



## INUKTUN MINIMAG™

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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. 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.

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## Description

The Inuktun Minimag™ is a magnetic tracked crawler capable of driving vertically or horizontally inverted along ferrous (iron based) surfaces. Additionally, the magnet modules allow the vehicle to pull longer lengths of tether than what could normally be achieved without magnets when travelling in steel pipes or on steel decks. The crawler has mount points for two Crystal Cam® cameras, a Spectrum 90™ and two 101 lights. The vehicle uses two 6000 series Minitracs™ for motive power that are mounted underneath the main chassis plate. The vehicle uses two powerful rare earth magnet modules that can be moved up and down to accommodate different pipe diameters and strength requirements.

This Minimag is intended to be controlled with a Versatrax™ power supply/controller.

## Specifications

<b>Depth Rating</b>	60m (200ft)
<b>Weight</b>	45 kg (100 lb)
<b>Cameras Supported</b>	Spectrum 90™, Crystal Cam®
<b>Tracks</b>	2 x 6000 series Minitracs™
<b>Lights</b>	2 x 101 Flood
<b>Payload</b>	4.5m·kgf (400in·lbf), 40kg (90lb) MAX*
<b>Minimum Driving Surface Radius</b>	1.5 m (60 in) **
<b>Control System</b>	Versatrax™ controller

<b>Power Requirements</b>	110/220 VAC (Switchable), 50-60Hz, 800W
<b>Operating Temperature</b>	0 ° - 50 °C (32 ° - 122 °F) Dependent on operating conditions. Ask your sales expert for more information.
<b>Storage Temperature</b>	-20 - 60° C (0 - 140° F)

\*Max payload is based on multiple variables; please refer to the Payload Calculation section.

\*\*For driving the vehicle on curved surfaces, the magnets must be spaced properly; see the Magnet Spacing section. These are estimates only, and thorough testing for magnetic adherence in all situations should be performed prior to a full inspection run.

## Safety

### Personal Safety Equipment

Observe all safety regulations required by law in your place of work. These typically include:

- Traffic safety protocols
- Standard personal safety equipment including:
  - Steel toed boots
  - Safety vests
  - Hard hats
  - Gloves
- Heavy lifting procedures
- Overhead lifting protocols.

### Equipment Safety

Some precautions should be taken to protect the Minimag™ system from damage.

- Repair damaged wires before operating the vehicle. A short circuit may damage the power system, telemetry system, cameras, or any attached equipment.
- Never drop the vehicle. Although built tough, the vehicle is heavy and can suffer structural damage when dropped.
- Prevent impact to the front of the 801 lights and the Spectrum 45™ camera as they can suffer damage.

### Operational Safety

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- All personnel operating or maintaining this equipment must read and understand the operations and maintenance manual prior to system operation.
- All personnel operating or maintaining this equipment must be competently trained.
- Appropriate personal protective equipment (PPE) must be worn while operating and maintaining the equipment.
- **Caution: Spark Hazard.** Under no circumstances should this equipment be used in a potentially explosive atmosphere.
- **Caution: High Voltage.** The tether carries 72VDC and 120VAC to the rear harness block; the track and camera whips carry 72VDC from the harness block, and the light whips carry 120VAC. Keep the tether capped at all times when not installed on the vehicle. Follow the guidelines for preventing tether damage. Do not operate with a damaged tether or device whips. 72VDC/120VAC can cause serious injury or death. Repair damaged wires before operating the vehicle. A short circuit may damage the controller, cameras, or any attached equipment.
- Disconnect the power source before servicing the product; otherwise, damage or fatal injury may result.
- **Caution: Trip Hazard.** Never stand on the tether. The vehicle and winch are strong enough to pull it out from underneath you and cause you to fall. Standing on the tether may also cause damage to the internal conductors and decrease the life of the protective jacket.
- **Caution: High Temperature.** Both the integrated harness block and the Minitracs™ may become extremely hot during operation. Always wear protective gloves when handling these parts of the vehicle after they have been in use.
- **Caution: Intense Optical Radiation.** The 801 lights and Spectrum™ camera lights are extremely bright. Never look directly at the lights or even from a shallow angle. Always use a welding filter (shade #8 or higher) when inspecting the LEDs.
- **Caution: Pinching Hazard.** There is a possibility that one's fingers could be drawn into the tracks should they be activated when the vehicle is being handled. To avoid this hazard do not connect the tether to the portable controller until the vehicle is configured, placed and ready to use. If the vehicle is being tested, do not connect the tether until handling of the vehicle is complete. If the vehicle is permanently installed onto a van or trailer and the tether cannot be disconnected, turn off the power.
- Establish a communication protocol between the person handling the vehicle and the operator at the computer. It is the operator's responsibility to check and ask if it is safe to power up the vehicle or initiate movement.
- **Caution: Extreme Magnetic Field.** The magnet modules can induce a large enough force to sever fingers! Always keep vehicle away from ferrous objects and keep hands clear of the magnets. Also keep any sensitive electronic or magnetic devices away from the vehicle.

