

SOLOPro+

Original Instruction Manual

Version G



This document is applicable to the SOLOPro+ Inspection System.

A standard system and available options are covered by this document. Depending on your system configuration you may lack some of the features mentioned in this document.

Disclaimer

Hardware and software mentioned in this document are subject to continuous development and improvement. Consequently, there may be minor difference between the information in the document and the performance or design of the product. Specifications, dimensions and other statements in this document are subject to change without prior notice.

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Warranty

Limited Warranty

Congratulations on the purchase of your new SOLOPro+ Inspection System. Our products are the result of many years experience and continuous developments. Conscientious manufacturing and checking are essential objectives in our company. Nevertheless failures cannot be excluded totally. If this occurs, you are covered by our generous warranty. Please consider that even the best products can only be durable and work properly with the correct handling and maintenance.

Extent of the Limited Warranty

Mini-Cam Limited warrants that your equipment will be in good working condition and free of defects in material and/or workmanship for a period of one year. If failure occurs, which is provable due to a defect in material and/or workmanship, we will remedy it free of charge during the warranty period. We reserve the right, at our option, to repair the equipment or to replace the whole unit or the faulty parts, or to refund the then current value of the equipment, if we are unable to repair or replace the unit. The warranty is a return to base warranty and we are not liable for any shipping costs.

Conditions of the Limited Warranty

Disassembling the camera, coiler, control unit or any part of the system, without approval of the manufacturer, is forbidden! Non-compliance of this direction will result in the loss of the warranty. The beginning of the warranty period is the date of delivery. This limited warranty does not cover damage due to improper treatment of the system, inadequate maintenance, alteration, repair, normal wear and tear or external causes like lightning, fire or frost. The warranty does not cover wear and tear parts like front camera lenses, O-rings, cable, push rod, rod rollers etc. If you require warranty service please return the system with the original invoice to your dealer or the nearest Mini-Cam Service Centre. Equipment returned **must** be consigned carriage paid. We will **not** be liable for carriage costs.

Warranty Limitations

Our responsibility under this warranty is limited to repair, replacement or refund, as set forth above. Mini-Cam Limited is not responsible for direct, special, incidental or consequential damages resulting from any breach of warranty including lost profits, downtime, goodwill, damage to or replacement of equipment and/or property.

Text Conventions

Danger, Caution and Note

In this user manual the following symbols are used:



DANGER!

Danger means a potentially dangerous situation that can cause death or severe bodily injury. The icon identifies the type of risk.



CAUTION!

Caution means that the system or equipment can be damaged or data lost. The icon identifies the type of risk.



NOTE!

Notes are used to convey throughout this manual important information or guidance for system use.

Bold Font

Bold font is used for important words (For example: This **must not** be done in reverse order).

Lists

Lists are marked as follows:

- Item 1
- Item 2

Procedures that must be performed in a specific order appear in numbered lists like this:

- 1 Perform this step first.
- 2 Perform this step second.

Menu Selections

When describing control unit operation, sequential menu selections are described in the following format:

Tools > Power Saving > Automatic Shutdown > OK

This example describes pressing the **Tools**  key and selecting the **Power Saving** option, then **Automatic Shutdown**, and finally pressing the **OK** key.

Product Description

The inspection system SOLOPro+ is a modular system designed for, but not limited to, inspecting pipeline systems. Using colour cameras, optional modules and accessories, the SOLOPro+ platform offers everything needed for professional pipeline inspection of pipes equal to and greater than 150mm diameter.

Built using high quality materials and state-of-the-art technology the SOLOPro+ inspection system is a robust and powerful tool for use in harsh environments.

EC Declaration of Conformity

CE Declaration

We Mini-Cam Ltd. Unit 4 Yew Tree Way, Stonecross Park, Golborne, Warrington, WA3 3JD hereby declare that the product SOLOPro+ to which this declaration refers is in compliance with the following standards or standardizing documents:

EN61000-6-2:2005 Generic standards – Immunity for industrial environments.

EN61000-6-4:2007 Generic standards – Emission for industrial environments

The following are the stipulated operating and environmental conditions for said compliance:

Residential, business, commercial, small-company and light industrial environments.

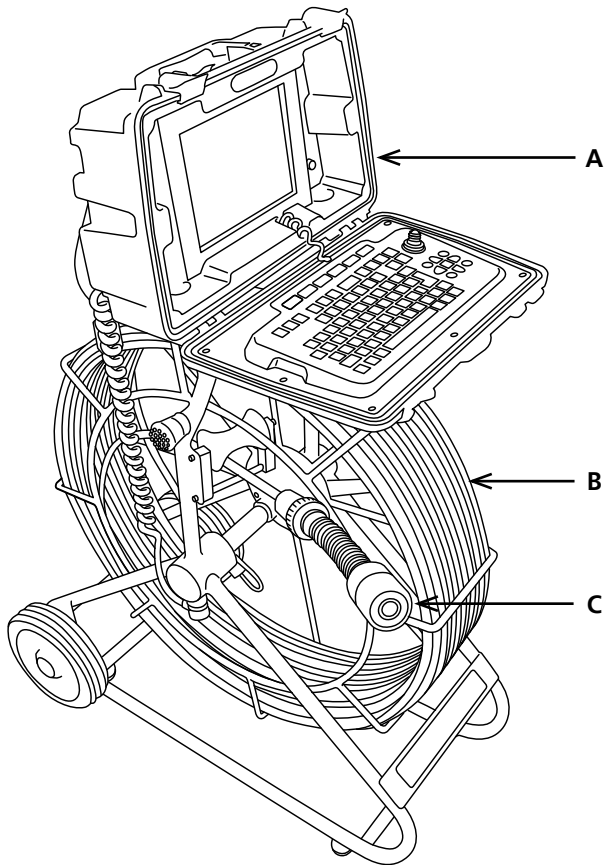
This declaration is based on test report(s) of the relevant EMC testing laboratory.

System Overview

The inspection system SOLOPro+ consists of the following main components:

- CCU (A)
- Coiler (B)
- Camera (C)

A typical configuration is shown in this illustration:



Warnings, Safety Measures and Care

Please read the safety measures closely and observe them. They preserve your own safety, the safety of co-workers as well as the prevention of damage to the SOLOPro+ inspection system and its components.



CAUTION!

The operator of the SOLOPro+ inspection system **must** be trained by either Mini-Cam or one of its authorised representatives before using the system.



CAUTION!

Despite all of the safety functions built into the system, the operator is not exonerated in any way from his/her duty of care. Thus the user alone is responsible for any damage caused as a result of misuse.



CAUTION!

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



DANGER!

Risk of deadly injuries from electrical current!

The mains plug and or IEC connector of the PSU is the supply isolation device and must be easily accessible.

- There are no user serviceable components within any module in the system.



DANGER!

Risk of deadly injuries from electrical current!

Only use an appropriately rated and approved cord set in accordance with the regulation of the country in which this system is used.



DANGER!

Risk of deadly injuries from electrical current!

Although the CCU and Coiler could be used in wet environments the **external PSU is for indoor use only** (as marked on its label) and must not be used in wet areas.



DANGER!

Risk of deadly injuries from electrical current!

Only the power supply supplied as part of the SOLOPro+ inspection system can be used and should **NOT** be replaced by any other.

Before first use

Please notice the following sources of risk for serious or deadly injuries:



CAUTION!

Risk of deadly injuries from electrical current!

- Ensure that no fluids can enter the control panel or penetrate the housing of the cable reel. If this happens, immediately disconnect the power supply and inform the appropriately trained staff or **Mini-Cam Service Centre**.
- Ensure that the electrical connection cables are intact and that they cannot be bent or crushed. If you find cable damage, immediately disconnect the power supply and inform the appropriately trained staff or **Mini-Cam Service Centre**.
- Work on the electronics, which are not covered in this document, **shall only** be carried out by trained specialist staff or a **Mini-Cam Service Centre**.
- Maintenance and repair work, which is not covered in this document, shall only be carried out by trained specialist staff at a **Mini-Cam Service Centre**.



CAUTION!

Risk of serious injuries by falling coiler!

When preparing the system for operation pay attention to the coiler position, that it is on a flat, level surface. When testing the rod pay-out, the coiler might fall into the manhole. Any person in the manhole may suffer serious injuries.

CAUTION!

Hazard of infection and contamination of fresh water!

Never alternate the use of the inspection system for inspections in wastewater and freshwater! Even a thorough cleaning of the system will not ensure sufficient protection against contamination. For inspections in wastewater and freshwater use a separate inspection system for each. Bacteria can lead to an infection. All individuals employed for the work must be advised of the hazards and must be instructed in the required safety measures.

**NOTE!****Avoid physical damage!**

The operator of the SOLOPro+ inspection system is responsible for the following aspects:

- Only use the inspection system for work that is appropriate to the specifications.
- Observe the operational requirements for this inspection system as described in this user manual.
- Keep the system clean. Observe the individual cleaning instructions for this purpose.

Maintenance

To ensure the maximum service life of the SOLOPro+ inspection system the individual modules and accessories belonging to the system have to be independently maintained and kept clean. Moving parts, in particular, can have improved operational life by frequent professional cleaning after inspections. Also, the risk to the operator of infection can be significantly reduced by using a cleaned system.

Take notice of the following comments on general maintenance:

- Keep the entire system clean and clean the system directly after each inspection.
- Thoroughly wash down the parts of the system that have come into contact with moisture and then dry them with a clean and dry cloth.
- Keep all electrical connections and contacts free of dirt, grease and moisture at all times.
- Never bend the cable of the system and avoid knots.
- Clean the cable with a rag when retracting.
- Regularly grease all exposed O-rings using O-ring lubricant as required in the maintenance instruction.
- Use only suitable display cleaners for cleaning the display as required in the maintenance instruction.
- Use only clean and dust free cloths for cleaning the display.
- Use water for cleaning without the addition of cleaning agents or solvents.

For detailed maintenance instructions for individual modules and accessories please read the comments in the description for each module. The specific maintenance work steps will also be explained.



NOTE!

The operator of the system is responsible for the proper disposal! See information on page 134 on the return of equipment at the end of the useful life.



IMPORTANT!

KEEP ALL ELECTRICAL CONNECTIONS AND CONTACTS FREE OF DIRT, GREASE AND MOISTURE AT ALL TIMES.

Cleaning

To minimise down time and subsequent repairs, it is necessary to keep your SOLOPro+ inspection system clean. Please follow the instructions below to help avoid disruption.



CAUTION!

Risk of fatal injuries caused by electrical current!

Ensure that no fluids can enter the control panel or penetrate the housing of the cable reel. If this happens, immediately disconnect the power supply and inform the **Mini-Cam Service Centre**.



CAUTION!

Risk of fatal injuries caused by electrical current!

For all cleaning and maintenance work disconnect the system from the power supply.

General cleaning work



CAUTION!

High-pressure cleaners **must not** be used. It can cause considerable damage to the coiler, camera and other system components.

Cleaning agents or solvents **must not** be used. These can damage the seals and other materials on the system.

Only clean water should be used.

- Clean the crawler and camera with water after the first inspection. Only after this should you loosen electrical connections.
- Immediately fit the protective caps after removing electrical connections.
- Check O-rings for damage and replace if necessary and grease regularly with O-ring lubricant.
- Clean the cable reel and control unit with a damp cloth.
- Only clean the camera and light lenses with a specific lens cleaning cloth to prevent scratches.

Preparing the CCU for First Use

This section describes the process of getting the SOLOPro+ pipeline inspection system ready to use when you have just received it.

Initial Inspection

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, keep it until you have verified that the contents are complete and you have tested your SOLOPro+ Pipeline Inspection System mechanically and electrically.

The accessory case contains the accessories shipped with the SOLOPro+ Pipeline Inspection System. If the contents of the accessory case are incomplete or if the SOLOPro+ Pipeline Inspection System does not operate as you would expect, notify Mini-Cam Ltd or your nearest **Mini-Cam Service Centre**. If the shipping container is damaged or the cushioning material shows signs of stress, also notify the carrier. Keep the shipping materials for the carrier's inspection. **Mini-Cam Ltd** or the **Mini-Cam Service Centre** will arrange for repair or replacement without waiting for a claim settlement. If the shipping materials are in good condition, retain them for possible future use. You may wish to ship your SOLOPro+ Pipeline Inspection System to another location or return it to **Mini-Cam Ltd** or your nearest approved **Mini-Cam Service Centre** for service.

Power Supplies

The SOLOPro+ Pipeline Inspection System will operate from an external 12volt or 24volt DC power source or from internal batteries. The external power source will also charge the internal batteries when connected. Operating the unit while the batteries are being charged has no effect whatsoever on the time taken to recharge the batteries.

The external power source must be 12 volts DC nominal and the unit may consume up to 2.5 amps if operated while the internal batteries are being charged.

Battery Charging

When you receive your SOLOPro+ Pipeline Inspection System, the batteries will be in a partially discharged state. It is recommended that the unit is fully charged before use. The equipment may be used while the batteries are being charged from a mains or vehicle battery supply, but should not be used on internal battery supply until the batteries have been fully charged. To charge the batteries,

connect the power inlet socket on the rear of the unit to either a 12 volt DC mains power supply unit or the 12 volt DC cigarette lighter lead to a 12 volt DC supply. The batteries should be fully charged within 8 hours.

When the batteries are fully charged, the battery charger automatically switches off, preventing battery damage due to overcharging. Therefore the external power supply may be left connected and switched ON indefinitely with no ill effects.

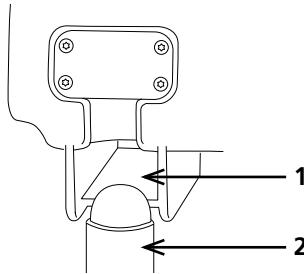


CAUTION!

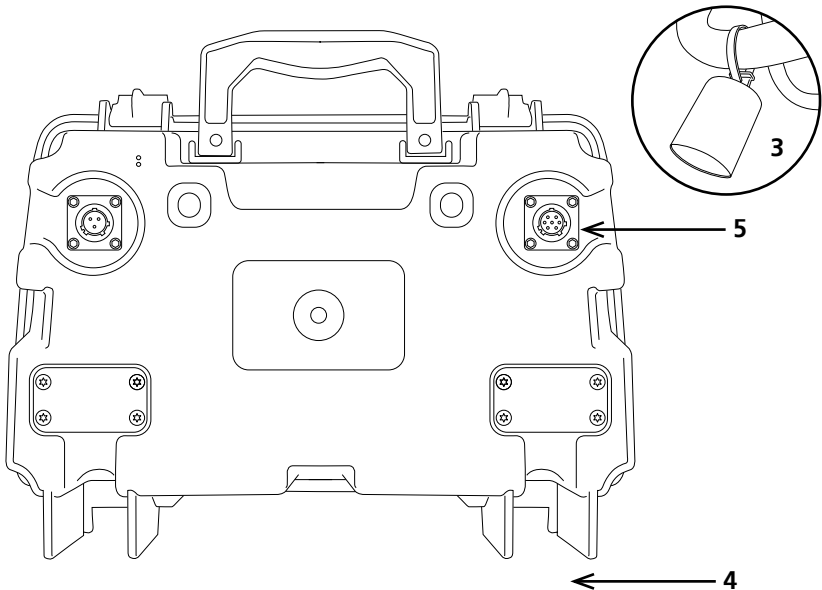
Never plug the control unit into a power supply source that is more than 24 volts DC nominal. Failure to ignore this will result in system damage.

Attaching the CCU to the Coiler

- 1 Position the CCU by aligning the location apertures (1) on the back of the CCU over and down onto the CCU location pins (2).



- 2 Remove the connector dust cover (3). Connect the curly lead (4) supplied with the coiler to the **Coiler In** connector (5) on the rear of the CCU.



NOTE!

The unit does not need to be installed on the coiler to operate. It can be operated stand alone for setting up, viewing recorded surveys and generating reports. It only needs to be installed on a coiler when actually performing a survey.

