Limited Warranty

“Products manufactured by CSI are warranted by CSI to be free from defects in materials and workmanship under normal use and service for twelve months from the date of shipment unless otherwise specified in the corresponding product manual. (Product manuals are available for review online at www.campbellsci.com.) Products not manufactured by CSI, but that are resold by CSI, are warranted only to the limits extended by the original manufacturer. Batteries, fine-wire thermocouples, desiccant, and other consumables have no warranty. CSI’s obligation under this warranty is limited to repairing or replacing (at CSI's option) defective Products, which shall be the sole and exclusive remedy under this warranty. The Customer assumes all costs of removing, reinstalling, and shipping defective Products to CSI. CSI will return such Products by surface carrier prepaid within the continental United States of America. To all other locations, CSI will return such Products best way CIP (port of entry) per Incoterms ® 2010. This warranty shall not apply to any Products which have been subjected to modification, misuse, neglect, improper service, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied. The warranty for installation services performed by CSI such as programming to customer specifications, electrical connections to Products manufactured by CSI, and Product specific training, is part of CSI's product warranty. CSI EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CSI hereby disclaims, to the fullest extent allowed by applicable law, any and all warranties and conditions with respect to the Products, whether express, implied or statutory, other than those expressly provided herein.”
Assistance

Products may not be returned without prior authorization. The following contact information is for US and international customers residing in countries served by Campbell Scientific, Inc. directly. Affiliate companies handle repairs for customers within their territories. Please visit www.campbellsci.com to determine which Campbell Scientific company serves your country.

To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 227-9000. Please write the issued RMA number clearly on the outside of the shipping container. Campbell Scientific’s shipping address is:

CAMPBELL SCIENTIFIC, INC.
RMA#____
815 West 1800 North
Logan, Utah 84321-1784

For all returns, the customer must fill out a “Statement of Product Cleanliness and Decontamination” form and comply with the requirements specified in it. The form is available from our website at www.campbellsci.com/repair. A completed form must be either emailed to repair@campbellsci.com or faxed to (435) 227-9106. Campbell Scientific is unable to process any returns until we receive this form. If the form is not received within three days of product receipt or is incomplete, the product will be returned to the customer at the customer’s expense. Campbell Scientific reserves the right to refuse service on products that were exposed to contaminants that may cause health or safety concerns for our employees.
Safety

DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at www.campbellsci.com or by telephoning (435) 227-9000 (USA). You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

General
- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a hardhat and eye protection, and take other appropriate safety precautions while working on or around tripods and towers.
- Do not climb tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical
- You can be killed or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in contact with overhead or underground utility lines.
- Maintain a distance of at least one-and-one-half times structure height, 20 feet, or the distance required by applicable law, whichever is greater, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.

Elevated Work and Weather
- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Maintenance
- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

WHILE EVERY ATTEMPT IS MADE TO EMBODY THE HIGHEST DEGREE OF SAFETY IN ALL CAMPBELL SCIENTIFIC PRODUCTS, THE CUSTOMER ASSUMES ALL RISK FROM ANY INJURY RESULTING FROM IMPROPER INSTALLATION, USE, OR MAINTENANCE OF TRIPODS, TOWERS, OR ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC.
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1. Introduction

CC5MPX will be used to refer to the series throughout the manual, unless otherwise specified.

The CC5MPX incorporates an integrated rugged environmental enclosure to reduce cost and installation time. Communication options include Ethernet, RS-232, and RS-485. The CC5MPX is fully web-enabled with FTP and email capabilities. Campbell Scientific’s PakBus® protocol is supported by the CC5MPX for integration with Campbell Scientific dataloggers. When required, an optional lens defroster is available.

The camera contains an onboard SD memory card that can turn the camera into a powerful image and video logger. The onboard memory card enables the CC5MPX to archive images and video internally.

The CC5MPX can operate in a stand-alone mode with image acquisitions triggered by the camera’s own precision real time clock. Image and video acquisitions can also be triggered by events through an external signal or motion detection.
2. Precautions

- READ AND UNDERSTAND the Safety section at the front of this manual.

- The CC5MPX is a precision instrument containing glass components. Do not subject to physical shock or drops.

- Avoid strong magnetic fields.

- Store SD memory cards in a case to protect them.

- Do not attempt to disassemble components.

- Use a blower or proper soft cloth to clean the lens.

- Do not exceed voltages as defined in Section 6.1, Specifications (p. 11).

- Desiccant and O-rings should be replaced every two years.

- WARNING: Installations requiring camera to be mounted on tripods, towers and other elevated structures require following safety guidelines of those structures.

3. Initial Inspection

- When the CC5MPX is first received, inspect the packaging and contents for damage. If any damage is found, file a damage claim with the shipping company.

- Immediately check the package contents. Thoroughly check all packaging material for product that may be concealed. Check model numbers, part numbers, and product descriptions against the shipping documents. Each product will is identified with a printed model number or part number. On cabled items, the number is often found at the end of the cable that connects to the measurement device. The Campbell Scientific number may differ from the part number or model number printed on the sensor by the sensor vendor. Ensure the expected lengths of any cables ordered are correct. Contact Campbell Scientific immediately if there are any discrepancies.

- Check the firmware version of the camera against the most recent version found on the Campbell Scientific website in the CC5MPX support tab and update as needed.

4. QuickStart

Ensure that the pigtail end of the power cable is properly terminated (see Section 8.1, Cables/Wiring (p. 15)) before connecting the power cable connector to the camera. If the power supply has an on/off switch, it is also recommended to switch the power off before connecting the power connector to the camera.

For the initial power up and set up of the camera, it is useful to unscrew the protective cap that protects the push button and LED indicator.
4.1 Factory Setup

The following outlines some of the CC5MPX settings that are relevant for initially communicating with the CC5MPX camera:

<table>
<thead>
<tr>
<th>Configuration Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Mode</td>
<td>Fully On</td>
</tr>
<tr>
<td>Link Local IP</td>
<td>169.254.99.99</td>
</tr>
<tr>
<td>Network IP Address</td>
<td>192.168.1.90 (Static)</td>
</tr>
<tr>
<td>Network Mask</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>Serial I/O Port</td>
<td>RS-232</td>
</tr>
<tr>
<td>RS-232 Baud Rate</td>
<td>115200</td>
</tr>
<tr>
<td>PakBus Address</td>
<td>55</td>
</tr>
</tbody>
</table>

There are two different ways to set up the parameters in the CC5MPX. The Ethernet network interface can be used with a web browser or the RS-232 serial lines can be used with Campbell Scientific’s Device Configuration Utility (DevConfig). The use of RS-232 serial lines will require the use of the DB9 terminal block adapter (pn 28840) in order to connect to a PC (TABLE 8-1, Power and I/O Cable Color Connections (p. 16)).

When power is first applied to the camera, the LED will turn on and remain steadily on for about 90 seconds. Once the LED starts flashing, the camera has initialized properly and is ready for operation.

4.2 Installing Multimedia Player

The use of a multimedia player is required to properly display the video from the CC5MPX on a computer. VideoLAN® VLC media player® is free, open-source PC software that plays back video on any Windows® computer. The download is available online at:

www.videolan.org/vlc

Download and install the appropriate VLC media player to the PC that will be interfacing with the CC5MPX.

4.3 ActiveX® Controls in Internet Explorer®

Currently the CC5MPX is only fully supported using the Windows Internet Explorer® (32 bit) browser.

The web interface for the CC5MPX requires the use of ActiveX® controls when using Internet Explorer. These add-ons allow Windows to interact with objects in the web interface through Internet Explorer.

When connecting to the CC5MPX via the web interface for the first time, a prompt will appear to run the ActiveX add-ons. The prompt is in the form of a
‘pop-up’ in Internet Explorer and must be allowed to function with the CC5MPX.

4.4 Setup Using Ethernet

4.4.1 Link Local IP Address Auto-Configuration

The CC5MPX supports an automatic IP address configuration in situations where the camera is directly connected, via Ethernet cable, to a computer without the need of a DHCP server.

This feature is automatically enabled in the camera and is transparent to its normal operation. In this situation, the camera will be accessible using the IP address 169.254.99.99. This address will be valid for accessing the camera in any network configuration.

NOTE

In order to use Link Local IP address, the computer connecting to the CC5MPX must be configured to use DHCP. If the computer is configured to use a static IP, one of the remaining interface arrangements will need to be used.

4.4.2 Static IP Address Setup

If the computer is not set to use DHCP to obtain an IP address automatically, follow the procedure outlined in this section to access the camera’s web page. Consult with an IT department employee if not familiar with configuring devices for operation on a network.

The default static IP address for the camera is 192.168.1.90. If the standard assigned static IP address is compatible with the current network, simply plug the camera into the network and access the web page using this IP. If this IP address is not compatible with the network, connect the camera directly to the computer’s Ethernet port in order to change its IP address.

The easiest way to connect to the CC5MPX to change its IP address settings is to manually configure the computer’s Ethernet IP address to be compatible with the default address assigned to the CC5MPX.

Administrator access is required to make these changes to the computer’s network settings. The procedure for changing these network settings in Windows 7 is explained below:

Connect the CC5MPX camera directly to the computer’s Ethernet port. Use either a standard Ethernet cable or a crossover Ethernet cable, as the CC5MPX auto-MDIX feature allows the camera to automatically connect using either cable.

Open the Control Panel. If in Icon view, click Network and Sharing Center. If in Category view, click Network and Internet | Network and Sharing Center (FIGURE 4-1).
FIGURE 4-1. Network and Sharing Center

Under Connections on the right-hand-side, click **Local Area Connection** | **Properties** (FIGURE 4-2).

FIGURE 4-2. Local Area Connection Properties

Click on **Internet Protocol Version 4 (TCP/IPv4)** | **Properties**.
FIGURE 4-3. Internet Protocol Version 4 (TCP/IPv4) Properties

Record the existing settings used on the computer to restore the connection once the CC5MPX setup is complete. In FIGURE 4-3, the computer is set to obtain the IP address automatically.
Click **Use the following IP address** and enter the following values (FIGURE 4-4):

- IP address: 192.168.1.91
- Subnet mask: 255.255.255.0
- Default gateway: 192.168.1.1

![Internet Protocol Version 4 (TCP/IPv4) Properties](image)

**FIGURE 4-4. IP Address Configuration**

Click **OK** to accept. This may prompt a *Microsoft TCP/IP Warning* pop-up. If this pop-up appears, click **Yes.**
It will now be able to open Internet Explorer and access the camera by typing http://192.168.1.90 or clicking this link. Once the camera establishes a connection, the following page should be displayed in the browser (FIGURE 4-5):

![Web Interface Live Video Homepage](image)

**FIGURE 4-5. Web Interface Live Video Homepage**

When selecting a video format to display from the **Video Display Size** drop-down box, a prompt will appear to install or allow an ActiveX control. By default, the browser may be configured to block pop-ups. Pop-ups will need to be enabled for the camera view to function.

Now that a connection has been established, please see Section 8.4.2, **Network Configuration** (p. 29), for further instructions on how to change the camera’s network settings.

After the changes have been completed, remember to re-enter the computer’s original IP address settings in the **Internet Protocol Version 4 (TCP/IPv4) Properties** window.

### 4.5 Setup Using *Device Configuration Utility*

Campbell Scientific provides a free software program called *Device Configuration Utility* (*DevConfig*) that supports the configuration of a variety of equipment. The CC5MPX can also be configured with *DevConfig*. Please visit the Campbell Scientific website to ensure the most recent version of this utility is installed.
The CC5MPX ships from the factory with the communication lines configured for RS-232. The green wire on the cable is the CC5MPX RS-232 TX (output) line; the white wire is the CC5MPX RS-232 RX (input) line. A connection will also need to be made from the CC5MPX black ground to the RS-232 ground.

The CC5MPX comes with a female DB9 to terminal block accessory that facilitates the connection from the Power and I/O Cable to a 9-pin RS-232 connector. See Section 8.1, Cables/Wiring (p. 15), for wiring details.

When power is first applied to the camera, the LED will turn on and remain steadily on for about 90 seconds. Once the LED starts flashing, the camera has initialized properly and is ready for operation.

DevConfig can now be invoked. Select the CC5MPX as the device type and choose the appropriate COM port (FIGURE 4-6).

Once the appropriate selections are made, select the Connect button.

![FIGURE 4-6. CC5MPX shown in Device Configuration Utility](image)
Due to the amount of data the camera has to process, it may take up to 30 seconds for the connection to be completed. Once the settings are loaded, clicking the tabs located near the top of the page will allow navigation to the various settings (FIGURE 4-7).

**FIGURE 4-7. CC5MPX Device Configuration Utility Settings Editor**

### 5. Overview

The CC5MPX and CC5MPXWD (FIGURE 5-1) are high-resolution digital cameras with video capabilities. They produce JPG images with a resolution of up to 5 megapixels and shoot videos with a resolution of up to 720P. Power conserving modes allow the cameras to be used in remote battery-powered installations.

Designed to work in harsh environments, the cameras can operate at temperatures as low as –40 °C and as high as 60 °C. They have an integrated environmentally sealed anodized enclosure that protects them from moisture and high-humidity. Additionally, the CC5MPXWD includes a window defroster that prevents and removes light frost and icing from the camera’s window.

Flexible configurations allow the cameras to serve as 1) a standalone field camera, requiring only a battery, solar panel, and available SD memory card, 2) an IP web camera, or 3) integrated into a Campbell system.
6. Specifications

6.1 Specifications

Power Supply

Operating:
- 9 to 30 Vdc 250 mA maximum (camera only)
- 9 to 16 Vdc 1.0 A max @ 12 Vdc (camera with defroster option)

Quiescent:
- 1 mA maximum (OFF power mode)

WARNING

The CC5MPX is specified to operate on a 9 to 30 Vdc supply input range. When the window defroster is installed, the 30 Vdc maximum must be reduced to 16 Vdc. Operating the CC5MPX with window defroster at voltages greater than 16 Vdc can cause damage to the CC5MPX.

Operating Temperature: 
-40 to 60 °C

Clock Accuracy:
± 2 minutes/year (−40 to 60 °C)

Lens

Mount:
- C-type

IRIS:
- DC compatible

Standard Lens:
- 4 to 12 mm, 27° to 80° field of view

Zoom Lens:
- 10 to 40 mm, 9° to 35° field of view

Fisheye Lens:
- 1.4 to 3.1 mm, 94° to 185° field of view

Image or Video

Capture Triggers:
- Two independent selftimers
- Motion detection
- Web page control
- External trigger
Still Image Resolution (JPEG): 2592 x 1944, 1280 x 960, 1280 x 720, 640 x 480
Video: Capable of 720P to 1280 x 720 (MPEG4), 640 x 480 (live video only/MJPEG), 320 x 240 (MPEG4)

External Input Signal
Logic Low Level: < 0.65 V (–20 Vdc absolute min)
Logic High Level: > 2.0 Vdc (20 Vdc absolute max)
Minimum Pulse Width: 10 ms

Communication Interfaces: Ethernet 10/100
RS-232 port
RS-485 port

Communication Protocols: Web page interface via web browser
FTP
Email
PakBus® (for Campbell dataloggers)

Communication Switched Power Output
Maximum Output Current: 750 mA

RS-232 and RS-485
Maximum Baud Rate: 115.2 kbps

NOTE
The recommended maximum cable length at this baud rate is 15 meters. The use of the 57.6 kbps rate has a recommended maximum cable length of 30 meters.

Memory Card Interface
Type: Secure Digital (SD)
File System: FAT32
File Type: JPEG (image), AVI (video)
Size: Verified up to 16 GB

Dimensions
Length: 220 mm (8.7 in)
Width: 229 mm (9.0 in) with zoom lens
Weight: 93 mm (3.7 in)

6.2 System Limitations
This section outlines some system limitations that exist in the CC5MPX camera.

6.2.1 High Resolution 5 Megapixel Images
The capturing of 5 MP pictures results in longer capture times than other image resolutions. When a 5 MP image is captured, the continuous video stream is paused, the image sensor is reconfigured, and then the 5 MP image is captured.
This longer delay time would be noticeable when capturing images from the external trigger. 5 MP images would take several seconds from the external trigger signal being asserted. All other still image captures are less than 1 second.

6.2.2 Simultaneous Processes

The CC5MPX cannot capture two events simultaneously. For example, the CC5MPX cannot capture a still image while video is being recorded. Also other processes such as downloading files from the memory card can add additional delays to the capture process.

7. Installation

The camera enclosure is designed to be environmentally sealed for outdoor installations. The enclosure provides protection from moisture or high humidity. It is not intended for operation under water. All that is required is an appropriate mounting fixture.

FIGURE 7-1. CC5MPX Mounting Holes

The camera is equipped with a set of three ¼-20 threaded mounting holes (see FIGURE 7-1). These mounting holes are centered along the bottom of the camera and are spaced 25.4 mm (1.0 in) apart from one another. At least two of the ¼-20 threaded holes are required for mounting the camera.
When using the optional mounting kit (pn 18549) as shown in FIGURE 7-2, align the outer holes of the CC5MPX with the center hole and the 180° slot of the mount. Loosely secure the two together with the two ¼-20 x 0.5 in. Hex bolts, lock washers, and washers included with the kit. It is now possible to mount the CC5MPX to either a crossarm or other mounting surface with the included U-bolt.

With the hardware loose, the camera and the 18549 mounting kit can be pivoted to allow a full range of motion when aiming the camera. The hardware should be secured once the camera is properly aimed at the intended target (FIGURE 7-3).

The focus of the camera should be checked and adjusted as required. Refer to Section 8.11.2, Focus and Zoom Adjustment (p. 88), for details. Be sure that the lens tube is fully seated, the sun shroud is properly oriented after the camera is aimed, and any protective caps are properly secured.

The sun shroud can be adjusted by loosening the Philips screws and turning the shroud; do not over tighten the screws as the shroud may crack. A light torque is all that is required to hold the shroud in place.
8. Operation

8.1 Cables/Wiring

8.1.1 Power and I/O Cable Connections

The wiring for the Power and I/O Cable connector assembly is as shown in TABLE 8-1. The wires can be terminated directly on the control ports of a compatible datalogger.

