

# ***CC640*** ***Digital Camera***

## ***Operating Manual***

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CSL 573



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# CC640 Digital Camera

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## 1. Specifications

### Power Supply

Operating: 9-15 VDC 250 mA Max  
Quiescent: 250 uA typical

**Operating Temperature** -40°C to +70°C

### Ext. Input Signal

Logic Low Level: 0 - 0.7 VDC (-12VDC Absolute Min)  
Logic High Level: 4 - 15 VDC (15VDC Absolute Max)

### RS-485

Max. BAUD Rate: 230.4 KBAUD

### RS-232

Max. BAUD Rate: 230.4 KBAUD

### CS I/O

Max. BAUD Rate: 76.8 KBAUD  
CSDC addresses: 7 or 8

### Memory Card Interface:

Type: Compact Flash  
File System: FAT16  
File Type: JPEG  
Size: Recommended 512 Mb or less

**Clock Accuracy** +/- 1 Minute/Year (0°C to 40°C)  
+/- 4 Minutes/Year (-40°C to 70°C)

### Lens

Mount: CS-Type  
IRIS: DC Compatible

**Resolution** 640 x 480 (307,200 pixels)  
640 x 504 (with Time Stamp banner)

### Dimensions

Length: 235 mm (9.25 inches) With Lens  
Width: 110 mm (4.33 inches)  
Height: 64 mm (2.52 inches)  
Weight: 0.9 kg (2.0 lbs)

## 2. Introduction

The CC640 digital camera was designed to meet the stringent operational requirements necessary for remote battery powered installations. The CC640 has a very low quiescent power draw and can operate over a wide temperature range.

The camera contains a compact flash memory card interface that turns the camera into a powerful image logger. The combination of JPEG compression and memory card storage enables the CC640 to store over 10,000 images.

The CC640 can operate in a stand-alone mode with image acquisitions triggered by the camera's own precision real time clock. Image acquisitions can also be triggered by an externally applied digital signal.

For Quick Set-up and Test Procedure in Standalone Mode – refer to Appendix B.



Figure 1 CC640 Camera

### 2.1 Connecting

The camera should be connected to the datalogger and power supply using the wiring recommendations in Table 1, Cable Colour Connections. The wiring is based on the use of the recommended FIN6COND cable supplied by Campbell Scientific (Canada) Corp. (CSC). The colour connections may differ if other cables are used.

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**NOTE**

It is essential that the Ground cable be connected first when wiring the camera to the datalogger or the power supply.

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**Table 1. Recommended cable colour connections**

<b>Colour</b>	<b>Required Connections</b>	<b>Recommended Signal Connection</b>
<b>Black</b>	Mandatory	Ground
<b>Red</b>	Mandatory	+12V
<b>Green</b>	Optional	Ext
<b>White</b>	N/A	No connection or Ground
<b>Yellow</b>	Optional	RS-485 A or RS-232 TX (Camera Output)
<b>Blue</b>	Optional	RS-485 B or RS-232 RX (Camera Input)
<b>Clear/Shield</b>	Mandatory	Camera Shield Terminal

After connecting the camera to a power source, turn the power switch to the ON position and verify the proper LED sequence before connecting the camera for communication.

For Standalone Mode, the CC640 can be connected directly to the power supply by wiring Ground first, and then +12VDC. Capturing images in Standalone mode requires the use of a FAT16 formatted Compact Flash Memory Card (Section 3.6). The only wire connections to the camera are the power supply wires (ground and +12 V) that connect to a 12 VDC source.

The recommended cable for use with the camera is a 3 pair individually shielded 24 AWG cable. The cable part number is L9721 and the Model number for a finished cable is a FIN6COND-L (L is the required Length). Only shielded cable should be used with the camera for proper operation. It is recommended to use the cable supplied by Campbell Scientific, as the cable is of high quality and well suited for communications between the camera and datalogger.

The individual conductor colours and their recommended connections are outlined in Table 1. Following the recommended colour scheme is not mandatory and users may be required to select their own colour schemes for cables with different colour arrangements.

The maximum recommended cable length of 24 AWG cable is 30 Metres (98.1 feet). Longer lengths can be used, however a heavier gauge of wire is suggested. It is recommended that the individual wire resistance on the +12VDC and Ground conductors not exceed 2.7 Ohms. Using longer cable in conjunction with RS-232 communications will require slower BAUD rates. Depending on the cable length and type of cable, RS-232 may not be suitable for communications and the use of RS-485 should be considered.

## 2.2 Configuring

The camera uses PakBus protocol to send image files to the datalogger and both must be configured to enable communications. The RS-232 port is used in conjunction with the Device Configuration software to change settings and operating parameters in the camera (Section 5, Page 14). Device Configuration Utility is a free download from any Campbell Scientific website.

## 2.3 Operating

The CC640 is capable of acquiring images in a self-timed mode, an external trigger mode, and by manually taking a picture using the Snap button (Section 3.3, page 6). Self-timed mode is set using the Device Configuration Utility, while a short pulse applied to the Ext. Input Signal on the camera will initiate image acquisition in the External Trigger Mode. When taking a picture manually using the Snap button, the power switch needs to be in the ON position.

## 2.4 Retrieving Images

Loggernet Version 3.1.3 or newer includes the executable LNCMD.EXE that is required for image file retrieval from dataloggers (Section 14, page 32). Images from cameras in standalone mode can be retrieved directly from the Compact Flash Memory Card with a PC that has a Compact Flash socket.

## 2.5 Additional Reference Material

The CC640 Operating Manual is intended for use by those experienced in working with Campbell Scientific dataloggers. For further information regarding the various uses and applications of the CR1000, CR10XPB, CR23X, MD485, or any additional technology listed in this manual, refer to the appropriate Operating Manuals of these products.

## 2.6 CC640 Quick Check List

- If interfacing to a Datalogger ensure that your datalogger has the appropriate PakBus operating system.
- The compact flash memory card must be formatted to FAT16 (Do not use FAT32).
- Use the Device Configuration Utility to change settings in the camera.
- Use the Device Configuration Utility to change settings in MD485 or other PakBus devices.
- The Device Configuration Utility can also be used to set the Dataloggers memory and PakBus parameters. These parameters can be incorporated into the datalogger program or changed with a Keyboard display.
- Verify that the lens cable is properly seated, as the connector may inadvertently become unplugged during handling or installation.

**Always ensure that the Power Switch is placed in the Auto Position**

### 3. Camera Hardware description

#### 3.1 Terminal Block Connections

**NOTE** Only shielded cable should be used for connections to the terminal block.

<b>Gnd</b>	Power Ground
<b>+12VDC</b>	9-15VDC Power, 250 mA
<b>Ext.</b>	External Trigger Input, 5.0 Volt Logic Signal, 15Volts Max
<b>RS-485A</b>	RS-485 communications
<b>RS-485B</b>	RS-485 communications
<b>Shield</b>	The shield (drain wire) needs to be connected to this terminal

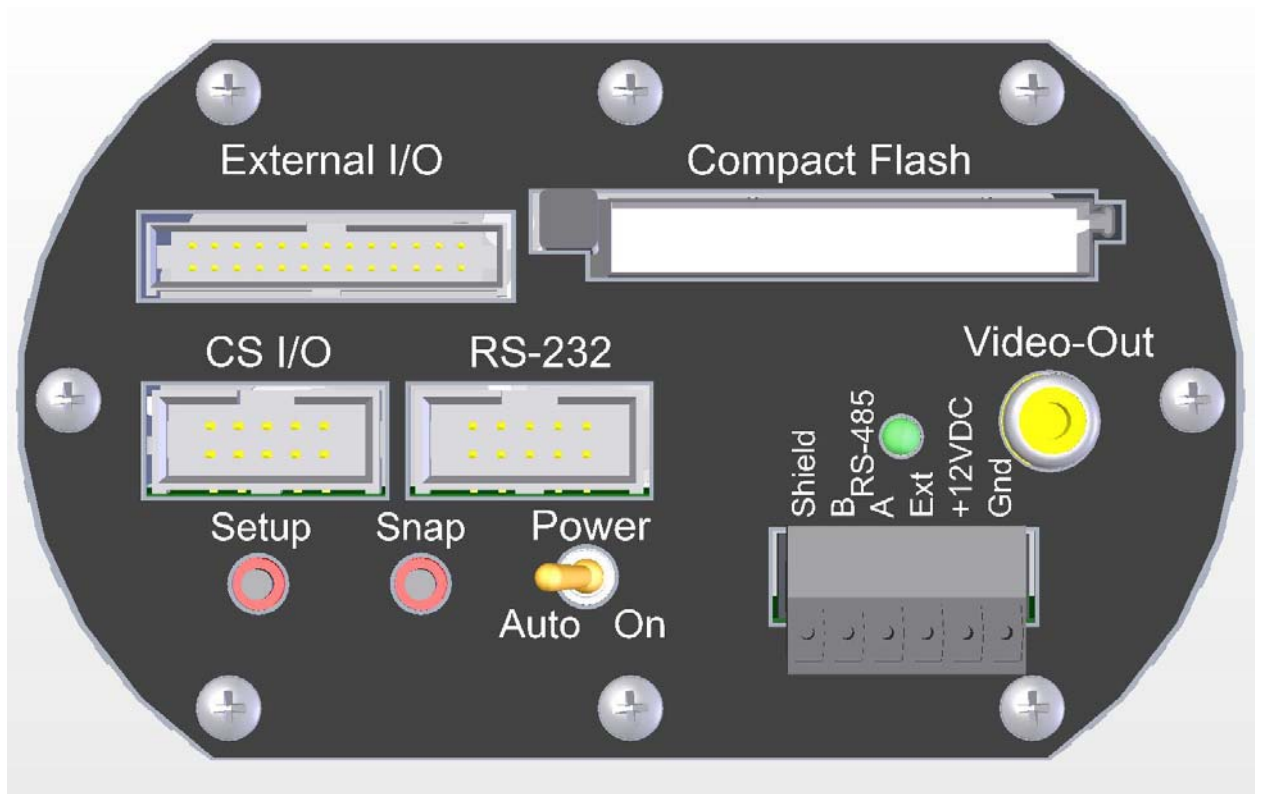


Figure 2 Terminal Block Position and Layout

## 3.2 Power Switch

The power switch can be used to power the camera continuously on or to place the camera in Auto power mode. The switch should not be left in the On position under normal operation. Leaving the switch in the On position will prevent the camera from entering its low power quiescent mode of operation. The power switch does need to be placed to the On position to perform configuration set-up or to focus the camera.

In the Auto position the camera will automatically reduce its power consumption to the low power quiescent mode after an image is acquired. It is recommended to place the switch in the Auto position when images are being triggered by either the external input or the self-timed mode.

## 3.3 Snap Button

The Snap button is used to manually take a picture. The power switch needs to be set to the On position for the Snap button to operate.

When the Snap button is pressed the LED will slowly flash 2 times, indicating successful initiation of an image acquisition.

## 3.4 Set-up Button

The Set-up button performs 2 functions: it toggles the video output on or off and it places the camera in set-up mode. The power switch will need to be in the On position for the Set-up Button to operate.

When the Set-up Button is pressed the LED will slowly flash once.

Pressing the Set-up button will force the camera to its default BAUD rate (115,200) on the RS-232 port for about 40 seconds so that the Device Configuration Software can be used to configure the camera. Image acquisitions will also be placed on hold for the same time period. To indicate that the camera is in Set-up mode the LED will briefly flash once per second.

If no configuration communications occur during the 40 seconds, the camera will exit set-up mode and resume its normal operating mode. The LED will flash once every 5 seconds.

Pressing the Set-up Button will toggle the Video output on or off. The video output is used to focus and target the camera in conjunction with a normal television or video monitor. The video output will remain on until the set-up button is pressed to toggle it off. The video output will be turned off when the camera enters its quiescent mode, 5 minutes after the camera's power switch has been placed in the Auto position.

## 3.5 Video Output

The video output connector provides an analogue video signal for the purpose of focusing and targeting the camera. The video output can be configured to NTSC (National Television System Committee) or PAL (Phase Alternating Line) using the Device Configuration Software. NTSC is the standard used in North America and PAL is the standard that is used in most European countries. Consult your monitor owner's manual for display information.

The video output signal is intended for use with a television or monitor that has a NTSC or PAL video input. Most monitors will have one or two audio input

connectors in addition to the video input. The audio inputs should remain unconnected, as the camera does not have audio capability.

The video output can be turned on and/or off by pressing the Set-up Button when the power switch is in the ON position.

During every image acquisition sequence the video output will be momentarily activated when the image is acquired, allowing the operator to view the image that is being captured.

### 3.6 External I/O Connector

The External I/O connector provides Inputs and Outputs for operating camera peripherals, such as the optional motorized enclosure that is used for operation under extremely harsh environmental conditions. Please contact a Campbell Scientific sales representative for details and availability of the CC640 peripherals.

The *Ext.* (External Control) input signal can be used to initiate an image acquisition. An image acquisition can be initiated on demand by applying a voltage pulse to the *Ext.* input. The camera will remain in its quiescent state when the signal to this input remains at logic low (Less than 0.7 Volts). To initiate an image acquisition the input should be pulsed high (4.0 - 15 Volts). The recommended duration of the pulse is between 1ms and 10 seconds.

Leaving the *Ext.* input signal high for more than 10 seconds will result in another image acquisition starting immediately after the completion of the first.

If the *Ext.* input signal is left in the High state continuously, the camera will not enter its low power mode and images will be acquired on a continuous basis.

The *Ext.* Control Input signal is operated with the power switch in the Auto mode. If the power switch is left in the ON position the LED will flash twice and begin an image acquisition when a positive *Ext* Signal is detected, providing easy confirmation of an externally applied signal.

### 3.7 LED (Green)

The green LED is intended to provide feedback for the operator. On power up the LED will slowly flash 4 times, indicating that a normal power-on sequence has occurred. If the LED flashes rapidly for several seconds, it means that the camera failed one of the power-on tests. This response is rare and will require that the camera be returned to an authorized repair facility.

The LED will also flash once if the Set-up button is pressed and twice if the SNAP button is pressed. During communications or a firmware update the LED will remain ON to indicate a process is in progress that should not be interrupted.

If the power switch is in the ON position the LED should flash once every 5 seconds to indicate that it is running. If the set-up button is pressed, the LED will briefly flash once a second to indicate that the camera is ready for set-up using the Device Configuration Utility.

The following table offers LED information at a glance:

<b>LED</b>	
<b>Always Off</b>	The camera has no power connected to it or it is in Quiescent Mode
<b>Quick Flash Every 5 Seconds</b>	The camera is Powered ON (Power switch is in the ON position)
<b>4 Slow Flashes</b>	Normal Power-On Sequence
<b>Rapid Flashes for 4 Seconds</b>	A Power on test did not pass.
<b>Quick Flash Every Second</b>	The camera is in Set-up Mode
<b>Steadily On</b>	The camera is carrying out a process that should not be interrupted. This includes acquiring an Image, transmitting an image via communications, or performing a firmware update.

### 3.8 Compact Flash Memory Card

The camera is equipped to use compact flash memory cards. It is important for the memory cards to be formatted as FAT16 and not FAT32, as the camera does not support the FAT32 file system. When formatting a memory card using a PC ensure that FAT32 is not selected (FAT16 or just FAT should be used).

Image files are stored on the compact flash memory card as JPEG files under the root directory "IMAGES". Each file will be uniquely named with a sequence number (i.e. *E1234567.JPG*).

The compact flash card should not be inserted or removed while the camera is in its ON state. Insertion or removal should only be done when the camera is in its quiescent state or when power is removed.

