

INUKTUN NANOMAG™

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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 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 NanoMag™ crawler is a custom video inspection vehicle for confined spaces. The vehicle features a worm-drive NanoTrac crawler platform with front and rear color cameras. Both cameras have their connections made in the center cross section of the frame and are mounted low between the tracks giving the vehicle an overall height of two (2) inches. The tether has a length of 100 feet (30 meters) and is terminated inside the left rear frame portion where it also is restrained. The vehicle is equipped with 10-barrel style magnets that can be found at the bottom of the vehicle behind two retainer plates. This allows the vehicle to crawl up and down a steel wall in any direction and operate completely inverted on a reasonably smooth surface.

The NanoMag crawler features a full function pan and tilt front camera with manual focus that can focus in on an object less than one (1) inch away. It is operated from the controller as well as the pan and tilt functions as well as the six (6) LEDs. The lights are fully adjustable in intensity from off to bright. The rear camera is fixed, as is the focus setting. Focus has been preset from six (6) inches to infinity.

Specifications

Front Camera	Spectrum 45™ pan and tilt camera
Pick-up Element	1/4" CMOS (NTSC or PAL)
Lens	3.6mm
Resolution	420 TV Lines (Horizontal)
Illumination	0.2 lux

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Focus	½" to ∞
Rear Camera	
Rear Camera	Crystal Cam®
Pick-up Element	1/4" CCD (NTSC or PAL)
Lens	3.6mm
Resolution	380 TV Lines
Illumination	0.5 lux
Focus	6" ~h
NanoMag™ Crawler	
Dimensions – (L x W x H)	224 x 105 x 50 mm (8.8 x 4.1 x 2.0 in) (inline)
Weight	2.27 kg (5 lb)
Speed	2.5 m (8 ft) per minute
Tether Length	30 m (100 ft)
Operating Temperature	0 ° - 50 °C (32 ° -122 °F) Dependent on operating conditions. Ask your sales expert for more information.

Safety

- 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.
- Under no circumstances should this equipment be used in a potentially explosive atmosphere.
- 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.
- The equipment must only be operated in a dry environment.

- Due to the varying range of operational requirements and environmental factors encountered at different locations, it is recommended that a Task Based Risk Assessment is performed before deploying the equipment.

Caution: Disconnect the power source before servicing the product; otherwise, damage may result.

System Setup

Working Environment

The NanoMag™ system is to be used in a dry, covered environment only. The controller, tether and vehicle are not waterproof. Keep all cords and cables away from water.

Recommended operating temperatures are between 0 ° and 50 °C.

Controller System Options For Nanomag

The NanoMag vehicle is designed to be powered and operated using the Versatrax™ control system. Several controller options are required for proper operation of the NanoMag. These are:

- Pan / Tilt Speed must be set to AUTO.
- Track Reversal must be set to LEFT.
- Track Type must be set to NanoMag .
- Chassis Type must be set to PARALLEL.

A number of Versatrax controller functions are not used with the NanoMag system and can be ignored. These are:

- Encoder Functions
- In-Line Chassis Configuration
- Master/Slave Mode
- Pan & Tilt Camera Feedback
- Zoom
- Aux AC Lights Control Knob

Avoiding Tether Damage

The tether is the most vulnerable part of the NanoMag system. Tether damage is a serious matter but is generally avoidable through proper handling. As a precaution, we recommend that anyone using or handling the NanoMag system read and understand the Caring for the Connector section before working with the system.

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System Operation

Pre-Operations Inspection

Before each mission:

1. Ensure that all fasteners are in place and secure.
2. Check all the controller connections.
3. Check that there is no mechanical damage to the vehicle and tether.
4. Power up the system and test each function to ensure proper operation before sending it on its mission.
5. Check that the Vehicle Type is set to NANOMAG.

Warning: Vehicle type must always be set to NANOMAG as motor damage will occur if the vehicle type is wrong (The 24-Volt motor will be sent 48 volts).