**NOTE**

It is essential that the ground cable be connected first when wiring the camera to the datalogger or the power supply.
**TABLE 8-1. Power and I/O Cable Color Connections**

<table>
<thead>
<tr>
<th>Color</th>
<th>Function</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Power Ground</td>
<td>System Ground</td>
</tr>
<tr>
<td>Red</td>
<td>Input Power</td>
<td>Power Source 9-30 Vdc</td>
</tr>
<tr>
<td>Green</td>
<td>RS-232 TX (output)</td>
<td>RS-232 Input (RX control port of datalogger or Pin 2 of a computer (DTE) DB9 Connector) &lt;br&gt; RS-485A when configured to RS-485</td>
</tr>
<tr>
<td>White</td>
<td>RS-232 RX (input)</td>
<td>RS-232 Output (TX control port of a datalogger or pin 3 of a computer (DTE) DB9 connector) &lt;br&gt; RS-485B when configured to RS-485</td>
</tr>
<tr>
<td>Yellow</td>
<td>Communication Switched Power (Output)</td>
<td>This line is intended to power a communication device. The camera switches the input power voltage to this line.</td>
</tr>
<tr>
<td>Blue</td>
<td>External Trigger (Input)</td>
<td>Connect to external signal source (i.e. datalogger control port). The external signal wakes up or initiates image/video acquisition.</td>
</tr>
<tr>
<td>Clear</td>
<td>Shield</td>
<td>Shield/Earth Ground</td>
</tr>
</tbody>
</table>

Refer to Section 8.5, *Internal Jumpers* (p. 76), if the current RS-232 or RS-485 interface option needs to be changed in the camera.

Refer to **TABLE 8-2** to help determine which wires will need to be connected for the camera application.
**TABLE 8-2. Power and I/O Cable Wire Usage**

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Function</th>
<th>Connection Required</th>
<th>When not Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Power Ground</td>
<td>Always</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>Input Power</td>
<td>Always</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>RS-232 TX (output) OR RS-485A</td>
<td>The green wire only needs to be connected when RS-232 or RS-485 communications are used for PakBus® or DevConfig.</td>
<td>Connect to a grey terminal block</td>
</tr>
<tr>
<td>White</td>
<td>RS-232 RX (input) OR RS-485B</td>
<td>The white wire only needs to be connected when RS-232 or RS-485 communications are used for PakBus® or DevConfig.</td>
<td>Connect to a grey terminal block</td>
</tr>
<tr>
<td>Yellow</td>
<td>Communication switched power (output)</td>
<td>When the camera is being used to manage power to a communication modem. For solar powered sites, the camera can remove power from the modem when communications are not required.</td>
<td>Connect to a grey terminal block</td>
</tr>
<tr>
<td>Blue</td>
<td>External trigger (input)</td>
<td>When another device is being used to trigger the camera to capture images or video. This can be a datalogger, a motion sensor, or a set of contacts. Another device can also help keep the camera in the Fully On power mode by leaving the External Trigger Input asserted.</td>
<td>Connect to ground if left in Factory Default settings</td>
</tr>
<tr>
<td>Clear</td>
<td>Shield</td>
<td>Always</td>
<td></td>
</tr>
</tbody>
</table>

### 8.1.2 Power and I/O Cable Details

The Power and I/O Cable that is used for the CC5MPX camera has an outdoor environmentally rated screw type connector on one end and discrete wire pigtailed on the other end that allow for flexible termination. When making the cable connection to the camera, the notch positions should always be lined up and care should be taken to not cross the connector.
Cable specifications:

- 24-AWG 3 pair (6 conductor) Individually Shielded Cables with Santoprene® Jacket
- IP-67 rated connector
- 10 inch pigtail for termination
- 3 Single Pole 16 to 20 AWG Grey Push Operated Connector Terminals (FIGURE 8-1)
- Maximum recommended cable length is 20 m (100 ft)

Longer cable lengths can be used; however, a heavier gauge wire is suggested. It is recommended that the individual wire resistance on the +12 Vdc 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.

FIGURE 8-1. CC5MPX Connector Layout

For information about the cable options available, see Appendix A, CC5MPX Series Cameras and Accessories (p. A-1).

8.1.3 Ethernet Cables

The Ethernet connection is used to configure the camera settings as well as for targeting and focusing the camera. The Ethernet port of the CC5MPX is auto MDIX; therefore, an Ethernet crossover cable is not required when connecting the camera to other devices.
A standard CAT5 (or better) Ethernet cable with RJ45 connectors (pn 28900) can be used to interface to the camera in indoor conditions or for temporary connection outdoors when conditions permit. When an Ethernet connection is required for permanent outdoor installations or when a connection to the camera is required in wet or harsh conditions, the Environmental Ethernet Cable assembly (pn CC5MPXCBL2-L) needs to be used.

The Environmental Ethernet Cable assembly provides one end with an environmental connector that provides a weatherproof connection when properly mated to the camera. The other end of the cable consists of a standard RJ45 connector. The Environmental Ethernet Cable is meant to provide an Ethernet connection between the CC5MPX and a network router, a cellular modem, or a laptop.

Details of the Environmental Ethernet Cable are as follows:

- CAT5E shielded cable with polyurethane jacket.
- IP67 environmentally rated RJ45 connector on one end and a regular RJ45 connector on the second end.
- Maximum recommended cable length 70 m (230 ft).

8.2 Camera Hardware Description

8.2.1 Ethernet RJ45 Connection

The RJ45 connector on the camera, shown in FIGURE 8-2, is meant to interface the CC5MPX with either a network router, a cellular modem, or directly to a laptop.

If a permanent Ethernet connection is not required for an outdoor environment, then the protective cap must be securely attached to the Ethernet connector to provide an environmental seal.
When the protective cap is removed, a standard cable with an RJ45 connector can be used to connect the camera to another device in an indoor environment or temporarily outdoors if weather permits.

If a permanent Ethernet connection is required outdoors or if a connection is required in wet or harsh locations, the Environmental Ethernet Cable must be used.

The maximum cable length for the Ethernet cable is 70 m (230 ft).

**NOTE**
The CC5MPX does not support the PakBus communication protocol over Ethernet.

### 8.2.2 Power and I/O Connection

Connection to the Power and I/O connector is necessary for camera operation and it is the only means to supply power to the camera. The connector that connects to the Power and I/O connector provides a weather tight connection and has an IP67 environmental rating when properly connected.

When making the cable connection to the camera, the notch positions should always be lined up and care should be taken to not cross thread the connector.

### 8.2.3 Setup Button/Status LED

The **Setup** button is located behind a protective metal cap on the camera. The **Setup** button also contains an integrated Status LED for user feedback.

To access the LED, unscrew the protective cap to expose the button/LED. It is highly recommended to place the protective cap back on for improved environmental protection.

### 8.2.3.1 Status LED

The Status LED located in the center of the button provides some useful diagnostic information about the camera. TABLE 8-3 describes the LED behavior.
<table>
<thead>
<tr>
<th>LED</th>
<th>CC5MPX State</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuously Off</td>
<td>No power or the camera is in one of the following Low Powered Modes:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Partially On</td>
<td>Pressing the Setup button will force the camera to exit any of the low powered modes and remain fully on for a period of 5 min with the LED rapidly flashing</td>
</tr>
<tr>
<td></td>
<td>• Deep Sleep</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OFF</td>
<td></td>
</tr>
<tr>
<td>Slow Flash</td>
<td>Normal Operation in Fully On power mode</td>
<td></td>
</tr>
<tr>
<td>1 sec on, 3 sec off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapid Flash</td>
<td>Exit from low power state. The camera is being kept on by:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Timeout (from the Setup button press)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Communications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Asserted External Trigger</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Image or video acquisition</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LED</th>
<th>CC5MPX State</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuously On</td>
<td>The camera is booting up. The booting up process takes approximately 90 sec.</td>
<td>The camera will be required to boot up whenever:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Power is first applied to it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The camera is exiting the OFF power mode to perform an operation.</td>
</tr>
</tbody>
</table>

### 8.2.3.2 Setup Button

The primary function of the Setup button is to wake the camera from any of the power saving modes that it may be in. Once the Setup button is pushed the CC5MPX enters a fully powered mode for 5 minutes. During this interval, it is possible to access the camera via Ethernet or RS-232/485 and make any necessary configuration changes. If no communications occur during the 5-minute window, the camera will return to its configured power saving mode and continue normal operation.

The secondary function of the Setup button is to facilitate a power down procedure. If the button is held for a period of 10 seconds, the camera will completely shut down for a period of 10 minutes. During this interval, it is possible to remove power from the camera and avoid possible corruption of the
memory card. This function is also available through the camera web interface via the **Shutdown Camera** button box.

### 8.2.4 SD Memory Card

The camera is internally equipped to use an SD memory card. An extended temperature memory card (pn 27506 for a 4 GB card, pn 27507 for an 8 GB card) is available as an option for the CC5MPX.

If using an SD memory card from another source, it will need to be formatted with a PC using the FAT32 format.

Image files can be stored on the SD memory card as JPEG files and video files are stored as AVI files. Individual image and video files are uniquely named with a sequence number, or with a date and time stamp. The directory location will correspond to the camera configuration and the method of triggering (i.e., motion detection).

The use of the card for image and video storage is entirely configurable to fit the needs of a given application. Individual image or video capture can be configured to manage memory card files as either a fill and stop, or with a ring memory.

Access to the SD card requires removal of the camera backplate. Insertion or removal should only be done when power is removed. See Section 8.2.4.2, *Accessing SD Memory Card* (p. 23), for more information on image and video retrieval from the SD card. It is generally recommended to delete older image files from the memory card after downloading them to a permanent storage location.

Once the contents of the memory card are read or downloaded, it is recommended to reformat the memory card (using FAT32) to delete the entire contents. The CC5MPX writes binary files to the memory card to facilitate file management.

---

**CAUTION**  
Deleting or editing the contents of the memory card manually outside of the camera will invalidate the binary files, causing image and video storage to function unpredictably.

---

### 8.2.4.1 Link for Most Recent Image and Video

There are also permanent links available in the CC5MPX web server to download the most recently captured images or video files available on the SD card. Each capture method has its own link. These links redirect to the actual files on the SD card, which means for continuity that the downloaded filename will be the same as the filename on the SD card.

---

**NOTE**  
The following are examples and the IP address will vary with the camera’s network configuration.
8.2.4.2 Accessing SD Memory Card

In order to access the SD memory card, the backplate of the CC5MPX must be removed. Before starting this process, remove the CC5MPX from any power supply and disconnect any attached cabling.

Refer to Section 9.2, Backplate Removal Procedures (p. 100), for details on removing the camera backplate.

The SD memory card is located on the main circuit board and can be removed by first pressing the card into the housing until a click is heard. The card can now be pulled from the card housing.

In order to properly reinstall the card, place it into the housing and press in until a click is heard.

Once finished with the SD card, replace the backplate. First ensure the O-ring is still seated properly on the backplate. This is very important as the O-ring is required to properly seal the camera.

The backplate can only be seated in the orientation that aligns the flat surfaces of the backplate and the bottom of the camera body. This will also help align the screw holes. The six screws can now be threaded and hand tightened. Be sure the two plastic washers are located between the tether chains and the backplate.

8.2.4.3 FTP Image Collection from Memory Card

If the camera is setup to store images to the memory card, it may be necessary to collect all the images from the memory card. The web interface does provide a user friendly method of viewing and saving select files from the memory card. However, if it is desired to collect a large number of files from an entire folder then using the web interface is very cumbersome.

It is recommended to access the CC5MPX memory card using the FTP file transfer process. On most Windows® machines this is easily done by typing: ftp://192.168.1.90:85 into Windows Internet Explorer®, where ‘192.168.1.90’ is the IP address of the camera and the ‘:85’ is the port used for FTP access. The camera supports FTP access to the memory card on port 85 of the camera. This will require an Ethernet connection to the camera.
Clicking a directory such as SelfTimed1Still (FIGURE 8-3) will begin the navigation into that directory. Whole directories or files can be saved, just like any other Windows folder.

FIGURE 8-3.  Image Collection from Installed SD Card

8.2.5 Switched Power Output

The intended purpose of the switched power output is to control the power for a communication device. One common application is to have the camera control the power to a communication modem at a solar powered site. Refer to Section 8.4.2.5, SNTP (TIME) Server Setting (p. 35), for details on configuring the switched power output via the web interface.

This power management feature can greatly reduce the system power requirements by only turning on the modem when required to transmit an image or video. The switched power output will turn on under the following conditions:

- The camera in one of its low power modes and the Setup button is pressed. The camera will exit the low power mode and stay awake for 5 minutes with the switched power output on.
- A low power mode is selected and the camera wakes up from an event where communications are required. This will include FTP, SMTP (email), or PakBus transfers. Events requiring memory card storage only, will not turn on the switched power output as these events would not require a modem for communications.

8.3 Camera Configuration

There are two methods for a user to configure the CC5MPX camera that do not require opening the camera.

The first is by using the web interface of the camera. This is the best way to set up the camera. Most users will need to communicate with the camera via the
Ethernet connection in order to facilitate focusing and targeting of the camera when installed.

The other means of setting up the camera is by using the RS-232 serial lines on the Power and I/O cable and using Campbell Scientific’s DevConfig software to change configuration parameters in the camera (Section 8.6, RS-232 Communications (p. 78)). DevConfig is a free download from any Campbell Scientific website.

If it is not possible to connect to the camera via the Local Area Connection due to a loss of configuration information, DevConfig must be used.

A third method is available that involves opening up the camera to access the internal USB connector. Refer to Section 10.1, Internal USB Function (p. 101), for more details.

### 8.4 Camera Operation using Web Browser Interface

The web interface allows the user to:

- Fully configure the CC5MPX, as required.
- View information, system status, date, and time.
- View live video for the purpose of targeting and focusing the camera.

The CC5MPX supports an automatic IP address configuration in situations where the camera is directly connected via Ethernet cable to a computer. The camera is accessible using the IP address 169.254.99.99.

The camera ships with the default static IP address of 192.168.1.90 and a Network Mask of 255.255.255.0. It is highly recommended to keep track of any changes made to the network settings.

Refer to Section 4.4, Setup Using Ethernet (p. 4), for details on making the initial network connection to the camera. To establish communications with the camera, use one of the methods previously discussed. Enter the appropriate IP address in the address bar of Internet Explorer. After typing the address, the homepage of the CC5MPX camera, as shown in FIGURE 8-4, will appear.

Currently, only Windows Internet Explorer web browser is supported for use with the CC5MPX camera.
Some general items to remember about the web interface are:

- The homepage of the camera is the **Live Video** page. There are no operational settings to change on the **Live Video** page.

- If any settings are changed or added on any of the other pages, then the **Submit** button must be keyed to accept the changes. If the **Submit** button is not keyed, the changes will not be saved.
8.4.1 Live Video

The Live Video homepage of the CC5MPX is shown in FIGURE 8-5.

![Image of CC5MPX Live Video homepage]

**FIGURE 8-5. Live Video (Homepage)**

The homepage allows the user to manually capture still images or view real time video. The use of these features aids in the installation of the camera and testing the images.

When the Video Display Size is changed from off to one of the video size settings, video should be displayed in the video display area. If the video cannot be viewed, review Section 4, QuickStart (p. 2).

The Still Capture box allows for the manual capture of still images. Select the desired size and method of capturing. The two methods of capturing include storing the image to the SD card in the directory ManualStill, or Save as File option, which enables the picture to be saved to the computer.

The Shutdown button provides a safe power down sequence. If at all possible, the Shutdown button should be used any time the power needs to be removed from a camera that is actively collecting and storing images or video. It will completely shut down for a period of 10 minutes and ensure the memory card is not corrupted. An alternate way of shutting down the camera is to hold the Setup button for at least 10 seconds.
Information features on the Live Video homepage include:

- **Motion Detection Indicator**
  - Turns from green to red when motion is detected.
  - This will indicate even if the motion capture is not enabled.

- **External Trigger Status**
  - Reflects the state of the External Trigger signal on the Power and I/O cable.

- **System Status**
  - Indicates the SD card presence, absence or scanning. Note that the scan process can take several minutes to complete, and is invoked if the camera is shut down by an unexpected reset or power removal.
  - Displays system messages.

- **Internal Board Temperature Value**
  - When Fully On, the internal temperature can be 10 to 15 °C above ambient.

- **Focusing Numbers**
  - Facilitates focusing. (Note: If the camera is targeted on an object that is far away (100 m or more), 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.)
  - See Section 8.11.2.1, Using the Focusing Number (p. 89).

- **Date and Time**

The Live Video homepage, as well as every other page, also contains a navigation bar with tabs that allow navigation to the other CC5MPX web pages. These are called Page Tabs.

---

**Important!**

Any configuration changes made in the web interface must be ‘submitted’ to save and activate changes, or changes will be lost.

---

**8.4.1.1 Real Time Streaming Protocol (RTSP)**

Users can access the live video stream outside of our ActiveX® control using RTSP. Only the 640 x 480 resolution is available.

---

**NOTE**

If a user is viewing the RTSP video stream and another user tries viewing a different resolution using the camera web page, the RTSP stream will stop.

The following sample code can be used to embed the video stream into a web page. The IP address will need to be appropriately changed.
8.4.2 Network Configuration

To access the main Network Configuration page, simply click the Network page tab.

When the Network page is first entered, the following prompt appears as a warning (see FIGURE 8-6). If changes are made to the camera that affects the access to the web interface, the browser must be restarted with the new configuration.

For example, if the IP address of the camera is changed, the changes will be accepted by clicking on the Submit button, and the new IP address will be in effect.

![Network Configuration Warning](image)

**FIGURE 8-6. Network Configuration Warning**

The Network page displayed in FIGURE 8-7 allows the user to configure settings that are related to the CC5MPX network connectivity.
To clarify, this manual will refer to the selection tabs that are located on the left of some of the pages as sub tabs.

The main Network page has five sub tabs:

- Network
- Power Mode
- FTP Server
- SMTP Server
- SNTP

### 8.4.2.1 Network Settings

The most common network settings (FIGURE 8-8) are displayed first in the **Network** sub tab. These settings are summarized in **TABLE 8-4**.