The use of a memory card is optional and is not required for users who utilize communications to retrieve the images. If a card is present, the camera will write the images to it. Once the memory card is filled, the camera will stop recording images to it unless deleting previous files creates additional image storage space. It is generally recommended to delete older image files from the memory card after downloading them to a permanent storage location.

#### 3.8.1 Firmware Update From Memory Card

##### **CAUTION**

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Failure to properly follow this procedure can result in corruption of the operating system. If this occurs, it may be necessary to send the camera to an authorized repair facility to have the operating system reloaded.

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The compact flash card is also used to provide a means of updating the camera's embedded firmware. This is done by downloading the appropriate files from any Campbell Scientific website, renaming the new firmware hex file as "NEWCODE.HEX" (all upper case), and placing it in the root directory of the compact flash memory card. When the camera powers up and finds the file in the root directory it will begin to update its firmware from the file. The LED will remain continuously on during this process, which may take up to 5 minutes. It is imperative that the power supply is not interrupted during this process. After completion the LED will turn off. Power down the camera, remove the memory card, and delete the "NEWCODE.HEX" file using a PC if no other cameras need to be updated. Leaving the file on the memory card will cause the camera to



repeatedly update its firmware every time the camera wakes up from its quiescent mode.

## 4. Communications

### 4.1 PakBus Communications

The camera uses the PakBus protocol to send image files from the camera to the datalogger or other PakBus compatible devices.

Communications are not enabled while the camera is in its quiescent mode. This is done to conserve power in its low power state. When an image file is ready to be transmitted, the camera will initiate communications and send the JPEG image via the selected PakBus port.

The camera is a PakBus Leaf node and is not capable of performing any routing.

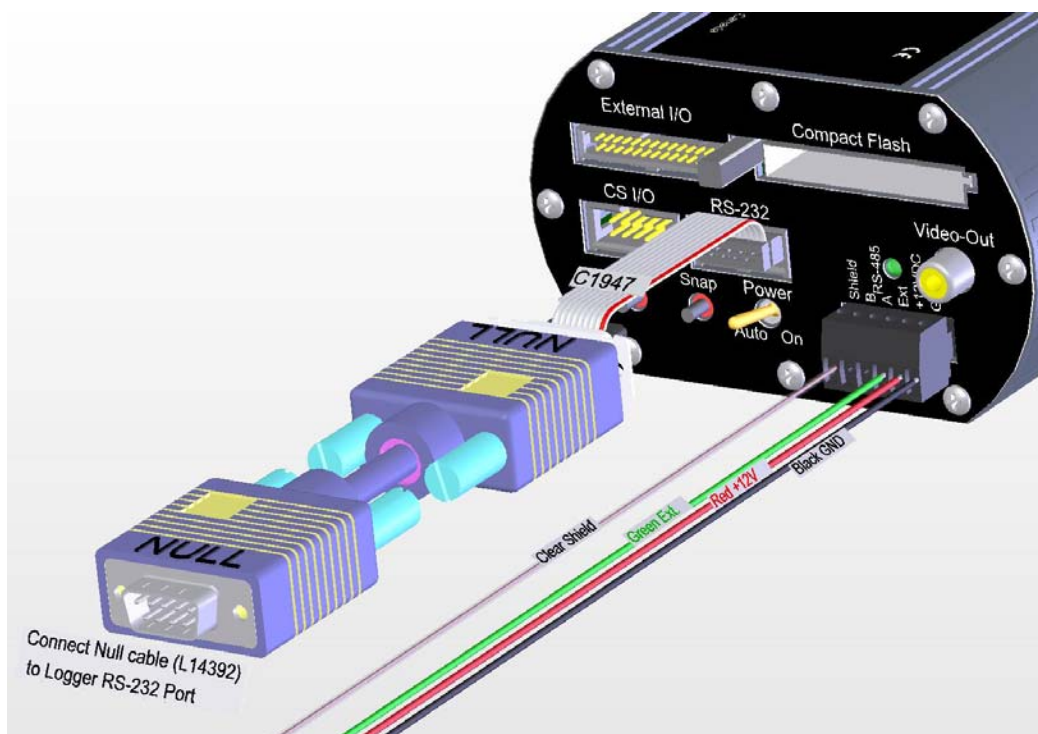


Figure 3 Camera to Datalogger RS-232 port (DCE) connection

### 4.2 RS-232 Port

The 10-pin RS-232 header connector is designed to provide a 9 Pin DCE type port by using either of the ribbon cable adapters provided with the camera. Part number C1946 provides a male 9-pin connector and C1947 provides a female 9-pin connector.

The RS-232 port can also provide an additional communication port for transmitting image files to a datalogger using the PakBus Protocol. Figure 3 illustrates the required connection to a RS-232 port on a Datalogger. A Datalogger and camera are both DCE type RS-232 devices; thus, requiring a NULL modem cable.

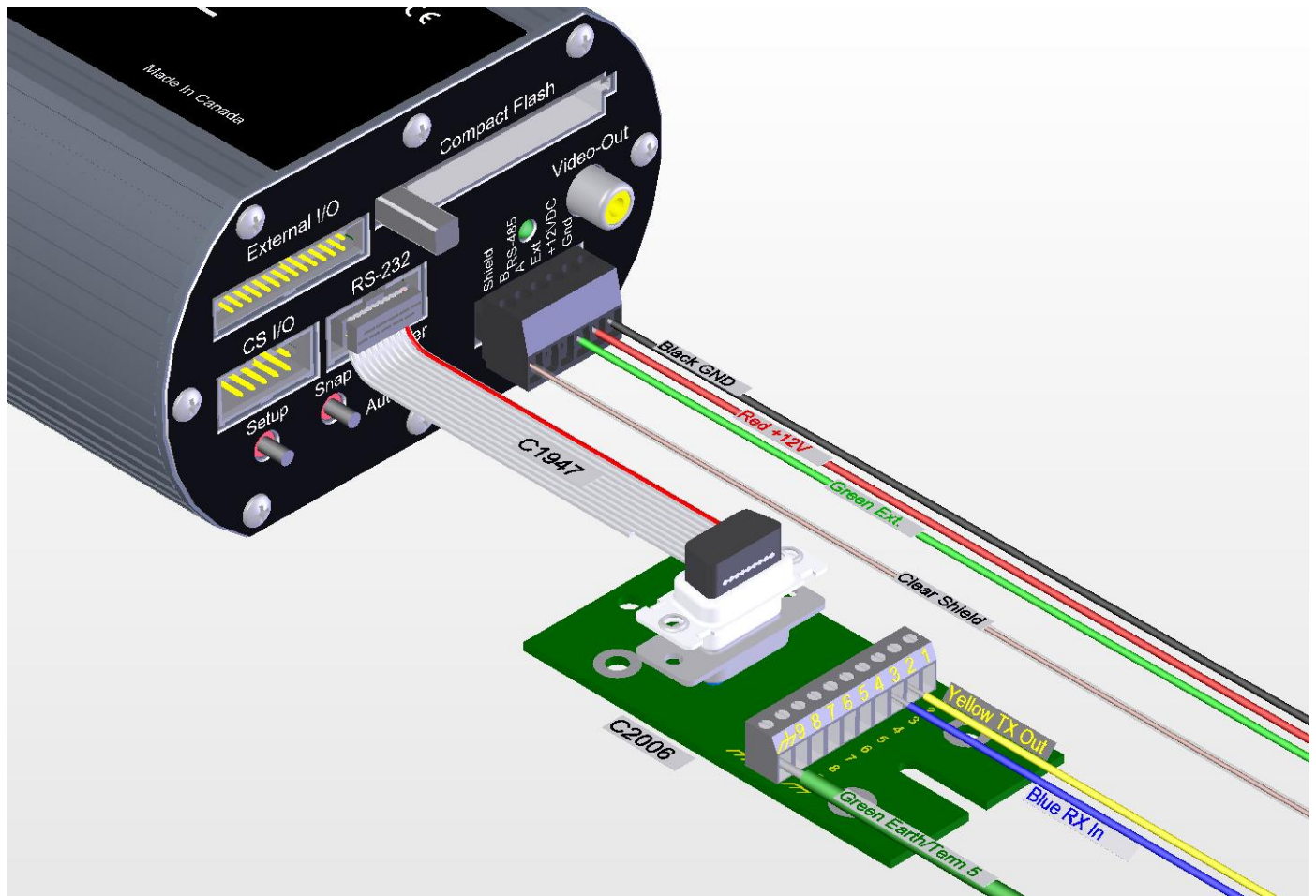


Figure 4 Using C2006 adapter board to carry RS-232 TX and RX on multi-conductor cable

The necessary RS-232 TX (transmit) and RX (receive) signals can also be carried by the recommended 6 conductor cable. Figure 4 demonstrates using a DB-9 to terminal breakout board (part C2006) and the standard cable to transmit the RS-232 signals. This provides a practical means of carrying the RS-232 signals when the camera is installed remotely from the datalogger.

If the recommended cable is used, the RS-232 can be used at distances up to 30 Metres (98.1 feet). Longer lengths or different cables may require that the BAUD rate be set slower than the default 115200 BAUD.

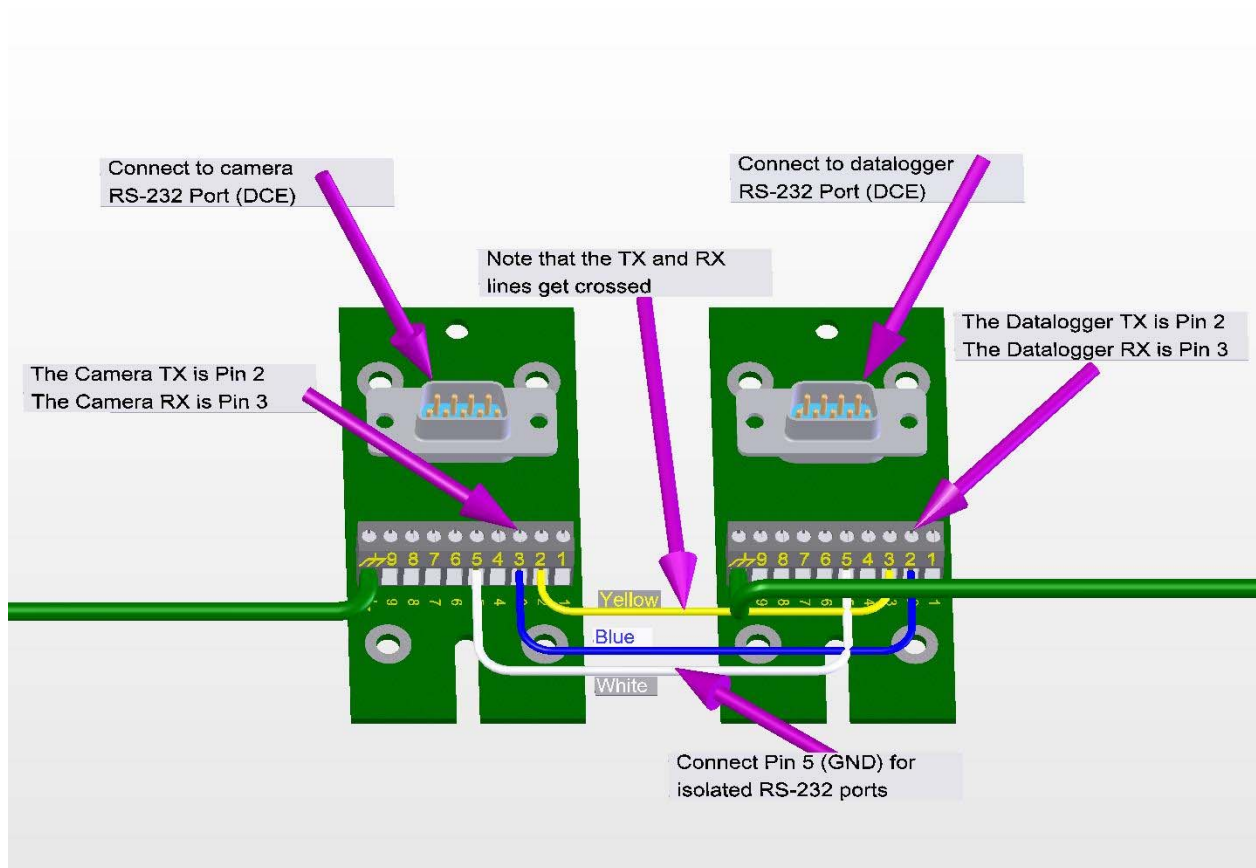


Figure 5 RS-232 wiring using C2006 boards with multi-conductor cable

Depending on the datalogger the wires can be terminated directly on the control ports or another C2006 adapter board can be used to provide a 9-pin connector at the datalogger end (see Figure 5).

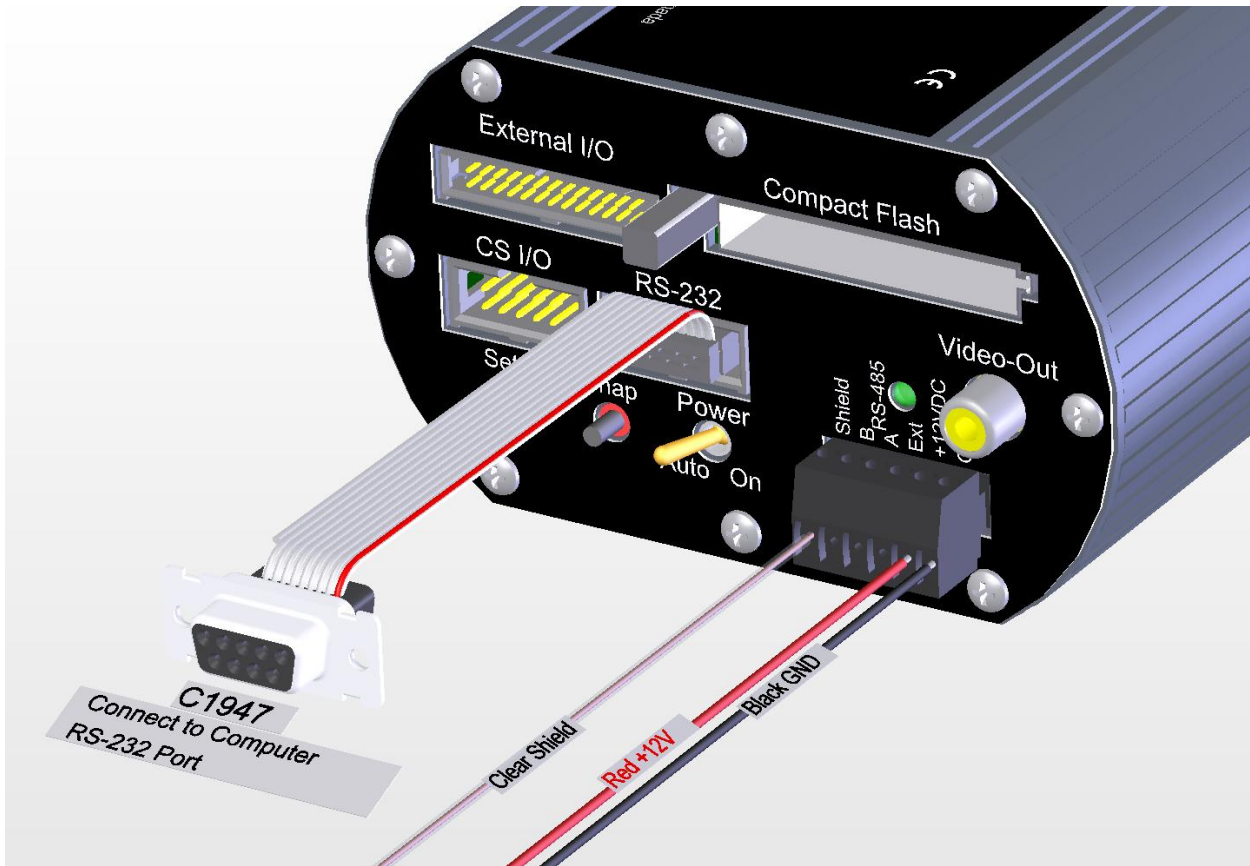


Figure 6 Connections for Configuration

The RS-232 port is used in conjunction with the Device Configuration software to change settings in the camera such as the PakBus addresses. Figure 6 illustrates the connections required for interfacing to a computer.

