



# TRK 065

TRACTOR DRIVE UNIT

**CE** USER MANUAL  
CARE INSTRUCTIONS  
PRODUCT SPECIFICATION

PLEASE READ CAREFULLY BEFORE OPERATION OF THIS EQUIPMENT

CARE AND USE INSTRUCTIONS  
PRODUCT SPECIFICATION

**DESCRIPTION** TRK 065 TRACTOR DRIVE UNIT  
FOR DRAIN AND PIPELINE INSPECTION

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## **CONTENTS**

### **INTRODUCTION**

### **MOUNTING THE CAMERA**

### **OPERATION**

GENERAL  
GETTING GOING  
LIGHTS  
ALIGN THE CAMERA  
FORWARD / REVERSE  
SPEED  
GANTRY  
WHEELS

### **SITE USE**

SAFETY  
ACCESS  
GENERAL CONSIDERATIONS

### **CARE INSTRUCTIONS**

HANDLING  
CLEANING

### **MAINTENANCE**

CHANGING LENS & LED COVERS  
SPARE PARTS  
TROUBLESHOOTING

### **PRODUCT SPECIFICATIONS**

Crusade Designs Ltd. reserves the right to make changes to the electrical, electronic, optical, mechanical, software and firmware specifications of its products without notification. This product carries a 12-month warranty against defective materials and workmanship without prejudice to the customer's statutory rights. Crusade Designs Ltd. disclaims any responsibility for consequential loss or failure due to incorrect use or use with incompatible equipment.

## INTRODUCTION

These instructions are limited to the use and care of the TRK 065 and forward camera and are in no way intended to give guidance on the interpretation of data or the techniques of safe access to line entry points.

The TRK 065 is designed for use with the CRUSADE DESIGNS MIC 520 base unit. Its camera is quickly and easily interchanged with the PRO 080 pan-rotate camera; both being operated by the same panel of controls on the MIC 520. It can also be retrofitted to many of the older base units. Cables supplied with any older CRUSADE DESIGNS MIC series base units are compatible without modification. Your supplier can advise on the compatibility of other existing equipment and provide details of any modifications required. These instructions assume that the user is conversant with the basic operation of the MIC 520.

## MOUNTING THE CAMERA / LIGHT HEAD ON THE TRK 065

The notes in this section apply to both the PRO 080 and the TRK 570 forward cameras.

The TRK 065 crawler may be connected to the MIC 520 base unit via its cable reel and link cable. The link cable is totally reversible as it is wired pin for pin.

**Always ensure that none of the equipment is powered up when mounting or dismounting a camera, light head or connecting cables.**

Site the crawler on a firm surface in its normal operating orientation with user access to the "front". The gantry may be either raised or lowered as desired. If it is raised, ensure the locking screws are tightened.

Identify the top of the camera. It is marked at the rear but is most readily identified when fitting by two notches in the mating face at its rear. Offer the camera up to the mating socket keeping the notches uppermost. They will engage with two corresponding pegs in the socket in the crawler head. It is self-evident when they have engaged, as it will not be possible to rotate the camera relative to the crawler. Engage and tighten the retaining ring. Note that it is a left-hand thread and must be rotated clockwise as viewed from the front of the crawler. When tight, the threaded portion of the camera rear should be just covered by the ring. If it is not, the camera is not correctly seated and the cause should be investigated before the unit is powered up.

Dismounting of the camera is simply a reversal of the procedure above. The retaining ring should be rotated anti-clockwise as viewed from the front of the crawler.

On the top of the tractor unit at the head of the gantry there is a cover plate held in place by two screws; remove this plate and keep it safe. The large light head can now be screwed in its place facing forwards, its rear butting up to the bar at the rear of the head. Two spring loaded contacts will engage with the two contact points on the crawler head.

Dismounting of the light head is simply a reversal of the procedure above. Be sure to replace the cover plate after removal to protect the head's contact points.

## OPERATION

### GENERAL

The notes in this section apply to the TRK 570 camera only. The orientations (forward, reverse etc.) referred to assume the operator to be viewing the camera picture on a monitor

and hence have the same view as someone behind the crawler. It is assumed that the camera is fitted to the crawler. See *MOUNTING* above and *SITE USE* below. Use of the controls is illustrated below with a simple example of the type of work the TRK 065 / TRK 570 is intended for, i.e. inspection of a pipe. It is strongly recommended that initial familiarisation with the camera is carried out above ground and that the pipe in the example is initially imagined.

## **GETTING GOING**

With the camera mounted and all cable connections secured, turn the base unit on. The LED lighting array on the camera will illuminate and a picture will be obtained on the monitor. If the large light head is fitted, it will not illuminate at this point; this is normal.