#### TABLE 8-4. Network Settings

<table>
<thead>
<tr>
<th>Configuration Settings</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHCP</td>
<td>Enables DHCP operation of the network interface. Operates as a Static IP address if Disabled.</td>
<td>Disabled</td>
</tr>
<tr>
<td>IP Address</td>
<td>Only set if DHCP is Disabled</td>
<td>192.168.1.90  (Static)</td>
</tr>
<tr>
<td>Netmask</td>
<td>Only set if DHCP is Disabled</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>Default Gateway</td>
<td>Only set if DHCP is Disabled</td>
<td>192.168.1.1</td>
</tr>
<tr>
<td>Primary Nameserver</td>
<td>Only set if DHCP is Disabled</td>
<td>192.168.1.1</td>
</tr>
<tr>
<td>HTTP Port</td>
<td>Alternate ports can be used for the http interface. Options are 80 or values between 1025 and 65535.</td>
<td>80</td>
</tr>
</tbody>
</table>

**FIGURE 8-8. Network Settings**
8.4.2.2 Ethernet Power Mode Settings

Clicking on the Power Mode sub tab allows the user to edit the Ethernet power mode settings. To reduce power consumption, the CC5MPX includes the ability to control the power characteristics of the Ethernet port. Three options are available (see FIGURE 8-9):

- **Always On**
  This power mode offers the maximum availability of the Ethernet port. If the camera is in the Fully On power state or the Partially On power state, the Ethernet port will always be on and available for communications.

- **Moderate**
  This power mode offers some power savings on the Ethernet port. This mode is only recommended if the camera is in Partially On power mode. If the camera is in the Partially On power mode, incoming data packets will wake up the camera for communications.

- **Full Power Save**
  This power mode should be used if the lowest power consumption is desired and incoming Ethernet communications are not required.

![Ethernet Power Savings Mode](image)

**FIGURE 8-9. Ethernet Power Savings Settings**

The specific behavior of the camera’s Ethernet power save is also influenced by the power mode of the camera. TABLE 8-5 will help outline the Ethernet power saving features versus various power modes of the camera.
<table>
<thead>
<tr>
<th>Camera Power Mode</th>
<th>Ethernet Power Save Mode</th>
<th>Operating Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully On</td>
<td>Always On</td>
<td>• Camera is always on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Highest power consumption.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet is on and always available for incoming communications.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power Save</td>
<td>• Not recommended.</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>• Camera is always on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Average power consumption is reduced by 50 mA @ 12 Vdc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet is normally turned off and is only enabled when outgoing communications are required (email or FTP).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• User needs to push the Setup button to temporarily enable the Ethernet port for web page access.</td>
</tr>
<tr>
<td>Partially On</td>
<td>Always On</td>
<td>• The camera is effectively off in a low powered state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Typical power consumption is 80 mA @ 12 Vdc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet is always on and always available for incoming communications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The camera will temporarily wake up to the Fully On power mode when traffic occurs on the network. In situations where there is constant network traffic, the camera may effectively be in the Fully On power mode.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power Save</td>
<td>• The camera is effectively off in a low powered state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Typical power consumption is 80 mA @ 12 Vdc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet is always off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disconnecting and connecting the camera to another Ethernet device will momentarily wake up the camera to allow it to process incoming communications. The camera will go into the low powered mode again if no communications occur.</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>• The camera is effectively off in a low powered state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Average power consumption is typically 10 mA @ 12 Vdc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The Ethernet is normally turned off and is only enabled when outgoing communications are required (email or FTP).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• User needs to push the Setup button to temporarily enable the camera and Ethernet port for web page access.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The camera can respond to RS-232 and RS-485 communications in this mode.</td>
</tr>
</tbody>
</table>
### TABLE 8-5. Ethernet Power Save Modes

<table>
<thead>
<tr>
<th>Camera Power Mode</th>
<th>Ethernet Power Save Mode</th>
<th>Operating Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Sleep</td>
<td>Always On</td>
<td>• The Deep Sleep power consumption (6 mA typically) is not affected by the Ethernet mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet, RS-232, and RS-485 communications are non-responsive in Deep Sleep state.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power Save</td>
<td>• Not recommended.</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>• The Deep Sleep power consumption (6 mA typically) is not affected by the Ethernet mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If Ethernet communications are not used this can reduce the power consumption of the camera by 50 mA when the camera exits the Deep Sleep state.</td>
</tr>
<tr>
<td>OFF</td>
<td>Always On</td>
<td>• The OFF state power consumption (1 mA typically) is not affected by the Ethernet mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet, RS-232 and RS-485 communications are non-responsive in OFF state.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power Save</td>
<td>• Not recommended.</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>• The OFF state power consumption (1 mA typically) is not affected by the Ethernet mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If Ethernet communications are not used this can reduce the power consumption of the camera by 50 mA when the camera exits the OFF state.</td>
</tr>
</tbody>
</table>

#### 8.4.2.3 FTP Client Set-up

Clicking on the **FTP Server** sub tab will display the FTP Server settings (see FIGURE 8-10).

![FTP Server Settings](image)

**FIGURE 8-10. FTP Server Settings**
These settings configure the CC5MPX to be able to act as an FTP client to send image files to an FTP server. There are settings for two different servers.

These settings configure the parameters that the camera will use to connect to the server. The FTP transfers must be enabled in the Image Capture menus. When specifying an FTP connection, the user can select between active and passive mode file transfers. The default setting is the passive mode. This mode allows a camera connected through a firewall to transfer files properly through the firewall to the remote server.

In the event of an FTP transfer failure, the CC5MPX will retry sending the file to the FTP server up to two times before aborting the file transfer.

The CC5MPX can also act as an FTP server to enable images and video to be transferred from the memory card. See Section 8.2.4.3, FTP Image Collection from Memory Card (p. 23), for more details.

### 8.4.2.4 SMTP (Email) Server Settings

Clicking on the SMTP Server sub tab will display the SMTP (email) server settings (see FIGURE 8-11). The CC5MPX can send images or video via email by using two different email servers.

Many SMTP servers are capable of using TLS encryption to securely communicate with email clients. Some SMTP servers, such as Google Gmail®, require secure connections in order to allow access. Support for TLS encryption is available in the CC5MPX SMTP program. If the CC5MPX connects to an SMTP server that supports TLS encryption, it will automatically be used, otherwise it will return to a normal, unencrypted connection.

In the event of a SMTP transfer failure, the CC5MPX will retry sending the file to the mail server up to two times before aborting the file transfer.

Details on the settings are as follows:

- **My Server Requires Authentication**
  Select this setting if the email server requires authentication. This usually means that a login is required, with a username and password.

- **Account Name**
  The Account Name is required only if Authentication is used.

- **Password**
  The Password is required only if Authentication is used.

- **Sender**
  The email address associated with the account is normally used here. The CC5MPX cannot receive emails.

- **SMTP Server**
  Enter the address of the SMTP server that is being used. Enter the SMTP server port number as part of the SMTP address, if required. The camera will default to port 25 if a value is not included. An example of a port number entry is: mail.server.com:587
- **Email Address**
  Enter the destination email addresses that are to receive the emails. Multiple email addresses can be included. There is a limit of 255 characters. For multiple email addresses, use a space, comma or semi-colon as a separator between addresses. Example: test1@somewhere.com;john@email.com.

![SMTP Server Setting](image)

**FIGURE 8-11. SMTP Server Settings**

### 8.4.2.5 SNTP (TIME) Server Setting

Clicking on the **SMTP Server** sub tab will display the SNTP (TIME) server settings (see **FIGURE 8-12**). The configuration of an SNTP server provides a means of synchronizing the onboard clock of the CC5MPX with the specified SNTP server. This ensures that the camera clock is always accurate. It is also possible to configure a time zone offset for the camera.

Other than the address of the SNTP server, the time zone needs to be selected and the **Automatically Adjust for Daylight Saving Time Changes** can also be selected.

Refer to [www.pool.ntp.org/zone/us](http://www.pool.ntp.org/zone/us) for SNTP server information covering the United States.

Refer to [www.pool.ntp.org/zone/ca](http://www.pool.ntp.org/zone/ca) for SNTP server information covering Canada.
8.4.3 System Configuration

Selecting the System page tab activates the System Settings page (see FIGURE 8-13). The main System Settings page has eight sub tabs:

- Date and Time
- Automatic Date and Time Update
- Site Name
- Users/Security
- Digital I/O
- Update
- Events
- Save/Read Camera Settings
8.4.3.1 System Date and Time

The Date and Time submenu (see FIGURE 8-14) provides a means for viewing and setting the current date and time of the camera. Available options include:

- Setting the Time manually:
  Select the Set Manually button and enter the date and time values from the drop-down boxes. Click the Submit button for the settings to take effect.

- Synchronize with Computer Time:
  The web page also displays the time reported by the computer. If this is the desired time, select the Synchronize with Computer Time button and click Submit. The camera time will be updated with the computer time.

- Synchronize with SNTP Server
  If an appropriate SNTP time server is set up in the Network Settings, this button can be selected to use an Internet SNTP time server. Clicking on Submit starts the process.

![Date and Time Settings](image)

FIGURE 8-14. Date and Time Settings

8.4.3.2 Automatic Date and Time Update

The Automatic Date and Time submenu (see FIGURE 8-15) configures the camera for automatic date and time updates. The setting parameters are:

- Time Variance in Seconds to perform clock update.
  Select the minimum allowable variance that will result in the camera’s time being changed.
• **Source Options**
  Select 1 of 3 options for the Automatic Time updates. The possibilities are:

  o **None**
    The camera’s clock is highly accurate and its drift is normally less than 2 min/year.

  o **PakBus Port**
    Normally this is a datalogger. The actual time update occurs only when a file transfer occurs to the datalogger from the camera.

  o **SNTP Server**
    The camera will use the SNTP time server that is specified under Network settings (see Section 8.4.2.5, SNTP (TIME) Server Setting (p. 35)). A proper network connection is also required. The time will update on every power up and wake out of sleep mode, as well as every 8 hours in Fully On mode.

![Automatic Date and Time Update Settings](image1)

**FIGURE 8-15. Automatic Date and Time Update**

### 8.4.3.3 Site Name

The **Site Name** submenu (see FIGURE 8-16) allows a site name to be used for a web page heading. By default, the Site Name is set to Campbell Scientific. This provides an easy way of confirming that the camera is connected to the web interface. The Site Name is limited to 32 characters.

Refer to FIGURE 8-17 for the location of the Site Name on the web pages.

![Site Name](image2)

**FIGURE 8-16. Site Name**
8.4.3.4 Users and Security

The Users/Security submenu (see FIGURE 8-18) allows for setting of security features in the CC5MPX.

By default, cameras are shipped with the security authentication disabled. When the Authentication setting is set to Enable, users will be prompted for a User Name and Password before access is given. By default, one user is set up with the user name of Admin and the password of 9999. Ensure that a record of user names and passwords are kept. In the event that this information is lost, and the camera can no longer be accessed, the settings can be viewed or changed by connecting the camera to a computer with DevConfig, using the RS-232 port.

In order to add a user, fill out the ‘Add/Modify Users’ parameters, select the required authority level, and submit the new user. Once the camera saves the action, the User List will show the user name and their authority level. The User name and password must be 4 to 32 characters in length.

Authority Level Access:

- **Admin**
  - Full camera access
  - Can create and edit users and disable security

- **Operator**
  - Full camera access
  - Only restriction is Security Settings

- **Viewer**
  - Only access to the Live Video homepage and the Memory Card page is given
  - No settings can be changed
  - Only read access to the Memory Card is allowed
If a user needs to be removed from the User List, this must be done by a user with Admin access. Remember that any deletion or changes will only be saved when the Submit button is clicked.

**8.4.3.5 Digital I/O**

The light and communication power are multiplexed on the same wire on the connector. If both powers are enabled, the output remains on from when the start of capture to when the file is transfer is complete.

The Digital I/O submenu (see FIGURE 8-19) allows the configuration of some of the camera’s I/O signals.
8.4.3.5.1 External Trigger Input Settings

The External Trigger Input can be configured to active **High** or active **Low**. When set to active **High**, 0 volts will be the Inactive state and a positive voltage will be the active state.

The CC5MPX is shipped from the factory by default with a pull-down resistor connected to the External Trigger Input and the External Trigger is set to active **High**. With this default setting, when no signal is applied to the input the External Trigger is inactive. A positive voltage is required to change to the active state.

8.4.3.5.2 Light Power Control Settings

The camera can be configured to switch the external +12 V on, based on the available light in the scene (yellow wire). There are three settings: **Not Used**, **Active**, and **Flash Type**. **Not Used** disables the output, while the other two enable it.

There are future plans to add two different modes of operation, but currently they operate in the same manner. The light will only come on when capturing from a self-timed capture or when an external trigger occurs while the camera is in sleep mode. The light does not turn on for motion detection capture. The light turns off after the capture is complete.

8.4.3.5.3 Communication Power Control

The Communication Power Control setting controls the communication switched power output line on the Power and I/O cable of the CC5MPX camera.

The switch output is intended to manage the power to a communication device, such as a cell modem. This is useful in a solar powered site when there is a need to limit power consumption of communication devices.

This option enables the CC5MPX to supply up to a maximum of 750 mA of current. The voltage level will be the same as the camera’s input power (i.e., 12 Vdc).

Some modems will require a warm up time or a period of time to register on a network. The Communication Warm up Time parameter allows an appropriate time to be entered for this purpose.

8.4.3.5.4 Heater Power Control

The Heater Power Control setting controls the operation of the optional window defroster. If enabled, the camera will only turn on the heater if the current internal temperature is below the threshold setting. The temperature threshold values are limited to –40 to 25 °C.

If the **Always On** option is selected, the heater will be on whenever the temperature is below the threshold and the camera is not in a low powered state.

If **Minutes prior to schedule** is selected, the camera will wake up prior to any of the Self Times schedules and turn on the heater if the temperature is below
the threshold settings. This feature does not work with motion detection or external trigger modes.

This is useful for a remote site that may be prone to riming and frost. A camera that is setup to take hourly pictures can be configured to turn on the defroster several minutes prior to the scheduled picture to defrost the window.

**8.4.3.6 Update**

The **Update I/O** submenu (see FIGURE 8-20) provides the ability to update the firmware in the camera. It is recommended to check for firmware updates on the Campbell Scientific website to ensure that the camera has the most recent version of firmware.

Once a file is downloaded, click the **Browse** button to select the new firmware update with the ‘tar.gz’ file extension. Once the proper file is selected, click on **Update** button and the process will begin.

**NOTE** During the update process DO NOT disconnect power, close web browser, or navigate away from the Update page. DO NOT extract the firmware update from the .tar.gz file. This compressed file must be sent to the CC5MPX in order to update the firmware.

Once the firmware update process is completed, a web page will be displayed indicating that the process has completed. The camera will reboot itself. It will take a few minutes for the camera to operate as normally.

The firmware update process normally keeps all configuration settings in the camera. It is recommended to verify the settings after an update.
8.4.3.7 Events

The Events submenu (see FIGURE 8-21) provides a list of system events. If the System Status box is red in the Live Video page, the details are logged in the Events Log. One of the most common recorded events is that the memory card is properly present after a power up. The message confirms that the memory card is functioning and it also indicates the size of the memory card.

Other types of event messages and log files include:

- The memory card or the allocated memory is full (when fill and stop memory management is used).
- Communication and file transfer errors that include:
  - FTP
  - Email
  - PakBus

![FIGURE 8-21. Event Logs](image-url)
8.4.3.8 Save/Read Camera Settings

This feature allows for configuration settings to be saved or loaded via the web interface (FIGURE 8-22). The .xml configuration files are also compatible with DevConfig.

FIGURE 8-22. Save/Read Camera Settings

8.4.4 Memory Card

Selecting the Memory Card page tab will bring up the Memory Card page (see FIGURE 8-23) and allow access to the internal SD card.

FIGURE 8-23. Memory Card Page
This page shows the size of the memory card loaded in the camera. If no camera is present, there will be a message stating so, and the view memory card link and memory card details will not appear.

Each capture event is allocated a limited amount of space on the SD card based on the settings on the event configuration page. As more space can be allocated on the event configuration page than is available on the SD card, the camera will automatically scale the allocated space to fit the SD card. This page shows the actual space available for each capture event, as well as the space currently being used.

Click on **View Memory Card** link to browse the files on the SD card.

![File List Of Memory Card](image)

**FIGURE 8-24. Memory Card Directory Listing**

There is a possibility of nine main directories that are created for Image and Video storage on the camera (FIGURE 8-24). There is a still image and video directory for each type of capture method and a directory for manually captured stills. A directory will not be created by the camera if the capture method is not used.
The directory names are:

- ExternTrig1Still
- ExternTrig1Video
- ManualStill
- MotionDetectStill
- MotionDetectVideo
- SelfTimed1Still
- SelfTimed1Video
- SelfTimed2Still
- SelfTimed2Video

Clicking one of the main folders will display the contents; normally another set of subfolders will be displayed. The camera creates subfolders that are named by date. The date subfolders can be configured to store images in folders named either by Year_Month or Year_Month_Day (see FIGURE 8-25).

FIGURE 8-25. Data Subfolders
Actual pictures and video will be located in these subfolders and can be viewed as shown in FIGURE 8-26.

FIGURE 8-26. Example Display of Files

The web interface will display up to 200 files per page. If more files exist in the directory than at the very bottom of the page, other pages can be selected to view the additional files (see FIGURE 8-27).

FIGURE 8-27. Example of Multiple Page Viewing

The web interface provides a method of viewing or deleting images and video from the memory card. It is possible to delete either complete or portions of directories or subfolders, as well as individual images or videos. Be cautious when using the Delete All function.
8.4.5 Video Settings

Selecting the Video Settings page tab will bring up the Video Settings page (see FIGURE 8-28). There are two sub tabs that provide two independent types of video to be recorded.

The video settings consist of the following parameters:

- Banner Position
  - Three available options are:
    - OFF
    - Inside Top (FIGURE 8-29)
    - Inside Bottom

FIGURE 8-28. Video Settings Page

FIGURE 8-29. Video Banner Inside Top with Timestamp and Text
• Name on Image Banner
  If YES is selected, text can be entered which would appear in the video banner. Refer to Section 8.8, PakBus® Communications (p. 80), for details on how to alter the banner via a PakBus datalogger.

• Include Timestamp in Banner
  There are five options for the style of timestamp to include in the banner text:
  - None
  - YYYY/MM/DD HH:MM:SS
  - MM/DD/YYYY HH:MM:SS
  - MM/DD/YYYY HH:MM
  - MM/DD/YYYY

• Default File Name
  A more meaningful file name can be assigned to the files. The maximum number of characters is 31. No spaces are allowed within the file name.