## System Setup

## Working Environment

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The portable controller is to be used in a **dry, covered** environment only. These components are not waterproof. Keep all cords and cables away from water. The recommended controller and power supply operating temperatures are between 0 °C – 50 °C (32 °F – 122 °F).

The **tether and vehicle** are depth rated to 60 metres (200 feet) of water. The tether connector is a dry-mate type which must be dry when connected to the vehicle. 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 in the recommended operating temperature range of 0 °C – 50 °C (32 °F – 122 °F).

System storage temperatures are between -20° C - 60° C (0° F - 140° F).

## System Power & Line Voltage Set

### Power Requirements

**Line Voltage:** When installing the system in a new location always check the line voltage selection switch located next to the AC power cord on the controller. This switch may be set for 110VAC or 220VAC power input and must match the line voltage of the power source. Incorrectly setting this switch will damage the controller.

If your system includes a powered cable winch refer to the winch manual for instructions on setting its input voltage. An incorrect voltage at the winch will damage the motor controller.



FIGURE 1: AC LINE VOLTAGE SELECTION

**Power Requirement:** The following figures are for a 1500-foot system and take component efficiency and tether power loss into account.

Vehicle and Controller = 800W. Winch = 1000W. Total system = 1800W peak load.

With no winch the system can operate comfortably on a 1000W supply or inverter. With a full system we recommend a minimum of 2000W supply or inverter. Remember to account for the power used by your monitors and video recorders.

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The Versatrax™ controller is designed to support our tracks, cameras, and lights. Powering other devices or equipment off the Versatrax controller is not recommended.

## 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.

## Video Hook-Up

The external video connectors on your Versatrax system use RCA style video jacks similar to most monitors and video equipment. An RCA style video cable has been supplied with the controller. Some industrial monitors may use a BNC style video jack. An RCA to BNC adapter has been supplied for this purpose.

Video from your Versatrax controller may be connected directly to the video input of a television, or other recording device. Please refer to your television or recording device owner's manual.

## Winch Installation

If your system includes an AC powered winch, refer to the winch manual for installation instructions.

## Auxiliary Device

There is provision in the Versatrax system to allow add-on devices such as a rear facing camera, sonar, or other vehicle electronics. A twisted pair in the tether is reserved for telemetry from this device. The controller must be configured by setting a dip switch on the main control PCB (see Figure 4 below). The standard configuration is to use this twisted pair for the rear camera.

- If the vehicle has a second camera, set the auxiliary dip switch to the position marked "rear video". This is the default position shipped from the factory. The switch must be in this position in order to receive video from a secondary camera.
- If the spare conductors are to be used by other devices, such as sonar or on-board sensors, the switch must be set to the position marked "spare cond." This will route the signals to the "Desktop Controller" connector on the controller.



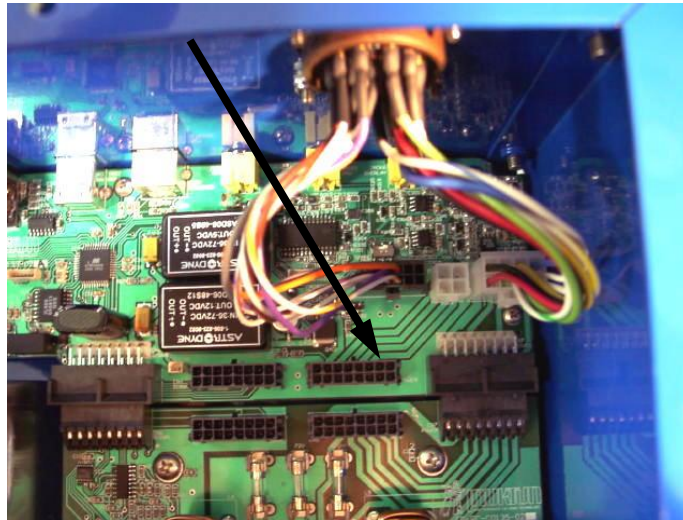


FIGURE 2: AUXILIARY DIP SWITCH

### Vehicle Tether Connection

It is very important to properly connect the tether and strain relief to the vehicle. Improper connection may result in costly tether damage. See the figures below.

1. The tow cable must be securely attached to the harness block.
2. The other end of the tow cable clips to the Kellems grip strain relief. Ensure the Kellems grip is adjusted properly to allow some tether slack as shown.
3. Plug the connector all the way in. It is important for the longevity of the connector that it be kept free of dirt, have good o-rings and be mated carefully.
4. It is important to adjust the Kellems grip to allow slack in the tether connection, no matter what angle the tether approaches the vehicle.
5. Tether connection to the parallel, and in-line vehicles are identical.
6. When the tether is not plugged in, it should be capped to prevent dirt and moisture from entering the pins.