CCU210 - Control Unit

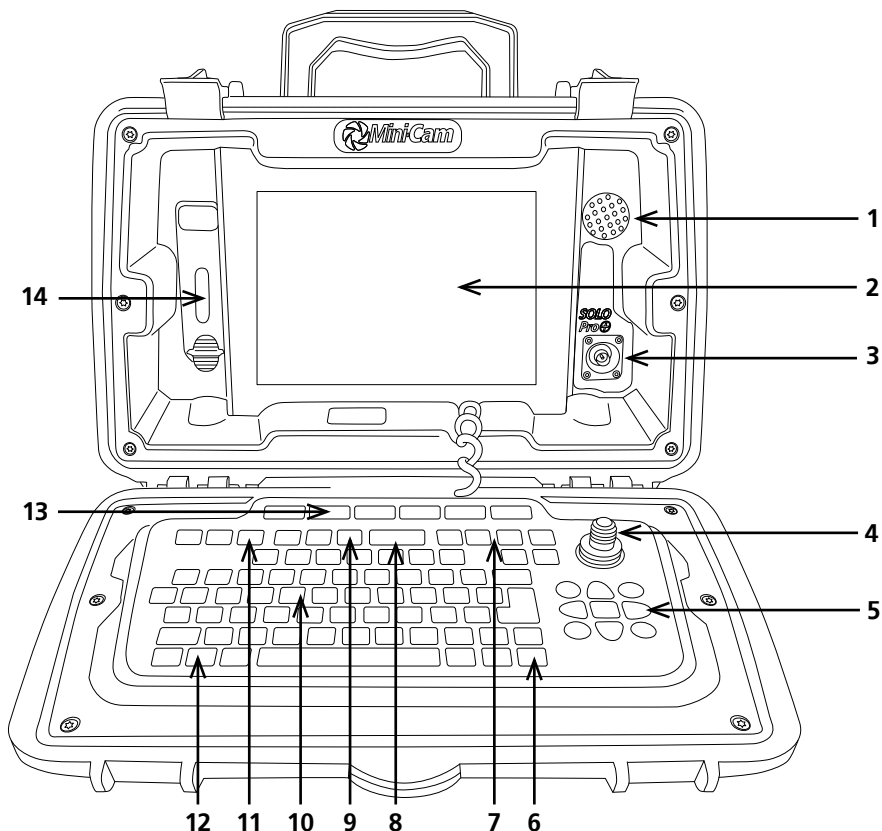
The control unit CCU210 is a robust and portable control unit for the SOLOPro+ system. It controls the functions and reports the status of the attached coiler and camera. It has the following features:

- Scalable internal solid state storage (32GB minimum)
- Data transfer via USB and SD card
- Sunlight readable display (SVGA 800x600 pixels)
- Video recording in MPEG-4 (WinCan compatible)
- Pictures saved in JPG format
- Customisable colour on screen text overlay
- Video output of live video with on-screen text
- Ergonomic design
- IP54 rated

The control unit CCU210 enables the operator to record video and photographic surveys, generate survey reports, and export the data via USB or SD card. The control unit can generate on screen text that is overlaid onto the recorded video in various colours and positions, allowing easy customisation.

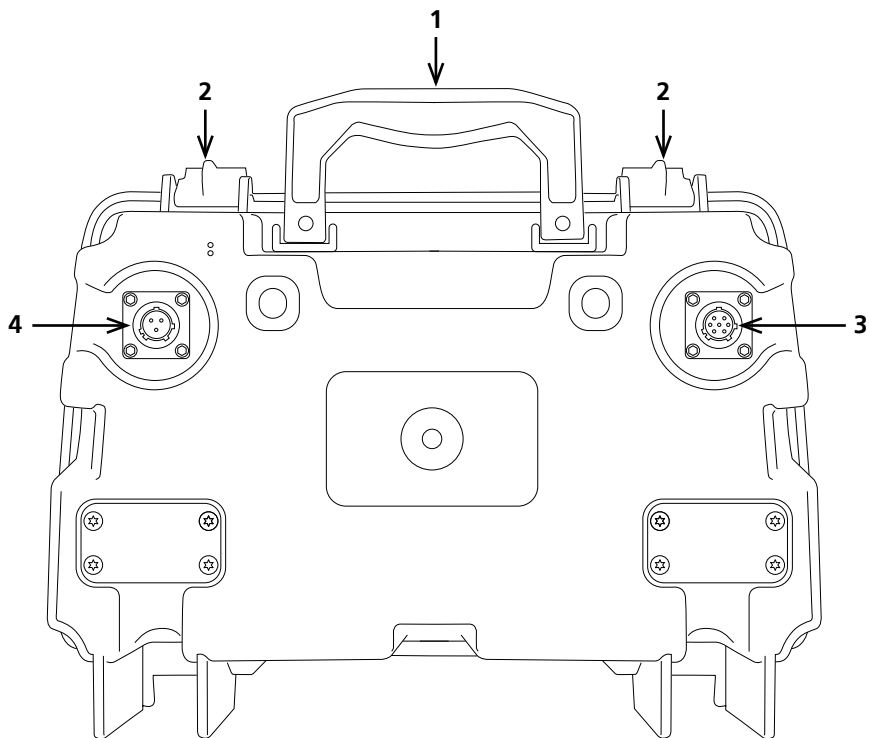
CCU Overview

Front view



- | | |
|--|---------------------------------|
| 1 Loudspeaker | 8 Power ON/OFF |
| 2 High Resolution TFT Screen
800 x 600 pixels | 9 Media Keys |
| 3 Video Output | 10 QWERTY style Keyboard |
| 4 Joystick | 11 Survey Keys |
| 5 Cursor Control Keys | 12 Special Function Keys |
| 6 Special Function Keys | 13 Multi-function "Hot" Keys |
| 7 Camera Keys | 14 Bung Flap for USB or SD Card |

Rear view



- 1 Carry Handle
- 2 Lid Fastener Clip
- 3 Coiler Input
- 4 PSU (Power Supply Unit) Input

Switching the CCU On



NOTE!

If you are using the SOLOPro+ control unit with the Pan & Rotate Camera (CAM026) or Axial Camera (CAM025) the system must be fully connected before turning the system on.

The SOLOPro+ control unit will automatically detect whether a standard Self-levelling camera or a Pan & Rotate camera is connected. This is done at power up.

Should the SOLOPro+ control unit be powered up without being connected to the coiler without Pan & Rotate camera then it is assumed that a standard Self-Levelling Axial camera is attached. You will not be able to control the Pan & Rotate camera functions unless you reboot the control unit.

To switch the SOLOPro+ on, press the **Power ON/OFF** button on the keypad **once only**. The green coloured LED indicator will start to flash to show that the unit is initialising. This will take approximately 35 seconds. Nothing will appear on the screen until this process has completed.



Initialising



Initialised

When the SOLOPro+ control unit has initialised the green coloured LED indicator stops flashing and is permanently illuminated, and the Mini-Cam splash-screen will show on the LCD display. When the splash-screen disappears you will be asked to press OK to acknowledge that you are familiar with the operational requirements of the equipment. Press **OK** to confirm

The live video picture from the push-rod camera will be shown, surrounded by a selection of icons showing system status, see page 31.



NOTE!

If a camera or coiler is not connected then the screen will remain blue but the icons will still be displayed.

Switching the CCU Off

To switch the SOLOPro+ off, press the **Power ON/OFF** button and a dialogue will be displayed asking for confirmation to Power Off.



Press **OK** or the Carriage Return key and the unit will switch off in a controlled fashion.



NOTE!

Under extreme circumstances, the unit may fail to turn off in this fashion, in which case, press and hold the **Power ON/OFF** button for 10 seconds; when the power button is then released the unit ... will turn off.

Environmental Operating Temperature Consideration

The operating temperature of the SOLOPro+ is between -10° to + 40°C, not in direct sunlight.

Care should be taken during the operating of the CCU, especially in hot environments, to shade it from direct sunlight. Radiant heat from the sun can cause the equipment to heat up to temperatures exceeding + 60°C. All computers generate their own heat on top of the ambient temperature surrounding it.



NOTE !

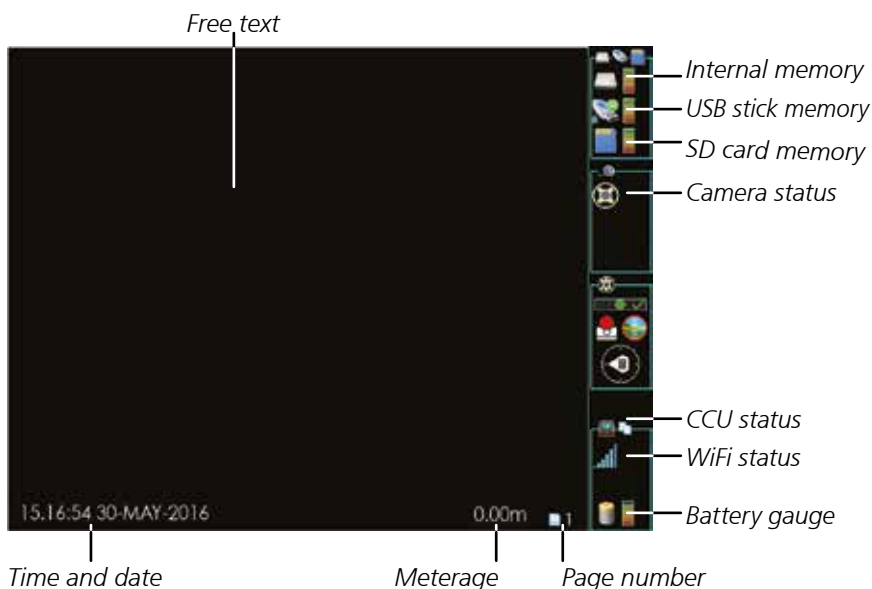
Using the equipment in direct sunlight can cause the electronics to overheat and shut-down unexpectedly. The equipment will not turn on again until it has been allowed to cool down.

Display Features

This section describes the characteristics of the front panel LCD display.

Introduction

The front panel of the SOLOPro+ unit houses an 20cm (8inch) Sunlight Readable Liquid Crystal Display (LCD) which is used to display live and recorded video and on screen menus. The display parameters such as contrast, brightness, colour and backlight intensity may be adjusted to suit the environment in which the unit is being viewed.



The live or recorded video picture is displayed in the left portion of the screen.

The right hand side is used to display a number of status icons which are seen on the screen but are not recorded.

There are areas of text at the bottom of the picture showing date, time and camera meterage. This text is recorded with the video picture. Text can be also be entered manually anywhere on the display. This is free text and is used to annotate the survey and is recorded with the video picture. The colour and position of this text may be controlled with dedicated keys on the keypad.



NOTE! There is an area below the picture where the filename of recorded or played back video file is displayed. This is not recorded with the picture.

If **Power Saving** is enabled (see **page 67**), the screen backlight intensity will automatically reduce to a low level if the keypad is not used for a pre-set time period, returning to its normal intensity when any key is pressed.

Status Icons



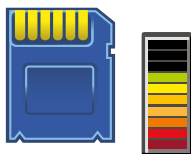
Camera Status

This shows whether or not there is a video signal available from the push-rod camera. If the camera is not connected or faulty, then a red cross appears over the icon.



Internal Memory

The gauge to the right of this icon shows the available capacity of the internal memory as a fraction of the total capacity. The used proportion of the internal memory is shown as the uncoloured bars at the top of the gauge, and the available portion is shown as the coloured bars at the bottom of the gauge.



SD/MMC Card Memory

The gauge to the right of this icon shows the available capacity of an SD (Secure Digital) or MMC (Multimedia Card) memory card in the front panel memory card slot. The used proportion of the SD or MMC memory is shown as the uncoloured bars at the top of the gauge, and the available portion is shown as the coloured bars at the bottom of the gauge.

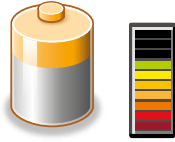


External USB Memory

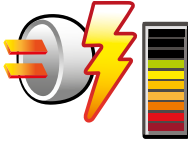
The gauge to the right of this icon shows the available capacity of a memory stick in the front panel USB socket. The used proportion of the USB memory is shown as the uncoloured bars at the top of the gauge, and the available portion is shown as the coloured bars at the bottom of the gauge.

Internal and External Battery Status

This icon shows whether an external power source is available (Power Plug icon) or if the CCU is operating on Internal batteries (Battery icon).



The gauge to the right of this icon shows the available capacity of internal batteries as a fraction of their total capacity. The available proportion of the internal battery is shown as the coloured bars at the bottom of the gauge, a fully charged battery shows all coloured bars, and a fully discharged battery shows no coloured bars.

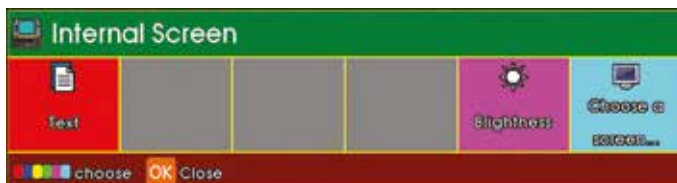


The gauge to the right of this icon shows battery capacity available while the CCU is being operated on battery and the charged state when the CCU is being operated from an external power source. When connected to an external power source, the battery icon is replaced with a power plug icon and when the battery is charging a lightning strike symbol appears to the right of the icon.

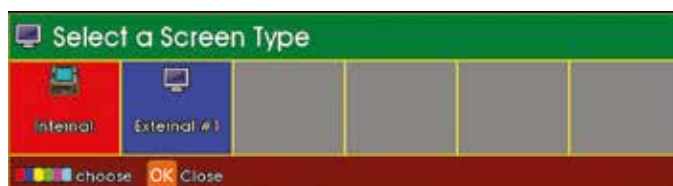
Display Brightness

The brightness, colour and backlight intensity of the internal (CCU) and external monitors can be adjusted to suit the environment in which the unit is being viewed:

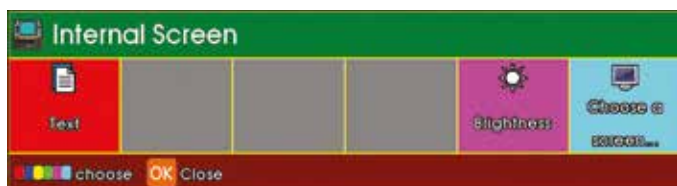
1 Press the **Screens** key.



Press **F6** (Cyan key) **Choose a Screen** to select the Internal Screen (CCU) or an External Monitor



Press **F1** (Red key) for **Internal** or **F2** (Blue key) for **External**



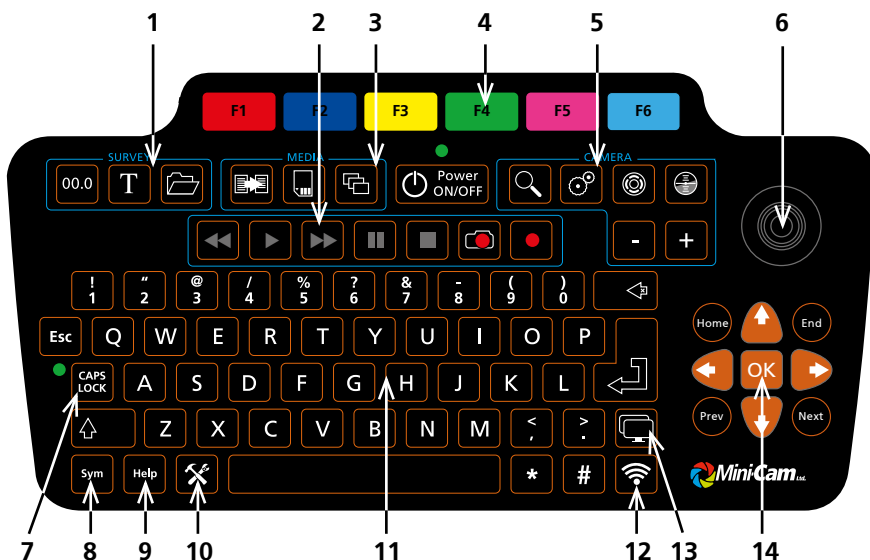
Press **F5** (Magenta key) to display the LCD Backlight status bar



Use the **Left Arrow** cursor key to decrease the brightness or the **Right Arrow** cursor keys to increase the brightness.

Keyboard

The keyboard is divided into clusters of keys and single keys as shown below.



