



SERKO

BA0153 Rev 00.4

Pipeline Girth Weld Scanner

SAFETY WARNINGS / PRECAUTIONS

KEEP THIS MANUAL – DO NOT LOSE

THIS MANUAL IS PART OF THE **SERKO** SYSTEM AND MUST BE RETAINED FOR THE LIFE OF THE PRODUCT. PASS ON TO SUBSEQUENT OWNERS.

Ensure any amendments are incorporated with this document.



CAUTION! The **SERKO** is designed for a specific use. Using the **SERKO** outside of its intended use is dangerous. Failure to comply with the warnings, instructions, and specifications in this manual could result in **PERSONAL INJURY** or **EQUIPMENT DAMAGE**. Read and understand this manual before using.



WARNING! Do **NOT** operate scanner in an explosive environment. Do **NOT** operate scanner in the presence of volatile substances.



WARNING! Do **NOT** operate scanner when wearing loose clothing or exposed long hair.



WARNING! LASER RADIATION. The battery powered optical guide contains a Class 1M laser. Do not view directly with optical instruments..



WARNING! ELECTRICAL SHOCK HAZARD. Disconnect the system controller when servicing the equipment. The system controller is powered even when the push-button is latched in the off position.



WARNING! DO NOT DISASSEMBLE. No user-serviceable parts. Disassembling any of the components in this product, beyond the instructions in this user manual, could void the regulatory certifications and/or effect the safety of the product.



WARNING! If the scanner is not plugged into the power supply **OR** the scanner is not powered on, the scanner is able to freewheel around the pipe band. This could result in the scanner running around the pipe band uncontrollably and striking a person. Ensure that the motor drive wheel is engaged and power is turned on to the motor before releasing your hold of the scanner.



WARNING! A reliable power source must be used for powering the scanner. Connections must be secured to prevent accidental disconnection. Power failure may cause the scanner to freewheel down. Portable generator usage is not recommended unless accompanied by the use of an uninterruptible power supply system.



WARNING! Proper grounding of the power supply is important for safe operation. If a generator is being used to supply power to the system (not recommended), the generator must be properly grounded (see the generator manual).



WARNING! ALWAYS wear a hard hat, eye protection and steel toed boots when handling or operating the **SERKO**.



WARNING! ELECTRICAL CORDS CAN BE HAZARDOUS.

Misuse can result in **FIRE** or **DEATH by ELECTRICAL SHOCK**. Inspect thoroughly before each use. Do **NOT** use if damaged. Do **NOT** use when wet. Keep away from water. Do **NOT** drive, drag or place objects over cord.



WARNING! If this product is to be used with any Child Products listed in (*Chapter 2.3*), be sure to read and comply with the warnings, instructions, and specifications in the Child Product's User Manual(s).



CAUTION! Pinch points exist with this product. Keep fingers and hands clear of pinch points.



CAUTION! Do **NOT** handle carriage using the umbilical cable. Use the provided handles.



CAUTION! Do **NOT** operate the **SERKO** on an inspection surface which is electrically connected to a component that is being welded.



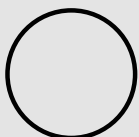
CAUTION! Do **NOT** disconnect under load. Shut off power before connecting or disconnecting the **SERKO**. Permanent damage to electronics could occur.



CAUTION! LIFTING HAZARD. Use of this product requires manual handling of heavy equipment. Be sure to use proper lifting techniques as to minimize risk of lifting related injury.



CAUTION! Power must be supplied from an approved JIREH power source.



OFF. This symbol indicates off button.



The **WEEE** symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately.
(see “Disposal” on page 118 for additional details)

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IDENTIFICATION

1.1. Product Brand

This user manual describes the proper safety precautions, setup and use of the **SERKO** system.

1.2. Manufacturer

Distributor:

Manufacturer:

Jireh Industries Ltd.
53158 Range Road 224
Ardrossan, Alberta, Canada
T8E 2K4
Phone: 780.922.4534
jireh.com

1.3. Compliance Declarations

1.3.1. ISED Emissions Compliance (Canada)

CAN ICES-003(A) / NMB-003(A)

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

1.3.2. FCC Suppliers Declaration of Conformity (United States)

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

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

RESPONSIBLE PARTY NAME:	Jireh Industries
ADDRESS:	2955 S Sam Houston Pkwy E Suite 300 Houston, Texas United States 77047
TELEPHONE:	832-564-0626

1.3.3. European Union CE Declarations

Jireh Industries hereby declares that the **SERKO** product complies with the essential requirements and other relevant provisions of the following European Union directives:



2014/30/EU	EMC Directive
2014/35/EU	Low Voltage Directive
2012/19/EU	Directive on Waste Electrical and Electronic Equipment
2011/65/EU	Directive on Restriction of Hazardous Substances (RoHS)

1.3.4. UKCA Declarations

Jireh Industries hereby declares that the **SERKO** product complies with the essential requirements and other relevant provisions of the following UK directives.



Title	Edition/Date of Issue
Electromagnetic Compatibility Regulations	2016
Electrical Equipment (Safety) Regulations	2016
Waste Electrical and Electronic Equipment Regulations	2013
Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations	2012

PRODUCT SPECIFICATIONS

2.1. Base SERKO System Specifications

This section outlines the product specifications of the base system. When the base system is used together with compatible components (*Chapter 2.2*) or child products (*Chapter 2.3*), the product specifications of the base system may be superseded. See (see “Compatible Component Specifications” on page 9) and (see “Child Product Specifications” on page 11).

2.1.1. Intended Use

The **SERKO'S** primary purpose is to perform inspections of ferrous and non-ferrous pipes by moving an inspection tool around a band attached to the surface. It is intended for industrial use only.

2.1.1.1 Operating Limits

Category	Parameter	Specification
Band Surface	Condition	Clean, free of excess rust, scale, debris (<i>i.e. dirt, sand, etc.</i>), ice, frost. No large burr on edges.
	Band cross-section geometry	Standard idler wheel assemblies (<i>BAS002</i>) are compatible with typical CRC Evans or RMS Welding Systems bands
	Minimum width	80 mm (<i>3.15 in</i>)
	Maximum width	127 mm (<i>5 in</i>)
	Minimum OD, external circumferential driving	254 mm (<i>10 in</i>)
	Maximum OD, external circumferential driving	Flat
	Minimum radial clearance from pipe surface	
	Main band	12 mm (<i>0.47 in</i>)
	Overlap section	9 mm (<i>0.35 in</i>)
	Maximum radial height of band clamping buckle/hardware above main band OD	20 mm (<i>0.78 in</i>)
	Maximum band temperature	50°C (<i>122°F</i>)
Inspection Surface	Minimum OD	
	Standard configuration	219 mm (<i>8.63 in</i>)
	With drop plate	114 mm (<i>4.5 in</i>)
	Maximum OD	Flat
	Maximum inspection surface temperature	50°C (<i>122°F</i>)

Category	Parameter	Specification
Scanner	Maximum umbilical length	60 m (200 ft)
	Maximum payload	27 kg (60 lb)
	Attachments	Restricted to those listed in compatible components or child products
	Required radial clearance above band OD	
	on 10 in OD band	232 mm (9.1 in)
	on 74 in OD band	218 mm (8.6 in)

2.1.1.2 Operating Environment

The SERKO is for use in dry industrial environments having ambient temperatures shown below. It is NOT intended for use in explosive environments

Category	Parameter	Specification
Environment	Minimum ambient temperature	-20°C (-4°F)
	Maximum ambient temperature	50°C (122°F)

2.1.1.3 User

The SERKO is intended to be used by persons who have read and understand the user manual. The intended user is to be a person without limitations in the physical abilities of the upper and lower limbs, sight, or hearing.

2.1.2. Unintended Use

The SERKO is NOT intended for:

- ▶ use outside of its intended use;
- ▶ operation on pipe bands outside the diameter range of: 10 in OD to flat;
- ▶ operation on pipe band outside the width range of: 80 to 127 mm;
- ▶ operation on pipe band unsuitable for Idler Wheels (custom Idler Wheels are available upon request)
- ▶ lifting or lowering objects or people;
- ▶ driving into or over obstructions;
- ▶ operation in temperatures below -20°C (-4°F) or above 50°C (122°F).

2.1.3. Dimensions and Weight

Category	Parameter	Specification	
Carriage (configured for Ø12 in)	A width	224 mm	8.8 in
	B depth	596 mm	23.5 in
	C height	308 mm	12.1 in
Carriage (configured for Ø72 in)	width	224 mm	8.8 in
	depth	645 mm	25.4 in
	height	233 mm	9.2 in
Carriage	weight	7.5 kg	16.5 lb

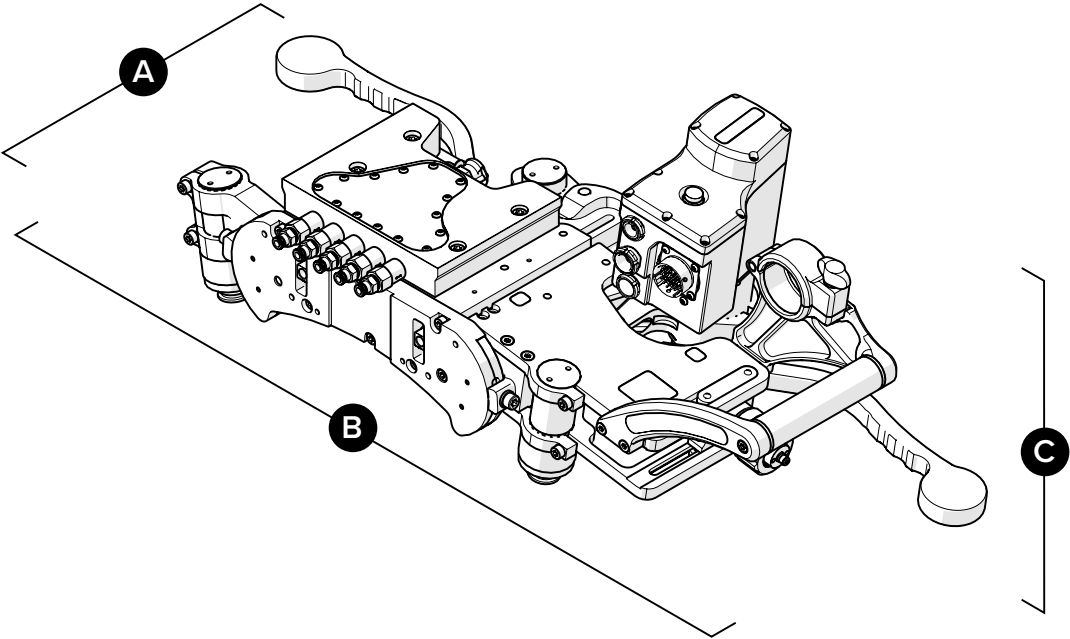


Fig. 1 - Carriage dimensions

2.1.4. Power Requirements



WARNING! A reliable power source must be used to power the carriage. Connections must be secured to prevent accidental disconnection. Power failure may cause the carriage to freewheel down when operating in a vertical orientation. Portable generator usage is not recommended unless accompanied by the use of an uninterruptible power supply.



WARNING! Proper grounding of the power supply is important for safe operation. When a generator is used to supply power to the system (*not recommended*), the generator must be properly grounded (*refer to generator manual*).



CAUTION! DO NOT DISCONNECT UNDER LOAD. Shut off power before connection or disconnecting. Permanent damage to electronics could occur.



CAUTION! Power must be supplied from an approved Jireh power source.

Power requirements: 100-240 VAC, 50/60 Hz, 3.5A

2.1.5. Environmental Sealing

Dust-tight, watertight (*not submersible*).

2.1.6. Performance Specifications

Category	Parameter	Specification
Carriage	Maximum speed	177 mm/sec (6.971 in/sec)
	Encoder resolution, motor	2464.50 counts/mm (62598.3 counts/in)

2.1.7. Encoder Interface Specifications

Output type: 4 channel quadrature 5VDC RS422 compatible.

Power: Power must be supplied to the interface.

5VDC +/-10% power limited to < 15w.

1	Enc B
2	Enc B'
3	Enc A
4	Enc A'
5	Aux Enc A'
6	Aux Enc A
7	Aux Enc B'
8	Aux Enc B
9	Enc +5V
10	Enc Com
H	Shield

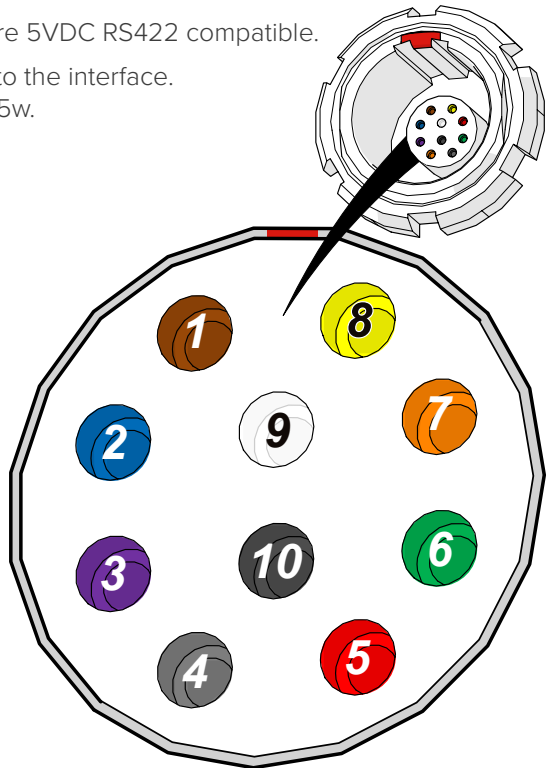


Fig. 2 - JIREH Industries pin out configuration

2.2. Compatible Component Specifications

The components listed in this section integrate with the base system to perform certain tasks. Their use may modify the product specifications (*i.e. intended use, power requirements, etc.*) from those of the base system. The specifications listed here supersede those of the base system. If no specifications are listed here, the specifications of the base system remain effective.

2.2.1. SERKO Probe Holder Frame

2.2.1.1 Intended Use

The **SERKO** Probe Holder Frame is intended to be mounted to the front of the **SERKO** to provide mounting of multiple probe holders

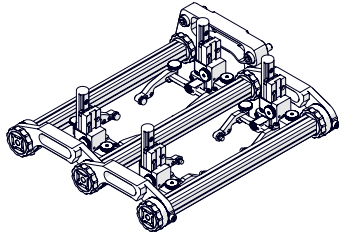


Fig. 3 - SERKO probe holder frame

2.2.1.2 Part Numbers

BAG005-	4 Probe, Phased Array and TOFD
BAG006-	Add-on, 2 Probe TOFD
BAG007-	Add-on, 2 Probe Phased Array
BAG008-	Add-on, 2 Probe Heavy Duty Phased Array
BAG009-	4 Probe, Heavy Duty Phased Array and TOFD

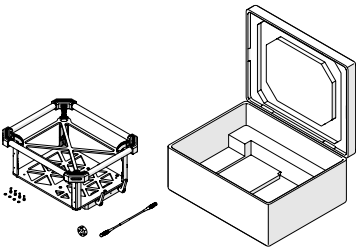
2.2.1.3 Operating Limits

Category	Parameter	Specification
SERKO probe holder frame	Maximum total weight of mounted objects (<i>including frame</i>)	7 kg (15.4 lb)
	Maximum number of probe holders	10
	Maximum width of frame	50 cm (19.7 in)

2.2.2. SERKO Instrument Box Frame
BAG010-

2.2.2.1 Intended Use

The **SERKO** Instrument Box Frame is intended to be mounted to the **SERKO** to provide mounting of a 3rd party instrument box.



2.2.2.2 Operating Limits

Fig. 4 - SERKO Instrument box frame

Category	Parameter	Specification
Instrument Box Frame	Maximum total weight of mounted objects <i>(including BAG010-)</i>	13 kg (28.6 lb)
Scanner	Required radial clearance above band OD	
	on 10 in OD band	432 mm (17 in)
	on 74 in OD band	356 mm (14 in)

2.2.3. SERKO Probe Holder Frame Drop Plate Kit
BAG011

2.2.3.1 Intended Use

The Probe Holder Frame Drop Plate Kit allows a Probe Holder Frame to be mounted lower on the SERKO. It allows the SERKO to scan smaller pipe sizes from a larger band. It is intended for use with bands for 16 in NPS pipes or smaller.

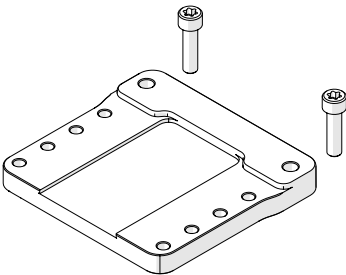


Fig. 5 - SERKO probe holder frame drop plate kit

2.2.3.2 Operating Limits

Category	Parameter	Specification	
Inspection Surface	Minimum NPS pipe size	Without drop plate	With drop plate
	With 16 in NPS pipe band	14 in	6 in
	With 14 in NPS pipe band	12 in	4 in
	With 12 in NPS pipe band	10 in	4 in
	With 10 in NPS pipe band	8 in	4 in

2.3. Child Product Specifications

The products listed in this section integrate with the base system to perform certain tasks. Their use may modify the product specifications (*i.e. intended use, power requirements, etc.*) from those of the base system. These products have a user manual of their own, and shall be referred to for their product specifications as well as how their use modifies the product specifications of the base system.

2.3.1. Motorized Couplant Pump
CMA015

The Motorized Couplant Pump aims to pump couplant fluid (non-toxic and Non-flammable) from a reservoir to a scanner for ultrasonic inspection.

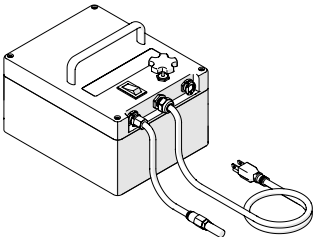


Fig. 6 - Motorized couplant pump

2.3.2. Preamp Kit CXG040-

The preamp amplifies the return signal from an ultrasonic transducer and improve the signal-to-noise ratio for transmission over long cables.

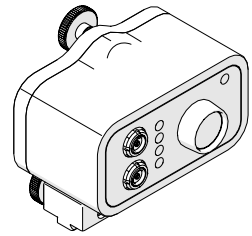


Fig. 7 - Preamp kit

2.3.3. Optical Guide CXG035

The Optical Guide mounts to any dovetail. The Optical Guide provides a green colour, point of reference for guiding scanners along a given path (*i.e. a weld*).

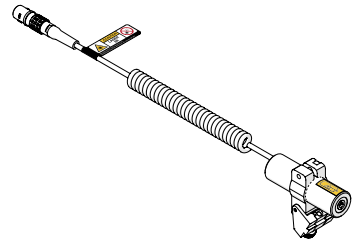


Fig. 8 - Optical guide

2.3.4. Battery / Charger DVG001-

The Battery allows the carriage to be powered without wall power. The battery is a Sealed Lithium Ion (Li-ion) battery. The battery is charged by the charger. The battery and charger are intended to be used by persons who have read and understood their user manual and the associated product user manual. The charger is intended for indoor use only (*or dry environments*).

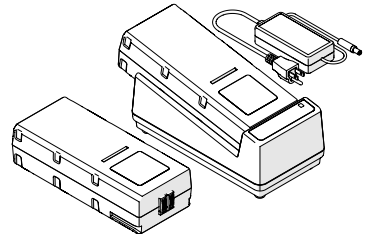


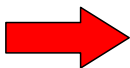
Fig. 9 - Battery / Charger

DEFINITIONS

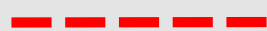
3.1. Definition of Symbols



Instructions to 'look here' or to 'see this part'.



Denotes movement. Instructing user to carry out an action in a specified direction.



Indicates alignment axis



Alerts the user that the view has changed to a reverse angle

3.2. Definitions of Terms

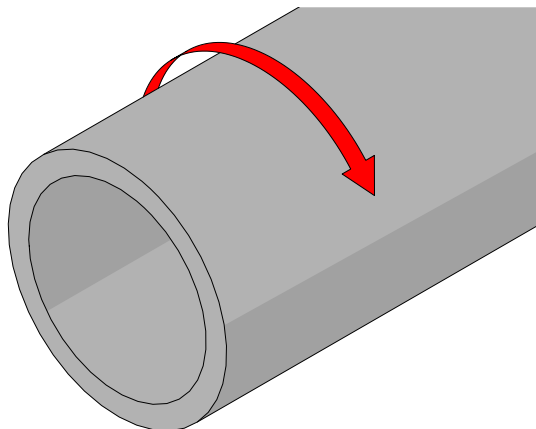


Fig. 10 - Circumferential scanning

Circumferential

Direction of scan travel is around the circumference of the pipe/tube (*Fig. 10*).

3.3. Safety Symbols

The following safety symbols might appear on the product and in this document. Read and understand their meaning below:



General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.



Shock hazard caution symbol

This symbol is used to alert the user to potential electric shock hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm.



Laser warning symbol

This symbol is used to alert the user to potential laser hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.

3.4. Safety Signal Words

The following safety signal words might appear in this document. Read and understand their meaning below:

DANGER!

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to will result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.

WARNING!

The WARNING signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to could result in death or serious personal injury. Do not proceed beyond a WARNING signal word until the indicated conditions are fully understood and met.

CAUTION!

The CAUTION signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a CAUTION signal word until the indicated conditions are fully understood and met.

SYSTEM COMPONENTS

4.1. Base System Components

4.1.1. Carriage BAA015

The motor carriage is clamped onto the band and rotates 360° around the band. A drive wheel with adjustable traction drives the motor carriage. Third party accessories can be mounted for the purpose of weld inspection.

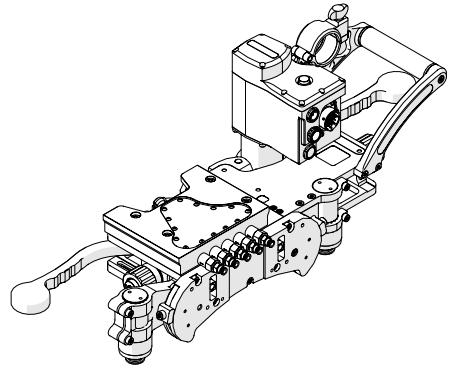


Fig. 11 - Carriage

4.1.2. High-Resolution Spring-Loaded Encoder BGS087-BJ-0.6

The high-resolution spring-loaded encoder mounts onto the frame bar of the probe holder frame.

The spring-loaded encoder wheel maintains contact pressure on the scan surface and provides positional data to the user's instrument.

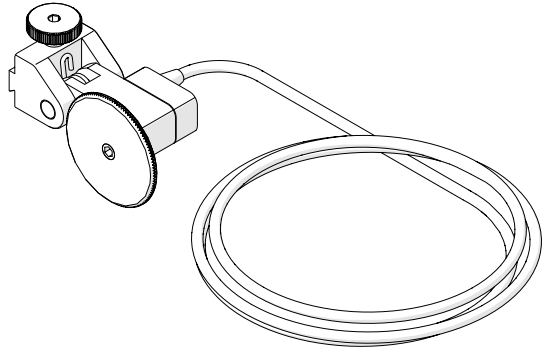


Fig. 12 - High-resolution spring-loaded encoder

4.1.3. System Controller ERA001-



CAUTION! DO NOT DISCONNECT UNDER LOAD. Shut off power before connection or disconnecting. Permanent damage to electronics could occur.



WARNING! There are no user serviceable components inside the system controller. Dangerous voltages can be present inside the case. Do **NOT** open. Return to manufacturer for repair.

The System Controller is an essential component that provides the **SERKO** with reliable power. It offers two power options, including a standard power supply that can be configured for various plug styles and is compatible with battery power (sold separately).

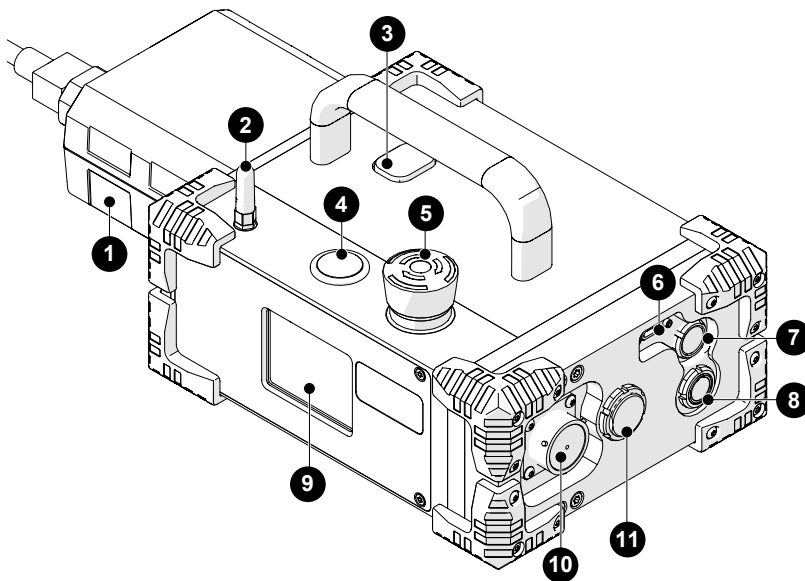


Fig. 13 - System controller

The system controller accepts 25-45VDC power from the AC/DC power supply or battery. Start/Stop logic and physical **ON** and **OFF** push buttons are integrated into the system controller.

1	AC/DC power supply	Connect the plug from a properly grounded source. Use an IEC320 cord approved for AC/DC power supply.
2	ScanLink™ Bluetooth Antenna	Bluetooth antenna for ScanLink™ enabled instruments.”
3	Release button	Unlatch the AC/DC power supply or battery from the system controller.
4	Power button	Activate system power by pressing the silver button.
5	Off button	The red off button latches down when pressed. This off button shuts down the system. Twist the off button clockwise to return to the released position. This must be done before power can be activated.
6	ScanLink™ connector	Connection for ScanLink devices.
7	AUX socket	Connection for the auxiliary cable.
8	ENC OUT socket	Connection for the encoder cable.
9	Status LCD	System controller status display.
10	Scanner connector	Connection for the umbilical.
11	NET socket	Connection for network cables for systems that support it.

In the event of a break in the stop circuit (*the stop circuit runs through the umbilical and the carriage's off button*), power will shut off.

4.1.3.1 AC/DC Power Supply



WARNING! ELECTRICAL CORDS CAN BE HAZARDOUS. Misuse can result in **FIRE** or **DEATH** by **ELECTRICAL SHOCK**. Inspect thoroughly before each use. Do **NOT** use if damaged. Do **NOT** use when wet. Keep away from water. Do **NOT** drive, drag or place objects over cord.

The **1** AC/DC power supply (*Fig. 13*) connects the system controller to a 100-240VAC, 50/60Hz grounded power source capable of supplying a minimum of 5 amps.

The safety of the system controller relies on the provision of a proper ground connection.

In environments with moisture present, a GFCI (*Ground Fault Circuit Interrupter*) must be used to ensure operator safety.

NOTE: *Some generators or DC-AC inverters may introduce significant levels of noise to the system. This may degrade overall system performance or reduce the system life expectancy. The use of generators or DC-AC inverters is not recommended and is used at the operator's risk.*

4.1.4. Umbilical UMA044-

The Umbilical is specifically designed to connect the carriage to the system controller, enabling uninterrupted power and data transmission during inspections.

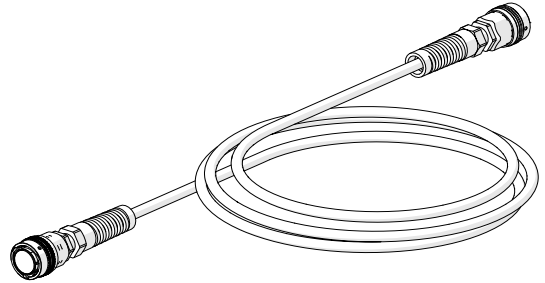


Fig. 14 - Umbilical

4.1.5. Handheld Controller DMA006



WARNING! MAGNETIC MATERIAL. The handheld controller contains magnetic material. Those with pacemakers or ICD's must stay at least 10 cm (4 in) away.



CAUTION! DO NOT DISCONNECT UNDER LOAD. Shut off power before connection or disconnecting. Permanent damage to electronics could occur.



With the Handheld Controller, users can control and adjust every aspect of the carriage's operation. The controller's color touch screen displays an intuitive and easy-to-use operating system, complete with haptic feedback.

User settings and scan information are edited using the handheld controller. The handheld controller is connected to the system controller.

The handheld controller utilizes a resistive touch screen. Care should be taken not to use sharp or gritty objects on the screen as the touch membrane can scratch. If the screen is damaged, all programmed functions can still be accessed using the D-pad.

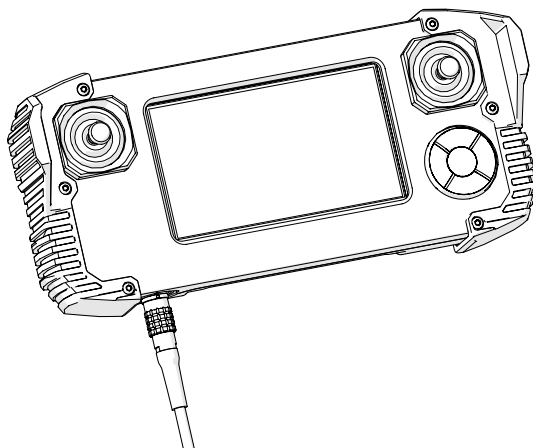


Fig. 15 - Handheld controller

NOTE: Do **NOT** connect the handheld controller while the system is activated.

4.1.6. Auxiliary Cable UMA017-

The auxiliary cable connects the handheld controller to the system controller. 36VDC and network signals are used in the cable.

Both auxiliary cable connectors are identical and interchangeable. The cable may be plugged into the 4-pin receptacle on the system controller.

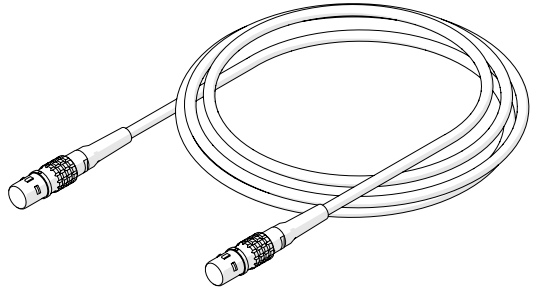


Fig. 16 - Auxiliary cable

4.1.7. J300 Encoder Cable UMA025-

The encoder cable connects the **SERKO** system to the user's instrument. This cable allows the transmission of positional signals from the **SERKO** to the instrument. The encoder cable also provides 5VDC from the user's instrument to the encoder isolation circuitry.

Various encoder styles are available for various instruments.

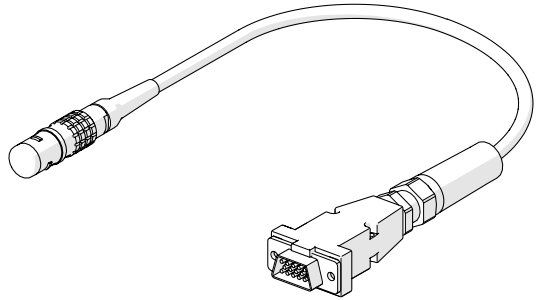


Fig. 17 - J300 Encoder cable

4.1.8. Cable Management, Elbow BAS032-

The cable management provides a means of protecting and organizing cables, tubes and hoses.

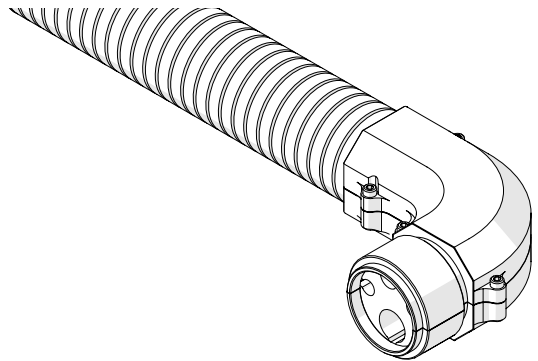


Fig. 18 - Cable management, elbow

4.1.9. Irrigation Kit CMG012-

The irrigation kit provides a variety of hoses, fittings, connectors, and splitters commonly used during non-destructive inspection.

