Miro C211
USER MANUAL

When it's too fast to see, and too important not to.®

PHANTOM®

ViSiON RESEARCH / AMETEK®

PHANTOM ®

The contents of this manual are subject
to change without notification.

PHANTOMHIGHSPEE

Miro C211
User Manual

CONTENTS

D . C O M

Miro C211

The Phantom® Miro® C211 is a member of the Miro C-Series family of small, flexible cameras designed for a large variety of applications and analyses. The C211 is designed for Ease-of-Use. It is small, sturdy, uses a variety of inexpensive C-mount lenses, and connects with standard Ethernet and BNC cables.

The c-mount also easily connects to microscopes, has small, densely packed pixels to capture detail, and reaches 1,800 frames per second (fps) at full 1.3 Mpx resolution (1280 x 1024), and over 2,500 fps at 720p HD;

The Miro C211's small form factor, small pixels, and high frame rates make it perfect for applications including:

- Microscopy

- Mechanical analysis

- Basic science studies

- Sports analysis

CAMERA CONTROL

Phantom cameras come with PCC software for Ethernet-based setup and control.

IMAGE STORAGE

The Miro C211 has either 8GB or 16GB of internal memory and a standard 240GB internal, non-removable CineFlash. The CineFlash allows users to quickly store a number of experiments or shots before downloading to a PC.

IMAGE MONITORING & VIDEO OUTPUTS

The C211 has HD-SDI output from the BNC port on the back of the camera. A video monitor or view finder can be connected to the BNC to view the image at the camera. Standard video rates up to 1080 p.30 are supported.

ADDITIONAL FEATURES

Set new CSR default: Set a CSR in PCC with customer-selected settings. If settings are not changed, the camera may be powered off and on and the CSR will remain active. Cameras must be set in full resolution.

Programmable I/O: Assign and define signal parameters for each programmable I/O port. Available signals include: Strobe, Ready, F-Sync, Pre-Trigger, Event, Memory Gate and several core signals. See Programmable I/O section for more detail.

Data Acquisition: External sensor data imported through a compatible National Instruments DAQ model can be embedded in Cine files sand visualized in PCC along with the high-speed images.

Image-Based Auto-Trigger (IBAT): Trigger the camera (or a number of connected cameras) from motion detected within the live image.

Exposure Tools: Auto-exposure, Threshold mode for the video output, PCC histogram, and a Zebra pattern overlay in PCC are all tools used to dial in the best exposure without over saturation.

**Multi-Cine:** Support for up to 63 partitions.

Quiet Fans: When enabled, the fans are stopped during capture to eliminate vibration.

Continuous Recording: Automatically and continuously saves Cines to external storage.

DHCP: Dynamic Host Configuration Protocol enables the automatic assignment of an IP address when using a DHCP router. This method eliminates the requirement to define the PC's dedicated camera network. Automatic DHCP is an alternative to the secondary user-definable IP network available in all Phantom cameras.

HV Trigger: High Voltage (HV) trigger, when selected in PCC the camera will trigger from a +6-32V pulse.

Detailed information about Phantom cameras, features, and software can be found at: *www.phantomhighspeed.com*
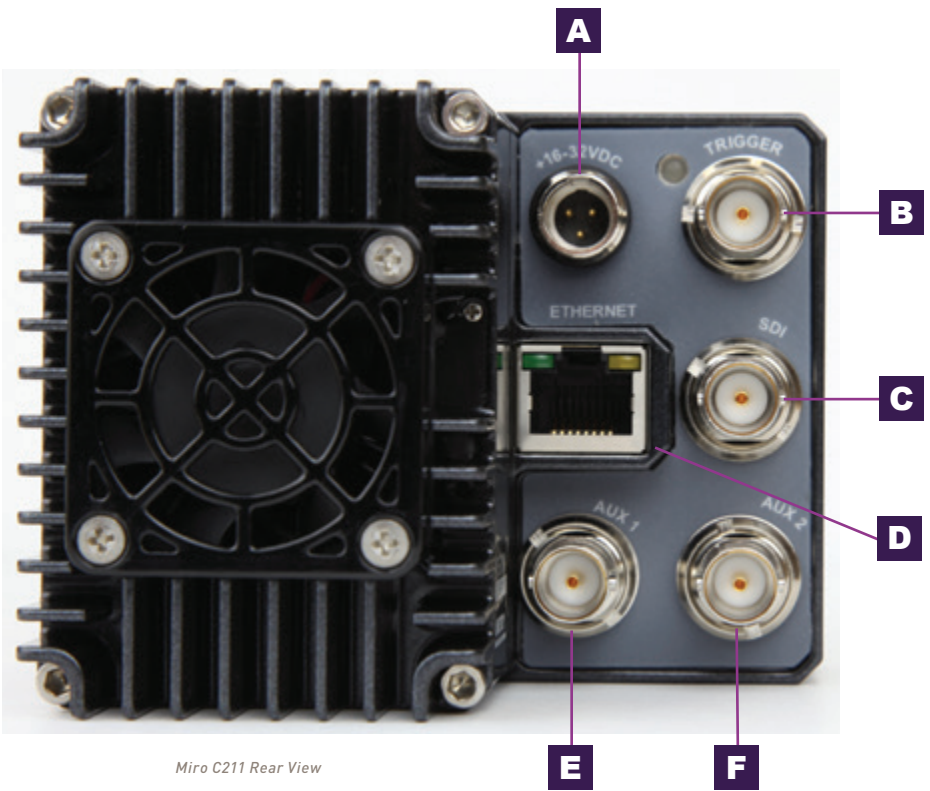
Miro C211 Rear View

A +16-32VDC   Mini XLR connector connects to +16-32VDC Power Supply.

B TRIGGER   Input: when a TTL pulse (rising / falling edge) is detected, camera triggers.

C SDI   BNC connector for HD video.

D ETHERNET   RJ45 connector connects via Gb Ethernet to a control unit computer / laptop for camera control communication.

E AUX 1   Strobe (Default)

Other signals available through Programmable I/O drop down list in PCC. Refer to Section 5, Programmable I/O

F AUX 2   Ready (Default)

Other signals available through Programmable I/O drop down list in PCC. Refer to Section 5, Programmable I/O

MIRO C211
CONNECTORS

QUICK START GUIDE

Phantom cameras are typically controlled with PCC software through a dedicated Ethernet network. PCC is compatible with the 64-bit version of Windows 10 operating systems.

The latest version can be downloaded at: ***www.phantomhighspeed.com/PCC***

ASSIGNING A Gb CAMERA NETWORK

Connecting the camera using Gb Ethernet simply requires the computer to detect the IP address range of Phantom cameras.

PCC software includes a **Network Configuration Utility** which will launch automatically after the software is first installed, or it can be later launched from the PCC program itself.
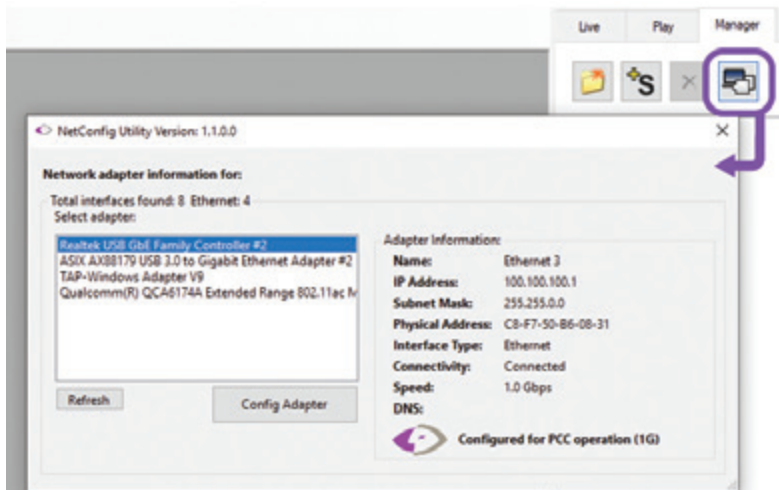
The NetConfig Utility will show all network interfaces currently installed in the PC. Identify the one that will be physically connected to the camera (this process can be done with or without a camera connected at the time).