• Count Type
  There are three options available:
  - None
    When using None, the same file will simply be overwritten on the memory card every time a video is recorded. This may also happen for the transmitted files that are sent via FTP.
  - Number Increment
    A unique number is appended to each file name. When the Number Increment is selected, an additional box will allow a starting number to be entered. An example of a file name with the count type is:
    Video1_0000001994.avi
  - Date and Time
    Each file name will have a timestamp appended to it. Examples of file names with Date and Time option are:
    Video1_2011_01_28_14_22_10.avi
    Video1_YYYY_MM_DD_HH_MM_SS.avi

• Resolution/Compression
  Currently there are two options for the video capture format; both options encode the video using MPEG4. The options are 1280 x 720 (720P) or 320 x 240.

• Frame Rate
  There are three frame rate options of 30, 15, and 7.5 frames per second (FPS). Lower frame rates can reduce the file sizes.

The video resolution and frame rate are the two factors that determine the file size for video files. TABLE 8-6 shows the approximate file size for every second of recorded video. According to the table, the largest file sizes are produced by the 720P 30 FPS video, which is 500 kB per second of video. The smallest video files are produced by the 320 x 240 7.5 FPS video which is 10 kB per second of video.
### Table 8-6. Typical Video File Sizes

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Frames Per Second</th>
<th>Kilobytes per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>720P 1280 x 720</td>
<td>7.5</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>500</td>
</tr>
<tr>
<td>320 x 240</td>
<td>7.5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>65</td>
</tr>
</tbody>
</table>

#### 8.4.5.1 GPS Coordinates

GPS coordinates (CC5MPXGPSLatitude and CC5MPXGPSLongitude) can be embedded in the image or video files that the camera generates. Two PakBus variables allow the logger to send the GPS coordinates to the camera, where they are embedded in the images or video.

The GPS coordinates must be sent as floating point values. Positive latitude and longitude represent northern and eastern hemispheres, respectively. While negative values represent southern and western hemispheres, respectively. Values are not saved through a power cycle, or in OFF mode, but do not need to be updated every time an image or video is sent.

#### 8.4.5.1.1 Example Program – Adding GPS Coordinates to the Image Banner

The following example illustrates the use of the CC5MPXGPSLatitude and CC5MPXGPSLongitude instructions, which can be used with CR800 series, CR1000, or CR3000 dataloggers.

**CRBasic Example 8-1. Adding GPS Coordinates to the Image Banner**

```crbasic
Public sendGps As Boolean
Public gpsLat, gpsLong As Float
Public sendVarResult

BeginProg
    sendGps = false
    gpsLat = 50.0
    gpsLong = -139.0
    SerialOpen (Com1,115200,4,0,2000)
    Scan (1,Sec,0,0)
    If sendGps Then
        sendGps = false
        SendVariables
            (sendVarResult,Com1,0,55,0000,0,"Public","CC5MPXGPSLatitude",gpsLat, 1)
            (sendVarResult,Com1,0,55,0000,0,"Public","CC5MPXGPSLongitude",gpsLong, 1)
    EndIf
    NextScan
EndProg
```
8.4.6  Image Capture

Selecting the *Image Capture* page tab will bring up the *Image Capture* settings page (see FIGURE 8-30). The Image Capture settings are the most significant settings in determining how the camera will operate.

There are six sub tabs that include:

- Power Modes
- Self Timed Capture2
- External Trigger
- Motion Detection
- Save/Read Camera Settings

![Image Capture Page](image.png)

*FIGURE 8-30. Image Capture Page*
8.4.6.1 Power Modes

The Power Modes sub tab (see FIGURE 8-31) allows for selection of the type of power management that will be used.

![Power Modes](image)

**FIGURE 8-31. Power Modes**

One of the main factors in determining which power mode to use is the power consumption budget that is available for the camera.

If the camera is operating from an AC main power supply, the camera will have the best performance characteristics in the Fully On state. On the other hand, if the camera needs to operate from a battery for long periods of time, then the OFF state is more suitable. Refer to TABLE 8-7 for the characteristics of each operating state.

TABLE 8-8, Capture Response Time (p. 54), shows typical response times from when a trigger occurs to the time that a picture or video is taken. The OFF state takes the longest as the main processor is not powered in this state and it must completely boot up to operate again from the OFF state.
<table>
<thead>
<tr>
<th>Power Mode</th>
<th>Ethernet Power</th>
<th>Operating Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Save Mode</td>
<td></td>
</tr>
<tr>
<td>Fully On</td>
<td>Always On</td>
<td>• Camera is always on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Highest power consumption.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet is on and always available for incoming communications.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power</td>
<td>• Not recommended.</td>
</tr>
<tr>
<td></td>
<td>Save</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>• Camera is always on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Average power consumption is reduced by 50 mA @ 12 Vdc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The Ethernet is normally turned off and is only enabled when outgoing communications are</td>
</tr>
<tr>
<td></td>
<td></td>
<td>required (email or FTP).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• User needs to push the <strong>Setup</strong> button to temporarily enable the Ethernet port for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>web page access.</td>
</tr>
<tr>
<td>Partially On</td>
<td>Always On</td>
<td>• The camera is effectively off in a low powered state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Typical power consumption is 80 mA @ 12 Vdc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet is on and always available for incoming communications.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power</td>
<td>• The camera will temporarily wake up to the Fully On power mode when traffic occurs on</td>
</tr>
<tr>
<td></td>
<td>Save</td>
<td>the network. In situations where there is constant network traffic, the camera may</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>effectively be in the Fully On power mode.</td>
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<tr>
<td></td>
<td></td>
<td>• Disconnecting and connecting the camera to another Ethernet device will momentarily</td>
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<td></td>
<td>wake up the camera to allow it to process incoming communications. The camera will go</td>
</tr>
<tr>
<td></td>
<td></td>
<td>into the low powered mode again if no communications occur.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The camera can respond to RS-232 and RS-485 communication in this mode.</td>
</tr>
</tbody>
</table>
### TABLE 8-7. Power Modes

<table>
<thead>
<tr>
<th>Power Mode</th>
<th>Ethernet Power Save Mode</th>
<th>Operating Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Sleep</td>
<td>Always On</td>
<td>• The Deep Sleep power consumption (6 mA typically) is not affected by the Ethernet power mode.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power Save</td>
<td>• If Ethernet communications are not used, this can reduce the power consumption of the camera by 50 mA when the camera exits the Deep Sleep state.</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>• The Deep Sleep power consumption (6 mA typically) is not affected by the Ethernet power mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethernet, RS-232, and RS-485 communications are non-responsive in Deep Sleep mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Not recommended.</td>
</tr>
<tr>
<td></td>
<td>Always On</td>
<td>• The OFF state power consumption (1 mA typically) is not affected by the Ethernet power mode.</td>
</tr>
<tr>
<td></td>
<td>Moderate Power Save</td>
<td>• Ethernet, RS-232, and RS-485 communications are non-responsive in the OFF state.</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>• The OFF state power consumption (1 mA typically) is not affected by the Ethernet power mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If Ethernet communications are not used, this can reduce the power consumption of the camera by 50 mA when the camera exits the Deep Sleep state.</td>
</tr>
</tbody>
</table>

**NOTE**

See Section 8.4.2.2, *Ethernet Power Mode Settings* (p. 31), for other settings that influence power consumption.

### TABLE 8-8. Capture Response Time

<table>
<thead>
<tr>
<th>Power Mode</th>
<th>Typical Capture Time from Trigger Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully On</td>
<td>&lt; 1 second</td>
</tr>
<tr>
<td>Partially On</td>
<td>10 seconds</td>
</tr>
<tr>
<td>Deep Sleep</td>
<td>15 seconds</td>
</tr>
<tr>
<td>OFF</td>
<td>90 seconds</td>
</tr>
</tbody>
</table>
8.4.6.2 Self Timed Capture1

The **Self Timed Capture1** sub tab (see FIGURE 8-32) is used to configure the camera to capture still images or video using the internal clock of the CC5MPX.

**FIGURE 8-32. Self Timed Capture Page**

When either of the **Self Timed Capture** triggers is enabled, the CC5MPX uses its internal clock as a trigger to initiate the capture of still images or video. In addition to the **Self Timed Capture1**, there is also a second independent **Self Timed Capture2**. Each configuration is independent of the other, but overlapping events may delay or prevent one or the other from occurring. For example, two video recordings or still image captures cannot occur at the same time.

The first step in setting up the **Self Timed Capture** is to select the **Enable** option for the capture method (see FIGURE 8-33). Once **Enable** is selected, parameters for the capture method can be edited.
FIGURE 8-33.  Enable and Capture Time Values

The Self Timed Capture triggers are set up with the timing relative to midnight. The first parameter to enter is the Start Minutes relative to midnight. The Start Minutes parameter is the first occurrence of a capture event after midnight. If the first timed event is to begin right at midnight, then set this parameter to zero. If the first timed event is at 7:00 am, then Start Minutes would be set to 420 as there are 60 minutes per hour, and the start time is 7 hours after midnight (7 hours • 60 minutes/hour = 420 minutes).

Similarly, the Stop Minutes specifies when the capture event is to stop relative to midnight. Set the Stop Minutes to 0 if there is no stop time. If a stop time such as 7:00 pm (1900h) is desired, then enter the value of 1140 as there are 60 minutes per hour, and the stop time is 19 hours past midnight (19 hours • 60 minutes/hour = 1140 minutes).

Illustrations of the Start and Stop Times are shown in TABLE 8-9.
<table>
<thead>
<tr>
<th>Start and Stop Time Settings</th>
<th>Graphical Illustration on a 24 hour Clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Minutes = 0&lt;br&gt;Stop Minutes = 0</td>
<td><img src="image1" alt="Graphical Illustration" /></td>
</tr>
<tr>
<td>Start Minutes = 420&lt;br&gt;(07:00H)&lt;br&gt;Stop Minutes = 1140&lt;br&gt;(19:00H)</td>
<td><img src="image2" alt="Graphical Illustration" /></td>
</tr>
<tr>
<td>Start Minutes = 1260&lt;br&gt;(21:00H)&lt;br&gt;Stop Minutes = 480&lt;br&gt;(08:00H)</td>
<td><img src="image3" alt="Graphical Illustration" /></td>
</tr>
</tbody>
</table>
The *Capture Interval* is the time between capture events once the *Start Minutes* value is reached. For hourly pictures, a value of 60 can be entered. If a value of 0 is entered (not recommended), the Image Interval time will apply to still images and video of the specified duration will be captured repeatedly.

TABLE 8-10 summarizes all the parameters associated with the Self Timed Capture.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self Timed Capture</td>
<td>• Enable • Disable</td>
<td>Enables or Disables the Self Timed Capture Trigger.</td>
</tr>
<tr>
<td>Start Minutes</td>
<td>0 to 1439</td>
<td>Start time in minutes relative to midnight.</td>
</tr>
<tr>
<td>Stop Minutes</td>
<td>0 to 1439</td>
<td>Stop time in minutes relative to midnight.</td>
</tr>
<tr>
<td>Capture Interval</td>
<td>0 to 1439</td>
<td>Interval between capture times in minutes. To initiate a capture interval every 5 min set the variable to 5.</td>
</tr>
<tr>
<td>Still Image Capture</td>
<td>• YES • NO</td>
<td>Select YES to include still image captures.</td>
</tr>
<tr>
<td>Number of Images</td>
<td>1 to 60</td>
<td>Determines how many still images will be taken when the capture time is reached.</td>
</tr>
<tr>
<td>Image Interval</td>
<td>1 to 60</td>
<td>If the number of images (above parameter) is greater than 1, this parameter is the time spacing between images.</td>
</tr>
<tr>
<td>Capture to Memory Card</td>
<td>• CARD • NO</td>
<td>Selecting CARD enables the still images taken to be stored to the memory card.</td>
</tr>
<tr>
<td>Maximum Memory Size</td>
<td>0 to 65535</td>
<td>This is the allowable space on the memory card that will be reserved for Still Images taken by the Self Timed Capture (in megabytes). A value of 1000 will reserve 1000 MB. A value of 0 has the camera automatically allocate memory.</td>
</tr>
</tbody>
</table>
| Management Type Options   | • Fill and Stop • Ring Memory | There are 2 methods of managing files on the memory card:  
  • Fill and Stop will stop recording additional images once the memory card is full or the allocated memory size is reached.  
  • Ring memory management will start deleting the oldest files once the memory card is full or the allocated memory size is reached. |
| Still Image               | • Setting #1 • Setting #2 | Still images for this Self Timed Capture can use 1 of 2 settings. Settings #1 and #2 can be setup with various banner, resolution and compression values. Refer to Section 8.4.8, *Still* (p. 72). |
| Main Folder Name          | Read Only Field  | This is a read only field. The name of the main folder where the still image files will be stored (SelfTimed1Still). |
### TABLE 8-10. Self Time Capture Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub Folder Options</td>
<td>• Year_Month_Day</td>
<td>An option is given to store images in a subfolder named by Year_Month or Year_Month_Day. Selecting the Year_Month_Day option has some performance advantages when a large number of images are taken. Reducing the number of files in a folder speeds up the storing and file management process. Speed advantages are only noticeable if the number of files in the Year_Month folder will exceed 1000.</td>
</tr>
<tr>
<td></td>
<td>• Year_Month</td>
<td></td>
</tr>
<tr>
<td>Send via email</td>
<td>• Disabled</td>
<td>Selecting one of the email settings enables the camera to transmit the still images via email. The selected email settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• Email Settings #1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Email Settings #2</td>
<td></td>
</tr>
<tr>
<td>Email Still Image</td>
<td>• Setting #1</td>
<td>One of the two Still Image settings can be used for the still images that are sent using the FTP.</td>
</tr>
<tr>
<td></td>
<td>• Setting #2</td>
<td></td>
</tr>
<tr>
<td>Send via FTP</td>
<td>• Disabled</td>
<td>Selecting one of the FTP settings enables the camera to transmit the still images to an FTP server. The selected FTP settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• FTP Setting #1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• FTP Setting #2</td>
<td></td>
</tr>
<tr>
<td>FTP Still Image</td>
<td>• Setting #1</td>
<td>One of the two Still Image Settings can be used for the still images that are sent using FTP.</td>
</tr>
<tr>
<td></td>
<td>• Setting #2</td>
<td></td>
</tr>
<tr>
<td>Send via PakBus</td>
<td>• Disabled</td>
<td>Used to enable the still images to be sent to PakBus compatible device. The PakBus settings should be properly configured in the Communications Page before enabling this option.</td>
</tr>
<tr>
<td></td>
<td>• Enabled</td>
<td></td>
</tr>
<tr>
<td>PakBus Still Image</td>
<td>• Setting #1</td>
<td>One of the two still image settings can be used for the still images that are sent using FTP.</td>
</tr>
<tr>
<td></td>
<td>• Setting #2</td>
<td></td>
</tr>
<tr>
<td>Video Capture</td>
<td>• YES</td>
<td>Select YES to include Video Capturing.</td>
</tr>
<tr>
<td></td>
<td>• NO</td>
<td></td>
</tr>
<tr>
<td>Video Settings</td>
<td>• Setting #1</td>
<td>One of two video settings can be used for video capture.</td>
</tr>
<tr>
<td></td>
<td>• Setting #2</td>
<td></td>
</tr>
<tr>
<td>Duration in Seconds</td>
<td>0 to 60</td>
<td>The length of time the video is recorded for.</td>
</tr>
<tr>
<td>Capture to Memory Card</td>
<td>• CARD</td>
<td>Selecting CARD enables the video taken to be stored to the memory card.</td>
</tr>
<tr>
<td></td>
<td>• NO</td>
<td></td>
</tr>
<tr>
<td>Maximum Memory Size</td>
<td>0 to 65535</td>
<td>This is the allowable space on the memory card that will be reserved for videos taken by the Self Timed Capture (in megabytes). A value of 1000 will reserve 1000 MB. A value of 0 has the camera automatically allocate memory.</td>
</tr>
<tr>
<td>Management Type Options</td>
<td>• Fill and Stop</td>
<td>There are 2 methods of managing files on the memory card:</td>
</tr>
<tr>
<td></td>
<td>• Ring Memory</td>
<td>• Fill and Stop will stop recording additional images once the memory card is full or the allocated memory size is reached.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ring memory management will start deleting the oldest files once the memory card is full or the allocated memory size is reached.</td>
</tr>
</tbody>
</table>
### TABLE 8-10. Self Time Capture Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Folder Name</td>
<td>Read Only Field</td>
<td>This is a read only field. The Name of the Main Folder where the still image files will be stored (SelfTimed1Video).</td>
</tr>
<tr>
<td>Sub Folder Options</td>
<td>• Year_Month_Day</td>
<td>An option is given to store Videos in a subfolder named by Year_Month or Year_Month_Day. Selecting the Year_Month_Day option has some performance advantages when a large number of Videos are taken. Reducing the number of files in a folder speeds up the storing and file management process. Speed advantages are only noticeable if the number of files in the Year_Month folder will exceed 1000.</td>
</tr>
<tr>
<td></td>
<td>• Year_Month</td>
<td></td>
</tr>
<tr>
<td>Send via Email</td>
<td>• Disabled</td>
<td>Selecting one of the email Settings enables the camera to transmit the video files via email. The selected email Settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• Email Settings#1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Email Settings#2</td>
<td></td>
</tr>
<tr>
<td>Send via FTP</td>
<td>• Disabled</td>
<td>Selecting one of the FTP settings enables the camera to transmit the video files to an FTP server. The selected FTP Settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• FTP Settings#1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• FTP Settings#2</td>
<td></td>
</tr>
<tr>
<td>Send via PakBus</td>
<td>• Disabled</td>
<td>Used to enable the video files to be sent to PakBus compatible device. The PakBus settings should be properly configured in the Communications Page before enabling this option.</td>
</tr>
<tr>
<td></td>
<td>• Enabled</td>
<td></td>
</tr>
</tbody>
</table>

#### 8.4.6.3 Self Timed Capture2

The settings and parameters are the same as Self Timed Capture1. Refer to the previous section (Section 8.4.6.2, Self Timed Capture1 (p. 55)).

#### 8.4.6.4 External Trigger

The External Trigger sub tab (see FIGURE 8-34) is used to configure the camera to capture still images or video using an external signal that is applied to the External Trigger input line.

