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INUKTUN VT100 VERTICAL CRAWLER™

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About This Manual

This manual has been prepared to assist you in the operation and maintenance of your Eddyfi Technologies' Inuktun 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 is meant 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. Customers will be notified of any changes to their equipment.

Information in this manual does not necessarily replace specific regulations, codes, standards, or requirements of others such as government regulations.

System Description

The Inuktun Versatrax100™ Vertical Crawler is a portable pipe inspection system based on the Microtrac 4000™ crawler. Three tracks are mounted on an expanding trilateral mechanism to fully grip the pipe in any orientation.

The inspection system has been manufactured with the hazards and demands of pipe inspection in mind.

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
- Steam headers
- Tanks and pressure vessels
- Oil and gas refineries and pipelines
- Pulp and paper mills

Specifications

Min Vehicle Dimensions			Ø200 x 440 mm (Ø 8 x 17.3 in)
Vehicle Weight[Error! Bookmark not defined.]			8.5 kg (19 lb)
Depth Rating			30 m (100 ft)
Pipe Size Range		Standard	200 – 300 mm (8 – 12 in)
		w/ 50 mm Extensions	300 – 400 mm (12 – 16 in)
		w/ 75 mm Extensions	350 – 400 mm (14 – 18 in)
Maximum Tether Length[2]			300 m (1,000 ft)
Tracks			3x Microtracs™ 4000
Camera		Front	Spectrum 45™
		Rear	Onyx™
Lights			2x 801 Lights
Reel		Optional portable tether reel with payout encoder	
Power Requirements			100 – 240 VAC 50/60Hz, 5A
Operating Temperature			0 – 50 ºC (32 – 122 ºF)
Storage Temperature			-20° – 60 ºC (-4 –140 ºF)

[1] Weights may vary depending on optional components
[2] Actual travel distance may be decreased depending on inspection geometry (traction and number of bends)

Precautions

IMPORTANT: When configuring a 70V system, check to see if the tracks are compatible. Older versions of 4000 series Microtracs™ are not 70V compatible. Look for the Wide Input Voltage symbol **\V/** located on the side plate of the track indicating 70V compatibility.

Certification

The Versatrax 100™ system is built in accordance with the Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC, and Electromagnetic Compatibility Directive 2004/108/EC.

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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 – 70 VDC. If the equipment is powered from a source other than an Eddyfi Technologies provided controller, the power supplied to the product must have reinforced isolation from the mains with no reference to earth ground.

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

WARNING: Pinch Hazard – The vehicle's expand mechanism operates with enough force to crush or severe appendages. Always power down the system before handling the vehicle.

WARNING: Intense Optical Radiation - The Spectrum 45™ 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.

- 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 Versatrax 100™ system is packed in three parts: Controller, Vehicle, and Reel / 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 Technologies 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, auxiliary lights, and harness block 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.

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 system (ICON™ Portable Controller or Interface Box and Control computer) is 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 30 m (100 ft) 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 portable reel is splash resistant only. Refer to the 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 an ICON™ Portable Controller or Interface Box. The interface box provides power to the tether and vehicle.

Power Input: 100 – 240 VAC, 50 / 60 Hz, 5 A.

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.

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.

Interface Box Connection

To set up an PC based control system with an Interface box, do the following;

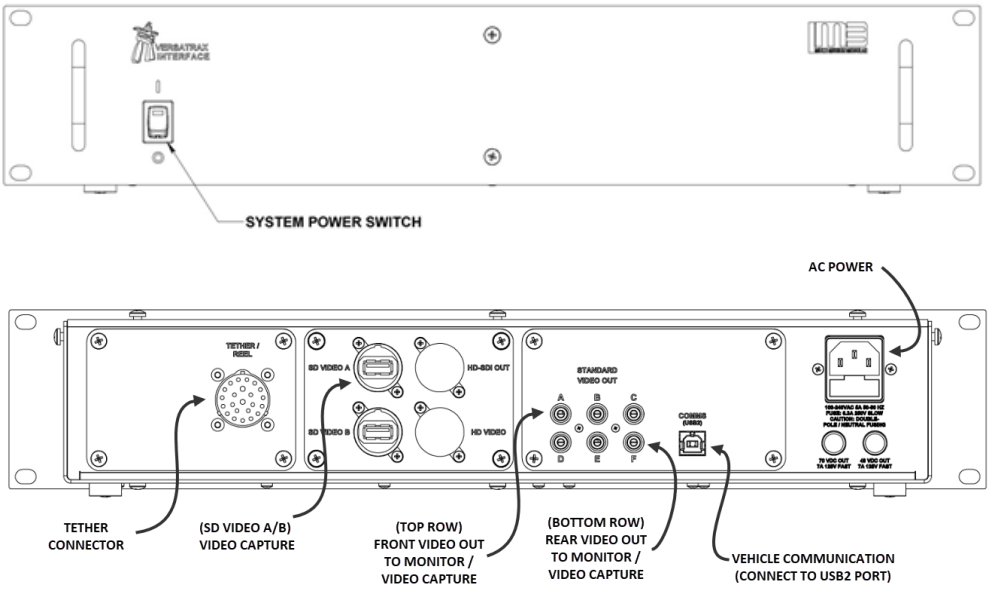
Set-up:

1. Connect the interface box to AC power using an equipment power cord.
2. Connect the tether (or reel 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.

