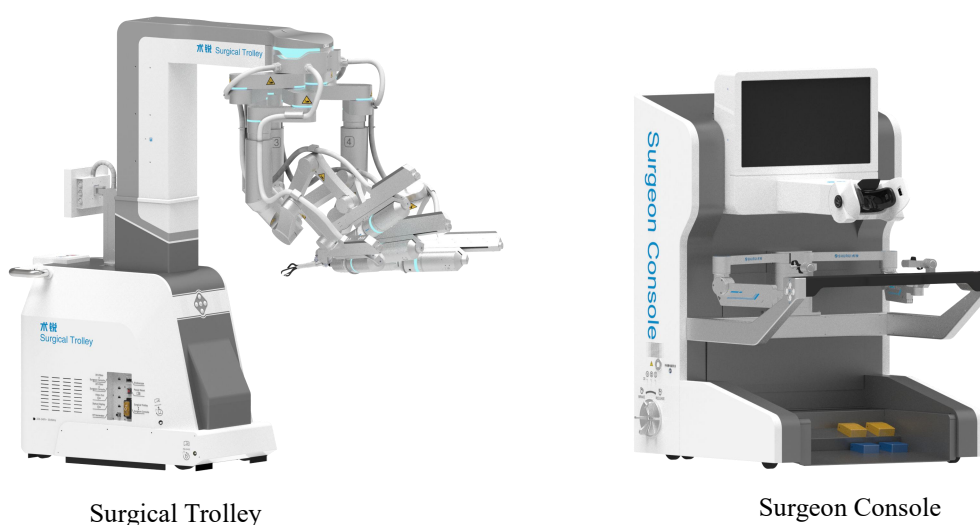


Figure 3.1 SHURUI® Endoscopic Surgical System

3.2 System Software

The system software is deployed on each workstation and control board of the Surgeon Console and Surgical Trolley. The information of system software is shown in Table 3.1.

Table 3.1 Software basic information

Software name	Model	Release version
Endoscopic Surgical System software	SR-ENS-600-SW	V01

The system's main software functions include user management, system setup, operation procedure guidance, robotic arm positioning, control of surgical instruments and 3D endoscope, alarming, and 3D simulation.

3.2.1 Data Security

From a security perspective, product data is classified into three categories: log information data is low risk, configuration data of product parameters is medium risk, and user information is high risk.

 WARNING	1) Surgerii Robotics' professional maintenance personnel provide relevant software setup, configuration, and update services.
 CAUTION	1) The system does not support a hospital network or other Ethernet connectivity.

3.3 Surgeon Console

The Surgeon Console integrates ergonomic adjustment, image display, status notification, operational input, functional controls, system communication and monitoring functions. During the operation, the surgeon sits in front of the Surgeon Console and controls the surgical instruments and the 3D endoscope by manipulating the left and right haptic masters and footswitch pedals.

The Surgeon Console consists of a 2D display, a 3D viewer, a touchpad, haptic masters (left/ right), a clutch pedal, a swap pedal, an endoscope control pedal, a brake, a footswitch panel, an emergency-stop button, a power button, a multi-functional button, an armrest, a “No Sitting” sign, 3D viewer up/down buttons, a 3D viewer extension lever, a 3D viewer pitch lever, a microphone, a speaker, an UPS, a battery indicator, infrared head sensors, yellow pedals (left/ right), blue pedals (left/ right), armrest up/down buttons, etc. The Surgeon Console components and position are shown in Figure 3.2.

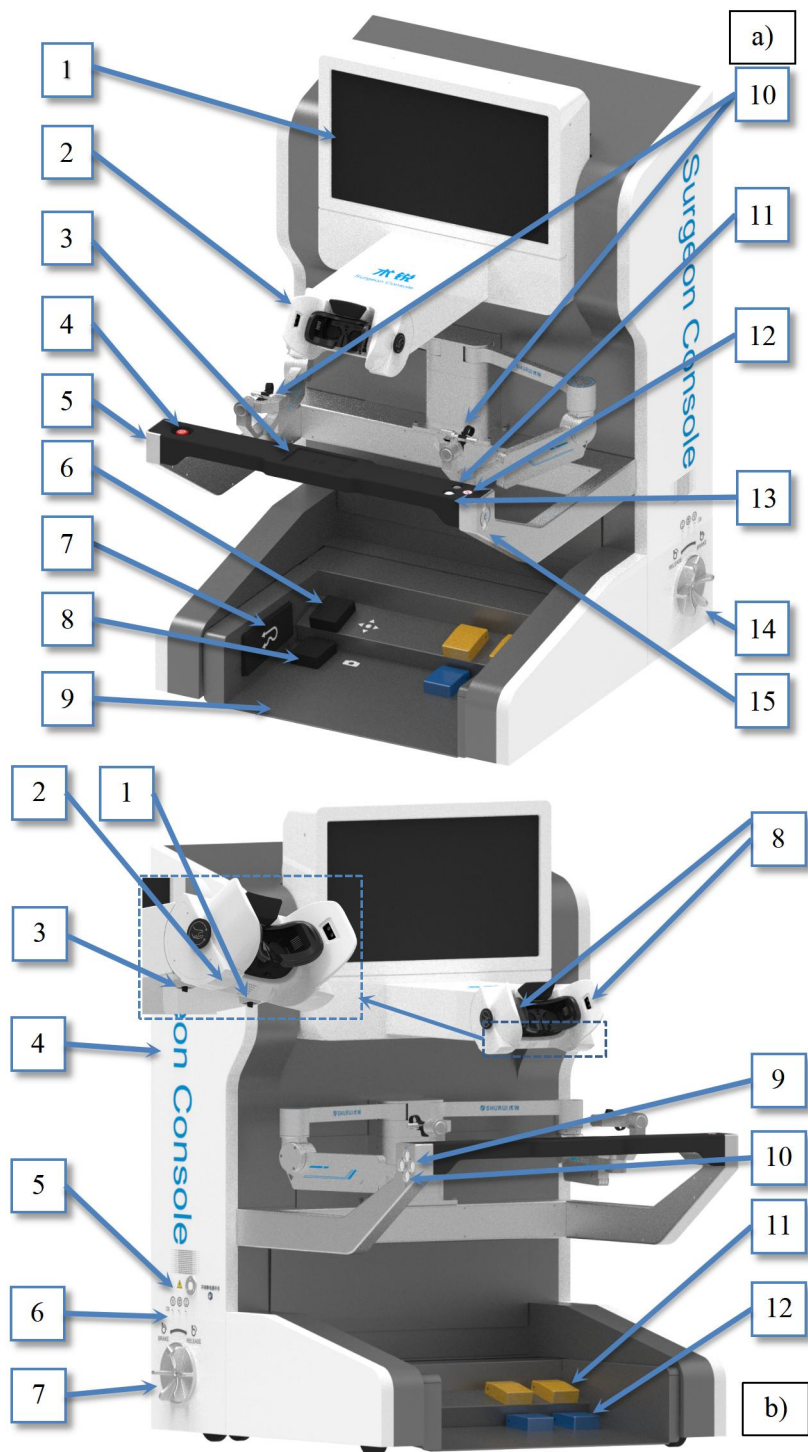


Figure 3.2 Surgeon Console: a) Right view (1-2D display, 2-3D viewer, 3-Touchpad, 4-Emergency-stop button, 5-Armrest, 6-Clutch pedal, 7-Swap pedal, 8-Endoscope control pedal, 9-Footswitch panel, 10-Haptic masters (left/ right), 11-Power button, 12-“No Sitting” sign, 13-Multi-functional button, 14-Brake, 15-3D viewer up/down button); b) Left view (1-3D viewer extension lever, 2-Microphone, 3-3D viewer pitch lever, 4-Speaker (interior), 5-UPS button, 6-Battery indicator, 7-Brake, 8-Infrared head sensors, 9-Footswitch panel move-in / move-out buttons, 10-Armrest up/down button, 11-Left/right yellow pedals, 12-Left/right blue pedals)

3.3.1 Haptic Masters

The haptic masters consist of a left haptic master and a right haptic master, which are used to collect user operation input. The structure of the left haptic master is shown in Figure 3.3.

1. Grip: Controls the clamping angle of the instrument end-effector.
2. Finger clutch: Disconnects the matching/teleoperation status of haptic master and surgical instrument.

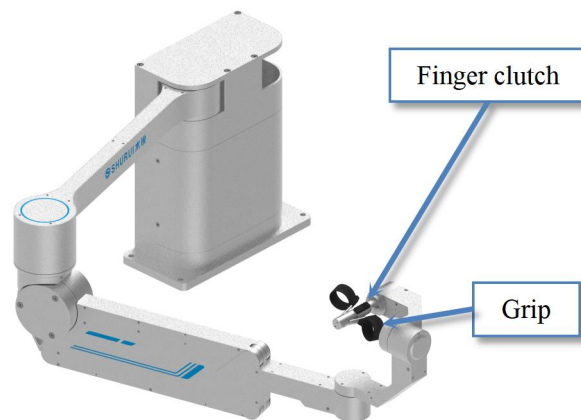


Figure 3.3 Left haptic master

The definition of each joint of the haptic master is shown in Figure 3.4, Figure 3.5, Figure 3.6, motion range of each joint is referred to Table 3.3.

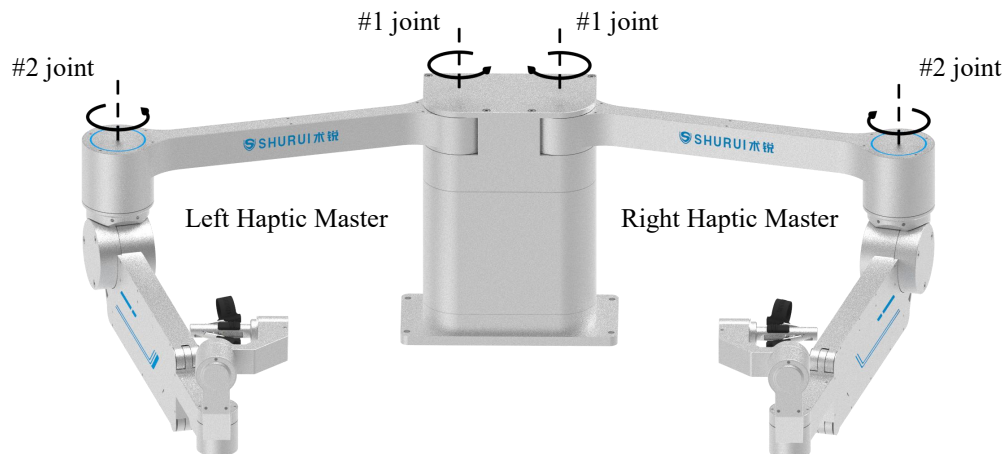


Figure 3.4 #1,2 joints of the haptic master (counterclockwise rotation represents positive)

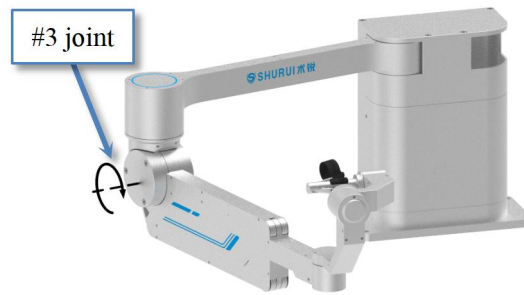


Figure 3.5 #3 joint of the haptic master (counterclockwise rotation represents positive)

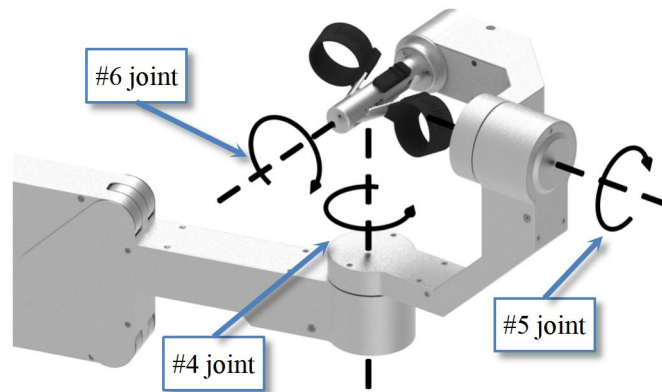


Figure 3.6 #4,5,6 joints of the haptic master

Table 3.2 Motion range of each joint

	Joint name	Initial limit	End limit
Left haptic master	#1 joint	0°	$\geq 90^\circ$
	#2 joint	15°	$\geq 135^\circ$
	#3 joint	45°	135°
	#4 joint	Unrestricted axial rotation	
	#5 joint	Unrestricted axial rotation	
	#6 joint	Unrestricted axial rotation	
Right haptic master	#1 joint	$\leq -90^\circ$	0°
	#2 joint	$\leq -135^\circ$	-15°
	#3 joint	45°	135°
	#4 joint	Unrestricted axial rotation	

	#5 joint	Unrestricted axial rotation
	#6 joint	Unrestricted axial rotation

3.3.2 Displays and 3D Viewer

Surgeon Console includes a 3D viewer, a 2D display, and a touchpad, as shown in Figure 3.2. The 3D viewer shows the stereoscopic image of the surgical field and the system status, the 2D display shows the 2D image of the surgical field and the system status, and the touchpad shows the software user interface of the Surgeon Console. The parts associated with the 3D viewer adjustments are shown in Figure 3.7, including interpupillary distance (IPD) sliding knobs, brightness button, 3D/2D switch button and diopter adjustment knobs. The brightness button is for adjusting the brightness of the 3D viewer. The 3D/2D switch button is for switching view mode between 3D and 2D. IPD sliding knobs and diopter adjustment knobs are used to adjust the IPD and the binocular diopter for different individuals.



Figure 3.7 3D viewer adjustment

3.3.3 Footswitch Pedals

The footswitch pedals of the Surgeon Console are used to collect input from user's feet, including swap pedal, clutch pedal, endoscope control pedal, yellow pedals, blue pedals and brake.

1. Swap pedal: Alternates the mapping relationship between the two surgical instruments assigned to the same haptic master.
2. Clutch pedal: Disconnects the matching status of the haptic master and surgical instruments.

3. Endoscope control pedal: Enables the control of the 3D endoscope.
4. Yellow pedals: The left and right yellow pedals activate the electric cutting function of the high-frequency surgical instrument controlled by the left and right haptic masters, respectively.
5. Blue pedals: The left and right blue pedals activate the electric coagulation function of the high-frequency surgical instrument controlled by the left and right haptic masters, respectively.
6. Brake: Controls the locking mechanism of the Surgeon Console to prevent unexpected motion. When movement is required, pedal the brake to unlocked the Surgeon Console.

3.3.4 Buttons

The buttons and knobs of the Surgeon Console include a power button, a multi-functional button, armrest up and down buttons, footswitch panel move-out and move-in buttons, 3D viewer up and down buttons, a 3D viewer extension lever, and a 3D viewer pitch lever. Functions are achieved by pressing the buttons or the levers.

1. Power button: Powers on or off the Surgeon Console.
2. Multi-functional button: Executes various predetermined movements for surgical instruments and 3D endoscope.
3. Emergency-stop button: Cuts off the system power in emergencies.
4. Armrest up and down buttons: Control the armrest height.
5. Footswitch panel move-out and move-in buttons: Control the position of the footswitch panel.
6. 3D viewer up and down buttons: Control the height of the 3D viewer.
7. 3D viewer extension lever: Controls the extension position of the 3D viewer.
8. 3D viewer pitch lever: Controls the tilting angle of the 3D viewer.

3.3.5 Infrared Head Sensors

The infrared head sensors are located in the distal sides of the 3D viewer (shown in Figure 3.8) and are used to determine whether the user is present with him/her viewing the 3D viewer. When the infrared head sensors do not detect a user, controlling the surgical instruments or 3D endoscope is not allowed, to prevent any unintended movement.



Figure 3.8 Infrared head sensors

3.3.6 Multi-functional Button LED Status Indicators

Table 3.3 Multi-functional button LED status indicators mode

	Condition	Mode
1	Any state of the surgical instrument is selected, and the multi-functional button is not pressed.	Always ON in blue.
2	Any state of the surgical instrument is selected, and the multi-functional button is pressed.	Flashing in blue (2 Hz, duty cycle 50%).
3	Other.	OFF.

3.3.7 Cable Connection Panel

The cable connection panel of the Surgeon Console is located on the lower back side of the Surgeon Console, including the power cable, the system connection cable, the 3D video port, the 2D video port, and the emergency power reset. The panel layout is shown in Figure 3.9.

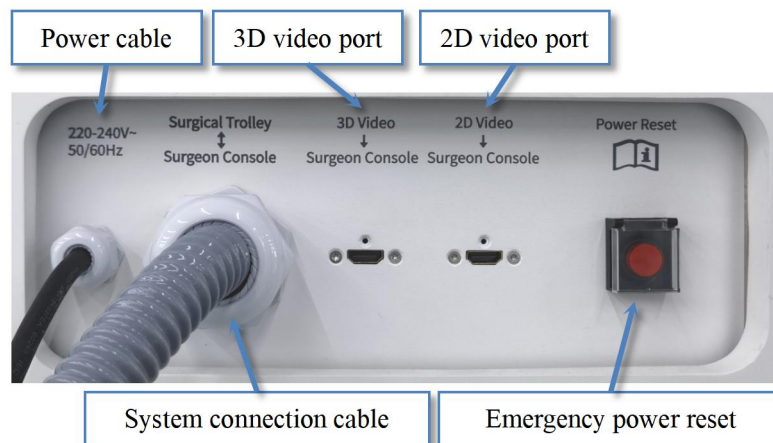


Figure 3.9 Surgeon Console cable connection panel

1. Power cable: Connects to an external power supply to power the Surgeon Console.
2. System connection cable: Connects to the system cable socket of the Surgical Trolley for communication between the Surgeon Console and the Surgical Trolley.
3. 3D video port: Receives the 3D imaging signal from the Surgical Trolley. Plug the 3D video cable in this port.
4. 2D video port: Receives the 2D imaging signal from the Surgical Trolley. Plug the 2D video cable in this port.
5. Emergency power reset: Long press for more than 5 seconds to reset the power supply of the Surgeon Console.

3.3.8 Other

1. Armrest: Provides comfortable arm support for the user. The height of the armrest can be adjusted by pressing the armrest up and down buttons. The armrest is not designed to bear the entire body weight and can support a maximum weight of 20kg.
2. “No Sitting” sign: Warns users not to sit or lie on the armrest.
3. Footswitch panel: Can be adjusted by the footswitch panel move-in and move-out buttons.
4. Handle: Located on the back of the console, and can be pushed or pulled by the user to move the Surgeon Console.
5. Microphone: Receives user’s voice input.
6. Speaker: Plays alarm tone, notification sound, and voice.
7. Battery indicator: Displays the current battery status of the UPS, as shown in Figure 3.10.
8. UPS switch: Long press this button to turn on and off the console’s UPS power output.

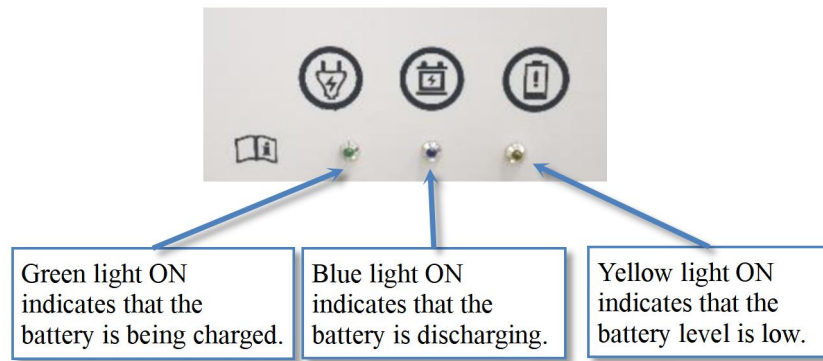


Figure 3.10 Surgeon Console UPS battery indicator

3.4 Surgical Trolley

The Surgical Trolley is positioned on the patient's side and is used with accessories. The Surgical Trolley can be loaded with surgical instruments and 3D endoscope to perform the operation in response to instructions from the Surgeon Console.

As shown in Figure 3.11, the Surgical Trolley includes stabilization feet, wheels, a microphone, a speaker, a status touchscreen, UPS buttons, a base, a helm, a front button panel, a cable connection panel, a positioning indicator, a horizontal laser, a height indicator, a warning laser radiation sign, warning hands pinching signs, a column, a beam, four robotic arms, and four actuation modules.

3.4.1 Base

The Surgical Trolley base integrates the wheels and the stabilization feet structures to achieve movement and stabilization functions. The two front wheels are lockable and electric driven. The Surgical Trolley base has a manual adjustment and release structure for the column, wheels, and stabilization feet (as shown in the Figure 3.12). This is used for patient release in case of a system power failure. To achieve the manual adjustment and the release function, users can use the Surgical Trolley adjustment tool placed on the back of the status touchscreen stack (as shown in the Figure 3.17) to twist the shafts at the adjustment and release sockets. Instructions are as follows.

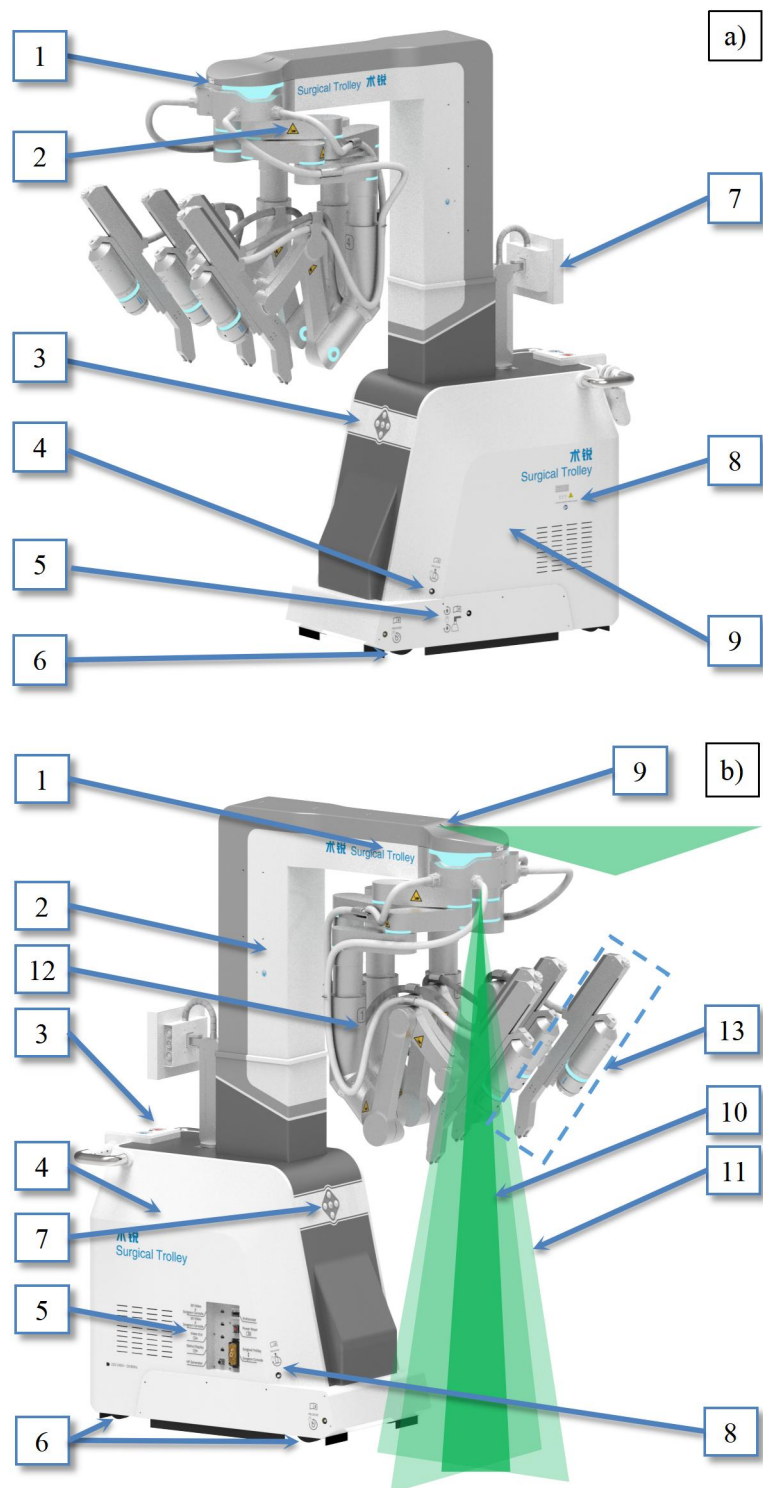


Figure 3.11 Surgical Trolley: a) Left view (1-Warning laser radiation sign, 2-Warning hands pinching sign, 3-Microphone (interior), 4-Left stabilization foot adjustment position, 5-Column adjustment position, 6-Left wheel, 7-Status touchscreen, 8-UPS buttons, 9-Speaker (interior)); b) Right view (1-Beam, 2-Column, 3-Helm, 4-Base, 5-Cable connection panel, 6-Right wheel, 7-Front button panel, 8-Right stabilization feet adjustment position, 9-Horizontal laser, 10-Positioning indicator, 11-Height indicator, 12-Robotic arm, 13-Actuation module)

1. Column adjustment: The column adjustment socket is in the middle of the left side of the Surgical Trolley base. Twist counterclockwise to raise the column, and twist clockwise to lower the column.
2. Wheel locking release socket: There are two wheel locking release sockets located on the left and right sides of the Surgical Trolley base to release the left and right wheels, respectively. Twist the left shaft counterclockwise to release; Twist the right shaft counterclockwise to release.
3. Stabilization feet release socket: There are two stabilization feet release sockets located on the upper left and right sides of the base. Twist the left shaft counterclockwise and twist the right shaft clockwise to raise the foot and release the locking status of the Surgical Trolley.

 WARNING	1) Before adjusting the column up or down or moving the Surgical Trolley, the surgical instruments and 3D endoscope must be exited, the sheath connectors should be released, so that the Surgical Trolley is completely released from the patient. Improper operation may cause injury to patients. 2) Only after the wheels and stabilization feet of the Surgical Trolley are manually released can the trolley be effectively moved away from the operating table.
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The Surgical Trolley base also integrates electrical components inside. A front button panel is at the front. On the side, the cable connection panel and UPS buttons are integrated. The rear top is fitted with a helm, and a system status touchscreen stack. The column extends upwards.

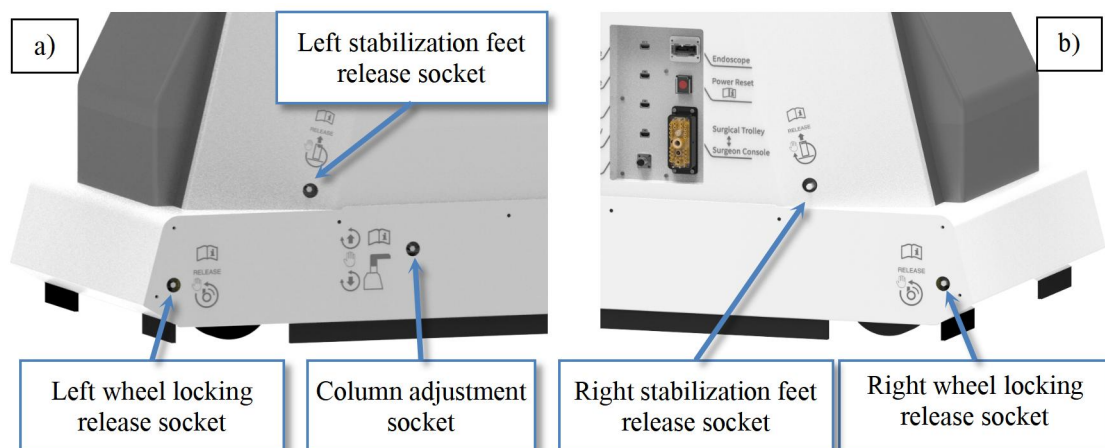


Figure 3.12 Manual adjustment and release for the column, wheels, and stabilization feet. a) Left-side view b) Right-side view



Figure 3.13 Partial view of UPS buttons

The UPS buttons, as shown in Figure 3.13, are from left to right: Select, Confirm, and Power. By using the hole grid window above the buttons to observe the UPS screen, the Select button is used for selecting operational information, the Confirm button is used for confirming operational information, and the Power button can turn on or off the UPS' output.

The front end of the Surgical Trolley base is equipped with a front button panel. The buttons integrated on this panel control the movement of the column, switch the target pose of the robotic arm, and trigger the movement of the robotic arm.

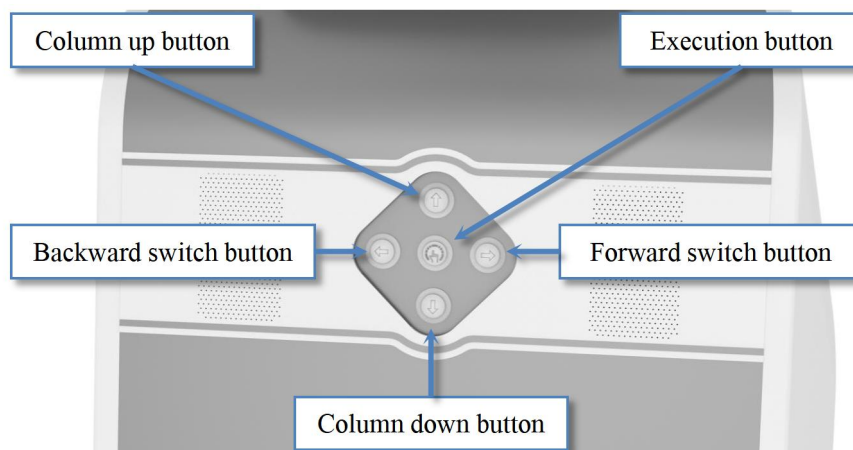


Figure 3.14 Front Button Panel

The front button panel of the Surgical Trolley consists of the following buttons:

1. Execution button: Enables the movement of the robotic arm towards the target pose.
2. Backward switch button: Switches the robotic arm movement target or state to the previous step.

3. Forward switch button: Switches the robotic arm movement target or state to the next step.
4. Column up button: Controls the upward movement of the column.
5. Column down button: Controls the downward movement of the column.

The cable connection panel of the Surgical Trolley is shown in Figure 3.15.

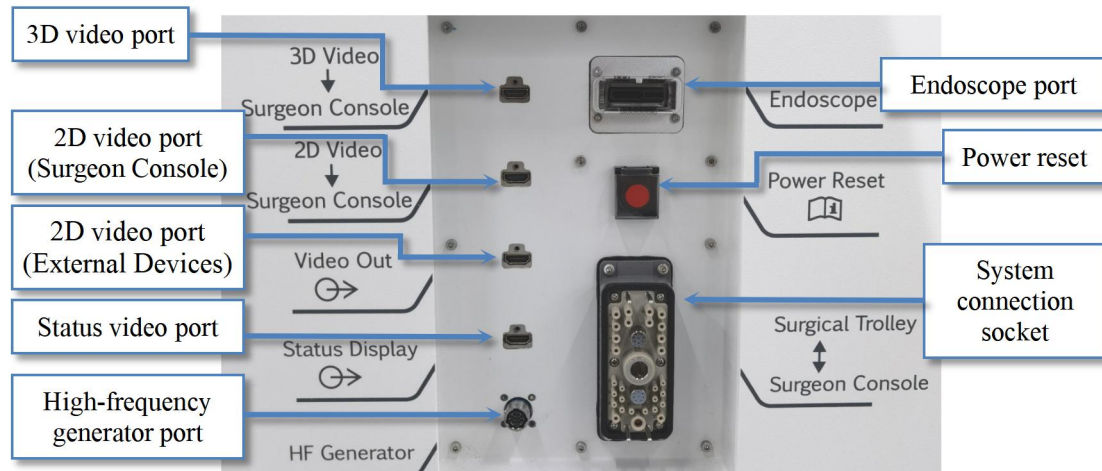


Figure 3.15 Surgical Trolley cable connection panel

1. 3D video port: Plug 3D video cable in this port. 3D imaging signal is transmitted to the Surgeon Console via this port.
2. 2D video port (Surgeon Console): Plug 2D video cable in this port. 2D imaging signal is transmitted to the Surgeon Console via this port.
3. 2D video port (external devices): Connects to other display devices or recording devices in the operating room using standard HDMI cables to output 2D image of the field of view.
4. Emergency power reset: Long press the button for more than 5 seconds to reset the power supply of the Surgical Trolley.
5. System connection socket: Plug in the connector of the system connecting cable of the Surgeon Console to establish the communication between the Surgeon Console and the Surgical Trolley.
6. Endoscope port: Can be connected to the 3D endoscope cable or to the dedicated maintenance bridging cable for maintenance operations.
7. Status video port: Connects to other displays in the operating room using standard HDMI cables to output the system status UI interface.
8. High-frequency generator port: Connects to the high frequency generator via energy activation cable.

 WARNING	1) Do not touch the emergency power reset button during the surgery to avoid unexpected system reset.
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The Surgical Trolley helm integrates the battery indicator, the drive controller, an emergency-stop button, a power button, a stabilization feet knob, etc., as shown in Figure 3.16.

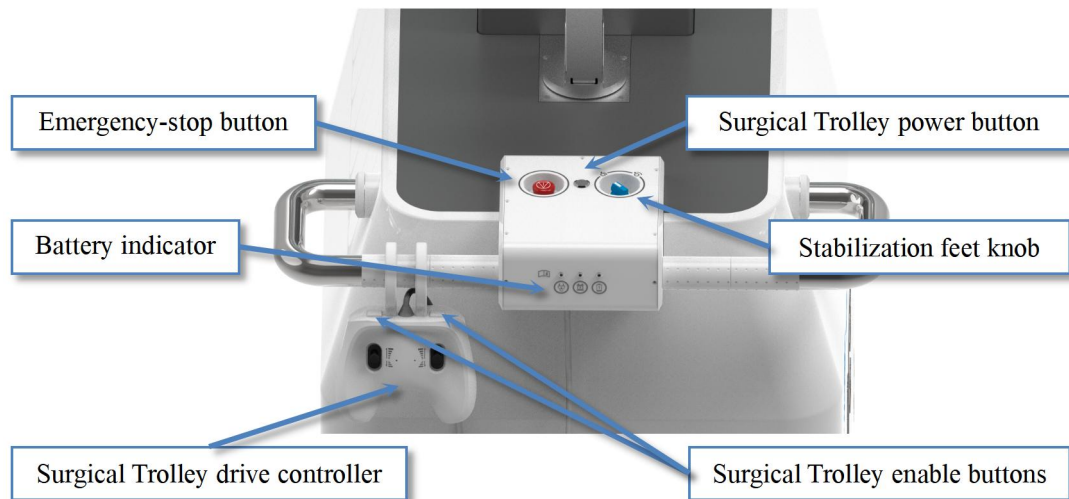


Figure 3.16 Surgical Trolley helm

The functions of the Surgical Trolley helm are detailed as follows:

1. Emergency-stop button: Cuts off the system power in an emergency.
2. Surgical Trolley power button: Turns on/off the Surgical Trolley.
3. Battery indicator: Displays the battery status of the Surgical Trolley's UPS.
The green light indicates battery charging; The blue light indicates battery discharging; The yellow light indicates low battery power.
4. Stabilization feet knob: Rotates to the left and the stabilization feet will extend downwards to the ground; Rotate to the right and the stabilization feet will raise up to release the Surgical Trolley.
5. Surgical Trolley drive controller: Drives the Surgical Trolley to move forward, backward, and steer.
6. Surgical Trolley enable buttons: Located on the drive controller. The trolley can move only when the buttons are pressed.

3.4.2 Status Touchscreen

The status touchscreen is a touch screen that presents the UI interface of the

Surgical Trolley and receives user input. The UI interface shows the system status and settings (which are used for status prompting), robotic arm positioning guidance, operation guidance, and system settings. The mount of the status touchscreen is adjustable, including two rotational movements around the vertical axis with a range of ± 90 degrees and a forward and backward tilting motion. This enables convenient adjustment of the direction of the status touchscreen. The status touchscreen has a column-up button, a column-down button, and an execution button, in the side, as shown in Figure 3.17.

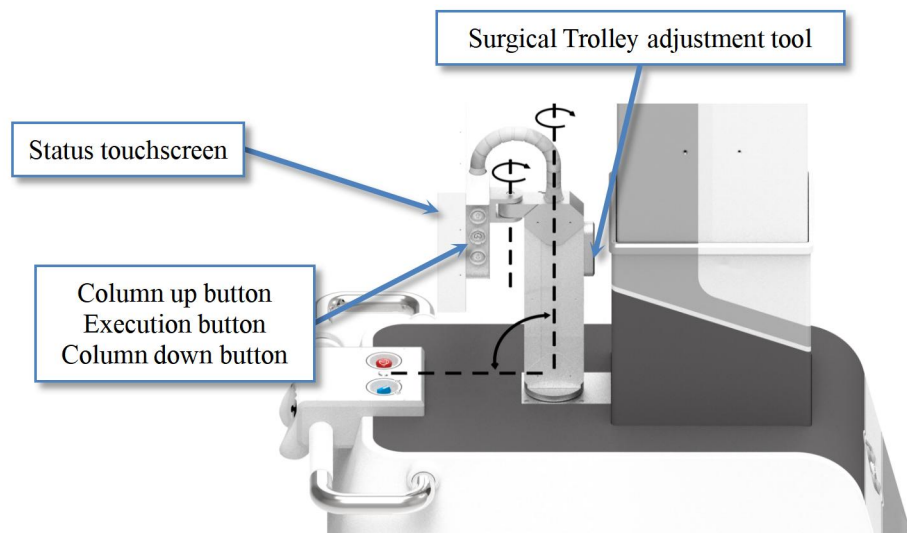


Figure 3.17 Status touchscreen and the stack

The buttons on the status touchscreen have the following functions:

1. Execution button: Enables the movement of the robotic arm towards the target pose.
2. Column up button: Controls the upward movement of the column.
3. Column down button: Controls the downward movement of the column.

3.4.3 Column and Beam

The Surgical Trolley column can be raised and lowered, with its top fixed to the beam. A system warning LED status indicator is on the beam-end. The front end of the beam-end connects with four robotic arms.

3.4.4 Robotic Arm

The Surgical Trolley integrates four robotic arms. Each of them contains multiple motion joints, and an actuation module at its end, as shown in Figure 3.18. To illustrate the structure of the robotic arm, only robotic arm 2 is included in this figure.

The robotic arm joint can be controlled to achieve single arm movement or coordinated movement together with other arms, and to adjust the position and orientation of the actuation module (Figure 3.19) and loaded surgical instruments or 3D endoscope.

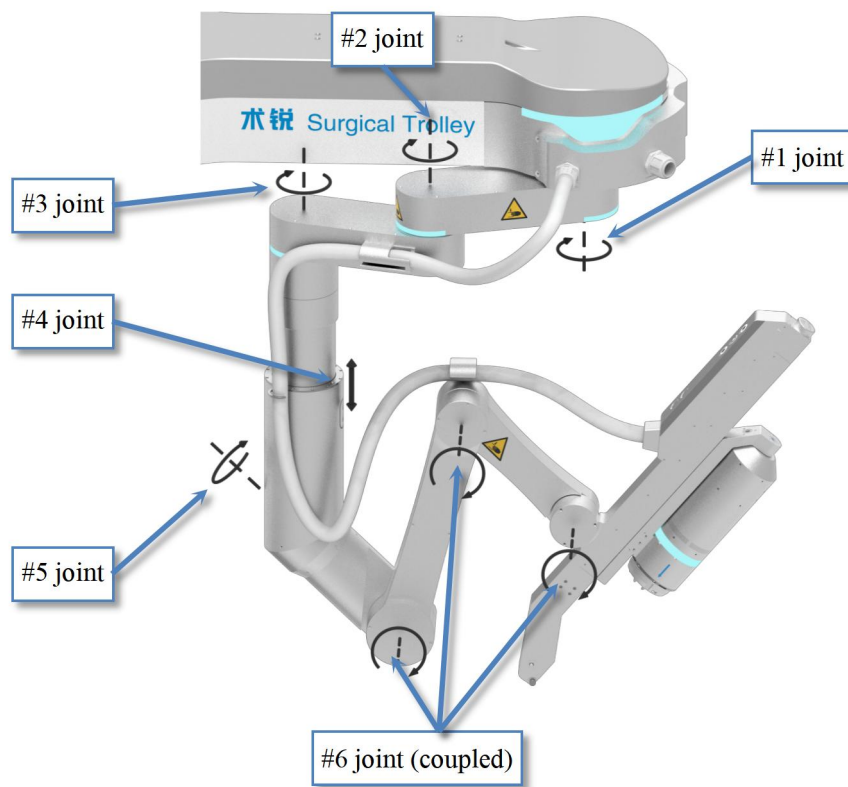


Figure 3.18 Robotic arms structural diagram

 WARNING	1) Be careful to avoid collisions between the robotic arms and other items in the operating room.
 CAUTION	1) The system continuously monitors the gap between robotic arms during movement. Upon detecting a potential collision, it automatically stops motion and triggers an alarm.

3.4.5 Actuation Module

The end of the robotic arm is equipped with an actuation module. The actuation module is composed of a linear module and a rotary module, in order to drive the surgical instruments and 3D endoscope. The actuation module integrates a series of buttons and other structures as shown in Figure 3.19.

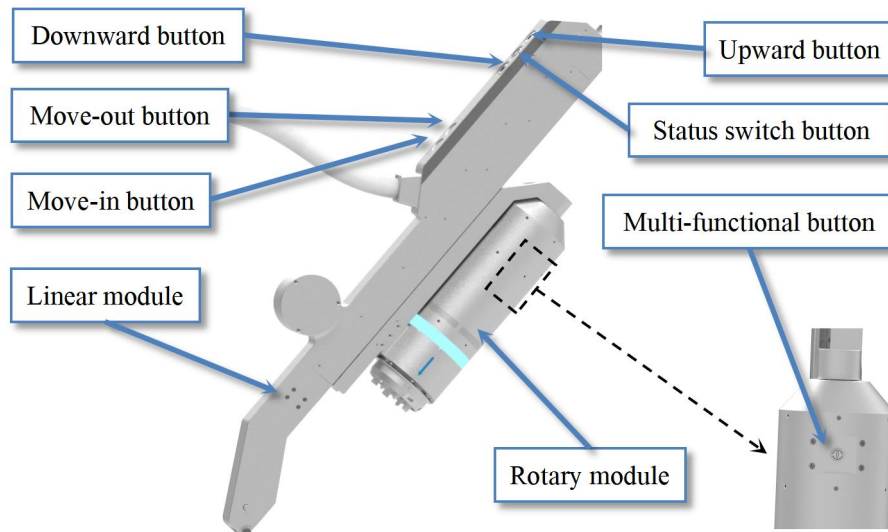


Figure 3.19 Actuation module structural diagram

1. Downward button and upward button: Adjust the pitch angle of the actuation module.
2. Status switch button: Switches between robotic arm motion status.
3. Move-in button: Controls the forward movement of the rotary module.
4. Move-out button: Controls the backward movement of the rotary module.
5. Multi-functional button: Long press to realize locking and unlocking of the instrument or the 3D endoscope driven by the rotary module, including locking between the rotary module and the instrument adapter of sterile drape and locking between the instrument adapter of sterile drape and the 3D endoscope or the surgical instruments.

3.4.6 LED Status Indicators

The Surgical Trolley LED status indicators includes the actuation module LED status indicator, robotic arm LED status indicator and system alarm LED status indicator, which are used for system notifications and warnings. The positions of the above LED status indicators are shown in Figure 3.20. This schematic diagram only shows robotic arm 2 for illustrative purpose.