The External Trigger can be configured for an active High signal or an active Low signal (see Section 8.4.3.5.1, External Trigger Input Settings (p. 41)). The capture is triggered by the transition from the inactive state to the active state. The minimum required pulse period is 10 msec. Preferably pulses should be short in duration (only a few seconds). The voltage levels are:

- Low Level: <0.65 V (−20 Vdc Absolute Min)
- High Level: >2.0 Vdc (+20 Vdc Absolute Max)

Leaving the signal on the External Trigger in the active state will prevent the camera from entering into a low powered state. If an external device is allowed to keep the camera in its Fully On state, power consumption will be greatly affected.

When the camera is Fully On and no other process is taking place, the time from the transition of the signal from inactive to active, to the time a picture is
captured or video is started, is typically less than 100 msec. The description of the parameters for the **External Trigger** setup is outlined in TABLE 8-11, *External Trigger Variables* (p. 69).

### 8.4.6.4.1 File Transfer Queuing

When performing multiple captures and transfers off the camera in rapid succession, the camera will queue file transfers (i.e., send via FTP, then SMTP, then PakBus). File queueing separates the transfer functions from image and video capture.

The camera can capture up to five images or videos in parallel with the file transfers all taking place at the same time. For this feature to work an SD card must be present.

### 8.4.6.4.2 External Trigger Video Pre-Recording

Video pre-recording allows the camera to record up to 30 seconds of video leading up to a related trigger event. This feature can only be used with external trigger and motion detection capture events.

The external trigger configuration page includes an option labeled *Pre-Record In Seconds*. By entering a value between 1 and 30 in this field, the CC5MPX will begin buffering video in its internal memory. When an event occurs, the CC5MPX will store the set number of seconds of video to file and then continue recording the live video until the number of seconds has elapsed.

The use of pre-recording does impose some limitations on the functionality available in the CC5MPX:

- The pre-recording feature can only be used when the camera is in the **Fully On** power mode.
- If the text banner is enabled in the Video Settings used as part of Pre-Record configuration, the text banner will be visible in the Live Video view on the web page.
- If both image capture and video pre-recording are configured for the same event, the video recording will take precedence. Only once the video has been recorded and saved or transferred from the camera will the image capture occur.
FIGURE 8-34. External Trigger Setup Page
### TABLE 8-11. External Trigger Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Trigger</td>
<td>• Enable</td>
<td>Enables or disables External Trigger capture.</td>
</tr>
<tr>
<td></td>
<td>• Disable</td>
<td></td>
</tr>
<tr>
<td>Still Image Capture</td>
<td>• YES</td>
<td>Select YES to include still image captures.</td>
</tr>
<tr>
<td></td>
<td>• NO</td>
<td></td>
</tr>
<tr>
<td>Number of Images</td>
<td>1 to 60</td>
<td>Determines how many still images will be taken when the External Trigger is activated.</td>
</tr>
<tr>
<td>Image Interval</td>
<td>1 to 60</td>
<td>If the Number of Images (above parameter) is greater than 1, this parameter is the time spacing between images.</td>
</tr>
<tr>
<td>Capture to Memory Card</td>
<td>• CARD</td>
<td>Selecting CARD enables the still images taken to be stored to the memory card.</td>
</tr>
<tr>
<td></td>
<td>• NO</td>
<td></td>
</tr>
<tr>
<td>Maximum Memory Size</td>
<td>0 to 65535</td>
<td>This is the allowable space on the memory card that will be reserved for Still Images taken by the Self Timed Capture (in megabytes). A value of 1000 will reserve 1000 MB. A value of 0 has the camera automatically allocate memory.</td>
</tr>
<tr>
<td>Management Type Options</td>
<td>• Fill and Stop</td>
<td>There are 2 methods of managing files on the memory card:</td>
</tr>
<tr>
<td></td>
<td>• Ring Memory</td>
<td>• Fill and Stop will stop recording additional images once the memory card is full or the allocated memory size is reached.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ring memory management will start deleting the oldest files once the memory card is full or the allocated memory size is reached.</td>
</tr>
<tr>
<td>Still Image</td>
<td>• Setting #1</td>
<td>Still images for this Self Timed Capture can use 1 of 2 settings. Settings #1 and #2 can be setup with various banner, resolution and compression values. Refer to Section 8.4.8, Still (p. 72).</td>
</tr>
<tr>
<td></td>
<td>• Setting #2</td>
<td></td>
</tr>
<tr>
<td>Main Folder Name</td>
<td>Read Only Field</td>
<td>This is a read only field. The Name of the Main Folder where the still image files will be stored (SelfTimed1Still).</td>
</tr>
<tr>
<td>Sub Folder Options</td>
<td>• Year_Month_Day</td>
<td>An option is given to store images in a subfolder named by Year_Month or Year_Month_Day. Selecting the Year_Month_Day option has some performance advantages when a large number of images are taken. Reducing the number of files in a folder speeds up the storing and file management process. Speed advantages are only noticeable if the number of files in the Year_Month folder will exceed 1000.</td>
</tr>
<tr>
<td></td>
<td>• Year_Month</td>
<td></td>
</tr>
<tr>
<td>Send via Email</td>
<td>• Disabled</td>
<td>Selecting one of the email settings enables the camera to transmit the still images via email. The selected email settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• Email Settings #1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Email Settings #2</td>
<td></td>
</tr>
<tr>
<td>Email Still Image</td>
<td>• Setting #1</td>
<td>One of the two Still Image Settings can be used for the still images that are sent using the email.</td>
</tr>
<tr>
<td></td>
<td>• Setting #2</td>
<td></td>
</tr>
<tr>
<td>Send via FTP</td>
<td>• Disabled</td>
<td>Selecting one of the FTP settings enables the camera to transmit the still images to an FTP server. The selected FTP settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• FTP Setting #1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• FTP Setting #2</td>
<td></td>
</tr>
<tr>
<td>FTP Still Image</td>
<td>• Setting #1</td>
<td>One of the two Still Image Settings can be used for the still images that are sent using FTP.</td>
</tr>
<tr>
<td></td>
<td>• Setting #2</td>
<td></td>
</tr>
<tr>
<td>Send via PakBus</td>
<td>• Disabled</td>
<td>Used to enable the still images to be sent to PakBus compatible device. The PakBus settings should be properly configured in the Communications Page before enabling this option.</td>
</tr>
<tr>
<td></td>
<td>• Enabled</td>
<td></td>
</tr>
</tbody>
</table>
## TABLE 8-11. External Trigger Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PakBus Still Image</td>
<td>• Setting #1, Setting #2</td>
<td>One of the two still image settings can be used for the still images that are sent using FTP.</td>
</tr>
<tr>
<td>Video Capture</td>
<td>• YES, NO</td>
<td>Select YES to include Video Capturing.</td>
</tr>
<tr>
<td>Video Settings</td>
<td>• Setting #1, Setting #2</td>
<td>One of two video settings can be used for video capture.</td>
</tr>
<tr>
<td>Duration in Seconds</td>
<td>0 to 60</td>
<td>The length of time the video is recorded.</td>
</tr>
<tr>
<td>Pre-Record in Seconds</td>
<td>0 to 30</td>
<td>The length of time the video is recorded prior to the external trigger event. This interval is a portion of the ‘Duration in Seconds’ interval. It is not in addition to the ‘Duration in Seconds’ interval.</td>
</tr>
<tr>
<td>Capture to Memory Card</td>
<td>• CARD, NO</td>
<td>Selecting CARD enables the video taken to be stored to the memory card.</td>
</tr>
<tr>
<td>Maximum Memory Size</td>
<td>0 to 65535</td>
<td>This is the allowable space on the memory card that will be reserved for videos taken by this External Trigger Capture (in megabytes). A value of 1000 reserves 1000 MB. A value of 0 has the camera automatically allocate memory.</td>
</tr>
<tr>
<td>Management Type Options</td>
<td>• Fill and Stop, Ring Memory</td>
<td>There are 2 methods of managing files on the memory card:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fill and Stop will stop recording additional video once the memory card is full or the allocated memory size is reached.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ring memory management will start deleting the oldest files once the memory card is full or the allocated memory size is reached.</td>
</tr>
<tr>
<td>Main Folder Name</td>
<td>Read Only Field</td>
<td>This is a read only field. The Name of the Main Folder where the still image files will be stored (ExternTrig1Video).</td>
</tr>
<tr>
<td>Sub Folder Options</td>
<td>• Year_Month_Day, Year_Month</td>
<td>An option is given to store videos in a subfolder named by Year_Month or Year_Month_Day. Selecting the Year_Month_Day option has some performance advantages when a large number of videos are taken. Reducing the number of files in a folder speeds up the storing and file management process. Speed advantages are only noticeable if the number of files in the Year_Month folder will exceed 1000. If speed is not an issue, then user preference is fine.</td>
</tr>
<tr>
<td>Send via Email</td>
<td>• Disabled, Email Settings#1, Email Settings#2</td>
<td>Selecting one of the email Settings enables the camera to transmit the video files via email. The selected email Settings should be properly configured before using the option.</td>
</tr>
<tr>
<td>Send via FTP</td>
<td>• Disabled, FTP Settings#1, FTP Settings#2</td>
<td>Selecting one of the FTP Settings enables the camera to transmit the video files to an FTP server. The selected FTP Settings should be properly configured before using the option.</td>
</tr>
<tr>
<td>Send via PakBus</td>
<td>• Disabled, Enabled</td>
<td>Used to enable the video files to be sent to PakBus compatible device. The PakBus settings should be properly configured in the Communications Page before enabling this option.</td>
</tr>
</tbody>
</table>
8.4.6.5 Motion Detection

The **Motion Detection** sub tab (see FIGURE 8-35) is used to configure the camera to capture still images or video using the Motion Detection capability of the camera. Refer to TABLE 8-12 for a description of each variable.

Even if this feature is enabled, the motion detection will only operate when the camera is in the Fully On power state.

![FIGURE 8-35. Motion Detection Page](image-url)
8.4.6.5.1 CC5MPX Motion Detection Description

The CC5MPX camera implements an adaptive motion detection scheme in order to help avoid false motion detection triggers that can occur in normal outdoor scenes. The adaptive motion detection method automatically adjusts the motion detection threshold based on the average motion characteristics of a given scene.

The adaptive motion detection scheme sets its threshold values based on a 20 second moving average of the scene. For example, if a CC5MPX was focused on a ceiling fan that was off, the CC5MPX motion detection would be triggered if the fan was turned on. After a period of 20 seconds the motion detection would no longer be triggered as the continuous motion of the fan would automatically increase the required motion detection trigger level.

The sensitivity level for motion detection is the only user configurable parameter for Motion Detection operation. A value of 1 provides the least sensitive motion detect threshold setting and a value of 99 provides the most sensitive motion detect threshold setting. Motion detection can be a complicated feature to implement. It is recommended to begin with a motion detect threshold setting of 50 and experiment with the performance based on the application.

If the camera is not detecting motion that is desired, the motion detection sensitivity level should be increased. If the camera is producing too many false triggers, then the motion detect level should be decreased. Note that there is always a probability that the camera can either produce false motion detects or not detect desirable motion due to too many scene variables. In some cases where motion detection of a small object is required, it may be necessary to set a motion detect level that will also produce frequent false triggers.

The adaptive motion detect is a very good method for most applications. One consideration is that when a continuous level of motion is introduced into a scene, the motion detection sensitivity decreases. The result is that some motion may not be detected when a continuous dynamic scene exists. For example, a person walking through a scene with windblown trees may not trigger the motion detect capture that would normally be triggered when there is no wind and the trees are not moving.

Motion Detection Notes:

- If a moving object that requires detection occupies a larger percentage of the image scene, the motion detection tends to be more reliable. Zooming in or moving the camera closer to the moving objects helps improve performance.

- Objects moving slowly within the image scene require a higher sensitivity setting compared to fast moving objects.

- Sudden changing light levels can falsely trigger motion detection. Sources of false triggers include rapidly changing light levels at sunrise or sunset, or during the movement of clouds.

- Good lighting of the image scene produces the best results.
• The motion detection feature uses the full 4:3 ratio frame to capture motion. Still images in the 320 x 176, 640 x 352 and 1280 x 720 formats, and video in the 720p format will crop a portion of the top and bottom of the image or video.

• Motion detection is paused when video is being recorded.

• The delay from motion occurring to image capture is typically 1 second (2 seconds for a 5 MP image).

8.4.6.5.2 Motion Detection Video Pre-Recording

Video pre-recording allows the camera to record up to 30 seconds of video leading up to a related trigger event. This feature can only be used with the external trigger and motion detection capture events.

The Motion Detection configuration page includes an option labeled Pre-Record In Seconds. By entering a value between 1 and 30 in this field, the CC5MPX will begin buffering video in its internal memory. When an event occurs, the CC5MPX stores a set number of seconds of video to file and then continues recording the live video until the number of seconds of duration has elapsed.

The use of pre-recording does impose some limitations on the functionality available in the CC5MPX:

• The pre-recording feature can only be used when the camera is in the Fully On power mode.

• If the text banner is enabled in the Video Settings used as part of Pre-Record configuration, the text banner will be visible in the Live Video view on the web page.

• If both image capture and video pre-recording are configured for the same event, the video recording will take precedence. Only once the video has been recorded and saved or transferred from the camera will the image capture occur.

<table>
<thead>
<tr>
<th>TABLE 8-12. Motion Detection Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Sensitivity Level</td>
</tr>
<tr>
<td>Motion Detection</td>
</tr>
</tbody>
</table>
### TABLE 8-12. Motion Detection Settings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Minutes</td>
<td>0 to 1439</td>
<td>Start time in minutes relative to Midnight. The Motion Detection can be set to be active for a certain time period only. See TABLE 8-9, Start and Stop Time Examples (p. 57), for more details.</td>
</tr>
<tr>
<td>Stop Minutes</td>
<td>0 to 1439</td>
<td>Stop time in minutes relative to midnight. The Motion Detection can be set to be active for a certain time period only. See TABLE 8-9, Start and Stop Time Examples (p. 57), for more details.</td>
</tr>
<tr>
<td>Still Image Capture</td>
<td>• YES • NO</td>
<td>Select YES to include still image captures.</td>
</tr>
<tr>
<td>Number of Images</td>
<td>1 to 60</td>
<td>Determines how many still images will be taken when the Motion Detection is activated.</td>
</tr>
<tr>
<td>Image Interval</td>
<td>1 to 60</td>
<td>If the Number of Images (above parameter) is greater than 1, this parameter is the time spacing between images.</td>
</tr>
<tr>
<td>Capture to Memory Card</td>
<td>• CARD • NO</td>
<td>Selecting CARD enables the still images taken to be stored to the memory card.</td>
</tr>
<tr>
<td>Maximum Memory Size</td>
<td>0 to 65535</td>
<td>This is the allowable space on the memory card that will be reserved for Still Images taken by Motion Detection capture (in megabytes). A value of 1000 reserves 1000 MB. A value of 0 has the camera automatically allocate the memory.</td>
</tr>
</tbody>
</table>
| Management Type Options| • Fill and Stop • Ring Memory | There are 2 methods of managing files on the memory card:  
• Fill and Stop will stop recording additional images once the memory card is full or the allocated memory size is reached.  
• Ring memory management will start deleting the oldest files once the memory card is full or the allocated memory size is reached. |
<p>| Still Image            | • Setting #1 • Setting #2 | Still Images for the External Trigger capture can use 1 of 2 settings. Settings #1 and Settings #2 can be setup with various banner, resolution and compression values. |
| Main Folder Name       | Read Only Field  | This is a read only field. The name of the main folder where the still image files will be stored (MotionDetectStill).                          |
| Sub Folder Options     | • Year_Month_Day • Year_Month | An option is given to store images in a subfolder named by Year_Month or Year_Month_Day. Selecting the Year_Month_Day option has some performance advantages when a large number of images are taken. Reducing the number of files in a folder speeds up the storing and file management process. Speed advantages are only noticeable if the number of files in the Year_Month folder will exceed 1000. |
| Send via Email         | • Disabled • Email Settings #1 • Email Settings #2 | Selecting one of the email settings enables the camera to transmit the still images via email. The selected email settings should be properly configured before using the option. |
| Email Still Image      | • Setting #1 • Setting #2 | One of two still image settings can be used for the still images that are sent using email.                                                     |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send via FTP</td>
<td>• Disabled • FTP Settings #1 • FTP Settings #2</td>
<td>Selecting one of the FTP Settings enables the camera to transmit the still images to an FTP server. The selected FTP settings should be properly configured before using the option.</td>
</tr>
<tr>
<td>FTP Still Image</td>
<td>• Setting #1 • Setting #2</td>
<td>One of the two Still Image settings can be used for the still images that are sent using FTP.</td>
</tr>
<tr>
<td>Send via PakBus</td>
<td>• Disabled • Enabled</td>
<td>Used to enable the still images to be sent to PakBus compatible device. The PakBus settings should be properly configured in the Communications Page before enabling this option.</td>
</tr>
<tr>
<td>PakBus Still Image</td>
<td>• Setting #1 • Setting #2</td>
<td>One of the two still image settings can be used for the still images that are sent using FTP.</td>
</tr>
<tr>
<td>Video Capture</td>
<td>• YES • NO</td>
<td>Select YES to include Video Capturing.</td>
</tr>
<tr>
<td>Video Settings</td>
<td>• Setting #1 • Setting #2</td>
<td>One of two video settings can be used for video capture.</td>
</tr>
<tr>
<td>Duration in Seconds</td>
<td>0 to 60</td>
<td>The length of time the video is recorded.</td>
</tr>
<tr>
<td>Pre-Record in Seconds</td>
<td>0 to 30</td>
<td>The length of time the video is recorded prior to the external trigger event. This interval is a portion of the ‘Duration in Seconds’ interval. It is not in addition to the ‘Duration in Seconds’ interval.</td>
</tr>
<tr>
<td>Capture to Memory Card</td>
<td>• CARD • NO</td>
<td>Selecting CARD enables the video taken to be stored to the memory card.</td>
</tr>
<tr>
<td>Maximum Memory Size</td>
<td>0 to 65535</td>
<td>This is the allowable space on the memory card that will be reserved for video taken by Motion Detection capture (in megabytes). A value of 1000 reserves 1000 MB. A value of 0 has the camera automatically allocate the memory.</td>
</tr>
<tr>
<td>Management Type Options</td>
<td>• Fill and Stop • Ring Memory</td>
<td>There are 2 methods of managing files on the memory card: • Fill and Stop will stop recording additional video once the memory card is full or the allocated memory size is reached. • Ring memory management will start deleting the oldest files once the memory card is full or the allocated memory size is reached.</td>
</tr>
<tr>
<td>Main Folder Name</td>
<td>Read Only Field</td>
<td>This is a read only field. The name of the main folder where the video files will be stored (MotionDetectVideo).</td>
</tr>
<tr>
<td>Sub Folder Options</td>
<td>• Year_Month_Day • Year_Month</td>
<td>An option is given to store Video in a subfolder named by Year_Month or Year_Month_Day. Selecting the Year_Month_Day option has some performance advantages when a large number of Videos are taken. Reducing the number of files in a folder speeds up the storing and file management process. Speed advantages are only noticeable if the number of files in the Year_Month folder will exceed 1000. If speed is not an issue, then user preference is fine.</td>
</tr>
</tbody>
</table>
TABLE 8-12. Motion Detection Settings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send via Email</td>
<td>• Disabled</td>
<td>Selecting one of the email Settings enables the camera to transmit the video files via email. The selected email Settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• Email Settings#1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Email Settings#2</td>
<td></td>
</tr>
<tr>
<td>Send via FTP</td>
<td>• Disabled</td>
<td>Selecting one of the FTP Settings enables the camera to transmit the video files to an FTP server. The selected FTP Settings should be properly configured before using the option.</td>
</tr>
<tr>
<td></td>
<td>• FTP Settings#1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• FTP Settings#2</td>
<td></td>
</tr>
<tr>
<td>Send via PakBus</td>
<td>• Disabled</td>
<td>Used to enable the video files to be sent to PakBus compatible device. The PakBus settings should be properly configured in the Communications Page before enabling this option.</td>
</tr>
<tr>
<td></td>
<td>• Enabled</td>
<td></td>
</tr>
</tbody>
</table>

8.4.6.6 Save/Read Camera Settings

This feature allows for configuration settings to be saved or loaded via the web interface (FIGURE 8-36). The .xml configuration files are also compatible with DevConfig.