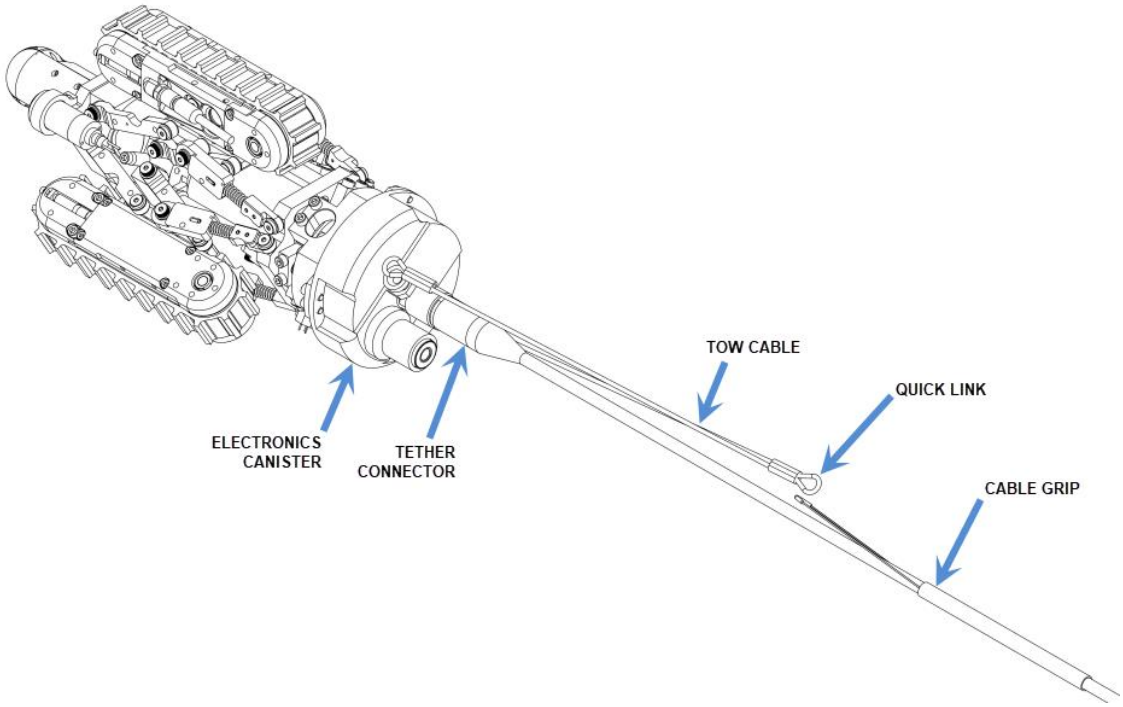
IMPORTANT: USB3 cables are required for video capture (SD VIDEO A / B) to maintain video quality.

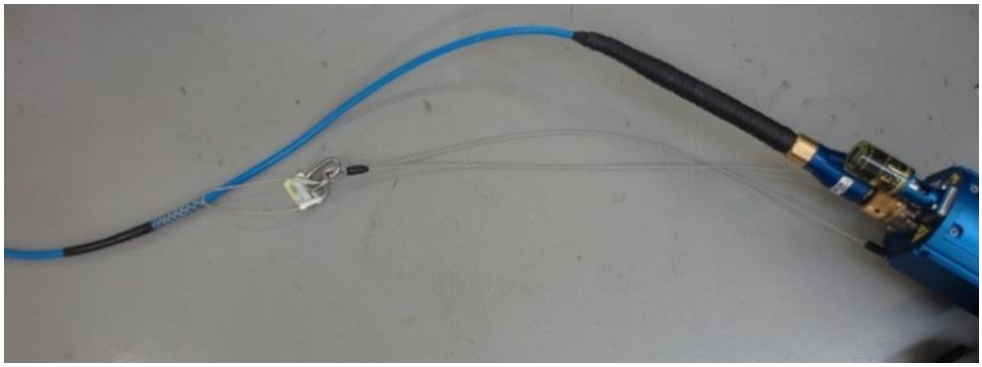


Vehicle and Tether Connection

It is important that the tether be properly connected to the vehicle – otherwise damage to the system may result.

1. Connect the vehicle end of tether to the back of the integrated harness block. Visually line up the key in the connector before mating. Fully screw down and hand-tighten the locking collar.
2. Secure the tow cable to the cable grip on the tether using the quick-link. Adjust the cable grip position to maintain a small amount of slack tether regardless the direction the tether is pulled, as illustrated below.
3. Verify all device whips from the harness block to their respective components are securely connected, and the whips are free from damage.
4. Ensure any unused connectors are capped with dummy plugs to insulate and protect their electrical contacts.