TETHER AND TOW CABLE CONNECTION

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KELLEMS GRIP HOOK-UP

## Magnet Removal/Installation

The Minimag™ comes equipped with two extremely powerful magnet modules. It is recommended that these modules remain on the vehicle to minimize handling and potential injury. If they must be removed take the following precautions:

1. Keep any sensitive electronic or magnetic devices away from the magnets
2. Work in an area away from all ferrous materials to minimize the risk of accidental magnetic adherence
3. Always store magnet modules away from each other and never bring them into contact with each other.



**Warning:** Magnet modules pose a serious pinch hazard and may become permanently attached if allowed to make contact.

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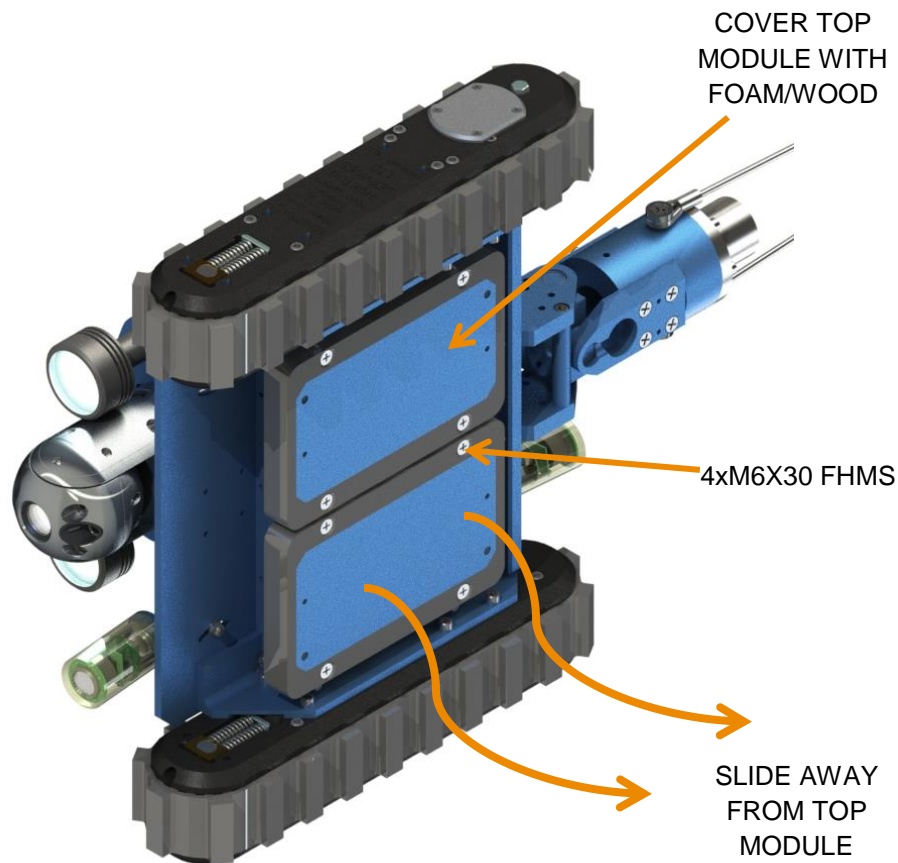


FIGURE 3: MAGNET MODULE REMOVAL

To remove the modules from the vehicle, do the following:

1. Lay the vehicle on its side; bracing may be required.
2. Cover the top magnet module with foam, wood or some other non-ferrous material (at least 50mm/2in thick is required).
3. Remove the 4x M6X30 FHMS from the bottom magnet module. **MAKE SURE TO HOLD THE MODULE INTO POSITION SO IT DOESN'T 'JUMP' ONTO THE OTHER MODULE!**
4. Very carefully slide the loose module down and away from the still attached module and store in a safe place.
5. The remaining module may now be removed.

Installation is the exact opposite of removal.

## Magnet Spacing

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The Minimag™ vehicle uses two very powerful permanent magnet modules to adhere the vehicle to a wall or pipe. In order to change the magnetic adhesion force, the spacing of the magnets away from the driving surface can be changed by using the following procedure:

1. Loosen the magnet height adjustment locking screws (4x M5 SHCS).
2. Tighten (increase height / decrease force) or loosen (decrease height / increase force) the magnet adjustment screws (4x M8 HEX BOLTS) by a half turn at a time, in a star pattern across the four corners.
3. Once the desired height is reached, re-tighten the magnet height adjustment locking screws.