## **LIGHTS**

Turn the lights on and adjust the intensity using the controls on the base unit that are used to control the extending light head supplied with the crawler (or the lights of a DRC 490 camera). Note that the crawler extending light head can be used in conjunction with the PRO 080 camera and it will work in the normal way. In practice, few jobs are likely to require both pan and rotate features and the additional light of the extending light head.

## **ALIGN THE CAMERA**

Offer the camera up to the line entry with the appropriate wheel set for the pipe size. Adjust the camera centreline height so that it is coincident with the pipe centreline using the crawler's adjustable gantry in the normal way. Bear in mind that there is a small vertical offset due to the crawler wheels riding up the side-walls of a pipe rather than on the bottom of the pipe.

## **FORWARD AND REVERSE**

The crawler can be driven along a line using the FWD, REV and STOP buttons in conjunction with the SPEED knob on the control panel in the normal way, with the on-screen measurement facility in use if required. Note that the REV button introduces a delay when T is displayed on the screen to allow the operator time to grasp and feed back the cable and rope so that the tractor does not roll over them. Adjust the lighting control as required.

## **SPEED**

The speed of the tractor is continuously variable from zero to full speed. Note that if speed is adjusted rapidly, the tractor will not follow it, but ramp its speed up or down to the set speed. This is particularly noticeable when stopping from full speed as it is designed to prevent wrenches to the drive train and gearing, prolonging their life.

## **GANTRY**

The height of the camera gantry is adjustable in conjunction with wheel size to allow centring in the pipe. This can be done by slackening the two M8 screws either side of the main body, lifting or lowering the head and retightening them.

## **WHEELS**

The tractor accepts three wheel sizes; the small wheels (100mm DIA) remain at all times fixed to the drive shafts. The other wheels (150mm DIA) for 9" pipes and (250mm DIA Pneumatic) for 12" and above will each attach to the smaller wheels by three M4 screws.

## SITE USE

The notes in this section apply to both the forward and the PRO 080 cameras. Users with site experience of the TRK 065 crawler may well have refined and improved the basic techniques for its use described.

### SAFETY

The crawler weighs up to 38Kg depending on the ancillaries fitted and so cannot always be safely manoeuvred by one person. Consideration should be given to the provision of tripods, pulleys and other lifting equipment. These are not discussed here. Users should satisfy themselves that the access technique proposed for each scheme of work is safe and that all necessary equipment and trained personnel make proper use of it and are available at any proposed work site. No camera equipment should be lowered or raised into or out of a manhole or other access points while personnel are at that access point unless the operation has been reviewed by a competent person to ensure it can be carried out safely.

In no circumstance should a crawler cable or camera gantry be viewed as a safe strong point on a crawler.

### ACCESS

The crawler should be lowered horizontally into the manhole using the body strong points or loops of rope underneath it. Take great care if lowering the crawler with a rope or similar attached to the head or camera. The head or camera may only be used to steady a crawler if the bulk of the weight is taken by ropes attached to or passing under the crawler. See *HANDLING* above.

It is recommended that the crawler be retrieved by driving it onto loops of rope and raising it in the horizontal orientation. Depending on manhole depth and equipment available, it may be possible to grapple-hook ropes into the strong points from above. Do not lift a crawler by the cable only. The cable should only be used to steady a crawler if the bulk of the weight is taken by ropes attached to or passing under the crawler. Lifting by the cable alone is very likely to cause damage to the front of the PRO 080 camera in particular but may also damage the forward camera.

### GENERAL CONSIDERATIONS

The forward camera should be used where access to the line entry is restricted, where a line is obstructed in some way or pan and rotate features are not required. As it is a straightforward job, it may be possible for a user to mount or dismount either camera on a crawler in a manhole if man-entry requirements are met (likewise, it may be possible to mount or dismount the extending light head or adjust the gantry height if these requirements are met.) Electrical connections and threads should be kept as clean and dry as possible if this is done. **Always ensure that the crawler is not powered up when mounting or dismounting a camera.**

Obviously, every attempt should be made to avoid driving into obstructions or the walls of bends as the risk of damage to lens and LED covers, retainers etc. is always present.

## CARE INSTRUCTIONS

### HANDLING

The reliability and lifetime of this camera will depend in large measure on the care it receives. It has been designed for the harsh environment of drain inspection, but as with any other equipment, it will repay a little care taken in its use and regular cleaning and inspection afterwards.

### CLEANING

The comments below apply to the PRO 080, the TRK 570 forward camera and the mating socket except where detailed. All exposed metal parts are either anodized aluminium or stainless steel (or brass in the case of the crawler head assembly). These units are rated for use in salt water but it is recommended that they be cleaned as soon as possible after use in saline solutions (even if only slight) or in any media that is suspected to contain chemicals such as bleach or acid in solution. Cleaning is always easier and more effective when the deposit is fresh. Both PRO 080 axes can be rotated against their friction clutches to any angle without fear of damage.