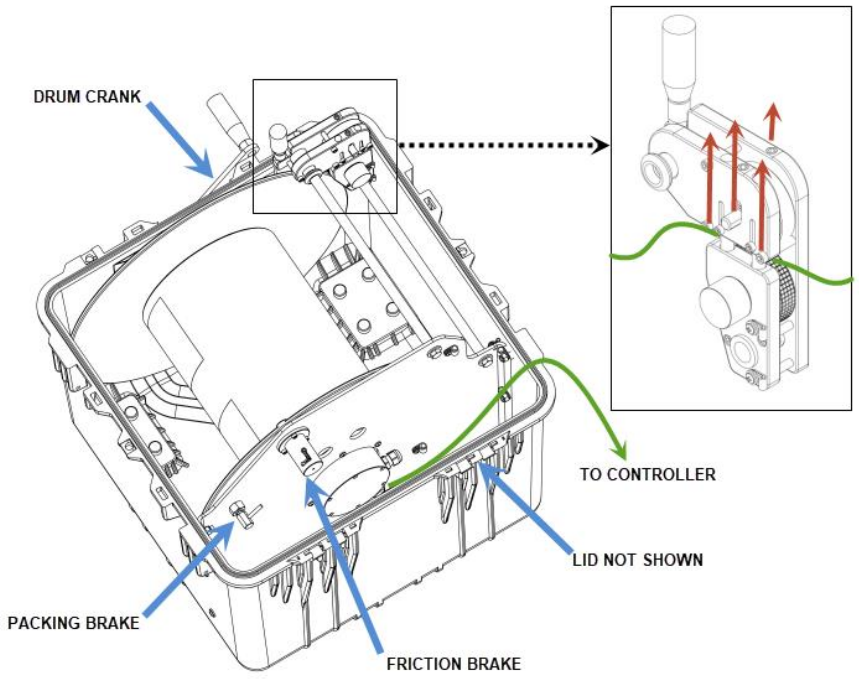




Portable Reel Setup

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

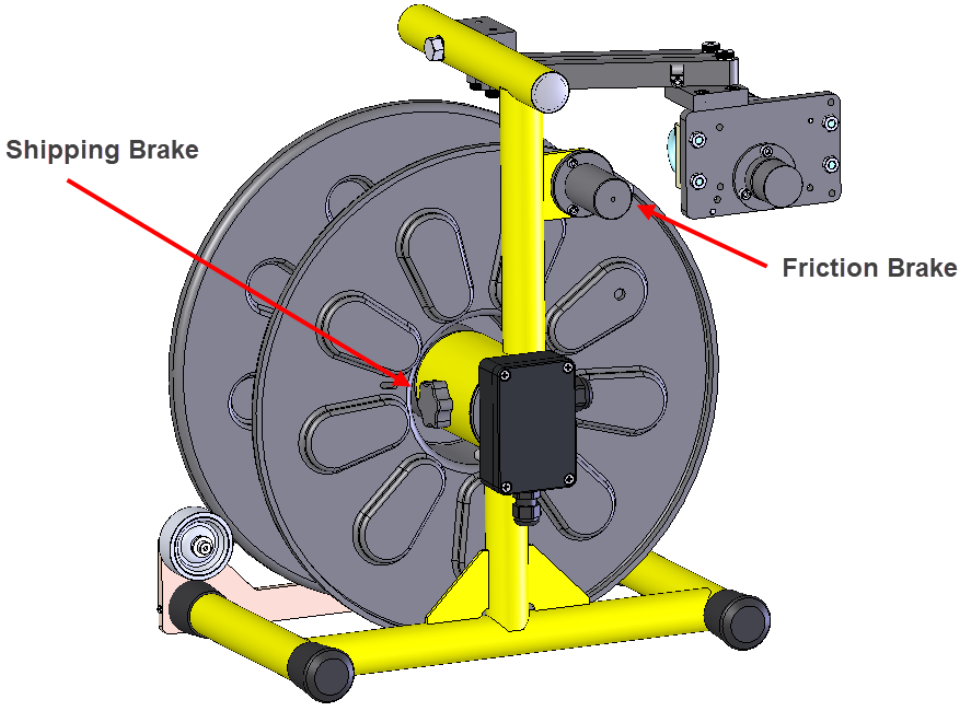
1. Remove the shipping cap from the front of the case and insert the crank handle.
2. Connect the deck cable from the reel to the controller.
3. Disengage the packing brake (pull back and turn on the locking pin).
4. Make sure the friction brake is **engaged** - disengaging the friction brake can result in slack tether resulting in potentially jamming the reel.
5. Unwind some tether and connect the tether to the vehicle.
6. Run the tether through the level wind as follows:
    a. There is an access slot which must be opened by lifting up on the two exposed screw heads to raise the tether support shafts.
    b. Pull up on both sides of the axle on the top wheel and slide the tether beneath it - failing to lift up on the wheel can scuff and damage the tether.
    c. Make sure that the two wheels that sandwich the tether top and bottom in the level wind are tracking properly as the tether is paid out - this tells the controller how much tether the reel has unwound and how far your vehicle has travelled.