Click '**Config Adapter**', which will then adjust the IP Address and Subnet to the first one available within the 100.100 network that all Phantom cameras are pre-configured to work with. Once connected, the Phantom logo will appear on the lower right with the "Configured for PCC operation" message.

OPTIONAL: MANUALLY ASSIGN Gb CAMERA NETWORK

Alternatively, In the Windows '**Network and Sharing Center**,' select the camera network.
Change the Ethernet IP settings by selecting '**Properties**,' then '**TCP/IPv4**' '**Properties**,' then select '**Use the following IP address**.'

Enter IP address **100.100.100.1** and **Subnet 255.255.0.0**. Other settings should be blank.

POWER ON CAMERA

Connect the camera's dedicated power supply to the mini-XLR port. The camera is ready for operation when the red capture light of the Trigger button is illuminated.

LAUNCH PCC SOFTWARE

Double-click the PCC icon located on the desktop. Camera will be recognized immediately if connected and network settings are correct.

SELECT CAMERA FOR USE

In the '**Manager**' tab, select the Phantom camera to be used from the '**Cameras**' group folder. Click the '**Live**' tab.

DEFINE RECORDING PARAMETERS

Click '**Cine Settings**' and define the following parameters by either selecting the value from the pull-down selection list or typing a value into the respective data entry field.

1. Set '**Resolution**' to the required Width x Height.

2. Choose the required '**Sample Rate**,' and '**Exposure Time**'.

3. Set '**Post Trigger**' to zero (0) by moving the 'T' (Trigger Position) slider to the right, or enter zero (0) into the '**Last**' data entry field.

Cover the lens and click the 'CSR' button to perform a Current Session Reference. A CSR is a black reference for that session. It is required before capturing the first cine and after changing any recording parameters.

With color cameras, perform a White Balance by right-clicking an area of the image that is neutral gray or white, as long as it is not 100 percent saturated.

SET DEFAULT CSR

For customers that rarely change their camera settings, the "**Set new CSR default**" feature provides a convenient alternative to this process. It is available in versions of PCC 3.77 and higher. The camera must operate at full resolution, for example 1280 x 1024 for the C211. The Set Default CSR is set for the frame rate and exposure time being used. That CSR will remain through turning the camera off and on, for as long as that setting is not changed.

Step 1: Enable in PCC:
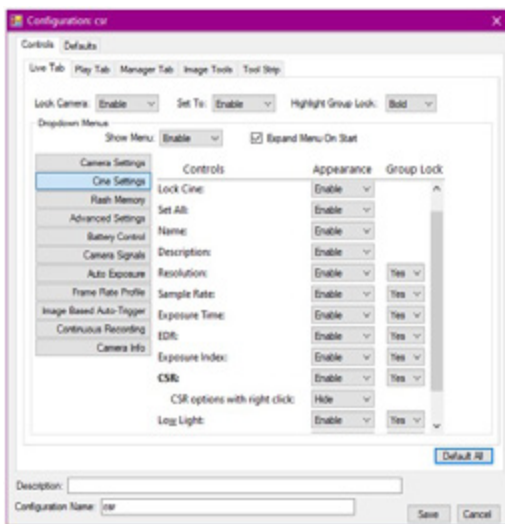
Step 2: Right click the CSR button in the live tab, and select "Set Default CSR"
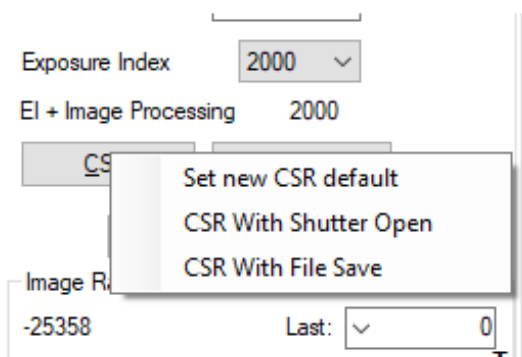
FINE-TUNE SETTINGS

After CSR and White Balance are performed, adjust settings, aperture and/or lighting to get a good exposure. A CSR must be performed after any camera settings are adjusted.

'ARM' CAMERA

Click the '**Capture**' button to start recording to the camera's internal RAM memory buffer.

TRIGGER

At the end of the action, click the 'Trigger' button at the bottom of the 'Live' panel or provide an external trigger signal (TTL pulse) via the Trigger connector.

PLAYBACK AND EDIT CINE

Click the 'Play' tab to Scrub through the timeline or use the 'Video Control' buttons to locate the first image to be saved.

Click the 'Mark-in' I button.

Locate the last image of the Cine to be saved and then click the 'Mark-Out' 1 button.

SAVE TO FLASH OR COMPUTER

To save to a PC:

Click the large 'Save Cine...' button on the bottom of the 'Play' panel.

1. Navigate to the folder where you want to save the Cine file.

2. Enter a file name and from the 'Save as Type', select the 'Cine Raw, .cine' file format.

3. Click the 'Save' button to begin downloading the Cine file from the camera.

To save to Flash:

Click the arrow next to the large 'Save Cine...' button on the bottom of the 'Play' panel. Click 'Save RAM cine to Flash'.
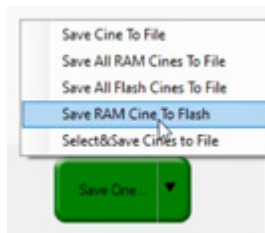
CONFIRM COMPUTER SAVE

Click the 'Open File' 📂 button. Navigate to the folder and open the saved Cine file. Review the playback by scrubbing through the file and viewing the playback.

SOFTWARE

This manual covers the most commonly used functions. See the 'PCC Help' file for details of other settings.

4 PHANTOM
PCC SOFTWARE

PRE-INSTALLATION

Phantom Camera Control (PCC) software operates with Microsoft Windows 10.

The computer and cameras must be associated with the same sub-network to communicate with one another. Typically, the IP address 100.100.100.1 and subnet 255.255.0.0 are defined to the control computer's network card.

When multiple computers are used to control the same camera, each computer requires a unique IP address.

For example, 100.100.100.1 (255.255.0.0), 100.100.100.2 (255.255.0.0), and so on.

PHANTOM CAMERA CONTROL (PCC) APPLICATION OVERVIEW

TOOLBAR

The '**Toolbar**' buttons provide quick access to the most frequently used functions.
In the program, hover over a button to display a text box briefly describing its function.

| Pcc Help |
| Camera hardware |
| Remote control |
| About |
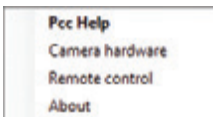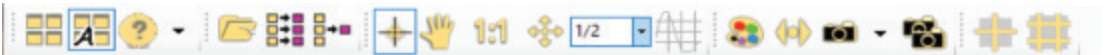
The '**Help**' options provide valuable reference information, along with extensive documentation, relating to the software. Online tutorials can be found at *www.phantomhighspeed.com/tutorials.*

CONTROL TABS

PCC provides three control tabs: '**Live**,' '**Play**' and '**Manager**.'

