

■ **TRIPOD**

DY0129 Rev 00.1

Robotic Zero-Turn Magnetic Crawler



SAFETY WARNINGS / PRECAUTIONS

KEEP THIS MANUAL – DO NOT LOSE

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

Ensure any amendments are incorporated with this document.



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



WARNING! FALLING OBJECT HAZARD. The area below a crawler must be kept clear at all times. A clearly marked **NO ENTRY ZONE** must be cordoned off directly below the area of crawler operation.

(see “Preparation for Safe Use” on page 29 for additional details)

WARNING! Do **NOT** operate or place crawler on a surface higher than 2 m (6 ft) without a proper tether held taut at all times.

(see “Tether Requirements and Attachment” on page 30 for additional details)



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





WARNING! MAGNETIC MATERIAL. The wheels of the crawler produce an extremely strong magnetic field which may cause failure or permanent damage to items such as watches, memory devices, CRT monitors, medical devices or other electronics.



Tools, magnets and metal objects can cut, pinch or entrap hands and fingers. **HANDLE WITH CARE.**

People with pacemakers or ICD's must stay at least 75 cm (30 in) away.

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.

WARNING! MAGNETIC MATERIAL. When the carrying case contains the crawler, a magnetic field exists outside the case 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 from the carrying case when it contains the crawler.

WARNING! MAGNETIC MATERIAL. The installation/removal mat (see "Scanner Installation/Removal Mat Use" on page 75) contains magnetic material.

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



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



WARNING! If this product is to be used with any Child Products listed in (Chapter 4.3), be sure to read and comply with the warnings, instructions, and specifications in the Child Product's User Manual(s).



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.



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



CAUTION! Do **NOT** operate the TRIPOD crawler 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. Permanent damage to electronics could occur.



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 114 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 **TRIPOD** system.

1.2. Manufacturer

Distributor:

Manufacturer:

Jireh Industries Ltd.
53158 Range Road 224
Ardrossan, Alberta, Canada
T8E 2K
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 **TRIPOD** 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 **TRIPOD** 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 (<i>Safety</i>) 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 TRIPOD System

This section outlines the product specifications of the base system. When the base system is used together with compatible components (*Chapter 4.2*) or child products (*Chapter 4.3*), the product specifications of the base system may be superseded. See (*see “Compatible Components” on page 22*) and (*see “Child Products” on page 25*).

2.1.1. Intended Use



WARNING! FALLING OBJECT HAZARD.

The **TRIPOD** is intended for a specific use. Read and understand the intended and unintended use limits below. Using the TRIPOD outside of its intended use is dangerous and could result in **SEVERE INJURY** or **DEATH**.

The **TRIPOD**'s primary purpose is to perform inspections of assets such as pipes, vessels, or storage tanks by moving an inspection tool over a ferrous surface. It is intended for industrial use only.

2.1.1.1 Operating Limits

Category	Parameter	Specification
Inspection Surface	Maximum coating thickness:	
	Up-side-down orientation	Bare metal only
	Vertical orientation	0.5 mm (0.020 in)
	Horizontal, Right-side-up orientation	1 mm (0.040 in)
	Condition	Clean, free of excess rust, scale, debris (i.e. dirt, sand, etc.), ice, frost
	Minimum surface thickness	3 mm (0.120 in)
	Minimum OD, external longitudinal driving	Ø305 mm (12 in)
	Minimum OD, external circumferential driving	Ø203 mm (8 in)
	Minimum OD, external dynamic transition between longitudinal and circumferential driving	Ø406 mm (16 in)
	Minimum ID, internal longitudinal driving	Ø914 mm (36 in)
	Minimum ID, internal circumferential driving	Ø762 mm (30 in)
	Minimum ID, internal dynamic transition between longitudinal and circumferential driving	Ø1067 mm (42 in)
	Maximum surface temperature	80°C (122°F)
Scanner	Maximum umbilical length	60 m (200 ft)
	Maximum steerable payload (performance may vary with surface condition)	10 kg (23 lb) (Umbilical and attachments are considered payload)
	Attachments	Restricted to those listed in compatible components or child products
	Orientation while driving at height >2 m (6 ft) on vertical surface	Umbilical strain relief to point downwards, or at worst, horizontal. It is not to point upwards.
	Required radial clearance on flat	156 mm (6.133 in) (With handle removed)

2.1.1.2 Operating Environment

The **TRIPOD** 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) *Operating below 0°C may require warm up procedure*
	Maximum ambient temperature	50°C (122°F)

2.1.1.3 User

The **TRIPOD** 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 **TRIPOD** is NOT intended for:

- ▶ use outside of its intended use
- ▶ lifting or lowering objects or people
- ▶ driving into or over obstructions, excluding standard weld caps
- ▶ installation on a surface on which welding is actively occurring
- ▶ operation in temperatures below -20°C (-4°F) or above 50°C (122°F)

In addition to the above points, for operating at a height greater than 2 m (6 feet), the crawler is NOT intended for:

- ▶ operation without a proper tether system
- ▶ operating up-side-down
- ▶ operating while oriented such that the umbilical strain relief points upward (*front for the **TRIPOD** is lower than the umbilical connection*)

2.1.3. Dimensions and Weight

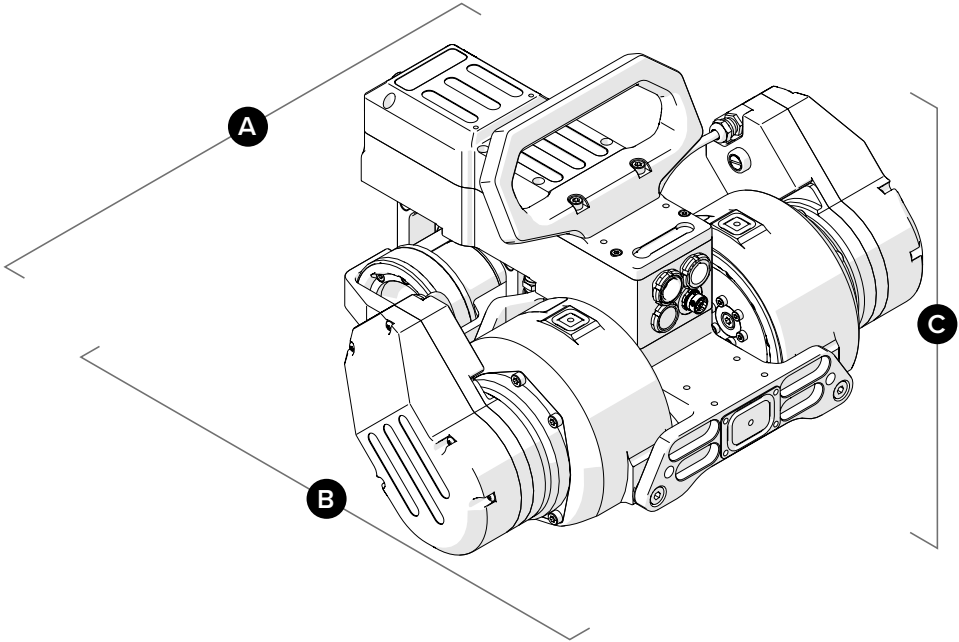


Fig. 1 - Crawler dimensions

A Width:	33.5 cm	13.2 in
B Depth:	26.5 cm	10.4 in
C Height:	19.4 cm	7.6 in
Weight:	10.5 kg	23 lb

2.1.4. Power Requirements



WARNING! A reliable power source must be used to power the crawler. Connections must be secured to prevent accidental disconnection. Power failure may cause the crawler 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*).

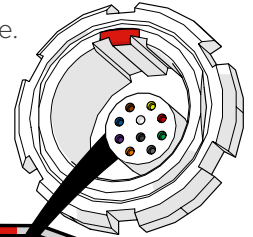
2.1.6. Performance Specifications

Category	Parameter	Specification
Crawler	Maximum speed	379 mm/sec (<i>14.9 in/sec</i>)
	Encoder resolution, motor	2592.45 counts/mm (<i>65848.3 counts/in</i>)
	Encoder resolution, idler	104.61 counts/mm (<i>2820.7 counts/in</i>)

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

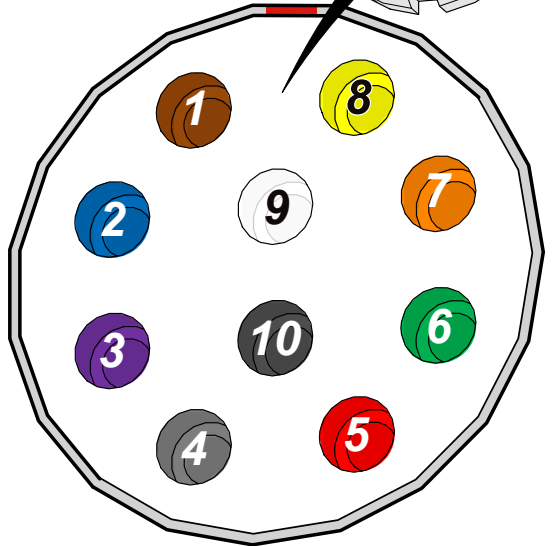


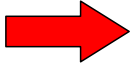
Fig. 2 - JIREH pin out configuration

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

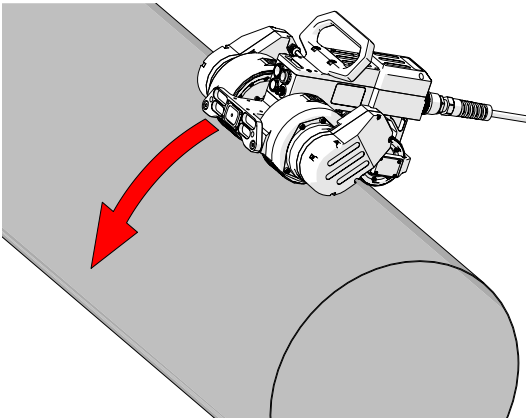


Fig. 3 - Circumferential scanning

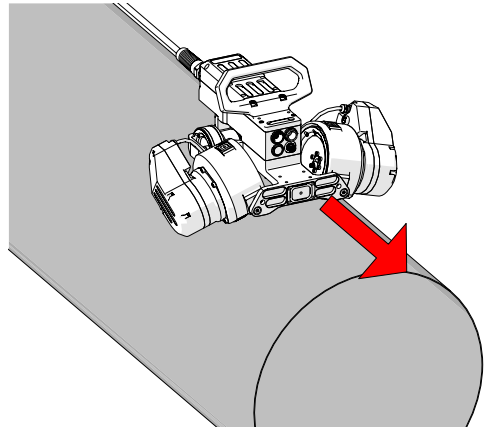


Fig. 4 - Longitudinal scanning

Circumferential

Direction of scan travel is around the circumference of the pipe/tube (Fig. 3).

Longitudinal

Direction of scan travel is lengthwise of the pipe/tube (Fig. 4).

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. TRIPOD Crawler DYA005



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



WARNING! MAGNETIC MATERIAL. The wheels of the crawler produce an extremely 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 75 cm (30 in) away.



WARNING! FALLING OBJECT HAZARD. The area below a crawler must be kept clear at all times. A clearly marked **NO ENTRY ZONE** must be cordoned off directly below the area of crawler operation.

WARNING! Do **NOT** operate or place crawler on a surface higher than 2 m (6 ft) without a proper tether held taut at all times.



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

The **TRIPOD** Crawler is a modular, motorized, and steerable scanner that can carry various attachments for scanning and inspection applications. The **TRIPOD** is capable of performing a wide range of inspections on circumferential or longitudinal ferrous materials.

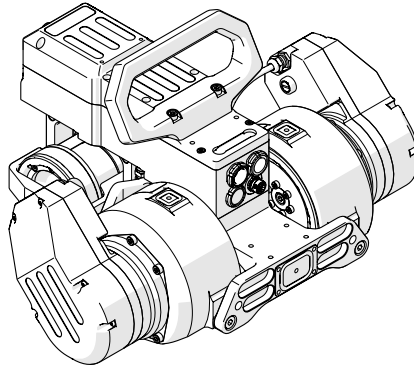


Fig. 5 - TRIPOD (crawler)

4.1.1.1 Auxiliary Connectors

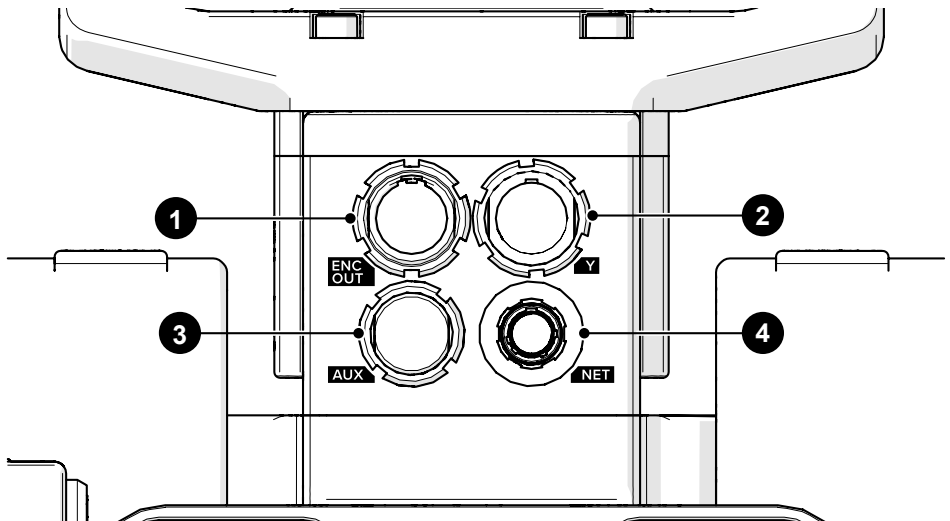


Fig. 6 - Auxiliary connector labels

- | | | |
|----------|---------|-------------------------------------|
| 1 | ENC OUT | Encoder output connection. |
| 2 | Y | Motorized module connection. |
| 3 | AUX | Connection for an auxiliary device. |
| 4 | NET | Connection for RECON camera system. |

4.1.1.2 Off Button

The **1** red button on the back of the **TRIPOD** (Fig. 8) is an off button which, when pressed, disconnects power to the crawler.

To restore system power, it is necessary to press the power button located on the system controller (see "System Controller" on page 14).

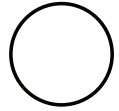


Fig. 7 - Off

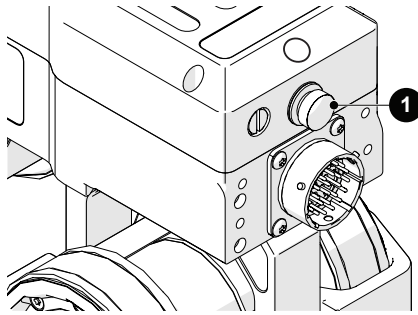


Fig. 8 - Off Button

4.1.2. 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 providing the **TRIPOD** with reliable power. It offers two power options, including a standard power supply that can be configured for various plug styles, and compatibility with battery power (sold separately).

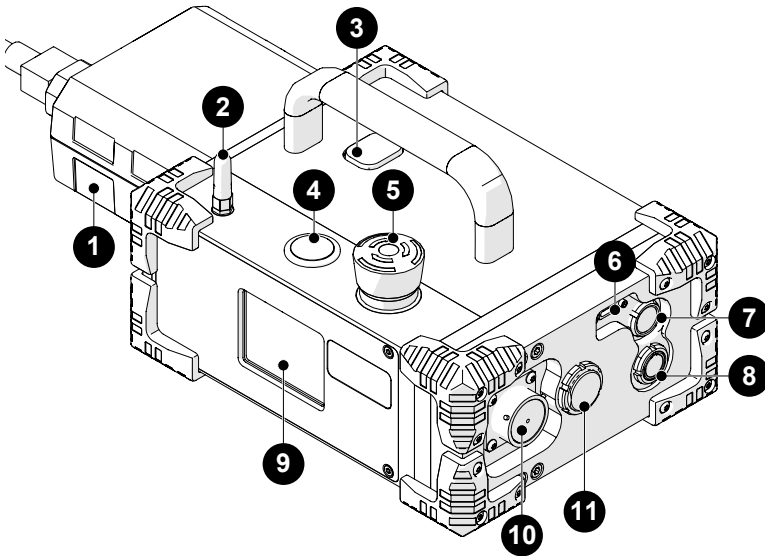


Fig. 9 - System controller

The system controller accepts 25-45VDC power from the AC/DC power supply or battery. A start/stop circuit 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 enabled controller adapter cables

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

4.1.2.1 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. 9) connects the system controller to a suitable 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.

4.1.3. Umbilical UMA044-



WARNING! FALLING OBJECT HAZARD.

Ensure the umbilical can freely uncoil during operation and does not become snagged. If umbilical becomes snagged, the crawler may fall and **SEVERE INJURY** or **DEATH** could result.

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

The circuitry is incorporated into the umbilical to protect or isolate all signals. The umbilical provides separation between the system controller and the crawler.

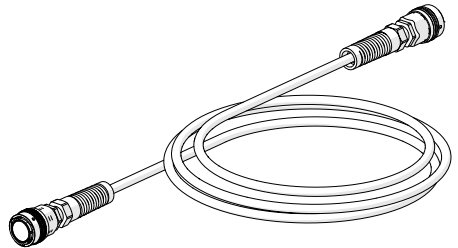


Fig. 10 - Umbilical, ethernet

4.1.4. 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 your crawler's operation. The controller's color touch screen displays an intuitive and easy-to-use operating system, complete with haptic feedback. The joysticks on the controller provide precise driving and steering control.

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

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.

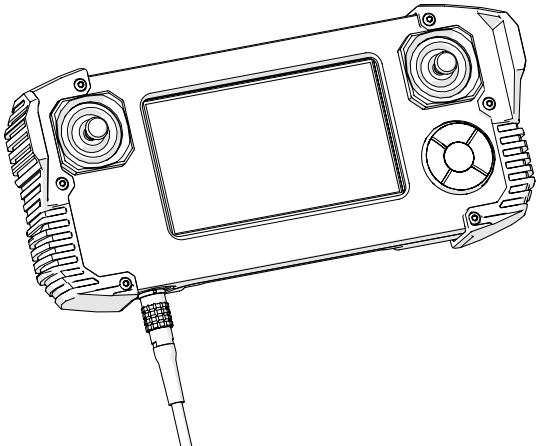


Fig. 11 - Handheld controller

NOTE: Shut off power before connecting the handheld controller.

4.1.5. Auxiliary Cable UMA017-

The auxiliary cable connects the handheld controller to the system controller.

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

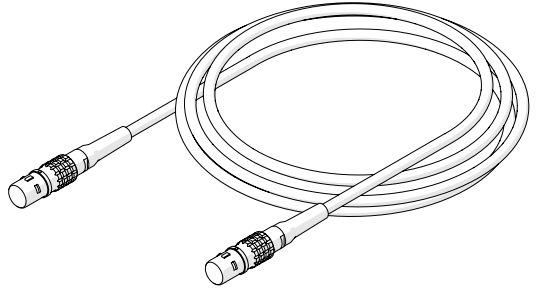


Fig. 12 - Auxiliary cable

4.1.6. J300 Encoder Cable UMA025-

The encoder cable connects the **TRIPOD** system to the user's instrument. This cable allows the transmission of two-axis position signals from the **TRIPOD** 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.

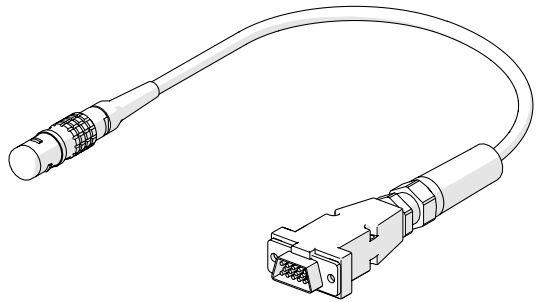


Fig. 13 - J300 Encoder cable

4.1.7. Installation/Removal Mat AAS061



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

The installation/removal mat is used to install and remove motorized magnetic-wheeled scanners from the inspection surface. A motorized scanner can drive on/off the mat while the integrated magnets in the mat hold it firmly in place on the inspection surface. The scanner installation mat can be used on both round and flat surfaces.

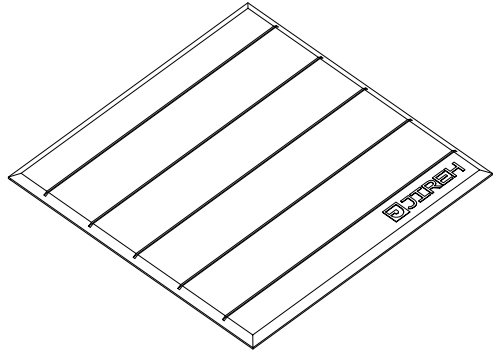


Fig. 14 - Installation/removal mat

4.1.8. Lifting Sling EA243

The lifting sling attaches to the crawler, providing an attachment point for tethers. When operating a **TRIPOD** at a height greater than 2 m (6 ft), the crawler **MUST** be tethered with a proper tether system to prevent the crawler from falling (see "No Entry Fall Zone" on page 29).

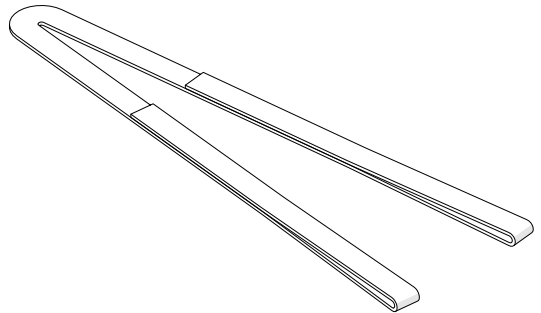


Fig. 15 - Lifting sling

4.1.9. Irrigation Kit CMG009-

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

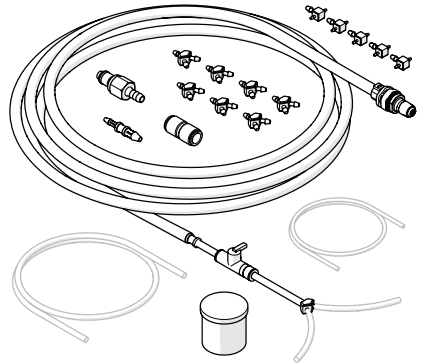


Fig. 16 - Irrigation kit

4.1.10. Cable Management, TRIPOD DYG002-

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

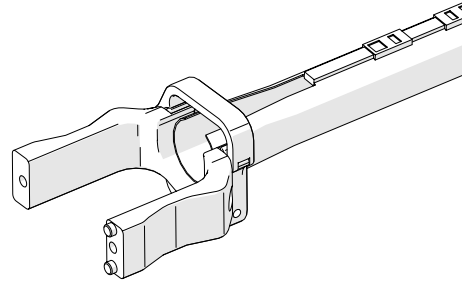


Fig. 17 - Cable management, TRIPOD

4.1.11. Battery DVA001

The battery is compatible with the system controller and provides power to the **TRIPOD** system.

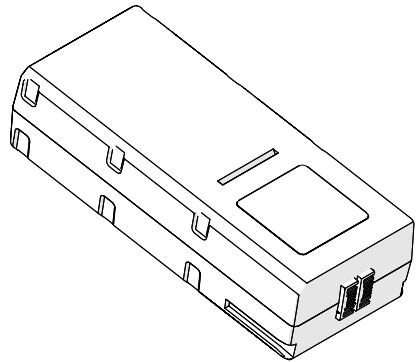


Fig. 18 - Battery

4.1.12. Charger and Power Adapter DVG002-

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

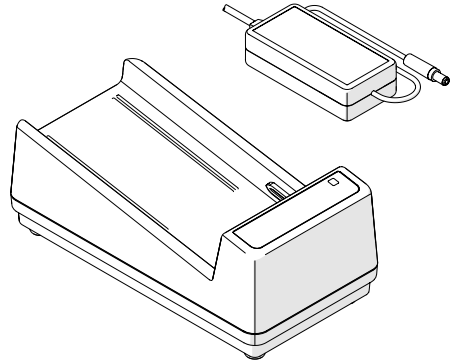


Fig. 19 - Charger and Power Adapter

4.1.13. Tools

Several tools are included for various scanner and accessory adjustments (see *"Included Tools"* on page 28 for additional details).

4.1.14. Cases

The **TRIPOD** system comes with an air shippable system case and has optional accessory cases available (see *"Cases"* on page 113 for additional details).

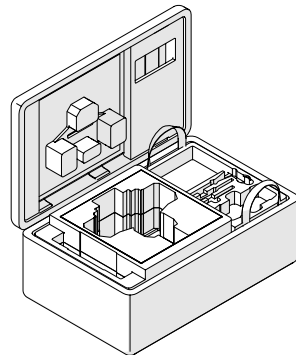


Fig. 20 - System case

4.2. Compatible Components

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.

4.2.1. Pivot Mount, Female CWS023

The pivot mount (*female*) allows probe holders to be affixed to the **TRIPOD**.

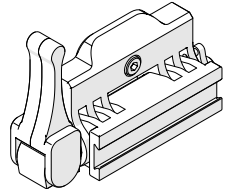


Fig. 21 - Pivot mount (female)

4.2.1.1 Intended Use

The pivot mount (*female*) is intended to allow compatible components to be mounted to the **TRIPOD**.

4.2.1.1.1 Operating Limits

Category	Parameter	Specification
Scanner	Minimum OD, external longitudinal driving	Ø406 mm (16 in)
	Minimum ID, internal circumferential driving	Ø1524 mm (60 in)

4.2.2. Double Pivot Mount, Male ENS016

The double pivot mount (*male*) is designed to securely attach accessories to the **TRIPOD**.

4.2.2.1 Intended Use

The double pivot mount (*male*) is intended to securely attach compatible accessories to the **TRIPOD**. The mount allows two pivot mounts to be used for connecting and positioning accessories such as a frame bar or motorized raster arm.