1 Survey Keys (page 37)

2 Recording and Playback Keys
(see page 40)

3 Media Keys (see page 44)

4 Function Keys (see page 59)

5 Camera Keys (see page 54)

6 Joystick (see page 57)

7 Caps Lock Key

8 Symbols Key (page 80)

9 Help Key (page 84)

10 Tools Key (page 61)

11 Text Entry Keys

12 Sonde Activation Key (page 79)

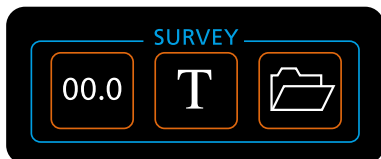
13 Screens Key (page 78)

14 Cursor Keys (see page 58)

Survey Keys

The Survey keys cluster features three keys:

A. Meterage B. Text C. Survey Features



Meterage

1

Press the **Meterage** key.



The meterage functions will be displayed on screen

2

Select the required function:

Zero F1 (Red key) Resets the meterage to 00.0.

Offset F2 (Blue key) Sets the meterage to your preferred value.

Move F3 (Yellow key) Use the cursor control **Left Arrow**, **Up Arrow**, **Right Arrow** and **Down Arrow** to re- position the on-screen text.



Hide F4 (Green key) Hides or shows the meterage from the display.

Colour F5 (Magenta) Change the colour and/or outline of the screen text.

Units F6 (Cyan) Set the units of measure:
0.00' / 0'.0" / 0.00m / 0.00cm.

Text

1 Press the Text key.



The text functions will be displayed on screen

2 Select the required function:

- | | |
|-------------------------------|---|
| Hide F1 (Red key) | Hides or shows the meterage from the display. |
| Cursor F2 (Blue key) | Hides or shows the cursor from the display. |
| Colour F3 (Yellow key) | Select the desired text colour from the drop down menu. |



- | | |
|--------------------------------|---|
| Meterage F4 (Green key) | Hides/shows the meterage from the display |
| Clock F5 (Magenta key) | Hides/shows the clock from the display |
| Move F6 (Cyan key) | Use the cursor control Left Arrow , Up Arrow , Right Arrow and Down Arrow to reposition the on-screen text. |

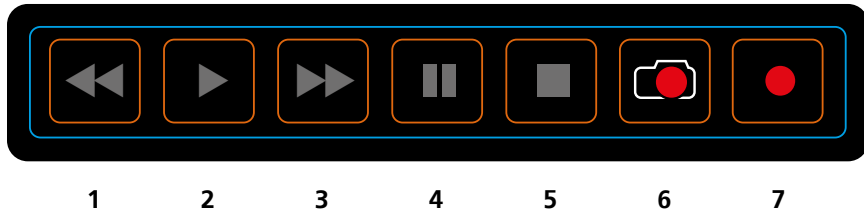


Survey Features

The Survey Folder key is used to start a *ProPipe* survey (see page 143) or *WinCan* survey (see page 106).

Recording and Playback Keys

These keys control the recording and playback of video files



- 1 Rewind
- 2 Start
- 3 Fast Forward
- 4 Pause
- 5 Stop
- 6 Snapshot
- 7 Record

The keys shown above are described in more detail on the following pages.

Recorder Control Keys


This section describes the functions of the **Recorder Control Keys** and how these can be used to make recordings and control the playback of stored surveys.





Making a recording



To start the recording of a survey.

Press the **Record** key



This will cause a recording to commence. The filename will be displayed at the bottom left of the screen together with an icon to show which memory type it is being recorded on. The elapsed time of the recording in minutes and seconds is displayed at the bottom right of the screen. A red dot  to indicate that a recording is taking place is displayed at the right of the screen




At any time the **Pause** key  may be pressed which will pause the recording, although the display will continue to show the live video and a **Pause** symbol will be displayed, and flashes,  to show that the recording has been paused. To resume the recording press either the **Pause** key  or the **Record** key .

To stop the recording, Press the **Stop** key . This will cause the record filename, the recording elapsed time and the record button to be removed from the display, and a pale blue rotating 'progress' circle  may appear on the right of the picture to show that the file is being saved and closed.




NOTE! While the progress icon is displayed, no action, such as removing a USB memory stick or an SD card, should be attempted as it may result in corrupted or bad files.





Playing back a recording

To play back a recording, press the **Gallery Browser**  key to select the .avi or .mp4 file which you wish to view, then press  or press the **Play Key** .



The selected video file will now start to play and the filename will be displayed at the bottom left of the screen together with an icon to show which memory type it was recorded on.


In the centre bottom of the screen, a progress bar is displayed to show the current position in the total length of the recorded file. To the right of this is the total



length of the recording (in minutes and seconds) and to the right of this is the elapsed time into the recorded file (also in minutes and seconds), and finally to the right of this is a pale blue **Play** symbol 

Once again, the **Pause Key**  may be pressed which will pause the playback and the picture on the screen will become stationary and the **Pause Symbol**  will flash to show that the playback has been paused. To resume playback of the recording press either the **Pause key**  or the **Play key** .



Fast Forward

During playback, the playback speed may be increased by pressing the **Fast Forward** key . Pressing this key once will cause the playback speed to advance at twice the normal speed (x2). Press this key a second time to increase the playback speed to 5 times normal speed (x5) and a third time to increase to the fastest playback speed of 12 times normal speed (x12). To return to normal playback speed press **Play** key .

To reduce the fast forward speed, press the **Rewind** key , each press reducing the playback speed from 12x to 5x to 2x and finally back to normal playback speed.

While the recording is fast forwarding, the **Play** symbol  on the screen becomes a **Fast Forward** symbol  with the fast forward speed being displayed to the right as x2, x5 or x12.

Fast Rewind

Fast Rewind is similar to fast forward except that there are only two rewind speeds, times five (x5) and times 12 (x12). While the recording is rewinding, the **Play** symbol  on the screen becomes a **Rewind** symbol  with the rewind speed being displayed to the right as x5 or x12.

Zoom

The survey picture may be zoomed in to see small details in the survey.

To zoom in press the **Zoom** key (see page 54). Pressing this key once will zoom in by a factor of 1.5, pressing a second time will increase the zoom ratio to 2 and pressing a third time will increase it to 3. Pressing this key a fourth time returns the picture to normal view.

At each stage of zoom, the area of the total survey picture which is being viewed on the screen is shown as a red box on a white background in the bottom left of the picture.




The area which is viewed in zoom mode can be moved around the survey picture using the cursor control **Left Arrow**, **Up Arrow**, **Right Arrow** and **Down Arrow** keys.



If the survey picture is zoomed in during a recording then the zoomed view will be recorded together with the red on white symbol to show which area of the survey picture is being viewed.

Snapshot Capture

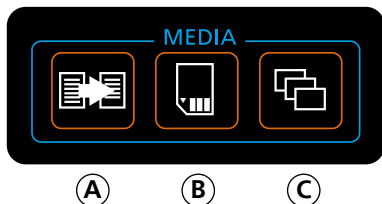
While a survey is being recorded or played back, a still image may be captured and stored by pressing the **Snapshot** key . The still image will be stored as a .jpg still image using the default filename format.

Snapshots may be taken while recording or playing back a survey. If a snapshot is taken while the picture is zoomed in (see page 42), then it will be the zoomed image which is stored as the snapshot.

Media Keys

The Media keys cluster features three keys:

- A** Data Transfer (currently inactive)
- B** Data Storage
- C** Media Browser



Data Transfer

The **Data Transfer** function is currently inactive.

Data Storage

The **Data Storage** function allows the user to store data on the internal memory of the CCU or on external storage using a USB stick or SD Card.

- 1 Press the **Data Storage** key.



The dialogue will show the internal memory of the CCU plus any mounted external memory eg: SD Card and/or USB Stick.

- 2 Select **Internal** to view the options available for the Internal Memory:



Select **SD Card** to view the options available for the SD Card:



Select **USB** to view the options available for the USB Stick:



The functions available for each storage option are as follows:

Remove

Select **Remove** for safe removal of the SD Card or USB stick to prevent loss of data. Then manually remove the SD Card or USB stick from its slot.

Explore

Select **Explore** to view all stored video and data files.

Erase All

Select **Erase** to erase all stored video and data files.

Media Browser

This section describes how the key is used to access and manipulate recorded survey video files.

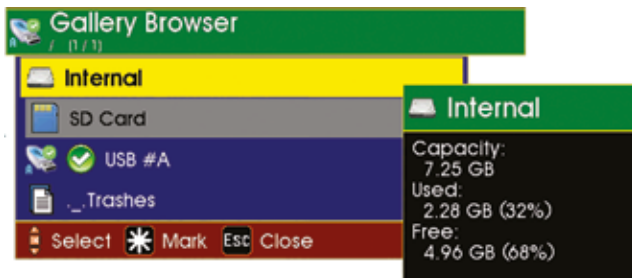
Gallery Menu

- 1 Press the **Media Browser**  key

- 2 The **Gallery Browser** dialogue will be displayed



Press **F1** (Red key) to display a menu that shows which of the three main memory types is being used and the contents of that memory type:



The three memory types are:-

- 1 Internal memory - usually used to record video surveys.
- 2 USB memory - usually a memory stick plugged into the front panel connector.
- 3 SD card memory - an SD card inserted into the front panel slot

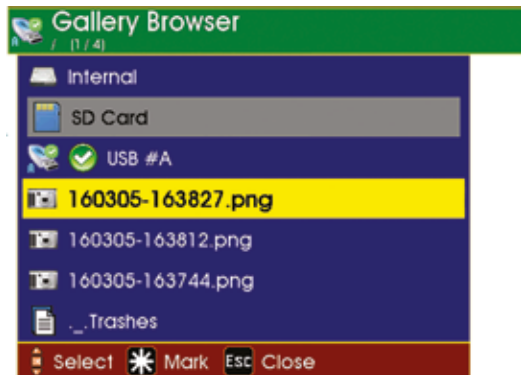
Surveys are stored in a **Daily Directory** which is automatically created when a survey is recorded or a picture is taken. This allows you to keep all the surveys organised by the day they were done. This is especially useful, for instance, at the end of the day when you want to copy all of the day's work from the CCU to an external media to hand into the office.

Daily Directories are named by the date they were created in the format:

YYMMDD, e.g 110702_Survey.dgs

By default all Daily Directories and surveys are recorded onto internal memory and are then copied to an SD card or USB stick using the **Gallery Copy** function. However, surveys may be recorded directly to an SD card or USB stick by selecting either of these as the default recording memory in the Gallery menu.

The memory types are shown in the gallery in the following way:-



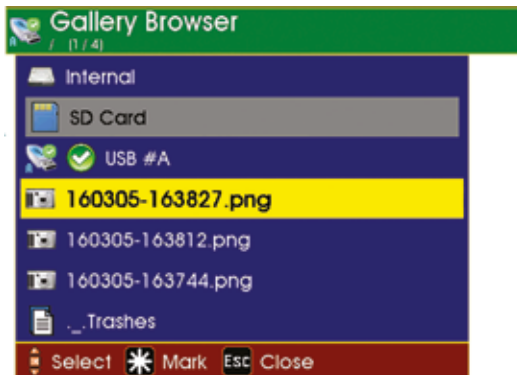
The tick next to one of the memory types shows which one is selected for viewing and where the video files are automatically recorded to.

To change the selected memory type

- 1 Move the cursor so that a new memory type is highlighted in yellow.
- 2 Press OK and a menu is displayed with an Explore option.



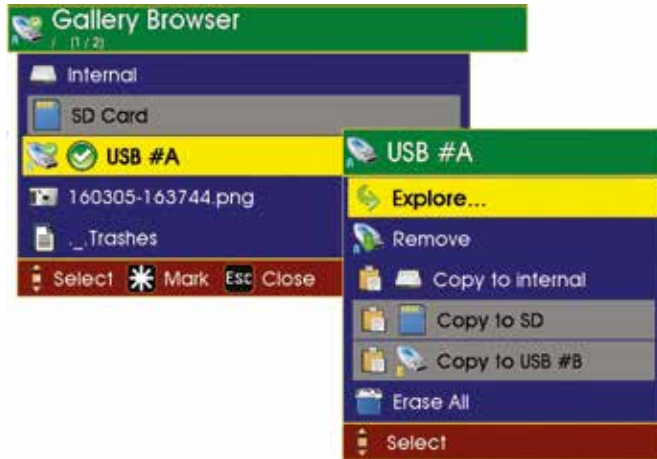
- 3 Select this option and the new memory type will now be ticked to show it is now the default memory type.



The daily directories or video files in the selected memory type are then displayed in the order in which they were recorded (most recent at the top of the list).

To view files contained inside the Daily Directory

- 1 Highlight the file to be viewed and press OK
- 2 Select **Explore**.



To select one of the files for viewing

- 1 Highlight the file and press OK. A sub-menu is displayed as shown below:

Explore (see note below)
Copy to
Rename
Delete


- 2 Select **Explore**. This will show video files within the **Daily Directory**



NOTE: If the selected file is a .jpg picture, then the first menu entry is **Show** and if the selected file is an .mp4 or .avi movie file, then the first menu entry is **Play**.

Show/Play Function

The Show/Play menu entry will be highlighted in yellow. Press **OK** and the selected video will play or picture will be displayed.

An alternative way to play a video file is to press the **Play** key  on the control section of the keyboard, which will play the selected file instantly.


The file list is able to display 7 files at a time, if more than 7 files have been stored in the selected memory, then a **Next Page** menu item is shown at the bottom. The next page of files may be selected by moving to this menu item and pressing **OK**.

Similarly if you wish to navigate to the previous list of files, move to the **Previous Page** menu item and press **OK**.

Copy function

With the copy function the user can copy all files from one memory type to another, e.g. Copy all files from the Internal memory to the external USB memory.

It is also possible to copy a daily directory or individual file directly to another media.

To use this function open the **Gallery Browser**  and highlight the source memory, daily directory, or file then press **OK**. You will now be presented with the option to copy directly to another media, e.g. Copy to SD or Copy to USB. Highlight the appropriate media and press **OK**.

If copying all files you will now be prompted to press **Y** to confirm copying all files.

A progress bar will show the status of the transfer. When you are copying multiple files the system will show you overall progress and individual file progress on two separate progress bars.

Rename Function

This function allows the user to change to file name to something more useful or meaningful.

However, it does not change the entire file name. It only changes the name after the time and date stamp of the survey. This is to keep the files in order.

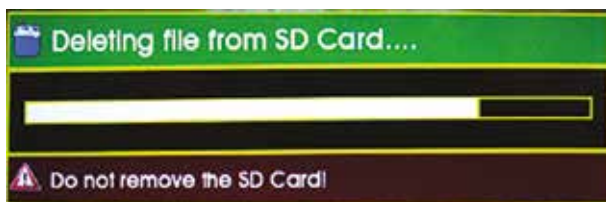
Delete function

The **Delete** function permanently removes the selected file from the system.

If this function is selected then a window is displayed asking the user to confirm that this file is to be deleted by pressing the **Y** key.




NOTE: The Delete function may take a short time to execute so to show how much of the function has been completed a progress bar is displayed on the screen.



Un-mounting external memory

Before any external memory device (SD card or USB memory stick) is removed from the unit, it must be un-mounted.

To do this open the **Gallery Browser**  and select the memory which needs to be removed using the **Up Arrow** and **Down Arrow** keys. Press **OK** and select the **Remove** option.