When first started, the '**Manager**' tab is selected. Connected cameras are selected for use and naming in this tab. It is also used to manage saved Cine files.

All camera control and capture parameters (sample rate, exposure time, etc.) are performed in the '**Live**' tab.

Reviewing, editing and saving of Cine files, either from the camera's internal RAM memory, installed Phantom CineMag V or external hard drive, are performed in the '**Play**' tab.
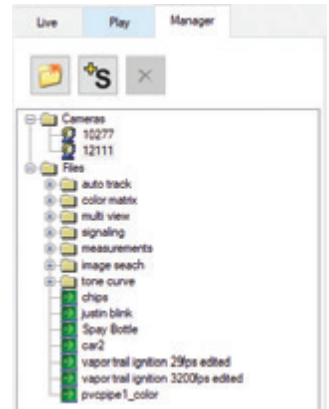
## *PHANTOM VIDEO PLAYER (PVP) APPLICATION OVERVIEW*

PVP can be launched directly from the desktop shortcut or by the '**Video Out**' toolbar button in PCC.

PVP controls the video outputs connected to a video monitor or viewfinder only.

PVP provides the ability to view, capture, review, edit and/or save a Cine recorded into the camera's RAM, to a hard drive or installed Phantom CineMag. PVP is extremely effective when used with high-resolution cameras since most computers will not play captured raw files smoothly.

The camera's video system and display settings are also set through PVP. The best video system for the project will vary based on the country you are in, what kind of video monitor is used and the required video resolution.

All available video systems for the connected cameras can be found in the '**Settings**' menu of PVP, along with production area and other video overlay controls.
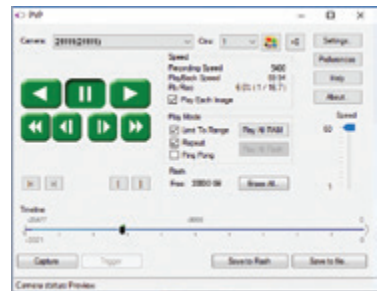
CAMERA CONTROL VIA PCC

PCC provides the ability to select units for specific camera parameters by clicking the '**Preferences**' button at the bottom of the '**Manager**' tab.

Units can be set to commonly used values ('Presets') or can be customized using the pull-down selection lists. First time users should use one of the three '**Presets**.'

The '**Exp**' unit is probably the most important unit to be set. It specifies what unit to use when setting the exposure time. The other
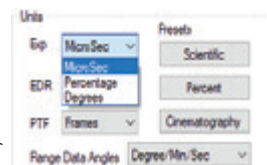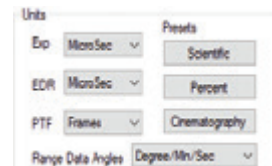
units to set are EDR (Extreme Dynamic Range, not compatible on all models) and PTF (Post Trigger Frames) covered later in this section.

SELECTING A CAMERA

Select the camera(s) to be controlled listed in the '**Manager**' tab, or select the camera(s) from the '**Camera**' pull-down list in the '**Live**' tab.

Once a camera is selected, a '**Preview**' panel will display to the left of the control tabs showing the current image being captured by the camera.

IMAGE PROCESSING

'**Image Tools**' provides extensive control over the look of the image, from color and contrast settings to image orientation and crop settings. The menu is accessed by clicking on the '**Image Tools**' toolbar button (the one that looks like an artist's palette).

The top of the '**Image Tools**' window displays a '**Histogram**.' This is a graphic representation of the pixel brightness levels of the displayed image. The left represents black, the right represents white and the height represents the proportionate number of pixels at that particular value. Unlike a waveform, the histogram's shape is not representative of the content—it is simply an averaging of the brightness values.

Below the histogram are controls which change image settings of the live images, recorded images and the video output.

Some of the variables include; brightness, gain, gamma, saturation, toe, white balance adjustments (Temp (K) and Tint), individual red, green and blue pedestal, gain and gamma values and tone curves.

At the bottom of the window is a '**Default**' button that restores all parameters except white balance, tone and color matrix to their default values.

The '**Default White Balance**' button restores white balance to the defaults on color cameras.

The Tone '**Reset**' button restores the image tone to the default values, and the Color Matrix '**Restore**' button returns the color matrix values to their default values.
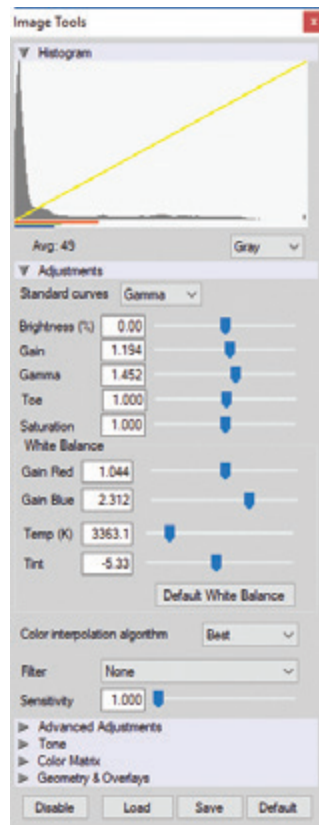
> Changes made here only affect the metadata of the Cine Raw file. They are applied in software but not "baked in."
>
> Image Processing settings are no longer editable after saving to a format other than Cine Raw, so it is important to ensure they are set to values that produce the best looking image.

IMAGE DISPLAY

The '**Zoom Actual Size**' toolbar button resizes the images being displayed in the '**Preview/Playback**' panel to their actual size.

The '**Zoom Fit**' toolbar button resizes the images to fit the panel. Images can also be zoomed to a specific magnification ratio by selecting a number from the pull-down list to the right of the '**Zoom Fit**' button.

WHITE BALANCE (COLOR CAMERAS)

Performing a '**White Balance**' should be the first step in color adjustment. White Balance not applicable to monochrome cameras.

Right click on an area that resembles white or neutral area in the image, then click on the '**White Balance**' pop-up window. It is not necessary to fill the frame with white—a small target can be used.
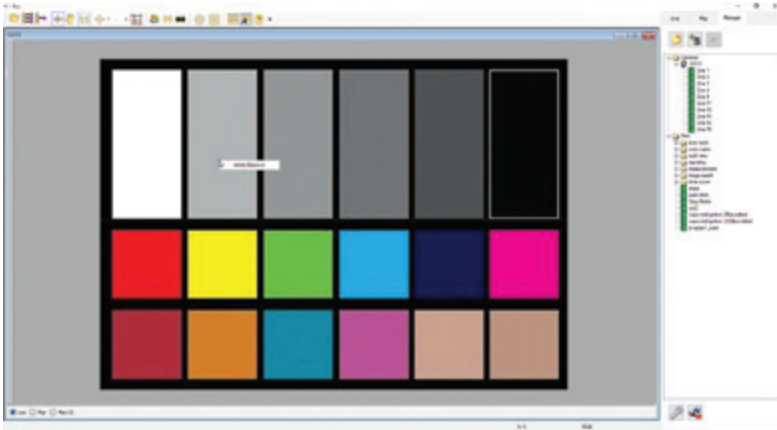
It is recommended to perform the White Balance after a CSR and on a white or gray object that is not fully saturated.