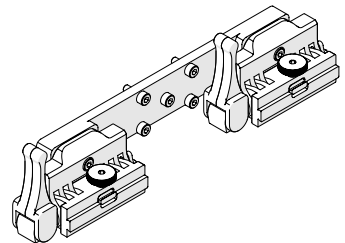


Fig. 22 - Double pivot mount (male)

4.2.2.1.1 Operating Limits

Category	Parameter	Specification
Scanner	Minimum ID, internal circumferential driving	Ø1524 mm (60 in)

4.2.3. Vertical Probe Holder Frame CXG007-

The vertical probe holder frame supports up to four probes for weld inspections. It is available in a range of configurations and lengths.

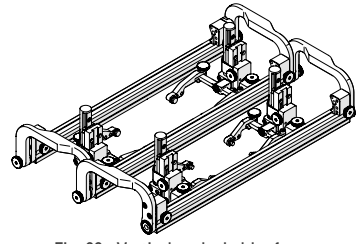


Fig. 23 - Vertical probe holder frame

4.2.3.1 Intended Use

The Vertical Probe Holder Frame is intended to be mounted onto the **TRIPOD** with a double pivot mount (*male*) to provide mounting of multiple probe holders.

4.2.3.1.1 Operating Limits

Category	Parameter	Specification
Scanner	Minimum OD, external dynamic transition between longitudinal and circumferential driving	Ø2438 mm (96 in)
	Minimum ID, internal dynamic transition between longitudinal and circumferential driving	Ø2438 mm (96 in)

4.2.4. Corrosion Thickness Probe Holder PHS046- / PHS056-

The corrosion thickness probe holder is designed for use with the **TRIPOD** base crawler and carries various probes for the purpose of corrosion inspection and is available with either a flat or circumferentially curved wear plate. Use of the corrosion thickness probe holder requires a pivot mount (*female*).

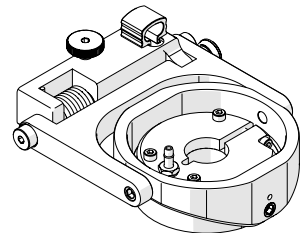


Fig. 24 - Corrosion thickness probe holder

4.2.4.1 Intended Use

The corrosion thickness probe holder is intended to provide a probe holding solution for specific probes or wedges that do not have pivot button holes.

4.2.5. Preamp Bracket CES029-

The preamp mounts to any dovetail groove. It is compatible with most standard preamps.

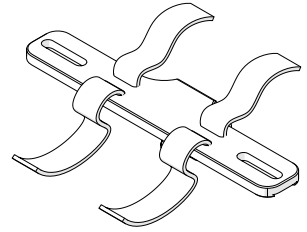


Fig. 25 - Preamp bracket

4.2.5.1 Intended Use

The Preamp Bracket is intended to mount objects, such as preamps, splitters, etc., on a probe holder frame or frame bar that is mounted to the **TRIPOD** crawler. The mounted object is attached to the **TRIPOD** with a lanyard or probe cables strong enough to prevent the object from falling, should the straps or screws that hold it to the bracket fail. Also, if the object is mounted with straps, it is to have smooth edges so as not to cut the straps.

4.2.5.1.1 Operating Limits

Category	Parameter	Specification
Pre-Amp Bracket	Maximum weight of mounted object	1.36 kg (3 lb)

4.2.6. 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*).

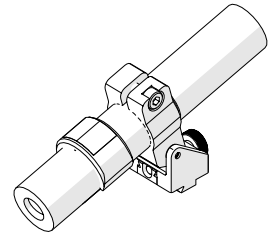


Fig. 26 - Battery powered optical guide

4.2.6.1 Intended Use

The Battery Powered Optical Guide is intended to provide a point of reference useful for guiding the **TRIPOD** along a given path (*i.e. a weld cap*). It is intended to be mounted in the dovetail groove of any probe holder frame or frame bar.

4.2.6.1.1 Operating Limits

Category	Parameter	Specification
Scanner	Required radial clearance	Dependent on mounted orientation of Optical Guide

4.2.6.2 Power Requirements

Power requirements: 1 AA Battery

4.3. Child Products

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.

4.3.1. Motorized Couplant Pump CMG013-

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

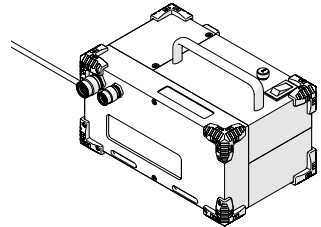


Fig. 27 - Motorized Couplant Pump

4.3.2. Motorized Raster Arm CWG002-

The motorized raster arm is available in various lengths and can carry many different probes for various types of corrosion inspection.

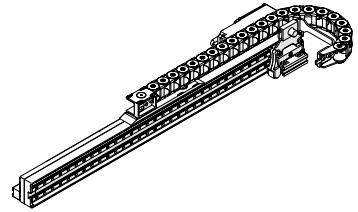


Fig. 28 - Motorized raster arm

4.3.2.1 Operating Limits

Category	Parameter	Specification
Scanner	Minimum OD, external dynamic transition between longitudinal and circumferential driving	Ø2438 mm (96 in)
	Minimum ID, internal dynamic transition between longitudinal and circumferential driving	Ø2438 mm (>96 in) depending on arm length

4.3.3. Corrosion Actuated Probe Lift DYG003-

The actuated probe lift allows the probe to be lifted from the inspection surface, preserving the probe's life and allowing travel over small obstacles and large welds. The actuated probe lift is compatible with various probe styles and is available with either a flat or curved wear plate.

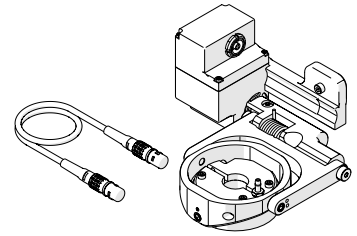


Fig. 29 - Actuated probe lift

4.3.3.1 Operating Limits

Category	Parameter	Specification
Scanner	Minimum ID, internal circumferential driving	Ø1524 mm (60 in)
	Minimum ID, internal dynamic transition between longitudinal and circumferential driving	Ø1829 mm (72 in)

4.3.4. Preamp 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.

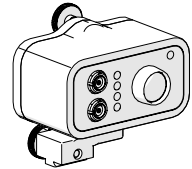


Fig. 30 - Preamp

4.3.5. Optical Guide CXG035

The optical guide mounts to any dovetail and provides a green colour point of reference useful for guiding scanners along a given path (*i.e. a weld*).

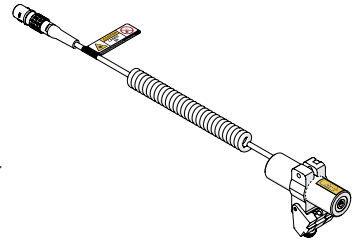


Fig. 31 - Optical guide

4.3.6. Battery / Charger DVG001-

The rechargeable battery provides portable power to the crawler and components.

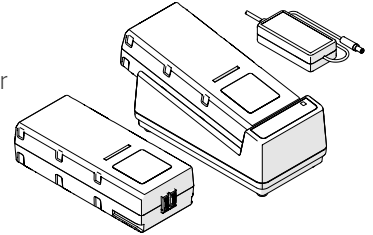


Fig. 32 - Battery / Charger

4.4. Tools

4.4.1. Included Tools

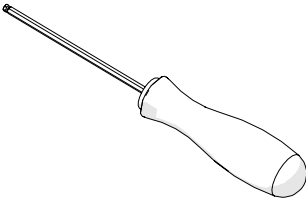


Fig. 33 - 3 mm hex driver

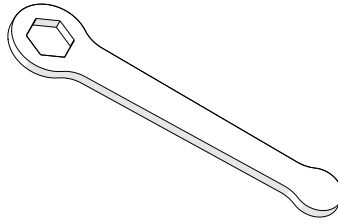


Fig. 34 - 3/8 in wrench

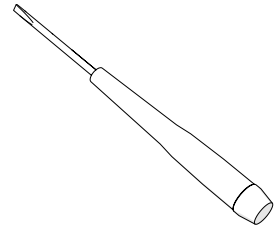


Fig. 35 - 3 mm flat driver

The included 3 mm hex driver (*Fig. 33*) is suitable for most typical adjustments within the **TRIPOD** system.

Also included in this kit is a 3/8 in wrench (*Fig. 34*), which is used to remove and install probe holder pivot buttons.

The included 3 mm flat driver (*Fig. 35*) helps release the flaps of a motorized raster arm's cable tray.

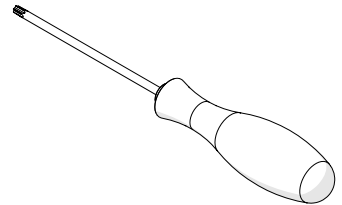


Fig. 36 - T20 Torx driver

The included T20 Torx driver (*Fig. 36*) is used to install and remove the cable management clamp as well as the handle .

4.4.2. Optional Tools

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



Fig. 37 - 1.5 mm hex wrench

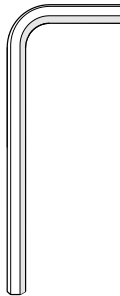


Fig. 38 - 2 mm hex wrench

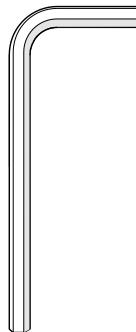


Fig. 39 - 3 mm hex wrench

PREPARATION FOR USE

5.1. Preparation for Transportation



CAUTION! PINCH / CRUSH HAZARD. BE CAREFUL when passing the **TRIPOD** crawler through narrow ferrous (*magnetic*) openings, such as man-holes. The magnetic drive wheels can cause bodily harm if allowed to slam onto the walls of the opening.

5.2. Preparation for Safe Use

5.2.1. No Entry Fall Zone



WARNING! FALLING OBJECT HAZARD. The area below a crawler must be kept clear at all times. A clearly marked **NO ENTRY FALL ZONE** must be cordoned off directly below the area of crawler operation.

The area below a crawler must be kept clear at all times. A clearly marked **NO ENTRY FALL ZONE** must be cordoned off directly below the area of crawler operation, according to the dimensions shown in (Fig. 40).

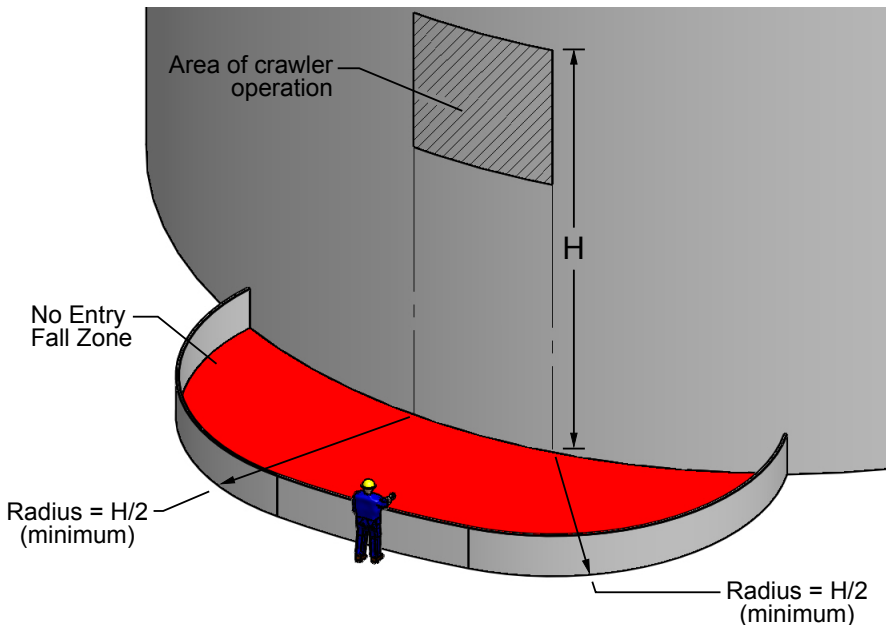


Fig. 40 - No entry fall zone

Example: If inspecting a tank that is 6 m (20 ft) tall, the No Entry Fall Zone radii must be no smaller than 3 m (10 ft) from the area below the area of crawler operation.

5.2.2. Tether Requirements and Attachment



WARNING! FALLING OBJECT HAZARD.

Failure to comply with the warnings, instructions, and specifications in this manual could result in **SEVERE INJURY** or **DEATH**.

WARNING! Do **NOT** operate or place crawler on a surface higher than 2 m (6 ft) without a proper tether held taut at all times.

WARNING! Hook the tether hook to the provided lifting sling **BEFORE** placing the crawler on the surface to be inspected (e.g. tank). **IMPORTANT:** Tether hook must have a safety latch to prevent accidental disconnection.

When used at a height greater than 2 m (6 ft), the **TRIPOD** crawler **MUST** be tethered with a proper tether system to prevent the crawler from falling. The tether system must:

- ▶ be capable of safely suspending the crawler from above in case the crawler detaches from the inspection surface;
- ▶ have sufficient capacity to catch and hold a 70 kg (150 lb) load;
- ▶ include a mechanism (i.e. self retracting inertia reel fall arrester) or a person to continuously take up the slack in the tether as the crawler moves;
- ▶ include a lifting hook with a safety latch to prevent accidental disconnection. The hook must be free of sharp edges that may cut or abrade the provided lifting sling.

Before placing the crawler on the surface to be inspected (e.g. tank), attach the provided lifting sling to the **TRIPOD** and then hook the tether hook to the lifting sling.



CAUTION! The overhead attachment point for the tether must be located as close as possible to a location directly above the crawler to minimize dangerous swinging of the crawler should it detach from the inspection surface.

5.2.3. Lifting Sling Setup



IMPORTANT! Carefully inspect the lifting sling for damage prior to each use. Ensure the tether hook does not have sharp edges that may cut the lifting sling.

Secure the lifting sling to the **TRIPOD** as illustrated here:

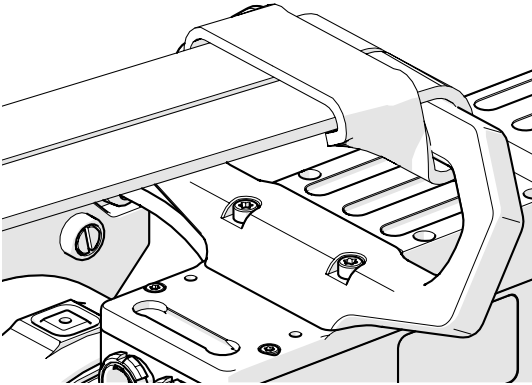


Fig. 41 - Attach the lifting sling with a choker hold

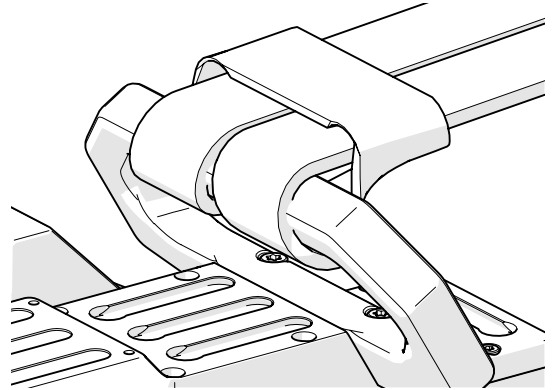


Fig. 42 - Attach the lifting sling with a choker hold

1. Wrap the supplied lifting sling around the handle of the **TRIPOD** using a choker hold knot (*Fig. 41*) and (*Fig. 42*).
2. Ensure the lifting sling is attached correctly to the **TRIPOD** and inspect the lifting sling for any damage prior to use.

5.3. Preparation of Inspection Surface



WARNING! FALLING OBJECT HAZARD.

The inspection surface must adhere to the conditions outlined in sections “*Intended Use*” on page 3 and “*Operating Environment*” on page 5 of this manual.

- ▶ Remove build-up of scale, and other debris (*i.e. dirt, ice*) from surface on which the crawler is to drive. Excessive build-up will cause the wheels to lose magnetic attraction which may lead to wheel slippage or crawler detachment.
- ▶ Ensure that no obstructions (*other than standard butt welds*) or voids are in the drive path. Obstructions and voids could cause the crawler to fall if driven into or over.
- ▶ Ensure that there are no patches of non-ferrous material in the drive path of the crawler. If the crawler drives over a non-ferrous patch, it will lose magnetic attraction and will cause the crawler to fall.

5.4. System Connectivity

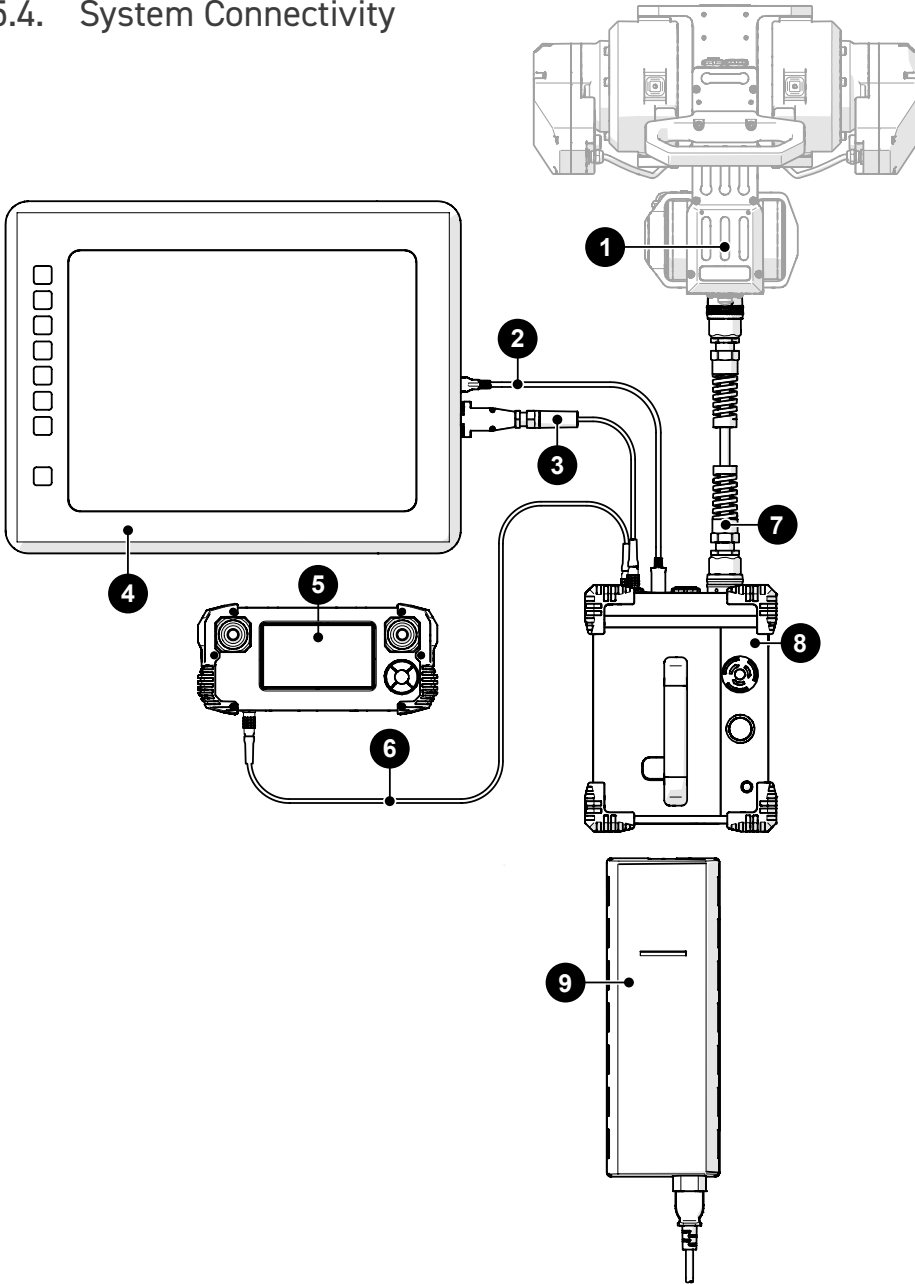


Fig. 43 - Standard crawler configuration

BOM ID	Description
1	TRIPOD crawler
2	SCANLINK™ cable
3	Encoder cable
4	User instrument
5	Handheld controller
6	Auxiliary cable
7	Umbilical
8	System controller
9	AC/DC power supply

To configure the **TRIPOD** 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 **1** the crawler to **8** system controller using the **7** umbilical.
2. Connect **5** handheld controller to **8** system controller using the **6** auxiliary cable.
3. Connect **3** encoder cable from the **4** user's instrument to the **8** system controller.
4. Insert **9** AC/DC power supply into the **8** system controller.
5. (see "TRIPOD Configuration" on page 35) to set up a particular configuration.

5.5. TRIPOD Configuration

5.5.1. Crawler with Corrosion Actuated Probe Lift

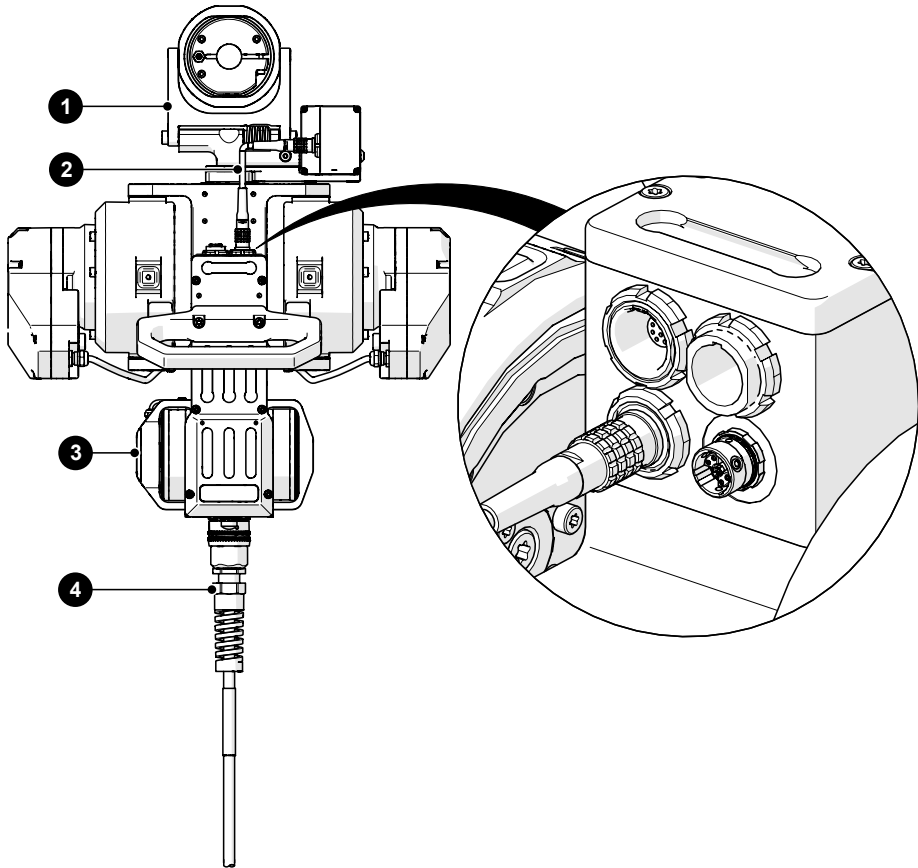


Fig. 44 - Standard TRIPOD configuration with corrosion actuated probe lift

BOM ID	Description
1	Corrosion actuated probe lift
2	Auxiliary cable
3	TRIPOD crawler
4	Umbilical

To configure the **TRIPOD** system for single-line corrosion scanning using crawler with a corrosion actuated probe lift, follow these steps (see “Corrosion Actuated Probe Lift” user manual):



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

1. Connect the **4** umbilical to **3** the crawler.
2. Attach the **1** corrosion actuated probe lift (see “Corrosion Actuated Probe Lift” user manual) to the **3** crawler.
3. Connect the **2** auxiliary cable to the **1** corrosion actuated probe lift and to the **3** crawler’s AUX port.

5.5.2. Crawler with Multiple Probe Holders

5.5.2.1 Vertical Probe Holder Frame

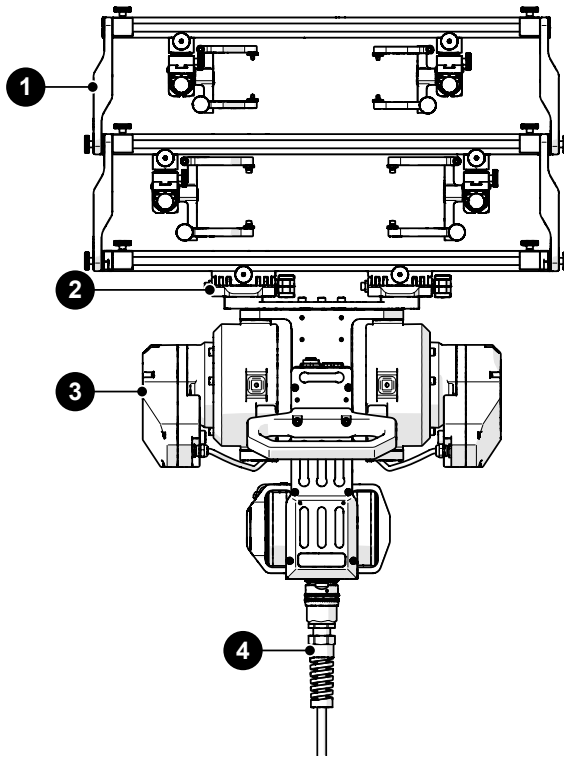


Fig. 45 - Standard crawler configuration with vertical probe holder frame

BOM ID	Description
1	Vertical probe holder frame
2	Double Pivot Mount
3	TRIPOD crawler
4	Umbilical

To configure the **TRIPOD** system for scanning with a vertical probe holder frame, follow these steps (see “Vertical Probe Holder Frame” on page 63):



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

1. Connect the **4** umbilical to **3** the crawler.
2. Mount the **2** double pivot mount (see “Double Pivot Mount” on page 41) to **3** the crawler.
3. Attach a configured **1** vertical probe holder frame (see “Vertical Probe Holder Frame” on page 63) to the double pivot mount.