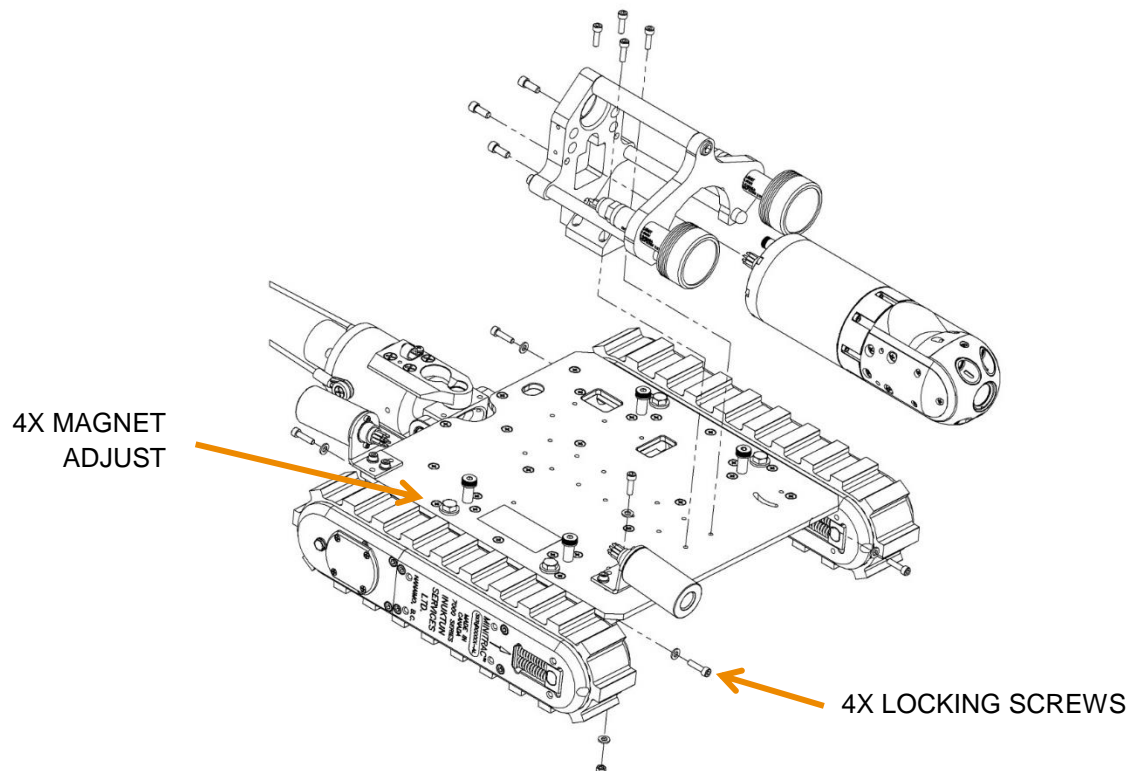


FIGURE 4: MAGNET SPACING ADJUSTMENT

If the vehicle is being driven inside a pipe, the magnets should be lowered to account for the specific pipe diameter. All situations are unique and thorough testing should be done to make sure the vehicle will remain adhered to the wall in all situations before inspections are undertaken.

Conversely, the magnets should be raised if driving on the exterior of a pipe. Again, thorough testing for adherence is recommended prior to a full inspection.

The minimum pipe diameters for both internal and external driving is estimated at 3m (120in).

## Peripheral Devices

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## Minitrac™ Mounting

The Minimag™ comes equipped with two 6000 series Minitracs™. In order to remove the tracks, the magnet modules must first be removed (see Magnet Removal/Installation). Once the magnets are removed the tracks can be dis-mounted by removing 6x ¼-20 SHCS from the inner mounting rails. Pull the tracks free and disconnect the track connectors.