During the un-mounting process, the memory icon next to the fuel gauge will show a downward pointing, green arrow with a red cross over it to show that the memory should not be removed. For the SD memory and USB memory the icons will look like this:



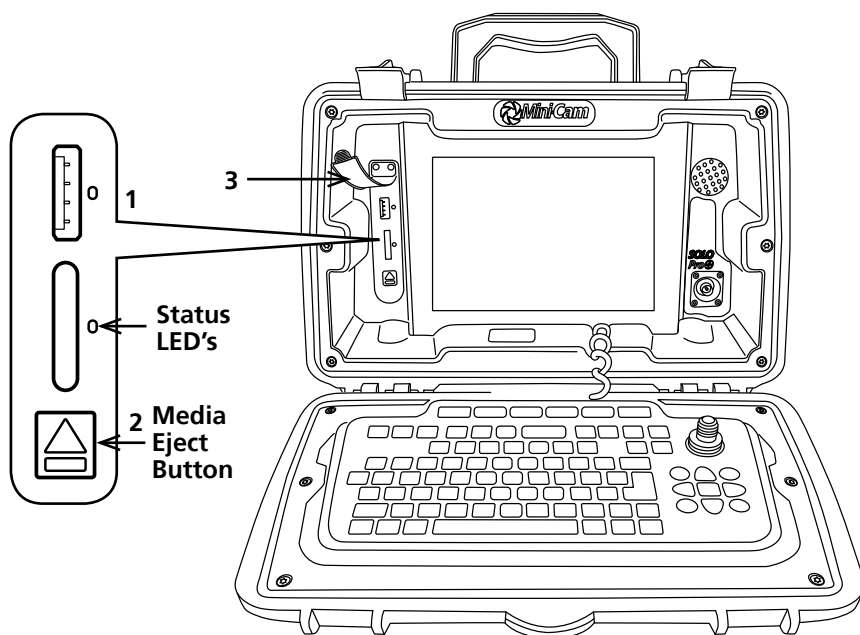
When it is safe to remove the selected memory, the red cross will disappear so only the green arrow will remain, indicating that the memory may be removed. For the SD memory and USB memory the icons will look like this:-



CAUTION: It is very important that external memory is un-mounted before it is removed. If this is not done and the memory is simply unplugged, then files on the memory device may become corrupted.

USB / SDHC Media Types

Due to variations in USB / SD Flash media technology, Mini-Cam Ltd cannot guarantee that all types and sizes will function correctly. For USB we recommend a read speed of a least 15MB/s and a write speed of a least 8MB/s. For SDHC we recommend a card of CLASS 5 or higher. Therefore it is recommended that they are purchased directly from Mini-Cam Ltd. Please contact us for further information. Contact details can be found on page 3



1 External media – USB and SD card slots

a External media status LED's.

- **Blue** – Media is plugged in but is not in use.
- **Orange** blinking – Media is currently selected and in use.
- **Green** – Media is safe to remove from the control unit.
- **Red** – Media is plugged in but is faulty.

2 External media eject button

- ### a
- Press this button for 1 second and release. This will instruct the control unit that you wish to unmount the external storage media. When the LED status indicators are green it is safe to remove the media.

3 External media protection cover

- ### a
- To protect the connectors from dirt and moisture.



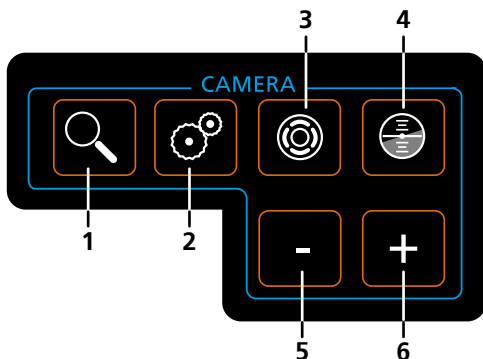
NOTE!

Always fit the external media protection cover (3) into position to protect from ingress of dirt and moisture.

Camera Keys

The Camera keys cluster features six keys:

- 1 Zoom
- 2 Camera Sweep
- 3 Illumination
- 4 Home
- 5 Focus Minus
- 6 Focus Plus



Zoom

Press the **Zoom** key.



Pressing this key once will zoom in by a factor of 1.5, pressing a second time will increase the zoom ratio to 2 and pressing a third time will increase it to 3. Pressing this key a fourth time returns the picture to normal view. At each stage of zoom, the area of the total survey picture which is being viewed on the screen is shown as a red box on a white background in the bottom left of the picture. The area which is viewed in zoom mode can be moved around the survey picture using the cursor control **Left Arrow**, **Up Arrow**, **Right Arrow** and **Down Arrow** keys.



If the survey picture is zoomed in during a recording then the zoomed view will be recorded together with the red on white symbol to show which area of the survey picture is being viewed.



Camera Sweep

Press the **Camera Sweep** key.



The menu displays the camera sweep options:

Press **F4** (Green key) to sweep camera clockwise.

Press **F5** (Magenta key) to sweep camera anti-clockwise.

Illumination

Press the **Illumination** key.



The Camera Illumination status bar will be displayed. Use the cursor control **Left Arrow** key to decrease the illumination. Use the cursor control **Right Arrow** key to increase the illumination.



Home

Press the **Home** key.



The camera head returns to the home position.

Focus

Press the **Plus** key or **Minus** key.



adjust the sharpness of the image on screen.

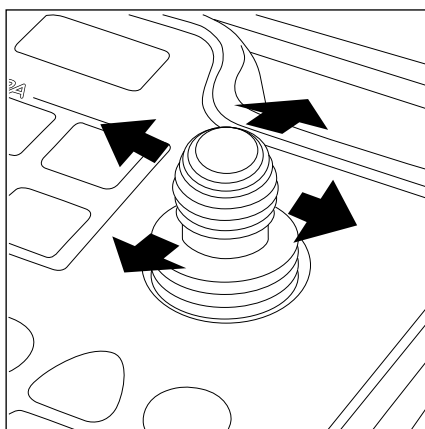
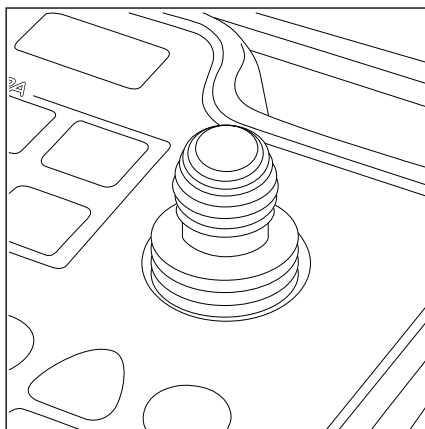
Joystick

The joystick is located at the top right-hand side of the keyboard. The joystick only becomes active when **CAM026** is connected to the system (see page 97).

The functions of the joystick are as follows:

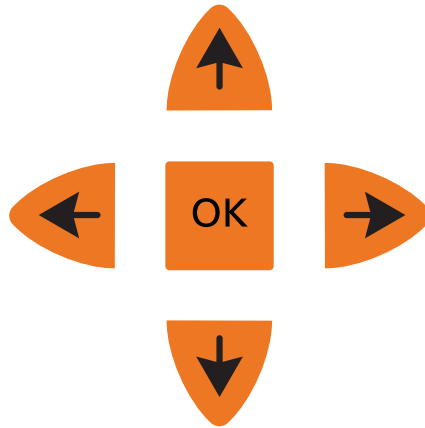
Move the joystick **Left** or **Right** to perform an 360° endless rotation of the camera.

Move the joystick **Up** or **Down** to pan the camera 135° + or - (Plus or Minus).



Cursor Control Keys

The cursor control consists of five keys; **Left Arrow**, **Up Arrow**, **Right Arrow**, **Down Arrow** and **OK**. These five keys are used to move the cursor around the screen after entering text and to move around and highlight menus in the gallery and set-up menus.



Function Keys



Located at the top of the keyboard, the Function keys or “Hot Keys” are user friendly multi-function keys used to navigate the menu dialogue screens for the various features of the system. The easy-to-use colour-coding matches the key on the keyboard to the option on the screen menu. The colours of the keys are referred to in this manual as shown below:



F1 Red key



F2 Blue key



F3 Yellow key



F4 Green key



F5 Magenta key



F6 Cyan key

Special Keys

Tools Key (Setup and Configuration)



Press the **Tools** key and the **Setup and Configuration** menu will be displayed. The functions of this menu are described on page 61.

Screens Key



Press the **Screens** key and the **Screens** menu will be displayed. The functions of this menu are described on page 78.

Sonde Key



Press the **Sonde** key and the **Sonde** menu will be displayed. The functions of this menu are described on page 79.

Symbols Key



Press the **Symbols** key and the **Symbols** menu will be displayed. The functions of this menu are described on page 80.

Help Key



Press the **Help** key and the **Help** menu will be displayed. The functions of this menu are described on page 84.

Tools (Setup and Configuration)

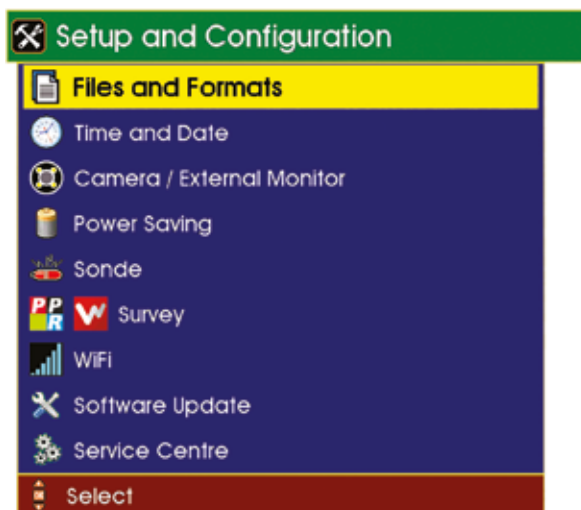
The SOLOPro+ CCU can be configured for your specific requirements using the setup menus described in this section.

To Display the Setup menu

- 1 Press the Tools key.



The Setup and Configuration menu will be displayed.



A map of the above menu is shown on the next page.



Sub menus are as follows:

Files and Formats

- >Base Filename
- >Video File Format
- >Theme
- >Licences

Time and Date

Camera / External Monitor

- >Colour Level
- >Brightness
- >Hue
- >Contrast

Power Saving

- >Camera and LCD Dimming
- >Automatic Shutdown

Sonde

- >Frequency

Survey

- >ProPIPE
- >WinCan

WiFi

Software Update

- >Software Update Browser

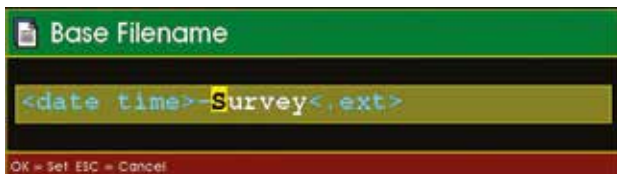
Service Centre

Each of the setup functions will be described in detail on the following pages.

Files and Formats

This menu entry allows the user to select the default filename and file format.

Base filename



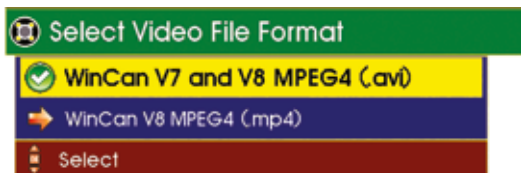
When recording a survey, SOLOPro+ automatically creates a filename which is made up from the date (in YYMMDD format) followed by an underscore character followed by the time (in HHMM format) followed by the default base filename. Thus the default filename can be set to be the company or industry standard and all recorded files will automatically be given a unique filename based on this default.

Example filename:

160630_1059-Minicam.avi

This indicates that the file was recorded on the 30th June 2016 and started at 10:59. Mini-Cam is the default filename and .avi shows that the file is in the motion video AVI format

Video File Format



AVI (MPEG4) is a motion video file which can be played back using WinCan V8, WinCan VX, Windows® Media Player and most other third party readers.



NOTE !

Please note that an additional codec may need to be installed on the host PC or Mac to play back video files. We recommend DivX.

Theme

This feature allows the user to select the colour theme used for the menu system on SOLOPro+.

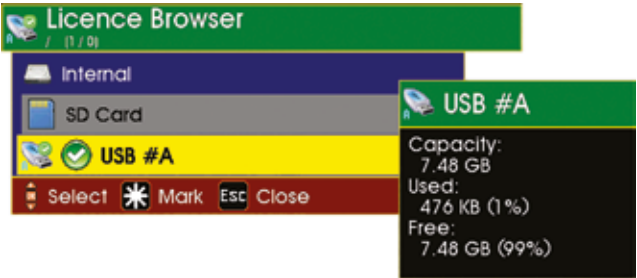


Licences

This feature allows the user to install or view currently installed licences on the SOLOPro+. Certain features require a licence to be installed to activate them i.e. ProPIPE Report and WinCan.



Select the required **View** or **Install** option:



Time and Date

This menu allows the time and date to be set for the local area. Having selected the Time and Date option, use the cursor control **Left Arrow**, **Up Arrow**, **Right Arrow** and **Down Arrow** to change the highlighted number then move the cursor **Left Arrow** or **Right Arrow** to move from one field to another.

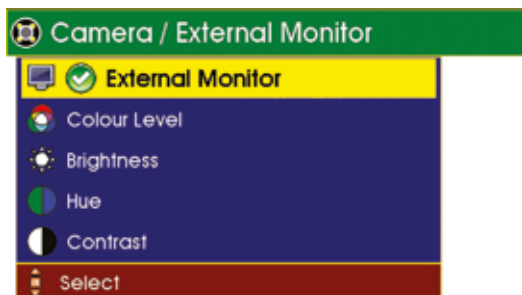


When you have set the date and time press **OK** to save and return to the setup menu.

Camera / External Monitor

External Monitor

This is an optional extra (purchased separately) on SOLOPro+. If installed you can turn the video output ON/OFF by selecting this option. When ON a green tick sits alongside this option to signify that it is active.



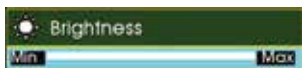
Colour Level

Adjusts the colour level of the picture. Press the **Left Arrow** or **Right Arrow** cursor key to change the setting. Press '0' to reset to default setting.



Brightness

Adjusts the Brightness of the picture. Press the **Left Arrow** or **Right Arrow** cursor key to change the setting. Press '0' to reset to default setting.



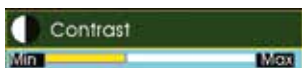
Hue

Adjusts the Hue of the picture. Press the **Left Arrow** or **Right Arrow** cursor key to change the setting. Press '0' to reset to default setting.



Contrast

Adjusts the Contrast of the picture. Press the **Left Arrow** or **Right Arrow** cursor key to change the setting. Press '0' to reset to default setting.



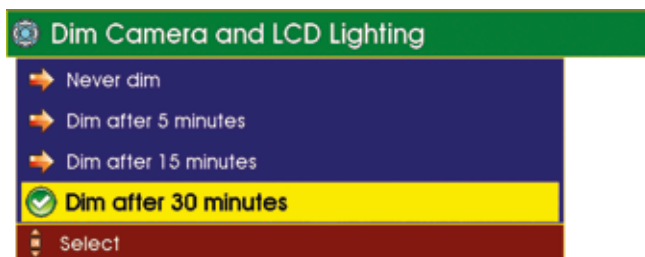
These settings do not affect the display of the menus on the screen, only the video from the camera is affected.

Power Saving

This menu allows the user to set the power saving features of the SOLOPro+.



Camera and LCD Dimming



The camera illumination and LCD backlight will dim after a period of inactivity.

The options are: Never / 15 / 30 minutes.

Automatic Shutdown



When the SOLOPro+ is powered only by internal batteries this feature will power down the SOLOPro+ after a period of inactivity.

The options are: Never / 5 / 15 / 60 minutes.

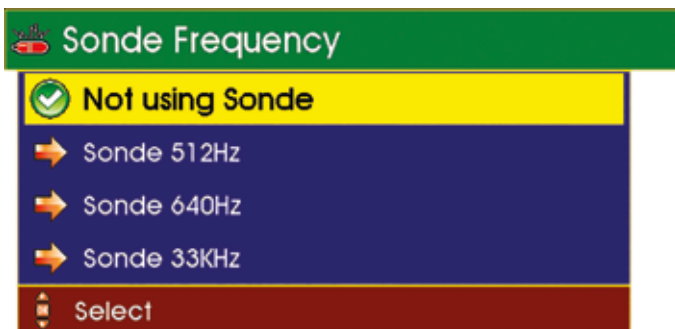
Sonde

This feature allows the user to set the Sonde frequency.

- 1 Select **Survey** from the **Setup and Configuration** drop-down menu
- 2 Select the required Sonde frequency from the drop-down menu.