Post-Operations Inspection

At the conclusion of each mission:

1. Visually inspect the vehicle for damage or entrained debris.
2. Test each function to ensure proper operation.
3. If the mission is totally complete, power down the system.
4. Clean the system and store it properly in a dry environment for next use.

Note: If the NanoMag™ is put away in good working order, deployment time is minimized the next time the vehicle is needed.

Controller Operation

Refer to the Versatrax™ controller manual for controller setup and operating instructions.

Note: The portable controller routes rear (AUX) video directly to the built-in monitor and recorder. Consequently, the Auxiliary Video jack on the portable controller is disabled.

Maintenance

Changing a Track Belt

The NanoMag can be outfitted with either a low-profile belt for magnetic operation, or with a deep lug belt for non-magnetic operation.

Note: For easy identification, the idler wheel has six (6) screws versus four (4) screws in the drive wheel.

1. Remove the six screws from the idler wheel cover and remove the cover.
2. Loosen the idler screw (Allen Flat Head) using a 5/32" Allan key.
3. Slip the belt off the idler wheel.

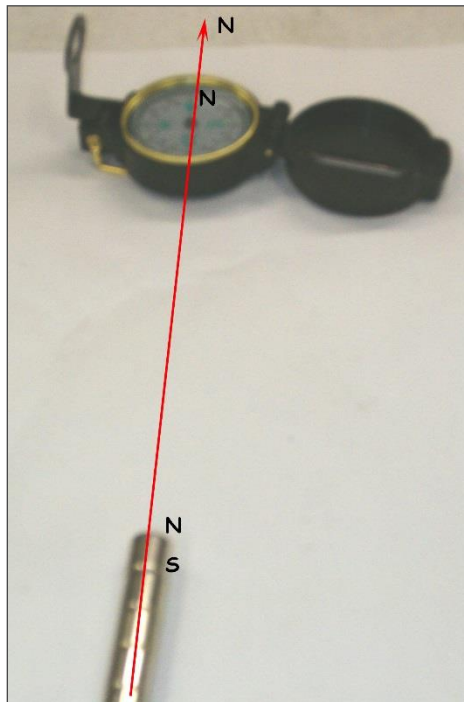
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4. Install the new belt.
5. Tension the new belt by pulling forward on the idler wheel and then tightening the Allen Flat Head idler screw.

Re-install the wheel cover and tighten the six (6) screws again.