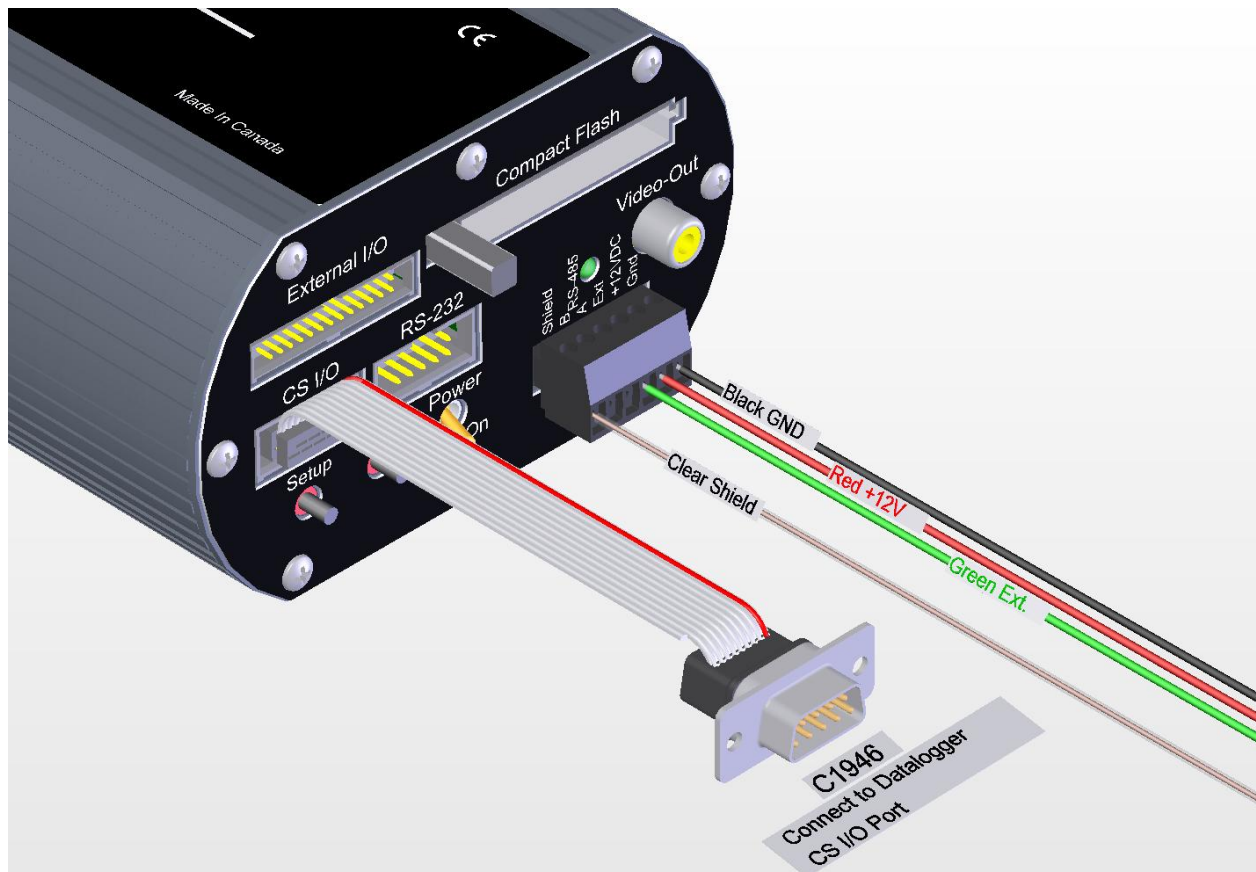


Figure 7 Camera connections for CS I/O port operation

### 4.3 CS I/O Port

The CS I/O port on the camera provides a connector for CS I/O communications. The port is designed to communicate with Campbell Scientific dataloggers equipped with CS I/O communication ports. A ribbon cable assembly (C1947) is used to provide a male 9-pin connector that can plug directly to the CS I/O port or to a SC-12 cable that connects to the CS I/O port (See Figure 7). The CS I/O port is used to download image files to the datalogger. The image files can then be collected remotely in conjunction with the regular data.

The camera will support only Concurrent Synchronous Device Communications (CSDC) and will not support Modem Enabled (ME) Communications. The camera can be assigned one of two CSDC addresses, 7 or 8. If another CSDC device is connected to the CS I/O port, then the camera must have an address that is different from the other device.

The CS I/O port cable lengths should be restricted to 12 feet or less to ensure optimal operation.

## 4.4 RS-485 Port

The RS-485 terminals can be used in conjunction with the MD485 to interface a datalogger to the camera over distances of up to 4000 feet. The +12V GND and EXT control lines cannot be practically run these long distances. Normally the RS-485A and RS-485B lines, and an additional ground connection, are run these distances. Refer to the MD485 manual for additional information.

# 5. Device Configuration Utility

The Device Configuration Utility can be used to set the clock on the camera as well as other operating parameters such as the PakBus addresses.

## 5.1 Using The Device Configuration Utility

- Connect an appropriate power supply to the camera.
- Connect the RS-232 cable to the camera and the computer.
- Turn the Power switch to the “ON” position.
- Press the Set-up Button (this temporarily forces the RS-232 port to 115KBAUD).
- Within 40 Seconds invoke the Device Configuration Utility (Figure 10).
- Select CC640 as the device and connect to the camera.
- Table 2 offers further information on configuration settings.

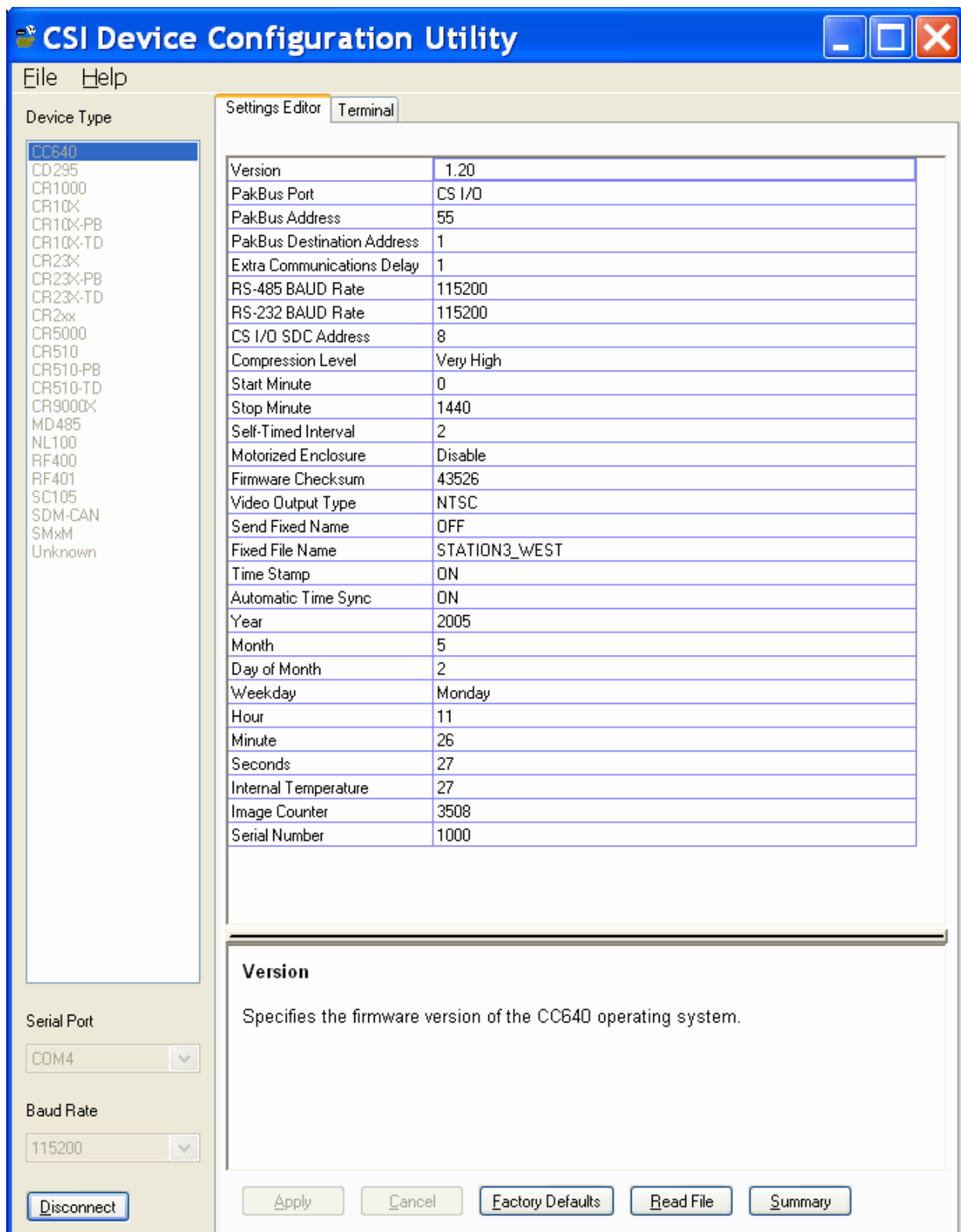


Figure 8 Device Configuration Utility Screen

Table 2. Explanation of Configuration Settings

Parameter	Type	Description	Default Value
<b>Version</b>	Read Only	The firmware version of the CC640 operating system	N/A
<b>PakBus Port</b>	Read/Write	Options: NONE, CS I/O, RS-485, RS-232  Only select a PakBus Port if communications are being used to transfer images via PakBus.	NONE
<b>PakBus Address</b>	Read/Write	Options: 1 – 4094  A PakBus Address should be assigned to the camera for PakBus Communications.	55
<b>PakBus Destination Address</b>	Read/Write	Options: 1 – 4094  This is the PakBus address of the destination device where the image files will be transmitted. The device is normally a Campbell Scientific datalogger.	1
<b>Extra Communications Delay</b>	Read/Write	Options: 0 – 10 Seconds  Additional Delays can be added for PakBus networks with long propagation delays.	1
<b>RS-485 BAUD rate</b>	Read/Write	Options: 230400, 115200, 76800, 57600, 38400, 28800, 19200, 9600, 1200	115,200
<b>RS-232 BAUD rate</b>	Read/Write	Options: 230400, 115200, 76800, 57600, 38400, 28800, 19200, 9600, 1200	115,200
<b>CS I/O SDC ADDRESS</b>	Read/Write	Options: 7 or 8  If other CSDC devices are connected to the same CS I/O port, each device must have its own address.	8
<b>Compression Level</b>	Read/Write	Options: Very High, High, Medium, Low, None  This option selects the amount of compression to be applied to the JPG files. Higher compression levels result in smaller files but the images will lose subtle details. Selecting none will produce a large sized (480Kb) Lossless image.	High
<b>Start Minute</b>	Read/Write	Options: 0-1339  If the camera is in a Self-Timed Mode, this parameter allows a start time from Midnight to be selected.	0
<b>Stop Minute</b>	Read/Write	Options: 0-1440  If the camera is in a Self-Timed Mode, this parameter allows a stop time from Midnight to be selected.	1440
<b>Self-Timed Interval</b>	Read/Write	Options: 0-1440  If this parameter is non-zero then the camera will automatically wake itself up and acquire images based on the interval entered.	0
<b>Motorized Enclosure</b>	Read/Write	Options: Disable, Enable  Select enable if the ENC-CC motorized covered enclosure is used. It is important to select disable if the motorized enclosure is not used. Selecting enable when a motorized enclosure is not present will slow down the operation of the camera.	Disable
<b>Firmware Checksum</b>	Read Only	This is the checksum calculated from the firmware present on the camera.	N/A



<b>Video Output Type</b>	Read/Write	Options: NTSC, PAL  NTSC video is the North American Standard. PAL is the VIDEO standard for most European Countries.	NTSC
<b>Send Fixed Name</b>	Read/Write	Options: ON, OFF  If set to off, then the camera will send each image with a unique file name. The format will be AAAA_XXXXXXXX.JPG Where AAAA is the camera's PakBus Address and XXXXXX is the Image Counter value.  If Send Fixed Name is on, then the image will always be sent with the same name. The name used will be the text entered in the Fixed File Name string followed by the JPG extension.	OFF
<b>Fixed File Name</b>	Read/Write	Options: ON, OFF  An optional fixed name that can be used for naming the JPEG files that are transferred from the camera. The name must be less than 16 characters. The JPG extension will be added to this name  The PakBus address of the camera will still be placed in front of the filename.  This Name Field will also be placed on the IMAGE if the Time Stamp is enabled.	OFF
<b>Time Stamp</b>	Read/Write	Options: ON, OFF  If set to on, a date and time stamp will be placed on the image in addition to the text entered in the Fixed File Name field.  The Images will be 640x504 pixels with the text added to the bottom last 24 pixel rows.	CC640
<b>Automatic Time Sync</b>	Read/Write	Options: ON, OFF  If set to on, the camera will attempt to update its clock automatically from the selected PakBus Destination Address.	OFF
<b>Year</b>	Read/Write	Options: 2004 - 2104	N/A
<b>Month</b>	Read/Write	Options: Jan - Dec	N/A
<b>Date</b>	Read/Write	Options: 1-31	N/A
<b>Weekday</b>	Read/Write	Options: Sun. – Sat.	N/A
<b>Hour</b>	Read/Write	Options: 0 – 23  In 24 Hour Format Only	N/A
<b>Minute</b>	Read/Write	Options: 0-59	N/A
<b>Second</b>	Read/Write	Options: 0-59	N/A
<b>Temperature</b>	Read Only	Temperature in Degrees Celsius -55 to +125. Temperatures beyond the operating temperature range are not recommended.	N/A
<b>Image Counter</b>	Read/Write	Options: 0 – 9999999 (7 Digits)  The file counter can be changed if desired. The file counter will loop back to zero after 9999999.	1
<b>Serial Number</b>	Read Only	Serial Number	N/A

## 6. Operational Description

### 6.1 Self Timed Mode

In self-timed mode the camera is capable of waking itself up and acquiring an image. In order to place the camera in self-timed mode use the Device Configuration Software to set the *Self-Timed Interval* parameter to non-zero.

#### Self-Timed Example 1:

To take a picture every 15 minutes starting at Midnight the self-timed mode parameters should be set as follows:

<i>Start Minute:</i>	0
<i>Stop Minute:</i>	1440
<i>Self-Timed Interval:</i>	15

#### Self-Timed Example 2:

To take a picture every Hour starting at 4:00AM and ending at 11:00PM the self-timed mode parameters should be set as follows:

<i>Start Minute:</i>	240 (4 hours * 60 Minutes)
<i>Stop Minute:</i>	1380 (23 Hours * 60 Minutes)
<i>Self-Timed Interval:</i>	60

### 6.2 External Trigger Mode

An image acquisition can also be triggered from the Ext. Input Signal on the camera. It is recommended that a short pulse be used to initiate the image acquisition. If a positive voltage is applied and not removed before the image acquisition sequence is complete, the camera will begin another image acquisition immediately after. An image acquisition can be as short as 10 Seconds.

---

**NOTE**

External Trigger Mode can be used in conjunction with the Self-Timed Mode by following all the steps as listed in this section.