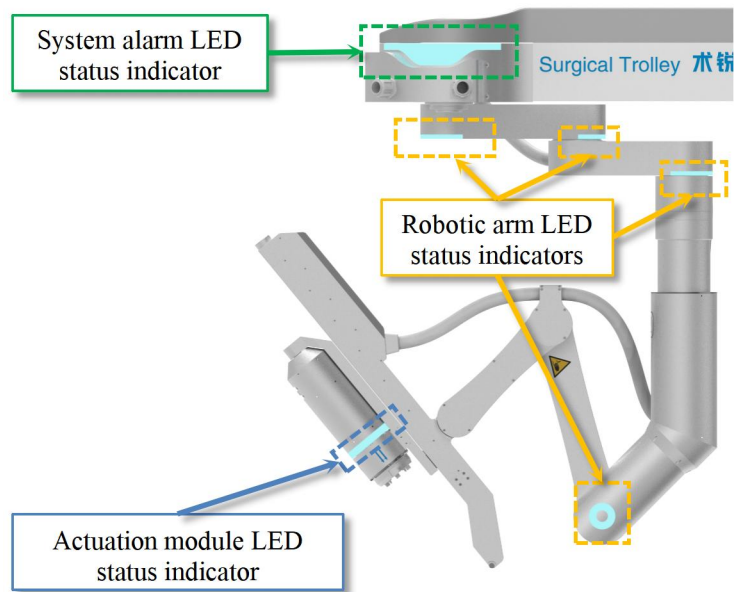


Figure 3.20 LED status indicators of the Surgical Trolley

The modes of the robotic arm LED status indicator are described in Table 3.5.

Table 3.4 Modes of robotic arm LED status indicator

	Condition	Mode
1	All arm positioning mode, at rest.	OFF
2	All arm positioning mode, in motion.	All LEDs flashing in blue (2 Hz, duty cycle 50%)
3	Single arm positioning mode, at rest.	LED of the selected joint always ON in blue.
4	Single arm positioning mode, in motion.	LED of the selected joint flashing in blue (2 Hz, duty cycle 50%).

The modes of the actuation module LED status indicator are described in the table below.

Table 3.5 Modes of actuation module LED status indicator

	Condition	Mode
1	Pre-surgery, the actuation module motor is at a standstill.	White light ON.
2	Pre-surgery, the actuation module motor rotates, or reading instrument information.	White flashing, 2Hz
3	During surgery, the actuation module motor ready to move with the haptic masters disconnected	Green light ON.
4	During surgery, the actuation module motor is in pre-defined motion, or the surgical instrument is being locked or unlocked.	White and green flashing, 2Hz.

5	During surgery, teleoperation.	Blue light ON.
6	Instrument adapter is installed successfully.	Flashes twice in green, 2 Hz.
7	Instruments ready for teleoperation.	Purple light ON.

The modes of the system alarm LED status indicator are described in Table 3.7.

Table 3.6 Modes of system alarm LED status indicator

	Condition	Mode
1	Critical failure.	Red flashing, 2Hz.
2	System warning.	Yellow flashing, 0.5Hz.
3	System prompt.	Yellow light ON.
4	No fault.	OFF.
5	Alarm light self check.	The yellow light ON for 2 s, OFF for 1 s, and the red light is ON for 2 s.

3.5 Surgical Instrument

Various surgical instruments can be used with the SHURUI® system. Please refer to Table 3.8 for details.

The surgical instrument is composed of an instrument housing, an instrument stem, an end-effector, a pressure valve, an energy instrument cord port (if applicable) and a grip release knob (if applicable), as shown in Figure 3.21. Different types of end-effectors are shown in Figure 3.22.

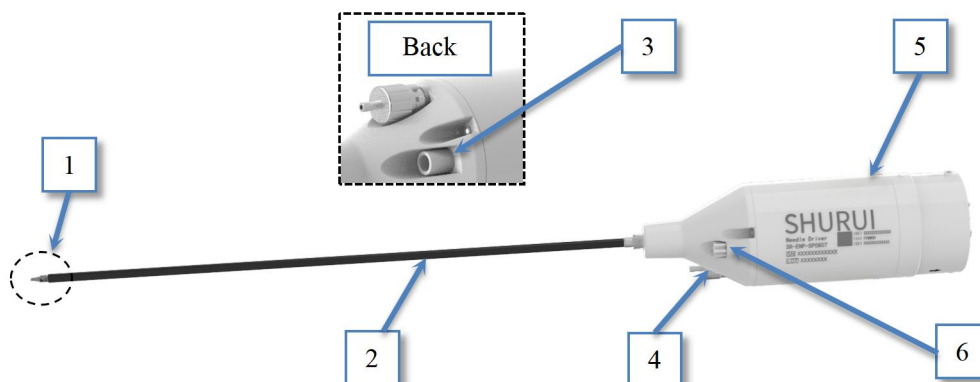


Figure 3.21 Composition of the surgical instrument (1-End-effector, 2-Stem, 3-Energy instrument cord port (if applicable), 4-Pressure valve, 5-Instrument housing, 6-Grip release knob)

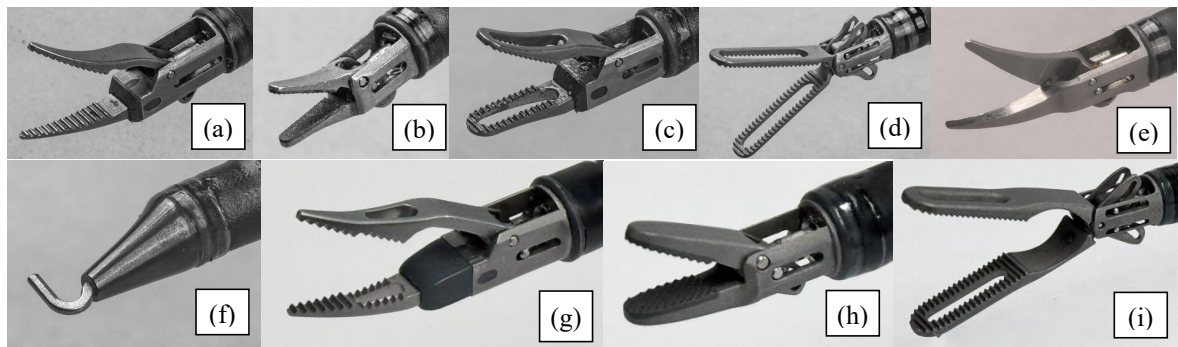


Figure 3.22 Surgical instrument end-effectors: a) curved bipolar dissector, b) needle driver, c) bipolar forceps, d) tissue forceps, e) monopolar curved scissors, f) monopolar cautery hook, g) maryland bipolar forceps, h) large needle driver, and i) large tissue forceps

The first and second segments of the stem can be rotated and turned in any direction as shown in Figure 3.23. The maximum bending angle of the #1 distal segment is 90° . The maximum bending angle of the #2 distal segment is 120° .

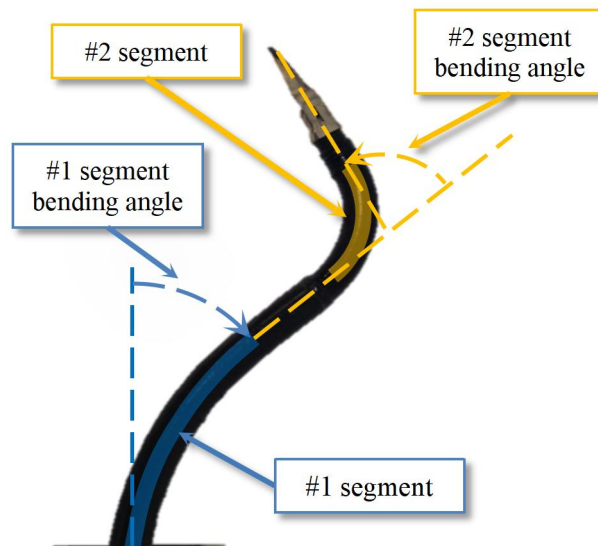


Figure 3.23 Surgical instrument stem segments

 CAUTION	1) The suture needle and thread used with needle driver have no special requirements. There are many variables in the use of suture needle and suture, such as needle size, needle tip configuration, suture type, tissue type, tissue thickness, toughness, etc. Surgeons choose the appropriate combination of suture needle and suture according to the actual use and clinical experience.
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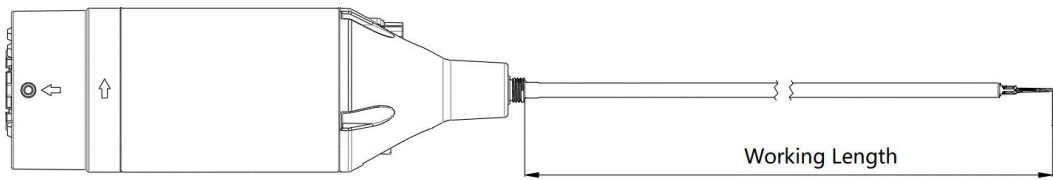
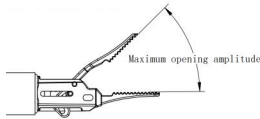
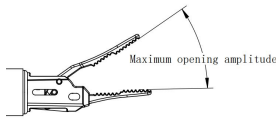
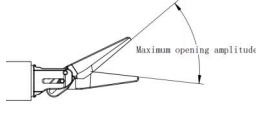
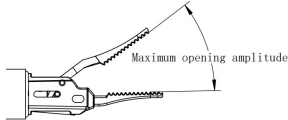
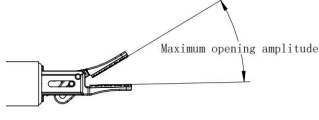
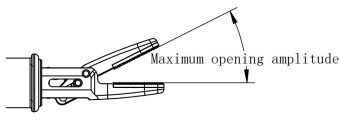
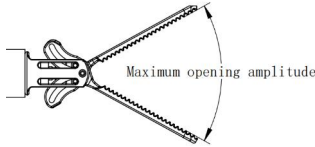
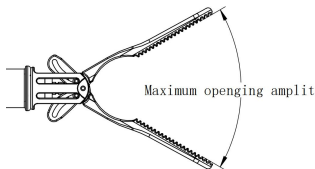


Figure 3.24 Schematic diagram of the working length of the surgical instrument

The working length of surgical instruments is shown in Figure 3.24. The working length, the length of end-effector, and the open angle of end-effector are shown in Table 3.8.

Table 3.7 Surgical instrument dimensions

Surgical instrument	Working length	End-effector length	Schematic diagram of the end-effector	End-effector open angle
Curved bipolar dissector	529mm±3%	24.4mm±2mm		43°±20%
Maryland bipolar forceps	529mm±3%	22.2mm±2mm		34°±20%
Monopolar curved scissors	530mm±3%	23mm±2mm		50°±20%
Monopolar cautery hook	518mm±3%	15.8mm±2mm	N.A	N.A
Bipolar forceps	529mm±3%	22.7mm±2mm		35°±20%
Needle driver	522mm±3%	15mm±2mm		25°±20%
Large needle driver	523mm±3%	16mm±2mm		27°±20%

Tissue forceps	535mm±3%	28.4mm±2mm		58°±20%
Large tissue forceps	540mm±3%	33.4mm±2mm		58°±20%

1. Instrument housing: House the transmission mechanism such that the actuation module can drive the movement of surgical instruments.
2. Instrument stem: The instrument stem has a flexible body and realizes bending movement of the surgical instrument.
3. End-effector: Performs various surgical operations.
4. Energy instrument cord port: Only equipped on high-frequency surgical instrument, and connects to the high-frequency generator via the energy cords.
5. Pressure valve: Balances the internal and external air pressure of the surgical instruments.
6. Grip release knob: Used to manually control the grip opening angle of the end-effector.

A brief description of the intended use of each surgical instrument is as follows:

- The curved bipolar dissector is intended to be used with the SHURUI® system for dissecting, grasping, manipulating, retracting, and coagulating tissues and vessels.
- The Maryland bipolar forceps are intended to be used with the SHURUI® system for dissecting, grasping, manipulating, retracting, and coagulating tissues and vessels.
- The monopolar curved scissors are intended to be used with the SHURUI® system for cutting, dissecting, coagulating and transecting tissues, suture threads, etc., with or without monopolar electrosurgical energy.
- The monopolar cautery hook is intended to be used with the SHURUI® system for manipulating, dissecting, coagulating, and transecting tissues using monopolar electrosurgical energy.
- The bipolar forceps are intended to be used with the SHURUI® system for

dissecting, grasping, manipulating, retracting, and coagulating tissues and vessels.

- The needle driver is intended to be used with the SHURUI® system to drive needles through tissues as well as handle and tie suture.
- The large needle driver is intended to be used with the SHURUI® system to drive needles through tissues as well as handle and tie suture.
- The tissue forceps are intended to be used with the SHURUI® system for grasping, manipulating, and retracting tissues.
- The large tissue forceps are intended to be used with the SHURUI® system for grasping, manipulating, and retracting tissues.

Instrument Release Wrench

Instrument release wrench: Used to manually release surgical instruments or 3D endoscope.



Figure 3.25 Instrument release wrench

Disposable Tip Cover

The disposable tip cover is used with the monopolar curved scissors. The tip cover is sleeved over the instrument during operation. The length of the instrument that extends the tip cover is approximately 8mm–10mm. After the operation is finished, the disposable tip cover should be removed and disposed of as medical waste.

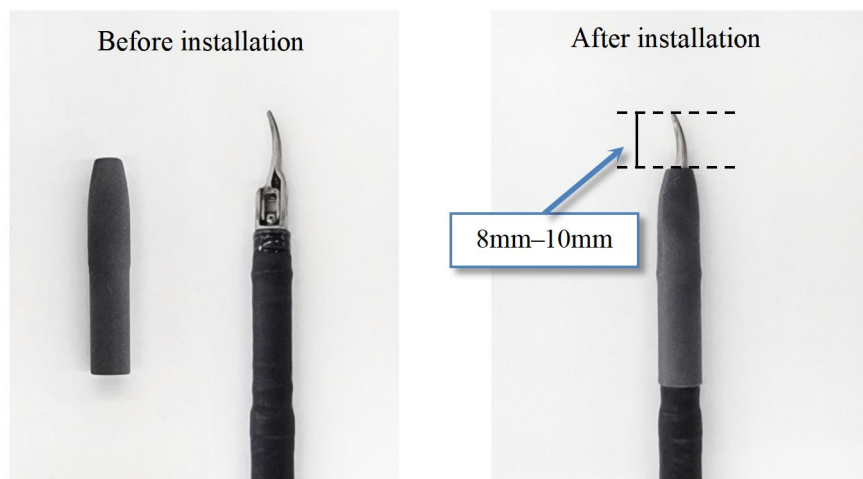


Figure 3.26 Use of disposable tip cover (sleeved over the monopolar curved scissors as an example)

 CAUTION	1) The disposable tip cover is for single use only and provided non-sterilized. Do not re-sterilize or re-use. Check the label on the package before use to verify that the disposable tip cover is within its expiration period.
---	--

3.6 3D Endoscope

3D endoscope is composed of the 3D endoscope housing, the endoscope stem, the vision module, the endoscope cable plug, the light guide port, the endoscope cable and the white balance button. The schematic diagram of the 3D endoscope is shown in Figure 3.27.

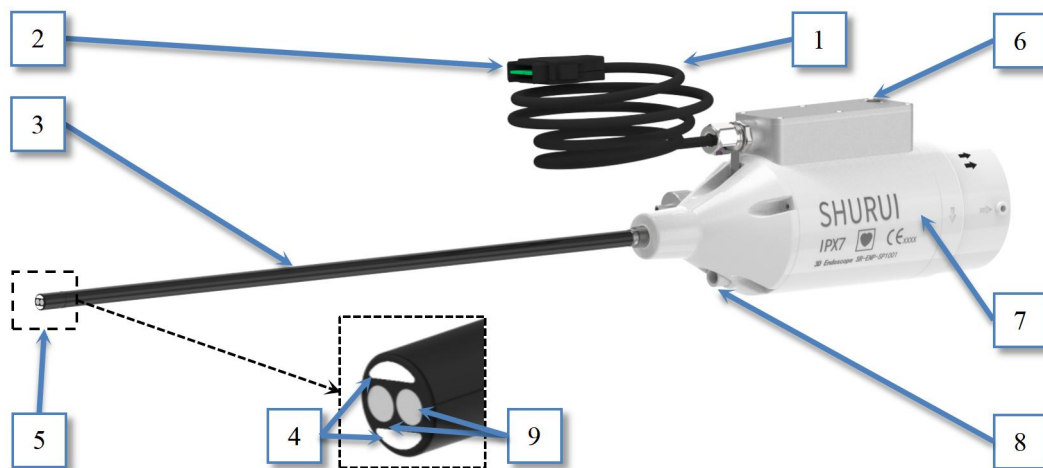


Figure 3.27 Composition of the 3D endoscope (1-Endoscope cable, 2-Endoscope cable plug, 3-Stem, 4-Vision module optical fiber, 5-Vision module, 6-White balance button, 7-Endoscope housing, 8-Light guide port, 9-Two groups of imaging chips and lens)

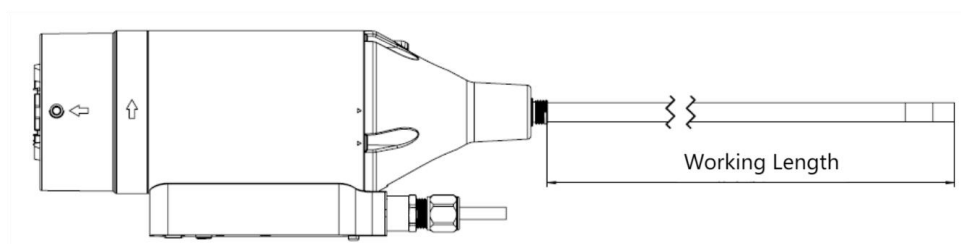


Figure 3.28 Schematic diagram of working length of 3D endoscope

The working length of 3D endoscope is approximately 480 mm.

1. 3D endoscope housing: Houses the transmission mechanism such that the actuation module can drive the motion of 3D endoscope.
2. 3D endoscope stem: The distal part (close to the vision module) of the stem is flexible and realizes bending of the 3D endoscope, and the proximal part

(close to the housing) is rigid.

3. Vision module: Composed of 2 groups of imaging chips, lenses and illuminating optical fibers.
4. White balance button: Aim at a white object and press the button to correct the color balance.
5. Light guide port: Connects to the cold light source via the illuminating optical fiber.
6. Endoscope cable: Connects to Surgical Trolley's endoscope port to transmit the image signal obtained by the 3D endoscope.

During surgery, the 3D endoscope collects the image signal and transmits it to the Surgical Trolley. After the image is processed by the Surgical Trolley, it is displayed on the 3D viewer of the Surgeon Console and the 2D display via the 2D and 3D image connecting cables.

The dimensions and basic imaging performance of the 3D endoscope are presented in the table below:

Table 3.8 3D Endoscope characteristics

Working length	Approx. 480 mm
Maximum diameter (inserted in the patient cavity during surgery)	φ10.8 mm
Imaging performance	Resolution: 1920×1080 Field of View: 85°

3.7 Accessories

3.7.1 Energy Instrument Cords

The monopolar energy instrument cord and bipolar energy instrument cord are used to connect the electric surgical instruments and the high-frequency generators to transmit electrical energy for electric cutting and coagulation. The cords are shown in Figure 3.28.

The monopolar energy instrument cord has a single-pin plug. The bipolar energy instrument cord has a two-pin plug.



Monopolar energy instrument cord



Bipolar energy instrument cord

Figure 3.29 Energy instrument cords

 WARNING	1) Monopolar and bipolar energy instrument cords have different connectors on the surgical instruments. Intentionally forcing the wrong cord to connect the instrument may result in leakage and electrical shock damage.
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3.7.2 Sterile Drape

Sterile drape is used to wrap around the robotic arms and column of SHURUI® system, to prevent the surgical team from directly coming into contact with these parts and then later with the patient's surgical site during surgery, thus avoiding potential infections. Please refer to the Sterile Drape User Manual for further information.

Model	Description
SR-ENS-600-D1	Used to wrap around the robotic arm
SR-ENS-600-D2	Used to wrap around the column

3.7.3 Trocar Incision Protector

Trocar incision protector is supplied sterile for single use. It is intended for use with the SHURUI® system. It is used to establish channels for the 3D endoscope and surgical instruments during surgery, protecting the incision from damage (without puncturing function). Refer to the Trocar Incision Protector User Manual for further information.

Model	Description
SR-TCIP-4-1	Composed of a standard 4-channel trocar (SR-TC-4-2) and an incision protector without auxiliary ports (SR-IP-1).
SR-TCIP-4-2	Composed of a standard 4-channel trocar (SR-TC-4-2) and an incision protector with an auxiliary port (SR-IP-2).
SR-TCIP-4-3	Composed of a short 4-channel trocar (SR-TC-4-3) and an incision protector without auxiliary ports (SR-IP-1).

SR-TCIP-4-4	Composed of a short 4-channel trocar (SR-TC-4-3) and an incision protector with an auxiliary port (SR-IP-2).
SR-TCIP-3-2	Composed of a standard 3-channel trocar (SR-TC-3-1) and an incision protector with an auxiliary port (SR-IP-2).
SR-TCIP-3-3	Composed of a compactly arranged 3-channel trocar (SR-TC-3-2) and an incision protector without auxiliary port (SR-IP-1).



Figure 3.30 Example of a trocar incision protector

3.7.4 Sheath Connector

The sheath connector is intended to connect and fix with the trocar adapter on the sterile drape with the trocar incision protector. Each sheath connector is provided with a sheath connector wrench.

Model	Description
SR-ENS-600-TCH1	Used on robotic arms 1, 2, and 4
SR-ENS-600-TCH2	Used on robotic arm 3

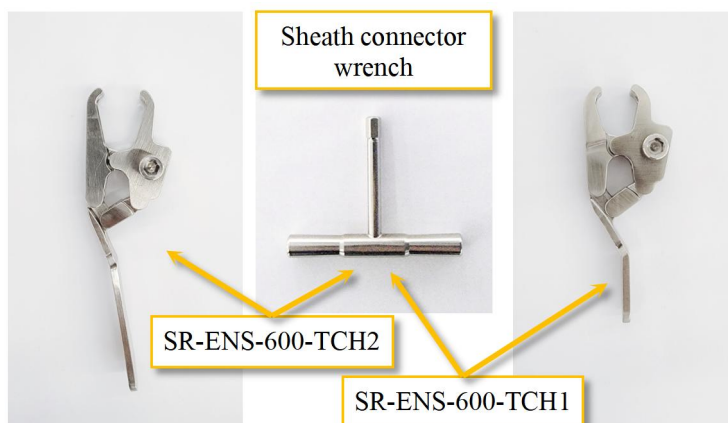


Figure 3.31 Sheath connector

3.8 Audio System

The audio system consists of two sets of microphones and speakers installed on the Surgical Trolley and the Surgeon Console, respectively, used for voice communication between OR personnel and the surgeon.

The audio system can also produce a variety of prompt tones. The Surgical Trolley speaker volume can be adjusted through the settings.

3.9 Main Technical Specifications

Please refer to the Technical Description for the main technical specifications of the product.

Chapter 4 Configure Operating Room and Position System

This chapter introduces the system arrangement in the operating room to ensure its correct and safe use.

4.1 Operating Room Configuration

Operating rooms may vary in size and shape. Therefore, the use of the product needs to consider the entrance and exit of the operating room, the arrangement of other equipment in the operating room, and the limitations of the ceiling structure for the placement of this product. Restrictions in the operating room may result in different product arrangements.

To ensure maximum patient-side access, the Surgical Trolley can be positioned on either side of the patient. This placement is recommended, as shown in Figure 4.1.

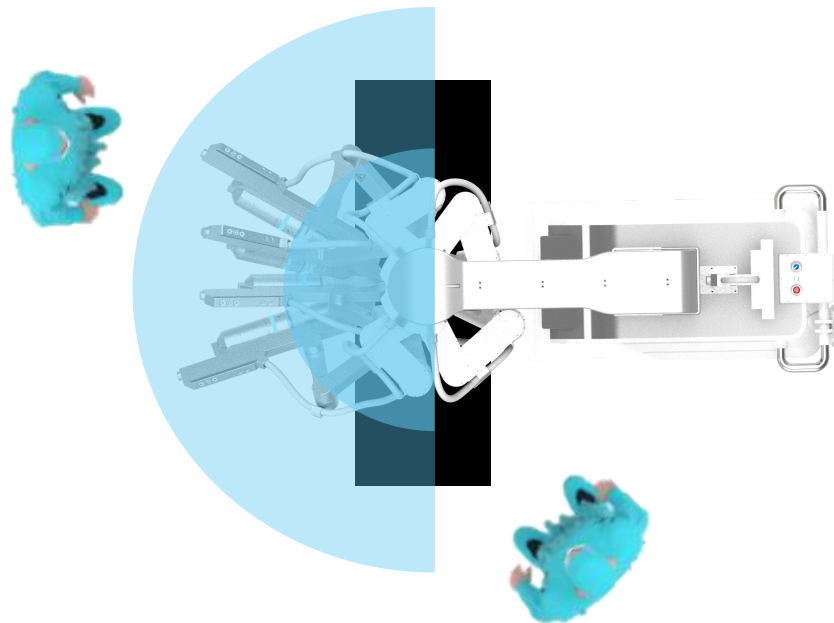


Figure 4.1 Surgical Trolley placement top view

1. Place the Surgical Trolley opposite the anesthesia cart at the beginning of the surgery to minimize movement of the anesthesia cart. Cable and cord connections and touchscreen visibility should be considered during the placement. The operating room staff should have a direct line of sight to the touchscreen to view guidance prompts and other messages.
2. Position the Surgeon Console in the non-sterile field.
 - 1) Ensure that the Surgeon Console operator (the surgeon) has a direct line of sight to the operative field.

- 2) Ensure that the surgeon can communicate with the patient-side assistants.

4.2 Products Used in Combination

The system requires the use of other compatible products in combination, and the requirements for these products are described below.

 WARNING	1) Using products that do not conform to the descriptions in this section may degrade the system performance or cause serious hazards.
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High-frequency generator

The high-frequency generator is for providing the energy to enable active instruments to perform electric cutting or coagulation. Compatible high-frequency generators are listed as follows:

The high-frequency generator that could be used together with the system should meet the following requirements:

- The input connector of the high-frequency generator shall be compatible with any of the following connectors: Amphenol 97-3106A-14s-2P (monopolar), Amphenol C016-20H003-110-12 (monopolar), Amphenol 97-3106A-14s-7P (bipolar), or Amphenol C016-30H006-110-12 (bipolar).
- The output connector of the high-frequency generator shall be compatible with the monopolar energy instrument cord (SR-ENT-MPC1000) and the bipolar energy instrument cord (SR-ENT-BPC1000).
- The system's maximum rated high-frequency repetitive peak voltage is 3448 V for monopolar surgical instruments and 530 V for bipolar instruments. When using with a high-frequency generator, ensure the output mode does not exceed these limits.

Any high-frequency generator that meets the requirements is compatible with the system, provided the operating mode is properly configured. Examples include the Covidien Valleylab FX8, Covidien Valleylab FT10, CONMED System 2450, and Erbe VIO 300S.

Cold light source

The cold light source is for providing the illumination via the optical fiber. The recommended cold light source that could be used together with the system is shown

below:

Device name	Manufacturer	Model name	CE mark
Medical Cold Light Sources	Wuzhou Aokace Technology Co., Ltd	AGS100	Class I, Basic UDI-DI: 697546580AGSCLSS5 Effective Date: 2023/06/01

Chapter 5 System Connections

The system cable connection is shown in Figure 5.1. The cables should be arranged so that they are out of the path of operating room 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 Surgical Trolley between its preoperative (draping) and intraoperative locations.

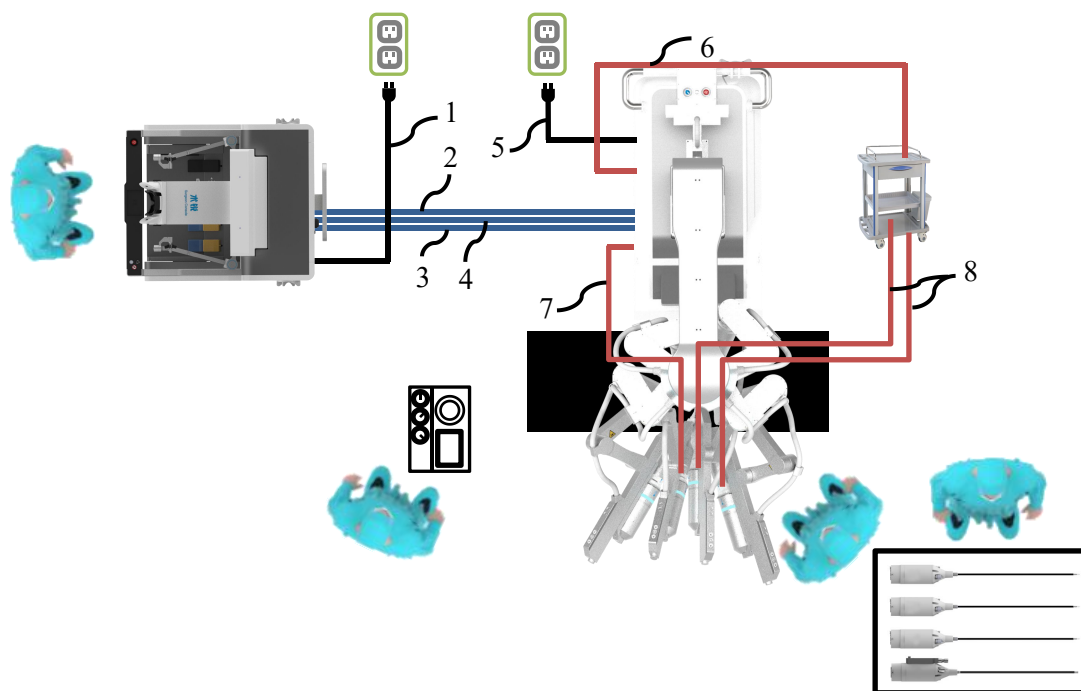


Figure 5.1 System cable connection diagram (1-Surgeon Console power cable, 2-System connection cable, 3-2D video cable, 4-3D video cable, 5-Surgical Trolley power cable, 6-Energy activation cable, 7-Endoscope cable, 8-Monopolar and bipolar energy instrument cord)

 CAUTION	1) The cables connected to the system should be properly arranged to avoid obstructing material transfer or tripping medical personnel.
---	---

5.1 Power Connections

Connect the power cable of the Surgeon Console and Surgical Trolley to wall outlets.

Check that the operating room sockets meet the power requirements as shown in Table 5.1.

Table 5.1 System power cable length and power requirements

	Power cable length (meter)	Power requirement
Surgeon Console	7	220-240V~, 50/60Hz or 110-120V~, 60Hz.
Surgical Trolley	7	220-240V~, 50/60Hz or 110-120V~, 60Hz.

 CAUTION	1) Do not use an extension cord on any system components. 2) The external equipment connected to the system should meet the general safety requirements of “IEC 60601-1:2005+AMD1:2012+AMD2:2020.” 3) Do not connect additional equipment to the same AC power wall outlet as the Surgeon Console and Surgical Trolley. This configuration could potentially overload the circuit. 4) Before using the system for the first time, connect the Surgical Trolley and the Surgeon Console to the power supply to fully charge the uninterrupted power supply (UPS). 5) When not using the system, the Surgeon Console and the Surgical Trolley should keep the power connection to ensure that the uninterrupted power supply (UPS) maintains sufficient power. 6) Should the Surgical Trolley or the Surgeon Console be unplugged, the system alarms that it is running on UPS battery power. It is highly advised to plug-in as soon as possible to avoid loss of power.
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5.2 Connections between Surgeon Console and Surgical Trolley

To establish the system connection, plug the system connection plug of the Surgeon Console into the system connection socket of the Surgical Trolley and lock it. After completing the connection between the Surgeon Console and the Surgical Trolley, turn on the Surgeon Console and the Surgical Trolley.



Figure 5.2 Surgeon Console system connection cable

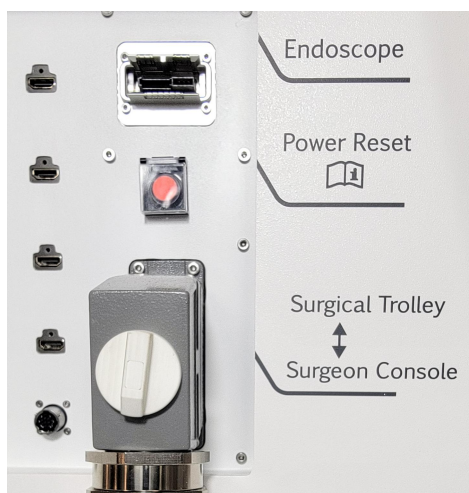


Figure 5.3 System connection socket of the Surgical Trolley

 WARNING	1) After the system is connected and powered on, the system connection cable should remain connected until the system is completely powered off. If the system connection cable plug is pulled out during use, the system will alert the user. To restore system functionality, plug in the cable and restart the system.
 CAUTION	1) The system cable socket contains a locking mechanism. When it is completely locked, there will be a “click” sound. If there is no such sound during the plug-in process, the system cable plug is not locked; please reconnect.

Connect the 3D video ports on the Surgeon Console and the Surgical Trolley using the 3D video cable.



Figure 5.4 3D video cable

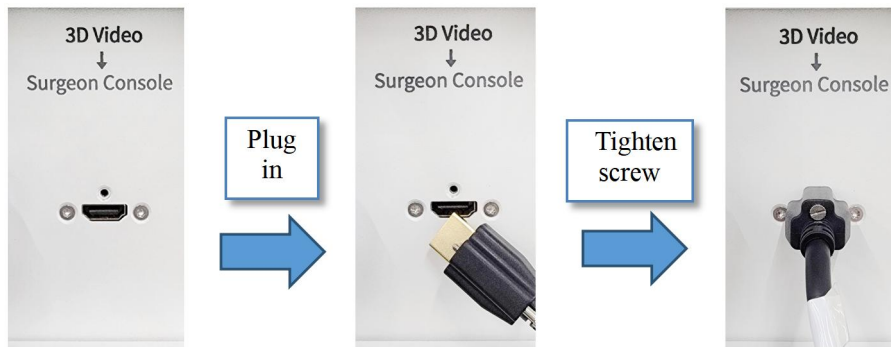


Figure 5.5 Connecting 3D video cable to the Surgeon Console



Figure 5.6 Connecting 3D video cable to the Surgical Trolley

Connect the 2D video ports on the Surgeon Console and the Surgical Trolley using the 2D video cable.



Figure 5.7 2D video cable

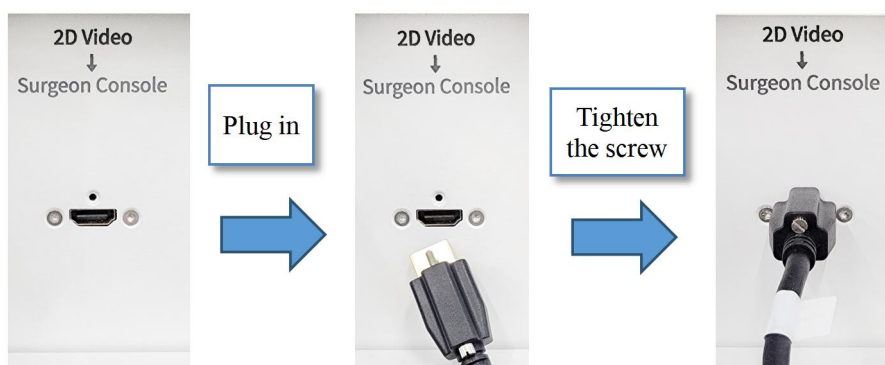


Figure 5.8 Connecting 2D video cable to the Surgeon Console

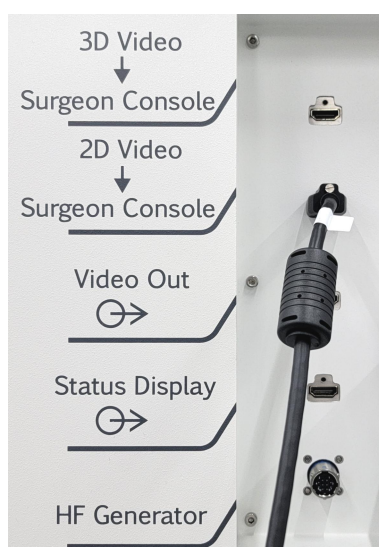


Figure 5.9 Connecting 2D video cable to the Surgical Trolley

 CAUTION	1) The labels tell that the 3D and 2D video cables are different. Refrain from mixing the two to avoid reducing the frame rate of the displayed image.
---	---

5.3 3D Endoscope Connection

The endoscope cable is connected to the endoscope port on the Surgical Trolley at the position shown in Figure 3.15. Use the illuminating optical fiber to connect the cold light source and 3D endoscope.

 CAUTION	1) Correctly insert the plug of the endoscope cable to the port of the Surgical Trolley. A “click” sound will be heard during the process. If there is no such sound during the plug-in process, it means that it is not locked, please reconnect.
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5.4 High-Frequency Generator Connections

1. Use the energy activation cable to connect the Surgical Trolley and the high-frequency generator. The location of the connector is shown in Figure 3.15.

Model	Description
SR-ENS-ESUC100	Energy activation cable
SR-ENS-ESUC200	
SR-ENS-ESUC500	
SR-ENS-ESUC600	



Figure 5.10 Energy activation cables

2. Use monopolar energy instrument cord (SR-ENT-MPC1000) or bipolar energy instrument cord (SR-ENT-BPC1000) to connect the surgical instrument and the high-frequency generator.

 WARNING	1) Ensure that only compatible high-frequency generators are connected to the system. Performance of cables or accessories other than those specified in this User Manual cannot be guaranteed.
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There is a requirement for the rated high-frequency repetitive peak voltage when using the high-frequency instruments. The voltage values are shown in the table below. The repetitive peak voltage should not exceed this rating when using the high-frequency instruments.

Table 5.2 Rated high frequency repetitive peak voltage for operating mode of high frequency surgical instruments

Instrument name	Working mode	Rated high-frequency repetitive peak voltage	Maximum power
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Monopolar curved scissors, Monopolar cautery hook	PURE CUT	1287V	300W
	BLEND CUT	2187V	200W
	SOFT COAG	264V	120W
	FULGURATE COAG	3448V	120W
	SPRAY COAG	3448V	60W
Curved bipolar dissector, Maryland bipolar forceps, Bipolar forceps	PRECISE	284V	70W
	STANDARD	415V	70W
	MACRO	530V	70W

Table 5.3 Rated high frequency repetitive peak voltage of the energy instrument cords and the 3D endoscope used in the high-frequency surgical applications' interconnection conditions

Name	Working mode	Rated high-frequency repetitive peak voltage
3D endoscope, Monopolar energy instrument cord, Bipolar energy instrument cord	Monopolar	3448V
	Bipolar	530V

5.5 External Display Device Connections

If necessary, the 2D video port (External Devices) and the system status video port of the Surgical Trolley can be connected with additional display devices to output endoscopic images and system state, respectively.

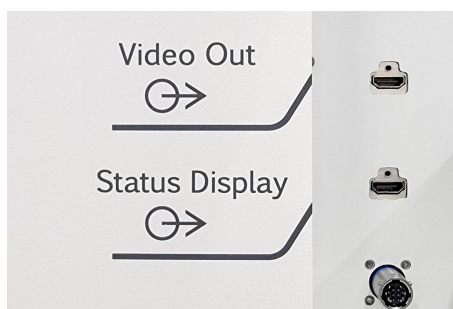


Figure 5.11 Surgical Trolley 2D video port (External Devices) and status video port

Chapter 6 System Startup

6.1 Start and Login

1. Ensure that the cables between the Surgeon Console and the Surgical Trolley are connected correctly.
2. Ensure that the Surgeon Console and Surgical Trolley are connected to AC power supply that meets the requirements.
3. Press the power button to start the Surgeon Console and the Surgical Trolley.

After the Surgical Trolley and the Surgeon Console are started up, log in to one and the other one will automatically log in.

6.2 Emergency Power Reset

Press and hold the emergency power reset for more than 5 seconds to reset the power supply of the Surgeon Console or the Surgical Trolley.



WARNING

- 1) When powered on, the system will perform a self-check. Do not immediately activate any system control components, including but not limited to the haptic master, buttons, pedals and infrared head sensors. Although the excitation of the above control components will be ignored by the system in most cases during startup, it may still cause system startup interruption. In such a scenario, the system must be restarted before use.
- 2) Do not restart the system within 1 minute after shutdown. A time interval that is too short may cause abnormal detection of the system components. If an immediate restart is needed, please press and hold the emergency power reset for over 5 seconds to restart.
- 3) Do not touch the emergency power reset during the operation to avoid an unexpected system reset.

Chapter 7 Patient Position and Trocar Incision Protector

Placement

During the process of pre-operative preparation, several accessories should be used, including the multi-channel trocar incision protectors. For further information on the trocar incision protectors (model: SR-TCIP-4-1, SR-TCIP-4-2, SR-TCIP-4-3, SR-TCIP-4-4, SR-TCIP-3-2, SR-TCIP-3-3), please refer to the Trocar Incision Protector User Manual.

7.1 Position the Patient

The planning of the patient's posture should be decided by the surgeon and adjusted according to different surgical procedures. The robotic arm should be arranged to avoid contact or collision with patients or other equipment in the operating room.

 WARNING	1) After any sheath connectors are connected to the trocar, the base drive function of the Surgical Trolley is disabled, and the wheels of the Surgical Trolley must not be moved to prevent serious injury.
 CAUTION	1) The positioning of the patient should be completed before the positioning of the Surgical Trolley. To facilitate positioning, it is necessary to adjust the Surgical Trolley to a suitable height before driving it close to the edge of the operating bed for docking.

If it is necessary to move the Surgical Trolley during the procedure, first remove all surgical instruments and the 3D endoscope from the Surgical Trolley, then disconnect all actuation modules from the trocar before moving the Surgical Trolley to the desired location. After moving, reconnect the actuation modules to the trocar.

7.2 Place Trocar Incision Protector

Trocar incision protector placement varies by procedure and patient and should be thoroughly discussed with an experienced surgeon. According to the actual operation situation, different incision and trocar incision protector placement schemes may be required.

For single-port endoscopic surgery, it is recommended to execute the abdominal incision 10 to 15 cm away from the surgical target area, place the incision protector at

the incision, and install the trocar into the incision protector. This step ensures that the target surgical area can be properly observed by the 3D endoscope, and is located in the workspace of the surgical instrument.

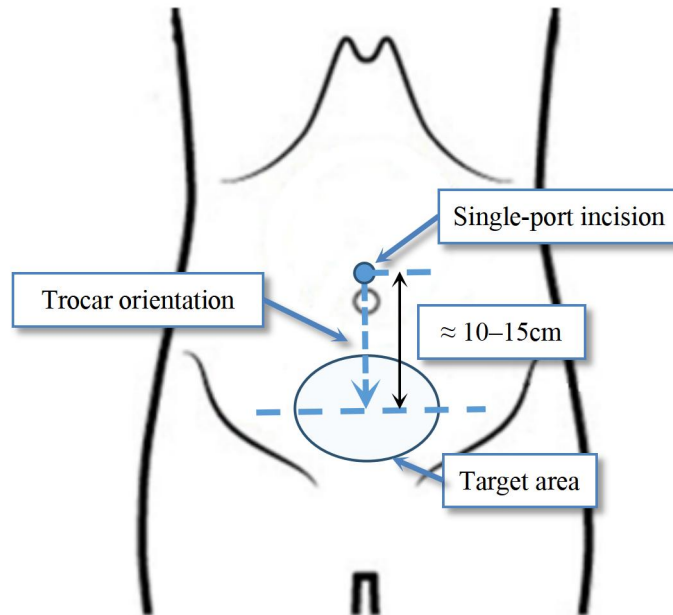


Figure 7.1 Single-port incision and trocar placement

Auxiliary ports can be added to facilitate the delivery of an intraoperative suction device, suture, stapler, etc., according to the actual needs of the operation.

