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INUKTUN VERSATRAX 100™

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About This Manual

This manual has been prepared to assist you in the operation and maintenance of your Eddyfi Technologies equipment. Correct and prudent operation rests with the operator who must thoroughly understand the operation, maintenance, service and job requirements. The specifications and information in this manual are current at the time of printing.

This product is continually being updated and improved. Therefore, this manual endeavors to explain and define the functionality of the product. Furthermore, schematics or pictorials and detailed functionality may differ slightly from what is described in this manual.

Eddyfi Technologies reserves the right to change and/or amend these specifications at any time without notice. Information in this manual does not necessarily replace specific regulations, codes, standards, or requirements of others such as government or site regulations.

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System Description

Description of Equipment & Intended Use

The Inuktun Versatrax 100™ (VT100) system is a 4000 series Inuktun Microtrac™ based vehicle used for navigating pipes of 4 to 12 inch (100 mm to 300 mm) internal diameter with the camera centered. The track mechanism is further adjustable to very large diameters or flat surfaces.

The inspection system has been manufactured with the hazards and demands of pipe inspection in mind. A minimized vehicle profile provides maximum clearance for passage of service intrusions in the pipe. The vehicle employs marine technology for underwater operation at up to 200 feet (60 m) depth.

All Versatrax hardware can be used dry, underwater, or in dirty, muddy conditions. The rugged design ensures a long service life and helps protect the vehicle from damage during normal use.

Typical applications include inspection of:

- Sewer and storm drains
- Hydroelectric pipe and infrastructure
- Tanks and pressure vessels
- Oil and gas refineries and pipelines
- Pulp and paper mills

Specifications

Pipe Size Range (Inline Chassis)[1]	4, 5, 6-inch pipe. [100, 125, 150mm] pipe. Camera centered with interchangeable skids. Spectrum 45 camera only.
Minimum Bend Radius (Inline)	7D radius in 4-inch pipe [7D radius in 200mm pipe] Radius is measured from the pipe centerline. Bend radii will be larger for the extended parallel chassis.
Pipe Size Range (Parallel Chassis)[1]	8-12-inch [200-300mm] pipe. Continuously adjustable track and camera. 12-24-inch [300-610mm] pipe. Continuously adjustable track. Camera extension kit needed to center the camera. 24-inch to flat [610mm –flat]. Continuously adjustable track. Camera not centered.
Operating Temperature Range	0 º -50 ºC (32 º -122 ºF) Dependent on operating conditions. Ask your sales expert for more information.
Storage Temperature	-20 ˚ - 60 ˚C (4 ˚ – 140 ˚F)
Minimum Vehicle Dimensions	848 x 100 x 100 mm (33 x 4 x in) (inline) 331 x 170 x 150 mm (13 x 7 x 6 in) (parallel)
Vehicle Weight	6.8 kg (15 lb) (parallel vehicle)
Depth Rating	60 m (200 ft) water
Tether Length	Up to 300 m (1,000 ft). Travel distance will depend on traction, bends, etc.
Reel	Optional tether reel with payout encoder.
Front Camera	Spectrum 45™ Pan & Tilt Camera Optional: Front facing Spectrum 90™ (parallel) Front facing Sapphire™ (parallel and/or inline) Rear facing Sapphire™ (parallel) Rear facing Onyx™ (inline)

[1] Specified pipe sizes are internal diameters.

Optional Operational Kits (Parallel Chassis)	Magnet Kit (standard & extended) Weight Kit (Adds 8 lb (3.6 kg) for traction, standard length) Camera Extension Kit (3069627). Five spacers up to 6 inches (52 mm).
Auxiliary Lights (Parallel Chassis)	801 Micro-controlled LEDs
Power Supply (Interface Box)	100-240VAC 50/60Hz, 5A

Certification

The Versatrax 100™ system is built in accordance with the Low Voltage Directive 2014/35/EU, Machinery Directive 2006/42/EC, and Electromagnetic Compatibility Directive 2014/30/EU.

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Safety

In order to be able to use this product properly and safely, every user must first read these operating instructions and observe the safety instructions contained therein. Take care of these operating instructions and keep them in a place where they can be accessed by everyone. Untrained personnel should not handle or operate this equipment.

CAUTION: Failure to follow these safety instructions may result in injury or equipment damage.

This system includes some specific devices that have their own User Manuals. Instructions on those manuals must be also read before using the system.

WARNING: High Voltage 36-72 VDC. If the equipment is powered from a source other than an Eddyfi provided controller, the power supplied to the product must have reinforced isolation from the mains with no reference to earth ground.

WARNING: Magnetic Pinch Hazard – The magnetic chassis is fitted with rare earth magnets. These magnets are very strong and create an immanent pinch hazard. Use caution when handling the magnets or vehicle near steel objects and tools, they may snap together unexpectedly.

WARNING: Medical Hazard – Operators with magnetically sensitive medical implants should be aware of and follow appropriate practices.

WARNING: Electronic Device Interference – Magnetically sensitive devices, including computer hard drives, cell phones, watches and credit cards may be disrupted or damaged by the magnetic field.

Note: Rare earth materials are mechanically weak, and magnetically very strong. They must therefore be handled very carefully to avoid damage.

Note: To reduce risk of injury and damage to equipment, always store the VT100 magnetic vehicle in its **magnetically shielded storage and shipping box** or store the magnets on a **steel plate** when not in use.

Note: We strongly recommend using gloves when handling the vehicle to reduce magnetic pinching hazard.

Warning: Avoid Magnetic Slamming. Extreme care must be taken when handling the vehicle, particularly when placing it onto a wall or into its storage box. Without taking heed of the sudden pull of the magnetic field onto surface, the VT100™ can be slammed down hard causing damage to the vehicle. Using a solid grip on the vehicle, we recommend touching down the vehicle by one end first and then pivoting flat.

WARNING: Intense Optical Radiation - The VT100™ camera lights and 801 auxiliary lights are extremely bright. Never look directly at the lights. Use a welding filter (shade #8 or higher) if inspecting the LEDs.

- **CAUTION: Class II Laser:** The optional Spectrum 90™ may be equipped with laser lines. Do not intentionally stare into the beam. Typically, Class II relies on the blink reflex to limit exposure to no more than ¼-second. Intentionally staring into the beam can cause eye injury.
- When performing maintenance or functional checks of the lasers and camera lights, take precautions to protect nearby personnel from unintended exposure which could be temporarily blinding.
- Observe safe lifting practices. For storage and shipping, the VT100 system is packed in three parts: Controller, Vehicle and Tether. Each of the three components is either built or packed into a Pelican case with carrying handle. The heaviest case containing the tether and mini-reel is equipped with wheels and extending handle like a suitcase.
- Do not operate the system with damaged wires. A short circuit may damage the power system, telemetry system, cameras, or attached equipment. Exposed wires may also create a shock hazard.
- Disconnect the power source before servicing the product; otherwise, damage may result.
- Although designed for durability, the vehicle and its components or attached devices may suffer structural damage if dropped or impacted. A lifeline or fall arrest system should be used at all time when the vehicle is navigating on a vertical or inverted horizontal position. In addition, stepping on the tether may pull the vehicle off the wall causing it to fall and sustain physical damage.
- All personnel operating or maintaining this equipment must be trained and competent.
- Eddyfi equipment is used in many varied environments from hot/dry to confined spaces to deep underwater. Such diverse environment risks must be addressed by the operators who are trained to work in such surroundings. As such, the operator is responsible to determine safe site setup and appropriate personal protective equipment (PPE) for operation and maintenance of the equipment.

WARNING: Spark Hazard - Under no circumstances should this equipment be used in a potentially explosive atmosphere

WARNING: Trip Hazard - Never stand on the tether. A snap load to the tether may pull it out from underneath you and cause you to fall. Standing on the tether may also damage its internal conductors, cause unnecessary wear, and decrease its life. Stepping on the tether may also pull a magnetic vehicle off the wall.

WARNING: High Temperature - The camera head and auxiliary lights may become hot during operation. Allow a cool-down period before handling.

WARNING: Mechanical Pinch Hazard – Rotating or moving components can draw fingers into a pinch position. Do not handle the vehicle while mobile parts are running, turn off power or disconnect the tether while reconfiguring or maintaining the vehicle.

WARNING: Falling Object - A lifeline or fall arrest system should be used at all times when using the magnetic option and the vehicle is navigating on a vertical or inverted surface. When the vehicle is climbing, never stand below the vehicle operations area.

System Setup

Personnel Requirements

Basic deployment of the VT100™ system may be performed by one person. Operations at more complex worksites may require two people, especially when the console location is removed from the point of deployment.

- **Console Operator:** This person is responsible for driving the vehicle, watching the pipe and making comments about the location and pipe condition. It is also the operator's responsibility to assess whether a pipe is in the appropriate condition for safe passage of the vehicle or if there is a risk of getting stuck. The operator may also assist in general site setup (cones, warning signs, etc.), vehicle maintenance and configuration.

- **Deployment / Tether Handler / Field Maintenance:** This person has several tasks including:
  - Configuring the vehicle for the current pipe
  - Lowering the vehicle in and out of the manhole
  - Watching the tether as the vehicle enters and exits the pipe
  - Operating the reel and winding the tether during recovery

Establish a good channel of communication between the operator and deployment personnel. Good communication can avoid accidents, damage to the equipment, and promotes efficiency and productivity. In particular, the person deploying the vehicle and watching the tether must be able to quickly tell the operator to stop the vehicle if something goes wrong. The operator should never turn on power or initiate movement without first communicating with the vehicle handler.

Working And Storage Environment

The **control rack**, computer and interface box, are to be used in a **dry, covered** environment only. These components are not waterproof. Keep all cords and cables away from water.

The **tether and vehicle** are depth rated to 60 meters (200 feet) of water. The tether connector is a wet-mate type which may be wet when plugged in but cannot be plugged in underwater. Keep the tether connector capped with a dummy plug when not connected to the vehicle to help keep out dirt. The tracks are tolerant to sandy and muddy conditions, although this decreases seal life. The vehicle may also be operated in dry or dusty environments.

The **winch** and portable reel are splash resistant only. Refer to the winch or reel manual.

To maximize component life and minimize deployment time it is recommended that the vehicle and tether be cleaned after use and the entire system stored in a dry, dust free, location.

Refer to the Specifications section for operating and storage temperatures.

System Power

Power Requirements

The VT100™ is operated through a 19-inch rackmount interface box. The interface box provides power to the tether and vehicle.

Power Input: 100-240 VAC, 5 Amps, 50-60 Hz.

Generators / Inverters

If powering the system from a generator or inverter, refer to that unit's operating manual for recommendations on continuous and peak load ratings. These power sources may apply a reduced output rating based on electrical load and environmental temperature. Remember to include the power needs of any other connected devices (external monitors, recording devices, lighting, etc.) when selecting a generator or inverter.

Interface Box Connection

The interface box supplies power to the tether and vehicle. It provides a communication interface to the vehicle, tether reel, and any optional vehicle sensor packages. It also provides video reception and distribution.

Set-up:

1. Connect the interface box to AC power using an equipment power cord.
2. Connect the tether (or winch deck cable).
3. Connect the communication port to the control computer using a USB cable.
4. Connect video equipment as needed (monitors, recording devices, etc).
    a. Front camera: Top row RCA jacks A, B, C.
    b. Rear camera: Bottom row RCA jacks D, E, F.

The interface box may be ordered with optional features such as video capture to USB or video format conversion. Additional connectors may be present on the rear center panel of the enclosure.

1. Connect SD Video A port to control computer using USB3 cable for front camera video capture.
2. Connect SD Video B port to control computer using USB3 cable for rear camera video capture.

Important: USB3 cables are required for video capture (SD VIDEO A / B) to maintain video quality.