---

## 7. Image Quality

### 7.1 Lighting conditions

Lighting conditions have the greatest influence on image quality. The CC640 camera produces the best images under normal daylight conditions. Pictures taken in good daylight conditions produce crisper and brighter images.

The CC640 uses the entire image to adjust the exposure settings for a particular scene.

Scenes that contain small variations in light intensities will produce better images as well. In scenes with high variations in light intensities, such as a bright sky and a dark horizon, the image may contain portions that are under-exposed and portions that are over-exposed, as with most cameras. The CC640 utilizes various techniques to produce an overall good picture under most lighting conditions.

When the CC640 is over-exposed by an overly bright object, such as the sun in a sky shot, the over-exposed object may begin to turn black. This is a result of the CMOS image sensor being over-exposed to light and becoming saturated. It is normal operation for the centre of the Sun to appear black under certain lighting conditions.

### 7.2 Night Time Images

Generally the camera does not produce distinguishable images at night time. If lighting is present (such as street lights), then objects may become noticeable.

### 7.3 Date and Time Stamp

Setting the Time Stamp option of the camera to ON will add a banner to the bottom of the images (Figure 9). The banner adds 24 pixel rows to the image and increases the size of the image from 640x480 to 640x504 pixels.

The banner includes the text entered for the fixed file name. The text that can be displayed includes numbers 0-9, letters A-Z (converted to upper case), and an underscore symbol. Unsupported symbols/characters are displayed as a space.

Following the fixed file name string is the Date and time stamp. The First 3 characters are used for the month followed by the day of month and year. The time is HH:MM in 24 hour clock format.

The banner ends with the internal camera temperature displayed in degrees Kelvin. This is intended for diagnostic purposes. The temperature is displayed in degrees Kelvin so that there is no confusion that the temperature represents some ambient temperature. The temperature is internal and can vary substantially from the actual ambient temperature. To convert the temperature to degrees Celsius subtract 273 from the value displayed.



Figure 9 Illustration of Time Stamp banner

## 7.4 JPEG Compression

There are 5 selectable levels of JPEG compression:

- Very High (32 Kbytes Typical)
- High (48 Kbytes Typical)
- Medium (72 Kbytes Typical)
- Low (100 Kbytes Typical)
- None (Lossless) (480 Kbytes Typical)

---

**NOTE** These are typical values with the time stamp enabled on the image (640x504 pixels). The size of the images varies with the image content.

---

Selecting **None** will produce the best quality JPEG files with Lossless compression. Lossless compression does not introduce additional distortions and every pixel is the same size as in the original image. Very High compression will produce the smallest files but with the most degradation of the image.

Small files may be important for slow telecommunication links or for applications that require a large number of pictures to be stored onto the memory card.

High compression is the recommended setting to produce satisfactory results for most applications while taking advantage of the benefits of smaller file sizes.

## 8. Lens

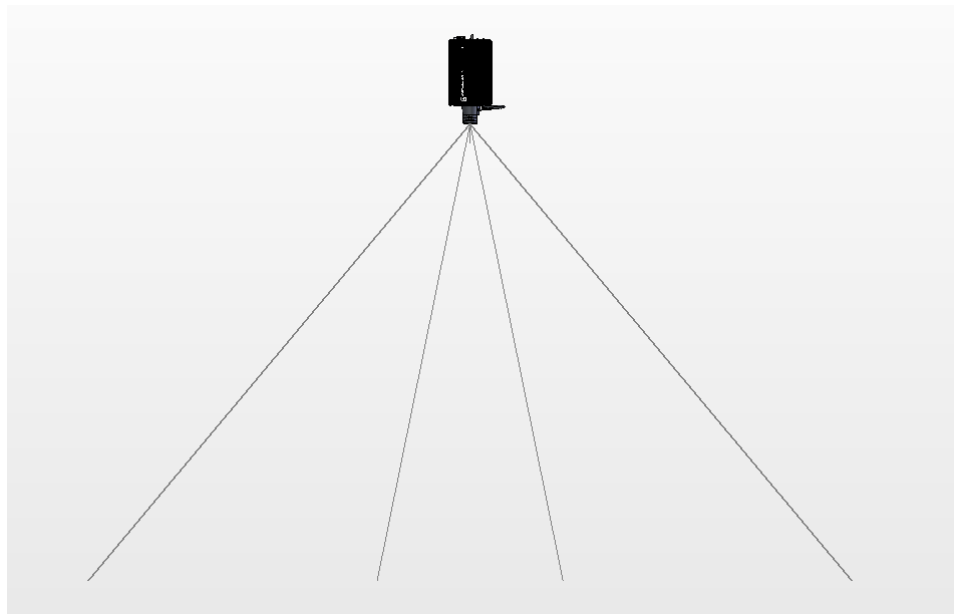
The standard Lenses for the CC640 camera contain the following features:

- CS Mount
- Varifocal (manual zoom)
- Manual Focus
- DC Iris

The camera controls the iris of the lens using the cable with a 4-pin connector. This connector must always be plugged into the receptacle (on the front lens plate of the camera) for proper operation.

### 8.1 Lenses and Field of View

- Currently there are 2 optional lenses for the CC640 camera. A 3.5-8mm and a 6-12mm.
- What does this mean? These numbers have a direct correlation to the zoom or field of view.
- The 3.5-8mm Lens has a field of view ranging from 79.8 to 35.4 Degrees
- The 6-12mm Lens has a field of view ranging from 47.3 to 23.0 Degrees
- Large angle is 79.8 Degrees Small angle is 23 degrees



## 8.2 Focus and Zoom Adjustment

The lens is equipped with manual zoom and focus adjustment rings. The most practical way to adjust the lens is by utilizing a normal Television monitor or a portable Television.

- Connect an appropriate video cable from the video output connector (RCA Jack) of the camera to the video input on the video monitor of the television.
- Turn the power switches of both the camera and the television to the ON position and then press the Set-up Button. Within a few seconds the video should appear on the monitor. Consult your monitor owner's manual for additional instructions on displaying video from the video input jack.
- Once the video is observed on the monitor, loosen the 2 thumbscrews on the adjustment rings of the lens.
- It is generally easier to adjust the zoom first and then the focus.
- Once the zoom is adjusted as desired tighten the thumbscrew so that the zoom will not inadvertently move when the focus is adjusted.
- Adjust the focus ring and then tighten its thumbscrew as well.

**Recommendation:** If the camera is targeted at an object that is far away (100 Metres or more), then it may be beneficial to adjust the lens before taking the camera into the field by using an object that is at a similar distance away. It is generally much easier to use a larger monitor in an office environment, rather than a portable TV at the installation site, as sunlight tends to make it difficult to view a television screen outdoors.

### 8.2.1 Temperature Variations and Focus

The CC640 can operate under extreme temperature variations. The focus of the lens can change slightly with large variations in temperature. For example, if a lens is focused at +25°C the lens may be slightly out of focus at -30°C. The change in focus will be less noticeable if the focus is adjusted closer to the cameras operating temperature.

## 8.3 Lens Filter

The CC640 camera is equipped with an IR cut filter on its lens. This is threaded onto the front of the lens and is required to filter out near-infrared light that can have an undesirable affect on the images. It is recommended that the filter always be left installed on the lens.

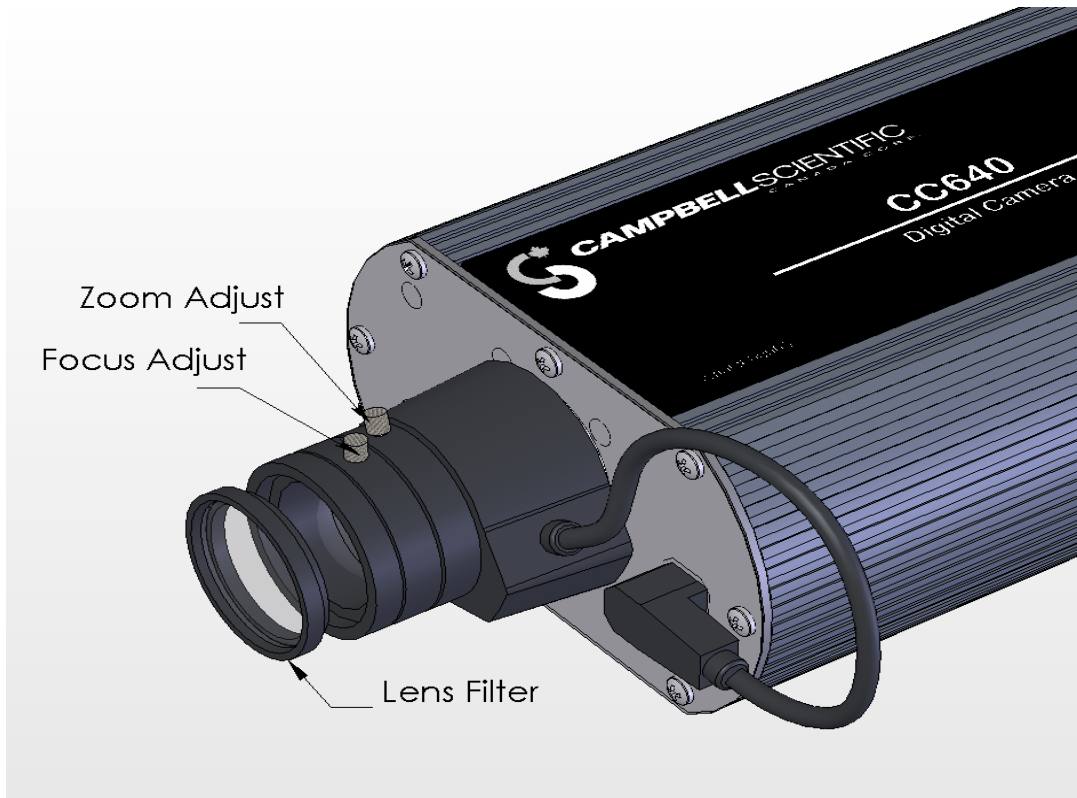


Figure 10 Lens and Filter

## 9. Maintenance

The CC640 requires little maintenance and no calibrations. Keeping the camera clean and in a dry environment is important for the longevity of the camera.

### 9.1 Lithium Battery

The Camera is equipped with a Lithium Thionyl Chloride Battery. The battery maintains the clock functionality for periods when power is not connected to the camera. The expected battery life is 2 years. If the camera is in operation and connected to a power supply, the battery life may be extended up to 10 Years.

It is recommended that the battery be replaced by a certified repair facility. The sticker on the bottom of the camera indicates the date of battery installation.

## 9.2 Lens Cleaning

If the filter or lens requires cleaning, it is very important that only a proper lens cloth (like those included with your CC640 camera) or lens tissue be used. The use of inappropriate materials to clean the lens can permanently damage or reduce the effectiveness of the filter or lens.

# 10. Set-up and Interface Guide

## 10.1 Trigger mode

Determine how the camera will be triggered to initiate an image acquisition. There are 2 different trigger sources. The first is using the external trigger input and the second is self-timed mode, which uses the cameras own real time clock. A combination of external trigger and self-timed mode can be used as well.

### 10.1.1 External Trigger

If the camera is being triggered by an external signal provided by another device then:

- Set the parameter *Self-Timed Interval* to zero
- Connect the external signal to the *Ext* input of the camera

### 10.1.2 Self-Timed Trigger

A camera that is used in self-timed mode should be set up as follows:

- Set the parameter *Self-Timed Interval* to a non zero value
- Change the *Start Minute* and *Stop Minute* values accordingly
- Leave the *Ext* input of the camera unconnected or connected to ground

### 10.1.3 Combination of External and Self-Timed Triggers

A camera that is used in this configuration should be set up as follows:

- Set the parameter *Self-Timed Interval* to an non zero value
- Change the *Start Minute* and *Stop Minute* values accordingly
- Connect the external signal to the *Ext* input of the camera



## 10.2 Communications

Communications can enable remote retrieval and/or storage of images to external devices such as compatible Campbell Scientific dataloggers. The PakBus protocol is used to facilitate the transfer of images.

### 10.2.1 Communications Disabled

When a camera is not connected to other devices for communications then it is important to:

- Set the parameter *PakBus Port* to None

### 10.2.2 CS I/O Communications

The camera can download images to a compatible Campbell Scientific datalogger via the CS I/O port. The following items are required for CS I/O PakBus communications:

- Set the parameter *PakBus Port* to CS I/O
- Set the parameter *PakBus Address* to a unique value in the PakBus network.
- Set the parameter *PakBus Destination Address* to the datalogger that is intended to store the images.
- Ensure that the parameter *CS I/O CSDC ADDRESS* of the camera is unique amongst the peripherals that are connected to the dataloggers' CS I/O port.
- Connect the camera's CS I/O port to the datalogger using the supplied ribbon cable adapter.
- Ensure that the dataloggers' CS I/O BAUD rate is set to 76.8 KB or less

Refer to Figure 7 (page 13) for connections required when using the CS I/O port.

---

**NOTE**

The camera must always have +12Volts power connected to it when connected to the CS I/O port of a datalogger. Failing to apply power to the camera will prevent other devices from communicating with the datalogger.

---

### 10.2.3 RS-232 Communications

The camera can download images via its RS-232 port using the PakBus protocol. The following items are required for RS-232 PakBus communications:

- Set the parameter *PakBus Port* to RS-232
- Set the parameter *PakBus Address* to a unique value in the PakBus network.
- Set the parameter *PakBus Destination Address* to the device that is intended to retrieve the images.
- Set the *RS-232 BAUD rate* to match the BAUD rate of the device being connected to the camera.

Refer to Section 4.2 for additional information and connections diagrams using the RS-232 port.

### 10.2.4 RS-485 Communications

The camera can download images via its RS-485 port using the PakBus protocol. An MD485 can be used to transmit images via PakBus from a camera to other devices:

- Set the parameter *PakBus Port* to RS-485
- Set the parameter *PakBus Address* to a unique value in the PakBus network.
- Set the parameter *PakBus Destination Address* to the device that is intended to retrieve the images.
- Set the *RS-485 BAUD rate* to match the BAUD rate of the RS-485 network that the camera is being connected to.

Refer to Section 4.4 for additional information on the RS-485 port.

### 10.2.5 Concurrent Communications

PakBus allows the camera to download images to a datalogger simultaneously with other datalogger communications. A communications task will take longer if the datalogger is communicating with multiple devices at the same time.

It may be beneficial to set up the system to avoid image transfers when other communications are scheduled.

For example, longer connect times on long distance telephone connections can be avoided by scheduling image transfers from the camera to the datalogger outside the scheduled data collection time. If a station is called on the hour to retrieve data, image acquisitions could be initiated before the scheduled call (15 minutes prior) to shorten the connect times.

## 11. Power Calculations and Timings

The CC640 was specifically designed for operation in power-constrained systems such as solar powered sites. It is critical in such systems that the power switch on the camera always be left in the AUTO position to take advantage of the low power mode. This section outlines power consumption of the camera for purposes of power supply design for a system.

### 11.1 Standalone Operation

In standalone mode the camera operates as a self-contained image logger.

The current draw of the camera while in low power quiescent mode is 250uA. When the camera wakes up to take a picture, operating current draw increases to a maximum of 250 mA for approximately 30 seconds. In order to calculate the daily power usage of the camera, both the quiescent and operating power consumptions need to be calculated.