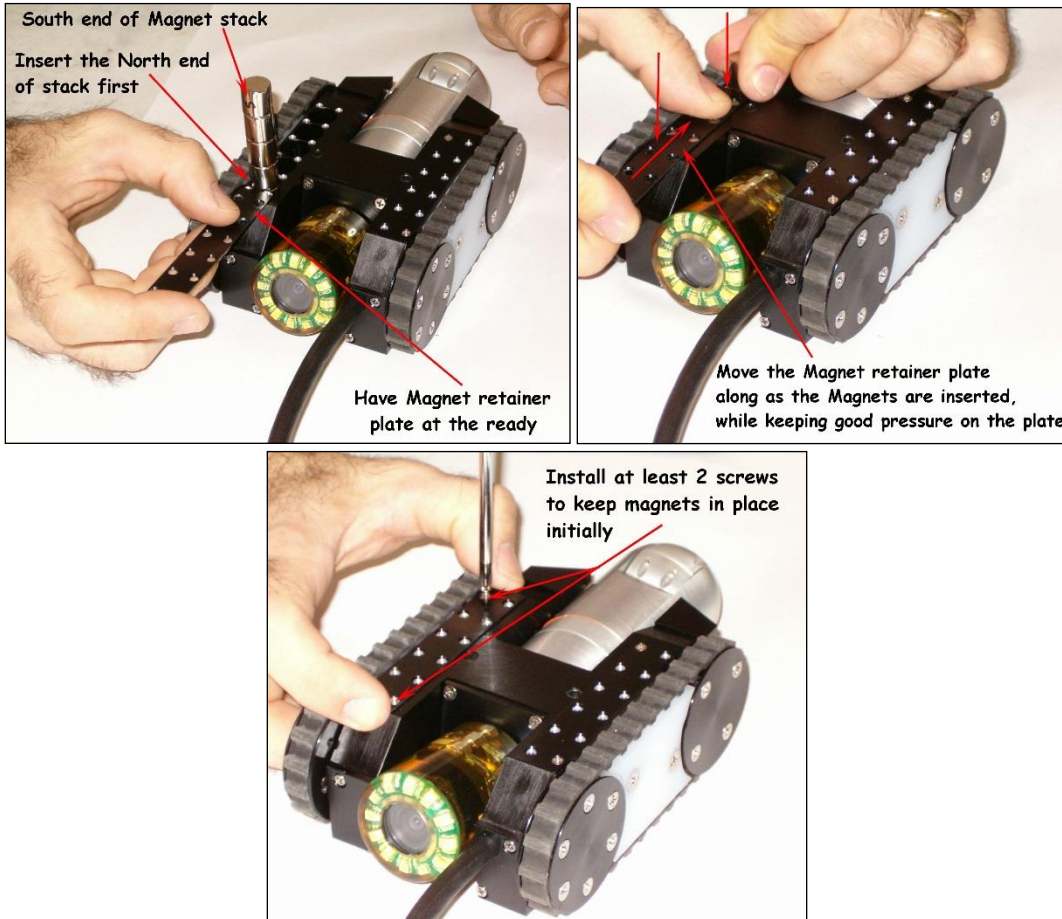
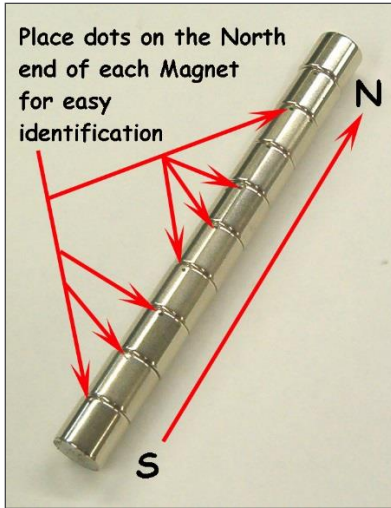
Magnet Installation and Removal

The magnetic strength of the vehicle can be varied by adding or removing magnets.



1. Determine North and South of each individual or entire stack of magnets. Refer to the photograph above.
2. Using a compass, align it with the magnets as show. When the needle shows 'North', the top of the magnet closest to the compass will be north as well. Consequently, the bottom end of the stack will be the 'South' end.
3. Mark the stack with an 'N' and an 'S' accordingly.
4. Mark each magnet with a black dot at the 'North' position.

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5. Follow the photographs above for the insertion of magnets. To remove magnets, reverse the procedure.

Warning: These magnets are very powerful. When removing the screws from the magnet retainer plate, maintain good pressure on the plate. Failing to do so will allow the magnets to jump out and could easily pinch or cut your fingers.

Caring For The Tether

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, Eddyfi offers the following tether handling tips:

Never step on the tether. Trampling the tether underfoot may crush conductors, leading to premature failure. Trampling is also abrasive to the tether jacket. Trampling fosters the wrong attitude toward the tether. Remember that this is an expensive multi-conductor tether, not a common electrical extension cord.

Never allow passenger or utility vehicles 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 a winch drum and any pulleys or tackle supports the tether beyond its minimum bend diameter. For an extended fatigue life, the minimum bend diameter should be considered larger.

Never kink the tether. A fully bent back kink causes local but permanent deformation in the tether. This can be serious because accelerated wire fatigue is subsequently concentrated at the kink location. 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. 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 transport device is suspended from a swinging deployment crane.

Avoid loading the tether unnecessarily. Unnecessary large loads will only shorten the fatigue life of the tether.

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Rear Camera Installation

To install the rear camera:

1. Attach the mounting plate (ME-MP-XAM0045-00) onto the camera using the bottom hole only. Ensure the camera is the right way up with the word "TOP" visible at the top of the camera.
2. Attach the micro-fit connector from the camera to the vehicle.
3. Attach the plate and camera to the vehicle using three #6-32 x 3/8" socket cap screws.