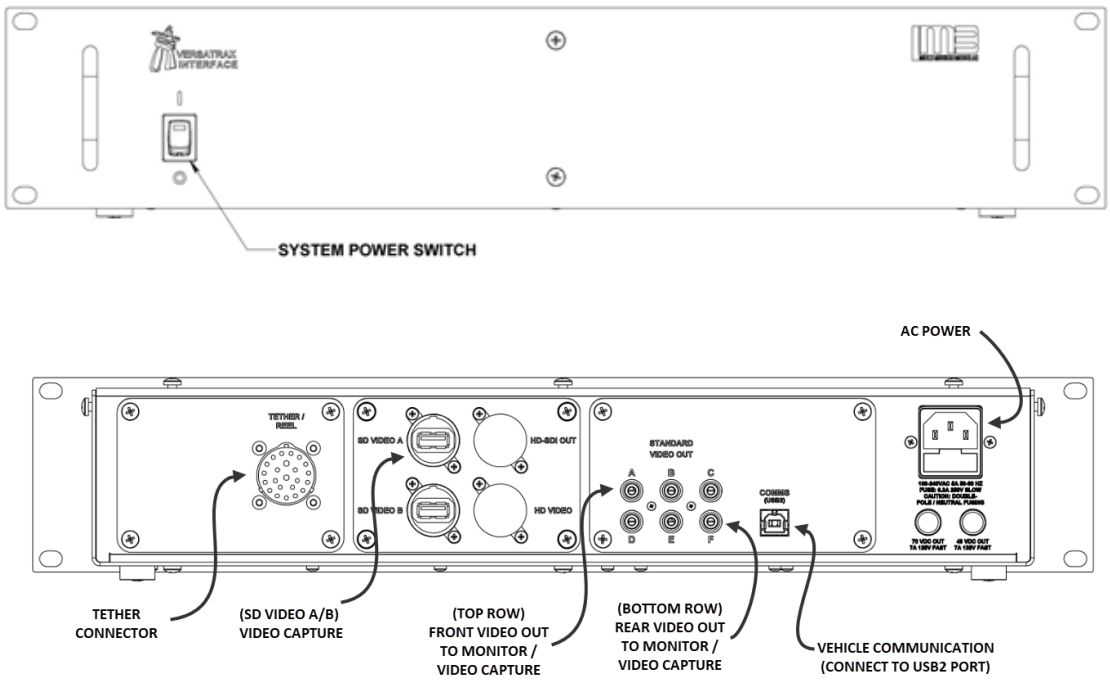

FIGURE 1: POWER SUPPLY & INTERFACE BOX

ICON™ Portable Controller Connection

The ICON™ Portable Controller supplies power to the tether and vehicle. It provides a communication interface to the vehicle. It also provides video reception and distribution.

Refer to the Controller Setup section of the ICON Portable Controller User Manual for more information.

Vehicle & Tether Connection

It is important that the tether be properly connected to the vehicle; otherwise, system damage or loss of vehicle may result. The tether attachment procedure is the same for the parallel and in-line.

1. Confirm the connector pins on the vehicle and tether are clean and lightly lubricated with silicone grease (DOW Corning #4, Molykote 44, or equivalent).
2. Visually line up the connector pins and push the connector all the way on.
3. Fully screw down and hand tighten the locking collar.
4. Secure the strain relief lanyards onto the vehicle using the tow cable clips illustrated below. Use Loctite 243 (blue) to secure the screws.
5. Confirm the lanyards are also secured to the tether splice block.

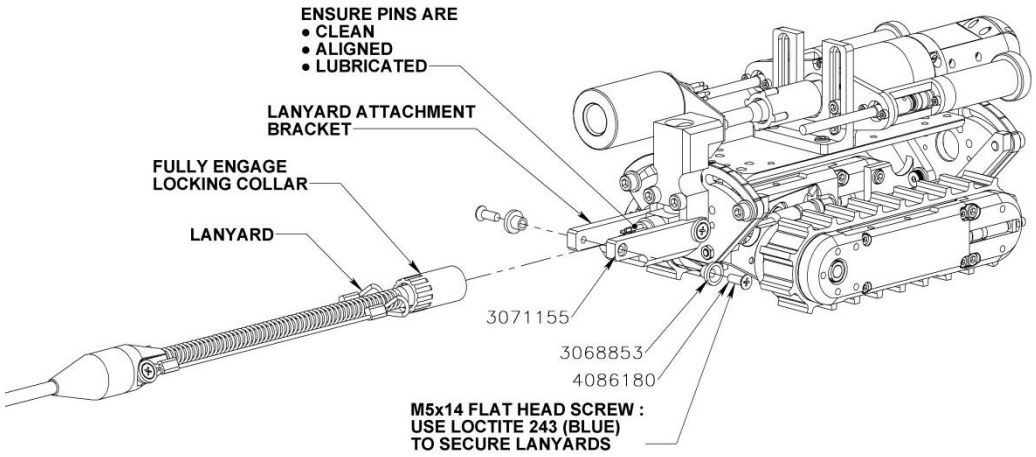

FIGURE 2: TETHER CONNECTION TO THE VEHICLE

Portable Reel Setup

If your system includes a portable reel, follow these steps to operate:

1. Remove the shipping cap from the front of the case and insert the crank handle.
2. Connect the deck cable from the reel to the controller.
3. Disengage the packing brake pin (pull and twist).
4. Make sure the friction brake is engaged to prevent drum freewheeling and tether pileup during deployment.
5. Connect the tether to the vehicle.

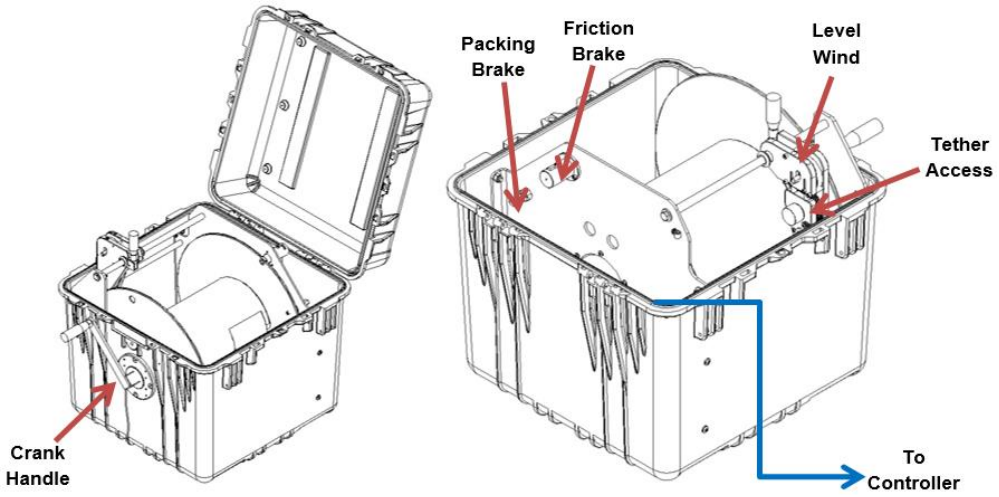

FIGURE 3: PORTABLE REEL SETUP

6. Feed the tether through the level wind as follows:
    a. Open the access slot by lifting the two exposed screw heads to raise the tether support shafts.
    b. Pull up on both sides of the top wheel's brass axle and slide the tether beneath it.
    c. Lower the two support shaft screws.
    d. Ensure that the top and bottom level wind wheels are tracking properly as the tether is spooled out. The bottom wheel turns an encoder for counting tether feed and vehicle travel.

Mini-Reel Setup

If your system includes a Mini-Reel, follow these steps to operate:

1. Remove the Mini-Reel from the shipping case.
2. Connect the deck cable from the reel to the Video Interface and Power Supply.
3. Connect the encoder deck cable from the reel to the Video Interface and Power Supply (if provided with Mini-Reel).
4. **Disengage** the shipping brake.
5. Make sure the friction brake is **engaged** – disengaging the friction brake can result in slack tether resulting in potentially jamming the reel.
6. Unwind some tether and connect the tether to the vehicle.

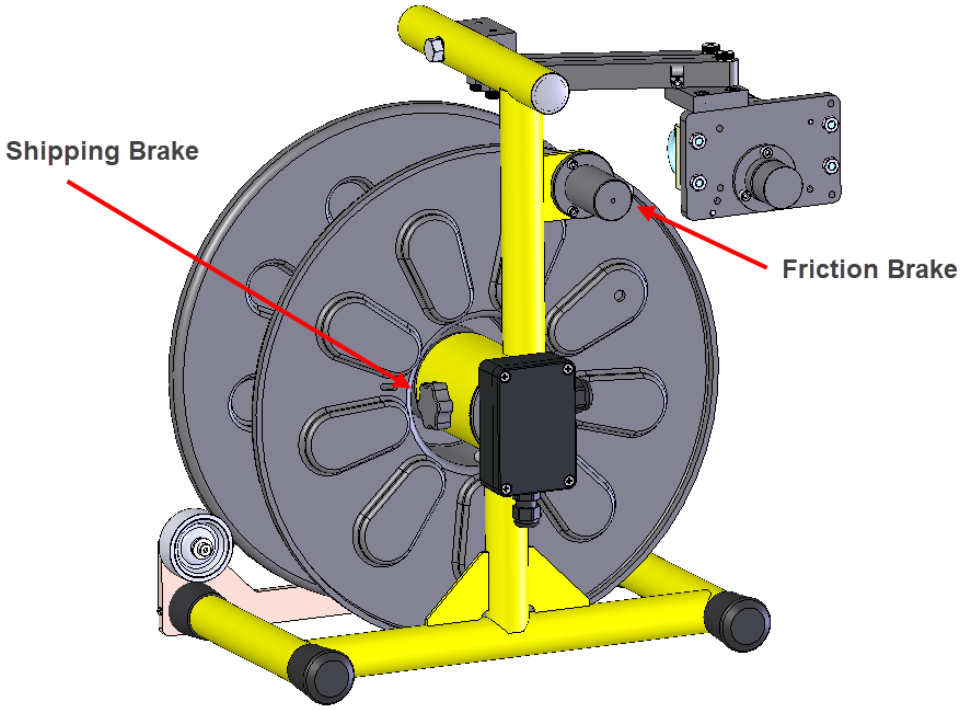

FIGURE 4 - MINI-REEL

Microtrac™ Voltages

The interface box provides tether power outputs for both 48V and 70V equipment. The VT100™ crawler is intended for 70V operation. **This vehicle should only be fitted with Microtracs™ marked for 70V DC supply.** 48V rated tracks will be damaged if connected to this system.

***Warning*: Track Voltage Input** – Microtracs are supplied in two different voltage ranges: 36-48VDC, and 30-70 VDC. Verify your tracks have the correct voltage input range for your system. 48V rated tracks will be damaged if connected to a 70-Volt system. Wide input tracks are designated by a **\V/** symbol on the side plate.

FIGURE 5 - MARKING FOR WIDE VOLTAGE INPUT TRACK

Vehicle Configuration

Parallel Configuration

Track Angle Adjustment

The parallel chassis' track angle may be continually adjusted from flat to 8-inch [200mm] pipe. To change the track angle, loosen the four M6 socket cap screws located in the end plate slots, move the track to its new angle, and retighten the screw. Indicator marks have been placed on the end plates for 8", 10", 12", 24" and FLAT configurations (200, 250, 300, 600 mm).