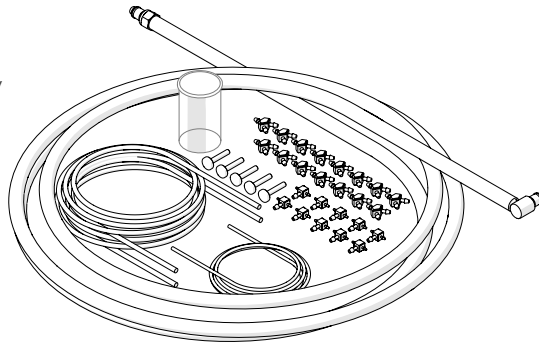


Fig. 19 - Irrigation kit

4.1.10. Battery DVA001

The battery is compatible with the system controller and will power the system for hours at a time.

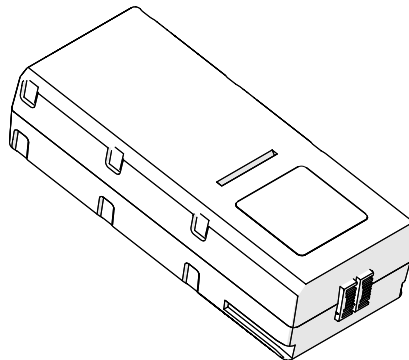


Fig. 20 - Battery

4.1.11. Charger and Power Adapter DVG002-

The charger and power adapter are used to charge the batteries.

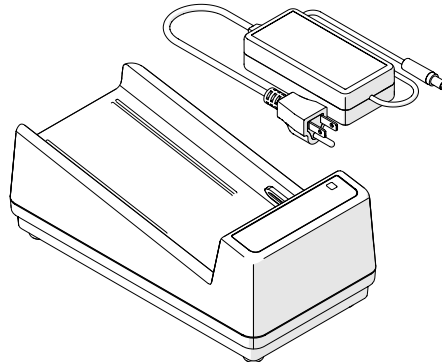


Fig. 21 - Charger and Power Adapter

4.1.12. Tools

Several tools are included for various scanner and accessory adjustments. (see “Included Tools” on page 26 for additional details).

4.1.13. Cases

Depending on the configuration selected at the time of purchase. This will determine the types and amount of cases included with the system.

4.2. Compatible Components

4.2.1. SERKO Probe Holder Frame BAG005-

The probe holder frame can be combined with add-on frames to carry up to ten probes during circumferential inspection. This frame includes two phased array vertical probe holders and two TOFD vertical probe holders.

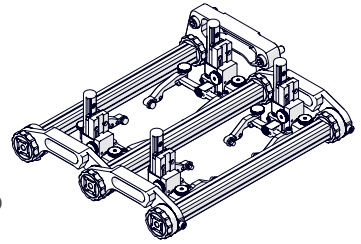


Fig. 22 - SERKO probe holder frame

4.2.2. SERKO Probe Holder Frame - TOFD Add-on BAG006-

This probe holder frame includes two TOFD vertical probe holders.

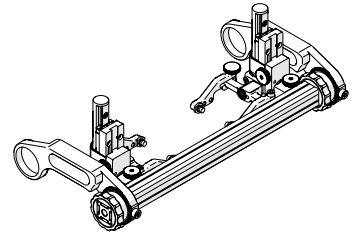


Fig. 23 - TOFD add-on

4.2.3. SERKO Probe Holder Frame - Phased Array Add-on BAG007-

This probe holder frame includes two phased array vertical probe holders.

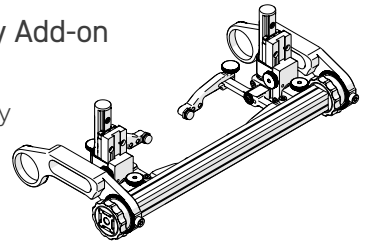


Fig. 24 - Phased array add-on

4.2.4. SERKO Heavy Duty Probe Holder Frame Add-on BAG008-

This probe holder frame includes two heavy duty vertical probe holders.

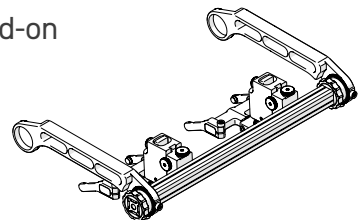


Fig. 25 - Heavy duty probe holder frame

4.2.5. SERKO Heavy Duty Probe Holder Frame BAG009-

This heavy duty probe holder frame includes two heavy duty vertical probe holders and two TOFD vertical probe holder. The heavy duty probe holder frame can be combined with add-on frames to carry up to ten probes during circumferential inspection.

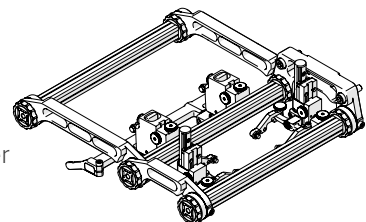


Fig. 26 - Heavy duty with TOFD add-on

4.2.6. SERKO Instrument Box Frame BAG010-01

The SERKO instrument box frame holds the user's instrument, offers a handle for the system and is compatible with Eddyfi Emerald.

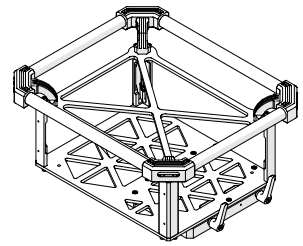


Fig. 27 - SERKO Instrument box frame

4.2.7. SERKO Instrument Box Frame BAG010-02

The SERKO instrument box frame holds the user's instrument, offers a handle for the system and is compatible with Eddyfi Emerald Splitter Box.

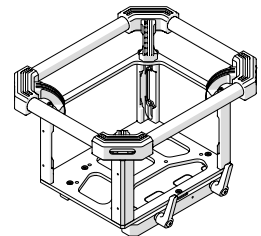


Fig. 28 - SERKO Instrument box frame

4.2.8. SERKO Probe Holder Frame Drop Plate Kit BAG011

The Probe Holder Frame Drop Plate Kit allows a Probe Holder Frame to be mounted lower on the SERKO. It allows the SERKO to scan smaller pipe sizes from a larger band. It is intended for use with bands for 16 in NPS pipes or smaller.

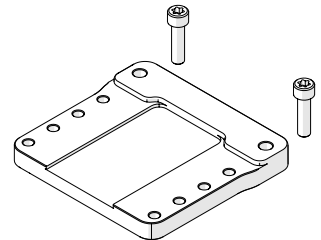


Fig. 29 - SERKO PH frame drop plate kit

4.2.9. Vertical Probe Holder PHA015-

The vertical probe holder is designed to carry many different types of probes and wedges. Available with various types of yokes, arms and pivot buttons. The vertical probe holder features several different adjustment options for each unique probe/wedge setup.

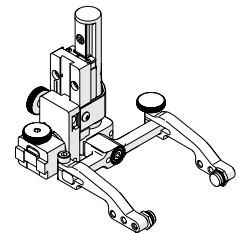


Fig. 30 - Vertical probe holder

4.2.10. 90° Heavy-Duty Vertical Probe Holder PHS109-

The 90° heavy duty vertical probe holder is designed to carry larger probes.

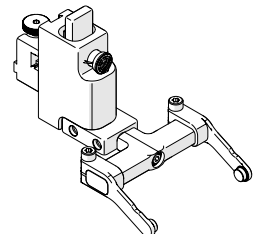


Fig. 31 - 90° Heavy duty vertical probe holder

4.2.11. Battery Powered Optical Guide CXS080

The battery powered optical guide provides a red colour point of reference useful for guiding scanners along a given path (*i.e. a weld*).

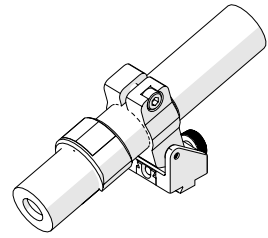


Fig. 32 - Battery powered optical guide

4.2.12. Encoder Adapter UMA010-

The encoder adapter changes the scanner's built-in encoder connector style.

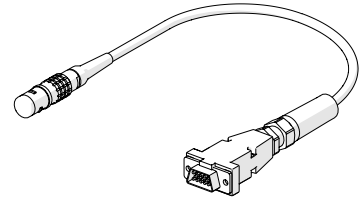


Fig. 33 - Encoder adapter

4.3. Child Products

4.3.1. Motorized Couplant Pump CMA015

The motorized couplant pump is a powered pumping unit that supplies couplant fluid to the scanning surface.

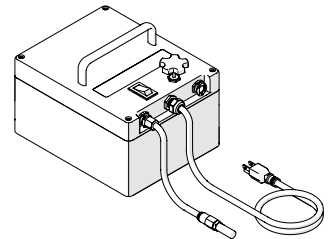


Fig. 34 - Motorized couplant pump

4.3.2. Preamp Kit CXG040-

The preamp is used to amplify the return signal from an ultrasonic transducer and improve the signal-to-noise ratio for transmission over long cables.

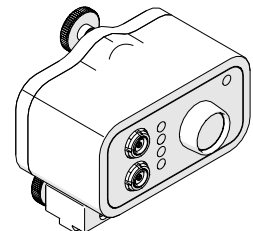


Fig. 35 - Preamp kit

4.3.3. Optical Guide CXG035

The Optical Guide mounts to any dovetail. The Optical Guide provides a green colour, point of reference for guiding scanners along a given path (*i.e. a weld*).

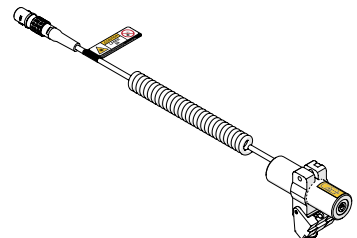


Fig. 36 - Optical guide

4.3.4. Battery Kit DVG001-

The rechargeable battery provides portable power to the carriage and components (*i.e. motorized raster arm*).

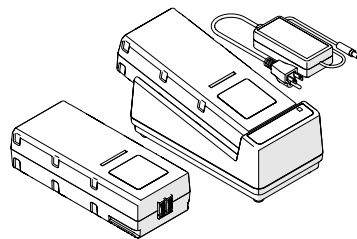


Fig. 37 - Battery kit

4.4. Tools

4.4.1. Included Tools

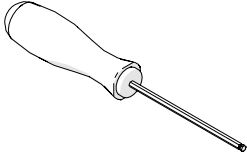


Fig. 38 - 3 mm hex driver

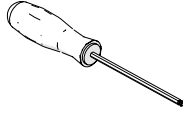


Fig. 39 - 2.5 mm hex driver

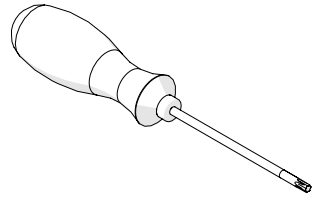


Fig. 40 - Torx driver: T25

- ▶ 3 mm hex driver (Fig. 38).
- ▶ 2.5 mm hex driver (Fig. 39).
- ▶ Torx Driver: T25 (Fig. 40).
- ▶ Torx driver: T30 (Fig. 41).
- ▶ Torx driver: T45 (Fig. 42)

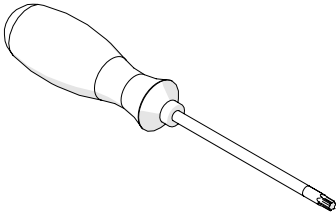


Fig. 41 - Torx driver: T30

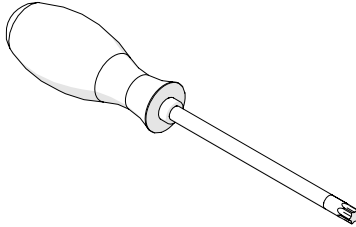


Fig. 42 - Torx driver: T45

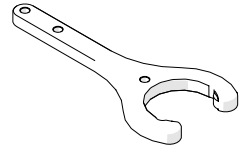


Fig. 43 - Red nut wrench

- ▶ The included red nut wrench (Fig. 43) loosens the Probe Holder frame nuts.

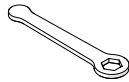


Fig. 44 - 3/8 wrench

- ▶ Also included in this kit is a 3/8 in wrench (Fig. 44), which is used to remove and install probe holder pivot buttons.

4.4.2. Optional Tools

Some specialized adjustments require tools that are not included in this kit.

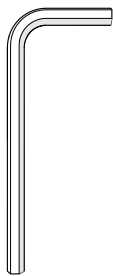


Fig. 45 - 1.5 mm hex
wrench

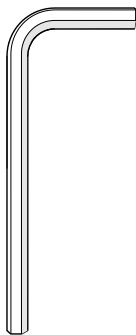


Fig. 46 - 3 mm
hex wrench

PREPARATION FOR USE

5.1. Preparation for Safe Use

5.1.1. Preparation of Inspection Surface



CAUTION! LIFTING HAZARD. Use of this product requires manual handling of heavy equipment. Be sure to use proper lifting techniques as to minimize risk of lifting related injury.

- ▶ Remove build-up of scale, and other debris (*i.e. dirt, ice*) from band on which the carriage is to drive. Excessive build-up may lead to wheel slippage or carriage detachment.
- ▶ Ensure that no obstructions (*other than standard butt welds*) or voids are in the drive path. Obstructions and voids could cause the carriage to fall if driven into or over.
- ▶ Ensure there is no damage to the contact edges of the pipe band.
- ▶ Ensure a minimum clearance of 24 cm (*9.5 in*) around the pipe band along the entire drive path.

5.2. System Connectivity

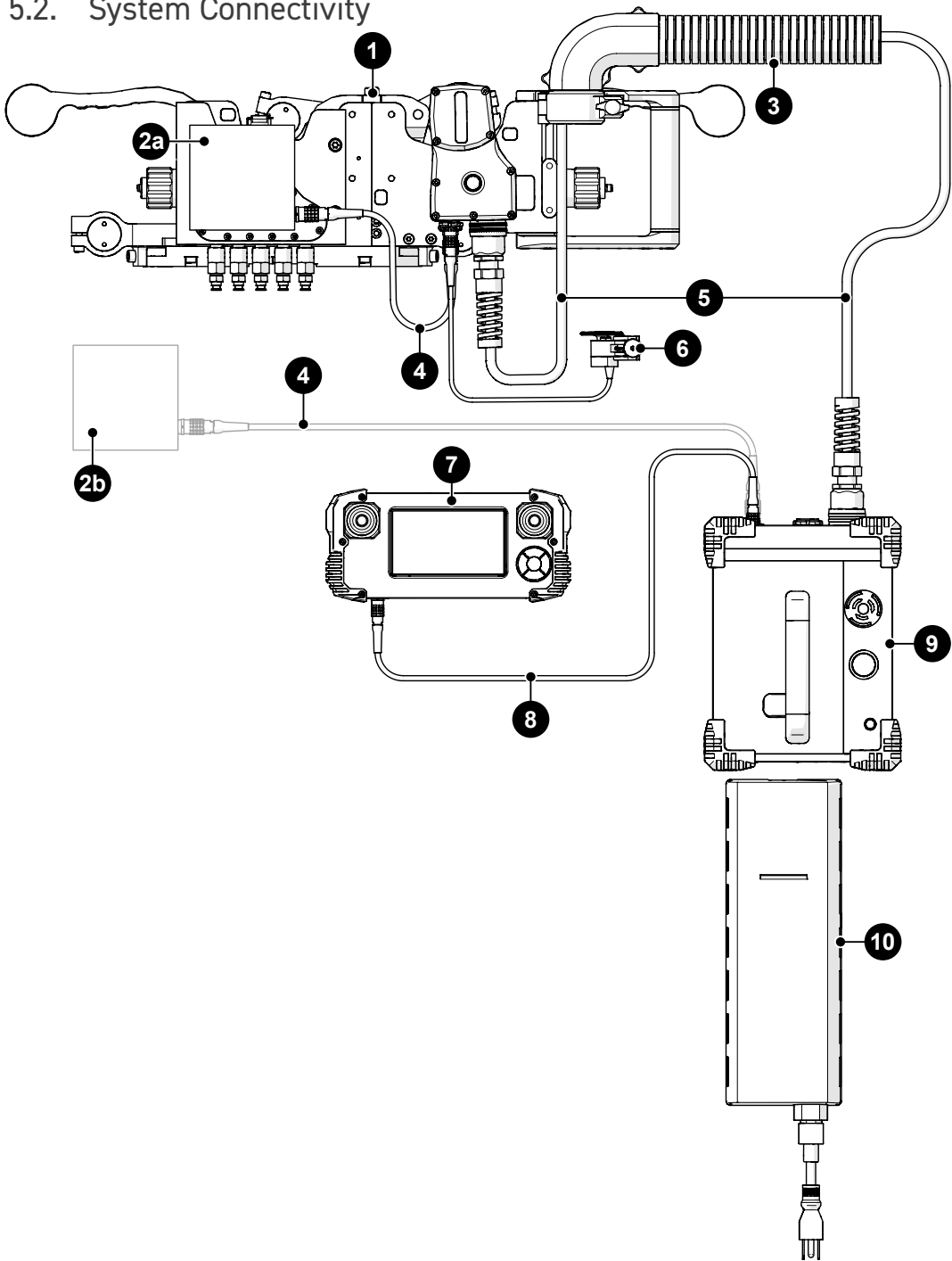


Fig. 47 - Standard carriage configuration

BOM ID	Description
1	Carriage
2a	Optional user instrument
2b	Optional user instrument
3	Cable management
4	Encoder cable
5	Umbilical
6	High-resolution spring-loaded encoder
7	Handheld controller
8	Auxiliary cable
9	System controller
10	AC/DC power supply

To configure the **SERKO** system for scanning, follow these steps:



CAUTION! DO NOT DISCONNECT UNDER LOAD. Shut off power before connection or disconnecting. Permanent damage to electronics could occur.

1. Connect the **5** umbilical to motor can of the **1** carriage.
2. Route the **5** umbilical through the **3** cable management.
3. Connect **5** umbilical to **9** system controller.
4. Connect **7** handheld controller to **9** system controller using the **8** auxiliary cable.
5. Connect the **6** high-resolution spring-loaded encoder to the motor can of the **1** carriage.
6. Connect **4** encoder cable from the **2b** user's instrument to the **9** system controller.
7. Alternatively, connect the **4** encoder cable from the **2a** user's instrument to the motor can of the **1** carriage.
8. Insert **10** AC/DC power supply into the **9** system controller.
9. (see "SERKO Configurations" on page 31) to set up a particular component.

5.3. SERKO Configurations

5.3.1. SERKO Probe Holder Frame

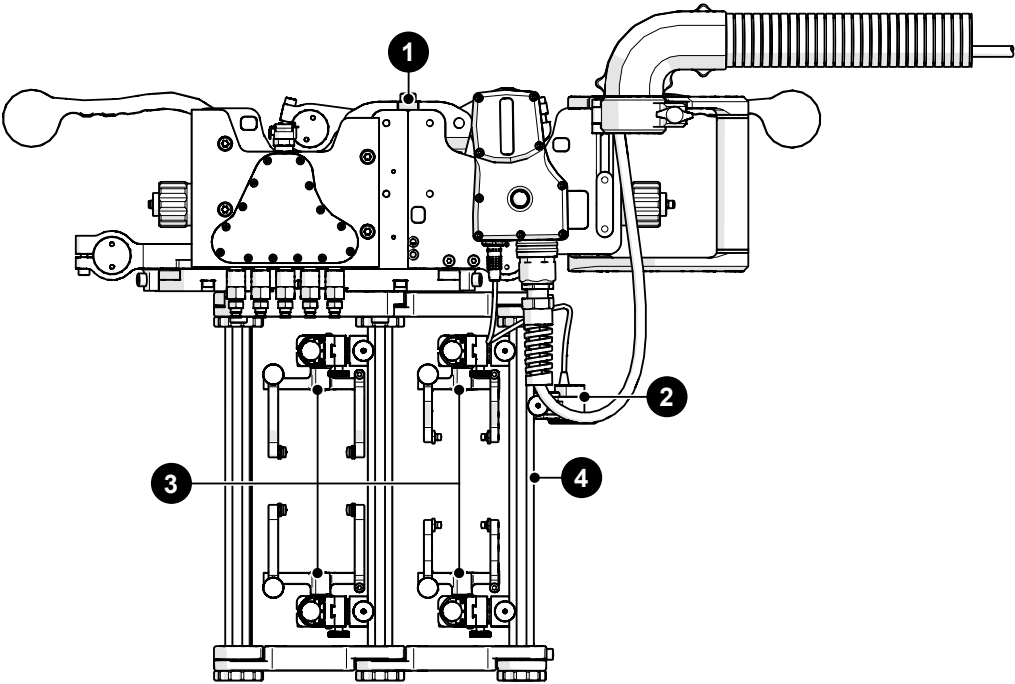


Fig. 48 - Single drive module configuration

BOM ID	Description
1	Carriage
2	High-resolution spring-loaded encoder
3	Vertical probe holders
4	SERKO probe holder frame

To configure the **SERKO** system for scanning using a **SERKO** probe holder frame, follow these steps:



CAUTION! DO NOT DISCONNECT UNDER LOAD. Shut off power before connection or disconnecting. Permanent damage to electronics could occur.

1. Mount and connect the **3** vertical probe holders to **4** probe holder frame.
2. Attach the configured **4** probe holder frame to the **1** carriage.
3. Mount the **2** high-resolution spring-loaded encoder to the **4** probe holder frame.
4. (see “*SERKO Probe Holder Frame*” on page 65) for additional information.

5.3.2. SERKO Probe Holder Frame
(Ten Probe Maximum)

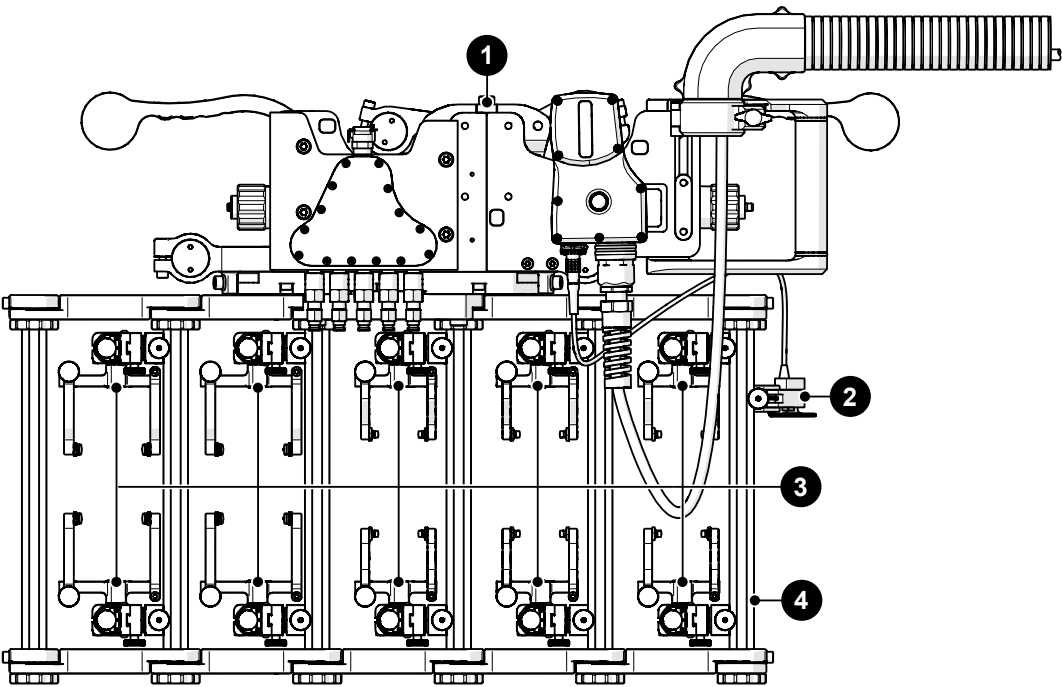


Fig. 49 - Single drive module configuration

BOM ID	Description
1	Carriage
2	High-resolution spring-loaded encoder
3	Vertical probe holders
4	SERKO probe holder frame

To configure the **SERKO** system for scanning using a **SERKO** probe holder frame, follow these steps:



CAUTION! DO NOT DISCONNECT UNDER LOAD. Shut off power before connection or disconnecting. Permanent damage to electronics could occur.

1. Mount and connect the **3** vertical probe holders to **4** probe holder frame.
2. Attach the configured **4** probe holder frame to the **1** carriage.
3. Mount the **2** high-resolution spring-loaded encoder to the **4** probe holder frame.
4. (see “*SERKO Probe Holder Frame*” on page 65) for additional information.

5.4. Carriage

5.4.1. Feature Identification

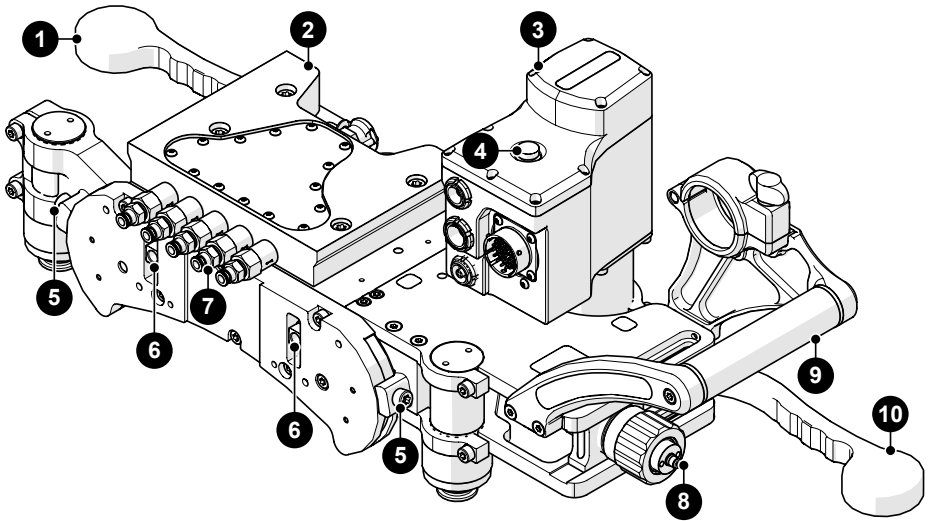


Fig. 50 - Feature identification

1	Idler clamp lever	6	Probe holder frame mount
2	Manifold/Instrument box mount	7	Irrigation outlets
3	Motor can	8	Traction indicator
4	Off button	9	Handle
5	Angle adjustment screws	10	Motor clamp lever

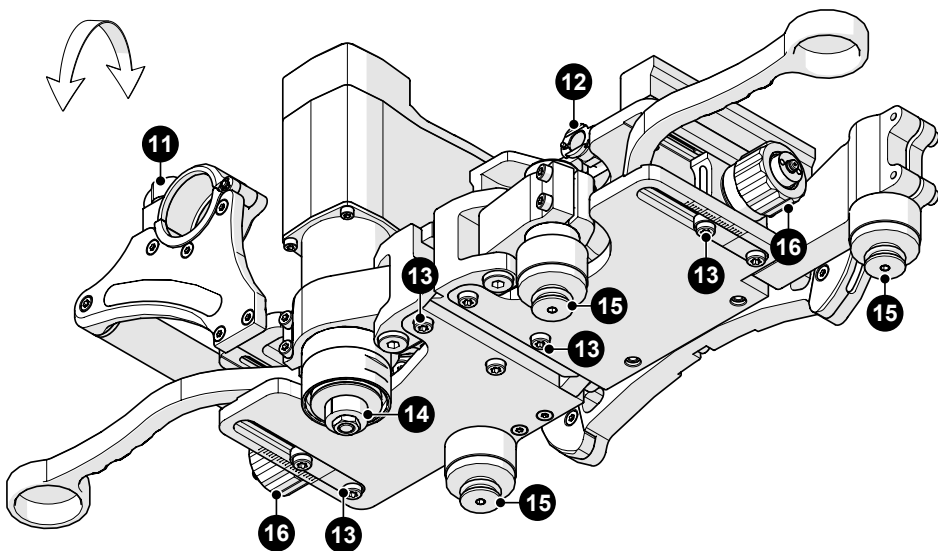


Fig. 51 - Feature identification

11	Cable management elbow clamp	14	Drive wheel
12	Irrigation inlet	15	Idler wheel
13	Width adjustment screws	16	Traction adjustment knob

5.4.2. Clamp Levers

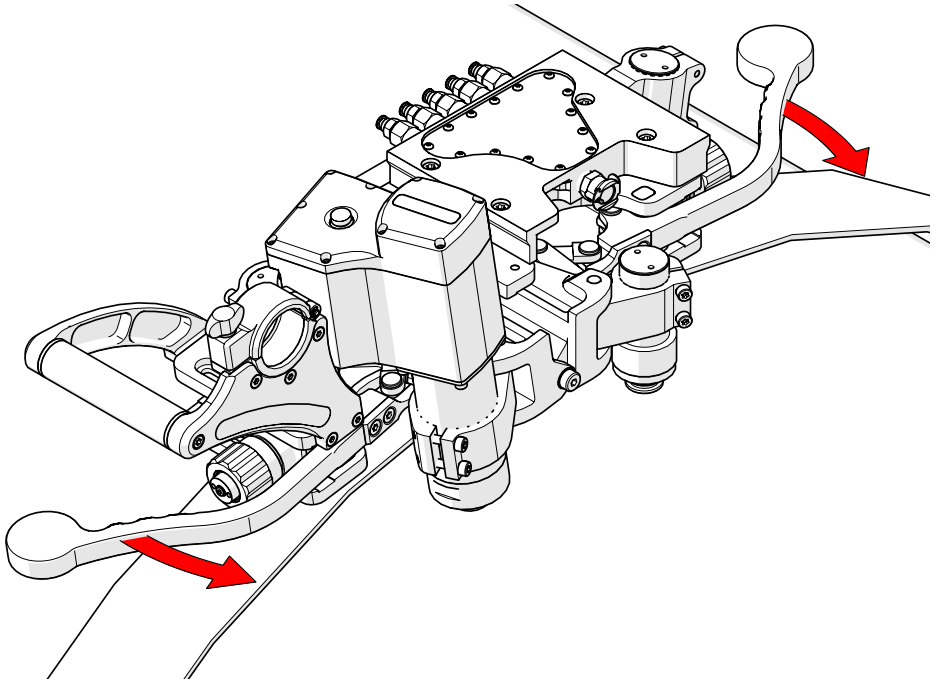


Fig. 52 - Press the clamp levers to mount the carriage to a band.

1. Press the clamp levers to mount the carriage to the band (Fig. 52).
2. Release the clamp levers to loosen the carriage and remove from the band.
3. When mounting the carriage to a band, ensure that the outer band is positioned in the top groove of the idler wheels (Fig. 53).
4. Ensure the idler wheels and band are properly aligned (see "Pipe Diameter Fine Adjustment" on page 42).

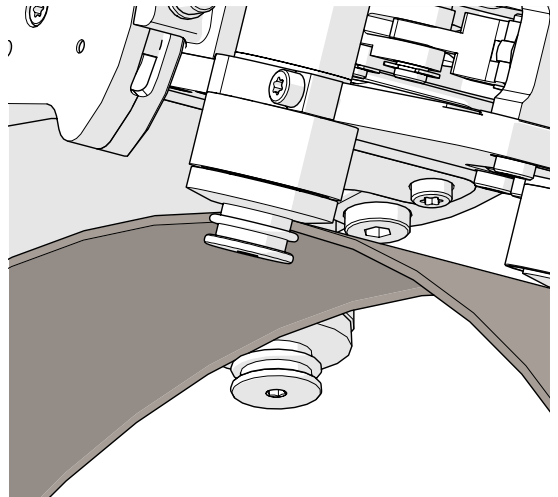


Fig. 53 - Ensure rollers are correctly positioned

5.4.3. Traction Indicators

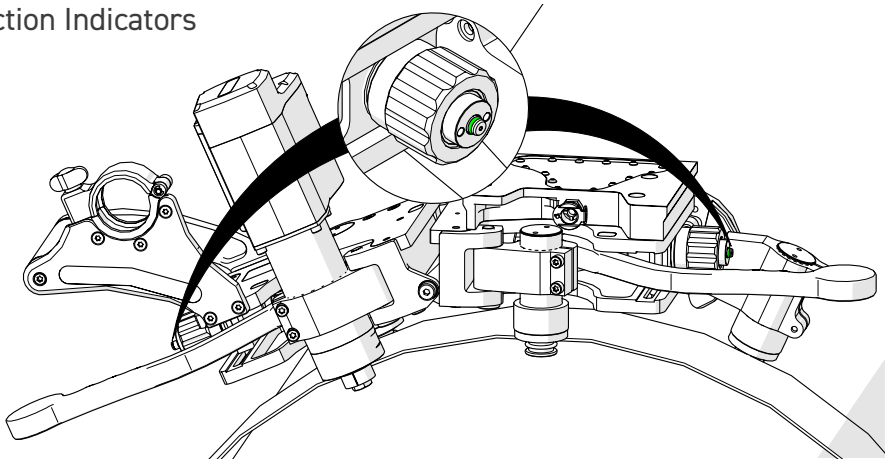


Fig. 54 - Check the traction indicators when mounting carriage to a band

1. Check the visibility of the green indicator on the traction indicator when the clamp levers are engaged. (Fig. 54).

2.