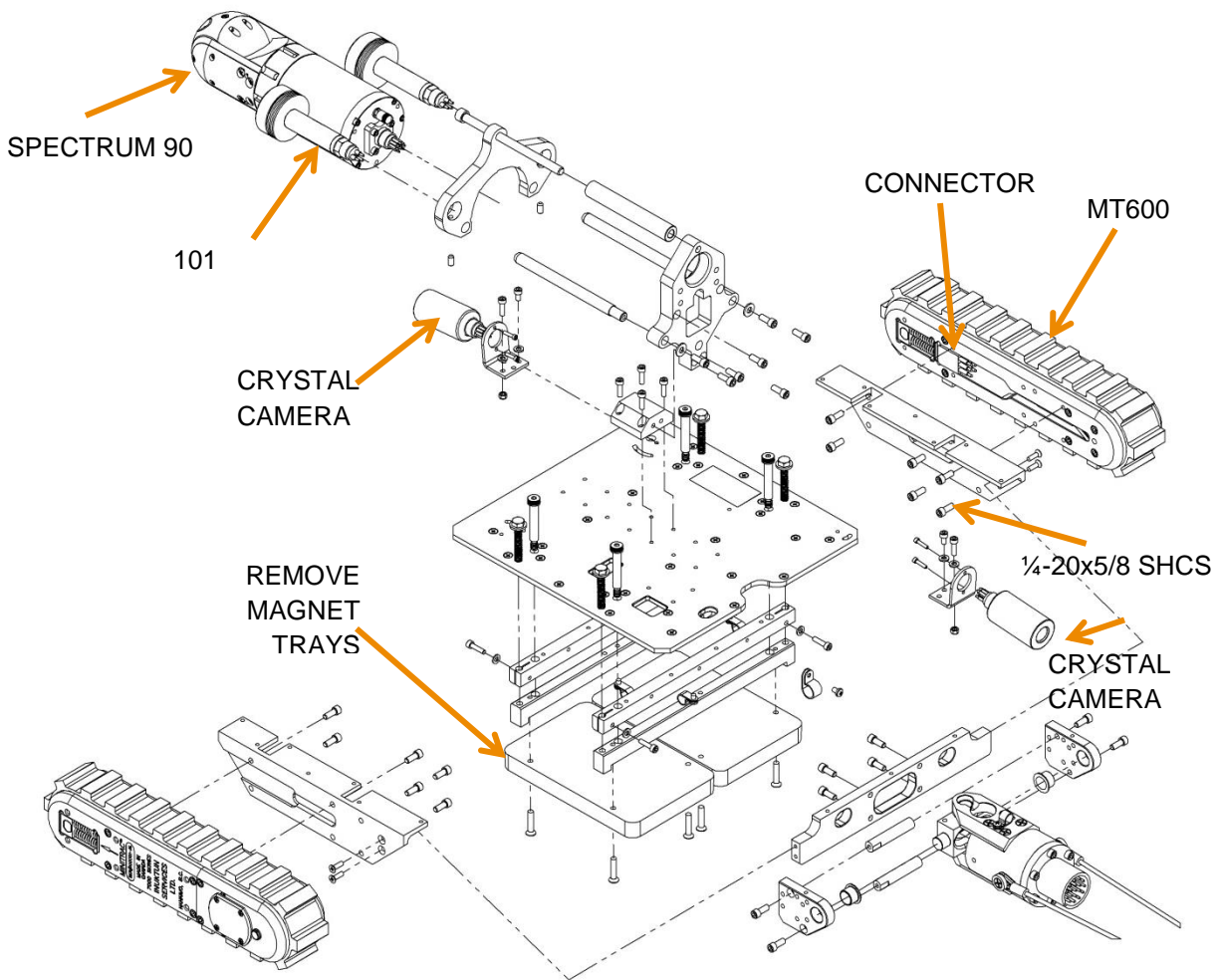


FIGURE 5: MINITRAC™ MOUNTING

Installation of the Minitracs™ is opposite of removal – make sure to grease the male connector with silicone lubricant

## Minitrac™ Control

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It is recommended to use spring replacement blocks on the Minitracs™ due to reverse tensioning of the belts during tight pivot maneuvers. See the user manual for the Minitrac for more information regarding spring replacement blocks.

When the Minimag™ vehicle is operating in a vertical position, the downward force on the chassis due to the weight of the Minimag may cause the Minitracs to back-drive and creep down the vertical surface. Loss of power to the system will cause the Minitracs to quickly descend a vertical surface. The Minimag vehicle can be ‘parked’ on a vertical surface by orientating the tracks sideways instead of up/down.



**Warning:** The Minitracs™ on the vehicle may back-drive and creep downwards while operating on a vertical surface.

## Light/Camera Installation

The vehicle comes with two 101 flood lights and the option for an Spectrum 90™ camera mounted into an integrated mount assembly. There is also a mounting location for a pivoting rear facing Crystal Cam® and an optional forward-facing Crystal Cam® if the Spectrum 90 is not used. The SP90/light mount can be located in multiple positions.