FIGURE 8-36. Save/Read Camera Settings
8.4.7 Communication Settings

**FIGURE 8-37. Communication Settings Page**

Communications using the PakBus protocol (FIGURE 8-37) enables remote retrieval and/or storage of images or video to external devices such as compatible Campbell Scientific dataloggers. The factory default communication interface is RS-232. If RS-485 is required, the internal camera jumpers will need to be changed. See Section 8.5, *Internal Jumpers* (p. 76), for more details.

Additionally, the PakBus neighbouring address allows for communication with devices that are several hops away on the PakBus network. See TABLE 8-13 for reference.
TABLE 8-13. PakBus Communication Settings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232 BAUD Rate</td>
<td>• 115200  • 57600  • 38400  • 19200  • 9600</td>
<td>Select the desired baud rate. Once the baud rate is set, it will always be fixed. The factory Default Settings is 115200 baud.</td>
</tr>
<tr>
<td>RS-485 BAUD Rate</td>
<td>• 115200  • 57600  • 38400  • 19200  • 9600</td>
<td>Select the desired BAUD rate. Once the baud rate is set, it will always be fixed. The factory Default Settings is 115200 baud.</td>
</tr>
<tr>
<td>PakBus Port</td>
<td>Read Only</td>
<td>This read only value reflects the internal jumper settings of the camera. It will either read RS-232 or RS-485. See Section 8.5, Internal Jumpers (p. 76), if the jumpers need to be changed. This value cannot be changed in this view.</td>
</tr>
<tr>
<td>PakBus Address</td>
<td>1 to 4094</td>
<td>The desired PakBus address for this camera. The factory default is 55.</td>
</tr>
<tr>
<td>PakBus Destination Address</td>
<td>1 to 4094</td>
<td>The PakBus address of the device the camera will communicate with or send files to.</td>
</tr>
<tr>
<td>PakBus Neighbour Address</td>
<td>0 to 4094</td>
<td>Enter the address of the PakBus device physically to connect to the CC5MPX PakBus communication lines. This allows the neighbour to relay communication between the CC5MPX and the final destination for the data.</td>
</tr>
<tr>
<td>PakBus Communication Delay</td>
<td>0 to 16</td>
<td>Extra delays may be required for certain communication links, such as satellite.</td>
</tr>
<tr>
<td>PakBus Security Code</td>
<td>0 to 65535</td>
<td>The factory default is 0. If a security code is not required by the PakBus destination device, set this parameter to 0. Otherwise set the security code as required by the destination service.</td>
</tr>
</tbody>
</table>

8.4.8 Still Image Settings

Selecting the Still Image Settings page tab brings up the Still Image Settings page (see FIGURE 8-38). The Still Image settings allows for the configuration of still images that the camera will take.

There are two sub tabs that include two independent Still Settings:

- Still Settings #1
- Still Settings #2

TABLE 8-14 describes the variables used in the Still Image Settings.
TABLE 8-14. Still Image Settings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>• 320 x 176&lt;br&gt;• 320 x 240&lt;br&gt;• 640 x 352&lt;br&gt;• 640 x 480&lt;br&gt;• 1280 x 720&lt;br&gt;• 1280 x 960&lt;br&gt;• 2592 x 1944</td>
<td>The resolution option is the resolution of the Still Image in pixels (width x height).</td>
</tr>
<tr>
<td>Banner Position</td>
<td>• OFF&lt;br&gt;• Inside Top&lt;br&gt;• Inside Bottom&lt;br&gt;• Outside Top&lt;br&gt;• Outside Bottom</td>
<td>Selecting the inside banner displays the text within the image area either at the top or bottom. The outside banner is a text bar placed above or below the still image. The vertical height of the picture is increased to accommodate the outside banner. See TABLE 8-15, Still Image Resolution Details (p. 74), for the image sizes with outside banners.</td>
</tr>
<tr>
<td>Name on Image Banner</td>
<td>• NO&lt;br&gt;• YES</td>
<td>Be selecting Yes, a custom name can be placed on the Image Banner. Refer to Section 8.8, PakBus® Communications (p. 89), for details on how to alter the Banner via a PakBus datalogger. See TABLE 8-15, Still Image Resolution Details (p. 74), for the number of characters that can fit on a specific resolution size. The actual text field can hold 255 characters.</td>
</tr>
<tr>
<td>Include Timestamp in Banner</td>
<td>• NONE&lt;br&gt;• YYY/MM/DD/HH/MM/SS&lt;br&gt;• MM/DD/YYYY HH:MM:SS&lt;br&gt;• MM/DD/YYYY HH:MM&lt;br&gt;• MM/DD/YYYY</td>
<td>A timestamp can be placed on the banner, there are several options for the format of the date and time to be printed on the image. For example, the YYY/MM/DD HH:MM:SS setting would print a date as: 2014/01/30/ 14:54:07.</td>
</tr>
<tr>
<td>Default File Name</td>
<td>Text Field</td>
<td>This text field allows a file name to be used for the still images produced. The text is limited to 32 characters.</td>
</tr>
</tbody>
</table>

FIGURE 8-38. Still Images Settings Page
### TABLE 8-14. Still Image Settings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Allowable Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count Type</td>
<td>• NONE</td>
<td>The NONE option uses the same file name for all pictures. Only 1 image name appears in a directory or is transmitted out (email, FTP, or PakBus).</td>
</tr>
<tr>
<td></td>
<td>• Date and Time</td>
<td>The Date and Time option appends a timestamp to the file name. The text entered in the above parameter (Default File Name) is followed by the date and time: &lt;Default File Name&gt;_YYYY_MM_DD_HH_MM_SS.jpg</td>
</tr>
<tr>
<td></td>
<td>• Number Increment</td>
<td>The Number Increment option appends a 10-digit counter to the file name. The files are named with the following format after the Default File Name text: &lt;Default File Name&gt;_XXXXXXXXXX.jpg</td>
</tr>
<tr>
<td>JPG Compression Level</td>
<td>• NONE/Lossless</td>
<td>The None/Lossless compression level produces the largest JPEG files with no loss of information. The Very High compression level produces the smallest file sizes, but there will be noticeable distortions in the picture due to compression. See TABLE 8-15, Still Image Resolution Details (p. 74), for typical size information.</td>
</tr>
<tr>
<td></td>
<td>• Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Med</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Very High</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 8-15. Still Image Resolution Details

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Size with Outside Banner</th>
<th>Maximum Characters in Banner</th>
<th>Compression Type</th>
<th>Typical File Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>320 x 176</td>
<td>320 x 192</td>
<td>45</td>
<td>None/Lossless</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td>6</td>
</tr>
<tr>
<td>320 x 240</td>
<td>320 x 256</td>
<td>45</td>
<td>None/Lossless</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td>8</td>
</tr>
<tr>
<td>640 x 352</td>
<td>640 x 384</td>
<td>64</td>
<td>None/Lossless</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td>16</td>
</tr>
</tbody>
</table>
### TABLE 8-15. Still Image Resolution Details

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Size with Outside Banner</th>
<th>Maximum Characters in Banner</th>
<th>Compression Type</th>
<th>Typical File Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>640 x 480</td>
<td>640 x 512</td>
<td>64</td>
<td>None/Lossless</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td>18</td>
</tr>
<tr>
<td>1280 x 720</td>
<td>1280 x 752</td>
<td>98</td>
<td>None/Lossless</td>
<td>448</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td>40</td>
</tr>
<tr>
<td>1280 x 960</td>
<td>1280 x 992</td>
<td>98</td>
<td>None/Lossless</td>
<td>580</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td>48</td>
</tr>
<tr>
<td>2592 x 1944</td>
<td>2592 x 1984</td>
<td>136</td>
<td>None/Lossless</td>
<td>1900</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
<td>264</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td>150</td>
</tr>
</tbody>
</table>

### 8.4.8.1 GPS Coordinates

See Section 8.4.5.1, *GPS Coordinates* (p. 50), and Section 8.4.5.1.1, *Example Program – Adding GPS Coordinates to the Image Banner* (p. 50).

GPS coordinates (*CC5MPXGPSLatitude* and *CC5MPXGPSLongitude*) can be embedded in the image or video files that the camera generates. Two PakBus variables allow the logger to send the GPS coordinates to the camera, where they are embedded in the images or video.

The GPS coordinates must be sent as floating point values. Positive latitude and longitude represent northern and eastern hemispheres, respectively. While negative values represent southern and western hemispheres, respectively. Values are not saved through a power cycle, or in OFF mode, but do not need to be updated every time an image or video is sent.
8.4.8.1.1 Example Program – Adding GPS Coordinates to Image Banner

The following example illustrates the use of the \textit{CC5MPXGPSLatitude} and \textit{CC5MPXGPSLongitude} instructions, which can be used with CR800 series, CR1000, or CR3000 dataloggers.

```plaintext
Public sendGps As Boolean
Public gpsLat, gpsLong As Float
public sendVarResult

BeginProg
sendGps = false
gpsLat = 50.0
gpsLong = -139.0
SerialOpen (Com1,115200,4,0,2000)

Scan (1,Sec,0,0)
If sendGps Then
sendGps = false
SendVariables
(sendVarResult,Com1,0,55,0000,0,"Public","CC5MPXGPSLatitude",gpsLat, 1)
SendVariables
(sendVarResult,Com1,0,55,0000,0,"Public","CC5MPXGPSLongitude",gpsLong, 1)
EndIf

NextScan
EndProg
```

8.5 Internal Jumpers

There are two sets of jumpers that are internal to the camera. One set is used to select either RS-232 or RS-485 communications on the Power and I/O cable. The other set is used to select a pull-up or a pull-down resistor on the External Trigger input line.

Refer to Section 9.2, \textit{Backplate Removal Procedures} (p. 100), for details to remove the backplate to access the internal jumpers of the camera.

8.5.1 RS-232/RS-485 Jumpers

Jumper locations are shown in FIGURE 8-39. There are three jumpers that can be moved from either the left or the right 2 x 3 jumper posts. When the jumpers are on the right 2 x 3 jumper posts, the RS-232 output is selected (Factory Default position). To change the serial output format from RS-232 to RS-485, move all three jumpers from the right to the 2 x 3 jumper posts located on the left position. Always move all three jumpers and never install additional jumpers.

The available communication interfaces can be configured with the cameras web interface or via \textit{DevConfig}. RS-232 and RS-485 interfaces can be configured to a range of baud rates between 9600 and 115200. Both interfaces support only the PakBus protocol.
8.5.2 External Trigger Pull-up/Pull-down Jumper

The jumper location for the External Pull-up/Pull-down location is shown in FIGURE 8-39. When the jumper is located on the right two pins of the header (factory default position), there is a 100 kΩ pull-down resistor connected from the External Trigger line to ground. When the jumper is placed on the left two pins of the header, there is a 47 K pull-up resistor connected from the External Trigger line to 3.3 Volts.

The pull-up resistor would be useful for having contact closures or open collector output signals trigger the camera. In the case of a contact closure, the jumper would be moved to the pull-up position and then 1 end of the contact would connect to the External Trigger signal and the other end of the contact would connect to ground. A schematic representation is shown in FIGURE 8-40.
8.6 RS-232 Communications

The RS-232 serial communications are used with the camera for two purposes: to configure and setup the camera using Device Configuration Utility software that Campbell Scientific provides; to send image files from the camera to other devices using PakBus.

Check the PakBus Port value under Communications Settings to confirm the camera has internal jumpers configured to RS-232 or RS-485 (see FIGURE 8-41).

---

FIGURE 8-41. Serial PakBus Port Setting

The CC5MPX Power and I/O port is configured by default to provide a 3-wire RS-232 connection (TX, RX, Ground). The wires can be terminated directly on the control ports of a compatible datalogger. For connection to a computer 9-pin serial port, use the DB9 Female to Terminal Block Adaptor (pn 28840), which facilitates the connection of the cable pigtail end to a computer 9-pin
serial port. The adaptor comes with the CC5MPX as an accessory. See FIGURE 8-42.

![CC5MPX Digital Camera](image)

**FIGURE 8-42. Connecting the CC5MPX to a 9-Pin RS-232 Port**

An illustration of the required RS-232 connections to a datalogger is shown in FIGURE 8-43.

![Datalogger Connections with RS-232](image)

**FIGURE 8-43. Datalogger Connections with RS-232**

### 8.7 RS-485 Communications

The optional RS-485 communication interface of the CC5MPX can be used in conjunction with the MD485 to interface a datalogger to one or more cameras. Refer to the *MD485 Manual* for additional information.
The MD485 is useful for connecting more than one camera to a datalogger or if long cable lengths are involved. If multiple cameras are connected to an MD485, then it would be beneficial to offset the capture times of the images so that only one camera is attempting to transmit a file at any given time.

The camera can download images or video via an RS-485 port using PakBus. An MD485 is required to interface the camera to a datalogger. The following items are required for RS-485 PakBus communications and can be confirmed by either the web interface of DevConfig (FIGURE 8-44):

- Confirm that the PakBus port parameter of the Communications Setting is reading RS-485.
- Set the RS-485 baud rate to match the baud rate of the device being connected to the camera.
- Set the parameter PakBus Address of Communication Settings to a unique value in the PakBus network.
- Set the parameter PakBus Destination Address of the device that the camera needs to send images to.
- Include PakBus Security Code, as required.

FIGURE 8-44. RS-485 Shown in PakBus Port Setting

8.8 PakBus® Communications

The camera uses PakBus to send image files from the camera to the datalogger or other PakBus compatible devices. The LoggerNet tool PakBus Graph can be used to change the configuration of a camera. The use of the PakBus Graph is discussed in Section 8.8.2, PakBus Graph Operations (p. 81). Refer to the LoggerNet literature or software for more details.
PakBus can also be used to control specific operational parameters, transfer variables or text between the datalogger and camera. When an image or video file is ready to be transmitted, the camera will initiate communications and send the image or video via the selected serial interface.

The CC5MPX is capable of producing video files that exceed 30 MB in size. Trying to send such a large file to a datalogger using PakBus can be problematic. For this reason, the CC5MPX is setup to not send any files using PakBus that are larger than 2 MB.

The camera is a PakBus lead node and is not capable of performing any routing. However, the CC5MPX has the ability to communicate with devices that are several hops away on the PakBus network.

8.8.1 Concurrent PakBus 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.

8.8.2 PakBus Graph Operations

The CC5MPX supports configuration via PakBus Graph over the serial port. A datalogger or other type of PakBus relay device is required to interface PakBus Graph to the camera.

8.8.2.1 Datalogger Settings

The datalogger must be configured as a router (i.e., Is Router must be set to TRUE) and the camera PakBus address must be in the list of allowed neighbours for the datalogger port used. The camera and the datalogger must be set to use the same baud rate to communicate properly.

8.8.2.2 Discovery

After starting PakBus Graph, the camera may not be visible immediately. To discover the camera, right click on the green box marked as [4094] in the graph and click Search for Neighbours. This will open the Search for Neighbours dialog box, press Start and the graph should display all the devices within the PakBus network.

8.8.2.3 Power Modes

The camera has several low power modes. The CC5MPX cannot respond to PakBus communications while the camera is in the low power mode, such as OFF or Deep Sleep. PakBus communications will wake up the camera if it is set for Partially On mode. Using the low power mode with the Ethernet power
mode set to Full Power Save will allow the camera to respond almost immediately (less than 10 seconds).

The external trigger can also be utilized to wake up the camera and enter high powered mode. As long as the external trigger is held high, the camera will remain in the high powered mode. Lowering the external trigger signal will allow the camera to enter a low powered operating mode again.

8.8.3 PakBus Variable Control

The camera is capable of receiving variables, commands, or text from a datalogger. The specific operational parameters that can be altered or controlled include:

- Still Image Banners
- Video Banners
- Camera Window Defroster
- Camera Shutdown

The use of the Send Variable instruction allows the datalogger to transfer values or text that can be used in the image or video banners. The Send Variable instruction is used to toggle the camera window defroster on/off or to safely shut the camera down.

To update the Banner information with values from a datalogger the variable is a String, and must be limited to 255 characters (including null terminator).

The camera variable names are:

- CC5MPXStillBanner1
- CC5MPXStillBanner2
- CC5MPXVideoBanner1
- CC5MPXVideoBanner2

The variable for controlling the window defroster is numeric and needs to be declared as a Long in CRBasic. The variable for controlling camera power is a Boolean, which needs to be declared in CRBasic. The names of the camera variables are:

- CC5MPXDefroster
- CC5MPXShutdown

8.8.3.1 PakBus Control of Window Defroster Function

PakBus will temporarily (one shot) override the existing window defroster control state. Users are advised to only use one type of control to avoid unexpected operation of the defroster. Options include the Automatic mode set via the web page or DevConfig, or PakBus SendVariables command.