The effective workspace of the surgical instruments is a truncated cone, as shown in Figure 7.2. Its axis coincides with the axis of the instrument channel of the trocar, and the base of the truncated cone is 60 mm away from the front end of the trocar. The height is 120 mm, the radius of the base is 85 mm, and the radius of the top surface is 50 mm.

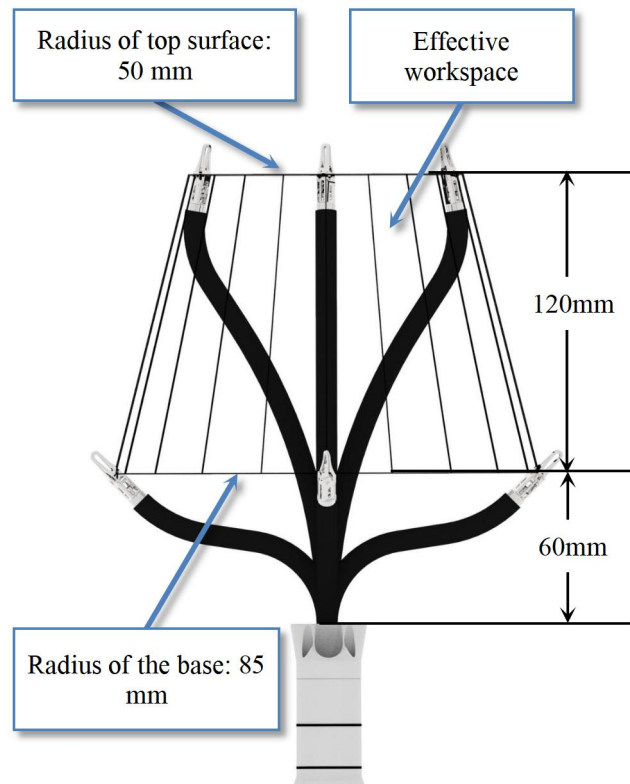


Figure 7.2 Effective workspace of the surgical instruments

Chapter 8 Imaging and Display of the System

8.1 Composition of the Imaging System

The composition of the imaging system in this product is shown in Figure 8.1, including the 3D endoscope, the visual processing workstation in the Surgical Trolley, 3D viewer and 2D display of the Surgeon Console, and the cables that connect above components.

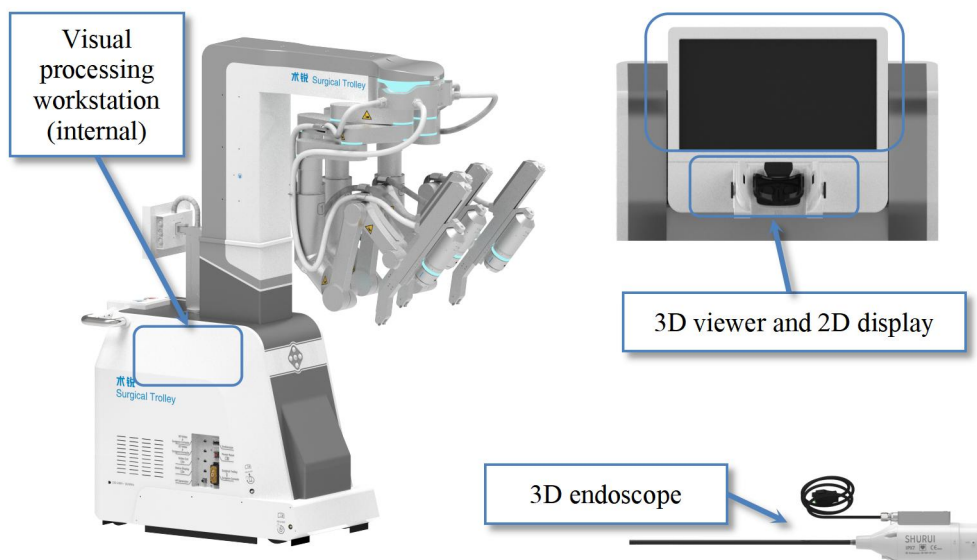


Figure 8.1 Composition of the imaging system

8.2 3D Endoscope

The surgical image signal collected by the 3D endoscope is processed by the visual processing workstation and transmitted to the Surgeon Console’s 3D viewer and 2D display. As shown in Figure 3.26, the 3D endoscope is composed of the endoscope housing, the endoscope stem, the vision module, the endoscope cable plug, the light guide port, the endoscope cable and the white balance button. The vision module and the 3D endoscope stem are parts that can enter the body.

8.3 Check the 3D Endoscope

 HAZARD	1) Do not use any 3D endoscopes with defects or signs of damage; otherwise, it may cause serious patient injury or surgical complications. These defects include but are not limited to damaged vision modules, stems, or cables.
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Before each use, please check the 3D endoscope for defects:

1. Inspect if the outside of the 3D endoscope is clean, paying particular attention to the vision module. The usable 3D endoscope should be free of visible contamination (such as adhered dust). Do not use the 3D endoscope if there is any residual contamination.
2. Inspect the lens glass surface of the 3D endoscope vision module. This area should be clean and free of deposits, residues, or fog to ensure a bright and clear image.
3. Inspect the 3D endoscope surface for defects or damage, such as sharp edges, cracks, dents, corrosion, or other mechanical defects.
4. Inspect the 3D endoscope cable for any cuts, damages, or defects.
5. Inspect the cable surface for any deposits or residues.

 WARNING	1) The 3D endoscope must be cleaned and sterilized within the service life before each use. 2) Failure to adhere to approved operating practices may damage the endoscope. For example, dropping equipment, collisions, and improper cleaning and sterilization techniques can cause damage. A damaged endoscope may result in fragments falling into the patient.
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8.4 3D Endoscope Use

Once the Surgeon Console and Surgical Trolley are connected and powered on, connect the endoscope cable plug of the 3D endoscope to the endoscope port on the Surgical Trolley. The 3D endoscope image will be output within 10 seconds.

 HAZARD	1) When the 3D endoscope is connected to the light source, do not use optical instruments (such as a magnifying glass or similar) to check the vision module of the 3D endoscope. If the light source is turned on, it may cause permanent serious damage to the eyes. 2) Be careful when turning on the light source. Avoid looking directly at the luminous end face of the 3D endoscope; otherwise, serious eye damage may occur. 3) Do not attempt any repairs to any optical components in the system. All repairs must be carried out by authorized maintenance personnel. 4) This product does not verify the compatibility with a third-party manufacturer's camera, endoscope, or optical fiber. Connecting an unauthenticated third-party optical fiber to the light guide port of the 3D endoscope may cause permanent serious eye injury or serious injury to patients.
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 WARNING	1) To avoid overheating the trocar channel when the cold light source is turned on, do not leave the 3D endoscope vision module in the trocar channel for long. 2) Do not block the light outlet of the 3D endoscope vision module so as to avoid light energy to be converted into heat energy, resulting in a high surface temperature of the vision module, which can cause tissue damage if it accidentally touches the patient's tissue. 3) Circuit faults in the 3D endoscope may cause the surface temperature of the metal square of the endoscope housing to be too high, which may cause burns to the operator.
 CAUTION	1) Only the 3D endoscope and accessories provided by Surgerii Robotics can be used. Follow this procedure to ensure image quality and product performance. 2) The system can be operated for surgery only when the 3D endoscope provides sufficient field of view. 3) The 3D endoscope should be handled with caution. It may be damaged by falling or hitting. Observe the regulations on sterilization, inspection, and connection. 4) High temperature and high-pressure sterilization of 3D endoscope is not allowed. 5) Do not put heavy objects on the cable connector of the endoscope to avoid contact failure and imaging interruption.

The 3D endoscope has been calibrated for white balance before delivery. If the user needs to correct the white balance, first connect the 3D endoscope to the medical cold light source. After the medical cold light source is turned on, aim the vision module at white objects (such as white paper, white gauze, etc.), and press the white balance button on the 3D endoscope to re-calibrate the white balance.

8.5 3D Endoscope Settings

The Surgeon Console's touchpad allows the user to set 3D endoscope imaging-related parameter settings, including brightness, contrast, sharpness, saturation, denoising, zoom (1x, 2x, 3x), and image enhancement.

Each time the endoscope is installed, and settings are changed, look in the 3D viewer to confirm that a live image is present and has the desired orientation. Adjust the endoscope orientation as necessary.

Chapter 9 Surgical Trolley Use

The Surgical Trolley performs two core functions. The first is the robotic arms positioning, and the second is the surgical instrument and 3D endoscope motion actuation.

The Surgical Trolley should be installed with sterile drapes to realize a sterile environment during surgery. The medical staff in the sterile area are responsible for replacing surgical instruments, the 3D endoscope, and other auxiliary work during surgery.

 CAUTION	1) When the robotic arm of the Surgical Trolley is moving during the preoperative preparation or intraoperative adjustment, there is a risk of hand pinch when the links of the robotic arm rotate close to each other. Users should watch out for this risk. 2) When the sixth joint of the Surgical Trolley robotic arm is moving during the preoperative preparation or intraoperative adjustment, hand pinching may occur. Users should watch out for this risk.
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9.1 Laser Indicators

The Surgical Trolley has a horizontal laser, height indicator, and positioning indicator, which assist in its movement and positioning.

9.1.1 Horizontal Laser

The horizontal laser is installed at the front of the beam of the Surgical Trolley. It projects a horizontal line in front of the Surgical Trolley, indicating the possible collision between the top of the Surgical Trolley and the ceiling structure of the operating room during the movement of the Surgical Trolley.

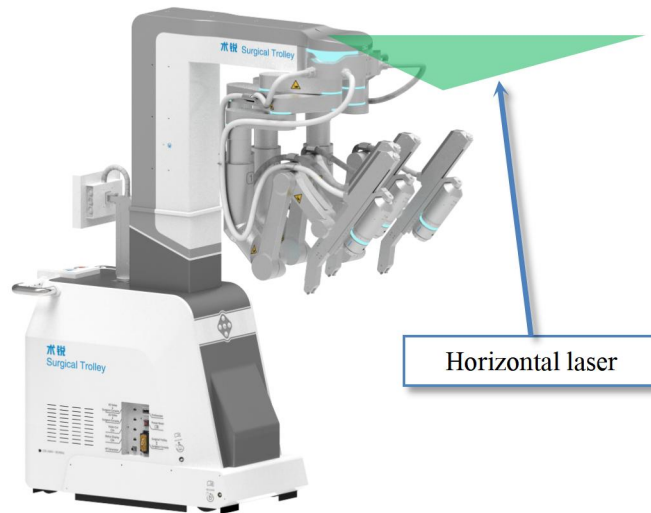


Figure 9.1 Horizontal laser of the Surgical Trolley

9.1.2 Positioning Indicator and Height Indicator

Positioning indicator and height indicator are installed beneath the beam-end of the Surgical Trolley. They project circular and cross-shaped light spots downward, respectively, to indicate the appropriate position and height of the Surgical Trolley relative to the patient.

In the single-port operation, when moving the Surgical Trolley towards the operating table, the Surgical Trolley's position should first be adjusted so that the center of the circular light spot projected by the positioning indicator is no more than 5 cm from the trocar's entry point. Then, change the height of the beam of the Surgical Trolley by pressing and holding the column up button or the column down button of the Surgical Trolley so that line A of the cross light is tangential to the projected circular light spot C. Line B intersects line A at the tangential point, which should be at the bottom left of the circle, as shown in Figure 9.2.

 WARNING	1) When the lifting movement of the column cannot be stopped, press the reverse direction movement button or press both the up and down buttons simultaneously to quickly stop the lifting movement of the column and prevent it from causing injury. 2) When the electric lifting movement of the column cannot be stopped, please press the emergency-stop button to stop the lifting movement of the column.
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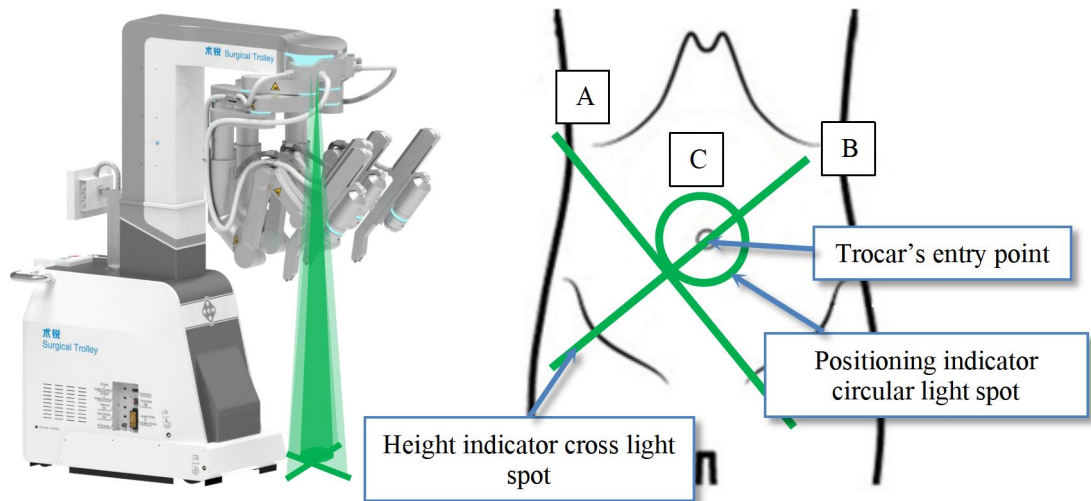


Figure 9.2 Light spot projection of positioning indicator and height indicator

9.2 Status Touchscreen User Interface

9.2.1 Startup Self-check

As shown in Figure 9.3, the Surgical Trolley will self test after starting up. After the system self-test, the Surgical Trolley and the Surgeon Console will attempt to establish a communication connection and update the connection status. If the self-test fails, corresponding system faults are reported, and alarm information can be viewed in the system information bar after login.



Figure 9.3 Power on system self-test

9.2.2 Login

After the self-test, the status touchscreen displays the login page, as shown in Figure 9.4. The system will verify the password after the user types in the username

and password. If there is an error, the user will be prompted for input error. If it is correct, the login is successful, and the main page will be displayed on the status touchscreen of the Surgical Trolley.

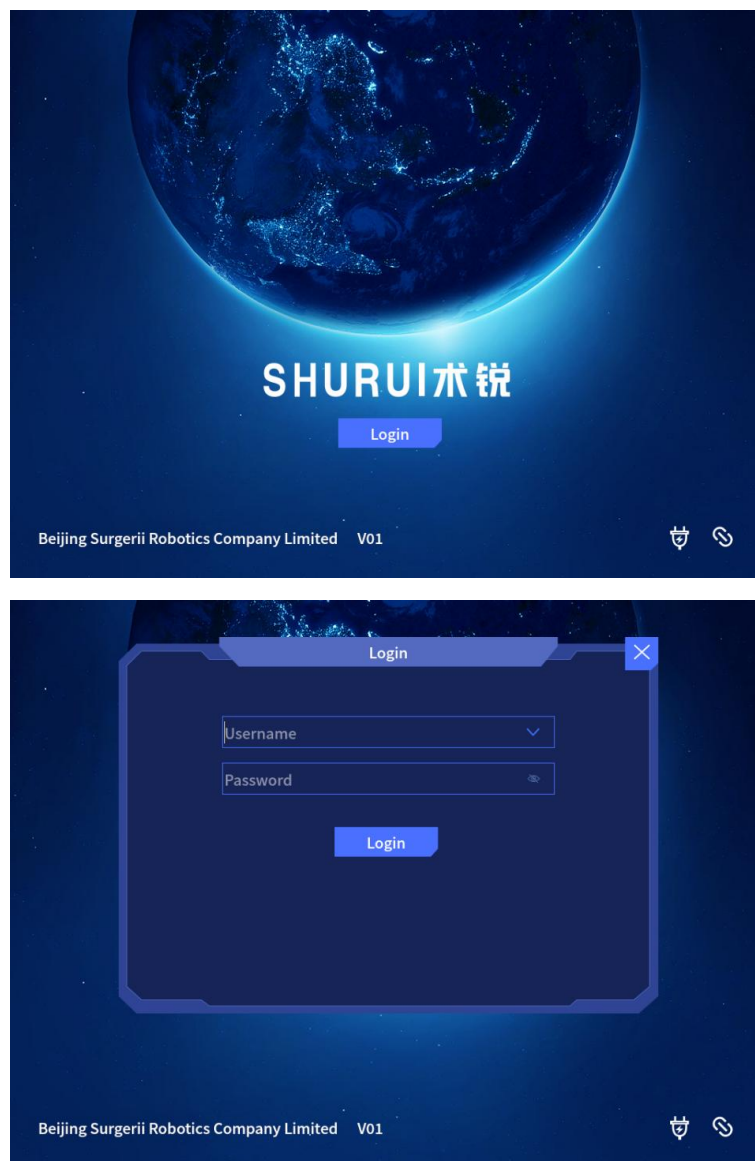


Figure 9.4 Surgical Trolley login page

9.2.3 Operation Selection

As shown in Figure 9.5, click the operation selection bar in the upper left corner of the status touchscreen to allow the user to select the operation type in the lower menu. The list of trocars varies according to the operation selection. The user needs to choose the trocar to be used in the operation and click OK to complete the operation and trocar selection.

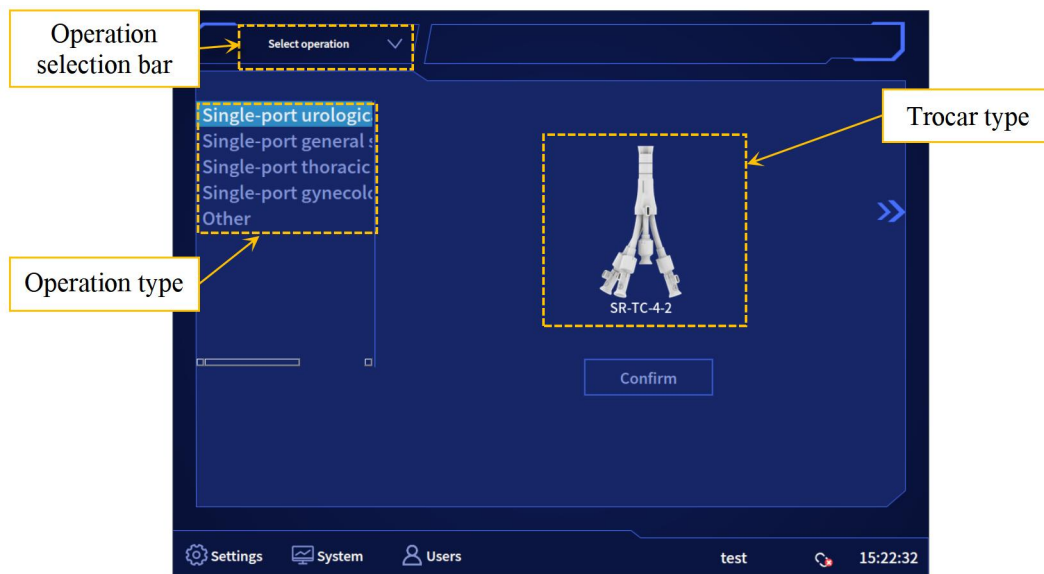


Figure 9.5 Operation selection

9.2.4 Positioning Guidance

The status touchscreen provides positioning guidance for the robotic arms. Users can view the guide pictures of the selected operation's preparation, positioning, and docking process. The guidance information for the operation varies according to the type of operation. The operational guidance includes the actuation modules' posture, the patient's position, the location of the body incision, and the adjustments of the robotic arms.

 CAUTION	1) The operation guidance pictures are only for reference, and the medical team should make final decision according to the actual situation.
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9.2.5 Preoperative Preparation Guidance

The status touchscreen can guide the preoperative preparation process and adjustments of the robotic arms. As shown in the following figure, click the view switch button to switch between the actuation modules' status and the robotic arms' pose simulation.

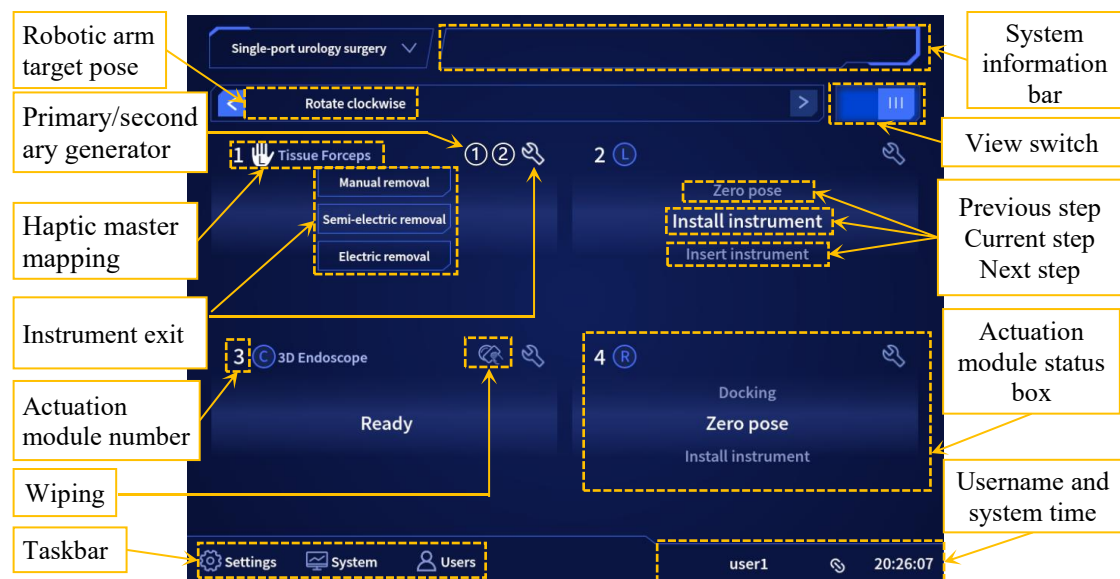


Figure 9.6 Actuation module status view

Each actuation module has a corresponding status box. The status box shows the actuation module's index number, the mapping status with the haptic master, the type of surgical instrument installed, the process guidance (showing the previous step, the current step, and the subsequent step, respectively), the wiping button, and the instrument exit button. Click the instrument exit button, and further options will pop up.

The robotic arm pose simulation view includes pose simulation, pose adjustment, and view adjustment. The system provides real-time robotic arm pose simulation of the Surgical Trolley. Various robotic arm pose adjustment modes can be selected. The pose simulation display can be adjusted by left-right rotation, up-down rotation, and zoom-in-out by dragging the sliding bar left and right after selecting the corresponding option.

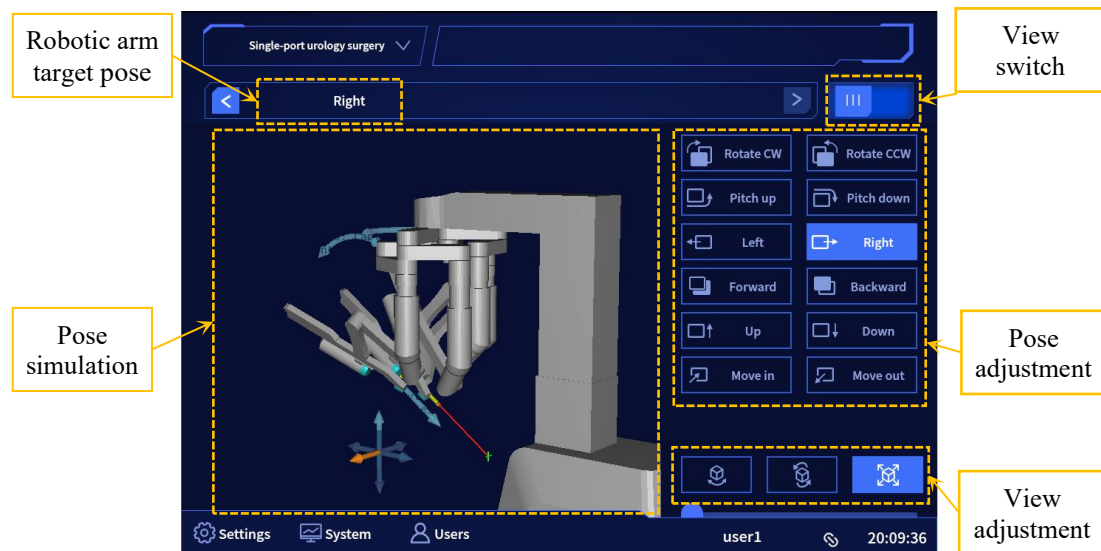


Figure 9.7 Robotic arm pose view

The target poses / motion modes of the robotic arms include: the shipping pose, the cleaning pose, the stowed pose, the arm 4 draping pose, the arm 3 draping pose, the arm 2 draping pose, the arm 1 draping pose, the folded pose, the adjusting pose, clockwise rotation, counter-clockwise rotation, the initial docking pose, the arm 2 docking pose, the arm 1&4 docking pose.

Users are allowed to move the four robotic arms together around the trocar entry point:

- Height adjustment
- Forward-backward adjustment
- Left-right adjustment
- Clockwise and counter-clockwise rotation
- Pitch up and pitch down adjustment
- Move-in and move-out

After selecting the motion mode, press the execution button to carry out the movement. Figure 9.8 is the schematic diagram of each motion mode in coordinated adjustment. Some details are omitted for clarity.

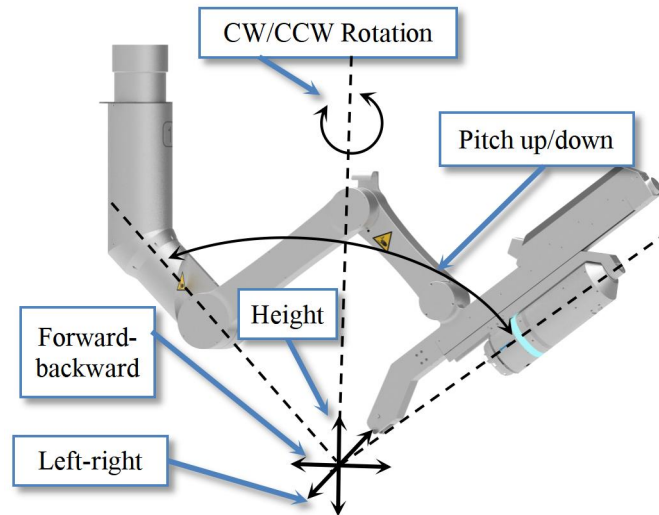


Figure 9.8 Robotic arms coordinated adjustment motion modes

9.2.6 Settings

Under settings, there are “audio,” “touch screen display,” “high-frequency,” “time settings,” and “auto logout” options.

Audio: The voice, microphone, and auditory alarm volumes can be adjusted. The volume adjustment range is 0 to 100. Audio defaults can also be restored. If necessary, enter the user password to save settings.



Figure 9.9 Audio settings

Touch screen display: The brightness and contrast of the screen can be adjusted, and the default values can be restored. The adjustment range of brightness and contrast is 0 to 100.

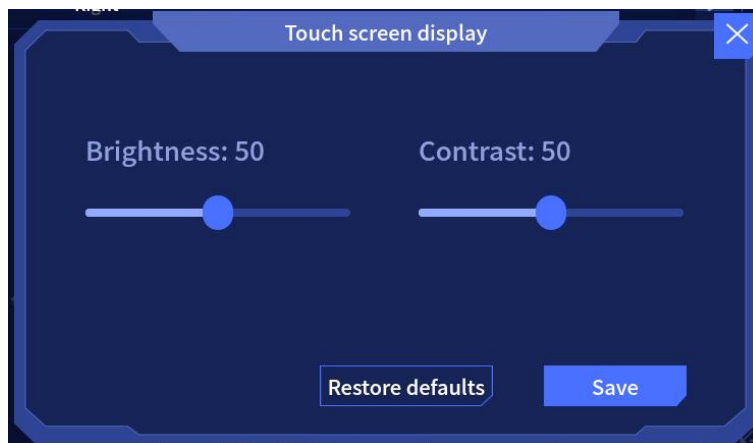


Figure 9.10 Touch screen display settings

High-frequency: The primary generator connection mode can be switched, and the secondary generator can be activated. The correspondence between the actuation module and the high-frequency generator can be set.

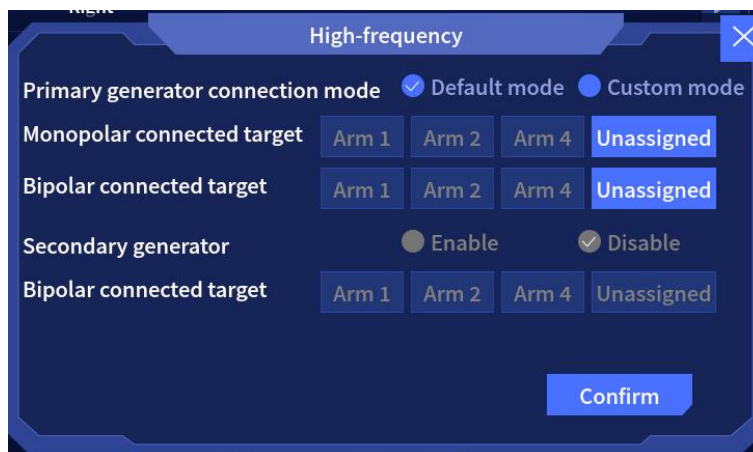


Figure 9.11 High-frequency settings

System time and automatic logout time can be set in the time setting page, if logged on with the system “admin” account.

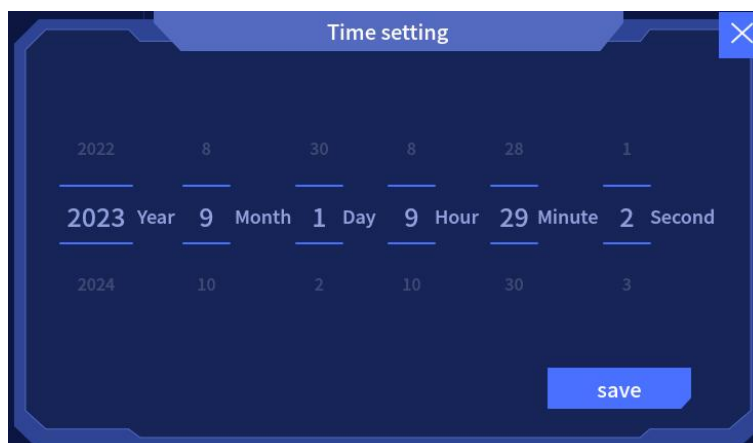


Figure 9.12 Time setting

Auto logout: The automatic logout time can be set. The options are 15 seconds, 30 seconds, 60 seconds.

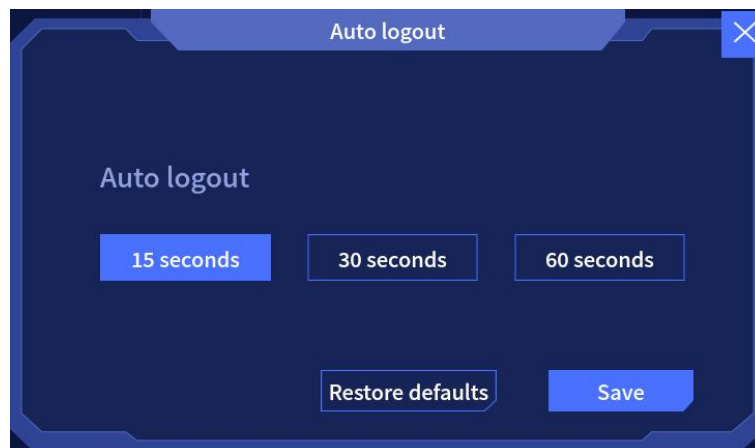


Figure 9.13 Auto logout settings

9.2.7 User Information

Under user information, there are “Modify user information” and “Log out” options.

Modify user information: The current user information can be modified, including the username and password. It is recommended to change the password regularly, such as every six months. The password requires at least six characters and up to 10 characters and can contain numbers, uppercase and lowercase letters, and special characters.

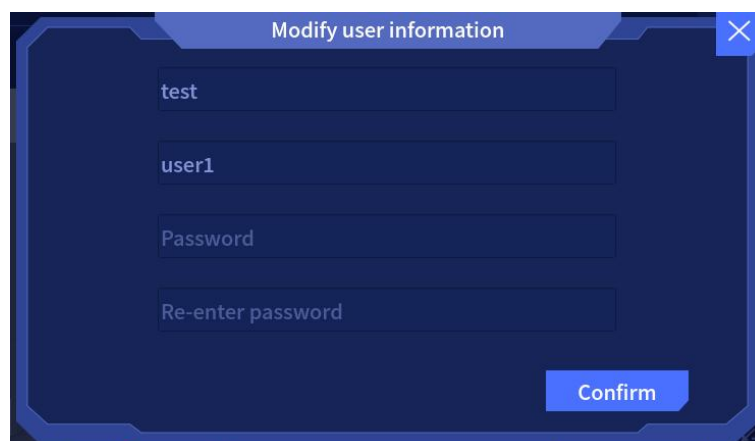


Figure 9.14 Modify user information

Log out: After selecting log out, the system will require the user to confirm the logout action.

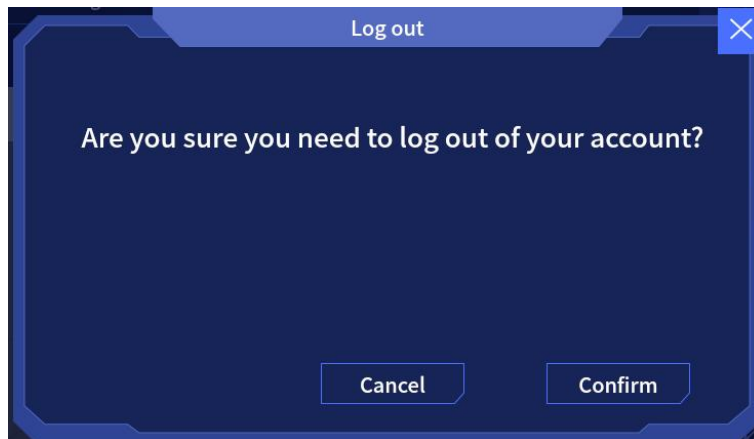


Figure 9.15 Logout confirmation

User management is available if logged on with the system administrator account:
Users can be added and removed; and user data is erased once users are removed.

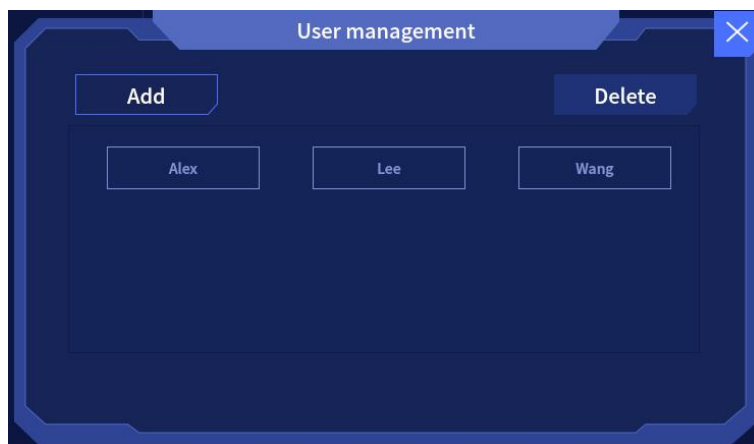


Figure 9.16 User management

A username, nickname, and password must be entered to add a user.

A dark blue form titled "Add user" with a close button (X) in the top right corner. It contains four text input fields stacked vertically, labeled "Username", "Nickname", "Password", and "Re-enter password". At the bottom right of the form is a blue button labeled "Confirm".

Figure 9.17 Add user

Select an existing user to delete it.

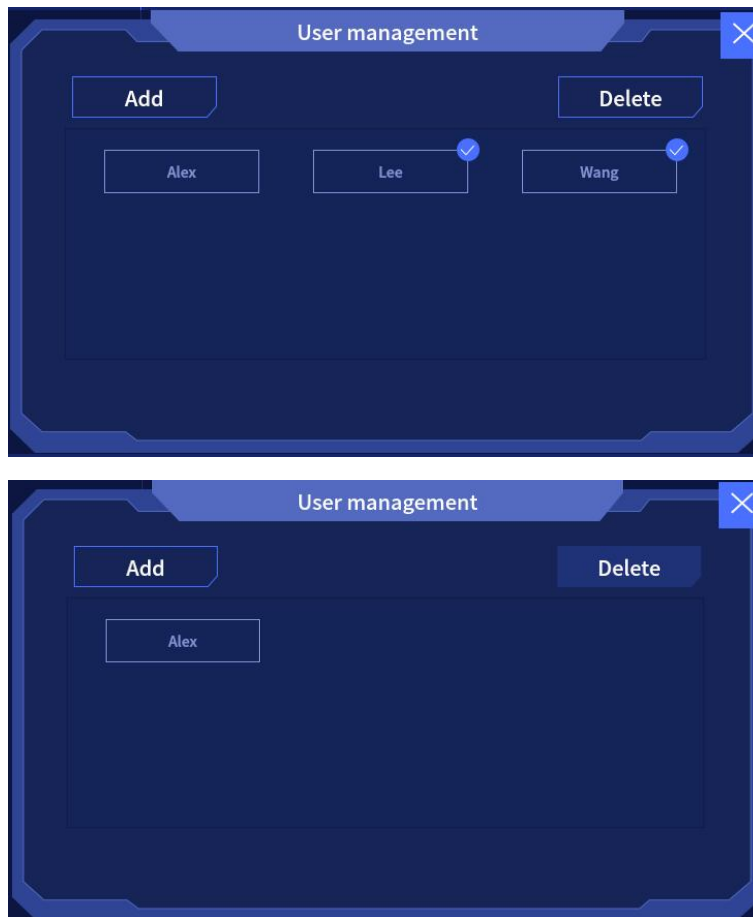


Figure 9.18 Delete user

9.2.8 System Information

The Surgical Trolley system menu includes “system information”, “instrument information”, “UPS”, “system log”, “training mode”, and “reboot” options.

System information: Displays system information, including the system model, the Surgical Trolley model (or the Surgeon Console model), the serial number, the software model, and the software version, and the copyright information.

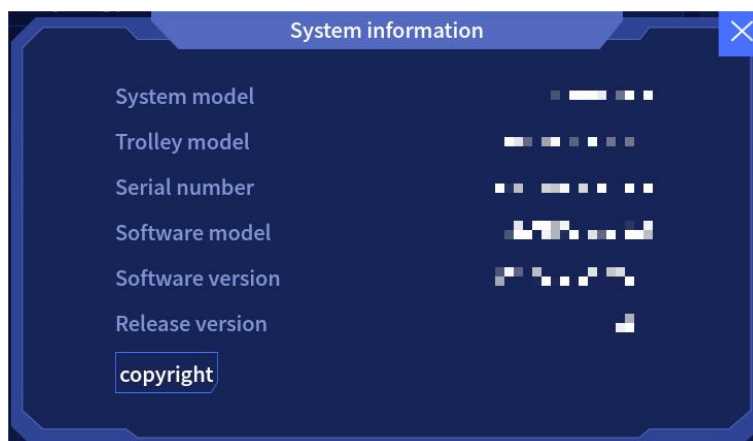


Figure 9.19 System information

Instrument information: Displays the trocar model, instrument types, remaining usage of the surgical instruments and the 3D endoscope.



Figure 9.20 Instrument information

UPS: Displays the UPS information, including the current power, charge, and discharge status.

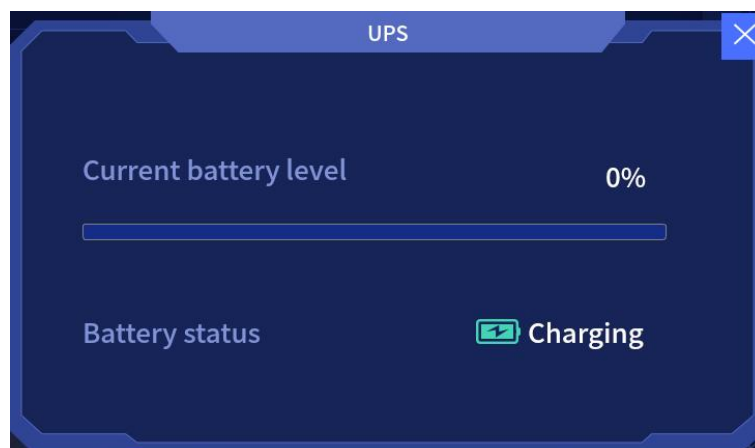


Figure 9.21 UPS information

Log: Log information can be reviewed on this page. The log information can be filtered by date, log, error, warning, and notification. The logs are saved for 90 days. Users cannot delete and modify logs.



Figure 9.22 System log

Training Mode: Medical staff can complete the operation training by entering the training mode.

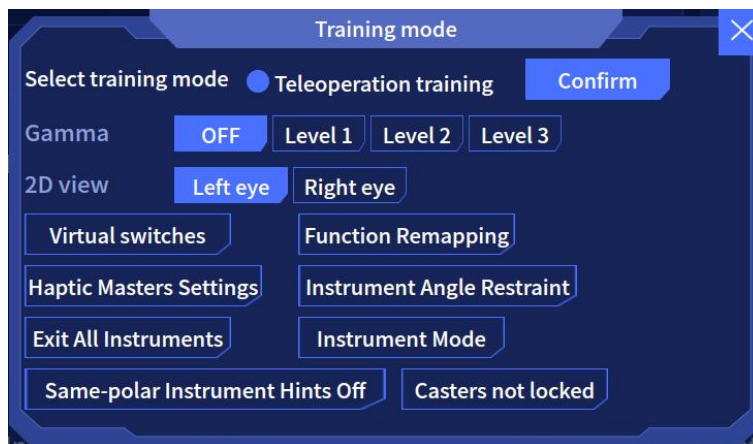


Figure 9.23 Training mode

Reboot: Click OK to reboot the system.

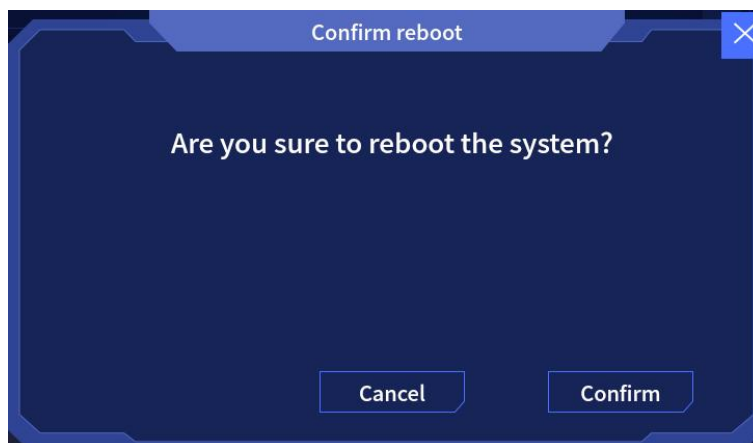


Figure 9.24 Confirm reboot

9.3 Preoperative Preparation

After starting up, the user can move the Surgical Trolley.

The two front wheels of the Surgical Trolley are electrically driven, allowing users to control the movement of the trolley via a drive controller with two enable buttons. The method for driving the Surgical Trolley is described below:

1. Before initiating motion, ensure that the lever on the drive controller is in its initial position, then press and hold the enable buttons to activate the front wheels.
2. To move the Surgical Trolley forward, simultaneously push both left and right levers forward to the same extent. The greater the deflection of the levers, the faster the forward speed will be.
3. To move the Surgical Trolley backward, simultaneously pull both left and right levers backward to the same extent. The greater the deflection of the levers, the faster the backward speed will be.
4. To turn the Surgical Trolley to the right, push the left lever forward while pulling the right lever backward. The greater the deflection of the levers, the faster the turning speed to the right will be.
5. To turn the Surgical Trolley to the left, pull the left lever backward while pushing the right lever forward. The greater the deflection of the levers, the faster the turning speed to the left will be.

Please exert caution while moving the Surgical Trolley into the sterile area for surgery. While operating the drive controller, watch for obstacles while driving the Surgical Trolley to the predetermined docking site. After placing the Surgical Trolley, the stabilization feet can be lowered to the ground for fixation.