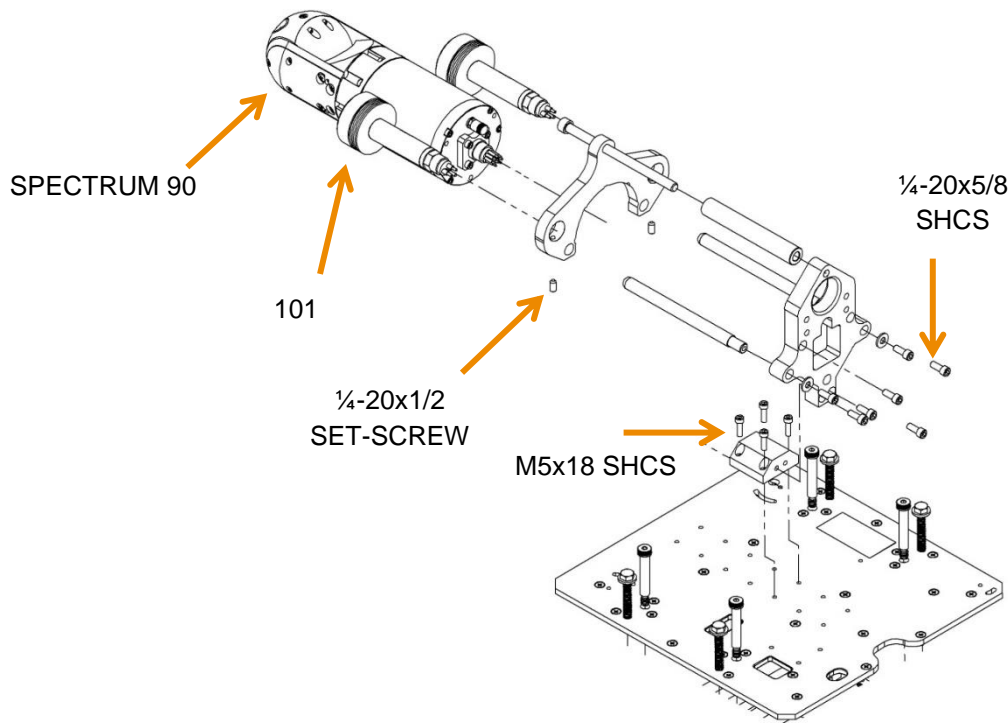


FIGURE 6: LIGHT / SP90 CAMERA MOUNT

To remove the 101 lights, disconnect the connector whip and loosen the 1/4-20 set-screw; slide the light forward out of the mount.

To remove the Spectrum™ camera, disconnect the connector whip and remove the 3x ¼-20x5/8 SHCS at the rear of the mount – the camera may then slide forward and away from the mount.

To adjust the position of the mount camera and light mount the Spectrum camera must first be removed. With no camera installed remove the 4x M5x18 SHCS from the base of the mount and slide the mount forward or backward to the desired position; re-install with the M5 SHCS.

A camera video adaptor whip is provided to support the optional forward-facing Crystal Cam®. The connector whip labelled 'CC Video Adaptor' must be installed in-line with the camera whip for the forward-facing Crystal Cam® to work.

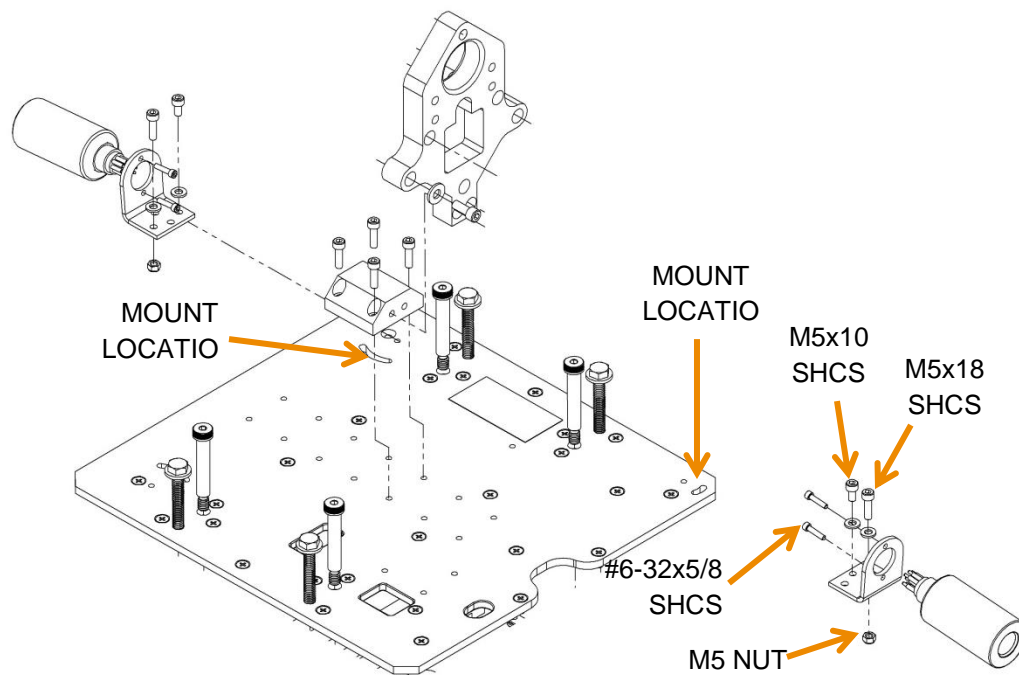


FIGURE 7: CRYSTAL CAM® MOUNTS

The main chassis plate has locations on the front and back for optional Crystal Cam®. To mount and adjust the cameras do the following:

1. Install the camera mount onto the chassis plate using the M5 SHCS.
2. Pivot the bracket into the desired position and tighten the M5 nut.
3. Install the Crystal Cam® using 2x #6-32x5/8 SHCS – make sure camera orientation is correct (there is a 'TOP' label on the camera)
4. Install the connector whip and optional 'CC Video Adaptor' whip – make sure to grease camera connector with silicone grease and make sure mating collar is secure