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.



Tether Handling

The tether is one of the most important parts of the system. It feeds power and control signals to the system and returns data to the controller. If the tether is damaged from improper use, poor handling or an accident, the system may become inoperable. This could lead to significant downtime, loss of production, and avoidable costly repairs. It is encouraged to stress the importance of the tether and its use to anyone operating or maintaining the system. For maximum tether life and reliability, we recommend the following tether handling tips.

- Do not step on the tether
- Do not drive over the tether
- Do not bend the tether beyond its minimum bend radius
- Do not kink the tether
- Do not snap load the tether
- Avoid loading the tether whenever possible
- Always use the cable grip strain relief if applicable to your system
- Regularly inspect the tether for damage
- Regularly clean the tether

Note: Protecting the conductors inside the tether is critical to the life and operation of the tether. Proper tether handling and care will result in extended tether life and system reliability.

Connector Handling

Connectors are an essential part of system reliability. They should be properly maintained and cared for to ensure long life and reliability. It is recommended to follow these steps to help prevent damage and increase the life of connectors.

- Always put the cap back on the tether bulkhead when the tether is disconnected
- Always inspect the end of the connector prior to engaging
- Never plug in a dirty or damaged connector
- Visually align key-ways or locating pins prior to engaging the connector
- Always fully engage or tighten the connector
- Secure locking collars finger tight
- Install dummy plugs on unused connectors
- Disconnect by pulling straight, not on an angle
- Do not pull on the cable to disengage the connector

IMPORTANT: Never “Hot Plug” any connector, this will result in internal damage to the electronics. Power down the system prior to connecting the inspection system tether.

Note: Never use WD-40 or similar solvent-based fluids on connectors or crawlers. These will cause the rubber parts of the connector or crawler to soften and swell rendering them inoperable.

SubConn Connector: Lubrication and Cleaning

- Periodically apply Molykote 111 silicone grease or equivalent before mating connectors
- For dry mate connections, a layer of grease corresponding to 1/10 the socket depth should be applied to the female connector
- After greasing, fully mate the male and female connector and remove excess grease from the connector joint
- General cleaning and removal of sand or mud on a connector should be performed using a spray-based contact cleaner like isopropyl alcohol

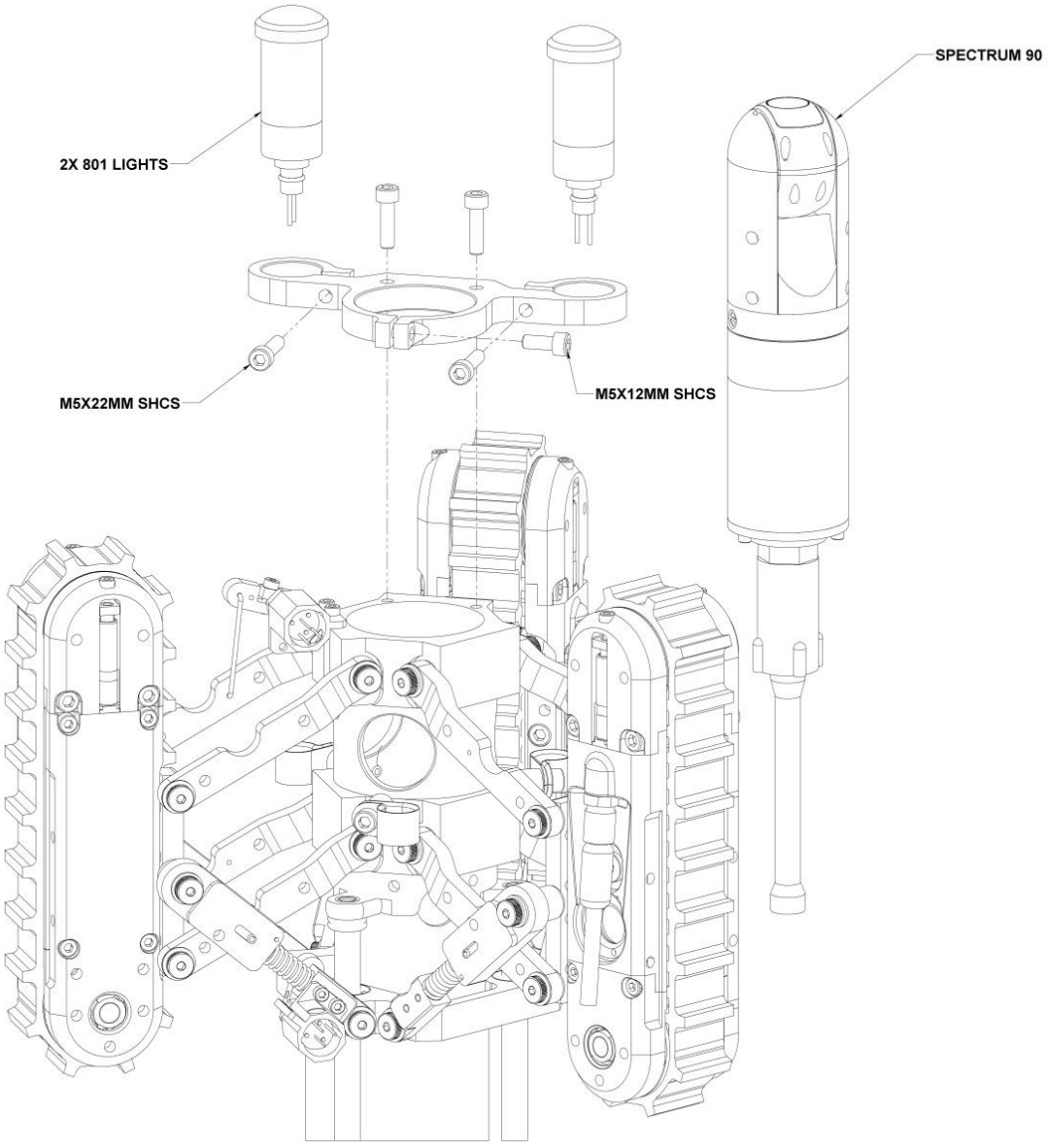
Impulse Connector: Lubrication and Cleaning