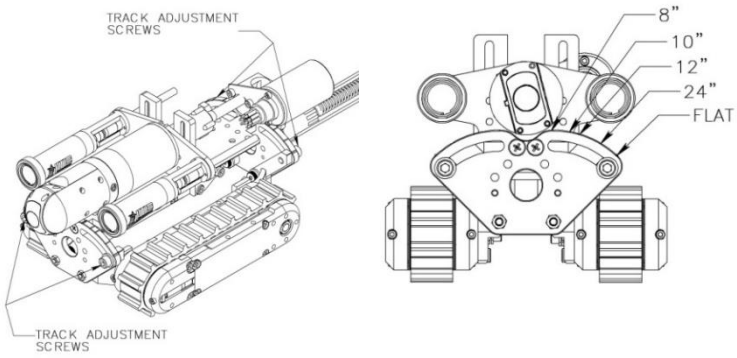

FIGURE 6: TRACK ANGLE ADJUSTMENT

Camera Height Adjustment

Camera height is adjusted by loosening the four M5 socket cap screws in the camera slider, moving the camera to the required height and retightening the screws. In 12” (300 mm) pipe, the upper adjustment screws are removed, and lower screws are placed at the top of the slot as illustrated below.

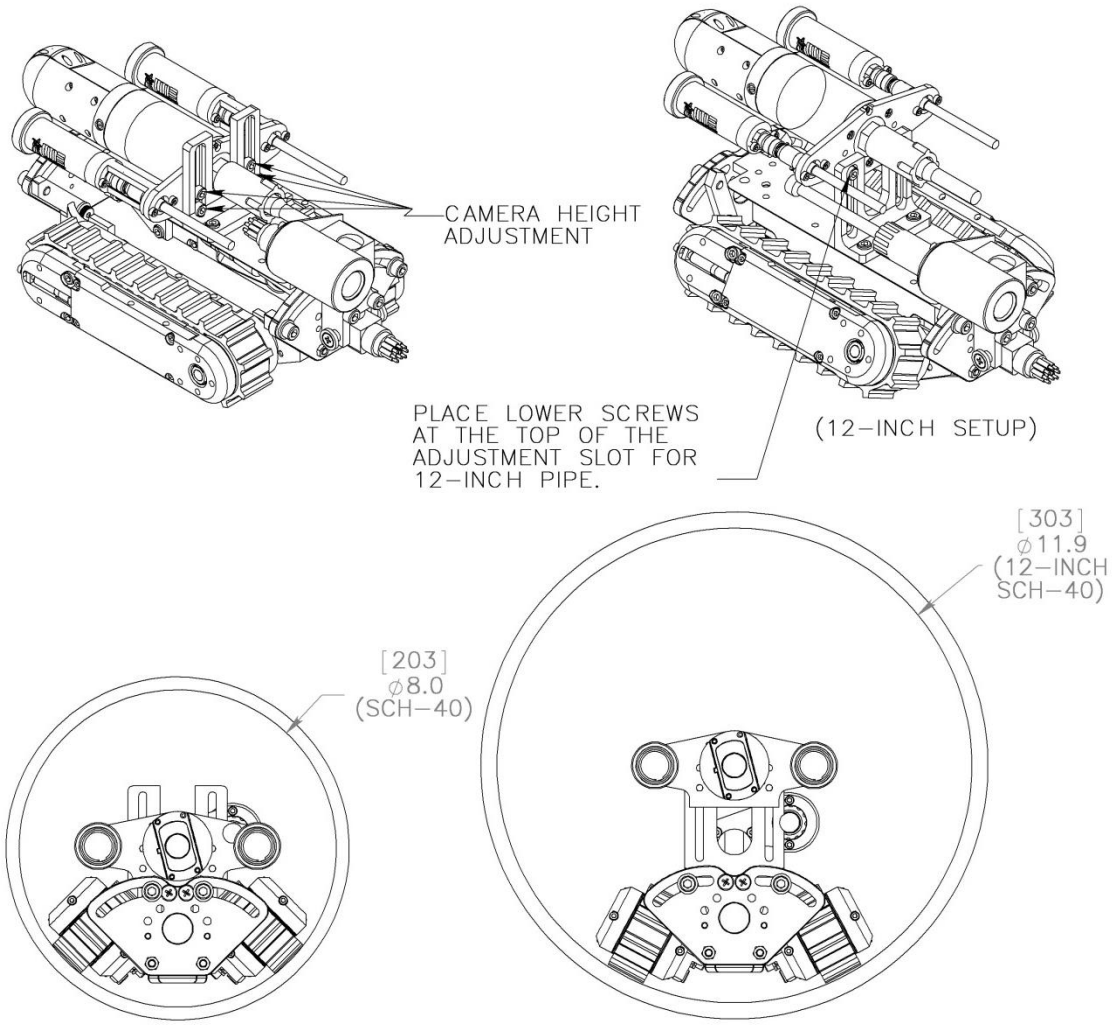

FIGURE 7: CAMERA HEIGHT ADJUSTMENT

Camera Height Extensions (Optional)

An optional height extension kit may be added to the parallel chassis to raise the camera an additional six inches. Five brackets are included with the kit. Used in combination with the above height adjustment, the kit allows for continuous camera adjustment between 12 and 24-inch (300-600 mm) pipe.

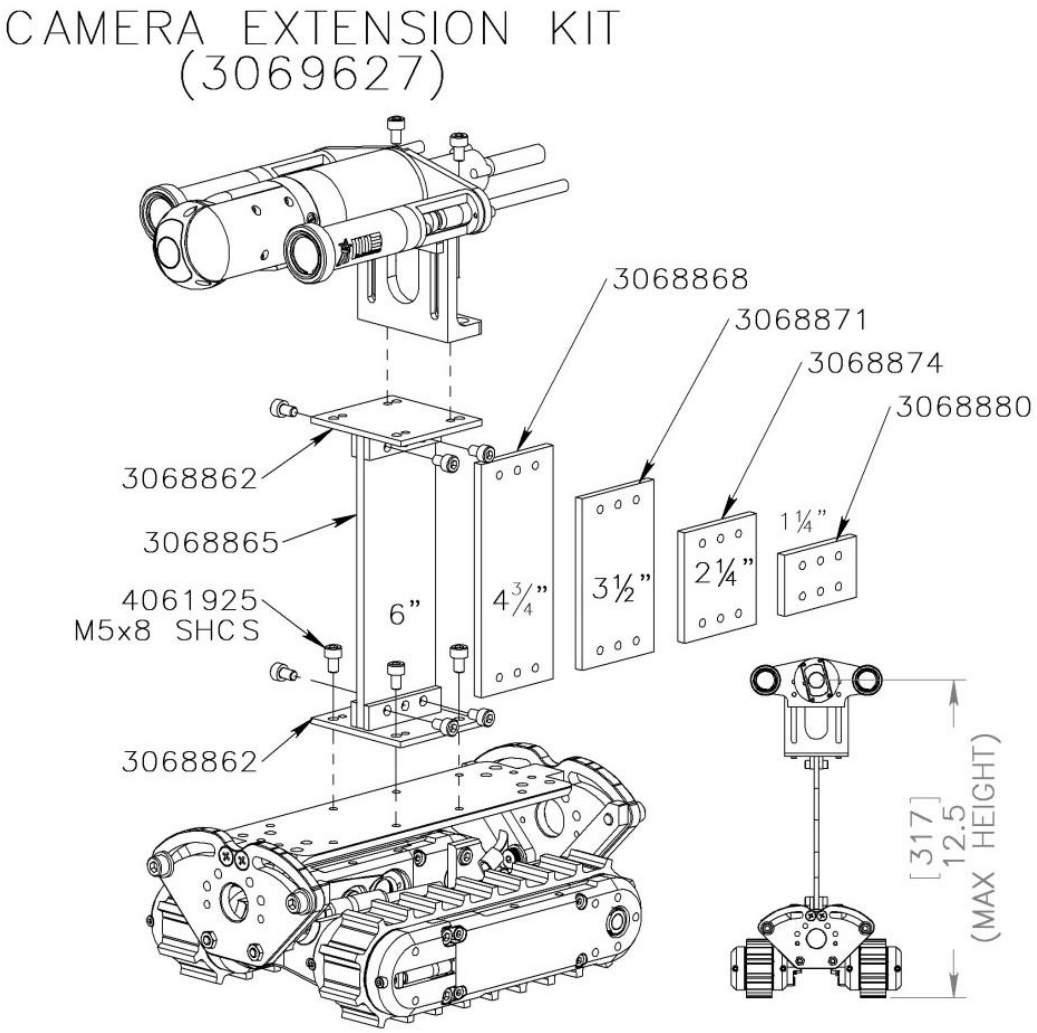

FIGURE 8: PARALLEL HEIGHT EXTENSION KIT

Camera & Light Installation

Spectrum 45

The front Spectrum 45™ (SP45) camera is mounted to the vehicle using M3x12mm flat head screws. There is a mark at the back of the camera which indicates the top for correct orientation. At the back of the camera you will find a ring of six screws around the connector holding on the back-end cap. Typically, only every second screw is installed, leaving the other three screw positions available for mounting the camera to the vehicle

Additional lighting is provided by two 801 Lights, installed using M3x8mm socket cap screws. Spacers move the lights forward to beside the camera.

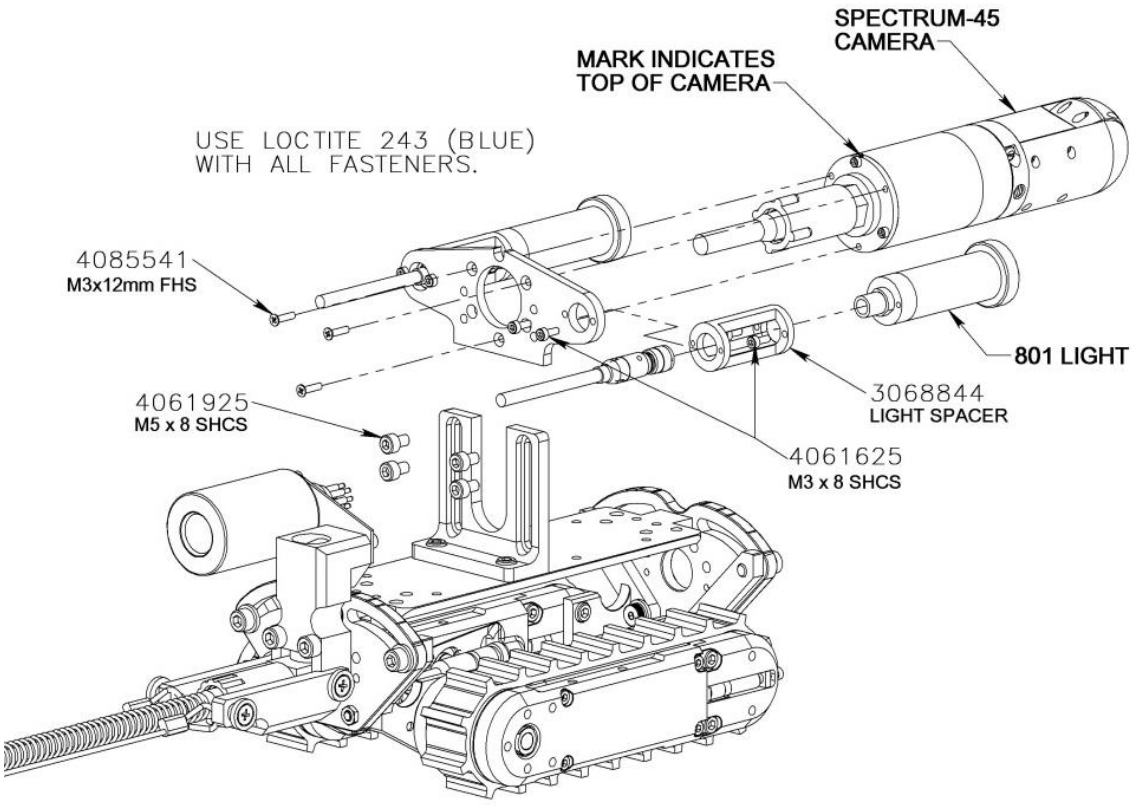

FIGURE 9: SP45 INSTALLATION

Spectrum 90™

A Spectrum 90™ (SP90) can be installed as an upgrade from the standard SP45™ for this vehicle. Note: this requires a different harness as whip lengths will change.