To turn on the defroster, the numeric value should be set to a non-zero value (i.e., 1). To turn the defroster off, the value should be set to zero. When a non-zero value is sent to the camera, the heater will turn on and a 65 second countdown timer will start. After 65 seconds, the defroster will automatically turn off (this should override settings already in place). If an additional non-zero is sent before the defroster is turned off, then the timer will be reset to zero and will begin the countdown again.
The defroster commands should be sent to the camera every 60 seconds or more to ensure continuous operation.

The defroster will be allowed to turn on only once for 65 seconds at internal temperatures between 25 and 50 °C. This flag will only be reset again once the internal temperature drops below 25 °C, or the camera is reset. Full, continuous operation is only allowed at temperatures of 25 °C or less. At internal temperatures above 50 °C, the defroster will not turn on.

8.8.3.2 PakBus Control of CC5MPX Power

The ability to shut down the camera safely using a PakBus command is available in the CC5MPX. By writing a value of 1 (or any value not equaling zero) to the public Boolean variable CC5MPXShutdown, the camera initiates a shutdown. The shutdown process can take up to 30 seconds. The camera will turn back on after 10 minutes, or can be externally triggered.

Following is an example of the CRBasic command that will shut down a camera with PakBus address 55:

SendVariables (SendVarResult,Com1,0,55,0000,400, “Public”, “CC5MPXShutdown”,1,1)

8.8.3.3 Example Program – SendVariable Instruction

The following example illustrates the use of the SendVariable instruction to alter Still Image Banner #2, as well as toggle the camera window defroster.

CRBasic Example 8.2. SendVariable Instruction

`'*CR1000 Series Datalogger`

`'Declare Public Variables`
Public PTemp, batt_volt
Public TurnDefrosterOn As Boolean
Public TurnDefrosterVal As Long
Public SendVarResult As Long
Public BannerString As String * 60
Public tempstring As String * 60

`'Define Data Tables`
Data(Test,1,-1)
DataInterval (0,60,Sec,10)
Minimum (1,batt_volt,FP2,0,False)
Sample (1,PTemp,FP2)
EndTable

`'Main Program`
BeginProg
SerialOpen (Com1,115200,4,0,2000)
Scan (10,Sec,0,0)
PanelTemp (PTemp,250)
Battery (batt_volt)

`'Enter other measurement instructions`
tempstring = FormatFloat(PTemp,"%2.2f")
BannerString = "Panel Temp " + tempstring

   If TimeIntoInterval (0,5,Min) Then
       SendVariables (SendVarResult,Com1,0,55,0000,400,"Public","CC5MPXStillBanner2",BannerString,1)
   EndIf
If TurnDefrosterOn = true Then
    TurnDefrosterVal = 1
    SendVariables
        (SendVarResult,Com1,0,55,0000,200,"Public","CC5MPXDefroster",TurnDefrosterVal,1)
EndIf
CallTest
NextScan
EndProg

8.8.4 PakBus Neighbouring Address

The PakBus protocol allows devices to relay data in a network. The CC5MPX
now has the ability to communicate with devices that are several hops away on
the PakBus network. To configure this new feature, a setting has been added to
the PakBus configuration screen on the web page.

Entering the address of the PakBus device physically connected to the
CC5MPX PakBus communication lines, allows the neighbour to relay
communication between the CC5MPX and the final destination for data. Leave
PakBus set to zero (0) if device is directly connected to the final destination.

8.9 Device Configuration Utility

DevConfig can be used to change settings in the CC5MPX. DevConfig
software can be downloaded at no charge from the Campbell Scientific
website.

Using DevConfig:

- Connect the camera to the serial port of a PC using the DB9
  FEMALE to Terminal Block Adaptor, as shown in Section 8.6, RS-
  232 Communications (p. 78).

- Once the camera is powered up (this can typically take 90 seconds),
  the LED must begin to flash. If the LED does not flash, press the
  Setup button to exit the camera from a low powered mode.

- Select the CC5MPX from the device list (see FIGURE 8-45) and
  connect to the camera.

- Normally the camera is set to 115200 baud. If the camera’s baud rate
  is set to a different baud rate, select the appropriate value in the
  Device Configuration drop-down list.

- Once connected to the CC5MPX, use the tabs (see FIGURE 8-46) to
  navigate and configure the camera.
CC5MPX

The CC5MPX is an environmentally rugged camera that can capture images and video, and can make use of the PakBus protocol to store its images in PakBus dataloggers. In addition to on-board storage the camera can also make use of standard networking protocols to FTP or Email captured files.

In order to connect to the CC5MPX, you must connect the RS-232 serial TV, DC and Ground lines to a 9-pin connector to communicate with your computer's serial port (refer to the Manual for details). Choose the correct serial port in the panel to the left. The CC5MPX is set to 115200 BAUD as a factory default. You may have to use a different BAUD rate if this was changed. The camera should be powered up and the LED flashing. Press the button to wake the camera up if it is in a low powered mode. If the LED is on but not flashing it may be booting up and this can take a few minutes. Finally, press the Connect button at left to establish communications.

FIGURE 8-45. CC5MPX Device Configuration Option

FIGURE 8-46. Device Configuration Utility Screen
8.10 Image Quality

Lighting conditions have the greatest influence on image quality. The CC5MPX camera produces the best images under normal daylight conditions. Pictures taken in good daylight conditions produce crisper and brighter images, as the camera uses the entire image to adjust the exposure settings of a scene.

Scenes that contain small variations in light intensities will produce better exposed images. In scenes with high variations in light intensities, such as a bright sky or a dark horizon, the image may contain portions that are under-exposed and portions that are over-exposed, as with most cameras. The CC5MPX utilizes various techniques to produce an overall good picture under most lighting conditions.

8.10.1 Night Time Images

In general, the camera does not produce good images at night. If lighting is present, such as street lights, then distinguishable pictures can be taken.

8.11 Lens

The standard and zoom lenses for the CC5MPX contain the following features:

- C-Type Mount
- Varifocal (manual zoom)
- Manual Focus
- DC Iris

Access to the lens for adjusting the zoom and focus requires the removal of the CC5MPX lens tube (see FIGURE 8-47). The lens tube is threaded on and needs to be turned counter clockwise to be removed.

The zoom and focus adjustments are shown in FIGURE 8-48. The thumbscrews may need to be loosened prior to moving the adjustments. It is important to tighten the thumb screws once the camera focus and zoom adjustments are completed, to avoid problems from vibration.

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.
8.11.1 Camera Lens and Field of View

The CC5MPX includes a 4-12 mm lens, which provides an approximate 27° horizontal field of view when fully zoomed in, and an 80° horizontal field of view when fully zoomed out.

The CC5MPX-Z camera includes a 10-40 mm lens, which provides an approximate 9° horizontal field of view when fully zoomed in, and a 35° horizontal field of view when fully zoomed out.

See FIGURE 8-49 for a visual representation of the field of view.
8.11.2 Focus and Zoom Adjustment

To facilitate the focus and zoom adjustment, a network connection will need to be established with the camera to view the live video on a web browser.

Refer to Section 4, QuickStart (p. 2), and Section 8.4, Camera Operation using Web Browser Interface (p. 25), for details on accessing the camera with a web browser.

If the LED is not flashing while the camera is wired up and the power is turned on, it may be necessary to press the Setup button to wake the camera from any of its low powered modes. In some configurations, pressing the Setup button may also be required to enable the Ethernet port.
Establish a connection to the camera by typing the address of the camera into the web browser (Factory Default IP address is 192.168.1.90). The homepage of the camera should appear once the address is entered.

To view the video, select an appropriate Video Display Size. With a direct connection, the best results are obtained by displaying the larger 1280 x 720 video. The smaller video display sizes are useful when working with the bandwidth limited connections.

- Loosen the two thumb screws on the adjustment rings of the lens. It is generally preferred to adjust the zoom (i.e. frame the scene), 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 tighten its thumbscrew as well.

**NOTE**

If the camera is targeted on an object that is far away (100 m or more), 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.

**8.11.2.1 Using the Focusing Number**

The main purpose of the focusing number is to facilitate focusing the camera when using a display in outdoor sunlight. The sunlight can make it difficult to distinguish fine detail on a computer screen.

The focusing number is displayed on the homepage of the web interface to assist with focusing the CC5MPX camera (see FIGURE 8-51). The focusing number is a number that generally increases as an images becomes more “in-focus.”

The lens should be adjusted so that the focusing number reads near its maximum achievable value. The numbers are relative and are dependent on the actual scene, so a value of 9000 may be in focus for one scene and a value of 2700 may be the maximum for another scene. The numbers are most useful when the lens is near its best focus position.

The camera should be in a fixed position when using the focusing numbers. If the camera is allowed to move, then movement will account for increasing or decreasing numbers.

There may be instances where the focusing numbers cannot be used to focus the CC5MPX. One such scene may be where a nearby object is desired to be in focus, and the background may be out of focus. However, for most “scene” images where near and far objects are not involved, the focusing numbers work well.
8.11.3 Temperature Variations and Focus

The CC5MPX 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 35 °C, the lens may be slightly out of focus at –40 °C. The change in focus will be less noticeable if the focus is adjusted closer to the camera’s operating temperature.

8.11.4 Lens IR Cut Filter

The CC5MPX is internally equipped with an IR cut filter. The filter is required to filter out near infrared light that can have an undesirable effect on the images.

8.12 Power Calculations and Timings

The CC5MPX was specifically designed for operation in power-constrained systems such as solar powered sites. It is critical in such systems that the camera be properly configured to meet the constraints of the intended application. This section outlines the power consumption of the camera for purposes of power supply design for a system.

8.12.1 Standalone Operation

In standalone mode, the camera operates as a self-contained image and video logger. Files will be stored onto the internal SD memory card.
The current draw of the camera is mainly dictated by the quiescent current draw of the power mode, plus the current draw when the camera enters the Fully On power mode (active current draw) to acquire an image or video. TABLE 8-16 shows some total power consumption (standalone) figures in ampere hours (A hr) per day depending on the power mode and frequency of images.

One thing to note is that the OFF state will only consume less power than the Deep Sleep state if fewer than 24 pictures are taken per day. This is due to the boot-up time that the camera requires when exiting the OFF state. The extra boot-up time means that the camera consumes the active current for a longer time (120 seconds).

### TABLE 8-16. Power Consumption (Standalone)

<table>
<thead>
<tr>
<th>Power Mode</th>
<th>Ethernet Power Save Mode</th>
<th>Quiescent Current Draw Max. @ 12 Vdc</th>
<th>Active Current Draw Max. @ 12 Vdc Active Duration</th>
<th>Ampere Hour Per Day 2 JPG/Hr</th>
<th>Ampere Hour Per Day 1 JPG/Hr</th>
<th>Ampere Hour Per Day 1 JPG/Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully On</td>
<td>Always On</td>
<td>250 mA</td>
<td>0 Sec/JPG</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>200 mA</td>
<td>0 Sec/JPG</td>
<td>4.8</td>
<td>4.8</td>
<td>4.8</td>
</tr>
<tr>
<td>Partially On</td>
<td>Always On</td>
<td>80 mA</td>
<td>250 mA 0 Sec/JPG</td>
<td>1.92</td>
<td>1.94</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>10 mA</td>
<td>200 mA 0 Sec/JPG</td>
<td>0.24</td>
<td>0.27</td>
<td>0.54</td>
</tr>
<tr>
<td>Deep Sleep</td>
<td>Always On</td>
<td>6 mA</td>
<td>250 mA 0 Sec/JPG</td>
<td>0.15</td>
<td>0.18</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>6 mA</td>
<td>200 mA 0 Sec/JPG</td>
<td>0.15</td>
<td>0.18</td>
<td>0.53</td>
</tr>
<tr>
<td>OFF</td>
<td>Always On</td>
<td>1 mA</td>
<td>250 mA 0 Sec/JPG</td>
<td>0.041</td>
<td>0.22</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>1 mA</td>
<td>200 mA 0 Sec/JPG</td>
<td>0.037</td>
<td>0.18</td>
<td>1.93</td>
</tr>
</tbody>
</table>

#### 8.12.2 Operation with Communications

The power calculations are more complicated when communications are involved, as the amount of time the camera is Fully On state is increased by the amount of time it takes for the camera to transfer an image or video.

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 consumes the Fully On current draw needs to be accounted for in the power calculation. Refer to TABLE 8-17 as a guideline for
determining the amount of time it takes to transfer files using RS-232 or RS-485 PakBus communications.

<table>
<thead>
<tr>
<th>Communication Baud Rate</th>
<th>Time (seconds) per 100 kB</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600</td>
<td>240 seconds 0.0123 A hr</td>
</tr>
<tr>
<td>19200</td>
<td>120 seconds 0.0076 A hr</td>
</tr>
<tr>
<td>38400</td>
<td>60 seconds 0.0054 A hr</td>
</tr>
<tr>
<td>57600</td>
<td>40 seconds 0.0044 A hr</td>
</tr>
<tr>
<td>115200</td>
<td>30 seconds 0.0038 A hr</td>
</tr>
</tbody>
</table>

To estimate the power consumption of the system, look up the parameters in TABLE 8-16, along with the communication times to calculate the power consumption as follows:

- Determine the Active Time in minutes:

  \[
  \text{Active Minutes} = \text{Number of pictures per day} \times (\text{Active Duration} + \text{Communication Time}) / 60
  \]

  For a camera in the Deep Sleep state sending 24 images per day at 115200 baud that are 100 kB in size:

  \[
  \text{Active Minutes} = 24 \times (25 \text{ seconds} + 30 \text{ seconds}) / 60 = 22 \text{ minutes/day of Active Time}
  \]

- Determine the total time in Quiescent Low Powered State

  \[
  \text{Quiescent Minutes} = 1440 \text{ minutes per day} - \text{Active Minutes}
  \]

  \[
  \text{Quiescent Minutes} = 1440 - 22 = 1418 \text{ minutes}
  \]

- Determine the power consumed by the Quiescent state in ampere hours.

  \[
  \text{Quiescent Power} = \text{Quiescent Minutes} \times \text{Quiescent Current Draw} / 60
  \]

  \[
  \text{Quiescent Power} = 1418 \text{ minutes} \times 6 \text{ mA} / 60 = 141.8 \text{ mA hr or 0.1418 A hr/Day}
  \]

- Determine the power consumed by the active state in ampere hours.

  \[
  \text{Active Power} = \text{Active minutes} \times \text{Active Current Draw} / 60
  \]

  \[
  \text{Active Power} = 22 \text{ minutes} \times 250 \text{ mA} / 60 = 91.67 \text{ mA hr or 0.0917 A hr/Day}
  \]
Total power consumption is the sum of the Active and Quiescent Power

\[
\text{Total Power} = \text{Quiescent Power} + \text{Active Power}
\]

\[
\text{Total Power} = 0.1418 \text{ A/hr/Day} + 0.0917 \text{ A/hr/Day}
\]

\[
\text{Total Power} = 0.2335 \text{ A/hr/Day}
\]

8.13 CR1000 Interface Guide

The CC5MPX can interface to the CR1000 using the RS-232 (default) or RS-485. The RS-232 configuration is the simplest option as it does not require an additional hardware interface. The pigtail end of the CC5MPX Power and I/O Cable can be terminated directly to the CR1000 wiring panel control ports (COM1-4). Refer to Section 8.6, RS-232 Communications (p. 78), for wiring details.

The CC5MPX RS-485 interface can also be used, but does require the use of an MD485 interface to provide conversion of the RS-485 signal. The MD485 can connect to the CR1000 using the CS I/O port or the RS-232 port. Refer to the MD485 manual for additional information.

8.13.1 CR1000 Memory Setup

To facilitate the storage of images, a CFM100 allows the use of a CompactFlash® 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 approximately 1048 kB, which is 25% of the 4 M bytes available on a standard CR1000.

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

- DevConfig
- PakBus Graph
- Editing the parameter from the Status Table
- CR1000 optional keypad and display

NOTE

The CC5MPX will not send any files using the PakBus that are greater than 2 MB.

8.13.2 CR1000 Files Manager

The Files Manager setting on the CR1000 facilitates the management of JPEG and AVI 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 Files Manager setting is changed using the Device Configuration Utility. Choose the Deployment Tab, and then select the Advanced tab.
Scroll down to the **Files Manager** section. Enter in the camera’s PakBus address.

Enter in a filename, including the file extension (jpg or avi). To save the files on the user drive or a memory card, type USR: or CRD: in front of the filename.

Enter the number of files to be retained at one time in the **Count** field.

The example shown here will collect images from a camera with a PakBus address of 55. The images will be saved in the USR directory with a filename of SkySouth####.JPG where #### is an incrementing number (entering a zero for this parameter will disable the automatic numbering and produce a fixed filename). The three most recent images will be kept. The oldest image will be deleted each time a new image is saved from the camera.

### 8.13.3 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 four **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 `DevConfig` or by using the **SerialOpen** instruction in the CR1000 program.

The following **SerialOpen** instruction configures **COM2** port:

- Baud rate – 115200
- SerialOpenFormat – 4
- Transmit delay – 0
- Buffer size – 1000
- `SerialOpen(Com2,115200,4,0,1000)`

### 8.14 Remote Image Retrieval

Once the camera has transferred an image or video to a datalogger, existing `LoggerNet` communications can be used to retrieve images and video remotely from the datalogger memory.

There are also permanent links available in the CC5MPX web server to download the most recently captured images or video files that have been saved to the SD card. Refer to Section 8.2.4.1, *Link for Most Recent Image and Video* (p. 22), for details.

#### 8.14.1 LoggerNet File Retrieval

`LoggerNet` (version 4.0 or newer) includes the *File Retrieval* setup (FIGURE 8-52) that facilitates the image and video file retrieval from PakBus dataloggers (CR800 series, CR1000, and CR3000). The *File Retrieval* tab is located in the *Setup* Screen as part of the datalogger configuration. Once configured, the *File Retrieval* software is used to retrieve images and video from a datalogger.