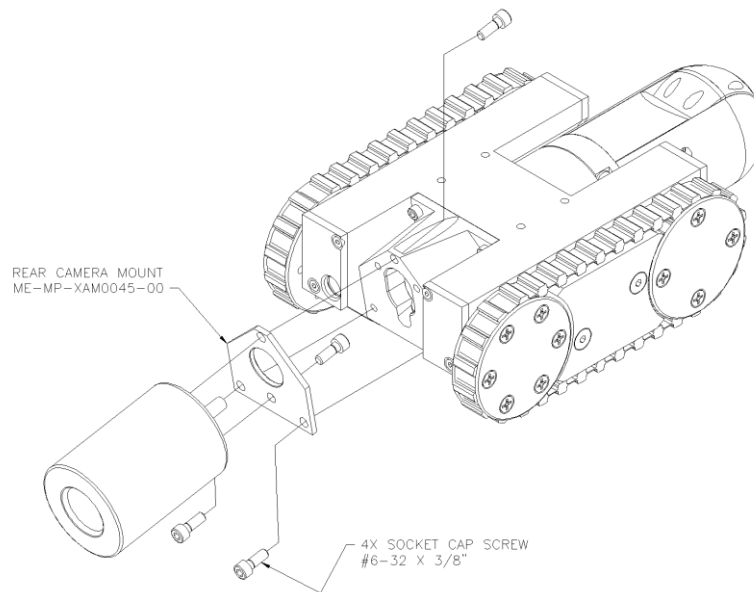


FIGURE 1: REAR CAMERA INSTALLATION

When the rear camera is removed, install blanking plate ME-MP-XAM0046-00 using four #6-32 x 3/8" socket cap screws.

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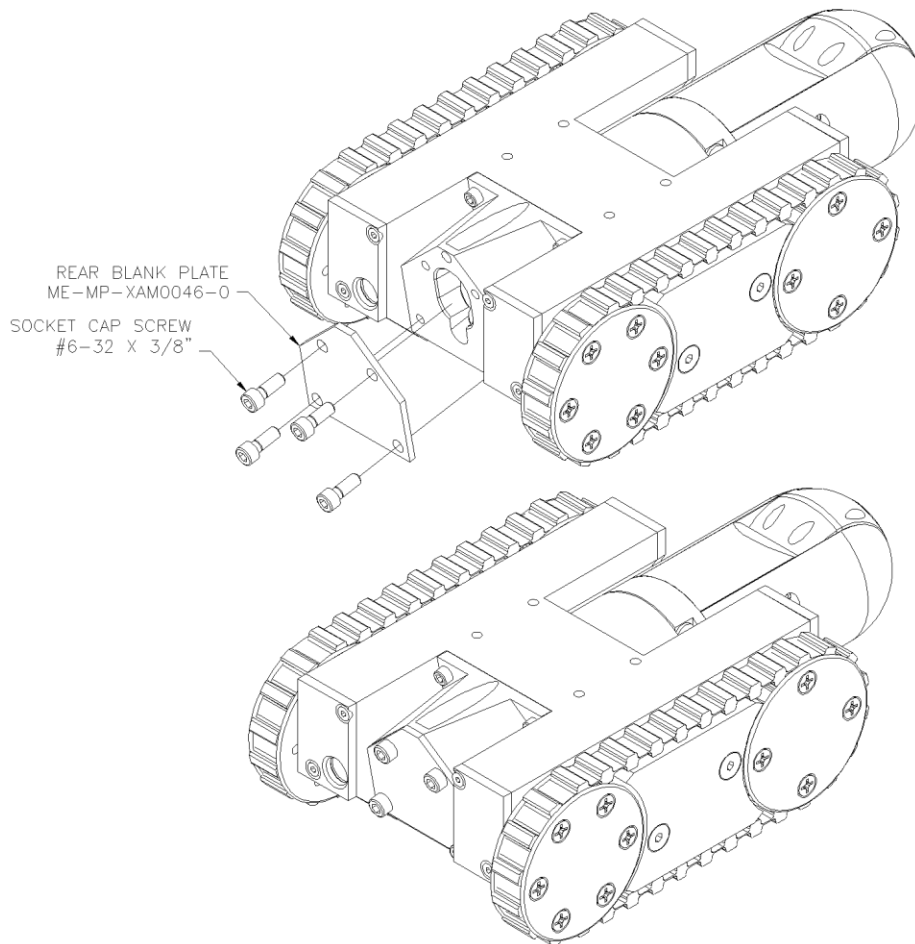