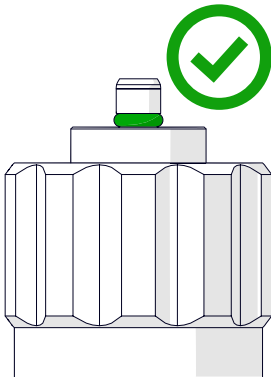


Fig. 55 - Correct traction setup

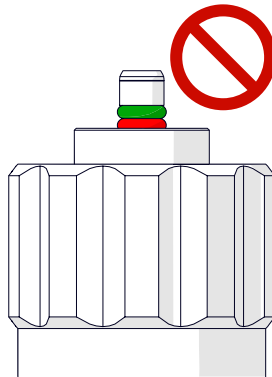


Fig. 56 - Traction is set too tight

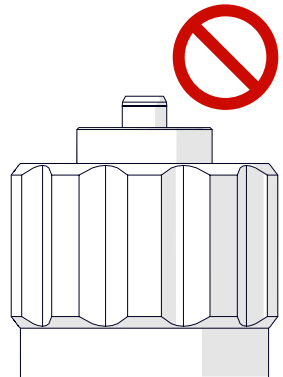


Fig. 57 - Traction is too loose

3. When the traction is correctly setup, any amount of the green indicator will be visible (Fig. 55).
4. If the traction is incorrectly set up, the red indicator will appear, which means the traction is too high (Fig. 56). Disengage the clamp levers and adjust the traction by rotating the traction adjustment knob as needed and check again.
5. If the traction is incorrectly set up, the green indicator will not be visible, indicating that the traction is too low (Fig. 57). Disengage the clamp levers, adjust the traction by rotating the traction adjustment knob as needed, and check again.
6. In certain situations, it may be necessary to exceed the traction indicator (e.g., displaying the red indicator or going beyond it). However, it's important to note that this can lead to accelerated wear of the drive wheel system and band.

5.4.4. Motor Can

The Motor Can propels the carriage around a band. The Motor Can may be loosened to allow the carriage to freewheel around the pipe on the band.

1. To position the motor can on the band, push the motor clamp lever.

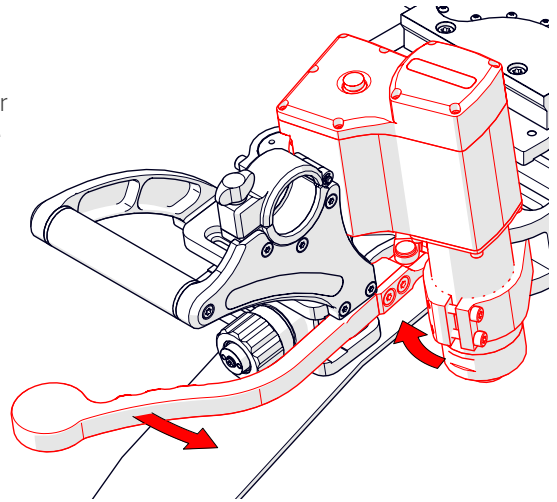


Fig. 58 - Engaging motor can

5.4.4.1 Motor Can Connections

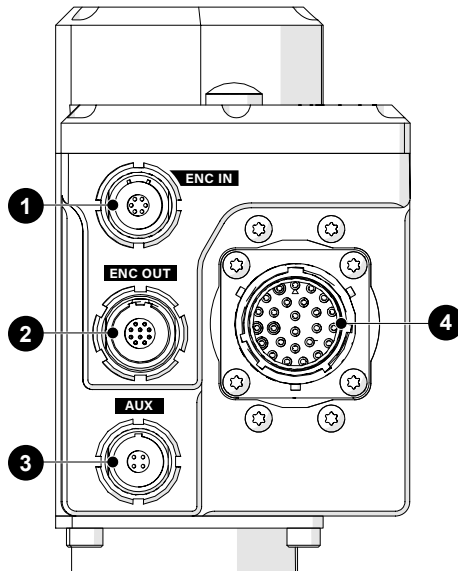


Fig. 59 - Motor can connections

1	ENC IN	Encoder input connection.
2	ENC OUT	Encoder input connection.
3	AUX	Connection for an auxiliary device.
4	Umbilical connection	Connection for the umbilical.

5.4.4.2 Off Button

The red button located on top of the motor can provides an off button to the entire system. When pressed, all power to the **SERKO** system will disengage.

To restore system power, press the power button located on the system controller (see “System Controller” on page 16).

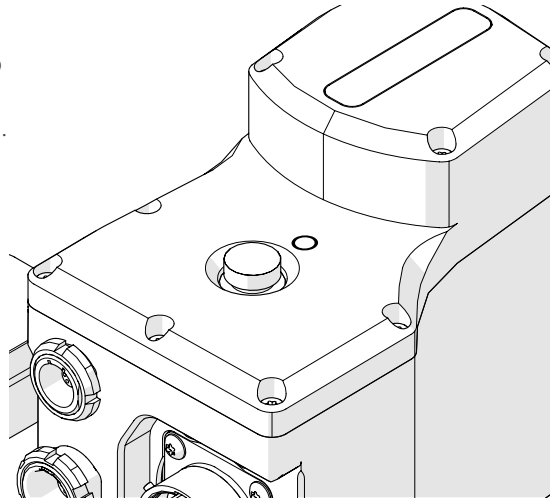


Fig. 60 - Off button

5.4.5. Pipe Diameter Setup

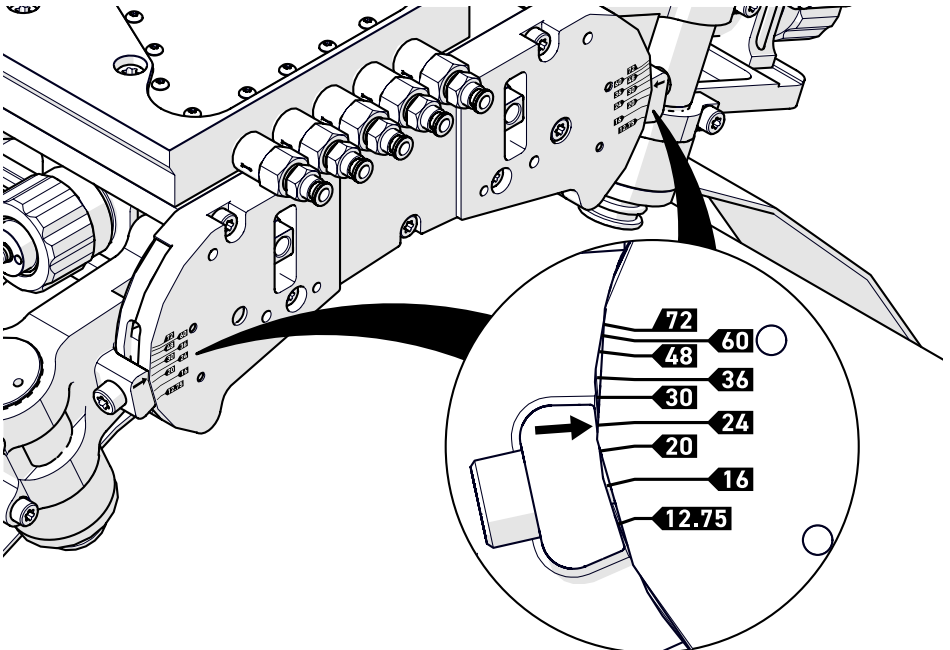


Fig. 61 - Pipe diameter markings on carriage

The etchings are designed to help users set up the carriage correctly for different pipe sizes. These markings are approximate and fine adjustment may be required when the carriage is mounted on the band. These markings indicate pipe diameters in inches.

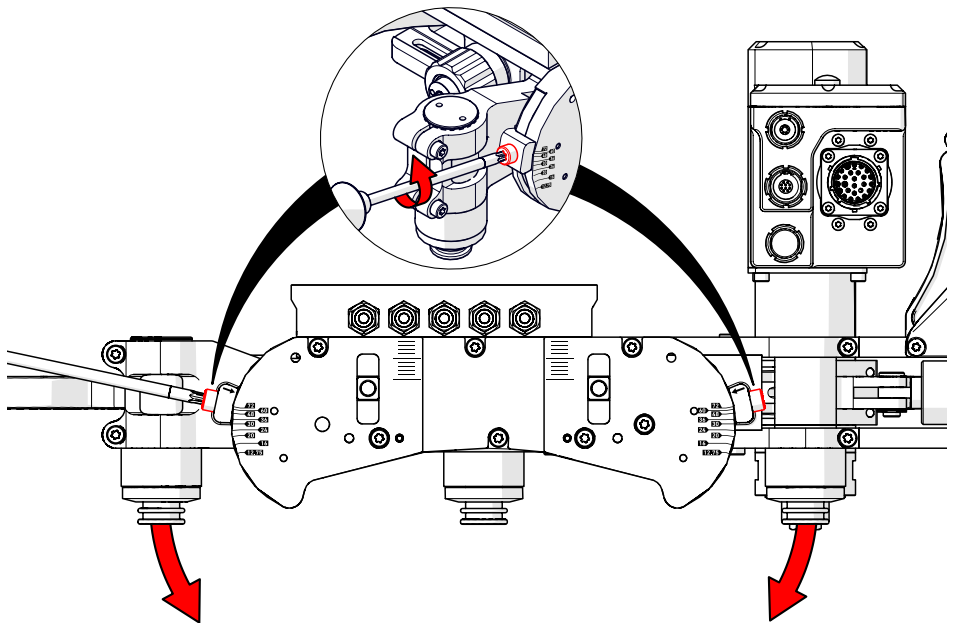


Fig. 62 - Carriage angle adjustment

1. Using the supplied T30 Torx driver, loosen the angle adjustment screws (Fig. 62).
2. This action will allow the wings of the carriage to be adjusted to the size of the (approximate) pipe diameter (Fig. 62).

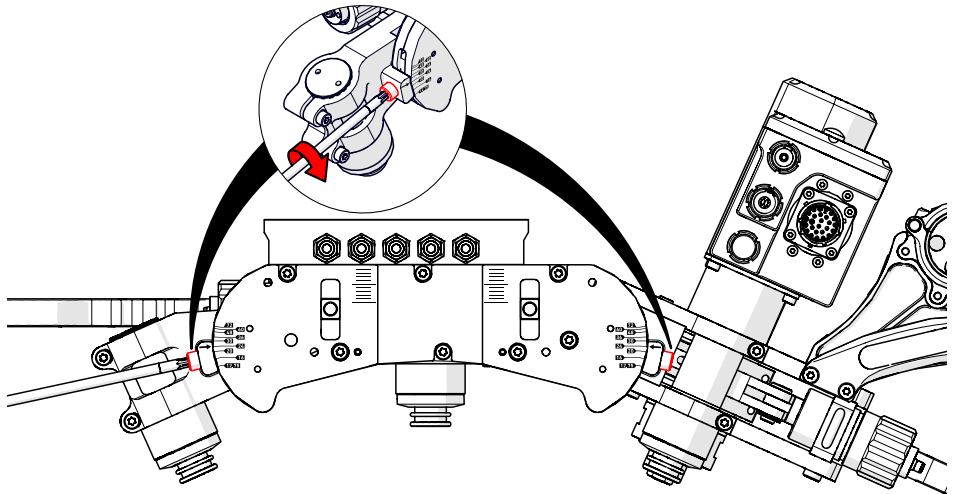


Fig. 63 - Carriage angle adjustment

3. Tighten the angle adjustment screws when the carriage wings are in position based on the arrow and pipe diameter markings (Fig. 63).

5.4.5.1 Pipe Diameter Fine Adjustment

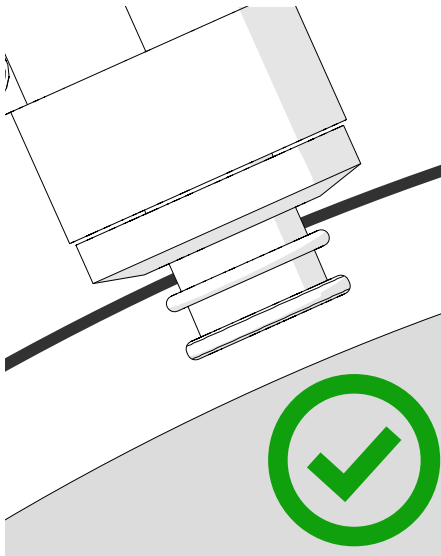


Fig. 64 - Correct idler wheel and band alignment

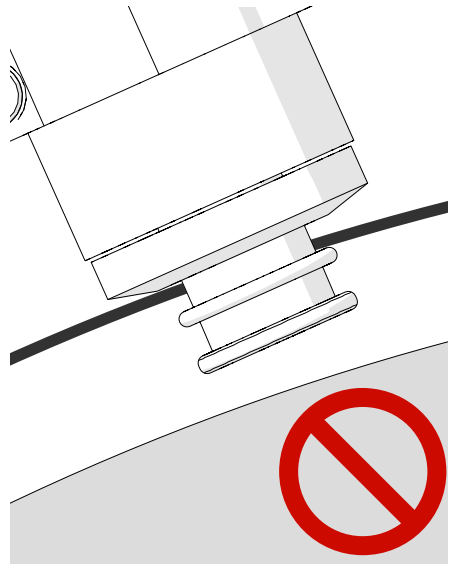


Fig. 65 - Incorrect idler wheel and band alignment

After adjusting the carriage to the approximate pipe size and the carriage has been mounted to the band (see *"Clamp Levers"* on page 37), the idler wheels should be checked to confirm they are all tangent to the band to prevent binding.

Correct adjustment will have the band look symmetric about the center axis of the wheel (Fig. 64).

Incorrect adjustment either way will have the band skewed with respect to the wheel (Fig. 65) (Fig. 66).

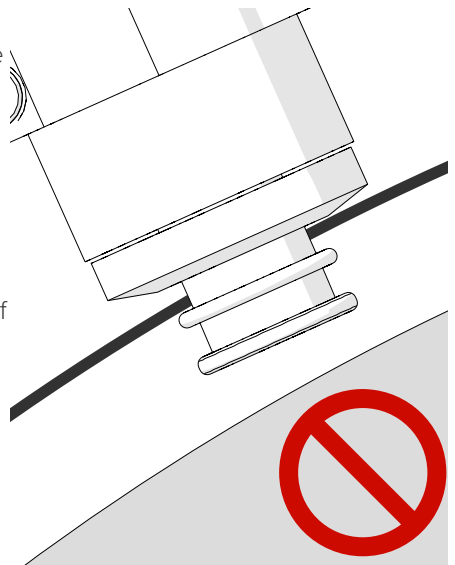


Fig. 66 - Incorrect idler wheel and band alignment

5.4.6. Band Width Setup

When required, the carriage can be adjusted to accommodate various band widths.

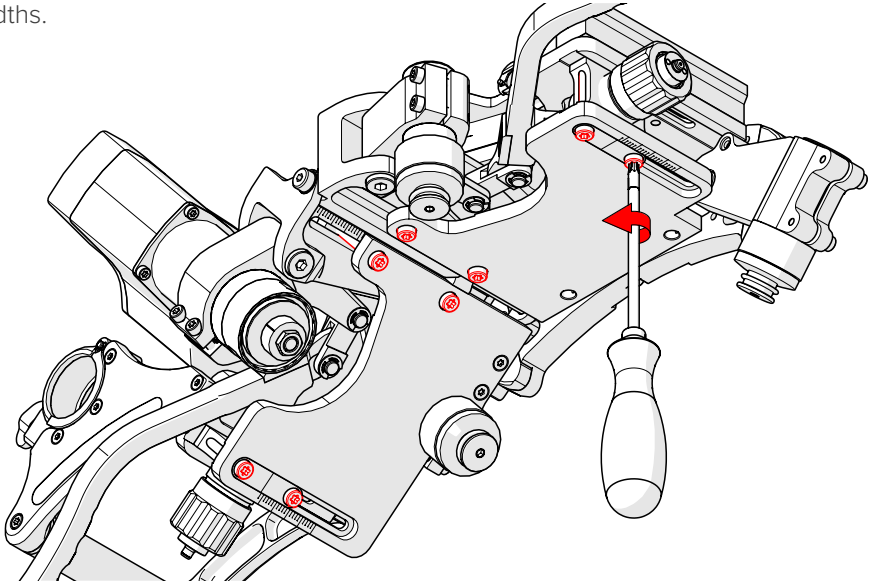


Fig. 67 - Loosen band adjustment screws

1. Loosen the eight width adjustment screws using the T30 Torx driver (Fig. 67).

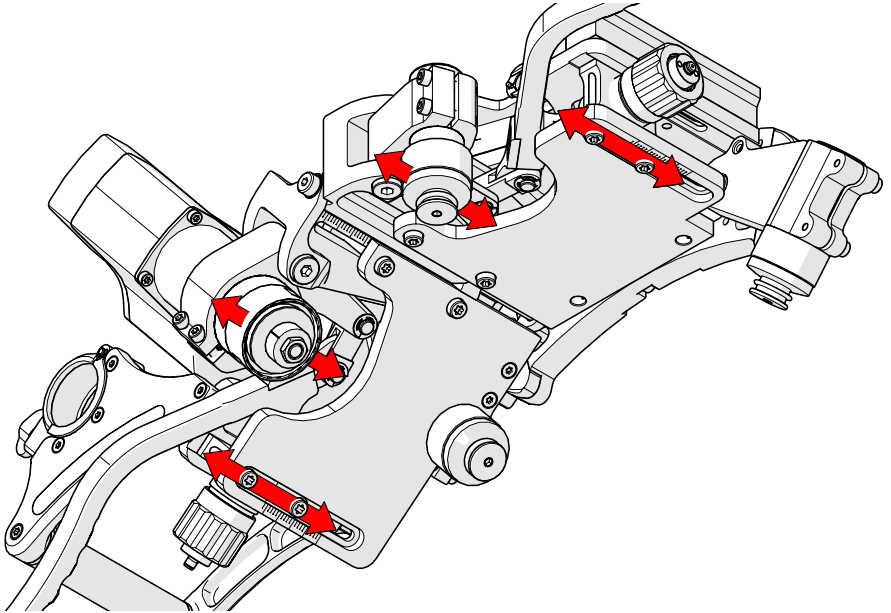


Fig. 68 - Position as required

2. Position as required to properly fit the band width (Fig. 68).

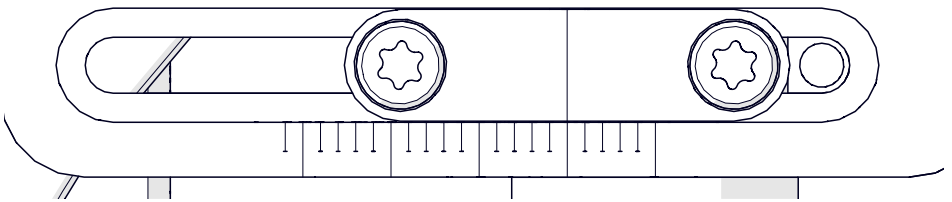


Fig. 69 - Markings to align position

3. Small markings are 2 mm apart and large markings are 10 mm apart.

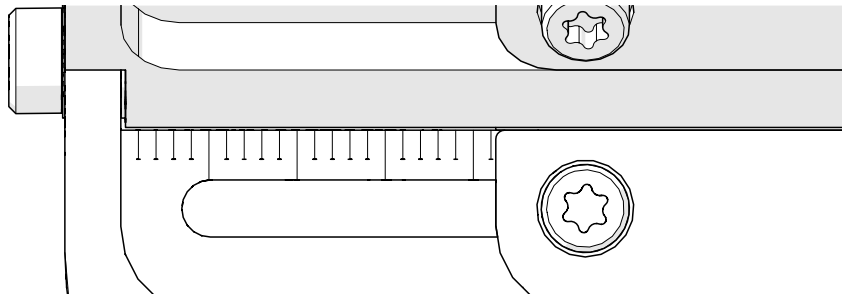


Fig. 70 - Markings to align position

4. Etchings are provided on the carriage to help ensure that all sections of the carriage are properly aligned.

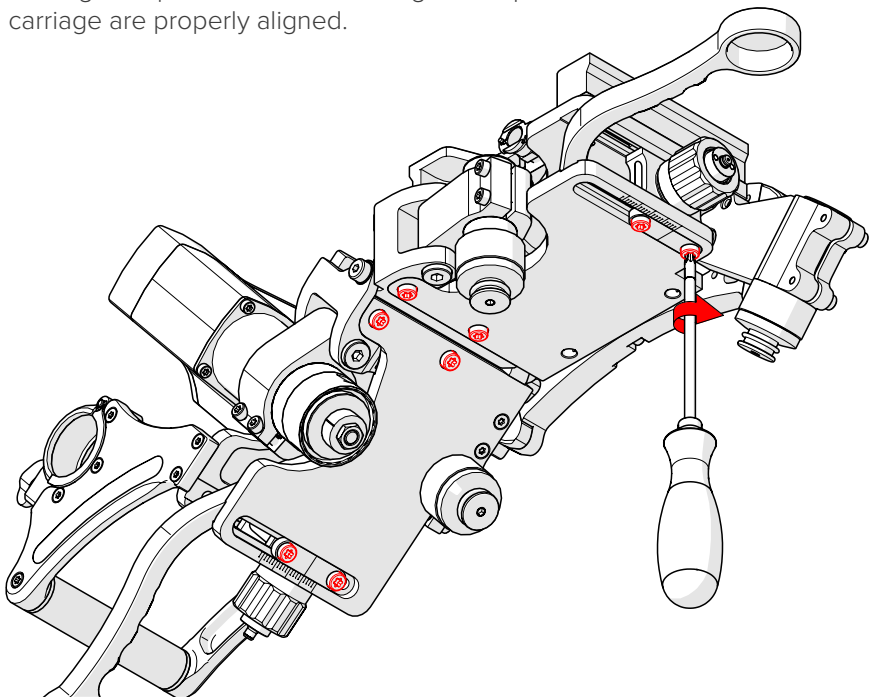


Fig. 71 - Tighten screws

5. Tighten the width adjustment screws (Fig. 71).

5.4.7. Umbilical Connection

1. Press the umbilical to the umbilical connection of the motor can (Fig. 72).

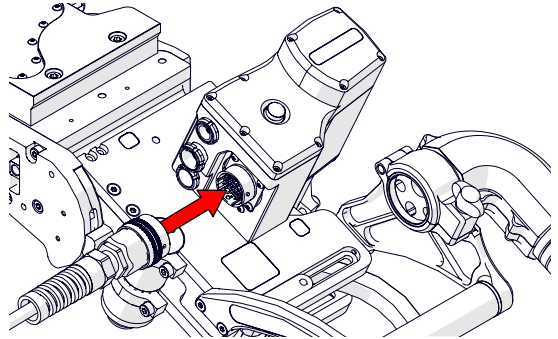


Fig. 72 - Press to umbilical connection

2. Rotate the umbilical until the umbilical becomes seated in the pins of the umbilical connection (Fig. 73).

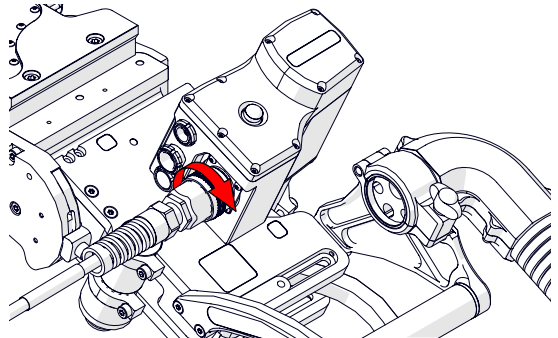


Fig. 73 - Press and rotate to seat pins of umbilical

5.4.8. Irrigation

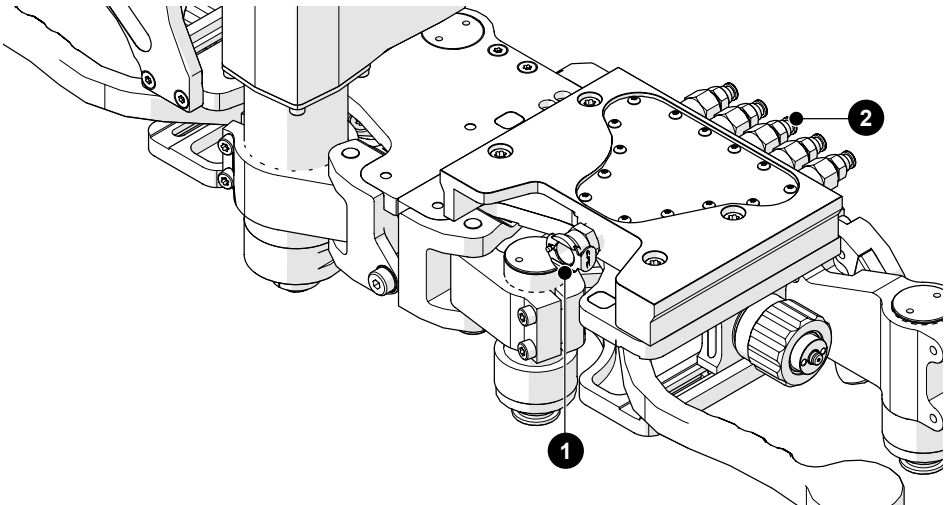


Fig. 74 - Irrigation connections

- | | | |
|----------|-------------------------|--|
| 1 | Irrigation Manifold IN | The connector for the main couplant. |
| 2 | Irrigation Manifold OUT | These connectors can deliver couplant fluid to probes. |

5.5. High-Resolution Spring-Loaded Encoder

To install the encoder, follow these steps:

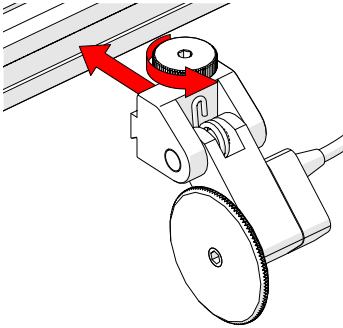


Fig. 75 - Attach to frame bar

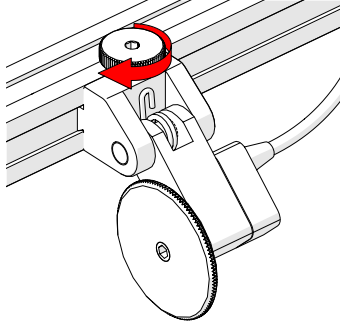


Fig. 76 - Tighten knob

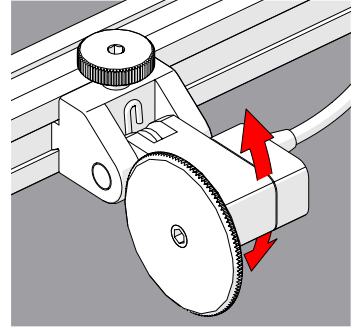


Fig. 77 - Place on scan surface

1. Loosen the encoder's dovetail jaw and mount it to the frame bar (Fig. 75).
2. Tighten the encoder knob (Fig. 76).
3. Spring tension maintains encoder contact with the scan surface (Fig. 77).
4. Plug the cable connector into the ENC IN socket (Fig. 78) on the motor can (see "Motor Can Connections" on page 39).

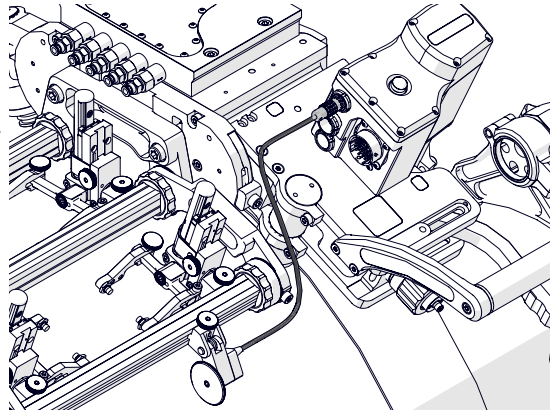


Fig. 78 - Cable routing

5.6. Handheld Controller



WARNING! MAGNETIC MATERIAL. The handheld controller produces a strong magnetic field which may cause failure or permanent damage to items such as watches, memory devices, CRT monitors, medical devices or other electronics.

People with pacemakers or ICD's must stay at least 10 cm (4 in) away.



CAUTION! DO NOT DISCONNECT UNDER LOAD. Shut off power before connection or disconnecting. Permanent damage to electronics could occur.

5.6.1. Magnetic Mounts

Magnetic mounts on the rear of the handheld controller assist in preventing the handheld controller from falling (*Fig. 79*).

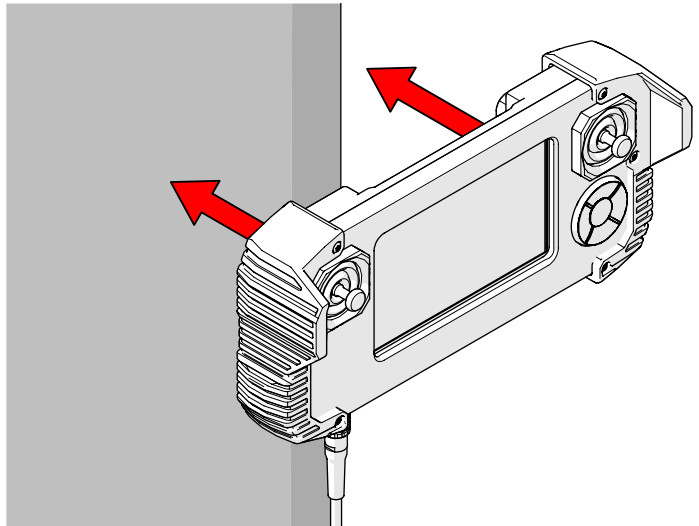


Fig. 79 - Mount to ferrous surfaces

5.7. Cable Management, Elbow

The cable management is offered in a variety of lengths and provides a means of bundling and protecting cables and hoses.

5.7.1. Mounting Cable Management

To attach the cable management, follow these steps:

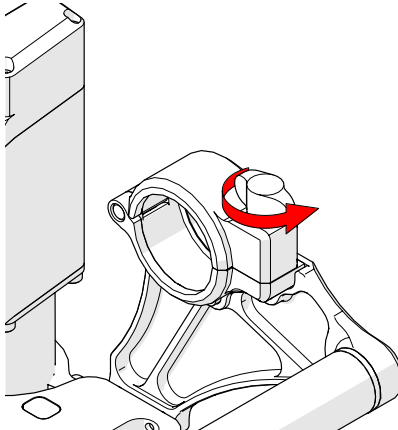


Fig. 80 - Loosen wing knob

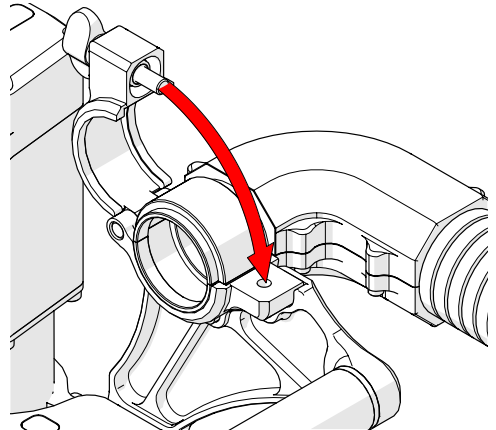


Fig. 81 - Place cable management and tighten wing knob

1. Unscrew the cable management clamp wing knob (Fig. 80).
2. Place the cable management in the cable management clamp and tighten the cable management clamp wing knob (Fig. 81).