5.6. TRIPOD Base Crawler

5.6.1. Handle

The handle is removable to achieve low profile scanning.

To remove the handle:

Unscrew both Torx screws
(*Fig. 46*), and lift the handle
upwards to remove (*Fig. 47*)

To reinstall the handle,
reverse the preceding steps.

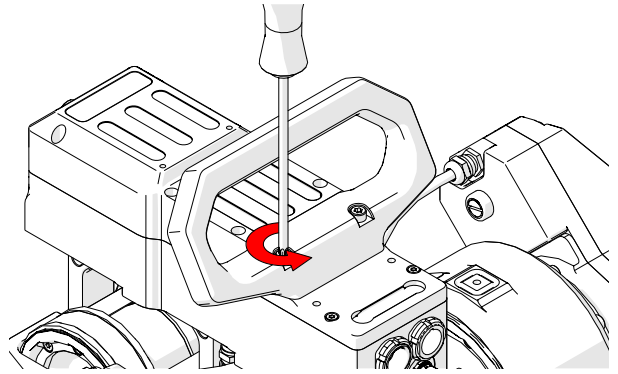


Fig. 46 - Unscrew Torx screws

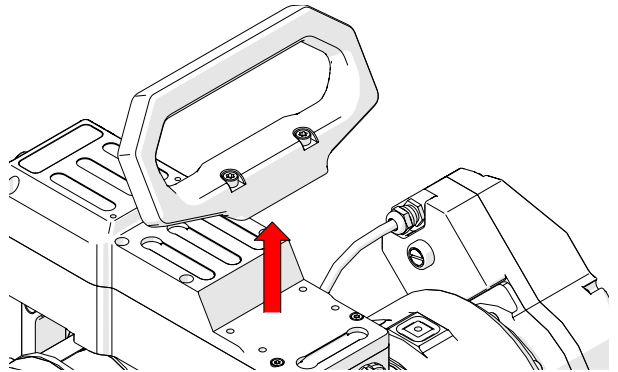


Fig. 47 - Lift Handle

5.6.2. Pivot Mount

The **TRIPOD** system can support a pivot mount for attaching accessories. To install the pivot mount to the **TRIPOD** follow these steps:

1. Attach the pivot mount to the **TRIPOD** using the provided 3 mm hex driver (Fig. 48).
2. To adjust the nose of the pivot mount. Lower the lever and adjust the nose as needed (Fig. 49).

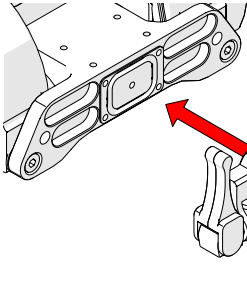


Fig. 48 - Install with driver

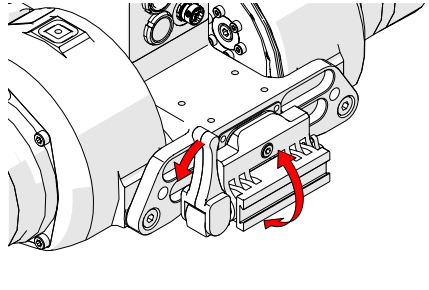


Fig. 49 - Adjust pivot nose by lowering lever

3. Secure the pivot mount by raising the lever (Fig. 50).

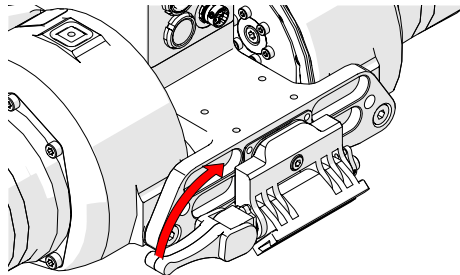


Fig. 50 - Secure with lever

5.6.3. Double Pivot Mount

For attaching a double pivot mount, follow these steps:

1. Install the double pivot mount to the **TRIPOD** using the provided 3 mm hex driver and fastening each of the five screws (Fig. 51).

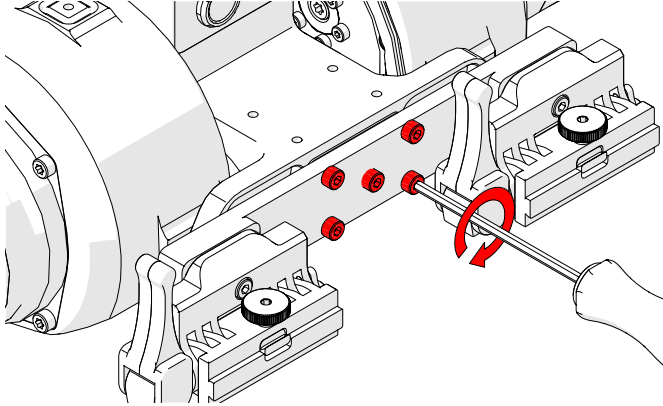


Fig. 51 - Installing double pivot mount

2. To add a frame bar to the double pivot mount, begin by loosening the knobs on the nose of both pivot mounts with the provided 3 mm hex driver (Fig. 52).
3. Slide frame bar onto both pivot mounts (Fig. 53).

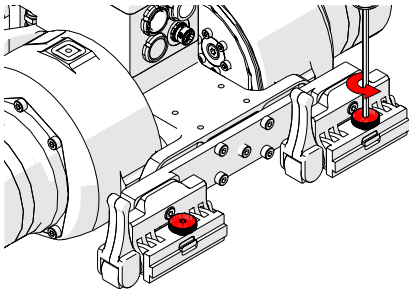


Fig. 52 - Loosen knobs with driver

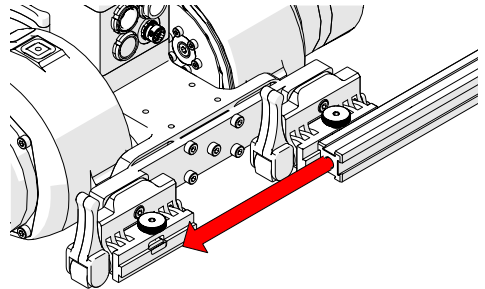


Fig. 53 - Slide frame bar onto mounts

4. Secure by tightening knobs on both noses of pivot mounts (Fig. 54).

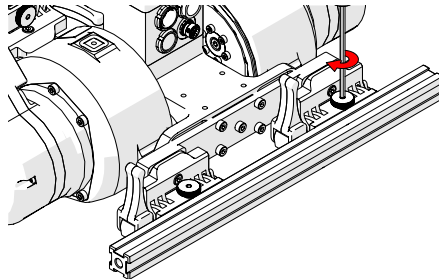


Fig. 54 - Secure with driver

5.7. Umbilical



WARNING! FALLING OBJECT HAZARD.

For operating at heights greater than 2 m (6 ft), ensure the umbilical strain relief is aligned according to the below instructions and never points upwards as shown in (Fig. 56). The crawler could fall.

SEVERE INJURY or DEATH could result.

1. For scanning at heights greater than 2 m (6 ft), the umbilical must be set parallel to the scanning surface (Fig. 55). Ensure the umbilical never points upwards during operation (Fig. 56).

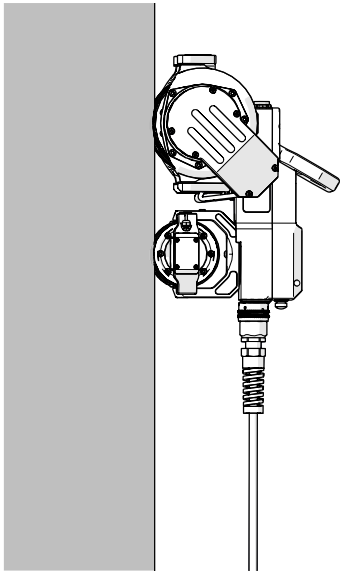


Fig. 55 - Correct use

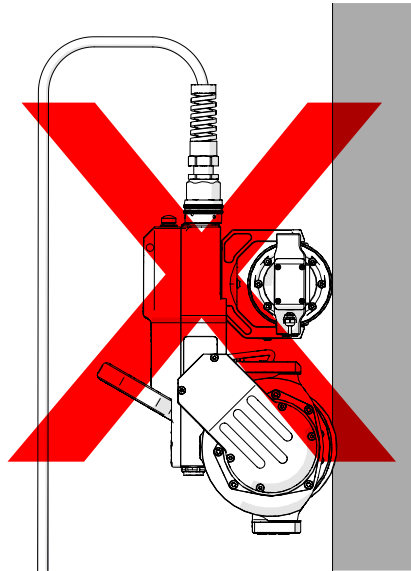


Fig. 56 - Incorrect use

2. Align the pins of the umbilical to the connector at the rear of the **TRIPOD**.
3. Twist the umbilical's sleeve clockwise, locking the umbilical in place.

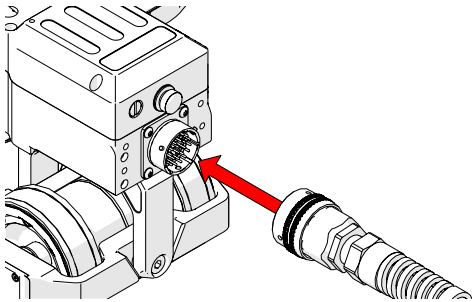


Fig. 58 - Align pins

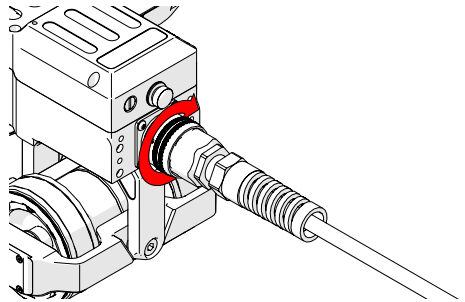


Fig. 57 - Twist to secure umbilical connection

5.8. Dovetail Accessory Mount

Affix optional accessories to the crawler using the dovetail accessory mount.

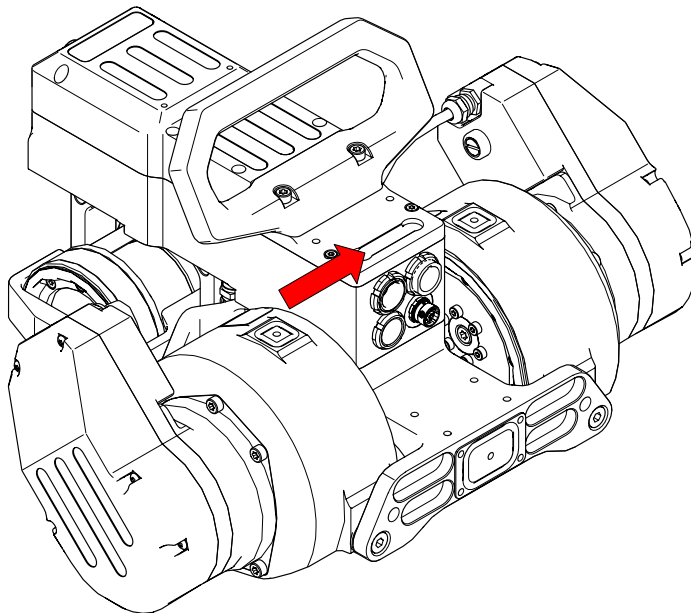


Fig. 59 - Dovetail accessory mount

5.9. 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.



5.9.1. Magnetic Mounts

Magnetic mounts on the rear of the handheld controller assist in preventing the handheld controller from falling.

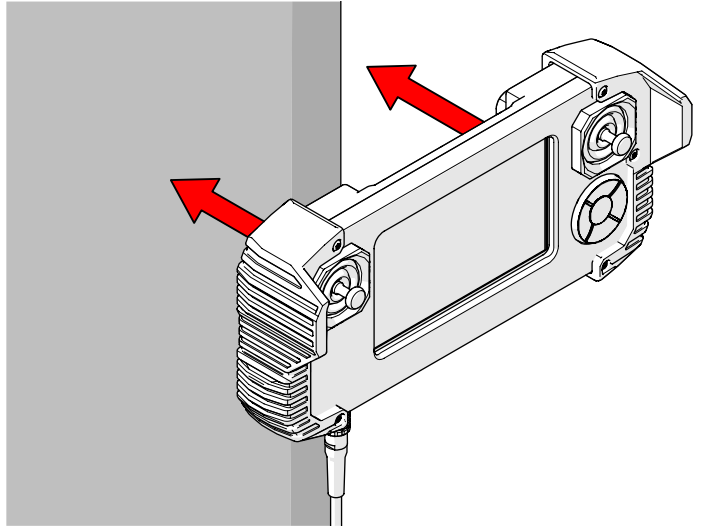


Fig. 60 - Mount to ferrous surfaces

5.10. Probe Holders

5.10.1. 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

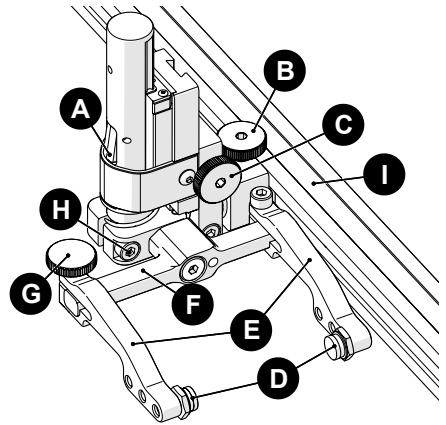


Fig. 61 - Vertical probe holder

5.10.1.1 Probe Holder Setup

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

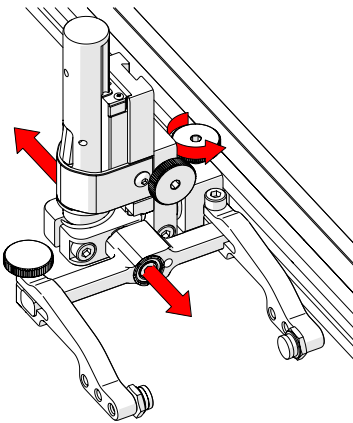


Fig. 62 - Adjust on frame bar

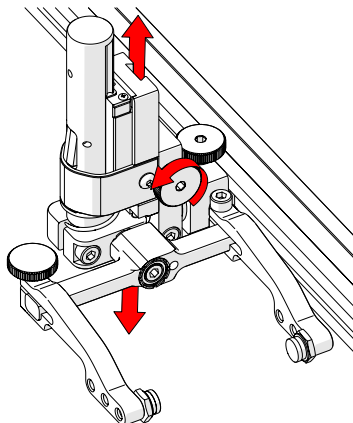


Fig. 63 - Vertical adjustment

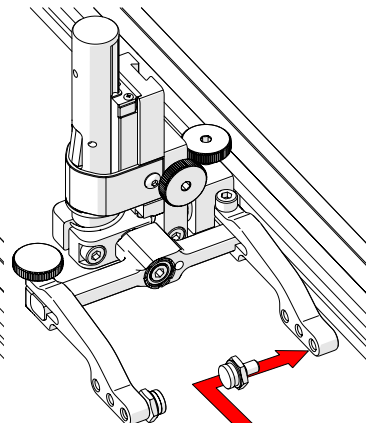


Fig. 64 - Place buttons

1. The probe holder adjustment knob allows the probe holder to be attached to a frame bar and adjusts horizontal positioning (Fig. 62).
2. The vertical adjustment knob allows the vertical probe holder height adjustment (Fig. 63).
3. Position the pivot buttons where necessary. When a narrow scanning footprint is required, use the pivot button holes closest to the yoke (Fig. 64).

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

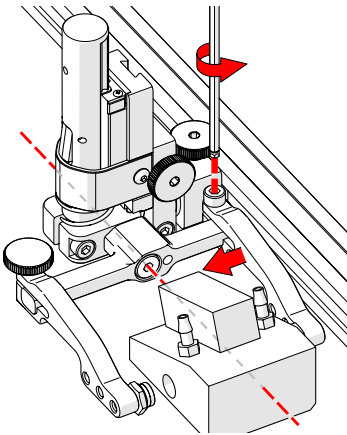


Fig. 65 - Adjust inner arm

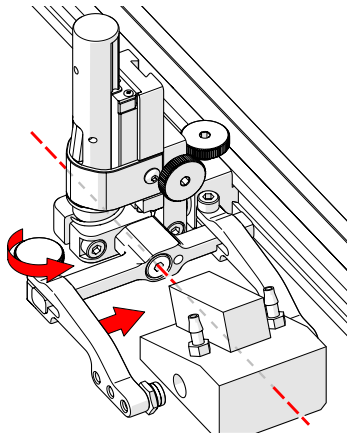


Fig. 66 - Adjust outer arm

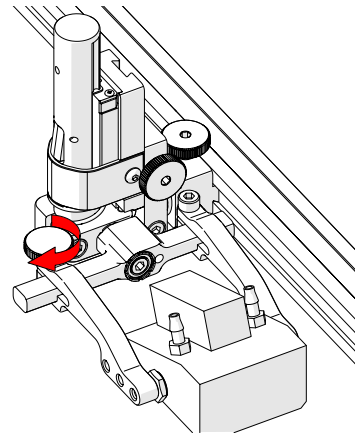


Fig. 67 - Tighten arm knob

4. Position the wedge on the inner probe holder arm (Fig. 65).

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. 65) using the supplied 3 mm hex driver (Fig. 33).

5. Loosen the probe holder arm adjustment knob (Fig. 66) and slide the probe holder arm along the yoke pinching the wedge in place.
6. Tighten the probe holder arm adjustment knob (Fig. 67).

5.10.1.2 Probe Holder Vertical Adjustment

To adjust the probe holder vertically, follow these steps:

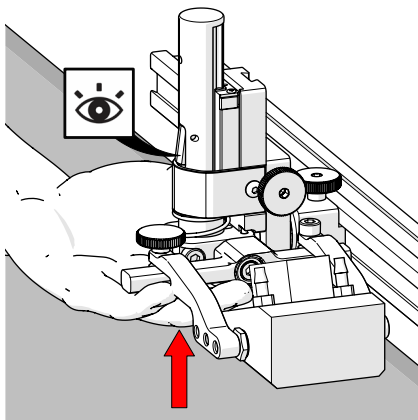


Fig. 68 - Latch probe holder

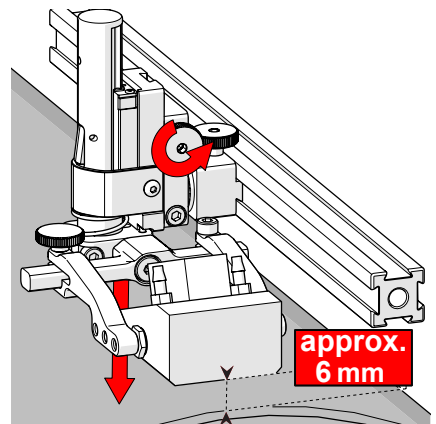


Fig. 69 - Lower toward scan surface

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. 68).

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. 69).

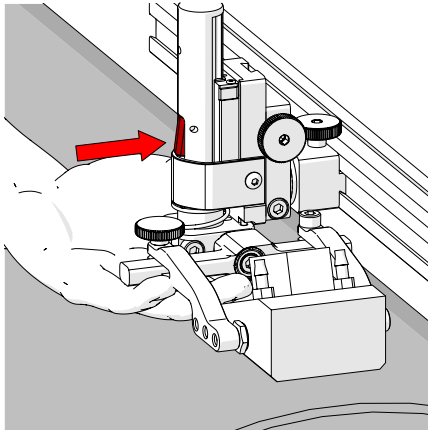


Fig. 70 - Press latch button

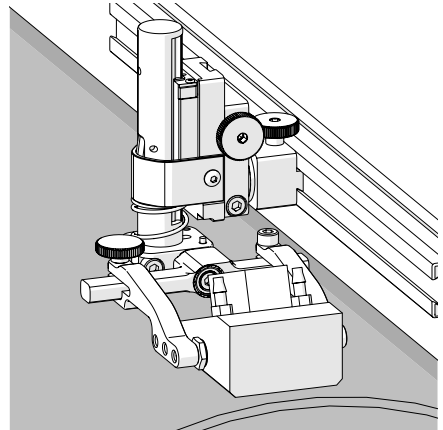


Fig. 71 - Lower toward scan surface

4. Lift the yoke slightly and press the latch button (Fig. 70), then slowly lower towards scanning surface to apply spring pressure to the wedge (Fig. 71).

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.

5.10.1.3 Probe Holder Transverse Adjustment

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

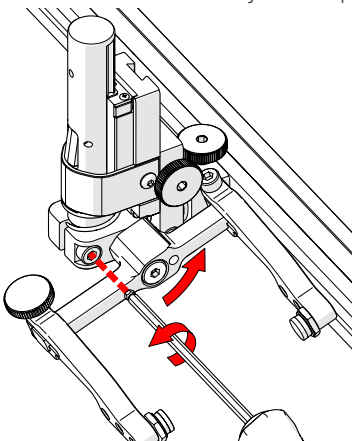


Fig. 72 - Loosen 3 mm screw

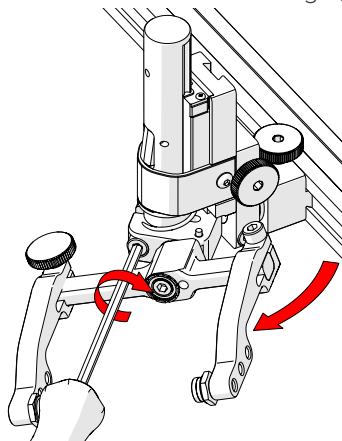


Fig. 73 - Rotate and tighten

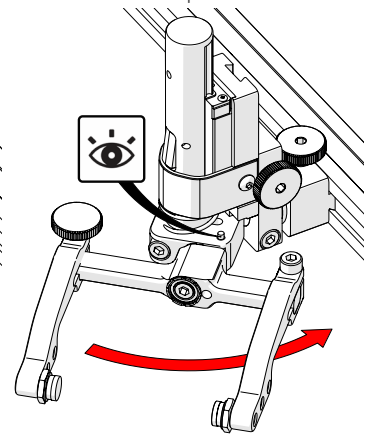


Fig. 74 - Stop post locates 90°

1. Ensure the probe holder is in the latched upper position (Fig. 68).

2. Using the supplied 3 mm hex driver loosen the transverse adjustment screw (Fig. 72) and rotate the yoke about the vertical shaft achieving the desired angle.
3. Tighten the transverse adjustment screw (Fig. 73).

To return the transverse adjustment to neutral (90°). The probe holder must be in the latched, upper position (Fig. 68). Rotate the yoke until the stop post contacts the base of the probe holder (Fig. 74). Then tighten the transverse adjustment screw.

5.10.1.4 Probe Holder Longitudinal Adjustment

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

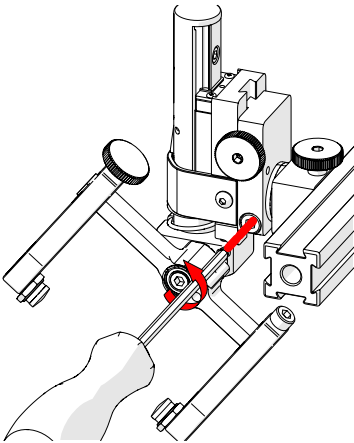


Fig. 75 - Loosen 3 mm screw

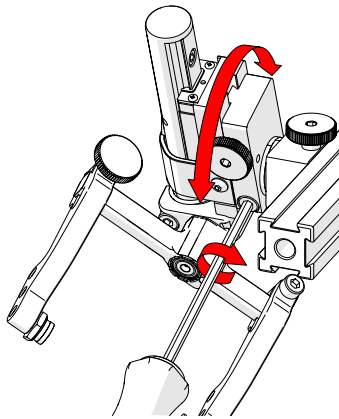


Fig. 76 - Rotate to position

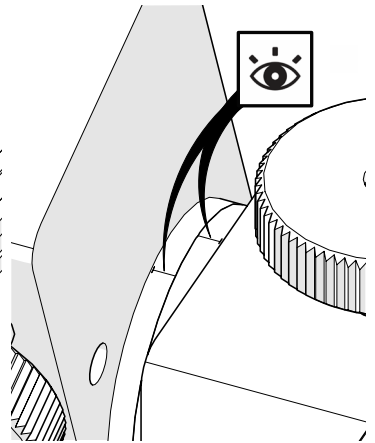


Fig. 77 - Line up markers

1. Ensure the probe holder is in the latched upper position (Fig. 68).
2. Using the supplied 3 mm hex driver (Fig. 33), loosen the longitudinal adjustment screw (Fig. 75).
3. Rotate the main body of the probe holder until it is at the desired angle (Fig. 76).
4. Tighten the longitudinal adjustment screw (Fig. 76).

To return the longitudinal adjustment to neutral (90°). Line up the longitudinal adjustment indicator markers (Fig. 77).

5.10.1.5 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. 37) is required.

1. Ensure the probe holder is in the latched upper position (Fig. 68).

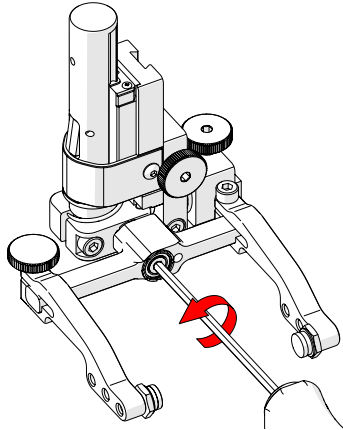


Fig. 78 - Unscrew yoke pivot screw

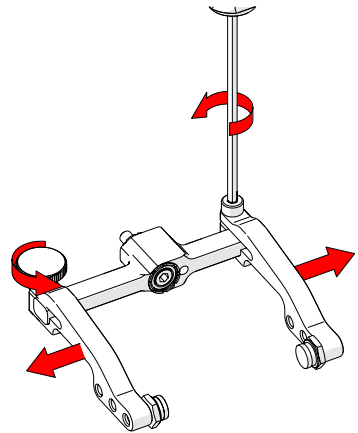


Fig. 79 - Remove probe holder arms

2. Using the supplied 3 mm hex driver (Fig. 33), unscrew the yoke pivot screw and remove the yoke (Fig. 78).
3. Loosen the probe holder arm adjustment knob and the arm clamp screw. Slide the probe holder arms off the yoke (Fig. 79).