- Lubricate mating surfaces regularly with 3M Silicone spray or equivalent, DO NOT GREASE
- Lubricate O-rings with Molykote 111 or equivalent
- Use dust caps to protect connectors wherever possible
- Clean connectors with soap and fresh water, rinse out with alcohol and allow connector to air dry before using.

Vehicle Configuration

Front Camera Removal / Installation

The Spectrum 45™ and lights are held onto the vehicle using a simple clamping fixture. To remove the camera or a light, loosen the clamping M5 x 12 mm SHCS and slide the camera or light out of the fixture as shown below. When reinstalling, ensure the connectors and locking collars are fully engaged – *make sure to properly align the pins on the mating connectors.*



Expansion Range

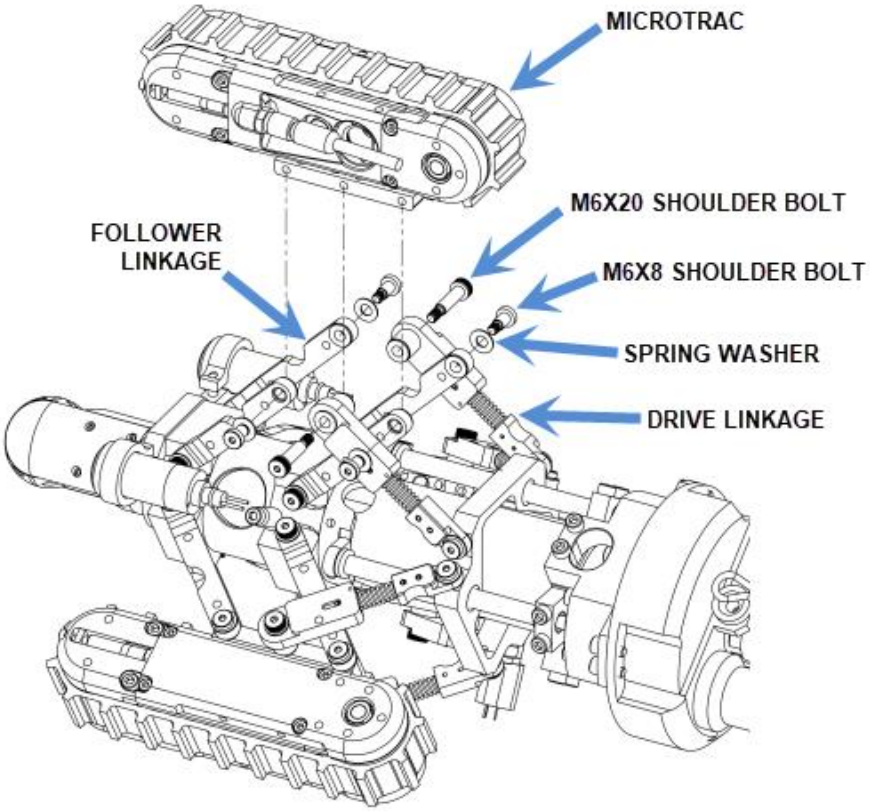
Base Configuration

The Versatrax100™ Vertical Crawler chassis comes standard configured for 200 – 300 mm (8 – 12in) pipe, the Microtracs™ are connected directly to the expansion linkages as illustrated below using the side mounting holes. Note all tracks are connected to the linkages in the same way, whether right or left.

To reconfigure the vehicle back to the standard configuration, do the following as shown below:

1. Connect the front follower linkages using M6 x 8 mm shoulder screws with plastic spring washers beneath the heads.
2. Connect the rear follower linkages using M6 x 8 mm shoulder screws with plastic spring washers beneath the heads.
3. Connect the drive linkages last using M6 x 20 mm shoulder screws.
4. Connect the track connector – *make sure to align the mating pins correctly*.
5. Repeat this procedure for each of the other two tracks.