The quiescent power consumption in Amp-Hours is calculated as follows:

$$P_{\text{quiescent}} = 250 \times 10^{-6} \text{ Amps} * 24 \text{ Hours} = 0.006 \text{ Amp-Hrs} / \text{Day}$$

The operating power usage per picture in Amp-Hours is calculated as follows:

$$P_{\text{operating}} = 0.250 \text{ Amps} * (30 \text{ Sec.} / 3600 \text{ Sec./Hr}) = 0.00208 \text{ Amp-Hrs} / \text{Picture}$$

The daily power usage will depend on the number of pictures taken per day. The power usage can be calculated using the following formula:

$$P_{\text{usage}} / \text{Day} = 0.006 \text{ Amp-Hrs} + (0.00208 \text{ Amp-Hrs} * \text{Number of Pictures Per Day})$$

The following table shows the power usage versus the number of pictures taken per day:

**Table 3. Standalone Operation Power Usages**

Number of Pictures Per Day	Power Usage Per Day
1 (Every 24 Hours)	0.008 Amp-Hrs
4 (Every 6 Hours)	0.014 Amp-Hrs
12 (Every 2 Hours)	0.031 Amp-Hrs
24 (Every 60 minutes)	0.056 Amp-Hrs
48 (Every 30 minutes)	0.106 Amp-Hrs
96 (Every 15 minutes)	0.206 Amp-Hrs
288 (Every 5 minutes)	0.606 Amp-Hrs
1440 (Every minute)	3.006 Amp-Hrs

## 11.2 Operation with Communications

If the camera is operating in a standalone mode, the time the camera is operational in this mode is typically 30 seconds. The power calculations are more complicated when communications are involved, as the amount of time the camera is in operating mode is increased by the amount of time it takes for the camera to transfer an image.

The transfer times are influenced by two main factors: the size of the image and the transfer speed used to send the image. The amount of time the camera is on will be increased as the size of the image becomes larger or as the communication rate slows down.

To properly determine the power consumption when using communications, the additional time the camera stays in operating mode needs to be accounted for. The following table is a guideline for determining the amount of time it takes to transfer an image using RS-232 Communications.

Table 4. RS-232 Port File Transfer Times and power usage per image

<b>RS-232 Communication BAUD RATE</b>	<b>Very High Compression (32kB Files)</b>	<b>High Compression (42kB Files)</b>	<b>Medium Compression (72kB Files)</b>	<b>Low Compression (100kB Files)</b>	<b>None Lossless Compression (480kB Files)</b>
<b>9600</b>	47 seconds 0.0053 A-Hrs	71 seconds 0.007 A-Hrs	105 seconds 0.0094 A-Hrs	147 seconds 0.0123 A-Hrs	706 seconds 0.0511 A-Hrs
<b>19200</b>	26 seconds 0.0039 A-Hrs	38 seconds 0.0047 A-Hrs	58 seconds 0.0061 A-Hrs	80 seconds 0.0076 A-Hrs	384 seconds 0.0286 A-Hrs
<b>38400</b>	15 seconds 0.0031 A-Hrs	22 seconds 0.0036 A-Hrs	33 seconds 0.0044 A-Hrs	45 seconds 0.0052 A-Hrs	218 seconds 0.0172 A-Hrs
<b>57600</b>	11 seconds 0.0028 A-Hrs	16 seconds 0.0032 A-Hrs	24 seconds 0.0038 A-Hrs	33 seconds 0.0044 A-Hrs	160 seconds 0.0132 A-Hrs
<b>115200</b>	8 seconds 0.0026 A-Hrs	12 seconds 0.0029 A-Hrs	18 seconds 0.0033 A-Hrs	25 seconds 0.0038 A-Hrs	120 seconds 0.0104 A-Hrs

Table 5. CR10XPB CS I/O File Transfer Times

<b>CR10XPB-2M CS I/O Communication BAUD RATE</b>	<b>Very High Compression (32kB Files)</b>	<b>High Compression (48kB Files)</b>	<b>Medium Compression (72kB Files)</b>	<b>Low Compression (100kB Files)</b>	<b>None Lossless Compression (480kB Files)</b>
<b>76800</b>	49 seconds 0.0055 A-Hrs	74 seconds 0.0072 A-Hrs	111 seconds 0.0098 A-Hrs	154 seconds 0.0128 A-Hrs	738 seconds 0.0533 A-Hrs

Table 6. CR1000 CS I/O File Transfer Times

<b>CR1000 CS I/O Communication BAUD RATE</b>	<b>Very High Compression (32kB Files)</b>	<b>High Compression (42kB Files)</b>	<b>Medium Compression (72kB Files)</b>	<b>Low Compression (100kB Files)</b>	<b>None Lossless Compression (480kB Files)</b>
<b>9600</b>	40 seconds 0.0049 A-Hrs	60 seconds 0.0063 A-Hrs	90 seconds 0.0083 A-Hrs	125 seconds 0.0108 A-Hrs	600 seconds 0.0438 A-Hrs
<b>19200</b>	23 seconds 0.0037 A-Hrs	34 seconds 0.0044 A-Hrs	51 seconds 0.0056 A-Hrs	71 seconds 0.007 A-Hrs	342 seconds 0.0258 A-Hrs
<b>38400</b>	14 seconds 0.0031 A-Hrs	21 seconds 0.0035 A-Hrs	31 seconds 0.0042 A-Hrs	43 seconds 0.0051 A-Hrs	209 seconds 0.0166 A-Hrs
<b>57600</b>	11 seconds 0.0028 A-Hrs	16 seconds 0.0032 A-Hrs	24 seconds 0.0038 A-Hrs	33 seconds 0.0044 A-Hrs	160 seconds 0.0132 A-Hrs
<b>115200</b>	Do not use	Do not use	Do not use	Do not use	Do not use

The communication transfer times indicated in the above tables do not include the 30 seconds that it takes for the camera to acquire the image. These times can be used to determine the additional power used by the datalogger to receive the image. The power usage numbers, however, do include the additional 30 seconds of on time for the camera.

## 12. CR10X Interface Guide

This section contains information for interfacing the CC640 camera to the CR10X datalogger. The CC640 camera can interface to the CR10X datalogger via the CS I/O port directly or through an MD485 interface.

### 12.1 CR10X Datalogger Requirements

It is highly recommended that the datalogger be a 2Meg datalogger. The datalogger must also contain the PakBus operating system to support the communications and file storage capabilities.

### 12.2 CR10X Memory Allocation

Memory must be allocated in the CR10X for the purpose of storing files. The memory is allocated in multiples of 64Kbyte blocks. Memory allocated for file storage comes out of final storage space. The files are stored in a circular buffer (ring memory). When new files are sent from the camera to the CR10X's final storage memory the oldest files will be deleted to make room for the new file.

The memory can be allocated as follows:

- Enter \*D16A
- 16:XX should be displayed. XX represents the number of 64 Kbyte memory blocks allocated for file storage.
- Enter the number of blocks required followed by A. (Recommend 6 to 16 blocks)

The number of memory blocks required will vary with the compression level selected and the number of files required to reside in the dataloggers final storage. It is recommended to allocate between 6 to 16 memory blocks. If the compression level selected is none then 16 memory blocks (1024 kbytes) is recommended. Files can exceed 500Kbytes with None selected as compression.

### 12.3 CR10X PakBus Settings

PakBus communications facilitate the transfer of images from the camera to the datalogger. Several parameters must be set on the CR10X to enable PakBus communications with the Camera.

These parameters can be set either with a CR10KD, using *Edlog \ Options \ PakBus Settings*, or even with the Device Configuration Utility using Terminal Emulator mode.

## 12.4 CR10X \*D15 Settings

The \*D15 Settings are used to set the PakBus Parameters necessary for communications with the camera. Refer to PakBus Networking Guide for additional information on PakBus and these settings. If values for parameters 01, 02, 03 are too small, you may not be able to connect to all network nodes.

- \*D      13:00
- 15A     15:???? – PakBus Address (prefer 1) must match the destination PakBus address of the camera setting.
- A        01:0000 –The Max number of Nodes recommend 3 or more
- A        02:0000 –The Max number of neighbours recommend 3 or more.
- A        03:0000 –The Max number of routers recommend 3 or more.
- A        04:0000 – Default router recommend to leave at zero

## 12.5 CR10X Multiple Cameras

Multiple cameras can be placed on a single CR10X datalogger. However, the system should be configured so that image transfers to the datalogger from more than one camera do not occur at the same time. If a collision does occur, images will not get stored onto the datalogger. Each camera on the logger should be set to have different PakBus addresses and CSDC addresses.

## 12.6 CR10X Connections

The Ext. connection is optional if the camera is set up in self-timed mode. It is also recommended that the CS I/O cable length between the camera and the CR10X be limited to 12 feet or less.

Refer to Figure 7 (page 13) for connections to the CR10X.

# 13. CR1000 Interface Guide

This section contains information for interfacing the CC640 camera to the CR1000 datalogger. The CR1000 and the CC640 both have several different types of communication ports. This provides many different interface options for the user. This includes using the CS I/O port, the 9 Pin RS-232 Serial Port, the control COM ports (1-4), and RS-485 if using an MD485 interface.

## 13.1 CR1000 Memory Set-up

To facilitate the storage of images a CFM100 allows the use of a compact flash card on the CR1000. Memory can also be allocated from the CR1000's internal memory to create a virtual user drive "USR:" Entering a non-zero value for the parameter "USR: drive size" allocates internal memory for the drive. The amount of memory required will vary depending on each application. A good number to start with is 524288 bytes (512K bytes which is 25% of the 2M bytes available on a standard CR1000).

The following methods can be used to set the drive size of the USR:

- The Device Configuration Utility program
- PakBus Graph
- Editing the parameter from the Status Table
- The CR1000's optional keypad and display.

## 13.2 CR1000 Files Manager

The Files Manager setting on the CR1000 facilitates the management of JPEG files that are received from the camera. The Files Manager allows the user to specify a name for the files and the number of files kept in a ring memory type fashion.

The format of the Files Manager setting is as follows:

(AAAA,DDD:NAME.EXT,NNNN)

- AAAA – Is the PakBus address of the camera
- DDD – Is the destination drive on the CR1000  
USR for the user drive  
CRD for the compact flash memory card
- NAME – Is any name string that will be used to name the files
- EXT – The file extension of the incoming file must match. In the case of the camera this must always be “JPG”.
- NNNN – The number of files kept in the ring memory. This number should be low enough so that the memory required for the files is less than what is available in the corresponding drive. However, for the internal USR drive this would normally be between 3 and 10 images and for CRD drive (memory card) this can be larger. When communications are used to retrieve images, it is suggested to limit the number of files in the ring memory to 200 in order to avoid long communication delays.

An example Files Manager setting is as follows:

(55,USR:SkySouth.JPG,3)

- Camera PakBus address is 55
- The files will be stored in the USR: director with a name SkySouth####.JPG where #### is an incrementing number. Entering a zero for this parameter will disable the automatic numbering and produce a fixed file name.
- The 3 most recent files will be kept. A new incoming file will cause the oldest to be deleted.

## 13.3 CR1000 CS I/O Communications

The camera can connect directly to the CS I/O port of the CR1000 to transfer images to it. In addition to setting up the Memory (refer to 013.1 CR1000 Memory ) and the Files Manager (refer to 0 13.2 CR1000 Files Manager) the CR1000 SDC7 and SDC8 BAUD rates must be changed from the default 115200 BAUD to 57600 BAUD.

If desired, a control port on the CR1000 can be configured to pulse a control port that is connected to the Ext. Input of the camera to initiate image acquisitions.

Refer to Figure 7 Camera connections for CS I/O port (page 13) for an illustration of the connections between the camera and the CR1000 datalogger.

## 13.4 CR1000 RS-232 Port Communications

The camera can be connected to the 9 pin RS-232 port of the CR1000. A Null modem cable or adapter must be used between the camera and the CR1000. The Null modem cable is required because both the camera and the CR1000 are DCE type devices.

The camera can be left at its default RS-232 BAUD rate of 115200. *Figure 3 Camera to Datalogger RS-232 port (DCE) connection* (page 5) illustrates the camera connection required for interfacing to the CR1000.

## 13.5 CR1000 COM Port (control port) Communications

On the CR1000 the control ports can be configured to function as RS-232 communication ports. Any of these 4 COM ports can be configured as PakBus ports and used to communicate with the camera.

The COM ports can be activated as PakBus ports using the Device Configuration utility or by using the SerialOpen instruction in the CR1000 program. The following SerialOpen instruction configures COM port 2. (BAUD rate 115200, PakBus Port - 4, transmit delay - 0, Buffer size - 1000.

```
SerialOpen (Com2,115200,4,0,1000)
```

To facilitate the RS-232 connection from the camera to the CR1000 terminal block an adapter board can be used (Part number C2006). As illustrated in Figure 4 (page 10), terminal 2 is the RS-232 output from the camera and terminal 3 is the RS-232 input to the camera. The C2006 adapter terminal block numbers corresponds with the DB-9 pin numbers. For example pin 1 on a DB9 corresponds with terminal #1 and pin 9 corresponds with terminal #9.

# 14. Remote Image Retrieval

Once the camera has transferred an image to a datalogger, existing communications can be used to retrieve the image remotely from the datalogger memory. For practical purposes it is recommended that the communication link used for image retrieval maintain a speed of 9600 BAUD or more.

## 14.1 LNCMD.EXE

Loggernet (Version 3.1.3 or newer) includes the executable LNCMD.EXE that facilitates the image file retrieval from dataloggers. LNCMD.EXE is an executable file that can be used to retrieve images from a datalogger. The file is normally placed in the directory C:\Program Files\Campbellsci\LoggerNet. The current command lines for the LNCMD.EXE executable are as follows:

- List\_Stations  
Lists the names of the stations available to call.
- List\_Files <Station>  
Lists the names of the files stored at a particular station.