The Sonde frequency options are:

512Hz / 640Hz / 33KHz



The Sonde frequency can also be set using the Sonde

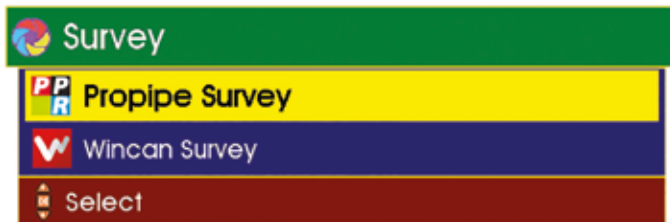


Key see page 79.

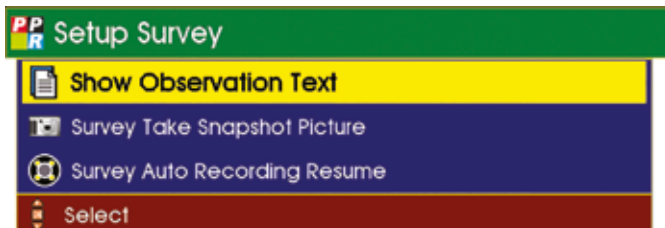
Survey

This feature allows the user to show observation text and take snapshot pictures.

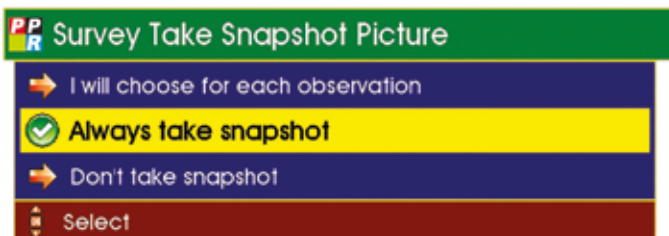
- 1 Select **Survey** from the **Setup and Configuration** drop-down menu (see page 61).
- 2 Select the required software: **ProPIPE** or **WinCan**.



- 3 Select the required option eg: **Survey Take Snapshot Picture**.



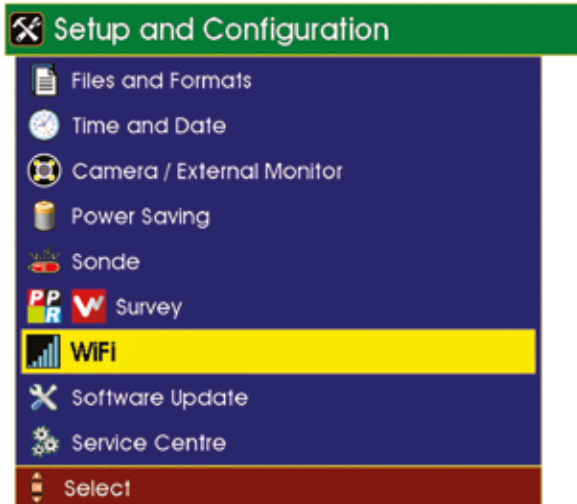
- 4 Select the required option. eg: **Always take snapshot**



WiFi

This feature allows the user to connect the CCU to WiFi.

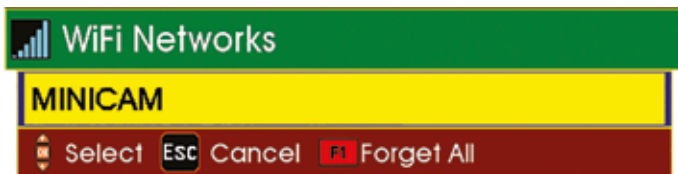
- 1 Select **WiFi** from the **Setup and Configuration** drop-down menu page 61.



- 2 A menu will be displayed giving options to connect to WiFi.



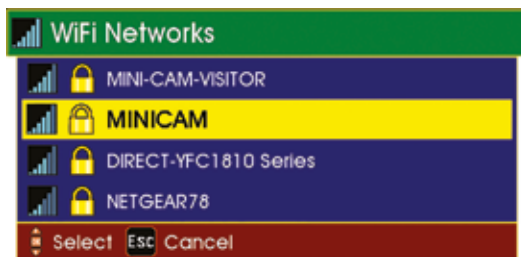
- 3 Select **Stored** F3 (Yellow Key) to view stored network URLs (addresses).



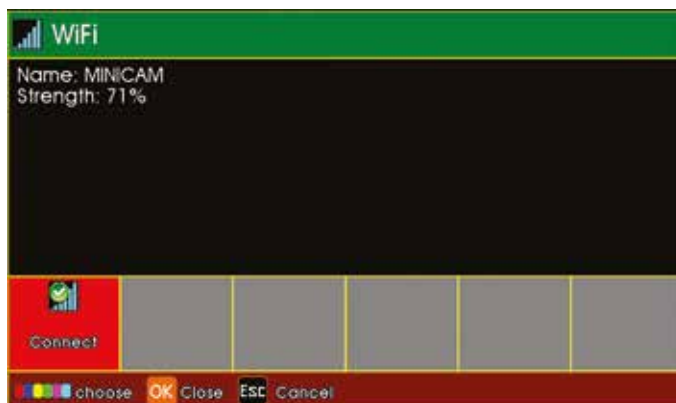
- 4 Select Find WiFi... F1 (Red Key) to search for available networks.



- 5 Select the required network form the menu.



- 6 Select **Connect** F1 (Red Key) to connect to the selected network (you will have to type a WiFi password in if required).



- 7 Status screens will display the connection progress, followed by connection confirmation, signal strength and IP Address.



- 8 The main display screen (see page 31) shows the WiFi status icon at the bottom right-hand side of the sidebar.

WiFi NOT CONNECTED
Red cross indicates no signal

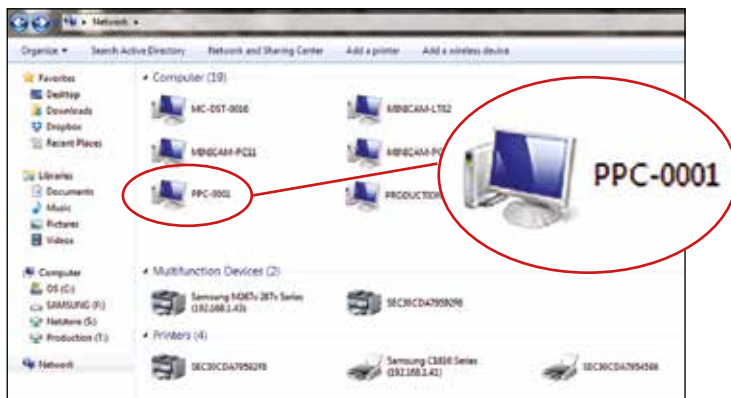


WiFi CONNECTED
Vertical blue coloured bars
indicate signal strength

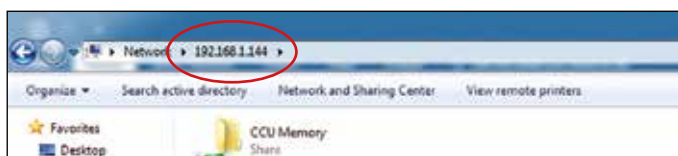


Connecting to your PC

Using *Explorer* in *Windows®* OS, the CCU may appear under the **Network Neighbourhood**. You can access your files directly.



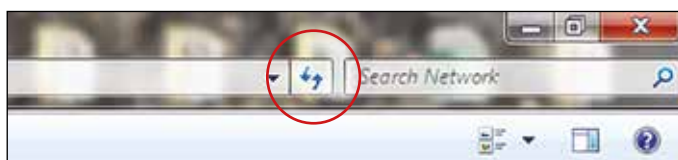
Alternatively, use the search bar in *Explorer* by typing \\ followed by the IP Address shown on your SOLOPro+ (Example - \\192.168.1.144)



This will then connect you to your SOLOPro+ control unit which will display a folder named **CCU Memory**. Double click on this folder to access all files currently on that control unit. You then can open any file to view video footage or still images and ProPIPE Reports or alternatively you can save them onto your PC.



NOTE: If the CCU is not displayed after the first search, try searching again by hitting the **Refresh** button on the menu bar





File Sharing



NOTE: To share the files over email or WincanWeb internet access is needed. Please connect to a Wifi with an internet connection before sharing files.

Email

- 1 Use the **Gallery Browser**  to select a file to be sent.
- 2 Navigate to the desired file, press **OK** and select the **Share**  option. **The Email option is only available for a single file, directories cannot be sent by email.**
- 3 From the menu select the **Email** option. A text box with all the necessary data inputs fields will be displayed.
- 4 Enter Address, CC Address, Subject and Body text then press **OK**. The CCU will start the sending process. A message will be displayed with the sending progress, which will display **Sent** when the email has been dispatched.





NOTE: The most recent Address, CC Address and Subject are stored over the power cycle.



NOTE: The file to be shared over the email cannot exceed 10MB

WincanWeb

If the user has a *WincanWeb* account he can use it to upload *Wincan* Embedded projects.

- 1 Use the **Gallery Browser**  to select a WinCan project to be sent.
- 2 Navigate to a WinCan project, press **OK**.
- 3 Select the **Share**  option.
- 4 From the menu select the **WincanWeb** option. A text box with all the necessary data inputs fields will be displayed.
- 5 Enter Login and Password, then press **OK**. The WinCanWeb will start the sending process. A message will be displayed with the sending progress, which will display **Sent** when the upload has finished.




NOTE: To share using WincanWeb, WinCan catalogues must be installed on the CCU.




NOTE: Login and password are stored over the power down.

Share Status

The user can clear the status window displayed after the share process has been started and an appropriate form filled, without interrupting file sharing.

The share icon  will be visible in the right bottom corner until the Email or WincanWeb has finished sending. The progress can be also seen in the **Share Status**

which can be accessed after pressing **Gallery Browser** . It will also inform the user in the case of a sending failure, which may happen if the internet connection has been interrupted or services are temporarily unavailable.



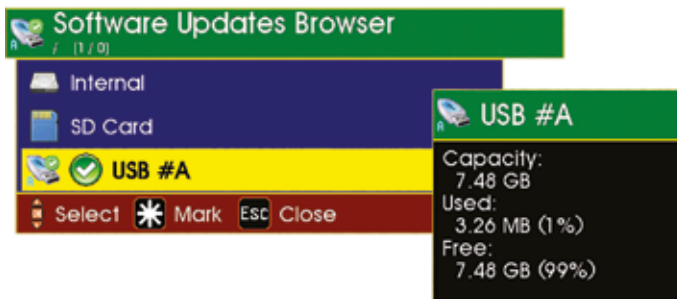
NOTE: To successfully share files, the CCU needs to remain on and connected to the internet until the sharing has finished.

Software Update

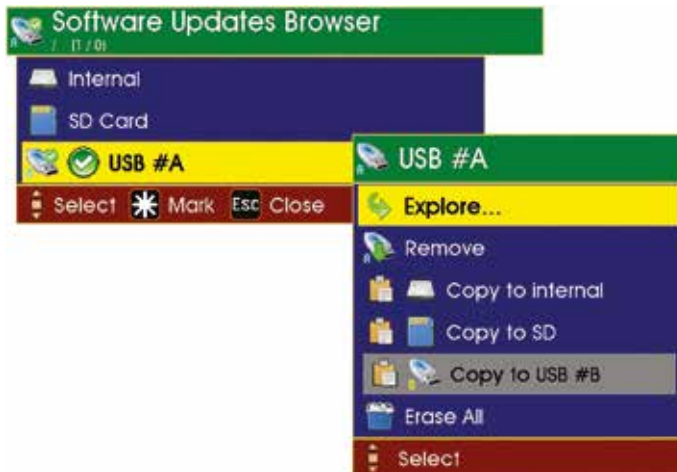
This feature allows the user to update the SOLOPro+ software, when available, in the field using removable media such as a USB memory stick or SD card.

- 1 Select **Software Update** from the **Setup and Configuration** drop-down menu page 61.

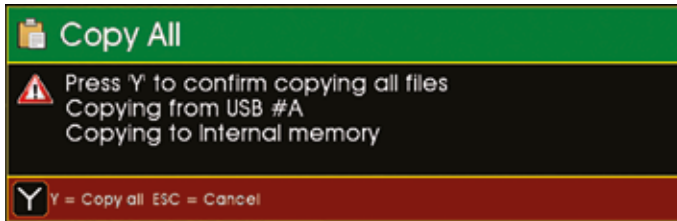
The **Software Updates Browser** will be displayed.



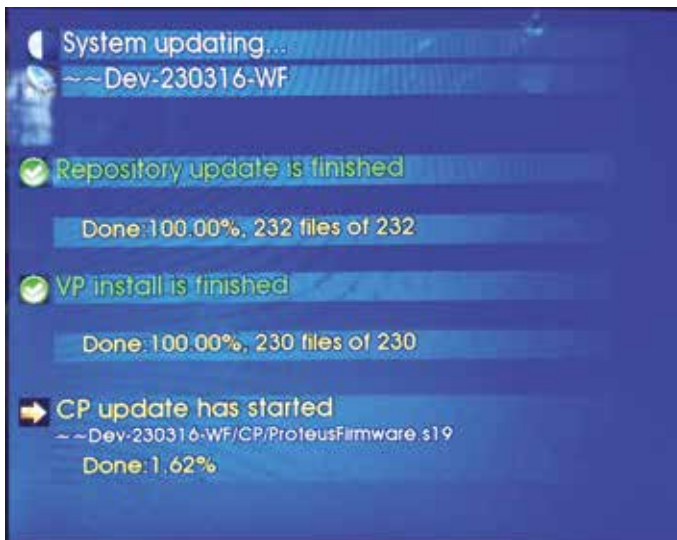
- 2 Select the removable media you are using and press **OK**. Highlight the update you want to install and press **OK**.



- 3 You will now be prompted to press **Y** confirm the copying the update.



The SOLOPro+ will now restart. On-screen text will show the status of the software update.



NOTE!

SOLOPro+ will not allow the user to use the Software Update feature if the internal batteries are less than 40% charged. This feature will then appear greyed out in the menu.

Service Centre

This menu option is for sole use by Mini-Cam and its authorised dealers. As such, this option is password protected.

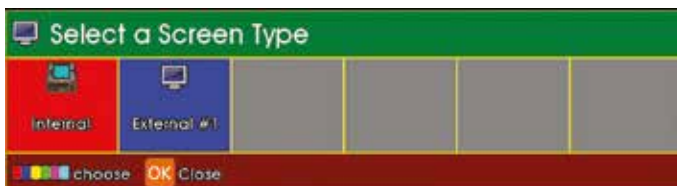
Screens Key

The brightness, colour and backlight intensity of the internal (CCU) and external monitors can be adjusted to suit the environment in which the unit is being viewed:

1 Press the **Screens** key.



Press **F6** (Cyan key) **Choose a Screen** to select the Internal Screen (CCU) or an External Monitor



Select **Internal** or **External**



Press **F1** (Red key) to display the LCD Backlight status bar



Use the **Left Arrow** cursor key to decrease the brightness or the **Right Arrow** cursor keys to increase the brightness.

Sonde Key

This feature allows the user to set the frequency of the Sonde transmitter.

- 1 Press the **Sonde** key 



The Sonde can be cycled through three states – OFF, PULSED, ON.

A symbol is displayed in the sidebar of the main screen indicating the current status and frequency of the Sonde:

1) OFF



2) PULSE ON/OFF



3) ON



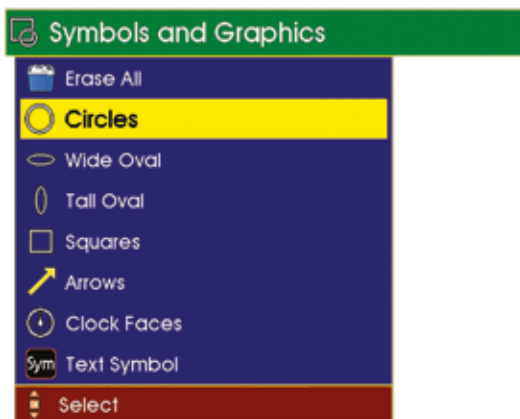
Symbols Key

Symbols and Graphics can be added to the recording, such as an arrow or circle, to highlight an area of interest.

- 1 Press the **Symbols** key

Sym

The **Symbols** menu will be displayed. Use the **Up Arrow** keys and **Down Arrow** cursor keys to highlight in yellow the symbol you require.



- 2 To add circles use the **Up Arrow** keys and **Down Arrow** cursor keys to highlight in yellow the size of symbol you require. Press OK.