Track removal is the opposite of installation



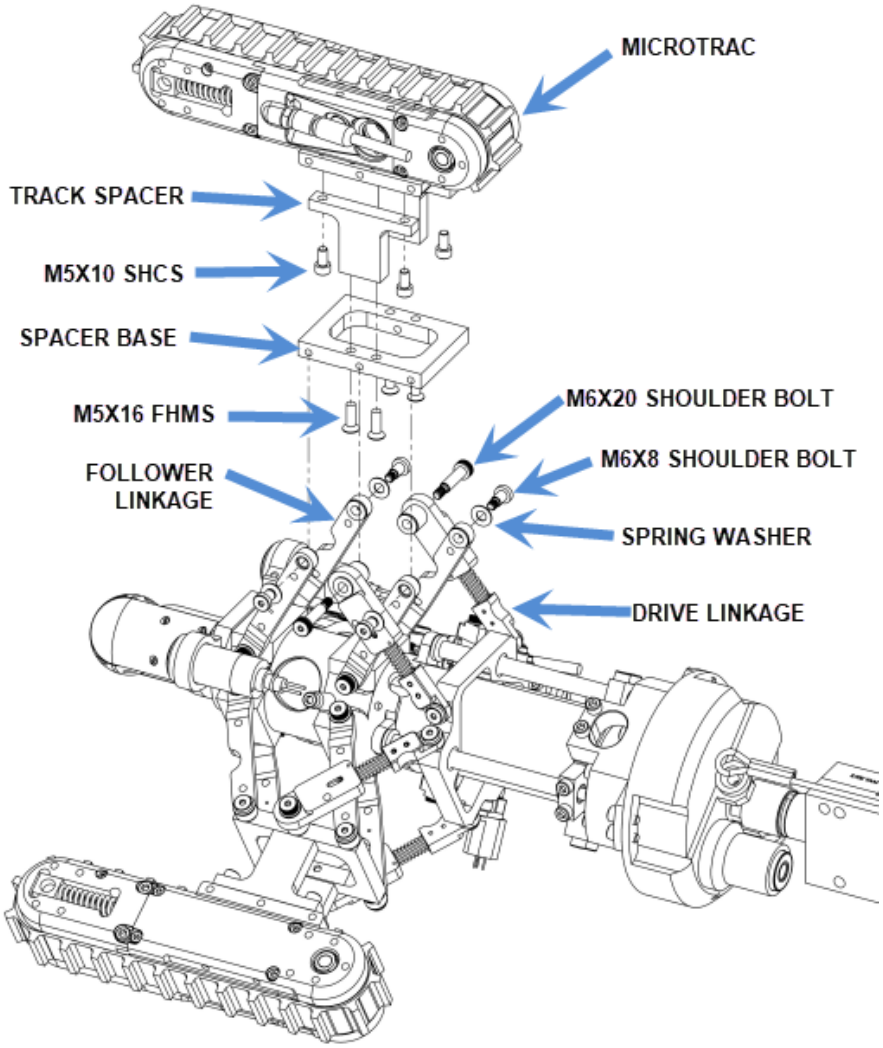
Extension Brackets

To increase the operating pipe size range, 50 mm (2 in) or 75 mm (3 in) extensions brackets can be installed onto the expansion linkages.

To install either size of extension brackets, do the following as shown below:

1. Fasten the correct sized track spacer to the spacer base using 4x M5 x 16 mm FHMS.
2. Attach the Microtrac™ to the extension bracket using 4x M5 x 10 mm SHCS.
3. Attach the spacer base to the expansion linkages as detailed in the previous section.
4. Ensure there is enough cable fed through the chassis to plug in the track. Wires can generally be secured to the long bushing on the driver linkage using a zip-tie.
5. Connect the track connector – *make sure to align the mating pins correctly*.
6. Repeat this procedure for each of the other two tracks.

Bracket removal is the opposite of installation



Operation

Pre-Operations Check

Before each deployment of the Versatrax™ system, ensure everything is completed on the following checklist:

- ❑ Check that the work area has been safely set up.
- ❑ Check that the line voltage available at the worksite matches the equipment setup.
- ❑ Check that power and deck cable connections are correct.
- ❑ Check the vehicle for the following:
  - ❍ Check that the vehicle is in the correct configuration for the deployment.
  - ❍ Check the vehicle for mechanical damage to the chassis or cable harnesses which could affect its operation.
  - ❍ Ensure that all fasteners are in place and secure. In particular, check the fasteners holding on cameras, lights, tracks and tow cable.
  - ❍ Visually inspect the vehicle and Microtracs™ to ensure that the moving parts are free of debris and functional. Make sure the track belt is free of debris and turns freely.
  - ❍ Check the tether and vehicle whips for damage.
  - ❍ Ensure camera viewports are clean.
  - ❍ Check the 801 lights are clean and operational
  - ❍ Check that the lead screws on the raise mechanism have been well lubricated.
- ❑ Check the winch/reel for the following:
  - ❍ Check that nothing will block movement of the level wind shuttle.
  - ❍ Check that the tether has no loose, dangling coils. Dangling coils can propagate as the drum rotates and have the potential to jump the drum. Take care of these before deploying the tether.
- ❑ Power up the system and check the following:
  - ❍ Check for enough SSD drive space for recording.
  - ❍ Check record directories are set.
  - ❍ Check video quality and camera control functions.
  - ❍ Test video recording.
  - ❍ Test main lights.
  - ❍ Test track control.