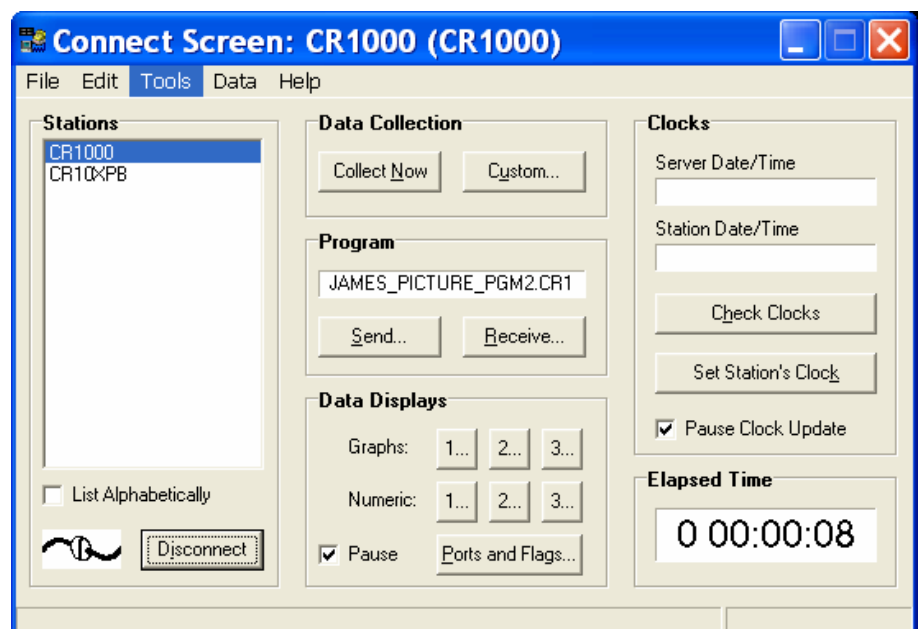


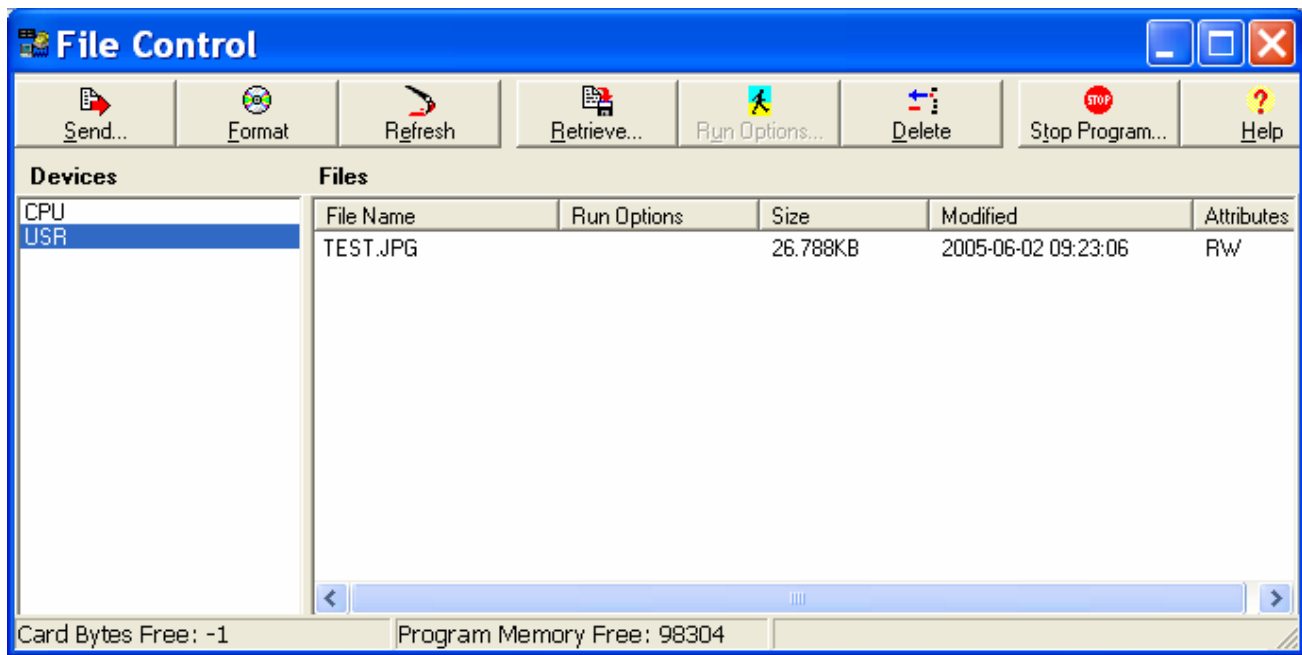
- **Send\_File <Station> <Filename>**  
Sends a particular file to a station.
- **Delete\_File <Station> <Filename>**  
Deletes a file stored in the datalogger. This is currently not supported on the CR10X datalogger.
- **Retrieve\_File < Station > < Filename > <Output Filename >**  
This should be the only command required to collect images with the CR10X. The files sent to the CR10X by the camera have a unique filename by using a counter. To retrieve all images in memory simply use the wildcard character \* for the JPG files:
- **Retrieve\_File <Station> \*.JPG**  
This will retrieve files that match the DOS type name entered. Other options for Retrieve\_File include Force and NoDateCheck
- **Force:** Will collect a file even if a file with the same name and date have already been collected.
- **NoDateCheck:** Will collect a file with the same name only if the date is different.

## 14.2 Using Loggernet File Control

Images that are in the dataloggers memory can be viewed or collected on demand by using the File Control feature that is available under the Tools menu of the connect screen. Using the file control can also be useful for debugging purposes.

In the case of the CR10XPB datalogger only the CPU device exists where files can be stored. In dataloggers such as the CR1000 Devices can include the CPU, USB and the CRD (compact flash module). The devices show up in the left hand side of the File Control panel. To view files of a certain device simply click on the desired device listed in the panel.





### 14.3 Task Set-up / LNCMD.EXE

Automated image collection can be achieved by setting up a Task in Loggernet that executes the LNCMD.EXE executable.

A sample screen of a Task set-up that executes LNCMD.EXE is shown in Figure 11 Task Set-up (below). In this example the station CR10XPB is a station that is set-up in Loggernet. The Add Scheduled button can be used to create a task with a programmable schedule. The task shown has the following functionality:

- Task schedule begins at 12:15 and collects images twice an hour at 15 minutes past and 45 minutes past, or every 30 minutes.
- Retrieves images from the station CR10XPB and stores them in the directory C:\Temp\_pics
- All files in the CR10X with the extension JPG will be collected. LNCMD.exe will not collect previously collected files unless the Force option is used in the command line.

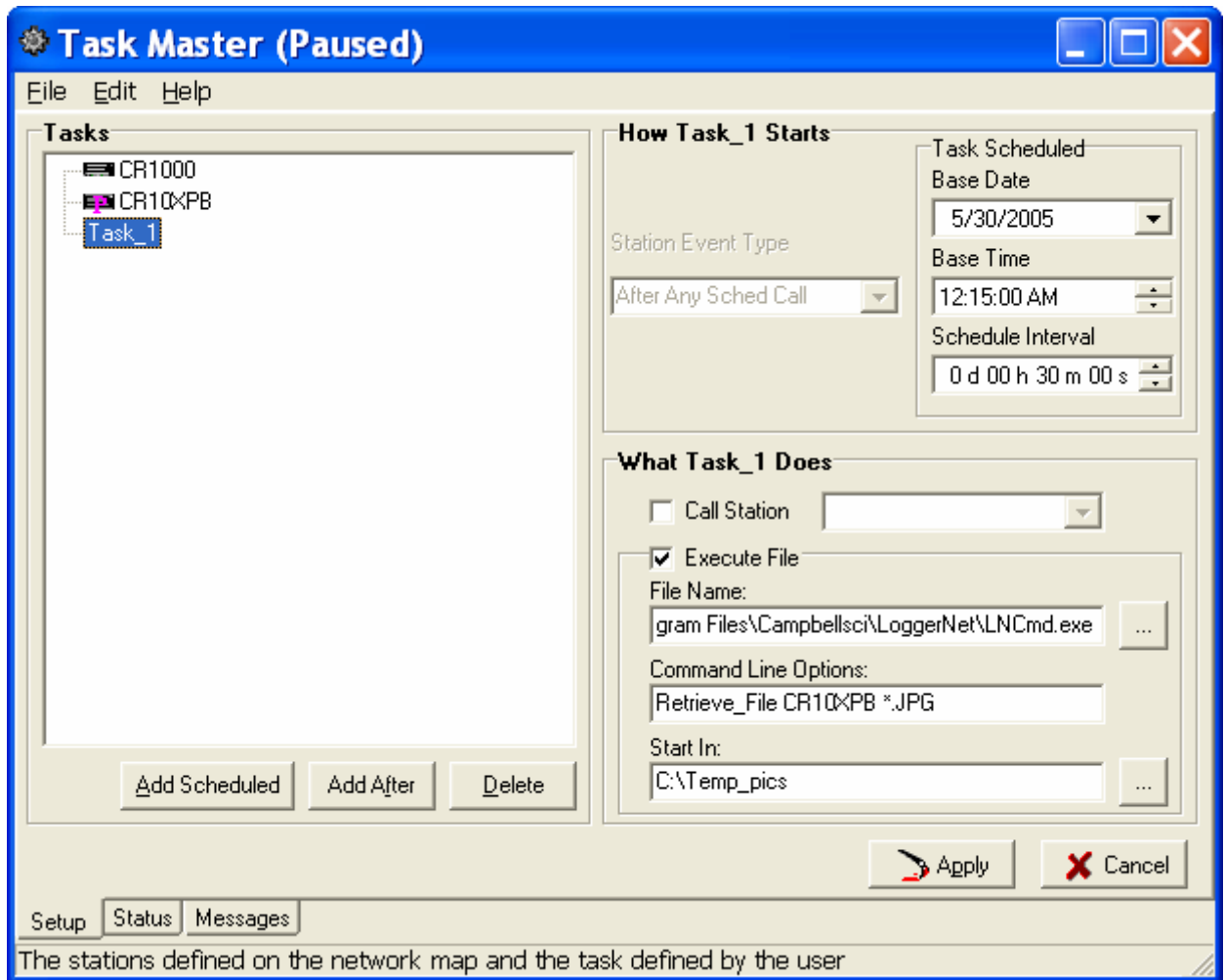


Figure 11 Task Set-up

In the above example the task will execute on its own schedule separate from data collection. A task can also be created that calls the LNCMD.EXE after scheduled data is collected. This may be more desirable for stations that are called using a dial up connection to eliminate separate dialling for data and images.

To set-up a task that executes after data is collected the desired station would be selected and the Add After option would be selected in the Task Master set-up screen. A pull down menu allows various stations event types to be selected. In this case *After Any Sched Call* is selected.

Note: In the station set-up the parameter Delay Before Hangup should be Non-zero to allow the task to operate.

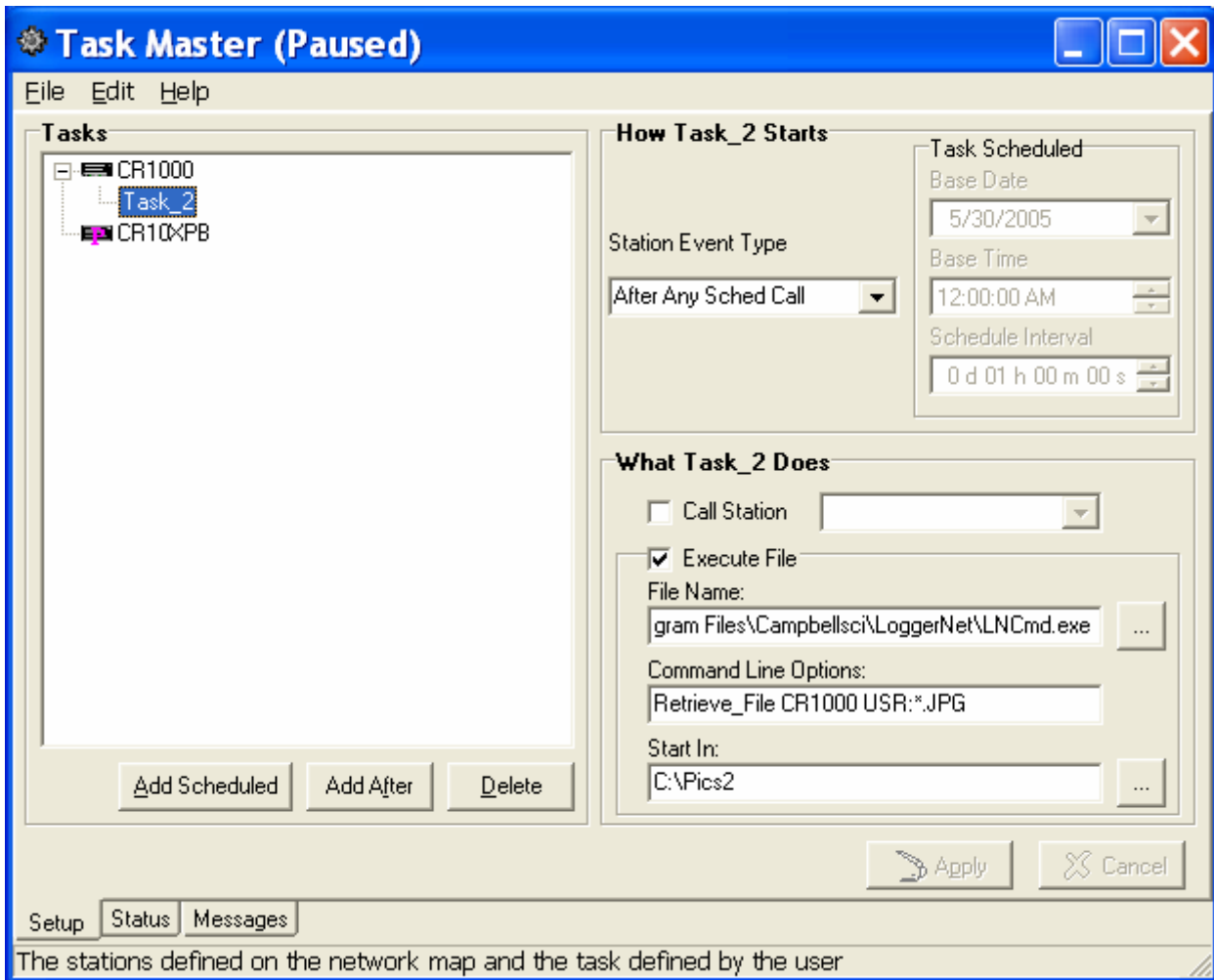


Figure 12 Task using Add After to collect images after scheduled call

Note that it is necessary to specify the directory in which the files are located for the CR1000. In our example the USR: drive is selected. Another option is the CRD: drive if the compact flash module is used with the CR1000.

## 15. Installation

The camera must be installed in an environmentally sealed enclosure that offers protection from moisture or high humidity. It is also recommended that desiccant be installed in the camera enclosure to absorb excess humidity. Failure to install or replace the desiccant as required may cause malfunctions or damage the camera.

### 15.1 Enclosures

Refer to Appendix A for recommended enclosures.

### 15.2 Mounting Holes

For flexibility, the camera is equipped with 2 different sets of mounting holes (Figure 13). There are three 1/4-20 threaded mounting holes along the centre of the camera that are spaced 2.0" (50.8mm) apart. The setscrews need to be removed with a 1/8" hex Allen key to use the 1/4-20 threaded mounting holes. At least two of the 1/4-20 threaded holes are required for mounting the camera. The camera is also equipped with four #4-40 threaded mounting holes that are spaced 1.5" x 5.0" (38 mm x 127 mm) apart.

**Important:** The fasteners used for mounting must be 0.375 inches (9.5 mm) or shorter. Using longer fasteners can cause damage to the camera by protruding too far into the camera and damaging the circuit boards. It is recommended to use only the fasteners provided with the camera.

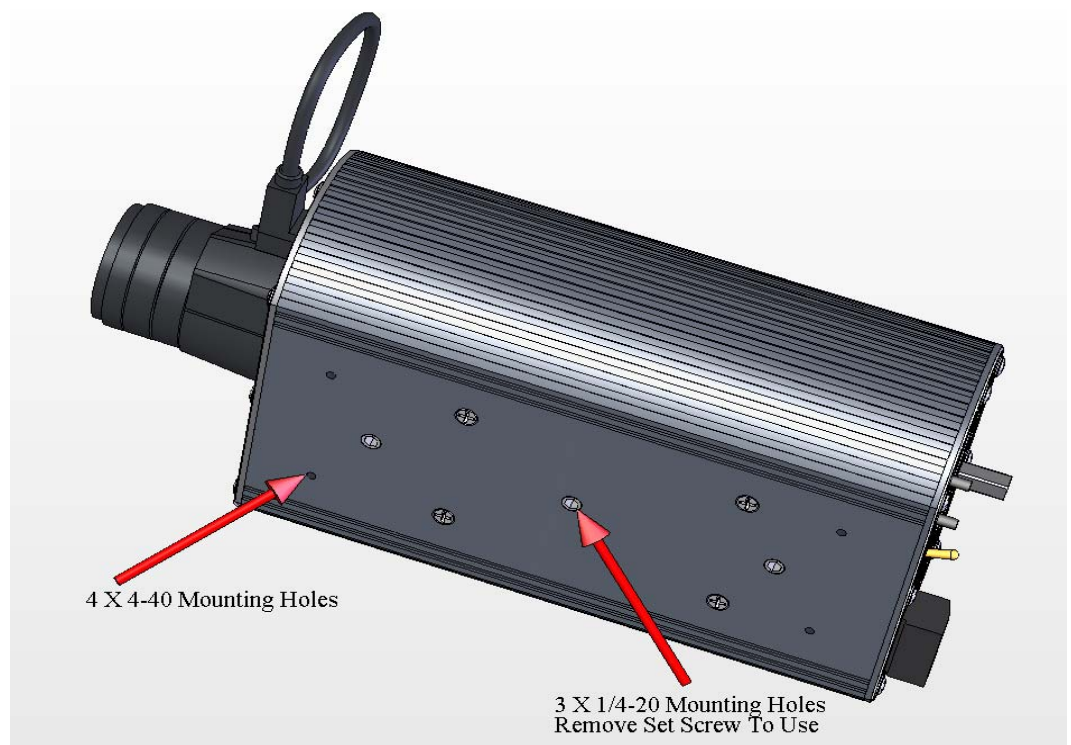


Figure 13 Mounting Holes



# Appendix A. Camera Enclosures

## 1. ENC 16/18-CC

The ENC16/18-CC enclosure provides a means of housing the camera along with other equipment such as a datalogger and modem. The ENC 16/18-CC enclosure uses the same fibreglass enclosure and mounts as the standard ENC 16/18 enclosure. The ENC 16/18-CC includes the following additional items to facilitate the camera:

- A 100mm x 100mm window (4"x4") is placed on the latch side of the enclosure
- A mounting plate and grommets are included for mounting the camera on the back-plate.
- The external sun-shroud reduces glare from the sun as well as provides protection from rain and snow.