5.7.2. Cable Management Setup

1. Unscrew the four screws using the 2.5 mm hex driver to open the cable management (Fig. 82).
2. Remove the conduit.

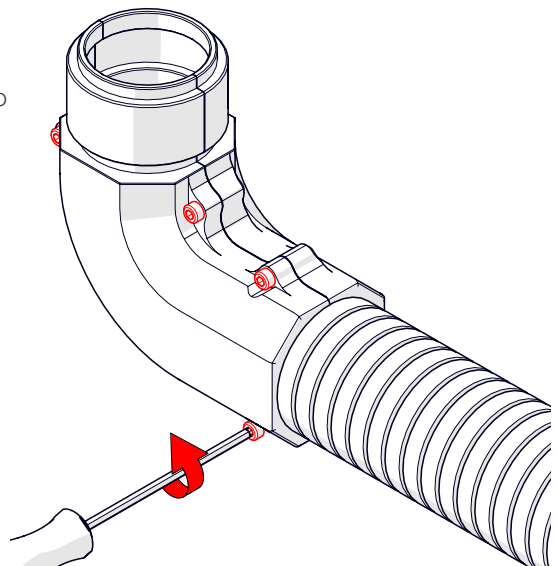


Fig. 82 - Unscrew to open cable management

3. Open the conduit and place cables and hoses in the conduit (*Fig. 83*).

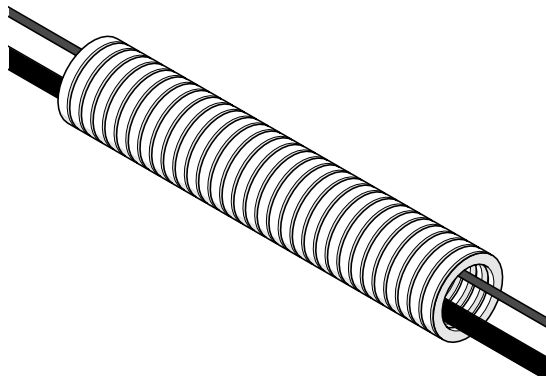


Fig. 83 - Route cables and hoses through conduit

4. Press the hoses and cables into the grooves of the rubber cable clamp (*Fig. 84*).
5. The rubber cable clamp fits into the cable management mount (*Fig. 85*).

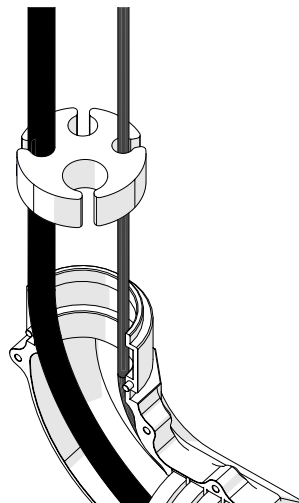


Fig. 84 - Route cables and hoses through rubber cable clamp

6. Ensure the conduit is positioned correctly within the ridges of the cable management mount (*Fig. 85*).
7. Press the opposite side of the cable management mount onto the conduit (*Fig. 85*).

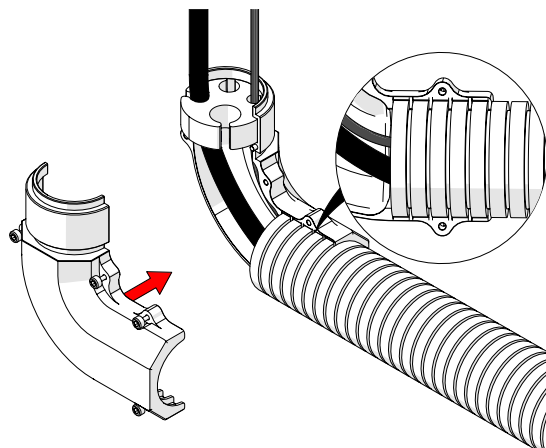


Fig. 85 - Place the conduit in the ridges of the mount

8. Use the 2.5 mm hex driver to tighten the screws (Fig. 86).

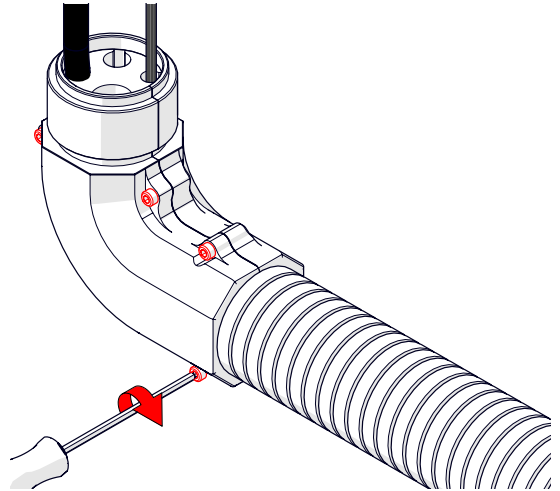


Fig. 86 - Tighten the four screws

5.8. SERKO Instrument Box Frame

The instrument box frame carries 3rd party instruments and provides handles for the carriage (Fig. 87).

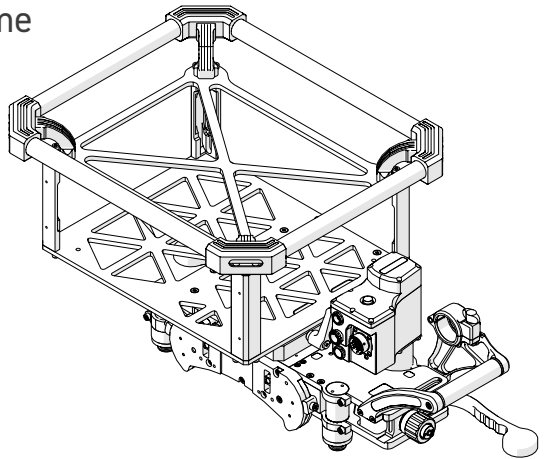


Fig. 87 - Instrument box frame mounted to the carriage

5.8.1. Installing 3rd Party Instruments

1. Using the T25 TORX driver, loosen the eight captured screws at the corners of the top half of the instrument box frame (Fig. 88).

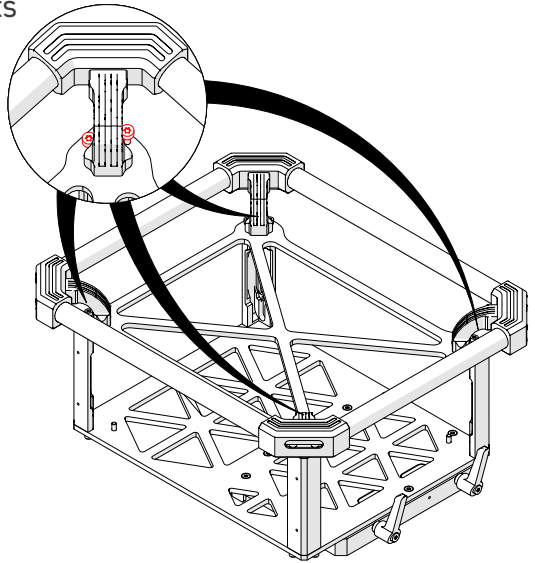


Fig. 88 - Loosen eight top half screws

2. Separate the top half of the instrument box frame from the bottom half (Fig. 89).

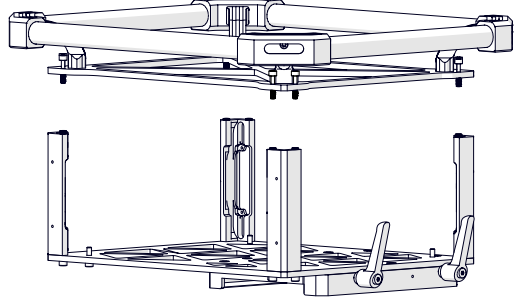


Fig. 89 - Top half of instrument box frame separated from bottom half

TIP: Placing the third-party instrument upside down can make it easier to lower the instrument box frame onto it.

3. Slide the bottom half of the instrument box frame onto the 3rd party instrument (Fig. 90).

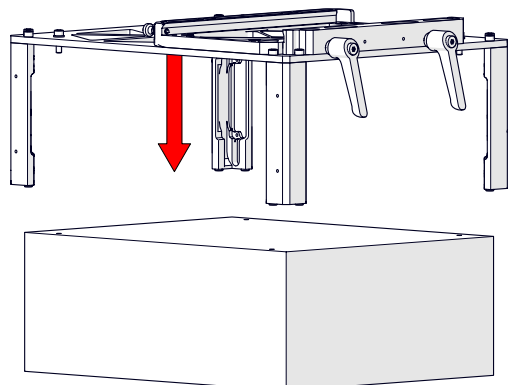


Fig. 90 - Slide onto 3rd party instrument

4. Secure the 3rd party instrument to the bottom half of the instrument box frame with hardware (Fig. 91).

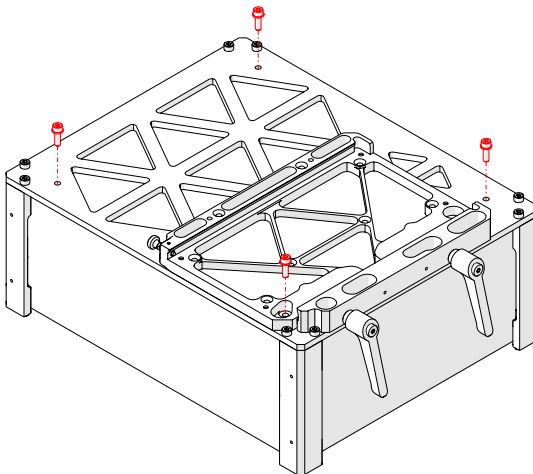


Fig. 91 - Secure with hardware

5. Rotate the bottom half of the instrument box frame, then place the top half on top, ensuring that it is fully seated to the bottom half (Fig. 92).

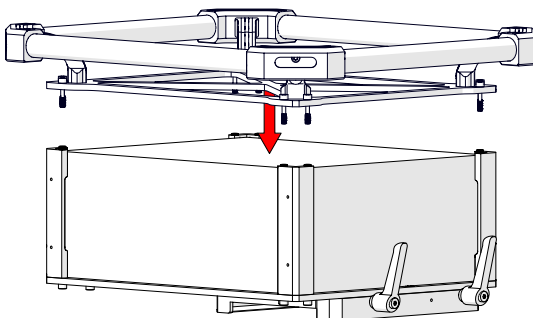


Fig. 92 - Place top half on top

6. Use the T25 TORX driver to tighten the eight screws.

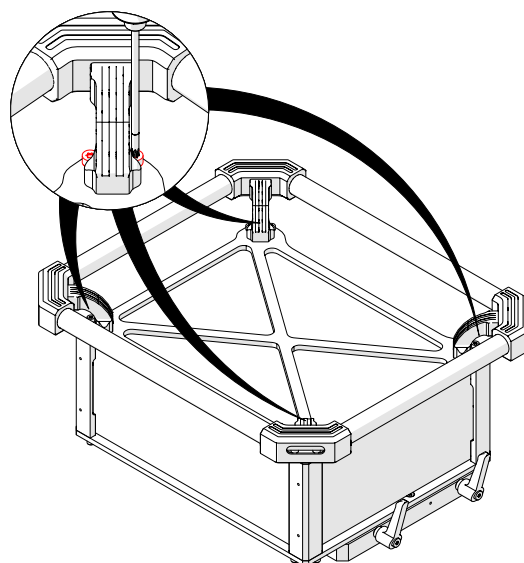


Fig. 93 - Secure with hardware

5.8.2. Installing on SERKO

To mount the instrument box frame, see the following steps:

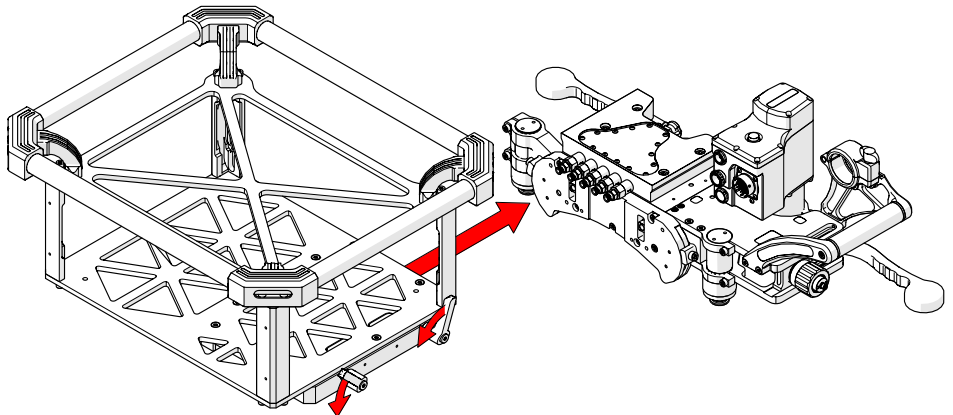


Fig. 94 - Loosen ratchet levers and align with the instrument box frame mount on the carriage

1. Ensure the ratchet levers are loose (*Fig. 94*).
2. Align the instrument box frame with the instrument box mount on the carriage and slide the instrument box frame onto the mount (*Fig. 95*).

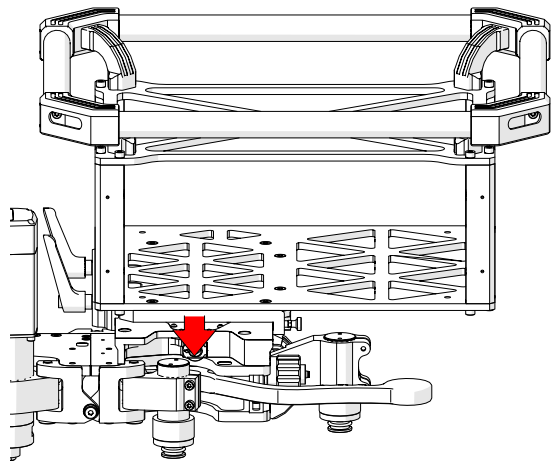


Fig. 95 - Slide onto instrument box mount

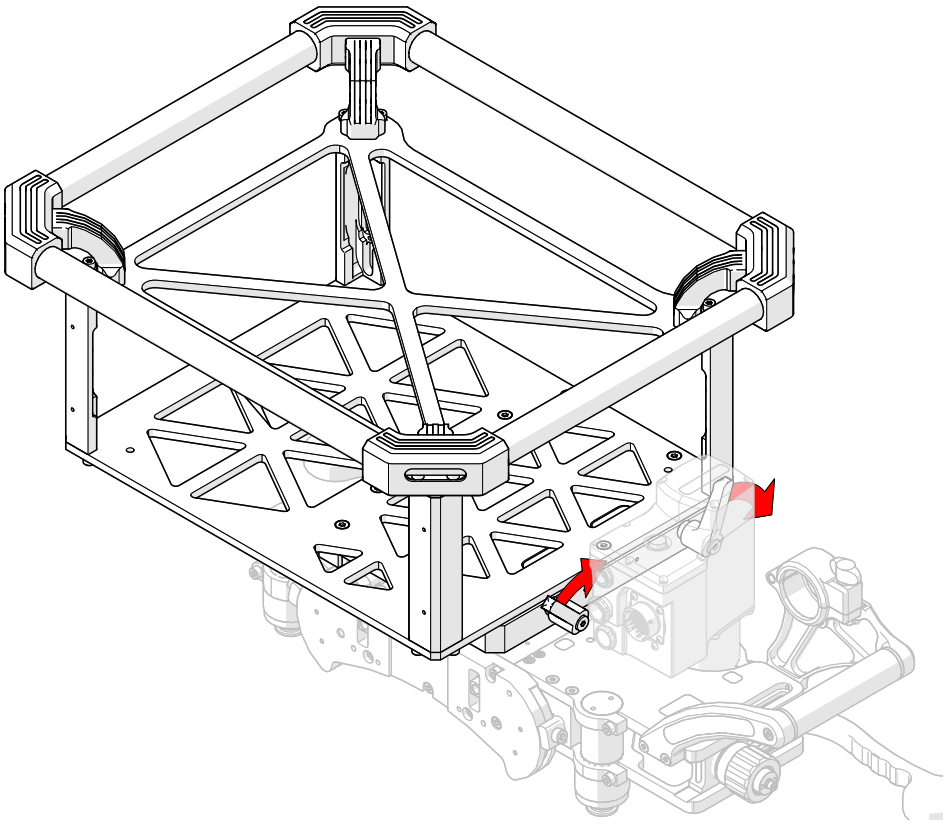


Fig. 96 - Tighten ratchet levers and align with the instrument box mount on the carriage

3. Tighten ratchet levers to mount the instrument box frame to the carriage (Fig. 96, Ratchet levers located behind motor can).
4. The instrument box mount provides variable mounting locations. Loosen the ratchet levers and position the instrument box frame where required and tighten the ratchet levers.

TIP: To reduce scanner width, position the instrument box frame towards the probe holder side of the scanner.

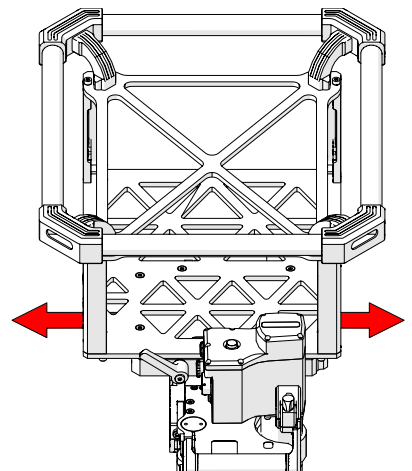


Fig. 97 - Instrument box frame position

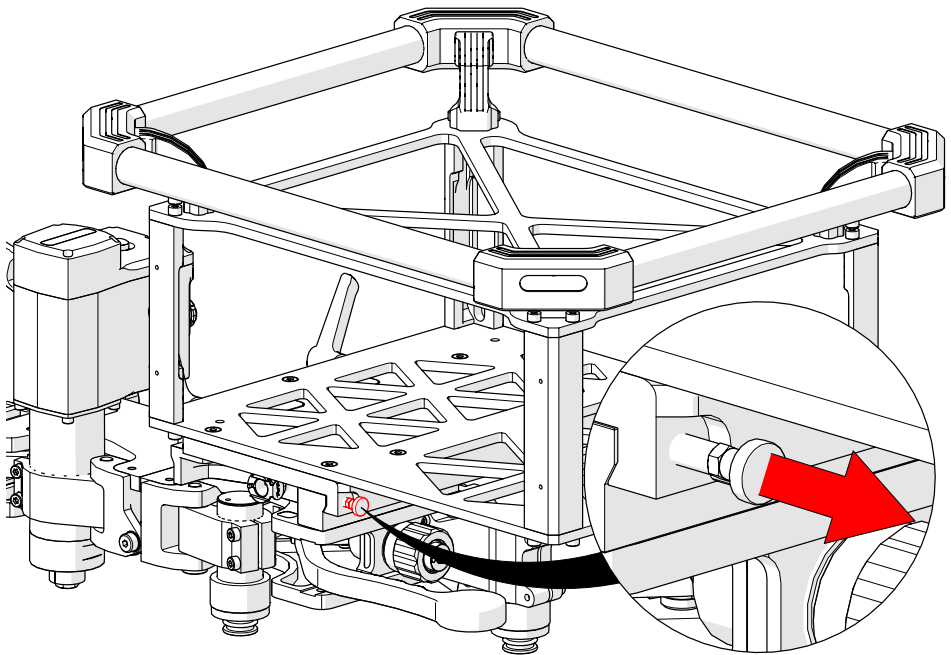


Fig. 98 - Loosen ratchet levers and align with the instrument box mount on the carriage

5. To remove the instrument box frame. Pull the latch and slide the instrument box frame off the carriage.

5.8.3. Ratchet Lever

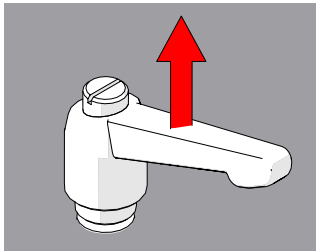


Fig. 99 - Pull ratchet handle

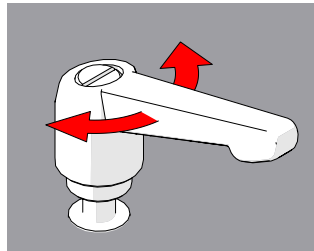


Fig. 100 - Rotate handle

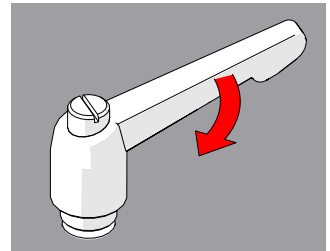


Fig. 101 - Tighten handle

Occasionally, movement of the lever locking position is required. The lever placement can be adjusted by following these steps:

1. Pull the ratchet lever away from the base to which it is connected (*Fig. 99*).
2. Continue to pull while rotating the lever in the appropriate direction (*Fig. 100*).
3. Release the lever and utilize the new tightening position (*Fig. 101*)

5.9. Probe Holders

5.9.1. Vertical Probe Holder

- | | |
|---|----------------------------------|
| A | Latch |
| B | Probe Holder Adjustment Knob |
| C | Vertical Adjustment Knob |
| D | Pivot Buttons |
| E | Probe Holder Arms |
| F | Yoke |
| G | Probe Holder Arm Adjustment Knob |
| H | Transverse Adjustment Screw |
| I | Frame Bar |

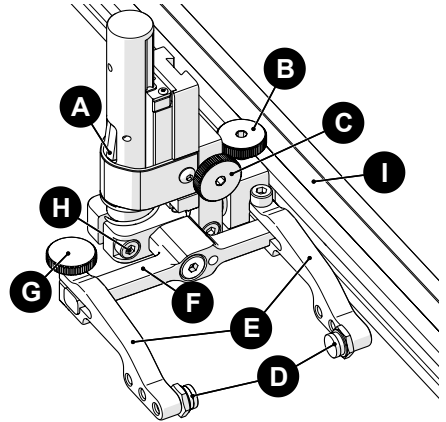


Fig. 102 - Vertical probe holder

5.9.1.1 Probe Holder Setup

To mount a UT wedge in the probe holder, follow these steps:

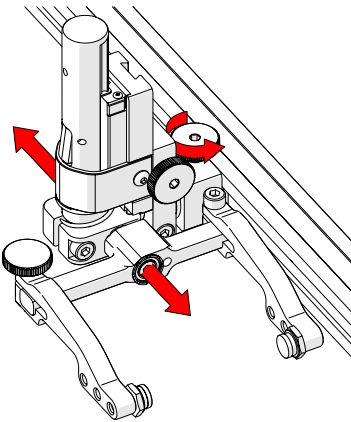


Fig. 103 - Adjust on frame bar

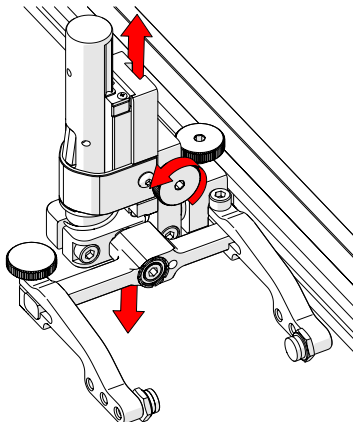


Fig. 104 - Vertical adjustment

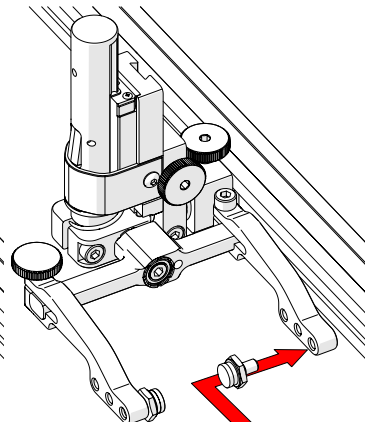


Fig. 105 - Place buttons

1. The probe holder adjustment knob allows the probe holder to be attached to a frame bar and adjusts horizontal positioning (*Fig. 103*).
2. The vertical adjustment knob allows the vertical probe holder height adjustment (*Fig. 104*).
3. Position the pivot buttons where necessary. When a narrow scanning footprint is required, use the pivot button holes closest to the yoke (*Fig. 105*).

TIP: Probe pivoting may be impeded when closer to the yoke.

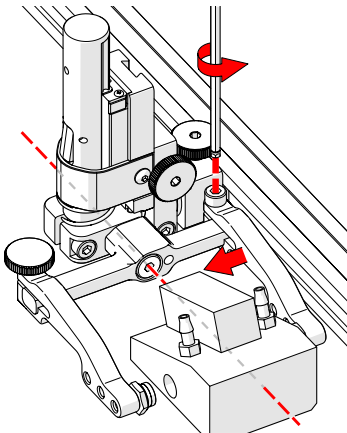


Fig. 106 - Adjust inner arm

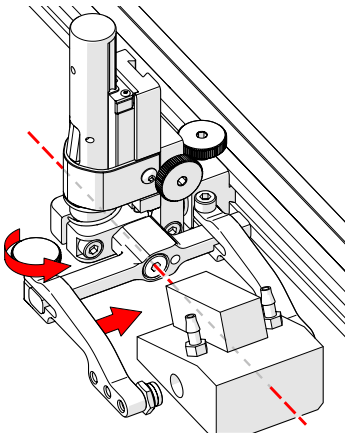


Fig. 107 - Adjust outer arm

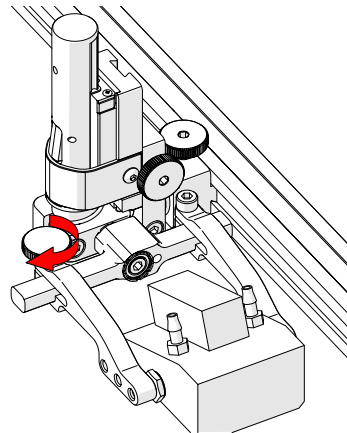


Fig. 108 - Tighten arm knob

4. Position the wedge on the inner probe holder arm (Fig. 106).

TIP: The probe holder yoke can accommodate many different probe and wedge sizes of varying widths. It is best to centre the wedge with the yoke's pivot axis. This can reduce wedge 'rocking' when scanning. Position the inner probe holder arm accordingly (Fig. 106) using the supplied 3 mm hex driver (Fig. 38).

5. Loosen the probe holder arm adjustment knob (Fig. 107) and slide the probe holder arm along the yoke pinching the wedge in place.
6. Tighten the probe holder arm adjustment knob (Fig. 108).

5.9.1.2 Probe Holder Vertical Adjustment

To adjust the probe holder vertically, follow these steps:

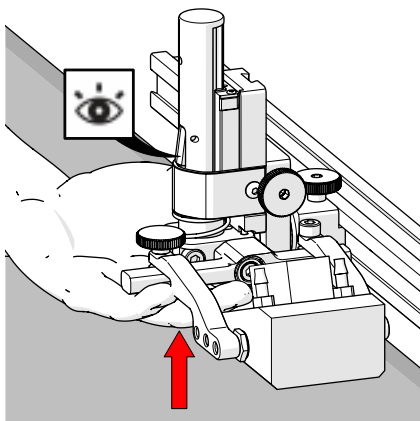


Fig. 109 - Latch probe holder

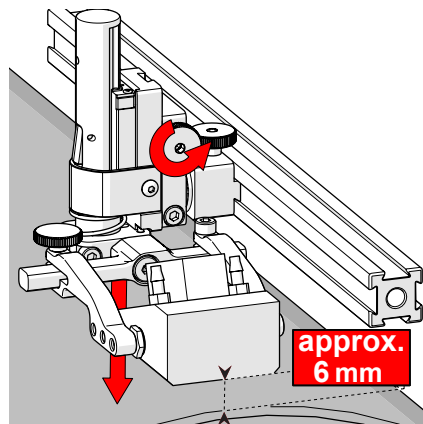


Fig. 110 - Lower toward scan surface

1. Ensure the probe holder is in the latched upper position. Lift the probe

holder until the latch is fully exposed and snaps out to lock (Fig. 109).

2. Loosen the vertical adjustment knob and slide the probe holder down until the wedge is approximately 6 mm ($\frac{1}{4}$ in) above inspection surface.
3. Tighten the vertical adjustment knob (Fig. 110).

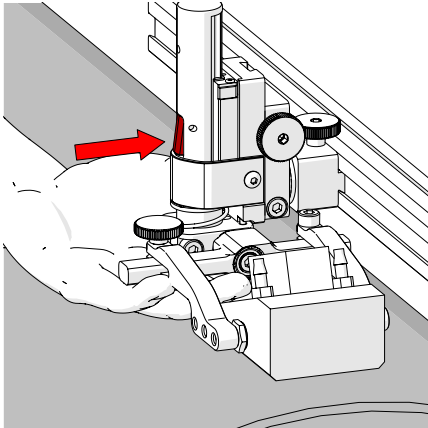


Fig. 111 - Press latch button

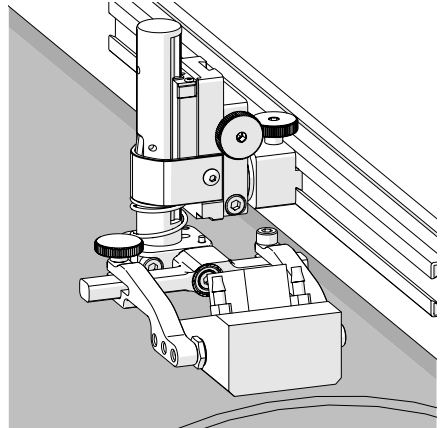


Fig. 112 - Lower toward scan surface

4. Lift the yoke slightly and press the latch button (Fig. 111), then slowly lower towards scanning surface to apply spring pressure to the wedge (Fig. 112).

TIP: If less spring force is desired, refer to step 2 and place the wedge approximately 20 mm ($\frac{3}{4}$ in) above the inspection surface.

5.9.1.3 Probe Holder Transverse Adjustment

To adjust the probe holder's transverse angle, follow these steps:

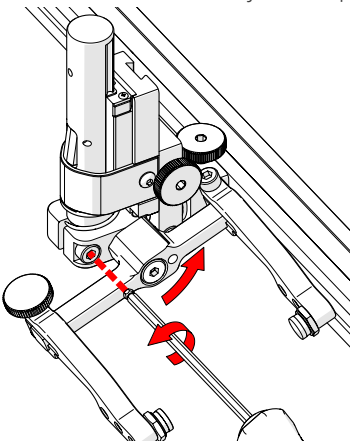


Fig. 113 - Loosen 3 mm screw

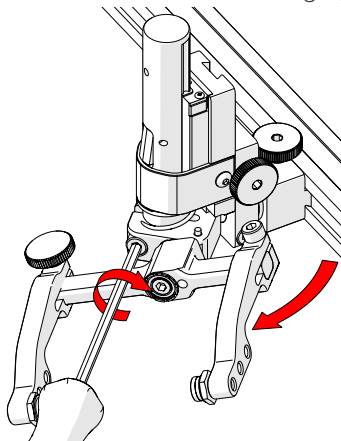


Fig. 114 - Rotate and tighten

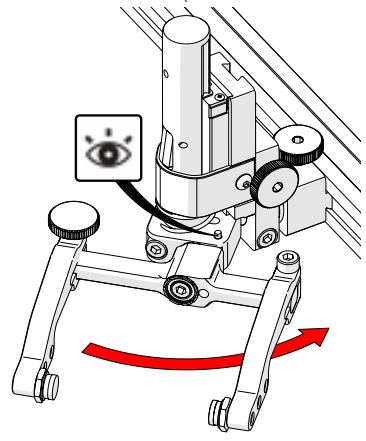


Fig. 115 - Stop post locates 90°

1. Ensure the probe holder is in the latched upper position (Fig. 109).

2. Using the supplied 3 mm hex driver loosen the transverse adjustment screw (*Fig. 113*) and rotate the yoke about the vertical shaft achieving the desired angle.
3. Tighten the transverse adjustment screw (*Fig. 114*).