Note: Installation of an SP90 may require the use of different fasteners when the system is equipped with a magnet tray. See the **Magnet Adjustment** section for more information.

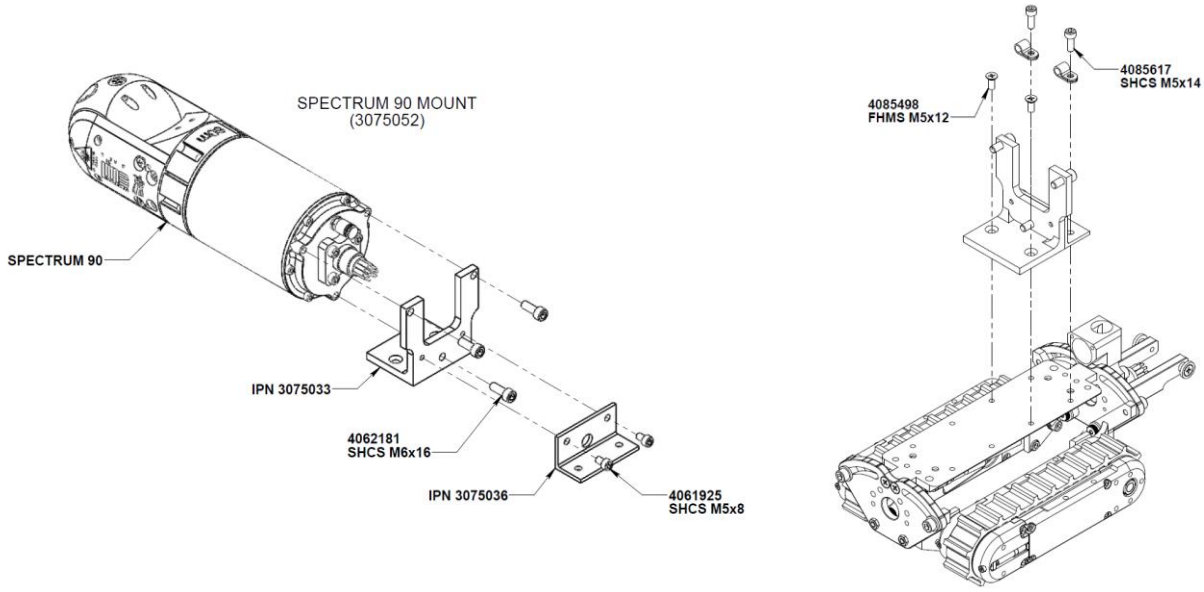

FIGURE 10: SP90 INSTALLATION

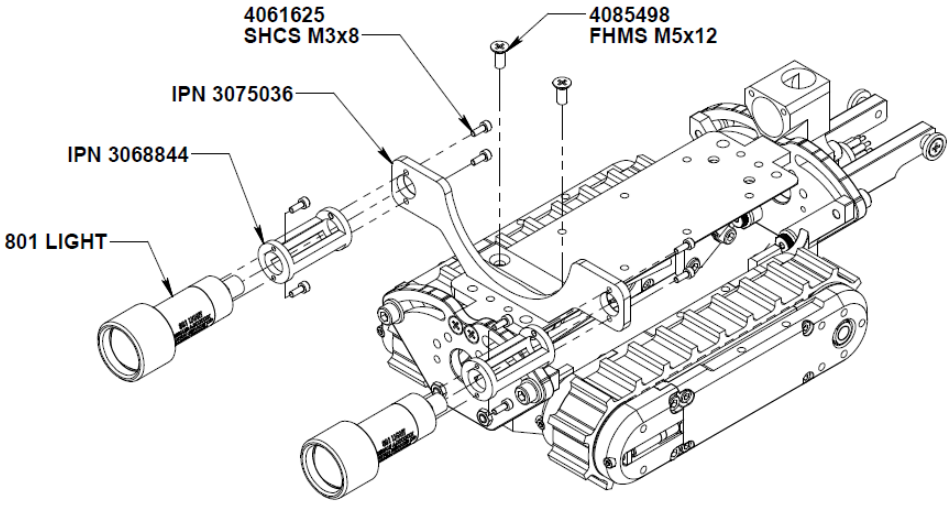

FIGURE 11: LIGHT MOUNT FOR USE WITH SP90

Track Removal/ Installation

The Microtracs™ are removed or installed onto the vehicle using four M5x8mm socket cap screws. The track whip connector must be fully mated (finger tight only), and the whip secured on place on the chassis using the provided P-clips.

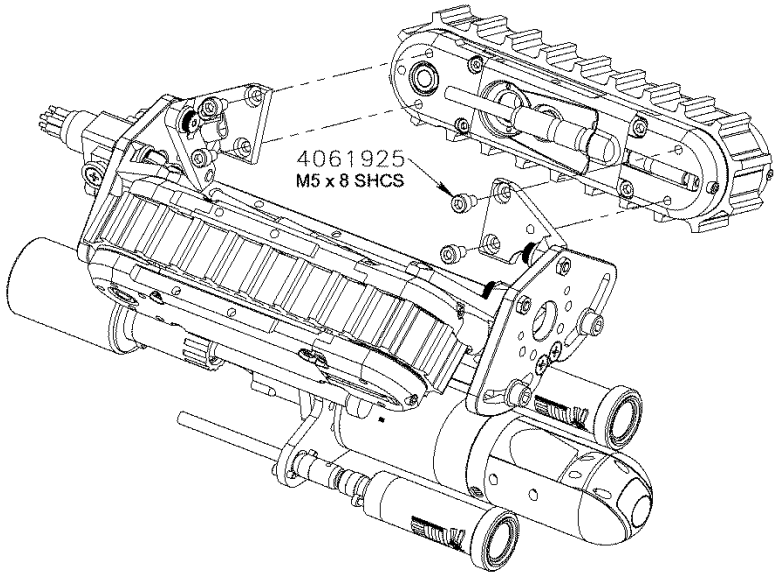

FIGURE 12: PARALLEL TRACK REMOVAL

The VT100™ crawler is intended for 70V operation. **This vehicle should only be fitted with Microtracs marked for 70V DC supply.** 48V rated tracks will be damaged if connected to this system.

***Warning*: Track Voltage Input** – Microtracs are supplied in two different voltage ranges: 36-48VDC, and 30-70 VDC. Verify your tracks have the correct voltage input range for your system. 48V rated tracks will be damaged if connected to a 70-Volt system. Wide input tracks are designated by a **\V/** symbol on the side plate.

Traction Weight Kit (Optional)

An optional weight kit may be added to the parallel vehicle to increase traction. The weight kit adds 8.7 lb. [3.9 kg] to the parallel vehicle. Standard weights are powder painted steel but are also available in brass or stainless steel.

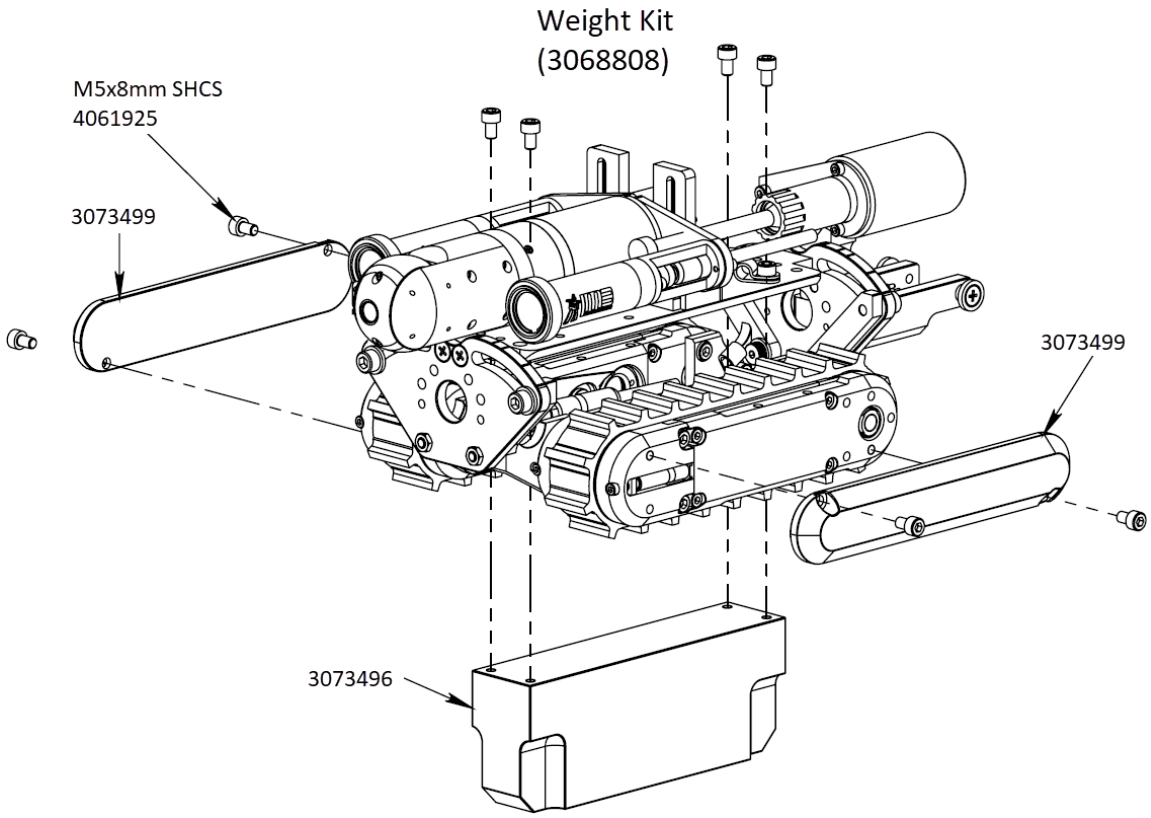

FIGURE 13: TRACTION WEIGHT KIT

Magnet Kit (Optional)

A magnetic attachment can be added to the parallel chassis for better traction in steel pipes and on steel surfaces. The following subsections give detail on installation and adjustment of the magnet kit.

Note: Systems equipped with an SP90™ require different fasteners for mounting the magnet tray. These systems are supplied with M6x30mm, M6x25mm, and M6x20mm socket head cap screws.

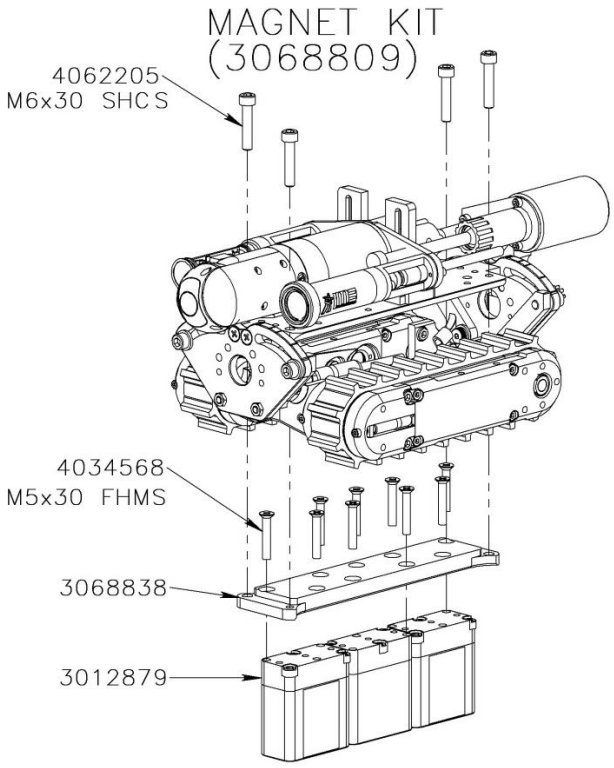

FIGURE 14: MAGNET KIT

Magnet Kit Installation

To install the magnet kit, start with the vehicle in the flat configuration with the front camera whip disconnected, then, remove the harness by unscrewing the two M6 socket head cap screws using a 5mm Allen wrench. Next, remove the four M5 flat head screws that hold on the center bar by using a No. 1 Philipps screwdriver.