FIGURE 2: BLANKING PLATE INSTALLATION

Spectrum™ 45 Camera Maintenance

Refer to the Spectrum 45 camera manual for care and maintenance instructions.

Troubleshooting

Refer to the troubleshooting guide at the back of the Versatrax™ controller manual.

Optional Spectrum 45™ Mount on Top of Chassis

The Spectrum 45 camera can be optionally mounted above and on top of the chassis to provide a higher view point. The following shows the Spectrum 45 in the optional position, followed by an exploded view showing how it is assembled.

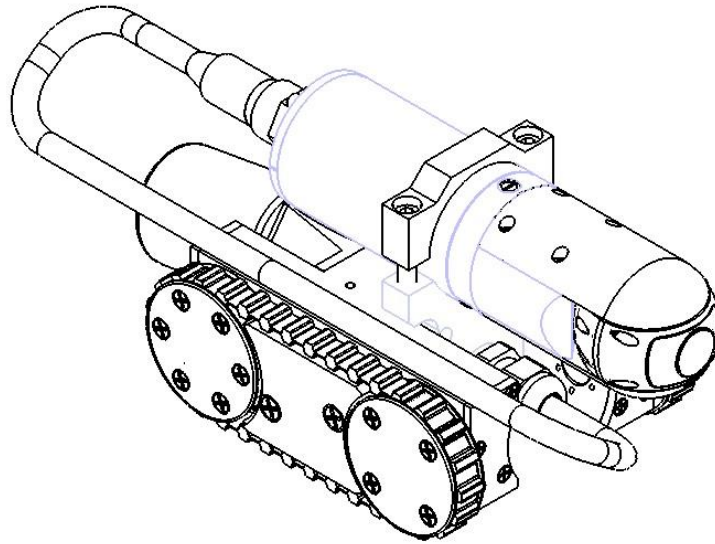


FIGURE 3: NANOMAG WITH SPECTRUM 45 MOUNTED ON TOP OF CHASSIS

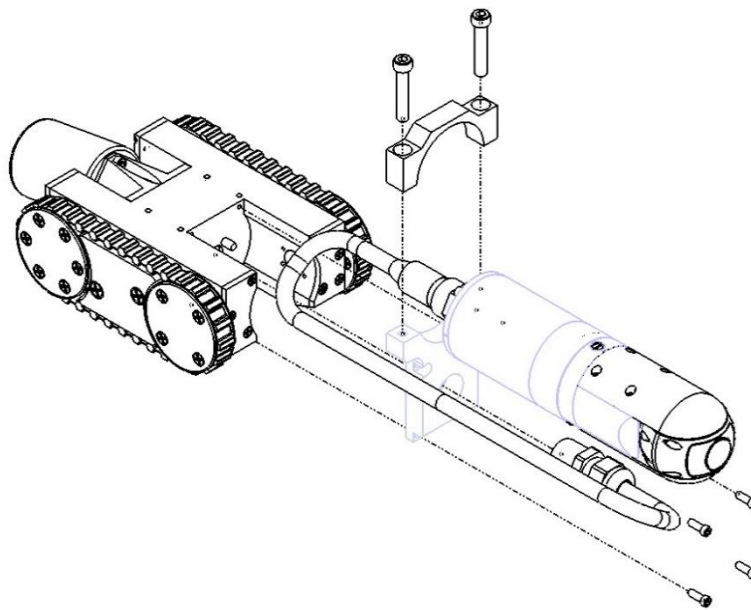


FIGURE 4: NANOMAG™ WITH SPECTRUM 45™ MOUNTED ON TOP OF CHASSIS EXPLODED VIEW

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Use parts as listed below to mount the Spectrum 45 in the optional location:

IPN #3062060 – High Mount Plate

IPN #3062053 – High Mount Clamp

IPN #4024100 – #4-40 x .375 Lg., SHCS (4x)

IPN #4061975 – M5 x 30mm Lg., SHCS (2x)

IPN #3004699 – 3/8 NPT Cable Gland

**Note:** The standard NanoMag SP45 must be changed for a full-length SP45 with connector to support the optional location.

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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

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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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Declaration of Conformity



Toll Free: 1.877.INUKTUN
 Ph: 250.729-8080 Fax: 250.729-8077
 email: inuktun@inuktun.com
 http://www.inuktun.com

Declaration of Conformity

Inuktun Europe Limited, 154 Forest Avenue, Aberdeen, UK AB15 4UN hereby declares that the following equipment:

Nano Magnetic Crawler Inspection Unit, Model No. WISL00359

The Nano Magnetic Crawler is a custom video inspection vehicle for confined spaces. The vehicle features a worm-drive NanoTrac Crawler Platform with front and rear colour cameras. The vehicle is equipped with 10 barrel style magnets; this allows the vehicle to crawl up and down a steel wall in any direction and can also operate completely inverted on a reasonably smooth surface.

Camera & Nano Crawler Vehicle Specifications

Front Camera
 Pick-up Element: 1/4" CMOS (NTSC or PAL)
 Lens: 3.6 mm
 Resolution: 420 TV Lines (Horizontal)
 Illumination: 0.2 lux
 Focus 1/2" to infinity

Rear Camera
 Pick-up Element: 1/4" CCD (NTSC or PAL)
 Lens: 3.6 mm
 Resolution: 380 TV Lines
 Illumination: 0.5 lux
 Focus setting: 6" to infinity

Nano Crawler
 Dimensions: 4.15" (105 mm) W x 7.6" (193 mm) L x 1.9" (49 mm) H
 Weight: 5 lb (2.27 kg)
 Speed: 8 fpm
 Tether Length: 100 ft (30 M)
 Operating Temperature: 32 ~ 122°F (0 ~ 50°C)

Has been designed and manufactured in accordance with;

The European Machinery Directive 98/37/EC being implemented in the United Kingdom by the Supply of Machinery (Safety) Regulations 1992 and as amended by S.I. 1992/3073, S.I. 1994/2063 and SI 2005/831

and

Inuktun Services Ltd. 2569 Kenworth Road, Suite C, Nanaimo, BC Canada V9T 4P7
 IN3067G005



Toll Free: 1.877.INUKTUN
Ph: 250.729-8080 Fax: 250.729-8077
email: inuktun@inuktun.com
http://www.inuktun.com

The European Low Voltage Directive 73/23/EEC – 93/68/EEC implemented in the United Kingdom by The Electrical Equipment (Safety) Regulations 1994 (SI 1994 / 3260)

This equipment was designed to meet with the following European Harmonised Standards;

BS EN ISO 12100-1 Safety of machinery. Basic concepts, general principles for design. Basic terminology, methodology

BS EN ISO 12100-2 Safety of machinery. Basic concepts, general principles for design. Technical principles

BS EN ISO 14121-1 Safety of machinery. Risk assessment. Principles

BS EN 60204-1 Safety of machinery. Electrical equipment of machines. General requirements

I hereby declare that the equipment described in this document has been designed and manufactured in compliance with the relevant sections and essential health and safety requirements of the aforementioned Standards, Codes and Directives / Regulations.

Name	Brian Storie	Position	Director
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Signed: 

24th May 2010

Inuktun Services Ltd. 2569 Kerworth Road, Suite C, Nanaimo, BC Canada V9T 4P7
IN3067G005

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