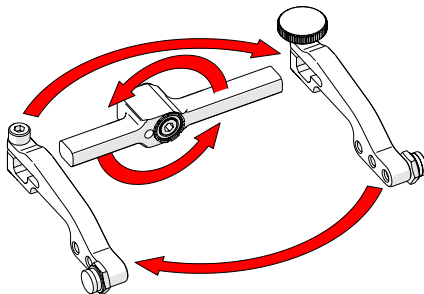


Fig. 80 - Flip yoke and reverse arms

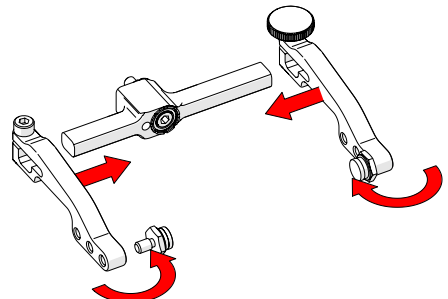


Fig. 81 - Attach arms & move buttons

4. Flip the yoke 180° and reverse the probe holder arms (Fig. 80).
5. Place the pivot buttons on the inside of the probe holder arms (Fig. 81) using a 3/8 in wrench (Fig. 34).

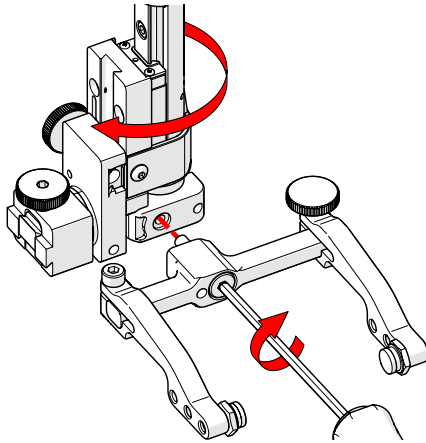


Fig. 82 - Screw yoke to opposite side

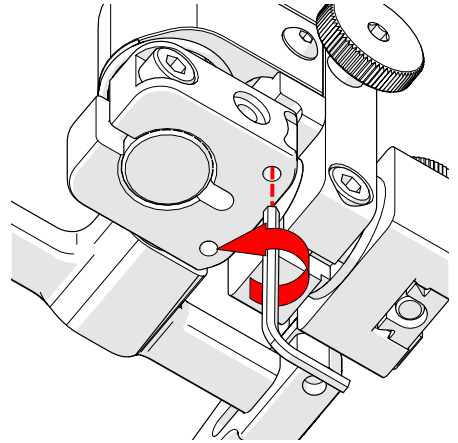


Fig. 83 - Lower 90° stop post

6. Mount the yoke to the opposite side of the base using the supplied 3 mm hex driver (Fig. 82).

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. 83).

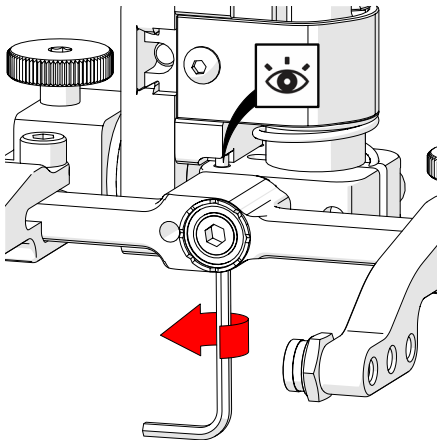


Fig. 84 - Raise opposite 90° stop post

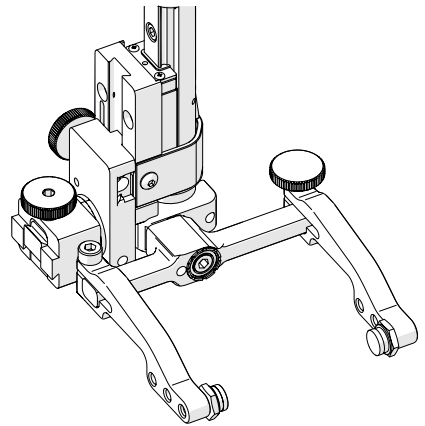
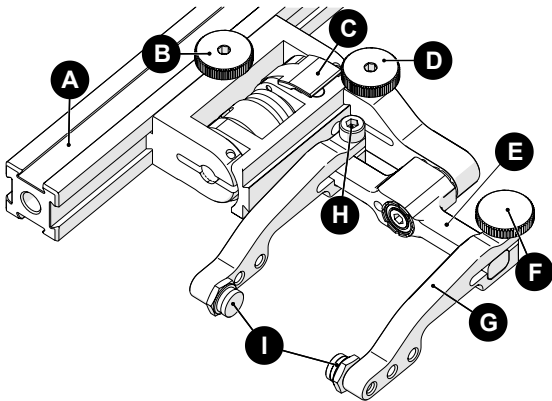


Fig. 85 - Reversed probe holder

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. 84).

5.10.2. Slip Joint Probe Holder



A	Frame Bar
B	Probe Holder Adjustment Knob
C	Latch
D	Swing Arm Knob
E	Yoke
F	Probe Holder Arm Adjustment Knob
G	Probe Holder Arm
H	Arm Clamp Screw
I	Pivot Buttons

Fig. 86 - Slip Joint Probe Holder

5.10.2.1 Probe Holder Setup

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

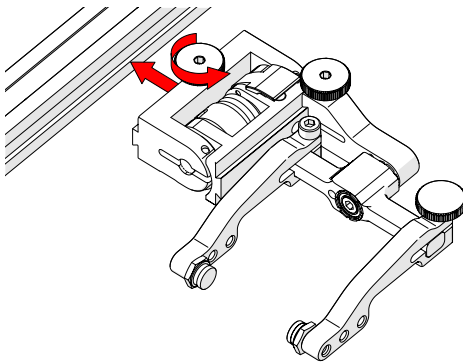


Fig. 87 - Attach to frame bar

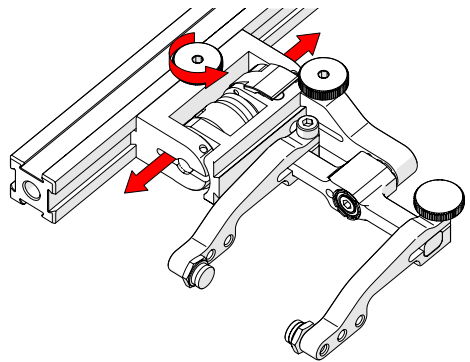


Fig. 88 - Adjust on frame bar

1. Rotate the probe holder adjustment knob and attach the probe holder to a frame bar (Fig. 87).
2. Use the probe holder adjustment knob to position the probe holder along the frame bar (Fig. 88).

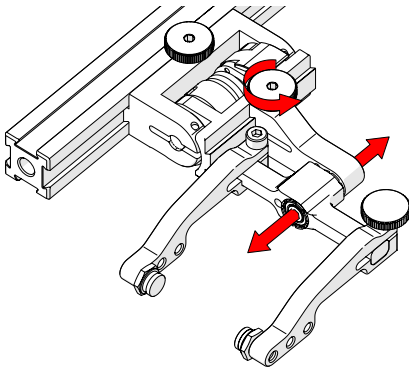


Fig. 89 - Adjust swing arm

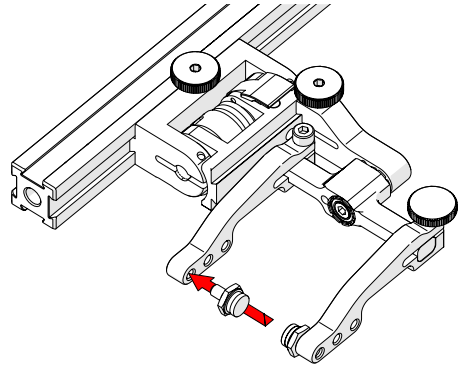


Fig. 90 - Place pivot buttons

3. Use the swing arm knob to position the swing arm (Fig. 89).

TIP: The swing arm is typically used to adjust TOFD center to center distance relative to the phased array probes on a four probe configuration.

4. Using the supplied 3/8 in wrench (Fig. 34), place the pivot buttons (Fig. 90) farthest from the yoke for maximum wedge clearance.

TIP: If narrow scanning footprint is required, use pivot button holes closest to the yoke. Wedge pivoting may be impeded when closer to the yoke.

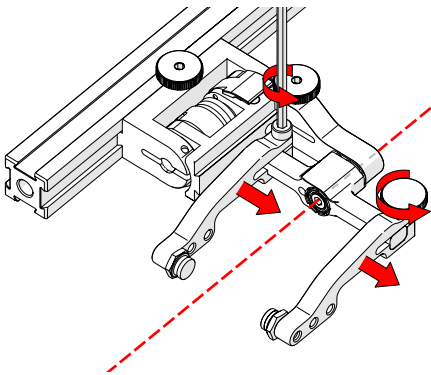


Fig. 91 - Adjust probe holder arms

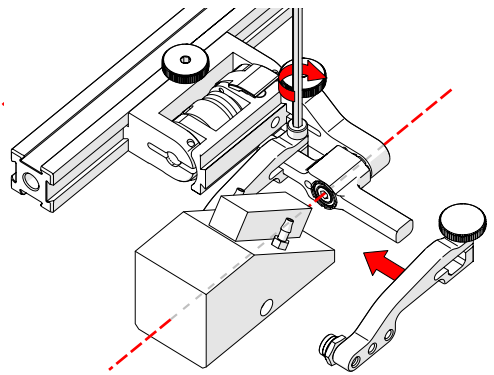


Fig. 92 - Place wedge

5. Loosen the probe holder arm adjustment knob (Fig. 91) and remove the outer probe holder arm from yoke.
6. Adjust the inner probe holder arm as required to best centre the probe on the yoke's pivot axis (Fig. 91).

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 to reduce wedge tipping when scanning. Position the inner probe holder arm accordingly with the centre of the yoke (Fig. 91).

7. Position the wedge on the inner probe holder arm (Fig. 92).
8. Slide the outer probe holder arm along the yoke pinching the wedge in place.
9. Tighten the probe holder arm adjustment knob (Fig. 93).

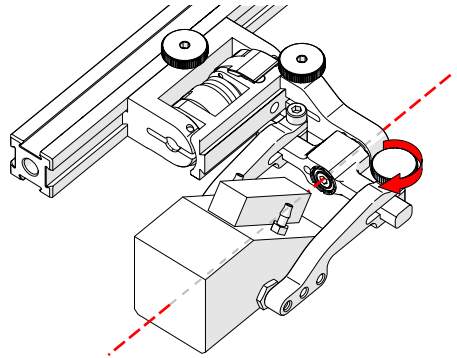


Fig. 93 - Pinch wedge with arm

5.10.2.2 Probe Holder Adjustment

To adjust the probe holder, follow these steps:

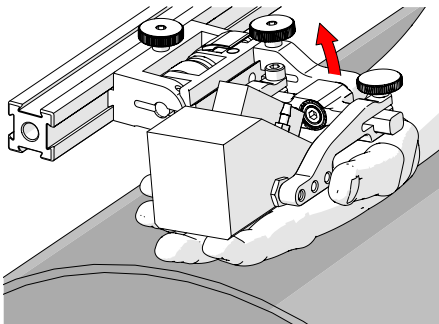


Fig. 94 - Lift to latched position

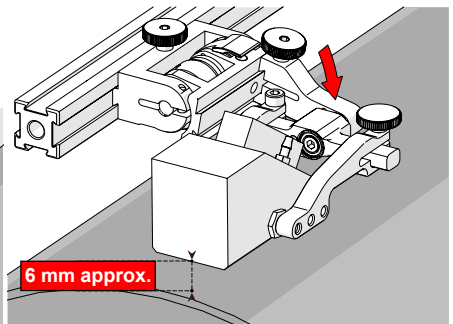


Fig. 95 - Lower to scanning surface

1. Ensure the probe holder is in the latched upper position (Fig. 94). If the probe holder is already latched, it will only move within the slip joint adjustment range and have no spring tension.
2. Push the probe holder yoke down toward the inspection surface until the wedge is approximately 6 mm ($\frac{1}{4}$ in) from the inspection surface (Fig. 95).

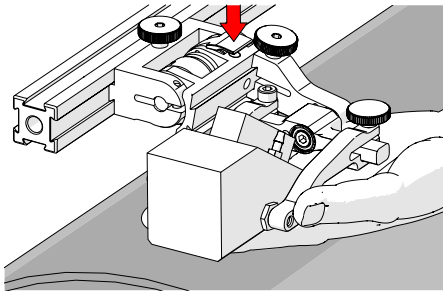


Fig. 96 - Lift and press latch button

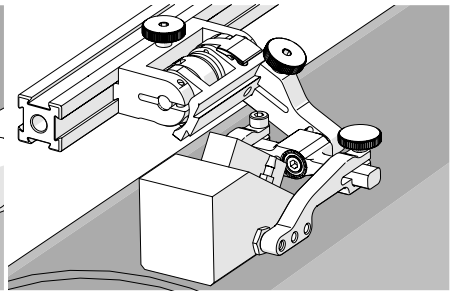


Fig. 97 - Spring loaded scan position

3. Lift the probe slightly and press the latch button (Fig. 96) to apply spring pressure to the wedge.
4. Gently lower probe holder and wedge to the scanning surface (Fig. 97).

5.10.2.3 Probe Holder Force Adjustment

It is possible to adjust the tension of the probe holder spring.

NOTE: The 2 mm hex wrench (Fig. 38) and 3 mm hex wrench (Fig. 39) are required to perform this operation.

Light	1 kg	2 lb
Medium	2 kg	4 lb
Heavy	3 kg	6 lb

When configured correctly, these settings exert the indicated spring force on the Probe.

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

NOTE: Do not perform this operation on the scanning surface.

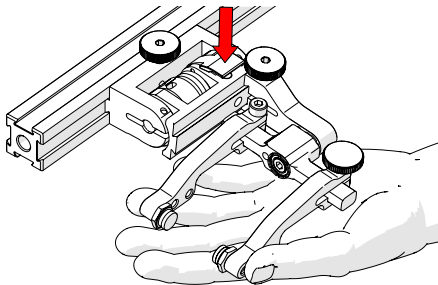


Fig. 98 - Lift slightly and press latch

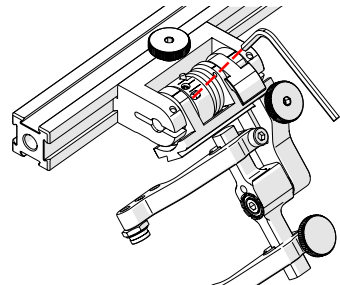


Fig. 99 - Unlatched position

1. Ensure the probe holder is in the upright latched position (Fig. 94).
2. Lift the probe holder slightly and press the latch button (Fig. 98) to release the probe holder to the full 45° degrees.
3. Insert the short arm of a 3 mm hex wrench into the 3 mm slot (Fig. 99).

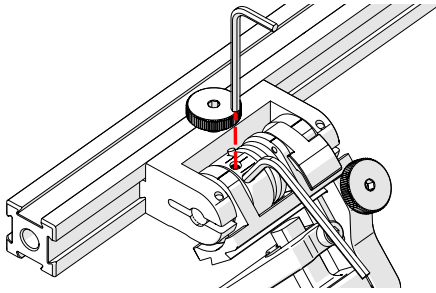


Fig. 100 - Insert hex tools

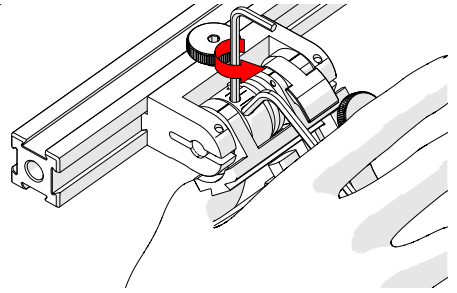


Fig. 101 - Press 3 mm hex wrench down

4. Place the 2 mm hex wrench into the force adjustment screw (*Fig. 100*).
5. Lightly press the long arm of the 3 mm hex wrench down. Using the 2 mm hex wrench, loosen the force adjustment screw but do not remove it (*Fig. 101*).
6. Gently apply pressure on the long leg of the 3 mm hex wrench until the force adjustment marker lines up with the desired spring tension. While keeping the markers in line, tighten the force adjustment screw (*Fig. 102*).

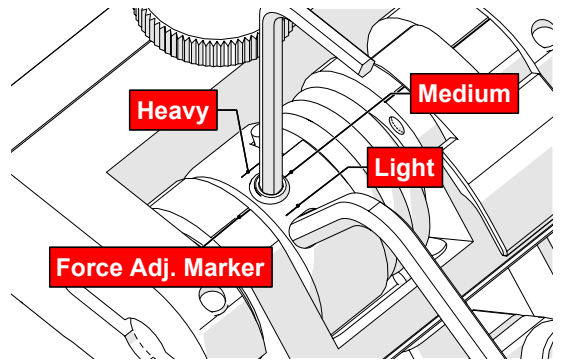


Fig. 102 - Choose desired tension

5.10.2.4 Slip Joint Probe Holder Left/Right Conversion

To reverse the probe holder, follow these steps:

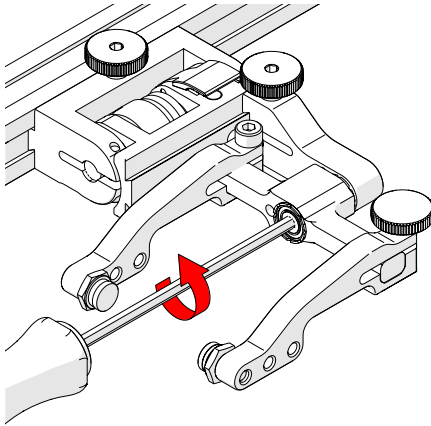


Fig. 103 - Unscrew yoke pivot screw

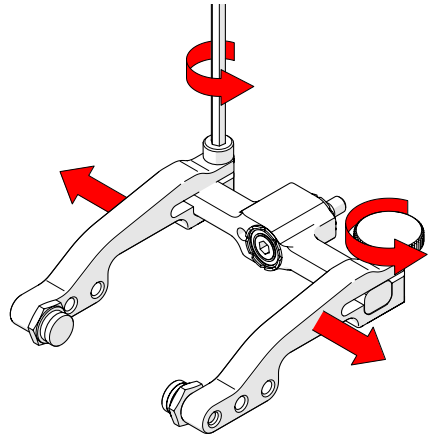


Fig. 104 - Remove arms

1. Unscrew the yoke from the swing arm (Fig. 103).
2. Loosen the probe holder arm adjustment knob and arm clamp screw. Slide the arms from the yoke (Fig. 104).

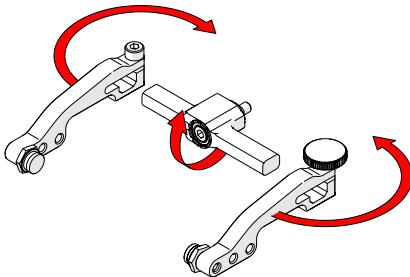


Fig. 105 - Flip yoke and reverse arms

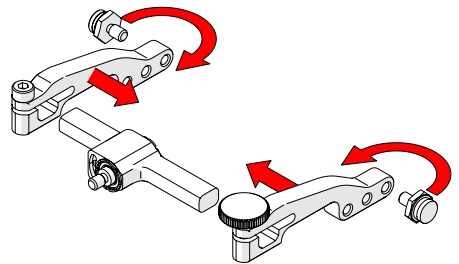


Fig. 106 - Attach arms and move buttons

3. Flip the yoke 180° and reverse the probe holder arms (Fig. 105).
4. Place the pivot buttons on the inside of the probe holder arms (Fig. 106) using a 3/8 in wrench (Fig. 34). Slide the arms onto the yoke and tighten the probe holder arm adjustment knob and the arm clamp screw.

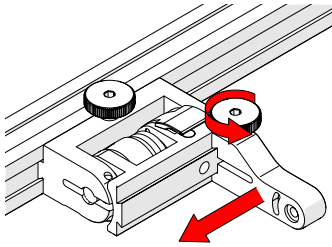


Fig. 107 - Position swing arm

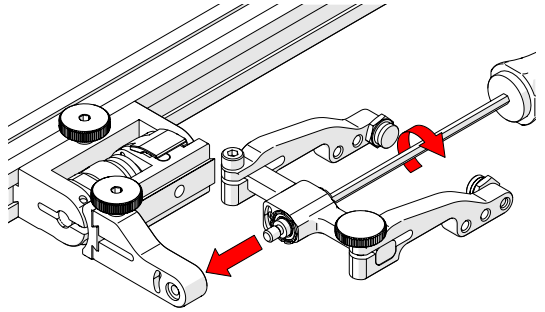


Fig. 108 - Install yoke to swing arm

5. Loosen the swing arm knob and slide the swing arm to the opposite end of the probe holder bracket (*Fig. 107*) or the preferred position. Tighten the swing arm knob.
6. Using the 3 mm hex driver, screw the yoke pivot screw into the opposite side of the probe holder swing arm (*Fig. 108*). Ensure the yoke is level to avoid issues with the plunger/set screw.

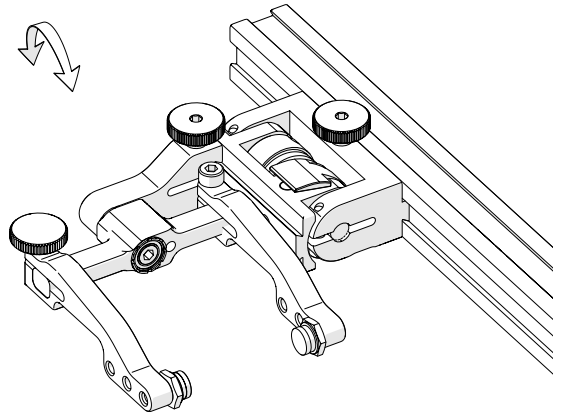


Fig. 109 - Reversed probe holder

5.10.3. Heavy Duty Vertical Probe Holder

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

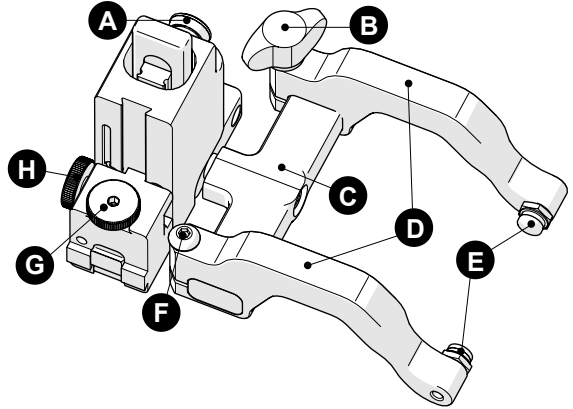


Fig. 110 - Heavy duty vertical probe holder

5.10.3.1 Probe Holder Setup

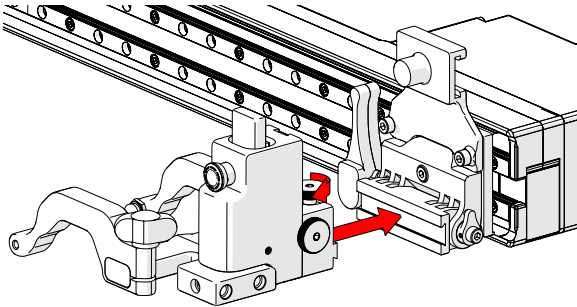


Fig. 111 - Mount probe holder to carrier

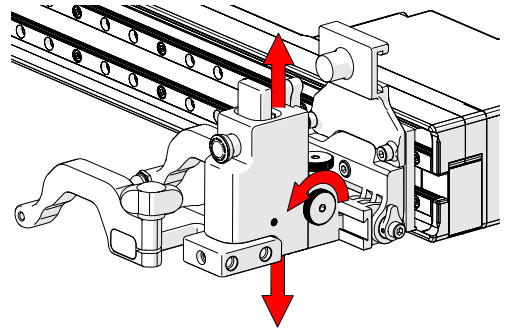


Fig. 112 - Vertical adjustment

1. Loosen the probe holder adjustment knob (*Fig. 111*) and mount the heavy duty vertical probe holder's dovetail jaw to the carrier.
2. The vertical adjustment knob (*Fig. 112*) allows height adjustment of the heavy duty vertical probe holder. This adjustment also controls the probe holder's spring tension.

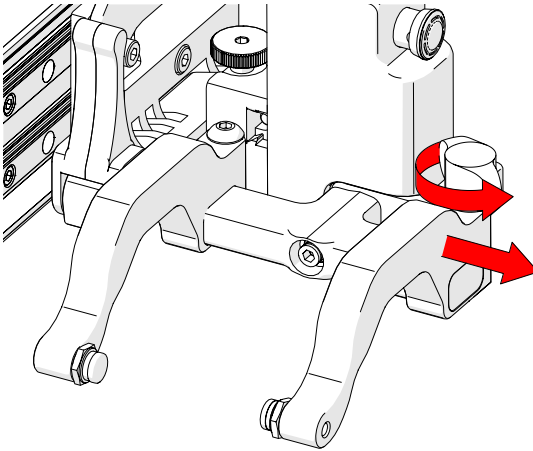


Fig. 113 - Remove outer arm

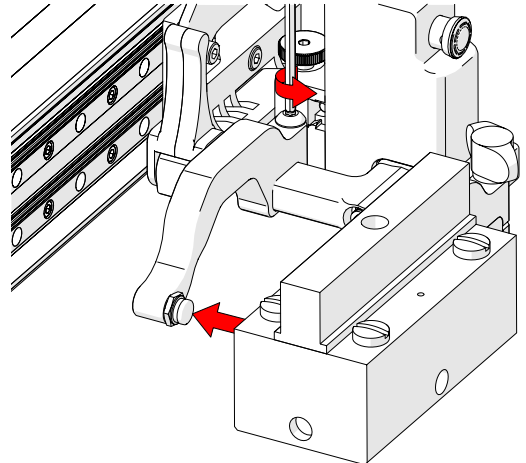


Fig. 114 - Adjust inner arm

3. Loosen the probe holder adjustment knob and remove the outer probe holder arm (Fig. 113).
4. Loosen the arm clamp screw (Fig. 114).
5. Place the wedge on the pivot button of the inner probe holder arm (Fig. 114).