Using the ENC 16/18-CC enclosure eliminates the need for the external wiring required if a separate housing is used for the camera.

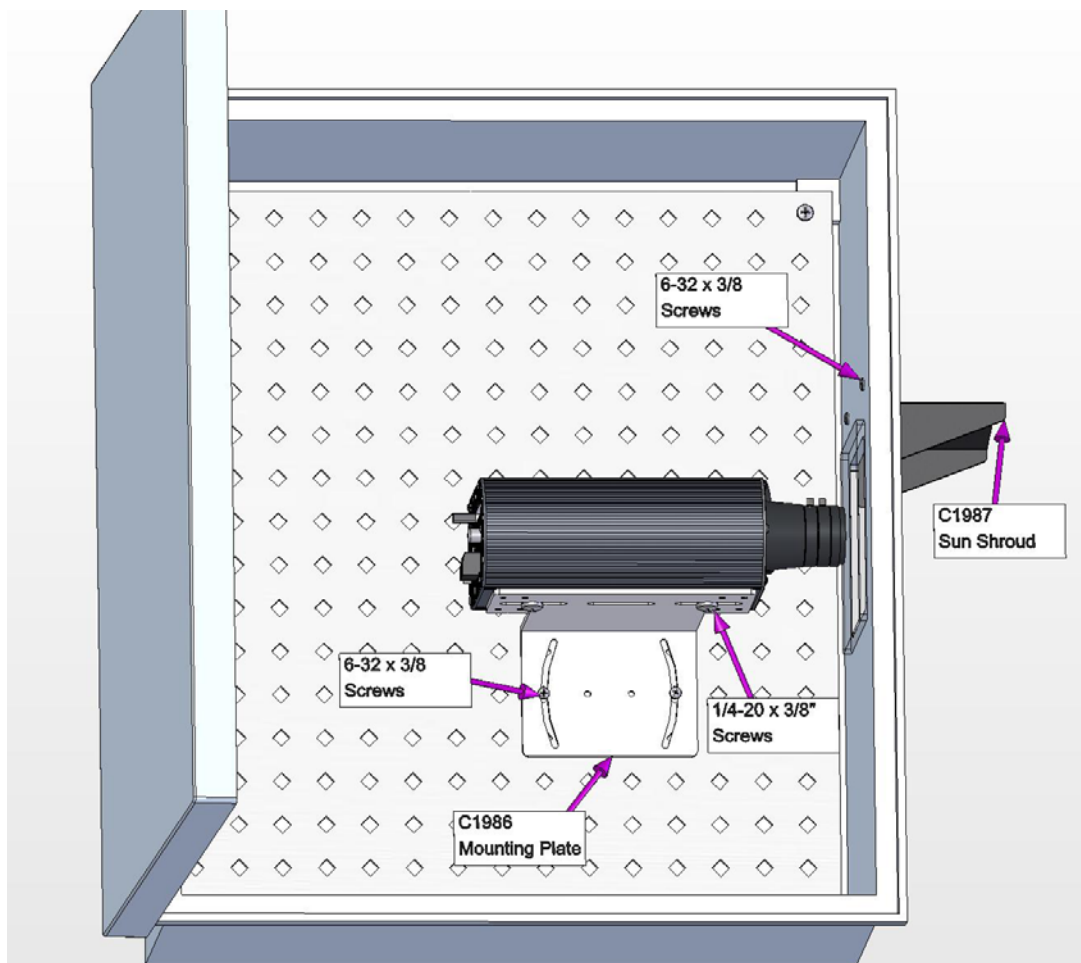


Figure A-1 Enc 16/19 Mounting

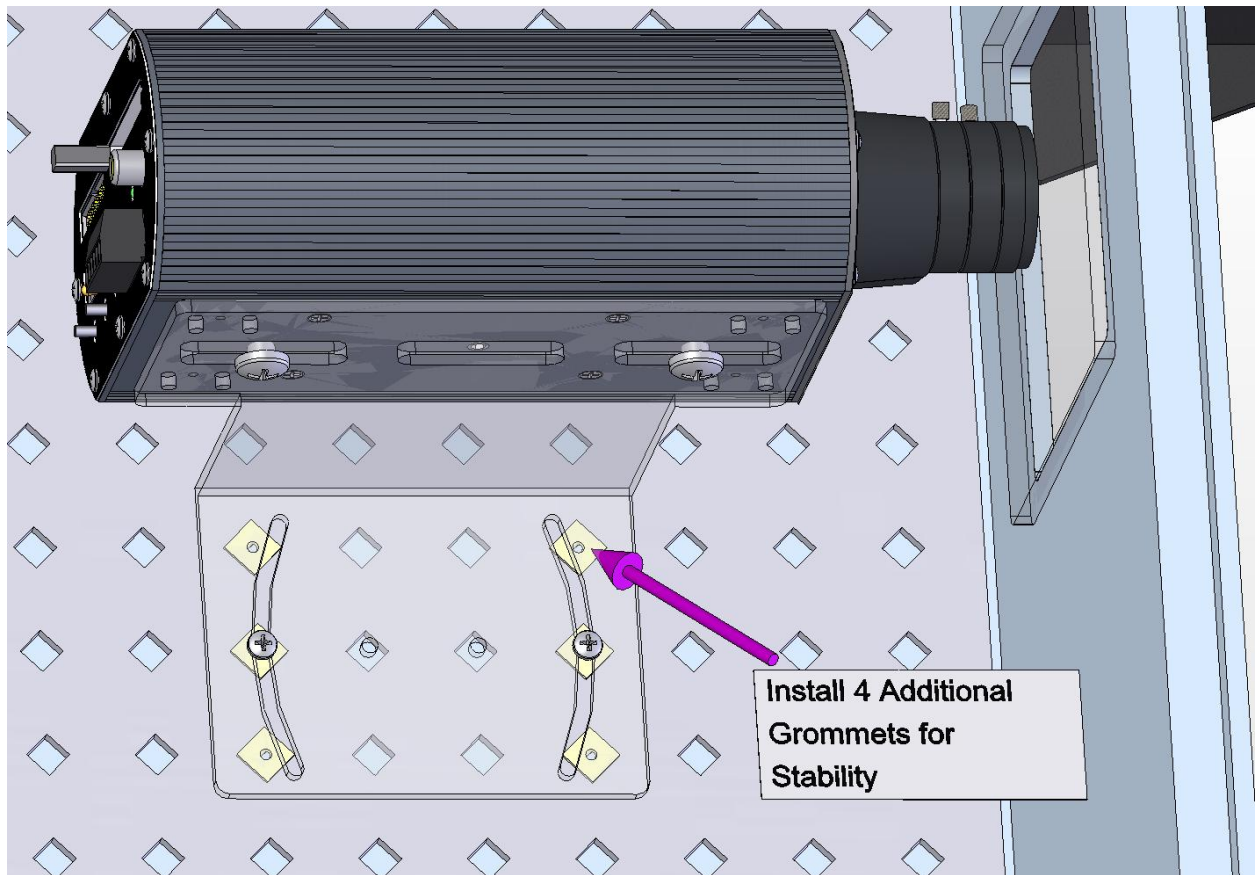


Figure A-1a Enc 16/18 Mounting



## 2. CC4718 Enclosure

The CC4718 Enclosure is an outdoor enclosure that can be used to house the CC640 camera.

The FIN6COND cable would normally be used to carry power from the supply to the camera. This cable also supplies enough conductors to use RS-485 or RS-232 communications to send images to a datalogger using PakBus. If RS-232 communications are required, then the C2006 adapter board is required.

Campbell Scientific supplies a knockout seal, which can be used to plug the unused entry port.

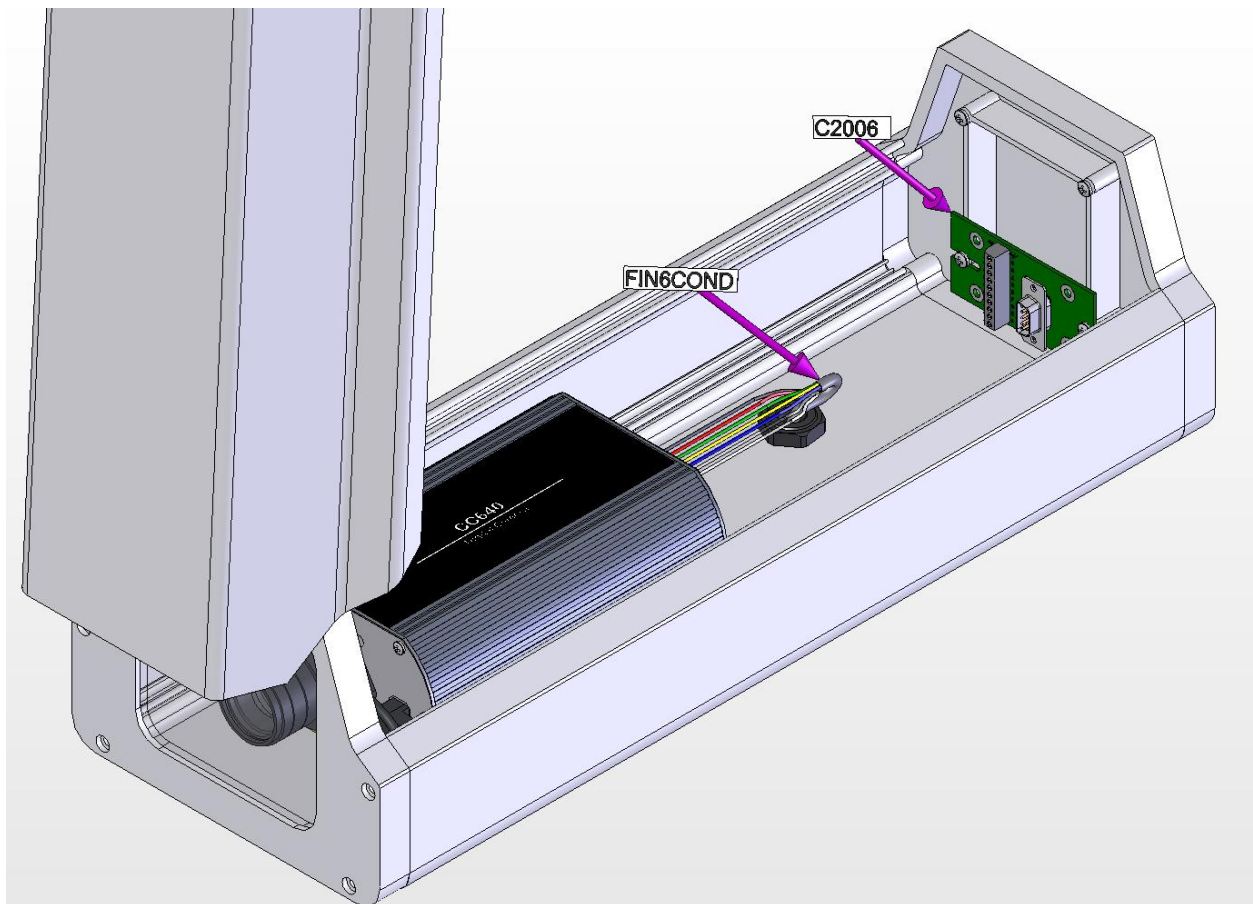


Figure A-2 CC4718 Enclosure with mounting location of optional Serial Interface Board (C2006)