To return the transverse adjustment to neutral (90°). The probe holder must be in the latched, upper position (*Fig. 109*). Rotate the yoke until the stop post contacts the base of the probe holder (*Fig. 115*). Then tighten the transverse adjustment screw.

5.9.1.4 Probe Holder Longitudinal Adjustment

To adjust the probe holder's vertical angle for longitudinal scanning, follow these steps:

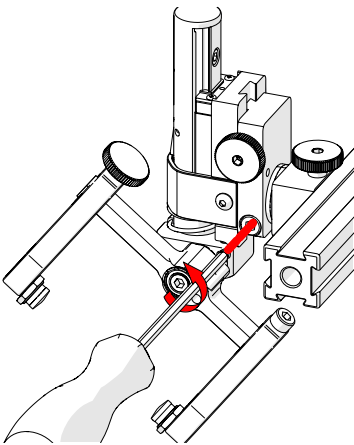


Fig. 116 - Loosen 3 mm screw

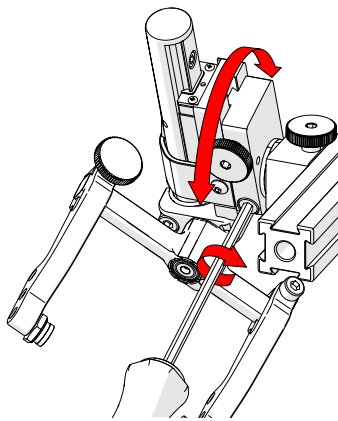


Fig. 117 - Rotate to position

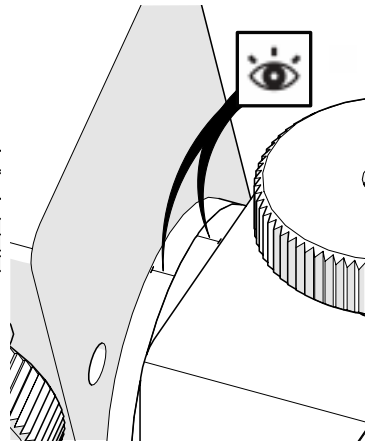


Fig. 118 - Line up markers

1. Ensure the probe holder is in the latched upper position (*Fig. 109*).
2. Using the supplied 3 mm hex driver (*Fig. 38*), loosen the longitudinal adjustment screw (*Fig. 116*).
3. Rotate the main body of the probe holder until it is at the desired angle (*Fig. 117*).
4. Tighten the longitudinal adjustment screw (*Fig. 117*).

To return the longitudinal adjustment to neutral (90°). Line up the longitudinal adjustment indicator markers (*Fig. 118*).

5.9.1.5 Probe Holder Left/Right Conversion

To reverse the probe holder, follow these steps:

NOTE: To perform this operation, the 1.5 mm hex wrench (Fig. 45) is required.

1. Ensure the probe holder is in the latched upper position (Fig. 109).

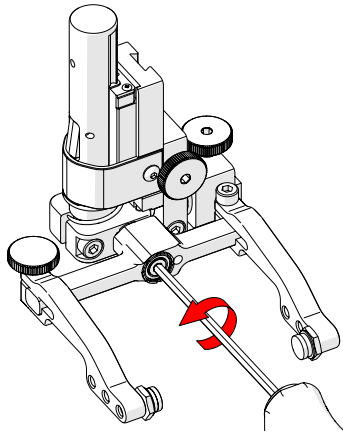


Fig. 119 - Unscrew yoke pivot screw

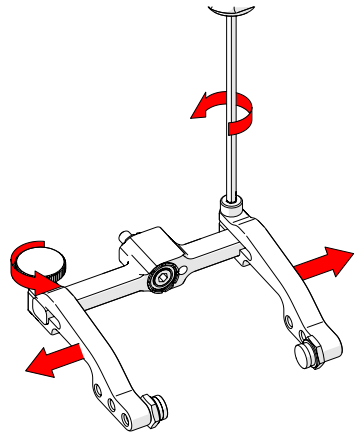


Fig. 120 - Remove probe holder arms

2. Using the supplied 3 mm hex driver (Fig. 38), unscrew the yoke pivot screw and remove the yoke (Fig. 119).
3. Loosen the probe holder arm adjustment knob and the arm clamp screw. Slide the probe holder arms off the yoke (Fig. 120).

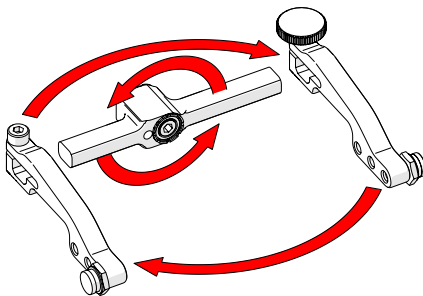


Fig. 121 - Flip yoke and reverse arms

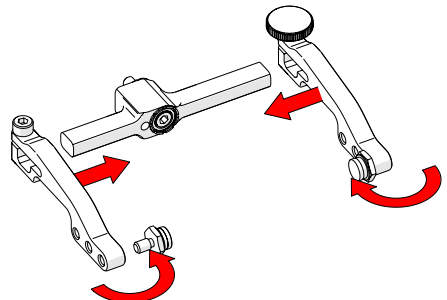


Fig. 122 - Attach arms & move buttons

4. Flip the yoke 180° and reverse the probe holder arms (Fig. 121).
5. Place the pivot buttons on the inside of the probe holder arms (Fig. 122) using a 3/8 in wrench (Fig. 44).

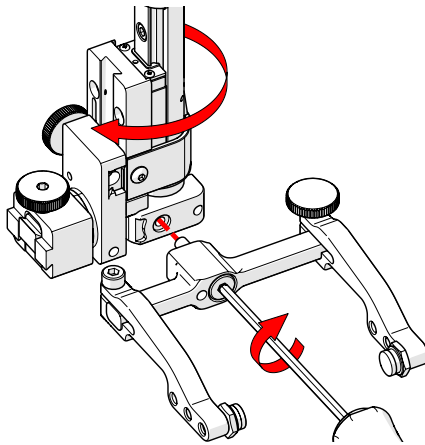


Fig. 123 - Screw yoke to opposite side

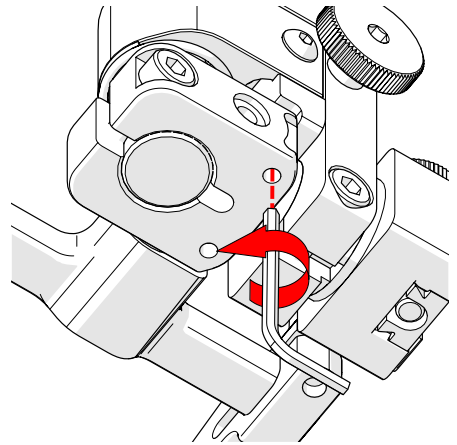


Fig. 124 - Lower 90° stop post

6. Mount the yoke to the opposite side of the base using the supplied 3 mm hex driver (Fig. 123).

TIP: Keep the yoke level with the base to ensure no conflicts with the plunger/set screw attached to the yoke.

7. Locate the recessed M3 screw (stop post) on the bottom of the probe holder. Unscrew the stop post using a 1.5 mm hex wrench until it has cleared all obstructions. Do not remove the stop post (Fig. 124).

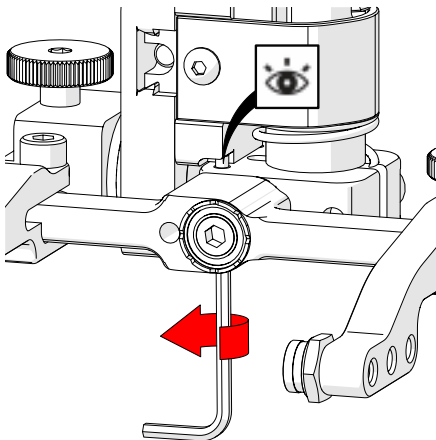


Fig. 125 - Raise opposite 90° stop post

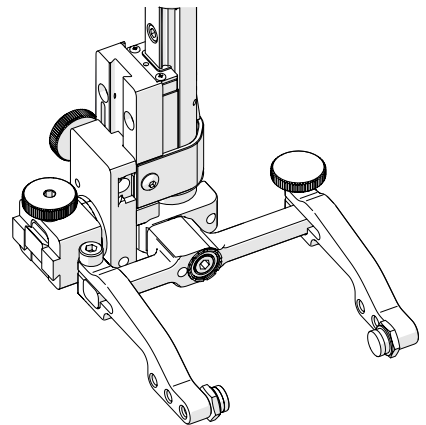


Fig. 126 - Reversed probe holder

8. Raise the stop post on the opposite side until the side of the post contacts the 90° stop point on the probe holder's base (Fig. 125).

5.9.2. 90° Heavy Duty Vertical Probe Holder

- A Probe Holder Adjustment Knob
- B Vertical Adjustment Knob
- C Latch
- D Arm Clamp Screw
- E Yoke
- F Probe Holder Arms with Pivot Buttons

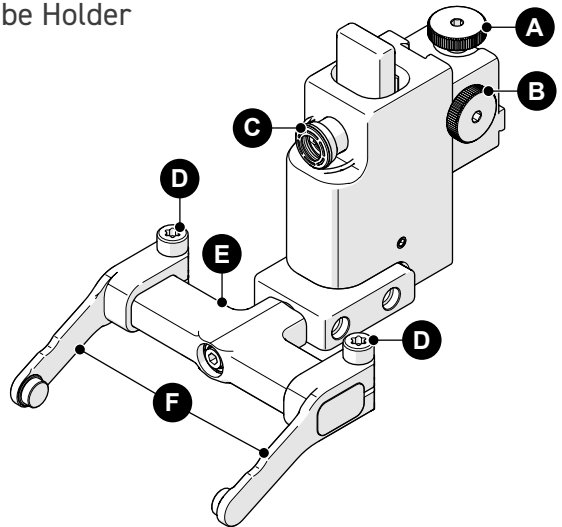


Fig. 127 - 90° Heavy duty vertical probe holder

5.9.2.1 Probe Holder Setup

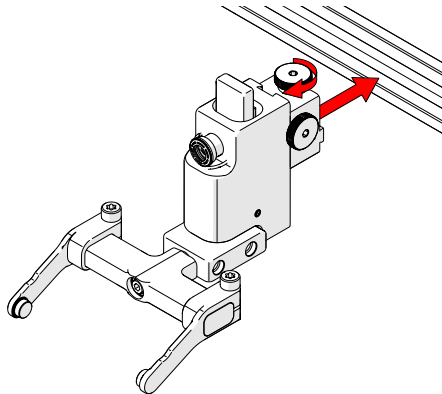


Fig. 128 - Mount probe holder to frame bar

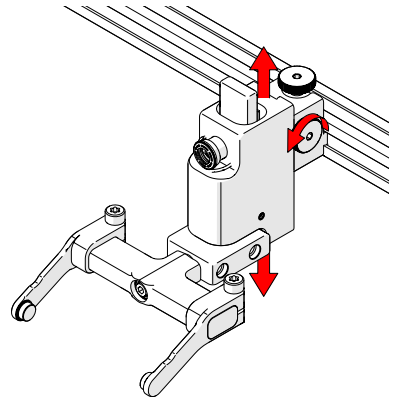


Fig. 129 - Vertical adjustment

1. Loosen the probe holder adjustment knob (*Fig. 128*) and mount the heavy duty vertical probe holder's dovetail jaw to the carrier.
2. The vertical adjustment knob (*Fig. 129*) allows height adjustment of the heavy duty vertical probe holder. This adjustment also controls the probe holder's spring force.

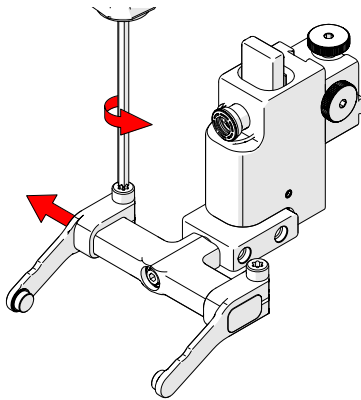


Fig. 130 - Remove probe holder arm

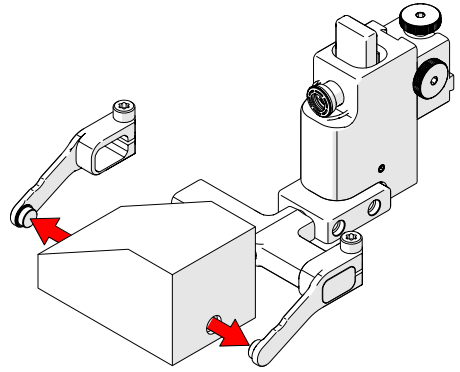


Fig. 131 - Align probe with pivot buttons

3. Loosen the arm clamp screw with the T25 TORX driver and remove a probe holder arm (Fig. 130).
4. Align the pivot button holes of the probe with the probe holder arms (Fig. 131).
5. Mount the probe holder arm on the yoke and tighten the arm clamp screw (Fig. 132).

TIP: Ensure the probe is centred on the yoke. Loosen both arm clamp screws and position the probe when required.

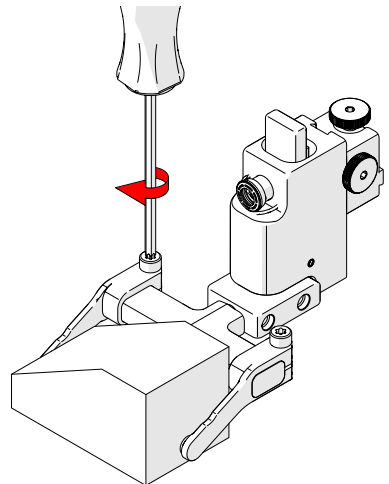


Fig. 132 - Tighten arm clamp screw

5.9.2.2 Probe Holder Vertical Adjustment

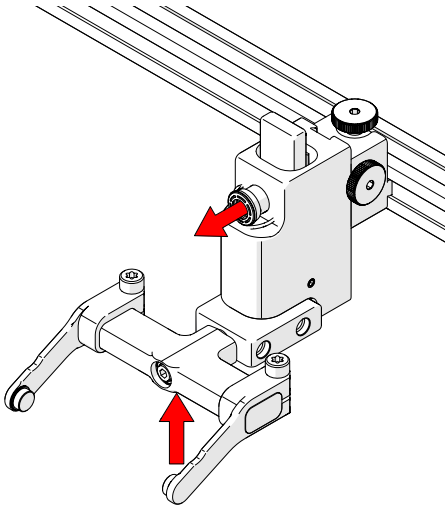


Fig. 133 - Press up and pull latch

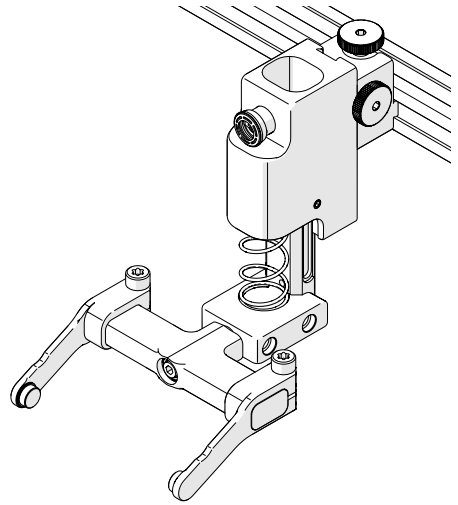


Fig. 134 - Lowered towards scan surface

1. Gently lift the 90° heavy duty vertical probe holder and simultaneously pull the latch (*Fig. 133*). This action will unlock the probe holder. Slowly lower the probe holder towards the scan surface (*Fig. 134*).

5.10. SERKO Probe Holder Frame

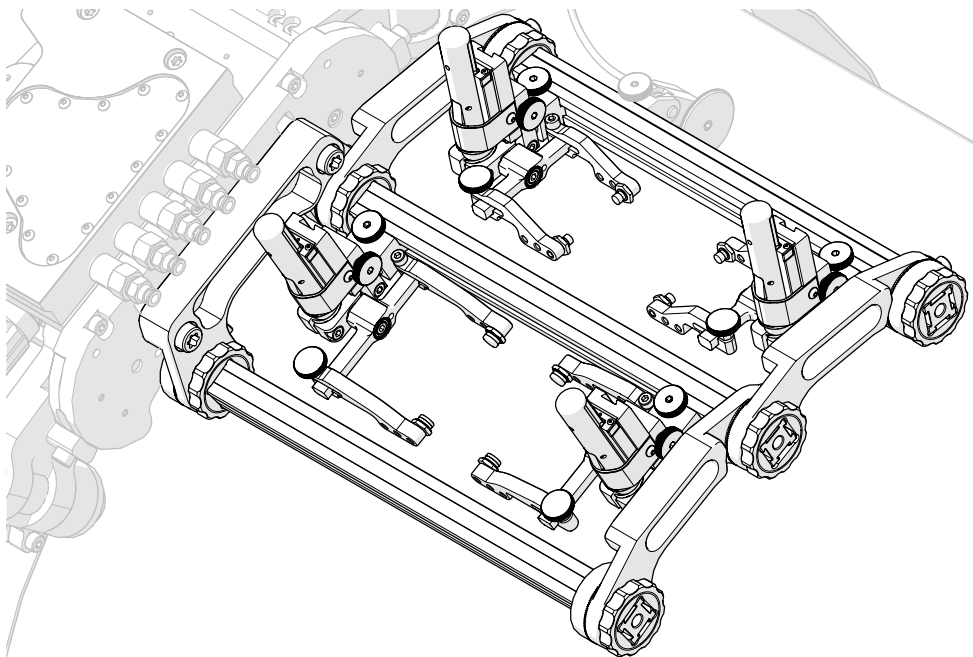


Fig. 135 - SERKO probe holder frame

5.10.1. Probe Holder Frame Adjustment

5.10.1.1 Frame Adjustment

The probe holder frame can be adjusted to match the diameter of a pipe.

1. Loosen two probe holder frame nuts (*Fig. 136*).

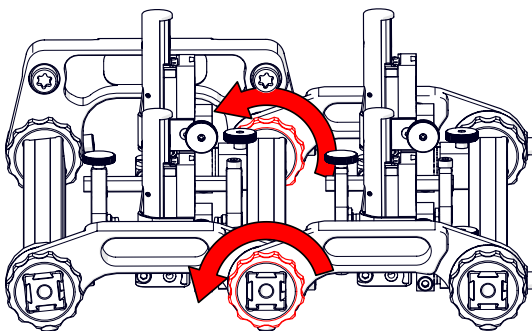


Fig. 136 - Loosen red probe holder frame nuts

2. Pivot the frame to the desired angle (Fig. 137).

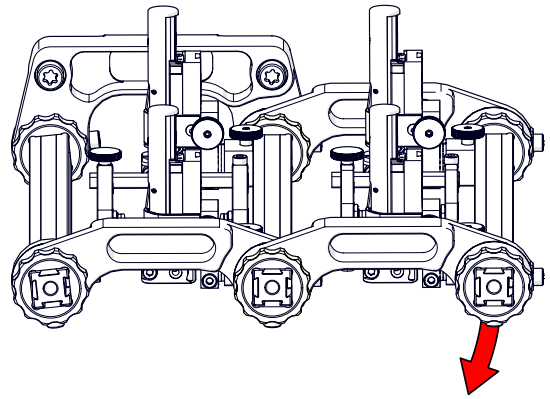


Fig. 137 - Pivot frame to required angle

3. Tighten the probe holder frame nuts to lock the frame at the desired angle (Fig. 138).

NOTE: Make sure the rosette teeth on the two units are fully meshed. Users must verify that all joints are correctly aligned and establish good contact.

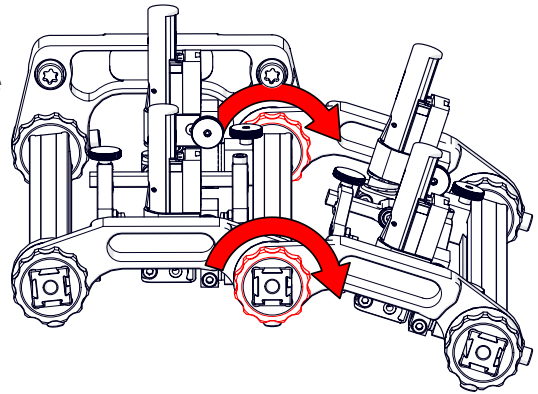


Fig. 138 - Tighten probe holder frame nuts

TIP: Hand tightening probe holder frame nuts is sufficient.

5.10.1.2 Red Nut Wrench

If the probe holder frame nuts become too tight to loosen by hand, a red nut wrench is provided.

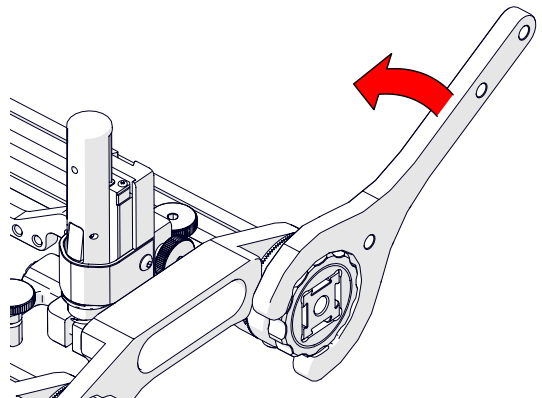


Fig. 139 - Red nut wrench can loosen probe holder frame nuts

5.10.2. Adding A Probe Holder Frame

The **SERKO** can carry up to 10 probes. To add additional probe holder frames see the following steps:

TIP: These steps can be done with the vertical probe holders still attached to the frame bar, but it may be simpler to remove the vertical probe holders before proceeding.

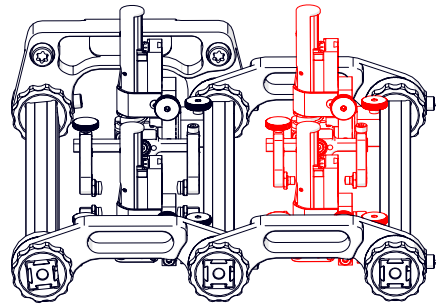


Fig. 140 - Remove vertical probe holders

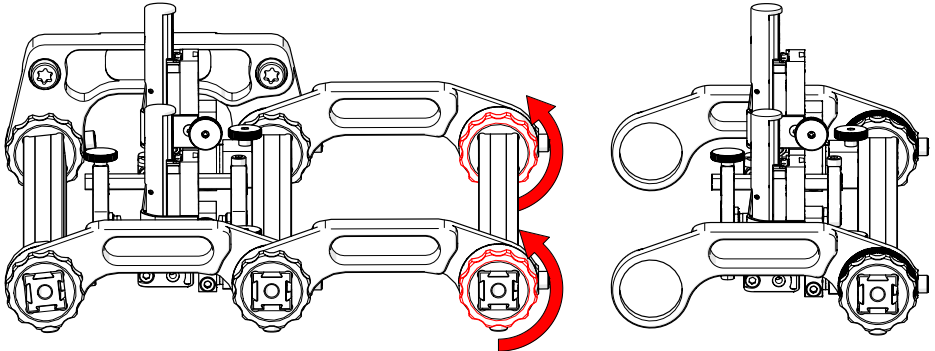


Fig. 141 - Unscrew the probe holder frame nuts

1. Remove vertical probe holders (Fig. 140).
2. Unscrew the two probe holder frame nuts (Fig. 141).
3. Remove the probe holder frame nut and the cap from the front of the probe holder frame (Fig. 142).
4. The other probe holder frame nut and cap will remain until frame bar is loosened.

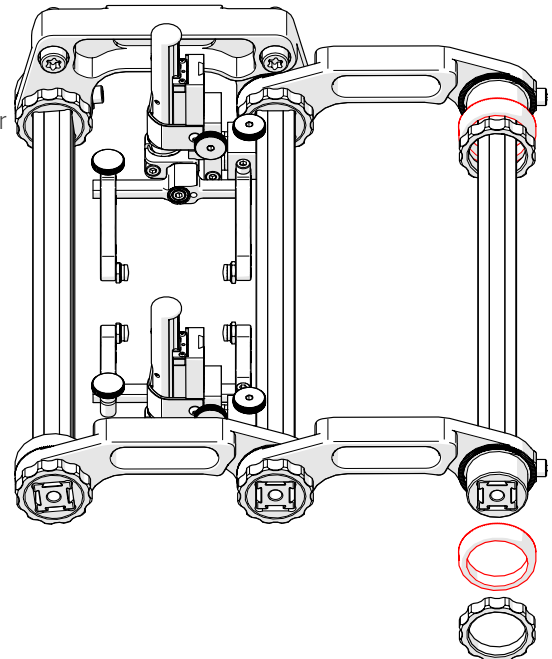


Fig. 142 - Remove probe holder frame nuts and caps where possible

5. Loosen the four dovetail screws (Fig. 143).

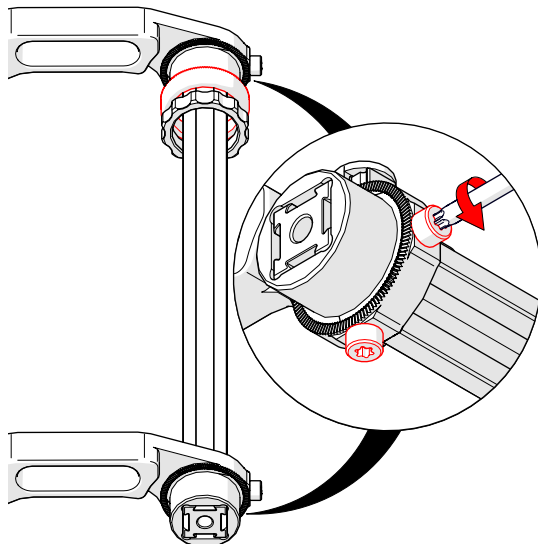


Fig. 143 - Loosen four dovetail screws

6. Slide the frame bar while taking care to remove the cap and keep the probe holder frame nut on the frame bar.

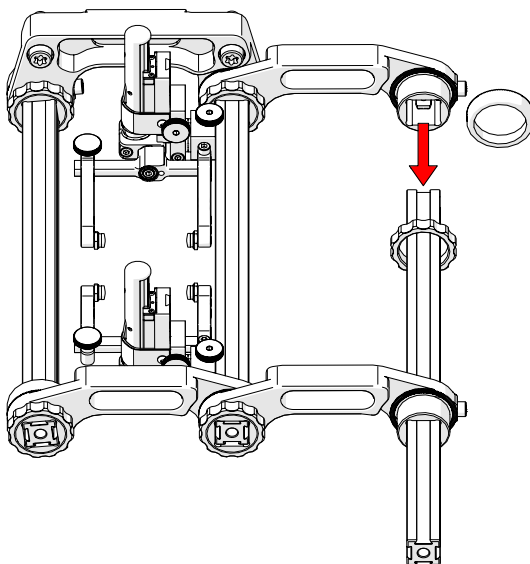


Fig. 144 - Slide frame bar removing cap

7. Angle the probe holder frame around the frame bar (*Fig. 145*).

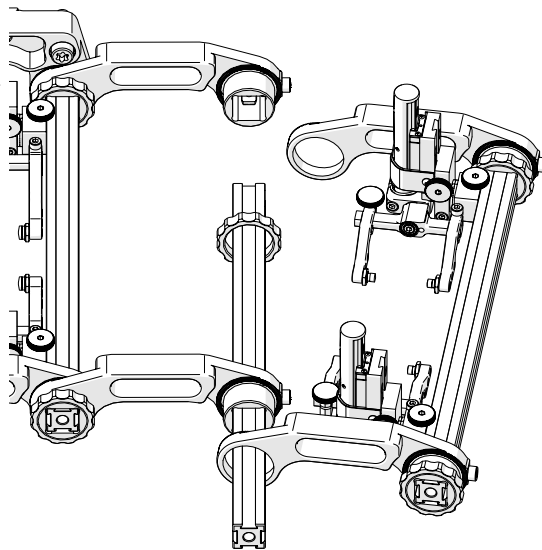


Fig. 145 - Angle probe holder around frame bar

8. Mount the probe holder frame and take care to ensure the teeth align correctly (*Fig. 146*).

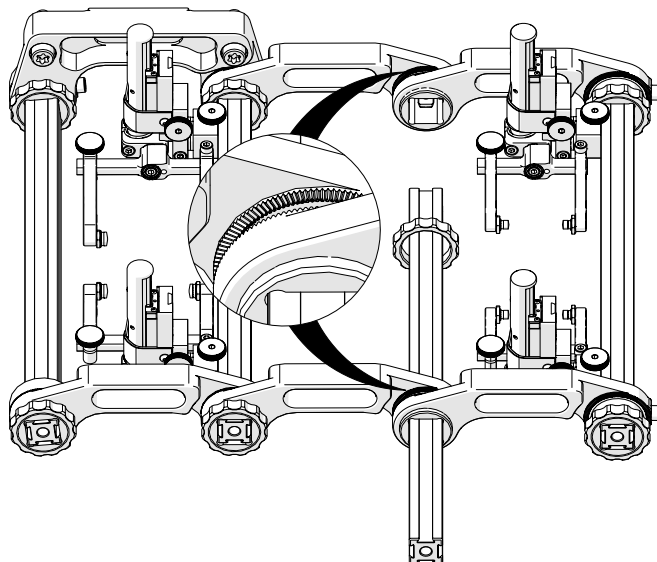


Fig. 146 - Mount probe holder frame

9. Slide the frame bar into the dovetail grooves (Fig. 147).

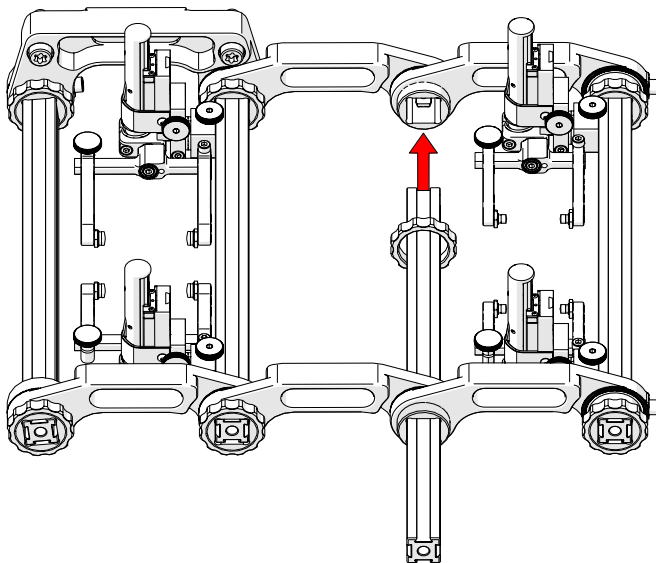


Fig. 147 - Mount probe holder frame

10. Ensure that the frame bar is installed flush with the surface (Fig. 148).
11. Tighten the four dovetail screws (Fig. 148).
12. Lift the probe holder frame if required to access all dovetail screws (Fig. 148).