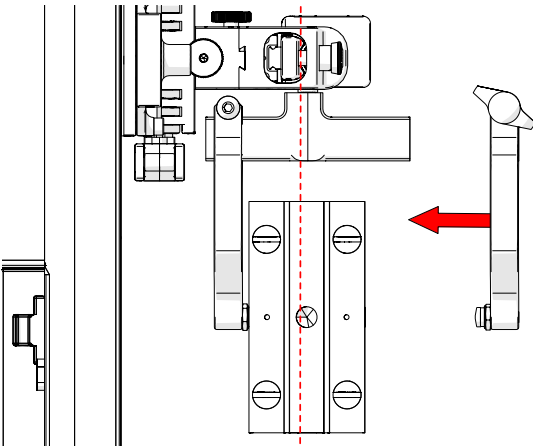


Fig. 115 - Align probe with yoke

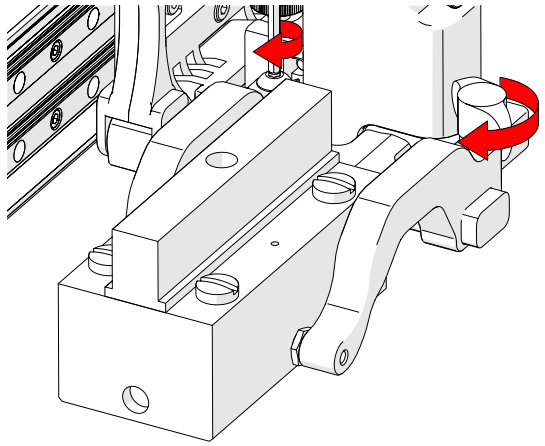


Fig. 116 - Tighten knob and screw

6. Align the middle of the wedge with the centre of the yoke (Fig. 115).
7. Tighten both the probe holder adjustment knob and the arm clamp screw (Fig. 115) while ensuring the wedge remains centred with the yoke.

5.10.3.2 Probe Holder Vertical Adjustment

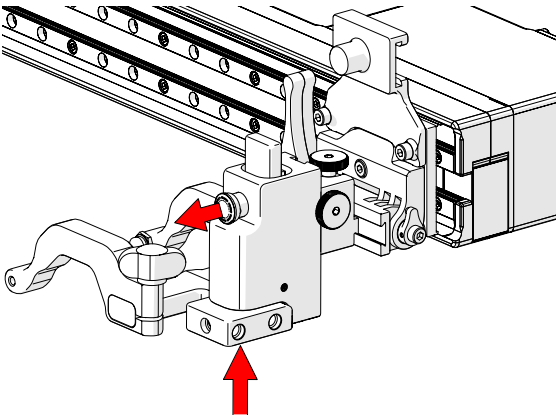


Fig. 117 - Press up and pull latch

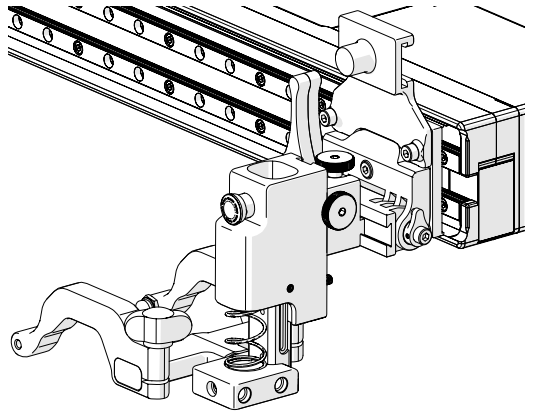


Fig. 118 - Lowered toward scan surface

1. Gently lift the heavy duty vertical probe holder and simultaneously pull the latch (Fig. 117). This action will unlock the probe holder. Slowly lower the probe holder towards the scan surface (Fig. 118).

5.10.3.3 Probe Holder Left/Right Conversion

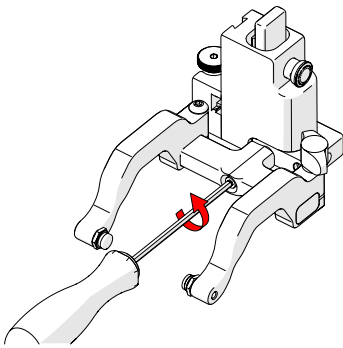


Fig. 119 - Remove yoke

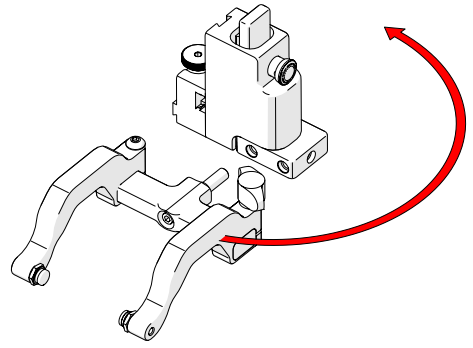


Fig. 120 - Orient to opposite side

1. Using the supplied 3 mm driver, unscrew the yoke (Fig. 119).
2. Position the yoke and arms to the opposite side of the probe holder (Fig. 120).

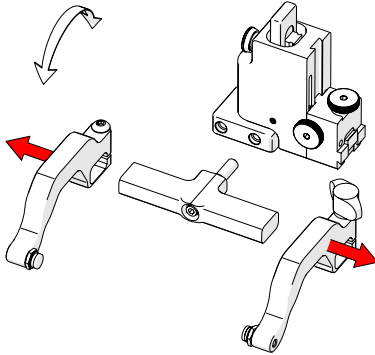


Fig. 121 - Remove probe holder arms

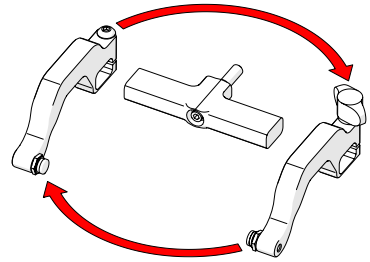


Fig. 122 - Reverse position around yoke

3. Loosen the arm clamp screw and probe holder arm adjustment knob allowing the removal of the probe holder arms (*Fig. 121*).
4. Position removed arms to opposite sides of the yoke (*Fig. 122*).

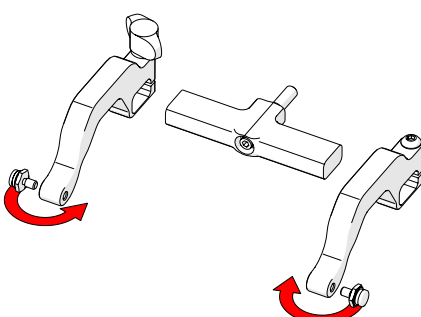


Fig. 123 - Position pivot buttons

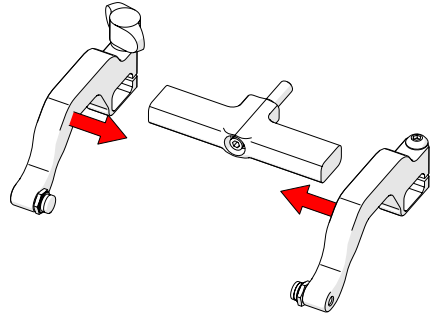


Fig. 124 - Place arms back onto yoke

5. Position the pivot buttons to the inside of the probe holder arms (Fig. 123).
6. Place the probe holder arms on the yoke and tighten the arm clamp screw and probe holder adjustment knob (Fig. 124).
7. Screw the yoke to the probe holder (Fig. 125).

TIP: Position the yoke in the threaded hole closest to the frame bar when using a standard yoke length. Position the yoke in the threaded hole furthest from the frame bar when using a wide yoke length.

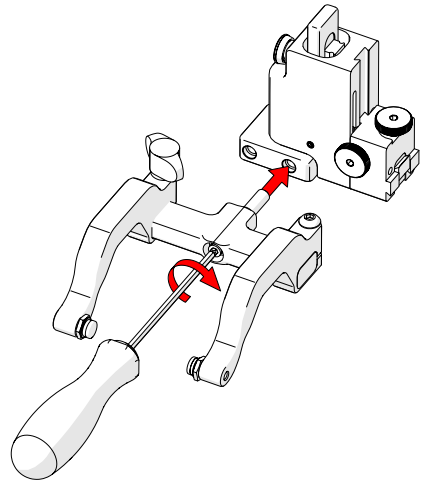


Fig. 125 - Screw into threaded hole

5.10.3.4 Probe Holder 90° Adjustment

1. Remove the yoke using the supplied 3 mm hex driver (Fig. 33).
2. Orient the yoke to the front of the probe holder and screw the yoke into the threaded hole provided (Fig. 126).

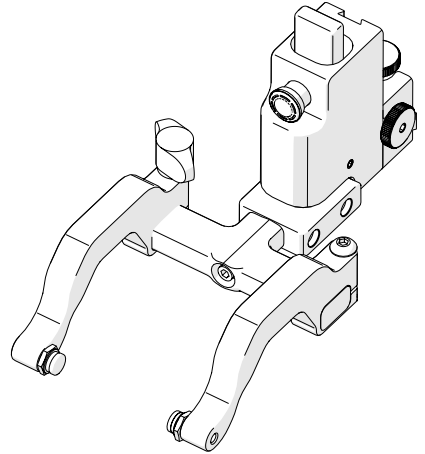


Fig. 126 - 90° probe holder positioning

5.10.4. Pivot Buttons

Available in a variety of shapes and sizes, fitting various wedge dimensions.

Use the supplied 3/8 in wrench (Fig. 34) to remove and install pivot buttons in desired hole location (Fig. 127).

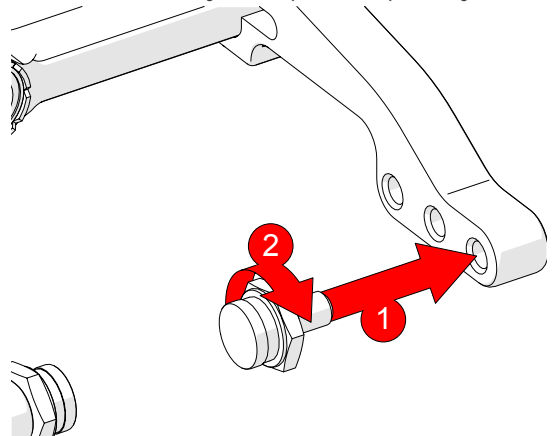


Fig. 127 - Tighten pivot buttons to probe holder arms

5.11. Probe Holder Frames

5.11.1. Vertical Probe Holder Frame



WARNING! FALLING OBJECT HAZARD.

When the Probe Holder Frame is mounted, only very slight corrective steering is permitted. Excessive steering may cause the crawler to fall and **SEVERE INJURY** or **DEATH** could result.



WARNING! FALLING OBJECT HAZARD.

It is imperative that the steps below be followed to properly set the height of the probe holder frame. If the height of the probe holder frame is set too low, the crawler may fall and **SEVERE INJURY** or **DEATH** could result.

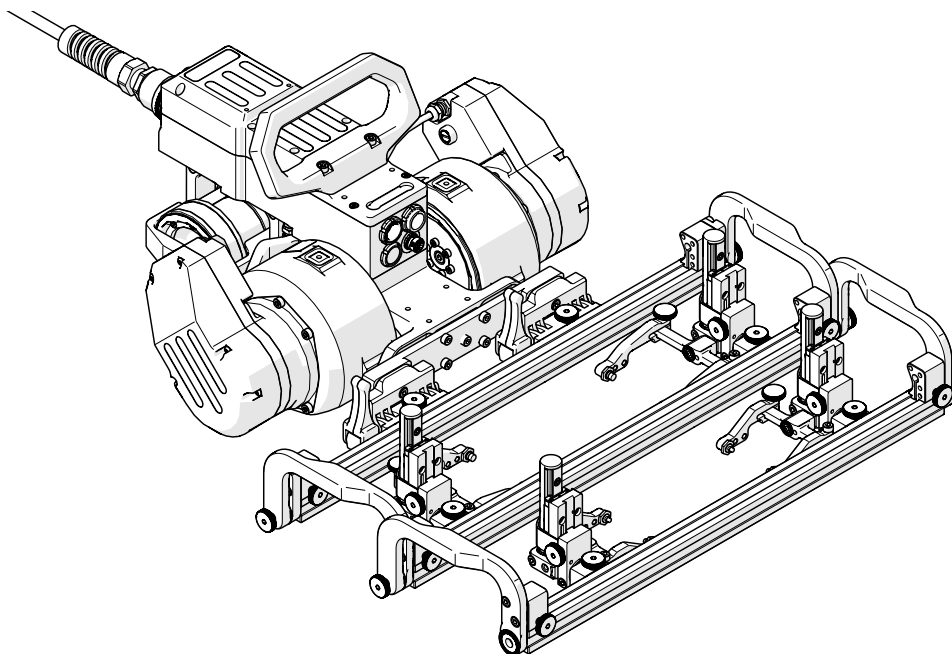


Fig. 128 - Vertical probe holder frame

The vertical probe holder frame adds weld scanning capability to the **TRIPOD** motorized scanner. This frame uses (4) vertical probe holders.

1. Attach the wedges to the probe holders that will be used (see “Probe Holder Setup” on page 45 for additional details).

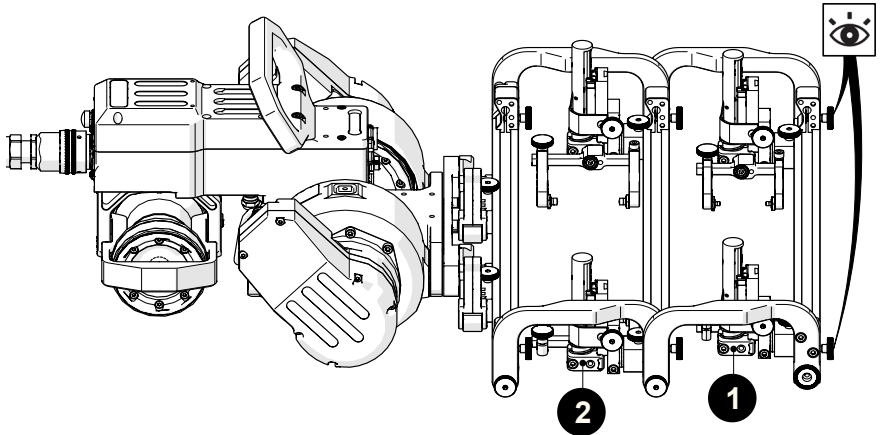


Fig. 129 - Position primary and secondary probe holders

2. Affix the probe holders (with attached wedges) to the probe holder frame. Place the secondary probe holder at the front of the **1** frame and place the primary probe holders at the rear of the **2** frame bar (Fig. 129).

TIP: Due to their larger size, scan results are generally improved when pulling or dragging phased array wedges.

3. Mount the probe holder frame to the double pivot mount. When mounting the probe holder frame, ensure the attachment knobs (Fig. 129) are at the front (non-crawler side).

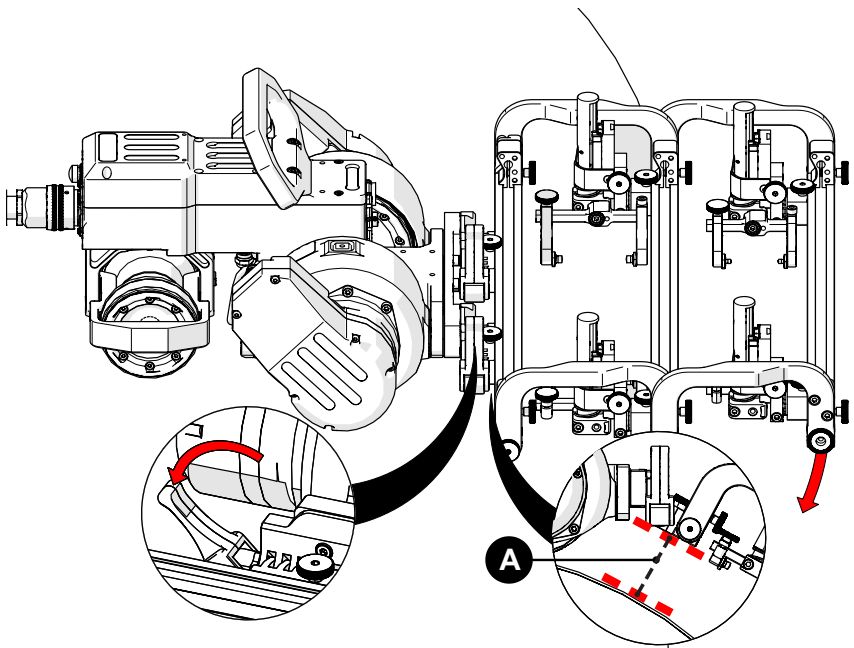


Fig. 130 - Align swivel mount with scan surface

4. Release the pivot mount levers (Fig. 130) to position the pivot mount parallel to the scan surface **A** (Fig. 130). When alignment with the scan surface is achieved, lock the pivot mount levers.

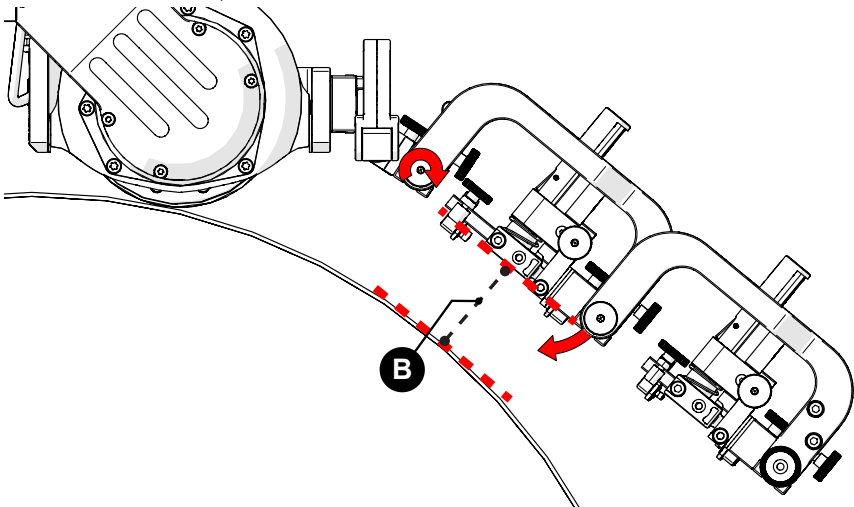


Fig. 131 - Set rear rotational adjustment knob

5. Loosen the rear rotational adjustment knob to lower the weld scan frame and position the frame's primary probe holders **B** (Fig. 131) parallel to the inspection surface. Ensure that gap **B** (Fig. 131) is no smaller than gap **A** (Fig. 130). Tighten rear rotational adjustment knob to secure.

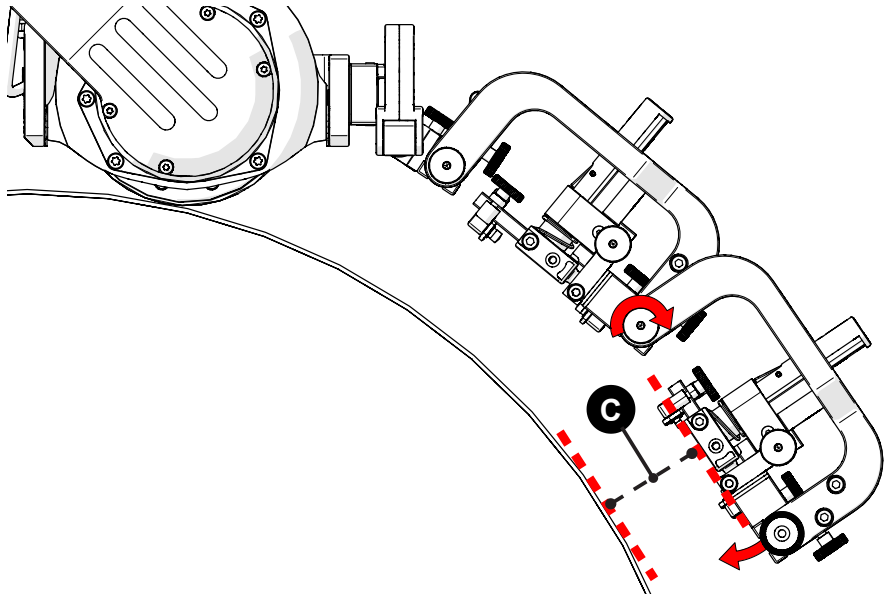


Fig. 132 - Set front rotational adjustment knob

6. Loosen the front rotational adjustment knob (Fig. 132) to lower the weld frame towards the inspection surface while ensuring gap **C** (Fig. 132) is no smaller than gap **B** (Fig. 131). Tighten front rotational adjustment knob to secure.
7. Lower the probe holders to the inspection surface (see "Probe Holder Vertical Adjustment" on page 46).

5.12. Accessories

5.12.1. Battery Powered Optical Guide



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

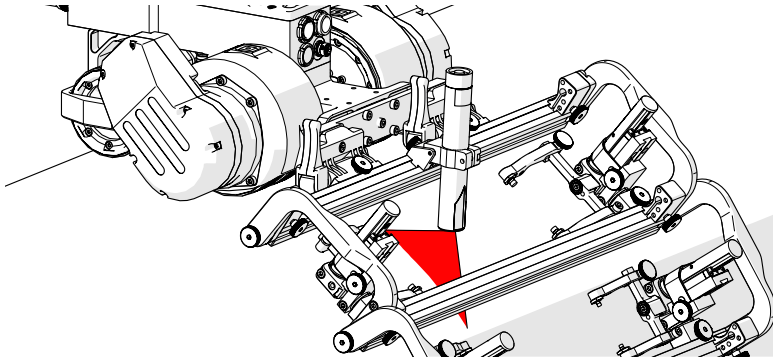


Fig. 133 - Battery powered optical guide

The battery powered optical guide provides a reference point to align the **TRIPOD** to a given path (*i.e. a weld*).

1. Loosen the battery powered optical guide knob (Fig. 134) and mount the optical guide to the frame bar.
2. Tighten the optical guide knob.
3. Adjust the optical guide's friction pivot to direct the laser beam as required (Fig. 135).
4. Loosen the optical guide knob to adjust the side-to-side position as required. Retighten the optical guide knob.
5. The included perpendicular mount allows for alternate mounting positions when required.

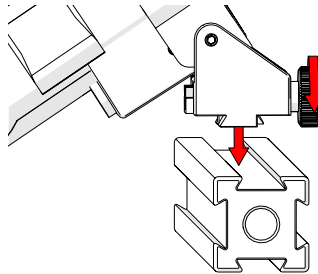


Fig. 134 - Mount on frame bar

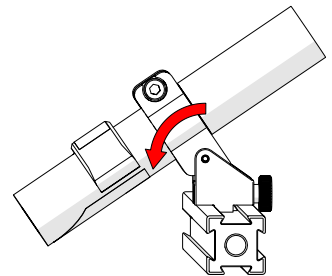


Fig. 135 - Aim guide

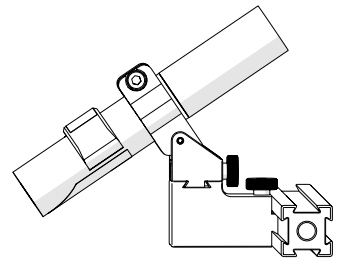


Fig. 136 - Perpendicular mount

NOTE: The battery powered optical guide requires 1 AA battery for operation.

5.12.2. Cable Management

The cable management is offered in a variety of lengths and provides a means of bundling and protecting cables and hoses that connect to the scanner.

5.12.2.1 Mounting Cable Management

To attach the cable management , follow these steps:

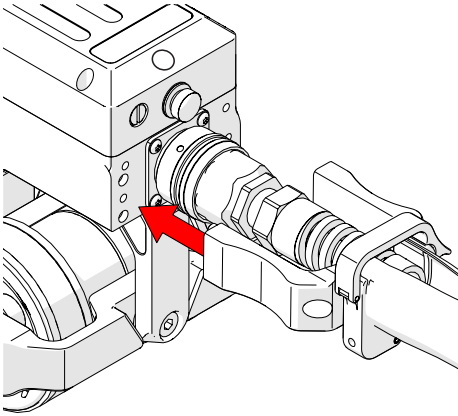


Fig. 137 - Align with umbilical

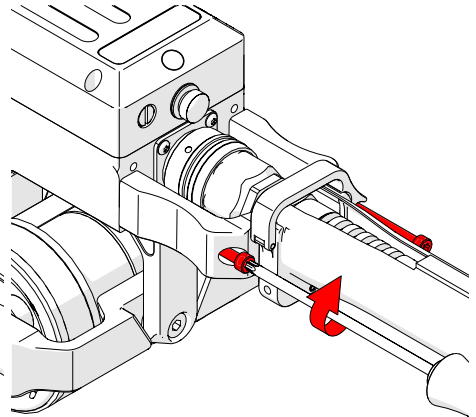


Fig. 138 - Tighten screws

1. Align the cable management clamp with the appropriate mounting position on the umbilical (Fig. 137).
2. Tighten the two clamp screws using the supplied T20 Torx driver to secure clamp to **TRIPOD** (Fig. 138).