## Payload Calculations

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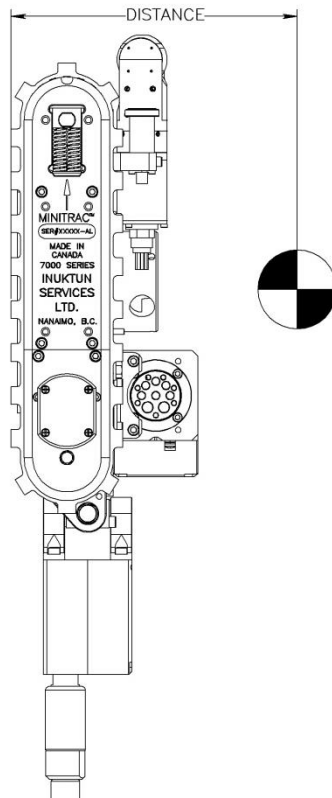


FIGURE 8: PAYLOAD CALCULATION

The maximum payload calculation is based on the magnet's ability to resist the gravitational moment (or torque) induced at the driving surface. When payload weight and/or distance from the wall is increased, the vehicle tries to pivot away from the wall and the magnets resist this moment. When the maximum payload moment is exceeded, the vehicle may fall off the driving surface during operation. The payload moment may be calculated as follows:

$$M = W \times D \leq 4.5\text{kgf} \cdot \text{m} [400\text{lbf} \cdot \text{in}]$$

Where  $W$  is the weight of the payload, and  $D$  is the distance of the centre of gravity of the payload from the driving surface. Note that the chassis and tether weight has already been accounted for and does not have to be included in customer payload.

The above calculation is for operation on **flat surfaces**. Payload calculations are de-rated for operation on curved surfaces.



## Fall Arrest

Due to the weight of the Minimag™ vehicle, the Minitracs™ will back drive and not hold the position of the vehicle during power loss or power shutdown. A lifeline or fall arrest system should be used at all time when the vehicle is navigating on a vertical or inverted horizontal position.

A Kellems grip (wire mesh grip) on the tether has been provided to attach a fall arrest system. Another optional fall arrest attachment point is the top handle of the SP90/light mount.



**Warning:** Fall arrest system should be used during vertical or inverted horizontal operation.

## 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 data from the sensors. If the tether becomes damaged from improper use, poor handling or an accident, the vehicle may become crippled or inoperable. This is a serious situation because of the cost for tether repairs, as well as significant downtime and loss of production. 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.

**Note:** For the standard Minimag system, the minimum tether bend diameter is 250mm (10in).

Never kink the tether. A kink will permanently bend a cable and may break a wire or fibre internally. Take precautions to never allow the tether to kink. Kink situations may occur when there is slack tether with closing loops, or when coils slip off a full drum.

Do not snap load the tether. Your tether has a maximum safe working load of 200kgf (450lbf) of tension. 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.

Never fully un-spool the tether. 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 paid out.

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## Connector Handling

With regards to system reliability, connectors come next after the tether in terms of importance. Though not quite as expensive to replace as a whole tether; a damaged connector can still represent significant cost in downtime and re-termination which could easily have been prevented. To this end, we recommend the following steps to help prevent damage to connectors.

When plugging in a connector:

- Inspect for dirt in both sides of the connectors. Do not plug in a dirty or damaged connector.
- Inspect for bent or burnt pins.
- Visually align the key-way or locating pin first before plugging in. **Do not** blindly jam and twist.
- 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, and burn-out.
- Use locking collars where available. In general, locking collars need only be screwed on finger tight.
- In general, all connectors on the vehicle are wet pluggable.
- Install dummy plugs on unused connectors.
- Regularly apply silicone grease to the connectors to keep them from seizing.
- Never use WD-40 or similar solvent-based fluids as this can cause serious damage to connectors.

## Shipping

The Minimag™ vehicle uses two very powerful permanent magnet modules to adhere the vehicle to a wall or pipe. Always use a steel box to shield magnets during shipping.



**Warning:** Always use a steel box to shield magnets during shipping.

## System Operation

### Pre-Operations Check

Before each deployment of the Minimag 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.

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- Ensure that all fasteners are in place and secure. In particular, check the fasteners holding on cameras, lights, tracks, and the harness block.
- Visually inspect the vehicle and Minitracs™ 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, light, and laser ports are clean.
- ❑ Check the 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.
- ❑ Check fall arrest system.
- ❑ Power up the system and check the following:
  - Check for sufficient SSD drive space for recording.
  - Check record directories are set.
  - Test video recording.
  - Test laser lines.
  - Test auxiliary lights.
  - Test track control.
  - Test camera 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.
- ☐ Take time to pack the system properly for transport away from the worksite.
- ☐ Store the system in a dry environment.