CAPTURE SETUP: CAMERA & CINE SETTINGS

Set Time: Synchronizes the timestamps embedded in the recorded image data to the computer's clock.

Bit Depth: Most Phantom cameras operate in 12-bit mode only.

Mode: Select the desired mode, binning or standard mode.

Partitions: Select the number of desired partitions (evenly divided memory segments) from the 'Partitions' pull-down menu. For basic camera setups, this should be set to one.

Lens Control: Available for Canon EF lenses only, for control of aperture and focus.

Backup & Restore: Allows for user and factory settings to be saved and recalled from the camera's memory.

Resolution: Sets the camera's acquisition resolution. There are several options in the pull-down menu. Alternatively, type in a value and the closest valid resolution will be set.

Sample Rate: Sets the acquisition frame rate in frames-per-second (fps).

Exposure Time (shutter): Sets the exposure time in degrees, microseconds or percentage (this depends on how the PCC preferences are set).

Exposure Index: Sets the exposure index (Effective ISO) of the image by loading preset tone curves. Adjusting gamma, gain and other settings will contribute to the overall EI value, and this combined value is what should be used to determine lighting.

CSR (Current Session Reference): Closes the camera's internal shutter and resets the black point of every pixel for optimal image quality.

Image Range and Trigger Position: The slider represents the memory buffer, with the 'Duration' indicated in seconds and the total number of frames available.

The trigger position is indicated in the 'Last' pull-down menu and as the 'T' slider along the timeline. The trigger position is exactly when the trigger signal will be detected in the Cine.

KEY ADVANCED SETTINGS

The "Start/End of Recording Actions" section provides options of actions that can automatically be performed at the start or end of each shot, including:

- **Auto save to Flash:** This feature saves a user-specified portion of a clip to the internal Flash immediately after recording.

- **Auto play Video Out:** Begins playback after recording. The range marked under 'Auto play Video Out' affects both playback and saving to the internal Flash.

- **Restart Recording:** When enabled, automatically restarts the recording process after the 'Auto' actions have been performed.
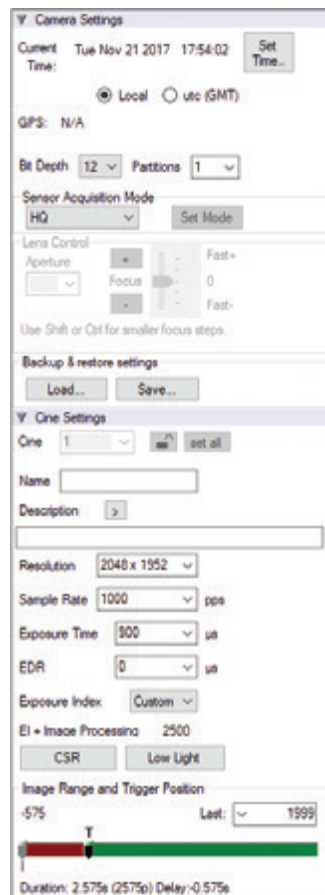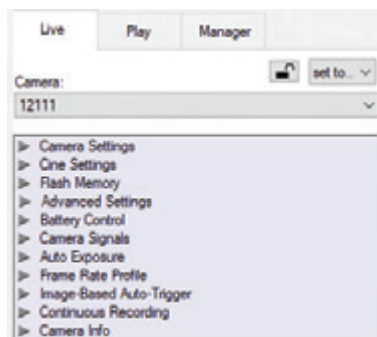
'**External Sync**' instructs the camera to use one of the following options:

- **Internal:** Camera uses its internal crystal oscillator to drive the frame rate.

- **External:** Camera uses externally supplied frame sync clock pulse to drive the frame rate. This can be used to synchronize two cameras together via F-Sync.

- **Lock to Video:** Frame rate is driven by the camera's current video rate. Fps will jump to the closest multiple of the current video rate (23.98, 24, 25, 29.97 or 30).

- **Sync to Trigger:** Instructs the camera to adjust its frame clock, upon detection of a trigger signal, to ensure all post trigger frames occur at the same moment in time from trigger when repetitive tests are required.

> **When using External Sync it is important to limit the top frame rate by ~1% to ensure the sync period is larger than 1/max_frame_rate + 0.1% or 200ns (whichever is larger), to account for frequency tolerance and jitter.**

FLASH MEMORY

This displays the amount of free space and size (in Gigabytes) of the internal flash.
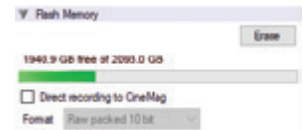
RECORDING A CINE

To begin recording to the camera's RAM click the red '**Capture**' button.

The red '**Capture**' button changes to '**Abort Recording**' and the green '**Trigger**' button

is enabled when the camera is recording. The '**Abort Recording**' button instructs the camera to stop recording, leaving the camera's RAM empty.

TRIGGERING THE CAMERA

Selecting the '**Trigger**' button instructs the camera to immediately stop recording when the '**Trigger Position**' is set to zero. If a value greater than zero is set, the camera will continue to record '**post-trigger**' frames until the user-specified value is met.

> **Using the camera's external trigger signal provides a more accurate trigger to the camera. This is also referred to as a '**hardware trigger.**'**

REVIEWING A CINE

Once the camera has completed recording a Cine in the camera's RAM or Flash, it can be reviewed by selecting it from the '**Cine**' pull-down selection list in the PCC '**Play**' tab.

A previously saved Cine stored on the computer's hard drive can be opened using the '**Open File**' 📂 toolbar button. (When used, it also places the file under the '**Cines**' group folder in the '**Manager'** tab.)

Use the '**Video Control**' buttons to review the Cine:
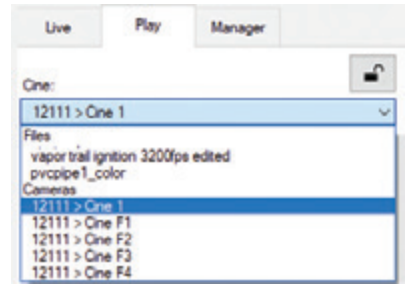
A	REVERSE PLAY
B	PAUSE
C	PLAY
D	FAST REVERSE
E	REVERSE 1-FRAME
F	ADVANCE 1-FRAME
G	FAST FORWARD
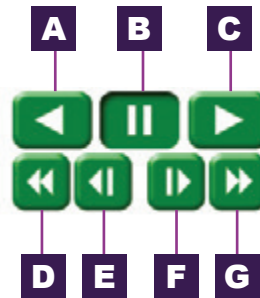
PERFORMING A QUICK SEARCH THROUGH A CINE

Quickly find the points of interest:

'**Scroll**' (scrub) through the clip using the slider or click anywhere on the timeline to jump to that point quickly.

'**Jump**' to the trigger frame by clicking on the '**T**' button, or jump to specific frames by entering the frame number into the jump '**#**' data entry field, then hit the enter key.

'**Image Search**.' The goal is to search or find an image change in the recording, based on the differences between image content. Right-click on the '**Play**' button to begin the image search. Besides image content changes, '**Image Search**' can also look for images that are tagged as '**Event**' images.
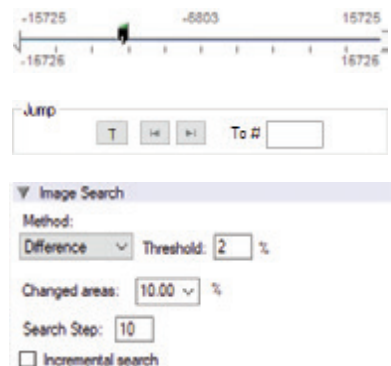
EDITING AND SAVING A CINE

Using the following 'Video Control' buttons, locate the first image of the Cine to be saved and click the 'Mark-In' [I] button. Locate the last image of the Cine to be saved and click the 'Mark-Out' [1] button.