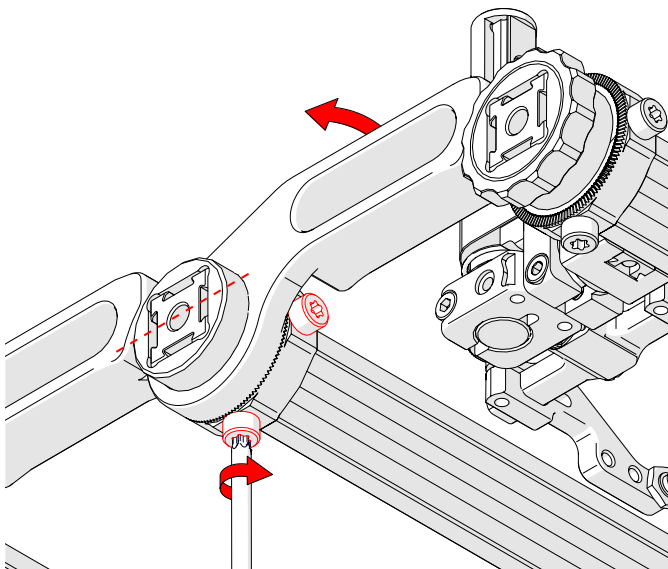


Fig. 148 - Mount probe holder frame

13. Thread on the two probe holder frame nuts (Fig. 149).

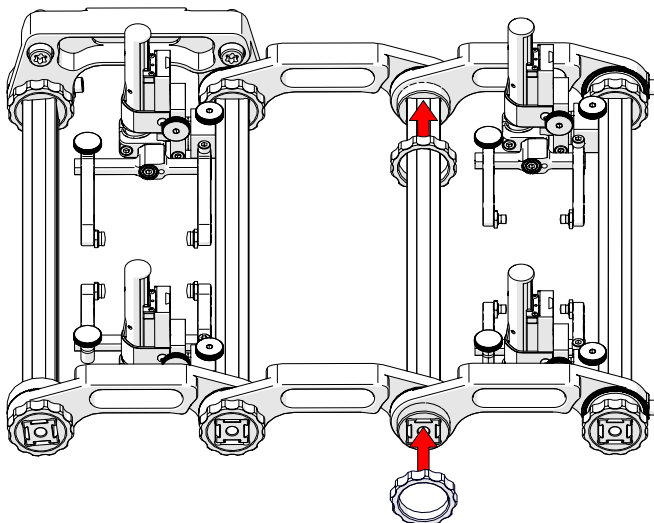


Fig. 149 - Attach the probe holder frame nuts

14. Using these previous methods and instructions, install the caps on the new probe holder frame (Fig. 150).

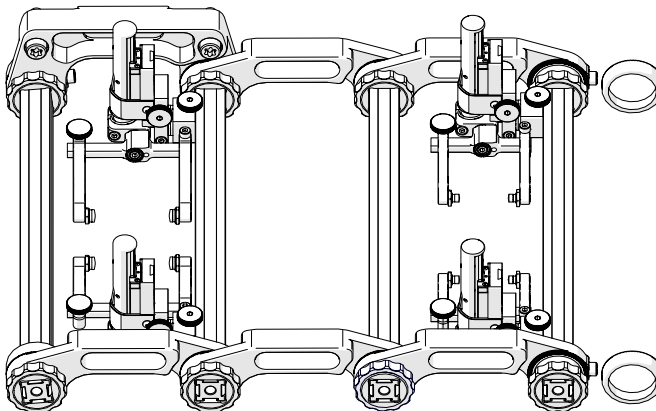


Fig. 150 - Install the caps on the new probe holder frame

15. Mount vertical probe holders (Fig. 151).
16. To remove a probe holder frame, reverse these steps.

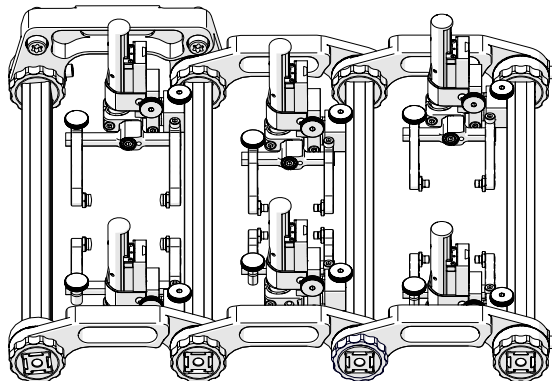


Fig. 151 - Mount vertical probe holders

5.10.3. Probe Holder Frame Installation

The probe holder frame adds weld scanning capability to the **SERKO**. This example frame uses (4) vertical probe holders. Additional frame components allow up to ten probes to be used (*contact Jireh Industries Ltd. on page 1*).

1. Attach the wedges to the probe holders that will be used (see “Probe Holder Setup” on page 56 for additional details).
2. Affix the probe holders (with attached wedges) to the probe holder frame (see “Probe Holder Setup” on page 56).
3. Use the supplied T45 driver and align the screws of the probe holder frame to the nuts on the carriage (Fig. 152).

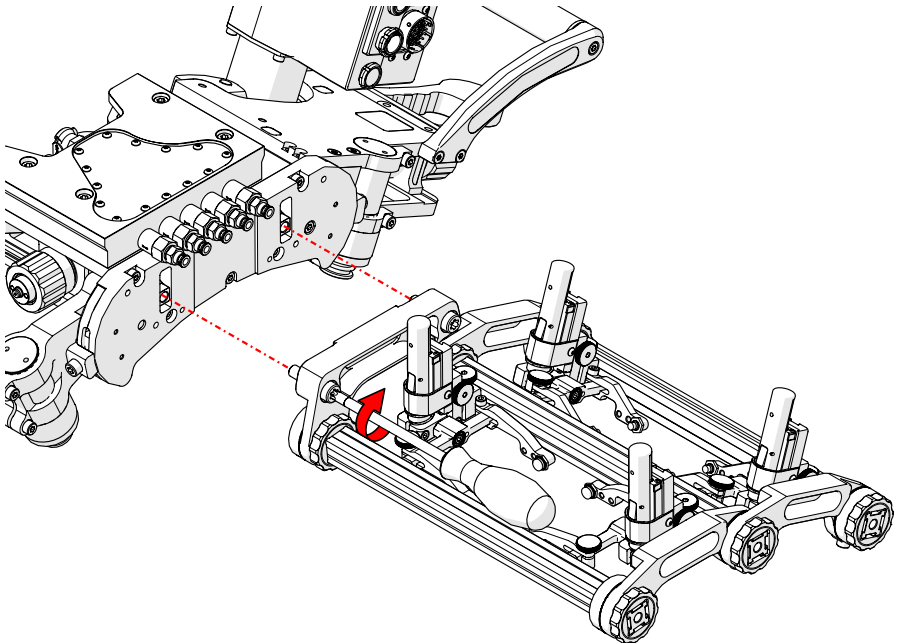


Fig. 152 - Screw the probe holder frame to the carriage

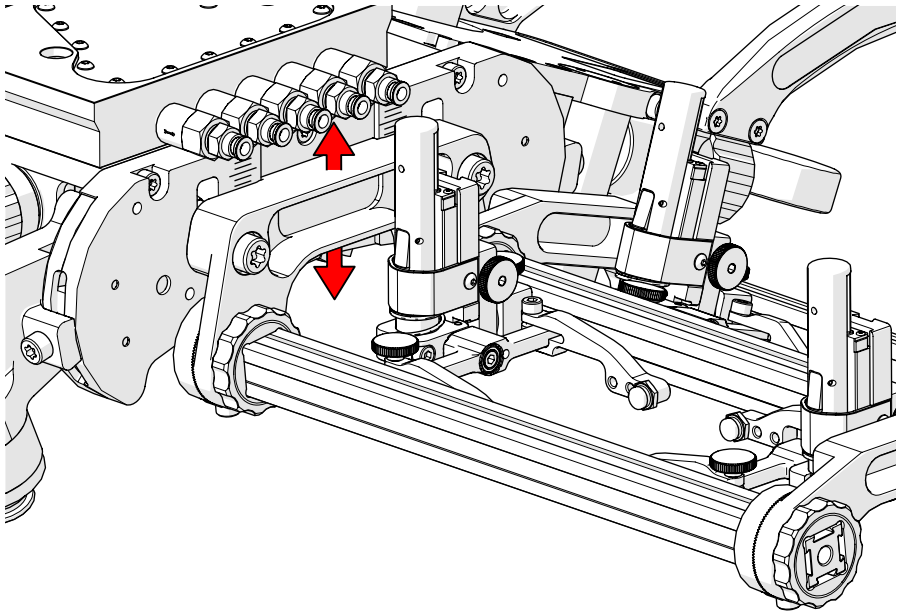


Fig. 153 - Vertical probe holder frame positioning

4. Before tightening the screws completely, the probe holder frame may be positioned vertically (*Fig. 153*).
5. Markings are provided on the carriage to assist with positioning the probe holder frame (*Fig. 154*).

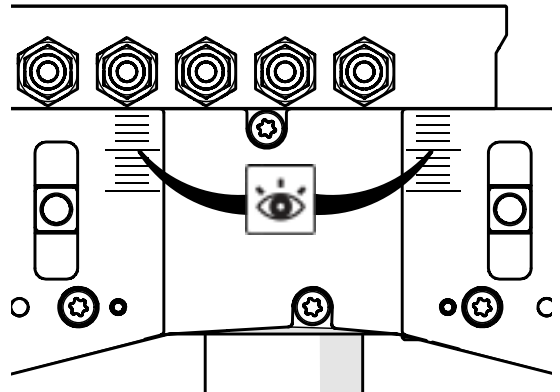


Fig. 154 - Markings for probe holder frame positioning

OPERATION

6.1. System Startup

To activate the system, follow these steps:

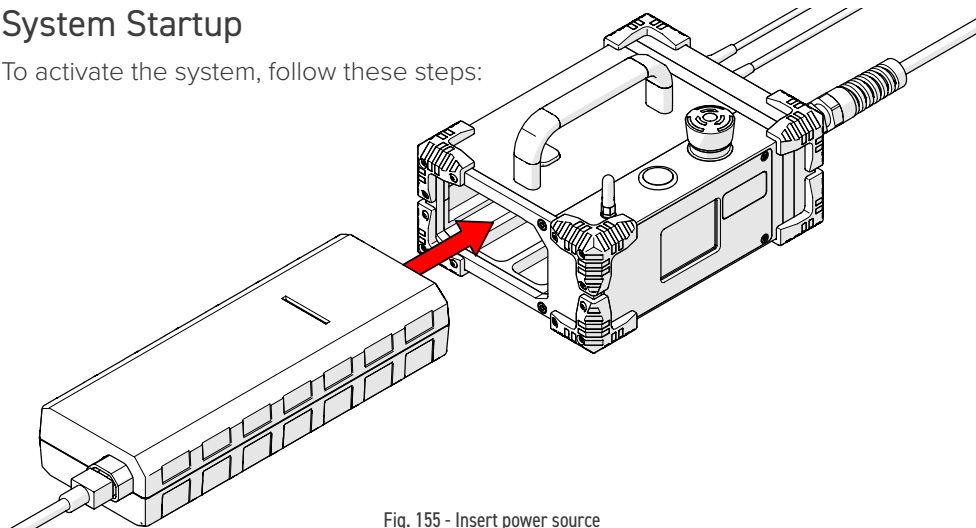


Fig. 155 - Insert power source

1. Insert the power source (Fig. 155) into the system controller dock.

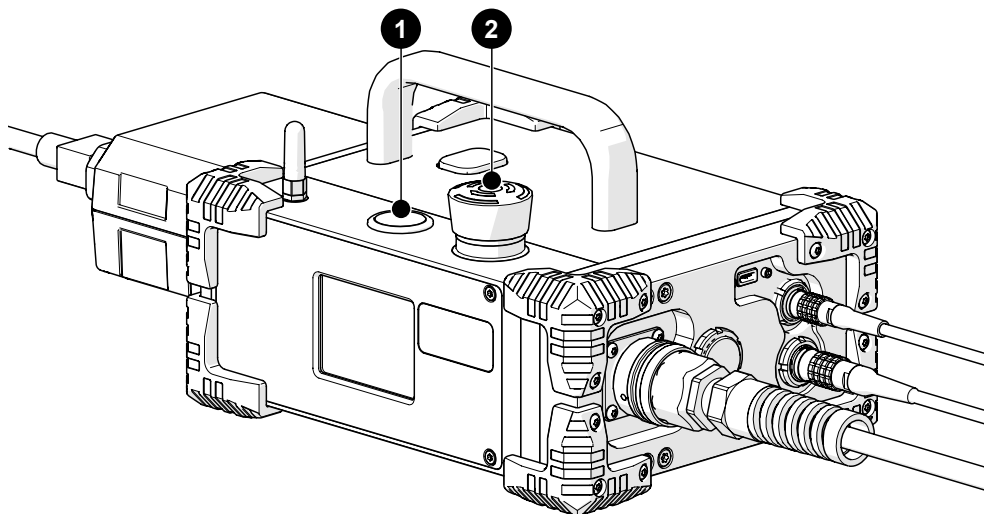


Fig. 156 - System controller

2. Locate the **2** red off push-button on the system controller. Rotate this button clockwise to unlatch (Fig. 156).
3. The **1** power button (Fig. 156) on the system controller activates the system.

NOTE: If the carriage is moving due to an external force when power is applied, the system will display a “Please Wait – Motor Moving” message until the movement stops. The carriage must be stationary for system initialization to be performed.

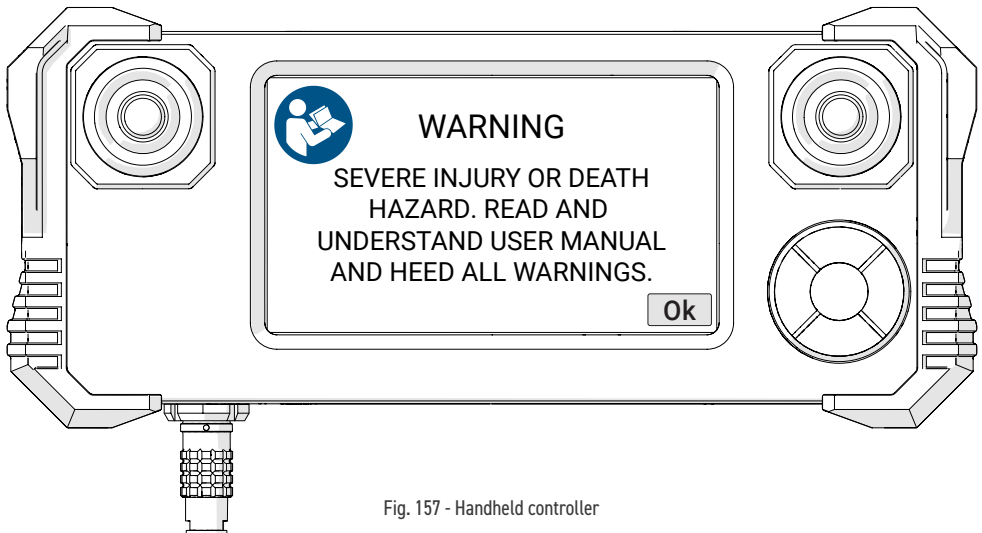


Fig. 157 - Handheld controller

4. A warning message will display on the handheld controller when power has been activated. Once the dangers of using the **SERKO** are recognized and understood by reading this user manual, touch **Ok** to acknowledge the warning (Fig. 157).

Once the system is initialized, the **Mode Select** screen will appear (see “Mode Select Screen” on page 78). The system is now ready for operation.

6.2. Placement of Carriage on Inspection Surface



CAUTION! Do **NOT** handle carriage using the umbilical cable. Use the provided handles.

Ensure the high resolution encoder is correctly contacting the inspection surface (see *“High-Resolution Spring-Loaded Encoder” on page 46 for additional details*).

6.3. Carriage Setup

Chapter 5 (*“Preparation for Use” on page 28*) of this user manual explains the setup of the carriage. These instructions only need to be completed once while inspecting the same diameter of pipe. Should an alternate pipe diameter be inspected, refer to Chapter 5 (*“Preparation for Use” on page 28*) to setup the system for the new pipe diameter.

6.4. Operation

6.4.1. Handheld Controller Layout

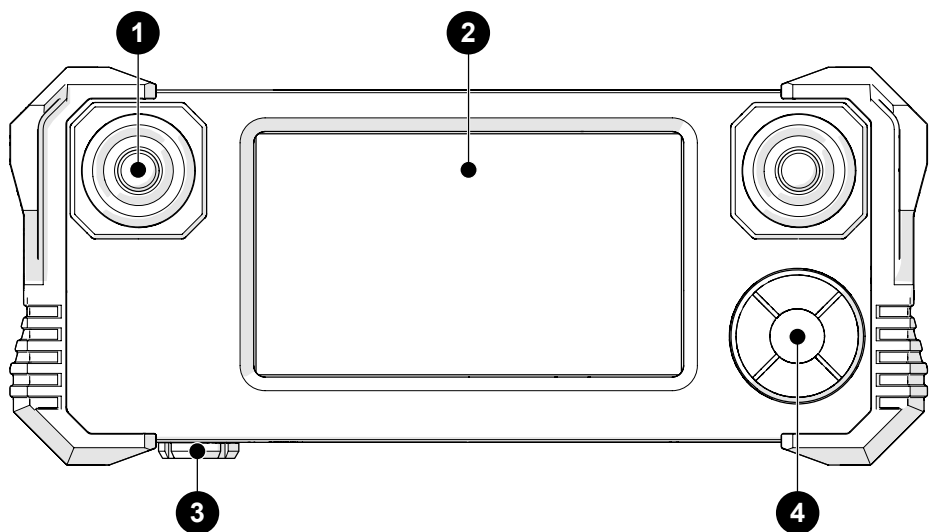


Fig. 158 - Handheld Controller

1	Fwd/Rev joystick	(see “Joysticks” on page 78)
2	Touchscreen	(see “Touchscreen” on page 77)
3	Auxiliary cable connector	Connection point for the auxiliary cable.
4	D-pad	A means of navigating the on-screen menus of the handheld controller.

6.4.1.1 Touchscreen

The 2 handheld controller’s touchscreen is the primary operator interface for the system (Fig. 158). Buttons are indicated on-screen with a red border.

6.4.1.2 D-pad

The 5 D-pad (Fig. 158) provides a redundant system control that may be utilized as an alternative to the touchscreen. A blinking box around a button indicates the D-pad selection. Pressing the outer buttons of the D-pad selects different buttons on-screen. Press the centre button of the D-pad to choose the button currently selected.

6.4.1.3 Joysticks

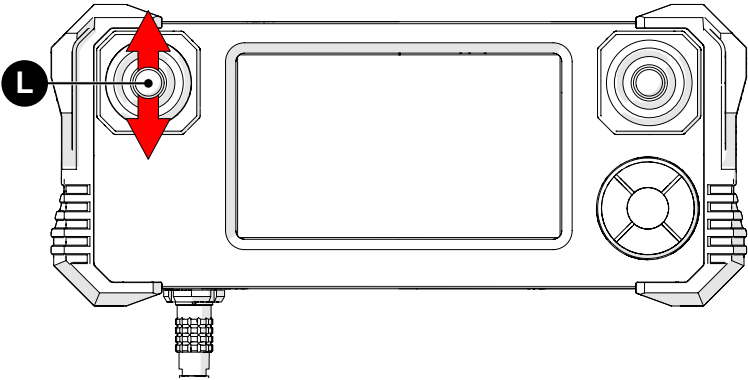


Fig. 159 - Handheld controller joysticks

The joysticks control system motion. The **L** left joystick controls the forward/reverse movement of the carriage (Fig. 159).

6.4.2. Mode Select Screen

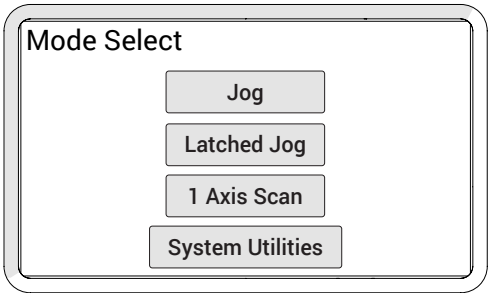


Fig. 160 - Mode select

The **Mode Select** screen offers four modes of operation for the system:

Jog Mode	(see “Jog Mode” on page 79)
Latched Jog Mode	(see “Latched Jog Mode” on page 80)
1 Axis Scan Mode	(see “1 Axis Scan Mode” on page 81)
System Utilities	(see “System Utilities Screen” on page 84)

6.4.3. Jog Mode

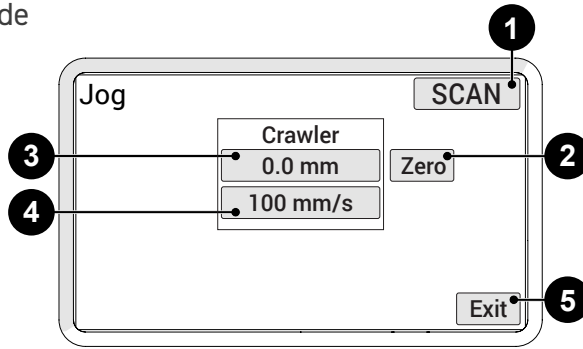


Fig. 161 - Button identification

Jog mode manually controls the system movement using the joysticks.

- | | |
|--|--|
| 1 Scan/Rapid Button
(Fig. 161) | Used to quickly switch between carriage speeds. The speed in either mode can be manually set to the user's preference.

<div style="border-left: 2px solid red; padding-left: 10px; margin-top: 10px;"><i>TIP: Fine adjustments to speed can be made in the User Settings (see "User Settings Screen" on page 85).</i></div> |
| 2 Zero Button | Sets the current position to zero for all modules. |
| 3 Module Position Button(s) | Displays the current position of the carriage. Press to set the position to any value using the Edit screen. When a module position is modified, the position will be modified for all other system modes.

<div style="border-left: 2px solid red; padding-left: 10px; margin-top: 10px;"><i>NOTE: This function only zeroes the number displayed on the SERKO handheld controller. It does not zero the position used in the data acquisition instrument.</i></div> |
| 4 Module Rate Button(s) | Displays the current maximum rate for the selected speed mode. Press to set the maximum rate using the Edit screen. The movement commanded by the joysticks will be limited to the indicated rate. When a rate is modified, the rate will be modified for all other system modes. |
| 5 Exit Button | Exits the jog mode and returns to the Mode Select screen. |

6.4.4. Latched Jog Mode

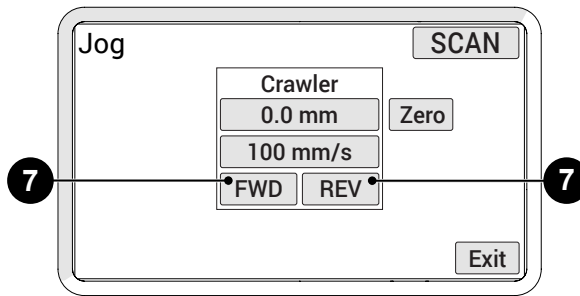


Fig. 162 - Latched jog mode

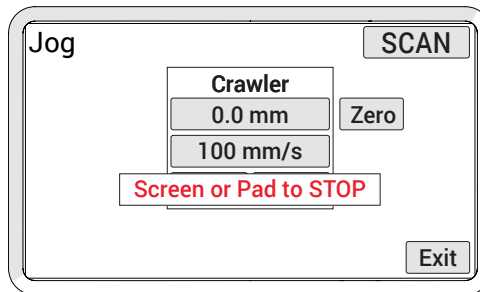


Fig. 163 - Latched jog stop screen

Identical to standard jog mode, latched jog mode adds forward or reverse carriage movement at the selected scan rate. This eliminates the need to manually hold the left joystick (see “Jog Mode” on page 79).

7 FWD & REV Buttons:

The **FWD** and **REV** buttons are located in the crawler tab. Press the **FWD** or **REV** button to drive the carriage at the current maximum scan rate. Touching the handheld controller screen or pressing the D-pad stops carriage movement.

NOTE: The FWD & REV Buttons will not be present in rapid mode.

6.4.5. 1 Axis Scan Mode

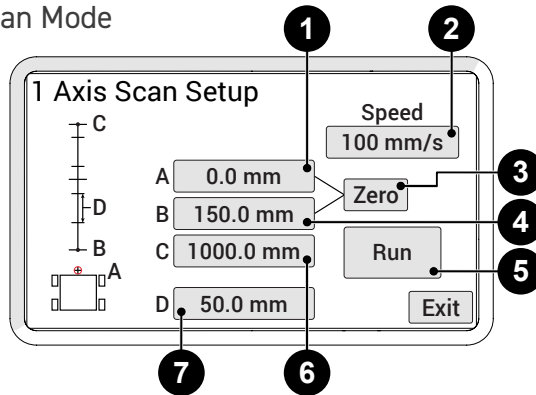


Fig. 164 - 1 Axis scan mode

1 Axis Scan mode drives the carriage along the band, stopping at programmed intervals.

1	Point A	The current encoder position of the carriage.
2	Speed Button	Access the User Settings screen to set the carriage's scan speed.
3	Zero Button	Set the numerical value for rows A and B to zero.
4	Point B	The start point of the scan travel. The system will move the carriage from the A point to this point at the start of a scan.
5	Run Button	Enables the 1 Axis Scan screen (see "1 Axis Scan Screen" on page 82).
6	Point C	The finish point of the overall scan travel.
7	Setting D	The distance the system will advance.

The **1 Axis Scan Setup** screen indicates the scan functions that may be entered. Each point and setting, **A**, **B**, **C**, **D**, corresponds to a coordinate entry button on the screen.

A typical scan begins at the **A** position and moves to the **B** position. Scanning begins at the **B** position and scans the distance of **D** until the **C** position is reached.

6.4.5.1 1 Axis Scan Screen

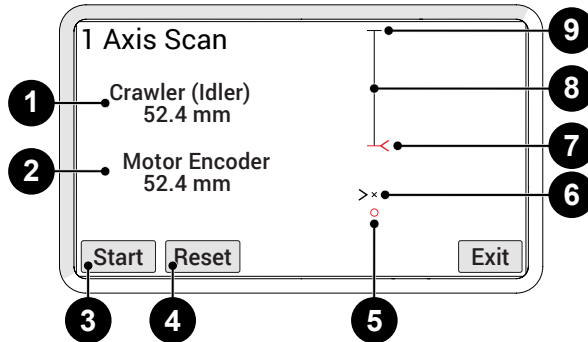


Fig. 165 - 1 Axis scan screen

The **1 Axis Scan** screen initiates and monitors the scan and advances the set distance. The initial scan screen is an approximation of a full view (*zoomed out*) of the entire scan path.

- | | |
|--|---|
| 1 Crawler (Idler)
(Fig. 165) | The current encoder position of the crawler. If an idler encoder is available, it will also indicate the encoder selected (<i>Motor or Idler</i>) for crawler positioning as set in the User Settings (see “ <i>User Settings Screen</i> ” on page 85). |
| 2 Motor Encoder | If an idler encoder is available, the position of the secondary encoder (<i>Motor or Idler</i>) is displayed for reference. This encoder is not used for positioning as per the User Settings (see “ <i>User Settings Screen</i> ” on page 85). |
| 3 Start/Stop button | Start or stop the scan sequence. When a scan has been stopped while in progress, the start button resumes the scan. |
| 4 Reset | Return the scanner to the A position. Press the start button to begin the scan sequence from the initial setting. |
| 5 Scan location | Small red circle indicates the A position. |
| 6 Scanner position | The blinking crosshair indicates the current scanner position. |
| 7 Next scanner position | Where the scanner will travel to next. |

NOTE: The red indicator is always where the scanner will go next.

- | | |
|---|--|
| <p>8 Summary screen</p> <p>9 End position</p> | <p>A visual representation of the scan area.</p> <p>The completed distance of programmed travel.</p> |
|---|--|

When Start is pressed the first time, the scanner will travel to point **B** and pause. The summary screen will show a closer view (*zoom in*) of the scan path.

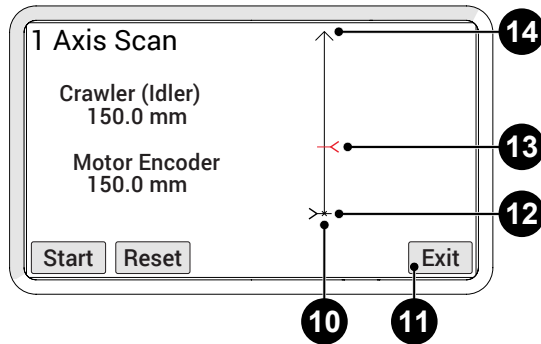


Fig. 166 - 1 Axis scan screen

- | | |
|--|--|
| <p>10 Scanner location</p> <p>11 Exit button</p> | <p>The current encoder position of the carriage.</p> <p>Pressing Exit stops all scanning motion. When the scanner is not in the A position, a warning appears (<i>Fig. 167</i>). The warning alerts that the A position of the scanner will be changed to the current position.</p> |
|--|--|

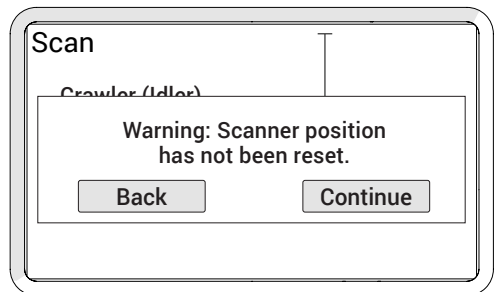


Fig. 167 - Exit warning

Press **Back** to return to the **1 Axis Scan** screen to reset the scanner and maintain original **A** position. Press **Continue** to exit to **1 Axis Scan Setup** screen.

- | | |
|----------------------------|---|
| <p>12 Scanner position</p> | <p>The blinking crosshair indicates the scanner position.</p> |
|----------------------------|---|

- 13 Next scanner position Where the scanner will travel to next.

NOTE: The red indicator is always where the scanner will go next.

- 14 End point Arrow indicates travel will continue to advance. A straight line indicates the end of programmed travel.

6.4.6. System Utilities Screen

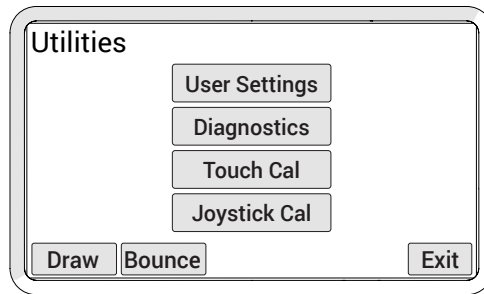


Fig. 168 - Utilities screen

The **Utilities** screen provides access to the setup, diagnostics and user preference settings.

User Settings Button (Fig. 168)	Access the User Settings screen allowing for various user preferences to be adjusted.
Diagnostics Button	Enters the Diagnostic screens to monitor system components and function.
Touch Cal Button	Used to initiate the Touch Calibration screen.
Joystick Cal Button	Used to enter the Joystick Calibration screen.
Draw Button	Enters mode used to test the touch screen accuracy and response.

6.4.6.1 User Settings Screen

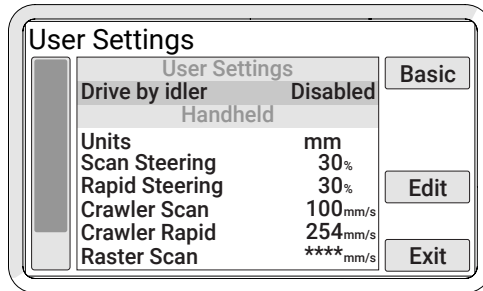


Fig. 169 - User settings screen

Allows a user to customize the system to their preferences.

The blinking highlighted box indicates the current selection. Use the D-pad or **Up** and **Down** buttons to select different settings.

Press **Edit** to enter the **Edit** screen to apply changes to the selected setting.

The **Exit** button directs to the **System Utilities** screen.

Title	Description
Drive by idler	Enables the idler encoder for carriage positioning in 1 and 2 axis scan modes. In automatic scan modes, if an idler encoder is available, enabling it will reduce the actual carriage position error as the idler encoder is not affected by drive wheel slippage on the surface.
Units	Change the measurement units for display and user entry. When set to 0, units measure in inches. When set to 1, units measure in millimetres.
Scan Steering	Sets the steering limit maximum when using the jog mode scan setting. Lower values make the steering joystick less sensitive and more accurate, enabling better control following a guide or feature. Units are a percentage of the maximum system allowed.
Rapid Steering	Sets the steering limit maximum when using the Rapid setting within Jog mode. Recommended to be left at 100 to allow maximum crawler maneuverability.
Crawler Scan	Sets the crawler scan rate in the current units/second. This setting can also be changed through the Jog or Two Axis Scan Speed screens.
Crawler Rapid	Sets the crawler rapid rate in the current units/second. This setting can also be changed through the Jog screen.
Display Brightness	Sets the brightness of the display.

6.4.6.2 Diagnostics Screens

Several diagnostic screens allow various system functions to be monitored. Navigate to different diagnostic screens using the **PREV** and **NEXT** buttons. The **Exit** button returns to the **System Utilities** screen.