Post-Operations Check

A Post-Ops inspection should be carried out after every deployment using the following checklist:

- ❑ Inspect the tether for damage as it is reeled in.
- ❑ Visually inspect vehicle for entrained debris or mechanical damage.
- ❑ Test each function to ensure proper operation.
- ❑ Clean the system by hosing it down with water at regular line pressure. Do not pressure wash. The tracks may be cleaned off by hosing them down while running. If the system has been used in salt water, thoroughly rinse the vehicle with fresh water right away.

CAUTION: Do not use a pressure washer to clean the camera. Very high-pressure water can push past seals and flood the camera resulting in electrical damage or personal injuries.

- ❑ Take time to pack the system properly for transport away from the worksite.
- ❑ Store the system in a dry environment.

Note: Ensuring the Versatrax™ system is always stored in good working condition will minimize deployment time for future inspections.

ICON™ & ICON™ RPT

Vehicle control and video recording are accomplished using ICON™ graphical interface controller software. Video playback and reporting are conducted through ICON RPT. **Manuals for these two software packages are included separately.** Controls for recording and snapshot functions are kept on-screen with the camera controls.

- ICON Manual – (Control Interface and Recording)
- ICON RPT Manual - (Reporting, Playback and Video Export)

Power-Up Sequence

Interface Box

After all wiring connections have been made, the system may be powered up. The recommended sequence for power-up is as follows:

1. Power up the control computer and allow time for it to fully boot.
2. Switch on the Interface Box.
3. Turn on the Vehicle Power Supply.
4. Start the ICON control program.

ICON always begins with identification of attached system components (cameras, tracks, etc.). If vehicle power is turned on after ICON is started, the system will not function until ICON is closed and restarted.

ICON Portable Controller

After all wiring connections have been made (as per ICON™ Portable Controller User Manual), the system may be powered up. The recommended sequence for power-up is as follows:

1. Power on System (“SYSTEM” button)
2. Power on Controller (“CONTROLLER” button).
3. Power on embedded PC (“PC” button).
4. Start the ICON control (controller) program.

Dealing With Obstacles

The operator will invariably encounter a range of obstacles in a pipe. Each time the operator must decide if the vehicle can safely pass or if there is risk of getting stuck. Common obstacles include but are not limited to:

- Crushed pipe
- Sand
- Rocks and/or debris
- Roots
- Intersecting service pipes
- Animals and their nests

If the operator is unsure about pipe navigability, he or she should consult with the site supervisor before moving forward.

Inspection Guidelines

The objective of an inspection is to obtain a recording of video and other data for review by the customer or pipe owner. If a recording is lost, fails to record, or is of poor quality the inspection will likely have to be re-done at the operator’s expense. Therefore, it is in the operator’s best interest to verify vehicle operation, video quality and recorder function before beginning each inspection.

A set of video overlay comments and data are usually required depending on the contract or client. Initial comments will usually include the location, pipe number and date. During the inspection the contractor may require certain pipe features or faults to be pointed out along with the distance from the pipe entry.

Conduct a complete inspection of pipe features and faults. For any feature or situation of interest, stop the vehicle and make a complete video survey using the continuous pan feature of the camera. Ultimately, the inspection is conducted for the benefit of the client who is reviewing the footage later on.

Vehicle Recovery

In the event the vehicle becomes disabled while on a mission in a pipe, provision has been made for recovery of the vehicle by pulling it out with the tether. Recovering the vehicle by pulling is a serious operation and can put great demand on the tether system. Listed below are three scenarios where the vehicle may need to be recovered. Loading the tether beyond its maximum safe capacity should be considered only as a last resort.

Note: Prevention is always the best policy. When traveling through a pipe or in any unknown area, carefully watch your monitor.

The vehicle may become stuck if it is traveling through a damaged pipe section or improperly steered around a corner. If the vehicle does become stuck:

1. Determine if it is the vehicle or the tether that is stuck. Look back at the tether with the camera if possible. If the vehicle can back up but the tether will not reel in, the tether is caught on something. Try to look for and fix the cause of the catch *before* putting any more strain on the tether. The operator should use any dexterity available first to free the vehicle without resorting to force.
2. If the vehicle cannot work itself free from a snag, try using *light* tether tension and tractor power simultaneously.
3. If still stuck, try a stronger tether tension.
4. If the vehicle seems to be permanently stuck in the pipe, the supervisor must decide whether to sacrifice the tether in order to pull harder, or to dig the vehicle out.