To add **Arrows** go to **Step 4**

To add **Wide Ovals**, **Tall Ovals** and **Squares** repeat 2 (above) selecting the required shape.

To add **Clock Faces** go to **Step 6**

To add **Text Symbols** go to **Step 9**

- 3 To colour shapes, use the **Up Arrow** and **Down Arrow** cursor keys to highlight the graphic colour you require. Press **OK**.



The shape will be displayed on screen.

- 4 To add arrows, use the **Up Arrow** keys and **Down Arrow** cursor keys to highlight the arrow direction you require. Press **OK**.



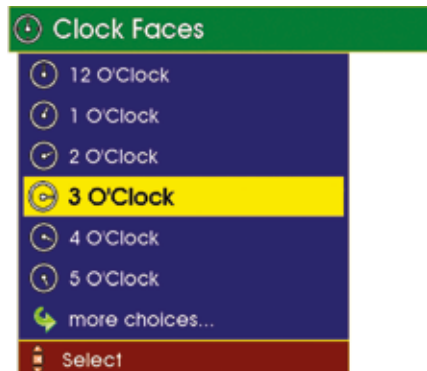
- 5 To colour arrows, use the **Up Arrow** keys and **Down Arrow** cursor keys to highlight the graphic colour you require. Press **OK**.



- 6 To add clock faces, use the **Up Arrow** keys and **Down Arrow** cursor keys to highlight in yellow the size of clock face you require. Press **OK**.



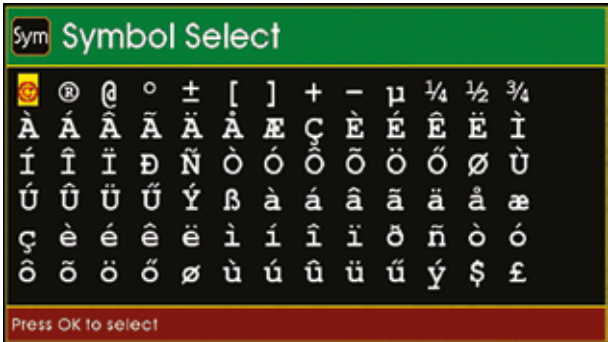
- 7 Use the **Up Arrow** keys and **Down Arrow** cursor keys to highlight in yellow the "time" of clock face you require. Press **OK**.



8 The clock face will be displayed.



9 To add Text Symbols, use the **Left Arrow**, **Up Arrow**, **Right Arrow** and **Down Arrow** cursor keys to highlight in yellow the symbol you require. Press **OK**.



Once a graphic (circle, wide oval, tall oval, square, arrow clock or text symbol) has been created and appears on screen, it can be moved and re-positioned on the screen using the cursor control **Left Arrow**, **Up Arrow**, **Right Arrow** and **Down Arrow**. When the desired position is located press **OK** to set the position.



NOTE! After pressing OK to position the graphic, it cannot be moved. The graphic will need to be erased and a new graphic created.

Help Key

At anytime, the **Help** key can be used to display a menu from which to navigate to the help options

1 Press the **Help** key

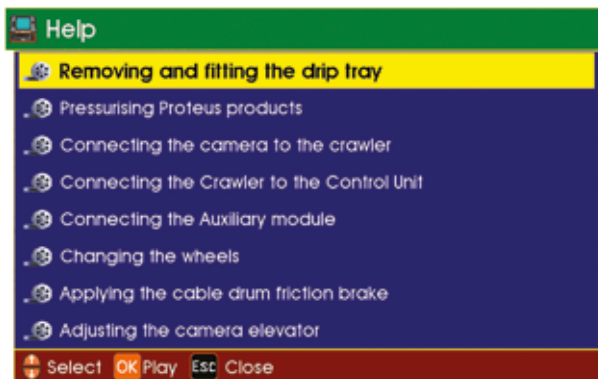
Help

The help menu will be displayed:



Press **F1** (Red key) to go to the “How To” Videos

F1



*Image for illustration purposes only.
Subject to change as videos are added to the system.*

Press **F3** (Yellow key) to go to the **Camera Help** which will show the camera pressure:



Press **F5** (Magenta key) to go to the **Keyboard Help** which will show the following menu from which to select a category:

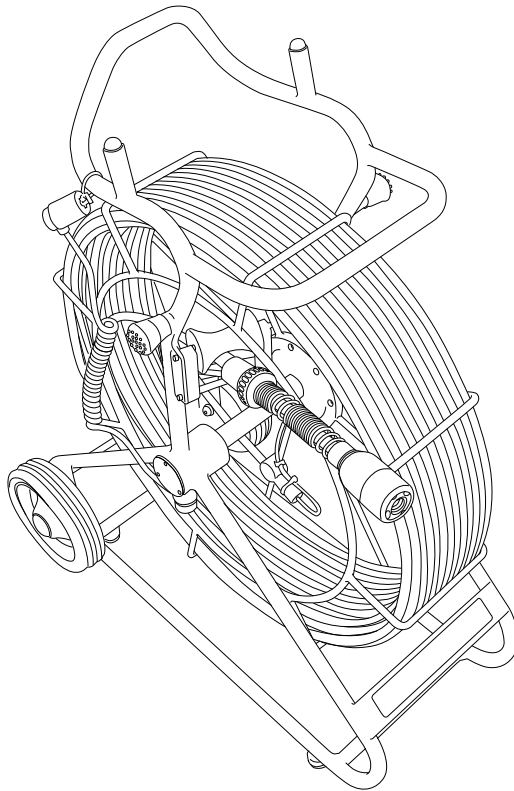


Technical Details - CCU210

Product ID:	CCU210
Dimensions:	435 x 250 x 140 (L x W x D)
Consumption:	Powder Coated
Weight:	3kg (6.6lb)
Controls:	Friction Brake
Temperature Range:	-10°C ~ +40°C
Environmental Protection:	IP54

Coiler

The coiler supplied with the SOLOPro+ system features Mini-Cam's unique Cow-horn shaped top section, enabling quick and easy fitting of the CCU to the coiler (see page 25). Available with rod lengths of 40m, 60m and 100m, the coiler also features a Friction Brake (see page 89) and has a Coiled Link Cable with protective dust cover. The interchangeable camera head allows the operator to use the Pan & Rotate camera - CAM026 (not shown) instead of the Self-Levelling Axial camera - CAM025 (**shown**). This provides great flexibility to meet demanding inspection requirements.

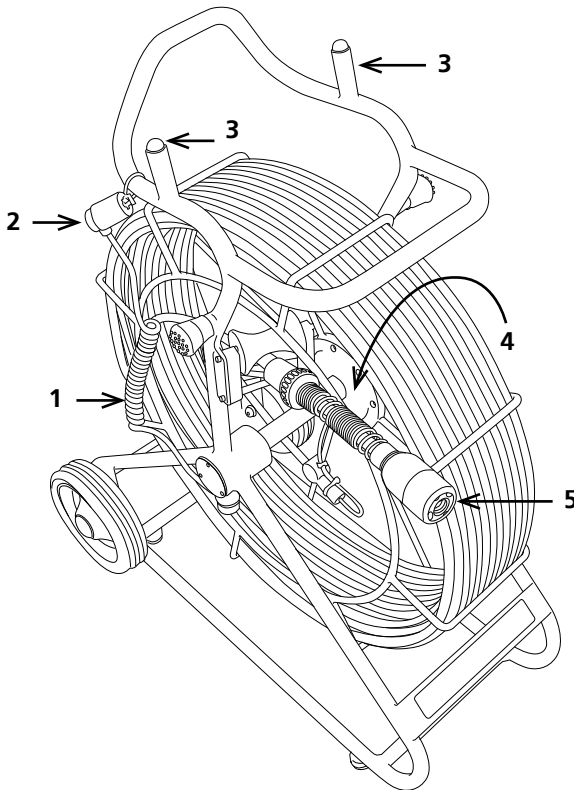


CAM025 is supplied as standard with SOLOPro+ Axial System

CAM026 is supplied as standard with SOLOPro+ Pan & Rotate System

CAM025 and CAM026 both supplied as standard with SOLOPro+ Duo System

Connections and Descriptions



- 1 Coiled Link cable (shown) or Extension Reel Cable (not shown) plugs directly into the CCU.
- 2 Protective Dust Cover.
- 3 CCU Location Pins.
- 4 Friction Brake.
- 5 Self-Levelling Axial camera -CAM025 (see opposite)



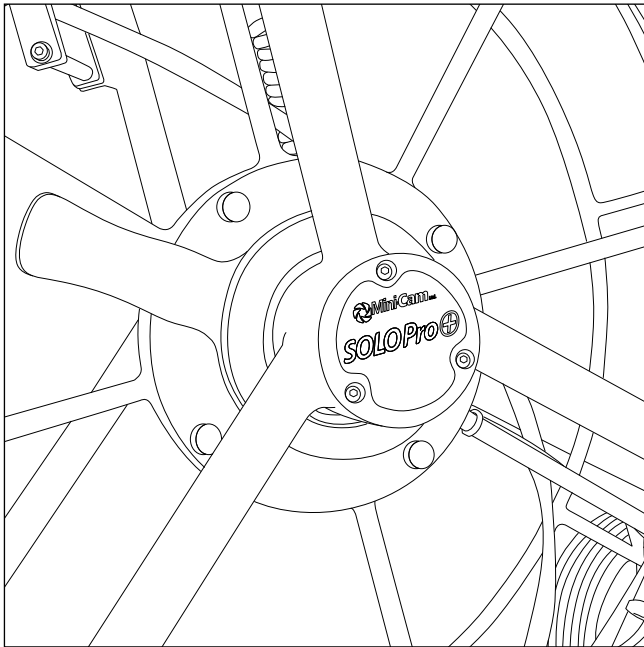
NOTE!

The CCU can power the coiler without the use of External Charger **SPP-PSU** or Proteus Battery Pack **BPP24**.

Friction Brake

Using the friction brake is a simple one handed operation with 3 options:.

- 1 The brake can be fully locked
- 2 The brake can be unlocked
- 3 The brake can applied as a friction brake to avoid unwanted pay-off of the rod.



Information and Care

Cleaning

Ensure that the cable is thoroughly cleaned after each inspection. Use a wet rag when winding the cable rod back onto the coiler. Ensure the connector for the coiler is free from dirt and moisture.

Maintenance

Ensure that all screw threads and connections are free from dirt.



CAUTION!

High-pressure cleaners **must not** be used. It can cause considerable damage to the coiler, camera and other system components.

Cleaning agents or solvents **must not** be used. These can damage the seals and other materials on the system.

Only clean water should be used.



IMPORTANT!

KEEP ALL ELECTRICAL CONNECTIONS AND CONTACTS FREE OF DIRT, GREASE AND MOISTURE AT ALL TIMES.

Technical Details - SOLOPro+ 40m Coiler

Product ID:	SPP-040
Construction:	Welded Steel
Finish:	Powder Coated
Distance Counter Units:	Feet, Metres
Controls:	Friction Brake
Weight:	15kg (33lb)
Dimensions (L x W x H):	52 x 37 x 69cm / 20.4 x 14.5 x 27.1 inches

Technical Details - SOLOPro+ 60m Coiler

Product ID:	SPP-060
Construction:	Welded Steel
Finish:	Powder Coated
Distance Counter Units:	Feet, Metres
Controls:	Friction Brake
Weight:	20kg (44lb)
Dimensions (L x W x H):	69 x 37 x 89cm / 27.1 x 14.5 x 35.0 inches

Technical Details - SOLOPro+ 100m Coiler

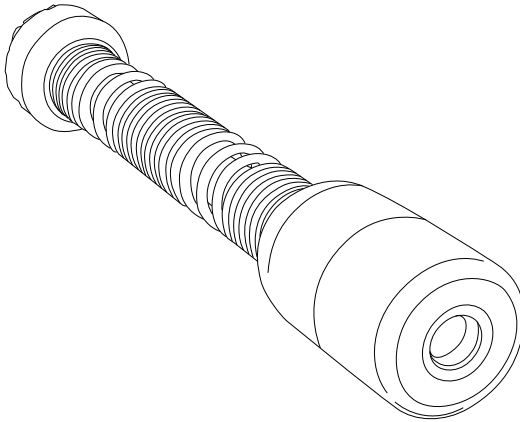
Product ID:	SPP-100
Construction:	Welded Steel
Finish:	Powder Coated
Distance Counter Units:	Feet, Metres
Controls:	Friction Brake
Weight:	30kg (66lb)
Dimensions (L x W x H):	80 x 37 x 100cm / 31.4 x 14.5 x 39.3 inches

CAM025 – Self Levelling Axial Camera

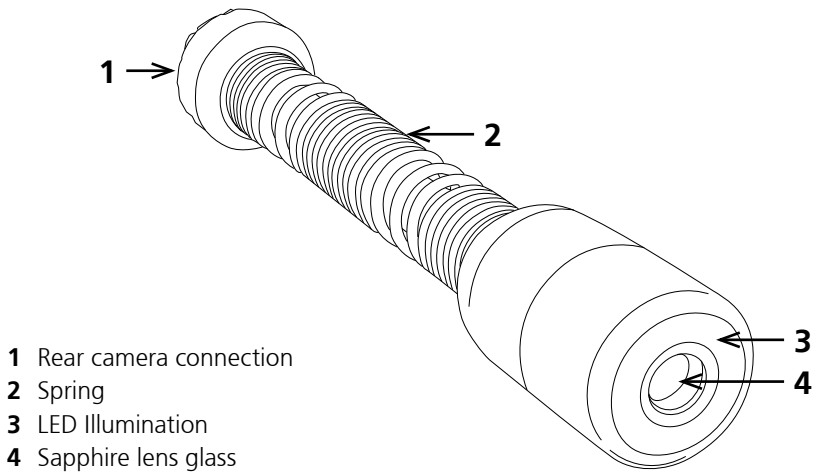
The camera module CAM025 provides a high resolution, colour, self-levelling camera for the SOLOPro+ platform. It has the following features:

- 1/4in colour CCD with DSP (Digital Signal Processor)
- Powerful 4 LED lighting with narrow beam width lenses
- Auto-levelling
- 470 HTVL Resolution
- Sensitivity <1.0 lux
- Illumination intensity adjustable to 12.5K lux at 150mm
- Pipe compatibility 50mm (2in) and up

The camera module is pressure-tested up to 1bar. It is suitable for inspections up to 10m water depth.



Connections and Descriptions



Information and Care

Pressurisation

The camera module is not pressurised.

Cleaning

Ensure the camera module is thoroughly cleaned after each inspection. Ensure the connectors are free from dirt and moisture. Always fit the protective cap immediately after disconnecting the camera module from the system.

Maintenance

Ensure that the camera connector is free from dirt.



CAUTION!

High-pressure cleaners **must not** be used. It can cause considerable damage to the coiler, camera and other system components.

Cleaning agents or solvents **must not** be used. These can damage the seals and other materials on the system.

Only clean water should be used.



IMPORTANT!

KEEP ALL ELECTRICAL CONNECTIONS AND CONTACTS FREE OF DIRT, GREASE AND MOISTURE AT ALL TIMES.

