Remote Control Unit - Help File

V i S i O N
R E S E A R C H

PHANTOM
when it's too fast to see, and too important not to®

AMETEK®
MATERIALS ANALYSIS DIVISION

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Firmware Version 5.3
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The Phantom Remote Control Unit is a small, lightweight, handheld controller, that doubles as a monitor, allowing the end-user to control most of the setting of a Phantom v-Series, Phantom HD, or Phantom 65 camera.

1.1   EULA (End User License Agreements)

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dd.c ,smbmount,smbumou	mount, umount	insmod_ksymoops_cle	
df.c	(various files)	an	nt(various files)
dmesg.c	netstat.c	install-info.pl	arp.c
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pwd.c	find.c	rarp.c	libctutils.so.0.0.0
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Mach Operating System

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1.2   Whats New in Phantom Help

The following additions and changes have been made to the Phantom Remote Control Unit - Help (Firmware Version 5.3), including:.

- **New/Changes:**

  – Supports new ph16 based cameras.

  – Supports the Multi Matrix feature in the V642 camera.

  – Allows setting min/max SDI in PH7 firmware version 763 and higher.

  – Allows setting first and last frame for auto saving in loop/burst mode.

- **New: Setup - Mode Menu**

  – Added an Auto Save button to the Setup>Mode menu to allow setting first and last frame for auto save.

- **New: Setup - Video Menu**

  – Added SDI and M Matrix buttons on the Setup–Video menu for min/max SDI settings and the Multi Matrix interface.

- **Fixes:**

  – Fixed a problem where a PH16 camera was sometimes being recognized as a PH7 camera and consequently, the wrong protocol commands were being used.

  – Fixed a problem that prevented auto saving in Loop/Burst mode from working for CineFlash in Phantom Miro M-Series cameras.

  – Fixed a problem where the jog/shuttle would not change the current frame position when in the Play menu, on small menus, and the Select button was chosen but the jog/shuttle was not controlling the Cine data field.

1.3 Quick Start Guide

Updated: 2/11/2011

Welcome to the Quick Start Guides for your Phantom camera.

The Quick Start Guides in this section are designed to provide a quick introduction on using a Phantom camera with the Phantom Camera Control application, Touch-Sensitive LCD Screens, and On-Camera Control Buttons. They are intentionally kept brief so that you can start using your camera as quickly as possible. The objective of these Quick Start Guides is not to teach you every single detail of the Phantom Camera Control applications, Touch-Sensitive LCD Screens, or On-Camera Control Buttons, but familiarize you with the basic procedures necessary to use your camera.

1.3.1   Phantom Cameras via Phantom Remote Control Unit

This Quick Start Guide aims to provide 6 easy steps to get started using your Phantom camera.

For full details on the procedures described in the guides, please refer to the Phantom Remote Control Unit - Help File.

STEP-BY-STEP PROCEDURES

▼ Connecting the Camera to the Remote Controller Unit

1. Connect the break-out box 19-pin Capture cable connector to the Capture interface of the camera.
2. Connect the 9-pin male Power, Control, Video cable connector to the Remote interface of the break-out box.
3. Connect the 9-pin female Power, Control, Video cable connector to the Power, Control, Video interface on the Remote Control Unit.
4. Insert the AC power cord into the Phantom camera Power Supply Adapter.
5. Attach the Power Supply Adapter's 4-pin connector to the 20-36VDC/5A Max connector of the break-out box.
6. Plug the Power Supply Adapter to the AC power source.
7. For Phantom cameras with HD-SDI interfaces connect one end of the HD cable to the HD-SDI Video-In BNC connector on the Remote Control Unit and the other end of the HD cable to the HD-SDI BNC connector of the camera.

▼ Capturing Video via the Remote Control Unit

1. With power applied to the Phantom camera, power on the Remote Control Unit by depressing the hardware MENU/PWR button on the Remote Control Unit.

RESULTS:

- RC LED on the unit activates white for approximately 25-seconds.
- RC LED flashes red and green for approximately 13-seconds.
- RC LED turns cyan, and the Phantom logo will appear on the display for approximately 25-seconds.
- Camera LED activates Blue when the camera is started up in pre-trigger mode or Red when the camera starts up in the recording mode, and the Home Menu displays on the LCD.

NOTE:

To view a live image while performing the following setup processes, or to restore the display to the full menu display, gently press on the Menu tab located at the center-top of the menu display.

2. From the Home Screen gently depress the Setup button.
3. From the Setup Screen gently depress the Acq, (Acquisition), button.
4. From the Acquisition Screen:
   a. Gently depress the down-arrow to the right of the Aspect Ratio entry field and select an Aspect Ration, by gently pressing on the desired ratio from the pull-down selection list.

b. Gently press on the first entry window to the right of the Resolution to define the Horizontal Resolution.

c. Use the Numerical Keypad to specify the desired Horizontal Resolution.

　1) To overwrite the present value:

　　a) Gently tap on the entry field once, to turn the entry field yellow, then

　　b) Gently tap on the numerical key pad to enter the desired value.

　　c) When desired value has been specified, gently tap on the Enter key to set the value.