 CAUTION	1) If releasing the enable button does not stop the movement, release your grip on the drive controller levers; they will automatically return to their neutral position, which should stop the Surgical Trolley. 2) After releasing the drive controller levers, if the Surgical Trolley continues to move, immediately press the emergency-stop button.
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9.3.1 Select Operation

According to the introduction in Section 9.2.3, the user can complete the operation selection.

9.3.2 Stowed Pose

After the system starts up, it is necessary to return the Surgical Trolley to the stowed pose. Once the system startup self-test is completed, select the “stowed pose” as the target position for the robotic arms. Then, press and hold the execution button on the Surgical Trolley to allow the four robotic arms to move to the stowed pose. The movement will stop when they reach the target pose. The posture of the stowed pose for the Surgical Trolley is shown in Figure 9.25.

When the robotic arms’ target pose is set to the “stowed pose,” the next operation cannot begin until the stowed pose is reached. The current step is to “return to stowed pose.” Press and hold the move-in button for each robotic arm until the movement stops automatically, indicating that the return to the stowed pose is completed. The status box will then update to show “return to stowed pose completed.”

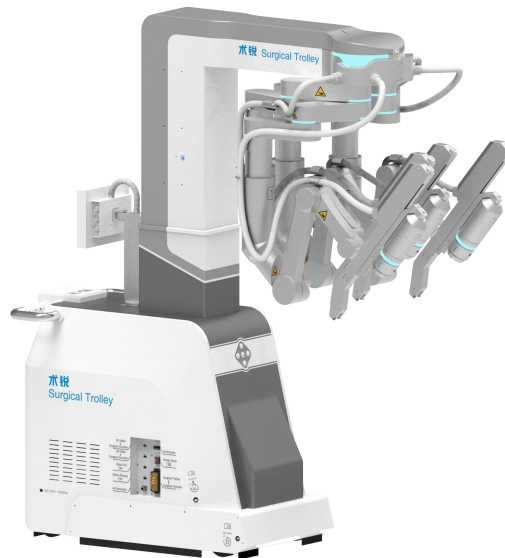


Figure 9.25 Surgical Trolley at the stowed pose

9.3.3 Draping Pose

After the robotic arms and the four actuation modules are returned to the stowed pose, the sterile drape can be installed by switching the target pose of the robotic arm to the draping pose through the forward switch button.

Before draping, a space specially used for draping should be planned in the operating room. This space should not interfere with the flow of personnel and other objects in the operating room.

When the target pose of the robotic arm is at “draping pose of arm 4,” and after the Surgical Trolley execution button is continuously triggered, the four robotic arms

are moving to the target pose of “draping pose of arm 4.” The user can release the button to stop the movement when the robotic arms are considered in appropriate positions.

In the “draping pose of arm 4,” press the downward button and upward button on actuation module 4 (see Figure 3.19 for the buttons), to adjust the pitch angle of the actuation module. The target pose of “draping pose of arm 4” is shown in Figure 9.26.

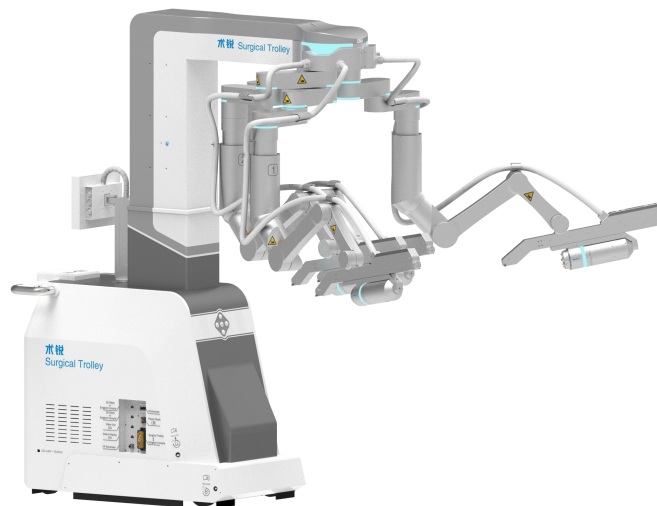


Figure 9.26 Draping pose of arm 4

9.3.3.1 Draping

 CAUTION	1) The images in this chapter are used only to illustrate the installation procedures. When performing these operations in actual use, relevant personnel must take proper precautions before proceeding.
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The sterile drape must be installed during the preoperative preparation of the Surgical Trolley. This process is called draping. The draping sequence is to install the sterile drape on the column first, then install the sterile drapes on the robotic arms one by one.

Model	Description
SR-ENS-600-D1	Used to wrap around the robotic arm
SR-ENS-600-D2	Used to wrap around the column

For further information on the sterile drape, please refer to the Sterile Drape User Manual.

The installation method of the sterile drape for the column is as follows. First,

open the pouch and place the sterile drape with the palm of the right hand upward, as shown in Figure 9.27.



Figure 9.27 Taking out the sterile drape

Tear off the easy-tear labels 1 and 2. Put hand into the sterile drape according to the palm label, and then unfold the drape, as shown in Figure 9.28.



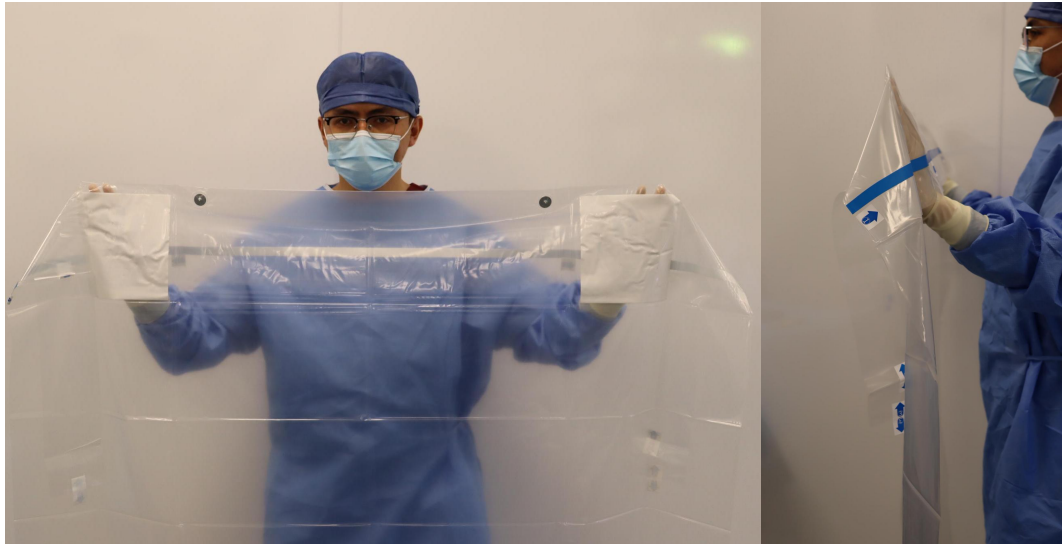


Figure 9.28 Unfolding sterile drape

Engage the metal disks on both sides of the sterile drape to the magnet of the column of the Surgical Trolley, as shown in Figure 9.29.



Figure 9.29 Engage the metal disks of the drape on the magnet of the Surgical Trolley column

Fasten the strap and install the drape on the side of the column, as shown in Figure 9.30.



Figure 9.30 Tie the strap to complete the installation of a sterile drape on the column

The draping sequence of the four robotic arms is arm 4, arm 3, arm 2, and arm 1. Before draping a specific robotic arm, the robotic arms must be adjusted to the appropriate pose. Installing a sterile drape on each robotic arm is the same. Here, only drape installation on the robotic arm 4 is taken as an example to illustrate the installation method.

First, open the pouch and take out the sterile drape, as shown in Figure 9.31.



Figure 9.31 Take out the sterile drape for the robotic arm

Unfold the sterile drape, first tear off the easy-tear label 1, then unfold the label on the right hand, as shown in Figure 9.32.



Figure 9.32 Unfold the sterile drape after tearing the label

According to the instructions on the palm label, put hands at the designated position, hold the upper and lower parts of the drape with the right hand over the actuation module, and cover the opening of the sterile drape from the end of the actuation module of the robotic arm, as shown in Figure 9.33.



Figure 9.33 Place the sterile drape over the robotic arm according to the label instructions

Push the sterile drape to the base of the robotic arm along the actuation module and the robotic arm, and interlock the plastic hooks at the end closure, as shown in Figure 9.34.



Figure 9.34 Push the sterile drape and interlock the hook on the end

Engage the metal disk on the drape with the magnet on the actuation module, as shown in Figure 9.35.

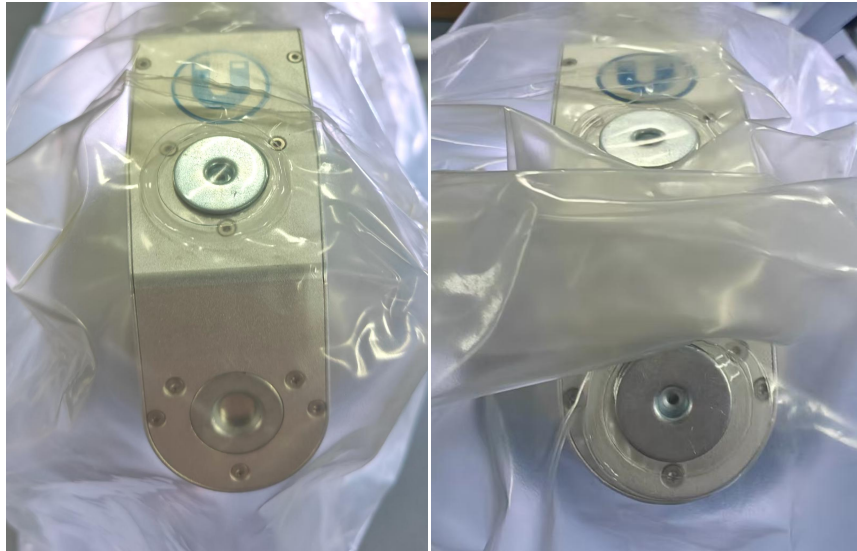


Figure 9.35 Engage the metal disk with the magnet

Push the trocar adapter all the way in along the front slot of the linear module, be careful not to clip the drape into the gap when pushing, and then tighten the fastening screws on both sides, as shown in Figure 9.36.

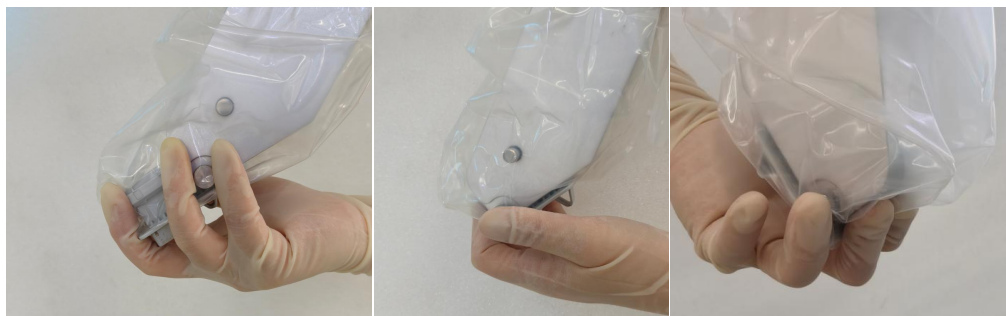


Figure 9.36 Installing the trocar adapter

Adjust the robotic arm to a proper posture, and snap the instrument adapter into the rotary module according to the direction indicated by the sign. After installation, the actuation module's LED status indicator will have a green flashing prompt. Then remove the fixing collar and zero-position retainer, as shown in Figure 9.37 and Figure 9.38. Press and hold the multi-functional button on the rotary module (see Figure 3.19) to lock the instrument adapter.

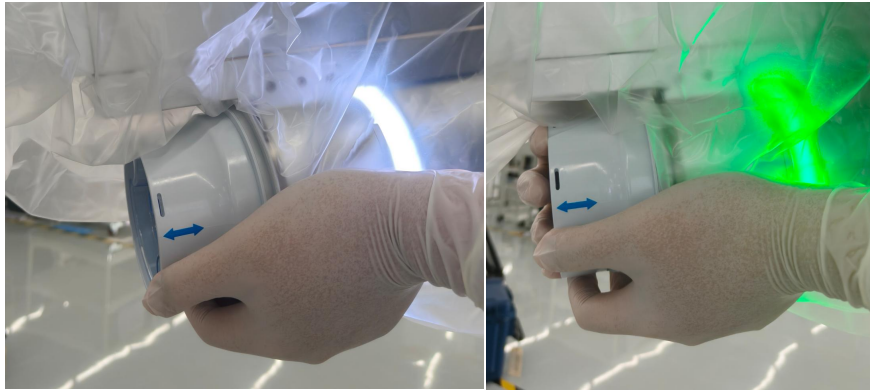


Figure 9.37 Install the instrument adapter according to the correct direction



Figure 9.38 Remove the fixing collar and zero-position retainer after installing the instrument adapter

After the installation of the instrument adapter, the status of the actuation module 4 is updated to “motion detection.” Press and hold the move-out button on the actuation module, and the actuation module will complete the motion of “return to zero, forward and reverse rotation.” The motion detection verifies the correctness of drape installation through the linear and rotating full-range motion of the actuation module, especially to avoid the use interruption caused by the possibility that the drape gets stuck during the operation. After the motion detection, press and hold the move-in button on the actuation module to return to the stowed pose.

Finally, tie the sterile drape straps so that the drape does not obstruct the line of sight. Additionally, make sure the strap is not tied too tightly to the robotic arm to avoid interfering with its movement, as illustrated in Figure 9.39.



Figure 9.39 Tie the strap and finalize the installation of the sterile drape for arm 4.

After installing the sterile drape for the robotic arm 4, use the sheath connector wrench to securely attach the sheath connector to the trocar adapter, as shown in Figure 9.40.

Robotic arm 3 of the Surgical Trolley connects to the sheath connector (SR-ENS-600-TCH2), while robotic arms 1, 2, and 4 connect to the sheath connector (SR-ENS-600-TCH1). The sheath connector wrench is used to lock the sheath connector and the trocar adapter; Please note that the wrench is not installed on the Surgical Trolley itself.

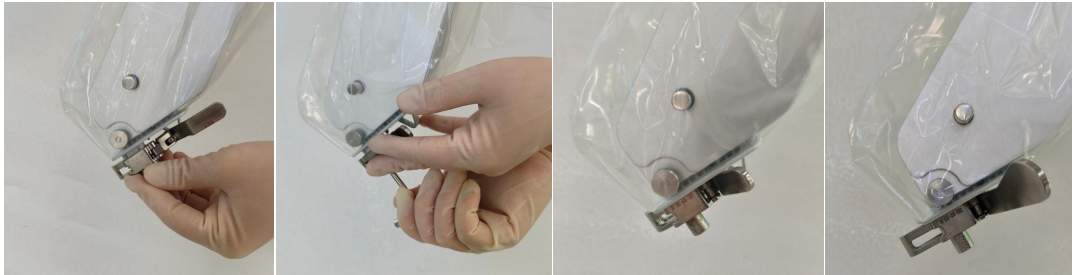


Figure 9.40 Install the sheath connector

After the draping of the robotic arm 4, switch the target pose of the robotic arm to the “arm 3 draping pose” by using the forward switch button. Then, enable movement by pressing the execution button to allow the robotic arm to move to the target pose.

Next, install the sterile drape on robotic arm 3 and connect the sheath connector. Follow the same steps to complete the installation of the sterile drape and sheath connector for robotic arm 2 and robotic arm 1.

The target positions for the installation of the sterile drape for arm 3, 2, and 1 are illustrated in Figure 9.41–Figure 9.43.

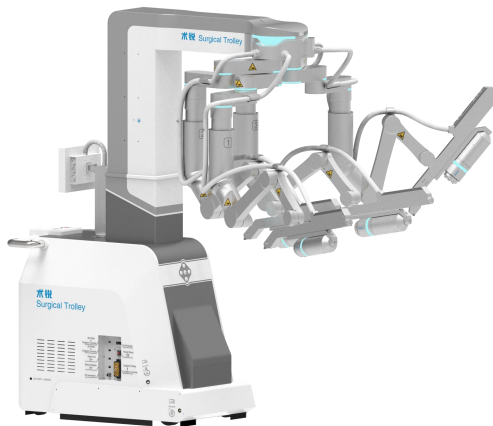


Figure 9.41 Target pose of draping pose of arm 3



Figure 9.42 Target pose of draping pose of arm 2

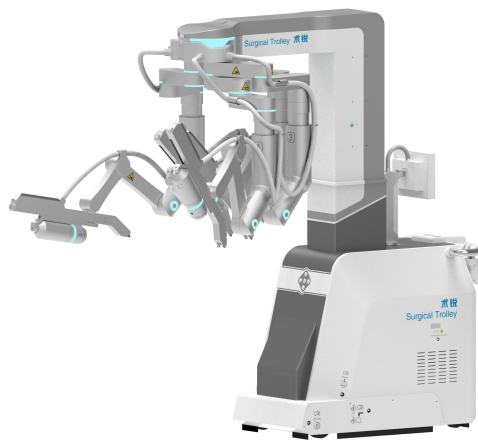


Figure 9.43 Target pose of draping pose of arm 1

9.3.4 Folded Pose

After the draping, press the forward switch button to switch the target pose of the robotic arms to the “folded pose.” Then press and hold the “execution button,” to drive all robotic arms move to the “folded pose.” The “folded pose” status indicates that the Surgical Trolley is ready before the operation. After the system is in the “folded pose,” the user can drive the Surgical Trolley towards the operating table. Figure 9.44 shows the target posture of the Surgical Trolley in the “folded pose.” Before driving the Surgical Trolley to the operating table, the patient’s surgical positioning, body incision, and the placement of the incision protector and trocar should be completed. After placing the trocar, connect the pneumo- peritoneum machine if needed. The 3D endoscope can be inserted into the patient cavity for observation. If necessary, using the visual feed of the 3D endoscope, surgeons can establish an auxiliary port.

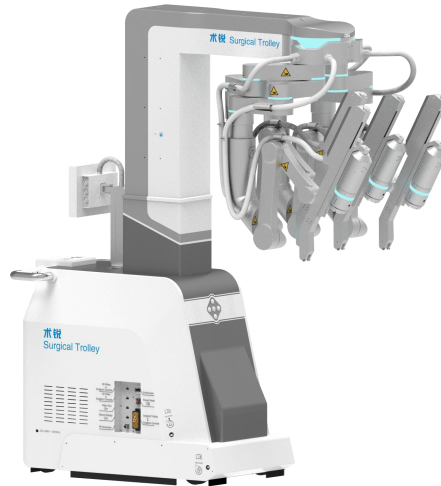


Figure 9.44 Surgical Trolley's "folded pose"

9.3.5 Parking of Surgical Trolley

After the Surgical Trolley completes the installation of the sterile drape and is in its folded pose, user can drive the Surgical Trolley to the side of the operating table for docking. Move the Surgical Trolley to the position where the circular light spot's center is close to the incision, and adjust the height of the beam of the Surgical Trolley to the height where the circular light spot and the cross light spot of the positioning indicator are tangent (refer to Section 9.1.2). Figure 9.45 shows the parking position of the Surgical Trolley. After the Surgical Trolley is parked in place, rotate the stabilization feet knob to lock the Surgical Trolley.

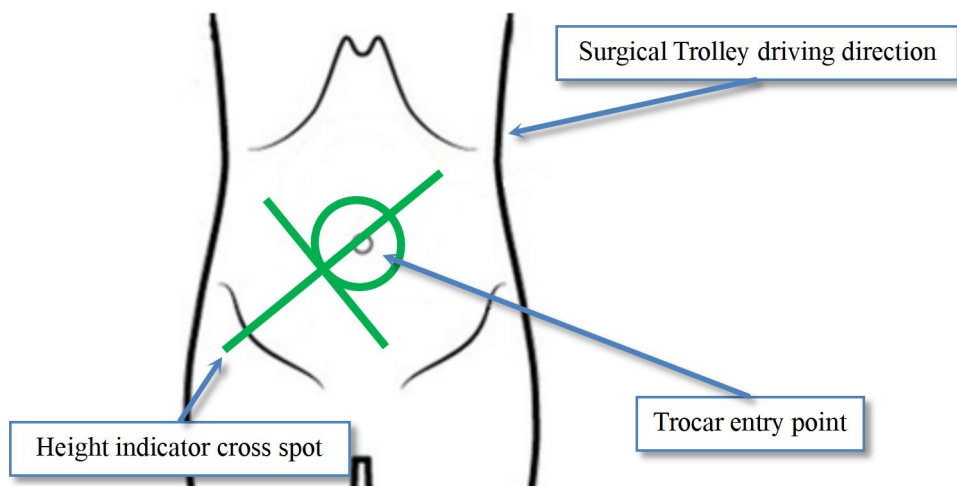


Figure 9.45 Fixed parking position of Surgical Trolley

9.3.6 Adjusting Pose

After the Surgical Trolley is parked, press the forward switch button to switch

the target pose of the robotic arms to the “adjusting pose.” In this state, by continuously pressing the execution button, the robotic arm can move to the “adjusting pose” as shown in Figure 9.46.



Figure 9.46 Surgical Trolley’s “adjusting pose”

After the robotic arms reach the adjusting pose, the current step status in the status box of each actuation module is automatically switched to “connect trocar.” The user can switch the robotic arm target pose to the “clockwise rotation” or “counterclockwise rotation” state using the status switch button of the robotic arm target pose (backward switch button or forward switch button) and continuously press the execution button to make the robotic arms rotate in a coordinated manner. According to the direction of the trocar required by the surgery, the user can adjust the clockwise or counterclockwise overall rotation of all robotic arms so that the axis direction of the rotary module of the robotic arm 3 is aligned to the direction of the channel of the trocar.

9.3.7 Dock Robotic Arms to Trocar

After completing the preliminary adjustment of the robotic arms’ overall steering, the pose adjustment can be made using the function described in the robotic arm pose adjustment option (refer to Section 9.2.5), to finish the docking of the robotic arm 3 and the trocar.



Figure 9.47 Robotic arm pose view of “initial trocar docking”

In single-port surgery, the system calculates the docking pose or avoidance pose based on the position of robotic arm 3 and the selected trocar model. Once robotic arm 3 is successfully docked, the user can set the target pose to “arm X docking pose” (where X can be 1, 2, or 4). This feature will automatically adjust the positions of the three arms to their designated poses, and the users can easily complete the docking process.

For faster docking, users may bypass the “adjusting pose” and set the target pose to “(fast) docking pose.” Once the execution button is pressed, all four robotic arms will coordinately move into their docking positions at the same time.

 CAUTION	1) In the single-port surgery, only robotic arms 1 and 4 have avoidance pose. 2) When connecting the robotic arm to the trocar, please pay attention to the sequence number of the trocar channel and connect the correct channel to the robotic arm.
---	--

After the robotic arm is successfully docked with the trocar, the current step in the status box will switch to “return to zero.” Users should continuously press the actuation module’s move-out button to realize the actuation module’s return to zero operation. After “return to zero” is completed, the current step in the status box switches to “install surgical instruments.” If adjustment is required, the user can disconnect the trocar, adjust the robotic arm, and dock again.

When the user switches the target pose to “arm 1 and 4 docking pose,” the target poses for arms 1 and 4 can be selected, respectively. There are three options for the target pose: “docking pose,” “avoidance pose,” and “not selected.” “Docking pose” is

for docking to the trocar. “Avoidance pose” is for moving away from the trocar, which can provide a larger bedside operation space. If “not selected,” the robotic arm will remain still.

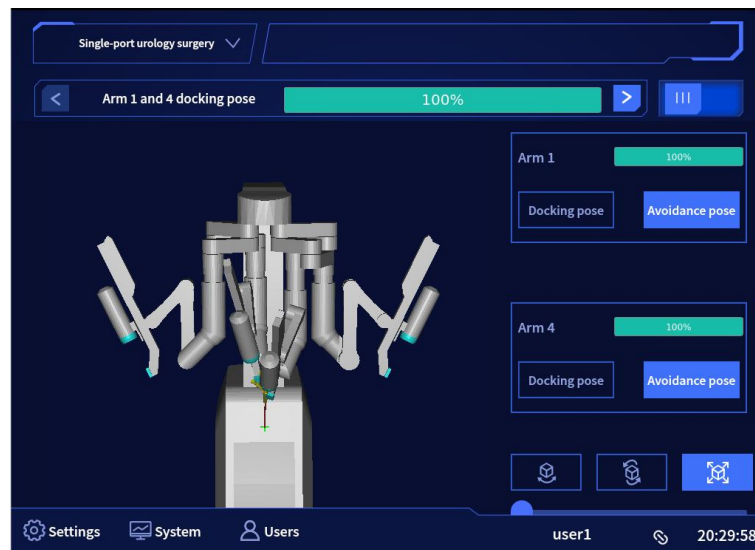


Figure 9.48 Robotic arm pose view of “Arm 1 and 4 docking pose”

After the robotic arm has docked to the trocar, the height of the trocar can be adjusted through the column up button or the column down button on the Surgical Trolley. In addition, the posture of the trocar can also be adjusted through the coordinated adjustment of the robotic arms.

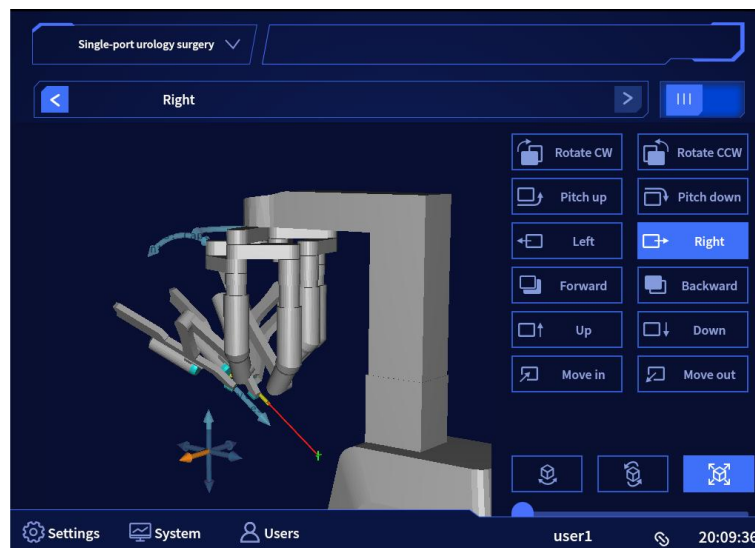


Figure 9.49 Robotic arm pose view during coordinated adjustment

The coordinated adjustment modes include clockwise and counterclockwise rotation around the entry point, pitch-up and down around the entry point, forward, backward, left, right, move-in, and move-out along the trocar axis. Select the adjustment mode and press the execution button to realize motion control.

Once a robotic arm is connected to the trocar, the system will disable the driving function of the Surgical Trolley's base. This function will remain disabled until all sheath connectors are disconnected. The electric wheel of the Surgical Trolley is self-locking, preventing external forces from moving the trolley when the driving power is turned off. In special circumstances, if the Surgical Trolley needs to be moved, use the trolley adjustment tool to release the stabilization feet and wheels, then move the trolley manually.

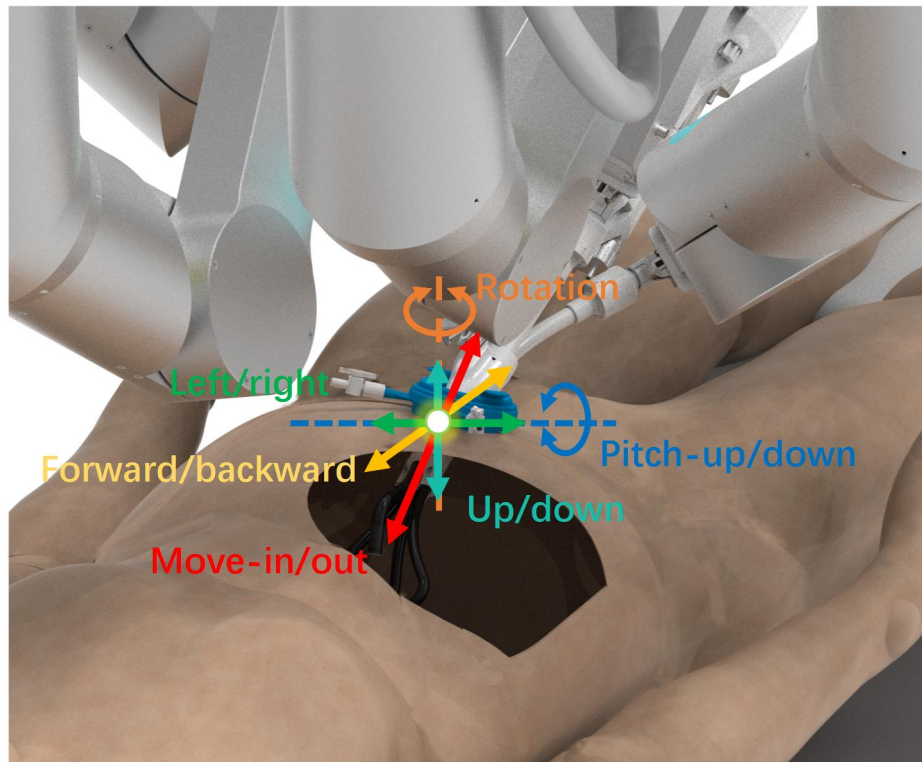


Figure 9.50 Schematic diagram of coordinated adjustment of the robotic arms

 WARNING	1) When the trocar is connected with any robotic arm, attention should be paid to the force inflicted by the trocar on the patient's body surface if the column is raised or lowered during the robotic arm coordinated adjustment. Improper operation may lead to tearing of the patient's body surface.
---	--

9.3.8 Install 3D Endoscope and Surgical Instruments

When installing the 3D endoscope and the surgical instruments, first align or insert the distal end of 3D endoscope or surgical instrument into the inlet of the corresponding trocar channel, and then install the proximal end of the 3D endoscope or the surgical instrument housing to the corresponding instrument adapter on the sterile drape. During installation, it is necessary to pay attention to slide the extruding

knob on the proximal side of the instrument housing into the guiding slot in the instrument adapter. The pressure valve interface should face away from the linear module. After the instrument is pushed all the way in, long press the multi-functional button of the actuation module to lock the instrument. After installing the instrument, the actuation module status box will show “exited.”, meaning the instruments are retracted from patient cavity.

9.3.9 Feed Instruments

After the installation of the surgical instrument or 3D endoscope is completed, the move-in button on the actuation module can be pressed continuously to feed the instrument in. After the instrument is placed, the movement stops automatically and displays “entered” in the corresponding arm status box. The surgical end-effector or vision module has just extended out of the trocar outlet port. After releasing the move-in button, continue to press the move-in button again, and the surgical instrument or 3D endoscope can move to the “initial pose.” The color of the actuation module LED status indicator changes to purple, indicating that the instrument is ready for control from the Surgeon Console. At this time, the state of the actuation module is switched to “ready,” and the user can control the surgical instrument or 3D endoscope via the Surgeon Console. Press the move-in button according to the actual situation, and the surgical instrument or 3D endoscope will feed to the specific target pose. The particular target pose could be the last pose before the instrument is retracted from the patient cavity or the default initial target pose at the start of this operation.



Figure 9.51 Pose of the Surgical Trolley during surgery

9.4 Intraoperative Process

After the teleoperation matching is established, the Surgical Trolley's actuation module responds to the Surgeon Console's controlling command to actuate the surgical instrument or 3D endoscope to perform the surgical operation.

An assistant surgeon in the sterile area is needed to perform the tasks such as wiping and changing the surgical instruments when needed.

To maintain a good performance of the surgical instruments, please follow the instructions below:

1. Timely cleaning of the end-effector of the replaced surgical instrument.
2. When the surgical instruments are in use, do not use one surgical instrument to clean another.



CAUTION

- 1) If the Surgical Trolley is powered off during the operation, the trolley adjustment tool can be used to raise the column to release the patient under the power loss.
- 2) In the process of teleoperation, if the user finds that the end-effector of the surgical instrument or the 3D endoscope has abnormal movement, the user should move their head away from the 3D viewer immediately so that any movement will stop.
- 3) When an unexpected movement is detected, the user should release any movement button or move the head away from the 3D viewer to stop the unintended movement.
- 4) When the unexpected movement cannot be stopped, the emergency stop button can be pressed to cut off the power of all motors to prevent the unintended movement.
- 5) During teleoperation, it is necessary to ensure that the end-effector of the surgical instrument is within the field of view of the 3D endoscope.
- 6) When the surgical instrument is close to the patient's tissue, it needs to be handled carefully to prevent injury to the patient.
- 7) Installed on the rotary module, the surgical instrument is capable of rotating up to ± 270 degrees along its longitudinal axis. Users should be aware of its motion limits.

9.4.1 Change Surgical Instruments

The surgeon can initiate a command to change the surgical instrument during the operation. After the surgeon disconnects the teleoperation matching, the assistant surgeon can press and hold the move-out button on the actuation module to exit the

surgical instrument to the zero position. Then, long press the multi-functional button on the actuation module to unlock the surgical instrument and remove the surgical instrument from the instrument adapter. After that, a different surgical instrument can be installed. After locking, press and hold the move-in button to complete the feeding of the surgical instrument.

 CAUTION	1) Before changing the surgical instruments, the surgeon must be able to observe all the surgical end-effectors to ensure safety in the process of removing the surgical instruments.
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9.4.2 Wipe and Clean 3D Endoscope

During the operation, if the 3D endoscope vision module is fogged or contaminated and affects the field of view, it is necessary to exit the 3D endoscope and wipe the lens with wet sterile gauze before sending the 3D endoscope back in again. For cleaning the endoscope, it only needs to exit the endoscope from the patient body without removing it from the actuation module, which can reduce the waiting time during the cleaning task. The operation steps are as follows:

1. Select “wiping” on the Surgeon Console touch screen or Surgical Trolley status touchscreen.
2. Press and hold the move-out button on the actuation module or the multi-functional button on the Surgeon Console to exit the 3D endoscope from the trocar until the arm of the 3D endoscope bends backwards to form a convenient wiping pose.
3. Carefully wipe the end face of the vision module of the 3D endoscope with a moist sterile gauze.
4. To further reduce the frequency of fogging, the 3D endoscope vision module can be briefly immersed in warm water and wiped clean with a sterile gauze.
5. Press and hold the move-in button on the actuation module to complete the 3D endoscope straightening and feeding-in movement. It can automatically proceed to the position memorized before the endoscope’s last removal.
6. The operation can continue after the 3D endoscope is fed back to the patient cavity.

9.4.3 Adjust Operating Area

During the operation, the operating area of the 3D endoscope and the instruments

can be adjusted. During this adjustment, it is necessary to ensure all the instruments end-effectors are within the field of view of the 3D endoscope.

When the operating area of the surgical instrument is close to the boundary of its workspace, which can lead to limited movements because of the instrument's joint limits, the robotic arm can be adjusted for a wider range of visual and operating area. When the robotic arms move, the trocar, 3D endoscope, and surgical instruments maintain the relative position unchanged.

With the robotic arms' coordinated adjustment, all the four abdominal quadrants can be covered by the instruments.

The operation steps and requirements are as follows:

- To avoid the collision and pulling of internal tissues and lower the risk, it is important to gather the 3D endoscope and the surgical instrument as closely as possible. It is necessary to release the grip of all surgical instruments on the tissue first and then move back the 3D endoscope to the trocar channel outlet while appropriately retracting the instruments. With all the instruments end-effectors in the field of view of the 3D endoscope, the robotic arms can be moved. To ensure higher safety, moving the surgical instruments back to the channel outlet or inside the trocar channel is recommended.
- After disconnecting the teleoperation control of the instruments and the 3D endoscope, follow the robotic arm coordinated adjustment function instruction in Section 9.3.7. Select the target adjustment mode, press and hold the execution button to move, and when the target pose is reached, release the button to stop and complete the corresponding adjustment action. Pay attention to the surgical field to avoid internal collision. Pay attention to the pulling tension force of the trocar on the patient's body surface incision or the incision protection device to prevent damage.
- After the operating area adjustment is completed, the surgeon can match the haptic masters again and continue the operation.

For safety reasons, the robotic arms coordinated adjustment and the instruments' teleoperation control cannot be performed simultaneously.



WARNING

- 1) Before the coordinated adjustment of robotic arms, make sure that the surgical end-effector does not grasp any body tissue.
- 2) When exiting the surgical instruments or 3D endoscope during surgery, the operation can only be performed when the end-effector is in the surgical

	field of view and away from human tissue. 3) During adjusting the operating area, keep the instrument stems and end-effectors away from human tissues, and ensure that all surgical instruments are centered within the surgical field of view. 4) The end-effector orientation indicator and instrument 3D simulation on the 2D display of the Surgeon Console can only be used as a reference, and the position of the instrument stem and the end-effector shall be subject to the actual position. 5) During the intraoperative operating area adjustment process, please avoid any collision between the robotic arms and other objects and persons.
--	---

9.5 Postoperative Wrap-up Tasks

After the operation, remove the surgical instruments and 3D endoscope, undock the Surgical Trolley from the patient, and drive the Surgical Trolley away from the operating table. For safety reasons, please ensure that any system movement is under the monitoring of at least one surgical team member.

9.5.1 Remove Surgical Instruments and 3D Endoscope

Please remove the 3D endoscope after removing all the surgical instruments. When the 3D endoscope is not ready for teleoperation control, feeding of any surgical instruments is not allowed.

 WARNING	1) Please be careful when removing the surgical instruments or 3D endoscopes during surgery. The operation can only be performed when the end-effector is in the surgical field of view. Otherwise, do not remove the surgical instrument. 2) If necessary, use a spare endoscope from the auxiliary hole to complete the visualization. 3) Ensure that the surgical end-effector does not grasp the tissue before removing the surgical instrument. If it does, loosen the grip first.
---	--

Before removing the surgical instruments, the surgeon should pay attention to the following operations:

1. Ensure that there is no tissue obstruction on the exiting path of the surgical instrument.
2. Disconnect the teleoperation matching status of the surgical instrument.
3. The surgeon should inform the assistant of the name of the surgical

instrument that needs to be removed.

The assistant must perform the following operations to remove the surgical instruments:

1. According to the received instructions from the surgeon, press the move-out button on the linear module until the rotary module moves to the zero position.
2. Press the multi-functional button on the actuation module to unlock the instrument. When the status of the actuation module in the status touchscreen is “install surgical instrument,” it indicates that the surgical instrument has been unlocked.
3. Remove the unlocked instrument from the instrument adapter.

9.5.2 Disconnect and Evacuate

After removing the surgical instruments and 3D endoscope, disconnect the sheath connector at the front end of all actuation modules from the trocar. Raise the column that disconnects the Surgical Trolley from the patient. After that, raise the stabilization feet and drive the Surgical Trolley away from the operating table.

9.5.3 Remove the Drapes

After the operation, adjust the robotic arm to a proper pose and remove all drapes and the sheath connectors.



CAUTION

- 1) The sheath connector is a reusable part, which can be reused after being treated according to the specified cleaning and sterilization process together with the sheath connector wrench.

9.5.4 Stow the Surgical Trolley

After removing the sterile drape of the Surgical Trolley, switch the robotic arm target pose to the stowed pose and press the execution button to drive the robotic arms to the stowed pose.

Depending on the actual situation, the external surface of the equipment can be cleaned before returning to the stowed pose.

After the Surgical Trolley is returned to the stowed pose, the medical staff can move the Surgical Trolley to the designated location to wait for the next operation.

Chapter 10 Surgeon Console Use

 HAZARD	1) If the surgical instrument cannot be controlled in a precise and controlled manner, or the movement of the surgical instrument is counter-intuitive, stop the operation immediately.
--	---

10.1 Button Groups

10.1.1 Emergency-stop Button

To stop the system operation in an emergency, press the emergency-stop button. After pressing this button, the system will stop driving the surgical instrument and 3D endoscope and keep them at the last commanded position.

If the surgical instrument grip is closed when the emergency-stop button is pressed, the surgical instrument grip will remain closed.

After the emergency-stop button is pressed, an alarm will be activated, and the alarm will continue until the fault is recovered. After the fault is recovered, rotate the emergency-stop button counterclockwise, which causes the button to automatically pop up and release the system from the emergency state.

10.1.2 Ergonomic Control Buttons

The user's ergonomic adjustment can be realized using the ergonomic control buttons on the Surgeon Console. Before adjustment, ensure that no external interference is blocking the components' movements of the Surgeon Console. The steps to adjust the ergonomic parameters of the Surgeon Console are:

1. Adjust to appropriate seat height so that the surgeon can easily move the legs and step on each pedal.
2. Adjust the height of the armrest so that the surgeon's forearms are comfortably supported and the shoulders are relaxed.
3. Adjust the height of 3D viewer according to the surgeon's preference.
4. According to the surgeon's preference, adjust the depth of the 3D viewer by triggering the 3D viewer extension lever.
5. According to the surgeon's preference, adjust the pitch angle of the 3D viewer by triggering the 3D viewer pitch lever.
6. According to the surgeon's preference, adjust the position of the footswitch

panel.

Please note that the armrest height, 3D viewer height, 3D viewer depth, 3D viewer pitch angle, and footswitch panel depth are protected by motion limit features.

10.2 Touchpad

10.2.1 Unlock the Touchpad

The touchpad is positioned on the upper side of the armrest. The touchpad will be locked when the infrared head sensors are activated to avoid unintended touches while in use, as illustrated in Figure 10.1. To unlock the touchpad, press and hold the screen.

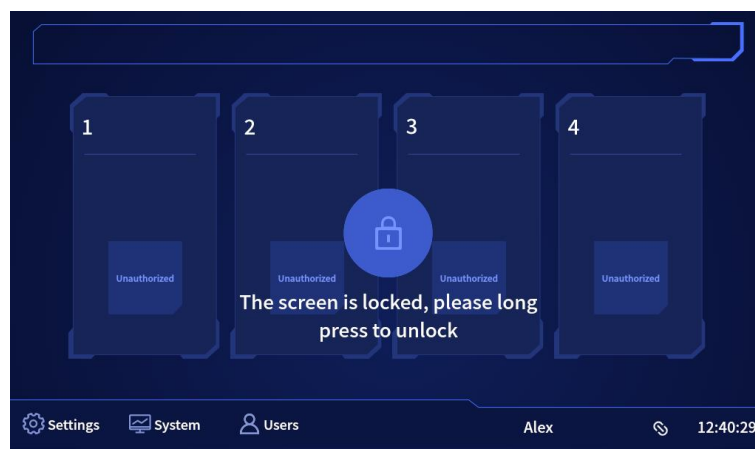


Figure 10.1 Locked status of the touchpad

10.2.2 Login

The user must enter the username and password to log in to the system. The touchpad login page is shown in Figure 10.2.



Figure 10.2 Touchpad login page

10.2.3 Main Page

The touchpad main page is shown in Figure 10.3. As shown in Figure 10.3, the main page includes system information bar, actuation module status display, menu bar, nickname, system time, etc.

The actuation module status display area consists of four status boxes for the actuation modules. Separated by actuation module 3 status box, the left side is assigned to the left haptic master, whereas the right side is assigned to the right haptic master. Each status box displays the actuation module number in the upper left corner. A hand icon indicates that the actuation module is matched with its corresponding haptic master.

A quick status switch lets users change the mapping between the actuation modules and the left or right haptic masters. For example, as shown in Figure 10.3, clicking the quick status switch for a specific actuation module will change actuation module 2, originally assigned to the left hand, to the right hand. This switching alters the numbering sequence from left to right, changing it from 1, 2, 3, 4 to 1, 3, 2, 4. Importantly, only two actuation modules assigned to the same haptic master can switch their mapping relationship; therefore, the maximum number of actuation modules that can be assigned to one haptic master simultaneously is two.

The name of the instrument loaded onto each actuation module is displayed in the corresponding status box, and if no instrument is loaded, it will not be shown. Notably, the 3D endoscope is installed on actuation module 3. Additionally, the status box includes a target pose selection button for each actuation module. During different operation stages, users can click this button to change the target pose and then press the multifunctional button on the Surgeon Console to control the instrument's movement to the selected target pose. The default target pose is set to the pose from the last pose before being disconnected from the teleoperation, while the system presets the initial pose.