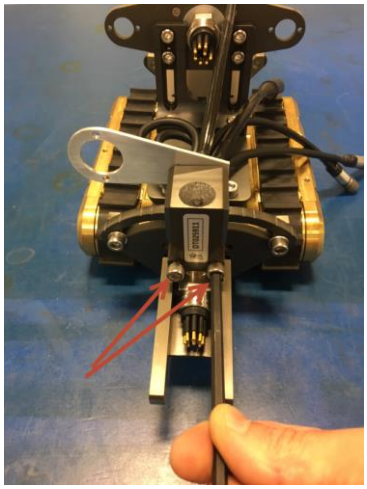

FIGURE 15: REMOVE HARNESS

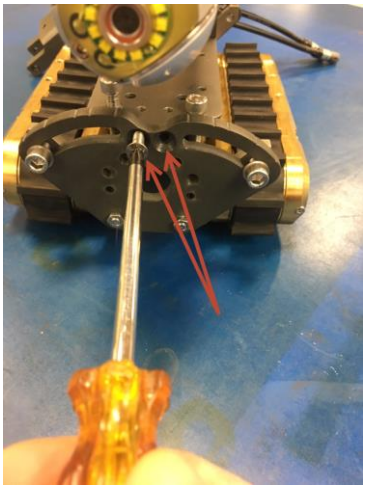

FIGURE 16: REMOVE CENTER BAR SCREWS

Finally, the center bar and camera mount can be lifted out of the chassis and the magnets installed to the center bar. See Figure 14 for assembly of the magnet plate and magnet boxes. Reassembly of the vehicle is the reverse of disassembly.

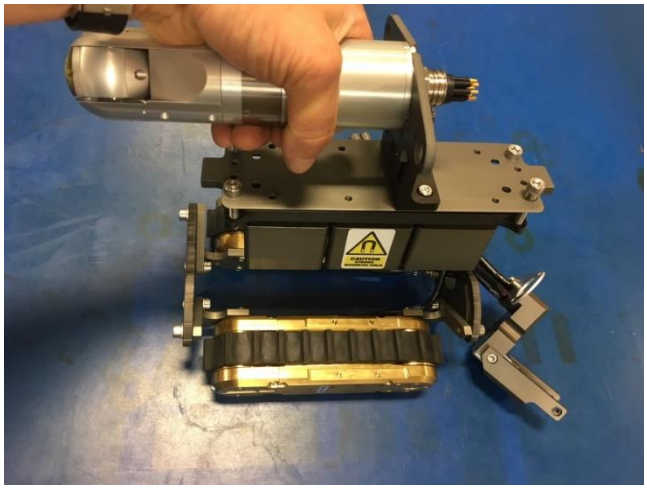

FIGURE 17: FRAME CENTER BAR REMOVAL

Magnet Adjustment

Note: The magnet tray is held by four M6 screws. Two screws are pulling up, and two screws are pushing down in an “X” arrangement. The screws that are pushing down (lock screws) are threaded through the chassis backplane. The screws that are pulling up (height adjustment screws) are threaded through the magnet tray. Using this method, small adjustments can be made to the tilt angle of the magnet tray as well as the height. To adjust the magnet height, loosen off the two locking screws. Then adjust the height using the height adjustment screws as required. Last, evenly snug down the locking screws. These do not require much torque – the magnet tray may easily be distorted if the locking screws are too tight. If the locking screws are not positioned evenly, the magnet tray will be crooked. Use Loctite 243 (blue) to hold the screws in place. Use low torque.

When adjusting the magnet tray, it is important to set it to an appropriate height. The proper setting for magnet height is a balance of three factors: required force, required ground clearance, and track loading. Generally, the magnets should be set as close to the wall surface as possible in order to yield the highest pulling force. However, if the magnets are set too close, the vehicle may stick itself to the surface it is driving on or the additional load may overload the tracks and immobilize the vehicle.

In the case that the vehicle will be operated on a vertical surface, special care should be taken to set the magnet height. The inherently higher danger of operating the vehicle on a vertical surface necessitates a higher margin of safety for the magnetic adhesion of the vehicle. Also, discontinuities on the surface, such as welds, may cause the vehicle to lose magnetic adhesion; therefore, inspections should not require the vehicle to navigate over such discontinuities if it is operating vertically.

Note: If the system is equipped with an SP90™, magnet tray mounting fasteners are to be replaced as required for clearance with the body of the SP90. Longer fasteners are to be used when the magnet tray is adjusted to a lower position and shorter fasteners are to be used when the magnet tray is adjusted to a higher position.

Warning: **Pinch Hazard** – Rare earth magnets are very strong. Use caution when handling the magnets or vehicle near steel objects, they may snap together unexpectedly.

Warning: **Strong Magnets** – Operators with magnetically sensitive medical implants should be aware and follow appropriate practices. Care should also be exercised around other magnetically sensitive devices, including computer hard drives, cell phones, watches and credit cards.

Extended Parallel With Spectrum 90™

Extended Parallel Chassis

The extended parallel chassis uses extended Microtracs to accommodate additional weights and magnets, and to better accommodate the SP90™ camera. Standard weight and magnet kits are incompatible with the extended chassis. With the SP90 camera installed, the minimum pipe size is 200mm [8”] SCH-40.

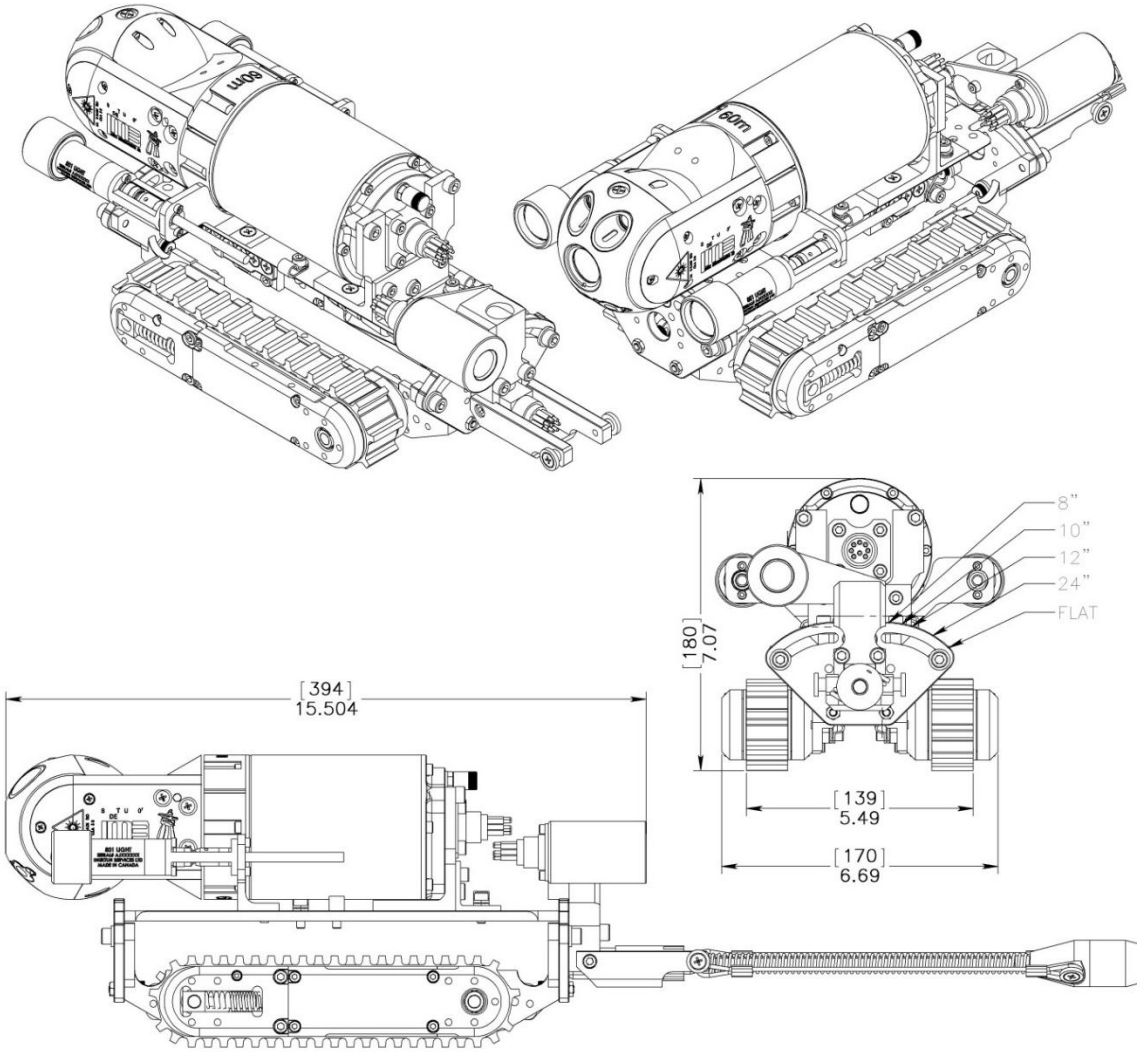

FIGURE 18: PARALLEL EXTENDED DIMENSIONS

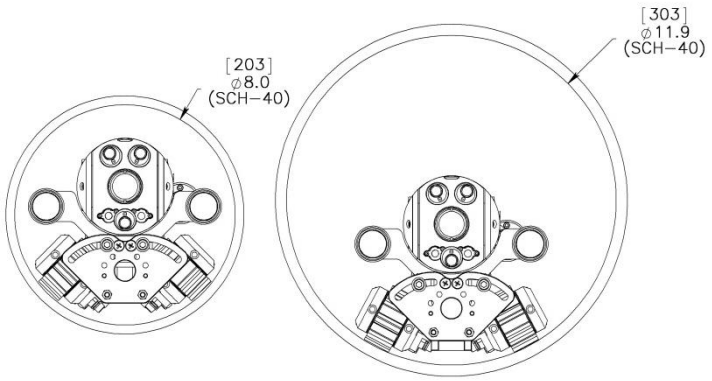

FIGURE 19: PARALLEL EXTENDED PIPE FIT

Camera & Light Installation

The front SP90™ camera is mounted to the vehicle using M6x16mm socket cap screws. The camera is oriented with the Schrader valve facing up. Additional lighting is provided by the two 801 Lights, installed using M3x8mm socket cap screws. Spacers move the lights forward to beside the camera. The rear facing camera uses an extended mount (from the factory) to prevent cabling interference with the Spectrum 90 camera. Use Loctite 243 (blue) with all fasteners.