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



**Caution:** Use regular water line pressure to rinse. Do not use a pressure washer. The high-pressure water jet can push past the seals.

## Power-Up Sequence

Make sure all the equipment is properly connected before powering up. Once turned on, the controller will run through a brief power up cycle. A start-up screen (discussed in the next section) will display choice of crawler type and tether length. When this screen is cleared, the controller is ready for operation.

If the system power is cycled off and back on quickly, the video overlay may not initialize properly. If this occurs, turning the controller off for five to ten (5-10) seconds will allow the display to reset itself.

Always power the system down before connecting or disconnecting any equipment. In particular, never connect or disconnect the camera with the power on.

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## Driving the Vehicle

When driving the vehicle, the operator should always be conscious of things that could cause the vehicle to disengage from the driving surface, either by drastically increasing magnet gap or overcoming the magnetic force entirely. These include the following:

- An external or internal pipe diameter too small for the vehicle.
- When driving on the outside of a pipe or curved surface, do not drive transverse to the curves centre line as this reduces the footprint of the vehicle and decreases stability.
- Welds or obstacles that is too large for the vehicle.
- Inward bulges or curves that increase magnet distance.
- Sheathing or coatings that increase magnet distance.
- Tensioning the tether at a large angle from the driving surface (approaching perpendicularity).
- When driving the vehicle face downwards, the tether may point perpendicular from the wall and act like a lever. This may result in increased possibility of the vehicle pulling away from the wall.

Always try to minimize the above risks to avoid system damage.



**Warning:** Fall arrest system should be used during vertical or inverted horizontal operation.

## 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.

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## Troubleshooting

### Camera Control Problems

1. 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.

2. 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 Eddyfi Technologies.
3. Camera is moving very slowly.
  - Check the tilt speed in the camera control window. Refer to the ICON user interface manual.

### Video Problems

1. 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 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.
2. Picture is very dark or very bright.
  - Check the light levels of both the camera and main lights.
3. 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.

4. 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.

## Vehicle Problems

1. Parallel vehicle won't steer or runs backward.
  - Chassis type is set incorrectly. Refer to the crawler configuration menu to set the chassis type.
  - One or more track reversals are set.
2. Tracks are running too fast or too slow.
  - Re-zero the joystick calibration. Refer to the calibration menu to zero joysticks.
  - Verify tether resistance settings.
  - Verify track type. Refer to crawler configuration menu to set track type and tether resistance.
3. Tracks running or creeping even with joystick centered.
  - Re-zero the joystick calibration. Refer to the calibration menu to zero joysticks.
  - Tether resistance is set incorrectly. Refer to crawler configuration menu to set track type and tether resistance.
4. Tracks slow down excessively when under load.
  - Tether resistance is set incorrectly. Refer to crawler configuration menu to set track type and tether resistance.
5. Tracks run out of control or speed up when under load.
  - Tether resistance is set incorrectly. Refer to crawler configuration menu to set track type and tether resistance.
6. Tracks will not run.
  - Check the current meters.
    - If current is at 100% then the tracks may be stalled. They could be wedged on an object or jammed with sand. Try reversing the tracks to clear any debris. If a jam will not clear, you will have to recover the vehicle by pulling it out with the tether.
    - If no current is registering then power is not getting to the tracks. Check all the cable connections.
  - Try changing tracks.
  - Inspect the vehicle wiring for damage.
  - Check all the system connectors.
  - Listen for the track motors. If the motors run but the track doesn't turn, suspect a mechanical fault in the drivetrain. Refer to the assembly diagram in the track drawing package.
7. Main lights don't function even when the dial is turned to maximum.
  - Check all the cable connections.
  - Inspect for blown bulbs. See your manual on how to change the bulb.
  - Ensure there is no water in the lights. This can cause the light fuse to blow.
  - Check the light fuse on the front panel.
  - Verify the light whips are plugged in fully and any unused whips are fitted with dummy plugs.

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- Check for tether or slip ring damage by testing tether continuity.

## Tether Re-termination

Tether termination is a specialized service beyond the scope of this manual. Contact your local representative if the tether is damaged or requires re-termination.

## 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.

Inuktun Services Ltd. (Canadian Headquarters and Manufacturing Location)

2569 Kenworth Road, Suite C

Nanaimo, BC, V9T 3M4

CANADA

TF 1.877.468.5886

T +1.250.729.8080

info@eddyfi.com

www.eddyfitechnologies.com

Eddyfi Technologies – US (American Authorized Distributor and Service Centre)

812 W 13th Street

Deer Park, TX, 77536

USA

T +1.281.542.3292

info@eddyfi.com

www.eddyfitechnologies.com

## 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.

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## 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.

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## 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.

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