NOTE: *The diagnostic information requires an in-depth understanding of the underlying technologies and programming in the system. Not all functions and information is explained in this manual.*

6.4.6.3 Touch Calibration Screen

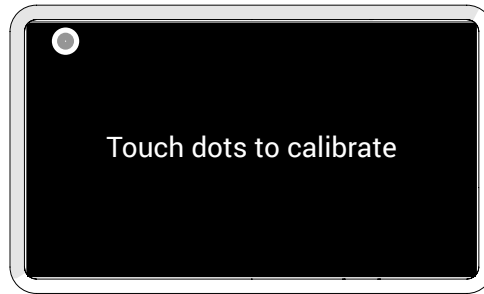


Fig. 170 - Touch calibration screen

This option allows calibration of the touch screen. Typically, this should not be necessary.

Touch the screen as the markers appear in the four corners of the screen.

TIP: *It is recommended that the markers be touched with a small object to enhance the touch position accuracy during calibration.*

The new calibration is stored immediately when the fourth marker is pressed. The calibration utility exits and return to the **System Utilities** screen. To abort the calibration, the system power may be turned off before the last marker is pressed.

6.4.6.4 Joystick Calibration Screen

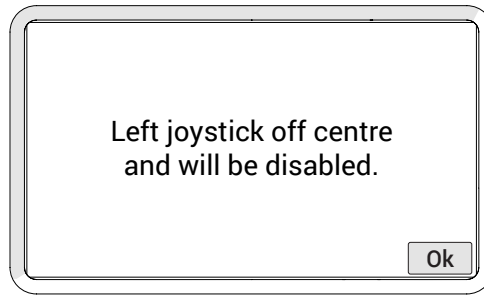


Fig. 171 - Joystick error

Typically joystick calibration is only necessary when an off-centre joystick error is detected upon startup (*Fig. 171*). Calibration may also be used when a joystick function does not appear to be properly centred.

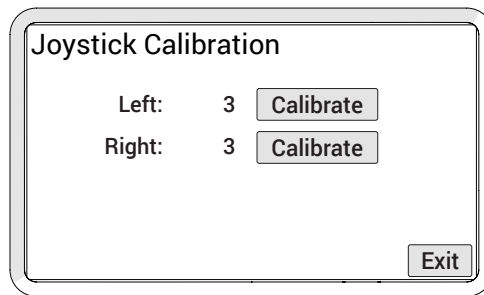


Fig. 172 - Joystick calibration screen

Current readings of the joysticks are displayed on the **Joystick Calibration** screen (*Fig. 172*). When the numbers are not near zero, press the **Calibrate** button to recalibrate to 0. The new calibration is stored when the **Exit** button is pressed.

6.4.6.5 Draw



Fig. 173 - Draw utility

The draw utility may be used to test the function of the touchscreen. Exit the utility by pressing the D-pad.

6.4.7. High Internal Temperature Screen



CAUTION! HOT SURFACE. The handles of the carriage and carriage body may be hot to the touch. Use appropriate protective equipment when removing a carriage from a high temperature surface.

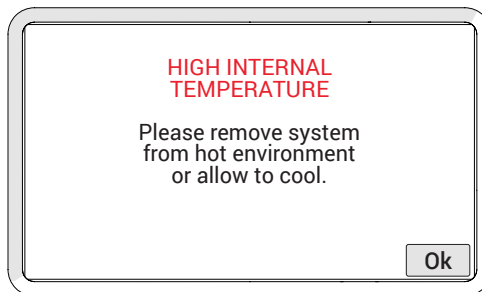


Fig. 174 - High internal temperature screen

When the system approaches its maximum operating temperature, the high internal temperature screen will display. When this alert screen is displayed, all motor and system functions will cease.

Press **OK** to reactivate the system to remove **SERKO** from the scan surface.

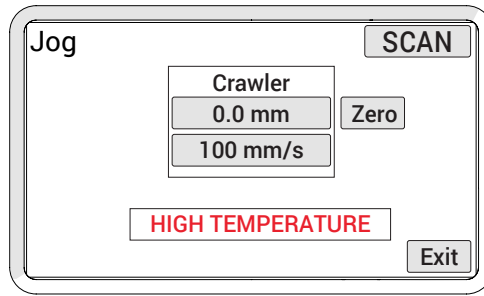


Fig. 175 - High internal temperature screen

Should the user choose to continue operating the carriage, the HIGH TEMPERATURE warning will continue to display until the temperature falls below the set temperature limit.

MAINTENANCE

7.1. Safety Precautions Before Maintenance



WARNING! ELECTRICAL SHOCK

HAZARD. Disconnect the system controller when servicing the equipment. The system controller is powered even when the push-button is latched in the off position.

7.2. Cleaning

General cleaning of components is important to keep your system working well. All components that have no wiring or cables are completely waterproof. Components can be washed with warm water, dish soap and a medium bristle brush.

Before using the scanner, ensure all connectors are free of water and moisture.

NOTE: All components with wiring, cables or electrical connections are splashproof. However, these components are **NOT** submersible.

NOTE: Never use strong solvents or abrasive materials to clean your scanner components.

7.3. Maintenance Schedule

The **SERKO** must be maintained according to the following schedule:

Task	Frequency
<u>Clean the drive wheel</u> Debris may collect on the drive wheel. Remove this debris before every use.	Every use
<u>Clean the band surface</u> Ensure the surface and edges of the band are clean. Wipe any excess dirt or contaminants before use.	Every use
<u>Inspect cables and connectors</u> Inspect the umbilical cable, the auxiliary cable and the power cable for damage. Have any damaged cable repaired by a qualified person or replace the cable assembly as necessary. Inspect all connectors for damage or moisture. Straighten bent pins. Dry connectors before using.	Every use
<u>General cleaning</u> Ensure that the scanner stays relatively clean by wiping off any excess dirt or other contaminants after every use. (see "Cleaning" on page 90).	Every use
<u>Inspect idler wheels</u> The idler wheels are made from a hardened material and therefore may become cracked. Inspect all idler wheels to make sure that they are not cracked or severely worn.	Daily
<u>Inspect drive wheel</u> The drive wheel is made from a hard material and therefore may become cracked or worn. Inspect the drive wheel to make sure that it is not cracked or severely worn.	Daily
<u>Linkages</u> Check to see that there is no excessive play in the clamp lever linkage. This includes all pinned connections from the clamp lever to the adjustable knob and to the idler wheel pivot arm / motor pivot arm.	Every 40 hours

TROUBLESHOOTING

8.1. Startup Issues

Two messages are possible in the event of a startup issue: **Joystick Off Center** or **Checking Network**.

8.1.1. Joystick Off Center

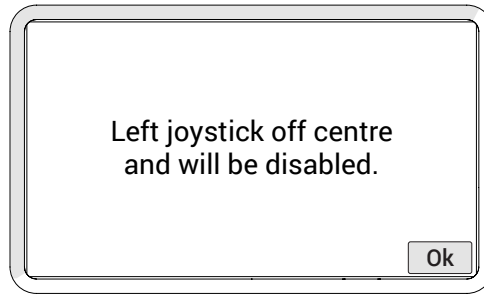


Fig. 176 - Joystick off centre screen

Upon system startup, the joystick positions are detected. When a joystick is detected outside the centre position, the **Joystick Off Center** screen displays, indicating the joystick will be disabled. Press **Ok** to continue system startup. All system functions will work normally with the exception of movements that require joystick operation.

Ensure the handheld controller's joysticks are free of interference and reset the system power to enable joystick control.

If no interference of the joystick is present, the joystick calibration may need to be performed (see "Joystick Calibration Screen" on page 87)

8.1.2. Checking Network

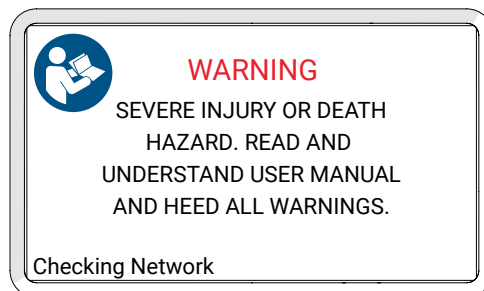


Fig. 177 - Checking network screen

During startup, the system initializes the communications to all the devices on

the network. If the network communication fails for any reason, the **Checking Network** message will appear and remain on screen.

Likely causes of this failure:

1. No devices connected to the network.
2. A problem with one of the devices.
3. Cable issue causing the entire network to fail.

Check the connections of the devices or try removing one device at a time from the system to isolate the problem device.

NOTE: Always turn off the system power before connecting or disconnecting any devices.

8.2. Startup Override

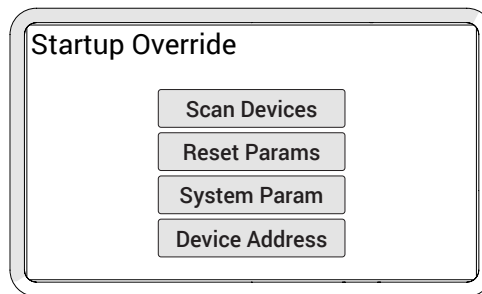


Fig. 178 - Startup override screen

A system maintenance mode may be accessed to correct system issues. Enter the maintenance mode by pressing the handheld controller D-pad while system power is activated. Continue pressing the handheld controller D-pad until the **Startup Override** screen appears.

8.2.1. Scan Devices

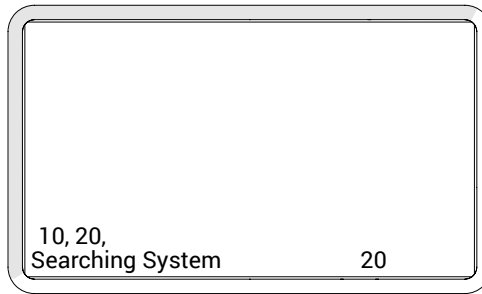


Fig. 179 - Searching System screen

This utility scans the system network for devices. All possible device addresses and speeds are scanned. As devices are found, the address of the devices is displayed. When the scanning is complete, power to the system must be cycled.

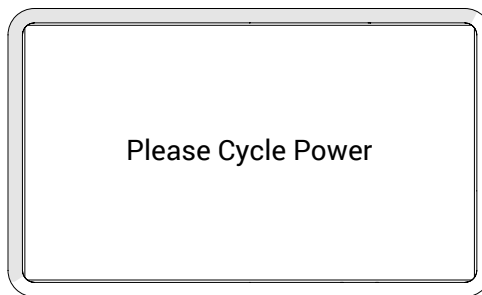


Fig. 180 - Cycle power screen

When a device is connected to the system but is not detected, this most likely indicates an internal device problem. Plug the suspect device into a different umbilical port and perform the scan again to confirm the device is faulty.

8.2.2. Reset Parameters

If the system parameters become corrupt or a change is made that prevents the system from functioning properly. All system parameters may be restored to their factory settings by selecting this option. When pressing the **Reset Params** button, the changes occur immediately. Power will need to be cycled for the reset to be complete.

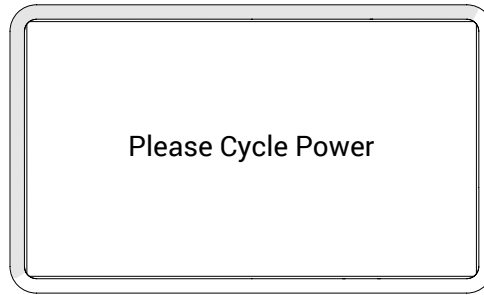


Fig. 181 - Cycle power screen

8.2.3. System Parameters

System parameters are factory set to control a variety of functions. These parameters can not be modified. However, special circumstances may occur when modification of these parameters could be recommended by the manufacturer.

Instructions for making changes to the system parameters will only be provided when deemed necessary by the manufacturer.

8.2.4. Device Address

Each device type in the system is factory assigned a unique identifier. This option allows for these identifiers to be changed in the field. Instructions for making changes to the identifiers will only be provided when deemed necessary by the manufacturer.

8.3. Umbilical Troubleshooting

Troubleshooting by way of simple continuity checks through the umbilical is not effective due to the isolation circuit.

Static, spike and signal conditioning are built into the umbilical for the network signals. Power fuses are provided within the umbilical for the power distribution to the various receptacles. When troubleshooting, if a module is not functioning properly when plugged into a receptacle, it may be plugged into any other matching receptacle.

8.4. Additional Issues

Problem	Possible Cause	Solution
Handheld controller display does not activate	Input power requirements not met.	Ensure input power meets requirements. (see "Power Requirements" on page 7)
	Handheld controller not plugged into umbilical.	Plug handheld controller into umbilical. Ensure connectors are dry, clean and connector pins are not bent.
	Umbilical cable not properly connected.	Check umbilical cable connections at both ends. Ensure connectors are dry, clean and connector pins are not bent.
	SERKO system not started.	Start the SERKO system. (see "System Startup" on page 74)
	Damaged components in handheld controller, carriage, system controller or cabling.	Contact manufacturer. (see "Jireh Industries Ltd." on page 1)
Handheld controller display is activated, yet carriage does not drive	Handheld controller is not in correct mode for driving.	(see "Mode Select Screen" on page 78 for additional details).
	Damaged components in handheld controller, carriage, system controller or cabling.	Contact manufacturer. (see "Jireh Industries Ltd." on page 1)
Carriage does not drive and is unreachable	See possible causes for problem one.	See solutions for problem one. If the carriage is still unresponsive (see "Technical Support" on page 97)
System is displaying "Please Wait – Motor Moving" when power is applied.	Carriage is moving when power is applied due to an external force (<i>gravity, etc.</i>).	Manually stop the carriage movement. The carriage must be stationary for system initialization to be performed.

8.5. Technical Support

For technical support, contact Jireh Industries (see “Jireh Industries Ltd.” on page 1).

SERVICE AND REPAIR



WARNING! ELECTRICAL SHOCK

HAZARD. Disconnect the system controller when servicing the equipment. The system controller is powered even when the off push-button is latched in the off position.



WARNING! DO NOT DISASSEMBLE.

No user-serviceable parts. Disassembling any of the components in this product, beyond the instructions in this user manual, could void the regulatory certifications and/or effect the safety of the product.

9.1. Idler Shaft Replacement

To replace any or all of the idler shafts, follow these steps:

NOTE: There are two idler shafts that share the same alignment method, while the single idler shaft has a different alignment procedure. Be sure to follow the respective alignment instructions for the two idler shafts versus the single idler shaft during installation.

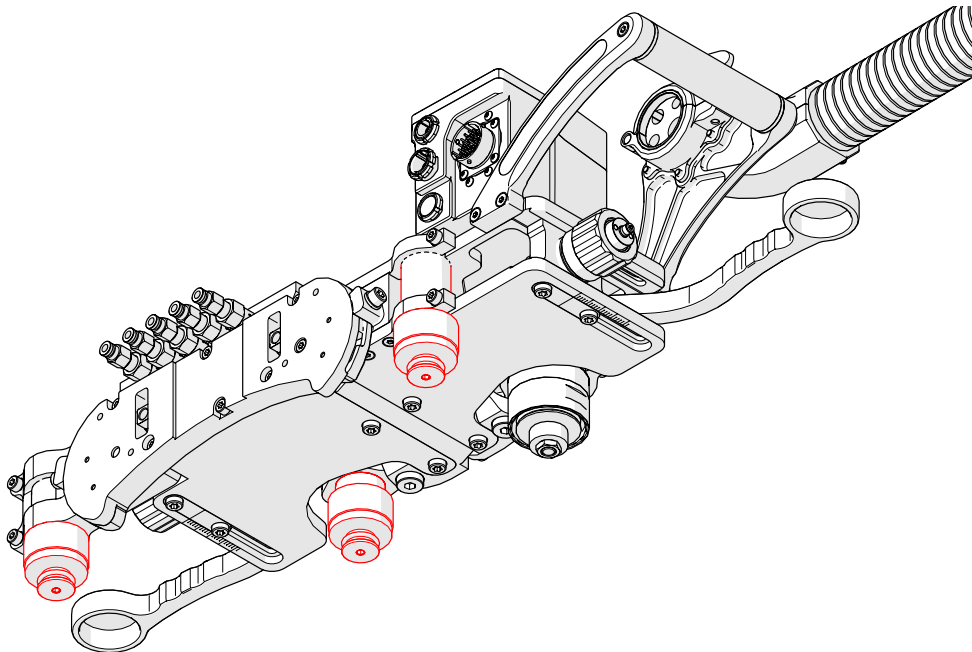


Fig. 182 - Idler shaft replacement

1. Loosen the two screws on the idler shaft clamp using a T25 TORX driver (*Fig. 183*).

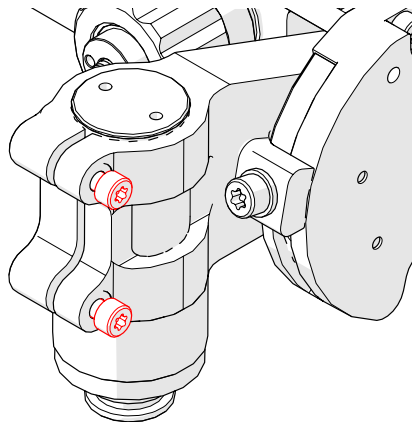


Fig. 183 - Loosen two screws

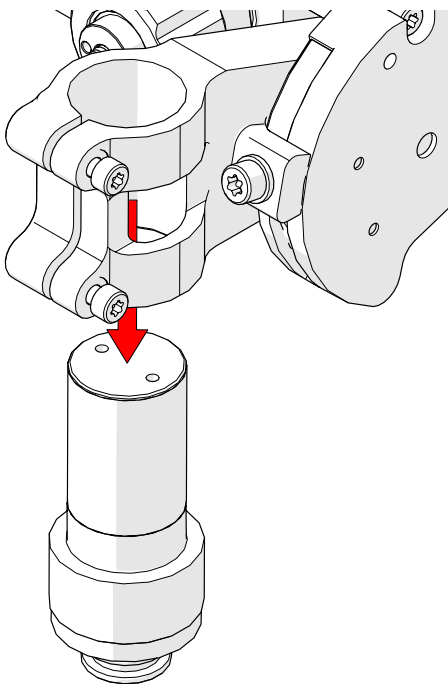


Fig. 184 - Remove idler shaft

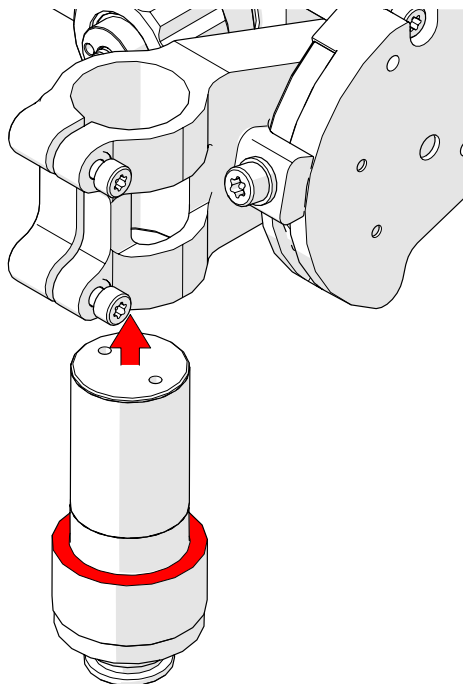


Fig. 185 - Install idler shaft

2. Remove idler shaft (*Fig. 184*).
3. Install the replacement idler shaft and until the idler shaft presses against the base of the clamp. (*Fig. 185*).

4. Tighten the two clamp screws (Fig. 186).

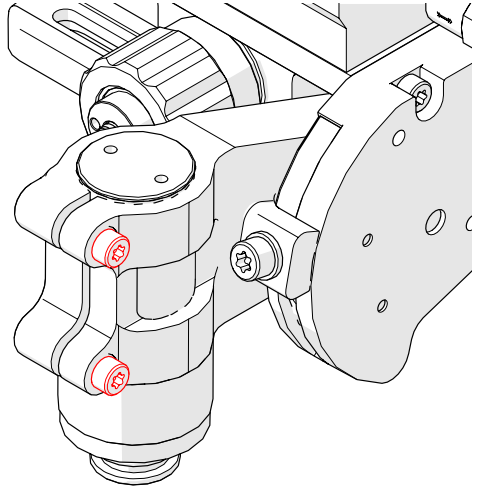


Fig. 186 - Tighten two screws

5. The idler shaft at the rear of the SERKO has a etched line that must be aligned with the base of the clamp to ensure the idler shaft is placed correctly (Fig. 187).

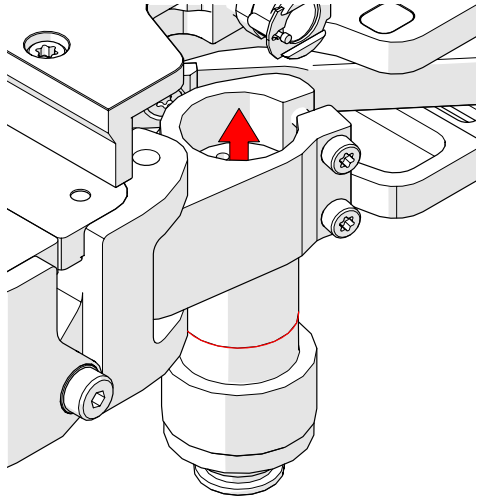


Fig. 187 - Align idler shaft etched line with base of clamp

9.2. Motor Can Replacement

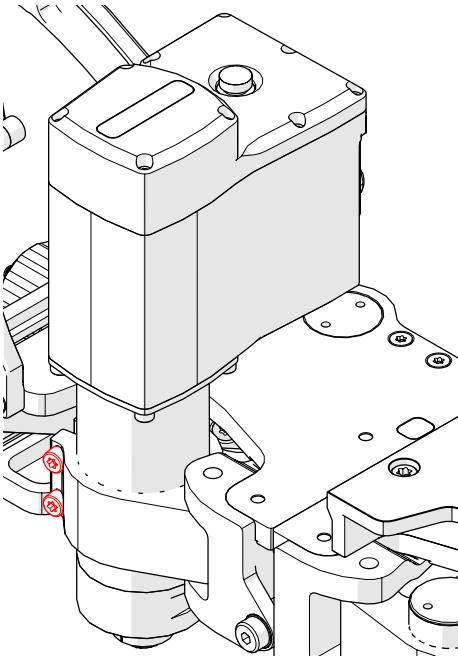


Fig. 188 - Unscrew two screws

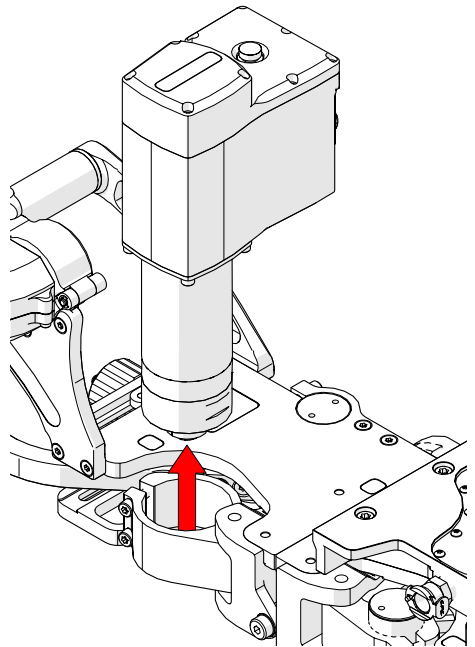


Fig. 189 - Remove motor can

1. Unscrew the two clamp screws using a T25 TORX driver (*Fig. 188*).
2. Remove the motor can (*Fig. 189*).
3. Align the etched line on the motor can with the base of the clamp and tighten the two clamp screws. This positions the motor can before confirming the positioning with the following steps (*Fig. 190*).

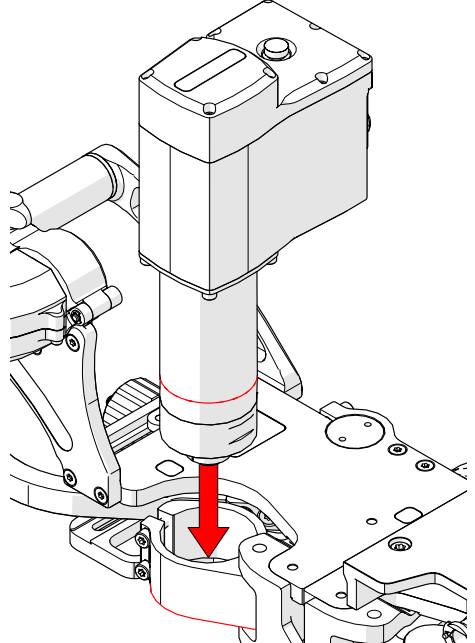


Fig. 190 - Align motor can etched line with base of clamp

- ▶ Ensure that the drive wheel maintains solid contact with both bands in the overlap section to prevent the motor can from being positioned too high, which may cause the drive wheel to lose contact with the inner band (*Fig. 191*).
- ▶ Ensure that the motor can is not positioned too low to prevent it from scraping on the pipe. (*Fig. 191*).
- ▶ Be sure to tighten the two clamp screws with a T25 TORX after any vertical adjustment of the motor can.

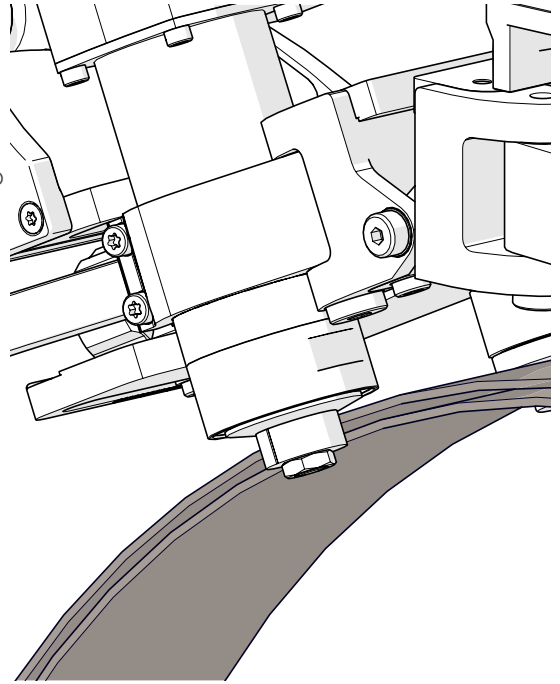


Fig. 191 - Ensure solid drive wheel contact with both bands

9.3. Drive Wheel Replacement

1. It is necessary to activate the SERKO system (see “System Startup” on page 74 for additional details).

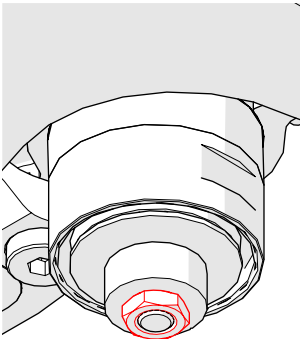


Fig. 192 - Unscrew the nut

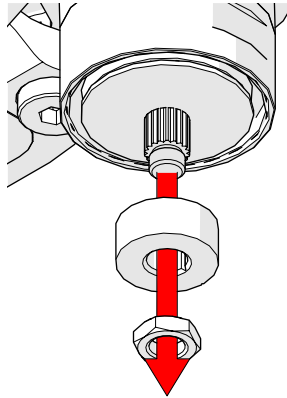


Fig. 193 - Remove nut and drive wheel

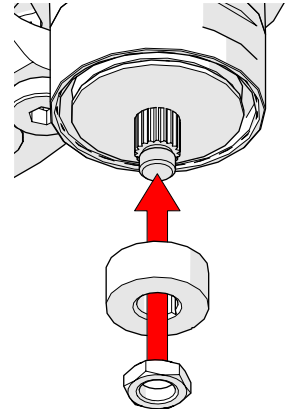


Fig. 194 - Install new drive wheel and nut

2. Using a 13 mm tool, unscrew the nut from the idler shaft (Fig. 192).
3. Remove the nut and drive wheel from the idler shaft (Fig. 193).
4. Apply a removable strength thread locker to the nut.
5. Install a new drive wheel onto the idler shaft and securely tighten the nut. Tighten the nut to 7 Nm (5 ft-lbs) using a torque wrench (Fig. 194).

SPARE PARTS

To order accessories or replacement parts for your **SERKO** system.
(contact Jireh Industries Ltd. on page 1)

NOTE: These drawings are for parts order. This is not a list of kit contents.