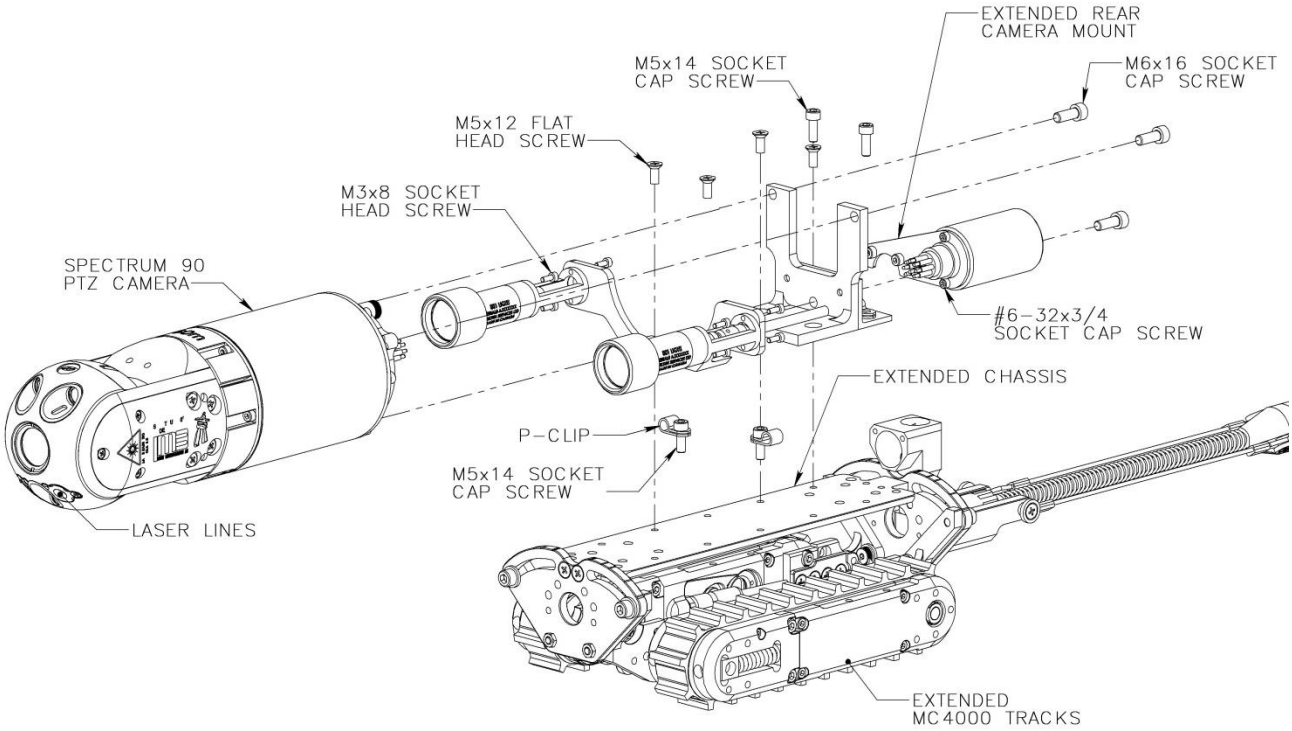

FIGURE 20: PARALLEL EXTENDED CAMERA MOUNT

Extended Traction Weight Kit (Optional)

An optional extended weight kit may be added to the extended parallel vehicle to increase traction. The weight kit adds 10 lb. (4.5 kg) to the parallel vehicle. Standard weights are powder painted steel but are also available in brass or stainless steel. Use Loctite 243 (blue) with all fasteners.

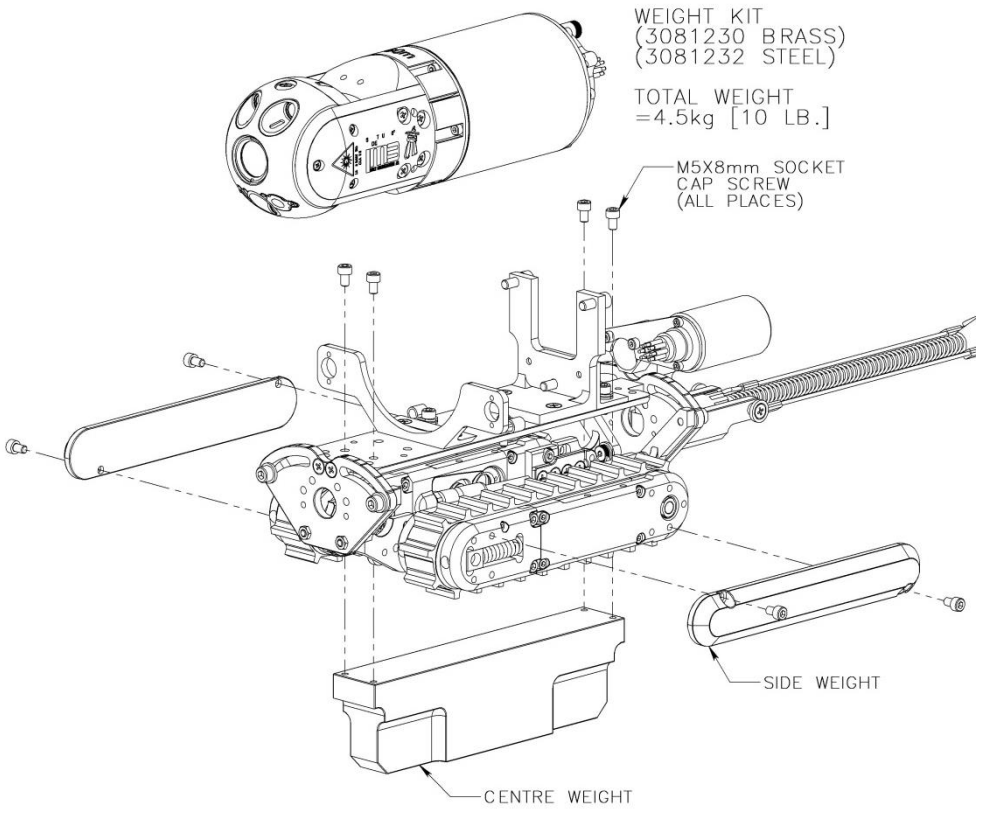

FIGURE 21: EXTENDED TRACTION WEIGHT KIT

Extended Magnet Kit (Optional)

A 4-Cup magnetic attachment can be added to the extended parallel chassis for better traction in steel pipes and on steel surfaces. Installation and adjustment of the magnet kit follows the same procedure as the standard-length magnet kit described above. Use Loctite 243 (blue) with all fasteners.

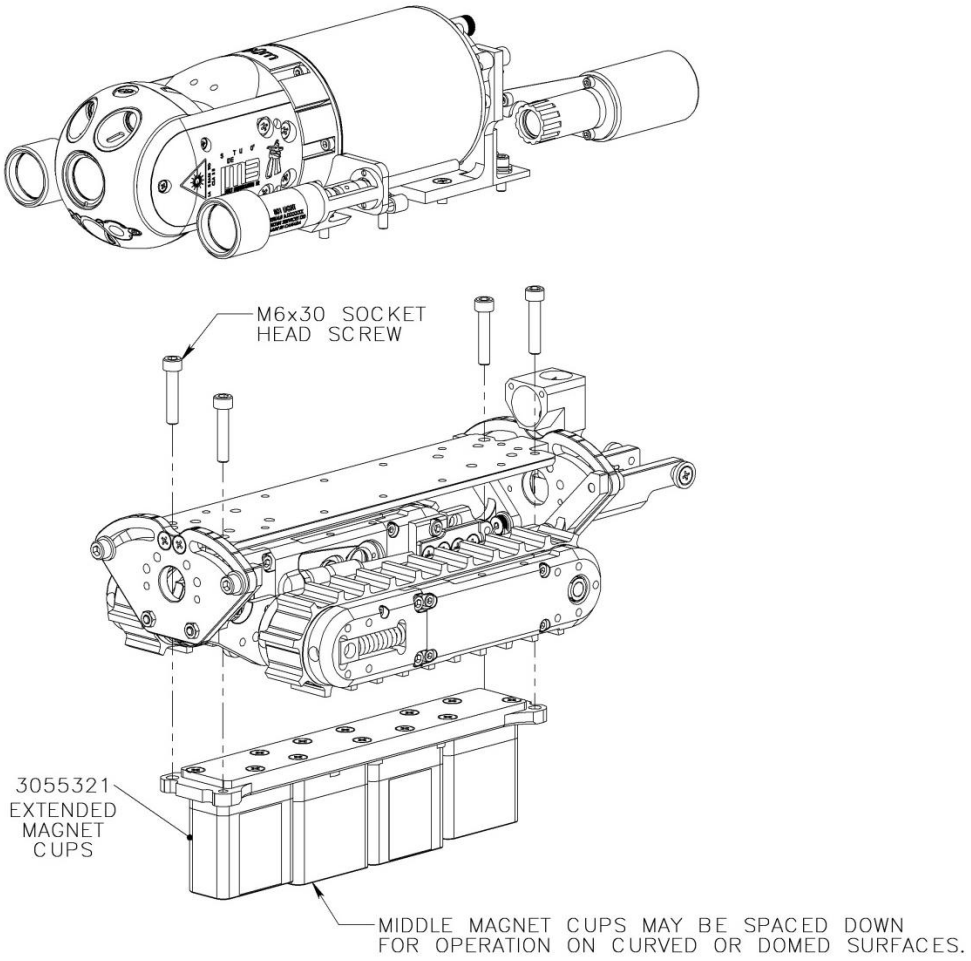

FIGURE 22: EXTENDED MAGNET TRAY

Inline Configuration

Track Installation

The inline VT100™ vehicle uses two sets of side plates and two sets of “X” hinges to connect the tracks. To begin assembly of the inline configuration, gather together the wiring harness, side plates, tracks, hinges, and screws. Line up the hinges and tracks as illustrated below. Note that the wiring harness remains strapped to the hinges. When disassembling the vehicle there is no need to remove the wiring from the hinges.

1. Connect the track electrical connectors. Both tracks are placed with the connectors on their right-hand side.
2. The hinges connect to the side plates, then the side plates to the tracks. First assemble the side plates into position with the hinge pivot pins sliding into the plate pivot holes. Then screw the side plates onto the tracks using M5 x 8 socket cap screws. Use Loctite 243 (blue) on all screws.

   The vehicle is now ready to configure for the target pipe size.