### DOS

- All items should be cleaned with a mild detergent solution (e.g. washing-up liquid). It is quite safe to immerse all items individually or as an assembly. Isopropanol (industrial alcohol) can be used to remove tar, fresh lining compounds etc.
- Remove, clean and inspect the 2mm O ring seal at the rear of the camera. To remove the O ring without damaging it, rub a blunt tool (a plastic pen top is good) along the O ring until it bunches up and can be hooked out. Clean the seat and ensure it is dry before refitting the O ring. Replace the O ring if there are any signs of damage.
- Pay particular attention to the camera retaining threads as silt, sand and similar material can be abrasive. A toothbrush and a small paintbrush are ideal for cleaning most of the recesses on all items.
- Inspect the exposed portions of the two wheel axles for any thread-like debris wrapped around them. This type of debris is often best removed with tweezers. It is important that such debris is removed as abrasive particulate debris sheltering in these recesses can be dispensed gradually onto the axles long after a single exposure to the contaminant.
- Rinse thoroughly in fresh water and allow to dry.
- Use a soft lint-free cloth or proprietary lens cleaning tissue to clean any smears left on the lens cover after rinsing.

### DON'TS

- The camera should not be cleaned by immersion if there is any suspicion that the watertight integrity of the lens or LED protection has been breached. See *MAINTENANCE* below.
- Do not scrub the lens covers to remove particulate material as you may scratch them. Scratches on the LED covers are of little consequence but scratches on the lens covers will result in the appearance of an imperfectly focused picture when severe enough.
- Petroleum-based products or proprietary electrical equipment cleaners such as WD40 may contain solvents that attack non-metallic parts and should not be used.
- The electrical connections in the mating sockets are gold plated so should not be abraded.
- Do not use a high-pressure water-jet or steam cleaner.

## MAINTENANCE

The worst case estimate for the lifetime of the moving parts of the TRK 065 is six months of constant daily use at which point the rotating seals of the axles may require replacement to maintain watertight integrity. It is probable that most users will achieve considerably longer service intervals, particularly if they follow the cleaning regime above. There are few other service items that will require routine replacement and these items form part of the service together with the axle seals. It is suggested that the TRK 065 be returned to the factory at 6-monthly intervals for simple functional and pressure integrity tests. Advice as to service requirements can be given on the basis of these test results.

There are no user serviceable items inside any of the equipment covered by these instructions. Aside from regular cleaning, the only user serviceable items are replacement lens and LED covers.

### CHANGING LENS & LED COVERS

The TRK 570 and PRO 080 cameras have a superficially similar arrangement for protection of the lens and LED clusters. There are some major differences however. The lens and LED covers and the O ring seals of the TRK 570 and the PRO 080 look similar to their respective counterparts but are different sizes and are not interchangeable. Replacements supplied by Crusade Designs or their agents are thickness controlled to optimise the seating of the O rings and hence the watertight integrity of the units. **Ensure the correct replacement covers and O rings are fitted.** It is suggested that damaged items not be discarded until they can be compared with replacements to avoid doubt.

Lens covers require replacement when scratched to the point where the picture appears de-focused either in some region or over the whole picture. Both cover types require replacement whenever even a minor crack is noticed. It is suggested that O rings (supplied with replacement covers) are replaced at the same time as covers because a cracked cover can damage an O ring. O ring seats, surrounding metalwork and retainers should be cleaned and inspected for damage. Retainers should be repaired or replaced as necessary. Relatively minor distortion of a retainer or small amounts of debris can prevent a cover sitting evenly on its O ring with a consequent loss of watertight integrity or even cracking of the cover when tightened. See the relevant section below for further information on the two camera types.

### TRK 570 FORWARD CAMERA

Replacement of lens and LED covers can be carried out quite safely under typical site conditions although it is recommended that the work be checked in a clean, dry and well-lit environment as soon as practical.

Both covers are retained by screw threads of the standard right-hand type. To change the lens cover it is necessary to remove the central retainer only. If difficulty gripping the lens retainer is experienced, wear a rubber glove to improve grip. To change the LED cover both retainers must be removed. The lens cover is toughened glass (cheaper than sapphire). There is an inner lens cover and the LED's are encapsulated within a watertight compartment. Consequently it is quite safe to immerse the entire assembly *without* its covers for cleaning. See *CLEANING* above.