Click 'Play, Speed & Option' and enable (check) 'Limit to Range.'

Under the 'Video Control' buttons, click the play button and review the edited Cine.

Click the 'Save Cine...' button to save the edited Cine to the computer's hard drive.

If you wish to save the clip to an internal Flash, click the down arrow to the right of the 'Save Cine...' button and select 'Save RAM Cine to Flash.'

| Save Cine To File |
| Save All RAM Cines To File |
| Save All Flash Cines To File |
| Save RAM Cine To Flash |
| Select&Save Cines to File |

Save Cine... ▼

WORKING WITH CINE FILES

The images recorded on the camera's RAM or Flash are stored in a Vision Research proprietary RAW (uncompressed) file structure called a 'Cine' file.

These Cine files can be converted to industry standard formats (ProRes, H264, DPX, DNG, TIFF, JPEG and more) with PCC software provided by Vision Research.

Phantom PCC and PVP software are compatible with Windows operating systems. There are third party solutions available for working with Phantom cameras in Mac OS X.

COMPATIBILITY WITH VIDEO EDITING PROGRAMS

Several popular video editing programs, such as DaVinci Resolve, have incorporated the Phantom Cine Raw file format into their software. This means Cine files do not have to be converted and no additional software is required.

Please test the footage with the program you choose before committing, as updates to the program or Cine file format can sometimes break compatibility. For this reason, it is important to know how to properly convert Cine Raw files using PCC.

CONVERTING CINE RAW FILES

Single Cine files can be converted by selecting the desired format from the 'Save as Type' selection list in the 'Save Cine' dialogue window.

The file formats above the separator line in the 'Save as Type' selection list are 'movie-

Re-saving a clip in the Cine Raw format can be useful for creating sub-clips with no loss in image quality or metadata.

like' formats (meaning the entire clip will be saved as a single file), while the formats below the line are image formats (meaning each frame of Cine will be saved as a sequence of images).

To convert a Cine to a '**movie-like**' format, select the desired format from the list, navigate to the destination folder, assign a file name to the clip and save.

Some valuable parameters can be found in the '**Advanced Settings**' window, such as the particular codec.

Other formats, like .avi and .mp4, allow the compression ratio to be entered. The lowest compression is the default.

CONVERTING TO A SERIES OR STACK OF IMAGES

Beginning with PCC software version 3.5, the autoname functionality eliminates the need to add a special character to create a sequence of images. Use one of the presets in the save dialogue. Vision Research also recommends setting a project name, in the '**Auto-name settings**' menu found in the top bar pull-down arrow next to the snapshot functions.
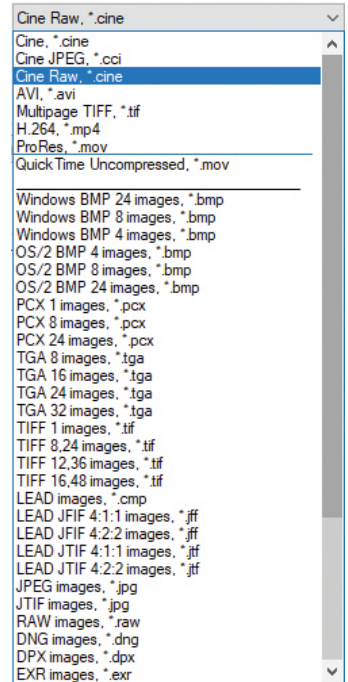
BATCH CONVERT

The '**Batch Convert Files**' ⬛ toolbar button can be used to convert a single saved Cine file, or multiple saved Cine files, into any one of the supported file formats.

Use the shift and/or control keys to select the Cine files you wish to convert in the '**Open Cine**' dialogue window, then click the '**Open' button**.

Navigate to the destination folder in the '**Multifile Convert Destination**' dialogue window and select the file format.

PCC creates a separate folder for each Cine file, assigns the original file name and appends the appropriate image number and extension to each image.

Once the '**Convert**' button is clicked, a progress window appears for the duration of the conversion process. Each converted Cine will be placed in its own folder named after the original Cine file.
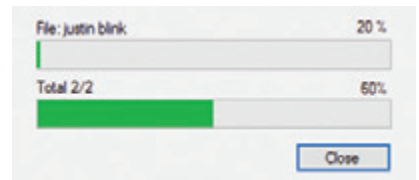
PROGRAMMABLE I/O

INTRODUCTION TO SIGNALS

Phantom cameras incorporate multiple hardware signals to interface to external devices.

The Aux ports on Phantom C211 cameras are programmable. The Programmable I/O ports have a default setting which will be set after a factory reset or by using the 'signal default' function in PCC.

Port Map for Programmable I/O Access

Programmable I/O incorporates a pulse processor. In addition to assigning different

| C211 PORTS			
Port Label	Default setting	Programmable I/O Capability	Programmable IO Port in PCC
Trigger	Trigger	Fixed	Port 1
Aux 1	Strobe	Prog. I/O	Port 4
Aux 2	Ready	Prog. I/O	Port 5

signals, the signal characteristics can be modified to better interface with external devices. In most cases, the signal polarity, filter time, delay and pulse width and edge (rising versus falling) can be set. Setting these characteristics is referred to as 'Pulse Processor Control.'

PCC INTERFACE

The 'Camera Signals' menu, located in the 'Live' tab, provides access to and control over these Programmable I/O signals.

A summary of the current signal settings can be found under the pull-down menu associated with each port. By clicking 'Default All,' PCC will reassign the factory-assigned defaults for the Programmable I/O signals.
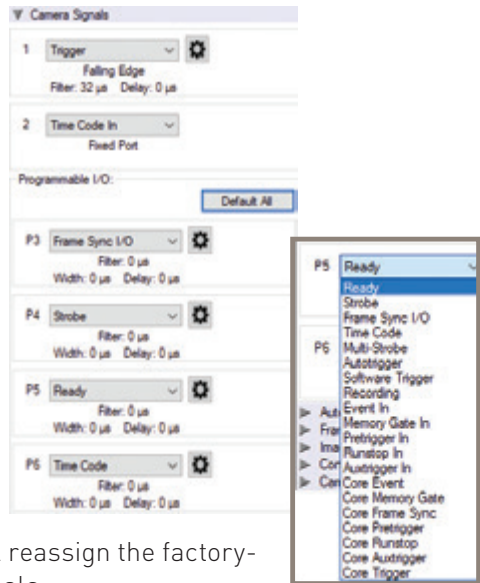
PULSE PROCESSOR CONTROL

After selecting the signal assignment, further configuration is possible by clicking the gear symbol next to each port. The 'Pulse Control' menu is opened, as shown on the next page.