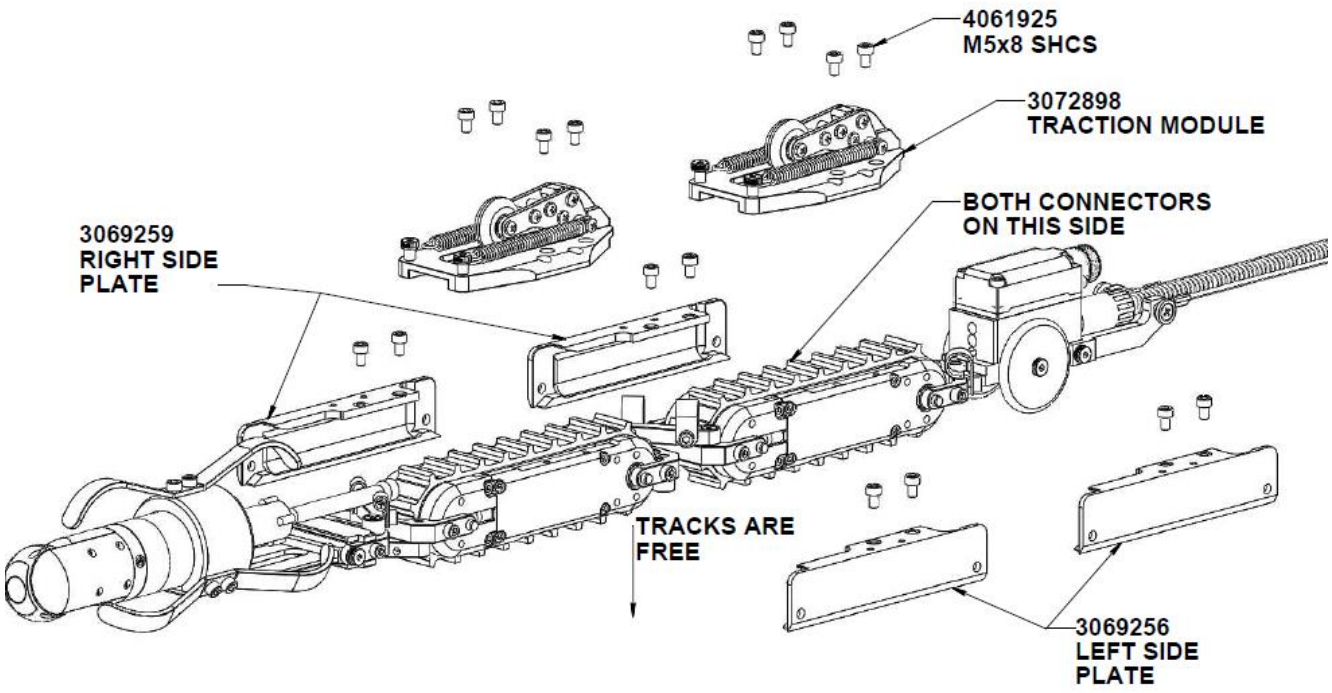

FIGURE 23: IN-LINE TRACK INSTALLATION

4-Inch Configuration

1. The 4-Inch in-line configuration uses the spring-loaded traction units (illustrated above) without spacers.

2. Install the 4-Inch skids around the camera (illustrated below). Use Loctite 243 (blue) with all fasteners.

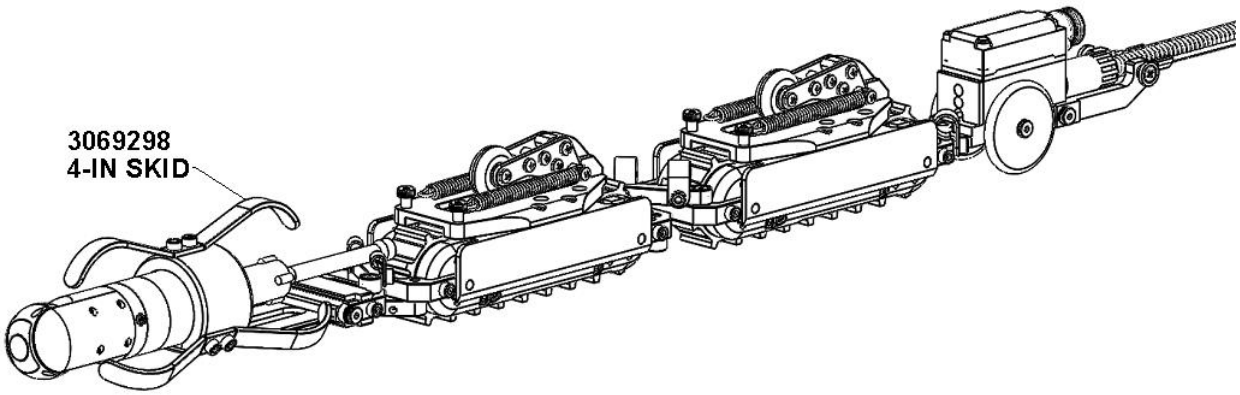

FIGURE 24: IN-LINE 4-INCH CONFIGURATION

5-inch Configuration

1. The 5-Inch in-line configuration uses the spring-loaded traction units (illustrated above) with one spacer.

2. Install the 5-Inch skids around the camera (illustrated below). Use Loctite 243 (blue) with all fasteners.

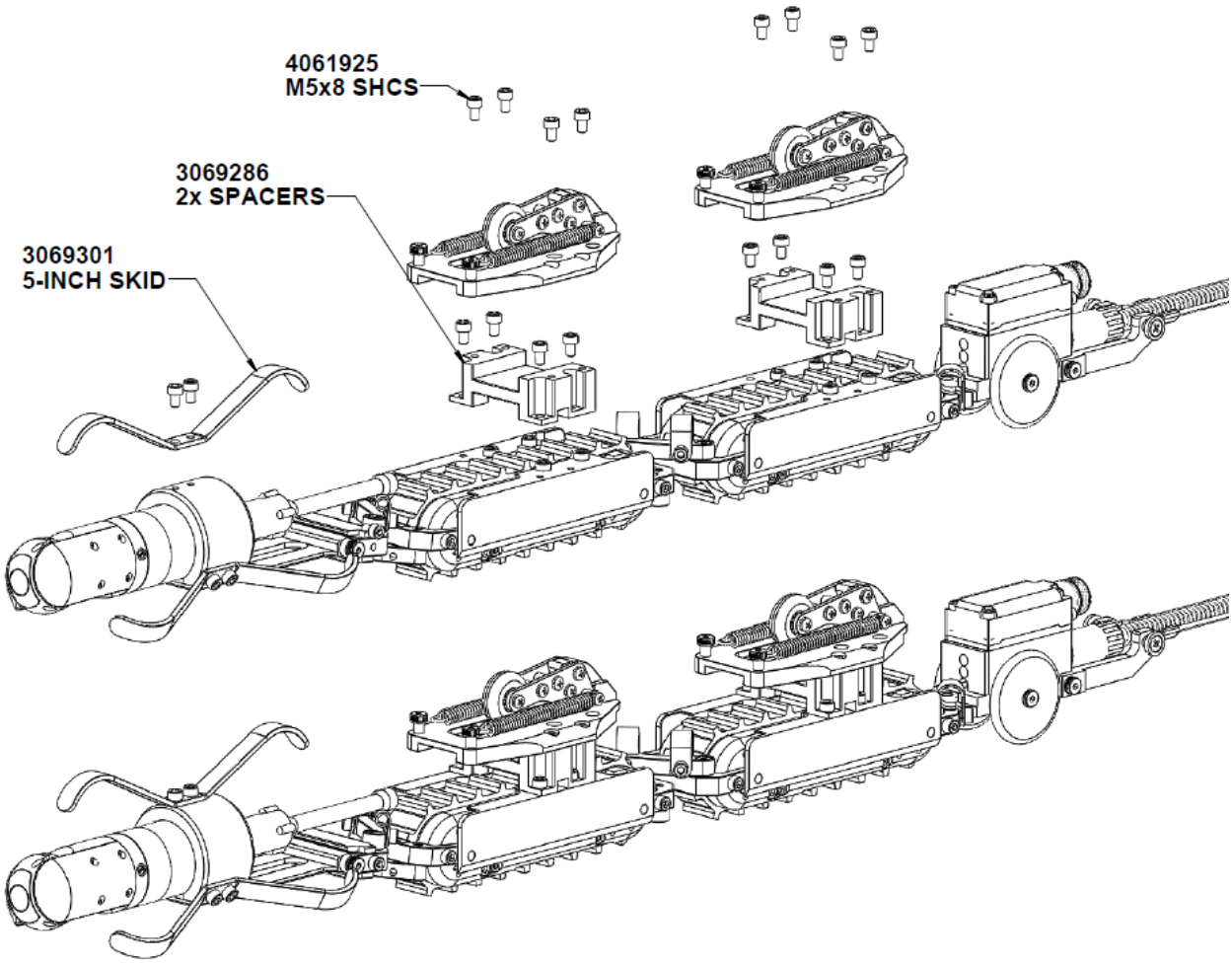

FIGURE 25: IN-LINE 5-INCH CONFIGURATION

6-Inch Configuration

1. The 6-Inch in-line configuration uses the spring-loaded traction units (illustrated above) with two spacers.

2. Install the 6-Inch skids around the camera (illustrated below). Use Loctite 243 (blue) with all fasteners.

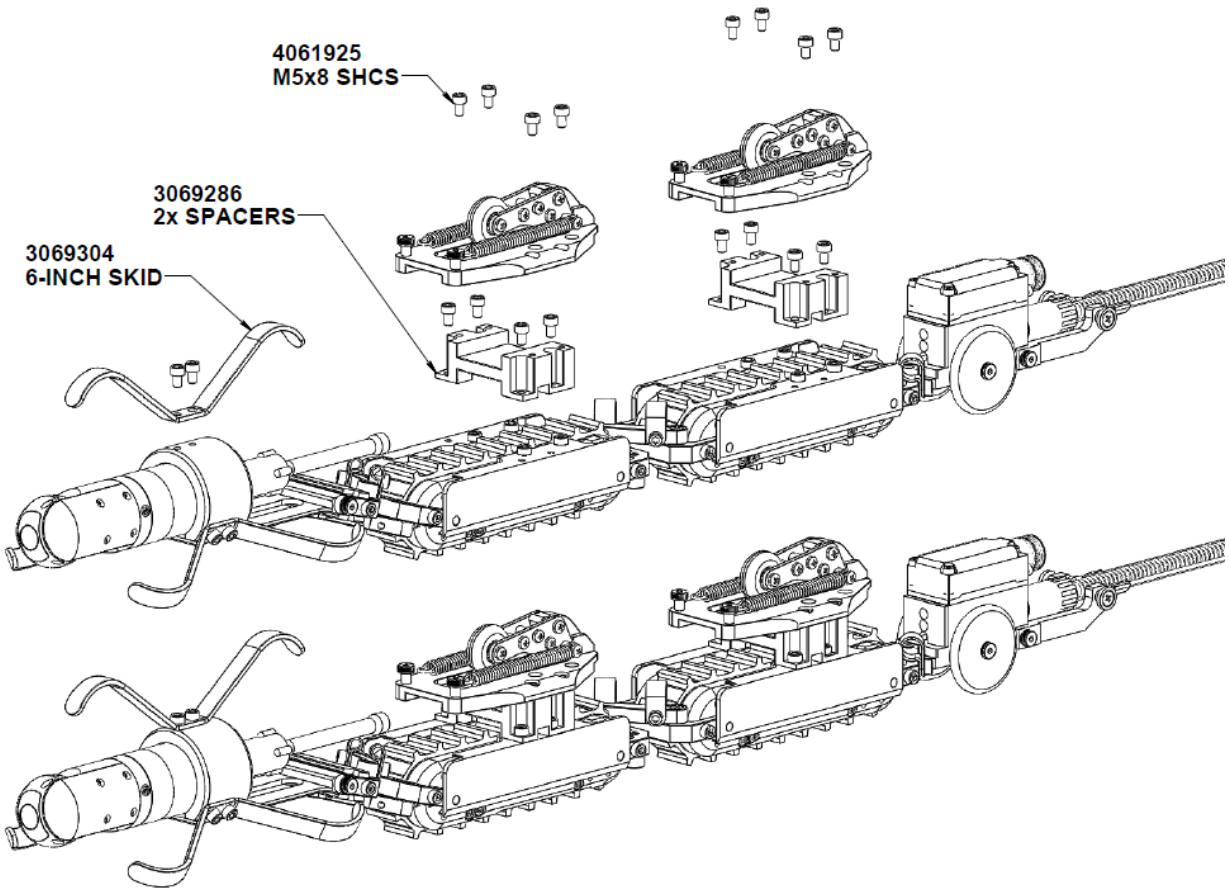

FIGURE 26: IN-LINE 6-INCH CONFIGURATION

Rear Camera (Optional)

An optional rear camera may be installed on the in-line vehicle.

No camera: Install the blank plate as shown below. The wired camera connector will be stowed in the counter-bored hole under the lid.

Rear camera: Remove the blank plate. Plug the camera connector wiring into the rear camera module. Screw the module in place, ensuring the O-ring is clean and fully seated in its groove. Camera modules come aligned from the factory. If further adjustment is required to level the image, slightly loosen the two screws holding on the camera lens and rotate until the image is level.