For the 3D endoscope, select “wipe” and press the move-out button of actuation module 3. The endoscope will completely retract from the trocar channel and bend backwards to the proximal end to facilitate cleaning and wiping of the vision module. After wiping, press the move-in button to control the endoscope to enter the trocar channel and continue to work. This allows the lens to be cleaned and wiped without unloading the endoscope from the actuation module.

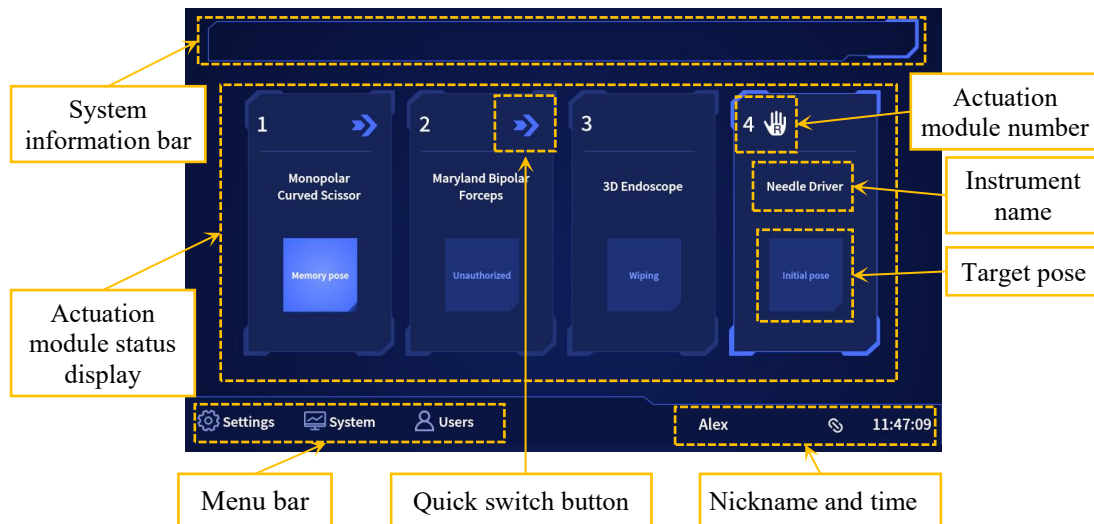


Figure 10.3 Touchpad main page

10.2.4 Settings

1. Haptic masters assignment: The user can allocate the relationship between the left or right haptic master and the actuation modules. This operation can be carried out before or after the installation of the surgical instruments.

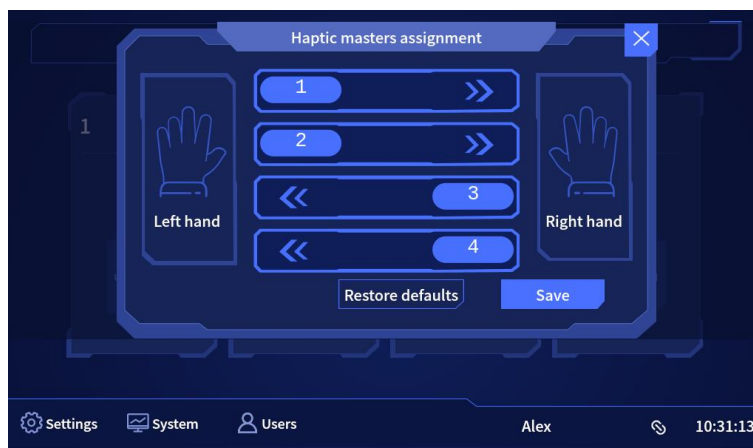


Figure 10.4 Haptic masters assignment



CAUTION

- 1) Reasonable allocation of the haptic masters can make the operation more efficient.

2. Scaling factor: The user can adjust the sensitivity of the haptic master to control the movement of the surgical instrument end-effector. There are three ratios in total. From L1 to L3, when the haptic master moves the same distance, the movement distance of the controlled surgical end-effector increases, and the corresponding ratios respectively are 3:1, 2:1, and 1.5:1.

Note: When controlling the surgical instruments, the system automatically filters out hand trembling to improve operational accuracy.

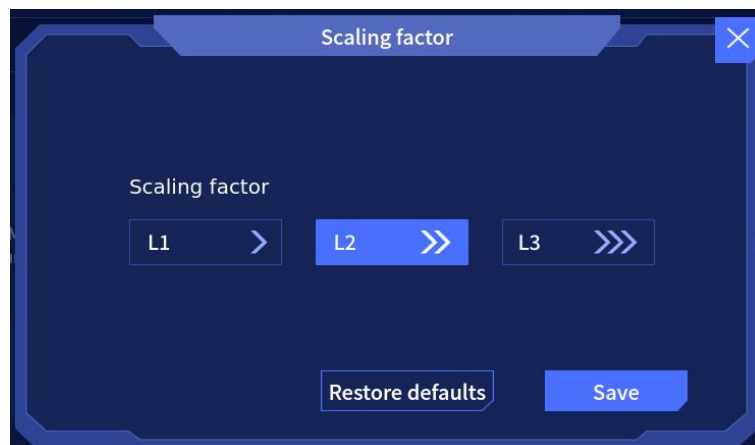


Figure 10.5 Scaling factor setting

3. Audio: The user can adjust the voice volume, microphone volume and alarm volume, and restore the audio default values. The adjustment range of the volume is from 0 to 100. Enter the user password and save the settings if necessary, .

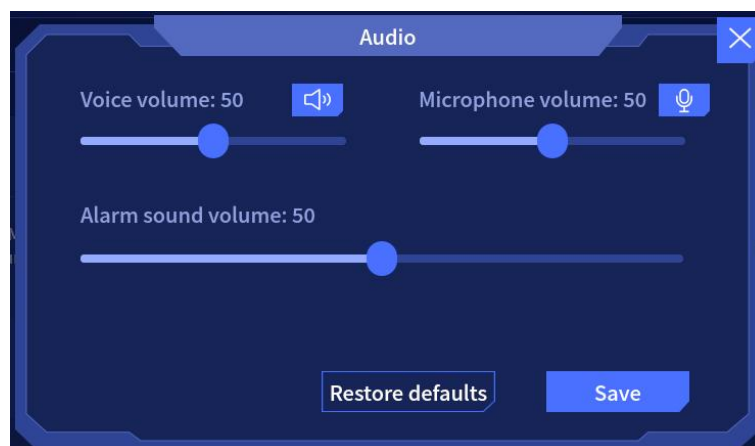


Figure 10.6 Audio settings

4. Touch screen display: The brightness and contrast of the touch screen display can be adjusted. The adjustment range of brightness and contrast is 0 to 100.

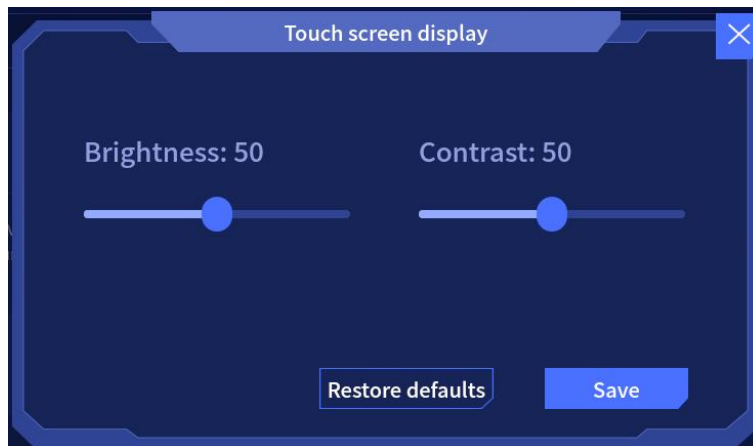


Figure 10.7 Touch screen display settings

5. Surgical field: The user can adjust the zoom, resizing and image enhancement of the surgical field image. The user can select the 2D image source from either the left or right eye to be presented on the 2D Display. Set “Enhancement ON” to adjust the brightness, sharpening, denoising, contrast, and saturation of the surgical field image.



Figure 10.8 Surgical field setting

6. Lock screen time: This option allows the user to adjust the screen lock time of the touchpad (options are 15 seconds, 30 seconds and 60 seconds). In order to prevent unintentionally touching the touchpad when manipulating the haptic master, the touchpad will be locked when the surgeon starts to manipulate the haptic masters.

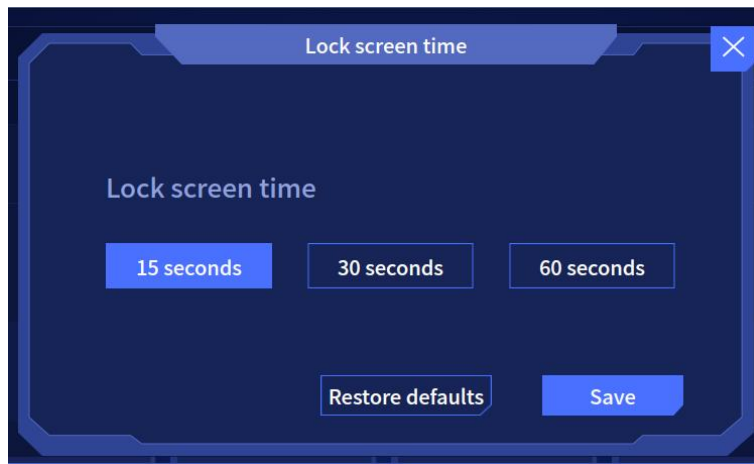


Figure 10.9 Lock screen time setting

7. Pedal settings: The left (right) pedal swap button allows the user to swap the functions of the upper or lower foot pedals between electrosurgical cut and coagulation, for the instruments corresponding to the left (right) haptic master. Default settings can be restored by the restore defaults button.



Figure 10.10 Pedal settings

8. Haptic master calibration: This page allows users to adjust the damping settings for the haptic master, utilize the finger clutch for instrument swapping, calibrate grip configurations, and enable the “auto flip” function.



Figure 10.11 Haptic master calibration

9. If logged in with “admin” (a.k.a. the system administrator account), the time to automatically log out the system administrator account can be set. The automatic logout options are 15 s, 30 s, and 60 s.

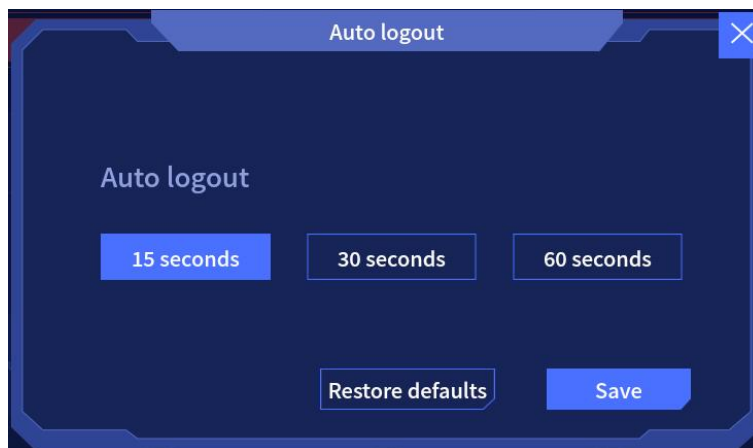


Figure 10.12 Auto logout setting

10.2.5 System

The Surgeon Console system menu includes system information, instrument information, UPS, log, reboot and other submenus.

1. System information: Displays system information, including system model, Surgical Trolley model (Surgeon Console model) , serial number, software model, software version, and copyright information.

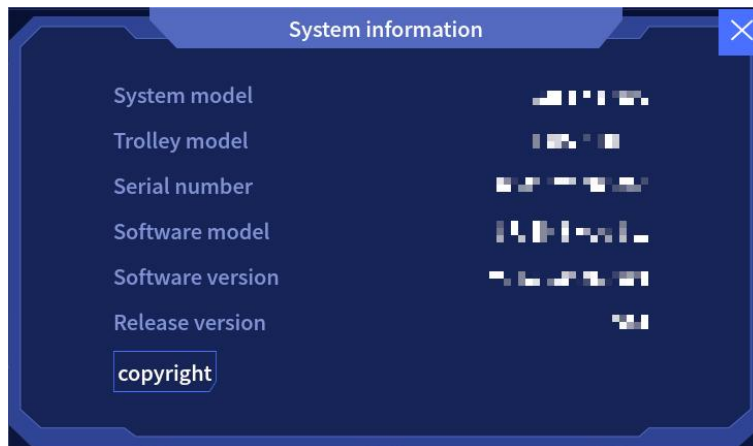


Figure 10.13 System information

- Instrument information: Displays instrument types, the remaining usage of the surgical instruments and the 3D endoscope.



Figure 10.14 Instrument information

- UPS: Displays the current power, charging and discharging status of the uninterruptible power supply.

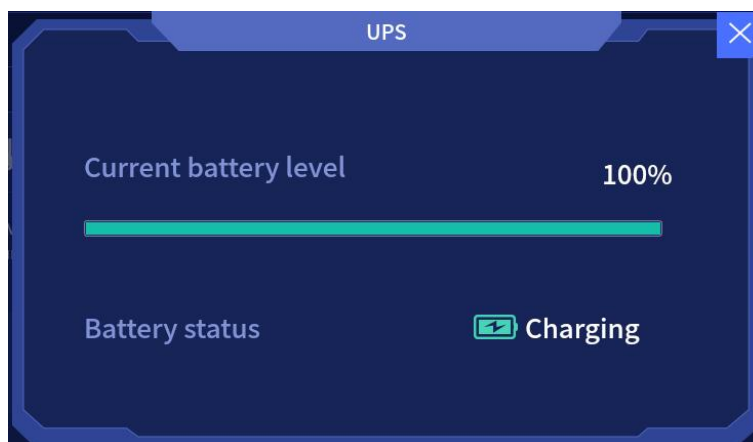


Figure 10.15 UPS information

- Log: Log information can be viewed on this page. The log information can

be filter by date, log, error, warning, and notification.



Figure 10.16 System log

5. Reboot: Select reboot and click OK to reboot the Surgeon Console.

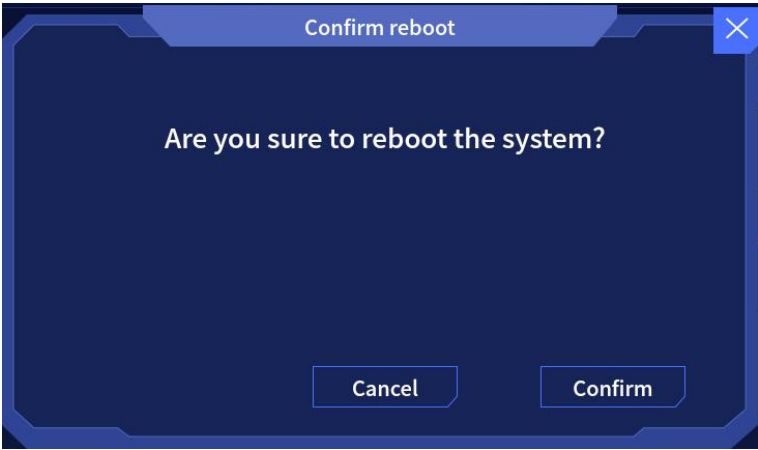


Figure 10.17 Confirm reboot

6. Robotic arm target pose: Click the buttons to select the target poses for the robotic arms. Press and hold the multi-functional button on the Surgeon Console or the execution button on the Surgical Trolley to execute the corresponding coordinated movement.

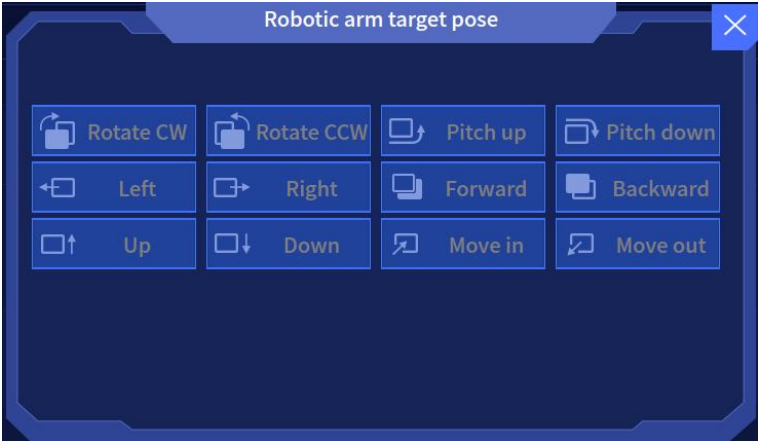


Figure 10.18 Robotic arm target poses

10.2.6 Users

The “users” submenu allows the user to logout and manage user profiles.

The user can update, apply, or rename the current user profiles in the “user profile” page. A total of 10 user profiles are supported.

Select any user profile and click the “update” button. The user can save the current settings of “scaling factor,” “surgical field,” “audio,” “touch screen display,” “lock screen” and ergonomic settings.

Select any user profile, click the “apply” button, the settings of “scaling factor,” “surgical field,” “audio,” “touch screen display,” “lock screen” will restore to the settings recorded in the user profile, and within 10 seconds, if any ergonomic adjustment button is pressed, the Surgeon Console armrest, footswitch panel, 3D viewer will move to the positions recorded in the user profile.

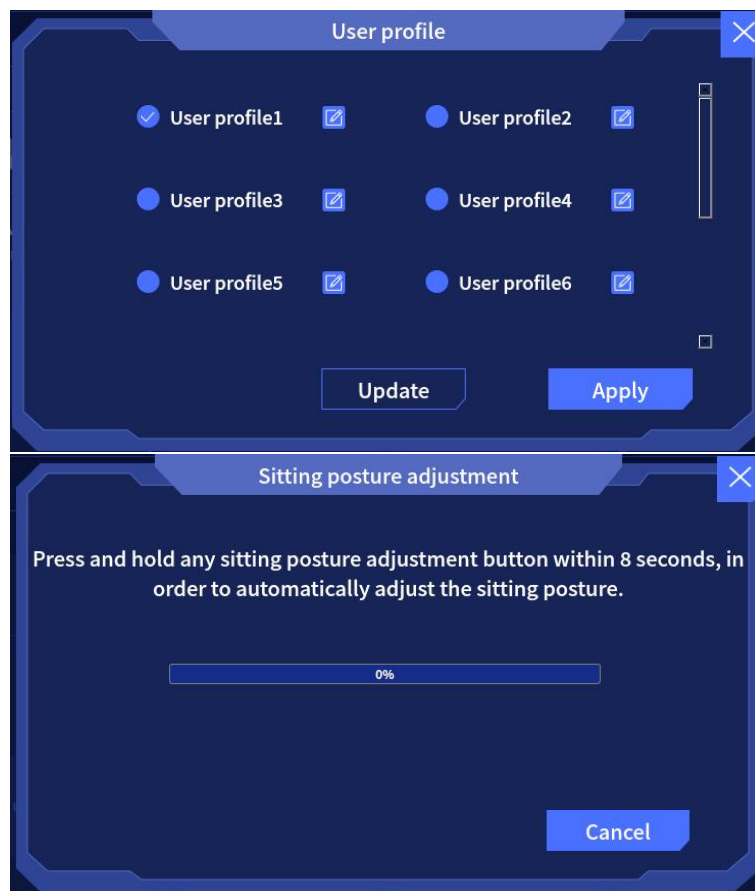


Figure 10.19 User profile configuration

When you choose to log out, you will be prompted to confirm that you need to log out of the account.

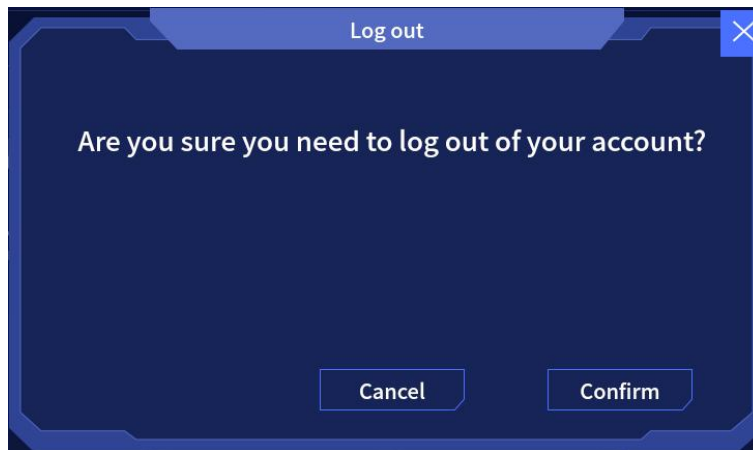


Figure 10.20 Log out

10.3 3D Viewer

The Surgeon Console 3D viewer displays the image of the surgical field and provides extended system information using icons and text messages. The 3D viewer interface of the Surgeon Console is shown in below.

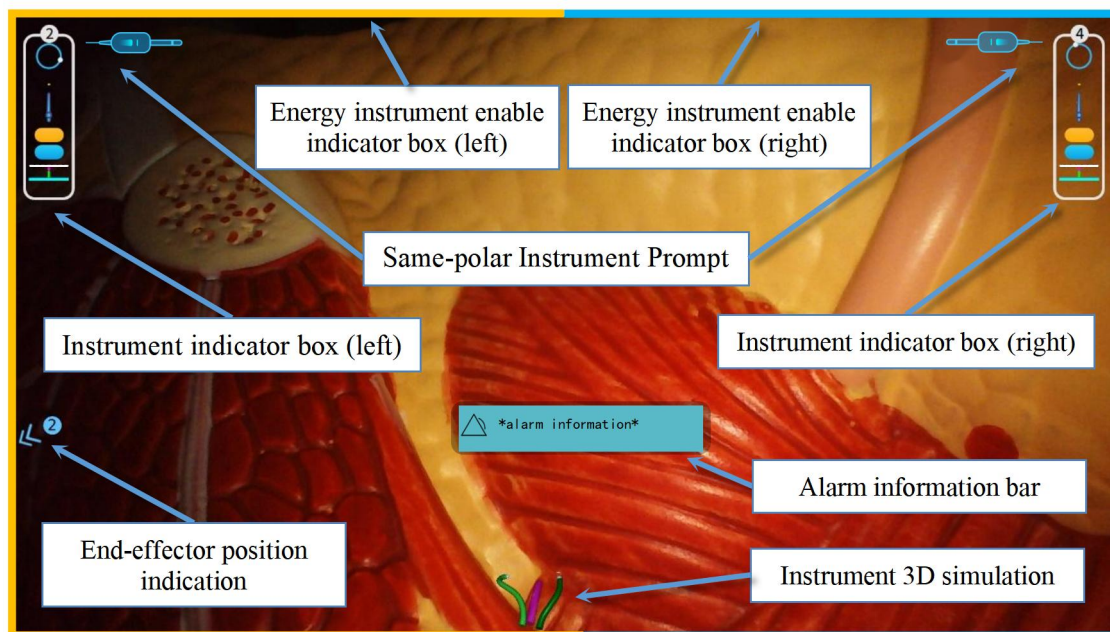


Figure 10.21 Surgeon Console 3D viewer interface

1. Energy instrument enable indicator boxes: The energy instrument enable indicator boxes on the left and right sides of the screen indicate the activation status of the left- and right-hand instrument's energy functions. Each enable indicator box has two activation status of electric cutting and electric coagulation, which are indicated by yellow and blue respectively.
2. Alarm information bar: Displays the alarm information that needs to be read

by the surgeon during the operation.

3. Instrument 3D simulation: Displays the instruments' simulated shape and pose during surgery in real time.
4. End-effector position indication: When any end-effector does not appear in the field of view of 3D endoscope, this icon indicates the directed position of the end-effector.
5. Instrument indicator box: There are two instrument indicator boxes on the upper side of the surgical field of view. The left and right ones correspond to the instruments assigned to the left and right haptic masters, respectively. As shown in Figure 10.22, the instrument indicator box includes:
 - 1) Actuation module number.
 - 2) Indication of the matching status of the surgical instruments: It is green when the matching is established and white when the matching is not established.
 - 3) Instrument rotation angle indication: The white dot on the ring indicates the current circular rotational position of the instrument. The dot moves on the ring as the instrument rotates. As the rotation approaches the limit, a red dot appears to indicate the rotation limit.
 - 4) Indication of grip opening angle: The length of the arc indicates the opening angle of the end-effector of the instrument, and the grip opening angle of the haptic master is indicated by a similar grip icon.
 - 5) High-frequency energy mode supported: The yellow icon indicates that it supports electric cutting, and the blue icon indicates that it supports electric coagulation.
 - 6) Haptic master position simulation: The vertical line indicates the height position of the hand grip, and the blue horizontal line is the middle position of the height stroke.

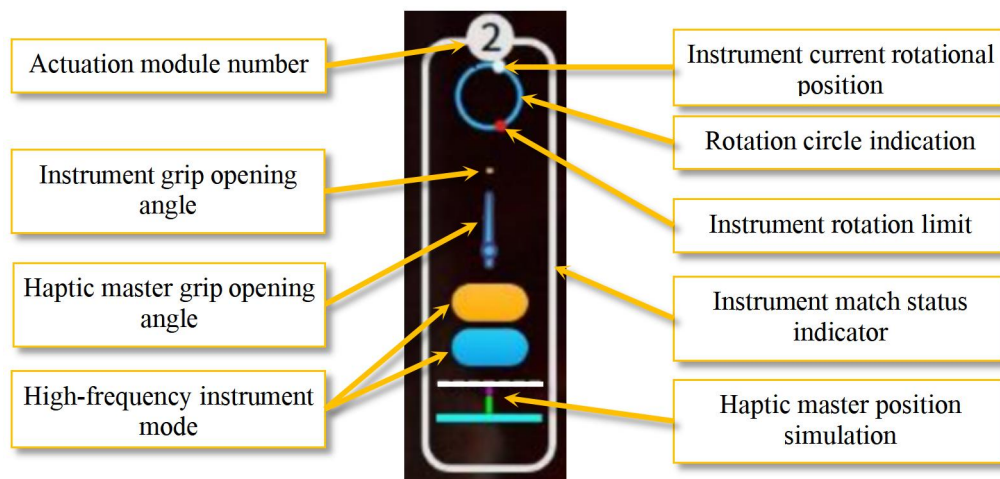


Figure 10.22 Instrument indicator box

7) Same-polar Instrument Prompt: When surgical instruments of the same polarity are installed and advanced into the body, a prompt indicates that the polar mode of the left-hand instrument and right-hand instrument is identical (the illustration in Figure 10.21 shows a prompt for two monopolar surgical instruments being installed simultaneously).

 CAUTION	1) When the turning angle of a certain segment of the instrument approaches the limit, the color of that section of the instrument will change to orange. 2) When the hand grip approaches the height limit, the vertical line will turn orange. At this time, the user should use the clutch to disconnect the matching and adjust the haptic master to a suitable height before continuing operation.
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10.4 Surgical Controls

This chapter introduces how to perform controlling of the surgical instruments and the 3D endoscope, as well as the use of the haptic master and the footswitch pedals.

10.4.1 User Detection

To use the haptic master for teleoperation of the instruments, the surgeon must first place his/her head into the 3D viewer. A pair of infrared sensors on the distal sides of the 3D viewer will detect whether a user is present. If the infrared sensor does not detect a user, the system will not allow the establishment of matching for teleoperation.

 WARNING	1) When the user's head is not within the range of the infrared head sensors of the 3D viewer, the teleoperation control of the surgical instrument or 3D endoscope on the Surgical Trolley will be stopped. 2) Do not intentionally cover the infrared head sensors to suppress this safety function.
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10.4.2 Match the Haptic Master Grip

Before establishing the matching between the haptic master and the surgical instrument, the surgeon must first match the haptic master grip. The matching of haptic master grip is a safety mechanism. Its purpose is not only to prevent the accidental start of the surgical instrument, but also to ensure that the held tissue will not loosen accidentally when the controlling is activated. Generally, the haptic master grip matching needs to meet the following requirements:

1. The opening angle of the haptic master grip changes over a threshold angle.
2. The opening angle of the haptic master grip matches the opening angle of the surgical instrument.
3. The haptic master matches the pose of the surgical instrument.

After completing the matching of the haptic master grip, teleoperation control begins. When the matching is disconnected, please avoid holding the haptic master forcefully so as to let the haptic master motor to actively adjust the pose of the grip, so that its pose is corresponding to the posture of the surgical end-effector.

 HAZARD	1) For the safe implementation of the operation, the surgeon shall not match the haptic master grip without seeing the end-effector in the surgical field of view. Failure to follow this instruction may cause serious injury to the patient. 2) Once the teleoperation control started, the surgeon should always maintain the control of the haptic masters with both hands until its head actively disengages from the 3D viewer, causing the system to stop the surgeon's teleoperation control mode. Otherwise, if the surgeon lets go the haptic masters during on-going teleoperation, the haptic master may move without control and cause serious injury to the patient.
 WARNING	1) To avoid electrical hazards, medical staff should not touch patients when the surgeon controls the haptic master.

 CAUTION	1) For the surgical instruments with a gripper, the action of matching the grip of the haptic master must be completed to start teleoperation.
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10.4.3 Footswitch Pedals

 CAUTION	1) Activating the incorrect pedal may lead to wrong or failure of high-frequency electric energy excitation of the surgical instruments, resulting in tissue damage of patients.
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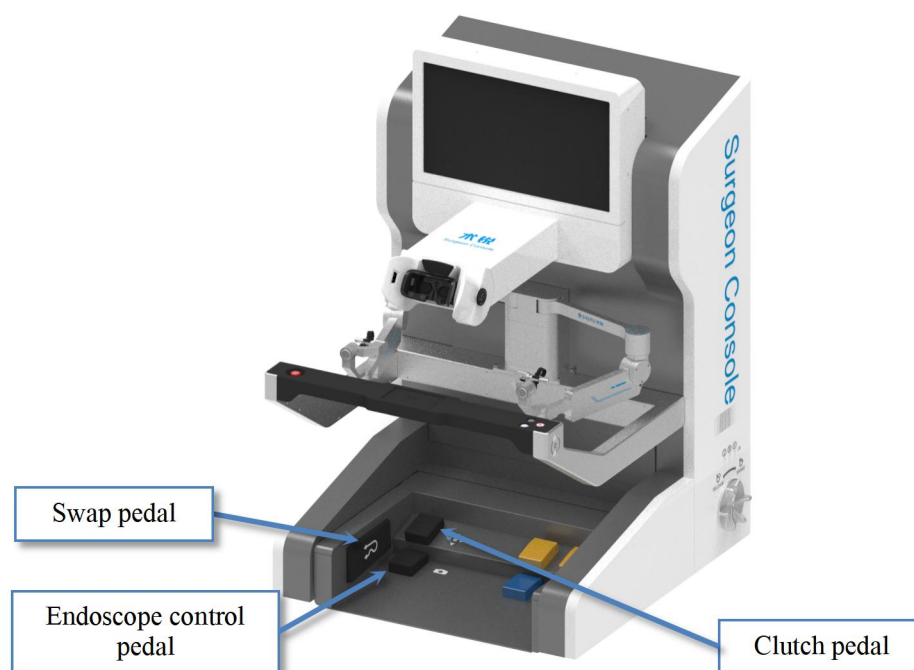


Figure 10.23 Endoscope control pedal, clutch pedal and swap pedal

1. Endoscope control pedal: Press the endoscope control pedal, and the haptic master control mode will switch from controlling the surgical instrument to controlling the 3D endoscope.
2. Clutch pedal: Press the clutch pedal will disconnect the matching state between the haptic master and the surgical instruments, allowing the surgeon to reposition both hands to obtain a more ergonomic operation range when all the surgical instruments remain unchanged. After pressing the clutch pedal, all surgical instruments will remain unchanged until the surgeon releases the pedal to establish the matching between the haptic master and the surgical instruments and restart teleoperation controlling again.

 CAUTION	1) Pressing the endoscope control pedal or clutch pedal can disconnect the surgical instruments from being controlled by the surgeon. After the pedal is released, the control of the surgical instrument can be restored by matching the opening angles of the haptic master grip and the surgical instrument end-effector (the change of the haptic master grip's opening angle over a threshold is no longer required).
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3. Swap pedal: Press the swap pedal to switch the mapping relationship between the haptic master and the actuation module, with two actuation modules assigned. Only one haptic master of the system can have an assignment relationship with two actuation modules simultaneously. Press and hold the swap pedal until an indicator appears, and then the actuation module 1 is swapped between the two haptic masters.

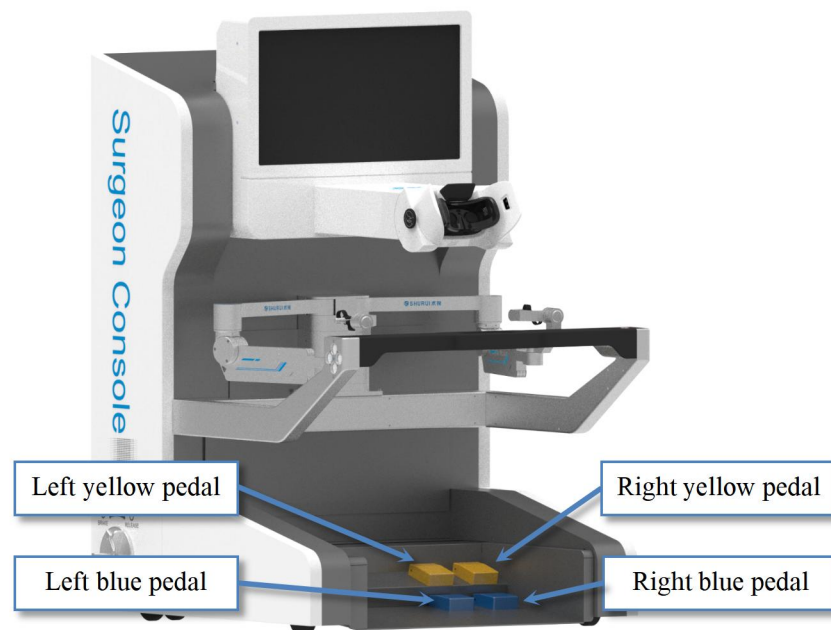


Figure 10.24 Yellow and blue pedals

4. Yellow/blue pedals: The left (right) yellow pedal activate the electric cutting function of the surgical instrument controlled by the left (right) haptic master. The left (right) blue pedal activates the electric coagulation function of the surgical instrument controlled by the left (right) haptic master. There is no energy output after pressing the yellow or blue pedal when it is not in teleoperation.

10.4.4 Controlling of Surgical Instruments and 3D Endoscope

The system can load one 3D endoscope and three surgical instruments simultaneously. Two surgical instruments are teleoperated by the two haptic masters at the same time.

10.4.4.1 Controlling of Surgical Instruments

In order to control the surgical instruments, the matching of the haptic master grip has to be completed. After the grip matching is successful, the matching between the haptic master and the surgical instrument can be established. Each haptic master controls its matched surgical instruments. After the matching is established, the surgical end-effector follows the movement of the haptic master in a set proportional manner, and the orientation of the surgical end-effector remains the same as that of the haptic master grip. For the surgical instruments with a gripper, the gripping (a.k.a. the jaw opening) of the corresponding surgical instruments is controlled by the grip of the haptic master.

The haptic master can be used in conjunction with the pedal to achieve surgical instrument switching, tissue cutting, coagulation, gripping, suturing and other surgical operations.

The risk of collisions during the operation of the surgical instruments should be noted during use; and the main content is as follows:

1. The user shall operate the surgical instrument with the surgical instrument seen in the field of view, preventing collisions between the surgical instruments.
2. The surgical instruments end-effectors shall be maintained within the field of view. When the surgical instruments are approached towards patient tissue, they need to be manipulated cautiously to prevent unintended harm to the patient.
3. When an unintended movement is perceived by the user, the corresponding control button should be released, or the user's head shall be moved away from the 3D viewer to stop the unintended movement immediately.
4. If unintended movement cannot be stopped, the power can be cut off to stop this unintended movement by pressing any of the emergency-stop buttons.

 CAUTION	1) When the surgical instrument is subjected to external force, the applied force will cause the end-effector to move. When external force is released, the surgical instrument will return to its previous state. 2) During the operation process, users should pay attention to the stress
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	situation of the surgical instrument. When accidental contact with another object is made or movement is obstructed, attention should be paid to the displacement of the end-effector. When unexpected movements occur with the surgical instruments, the teleoperation control should be disconnected immediately. 3) When the coordinated adjustment of the robotic arms is stopped, there may be slight vibrations at the end of the robotic arms and the surgical instruments. During both teleoperation and coordinated adjustment of the robotic arms, it is important to ensure that the instrument end-effectors remain within the surgical field.
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10.4.4.2 Controlling of 3D Endoscope

Press and hold the endoscope control pedal, and the haptic master control mode will switch from controlling the surgical instrument to controlling the 3D endoscope. In the 3D endoscope control mode, the movement of the two haptic masters realizes the adjustment of the surgical field of view. The adjustment of the surgical field of view by the two haptic masters can be imagined as holding the surgical field picture with both hands, and the movement of both hands up, down, left, right, further and closer together can make the surgical field picture move in the same direction. The left and right hands move up and down, and rotate clockwise and counterclockwise like steering a wheel; the surgical field image can rotate in the same way. Release the endoscope control pedal to end the controlling of the 3D endoscope.

The user can adjust the surgical field image by controlling the 3D endoscope, so that the surgical instrument (including the end-effector and the entire stem) is under observation and unintended collisions or tissue contact can be avoided.

 CAUTION	1) When the surgical field of view of the 3D endoscope cannot cover the entirety of the surgical instrument, including the end effector and the stem, users should refer to the 3D simulation of the surgical instruments and whether the instruments produce unexpected motions, to watch for possible collision or contact with the tissues or between the instruments that are not within the surgical field of view. If necessary, observation can be made by adjusting the endoscope.
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Chapter 11 Shut Down and Stow the System

11.1 Remove the Surgical Trolley

1. Remove all surgical instruments from the Surgical Trolley.
2. Remove the 3D endoscope from the Surgical Trolley.
3. Open the latches of all sheath connectors to separate the trocar from the linear modules.
4. Raise the beam of the Surgical Trolley appropriately according to the actual needs.
5. Release the stabilization feet and drive the Surgical Trolley away from the operating table.

 CAUTION	1) Before driving the Surgical Trolley, check the parking state, and be sure to release the stabilization feet. 2) When moving the Surgical Trolley, pay attention to the cables, avoiding rolling over or dragging the cables.
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11.2 Remove the Drapes

1. According to the prompt on the status touchscreen, adjust the robotic arm posture to make enough space to remove the sterile drapes.
2. Remove the sterile drapes. Uninstall the sheath connectors on the sterile drapes used for the robotic arms; reuse the sheath connectors after cleaning and sterilization.
3. Dispose of all used drape components according to the medical waste disposal principle.

11.3 Stowing and Shutdown

After the operation is complete, follow the below steps to complete the stowing and shutdown:

1. According to the prompt on the status touchscreen, adjust the robotic arm posture to the stowed pose; drive actuation module to the stowed pose as well.
2. Adjust the height of the Surgical Trolley to a suitable position, and drive the Surgical Trolley to the storage position. For the Surgical Trolley, after

removing the system connecting cable, install the wheel drive enabling block.



Figure 11.1 Installation of Surgical Trolley wheel drive enabling block

3. Shut down the Surgical Trolley: Press and hold the power button for about 5 seconds until a prompt appears. After the prompt appears, release the button and then press and hold the power button for more than 2 seconds within 3 seconds to shut down the Surgical Trolley.
4. Shut down the Surgeon Console: Press and hold the power button for about 5 seconds until a prompt appears. Within 3 seconds after the prompt appears, release the button and press it again to shut down the Surgeon Console.

11.4 Cleaning

Wipe and clean the external surface of the Surgical Trolley and the Surgeon Console according to local applicable regulations and guidelines.

11.5 Storage Conditions

The storage conditions of the Surgeon Console, the Surgical Trolley, 3D endoscope, surgical instruments, and energy instrument cords are as follows:

1. Temperature: $-10 - 50^{\circ}\text{C}$
2. Relative humidity: 20% – 95%
3. Atmospheric pressure: 651 hPa – 1060 hPa
4. No corrosive gas is allowed in the environment where the Surgeon Console and the Surgical Trolley are located.
5. The Surgeon Console and the Surgical Trolley should be placed on a flat ground with a slope of no more than 10° .

Chapter 12 System Maintenance and Troubleshooting

The maintenance of the system can be mainly divided into the following parts: reprocessing of the surgical instruments, 3D endoscope and accessories and other parts; cleaning of the Surgical Trolley, the Surgeon Console and their connecting cables; system preventive maintenance and troubleshooting.

For reprocessing instructions of the surgical instruments, 3D endoscope, accessories and other parts, please refer to Instrument Reprocessing Instructions, 3D Endoscope Reprocessing Instructions, and Accessories Reprocessing Instructions.

For the accessories with a sterile packaging, check the package to be intact before use and do not use the accessories with broken package.

12.1 Cleaning of the Surgeon Console and the Surgical Trolley

The Surgeon Console and the Surgical Trolley need to be cleaned regularly.

The Surgeon Console is relatively simple to clean. The robotic arms of the Surgical Trolley have complex poses. Hence, its regular cleaning requires extra care. In order to facilitate the user to clean the Surgical Trolley surface, the system is designed with a “cleaning pose.” As shown in Figure 12.1 the target pose of robotic arm “cleaning pose” is displayed. In the “cleaning pose,” all robotic arms are in the unfolded state.

If the Surgical Trolley is not in the “cleaning pose,” press the backward or forward switch button to switch the robotic arm target pose; the “cleaning pose” is after the “shipping pose” and before the “stowed pose.” Select the “cleaning pose” and press and hold the execution button, the robotic arms will move to the “cleaning pose” target pose for the cleaning of the Surgical Trolley robotic arms. The medical staff can gently wipe the surface of each robotic arm and the rotary module with a damp towel to clean the Surgical Trolley. The clean frequency is determined according to local applicable regulations and guidelines.

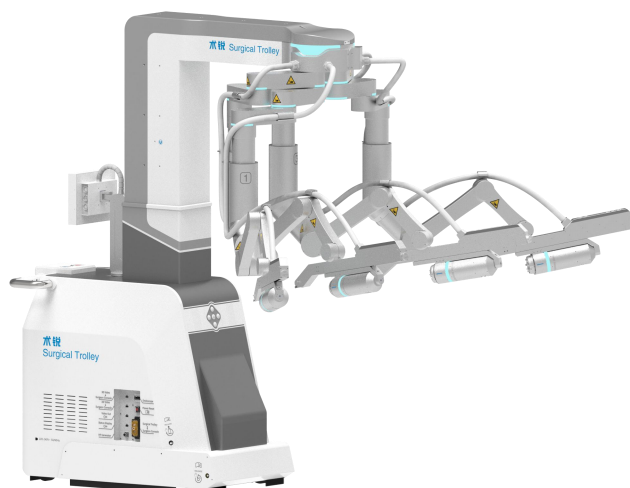


Figure 12.1 Surgical Trolley “cleaning pose” target posture

 WARNING	1) The Surgeon Console and the Surgical Trolley are not designed to be waterproof. Measures should be taken to prevent the entry of cleaning agents or liquids into their interiors. In case of excessive detergent exposure, stop using this product immediately and contact Surgerii Robotics for help as soon as possible to avoid damage to equipment or electric shock injury.
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12.2 Preventive Maintenance

This product needs regular preventive maintenance by professional maintenance personnel of Surgerii Robotics at least once a year. Maintenance inspection shall be performed on the various components of the product to ensure safe and effective operation of the system.

The foot switch of the Surgeon Console shall be replaced every two years, and the uninterruptible power supply of the Surgical Trolley and the Surgeon Console shall be replaced every three years. The replacement shall be completed by the authorized personnel from Surgerii Robotics.