Technical Details CAM025

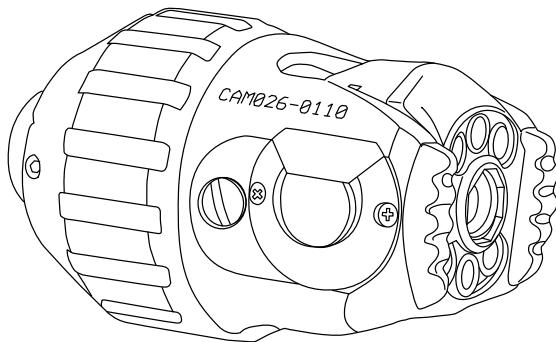
Product ID:	CAM025
Dimensions:	228 x 41mm (L x W)
Construction:	Stainless Steel
Pipe Compatibility:	50-225mm
Imager:	0.25in colour CCD DSP
Effective Pixels:	512px x 582px (PAL)
Resolution:	470 HTVL (enhanced)
Sensitivity:	<1.0 lux
Aperture:	FOV: F2.5 / 75°
Power Consumption:	4W
Weight:	589g (1.29lb)
Temperature Range:	-20°C ~ +50° C

CAM026 – Pan & Rotate Camera Module

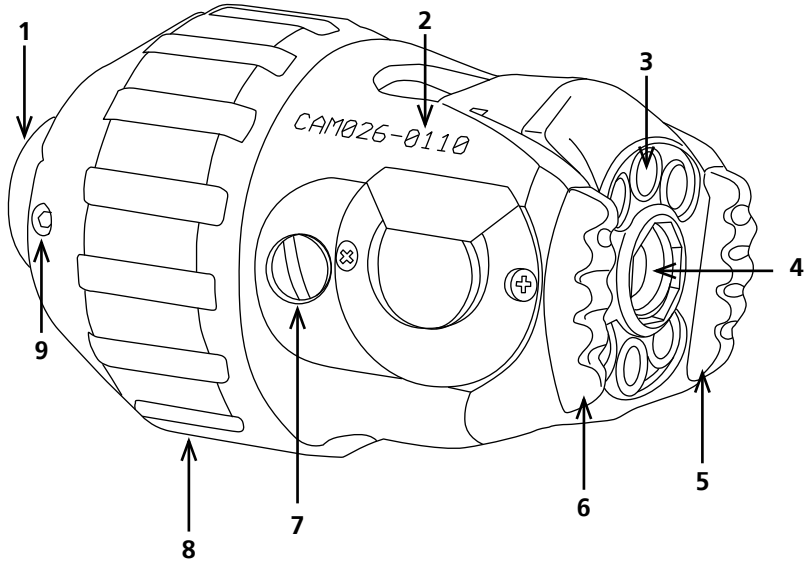
The camera module CAM026 provides a high resolution, colour, pan and rotate camera for the SOLOPro+ platform. It has the following features:

- High resolution colour CCD image sensor
- Powerful LED lighting with narrow beam width lenses
- Endless rotation range
- Panning range of +/- 135°
- Motorised focus control
- Internal pressure monitoring
- Impact resistant with user replaceable rubber protectors

The camera module is pressure-tight up to 1 bar. It is suitable for inspections up to 10m water depth.



Connections and Descriptions



- 1 Camera connector
- 2 Serial number location
- 3 LED illumination
- 4 Camera lens
- 5 Rubber protector
- 6 Rubber protector
- 7 Purge point
- 8 Camera protection skid
- 9 Camera protection skid screws (x6)

Pan & Rotate Camera Operation and Control

This section describes the operation and control of the Pan & Rotate camera on the SOLOPro+ system.

Basic camera operation

When the SOLOPro+ CCU is first switched on the joystick is active.

There is a set procedure to follow to operate the camera:

- Home
- Check Pressure

When using the joystick extra symbols are displayed on the right hand side of the display. These are not recorded on the video but provide a visual cue to the operator of the camera pressure and rotation.

A further two symbols are drawn on the top left of the display showing pan and rotation angles. These are recorded on the video.

Home

Press the **Home** key.



The camera head returns to the home position. After the homing is complete the camera will now auto-level when in use until the joystick is moved. If the joystick is moved, press the Home key to home the camera and to enable auto-level again.



NOTE! The camera will only home when it is positioned within +/-45 degrees of horizontal. Otherwise it is unaware of which way is up! If the camera fails to home check the camera body position.

Likewise the auto-level feature will only work up to +/-45 degrees from horizontal.

Check Pressure

The camera pressure bar displayed on the right hand side of the display will either show a red bar with **LO** written within it or it will be green with the pressure written within it in mBar.

The Pan & Rotate camera must only be used when the bar is green.

To pressurise the camera see the pressurisation section below.



CAUTION! Attempting to record a video when the camera pressure is displayed **LO** in a red bar will display a warning on screen to the operator:

The camera pressure is low! Using the camera with low pressure will void the warranty and may damage the camera!

If you still wish to record with the camera now, press the **Y** key to confirm, or press **ESC** to cancel."

If the camera is used with low pressure this information is recorded inside the camera and the warranty void.

Pressing the menu key when the joystick camera control is enabled will automatically disable it to allow the operator control of the menu system. The operator must enable the joystick camera control manually afterwards.

Camera Pressurisation

To pressurise the Pan & Rotate camera it must be connected to the SOLOPro+. If not already done so, follow the instructions - **Basic Camera Operation** (opposite) to get the camera working first.

- 1 Move the camera with the joystick to allow easy access to the valve on the side.
- 2 Unscrew the protection cap from the camera and screw in the recharge valve.

3 Press the **Help** key



The help menu will be displayed:




Press **F3** (Yellow key) to go to **Camera**

This now gives a screen version of the live pressure gauge. The camera can now be pressured to approximately 500mBar with the pressurisation kit.

Do not over pressure! The CCU will warn for under/over pressure.

Driving the camera with pre-set movements

A range of pre-set camera movements are available to drive the camera e.g. drive a full 360° clockwise or anti-clockwise.

To view the full range of pre-set movements press the **Camera Sweep Key**  and select **Go** from the menu. Highlight the required movement and press **OK** to activate it.

Information and Care

Pressurisation

The camera module must always be correctly filled with CO₂ or Nitrogen. The control unit displays the internal pressure.

Cleaning

Ensure the camera module is thoroughly cleaned after each inspection. Ensure the connector is free from dirt and moisture. Always fit the protective cap immediately after disconnecting the camera module from the system.

Maintenance

Ensure that all screw threads and connections are free from dirt. Replace the rubber protectors when worn or damaged.



CAUTION!

High-pressure cleaners **must not** be used. It can cause considerable damage to the coiler, camera and other system components.

Cleaning agents or solvents **must not** be used. These can damage the seals and other materials on the system. Only clean water should be used.



IMPORTANT!

KEEP ALL ELECTRICAL CONNECTIONS AND CONTACTS FREE OF DIRT, GREASE AND MOISTURE AT ALL TIMES.

Technical Details CAM026

Product ID:	CAM026
Dimensions:	120 x 73 x 73mm (L x W x H)
Power Consumption:	10W
Weight:	0.85Kg (1.87lb)
Temperature Range:	-20°C ~ +50° C
Environmental Protection:	Pressurised
Internal Pressure:	0 to 500mb



WinCan Embedded and ProPIPE+

Reporting Software

for Proteus™ and SOLOPro+ Systems

Version A

Principle

WinCan Embedded and *ProPIPE+* on the *Proteus™* and *SOLOPro+* CCUs allows you to create and maintain your surveys collected together as “Projects”.

Within a Project you can have many separate “Sections”. For example, a “Project” might be a housing estate, and each street within that housing estate could be a “Section”.

Each Project is stored in it’s own Folder in memory. The Folder contains all the information about that Project’s Sections, and their videos, photos, and report documents.

You can:

- Have as many Projects as you want.
- Add Sections to Projects whenever you want.
- Create, close, save, reopen, and edit previously created Projects.
- Reopen and edit Section Surveys, even after you’ve finished the Survey.
- Create PDF and RTF report documents in a choice of graphical or textual styles.
- Export your Projects Folder onto a USB memory device for later viewing on a PC.
- Import and merge together Sections from Projects made on other CCUs.
- Import *WinCan* Projects into *WinCan VX* on the PC.
- Upload files from *WinCan* Projects directly from the CCU to the *WinCanWeb* cloud.

Basic Usage

The structure is:

- You can have multiple **Projects**, each has it's own storage folder.
- A **Project** can contain multiple **Sections**.
- Each **Section** has **Header Information** and a **Survey**.
- A **Survey** can have multiple **Observations** and **Photos**, and a **Video** recording.

The basic operating sequence is:









- Select *WinCan* or *ProPIPE+* as your Project type.
- Create a New Project or open an Existing Project.
- Create a New Section in that Project, or open an existing Section.
- Perform the Survey, first filling in the Header Information, then making Observations.
- End the Survey.
- Review and edit the Survey if you want to.
- Create a report from a choice of different styles. You get an RTF report document and a PDF report document.
- Export the Project to a USB memory device so you can view on the PC.
- For *WinCan* Projects, these can be imported into *WinCan VX* on the PC.

Quick User Guide




Refer to this **Quick User Guide** when the CCU is directly available. The **Quick Guide** does not explain every screen, or key, or scenario, and relies on you physically seeing it operating on the CCU as you work through the guide.

In a separate section later in this document is a **Detailed User Guide** containing screenshots and more information.




Create a New Project

- Press  then choose  or 
- Press  to create a **New Project**.
- Use  and  to select the survey standard.
- Enter the **Project Name** and comments (use  to navigate between fields).
- Press  to create the **Project**, then this **New Project** will be listed as available.




Choose Which Project to use

- Use  and  to highlight the **Project Name** you require and then press . This then opens the **Project** for you to create your **Sections**.





Create a Section in the Project



- Press  then  to create a **New Section**.
- Enter the **Section Name** and comments then press  to create the **Section**.
- Your newly created **Section** will then appear in your **Project**.





Select the Project Section to use

- Use  and  to highlight the **Section** name you require and press . This will then open the **Section** for you to enter the **Section Header** details.



Enter the Section Header Information

- Enter all relevant **Section Header** information. Anything marked with a  is required information which needs to be entered to be able to proceed to next page. There may be several pages of **Header Information**.
- If you would like to display any of the **Header Information** on the live video 'project bar text', press . This then displays the  and  keys for you to select the information you would like to display by highlighting the desired **Header Information** line

and pressing the relevant  and/or  key.


- When all **Header Information** pages have been completed press .
- Now you can enter some **Text Comments** which will appear in the final report document along with the observations.
- After entering your comments press  to prepare for starting the Survey.
- The screen will say "**Ready for Survey**" and informs you to press the  'Record' key when you want to begin. Press  now and this information box will disappear.
- The screen will now display a live picture with your chosen **Header Information** showing on-screen.

Start Your Survey

- Get your inspection equipment into position.
- Start your recording by pressing the  key. A red recording symbol  will appear in the **Status Box** on the right of the screen which indicates your video recording and survey has begun. After a few seconds the on-screen video text will automatically disappear so that you can proceed with survey.

Create a New Observation

- When you come to a point in your survey where you need to create a


New Observation press  which will automatically pause the recording


and show a **Control Menu**. Now you can either enter the **Defect Code**

if you know it, or press to  select **Survey Code Lookup** which will give

you a selection of **Defect Category Folders** to explore, then highlight the

relevant **Defect Code** and press  . Once you have entered or selected

your **Defect Code** you fill in the information it asks for. Then press 

to store the **New Observation** with *no photo* or press  to store
with a photo.

- Now you can continue your Survey. The system will automatically resume recording, and after a couple of seconds the observational text will disappear from the live picture.




NOTE!






If you move the camera before auto recording resumes you may notice a slight jump in the video playback!

- Repeat these steps each time you wish to capture a new observation.


Review Your Survey

- At any time, you can review the **Observations** in your survey. Press  and select Review Survey. This will show you each observation you have created with the meterage displayed along with the captured image.

End Your Survey

- To end the survey press  then in the control menu that appears select **End Survey** and press . You will be prompted to **Confirm End Survey** by pressing .
- A summary of the **Section** which has just been completed is then shown.
- If multiple surveys are being performed immediately within the same Project, press  and then press  to create a **New Section**, then repeat everything, starting from that **New Section's** creation.
- Otherwise you can just create a report for that section if you wish to.

Create Your Report Documents


- To create an instant PDF report press . Then choose the style of report that you want. The report is saved into the **Project's** folder along with the video and photos. You can copy the report onto a USB memory device using the **Gallery Browser** for later printing on a PC, or you can copy it to USB using the **Project Export** feature.

Detailed User Guide

Using Projects

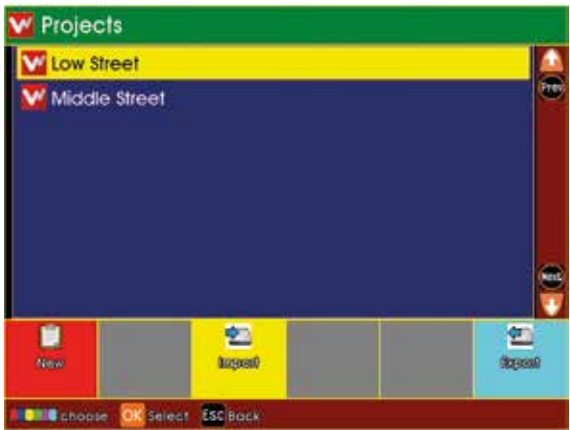
Each **Project** is stored in it's own **Folder** in memory. The Folder contains all the information about that **Project's Sections**, and their videos, photos, and report documents.



Press the **Projects**  key, and the **Project Type** choice appears.






The Projects List appears

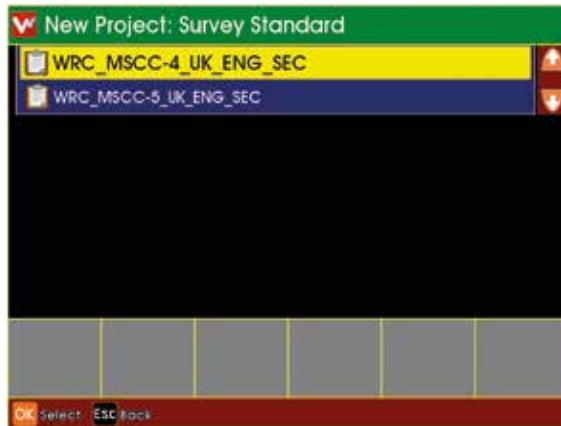




- If you have any existing Projects, they will appear in the list.
- If you have no existing Projects, the list will be empty

Choose New Project or an Existing Project

- To create a **New Project**, press  .
 - Or to open an existing **Project**, highlight it using the arrows  and then press  .
-


If you chose to create a New Project



- Use the arrows  to select which **Inspection Standard** you wish to use, then press  .
- Enter a **Name** for the **Project**.

- You may also enter **Comments** for the **Project** of you wish.




- Press  to create the Project.

The Projects List appears


- If you just created a **New Project**, it will appear in this list



- Choose a **Project** to open
- Highlight the **Project** using the arrows  and press **OK** .

The project is now opened

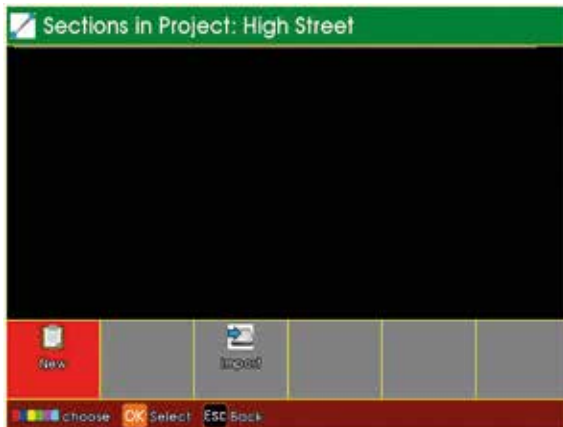


- A summary of the **Project** is shown.
 - A **New Project** will not yet have any **Sections**.
 - An existing **Project** may already have **Sections**.
Press  to see existing **Sections** or create **New Sections** in the **Project**.
-

Using Project Sections



Each **Project** can contain either just one, or multiple **Sections**.

The list of **Existing Sections** is shown




- If the **Project** has any existing **Sections**, they will appear in the list.
- If the **Project** has no existing **Sections**, the list will be empty.

You can choose to create a **New Section** in the **Project**, or open an **Existing Section**

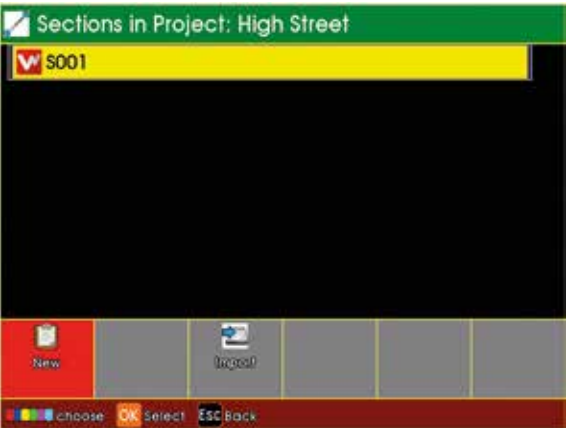
- To create a **New Section**, press  .
- Or to open an existing **Section**, highlight it using the arrows  and then press  .