A graphic representation of the signal behavior is also displayed. However, this is **not to scale** and should be used as reference only. Use of this feature requires an oscilloscope to truly visualize the signals and the subsequent changes with each adjustment.
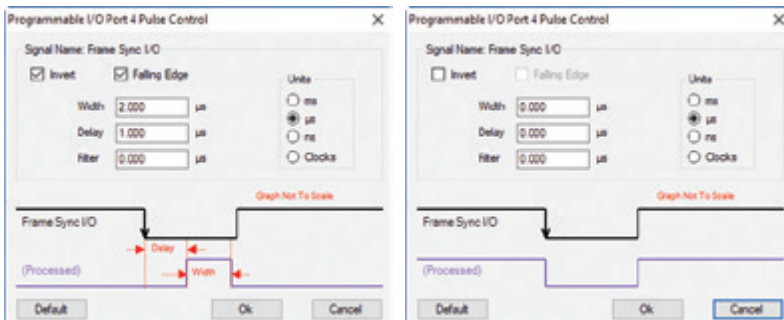
Input: When a signal is generated by the camera, it serves as an input to the 'pulse processor.' In this context, the term 'input' does not represent an externally generated signal.

SUMMARY OF PULSE PROCESSOR SETTINGS

Invert: Inverts the signal at the output of the pulse processor.

Falling: Selects 'Falling Edge' mode for the pulse processor. This mode is only relevant if the 'Width' is also specified. When the 'Falling' token is present together with 'Width,' the pulse processor will generate a negative pulse, triggered from the negative edge of the input signal.

Width (Pulse Width): When a 'Width' token is present, a defined-length pulse is generated, which starts after the specified 'Delay' and after the active edge of the 'input' signal. The length of the pulse is specified in microseconds (as a floating point number) and internally converted to pixel clock units. The maximum pulse width is at least 10 seconds. However, if the period of the 'input' signal is lower than the selected width, the latter is dynamically clamped to the signal period. The minimum pulse width is one pixel clock.

Delay: Delays the output pulse by the specified time in ms, µs or camera clock multiples. If the 'Width' token is not present, both edges of the signal are delayed by the same amount. If present, the delay is measured from the rising edge of the input* signal unless the 'Falling' token is present, in which case the delay is measured from the falling edge of the input. The delay time is specified in microseconds and is internally converted to pixel clock units.

Filter (Filter Time): When a 'Filter' token is present, the 'input' of the pulse processor is filtered through an edge filter of the specified time. The time of the filter can be between 0 and 1 second. In order for the output of the filter to be asserted, the 'input' signal must be continuously de-asserted for the same duration. The edges of the 'input' are thus delayed by the specified filter time (for a 'clean' input pulse). Filtering is applied before and independently of the delay and duration. The filter time is specified in microseconds and is internally routed to pixel clock units.

> **Pixel Clock:** The period of the pixel clock is the basic time interval for all camera timing.

Please note that pulse processors can sometimes generate pulses too short for the output drivers to switch and the processed signal should be verified with an oscilloscope before use.

PROGRAMMABLE SIGNALS & DESCRIPTIONS

The settings as described are the signal's default state prior to processing.

Ready: An isolated open collector output with 1k pull-up signal (active high). 'Ready' is asserted when the camera goes into 'Capture' mode and is de-asserted either when the Cine is triggered or when recording is completed. 'Ready' changes synchronously with frame capture (at the end of each exposure), so in 'External Sync' mode it will not change until F-Sync pulses are received.

Strobe: An isolated open collector output signal with 1k pull-up. When asserted (low) 'Strobe' indicates that the electronic shutter is open. Strobe is low for the duration of the exposure.

F-Sync: The only signal can be set as an output or input. By default, it is output (sync-internal).
Output signal is a frame sync pulse from the camera's frame rate generator. A short (few hundred ns depending on camera model) negative pulse with the falling edge is used as timing reference. Input signal is active on falling edge. (Default state is high.)

TC-Out: A positive polarity time code signal. Normally an unmodulated (dc-shifted) IRIG-B (at RS-232 levels) which follows the internal time base of the camera. It is recommended not to process the 'TC-Out,' since a processed signal will not represent an accurate time code.

Auto-Trigger: Used to output a hardware trigger signal or pulse with the duration.

Software Trigger: An active high-output signal (pulse) generated as a result of the trigger protocol command.

Recording: An active high-output signal indicating active recording into a RAM partition.

Event In: If the input is sampled low at the end of an exposure, an 'E' (Event) bit in the frame's timestamp is set.

Memory Gate In: If the input is sampled low at the end of an exposure, the corresponding frame is skipped from storage to RAM.

Pre-trigger: An active low-input (default high) signal. Keeping this signal low for enough time (10—500 ms or until 'Ready' signal goes high) will make the camera start recording, if it has an available RAM partition.

Aux Trigger: An input signal active on the rising edge (default high). An alternative trigger input that can be processed through the pulse processor and assigned to different ports.

THE CORE SIGNALS

Core signals are copies of externally generated signals, routed through the camera and output to assigned ports. Unless indicated otherwise, feedback is taken after any pulse processor for the input. Core signals can be pulse-processed before being output.

Core Event: Feedback output from the 'Event In' signal.

Core Memory Gate: Feedback output from the 'Memory Gate In' signal.

Core Frame Sync: Feedback output from the 'F-Sync In' signal. The feedback is taken after any pulse processor for the output, but before the delay element.

Core Pre-trigger: Feedback output from the 'Pre-trigger' signal.

Core Aux Trigger: Feedback output from the 'Aux Trigger In' signal.

Core Trigger: Feedback output from the main 'Trigger' input. The feedback is taken before the trigger signal is affected by the trigger polarity, filter or delay settings.
'Core Trigger' can be used like the 'Trigger Out' signal.

MIRO C211
TOP VIEW
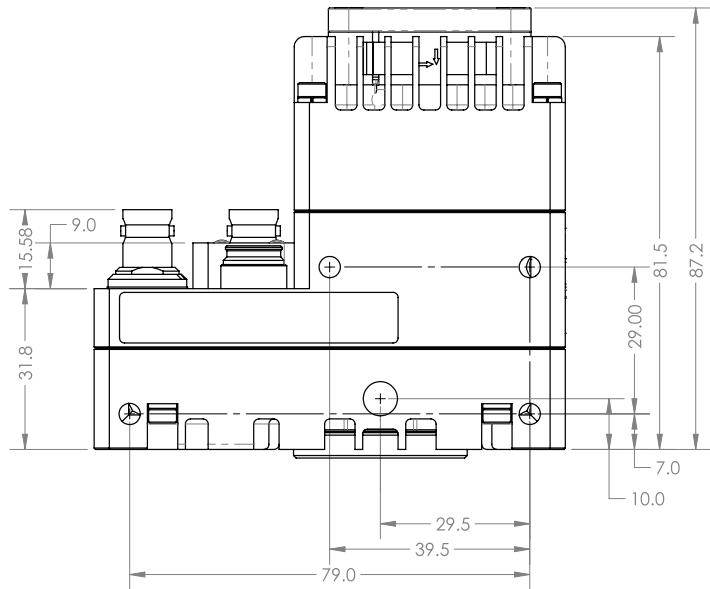
MIRO C211
BOTTOM VIEW
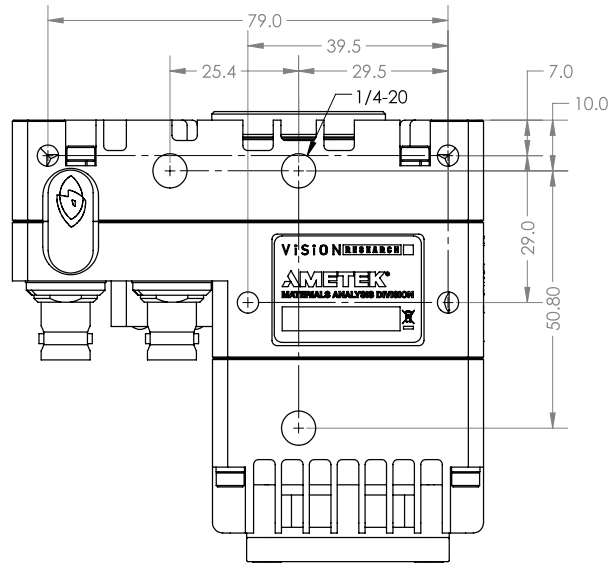
MECHANICAL DRAWIN