 CAUTION	1) Check the grounding condition of the product at least once a year to ensure safe and effective use. 2) Strictly adhere to the operational guidelines outlined in the User Manual and Technical Description. The system should be operated by trained personnel only, and unauthorized individuals should be prohibited from using it to prevent possible damage. 3) At least once a year, check or replace the Surgical Trolley robotic arms' joint
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	timing belt, electromagnetic brake, etc. 4) The UPS shall be inspected at least once a year to confirm its availability. 5) During normal use, if a malfunction prompt occurs, please contact Surgerii Robotics in a timely manner for professional technical services.
 WARNING	1) This product must be maintained periodically. If it is not maintained regularly, the performance of the worn parts may decline, and even cause injury during the operation. 2) Faulty parts must be replaced with original spare parts.
 PROHIBITION	1) Users are strictly forbidden to dismantle this product for maintenance without authorization. 2) Do not violate the use requirements of this User Manual.

12.3 Alarms

This system has a distributed alarm system. During its operation, should any faults occur, the system will alert users through both visual and auditory means.

If an alarm is related to both the Surgical Trolley and the Surgeon Console, it will also be transmitted to the Surgeon Console when the alarm is sourced from the Surgical Trolley. The Surgical Trolley will display the alarm information in the system information bar, show corresponding visual alarm signals with the alarm light, and play the corresponding alarm sound through the speaker. Meanwhile, the Surgeon Console will display the alarm information in the system information bar and play the corresponding alarm sound via its speaker as well.

If the Surgeon Console is the source of the alarm, it will transmit the alarm information to the Surgical Trolley, and the alarm methods will be identical to those described above.

The Surgical Trolley and the Surgeon Console will each trigger their own alarm to alert the user when the alarm is not related the both the Surgical Trolley and the Surgeon Console.

The system performs a self-test on the alarm system during the power-on process: the alarm light first flashes yellow, then red, followed by two start-up prompt tones. It is also possible to trigger an alarm during use to check whether the alarm system is functioning properly (for example, by pressing the emergency-stop button).

If you encounter technical problems, faults, etc., please contact Surgerii Robotics for technical support.

 WARNING	1) If the user does not hear the startup sound and the alarm light flashes during system startup, please contact Surgerii Robotics for technical support.
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12.3.1 Alarm Information

The “system information bar” displays current alarm information along with corresponding alarm icons. Alarm messages are categorized into high, medium, and low priority levels, each represented by different colors. Red indicates high priority, yellow indicates medium priority, and cyan-green indicates low priority.

All alarms are technical alarms. Between the Surgical Trolley and the Surgeon Console, the delay from the generation of the alarm signals of the Surgical Trolley to the generation of the alarm signals of the Surgeon Console (or vice versa) is not more than 0.5 seconds.

When connection lost between the Surgeon Console and the Surgical Trolley occurs, the alarm should appear within 10 seconds, while, other alarm should appear within 5 seconds after the occurrence of the alarm event.



Figure 12.2 System information bar

The meanings of the alarm icons, the alarm priority and the Sound OFF icons are described in the table below.

Table 12.1 Alarm icon description

Icon	Description
	“Alarm icon” When alarm information appears, this icon is displayed in the system information bar
	“Alarm OFF” When the alarm is closed, this icon is displayed in the system information bar
	“Sound OFF” When “Sound OFF” is activated, this icon is displayed in the system information bar

Table 12.2 Alarm priority description

Alarm priority	Alarm type	Alarm message color
Low priority	System prompt	Cyan
Medium priority	System warning	Yellow
High priority	Critical failure	Red

Click “system information bar” to display the current alarm information list. When there are multiple alarms with different priority levels in the “system information bar,” the alarm system displays visual alarm signals and plays alarm tones according to those with the highest priority level in the list; When there are multiple alarms with the same highest priority level in the “system information bar”, the alarm system will alternately display the alarm information with the highest alarm priority. The number in the upper right corner represents the total number of alarm messages. Click the number to expand the alarm message list and view each alarm message.

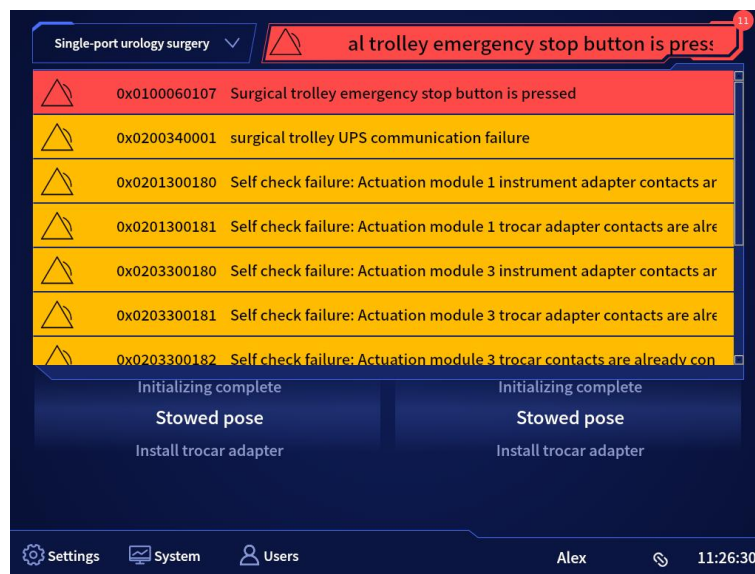


Figure 12.3 Alarm list

Click any alarm message in the list to pop up the alarm detail message box.

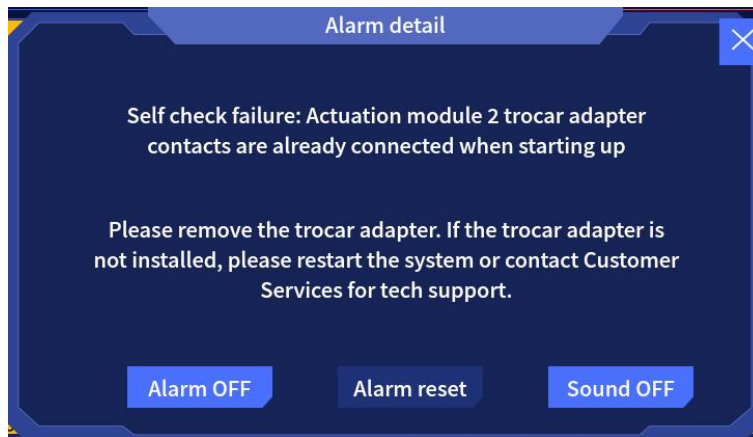


Figure 12.4 Alarm detail message box

Click the “Alarm OFF” button to close the current alarm information. Click the “Alarm reset” button, the alarm information is to be cleared if the alarm event ceases. The alarm will repeat if the alarm event continues to occur. Click the “Sound OFF” button to close the alarm sound of the current alarm information. At this time, the “Sound OFF” icon is updated to “Sound ON”. Click the “Sound ON” button to restore the Alarm prompt tone.

After clicking “Alarm OFF” and “Sound OFF”, you can view the corresponding prompt signal in the “system information bar.”

		0x0201300181	Self check failure: Actuation module 1 trocar adapter contacts are alre
		0x0203300180	Self check failure: Actuation module 3 instrument adapter contacts ar
		0x0203300181	Self check failure: Actuation module 3 trocar adapter contacts are alre
		0x0203300182	Self check failure: Actuation module 3 trocar contacts are already con

Figure 12.5 Alarm OFF and Sound OFF signals

The alarm status list is shown in the following table and the fields containing “%” display actual alarm content. “%” combined with adjacent text represents different meanings, varying with different situations. For example, in “Actuation module %1 motor communication failure,” “%1” is a variable field that might be displayed as “Actuation module 2 motor communication failure” in actual conditions. The specific meanings of each variable field are detailed in the following table.

Table 12.3 Alarm status list

ID	Alarm type	Description	Message	Advice
GD10-INFO-0001	System Warning	self-test failure: actuation module %1 multi-functional button contact	self-test failure: actuation module %1 multi-functional button adhesion	Please confirm the button is not pressed. If the error reappear, please restart the system or contact Customer Services for tech support.

ID	Alarm type	Description	Message	Advice
		adhesion (button release abnormal)		
GD10-INFO-0002	Critical Failure	%1 Actuation module internal can communication failure	%1 Actuation module internal can communication failure	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0003	System Warning	Self-test failure: actuation module %1 DMG signal adhesion	Self-test failure: actuation module %1 DMG signal adhesion	Please confirm the button is not pressed. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0004	Critical Failure	Actuation module %1 non-feed shaft motion sensor abnormal	Actuation module %1 non-feed shaft motion sensor abnormal	Please follow the instruction to remove the instrument and contact Customer Services for tech support.
GD10-INFO-0005	Critical Failure	%1 Actuation module 1%d axis position sensor and EPOS encoder deviation	%1 Actuation module 1%d axis position sensor and EPOS encoder deviation	Please follow the instruction to remove the instrument and contact Customer Services for tech support.
GD10-INFO-0006	Critical Failure	%1 Actuation module 1%d axis movement overrange	%1 Actuation module 1%d axis movement out of range	Please follow the exit procedure to exit the surgical instrument and contact after-sales support.
GD10-INFO-0007	Critical Failure	Actuation module %1 shaft 1%d motor sensor data mismatch	%1 Actuation module 1%d axis motor movement excessive deviation	Please follow the exit procedure to exit the surgical instrument and contact after-sales support.
GD10-INFO-0008	Critical Failure	Actuation module %1 feed shaft position sensor abnormal	Actuation module %1 feed shaft motion sensor abnormal	Please follow the instruction to remove the instrument and contact Customer Services for tech support.
GD10-INFO-0009	Critical Failure	Actuation module %1 feed shaft position sensor and EPOS encoder deviation	Actuation module %1 feed shaft motion sensor abnormal	Please follow the instruction to remove the instrument and contact Customer Services for tech support.
GD10-INFO-0010	Critical Failure	Actuation module %1 feed shaft motion overrange	Actuation module %1 feed shaft motor motion abnormal	Please follow the instruction to remove the instrument and contact Customer Services for tech support.
GD10-INFO-0011	Critical Failure	Actuation module %1 feed shaft motor sensor data mismatch	Actuation module %1 feed shaft motor motion abnormal	Please follow the instruction to remove the instrument and contact Customer Services for tech support.
GD10-INFO-0012	Critical Failure	%1 Actuation module 1%d axis EPOS error 2%D	%1 Actuation module 1%d axis EPOS error	Please follow the exit procedure to exit the surgical instrument and contact after-sales support.
GD10-INFO-0013	Critical Failure	Actuation module %1 monitoring program error	Actuation module program error	Please contact Customer Services for tech support.
GD10-INFO-0100	Critical Failure	Self-test failure: surgical trolley	Self-test failure: surgical trolley	Please release the button and repeat the self-test. If the error

ID	Alarm type	Description	Message	Advice
		power button sticking	power button sticking	reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0101	System Warning	Self-test failure: Startup status abnormal	Self-test failure: surgical trolley power status failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0102	Critical Failure	Self-test failure: shutdown relay failure	Self-test failure: surgical trolley power failure	Please power off the system, and contact Customer Services for tech support.
GD10-INFO-0103	System Prompt	Emergency stop circuit self-test. Do not operate.	Emergency stop circuit self-test. Do not operate.	
GD10-INFO-0105	Critical Failure	self-test failure: trolley safety relay failure	self-test failure: surgical trolley power supply failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0106	System Warning	self-test failure: trolley caster power supply failure	self-test failure: surgical trolley chassis drive failure	Please switch to the manual mode.
GD10-INFO-0107	Critical Failure	self-test failure: Surgeon console or Surgical trolley emergency stop circuit failure	self-test failure: emergency stop circuit failure	Please confirm the Emergency stop is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0108	System Warning	Surgical trolley external power supply disconnected	Surgical trolley external power supply disconnected	Please check the surgical trolley power cable connection.
GD10-INFO-0109	System Warning	Surgical trolley chassis power supply failure: power on when output forbidden	Surgical trolley chassis drive failure	Please switch to the manual mode.
GD10-INFO-0110	System Warning	Surgical trolley chassis power supply failure: power off when output allowed	Surgical trolley chassis drive failure	Please switch to the manual mode.
GD10-INFO-0111	Critical Failure	Surgical trolley safety relay output abnormal: falsely pulled in	Surgical trolley power supply failure	Entering the surgery terminating process.
GD10-INFO-0112	System Warning	Surgical trolley safety relay output abnormal: falsely disconnected	Surgical trolley power supply failure	Entering the manual withdraw process.
GD10-INFO-0113	Critical Failure	Surgeon console emergency stop button is pressed	Surgeon console emergency stop button is pressed	Please confirm the continuous operation without risks, before reset the Emergency stop.
GD10-INFO-0114	Critical Failure	Surgical trolley emergency stop button is pressed	Surgical trolley emergency stop button is pressed	
GD10-INFO	System	The overheated	The overheated	

ID	Alarm type	Description	Message	Advice
-0115	Warning	protection of the surgical trolley column has been activated.	protection of the surgical trolley column has been activated.	
GD10-INFO-0116	System Warning	Surgical trolley column failure: power on when output forbidden	Surgical trolley column failure	Please power off the system, and contact Customer Services for tech support. If continuous use is needed, please do not operate the column to prevent the risk.
GD10-INFO-0117	System Warning	Surgical trolley column failure: power off when output allowed	Surgical trolley column failure	
GD10-INFO-0118	System Warning	Surgical trolley brace failure: power on when output forbidden	Surgical trolley brace failure	
GD10-INFO-0119	System Warning	Surgical trolley brace failure: power off when output allowed	Surgical trolley brace failure	
GD10-INFO-0120	System Prompt	Surgical trolley column: reaching the upper limit	Surgical trolley column: reaching the upper limit	
GD10-INFO-0121	System Prompt	Surgical trolley column: reaching the lower limit	Surgical trolley column: reaching the lower limit	
GD10-INFO-0123	Critical Failure	Surgical trolley safety monitoring board program error	Surgical trolley safety monitoring board program error	Please contact Customer Services for tech support.
GD10-INFO-0200	System Warning	self-test failure: execution button sticking	self-test failure: execution button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0201	System Warning	self-test failure: previous status button sticking	self-test failure: previous status button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0202	System Warning	self-test failure: next status button sticking	self-test failure: next status button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0203	System Prompt	The double contacts of the Execution button are not actuated at the same time, please fully press the button.	The double contacts of the Execution button are not actuated at the same time, please fully press the button.	
GD10-INFO	System	The double	The double contacts	

ID	Alarm type	Description	Message	Advice
-0204	Prompt	contacts of the previous status button are not actuated at the same time, please fully press the button.	of the previous status button are not actuated at the same time, please fully press the button.	
GD10-INFO-0205	System Prompt	The double contacts of the next status button are not actuated at the same time, please fully press the button.	The double contacts of the next status button are not actuated at the same time, please fully press the button.	
GD10-INFO-0206	System Warning	self-test failure: Actuation module %1 S_STOP signal failure.	self-test failure: actuation module %1 power supply failure	Please restart the system or contact Customer Services for tech support.
GD10-INFO-0207	System Warning	self-test failure: Actuation module %1 DMG signal failure.	self-test failure: actuation module %1 power supply failure	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0208	System Warning	self-test failure: actuation module %1 power supply failure	self-test failure: actuation module %1 power supply failure	Please restart the system or contact Customer Services for tech support.
GD10-INFO-0209	System Warning	self-test failure: actuation module %1 forward button sticking	self-test failure: actuation module %1 forward button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0210	System Warning	self-test failure: actuation module %1 backward button sticking	self-test failure: actuation module %1 backward button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0211	System Warning	self-test failed: %1 robotic arm reverse motion button stuck	self-test failed: %1 robotic arm reverse motion button stuck	Please confirm that no button has been activated and try to re-self-check. If it fails, please restart the system or contact after-sales support.
GD10-INFO-0212	System Warning	self-test failure: robotic arm %1 status switch button sticking	self-test failure: robotic arm %1 status switch button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0213	System Warning	self-test failed: %1 robotic arm forward motion button stuck	self-test failed: %1 robotic arm forward motion button stuck	Please confirm that no button has been activated and try to re-self-check. If it fails, please restart the system or contact after-sales support.
GD10-INFO	System	self-test failure:	self-test failure:	Please restart the system or

ID	Alarm type	Description	Message	Advice
-0214	Warning	Robotic arm %1 RCM joint power supply feedback failure	robotic arm %1 power supply failure	contact Customer Services for tech support.
GD10-INFO-0215	System Warning	self-test failure: Robotic arm %1 joint 1 to 4 power supply feedback failure	self-test failure: robotic arm %1 power supply failure	Please restart the system or contact Customer Services for tech support.
GD10-INFO-0216	System Prompt	The double contacts of the actuation module %1 forward button are not actuated at the same time, please fully press the button.	The double contacts of the actuation module %1 forward button are not actuated at the same time, please fully press the button.	
GD10-INFO-0217	System Prompt	The double contacts of the actuation module %1 backward button are not actuated at the same time, please fully press the button.	The double contacts of the actuation module %1 backward button are not actuated at the same time, please fully press the button.	
GD10-INFO-0218	Critical Failure	Actuation module %1 power supply exists while condition mismatched	Actuation module %1 power supply failure	Please follow the instruction to remove the instrument and contact Customer Services for tech support.
GD10-INFO-0219	Critical Failure	Actuation module %1 power supply inexists while condition matched	Actuation module %1 power supply failure	Please reset the Alarm and retry.
GD10-INFO-0220	System Prompt	System detected %1 robotic arm reverse motion button dual contacts not triggered simultaneously, please use fingertip to press vertically	System detected %1 robotic arm reverse motion button dual contacts not simultaneously triggered, please press with fingertip vertically	
GD10-INFO-0221	System Prompt	The double contacts of the robotic arm %1 status switch button are not actuated at the same time, please fully press the button.	The double contacts of the robotic arm %1 status switch button are not actuated at the same time, please fully press the button.	
GD10-INFO-0222	System Prompt	System detected %1 robotic arm forward motion button dual	System detected %1 robotic arm forward motion button dual contacts not	

ID	Alarm type	Description	Message	Advice
		contacts not triggered simultaneously, please use fingertip to press vertically	simultaneously triggered, please press with fingertip vertically	
GD10-INFO-0223	System Warning	Robotic arm %1 RCM joint power supply exists while condition mismatched	Robotic arm %1 power supply failure	Entering the manual withdraw process.
GD10-INFO-0224	System Warning	Robotic arm %1 RCM joint power supply inexists while condition matched	Robotic arm %1 power supply failure	Please contact Customer Services for tech support, after withdrawing the instruments.
GD10-INFO-0225	System Warning	Robotic arm %1 joint 1 to 4 power supply exists while condition mismatched	Robotic arm %1 power supply failure	Entering the manual withdraw process.
GD10-INFO-0226	System Warning	Robotic arm %1 joint 1 to 4 power supply inexists while condition matched	Robotic arm %1 power supply failure	Please contact Customer Services for tech support, after withdrawing the instruments.
GD10-INFO-0227	System Warning	Robotic arm %1 releasing brake holding signal timeout	Robotic arm %1 releasing brake holding signal timeout	Please reset the Alarm and retry.
GD10-INFO-0228	System Warning	Actuation module %1 power supply holding signal timeout	Actuation module %1 power supply holding signal timeout	Please reset the Alarm and retry.
GD10-INFO-0229	System Warning	Robotic arm execution button sticking	Robotic arm execution button sticking	Please confirm the button is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0230	System Warning	Robotic arm previous status button sticking	Robotic arm previous status button sticking	Please confirm the button is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0231	System Warning	Robotic arm next status button sticking	Robotic arm next status button sticking	Please confirm the button is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0232	System Warning	Actuation module %1 forward button sticking	Actuation module %1 forward button sticking	Please confirm the button is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO	System	Actuation	Actuation	Please confirm the button is

ID	Alarm type	Description	Message	Advice
-0233	Warning	module %1 backward button sticking	module %1 backward button sticking	not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0234	System Warning	%1 Robotic arm reverse motion button stuck	%1 Robotic arm reverse motion button stuck	Please confirm that no button has been activated and try to reset the alarm. If the fault persists, please restart the system or contact after-sales support.
GD10-INFO-0235	System Warning	Robotic arm %1 status switch button sticking	Robotic arm %1 status switch button sticking	Please confirm the button is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0236	System Warning	%1 Robotic arm forward motion button stuck	%1 Robotic arm forward motion button stuck	Please confirm that no button has been activated and try to reset the alarm. If the fault persists, please restart the system or contact after-sales support.
GD10-INFO-0237	System Warning	Actuation module %1 forward button activated for long duration	Actuation module %1 forward button activated for long duration	Please confirm the button is not pressed.
GD10-INFO-0238	Critical Failure	Column safety monitoring board program error	surgical trolley module program error	Please contact Customer Services for tech support.
GD10-INFO-0239	System Warning	Actuation module %1 backward button activated for long duration	Actuation module %1 backward button activated for long duration	Please confirm the button is not pressed.
GD10-INFO-0240	System Warning	self-test failed: %1 robotic arm button enable signal stuck	self-test failed: %1 robotic arm button enable signal stuck	Please confirm that no button has been activated and try to re-self-check. If it fails, please restart the system or contact after-sales support.
GD10-INFO-0241	System Warning	System detected %1 robotic arm button enable signal not triggered simultaneously, please use fingertip to press vertically	System detected %1 robotic arm button enable signal not simultaneously triggered, please press with fingertip vertically	
GD10-INFO-0242	System Warning	Robotic arm button enable signal stuck	Robotic arm button enable signal stuck	Please confirm that no button has been activated and try to reset the alarm. If the fault persists, please restart the system or contact after-sales support.
GD10-INFO-0300	System Warning	self-test failure: surgeon console power button sticking	self-test failure: surgeon console power button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for

ID	Alarm type	Description	Message	Advice
				tech support.
GD10-INFO-0301	System Warning	self-test failure: Startup status abnormal	self-test failure: surgeon console power status failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0302	System Warning	self-test failure: shutdown relay failure	self-test failure: surgeon console power failure	Please power off the system, and contact Customer Services for tech support.
GD10-INFO-0303	System Warning	self-test failure: Infrared head sensor activated	self-test failure: Infrared head sensor activated	Please move your head out of the 3D viewer. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0304	System Warning	self-test failure: multi-functional button sticking	self-test failure: multi-functional button sticking	Please confirm the button is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0305	System Warning	self-test failure: Operation pedal enablement closed	self-test failure: operation pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0306	System Warning	self-test failure: endoscope control pedal failure	self-test failure: endoscope control pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0307	System Warning	self-test failure: clutch pedal failure	self-test failure: clutch pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0308	System Warning	self-test failure: swap pedal failure	self-test failure: swap pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0309	System Warning	self-test failure: High-frequency pedal enablement closed	self-test failure: High-frequency pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0310	System Warning	self-test failure: Left CUT pedal failure	self-test failure: Left CUT pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0311	System Warning	self-test failure: Left COAG pedal failure	self-test failure: Left COAG pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear,

ID	Alarm type	Description	Message	Advice
				please restart the system or contact Customer Services for tech support.
GD10-INFO-0312	System Warning	self-test failure: Right CUT pedal failure	self-test failure: Right CUT pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0313	System Warning	self-test failure: Right COAG pedal failure	self-test failure: Right COAG pedal failure	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0314	System Warning	self-test failure: energy module output enable abnormally activated	self-test failure: energy generator module failure	Please power off the system, and contact Customer Services for tech support.
GD10-INFO-0315	System Warning	self-test failed: main bipolar coagulation output feedback abnormal activation	self-test failed: high frequency generator module fault	Please shut down the system and contact after-sales support.
GD10-INFO-0316	System Warning	self-test failure: Monopolar cutting output feedback abnormally activated	self-test failure: energy generator module failure	Please power off the system, and contact Customer Services for tech support.
GD10-INFO-0317	System Warning	self-test failure: Monopolar coagulation output feedback abnormally activated	self-test failure: energy generator module failure	Please power off the system, and contact Customer Services for tech support.
GD10-INFO-0318	System Warning	surgeon console external power supply disconnected	surgeon console external power supply disconnected	Please check the surgeon console power cable connection.
GD10-INFO-0319	System Warning	surgeon console power failure	surgeon console power failure	Please power off the system by EPR, and and contact Customer Services for tech support.
GD10-INFO-0320	System Prompt	The double contacts of the surgeon console multi-functional button are not actuated at the same time, please fully press the button.	The double contacts of the surgeon console multi-functional button are not actuated at the same time, please fully press the button.	
GD10-INFO-0321	System Prompt	The double contacts of Infrared head sensor are not actuated at the same time.	The double contacts of Infrared head sensor are not actuated at the same time.	

ID	Alarm type	Description	Message	Advice
GD10-INFO-0322	System Prompt	The double contacts of operation pedal are not actuated at the same time.	Please fully release the pedal	
GD10-INFO-0323	System Prompt	The double contacts of endoscope control pedal are not actuated at the same time. Please use the front foot to activate the pedal.	Please fully release the pedal	
GD10-INFO-0324	System Prompt	The double contacts of clutch pedal are not actuated at the same time. Please use the front foot to activate the pedal.	Please fully release the pedal	
GD10-INFO-0325	System Prompt	The double contacts of swap pedal are not actuated at the same time. Please use the front foot to activate the pedal.	Please fully release the pedal	
GD10-INFO-0326	System Prompt	The double contacts of High-frequency pedal are not actuated at the same time. Please use the front foot to activate the pedal.	Please fully release the pedal	
GD10-INFO-0327	System Prompt	The double contacts of left CUT pedal are not actuated at the same time. Please use the front foot to activate the pedal.	Please fully release the pedal	
GD10-INFO-0328	System Prompt	The double contacts of left COAG pedal are not actuated at the same time. Please use the front foot to activate the pedal.	Please fully release the pedal	
GD10-INFO-0329	System Prompt	The double contacts of right CUT pedal are not actuated at the same time. Please use the front foot to activate the pedal.	Please fully release the pedal	
GD10-INFO-0330	System Prompt	The double contacts of right	Please fully release the pedal	

ID	Alarm type	Description	Message	Advice
		COAG pedal are not actuated at the same time. Please use the front foot to activate the pedal.		
GD10-INFO-0331	System Warning	Main bipolar coagulation output error, no feedback signal when outputting	High frequency generator output fault	Discharge operation has been prohibited, please contact after-sales support after the surgery is terminated.
GD10-INFO-0332	System Warning	Main bipolar coagulation output error, feedback signal when not outputting	High frequency generator output fault	Discharge operation has been prohibited, please contact after-sales support after the surgery is terminated.
GD10-INFO-0333	System Warning	Monopolar cutting output error. No feedback signal during output	Energy generator output failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0334	System Warning	Monopolar cutting output error. Feedback signal exists when not output	Energy generator output failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0335	System Warning	Monopolar coagulation output error. No feedback signal during output	Energy generator output failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0336	System Warning	Monopolar coagulation output error. Feedback signal exists when not output	Energy generator output failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0337	System Prompt	More than one pedal are pressed	More than one pedal are pressed	Please release the pedal.
GD10-INFO-0339	System Warning	haptic master matching hold signal timeout	haptic master matching hold signal timeout	Please retry. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0340	System Warning	Multi-functional button sticking	Multi-functional button sticking	Please confirm the button is not pressed and reset the Alarm. If the error reappear, please manually withdraw the instruments and restart the system or contact Customer Services for tech support.
GD10-INFO-0341	System Warning	Infrared head sensor sticking	Infrared head sensor sticking	Please confirm the Infrared head sensor is not activated and reset the Alarm. If the error reappear, please manually withdraw the instruments and restart the system or contact Customer Services for tech support.
GD10-INFO-0342	System Warning	Operation pedal sticking	Operation pedal sticking	Please confirm the pedal is not pressed and reset the

ID	Alarm type	Description	Message	Advice
				Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0343	System Warning	Endoscope control pedal sticking	Endoscope control pedal sticking	Please confirm the pedal is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0344	System Warning	Clutch pedal sticking	Clutch pedal sticking	Please confirm the pedal is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0345	System Warning	Swap pedal sticking	Swap pedal sticking	Please confirm the pedal is not pressed and reset the Alarm. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0346	System Warning	High-frequency pedal sticking	High-frequency pedal sticking	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0347	System Warning	Left CUT pedal sticking	Left CUT pedal failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0348	System Warning	Left COAG pedal sticking	Left COAG pedal failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0349	System Warning	Right CUT pedal sticking	Right CUT pedal failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0350	System Warning	Right COAG pedal sticking	Right COAG pedal failure	The cautery function has been prohibited, please terminate the surgery and contact Customer Services for tech support.
GD10-INFO-0351	System Warning	The power supply holding signal timeout	The power supply holding signal of the IO board timeout	Please retry. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0352	System Warning	Energy activation is not allowed	Endoscope control pedal being pressed, energy generator activation is not alloed.	
GD10-INFO	System	Energy activation is	Clutch pedal being	

ID	Alarm type	Description	Message	Advice
-0353	Warning	not allowed	pressed, energy generator activation is not allowed.	
GD10-INFO-0354	System Warning	Swap pedal pressing interrupted	Swap pedal pressing interrupted, please kick sideways.	
GD10-INFO-0356	Critical Failure	Surgeon Console IO module program error	Surgeon Console IO module program error	Please contact Customer Services for tech support.
GD10-INFO-0357	System Warning	self-test failed: auxiliary bipolar coagulation output feedback abnormal activation	self-test failed: high frequency generator module fault	Please shut down the system and contact after-sales support.
GD10-INFO-0358	System Warning	Auxiliary bipolar coagulation output error, no feedback signal when outputting	High frequency generator output fault	Discharge operation has been prohibited, please contact after-sales support after the surgery is terminated.
GD10-INFO-0359	System Warning	Auxiliary bipolar coagulation output error, feedback signal when not outputting	High frequency generator output fault	Discharge operation has been prohibited, please contact after-sales support after the surgery is terminated.
GD10-INFO-0500	System Warning	self-test failure: sitting posture control board button enable signal sticking	self-test failure: sitting posture control board button enable signal sticking	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0501	System Warning	self-test failure: sitting posture control board footswitch panel depth out button sticking	self-test failure: sitting posture control board footswitch panel depth out button sticking	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0502	System Warning	self-test failure: sitting posture control board footswitch panel depth in button sticking	self-test failure: sitting posture control board footswitch panel depth in button sticking	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0503	System Warning	self-test failure: sitting posture control board armrest up button sticking	self-test failure: sitting posture control board armrest up button sticking	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0504	System Warning	self-test failure: sitting posture control board armrest down button sticking	self-test failure: sitting posture control board armrest down button sticking	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0505	System Warning	self-test failure: sitting posture	self-test failure: sitting posture	Please confirm the pedal is not pressed and try to redo the

ID	Alarm type	Description	Message	Advice
		control board 3D viewer up button sticking	control board 3D viewer up button sticking	self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0506	System Warning	self-test failure: sitting posture control board 3D viewer down button sticking	self-test failure: sitting posture control board 3D viewer down button sticking	Please confirm the pedal is not pressed and try to redo the self-test. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-0507	System Warning	self-test failure: sitting posture control board pedal depth limit error	self-test failure: sitting posture control board pedal depth limit error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0508	System Warning	self-test failure: sitting posture control board armrest height limit error	self-test failure: sitting posture control board armrest height limit error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0509	System Warning	self-test failure: 3D viewer height limit error	self-test failure: 3D viewer height limit error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0510	System Warning	self-test failure: sitting posture control board potentiometer failure	self-test failure: sitting posture control board potentiometer failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0511	System Prompt	The double contacts of sitting posture control button enable are not actuated at the same time. Please fully press the button.	The double contacts of sitting posture control button enable are not actuated at the same time. Please fully press the button.	
GD10-INFO-0512	System Prompt	The double contacts of footswitch panel depth out button are not actuated at the same time. Please fully press the button.	The double contacts of footswitch panel depth out button are not actuated at the same time. Please fully press the button.	
GD10-INFO-0513	System Prompt	The double contacts of footswitch panel depth in button are not actuated at the same time. Please fully press the button.	The double contacts of footswitch panel depth in button are not actuated at the same time. Please fully press the button.	
GD10-INFO-0514	System Prompt	The double contacts of armrest up button are not actuated at the same time. Please fully press the	The double contacts of armrest up button are not actuated at the same time. Please fully press the button.	

ID	Alarm type	Description	Message	Advice
		button.		
GD10-INFO-0515	System Prompt	The double contacts of armrest down button are not actuated at the same time. Please fully press the button.	The double contacts of armrest down button are not actuated at the same time. Please fully press the button.	
GD10-INFO-0516	System Prompt	The double contacts of 3D viewer up button are not actuated at the same time. Please fully press the button.	The double contacts of 3D viewer up button are not actuated at the same time. Please fully press the button.	
GD10-INFO-0517	System Prompt	The double contacts of 3D viewer down button are not actuated at the same time. Please fully press the button.	The double contacts of 3D viewer down button are not actuated at the same time. Please fully press the button.	
GD10-INFO-0518	System Warning	sitting posture control board pedal depth in and out motion error	surgeon console pedal depth in and out motion error	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0519	System Warning	sitting posture control board armrest up and down motion error	surgeon console armrest up and down motion error	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0520	System Warning	sitting posture control board 3D viewer up and down motion error	surgeon console 3D viewer up and down motion error	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0521	System Warning	sitting posture control board pedal depth in and out unexpected motion	surgeon console pedal depth in and out unexpected motion	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0522	System Warning	sitting posture control board armrest up and down unexpected motion	surgeon console armrest up and down unexpected motion	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0523	System Warning	sitting posture control board 3D viewer up and down unexpected motion	surgeon console 3D viewer up and down unexpected motion	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0524	System Warning	sitting posture control board illegal moving destination value	surgeon console sitting posture control illegal moving destination value	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0525	System Prompt	sitting posture control board pedal depth in and out buttons are pressed simultaneously	surgeon console pedal depth in and out buttons are pressed simultaneously	Please release both buttons.

ID	Alarm type	Description	Message	Advice
GD10-INFO-0526	System Prompt	sitting posture control board armrest up and down buttons are pressed simultaneously	surgeon console armrest up and down buttons are pressed simultaneously	Please release both buttons.
GD10-INFO-0527	System Prompt	sitting posture control board 3D viewer up and down buttons are pressed simultaneously	surgeon console 3D viewer up and down buttons are pressed simultaneously	Please release both buttons.
GD10-INFO-0528	System Prompt	Surgeon console pedal tray extension limit reached	Surgeon console pedal tray extension limit reached	
GD10-INFO-0529	System Prompt	Surgeon console pedal tray retraction limit reached	Surgeon console pedal tray retraction limit reached	
GD10-INFO-0530	System Prompt	Surgeon console armrest reached upper limit	Surgeon console armrest reached upper limit	
GD10-INFO-0531	System Prompt	Surgeon console armrest reached lower limit	Surgeon console armrest reached lower limit	
GD10-INFO-0532	System Prompt	Surgeon console 3D viewer upper limit reached	Surgeon console 3D viewer upper limit reached	
GD10-INFO-0533	System Prompt	Surgeon console 3D viewer lower limit reached	Surgeon console 3D viewer lower limit reached	
GD10-INFO-0534	System Warning	sitting posture control button enable signal adhesion	sitting posture control button enable signal adhesion	
GD10-INFO-0535	System Warning	pedal depth in button adhesion	pedal depth in button adhesion	
GD10-INFO-0536	System Warning	pedal depth out button adhesion	pedal depth out button adhesion	
GD10-INFO-0537	System Warning	armrest up button adhesion	armrest up button adhesion	
GD10-INFO-0538	System Warning	armrest down button adhesion	armrest down button adhesion	
GD10-INFO-0539	System Warning	3D viewer up button adhesion	3D viewer up button adhesion	
GD10-INFO-0540	System Warning	3D viewer down button adhesion	3D viewer down button adhesion	
GD10-INFO-0542	Critical Failure	Sitting posture control program error	Sitting posture control program error	Please contact Customer Services for tech support.
GD10-INFO-0550	Critical Failure	3D Viewer angle acquisition submodule 485 bus communication failure	3D Viewer angle acquisition submodule 485 bus communication failure	Check if the 485 connector is properly plugged in.
GD10-INFO	Critical	3D Viewer angle	3D Viewer angle	

ID	Alarm type	Description	Message	Advice
-0551	Failure	acquisition submodule spi bus communication failure	acquisition submodule spi bus communication failure	
GD10-INFO-0552	Critical Failure	3D Viewer encoder unexpected reset	3D Viewer encoder abnormal reset	
GD10-INFO-0553	Critical Failure	3D Viewer encoder internal error	3D Viewer encoder internal error	Check if the magnet's installation position relative to the magnetic encoder board is correct.
GD10-INFO-0554	Critical Failure	3D Viewer encoder access error, reading incorrect register address	3D Viewer encoder access error, read incorrect register address	
GD10-INFO-0555	Critical Failure	3D Viewer encoder angle value invalid	3D Viewer encoder angle value invalid	Check if the magnet's installation position relative to the magnetic encoder board is correct.
GD10-INFO-0600	System Warning	self-test failure: Actuation module %1 shaft 1%d EPOS error 2%D	self-test failure: actuation module %1 motor failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0601	System Warning	self-test failure: Actuation module %1 shaft 1%d EPOS communication failure	self-test failure: actuation module %1 motor communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0602	System Warning	self-test failure: Actuation module %1 shaft 1%d EPOS status switching timeout	self-test failure: actuation module %1 motor failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0603	Critical Failure	%1 Actuation module 1%d axis EPOS error 2%D	%1 Actuation module motor fault	Please follow the instruction to remove the instrument
GD10-INFO-0604	Critical Failure	%1 Actuation module 1%d axis EPOS communication failure	%1 Actuation module motor communication failure	Please reset the alarm, If the error reappear, Please follow the instruction to remove the instrument
GD10-INFO-0605	Critical Failure	%1 Actuation module 1%d axis EPOS state transition error	%1 Actuation module motor fault	Please reset the alarm, If the error reappear, Please follow the instruction to remove the instrument
GD10-INFO-0606	Critical Failure	%1 Actuation module 1%d axis EPOS following fault	%1 Actuation module motor following fault	Please reset the alarm, If the error reappear, Please follow the instruction to remove the instrument
GD10-INFO-0607	Critical Failure	%1 Actuation module 1%d axis EPOS low voltage error, detected voltage is 4%fv, normal voltage should be greater than 23v	%1 Actuation module low voltage error	Please reset the alarm, If the error reappear, Please follow the instruction to remove the instrument

ID	Alarm type	Description	Message	Advice
GD10-INFO-0608	Critical Failure	%1 Actuation module 1%d axis EPOS position holding failure	%1 Actuation module motor angle drifting	Please reset the alarm, If the error reappear, Please follow the instruction to remove the instrument
GD10-INFO-0609	Critical Failure	%1 Actuation module 1%d axis control speeding overrange, detected speed is 4%drpm, normal speed should be in the range [4%d,4%d]rpm	%1 Actuation module motor speeding overrange	Please follow the instruction to remove the instrument
GD10-INFO-0610	Critical Failure	%1 Actuation module 1%d axis control angle overranged, detected position is 4%d, normal position should be in the range [4%d,4%d]	%1 Actuation module control angle overranged	Please follow the instruction to remove the instrument
GD10-INFO-0611	Critical Failure	%1 Actuation module 1%d axis control position jumping error, detected position difference is 4%d, normal position difference should not exceed 4%d	%1 Actuation module control position jumping error	Please follow the instruction to remove the instrument
GD10-INFO-0612	Critical Failure	%1 Actuation module 1%d axis current position jump error, detected position difference is 4%d, normal position difference should not exceed 4%d	%1 Actuation module current position jump error	Please follow the instruction to remove the instrument
GD10-INFO-0613	System Prompt	%1 Actuation module 1%d axis EPOS emergency stop timeout	%1 Actuation module emergency stop timeout	Please follow the instruction to remove the instrument
GD10-INFO-0614	System Warning	%1 Actuation module 1%d axis motor position retrieval failure	%1 Actuation module failed to acquire motor position value	Please follow the instruction to remove the instrument
GD10-INFO-0615	Critical Failure	%1 Linear module EPOS error 2%D	%1 Linear module motor fault	Please follow the instruction to remove the instrument.
GD10-INFO-0616	Critical Failure	linear module %1 EPOS communication error	linear module %1 motor communication failure	Please reset the Alarm. If the error reappear, Please follow the instruction to remove the instrument.
GD10-INFO-0617	Critical Failure	linear module %1 EPOS status switching error	linear module %1 motor failure	Please reset the Alarm. If the error reappear, Please follow the instruction to remove the instrument.

ID	Alarm type	Description	Message	Advice
GD10-INFO-0618	Critical Failure	linear module %1 EPOS following failure	linear module %1 motor following failure	Please reset the Alarm. If the error reappear, Please follow the instruction to remove the instrument.
GD10-INFO-0619	Critical Failure	%1 Linear module EPOS low voltage error, detected voltage is 4%fV, normal voltage should be greater than 23V	%1 Linear module motor low voltage error	Please try to reset the alarm, If the error reappear, Please follow the instruction to remove the instrument
GD10-INFO-0620	Critical Failure	linear module %1 EPOS location holding failure	linear module %1 location holding failure	Please reset the Alarm. If the error reappear, Please follow the instruction to remove the instrument.
GD10-INFO-0621	Critical Failure	%1 Linear module EPOS control speed out of range, detected speed is 4%drpm, normal speed should be in the range [4%d,4%d]rpm	%1 Linear module control speed out of range	Please follow the instruction to remove the instrument
GD10-INFO-0622	Critical Failure	%1 Linear module EPOS control position out of range, detected position is 4%d, normal position should be in the range [4%d,4%d]	%1 Linear module control position out of range	Please follow the instruction to remove the instrument
GD10-INFO-0623	Critical Failure	%1 Linear module EPOS control position jump error, detected position difference is 4%d, normal position difference should not exceed 4%d	%1 Linear module position jump error	Please follow the instruction to remove the instrument
GD10-INFO-0624	Critical Failure	%1 Linear module EPOS current position jump error, detected position difference is 4%d, normal position difference should not exceed 4%d	%1 Linear module current position jump error	Please follow the instruction to remove the instrument
GD10-INFO-0625	System Prompt	linear module %1 EPOS emergency stop timeout	linear module %1 emergency stop timeout	Please follow the instruction to remove the instrument.
GD10-INFO-0626	System Warning	linear module %1 obtaining motor position value failure	linear module %1 obtaining motor position value failure	Please follow the instruction to remove the instrument.
GD10-INFO-0627	Critical Failure	Actuation module %1 motor control module unexpected reset	Actuation module %1 motor control module unexpected reset	Entering the manual withdraw process.