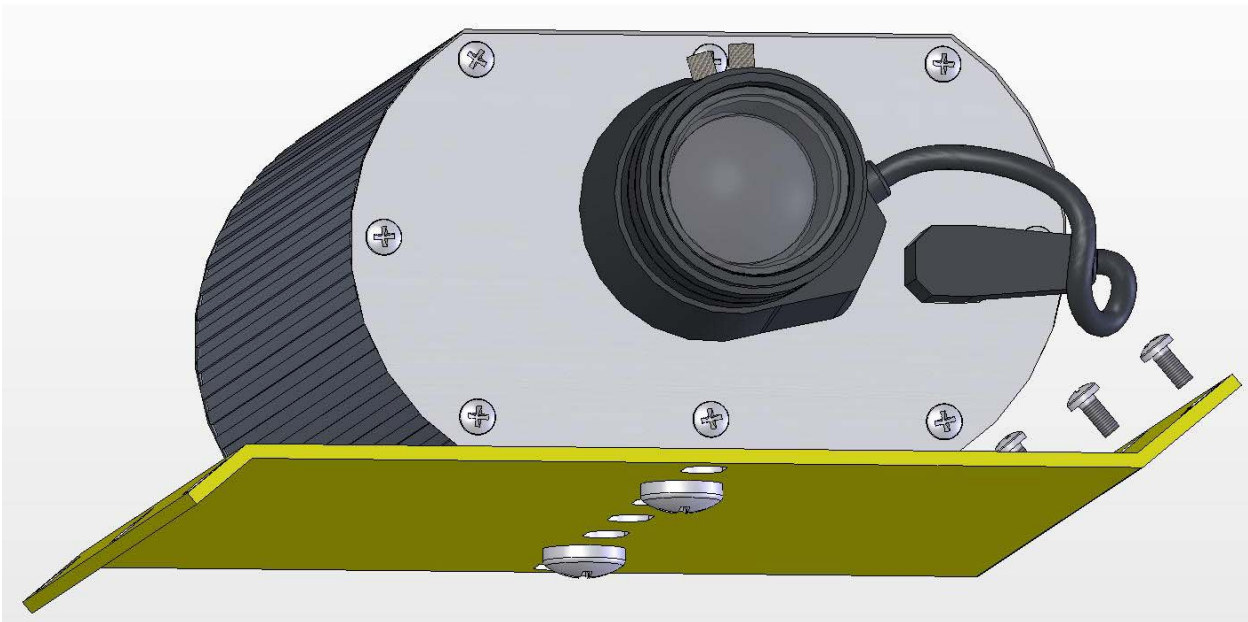


Figure A-3 Camera on CC4718 Mounting Plate

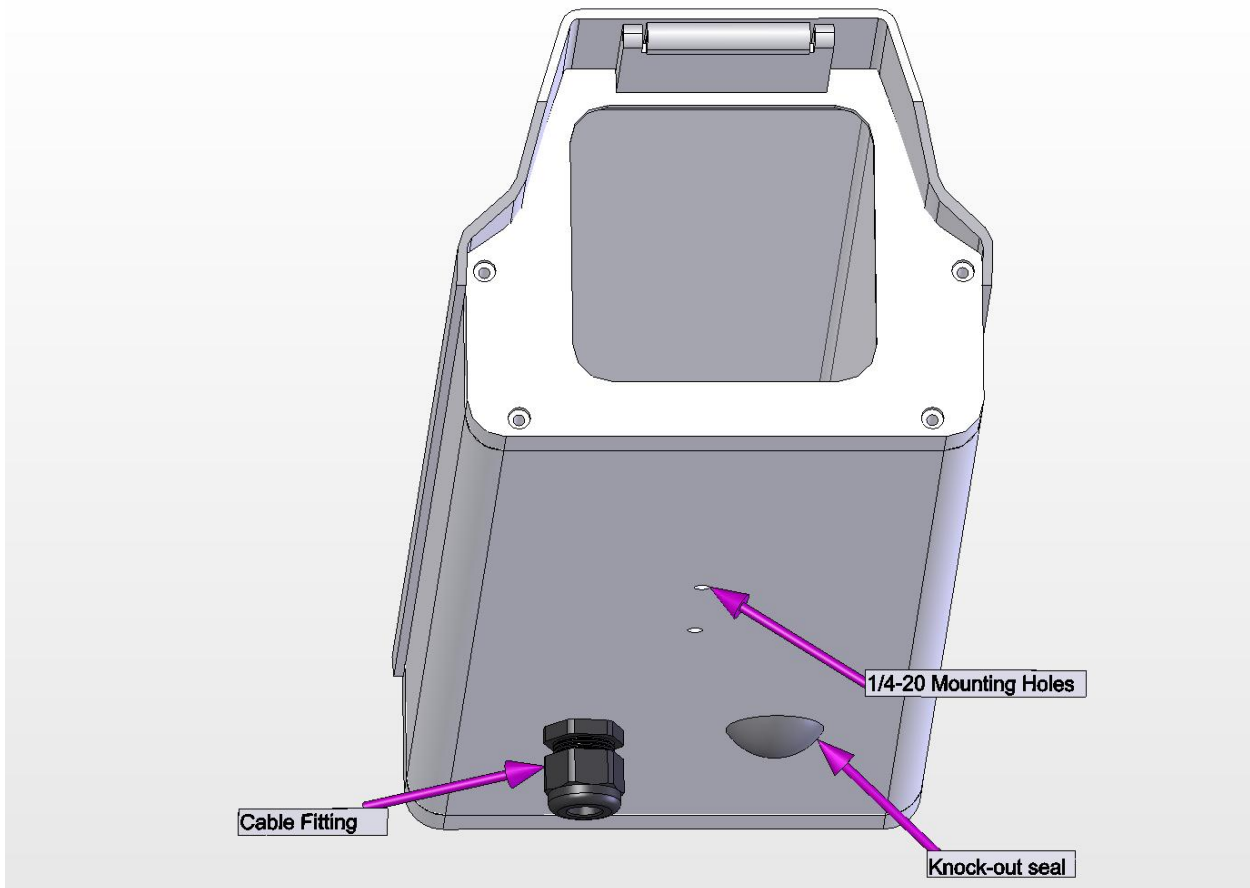


Figure A-4 CC4718 Bottom View

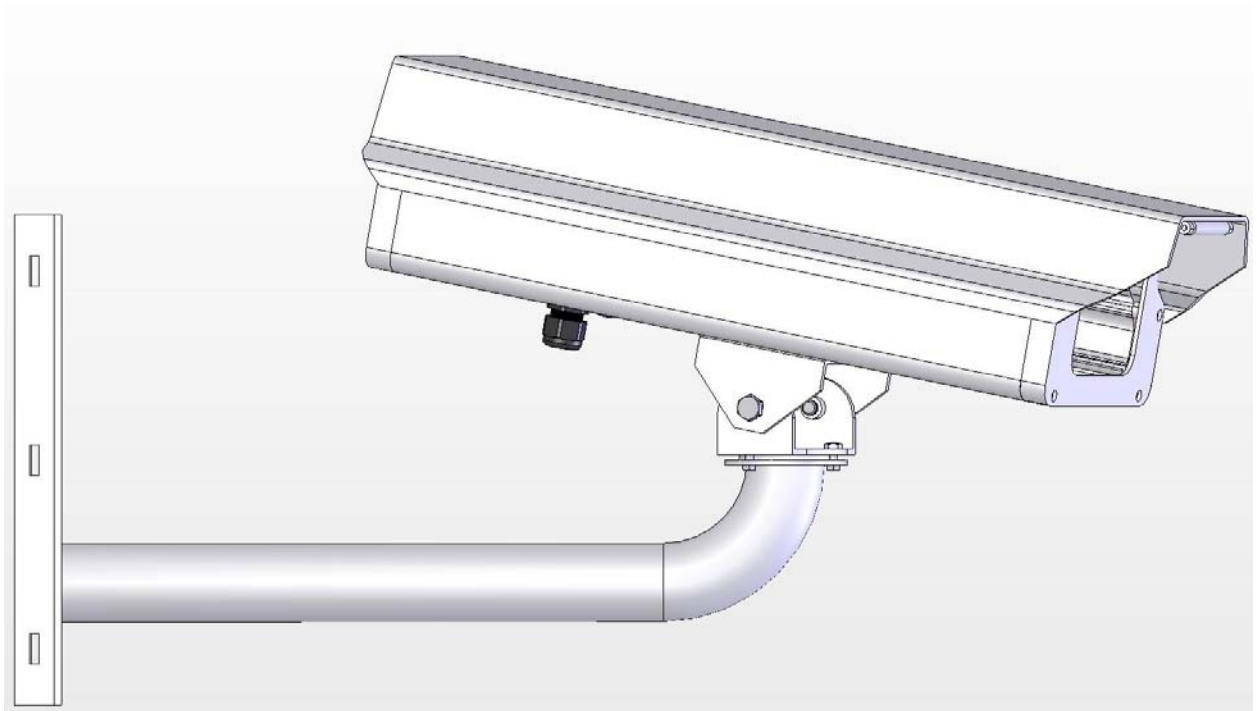


Figure A-5 Vertical Pipe Mount

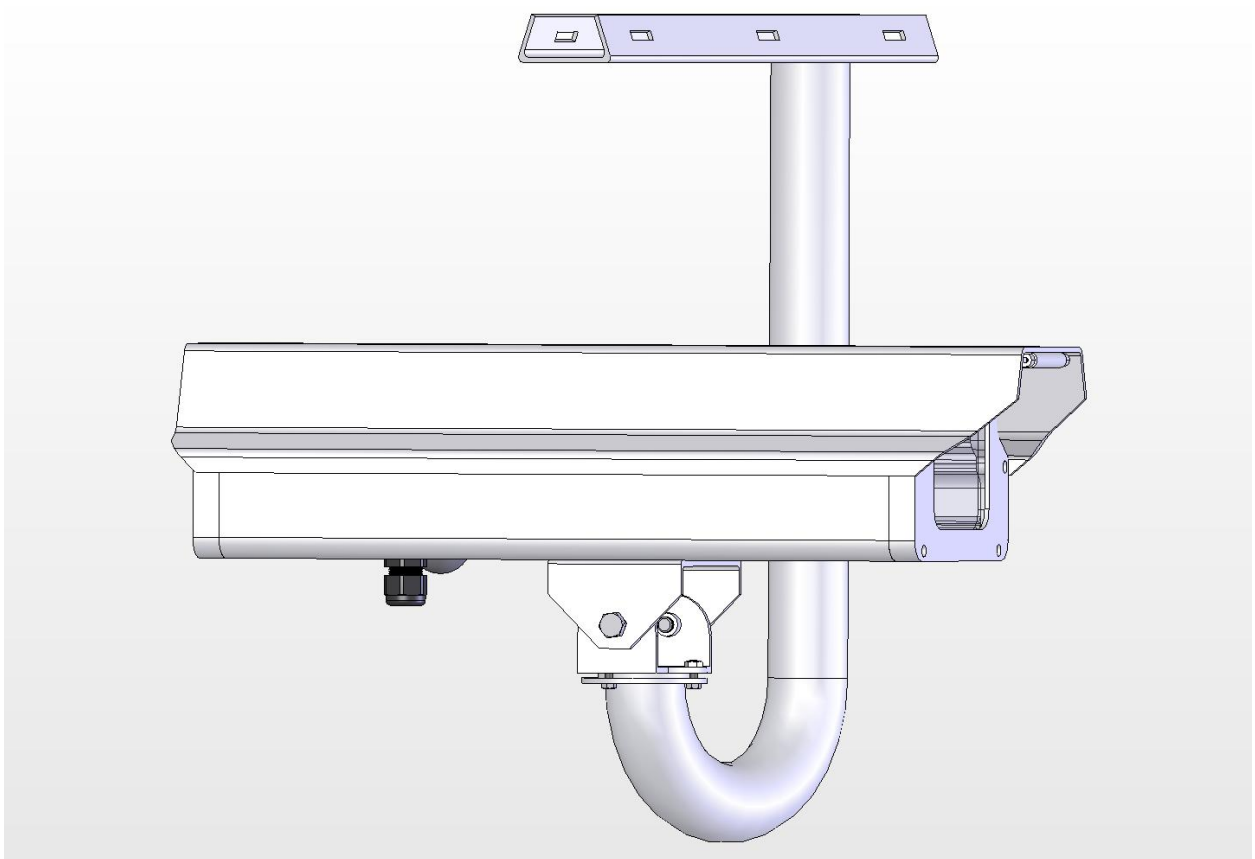


Figure A-6 Horizontal Pipe Mount

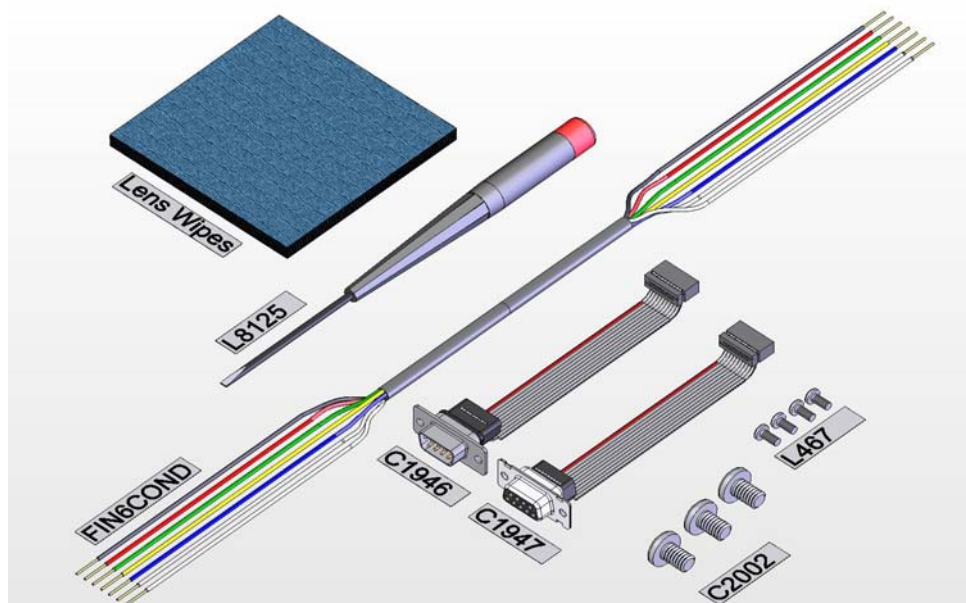


# Appendix B. Quick Set-up and Test Procedure CC640 in Standalone Mode

**PURPOSE:** The steps below are designed to help first time users operate the CC640 camera. The procedures are useful to do a quick check on the camera's operation and familiarize the user with focusing. These procedures are intended for use only as an initial check of the CC640's operation. It is recommended to read the CC640 manual prior to deployment in the field.

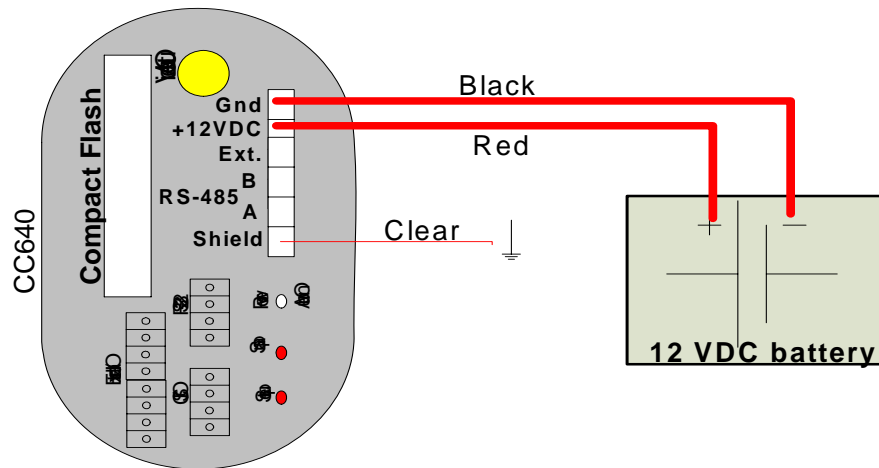
**STEP 1:** Remove the CC640 and accessories from its packaging. Ensure the lens is free from any dust and clean the lens using the cloths provided if necessary.

## ACCESSORIES



Item	Part Number
RS-232 interface ribbon cable, 10 pin female header to DB9 female	C1946
CS I/O interface ribbon cable, 10 pin female header to DB9 male	C1947
Finished 6 conductor cable, approximately 60cm (2 Feet) long	Fin6Cond
Precision slotted screw driver 2.5mm (3/32") wide	L8125
Screws – ¼-20x3/8" Philips Pan Qty 3	C2002
Screws – 4-40x3/8" Philips Pan Qty 4	L467
Lens wipes	N/A

**STEP 2:** Using the screwdriver and cable that is provided with the camera, connect a 12VDC power source to the CC640 using the diagram below:



- Connect the Gnd terminal of the camera to the “-“ of your supply using the black wire.
- Connect the Shield terminal of the camera to an earth ground of your supply using the clear wire. If you do not have a separate earth ground on your supply, connect the clear shield to the “-“ negative of the power supply as well.
- Connect the +12VDC terminal from the camera to the “+“ of your supply using the red wire.

**STEP 3:** Your camera will begin to flash the LED and enter an image acquisition sequence upon applying power to the camera. If the camera has been previously configured, following the instructions in Section 8, Device Configuration Utility, can reset factory default settings.

**STEP 4:** Connect your TV or video monitor to the video-out port on the back of the CC640 and turn it on.

**STEP 5:** Move the toggle switch on the back of the CC640 to the ‘On’ position. Observe that the LED flashes 4 times. This is a normal power on sequence.

**STEP 6:** Press the ‘Setup’ button for 1 second. An image of what the CC640 is pointed at should appear on the TV or video monitor.

**STEP 7:** If desired you may focus the CC640 by moving the adjustment screws. The setscrews that keep focus adjustments in place may need to be loosened prior to focusing. It is recommended to adjust the zoom first and then the focus.

**STEP 8:** Once you have the image in focus, tighten the setscrews finger-tight. When mounting the CC640 in the field, you will need to repeat this procedure to ensure you have a clear image.

**STEP 9:** Press the 'Setup' button again and observe that the video output turns off. Pressing the setup button toggles the video output on and off. Ensure that the video output is off for the next step.

**STEP 10:** Press the 'Snap' button. The LED will flash twice and the video output will momentarily turn on and then off. You have just initiated an image acquisition by using the manual Snap button.

---

**NOTE**

Refer to the CC640 manual for operation with a compact flash memory card. If a properly formatted memory card is inserted in your camera, pressing the Snap button will store the images to the memory card.

---

**STEP 11:** You may now toggle the power switch to the Auto position. You can disconnect your power supply at this point or you may refer to the manual and follow the procedures to configure the camera for your necessary application.







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