MIRO C211
RIGHT / LEFT

M4x0.7 TYP

66.0
59.0
73.0
36.5
33.0
29.5

16.0
29.5
32.0
36.5
59.0
79.0
93.0

12.0
21.0
20.1
9.0
10.5

+16-32VDC
TRIGGER
ETHERNET
SDI
AUX 1
AUX 2

23.0
29.2
23.0
36.5

33.0
66.3

NGS

7.0

59.0

29.5

3.3

13.3 LENS MOUNT TO
ACTIVE SENSOR AREA

7.0

29.0

10.0

59.0

36.5

29.5

MIRO
C 211

MADE IN USA
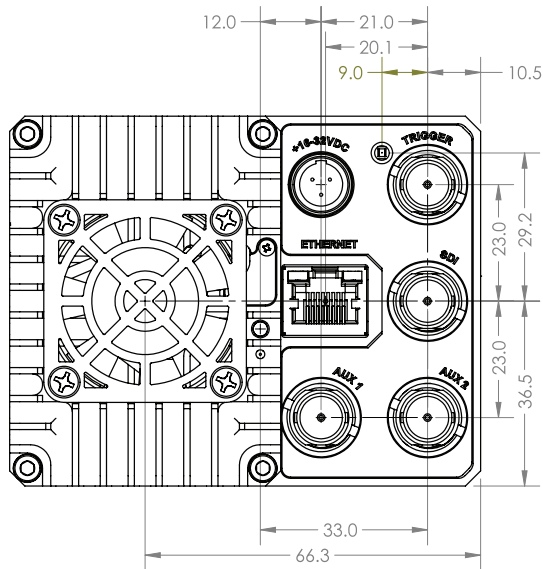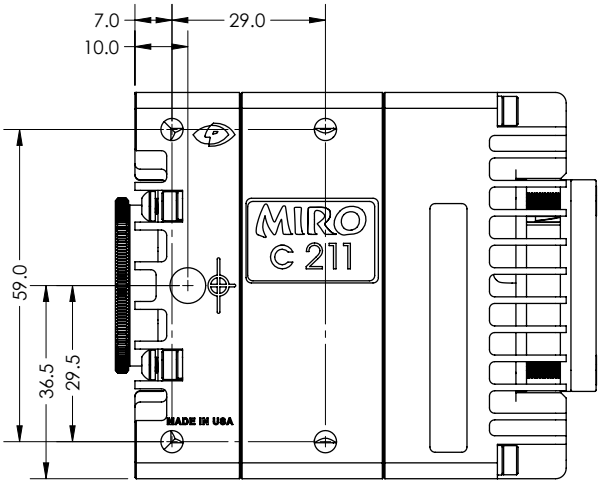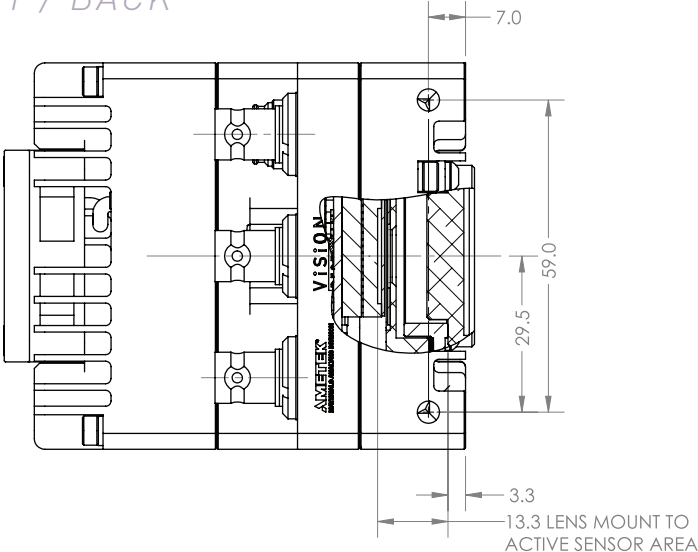
MIRO C211 STATUS INDICATORS
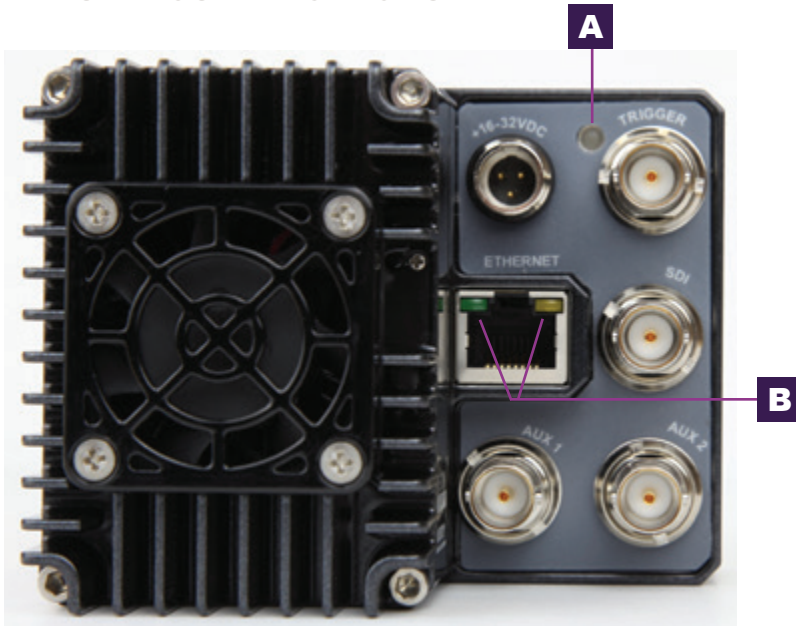
Miro C211 Rear View

A TRIGGER LED

COLOR	CAMERA STATE
White	Camera Booting
Green	Preview Mode
Red	Capture Mode
Red Flashing	Trigger mode, and saving images

B ETHERNET LED

COLOR	CAMERA STATE
Green	EtherLink Active
Amber	Ethernet Activity

These pin-out diagrams refer to the connector on the camera body. Part numbers indicated are for the cable's connector.

POWER CONNECTOR

Power port

3-pin Mini XLR Connector part # REAN RT3FC-B

PIN	NOMENCLATURE/FUNCTION
1	GND / Power Ground
2	VDC / Provides DC (Direct Current) positive power to the Phantom camera. Valid voltage ranges are +12-32VDC
3	CHGND / Chassis Ground

ETHERNET CONNECTOR

Gigabit Ethernet port

RJ-45

PIN	NOMENCLATURE/FUNCTION
1	MDI2+ / Gigabit Ethernet
2	MDI2- / Gigabit Ethernet
3	MDI3+ / Gigabit Ethernet
4	MDI3- / Gigabit Ethernet
5	MDI1+ / Gigabit Ethernet
6	MDI1- / Gigabit Ethernet
7	MDI0+ / Gigabit Ethernet
8	MDI0- / Gigabit Ethernet

CONNECTOR PIN-OUT

BNC CONNECTORS

Multiple signal ports

BNC

PIN	NOMENCLATURE/FUNCTION
Trigger	Input: when a TTL pulse (rising / falling edge) is detected, camera triggers
SDI	Output: for HD video
Aux 1	• Default setting: Strobe • Other signals available through Programmable I/O drop down list in PCC. Refer to Section 5, Programmable I/O.
Aux 2	• Default setting: Ready • Other signals available through Programmable I/O drop down list in PCC. Refer to Section 5, Programmable I/O.