ID	Alarm type	Description	Message	Advice
GD10-INFO-0628	System Prompt	Actuation module %1 shaft 1%d EPOS following error	Actuation module %1 motor following error	Please retry.
GD10-INFO-0629	Critical Failure	Actuation module %1 motor control board program error	Actuation module %1 motor control board program error	Please contact Customer Services for tech support.
GD10-INFO-0630	System Prompt	%1 Actuation module 1%d axis initial control position jump error, detected position difference is 4%d, normal position difference should not exceed 4%d	%1 Actuation module initial control position jump error	
GD10-INFO-0631	System Prompt	%1 Linear module initial control position jump error, detected position difference is 4%d, normal position difference should not exceed 4%d	%1 Linear module initial control position jump error	
GD10-INFO-0633	System Prompt	Actuation module %1 1%d EPOS overcurrent prompt	Actuation module %1 overcurrent prompt	
GD10-INFO-0634	Critical Failure	%1 Actuation module 1%d axis EPOS overcurrent fault	%1 Actuation module overcurrent fault	Please reset the alarm, If the error reappear, Please follow the instruction to remove the instrument
GD10-INFO-0635	Critical Failure	linear module %1 EPOS overcurrent failure	linear module %1 overcurrent failure	Please reset the Alarm. If the error reappear, Please follow the instruction to remove the instrument.
GD10-INFO-0636	System Prompt	%1 Actuation module motion not ready (%s)	Actuation module motion not ready	Please try the operation again.
GD10-INFO-0700	System Warning	self-test failure: haptic master %1 finger clutch is pressed, please self-test when finger clutch is released	self-test failure: haptic master finger clutch sticking	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0701	System Warning	self-test failure: haptic master %1 pinch controller is closed, please self-test when pinch is released	self-test failure: haptic master clamp sticking	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0703	System Warning	self-test failed: haptic master %1 grip sensor failure	self-test failed: haptic master grip fault	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO	System	self-test failure:	self-test failure:	Please restart the system, If

ID	Alarm type	Description	Message	Advice
-0704	Warning	haptic master %1 pinch controller redundancy check failure	haptic master pinch controller redundancy check failure	the error reappear, please contact Customer Services for tech support.
GD10-INFO-0705	System Warning	self-test failure: haptic master %1 joint potentiometer 1%d data overrange	self-test failure: haptic master joint sensor data overrange	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0706	System Warning	self-test failure: haptic master %1 internal SPI communication failure	self-test failure: haptic master internal communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0707	System Warning	self-test failure: haptic master %1 joint 1%d position redundancy check failure	self-test failure: haptic master joint position redundancy check failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0708	System Warning	self-test failed: haptic master %1 joint motor 1%d communication failure	self-test failed: haptic master joint motor communication failure	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0709	System Warning	self-test failed: haptic master %1 joint motor 1%d mechanical angle out of range	self-test failed: haptic master joint motor mechanical angle out of range	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0710	System Warning	self-test failure: haptic master %1 joint motor 1%d rotary speed overrange	self-test failure: haptic master joint motor rotary speed overrange	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0711	System Warning	self-test failure: haptic master %1 joint motor 1%d torque current overrange	self-test failure: haptic master joint motor torque current overrange	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0712	System Warning	self-test failure: haptic master %1 joint motor 1%d temperature overrange	self-test failure: haptic master joint motor temperature overrange	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0713	System Warning	self-test failed: haptic master %1 joint encoder 1%d communication failure	self-test failed: haptic master joint encoder communication failure	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0714	System Warning	self-test failed: haptic master %1 joint encoder 1%d position value out of range	self-test failed: haptic master joint encoder position value out of range	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0715	System Warning	self-test failure: haptic master %1 parameter verification failure	self-test failure: haptic master parameter verification failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.

ID	Alarm type	Description	Message	Advice
GD10-INFO-0716	System Warning	self-test failed: haptic master %1 joint 1%d position value out of range	self-test failed: joint position value out of range	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-0717	System Warning	self-test failure: haptic master %1current posture error	self-test failure: haptic master current posture error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0718	System Warning	self-test failure: haptic master %1 obtaining joint potentiometer angle value failure	self-test failure: haptic master obtaining joint potentiometer angle value failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0719	System Warning	self-test failure: haptic master %1 joint motor 1%d zero calibration failure	self-test failure: haptic master joint motor zero calibration failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0720	System Warning	self-test failed: haptic master %1 joint 1%d motor and encoder communication failure	self-test failed: haptic master joint motor and encoder communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-0702	System Warning	self-test failed: haptic master %1 joint query encoder type failed	self-test failed: haptic master joint encoder type query failed	Please enter MFG, upgrade encoder motor component
GD10-INFO-0721	System Warning	Haptic master %1 grip sensor failure	Haptic master grip fault	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0722	System Warning	Haptic master %1 grip redundancy check failure	Haptic master grip redundancy check failed	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0723	System Warning	haptic master %1 joint potentiometer 1%d data overrange	haptic master joint potentiometer data overrange	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0724	System Warning	haptic master %1 internal SPI communication failure	haptic master internal communication failure	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0725	System Warning	Haptic master %1 joint 1%d position redundancy check failure	Haptic master joint position redundancy check failed	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0726	System Warning	Haptic master %1 joint motor 1%d communication failure	Haptic master joint motor communication failure	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0727	System Warning	Haptic master %1 joint motor 1%d mechanical angle out of range	Haptic master joint motor mechanical angle out of range	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO	System	haptic master %1	haptic master joint	Please reset the Alarm. If the

ID	Alarm type	Description	Message	Advice
-0728	Warning	joint motor 1%d rotary speed overrange	motor rotary speed overrange	error reappear, please contact Customer Services for tech support.
GD10-INFO-0729	System Warning	haptic master %1 joint motor 1%d torque current overrange	haptic master joint motor torque current overrange	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0730	System Prompt	haptic master %1 joint motor 1%d temperature overrange warning	haptic master joint motor temperature overrange warning	
GD10-INFO-0731	System Warning	haptic master %1 joint motor 1%d temperature overrange failure	haptic master joint motor temperature overrange failure	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0732	System Warning	haptic master %1 joint motor 1%d control value overrange	haptic master joint motor control value overrange	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0733	System Warning	Haptic master %1 joint encoder 1%d communication failure	Haptic master joint encoder communication failure	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0734	System Warning	Haptic master %1 joint encoder 1%d position value out of range	Haptic master joint encoder position value out of range	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0735	System Warning	haptic master %1 parameter verification failure	haptic master parameter verification failure	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0736	System Warning	haptic master %1 joint 1%d position value overrange	haptic master joint position value overrange	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0738	System Warning	haptic master %1 unexpected reset	haptic master abnormal reset	Please restart the surgeon console, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0739	System Warning	haptic master %1 target pose error	haptic master target pose error	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0740	System Warning	haptic master %1 current pose error	haptic master current pose error	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0741	System Prompt	Please relax your hands and follow the adjustment movements of the haptic master.	Please relax your hands and follow the adjustment movements of the haptic master.	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0742	System Prompt	haptic master %1 joint 1%d unable to reach target angle	please rotate haptic master %1 following joint 1%d	
GD10-INFO-0743	System Prompt	Haptic master cannot align with	Haptic master cannot align with	Please reset the Alarm. If the error reappear, please contact

ID	Alarm type	Description	Message	Advice
		the surgical instrument. Please switch to the other haptic master or adjust the endoscopic view.	the surgical instrument. Please switch to the other haptic master or adjust the endoscopic view.	Customer Services for tech support.
GD10-INFO-0744	Critical Failure	haptic master %1program error	haptic master %1program error	Please contact Customer Services for tech support.
GD10-INFO-0745	System Prompt	The current posture does not support switching the rotary joint mapping mode	The current posture does not support switching the rotary joint mapping mode	Please move the instrument to the initial pose and retry.
GD10-INFO-0746	System Prompt	Switching the rotary joint mapping mode is not available currently. Please try disconnecting the remote controlling matching or the surgical instrument feeding past the initial position.	Switching the rotary joint mapping mode is not available currently. Please try disconnecting the remote controlling matching or the surgical instrument feeding past the initial position.	
GD10-INFO-0747	System Prompt	The haptic master cannot maintain the current instrument angle and has flipped the mapping mode	The haptic master cannot maintain the current instrument angle and has flipped the mapping mode	
GD10-INFO-0748	System Prompt	haptic master %1 rotary shaft rotating too fast	haptic master %1 rotary shaft rotating too fast	Please rematch the haptic master
GD10-INFO-0750	System Warning	Haptic master %1 joint 1%d motor and encoder communication failure	Haptic master joint motor and encoder communication failure	Please try to reset the alarm, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-0751	System Warning	Haptic master %1 joint 1%d encoder internal fault	Haptic master joint encoder internal fault	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-0752	System Warning	Haptic master %1 joint query encoder type failed	Haptic master joint encoder type query failed	Please enter MFG, upgrade encoder motor component
GD10-INFO-0838	System Prompt	%1 Actuation module 1%d axis current position jump error, detected position difference 4%d, normal position difference should not exceed 4%d	%1 Actuation module 1%d axis current position jump error, detected position difference is 4%d, normal position difference should not exceed 4%d	The actuation module is moving unexpectedly, please avoid manually moving the actuation module.
GD10-INFO-0839	System Prompt	Start install clip applier	Start install clip applier	
GD10-INFO	System	Actuation	Actuation	

ID	Alarm type	Description	Message	Advice
-0800	Prompt	module %1 return zero motion signal is unstable	module %1 return zero motion signal is unstable	
GD10-INFO-0801	System Prompt	Actuation module %1 feeding or exiting motion signal is unstable	Actuation module %1 feeding or exiting motion signal is unstable	
GD10-INFO-0802	System Warning	self-test failure: Actuation module %1 loading configuration failure	self-test failure: Actuation module %1 loading configuration failure	Please contact Customer Services for tech support.
GD10-INFO-0803	System Warning	Actuation module %1 trocar information reading failure	Actuation module %1 trocar information reading failure	Please contact Customer Services for tech support.
GD10-INFO-0804	System Warning	Actuation module %1 motor control module response timeout	Actuation module %1 motor control module response timeout	Please restart the system during the surgery. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0814	System Prompt	Actuation module %1 instrument installation error	Actuation module %1 instrument installation error. The endoscope can only be installed in the actuation module 3.	Please install the proper instruments.
GD10-INFO-0814	System Prompt	Actuation module %1 instrument installation error	Actuation module %1 instrument installation error. The clip applier can only be installed in the actuation module 1.	Please install the proper instruments.
GD10-INFO-0815	System Prompt	Actuation module %1 instrument installation error	Actuation module %1 instrument installation error. Actuation module 3 can only be equipped with an endoscope.	Please install the endoscope.
GD10-INFO-0816	System Prompt	Actuation module %1 instrument unrecognized	Actuation module %1 instrument unrecognized	Please change the instrument
GD10-INFO-0818	System Warning	Actuation module %1 motion signal is unstable during remote control	Actuation module %1 motion signal is unstable during remote control	The %1 actuation module experienced unstable motion signals during the teleoperation
GD10-INFO-0820	System Prompt	Actuation module %1 grip motion too fast	Actuation module %1 grip motion too fast	
GD10-INFO	System	Actuation	Actuation	Please restart the system, If

ID	Alarm type	Description	Message	Advice
-0821	Prompt	module %1 overall rotation reaches one circle	module %1 overall rotation reaches one circle	the error reappear, please contact Customer Services for tech support.
GD10-INFO-0822	System Warning	Actuation module %1 position jump after restart	Actuation module %1 position jump after restart	The position of the actuation module has unintended difference. Please stop using.
GD10-INFO-0823	Critical Failure	Actuation module %1 motor control module version mismatch	Actuation module %1 motor control module version mismatch	Please contact Customer Services for tech support.
GD10-INFO-0824	Critical Failure	Actuation module %1 motion monitoring module version mismatch	actuation module %1 motion monitoring module version mismatch	Please contact Customer Services for tech support.
GD10-INFO-0825	Critical Failure	Actuation module %1 motor control module initial status synchronizing timeout	Actuation module %1 motor control module initial status synchronizing timeout	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0826	Critical Failure	%1 Actuation module safety monitoring module disabled	%1 Actuation module safety monitoring module disabled	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-0827	System Warning	Actuation module %1 safety monitoring module response timeout	actuation module %1 safety monitoring module response timeout	Please restart the system during the surgery. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0828	System Prompt	To install the clip applicator, please open the haptic master gripper to maximum angle.	To install the clip applicator, please open the haptic master gripper to maximum angle.	
GD10-INFO-0833	System Prompt	Please ensure that the scissors are in a closed state before feeding or exiting	Please ensure that the scissors are in a closed state before feeding or exiting	
GD10-INFO-0834	System Prompt	%1 Actuation module 1%d axis motor controller temperature 4%f, exceeds warning temperature 82°	%1 Actuation module 1%d axis motor controller temperature is 4%f, exceeds warning temperature 82°c	Avoid using this instrument for critical operations.
GD10-INFO-0835	Critical Failure	%1 Actuation module 1%d axis current position jump error, detected position difference 4%d, normal position difference should not exceed 4%d	%1 Actuation module 1%d axis current position jump error, detected position difference is 4%d, normal position difference should not exceed 4%d	Please trigger the returning zero process through the GUI.
GD10-INFO-0836	Critical Failure	%1 Actuation module 1%d axis current position jump error,	%1 Actuation module 1%d axis current position jump error, detected	Please follow the manual exit procedure to exit the surgical instrument, then trigger the returning zero process

ID	Alarm type	Description	Message	Advice
		detected position difference 4%d, normal position difference should not exceed 4%d	position difference is 4%d, normal position difference should not exceed 4%d	through the GUI.
GD10-INFO-0837	Critical Failure	%1 Actuation module safety monitoring module initial state synchronization timeout	%1 Actuation module safety monitoring module initial state synchronization timeout	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-0902	System Prompt	haptic master %1 posture data timeout	haptic master %1 posture data timeout	Please rematch the haptic master
GD10-INFO-0903	System Prompt	Actuation module %1 current posture data timeout	actuation module %1 current posture data timeout	Please rematch the haptic master
GD10-INFO-0904	System Prompt	Infrared head sensor signal timeout	Infrared head sensor signal timeout	Please rematch the haptic master
GD10-INFO-0906	System Prompt	%1 Haptic master moving too fast, controlling surgical tool speed 4%fmm/s, exceeds control threshold 200mm/s	%1 Haptic master moving too fast	Please rematch.
GD10-INFO-0907	System Warning	motion holding signal timeout	System control motion holding signal timeout	
GD10-INFO-0908	System Warning	%1 Haptic master motion data jump, controlling surgical tool speed 4%fmm/s, exceeds jump threshold 4%fmm/s	%1 Haptic master movement data jump	
GD10-INFO-0909	Critical Failure	Unable to obtain %1 haptic master device data	unable to connect haptic master	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-0910	System Prompt	Robotic arm posture has not been updated and remote control is not possible	Robotic arm posture has not been updated and remote control is not possible	
GD10-INFO-0911	System Prompt	%1 haptic master clamp data timeout	%1 haptic master clamp data timeout	Please rematch the haptic master
GD10-INFO-1000	System Warning	Endoscope parameter verification failure	Endoscope parameter verification failure	Please check the cord connection. If the error reappear, please change the endoscope or restart the system.
GD10-INFO-1001	System Warning	Endoscope image interrupted	Endoscope image interrupted	Please check the cord connection. If the error reappear, please change the endoscope or restart the

ID	Alarm type	Description	Message	Advice
				system.
GD10-INFO-1002	System Warning	Endoscope initialization error(%s)	Endoscope initialization error	Please check the cord connection. If the error reappear, please change the endoscope or restart the system.
GD10-INFO-1003	System Prompt	Graphics card driver initialization error	Graphics card driver initialization error	Please restart the system. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1004	System Prompt	Endoscope not connected	Endoscope not connected	Please change the endoscope. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1005	System Warning	Endoscope identification is not unique	Endoscope identification is not unique	Please change the endoscope. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1006	System Warning	Endoscope parameter reading failed	Endoscope parameter reading failed	Please change the endoscope. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1007	System Warning	Abnormal distortion parameters of endoscopic device	Abnormal distortion parameters of endoscopic device	Please change the endoscope. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1008	System Warning	The number of display devices does not match	The number of display devices does not match	Please reconnect the 2D/3D display cord. If the error reappear, please change the endoscope or restart the system.
GD10-INFO-1009	System Warning	Endoscope one-eye image acquisition failed	Endoscope one-eye image acquisition failed	Please reconnect the 2D/3D display cord. If the error reappear, please change the endoscope or restart the system.
GD10-INFO-1100	System Warning	haptic master conversion control module status check abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1101	System Warning	Surgeon console IO module status check abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1102	System Warning	Surgeon consoleUI module status check abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1103	System Warning	sitting posture adjustment module status check abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1104	System Warning	haptic master %1 status check abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO	System	haptic master	self-test failure:	Please restart the system, If

ID	Alarm type	Description	Message	Advice
-1105	Warning	conversion control module version check abnormal	surgeon console module error	the error reappear, please contact Customer Services for tech support.
GD10-INFO-1106	System Warning	Surgeon console IO module version mismatch	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1107	System Warning	Surgeon consoleUI module version mismatch	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1108	System Warning	sitting posture adjustment module version mismatch	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1109	System Warning	haptic master %1 version mismatch	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1110	System Warning	haptic master conversion control module status configuration abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1111	System Warning	Surgeon consoleUI module status configuration abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1112	System Warning	Surgeon console IO module status configuration abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1113	System Warning	sitting posture adjustment module status configuration abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1114	System Warning	haptic master %1 status configuration abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1115	System Prompt	Login info changed	Login info synchronized as surgical trolley user	
GD10-INFO-1116	System Warning	Obtaining haptic master %1 joint 6 type timeout	Obtaining haptic master %1 joint 6 type timeout	
GD10-INFO-1117	Critical Failure	Left and right haptic masters joint 6 type mismatch	Left and right haptic masters joint 6 type mismatch	
GD10-INFO-1118	System Prompt	Sitting posture adjustment is not allowed during actuation module %1 teleoperation.	Sitting posture adjustment is not allowed during actuation module %1 teleoperation.	Please release the ergonomic button.
GD10-INFO-1119	System Prompt	Actuation module %1	Actuation module %1	Please release the ergonomic button.

ID	Alarm type	Description	Message	Advice
		detected sitting posture adjustment button has been pressed while shortcut function is executing	detected sitting posture adjustment button has been pressed while shortcut function is executing	
GD10-INFO-1122	System Prompt	Abnormal status of the surgeon console IO module. Trying to recover.	Abnormal status of the surgeon console IO module. Trying to recover.	Please continue to operate after the status back to normal.
GD10-INFO-1123	System Prompt	Abnormal status of the sitting posture adjustment module. Trying to recover.	Abnormal status of the sitting posture adjustment module. Trying to recover.	Please continue to operate after the status back to normal.
GD10-INFO-1124	System Prompt	Abnormal status of haptic master %1. Trying to recover.	Abnormal status of the sitting posture adjustment module. Trying to recover.	Please continue to operate after the status back to normal.
GD10-INFO-1201	Critical Failure	actuation module motion control module %1status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1202	Critical Failure	safety monitoring module (trolley) status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1203	Critical Failure	safety monitoring module (column) status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1204	Critical Failure	surgical trolley UI module status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1205	Critical Failure	Robotic arm motion control module status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1207	Critical Failure	actuation module motion control module %1, version mismatch	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1208	Critical Failure	safety monitoring module (trolley) version mismatch	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1209	Critical Failure	safety monitoring module (column) version mismatch	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1210	Critical Failure	surgical trolley UI module version mismatch	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1211	Critical Failure	Robotic arm motion control module version mismatch	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for

ID	Alarm type	Description	Message	Advice
				tech support.
GD10-INFO-1212	Critical Failure	actuation module motion control module %1 status switching failure	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1213	Critical Failure	safety monitoring module (trolley) status switching failure	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1214	Critical Failure	safety monitoring module (column) status switching failure	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1215	Critical Failure	surgical trolley UI module status switching failure	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1216	Critical Failure	Robotic arm motion control module status switching failure	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1250	System Warning	self-test failure: Actuation module %1 instrument adapter contacts are already connected when starting up	self-test failure: Actuation module %1 instrument adapter contacts are already connected when starting up	Please remove the instrument adapter. If the instrument adapter is not installed, please restart the system or contact Customer Services for tech support.
GD10-INFO-1251	System Warning	self-test failure: Actuation module %1 trocar adapter contacts are already connected when starting up	self-test failure: Actuation module %1 trocar adapter contacts are already connected when starting up	Please remove the trocar adapter. If the trocar adapter is not installed, please restart the system or contact Customer Services for tech support.
GD10-INFO-1252	System Warning	self-test failure: Actuation module %1 trocar contacts are already connected when starting up	self-test failure: Actuation module %1 trocar contacts are already connected when starting up	Please remove the trocar . If the trocar is not installed, please restart the system or contact Customer Services for tech support.
GD10-INFO-1253	System Warning	self-test failure: Actuation module %1 instrument contacts are already connected when starting up	self-test failure: Actuation module %1 instrument contacts are already connected when starting up	Please remove the instrument adapter. If the instrument is not installed, please restart the system or contact Customer Services for tech support.
GD10-INFO-1260	System Prompt	Actuation module %1 motor failed to enter hold state	actuation module %1 motor failed to enter hold state	Please retry.
GD10-INFO-1261	System Prompt	unable to perform operation %s. surgical operation not selected	unable to perform operation %s. surgical operation not selected	Please select the surgery first
GD10-INFO-1262	System Prompt	unable to perform operation %s. Actuation	unable to perform operation %s. Actuation	Please remove the trocar and retry.

ID	Alarm type	Description	Message	Advice
		module %1 trocar connected	module %1 trocar connected	
GD10-INFO-1263	System Prompt	unable to perform operation %s. Actuation module %1 instrument adapter connected	unable to perform operation %s. Actuation module %1 instrument adapter connected	Please retry after removing the instrument adapter.
GD10-INFO-1264	System Prompt	unable to perform operation %s. Actuation module %1 trocar adapter connected	unable to perform operation %s. Actuation module %1 trocar adapter connected	Please retry after removing the trocar adapter.
GD10-INFO-1265	System Prompt	unable to perform operation %s. Actuation module %1 trocar not installed	unable to perform operation %s. Actuation module %1 trocar not installed	Please complete the docking process and retry.
GD10-INFO-1266	System Prompt	unable to perform operation %s. Actuation module %1 instrument adapter not installed	unable to perform operation %s. Actuation module %1 instrument adapter not installed	Please retry after removing the instrument adapter.
GD10-INFO-1267	System Prompt	unable to perform operation %s. Actuation module %1 trocar adapter not installed	unable to perform operation %s. Actuation module %1 trocar adapter not installed	Please retry after removing the trocar adapter.
GD10-INFO-1268	System Prompt	Actuation module %1 unable to perform operation %s. endoscope feed not completed	Actuation module %1 unable to perform operation %s. endoscope feed not completed	Please install the endoscope and complete the insertion, and retry.
GD10-INFO-1269	System Prompt	Actuation module %1 currently unable to perform operation %s.	Actuation module %1 currently unable to perform operation %s.	Please retry.
GD10-INFO-1270	System Prompt	Actuation module %1 unable to perform operation %s. executing robotic arm adjustment	Actuation module %1 unable to perform operation %s. executing robotic arm adjustment	Please retry when robotic arms are not working,
GD10-INFO-1271	System Prompt	unable to perform operation %s. related error has not been cleared	unable to perform operation %s. related error has not been cleared	Please check and solve other alarms and retry.
GD10-INFO-1272	System Prompt	Robotic arm motion test mode, Actuation module %1 unable to perform operation %s.	Robotic arm motion test mode, Actuation module %1 unable to perform operation %s.	
GD10-INFO	System	Actuation	Actuation	Please change the instrument

ID	Alarm type	Description	Message	Advice
-1273	Prompt	module %1 code is 0, this instrument is for testing only.	module %1 code is 0, this instrument is for testing only.	
GD10-INFO -1274	System Prompt	Cannot perform operation %s with the instrument. Actuation module %1 instrument contacts connected	Cannot perform operation %s with the instrument. Actuation module %1 instrument contacts connected	Please use the instrument release wrench to remove the instrument and try again.
GD10-INFO -1275	System Prompt	Actuation module %1 motion control module response timeout	Actuation module %1 motion control module response timeout	Please retry.
GD10-INFO -1276	System Prompt	Actuation module %1 request to obtain contact status timeout	Actuation module %1 request to obtain contact status timeout	Please retry.
GD10-INFO -1277	System Prompt	Actuation module %1 instrument locking not completed	Actuation module %1 instrument locking not completed	Please retry.
GD10-INFO -1278	System Prompt	Actuation module %1 instrument unlocking not completed	Actuation module %1 instrument unlocking not completed	Please retry.
GD10-INFO -1279	System Prompt	Actuation module %1 instrument zero calibration not completed	Actuation module %1 instrument zero calibration not completed	Please move the actuation module to the zero pose or the stowing pose.
GD10-INFO -1280	System Prompt	Actuation module %1 power supply control timeout	Actuation module %1 power supply control timeout	
GD10-INFO -1281	System Prompt	Actuation module %1 not in stowing pose	Actuation module %1 not in stowing pose	Please move the actuation module %1 to the stowing pose first.
GD10-INFO -1282	System Prompt	unable to perform operation %s. Actuation module %1 feeding not completed	unable to perform operation %s. Actuation module %1 feeding not completed	Please retry after insertion.
GD10-INFO -1283	System Prompt	Actuation module %1 DMG contacts are connected while functional contacts disconnected.	The double contacts of the actuation module %1 motion button are not actuated at the same time, please fully press the button.	Please re-press the button, If the error reappear, please contact Customer Services for tech support.
GD10-INFO -1284	System Prompt	%1 Actuation module button function replaced by another button	%1 Actuation module button function replaced by another button	Turn off the mapping and try again.
GD10-INFO -1285	System Prompt	Cannot set button mapping, please release %1	Cannot set button mapping, please release the related	After releasing the relevant buttons, try again.

ID	Alarm type	Description	Message	Advice
		actuation module related buttons first	buttons of %1 actuation module first	
GD10-INFO-1286	Critical Failure	Actuation module %1 DMG contacts sticking	Actuation module %1 DMG contacts sticking	Please release the button, and move the head out of the 3D viewer, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1287	System Prompt	Cannot set button mapping, please release Surgeon Console multi-function button first	Cannot set button mapping, please release the multi-function button on the Surgeon Console first	After releasing the Surgeon Console buttons, try setting again.
GD10-INFO-1288	System Prompt	Actuation module %1 multi-functional button has not been released, there should be DMG, but DMG disappears. Please fully press the button to ensure that both contacts are activated simultaneously	The activation method of the button is incorrect, and the two contacts are not simultaneously activated	Please release the button, and fully re-press the button.
GD10-INFO-1289	System Prompt	Actuation module %1 backward button has not been released, there should be DMG, but DMG disappears. Please fully press the button to ensure that both contacts are activated simultaneously	The activation method of the button is incorrect, and the two contacts are not simultaneously activated	Please release the button, and fully re-press the button.
GD10-INFO-1290	System Prompt	Actuation module %1 forward button has not been released, there should be DMG, but DMG disappears. Please fully press the button to ensure that both contacts are activated simultaneously	The activation method of the button is incorrect, and the two contacts are not simultaneously activated	Please release the button, and fully re-press the button.
GD10-INFO-1291	Critical Failure	Surgeon console multi-functional button has not been released. There should be DMG but	DMG signal failure	Please contact Customer Services for tech support.

ID	Alarm type	Description	Message	Advice
		Actuation module %1 DMG dissappeared.		
GD10-INFO-1292	Critical Failure	Infrared head sensors activated. There should be DMG but Actuation module %1 DMG dissappeared.	DMG signal failure	Please contact Customer Services for tech support.
GD10-INFO-1293	System Warning	Actuation module %1 instrument adapter disconnected	Actuation module %1 instrument adapter disconnected	Please reinstall the instrument adapter. If the instrument adapter is not installed, please restart the system or contact Customer Services for tech support.
GD10-INFO-1294	System Warning	Actuation module %1 trocar adapter disconnected	Actuation module %1 trocar adapter disconnected	Please reinstall the trocar adapter. If the trocar adapter is not installed, please restart the system or contact Customer Services for tech support.
GD10-INFO-1295	System Warning	Actuation module %1 trocar disconnected	Actuation module %1 trocar disconnected	Please re-dock. If the error reappear, please restart the system or contact Customer Services for tech support.
GD10-INFO-1296	System Warning	Actuation module %1 instrument contacts disconnected	Actuation module %1 instrument contacts disconnected	Please follow the withdrawing process to uninstall the instrument, uninstall the drape, move the actuation module to zero pose and then reinstall the instrument,
GD10-INFO-1297	System Prompt	unable to perform operation %s. Actuation module %1 drape movement interference test incomplete	unable to perform operation %s. Actuation module %1 drape movement interference test incomplete	Please retry after finishing movement test.
GD10-INFO-1298	System Prompt	Actuation module %1 has risk of damaging instrument adapter.	Actuation module %1 has risk of damaging instrument adapter.	Please retry after removing the instrument adapter.
GD10-INFO-1299	System Prompt	Actuation module %1 incorrect exit method selection, please reselect	Actuation module %1 does not support current exit method selection, please reselect	Please re-select the withdraw method
GD10-INFO-1300	System Prompt	unable to perform operation %s. Please unlock instrument %1 first.	unable to perform operation %s. Please unlock instrument %1 first.	Please unlock the instrument and retry.
GD10-INFO-1301	System Prompt	Actuation module %1 DMG status redundancy check inconsistent	Actuation module %1 DMG status redundancy check inconsistent	Please contact Customer Services for tech support.

ID	Alarm type	Description	Message	Advice
GD10-INFO-1302	System Prompt	Actuation module %1 instrument adapter is in semi-locked status. Unable to perform operation %s.	Actuation module %1 instrument adapter is in semi-locked status. Unable to perform operation %s.	
GD10-INFO-1303	System Prompt	unable to perform operation %s. Actuation module %1 instrument adapter is unlocked	unable to perform operation %s. Actuation module %1 instrument adapter unlocked	Please move the actuation module to the draping pose and lock the instrument adaptor.
GD10-INFO-1304	System Prompt	Actuation module %1 instrument adapter is semi-locked	Actuation module %1 instrument adapter is semi-locked	Please retry after unlock the instrument adaptor.
GD10-INFO-1305	System Prompt	Actuation module %1 unable to perform operation %s. Adjusting endoscope	Actuation module %1 unable to perform operation %s. Adjusting endoscope	Please retry after finishing the operation.
GD10-INFO-1306	System Prompt	Actuation module %1 cannot cancel wiping function at current position	Actuation module %1 cannot cancel wiping function at current position	Please retry after finishing the operation.
GD10-INFO-1307	System Prompt	unable to perform operation %s. Actuation module %1 instrument adapter is locked	unable to perform operation %s. Actuation module %1 instrument adapter is locked	Please retry after finishing the operation.
GD10-INFO-1308	System Prompt	Wiping function activated. Actuation module %1 initial position activation is not allowed	Wiping function activated. Actuation module %1 initial position activation is not allowed	Please retry after disabling the "Wiping" function.
GD10-INFO-1309	System Prompt	Actuation module %1 not allowed to disassemble instrument adapter outside the draping pose	Actuation module %1 not allowed to disassemble instrument adapter outside the draping pose	Please move the robotic arm to the draping pose and retry.
GD10-INFO-1310	System Prompt	Actuation module %1 in motion and not allowed to chosen	Actuation module %1 in motion and not allowed to chosen	Please retry after stopping the remote control and insertion or withdrawing movement.
GD10-INFO-1311	System Prompt	Actuation module %1 DMG not activated, motion is not allowed	Actuation module %1 DMG not activated, motion is not allowed	Please confirm the Infrared head sensor is not activated and the button is not pressed.
GD10-INFO-1312	Critical Failure	Endoscope info reading failure	Endoscope info reading failure	Please select alarm off to use the recorded information, or

ID	Alarm type	Description	Message	Advice
				unlock and install a new endoscope.
GD10-INFO-1350	System Prompt	The status switch has not been completed. Please click on confirm or cancel to complete the status switch	The status switch has not been completed. Please click on confirm or cancel to complete the status switch	
GD10-INFO-1353	System Prompt	unable to perform operation %s. related robotic arm is adjusting	unable to perform operation %s. related robotic arm is adjusting	Please retry after finishing the operation.
GD10-INFO-1354	System Prompt	Actuation module %1 not in zero position. Unable to perform operation %s	Actuation module %1 not in zero position. Unable to perform operation %s	Please perform %s at zero pose
GD10-INFO-1355	System Prompt	unable to perform operation %s. Actuation module %1 power supply enabled	unable to perform operation %s. Actuation module %1 power supply enabled	Please deactivate the infrared head sensor or release the related buttons.
GD10-INFO-1356	System Prompt	Brake control command response timeout	Brake control command response timeout	Please retry.
GD10-INFO-1357	System Prompt	Robotic arm motion starting command response timeout	Robotic arm motion starting command response timeout	Please retry.
GD10-INFO-1358	System Prompt	unable to perform operation %s. Robotic arm not reaching destination	unable to perform operation %s. Robotic arm not reaching destination	Press the robotic arm movement button to move the robotic arm into place.
GD10-INFO-1359	System Prompt	Backward moving is not allowed	Backward moving is not allowed	
GD10-INFO-1365	System Prompt	Current status does not allow manual zeroing	Current state does not allow manual zeroing	Please fully unlock the instrument adapter and ensure that the instrument adapter and module are completely detached before trying again.
GD10-INFO-1360	System Warning	Robotic arm %1 control enable signal response timeout	Robotic arm control enable signal response timeout	
GD10-INFO-1361	System Warning	Robotic arm %1 control enable holding signal response timeout	Robotic arm control enable holding signal response timeout	
GD10-INFO-1362	System Prompt	Robotic arm 1 and 4 motion mode not selected	Robotic arm 1 and 4 motion mode not selected	Please retry after selecting the mode.
GD10-INFO-1363	System Prompt	Robotic arm motion button has not been pressed. Please press the Robotic arm	Robotic arm motion button has not been pressed. Please press the Robotic arm motion button	Please retry after pressing the execution button.

ID	Alarm type	Description	Message	Advice
		motion button first and then try again	first and then try again	
GD10-INFO-1380	System Prompt	Actuation module %1 instrument [number: %s] is about to reach its maximum number of uses, the maximum number of uses of the instrument is 2%d, and [2%d] used, it could not be used next time.	%1 Actuation module instrument [ID: %s] usage approaching limit, please recycle after surgery	Please dispose it after the surgery ends.
GD10-INFO-1381	Critical Failure	Actuation module %1 instrument [number: %s] has reached its maximum number of uses, the maximum number of uses of the instrument is 2%d, it could not be used this time.	%1 Actuation module instrument [ID: %s] usage reached limit	Please replace the instrument.
GD10-INFO-1382	Critical Failure	Actuation module %1 instrument info reading failure.	Actuation module %1 instrument info reading failure.	Please reinstall the instrument.
GD10-INFO-1383	Critical Failure	Actuation module %1 instrument can not install endoscope, endoscope has installed.	Actuation module %1 instrument can not install endoscope, endoscope has installed.	Please install the proper instruments.
GD10-INFO-1384	System Prompt	Actuation module %1 instrument information is inconsistent before and after restarting during surgery. Please perform operations such as returning zero and installing the instrument again	Actuation module %1 instrument information is inconsistent before and after restarting during surgery. Please perform operations such as returning zero and installing the instrument again	
GD10-INFO-1385	System Prompt	Actuation module %1 instrument information was not correctly obtained during intraoperative restart and has been restored using	Actuation module %1 instrument information was not correctly obtained during intraoperative restart and has been restored using	

ID	Alarm type	Description	Message	Advice
		recorded data	recorded data	
GD10-INFO-1386	System Prompt	%1 Actuation module instrument [ID: %s] exceeded maximum allowed usage time, max usage time 2%d minutes, used [2%d minutes], cannot continue	%1 Actuation module instrument [ID: %s] usage time reached limit	Please replace the instrument.
GD10-INFO-1387	System Prompt	%1 Actuation module instrument [ID: %s] approaching maximum allowed usage time, max usage time 2%d minutes, used [2%d minutes]	%1 Actuation module instrument [ID: %s] usage time approaching limit	
GD10-INFO-1388	System Prompt	Actuation module %1 instrument[code: %s] instrument data update failure	Actuation module %1 instrument[code: %s] recording instrument usage failure	Please change the instrument
GD10-INFO-1389	System Prompt	Actuation module %1 instrument[code: %s] instrument data update failure	Actuation module %1 instrument[code: %s] recording instrument usage failure	Please change the instrument
GD10-INFO-1390	System Prompt	Actuation module %1 instrument[code: %s] instrument data update failure	Actuation module %1 instrument[code: %s] recording instrument usage failure	
GD10-INFO-1391	System Prompt	The overall motion of the actuation module has been selected, please unselect it first and try again.	The overall motion of the actuation module has been selected, please unselect it first and try again.	please unselect it first and try again.
GD10-INFO-1392	System Prompt	Detecting that the angle of the 3d viewer has been adjusted during tele operation will stop tele operation.	Detecting that the angle of the 3d viewer has been adjusted during tele operation will stop tele operation.	
GD10-INFO-1393	System Warning	Instrument [No.: %s], Maximum number of clamps applied [2%d], Number of clamps applied [2%d]	Instrument [No.: %s], number of clamps applied close to the upper limit	
GD10-INFO-1394	Critical Failure	%1 Actuation module instrument	%1 Actuation module instrument	Please unlock the instrument and try to reinstall it.

ID	Alarm type	Description	Message	Advice
		[ID: %s] read instrument usage time failed	[ID: %s] failed to read usage time	
GD10-INFO-1395	Critical Failure	Instrument [No.: %s] Clamping limit reached, maximum number of clamps [2%d], number of clamps applied [2%d]	Instrument [No.: %s], number of clamps applied reached to the upper limit	Please change the instrument
GD10-INFO-1396	Critical Failure	Instrument [number: %s], failed to read number of clamps applied	Instrument [number: %s], failed to read number of clamps applied	
GD10-INFO-1397	Critical Failure	Instrument [number: %s], failed to record number of clamps applied	Instrument [number: %s], failed to record number of clamps applied	
GD10-INFO-1410	System Prompt	Actuation module %1 motor control module status abnormal. Attempting to recover	Actuation module %1 motor control module status abnormal. Attempting to recover	Please continue to operate after the status back to normal.
GD10-INFO-1411	System Prompt	Robotic arm %1 motor control module status abnormal. Attempting to recover	Robotic arm %1 motor control module status abnormal. Attempting to recover	Please continue to operate after the status back to normal.
GD10-INFO-1412	System Prompt	%1 motion monitoring module status abnormal. Attempting to recover	%1 motion monitoring module status abnormal. Attempting to recover	Please continue to operate after the status back to normal.
GD10-INFO-1413	System Prompt	Trolley safety monitoring board status abnormal. Attempting to recover	Trolley safety monitoring board status abnormal. Attempting to recover	Please continue to operate after the status back to normal.
GD10-INFO-1414	System Prompt	Column safety monitoring board status abnormal. Attempting to recover	Column safety monitoring board status abnormal. Attempting to recover	Please continue to operate after the status back to normal.
GD10-INFO-1415	Critical Failure	Actuation module %1 motor control module status recovering failure.	Actuation module %1 motor control module status recovering failure.	Please restart the system during the surgery.
GD10-INFO-1416	Critical Failure	Robotic arm %1 motor control module status recovering failure.	Robotic arm %1 motor control module status recovering failure.	Please restart the system during the surgery.
GD10-INFO	Critical	motion monitoring	otion monitoring	Please restart the system

ID	Alarm type	Description	Message	Advice
-1417	Failure	module %1 status recovering failure.	module %1 status recovering failure.	during the surgery.
GD10-INFO-1418	Critical Failure	%1 Actuation module installed unrecognized instrument [ID: %s]	%1 Actuation module installed unrecognized instrument [ID: %s]	Please contact after-sales support to reflash.
GD10-INFO-1419	Critical Failure	%1 Actuation module installed unauthorized instrument [type: %s, ID: %s]	%1 Actuation module installed unauthorized instrument [type: %s, ID: %s]	Please contact after-sales support to import the correct authorization information.
GD10-INFO-1500	System Warning	surgeon console UPS communication failure	surgeon console UPS communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1501	System Warning	Surgeon Console UPS remaining power 1%d%, below threshold 1%d%	Surgeon Console uninterruptible power supply low battery	Please complete the operation as soon as possible and shut down the system.
GD10-INFO-1550	System Warning	surgical trolley UPS communication failure	surgical trolley UPS communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1551	System Warning	Surgical Trolley UPS remaining power 1%d%, below threshold 1%d%	Surgical Trolley uninterruptible power supply low battery	Please complete the operation as soon as possible and shut down the system.
GD10-INFO-1600	System Warning	self-test failure: Robotic arm %1 joint motor 1%d communication failure	self-test failure: Robotic arm %1 joint motor communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1601	System Warning	self-test failed: %1 robotic arm joint motor 1%d mechanical angle overrange detected angle 2%d, normal angle should be in the range [0,8191]	self-test failed: %1 robotic arm joint motor mechanical angle overrange	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1604	System Warning	self-test failed: %1 robotic arm joint motor 1%d temperature out of range, detected temperature 1%d°c, exceeds temperature threshold 125°c	self-test failed: %1 robotic arm joint motor temperature out of range fault	2%S
GD10-INFO-1605	System Warning	self-test failed: %1 robotic arm joint encoder 1%d communication failure	self-test failed: %1 robotic arm joint encoder communication failure	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-1606	System Warning	self-test failed: %1 robotic arm joint	self-test failed: %1 robotic arm joint	Please try to reset the alarm, if the alarm still exists after

ID	Alarm type	Description	Message	Advice
		encoder 1%d position value out of range, detected position 4%d, normal position should be in the range [0,16777216]	encoder position value out of range	resetting, please click the alarm close button.
GD10-INFO-1607	System Warning	self-test failed: %1 robotic arm joint 1%d position verification failed, detected dual encoders difference 4%f, exceeds threshold 4%f	self-test failed: %1 robotic arm joint position verification failed	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-1609	System Warning	self-test failed: %1 robotic arm joint 1%d position value out of range, detected position 4%f radians, normal position should be in the range [4%f,4%f] radians	self-test failed: %1 robotic arm joint position value out of range	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1610	System Warning	self-test failure: Robotic arm %1 parameter verification failure	self-test failure: Robotic arm %1 parameter verification failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1611	System Warning	Robotic arm %1 joint motor 1%d communication failure	Robotic arm %1 joint motor communication failure	Please reset the Alarm. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1612	System Warning	%1 Robotic arm joint motor 1%d mechanical angle out of range, detected angle 2%d, normal angle should be in the range [0,8191]	%1 Robotic arm joint motor mechanical angle out of range	Please try to reset the alarm, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1615	System Prompt	%1 Robotic arm joint motor 1%d temperature out of range warning, detected temperature 1%d°c, exceeds temperature threshold 100°c	%1 Robotic arm joint motor temperature out of range warning	2%S
GD10-INFO-1616	System Warning	%1 Robotic arm joint motor 1%d temperature out of range fault, detected temperature 1%d°c, exceeds temperature	%1 Robotic arm joint motor temperature out of range fault	2%S

ID	Alarm type	Description	Message	Advice
		threshold 125°C		
GD10-INFO-1617	System Warning	%1 Robotic arm joint motor 1%d control value out of range, detected control value 4%d, normal control value should be in the range (4%d,4%d)	%1 Robotic arm joint motor control value out of range	13%S
GD10-INFO-1618	System Warning	%1 Robotic arm joint encoder 1%d communication failure	%1 Robotic arm joint encoder communication failure	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-1619	System Warning	%1 Robotic arm encoder 1%d position value out of range, detected position 4%d, normal position should be in the range [0,16777216]	%1 Robotic arm encoder position value out of range	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-1620	System Warning	%1 Robotic arm joint 1%d position verification failed, detected dual encoders difference 4%f radians, exceeds threshold 4%f radians	%1 Robotic arm joint position verification failed	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button.
GD10-INFO-1621	System Warning	%1 Robotic arm joint 1%d control value out of range, detected control value 4%f radians, normal control value should be in the range [4%f,4%f] radians	%1 Robotic arm joint control value out of range	Please try to reset the alarm, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1622	System Warning	%1 Robotic arm joint 1%d control speed out of range, detected speed 4%f radians/second, normal speed should be in the range [4%f,4%f] radians/second	%1 Robotic arm joint control speed out of range	Please try to reset the alarm, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1623	System Warning	%1 Robotic arm joint 1%d position value out of range, detected position 4%f radians, normal position should be in the range [4%f,4%f] radians	%1 Robotic arm joint position value out of range	Please try to reset the alarm, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO	System	Robotic arm %1	Robotic arm %1	Please reset the Alarm. If the

ID	Alarm type	Description	Message	Advice
-1624	Warning	parameter verification failure	parameter verification failure	error reappear, please contact Customer Services for tech support.
GD10-INFO-1625	System Warning	Robotic arm %1 motor control module unexpected reset	Robotic arm %1 motor control module unexpected reset	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1626	System Warning	%1 Robotic arm joint motor 1%d following error, detected deviation 4%f radians, exceeds threshold 4%f radians	%1 Robotic arm joint motor following error	Please try to reset the alarm, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1627	System Prompt	Robotic arm %1 motion signal timeout	Robotic arm %1 motion signal timeout	
GD10-INFO-1628	System Prompt	Robotic arm %1 motion enable signal timeout	Robotic arm %1 motion enable signal timeout	
GD10-INFO-1629	System Warning	%1 Robotic arm joint 1%d slippage risk, detected slippage 4%f radians, exceeds threshold 4%f radians	%1 Robotic arm sliding risk present	Please try to reset the alarm, if the alarm still exists after resetting, please click the alarm close button. After the surgery, please contact after-sales support as soon as possible to check the robotic arm brake.
GD10-INFO-1630	Critical Failure	Robotic arm %1 motor control board program error	Robotic arm %1 motor control board program error	Please contact Customer Services for tech support.
GD10-INFO-1705	System Warning	The system detects a change in the position of the robotic arm relative to the position before the restart	The system detects a change in the position of the robotic arm relative to the position before the restart	Please confirm the position of the robotic arm is not manually changed.
GD10-INFO-1700	System Warning	The system detected a change in the joint position of %1 robotic arm 4%d relative to the position before reboot, which was 4%f before reboot and 4%f after reboot	Robotic arm %1 position changes relative to before restarting	Please confirm the position of the robotic arm is not manually changed.
GD10-INFO-1701	System Prompt	Robotic arm 1/4 is not in docking pose/avoidance pose	Robotic arm 1/4 is not in docking pose/avoidance pose	Robotic arm adjustment function has been prohibited, please try to restart the system and select “Do not restore”
GD10-INFO-1702	System Prompt	%s	robotic arm gap reaches limit	Please stop the movement toward the direction.
GD10-INFO-1703	System Warning	Trocar information reading failure	Trocar information reading failure	Please contact Customer Services for tech support.
GD10-INFO-1708	Critical Failure	Robotic arm %1 motor control module version	robotic arm %1 motor control module version	Please contact Customer Services for tech support.