5.12.2.2 Cable Management Setup

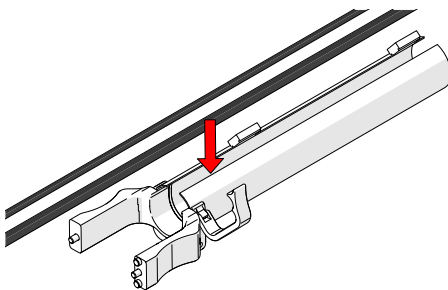


Fig. 139 - Insert cables and hoses

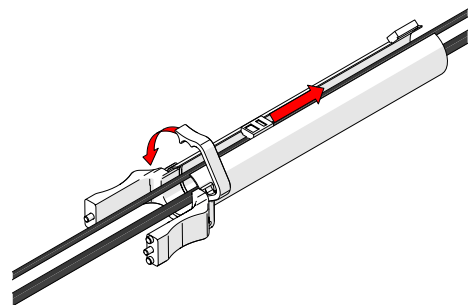


Fig. 140 - Zip to close

1. Open the cable management tube. Begin at the clamp end and start placing the cabling in the tube (Fig. 139).
2. Secure clamp and follow the cable placement zipping the tube closed (Fig. 140).

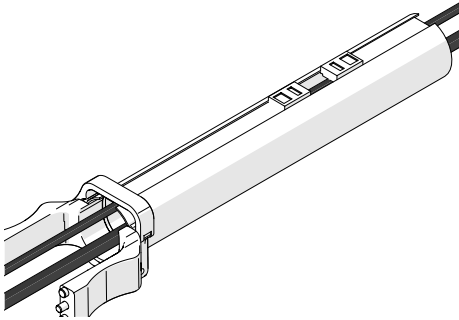


Fig. 141 - Zip opposite end

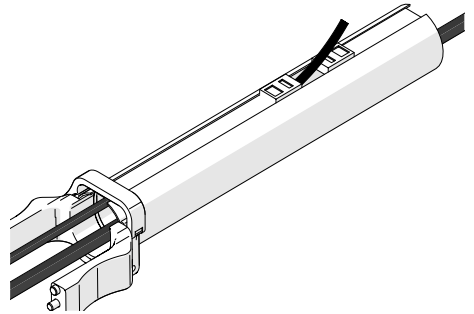


Fig. 142 - Flexible routing

3. Once the cable is placed the entire length of tube, bring the zipper from the opposite end to meet at any point in the middle. (Fig. 141)
4. When necessary, the two zippers may be opened to allow any cables to be routed out of the tube. (Fig. 142)

5.12.2.3 Clamp Setup

In the event the tube becomes disconnected from the cable management clamp, follow these instructions to reattach the tube and clamp.

1. Loosen the clamp screw using the supplied 3 mm hex driver. Slide the clamp around the tube first, and then slide the tube around the outside of the cable management mount (Fig. 143). Align the tube opening and the cable management clamp opening.
2. Slide the clamp over the tube and cable management mount, pinching the tube in between (Fig. 144).
3. Tighten the clamp screw (Fig. 145).

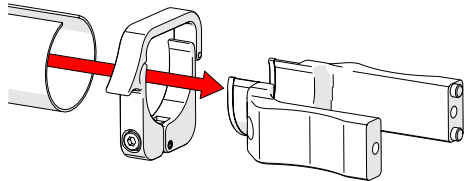


Fig. 143 - Slide tube around mount

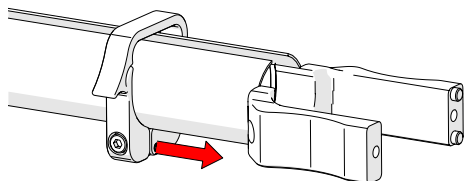


Fig. 144 - Slide clamp onto mount

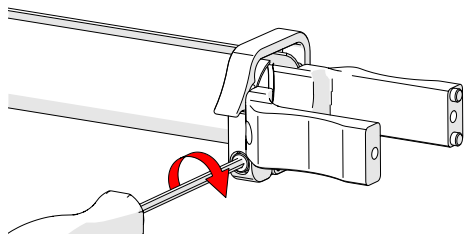


Fig. 145 - Tighten clamp screw

5.12.3. Preamp Bracket

Compatible with most standard preamps, use screws or the optional velcro straps to attach a preamp to the preamp bracket.

Intended Use

- ▶ The preamp bracket is intended to mount objects (e.g. preamps, splitters, etc.) that:
- ▶ have a maximum weight of 1.36 kg (3 lb)
- ▶ are attached to the **TRIPOD** with a lanyard or probe cables strong enough to prevent the object from falling
- ▶ have smooth edges so as not to cut bracket's velcro strap

5.12.3.1 Mounting Preamp Bracket

The preamp bracket mounts to any dovetail groove.

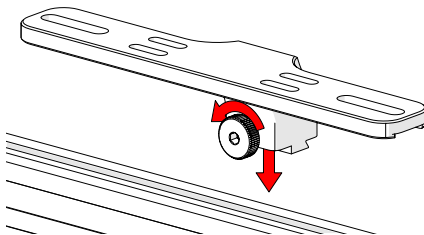


Fig. 146 - Loosen knob and mount to dovetail groove

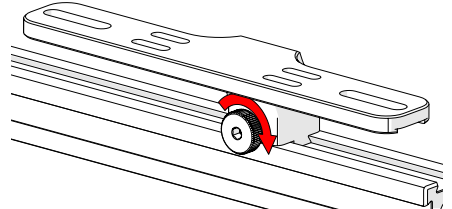


Fig. 147 - Tighten knob

1. Loosen the knob and align with the dovetail groove (Fig. 146).
2. Tighten the knob to lock the preamp bracket in place (Fig. 147).

5.12.3.2 Attaching Preamp with Screws

Use the adjustable screw mounting channel on the bottom of the bracket to attach a preamp (screws not included).

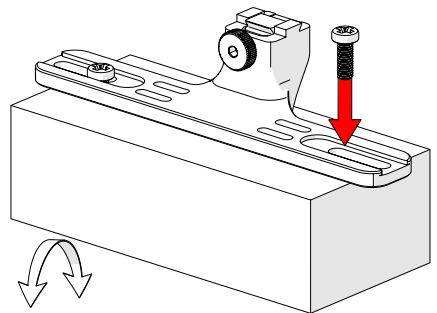


Fig. 148 - Attach preamp with screws

5.12.3.3 Attaching Preamp with Velcro Straps

To attach the preamp to the bracket using velcro straps (*sold separately*), follow these steps:

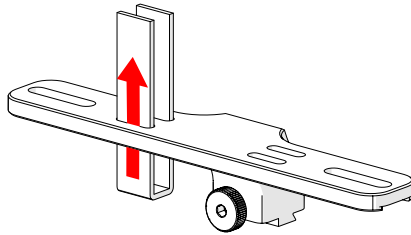


Fig. 149 - Insert velcro straps

1. Slide the velcro strap through the bracket's holes (*Fig. 149*).
2. Centre and place the preamp on the bracket wrapping the velcro around the preamp (*Fig. 150*).
3. Secure the preamp to the bracket attaching each side of the velcro (*Fig. 151*).

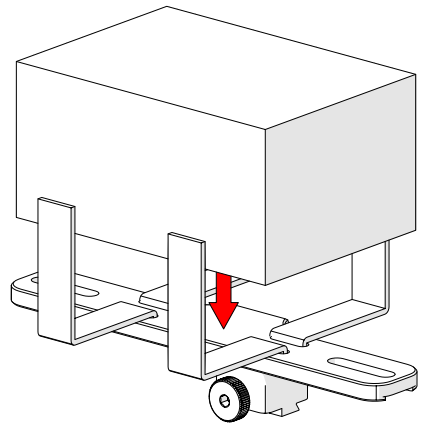


Fig. 150 - Place preamp and wrap velcro

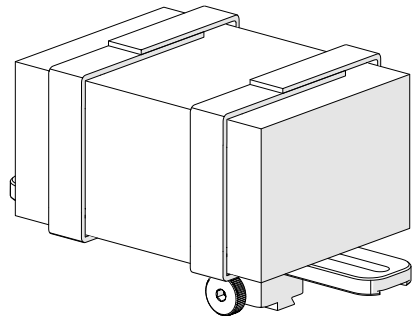


Fig. 151 - Velcro wrapped around preamp

OPERATION

6.1. System Startup

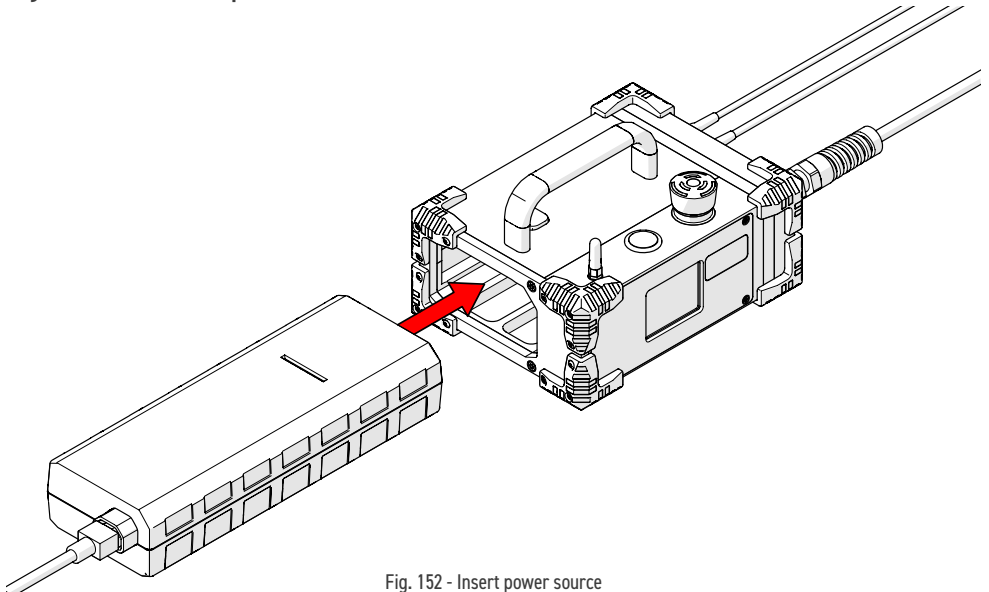


Fig. 152 - Insert power source

To activate the system, follow these steps:

1. Insert the power source (Fig. 152) into the system controller dock.
2. Connect the components (see "TRIPOD Configuration" on page 35).

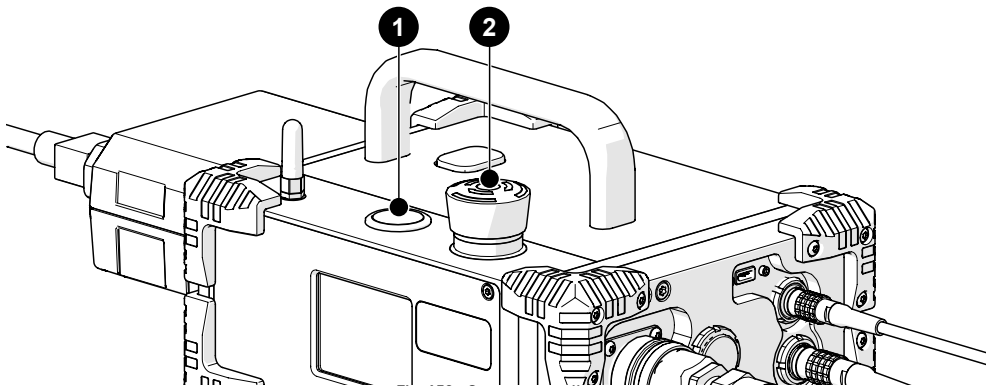


Fig. 153 - System controller

3. Locate the **2** red off push-button on the system controller. Rotate this button clockwise to unlatch (Fig. 153).
4. The **1** power button (Fig. 153) on the system controller energizes the crawler.

NOTE: If the crawler 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 crawler must be stationary for system initialization to be performed.

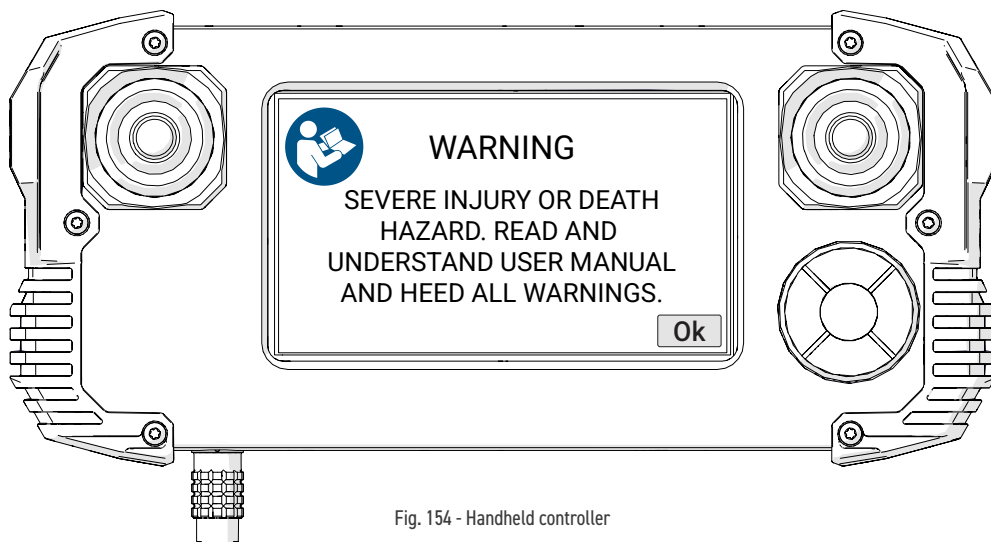


Fig. 154 - Handheld controller

5. A warning message will display on the handheld controller when power has been activated. Once the dangers of using the **TRIPOD** are recognized and understood by reading this user manual, touch **Ok** to acknowledge the warning (Fig. 154).

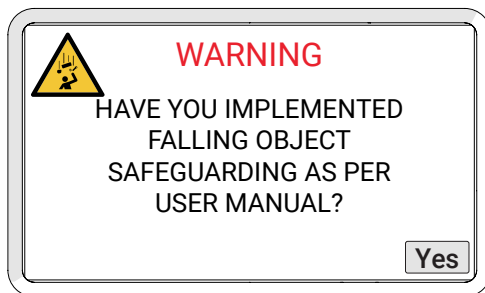


Fig. 155 - Falling object warning

6. A second warning message (Fig. 155) will display requesting assurance that a no-entry fall zone has been established (see “Preparation for Safe Use” on page 29) and tether requirements are met (see “Tether Requirements and Attachment” on page 30). Acknowledge this warning by touching **Yes**.

Once the system is initialized, the **Mode Select** screen will appear (see “Mode Select Screen” on page 79). The system is now ready for operation.

6.2. Placement of Crawler on Inspection Surface



WARNING! FALLING OBJECT HAZARD.

Read and understand the proper procedure for using the Installation/Removal Mat. If crawler installation is done at elevated heights, improper use may cause the crawler to fall and **SEVERE INJURY** or **DEATH** could result.



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



CAUTION! Do not place the crawler directly on the inspection surface. Use of the scanner installation/removal mat as a spacer between the crawler and the inspection surface is required during scanner placement. This is necessary to protect the electronic components within the crawler from damaging shock, should the crawler be slammed directly onto the inspection surface.



WARNING! MAGNETIC MATERIAL. The wheels of the crawler produce an extremely strong magnetic field which may cause failure or permanent damage to items such as watches, memory devices, CRT monitors, medical devices or other electronics.



Tools, magnets and metal objects can cut, pinch or entrap hands and fingers. **HANDLE WITH CARE.**

People with pacemakers or ICD's must stay at least 75 cm (30 in) away.

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

6.2.1. Scanner Installation/Removal Mat Use

To place the crawler on the inspection surface using a scanner installation mat, follow these steps:

NOTE: The manufacturer recommends two persons install the crawler on an inspection surface when using the scanner installation/removal mat.

Once crawler preparation is complete (see “Preparation for Use” on page 29).

1. Set the crawler to Jog Mode (see “Jog Mode” on page 79).

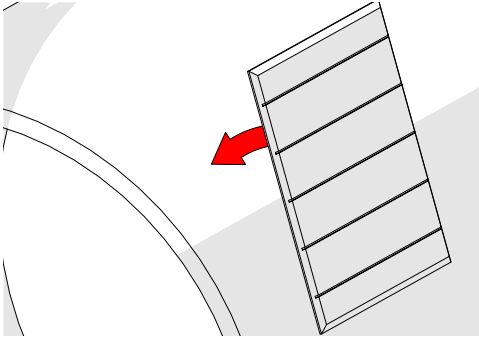


Fig. 156 - Place installation/removal mat

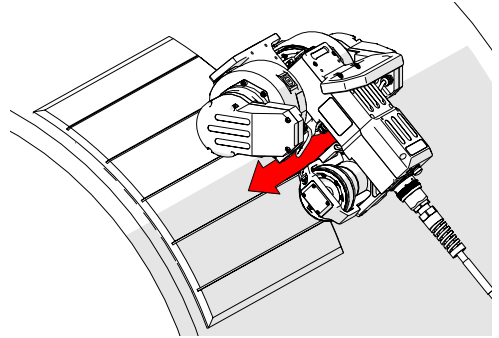


Fig. 157 - Lower crawler to mat

2. Place the installation/removal mat (Fig. 156) on the inspection surface (Fig. 156).
3. Place and hold the crawler on the installation/removal mat (Fig. 157).

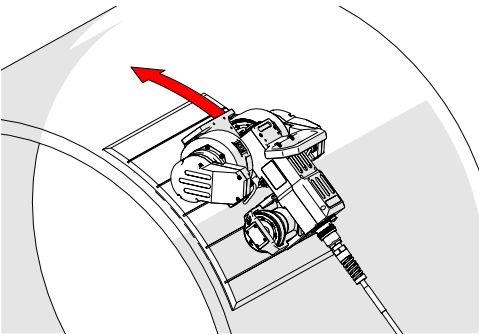


Fig. 158 - Drive crawler off the mat

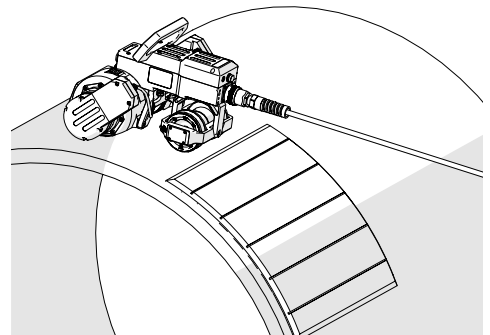


Fig. 159 - Magnetized to surface

NOTE: Do **NOT** let go of the crawler until instructed.

4. Ensure all three wheels of the crawler are held firmly against the installation/removal mat. While holding the crawler, use **Jog Mode** (see “Jog Mode” on page 79) to carefully drive (Fig. 158) the crawler off the installation/removal mat and onto the inspection surface (Fig. 159).

5. Once the crawler is securely on the inspection surface, the user may let go of the crawler (Fig. 159).

TIP: Avoid the crawler slamming onto the inspection surface. This can occur when all three wheels are not in contact with the installation/removal mat while the crawler is driven onto the inspection surface.

6. Remove the installation/removal mat from the inspection surface.

TIP: Circumstance may arise when only one person is available for placement of the crawler on an inspection surface. With the system power off, it is possible to place the crawler on the inspection/removal mat and manually push the crawler off the mat and onto the inspection surface.

6.3. Operation

6.3.1. Handheld Controller Layout

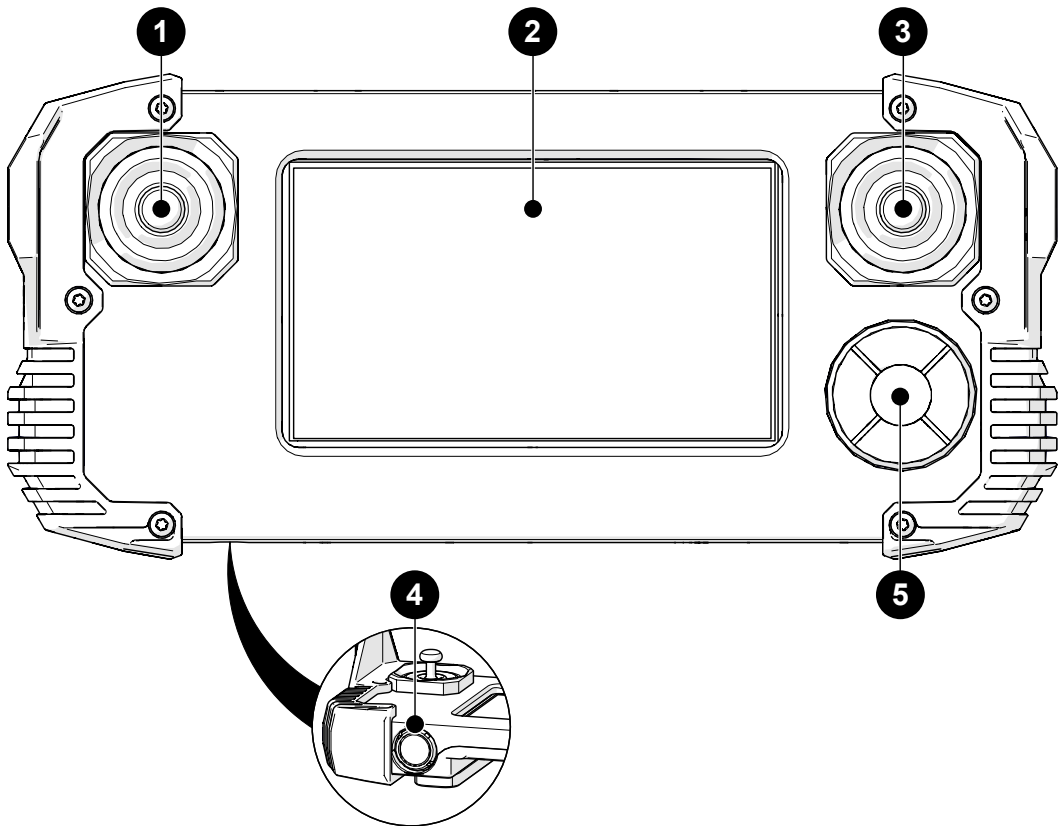


Fig. 160 - Handheld Controller

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

6.3.1.1 Touchscreen

The **2** handheld controller's touchscreen is the primary operator interface for the system (*Fig. 160*). Buttons are indicated on-screen with a red border.

6.3.1.2 D-pad

The **5** D-pad (*Fig. 160*) 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.

6.3.1.3 Joysticks

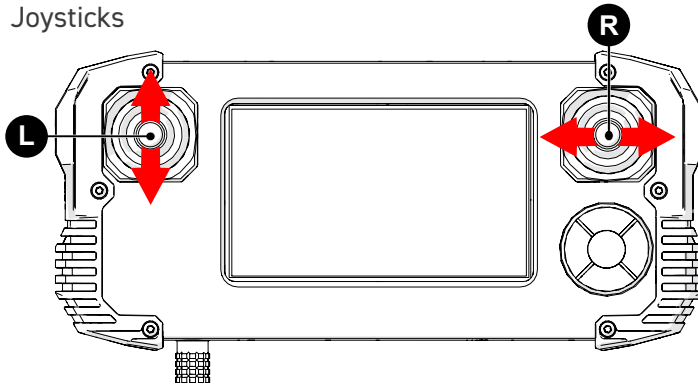


Fig. 161 - Handheld controller joysticks

The joysticks control system motion. The **L** left joystick controls the forward/reverse movement of the crawler. The **R** right joystick function is selected on screen. Functions include crawler steering or motorized raster arm movement (*Fig. 161*).

6.3.2. Mode Select Screen

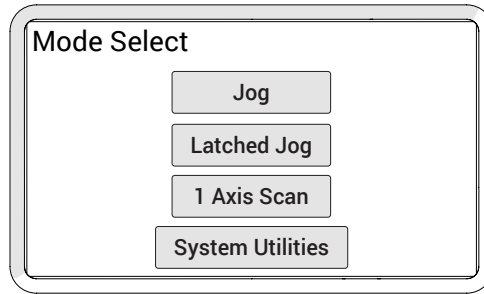


Fig. 162 - Mode select

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 81)
1 Axis Scan Mode	(see "1 Axis Scan Mode" on page 82)
System Utilities	(see "System Utilities Screen" on page 85)

6.3.3. Jog Mode

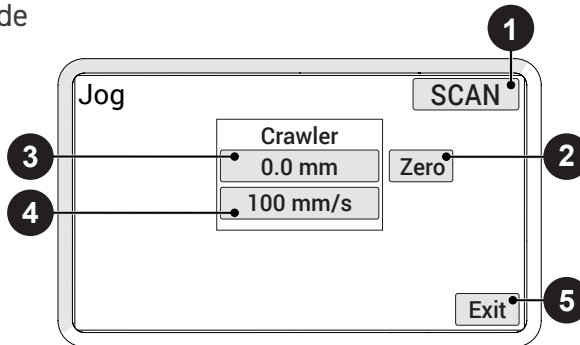


Fig. 163 - Button identification

Jog mode manually controls the system movement using the joysticks.

1 Scan/Rapid Button (Fig. 163)

Used to quickly switch between crawler speeds. The speed in either mode can be manually set to the user's preference. Rapid mode also changes the steering sensitivity according to the user settings.

TIP: Fine adjustments to speed and steering can be made in the User Settings (see "User Settings Screen" on page 86).

- | | | |
|---|-----------------|--|
| 2 | Zero Button | Sets the current position to zero. |
| 3 | Position Button | Displays the current position of the crawler. Press to set the position to any value using the Edit screen. When the crawler's position is modified, the position will be modified for all other system modes.