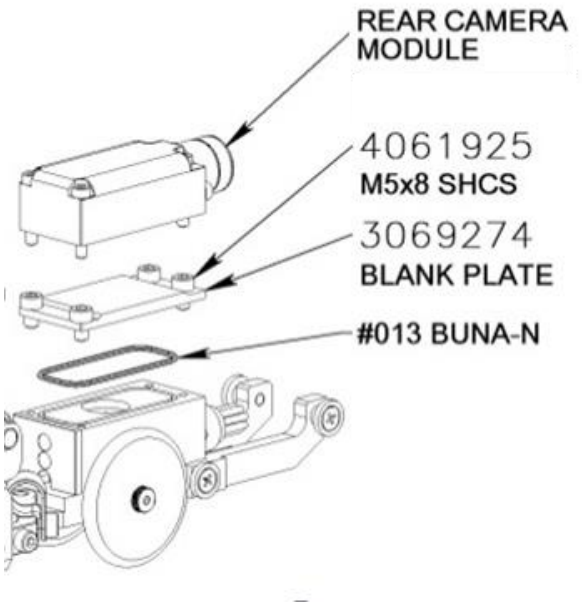

FIGURE 27: OPTIONAL REAR CAMERA

Crystal Cam™ front camera (optional)

The inline vehicle can be configured with a Crystal Cam™ as its front camera. This requires a non-standard harness.

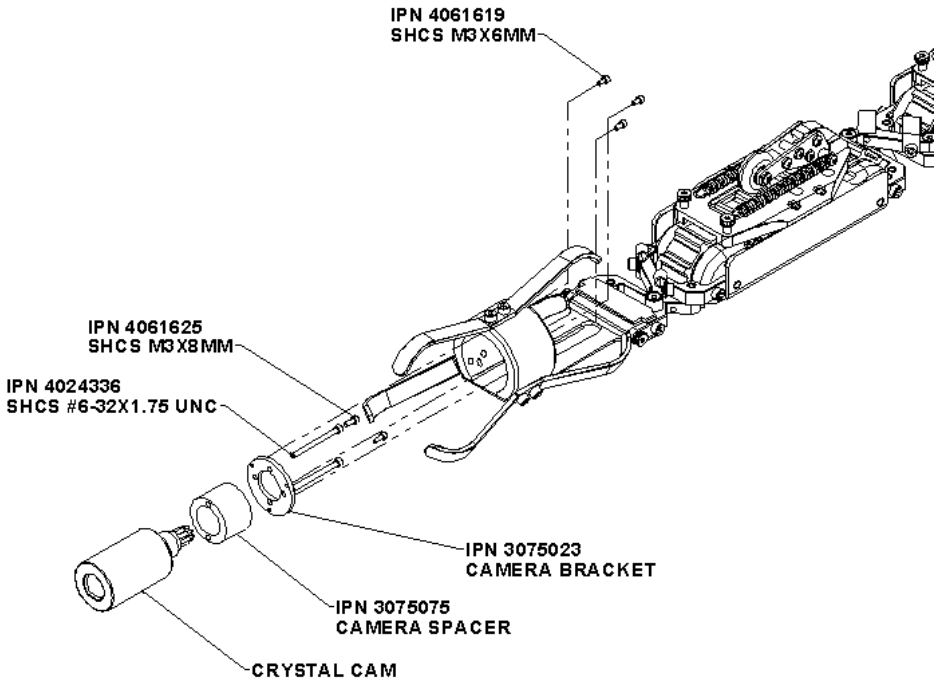

FIGURE 28: OPTIONAL CRYSTAL CAM FRONT CAMERA

Maintenance

Tether Handling

The tether should be considered the most important part of the vehicle system. It feeds power and control signals to the vehicle and returns video and sensor data. If the tether becomes damaged from improper use, poor handling or an accident, the vehicle may become crippled or inoperable. This may result in repairs, down time, and loss of production. Recovery of a disabled vehicle while in pipe can be costly and time consuming.

For maximum tether life and reliability, we offer the following tether handling tips:

- Never step on the tether. Trampling the tether may crush conductors, leading to premature failure. Trampling is also abrasive to the tether jacket. Trampling fosters the wrong attitude toward the tether. Remember, this is an expensive multi-conductor tether, not a common electrical extension cord.
- Never allow vehicles, trucks, cars, etc. to drive over the tether. This will do concentrated, immediate and permanent damage. Set up cones or blockades to keep vehicles away.
- Do not bend the tether beyond its minimum bend diameter. If the tether has difficulty bending, you have bent it too far. If the tether is bent beyond its minimum diameter on pulleys or around corners, wire fatigue will be accelerated. It is important that any pulleys or tackle support the tether at or beyond its minimum bend diameter. For an extended fatigue life, the minimum bend diameter should be considered larger.
- Never kink the tether. A kink will permanently deform a cable and may create a weak point in the cable jacket or the internal conductors. Take precautions to never allow the tether to kink. Kink situations may occur when there is slack tether with closing loops, or if coils slip off the side of the tether reel drum.
- Do not snap load the tether. Loads may peak at a very high value when the tether snaps taut. Snap loading may easily occur when a slack tether is reeled onto a motorized spool, or when the vehicle is suspended from a swinging deployment crane.
- Avoid loading the tether unnecessarily. Unnecessary large loads will only shorten the fatigue life of the tether.
- Always ensure the strain relief lanyards are properly installed when connecting the tether to the vehicle.
- Never fully un-spool the tether from the reel. The surface end of the tether is anchored to the spool drum. If the spool is turned past the anchor point, the tether may be kinked or broken and require re-termination. To help prevent this, a band of tape is typically wrapped around the last few coils to act as a visible and audible warning that the tether is fully payed out.

Connector Care

Proper connector care is important for system reliability. Preventable connector problems can represent a significant cost in downtime and re-termination which could easily have been avoided. A good tether isn't much use without a connector. We recommend the following steps to help prevent damage to connectors.

1. When plugging in a connector:
    a. Ensure the system power is OFF.
    b. Inspect for dirt in both sides of the connectors.
    c. Inspect for bent or burnt pins.
    d. All connectors - visually align the key-way or locating pin first before plugging in. Do not blindly jam and twist.
    e. Fully tighten or engage a connector. Never use a connector partly plugged or screwed in. Contacts left partly open may be subject to leaking, arcing or burn-out. In general, locking collars need only be finger tight.
2. Do not plug in dirty or damaged connectors.
3. Cap any unused connectors with dummy plugs.
4. The rubber vehicle and camera connectors are wet pluggable. The small collared light and track connectors must be dry when mating.
5. The waterproof vehicle connectors require occasional lubrication:
    a. Wet pluggable connectors, including the vehicle and camera connections, should be lubricated with silicone grease.
    b. Dry mating miniature connectors on the Microtracs and 801 lights can be lubricated with 3M Silicone Spray (or equivalent). Do not grease these connections.
6. Never use WD-40 or similar solvent-based fluids as this can cause serious damage to connectors.

Fuse Replacement

The Versatrax™ interface box is fitted with fuses for its AC power inlet and DC tether power output supply rails. These fuses are accessible from the rear of the interface box. Replace fuses with the same type and rating only.

Caution: A blown fuse is an indication of possible component failure. If, after restoring power, the system does not operate normally or if the circuit blows a second time, please contact Eddyfi Technologies technical support.

AC Line Input Fuses	Power cord inlet (drawer)	AC input fuses (2) 6.3A 250V, Time Delay, 5x20mm (Bussmann S506-6.3-R)
Tether Output Fuse, (70VDC)	Rear panel	Output supply to the tether and vehicle. 7A 125VDC, Fast, ¼ x 1-¼" (Bussmann ABC-7-R)
Tether Output Fuse (48VDC)	Rear panel	Output supply to the tether and vehicle. 7A 125VDC, Fast, ¼ x 1-¼" (Bussmann ABC-7-R)

CAUTION: DOUBLE POLE / NEUTRAL FUSING. This power supply contains fuses on both AC input lines. Disconnect power before servicing.

Microtrac™ Maintenance

Refer to the Microtrac manual for Microtrac maintenance and servicing instructions.

Camera Maintenance

Refer to your camera manual for operation and maintenance instructions.

Tether Re-termination

Contact us if tether re-termination is required. Tether re-termination kits are also available. Detailed instructions and wiring diagrams will be included with the kit.

Parts and Repairs

Ordering Parts/Customer Service

Spare and/or replacement parts are available for your product and can be ordered directly from your local office.

When ordering parts always make sure to quote the sales order acknowledgement (SOA) number and/or the serial number of the system component in question.

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Warranty Repairs

Warranty conditions are specified in the Warranty section. Should any conditions of the manufacturer's warranty be breached, the warranty may be considered void. All returned items must be sent prepaid to Eddyfi Technologies at the above address.

Factory Returns to Canada

Some sub-assemblies of your Eddyfi Technologies product are not field-serviceable and may need to return to the factory for repair. Warranty claims must return to the factory for evaluation.

To return an item for evaluation or repair, first contact Eddyfi Technologies at our toll-free number or e-mail address. Eddyfi Technologies will supply a Return Merchandise Authorization (RMA) number with detailed shipping and customs instructions. Items shipped without an RMA number will be held at Eddyfi Technologies until the correct paperwork is completed. If cross-border shipments are not labelled as per the instructions, the items may be held by customs and issued additional fees.

All returned items must be sent prepaid unless other specific arrangements have been made.

When the product or system is being shipped anywhere by courier or shipping company, it must be packaged in the original packaging it was received in. This measure greatly reduces the consequences of rough handling and subsequent shipping damage.

Eddyfi Technologies cannot be held responsible for damages due to improper packaging. Shipping damage may have significant impact on repair turnaround times.

Product/System Drawing Package Availability

Mechanical assembly and electrical wiring diagram drawing packages for your equipment are available in PDF format upon request. Printed copies may also be purchased from Eddyfi. Contact your local sales contact for more information.

Limited Warranty Policy

Eddyfi Technologies will repair or replace, at its expense and at its option, any system or component, subject to the limitations and / or exclusions specified herein, which in normal use has proven to be defective in workmanship or material provided that, within one (1) year of the purchase date, the original purchaser returns the product prepaid, accompanied by proof of purchase, from a sales agent authorized by Eddyfi Technologies, and provides Eddyfi Technologies with reasonable opportunity to verify the alleged defect by inspection.

Warranty Limitations and/or Exclusions:

1. This warranty does not apply to light bulbs.
2. Batteries, fuses, transistors, integrated circuit modules (IC's), voltage regulating devices and electrical plugs and / or connectors are warranted to be free from defects in material and workmanship for a period of ninety (90) days from the date of shipment to the original purchaser.
3. Any article purchased from, but not manufactured by, Eddyfi Technologies is sold with only such warranties as are made by the manufacturer therein. Eddyfi Technologies only warrants that it has title thereto, free of all liens or encumbrances.
4. This warranty does not apply to units which are damaged by connection to improperly wired AC receptacles.
5. Track belts, tethers, view ports and other components subject to wear through abrasion are warranted to be free from defects in material and workmanship for a period of ninety (90) days from the date of shipment to the original purchaser.
6. Any damage caused by failure to observe proper packing or to observe instructions for operation and maintenance as contained in the Instruction Manual furnished with the equipment, by accident in transit or elsewhere, will not be covered by the warranty.
7. Repairs are warranted for 90 days.

Eddyfi Technologies may require that certain components may be returned, prepaid, to a manufacturer's authorized station for inspection and repair or replacement.

Eddyfi Technologies will not be responsible for any asserted defect which has resulted from Acts of God, normal wear, misuse, abuse, improper configuration, repair, or alteration made, or specifically authorized by, anyone other than a representative of Eddyfi Technologies authorized to do so. The giving of, or failure to give, any advice or recommendation by Eddyfi Technologies shall not constitute any warranty by, or impose any liability on, Eddyfi Technologies.

The foregoing constitutes the sole and exclusive remedy of the purchaser and the exclusive liability of Eddyfi Technologies and is in lieu of any and all other warranties, express, implied or statutory as to merchantability, fitness for purpose sold, description, quality productiveness, or any other matter. Under no circumstances shall Eddyfi Technologies be liable for special, incidental or consequential damages, or for delay in performance of this warranty.