ID	Alarm type	Description	Message	Advice
		mismatch	mismatch	
GD10-INFO-1709	Critical Failure	Robotic arm %1 motor control module status switching failure	robotic arm %1 motor control module status switching failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1710	System Warning	Robotic arm joint position information missing	Robotic arm joint position information missing	Please contact after-sales support.
GD10-INFO-1800	System Warning	IO module communication failure	surgeon console module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1801	System Warning	haptic master module communication failure	surgeon console module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1802	System Prompt	ergonomic module communication failure	surgeon console module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1850	System Warning	trolley safety monitoring board communication failure	surgical trolley module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1851	System Warning	column safety monitoring board communication failure	surgical trolley module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1852	System Warning	Actuation module %1 monitoring module communication failure	surgical trolley module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1853	System Warning	Actuation module %1 motor control module communication failure	surgical trolley module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1854	System Warning	Robotic arm %1 motor control module communication failure	surgical trolley module communication failure	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2000	System Warning	self-test: surgeon console system %s	self-test: surgeon console system %s	Please contact Customer Services for tech support.
GD10-INFO-2001	System Warning	surgeon console system: %s	surgeon console system soft restart: %s	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2002	System Warning	CPU usage exceeds threshold: %s	CPU usage exceeds threshold: %s	Please contact Customer Services for tech support.
GD10-INFO-2003	System Prompt	Surgeon Console control workstation cpu temperature warning, current value: 1%d,	Surgeon Console control workstation cpu temperature warning	Please contact after-sales support.

ID	Alarm type	Description	Message	Advice
		threshold: 85		
GD10-INFO-2100	System Warning	self-test: surgical trolley system %s	self-test: surgical trolley system %s	Please contact Customer Services for tech support.
GD10-INFO-2101	System Warning	surgical trolley system soft restart: %s	surgical trolley system soft restart: %s	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2102	System Warning	CPU usage exceeds threshold: %s	CPU usage exceeds threshold: %s	Please contact Customer Services for tech support.
GD10-INFO-2103	System Prompt	Surgical Trolley control workstation cpu temperature warning, current value: 1%d, threshold: 85	Surgical Trolley control workstation cpu temperature warning	Please contact after-sales support.
GD10-INFO-2200	System Warning	self-test: vision system %s	self-test: vision system %s	Please contact Customer Services for tech support.
GD10-INFO-2201	System Warning	visual processing workstation soft restart: %s	visual processing workstation soft restart: %s	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2202	System Warning	CPU usage exceeds threshold: %s	CPU usage exceeds threshold: %s	Please contact Customer Services for tech support.
GD10-INFO-2203	System Prompt	visual processing workstation cpu temperature warning, current value: 1%d, threshold: 95	visual processing workstation cpu temperature warning	Please contact after-sales support.
GD10-INFO-2300	System Warning	self-test failure: surgical trolley UI module status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2301	System Warning	self-test failure: visual UI module status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2302	System Warning	self-test failure: visual processing module status check abnormal	self-test failure: surgical trolley module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2303	System Warning	self-test failure: surgeon console UI status check abnormal	self-test failure: surgeon console module error	Please restart the system, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-2304	System Warning	Surgical Trolley voice communication service startup failed	Surgical Trolley voice communication service startup failed	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-2305	System Warning	Surgeon Console voice communication service startup failed	Surgeon Console voice communication service startup failed	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-2306	System Warning	High-frequency cable and surgical	High-frequency cable and surgical	In the high-frequency settings, configure the

ID	Alarm type	Description	Message	Advice
		instrument mapping not configured	instrument mapping not configured	mapping relationship between the high-frequency cable and the surgical instrument.
GD10-INFO-1900	System Warning	Surgical Trolley component communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1901	System Warning	Surgeon Console component communication failure	%s (component 4%d) communication failure	Please try to restart the Surgeon Console, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1902	System Warning	Surgeon console communication disconnected	Surgeon console communication disconnected	Please confirm communication cable connection or restart surgeon console. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1903	System Warning	Surgical trolley communication disconnected	Surgical trolley communication disconnected	Please confirm communication cable connection or restart surgical trolley. If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1904	System Warning	visual processing workstation communication disconnected	visual processing workstation communication disconnected	Please restart surgical trolley, If the error reappear, please contact Customer Services for tech support.
GD10-INFO-1905	System Prompt	%s message hijacked	%s (component %1) message is hijacked	
GD10-INFO-1906	System Warning	%1 Actuation module motor control module communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1907	System Warning	%1 Actuation module motion control module communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1908	System Warning	%1 Actuation module monitoring module communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1909	System Warning	%1 Haptic master communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1910	System Warning	Robotic arm motion control module communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1911	System Warning	%1 Robotic arm motor control module communication	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.

ID	Alarm type	Description	Message	Advice
		failure		
GD10-INFO-1912	System Warning	Visual processing module communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1913	System Warning	Ergonomic module communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1914	System Warning	UPS communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.
GD10-INFO-1915	System Warning	%s communication failure	%s (component 4%d) communication failure	Please try to restart the system, if the fault cannot be resolved, please contact after-sales support.

Table 12.4 Meaning of the variable fields in the alarm status

Variable field content	Mutable character	Meaning of variable characters
robotic arm %1	%1	Index number of the robotic arm
actuation module %1	%1	Index number of the actuation module
linear module %1	%1	Index number of the linear module
rotary module %1	%1	Index number of the rotary module
motion monitoring module %1	%1	Index number of the motion monitoring module
haptic master %1	%1	Left or right hand
%r	%r	Robotic arm clearance reaching the limit
%s (component %1)	%s	Component name
%s (component %1)	%1	Component number
1%d EPOS	1%d	EPOS index number
1%d non-feed shaft	1%d	Index number of the non-feed shaft
EPOS error 2%d	2%d	Error code
component(4%d)	4%d	Component number
Error code: 1%d, 1%d	1%d	Error code
instrument [number:%s]	%S	Instrument serial number
Joint 1%d	1%d	Robotic arm's joint index number
Joint encoder 1%d	1%d	Robotic arm's joint encoder index number
Joint motor 1%d	1%d	Robotic arm's joint motor index number
Joint potentiometer 1%d	1%d	Robotic arm's joint potentiometer index

		number
Endoscope device initialization error (%s)	%S	Error content
Actuation module 1%d shaft	1%d	Index number of the actuation module's axis
Remaining usable time [2%d] minutes	2%d	Minutes remaining
Used time [2%d minutes]	2%d	Minutes used
Perform%s operation	%S	Operation name
Total packages sent: 8%d. Total retransmission packages: 8%d	8%d	Number of packages

12.3.2 Alarm Tone

For the alarm tones of the Surgical Trolley or the Surgeon Console, the maximum sound pressure level is not less than 80 dB, and the sound pressure level of all alarm sounds is not less than 45 dB.

In “audio settings”, set the volume of alarm tone, which can be adjusted from 0 to 100. Default volume is 50. Note that 0 represents the minimum adjustable volume, 100 represents the maximum adjustable volume, and does not represent the sound pressure level.

Click the “save” button in the “audio setting”, and enter the user password to save the alarm sound volume adjustment. After the system restarts, log in as the same user, and the Surgical Trolley will automatically restore the last saved settings; After clicking the “save” button, the Surgeon Console needs to click “update” in the “user profile.” After the system restarts, select the saved user profile and click “apply” to restore the selected settings.

 CAUTION	1) In case of power interruption, after the power is restored, the audio settings of the Surgical Trolley can be automatically restored after the user logs in; The audio setting of the Surgeon Console can be automatically restored to the last “updated” setting.
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12.3.3 Alarm Light

Table 3.5, Table 3.6 and Table 3.7 show the flashing modes of the alarm lights under different conditions.

12.3.4 Handling Ongoing Surgery during Alarms

In the event of a system failure (including power failure) during the surgery

using this product, the operator should first assess whether the malfunction can be resolved. If it is determined that the malfunction is not resolvable, the operator must make the decision to stop the surgery immediately. The main steps in the surgery termination process involve exiting and removing all the surgical instruments and the 3D endoscope, and safely driving the Surgical Trolley away from the operating table.

As shown in Figure 9.6, click the instrument exit button to pop up the instrument exit option. The methods for removing the surgical instruments and 3D endoscopes from the patient cavity include electric exit, semi-electric exit, and manual exit.

Electric exit: The user can activate the electric exit function of any actuation module using the status touchscreen. After the electric exit function is activated, continuously press the move-out button of the actuation module to realize the exit movement of the surgical instruments and the 3D endoscope. After exiting, the user can unlock the surgical instruments or unload the 3D endoscope by triggering the multi-functional button.

Semi electric exit: The user can activate the semi electric exit function of any actuation module using the status touchscreen. After the semi electric exit function is activated, unlock the surgical instruments using the instrument release wrench. If necessary, close the instrument grip by turning the grip release knob on the surgical instruments. The user keeps pressing the move-out button on the linear module, and the rotary module moves backward. Hold the surgical instruments or 3D endoscope at the same time to realize the separation of the surgical instrument or 3D endoscope from the rotary module. When the above surgical instruments or 3D endoscope is disconnected from the instrument adapter, the stem of the surgical instruments or 3D endoscope is may generate rebound movement. Please ensure that the surgical end-effector is in sight and operate carefully to avoid rebound movement of the stem. Then press the move-out button continuously, hold the surgical instruments or 3D endoscope at the same time, and follow the rotary module until there is enough space between the rotary module and the trocar to unload the surgical instruments or 3D endoscope.

Manual exit: The user can activate the manual exit function of any actuation module through the status touchscreen interface. For the manual exit, the user unlocks the surgical instruments using the instrument release wrench, and if necessary, close the grip by turning the grip release knob on the surgical instruments. Remove the manual exit knob shell by rotating it counterclockwise. Then rotate the manual exit

knob at the end of the linear module clockwise to drive the rotary module to move backward, and hold the surgical instruments or 3D endoscope at the same time to realize the separation of the surgical instruments or 3D endoscope from the rotary module. When the above surgical instruments or 3D endoscope is separated from the instrument adapter, the stem of the surgical instruments or 3D endoscope may generate rebound movement. Please ensure that the surgical end-effector is in sight and operate carefully to avoid rebound movement of the stem. Then continue to twist the manual exit knob at the end of the linear module to drive the rotary module to move backward, hold the surgical instruments or 3D endoscope, and follow the rotary module until there is enough space between the rotary module and the trocar to unload the surgical instruments or 3D endoscope. Figure 12.6 and Figure 12.7 show the manual exiting of the rotary module and the manual releasing of the surgical instruments or 3D endoscope, respectively.

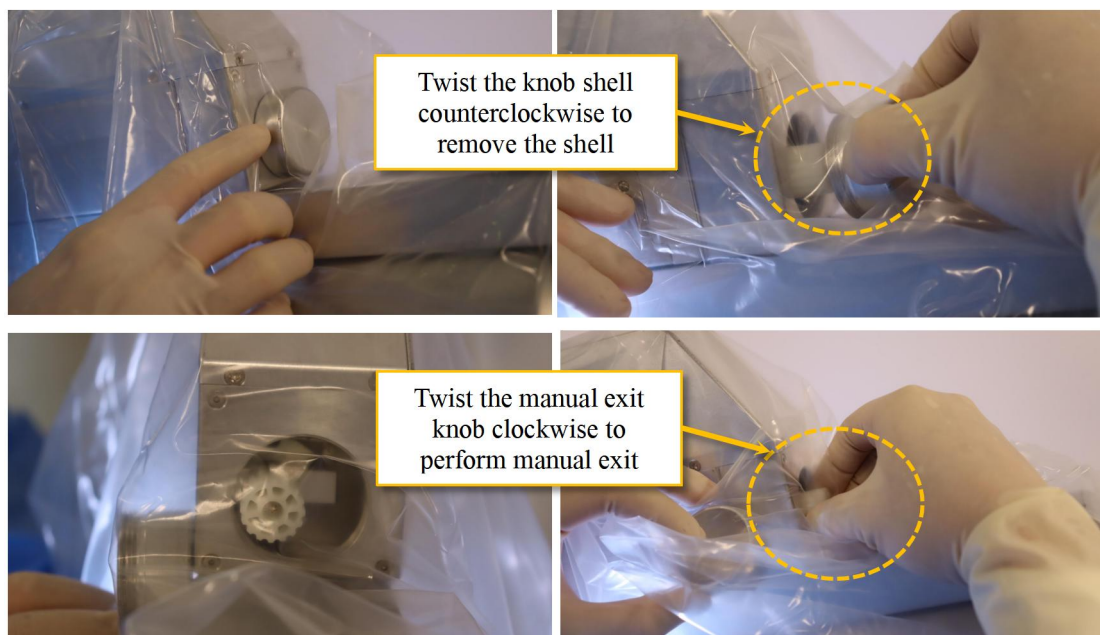
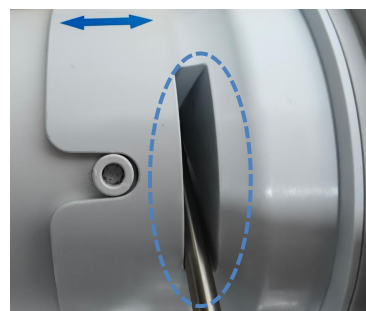


Figure 12.6 Rotary module manual exit knob



Instrument releasing slot



Insert the wrench into the circular hole, rotate along the slot so as to release the instrument

Figure 12.7 Manual release of the surgical instruments

The bedside Surgical Trolley separation includes electric separation and non-electric separation. When the system power supply is normal and the functions of column, wheel and stabilization feet are normal, the electric method can be selected to separate the Surgical Trolley from the operating table, just as the routine use method of the system. If the electric separation cannot be carried out due to system failure, the Surgical Trolley can be separated manually. The manual separation procedure of the Surgical Trolley from the operating table mainly includes manually raising the column, manually raising the stabilization feet, manually releasing the wheel and pushing the Surgical Trolley from the operating table. Refer to Section 3.4.1 for details.

 CAUTION	1) During use, pay attention to observe whether the system moves unexpectedly. In such cases, immediately press the emergency-stop button on the Surgeon Console or Surgical Trolley to stop the system movement. If necessary, restart the system before continuing the surgical operation process. 2) After intraoperative reboot, if the system meets the recovery conditions, the user can click “confirm” on the touch screen to restore the system state before restart.
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12.3.5 Alarm Log

This product has the function of logging. The user can view alarm logs through “log” in the “system” menu.

 CAUTION	1) If the external power supply and UPS are interrupted in the same time, the system will possibly not be able to record the log after the power failure; the log for a short period of time before power failure may be lost.
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Chapter 13 Service Life, Reusability Limits and Accessories

13.1 Service Life and Attached Accessories

See the table below for the system service life.

Table 13.1 Service Life of System Components

Component	Model	Service life
Surgeon Console	SR-ENS-600-SC	8 years
Surgical Trolley	SR-ENS-600-ST	8 years

13.2 Endoscope, Instruments and Reusable Accessories

See the table below for the validated number of reuses for the 3D endoscope, surgical instruments and reusable accessories.

Table 13.2 Number of uses of 3D endoscope, surgical instruments and reusable accessories

Name		Model	Service Life
3D endoscope		SR-ENP-SP1001	50 uses
Surgical instruments	Curved bipolar dissector	SR-ENT-SP0801	10 uses
		SR-ENT-SP0801S	10 uses
	Maryland bipolar forceps	SR-ENT-SP0802	10 uses
		SR-ENT-SP0802S	10 uses
	Monopolar curved scissors	SR-ENT-SP0803	10 uses
		SR-ENT-SP0803S	10 uses
	Monopolar cautery hook	SR-ENT-SP0805	10 uses
		SR-ENT-SP0805S	10 uses
	Bipolar forceps	SR-ENT-SP0806	10 uses
		SR-ENT-SP0806S	10 uses
	Needle driver	SR-ENT-SP0807	10 uses
		SR-ENT-SP0807S	10 uses
	Tissue forceps	SR-ENT-SP0808	10 uses
		SR-ENT-SP0808S	10 uses
	Large tissue forceps	SR-ENT-SP0809	10 uses

	Large needle driver	SR-ENT-SP0809S	10 uses
		SR-ENT-SP0810	10 uses
		SR-ENT-SP0810S	10 uses
Reusable accessories	Monopolar energy instrument cord	SR-ENT-MPC1000	10 uses
	Bipolar energy instrument cord	SR-ENT-BPC1000	10 uses

The surgical instruments and the 3D endoscopes have restrictions on the number of uses, as shown in Figure 9.20, you can view the number of times the instruments are available. The system will send out alarm when the instruments with the usage times approaching or reached the limit are installed. Click the alarm information in the system information bar to view the alarm details. Typical alarm information approaching or reaching the upper limit is shown in Figure 13.1.

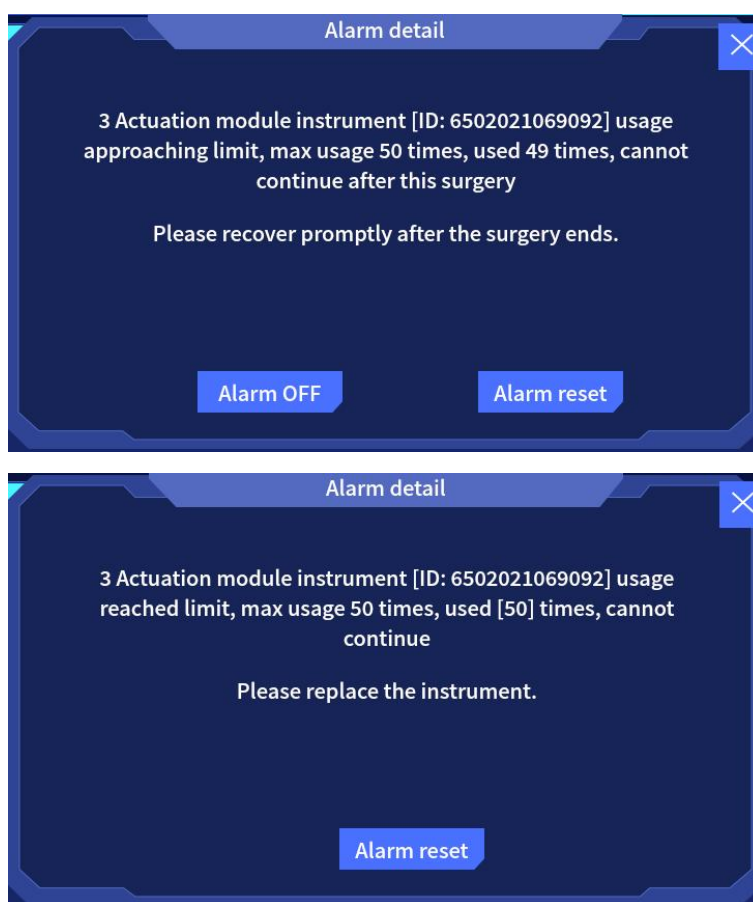


Figure 13.1 Alarm information of approaching or reached the limit of use

 WARNING	1) Surgical instruments, 3D endoscopes and accessories have limits on their uses. Users are responsible for avoiding using them beyond the approved usage limit, so as to avoid harm to patients caused by the decline of the performance. 2) For the disposal and replacement of surgical instruments, 3D endoscope, cables and other components, please contact Surgerii Robotics. The use of unauthorized components may result in serious injury to patients or surgical complications.
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13.3 Single-use Accessories and Shelf Life

The following accessories are intended for single use only and must not be reprocessed or reused. Reuse of single-use devices may lead to device failure or patient injury.

Table 13.3 Shelf Life of Single-use Accessories

Name	Model	Shelf Life
Single-use Accessories	Trocar incision protector	SR-TCIP-4-1 2 years
	Trocar incision protector	SR-TCIP-4-2 2 years
	Trocar incision protector	SR-TCIP-4-3 2 years
	Trocar incision protector	SR-TCIP-4-4 2 years
	Trocar incision protector	SR-TCIP-3-2 2 years
	Trocar incision protector	SR-TCIP-3-3 2 years
	Sterile drape	SR-ENS-600-D1 2 years
	Sterile drape	SR-ENS-600-D2 2 years

13.4 End-of-life and Disposal Information

Dispose of the surgical instruments, 3D endoscopes and accessories following the hospital procedure for processing medical wastes and all applicable national and local laws and guidelines.

	The disposal shall be made in compliance with the Waste Electrical and Electronic Equipment Directive (2012/19/EU).
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Appendix A Symbols and Identifications

Table A.1 Attentions

Number	Symbol	Description
1	 Caution	CAUTION symbol alerts reader what needs attention when operating and using. Details of relevant scenarios are given in boxes similar to this box.
2	 Warning	WARNING symbol alerts reader about a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to the user or patient or damage to the equipment or other property. Details of relevant scenarios are given in boxes similar to this box.
3	 Hazard	HAZARD symbol alerts reader about a situation which, if not avoided, could result in death or serious injury or serious damage to the equipment or other property. Details of relevant scenarios are given in boxes similar to this box.
4	 Prohibition	PROHIBITION symbol alerts reader about actions that are absolutely forbidden or prohibited. Details of relevant scenarios are given in boxes similar to this box.
5		Operating instructions
6		Read the User Manual before use
7		Caution

Table A.2 Current

Number	Symbol	Description
1		Alternating current

Table A.3 Grounding

Number	Symbol	Description
1		Protective earth (ground)
2		Earth (ground)

Table A.4 Other symbols

Number	Symbol	Description
1		Type CF Applied Part
2		Country of manufacture
3		Use by Date
4		Serial Number
5	IPN.N₂	Ingress Protection (IP) Rating
6		Non-sterile
7		Do not use if package is damaged
8		Do not re-use
9		Unique Device Identifier
10		Medical Device
11		Dispose in accordance with local regulations—particularly applies to electronic components
12		Batch code
13		Model number

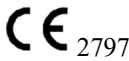
Number	Symbol	Description
14		Sterilized using ethylene oxide
15		Do not re-sterilize
16		Manufacturer
17		Authorized representative in the European Union
18		Catalogue number
19		In conformity with Regulation (EU) 2017/745 European Medical Devices Regulation (MDR)

Table A.5 Warning signs

Number	Sign	Description
1		Hands pinching warning
2		No sitting

Table A.6 Outer packaging symbols

Number	Symbol	Symbol Name
1		Keep dry
2		Keep away from sunlight
3		Fragile, handle with care
4		Temperature limit

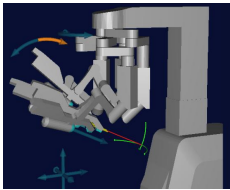
Number	Symbol	Symbol Name
5		Humidity limit
6		Atmospheric pressure limit
7		This way up
8		Do not roll
9		Do not stack
10		Stacking limit by number

Table A.7 Symbols or icons on UI

Number	Symbol or icon	Description
1		Menu: Settings
2		Menu: System
3		Menu: Users
4		Electric coagulation of the instrument assigned to the left haptic master is activated
5		Electric cutting of the instrument assigned to the left haptic master is activated
6		Electric coagulation of the instrument assigned to the right haptic master is activated

7		Electric cutting of the instrument assigned to the right haptic master is activated
8		Haptic master and surgical instrument are not matched
9		Haptic master and surgical instrument are matched
10		Indicates the endoscope is in control and the tilting angle of the endoscope
11		The surgical instrument supports electric coagulation
12		The surgical instrument supports electric cutting
13		Actuation module index number
14		Symbol of 3D endoscope
15		Appears when both the left and right hand-assigned instruments are monopolar energy instruments.
16		Appears when both the left and right hand-assigned instruments are bipolar energy instruments.
17		Appears on the left when the swap pedal is pressed and held to indicate that the actuation module 1 is swapped between two haptic masters
18		Appears on the right when the swap pedal is pressed and held to indicate that the actuation module 1 is swapped between two haptic masters
19		Screen locked
20		Screen unlocked
21		Switch this instrument to the right hand
22		Switch this instrument to the left hand
23		UPS charging

24		UPS NOT charging
25		Switch language
26		Voice enabled
27		Voice disabled
28		Microphone enabled
29		Microphone disabled
30		Login password is invisible
31		Login password is visible
32		Connected to grid power
33		NOT connected to grid power.
34		Teleoperation connection is established
35		Teleoperation connection is not established
36		View switch: switch views between status of the actuation modules and the pose simulation of the robotic arms
37		Instrument exit
38		“Wiping” function for 3D endoscope
39		Coordinated adjustment mode: Rotate clockwise
40		Coordinated adjustment mode: Rotate counterclockwise
41		Coordinated adjustment mode: Pitch down
42		Coordinated adjustment mode: Pitch up
43		Coordinated adjustment mode: Move left
44		Coordinated adjustment mode: Move right
45		Coordinated adjustment mode: Move backward
46		Coordinated adjustment mode: Move forward

47		Coordinated adjustment mode: Move down
48		Coordinated adjustment mode: Move up
49		Coordinated adjustment mode: Move in
50		Coordinated adjustment mode: Move out
51		Left-right rotation of the robotic arm simulation
52		Up-down rotation of the robotic arm simulation
53		Zoom in-out of the robotic arm simulation
54		Actuation module assigned to left haptic master
55		Actuation module assigned to right haptic master
56		The pose simulation of the robotic arms

Product Labels

The Surgeon Console label is located on the back surface of the console's outer casing, above the cable connection panel.

The Surgical Trolley label is located on the back surface of the trolley's outer casing, below the Surgical Trolley helm.

These product labels contain essential information for each device.

Appendix B Glossary

Table B.1 Abbreviations

Abbreviation	Meaning
BPC	Bipolar Energy Instrument Cord
ENP	3D Endoscope
ENS	Endoscopic Surgical System
ENT	Surgical instrument
MPC	Monopolar Energy Instrument Cord
SC	Surgeon Console
SP	Single-Port
SR	Beijing Surgerii Robotics Company Limited
ST	Surgical Trolley
SW	Software
UI	User Interface
UPS	Uninterruptible Power Supply

Table B.2 Terms

Term	Definition
2D display	Located on the Surgeon Console. During surgery, the image signal is transmitted to and displayed on the 2D display.
2D/3D video port	Located on both the Surgical Trolley and the Surgeon Console. 2D/3D video cables are plugged in to transmit and receive imaging signal through these ports.
3D endoscope housing	Part of the 3D endoscope. Housing for the electronics, providing mounting, and transmission with the actuation module to drive the motion of 3D endoscope.
3D endoscope stem	Part of the 3D endoscope. It connects the distal vision module and the 3D endoscope housing. The distal portion (near vision module) of the stem is flexible and the proximal portion (near the housing) is rigid.
3D viewer	Located on the Surgeon Console. The 3D viewer shows the stereoscopic image of the surgical field of view and the system status to the surgeon.
Actuation module	Part of the robotic arm. Composed of a linear module and a rotary module. It is to drive the surgical instrument and 3D endoscope.
Alarm	System prompt for the user through visual and auditory approaches, including alarm information in the system information bar, alarm light, and the corresponding

	alarm tone.
Alarm information bar	A component on the user interface screen, to display the alarm information that needs to be read by the user during surgery.
Armrest	Located on the Surgeon Console, to provide comfortable arm support for the user.
Audio system	The audio system consists of two sets of microphones and speakers installed in the Surgical Trolley and the Surgeon Console, respectively, used for voice communication between OR personnel and the surgeon.
Base	Part of the Surgical Trolley. It integrates wheels, stabilization feet, front button panel, cable connection panel, UPS buttons, helm and system status touchscreen stack.
Battery indicator	Displays the battery status of the UPS.
Beam	Part of the Surgical Trolley. The front end of the beam-end has a LED status indicator and connects with all 4 robotic arms.
Bipolar energy instrument cord	Bipolar energy instrument cords are used to connect electrical surgical instruments and high frequency generators to transmit electrical energy.
Blue pedals	Located on the Surgeon Console. They activate the electric coagulation function of the surgical instrument.
Brake	Located on the Surgeon Console. It controls the locking mechanism of the Surgeon Console to prevent unexpected movement.
Clutch pedal	Located on the Surgeon Console. Pressed to disconnect the matching status of the haptic masters and the surgical instruments.
Cold light source	Providing the illumination through the optical fiber.
Column	Part of the Surgical Trolley. It can be raised and lowered, with its top fixed to the beam.
Coordinated adjustment	Under specific condition, users are allowed to move the 4 robotic arms together around the trocar entry point.
Disposable tip cover	Used with the monopolar curved scissors. it sleeves the distal portion of the monopolar curved scissors during operation.
Emergency power reset	Located on both the Surgeon Console and the Surgical Trolley. Used to reset the power supply.
Emergency-stop button	Located on both the Surgeon Console and the Surgical Trolley. Used to cut off the system power supply in an emergency.

End-effector	Distal part of the instrument. It performs various surgical operations.
Endoscope cable	It connects to the Surgical Trolley's endoscope port to transmit the image signal obtained by the 3D endoscope.
Endoscope control pedal	Located on the Surgeon Console. Used to switch from controlling the surgical instrument to controlling the 3D endoscope.
Ergonomic control buttons	Located on the Surgeon Console. Ergonomic adjustment for the user can be realized through them.
Execution button	Located on the Surgical Trolley. It enables the movement of the robotic arms towards the target pose.
Finger clutch	Part of the haptic master. Triggered to disconnect the matching status of haptic master and surgical instrument.
Grip	Part of the haptic master. Triggered to control the closing angle of the instrument end-effector.
Grip release knob	Part of the surgical instrument. Used to manually open the grip when necessary.
Handle	Located on the back of the Surgeon Console. Can be pushed or pulled by the user to move the Surgeon Console.
Haptic masters	Located on the Surgeon Console. It consists of the left haptic master and the right haptic master, which are used to collect user operation inputs.
Height indicator	Located below the beam-end of the Surgical Trolley. It projects cross shaped light spots downward to indicate the appropriate height.
High-frequency generator	Providing the energy to enable active instruments to perform electric cutting or coagulation.
Horizontal laser	Located at the front of the beam-end of the Surgical Trolley. It projects a horizontal line, indicating the possible collision between the Surgical Trolley and objects hung from the ceiling.
Imaging system	It includes the 3D endoscope, the visual processing workstation in the Surgical Trolley, the 3D viewer and the 2D display of the Surgeon Console, and the cables that connect the aforementioned components.
Infrared head sensors	Located in the distal portion of the 3D viewer on the Surgeon Console. They are used to determine whether a user is present, watching the 3D viewer.
Instrument 3D simulation	A component in the surgical field of view. It displays the instrument poses during surgery in real time.
Instrument	Part of the surgical instrument. Housing for the electronics, providing mounting and

housing	transmission with the actuation module to drive the motion of the instrument.
Instrument release wrench	Used to manually release the surgical instruments or 3D endoscope.
Instrument stem	Part of the surgical instrument. It connects the end effector and the instrument housing. The distal portion (near the end effector) of the stem is flexible and the proximal end (near the housing) is rigid.
Led status indicators	Located on the Surgical Trolley. They consist of the actuation module LED status indicator, the robotic arm LED status indicators and the system alarm LED status indicator, which are used for system prompt and warning.
Light guide port	Part of the 3D endoscope. The Illuminating optical fiber is plugged in to connect the cold light source.
Linear module	Part of the actuation module. Used to drive the move-in and move-out movements of the surgical instruments and the 3D endoscope.
Login page	After the start-up self-test, the status touchscreen displays the login page. The system will verify the username and password.
Monopolar energy instrument cord	Monopolar energy instrument cords are used to connect electrical surgical instruments and high frequency generators to transmit electrical energy.
Positioning indicator	Located below the beam-end of the Surgical Trolley. It projects circular light spots downward to indicate the appropriate position relative to the patient.
Power button	Located on both the Surgeon Console and the Surgical Trolley. Used to power on and shut down the system.
Pressure valve	Part of the surgical instrument and the 3D endoscope. It balances the internal and external pressure.
Real-time robotic arm pose simulation	Displayed on the status touchscreen of the Surgical Trolley. The system provides real-time robotic arm pose simulation of the Surgical Trolley.
Robotic arms	The Surgical Trolley integrates four robotic arms. Each of them contains multiple motion joints, and an actuation module at its distal end. The robotic arm can be loaded with surgical instruments or 3D endoscope.
Rotary module	Part of the actuation module. Used to rotate the surgical instruments and the 3D endoscope.
Scaling factor	On the setting page of touchpad, user can adjust the sensitivity of the haptic master to control the movement of the surgical instrument end-effector.

Sheath connector	The sheath connector is intended to connect and fix the trocar adapter on the sterile drape with the trocar incision protector.
Stabilization feet	Located on the Surgical Trolley. After the Surgical Trolley has been moved in place, the stabilization feet can be lowered to the ground for Stabilization.
Sterile drape	Sterile drapes are used to wrap the robotic arms and column, to prevent the surgical team from directly coming into contact with these parts and then later with the patient's surgical site during surgery, thus avoiding potential infections.
Surgeon Console	During surgery, the surgeon sits in front of the Surgeon Console and controls the surgical instruments and the 3D endoscope by operating the left and right haptic masters and footswitch pedals.
Surgical instruments	The surgical instruments are controlled by the SHURUI® Endoscopic Surgical System, and include blunt and sharp endoscopic dissectors, scissors, forceps, needle drivers, endoscopic retractors, electrocautery and accessories for endoscopic surgical operations, including grasping, cutting, blunt and sharp dissection, approximation, ligation, electrocautery, and suturing through a single port.
Surgical Trolley	The Surgical Trolley can be loaded with the surgical instruments and the 3D endoscope to perform surgery in response to control signals from the Surgeon Console.
Surgical Trolley drive controller	Used to drive the Surgical Trolley to move forward, backward, and steer.
Swap pedal	Located on the Surgeon Console. Press to alternate the mapping relationship between the two surgical instruments that are assigned to the same haptic master.
System connection cable	Used to plug in the system cable socket of the Surgical Trolley for communication between the Surgeon Console and the Surgical Trolley.
System software	The system software is deployed on each workstation and control board of the Surgeon Console and the Surgical Trolley.
Touchpad	Located on the armrest of the Surgeon Console. The touchpad shows the software user interface of the Surgeon Console.
Touchpad main page	The touchpad main page includes system information bar, actuation module status display, menu bar, nickname, system time, etc.
Trocar incision protector	Trocar incision protector is intended for use with the system and is used to establish channels for endoscope and surgical instruments during surgery, protecting the incision from damage.
UPS buttons	Located on the Surgical Trolley. Used to control the UPS of the Surgical Trolley.

UPS switch	Located on the Surgeon Console. Long press this button to turn on and off the UPS power output of the console.
User profiles	The system allows user to manage user logout and user configuration, and supports a total of 10 groups of user configurations.
Vision module	Located on the distal end of the 3D endoscope. It is composed of 2 groups of imaging chips, lenses and imaging optical fibers.
Wheels	Located on the Surgical Trolley. Used to moving and steering.
White balance button	Part of the 3D endoscope. Aim at a white object and press the button to correct the color balance.
Yellow pedals	Located on the Surgeon Console. They activate the electric cutting function of the surgical instrument.

Appendix C Compliance and Classifications

1. Classification by type of protection against electric shock: Class I.
2. Classification by degree of protection against electric shock: CF for all patient applied parts (the surgical instruments that in contact with patient and 3D endoscope).
3. Classification by degree of protection against ingress of liquid:
 - 1) Surgeon Console: IPX0
 - 2) Surgeon Console footswitch pedals: IPX8
 - 3) Surgical Trolley: IPX0
 - 4) Surgical instrument: IPX7
 - 5) 3D endoscope: IPX7
4. Classification by the safety when using in the presence of flammable anaesthetic mixture with air or flammable anaesthetic mixture with oxygen or nitrous oxide: Equipment that cannot be used in the presence of flammable anaesthetic mixture with air or flammable anaesthetic mixture with oxygen or nitrous oxide.
5. Classification by mode of operation: Continuous operation.
6. Rated voltage and frequency of equipment: 220–240V~, 50/60Hz or 110–120V~, 60Hz.
7. Input power of equipment:
 - 1) Surgeon Console: 1000VA;
 - 2) Surgical Trolley: 2000VA.
8. Application part of equipment that provides protection against defibrillation discharge effect: Not applicable.
9. Signal output or input part of equipment: Yes.
10. Transportable equipment: No. This product is a stationary equipment.

Compliance

This system is in conformance with the essential requirements and provisions of the Medical Device Regulations (EU 2017/745) and the following standards:

- EN 60601-1 General requirements
- EN 60601-1-2 EMC requirements and tests
- EN 60601-1-6 Usability

- EN 60601-1-8 Alarms
- EN 60601-2-2 High frequency surgical equipment
- EN 60601-2-18 Endoscopic equipment

Essential Performance of the SHURUI® System

The following essential performance information is in compliance with IEC 60601-1.

- The Endoscopic Surgical System allows real-time acquisition of surgical field images on the side of surgical instruments through a 3D endoscope. Surgical field can be displayed normally on 2D display and 3D viewer with no interruption or blackout in image transmission.
- The Endoscopic Surgical System provides motion control of the surgical instruments and 3D endoscope loaded on the Surgical Trolley through the Surgeon Console with master-slave teleoperation accuracy and master-slave teleoperation time delay within the claimed range: master-slave teleoperation distance accuracy $\leq 2\text{mm}$, master-slave teleoperation distance repeatability $\leq 2\text{mm}$, master-slave teleoperation time delay $\leq 200\text{ms}$.
- The Endoscopic Surgical System have no unintended motion during preoperative preparation and intraoperative manipulation.

Appendix D Electromagnetic Compatibility Description

D.1 Instructions

1. This product requires specific guidance on electromagnetic compatibility and instructions for installation and use based on the electromagnetic compatibility information provided in this appendix.

2. Portable and mobile RF communication devices may affect the product.

This product complies with IEC 60601-1-2:2014 + A1:2020. During immunity testing, the basic safety and essential performance criteria in Appendix C were satisfied.

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

 WARNING	1) In the event of suspected interference from other equipment which prevents the proper functioning of the SHURUI® Endoscopic Surgical System, contact Surgerii Robotics and discontinue use of the system until the problem can be remedied, to prevent procedure delay and potential patient harm. Symptoms of interference could include repeated faults, unintentional movement of the robotic arms, instruments, or 3D endoscope, and lost or frozen video.
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D.2 Cables Used

Name	Quantity used	Length (meter)	Shielding layer
Surgeon Console Power Cable	1	7	No
Surgical Trolley Power Cable	1	7	No
System Connection Cable	1	10	Yes
2D Video Cable	1	10	Yes
3D Video Cable	1	10	Yes
Energy Activation Cable	1	5	Yes
Monopolar Energy Instrument Cord	1	5	No
Bipolar Energy Instrument Cord	1	5	No

The use of accessories and cables other than those specified by the manufacturer of this product may lead to an increase in the emission of this product or a decrease in the degree of perturbation.

D.3 Electromagnetic Emission Statement

Table D.1 IEC 60601-1-2:2014+A1:2020, Manufacturer's Declaration - Electromagnetic Emissions

IEC 60601-1-2:2014+A1:2020, Manufacturer's Declaration - Electromagnetic Emissions		
This product is intended for use in the electromagnetic environment specified below. The customer or the user of this product should ensure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11	Group 1	This product does not use RF energy for its function. Therefore, its RF emissions are very low and are not likely to cause any interference for nearby electronic environment.
RF emissions CISPR 11	Class A	This product 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	Not Applicable	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Not Applicable	

NOTE: The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

D.4 Warning

This product should not be placed near or stacked with other devices. If it is necessary to place it near or stack it with other devices, you should observe and verify that it operates properly in the given configuration.

Table D.2 IEC 60601-1-2:2014+A1:2020, Manufacturer's Declaration - Electromagnetic Immunity

IEC 60601-1-2:2014+A1:2020, Manufacturer's Declaration - Electromagnetic Immunity			
This product is intended for use in the electromagnetic environment specified below. The customer or the user of this product should ensure 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	±8 kV contact ±2 kV ±4 kV ±8 kV ±15kV air	±8 kV contact ±2 kV ±4 kV ±8 kV ±15kV air	NA
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	The network power supply should have the quality used in typical commercial or hospital environments
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	The network power supply should have the quality used in typical commercial or hospital environments
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 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 250 cycles.	<5% UT (>95% dip in UT) for 0.5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 250 cycles.	The network power supply should have the quality used in typical commercial or hospital environments. The uninterruptible power supply (UPS) can support the system to run continuously during a power interruption.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	The network power supply should have the quality used in typical commercial or hospital environments
Note: UT is the AC mains voltage before application of the test level.			

Table D.3 IEC 60601-1-2:2014+A1:2020, Manufacturer's Declaration - Electromagnetic Immunity

IEC 60601-1-2:2014+A1:2020, Manufacturer's Declaration - Electromagnetic Immunity			
This product is intended for use in the electromagnetic environment specified below. The customer or the user of this product should ensure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 12 inches (30 cm) to any part of the system, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
	6 Vrms in ISM/Amateur band	6 Vrms	
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz 9 V/m to 28 V/m Proximity fields	3 V/m 9 V/m to 28 V/m	
Note 1: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people. Note 2: In all cases, the system should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orientating or relocating the system.			

Table D.4 IEC 60601-1-2:2014+A1:2020, Recommended separation distances between portable and mobile RF communications equipment and this product

IEC 60601-1-2:2014+A1:2020, Recommended separation distances between portable and mobile RF communications equipment and this product	
This product is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of this product can help prevent electromagnetic interferences by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and this product as recommended below, according to the maximum output power of the communications equipment.	
Rated maximum	Separation distance according to frequency of transmitter meters (m)

output power of transmitter watts (W)	150kHz–80MHz $d=1.2\sqrt{P}$	80MHz–800MHz $d=1.2\sqrt{P}$	800MHz–2.5GHz $d=2.3\sqrt{P}$
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.

Appendix E Manufacturer Information

Manufacturer information:

Manufacturer Name: Beijing Surgerii Robotics Company Limited

Manufacturer Address:

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Production Address:

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102629, China

EU Representative Information

Name: Surgerii Robotics (Netherlands) B.V.

Address: Herengracht 449A, 1017 BR, Amsterdam, Netherlands

Contact: +31-850643988

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