<i>NOTE: This function only zeroes the number displayed on the TRIPOD handheld controller. It does not zero the position used in the data acquisition instrument.</i> |
| 4 | Rate Button | 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. |

6.3.4. Latched Jog Mode

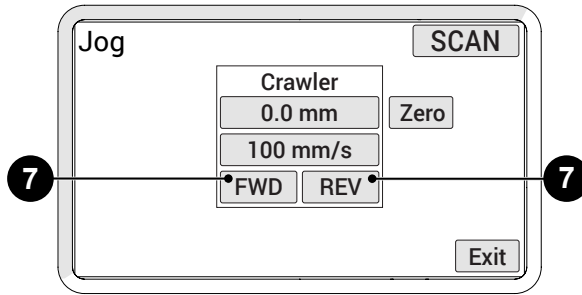


Fig. 164 - Latched jog mode

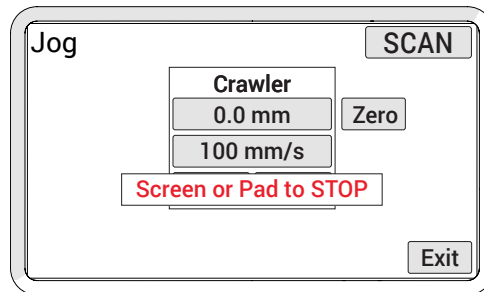


Fig. 165 - Latched jog stop screen

Identical to standard jog mode, latched jog mode adds forward or reverse crawler 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 crawler at the current maximum scan rate. When the crawler is in motion, the steering joystick is still enabled. Touching the handheld controller screen or pressing the D-pad stops crawler movement.

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

6.3.5. 1 Axis Scan Mode

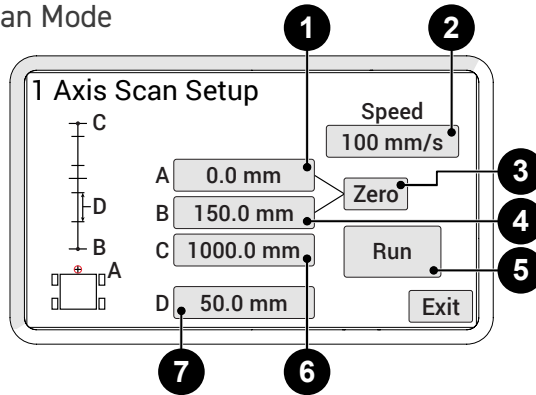


Fig. 166 - 1 Axis scan mode

1 Axis Scan mode drives the crawler in a straight line, stopping at programmed intervals.

1	Point A	The current encoder position of the crawler.
2	Speed Button	Access the User Settings screen to set the crawler'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 scanner 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 83).
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.

6.3.5.1 1 Axis Scan Screen

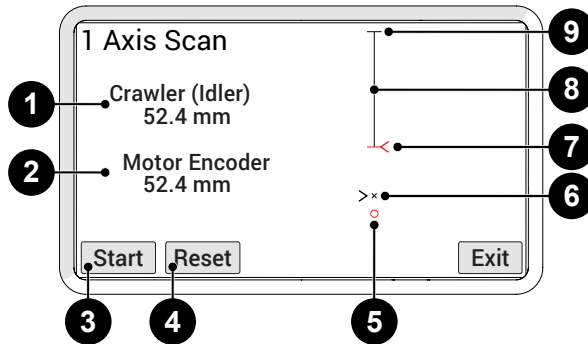


Fig. 167 - 1 Axis scan screen

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.

<p>1 Crawler (Motor) (Fig. 167)</p>	<p>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 86).</p>
<p>2 Idler Encoder</p>	<p>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 but is only for reference (see “<i>User Settings Screen</i>” on page 86).</p>
<p>3 Start/Stop button</p>	<p>Start or stop the scan sequence. When a scan has been stopped while in progress, the start button resumes the scan.</p>
<p>4 Reset</p>	<p>Return the scanner to the A position. Press the start button to begin the scan sequence from the initial setting.</p>
<p>5 Scan location</p>	<p>Small red circle indicates the A position.</p>
<p>6 Scanner position</p>	<p>The blinking crosshair indicates the current scanner position.</p>
<p>7 Next scanner position</p>	<p>Where the scanner will travel to next.</p>
<p>NOTE: The red indicator is always where the scanner will go next.</p>	

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

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.

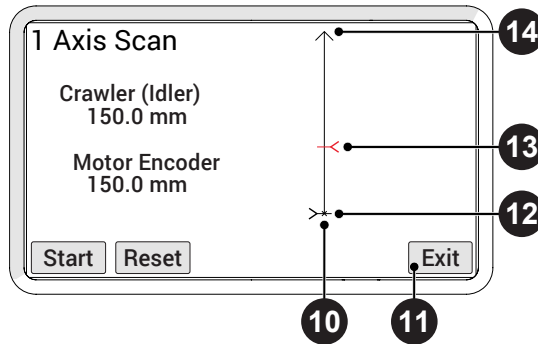


Fig. 168 - 1 Axis scan screen

- 10 Scanner location The current encoder position of the crawler.
- 11 Exit button Pressing **Exit** stops all scanning motion. When the scanner is not in the **A** position, a warning appears (*Fig. 169*). The warning alerts that the **A** position of the scanner will be changed to the current position.

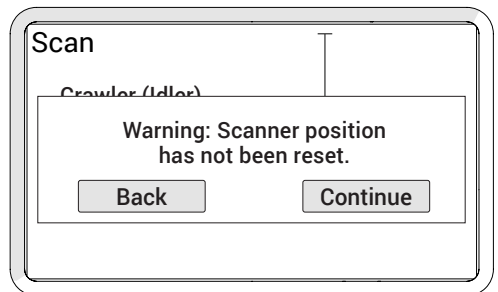


Fig. 169 - Exit warning

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.

- 12 Scanner position The blinking crosshair indicates the scanner position.

- 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.

6.3.6. System Utilities Screen

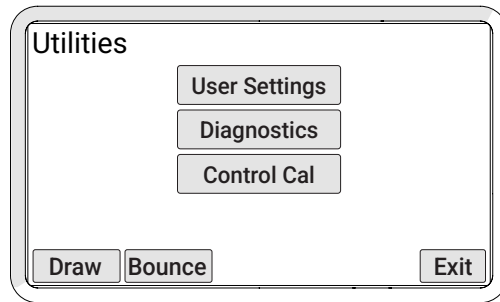


Fig. 170 - Utilities screen

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

User Settings Button
(Fig. 170)

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.

Control Cal Button

Used to enter the **Control Calibration** screen and calibrate the joysticks and touch screen.

Draw Button

Enters mode used to test the touch screen accuracy and response.

6.3.6.1 User Settings Screen

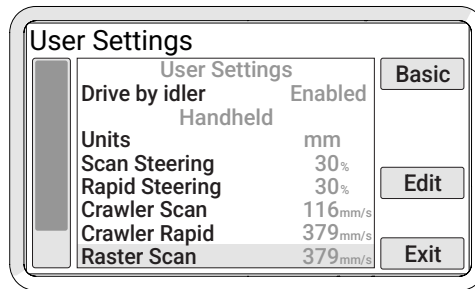


Fig. 171 - User settings screen

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.

The **Basic** button allows access to the advanced 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 crawler positioning in 1 and 2 axis scan modes. In automatic scan modes, if an idler encoder is available, enabling it will reduce the actual crawler 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.
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.

6.3.6.2 Advanced Settings

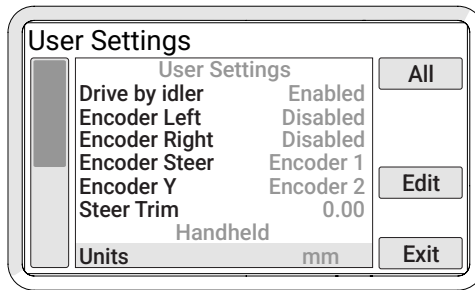


Fig. 172 - Advanced user settings screen

The Advanced Settings allow the user to change advanced system configurations that in normal system operation are not normally modified.

6.3.6.2.1 Advanced Settings - Encoder Output Configuration

Two encoder channels are available to provide encoder position information to an instrument. Position information from one crawler system encoder may be configured to each of the available encoder channels. To select which encoder information is output to the instrument on which channel, each encoder may be set to “Encoder 1”, “Encoder 2”, or “Disabled”. Only one encoder may be assigned to the “Encoder 1” or “Encoder 2” channel at a time. Typically “Encoder 1” is used for the Crawler’s position and “Encoder 2” is used for the “Raster Position”.

Title	Description
Encoder Left	Encoder found on the left drive module.
Encoder Right	Encoder found on the right drive module.
Encoder Steer	Encoder integrated into the rear steering module. Encoder Steer is the default setting and is used by the TRIPOD as the positional encoder.
Encoder Y	Assigns the encoder for an accessory that uses the TRIPOD 's Y accessory connector.

6.3.6.2.2 Advanced Settings - Other

Title	Description
Steer Trim	Allows the operator to adjust the steering trim up to 2° in either direction.

6.3.6.3 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.*

6.3.6.4 Control Calibration Screen

The control calibration screen allows users to access joystick calibration and touch calibration.

Typically joystick calibration is only necessary when an off-centre joystick error is detected upon startup (Fig. 173). Calibration may also be used when a joystick function does not appear to be properly centred.

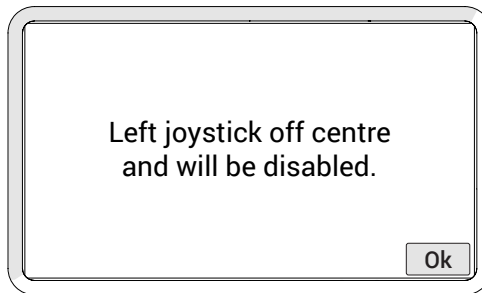


Fig. 173 - Joystick error

Current readings of the joysticks are displayed on the screen (Fig. 174). 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.

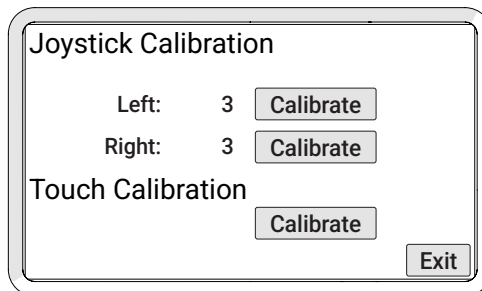


Fig. 174 - Control calibration screen

The **Calibrate** button under Touch Calibration allows for calibration of the touch screen. Typically, this should not be necessary.

If required, press the **Calibrate** button and touch the screen as the markers appear on the screen (Fig. 175).

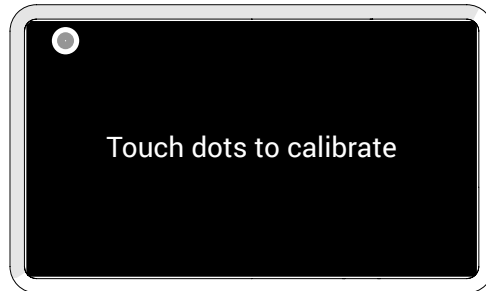


Fig. 175 - Touch calibration screen

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 last marker is pressed. The calibration utility exits and returns to the Control Calibration screen. To abort the calibration, the system power may be turned off before the last marker is pressed.

6.3.6.5 Draw

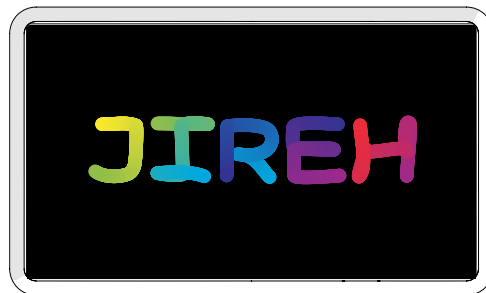


Fig. 176 - Draw utility

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

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 stop push-button is latched in the off position.



WARNING! MAGNETIC MATERIAL.

The wheels of the crawler produce an extremely strong magnetic field which may cause failure or permanent damage to items such as watches, memory devices, CRT monitors, medical devices or other electronics.



Tools, magnets and metal objects can cut, pinch or entrap hands and fingers. **HANDLE WITH CARE.**

Those with pacemakers or ICD's must stay at least 75 cm (30 in) away at all times.

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 **TRIPOD** system must be maintained according to the following schedule:

Task	Frequency
<u>Inspect safety apparatus</u> This includes: <ul style="list-style-type: none">All components of the tether system. Replace damaged components as necessary.Lifting sling on crawler. If the lifting sling shows signs of damage (<i>e.g. cuts, abrasion, etc.</i>), do NOT use.	Every Use
<u>Clean the wheels</u> Debris may collect on the wheels. Remove this debris before every 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. (<i>see "Cleaning" on page 90</i>).	Every Use

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

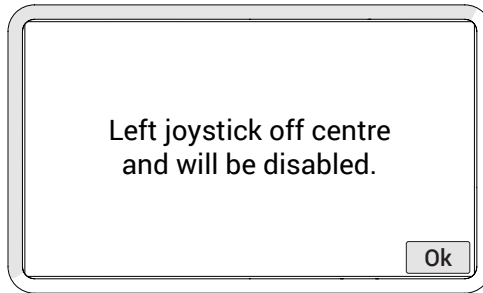


Fig. 177 - Joystick off centre screen

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 "Control Calibration Screen" on page 88)

8.1.2. Checking Network

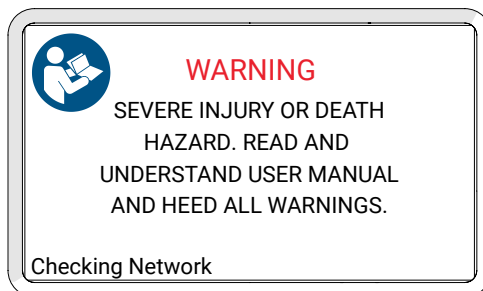


Fig. 178 - Checking network screen

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

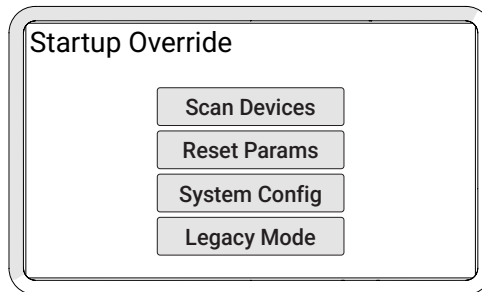


Fig. 179 - Startup override screen

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

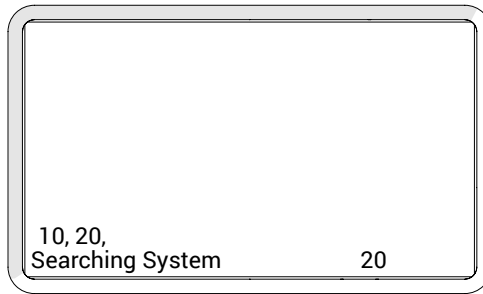


Fig. 180 - Searching System screen

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.

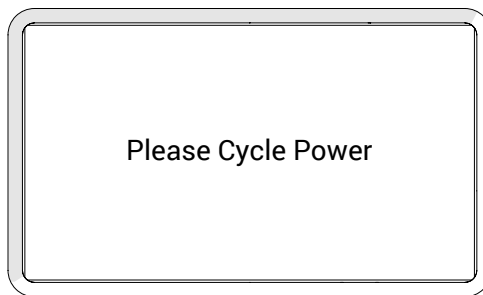


Fig. 181 - Cycle power screen

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.

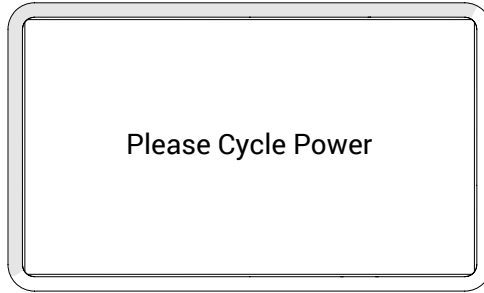


Fig. 182 - Cycle power screen

8.2.3. System Configurations

System configurations are factory set to control a variety of functions. These parameters cannot 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 configurations 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. <i>(see "Power Requirements" on page 7)</i>
	Handheld controller not plugged into system controller	Plug handheld controller into the system controller. 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.
	TRIPOD system not started.	Start the TRIPOD system. <i>(see "System Startup" on page 72)</i>
Handheld controller display is activated, yet crawler does not drive	Damaged components in handheld controller, crawler, system controller or cabling.	Contact manufacturer. <i>(see "Jireh Industries Ltd." on page 1)</i>
	Handheld controller is not in correct mode for driving.	<i>(see "Mode Select Screen" on page 79 for additional details).</i>
Crawler does not drive and is unreachable	See possible causes for problem: Handheld controller display does not activate.	See solutions for problem: Handheld controller display does not activate. If the crawler is still unresponsive <i>(see "Retrieval of a Stranded Crawler" on page 97)</i>
Crawler does not steer properly	One of the drive motors may not be functioning correctly.	Contact manufacturer. <i>(see "Jireh Industries Ltd." on page 1)</i>

System is displaying “Please Wait – Motor Moving” when power is applied.

Crawler is moving when power is applied due to an external force (*gravity, etc.*).

Manually stop the crawler movement. The crawler must be stationary for system initialization to be performed.

8.5. Retrieval of a Stranded Crawler



WARNING! FALLING OBJECT HAZARD.

The tether system must remain active while retrieving the crawler (*i.e. a mechanism or person must be continuously taking up the slack in the tether*).

Should the **TRIPOD** crawler become inoperative while out of reach, first attempt the solutions offered in this manual (*see “Troubleshooting” on page 92*)

If troubleshooting does not rectify the issue, it may be necessary to retrieve the crawler manually. To do so:

1. Press the off push-button. This will turn the crawler power off.
2. If payload is of high enough weight or downward force is applied to the crawler it may descend. Otherwise, use a ladder, man lift or scaffolding to retrieve the crawler.

NOTE: FALLING OBJECT HAZARD. *It is **CRUCIAL** that the tether system remains active while retrieving the crawler (i.e. a mechanism or person must be continuously taking up slack in the tether).*

8.6. 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! MAGNETIC MATERIAL.

The wheels of the crawler produce an extremely strong magnetic field which may cause failure or permanent damage to items such as watches, memory devices, CRT monitors, medical devices or other electronics.



Tools, magnets and metal objects can cut, pinch or entrap hands and fingers. **HANDLE WITH CARE.**

Those with pacemakers or ICD's must stay at least 75 cm (30 in) away at all times.



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.

SPARE PARTS

To order accessories or replacement parts for your **TRIPOD** 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. Crawler

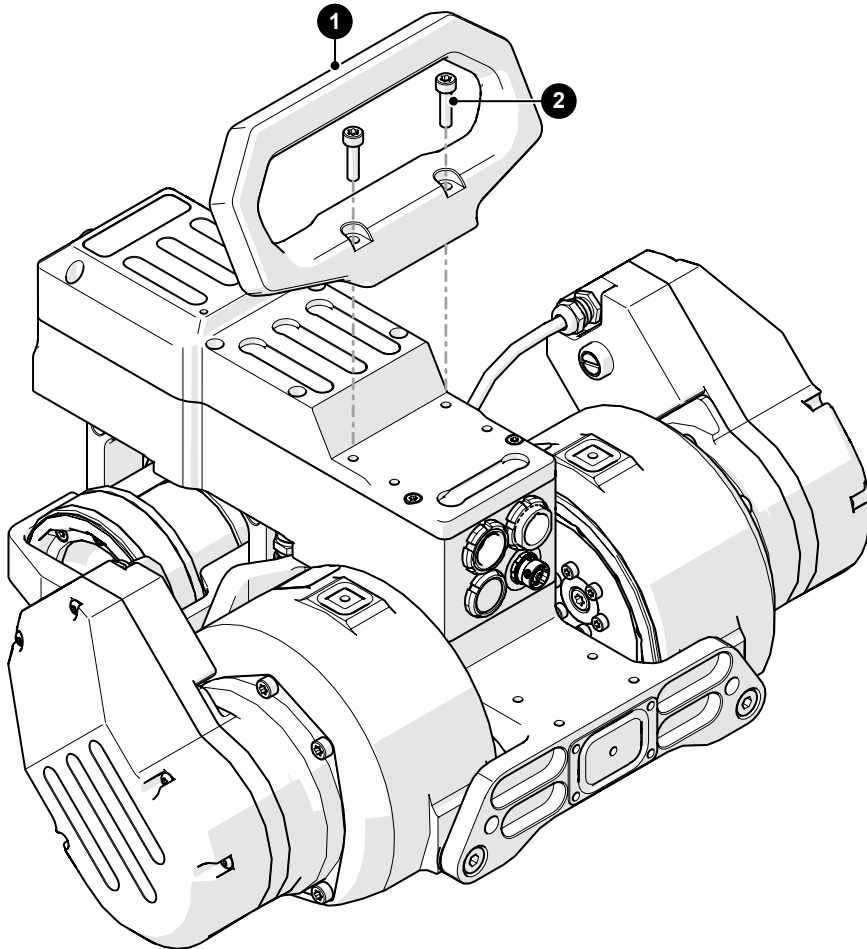


Fig. 183 - Crawler parts

BOM ID	Part #	Description
1	DY0080	TRIPOD handle
2	MD425-016	SHCS-TX M4X0.7 X 16MM, SST

10.2. Kit Components

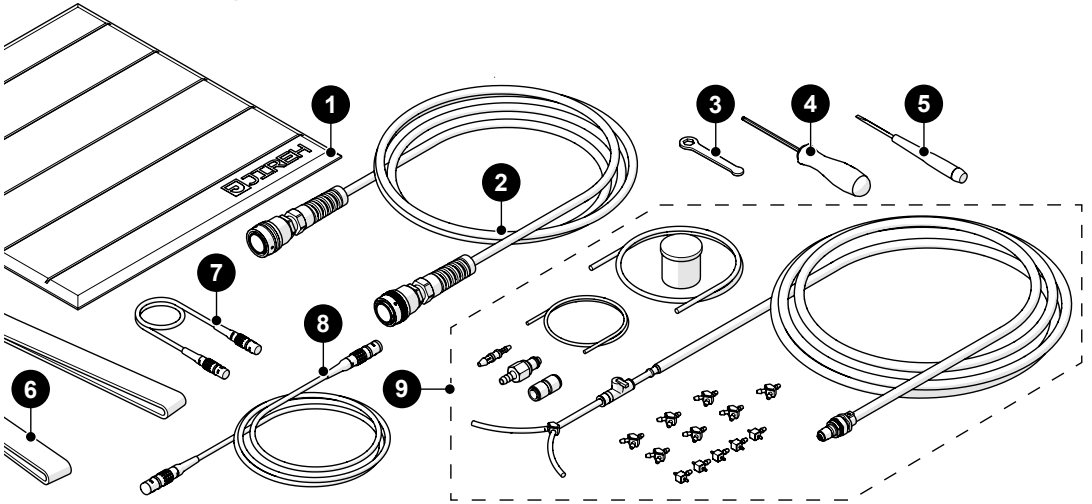


Fig. 184 - Kit components

BOM ID	Part #	Description
1	AAS061	Installation/removal mat
2	UMA044-__	Umbilical (<i>various lengths available</i>)
3	EA470	10 mm (<i>3/8 in</i>) wrench
4	EA414	3 mm (<i>0.118 in</i>) hex driver
5	EA480	3 mm (<i>0.118 in</i>) flat driver
6	EA243	Lifting sling
7	UMA017-06	Auxiliary cable, 6 m (<i>19.6 ft</i>)
8	UMA025-__	J300 Encoder cable (<i>see Encoder Connector Type</i>)
9	CMG009-__	Irrigation kit, 2-4 probe, large tube (<i>various lengths available</i>)

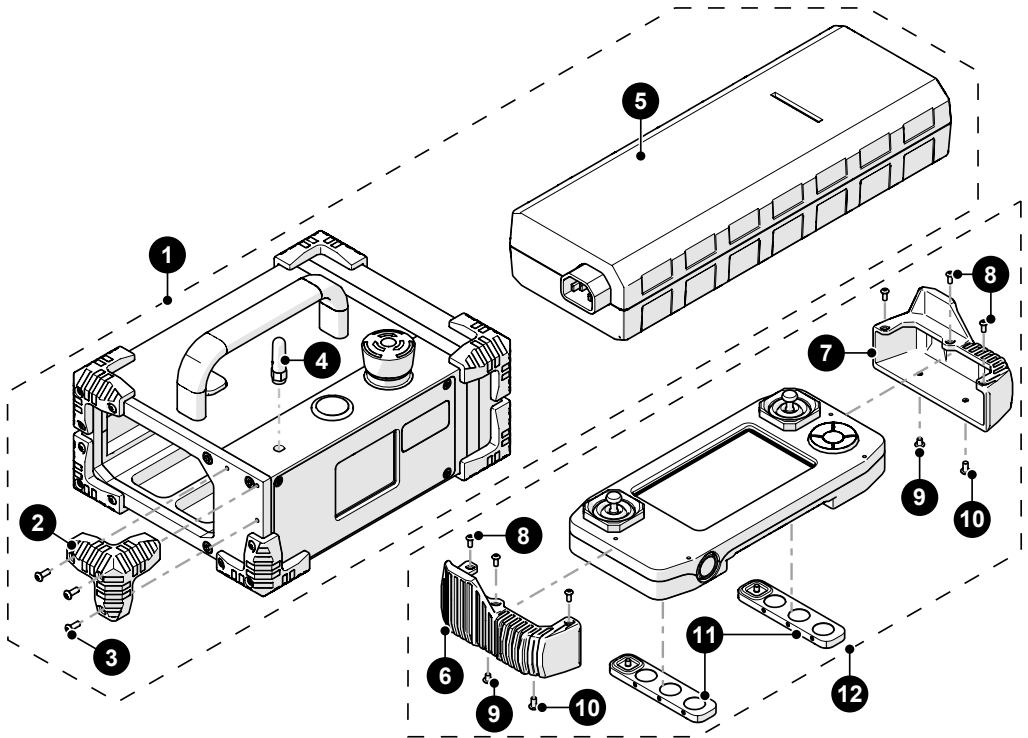


Fig. 185 - Kit components

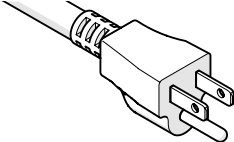
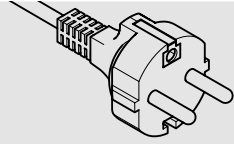
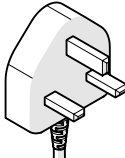
BOM ID	Part #	Description
1	ERA001_	System controller (<i>see Power Cord Type</i>)
2	DY0011	Rubber bumper
3	MD411-008	BHCS-TX, M3x0.5 X 8mm ISO 7380-1 A2
4	SU004	Bluetooth antenna
5	CXS122	Power supply
6	DM0088-L	Handheld controller bumper (<i>left</i>)
7	DM0088-R	Handheld controller bumper (<i>right</i>)
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. Encoder Connector Type