Can I use any Ethernet cable with the Miro C211?

Yes. We include an Ethernet cable and a BNC cable with the camera, just to get you started. But any Ethernet or BNC cable will work.

Can I use my F-mount lens with the Miro C-Series cameras?

Yes, with a converter. The Miro C's come with a C lens mount that can be reversed to become a CS lens mount. To use an F-mount lens, you can purchase a converter (part number VRI-FMNT-CMNT).

What is Default CSR?

The Miro C's do not have a mechanical shutter. This allows them to be as rugged as they are but can make a CSR for good image quality inconvenient because you need to cover the lens. When you turn the camera off, the CSR returns to the factory default.

For customers that rarely change their camera settings, the "Set new CSR default" feature provides a convenient alternative to this process. You must operate the camera at full resolution, for example 1280 x 1024 for the C211. You may then set the CSR for the frame rate and exposure time you are using. That CSR will remain through turning the camera off and on, for as long as you don't change that setting. Always run at 1000 fps and a certain exposure, for example? Set CSR once, get great image quality, and don't worry about it again, no matter how many times you turn the cameras on and off.

The C211 looks like the C321. Is it Hi-G? Can it be used with a Miro Junction Box?

The Miro C211 has many of the design features as the C321, and it is made to be rather tough. However, it is not specified as a Hi-G camera, and cannot survive the same shocks and vibrations that the C321 can survive. The C211 is not designed to work with a Miro Junction Box, and has different connectors.

FAQS

If the camera doesn't have a shutter, how can I perform a Current Session Reference?

The Miro C's do not have a shutter, but you can still perform a Current Session Reference (CSR). Just make sure you cover the lens before clicking the CSR button.

What are the available signals for the C211?

Trigger (dedicated BNC); SDI (dedicated BNC); Strobe (Aux 1 default); Ready (Aux 2 default), and many other signals and capabilities through programmable I/O. However, please note that the C211 does NOT have IRIG In, only IRIG Out.

What is the worst case power draw of the cameras?

The cameras draw only 12W during operation.

BASIC TROUBLESHOOTING

There are fixed black spots on the image, particularly at small apertures.

This is most likely caused by dust particles stuck on the sensor surface. The best way to check is to remove the lens and look at the glass surface with a bright light source. Vision Research recommends not to use canned air or cotton swabs to clean the sensor surface. It is safer to use a manual bulb-style air blower and/or sensor cleaning brush for removing loose dust particles.

Additional tips for cleaning sensors can be found in the maintenance section of this manual.

The live images look scrambled and the frame rate can't be set.

If the image is non-responsive and scrambled, the camera may be set to an external sync

TROUBLE SHOOTING

without a sync source connected. In the PCC → Live → Advanced Settings menu, check the External Sync setting to ensure that 'Internal' is selected.

Restoring the factory defaults.

If the camera is stuck in an unusual state it may be useful to restore the camera's factory defaults. This returns the capture parameters, image processing, video modes, and image calibration back to the original settings.

To do this, you will need to perform an 'iLoad'. For details on performing an 'iload' follow the 'Step-by-Step Procedures / Live Panel Procedures / Advanced Settings / Performing an iLoad (on a Ph16 Camera)' topic within the supplied PCC Help file.

Back Focus Adjustment

Due to differences in various lenses and other mechanical tolerances it may be necessary to adjust the lens mount on the camera to obtain proper focus. In most cases, changing a lens or replacing a mount will not require adjusting the back focus, though it should be verified. When the focus distance marks on a lens do not match the measured distance between the sensor & subject, it indicates the need to adjust the back focus.

By adjusting the back focus, you are changing the distance of between the flange and the sensor plane. Shims are included to assist in both slight and coarse back focus adjustments.

TROUBLE SHOOTING

Sensor Cleaning Technical Tips

- Sensor cleaning should only be attempted by experienced imaging professionals.

- Use a small, but powerful flashlight to look at the sensor and filter, it's easier to spot the dust.

- Sensor cleaning must be done in a clean and controlled environment.

- Always have a forced-air bulb style blower and a clean sensor cloth handy for more serious dirt.

- Sensor cleaning solution (like Eclipse) should only be used if absolutely necessary, and applied with a soft wipe intended for sensor cleaning.

- Cotton swabs aren't a good idea, unless they are wrapped in a sensor wipe material. They leave behind more than they remove.

- Never use your finger to get a speck of dust off, it's going to make things much worse.

- Never blow on the sensor.

- Never put sharp objects near the surface of the sensor.

- Always keep the Phantom body cap on the camera when there is no lens attached.

MAINTENANCE

CONTACT SUPPORT

GLOBAL HEADQUARTERS

Vision Research, Inc.—Wayne, New Jersey

100 Dey Road
Wayne, New Jersey 07470 USA
T: +1.973.696.4500

For answers to most questions, please visit us at: *www.phantomhighspeed.com* and search the camera product pages, tutorials, support knowledgebase and FAQs.

SUBMITTING A SUPPORT TICKET

For technical product support, operation and application information or to request an RMA, please submit a ticket by filling out a form at *www.phantomhighspeed-service. force.com* or by emailing us at **phantom-support@ametek.com.**

LIVE CUSTOMER AND TECHNICAL SUPPORT

Serving the Americas:
M-F 8:00 AM to 5:00 PM EST (GMT -4:00)
T: +1.973.696.4500
Customer Support, ext. 4002
Technical Support, ext. 4003

Serving Europe, the Middle East and Africa:
M-F 9:00 AM to 6:00 PM GMT +3:00

Vision Research, Inc.—Bucharest, Romania
T: +40 21 210 8587

Serving Asia Pacific:
M-F 8:00 AM to 5:00 PM GMT +8:00

Vision Research, Inc.—Shanghai, China
T: 86-21-58685111, ext. 141

CONTACT SUPPORT

REGULATORY

CE - 2019

CE Emissions	CE Compliant - EN 61326-1, Class A
CE Immunity	CE Compliant - EN 61326-1, Class A
FCC	CFR 47, Part 15, Subpart B & ICES-003 Class A
Safety	IEC 60950-1

KC - 2022

Country of Origin: USA

R-R-VRi-MiroC211: All models Phantom C211 Series

KC Emissions	KC Compliant - KS C 9832
KC Immunity	KC Compliant - KS C 9835

Class A device (Broadcasting Communication Device for Office Use): This device obtained EMC registration for office use (Class A), and may be used in places other than home. Sellers and/or users need to take note of this.

PHANTOM®

WWW.**PHANTOM**HIGHSPEED.COM

The contents of this manual are subject
to change without notification.

PN: ZDOC-64078-MA-0004   Rev 1
Last Updated: December 2022

ViSiON / AMETEK®
RESEARCH

100 Dey Road
Wayne, NJ 07470 USA
+1.973.696.4500