If you chose to create a new section



- Enter a name for the **Section**.
- You may also enter comments for the **Section** of you wish.
- Press  to create the **Section**.

The Sections List appears




- If you just created a **New Section**, it will appear in this list.
- Choose a **Section** to open.
- Highlight the **Section** using the arrows  and then press .

The Section is now opened

- A summary of the **Section** is shown.




If this is a **New Section**, you will need to perform the survey for the **Section**, so that you can create **Survey Observations**.

- Press  to begin performing the survey and create **Observations**.

If this is an **Existing Section**, it may already have had a survey performed for it, and will have existing **Observations**.

- Press  to review the existing **Observations** for this **Section**.

You can generate a Report Document for the survey Observations in this Section

- Press  to generate a Report Document


Preparing for the Survey

Entering Survey Header Information

If you chose to perform a survey for the **Section**:

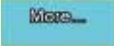
The **Survey Header Information** appears

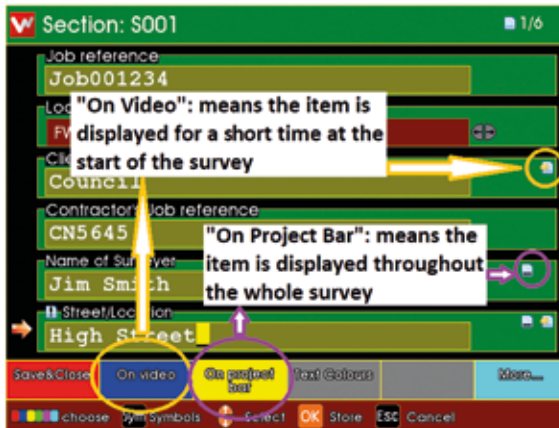
The screenshot shows a software interface for entering survey header information. At the top, a green header bar displays 'Section: S001' and '1/6'. Below this, several input fields are visible: 'Job reference' with the value 'Job001234', 'Location Code' with the value 'FWY: A footway beside a road', 'Client' with the value 'Council', and 'Contractors Job reference' with the value 'CN5645'. A yellow circle highlights the 'Name of Surveyor' field, which contains 'Jim Smith'. A red arrow points to the 'Street/Location' field, which contains 'High Street'. A white callout box with a black border points to the 'Name of Surveyor' field and contains the text 'Means: Mandatory information that must be provided'. At the bottom of the form, there are buttons for 'Save & Close', 'Free Text', and 'More...'. Below these buttons is a row of icons and labels: 'choose', 'Sym Symbols', 'Select', 'OK Store', and 'ESC Cancel'.



- Type in, or select, the appropriate information for the survey.
- Anything marked with a  is mandatory information that must be provided.
- There may be several pages of Header Information.

For each Header Information item, you can choose whether

- it is displayed briefly onto the camera picture “On Video” at the start of the survey.
- you would like it displayed constantly “On Project Bar” throughout the whole survey.

Press the  key, and the choices of the coloured keys change.



- Press  to toggle whether the **Header Item** is shown briefly at the start of the survey.
- Press  to toggle whether the **Header Item** is shown constantly throughout the survey.
- Header Items can be both “On Video” and also “On Project Bar”.
- There is a limit to the number of **Header Items** that can be selected simultaneously.



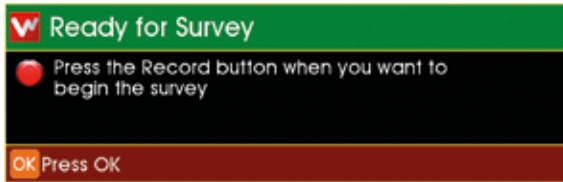
After entering all the **Header Information**, you can enter some comments for the Survey

- Type in some **Survey Comments** if you wish
- Then press **Begin Survey** to prepare for performing the survey.



The system is now in **Survey Standby**, waiting for you to begin the survey.

- Video recording is ready, but is paused.
- Press the **OK** key, and position the inspection equipment ready for the survey.



Beginning the Survey

When you are ready to start video recording, press the  Record key.

- Video recording starts.




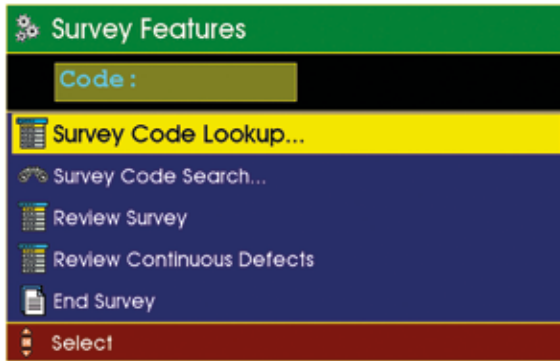
- Your selected “On Video” **Header Information** text about the survey appears on the camera screen, and is recorded onto video.
- After a short time, this information is removed.
- You can now perform the inspection Survey.

Performing the Survey

Creating Defect Observations

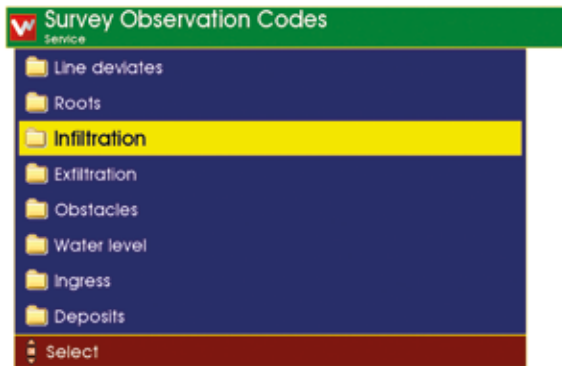
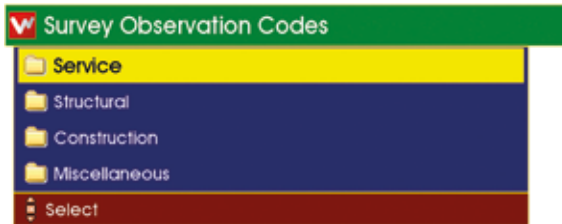
When you see a Defect, you can create an **Observation** for it.


Press the **Projects**  key, and the **Survey Features** menu appears.



- If you know the **Defect Code**, you can simply type it in.
- If you don't know the code, you can search, or you can use the **Lookup** to find it.



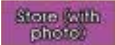
If you chose to **Lookup** the **Defect Code**:
You see a list of the **Defect Code** categories



- Use the arrows , **Esc**, and **OK** to browse the **Defect Code** categories to find the **Defect Code** that you require.
- When you have found the **Defect Code**, press **OK**.

Enter the information for the Observation



- Type in, or select, the appropriate information for the Observation.
- Anything marked with a  is mandatory information that must be provided.
- There may be more than one page of Observation Information.
- When you have entered the information, you can store the Observation.
- Press  to store without taking a photo.
- Press  to take a photo then store.

If you chose to take a photo:


- Your entered **Observation Text** information is shown on the camera screen

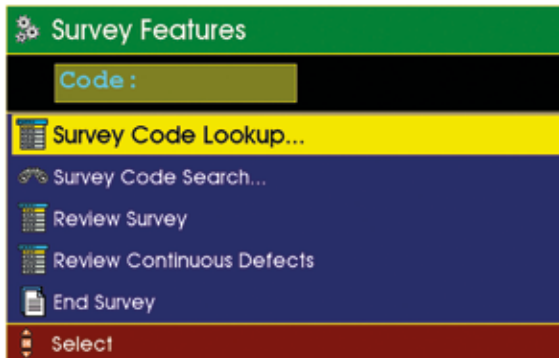



- The system takes a photo, with this information on it.
- After a short time, the information is removed.

Video recording then restarts automatically and you can now move on to find the next Defect.

Ending the Survey


Press the **Projects**  key, and the **Survey Features** menu appears.



- Select **End Survey** and press .



You are asked to confirm you do want to end the survey.

- Press  to confirm.
- Any other key cancels ending the survey.

Reviewing the Survey

Viewing the Observations


When you have selected a **Section**, the **Section Information** is shown.





■ Press  to **Review** the existing **Observations** for this **Section**.




The **Section Observations** are shown.

- Use the arrow keys  to select the **Observation** you are interested in. The screen shows the Observation information and the photo (if there is one).

- Press  if you want to **Edit** and change the selected **Observation**.

- Press  if you want to **Delete** the **Observation** (you will be asked to confirm the delete).


You can also create a **New Observation**, if one was missed when the **Survey** was being performed.

- Press  to create a New Observation.

Editing an Existing Observation

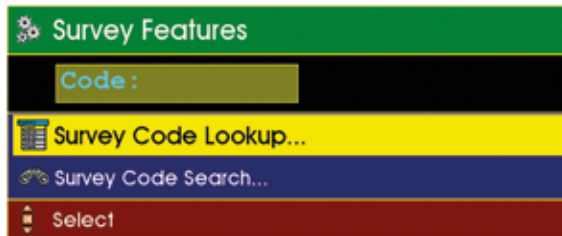
When you have selected the **Observation** to be edited, the **Observation Information** is shown.



- Make any changes as you desire.
- Press  to store your changes to that **Observation**.

Creating a New Observation

When you have chosen to create a New Observation



- First select the **Defect Code** for that **New Observation**.
- This is done in the same way as when the **Survey** was originally performed.
- Either enter the Defect Code directly, or use **Search**, or use the **Lookup**.

When you have selected the **Defect Code** for the new **Observation**, the **Observation Information** is shown.



- Enter the information as desired.
- Press **OK** to store this as a **New Observation**.

Your **New Observation** now appears added into in the **Review List of Observations**.

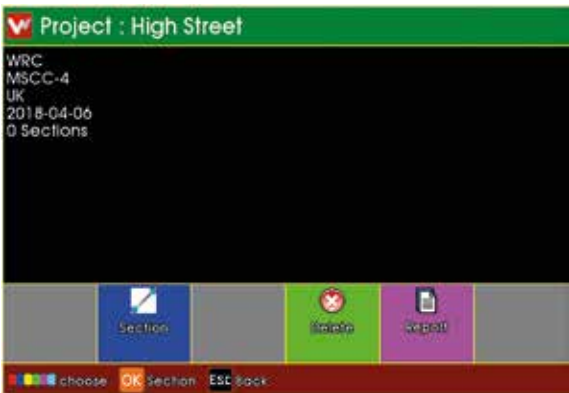



- New created **Observations** don't have photos.
- The **Observations** are sorted into ascending distance order.

Creating Reports

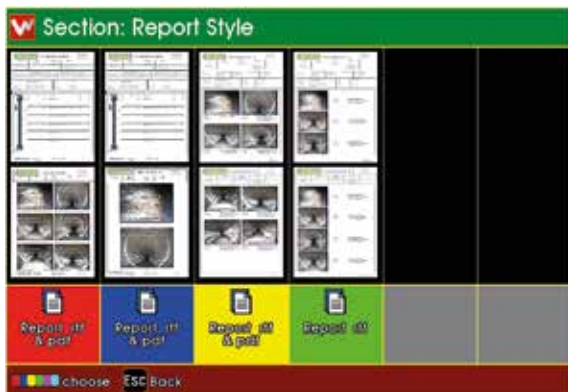
Creating Reports for the Whole Project


When you have selected and opened a **Project**, the **Project Information** is shown.



- Press  to generate **Report Documents** for the whole **Project**.
- Depending upon **Project** and **Section** complexity, this could take some minutes.

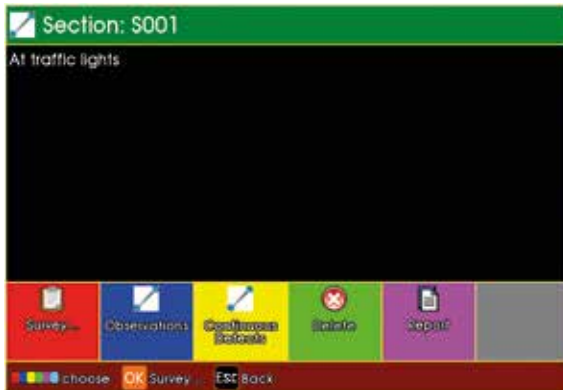
Previews of the various **Report Styles** are displayed.



- Press the relevant coloured key to generate a report document of your chosen style.
- Most reports are generated as both **RTF** and **PDF** documents.
- The  style generates only **RTF**.
- The report documents are stored into the **Project's** memory **Folder**, along with the **Project's** video and photo files.

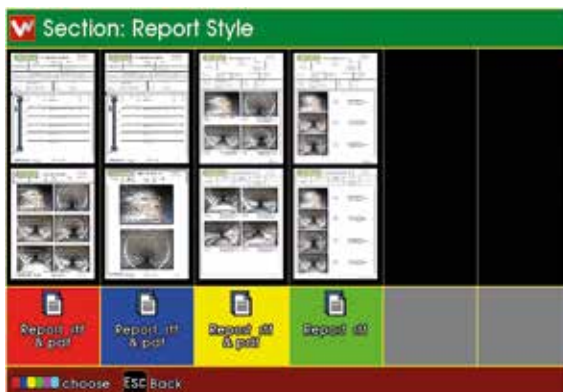
Creating Reports for a Selected Section

When you have selected a **Section**, the **Section Information** is shown.




- Press  to generate **Report Documents** of this **Section**.

Previews of the various **Report Styles** are displayed.



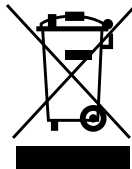
- Press the relevant coloured key to generate a report document of your chosen style
- Most reports are generated as both **RTF** and **PDF** documents.

- The  style generates only RTF.
- The report documents are stored into the **Project's** memory **Folder**, along with the **Project's** video and photo files.

WEEE Statement

Under the European Union (EU) Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC, products of electrical and electronic equipment cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment are obligated to take back such products at the end of their useful life. Mini-Cam will comply with the product take back requirements at the end of life of Mini-Cam products that are sold into the EU.

For disposal contact Mini-Cam or the **Mini-Cam Partner** in your country.



Information on Disposal for Business Users

Your SOLOPro CCU is marked with the symbol shown above. It means that used electrical and electronic products should not be disposed of in with general household waste. Contact your Local Council who will advise on the correct recycling procedure to follow.

In the European Union

Please contact **Mini-Cam Ltd** or you nearest **Mini-Cam Service Centre** who will inform you about the take-back of the product. You may be charged for the cost arising from take-back and recycling. Small products (and small amounts) might be taken back by your local collection facilities.

For Spain: Please contact the established collection system of your local authority for take-back of your used product.

Countries outside the EU: If you wish to dispose of your SOLOPro CCU, please contact your local authorities and ask for the correct method of disposal.

Batteries

As a producer of industrial batteries under the Waste Batteries and Accumulators Regulations 2009, we Mini-Cam Limited produce Lithium Ion batteries. We are obliged to take back free of charge, waste industrial batteries supplied to an end user for treatment and recycling. We are required to do this in any calendar year we place new industrial batteries on the market. If any of our customers or in certain cases other end users, require us to take back industrial batteries, they should contact us at:

Mini-Cam Limited
Unit 4, Yew Tree Way,
Golborne,
Warrington,
Cheshire,
WA3 3JD
United Kingdom.

email: info@minicam.co.uk

Telephone +44 (0) 1942 444555

We will agree the necessary arrangements for the return, proper treatment and recycling of the waste industrial batteries.

Product Serial Numbers

Enter your product serial numbers below for future reference:

CCU	P	P	C	-						
COILER	S	P	P	-						
CAM025 Self Levelling Axial	C	A	M	0	2	5	-			
CAM026 Pan & Rotate	C	A	M	0	2	6	-			

Useful Information

UK Customers:

For service and repair contact Mini-Cam Ltd

Tel: 01942 270524

Email: service@minicam.co.uk

International Customers:

For service and repair contact your local Mini-Cam Approved Dealer

To view "How To" Videos visit:

www.minicam.co.uk

This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, leaving small margins at the top and bottom. There are no vertical margin lines, and the paper appears to be from a standard notebook or legal pad.

Notes

[illegible]



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A **Halma** company