Care should be taken to ensure that the O ring seats and other small recesses are completely dry before refitting the O rings and covers. This can be done by leaving the assembly in a warm ventilated environment or by simply refitting it to the crawler and allowing it to warm up. If all the moisture is not driven off it will reappear as condensation on the inside of the covers when the unit is in service.

## PRO 080

The lens cover is sapphire (expensive) and several times more scratch resistant than glass. It should rarely require replacement if care is taken to clean it without the circular scrubbing motion that is the intuitive but incorrect method. See *CLEANING* above. **Replacement of lens and LED covers of the PRO 080 should only be carried out in a clean, dry and well-lit environment with suitable tools and cleaning materials to hand.** When either the lens or LED cover are removed or even just cracked, the watertight integrity of the PRO 080 is destroyed until they are replaced correctly. The unit should be cleaned as much as possible externally before the covers are removed.

Both covers are retained by M2.5 X 8 stainless steel countersunk screws. To change the lens cover it is necessary to remove the central retainer only. To change the LED cover both retainers must be removed. Use a correctly fitting screwdriver.

It is important that moisture and debris do not enter the unit while dismantling, cleaning and inspecting it as it may well be impossible for a user to rectify this. There is silica gel within the watertight enclosure that is capable of absorbing small quantities of water. Do not leave the PRO 080 without its covers for extended periods as this gel will absorb atmospheric moisture and become ineffective. If debris has accumulated around the edge of the covers and dried it may gum the covers in place. These can be freed by lightly tapping on them. It is suggested that the lens and LED cavities be blanked off as much as possible during cleaning with cotton wool or similar material and masking tape. A supply of compressed air can be helpful for blowing debris clear. If it is necessary to clean the lens itself, use a soft lint-free cloth or proprietary lens cleaning tissue.

When refitting, double-check each screw for tightness to a torque of approximately 250 mNm (about as much torque as it is reasonable to apply with a 12mm diameter screwdriver handle).

## USER SERVICE KIT

The TRK 065 TRACTOR

SERVICE KIT COMPRISING:

- 1 X 3mm and 6mm "T" bar style allen key's
- 2 X 24.5mm x 2mm GLASSES with 19.5mm x 2mm O RING'S (for lens protection)
- 1 X 56.5mm x 26.5mm ANNULUS with 27.5mm x 2mm and 52mm X 2mm O RING'S (for LED protection)
- 2 X 35W 24V LAMPS and 35mm x 3mm O RING'S
- 2 X 40.5mm FROSTED GLASS and 38mm x 1.5mm O RING'S (for lamp protection)
- 1 X KEY for light head glass changing
- 2 X 38mm x 1.5mm O RING'S (cover plate seals)
- 4 X 15mm x 1mm O RING'S (light head contact protection)
- 2 X 19mm x 2mm O RING'S (rear connector seal's)
- 3 X PC8 DS contact pins
- 12 X M4 x 20mm S/STEEL caphead screws (for wheels)
- 4 X M4 x 12mm S/STEEL caphead screws (for light head)

## TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	ACTION
No picture or grainy picture	Lights off or low	Turn lights on or up
Crawler responding badly or not	Telemetry train degraded	Power down, check main and

at all to commands		link cables by substitution
Condensation on inside of lens cover	Loss of watertight integrity	Withdraw from service, read <i>MAINTENANCE</i> section
Condensation on inside of LED cover	Loss of watertight integrity	Withdraw from service, read <i>MAINTENANCE</i> section

## SPECIFICATIONS

### Tractor

Voltage	30 volt
Control format	Reverse telemetry encoding
Drive power:	90 watts
Torque produced	21 N/M
Wheel bearings	Thrust bearings / double lip seals
Drive:	All wheels driven
Length	525mm
Width	115mm
Height	95mm
Environmental	Waterproof to 5m; immune to salt water

### Auxiliary Lighting Head

Lamps	2 x 35 watt quartz halogen
Voltage	30 volt
Control	Reverse telemetry encoding
Lamp Protection	Frosted toughened glass discs
Environmental	Waterproof to 5m; immune to salt

### Camera

Camera support	Adjustable gantry
Lighting	48 high bright white led's
Lens protection	Sapphire disc plus sacrificial outer lens cover
LED Protection	Acrylic annulus
CCD	400 lines; sensitivity 3 lx with f2.0 lens
Angle of view	Approximately 70 degrees x 90 degrees
Environmental	Waterproof to 5m; immune to salt water

### Wheels

Fixed Wheel	95mm
Intermediate Wheel	145mm
Large Wheel	275mm

Total Weight 23kg                      Supply Voltage 30 volt DC                      Supply Current 5 amp

**Compliance:** Electromagnetic Compatibility Directive 89/336/EEC                      Electrical Equipment Directive 73/23/EEC.