10.1. Carriage

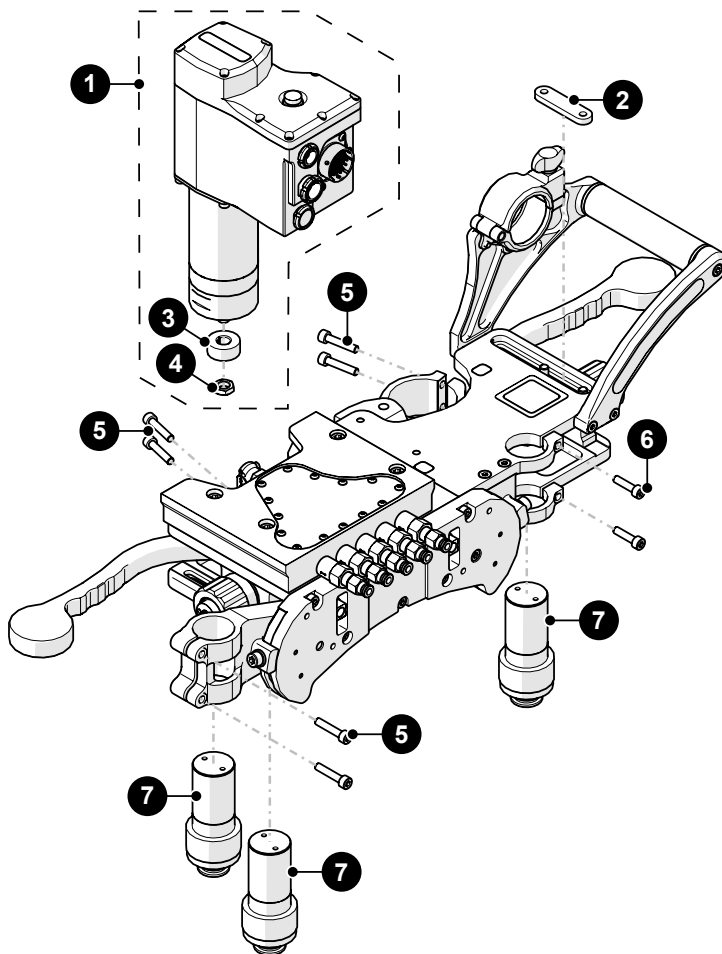


Fig. 195 - Carriage parts

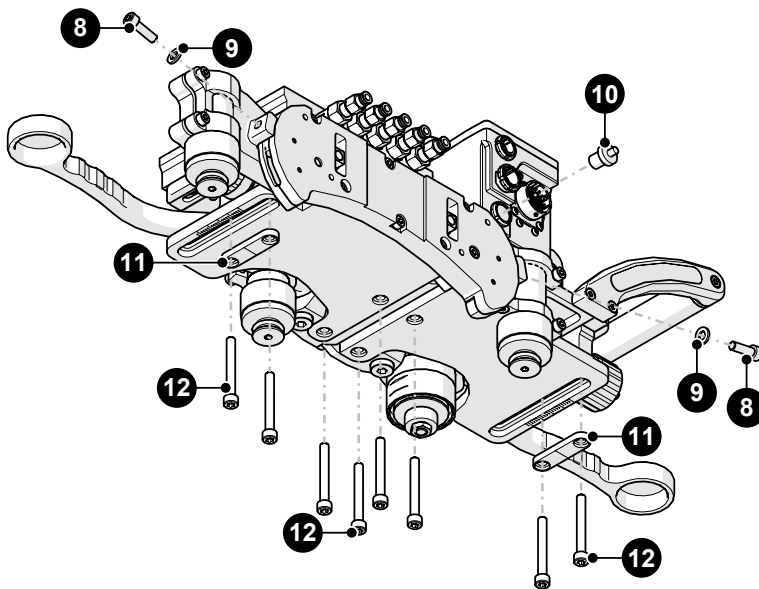


Fig. 196 - Carriage parts (continued)

BOM ID	Part #	Description
1	BAS026	Motor can
2	BA0125	Upper plate
3	EA195	Drive wheel
4	MA082	NUT, M8x1.0 HEX THIN SST
5	MD427-025	SHCS-TX, M5x0.8 X 25mm ISO 14579 A2
6	MD427-020	SHCS-TX, M5x0.8 X 20mm ISO 14579 A2
7	BAS002	Idler wheel subassembly
8	MD428-020	SHCS-TX, M6x1 X 20mm ISO 14579 A2 (<i>Angle adjustment screw</i>)
9	MD302-006	Washer, M6, DIN 125A, SST
10	JP069	Plug: Lemo Receptacle, 10 mm
11	BA0126	Lower plate
12	MD428-050	SHCS-TX, M6x1 X 50mm ISO 14579 A2 (<i>Width adjustment screw</i>)

10.2. Kit Components

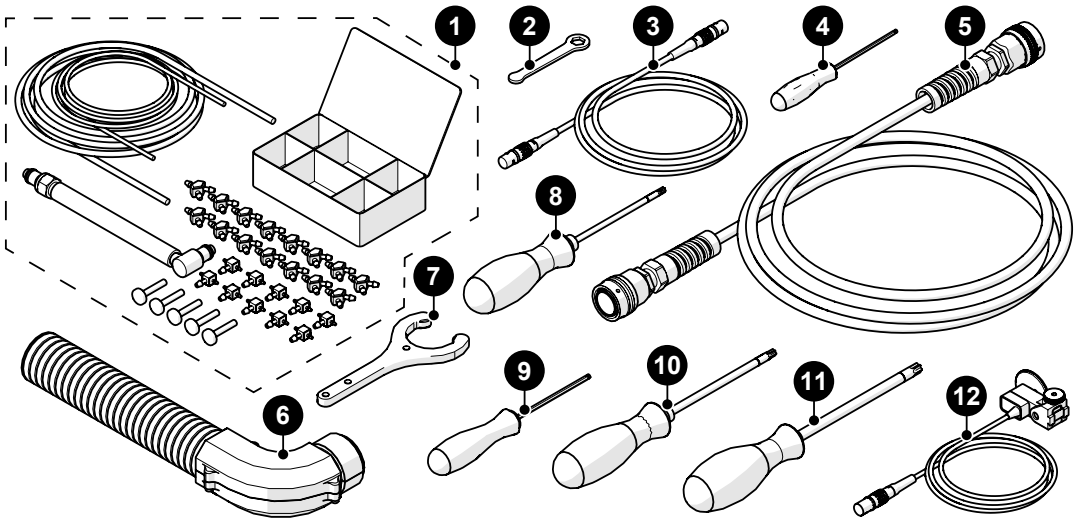


Fig. 197 - Kit components

BOM ID	Part #	Description
1	CMG012-__	SERKO irrigation kit (<i>various lengths available</i>)
2	EA470	10 mm (<i>3/8 in</i>) wrench
3	UMA017-06	Auxiliary cable
4	EA599	Hex driver: 2.5 mm (<i>0.098 in</i>)
5	UMA044-__	Umbilical (<i>various lengths available</i>)
6	BAS032-__	Cable management, elbow (<i>various lengths available</i>)
7	BG0041	Red nut wrench
8	EA644	Torx Driver: T25
9	EA414	3 mm (<i>0.118 in</i>) hex driver
10	EA643	Torx Driver: T30
11	EA627	Torx Driver: T45
12	BGS087-BJ-0.6	High-resolution spring-loaded encoder

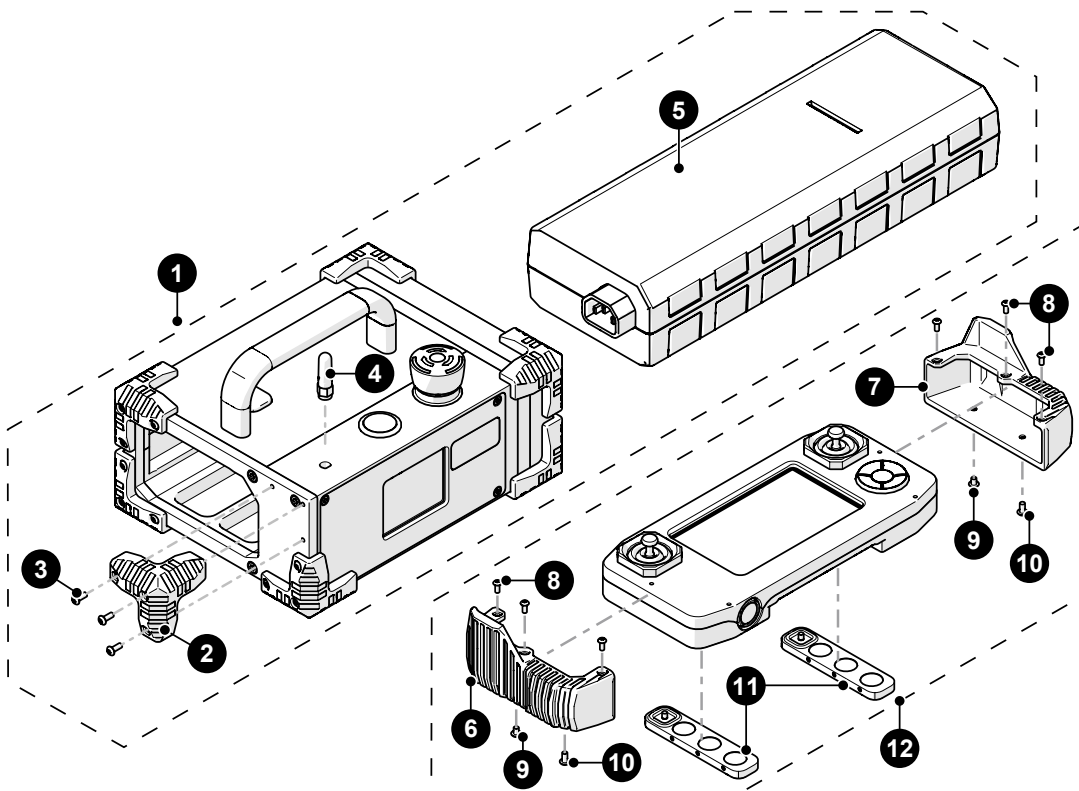
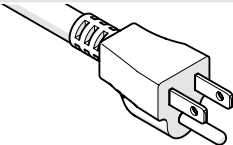
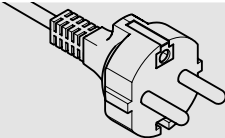
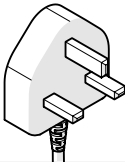


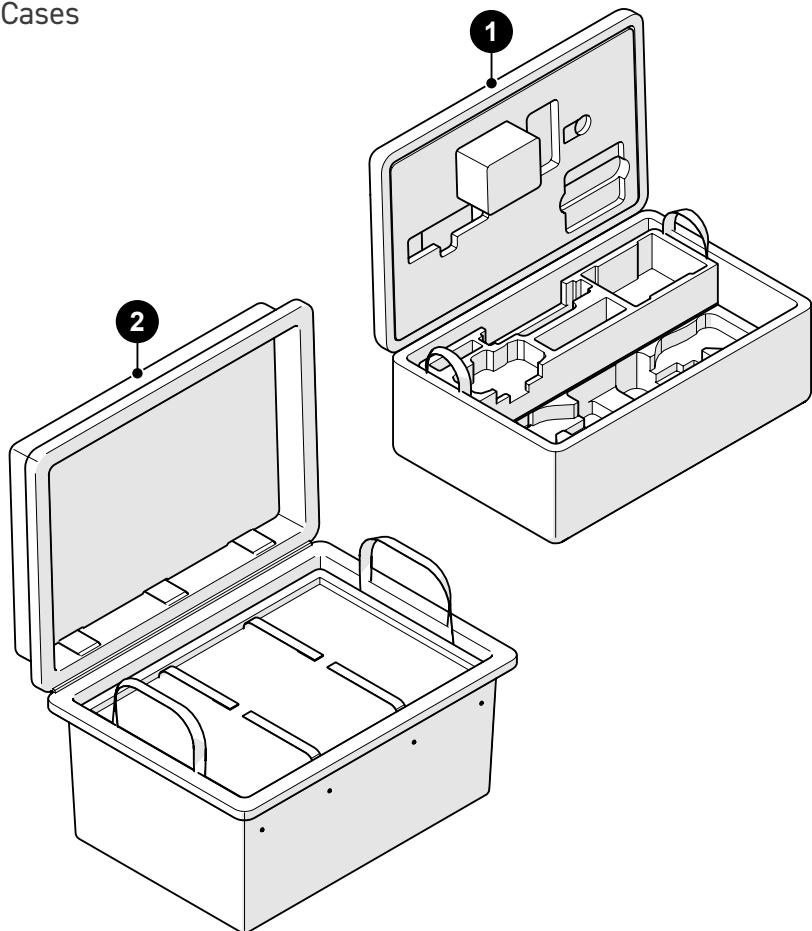
Fig. 198 - Kit components

BOM ID	Part #	Description
1	ERA001_	System controller (see Power Cord Type)
2	DY0011	Rubber bumper
3	MD411-008	BHCS-TX, M3x0.5 X 8mm ISO 7380-1 A2
4	SU004	Antenna
5	CXS122	Power supply
6	DM0088-L	Handheld controller bumper (left)
7	DM0088-R	Handheld controller bumper (right)
8	MD409-006	BHCS-TX, M2.5x0.5 X 6mm ISO 7380-1 A2
9	MD411-004	BHCS-TX, M3x0.5 X 4mm ISO 7380-1 A2
10	MD411-006	BHCS-TX, M3x0.5 X 6mm ISO 7380-1 A2
11	DMS005	Handheld controller magnet holder
12	DMA006	Handheld controller

10.2.1. Power Cord Type

Connector Type	Part #	Power Cord	
N	SL032	North American	
E	SL039	European	
U	SL059	United Kingdom	
Z		No Cord	

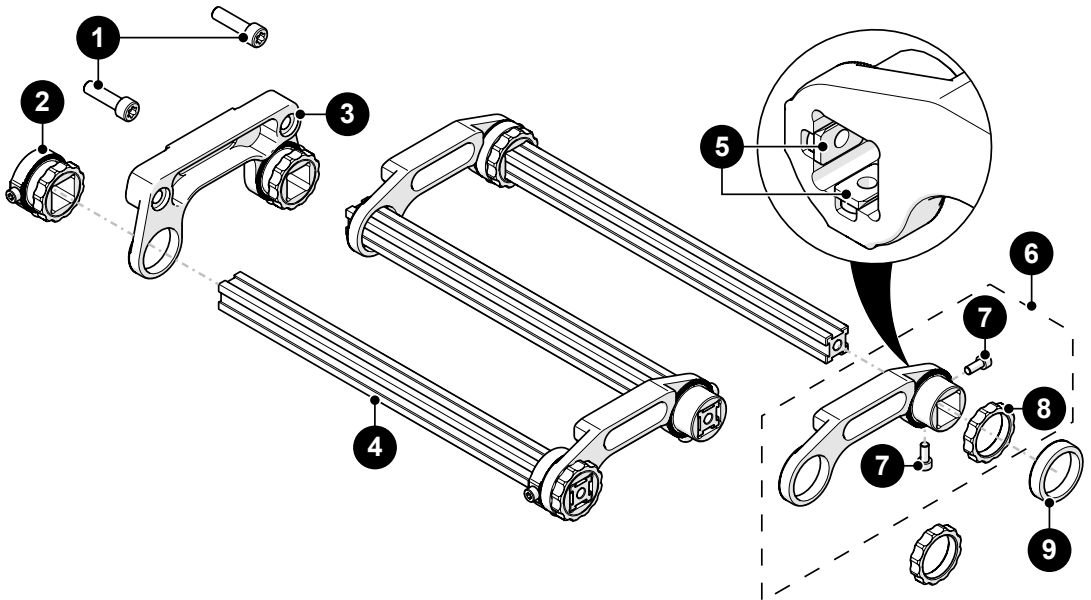
10.2.2. Cases



BOM ID	Part #	Description
1	BAA018	SERKO carriage case
2	BAA020	SERKO umbilical & accessories case

Fig. 199 - Cases

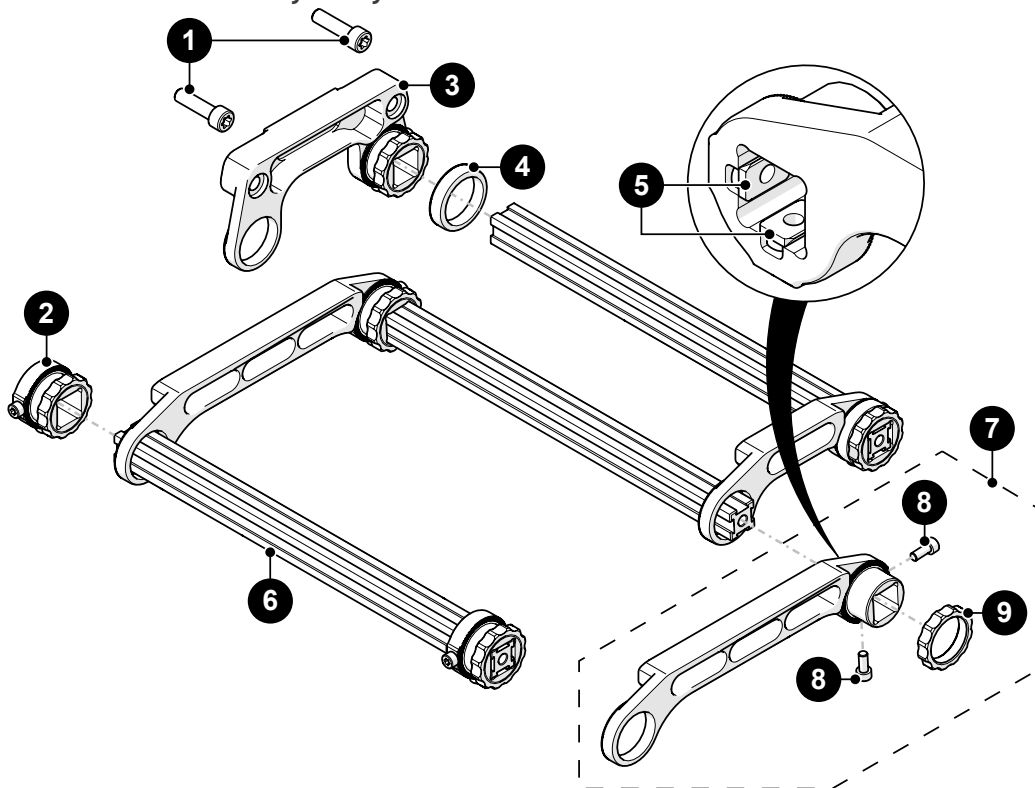
10.3. SERKO Probe Holder Frame



BOM ID	Part #	Description
1	MD429-030	SHCS-TX, M8x1.25 X 30mm ISO 14579
2	BAS048	Probe holder frame end
3	BAS047	Probe holder frame mount
4	BG0090-30	Frame bar with ruler (<i>see Frame Bar with Ruler</i>)
5	BT0014	Dovetail nut
6	BAS046	Probe holder frame arm
7	MD427-012	SHCS-TX, M5x0.8 X 12mm ISO 14579
8	BG0035	Probe holder frame nut
9	BA0148	Cap

Fig. 200 - SERKO probe holder frame

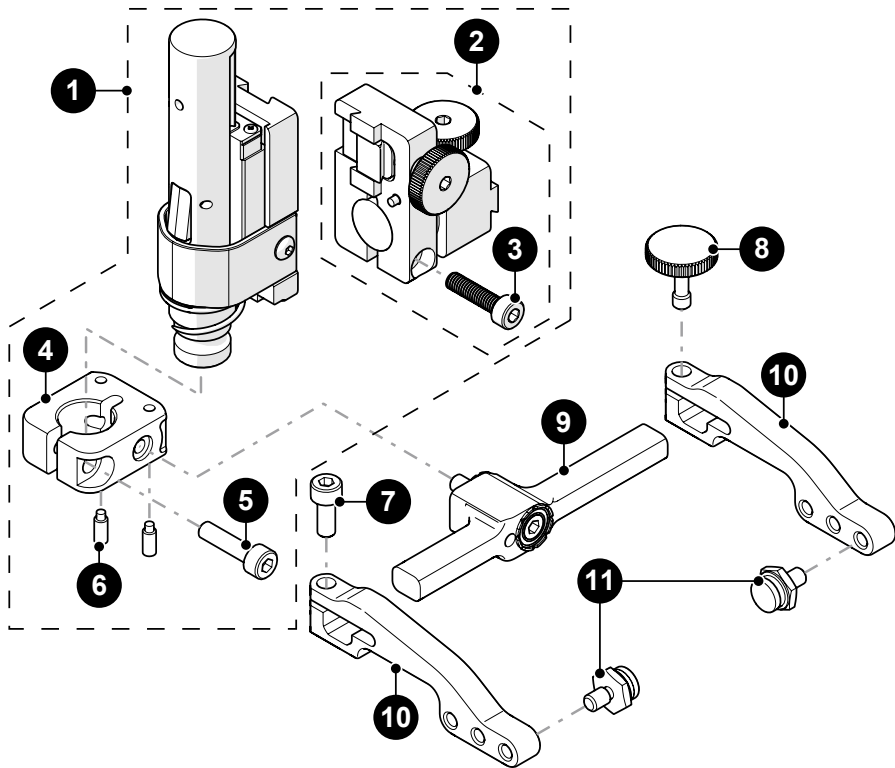
10.4. SERKO Heavy Duty Probe Holder Frame



BOM ID	Part #	Description
1	MD429-030	SHCS-TX, M8x1.25 X 30mm ISO 14579
2	BAS048	Probe holder frame end
3	BAS047	Probe holder frame mount
4	BA0148	Cap
5	BT0014	Dovetail nut
6	BG0090-30	Frame bar with ruler (<i>see Frame Bar with Ruler</i>)
7	BAS049	Heavy duty probe holder frame arm
8	MD427-012	SHCS-TX, M5x0.8 X 12mm ISO 14579
9	BG0035	Probe holder frame nut

Fig. 201 - SERKO heavy duty probe holder frame

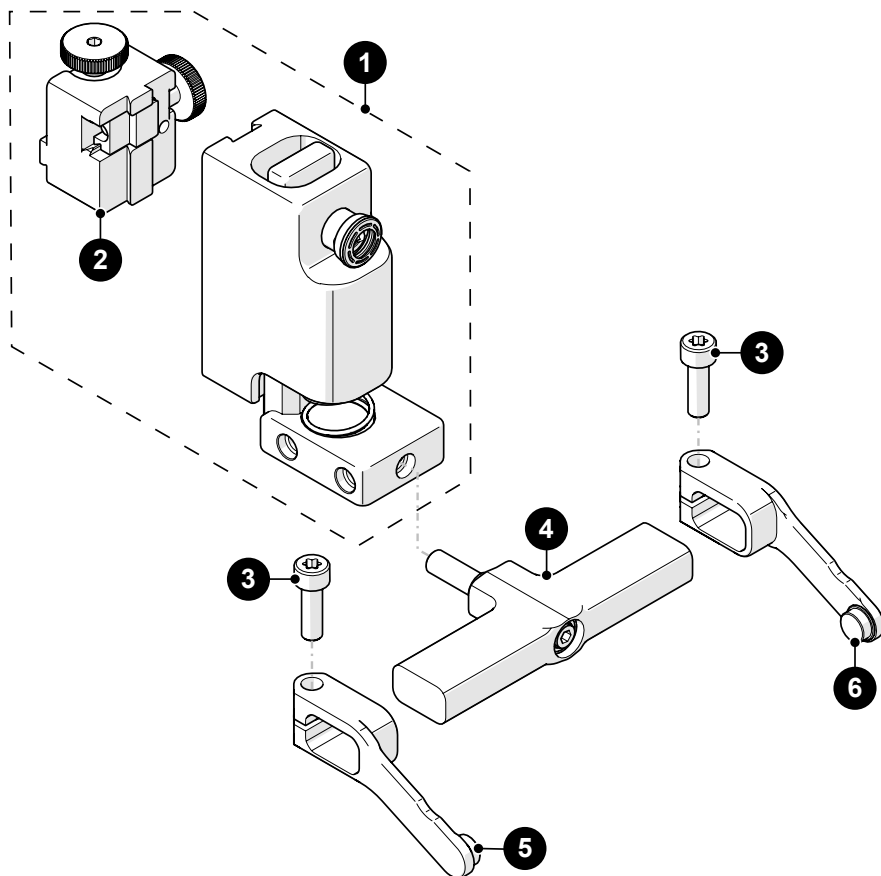
10.5. Vertical Probe Holder Parts



BOM ID	Part #	Description
1	PHS028	Vertical Probe Holder Subassembly
2	PHS061	Vertical Probe Holder Sub-Assembly: pivoting mount
3	MA307	Screw, M4x16 mm High Strength SST SHCS
4	PH0087	Vertical Probe Holder Base
5	MD050-016	SHCS, M4 x 0.7 x 16 mm, SST
6	MA096	Screw, M3x8 mm Dog Point Set, SST
7	MD050-010	SHCS, M4 x 0.7 x 10 mm, SST
8	PH0082	Knurled Knob, M4 x 0.7 x 10 mm, 3 mm stand off, SST
9	see Yoke Style	
10	see Arm Style	
11	PH0011-__	Pivot Button Style (see <i>Pivot Button Style</i>)

Fig. 202 - Vertical probe holder parts

10.6. 90° Heavy Duty Vertical Probe Holder

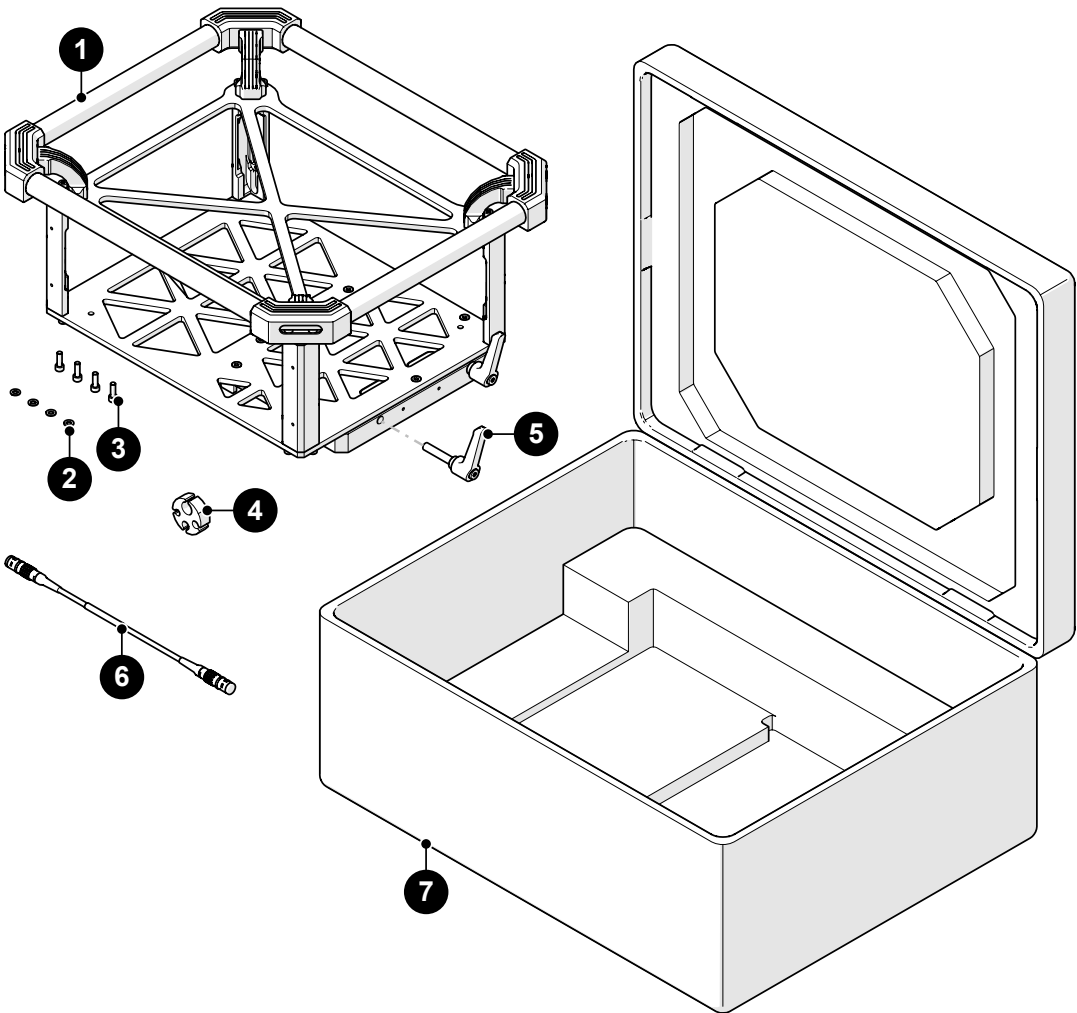


BOM ID	Part #	Description
1	PHS049	Heavy Duty Probe Holder Subassembly
2	PHS085	Heavy Duty Probe Holder Mount
3	MD427-016	SHCS-TX, M5x0.8 X 16mm ISO 14579 A2
4	<i>See Heavy Duty Yoke Style</i>	
5	PH0333-R	Probe Holder Arms with Pivot Buttons (<i>Right side</i>)
6	PH0333-L	Probe Holder Arms with Pivot Buttons (<i>Left side</i>)

Fig. 203 - 90° heavy duty vertical probe holder parts

10.7. SERKO Instrument Box Frame

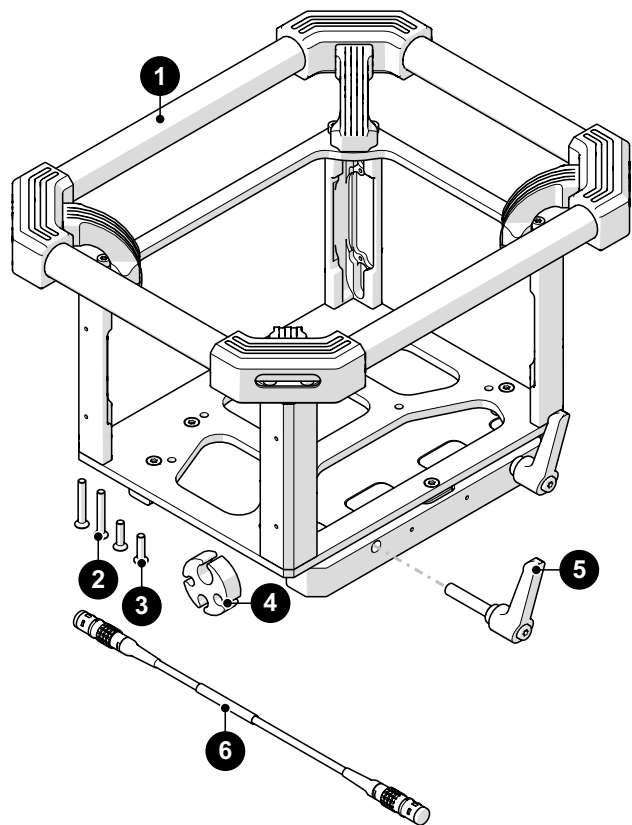
10.7.1. Eddyfi Emerald Compatible



BOM ID	Part #	Description
1	BAS036	Instrument box frame
2	MD302-005	WASHER, M5, DIN 125A, SST
3	MD427-016	SHCS-TX, M5x0.8 X 16mm ISO 14579
4	BA0135	Rubber cable clamp
5	EA641	Instrument box frame ratchet lever
6	UMA025-E-0.4	J300 Encoder cable
7	BAA019	SERKO Instrument box frame case

Fig. 204 - SERKO Instrument box frame

10.7.2. Eddyfi Emerald Splitter Box Compatible



BOM ID	Part #	Description
1	BAS050	Instrument box frame
2	MD402-035	FHCS-TX, M5x0.8 X 35mm ISO 14581
3	MD402-020	FHCS-TX, M5x0.8 X 20mm ISO 14581
4	BA0178	Rubber cable clamp
5	EA641	Instrument box frame ratchet lever
6	UMA025-E-05	J300 Encoder cable

Fig. 205 - SERKO Instrument box frame

10.8. Probe Holder Components

10.8.1. Arm Style

Arm Style	Part #		Arm Style	Part #	
A Standard, Flat	PH0090		B Short, Flat	PH0089	
C Long, Flat	PH0099		D Standard, Drop	PH0093	
E Short, Drop	PH0092		F Long, Drop	PH0094	
G Standard, Extra-Drop	PH0096		H Short, Extra-Drop	PH0095	
I Extra-Short, Flat	PH0159		J Extra-Short, Drop	PH0161	

Fig. 206 - Probe holder arm selection

10.8.2. Yoke Style

Yoke Style	Part #	Length		Yoke Style	Part #	Length	
S Standard	PHS052	6.3 cm (2.47 in)		W Wide	PHS063	7.9 cm (3.06 in)	

Fig. 207 - Probe holder yoke selection

10.8.3. Heavy Duty Yoke Style

Yoke Style	Part #	Length		Yoke Style	Part #	Length	
1 Small	PHS048	8.3 cm (3.26 in)		2 Medium	PHS111	9.8 cm (3.84 in)	
3 Large	PHS047	12.2 cm (4.79 in)					

Fig. 208 - Heavy duty yoke selection

10.8.4. Pivot Button Style

Pivot Hole Size	Wedge Type		Pivot Hole Size	Wedge Type	
01 8.0 mm (0.315 in)	Olympus PA		02 5.0 mm (0.197 in)	Olympus TOFD	
03 2.7 mm (0.106 in)	Sonatest DAAH PA		04 9.5 mm (0.375 in)	-	
06 3.0 mm (0.118 in)	-		07 2.3 mm (0.09 in)	-	
08 Conical Head	-		09 5 mm (0.197 in) Internal	Zetec PA/TOFD	
11 3 mm (0.118 in) Internal	-		14 4 mm (0.157 in)	-	

Fig. 209 - Pivot button selection

NOTE: Additional probe holder pivot button types available.
(contact Jireh Industries Ltd. on page 1)

10.9. Variable Components

10.9.1. Frame Bar with Ruler

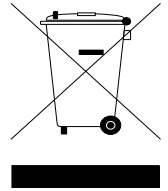
Part #	Length		Part #	Length	
BG0090-05	5 cm (1.97 in)		BG0090-10	10 cm (3.94 in)	
BG0090-15	15 cm (5.91 in)		BG0090-20	20 cm (7.87 in)	
BG0090-25	25 cm (9.84 in)		BG0090-30	30 cm (11.81 in)	
BG0090-35	35 cm (13.78 in)		BG0090-40	40 cm (15.75 in)	
BG0090-45	45 cm (17.72 in)		BG0090-50	50 cm (19.69 in)	
BG0090-55	55 cm (21.65 in)				

Fig. 210 - Frame bar with ruler selection

DISPOSAL

WEEE Directive

In accordance with European Directive on Waste Electrical and Electronic Equipment (WEEE), this symbol indicated that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to Jireh Industries for return and/or collection systems available in your country.



LIMITED WARRANTY

WARRANTY COVERAGE

Jireh Industries warranty obligations are limited to the terms set forth below: Jireh Industries Ltd. (“Jireh”) warrants this hardware product against defects in materials and workmanship for a period of THREE (3) YEARS from the original date of purchase. If a defect exists, at its option Jireh will (1) repair the product at no charge, using new or refurbished replacement parts, (2) exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product, or (3) refund the purchase price of the product. A replacement product/part assumes the remaining warranty of the original product or ninety (90) days from the date of replacement or repair, whichever provides longer coverage for you. When a product or part is exchanged, any replacement item becomes your property and the replaced item becomes Jireh’s property. When a refund is given, your product becomes Jireh’s property.

OBTAINING WARRANTY SERVICE

To utilize Jireh’s warranty service you must ship the product, at your expense, to and from Jireh Industries. Before you deliver your product for warranty service you must phone Jireh and obtain an RMA number. This number will be used to process and track your product. Jireh is not responsible for any damage incurred during transit.

EXCLUSIONS AND LIMITATIONS

This Limited Warranty applies only to hardware products manufactured by or for Jireh Industries. This warranty does not apply: (a) to damage caused by accident, abuse, misuse, misapplication, or non-Jireh products; (b) to damage caused by service (including upgrades and expansions) performed by anyone who is not a Jireh Authorized Service Provider; (c) to a product or a part that has been modified without the written permission of Jireh.

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