Connector Type	Company/Instrument	Connector Type	Company/Instrument
B	Olympus OmniScan MX Zetec Topaz	G	Sonotron Isonic 25xx
C	Olympus Focus LT Zetec Z-Scan Eddyfi Ectane 2	U	Sonatest Veo / Prisma
E	Olympus OmniScan SX/MX2/X3 M2M MANTIS/GEKKO LEMO	V	Pragma PAUT
F	TD (<i>Technology Design</i>)	AD	Sonatest Veo / Prisma - Single Axis

NOTE: Additional encoder connector types are available. (contact Jireh Industries Ltd. on page 1)

10.2.2. Power Cord Type

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

10.3. Cable Management

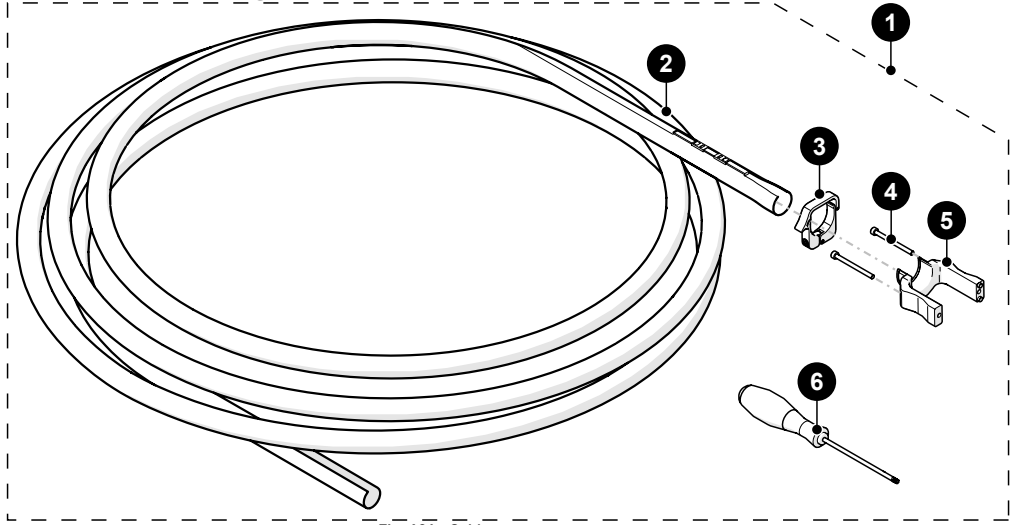
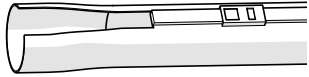
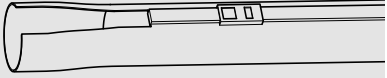




Fig. 186 - Cable management parts

BOM ID	Part #	Description
1	DYG002-	Cable management, TRIPOD
2		<i>see Cable Management Sleeving</i>
3	DYS017	Cable management clamp, large
4	MD425-050	SHCS-TX, M4x0.7 X 50mm, SST
5	DY0088	Cable management mount, TRIPOD
6	EA533	T20 Torx driver

10.3.1. Cable Management Sleeving

Length	Part #	Description	
04.5	CX0141	4.5 m (14.8 ft)	
09.5	CX0145	9.5 m (31.2 ft)	
14.5	CX0146	14.5 m (47.6 ft)	
29.5	CX0147	29.5 m (96.8 ft)	

10.4. Probe Holder Frame

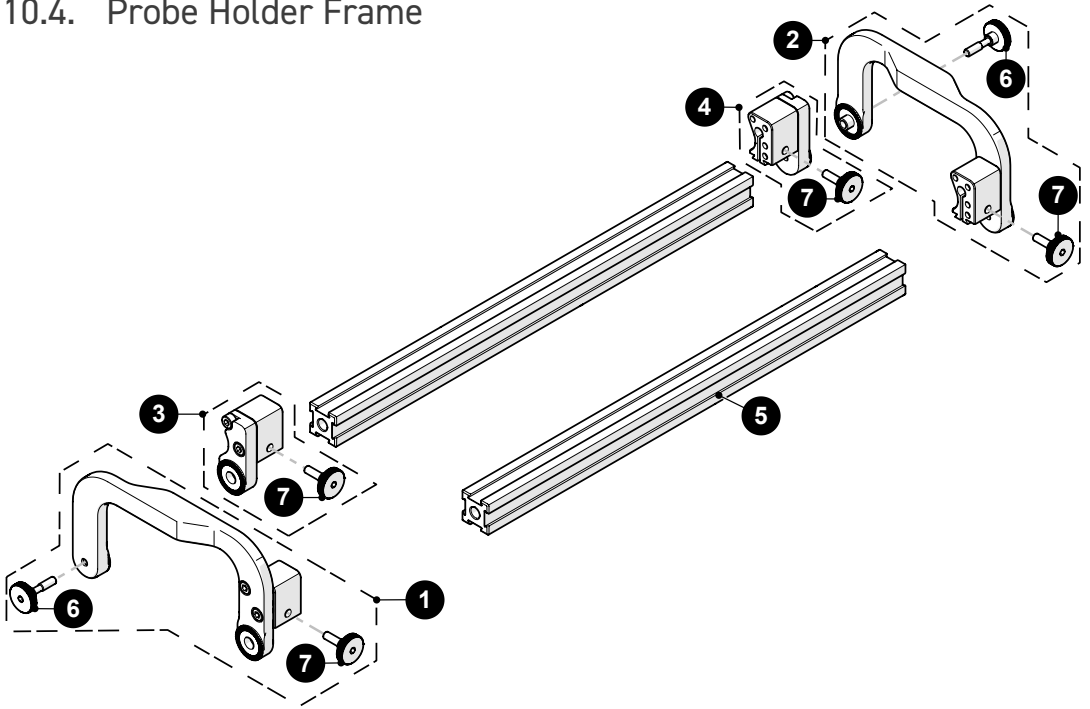
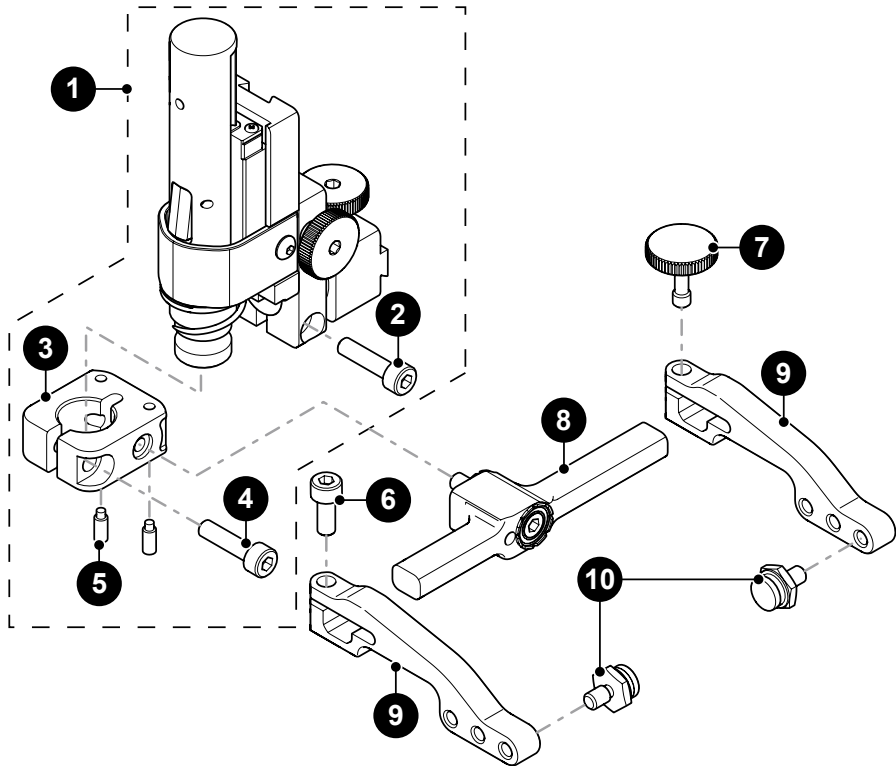


Fig. 187 - Probe holder frame parts

BOM ID	Part #	Description
1	CXS042	Vertical probe holder side arm, right
2	CXS043	Vertical probe holder side arm, left
3	CXS072-R	Arm mount block, right
4	CXS072-L	Arm mount block, left
5	BG0038_	Frame bar (see <i>Frame Bar</i>)
6	CX0125	Knob, M4 x 16 mm
7	CX0126	Knurled Knob, M4 x 0.7 x 11.5 mm, 3 mm hex, 4 mm stand off, SST

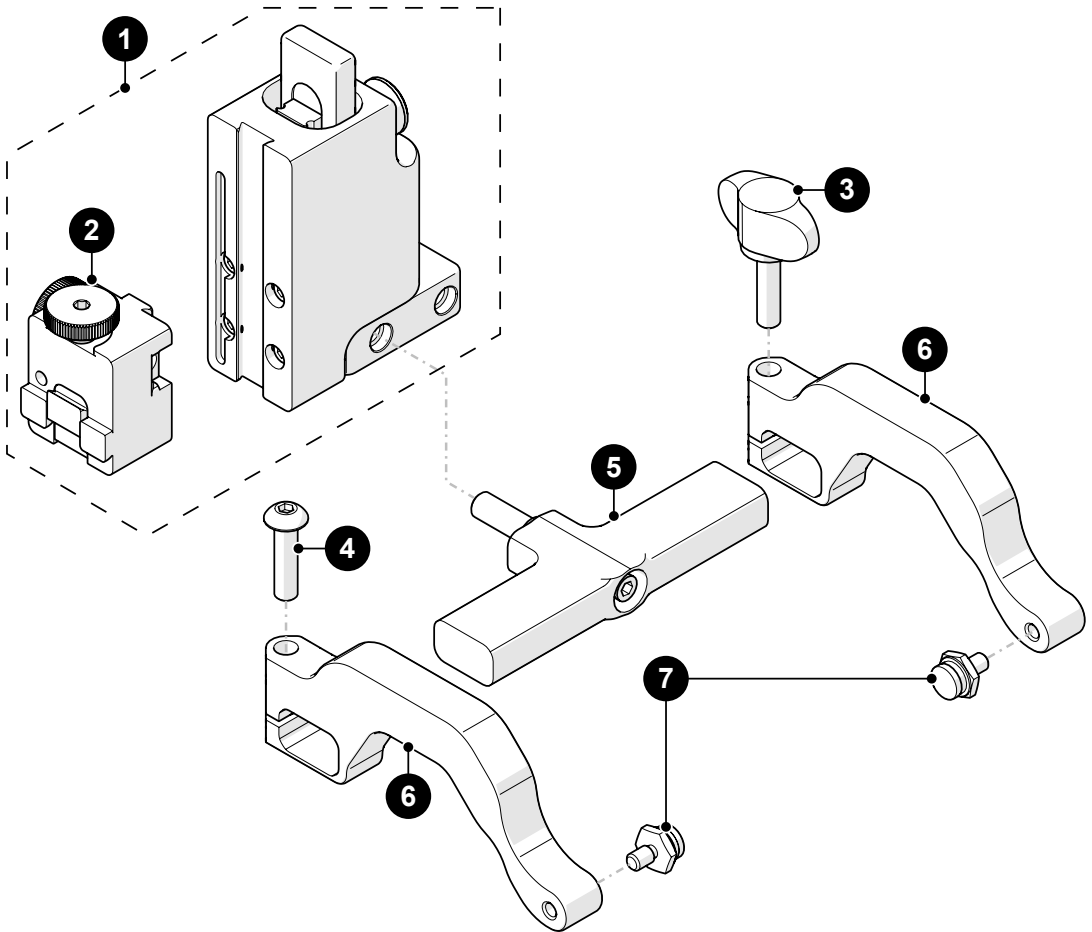
10.6. Vertical Probe Holder Parts



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

Fig. 189 - Vertical probe holder parts

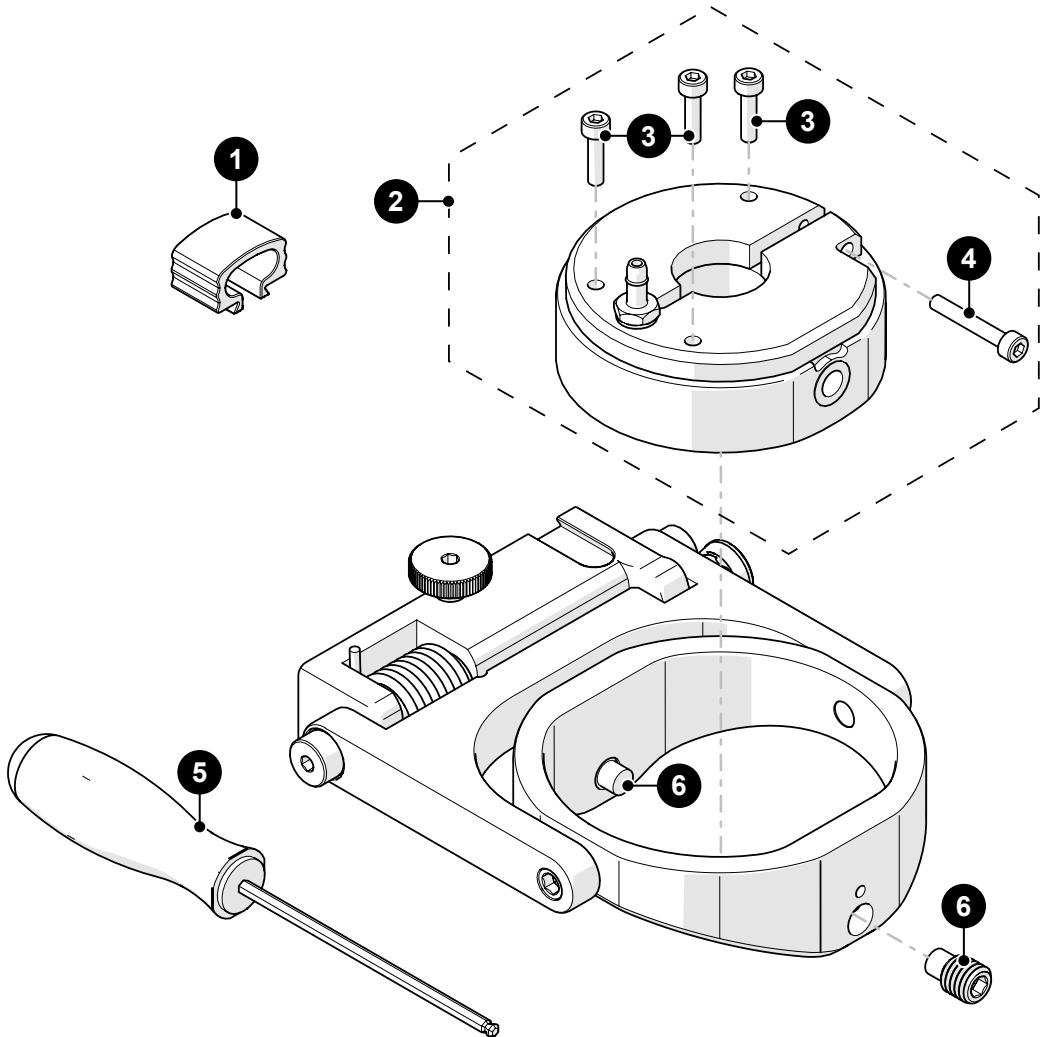
10.7. Heavy Duty Vertical Probe Holder



BOM ID	Part #	Description
1	PHS049	Heavy Duty Probe Holder Subassembly
2	PHS085	Heavy Duty Probe Holder Mount
3	EA154	Probe Holder Arm Adjustment Knob
4	MD074-020	BHCS, M5 x 0.8 x 20 mm, SST
5		See Heavy Duty Yoke Style
6	PH0165	Heavy Duty Probe Holder Arm, Standard, Drop
7	PH0011- <u> </u>	Pivot Button Style (See Pivot Button Style)

Fig. 190 - Heavy duty vertical probe holder parts

10.8. Corrosion Thickness Probe Holder



BOM ID	Part #	Description
1	BG0091	Cable Clip
2	<i>See Probe Holder Receptacle and Wear Plate</i>	
3	MD049-012	SHCS, M3x0.5 x 12 mm, SST
4	MD049-020	SHCS, M3x0.5 x 20 mm, SST
5	EA599	2.5 mm (0.098 in) Hex Driver
6	MA264	SHSS, M8 x 1.25 x 12 mm, dog point, SST

Fig. 191 - Corrosion thickness probe holder parts

10.9. Probe Holder Components

10.9.1. Arm Style



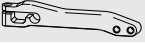







Arm Style	Part #		Arm Style	Part #	
A Standard, Flat	PH0090		B Short, Flat	PH0089	
C Long, Flat	PH0099		D Standard, Drop	PH0093	
E Short, Drop	PH0092		F Long, Drop	PH0094	
G Standard, Extra-Drop	PH0096		H Short, Extra-Drop	PH0095	
I Extra-Short, Flat	PH0159		J Extra-Short, Drop	PH0161	

Fig. 192 - Probe holder arm selection

10.9.2. 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. 193 - Probe holder yoke selection

10.9.3. Swing Arm Style

Swing Arm Style	Part #	Length		Swing Arm Style	Part #	Length	
Short	PH0069	4.1 cm (1.61 in)		Long	PH0100	4.6 cm (1.81 in)	

Fig. 194 - Swing arm selection

NOTE: Short swing arm only compatible with standard yoke style.

10.9.4. Heavy Duty Yoke Style

Yoke Style	Part #	Length		Yoke Style	Part #	Length	
S Standard	PHS048	8.3 cm (3.26 in)		W Wide	PHS047	12.2 cm (4.79 in)	

Fig. 195 - Heavy duty yoke selection

10.9.5. 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. 196 - Pivot button selection

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

10.10. Probe Holder Receptacle and Wear Plate








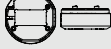

Part #	Wear Plate	Receptacle	Part #	Wear Plate	Receptacle
PHS066-A	Curved	9.53 mm (0.375 in) dia. 	PHS066-B	Curved	12.7 mm (0.5 in) dia. 
PHS066-C	Curved	19 mm (0.75 in) dia. 	PHS066-E	Curved	25.4 mm (1 in) 
PHS067-A	Flat	9.53 mm (0.375 in) dia. 	PHS067-B	Flat	12.7 mm (0.5 in) dia. 
PHS067-C	Flat	19 mm (0.75 in) dia. 	PHS067-D	Flat	Technisonic 
PHS067-E	Flat	25.4 mm (1 in) 			

Fig. 197 - Probe holder receptacle and wear plate selection

10.11. Variable Components

10.11.1. Frame Bar












Part #	Length		Part #	Length	
BG0038-05	5 cm (1.97 in)		BG0038-10	10 cm (3.94 in)	
BG0038-15	15 cm (5.91 in)		BG0038-20	20 cm (7.87 in)	
BG0038-25	25 cm (9.84 in)		BG0038-30	30 cm (11.81 in)	
BG0038-35	35 cm (13.78 in)		BG0038-40	40 cm (15.75 in)	
BG0038-45	45 cm (17.72 in)		BG0038-50	50 cm (19.69 in)	
BG0038-55	55 cm (21.65 in)				

Fig. 198 - Frame bar selection

10.12. Accessories

10.12.1. Preamp Bracket

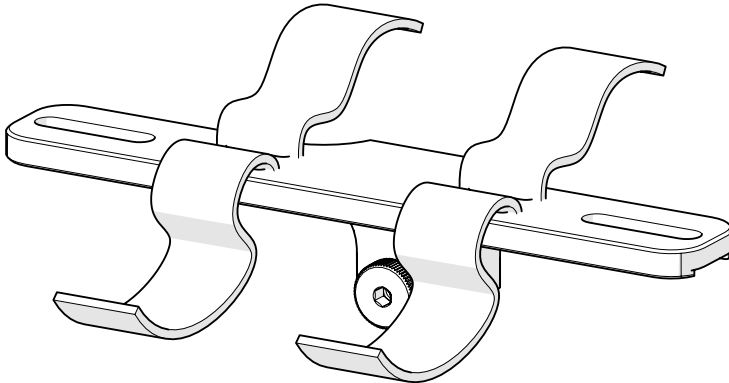


Fig. 199 - Preamp bracket

BOM ID	Part #	Description
1	CES029	Preamp Bracket
2	CES029-V	Preamp Bracket with Velcro

10.12.2. Battery Powered Optical Guide

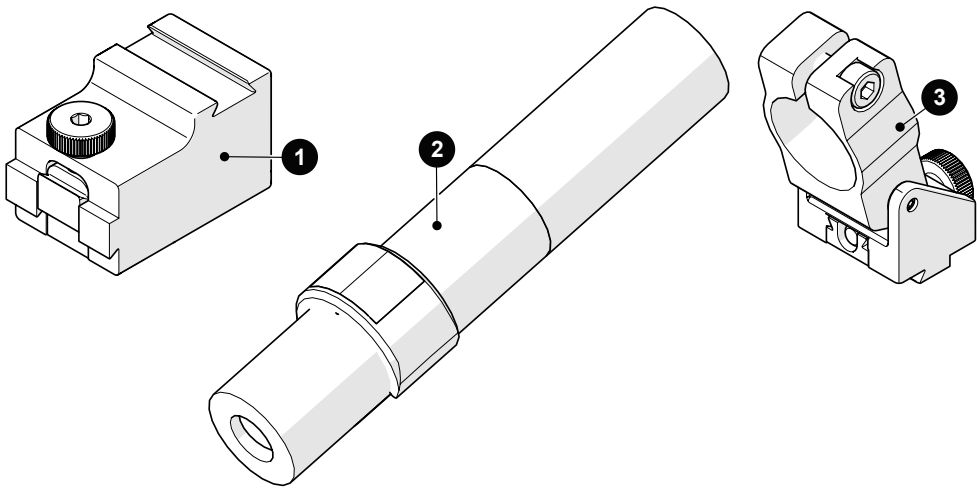


Fig. 200 - Battery powered optical guide

BOM ID	Part #	Description
1	BGS068	Perpendicular Dovetail Mount
2	CX0490	Line Laser, Battery Powered, Class 1
3	CXS082	Optical Guide Clamp

10.12.3. Cases

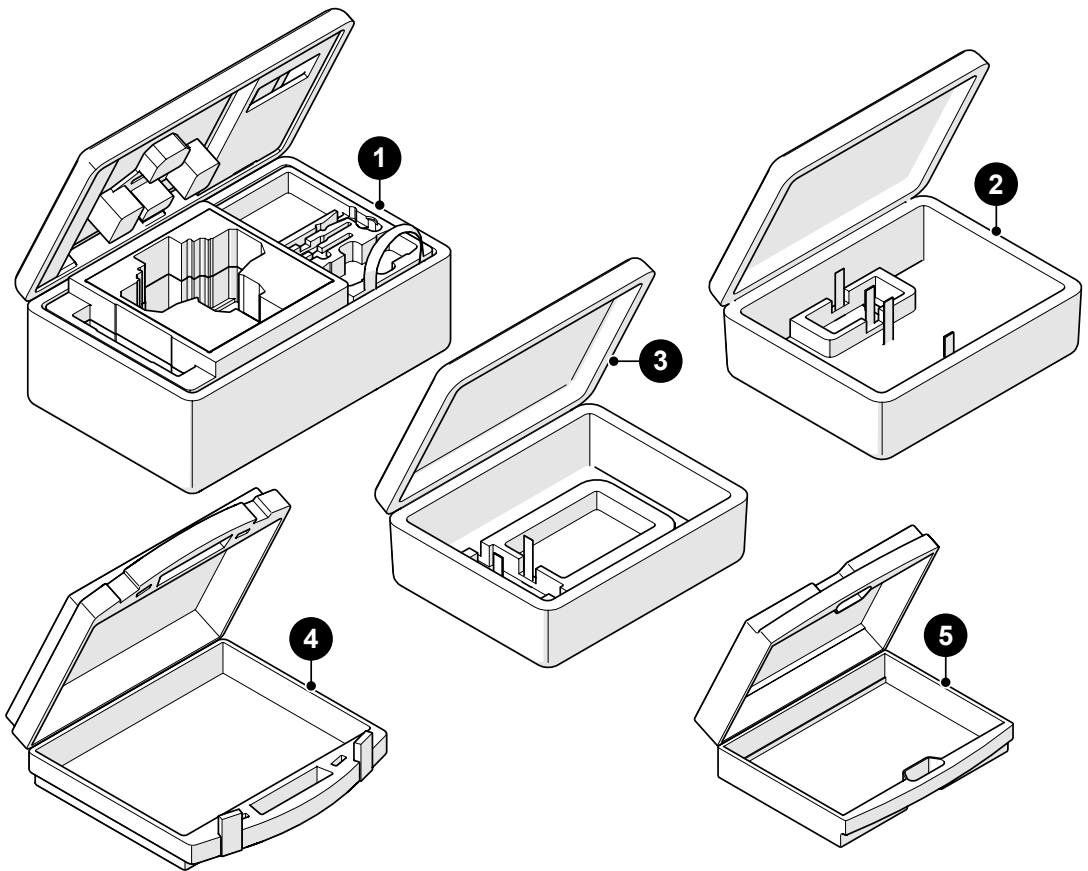


Fig. 201 - Cases

BOM ID	Part #	Description
1	DYA007	TRIPOD Crawler Case
2	CXA023	Umbilical / Probe Holder Frame Case
3	CMA021	Pump Case
4	EA610	Umbilical Case (<i>large</i>)
5	EA421	Umbilical Case

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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All specifications are subject to change without notice.

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