![Setup Screen](image)

**FIGURE 8-52. File Retrieval Setup Screen**

Select the required *Retrieval Mode* for the application. The use of the *Follow Scheduled Data Collection* option will use the scheduled configuration in the *Schedule* Tab. If the *New Schedule* option is selected, the Base Date and Time, and Retrieval Interval parameters will need to be configured.
It is possible to configure the *File Retrieval* to delete files once retrieved from the datalogger. If datalogger memory capacity is a concern, it is recommended to use this feature.

To add a file retrieval process, start by clicking **Add New** under **File Pattern**. Once added, the **Edit File Pattern**, **Output Directory**, and **Max Files** parameter become available to fill out. Each **File Pattern** added will need to be individually configured.

Under the **Edit File Pattern** parameter, select from the directory location options, in order to specify the image or video to be retrieved. By default, the jpg and avi names are a wild card (*), which means all jpg or avi files in the specified directory will be retrieved. If specific filenames are used in the camera configuration, specify these names in the **Edit File Pattern** parameter. It is possible to configure multiple **File Patterns** to collect images or video on different schedules or from multiple directories.

**NOTE**

If the version of *LoggerNet File Retrieval* does not list the avi files as an option under **Edit File Pattern**, it is possible to force the filename and format by typing the filename or suffix into the **Edit File Pattern** parameter.

The default Output Directory is C:\Campbellsci\LoggerNet. If required, change this by browsing to the preferred location. The **Max Files** parameter specifies the maximum number of files that can be retrieved during each scheduled event. The newest files will be retrieved.

When the **Force Retrieval** box is selected, a file that matches the file pattern will be retrieved regardless of the file’s timestamp or whether the file has already been retrieved. When the **Record If Skipped** box is selected, the names and dates of any files that are not retrieved because of the **Max Files** parameter will be recorded and they will not be retrieved later. If this box is not selected, the skipped files can be retrieved in a later attempt.

### 8.14.2 Using *LoggerNet File Control*

Images or video that are in the dataloggers memory can be viewed or collected on demand by using the **File Control** feature that is available from the *Connection Screen* menu (FIGURE 8-53). The use of **File Control** requires a communications connection to the datalogger. Using the **File Control** can also be useful for debugging purposes.
FIGURE 8-53. LoggerNet Connection Screen

In dataloggers such as the CR1000, the device map can include the CPU, USR, and the CRD (CompactFlash® 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 (FIGURE 8-54). Use the retrieve button to download the image from the datalogger.

FIGURE 8-54. USR Drive View in File Control
9. Maintenance

9.1 Maintenance

The CC5MPX requires little maintenance and no calibrations. Keeping the camera clean is important for the longevity of the camera and image and video quality.

9.1.1 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 10 years. It is recommended that the battery be replaced by a certified repair facility.

9.1.2 Window and Lens Cleaning

If the enclosure window or lens requires cleaning, it is very important that only a proper lens cloth or lens tissue be used. The use of inappropriate materials to clean the lens or window can permanently damage the surface and reduce the clarity.

9.1.3 CC5MPX O-Rings

There are three O-rings that should be inspected on the camera. If any of the O-rings look cracked or damaged, they require replacement. The locations of the three O-rings are shown in FIGURES 9-1 to 9-3.

FIGURE 9-1. Backplate O-ring
It is recommended that the O-rings be inspected whenever opened, or at a minimum every two years (with desiccant replacement) to ensure that the seal integrity is maintained. Contact Campbell Scientific for details on replacement parts.

NOTE

The Button Cap O-ring and the Front Main Body O-ring are both glued into place to prevent the O-rings from inadvertently falling out. Do not attempt to remove these O-rings unless they are being replaced.

9.1.4 CC5MPX Desiccant

The CC5MPX contains three small desiccant packets inside the camera. If the camera is frequently opened (i.e., backplate of lens tube removed), the desiccant packets of the camera should be replaced annually. Otherwise, the
Desiccant packets should be replaced every two years as preventative maintenance.

The desiccant that is supplied with the camera is an indicating type of desiccant. There is a small viewing window on the packet that shows the color of the desiccant. If the desiccant is blue, it is good. If the desiccant is pink, it is saturated with moisture.

The desiccant packets are located under the PCB on the bottom of the camera (see FIGURE 9-4). Needle nose pliers will be useful in helping remove and reinsert the three desiccant packets.

FIGURE 9-4. Desiccant Location

9.2 Backplate Removal Procedures

It is necessary to remove the backplate for the following reasons:

- Access to the SD memory card
- Change internal jumper positions
- Replace desiccant
- Inspect O-rings

If the camera is powered up and operating (LED flashing), properly shut down the camera by holding down the Setup button for more than 10 seconds continuously. Alternatively, the Shutdown button can be used from the Live Video homepage of the camera. Once the LED stops flashing, remove the CC5MPX from any power supply and disconnect any attached cabling.

To remove the backplate, start by removing the six Philips screws located along the perimeter of the backplate (see FIGURE 9-5). Note that there are two
washers included with protective cover chains of the bottom cap and the RJ45 cap.

After the screws are removed, gently pull the backplate out. The backplate will still be attached to the camera with the wires. Do no remove the wires. Pivot the backplate to the left side of the camera. The inside of the camera is now accessible.

When replacing the backplate, ensure that the O-ring is still seated properly on the backplate (see FIGURE 9-1, Backplate O-ring (p. 98)). This is very important as the O-ring is required to properly seal the camera.

The backplate can only be seated in the orientation that aligns the flat surfaces of the backplate and the bottom of the camera body. This will also help align the screw holes. The six screws can now be threaded and hand tightened. Be sure the two plastic washers are located between the tether chains and the backplate.

FIGURE 9-5. Backplate View

10. Miscellaneous Notes

10.1 Internal USB Function

The internal USB port in the camera currently only has one function. It provides a backdoor for setting up the network interface on the camera. When first connected to a PC the following window will appear:
FIGURE 10-1. USB Network Interface

Select Open folder to view files using Windows Explorer.

The following will be the viewable files:

FIGURE 10-2. CC5MPX USB Directory
Run the `usbconf.exe`.

**USB Configuration v1.03**

<table>
<thead>
<tr>
<th>Title</th>
<th>Campbell Scientific(00:50:52:24:11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address</td>
<td>191 172 198</td>
</tr>
<tr>
<td>Gateway</td>
<td>201 191 172</td>
</tr>
<tr>
<td>HTTP Port</td>
<td>00</td>
</tr>
</tbody>
</table>

**DHCP**

<table>
<thead>
<tr>
<th>Netmask</th>
<th>DNS Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>255 255 255 255</td>
<td>205 230 109 39</td>
</tr>
</tbody>
</table>

**FIGURE 10-3. Network Configurations**

At this point, confirm or edit the IP address settings. If changes are made, the **Apply** button must be selected followed by **Exit**. **Do not unplug the USB cable or shut down the camera at this point.** The USB device must be safely removed before unplugging the cable or shutting down the camera, otherwise the changes will be lost.

### 10.2 Quick Notes

#### 10.2.1 CC5MPX General

- The LED will flash or be on when the camera is in an Active Power state.
- When the LED is steadily on, the camera is booting up. Avoid interrupting this process.
- Briefly pressing the **Setup** button will always cause the camera to exit from any low powered quiescent states and enable the Ethernet interface for communications. The camera will remain in this state for 5 minutes.
- An active session to the camera with a web browser will prevent the camera from entering a low powered state.
- Avoid removing power from the camera when it is in an active state. If the camera is in an active state (LED is flashing), properly shut down the camera to avoid any memory card corruption before removing power. The camera can be shut down by pressing the **Setup** button continuously for more than 10 seconds or by using the **Shutdown** button on the web interface.
- The SD memory card must be formatted to FAT32.
- If a memory card is removed from the CC5MPX to read or download its contents, do not delete or add files manually. If files need to be deleted, it is recommended to reformat the entire card (using FAT32) or to use the CC5MPX web interface to delete them.
- Verify that the lens cable is properly seated, as the connector may inadvertently become unplugged during handling or installation.
• Always ensure that the cable connectors, the covers, and the lens tube are securely in place.

• Record any changes to the IP settings of the camera. This information is important to gain access to the camera for focusing or reconfiguration.

• The camera configuration file can be saved or loaded via the web interface. This feature can be found under the System and Image Capture tabs.

• Check the Campbell Scientific website for firmware updates that may apply.

10.2.2 Campbell Dataloggers Users

• If interfacing to a datalogger, ensure that the datalogger has the appropriate PakBus® operating system.

• Use either the CC5MPX built in web interface, DevConfig or PakBus Graph to change settings in the camera.

• Use DevConfig to change settings in MD485 or other PakBus devices.

• DevConfig can also be used to set the datalogger memory and PakBus parameters.

• Files must be less than 2 MB for PakBus transmissions.

• The datalogger instruction SendVariable can be used to send variables or text to the camera, for use in image or video banners. The instruction can also be used to control the window defroster.

10.2.3 Configuration Process

1. Determine what will trigger the capture of an image or video. Options are:
   a. Time – Enable and configure Self Timed Capture 1, Self Timed Capture 2, or both.
   b. External Signal – Enable and configure the External Trigger Capture.
   c. Motion Detect – Enable and configure Motion Detect Capture.

2. Select the power mode that best suits the specific requirements (see TABLE 10-1). Options are:
   a. Fully On – Used if no power constraints exist or if high performance is required.
   b. Partially On – Provides substantial reduction in power (especially with the Ethernet power mode set to Full Power Save).
   c. Deep Sleep – Provides very good power savings. The camera does not need to reboot when activated by a trigger. Recommended to use if more than 24 triggers are expected per day.
d. OFF – Offers the best power savings mode. Useful if less than 24 images or video captures are required per day. It takes about 90 seconds for the camera to wake up to start acquiring a picture.

<table>
<thead>
<tr>
<th>Power Mode</th>
<th>Ethernet Power Save Mode</th>
<th>Quiescent Current Draw Max. @ 12 Vdc</th>
<th>Time (seconds) from wakeup to start of capture</th>
<th>Time (seconds) in Fully On Mode (Active Current Draw)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully On</td>
<td>Always On</td>
<td>250 mA</td>
<td>&lt; 1</td>
<td>0 – Always Active</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>200 mA</td>
<td>&lt; 1</td>
<td>0 – Always Active</td>
</tr>
<tr>
<td>Partially On</td>
<td>Always On</td>
<td>80 mA</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>10 mA</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Deep Sleep</td>
<td>Always On</td>
<td>6 mA</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>6 mA</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>OFF</td>
<td>Always On</td>
<td>1 mA</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Full Power Save</td>
<td>1 mA</td>
<td>90</td>
<td>120</td>
</tr>
</tbody>
</table>

3. Set the details of the still image or video:
   a. Set the still image settings
   b. Set the video settings

4. Set other details related to Communications and I/O. These other parameters are located under:
   a. Network
   b. System
   c. Communications
Appendix A. CC5MPX Series Cameras and Accessories

A.1 CC5MPXWD

Ordering part numbers:
1. CC5MPXWD

Details:
• CC5MPX with window defroster

A.2 CC5MPXFE

Ordering part numbers:
1. CC5MPXFE (by special order only)

Details:
• Lens has 1.4 – 3.1 mm focal length
• Lens has 94° to 185° field of view

A.3 Window Defroster

Camera models are available with a factory installed window defroster option. The window defroster is useful in preventing and removing light frost and icing from the camera window. See Appendix B, Window Defroster Option Specifications (p. B-1), for further details.

Order:
1. CC5MPXWD

Details:
• Factory install only

A.4 Power and I/O Cable

Two Power and I/O Cable options are available. The choice between the cable options is dependent on the addition of either window defroster. If the application calls for the use of the window defroster, the CC5MPXCB1-L Power and I/O Cable (130 ft maximum length) is recommended.

Ordering part numbers:
1. CC5MPXCB1-L (-L is length in feet)

Details:
• 24-AWG 3-pair individually shielded cable with Santoprene® jacket
• 6-pin environmental connector
• Maximum length 30 m (100 ft)
• Includes three single pole 16-20AWG grey push operated connector terminals for unused wires
A.5 Environmental Ethernet Cable

Ordering part numbers:
1. CC5MPXCBL2-L (-L is length in feet)

Details:
- 26-AWG 4 Pair (8 conductor) shielded CAT5E cable with polyurethane jacket
- RJ45 environmental connector on one end and regular RJ45 connector on the other end
- Maximum length 70 m (230 ft)
A.6 18549 Mounting Kit

Details:
- Mounting kit with U-bolt and fasteners

![18549 Mounting Kit](image)

*FIGURE A-3. 18549 Mounting Kit*

The 18549 can be mounted to a pipe up to 1.5 in. O.D.

A.7 DB9 FEMALE To Terminal Block Adaptor

Details:
- Adaptor 9-pin female RS-232 to screw terminal block

![DB9 FEMALE To Terminal Block Adaptor](image)

*FIGURE A-4. DB9 FEMALE To Terminal Block Adaptor*
A.8 4091 Desiccant

Details:
- Silica gel indicating desiccant, 2 gram MiniPax (3 per camera)

FIGURE A-5. 4091 Desiccant
Appendix B. Window Defroster Option Specifications

B.1 Power Supply

The CC5MPX is specified to operate on a 9 to 30 Vdc supply input range. When the window defroster is installed, the 30 Vdc maximum must be reduced to 16 Vdc. Operating the CC5MPX with window defroster at voltages greater than 16 Vdc can cause damage to the CC5MPX.

- Operating voltage: 9 – 16 Vdc
- CC5MPX Current Consumption with Defroster On:
  - 1.2 Amps Max. @ 16 Vdc
  - 1.0 Amps typical on 12 Vdc systems

B.2 Description

The window defroster consists of an aluminum ring with a resistive type heating element (see FIGURE B-1). The CC5MPX can be programmed to turn on power to the heater based on the internal temperature reading of the camera. The on duration can also be set on the CC5MPX camera. Refer to Section 8.8.3, PakBus Variable Control (p. 82), for details on datalogger control of the window defroster via PakBus®.

The heating element is nominally 18 ohms in resistance. The current draw will vary with the allowable input voltage range of 9 to 16 Vdc. The current draw from the CC5MPX and heater combined is 1.2 Amps max at 16 Vdc and is typically 1.0 Amps on a nominal 12 Vdc system.

The window defroster is useful in preventing and removing light frost and icing from the camera window. With extreme icing or riming conditions and low temperatures, the window defroster may not be able to clear the window due to power constraints of the defroster.

Springs are used to press the window defroster against the window. It is normal for the window defroster to leave marks on the window. These marks are outside of the camera’s viewing angle (see FIGURE B-2).
Appendix B. Window Defroster Option Specifications (Parts C2670 or C2681)

FIGURE B-1. CC5MPX Window Defroster

FIGURE B-2. Window Defroster with Lens Tube Installed
# Campbell Scientific Companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>City, Province</th>
<th>Country</th>
<th>Website</th>
<th>Email Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell Scientific, Inc.</td>
<td>815 West 1800 North</td>
<td>Logan</td>
<td>United States</td>
<td><a href="http://www.campbellsci.com">www.campbellsci.com</a></td>
<td><a href="mailto:info@campbellsci.com">info@campbellsci.com</a></td>
</tr>
<tr>
<td>Campbell Scientific Canada Corp.</td>
<td>14532 – 131 Avenue NW</td>
<td>Edmonton</td>
<td>Canada</td>
<td><a href="http://www.campbellsci.ca">www.campbellsci.ca</a></td>
<td><a href="mailto:dataloggers@campbellsci.ca">dataloggers@campbellsci.ca</a></td>
</tr>
<tr>
<td>Campbell Scientific Africa Pty. Ltd.</td>
<td>PO Box 2450</td>
<td>Somerset West</td>
<td>South Africa</td>
<td><a href="http://www.campbellsci.co.za">www.campbellsci.co.za</a></td>
<td><a href="mailto:cleroux@csafrica.co.za">cleroux@csafrica.co.za</a></td>
</tr>
<tr>
<td>Campbell Scientific Centro Caribe S.A.</td>
<td>300 N Cementerio, Edificio Breller</td>
<td>Santo Domingo</td>
<td>Costa Rica</td>
<td><a href="http://www.campbellsci.cc">www.campbellsci.cc</a></td>
<td><a href="mailto:info@campbellsci.cc">info@campbellsci.cc</a></td>
</tr>
<tr>
<td>Campbell Scientific Southeast Asia Co., Ltd.</td>
<td>877/22 Nirvana@Work, Rama 9 Road</td>
<td>Suan Luang</td>
<td>Thailand</td>
<td><a href="http://www.campbellsci.asia">www.campbellsci.asia</a></td>
<td><a href="mailto:info@campbellsci.asia">info@campbellsci.asia</a></td>
</tr>
<tr>
<td>Campbell Scientific Australia Pty. Ltd.</td>
<td>PO Box 8108</td>
<td>Garbutt</td>
<td>Australia</td>
<td><a href="http://www.campbellsci.com.au">www.campbellsci.com.au</a></td>
<td><a href="mailto:info@campbellsci.com.au">info@campbellsci.com.au</a></td>
</tr>
<tr>
<td>Campbell Scientific (Beijing) Co., Ltd.</td>
<td>8B16, Floor 8 Tower B, Hanwei Plaza</td>
<td>Chaoyang</td>
<td>China</td>
<td><a href="http://www.campbellsci.com">www.campbellsci.com</a></td>
<td><a href="mailto:info@campbellsci.com.cn">info@campbellsci.com.cn</a></td>
</tr>
<tr>
<td>Campbell Scientific Ltd.</td>
<td>3 Avenue de la Division Leclere</td>
<td>92160 Antony</td>
<td>France</td>
<td><a href="http://www.campbellsci.fr">www.campbellsci.fr</a></td>
<td><a href="mailto:info@campbellsci.fr">info@campbellsci.fr</a></td>
</tr>
<tr>
<td>Campbell Scientific Ltd.</td>
<td>Fahrenheitstraße 13</td>
<td>28359 Bremen</td>
<td>Germany</td>
<td><a href="http://www.campbellsci.de">www.campbellsci.de</a></td>
<td><a href="mailto:info@campbellsci.de">info@campbellsci.de</a></td>
</tr>
<tr>
<td>Campbell Scientific Spain, S. L.</td>
<td>Avda. Pompeu Fabra 7-9, local 1</td>
<td>08024 Barcelona</td>
<td>Spain</td>
<td><a href="http://www.campbellsci.es">www.campbellsci.es</a></td>
<td><a href="mailto:info@campbellsci.es">info@campbellsci.es</a></td>
</tr>
</tbody>
</table>

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