Troubleshooting

Camera Control Problems

- Not all the auxiliary lights are on.
  - The ICON™ software allows the lights to be controlled independently. Ensure all lights are enabled. Refer to the ICON interface manual.
  - Inspect for blown LEDs.
- Warning: High Intensity. Do not look directly into the lights. Use a welding filter (shade #8) to observe the light elements.
- Camera pan or tilt does not function in one or both directions.
  - Check that the camera is not jammed.
  - If you can hear a motor running but see no movement, there is a mechanical or clutch problem inside the camera. Contact us.
- Camera is moving very slowly.
  - Check the pan & tilt speed in the camera control window. Refer to the ICON user interface manual.

Video Problems

- No video (black or blue background)
  - Interface box is not turned on.
  - Video cables are not hooked up between interface box and computer.
  - Camera connector on vehicle is loose (turn power off first before plugging in camera).
  - Check that the camera harness whip is plugged into the correct socket on the telemetry can.
  - Check monitor input settings.
- Vehicle power is not on.
  - Check for problems with other video components between the computer and monitor.
  - Try a different monitor. Whole days have been spent on field maintenance trips only to discover a faulty monitor.
- Picture is very dark or very bright.
  - Check the light levels of both the camera and main lights.
- Intermittent picture.
  - Check and replace the video cables.
  - Check the monitor is working properly.
  - Check that the camera harness whip is fully plugged in.
  - Check for intermittent breaks in the camera harness cable.
  - Check the tether connectors at both controller and vehicle.
  - Check for tether or slip ring damage by testing tether continuity.
- Picture is blurry, will not focus, or has poor color.
  - This may be a dirty camera view port, or a narrow object lying in front of the view port.
  - Object may be too close to the camera.
- No Rear Video
  - Verify the video connection from the interface box to the computer.
  - This may be a dirty camera view port, or a narrow object lying in front of the view port.

Vehicle Problems

- Vehicle won't steer or vehicle runs backward.
  - Tracks set to the wrong positions.
  - Track reverse setting incorrect in control software.
  - Node ID conflict between one or more devices on the vehicle.

- Tracks will not run.
  - Check the track current feedback (See ICON manual).
    - If current is at 100% and the vehicle doesn't move, then the tracks may be jammed. They could be wedged on an object or jammed with sand. Try reversing the tracks to clear debris. If a jam will not clear you will have to recover the vehicle by pulling it out with the tether.
    - If no current registers, then power or communication is not getting to the tracks. Check all the cable connections.
  - Try power cycling the system.
  - Inspect the vehicle wiring for damage.

  - Check all the system connectors.
  - Try restarting ICON™
  - Listen for the track motors. If the motors run but the track doesn't turn there is a problem with the gearing or shaft pins.
  - Try changing tracks. (ICON will require a restart.)
- Track Raise will not move.
  - Check the linkage between the top linkage and the encoder feedback
  - Check the connector to the camera raise motor.
  - Try restarting ICON.

Reel Problems

- Tether distance does not read correctly.
  - Check that the pressure wheel is pressing the tether against the payout sheave. If the tether is being pulled up from the sheave instead of down, it may be disengaged from the sheave.
  - Check that the units are set properly in the graphical overlay.
  - Recalibrate distance encoder.
  - Ensure that the correct COM port is selected in the control software.

Maintenance

Rinsing and Cleaning

After every mission check to see if the vehicle needs cleaning.

1. If the system has been used in salt water, thoroughly rinse the vehicle with fresh water prior to being stored away. Accelerated corrosion will result if the inspection system is not rinsed properly. Pay close attention to rinsing and cleaning the camera window, LED light dome and the spaces between moving parts and track belts.
2. Use an open hose or tap at regular water line pressure for rinsing. Do not pressure wash the equipment – water will be forced into the camera at these high pressures.
3. Avoid scratching the camera port. Use glass cleaner and a soft cloth to clean the port.

CAUTION: Do not use a pressure washer to clean the camera. Very high-pressure water can push past seals and flood the components resulting in electrical damage or personal injuries.

Periodically:

1. Use a damp cloth or spray cleaner for the power supply / controller box. The box must never be sprayed down or immersed in water. Unplug the controller before cleaning.
2. For general cleaning of the cameras and tracks, use a mild detergent.
3. Clean the expansion lead screws using a mild degreaser and re-grease with Molykote G1502FM or similar grease.

Fuse Replacement

The controller and power supply contain panel mount fuses for both AC and DC voltages. These fuses are for the safety of the operator(s) as well as to protect the equipment from damage. If a fuse blows, stop and look for possible causes. Causes might include cable damage, water incursion or improper connections. *See the controller manual for fuse replacement.*

Fuse values have been carefully selected for their application. Always replace the fuses with the same type and rating.

WARNING: Disconnect the power source before checking or replacing fuses.

Microtrac™ Maintenance

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

Camera Maintenance

Refer to Spectrum 45™ manual for camera 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 Technologies. 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.