　2) To append the value:

　　a) Gently tap on the entry field twice, to turn the entry filed white, then

　　b) Gently tap on the numerical key pad to append the value.

　　c) When desired value has been specified, gently tap on the Enter key to set the value.

d. Gently press on the second entry window to the right of the Resolution to define the Vertical Resolution using the same method described in Step 4c.

e. Define the Frame Rate, Exposure, and Post Trigger settings using the same method described in Step 4c.

f. Gently press on the Return, ⬅, icon located in the upper-left hand corner of the Acquisition Screen to return to the Setup Screen.

g. Gently press on the Adv Acq, (Advanced Acquisition), button.

h. From the Advanced Acquisition Screen:

　1) Define the EDR settings using the same method described in Step 4c.

　2) Select the desired Bit Depth, Exposure Units, and Post Trigger Units using the same method described in Step 4a.

i. Gently press on the Return, ⬅, icon located in the upper-left hand corner of the Acquisition Screen to return to the Setup Screen.

j. Gently press on the HW Sigs, (Hardware Signals), button.

k. From the H/W Signals Screen:

　1) Select the desired Trigger Edge using the same method described in Step 4a.

　2) Define the Filter setting using the same method described in Step 4c.

　3) Select the desired IRIG and Sync using the same method described in Step 4a.

l. Gently press on the Return, ⬅, icon located in the upper-left hand corner of the H/W Signals and Setup Screens to return to the Home Screen.

m.From the Home Screen gently press the Capture button, then

　1) Gently press the CSR, (Current Session Reference), button.

　2) When prompted gently press the Begin button.

　3) Gently press the Rec, (Record), button to start the image capture process.

n. Apply a trigger to the camera by:

　1) Depressing the hardware Trigger Button on the Remote Control Unit.

　2) Apply a TTL Trigger-In signal to the Trigger connector of the break-out box.

o. Playback the recorded cine, (image data).

▾ Playback Operation

1. Open the Play Control Panel by clicking on the Play button.

2. Gently press on the Play Forward [▶] button or Play Reverse [◀] button.

3. Press the Pause button to halt the playback process, or press the Stop button to stop the playback process and return to the first image of the cine.

NOTE

You can perform a Quick Search through the cine file by:

1. *Gently press and hold down on the Image Location [△] Identifier Up-Arrow, located just below the Cine Editor Bar.*

   The present image number will be displayed above the Cine Editor Bar.
2. *Slide your finger to the right to quickly move forward in the stored cine, alternately*
3. *Slide your finger to the left to move backwards quickly in the stored cine.*

You can also perform a quick search using the Jog/Scroll Dial by rotating the dial until the desired point is achieved.

4. Edit the recorded cine.

   a. Advance the cine file to the first image you desire to save for the cine clip via the:

      1) Quick Search process described above.

      2) Playback buttons:

         a) Gently press on the Play Forward [▶] button or Play Reverse [◀] button.

         b) Press the Pause button when the first image you desire to save for the cine clip has been located.

   b. Gently press the Mark In [A▶] button, alternatively depress the A hardware button of the RCU.

   c. Advance the cine file to the last image you desire to save for the cine clip via the:

      1) Quick Search process described above.

      2) Playback buttons.

         a) Gently press on the Play Forward [▶] button or Play Reverse [◀] button.

         b) Press the Pause button when the last image you desire to save for the cine clip has been located.

   d. Gently press the Mark Out [◀B] button, alternatively depress the B hardware button of the RCU.

5. Save the edited cine to an attached Phantom CineMag.

▾ Save Cine File to an Attached Phantom CineMag

1. After completing the Playback Operations procedure,

2. Gently press the Save button in the Play Screen to save the captured cine file to the camera's attached Phantom CineMag.

3. Review the saved cine files by:

   a. Gently pressing the down-arrow to the right of the Source entry field, and

   b. Gently pressing on the Cine Mag option in the pull-down selection list.

   c. Gently press the plus or the minus button to the right of the Cine entry filed to scroll through multiple cine files stored in the attached Phantom CineMag.

   d. Use the Playback buttons to review the saved cine file.

▼ **Get Ready to Record Again**

After ensuring the cine file you just reviewed, has been saved to the attached Phantom CineMag, and was not corrupted:

1. Navigate back to the Capture Screen.

2. If the Messages option is turned On, gently press the Close button when the "Cine(s) are recorded in volatile memory of this camera. Select 'Record' to delete the cine(s) & start a new recording. Select 'Stop' to stop capture and wait for pretrigger, retaining the cine(s)" window is displayed.

3. Gently press the Rec, (Record), button and repeat the process Capture and Save processes described previously.

▼ **Power Off the Remote Control Unit**

1. To power off the unit hold in the hardware MENU/PWR button for approximately 6-seconds.

IMPORTANT OPERATIONAL NOTES

1. ALL images will be LOST in camera if power to the camera is removed.

2. Insure the lens is clean before recording.

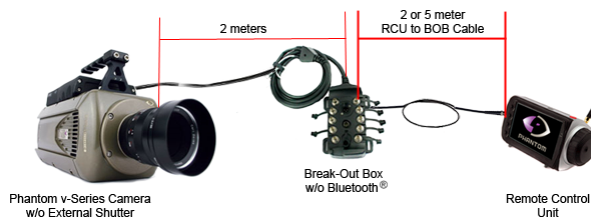# 1.4   Basic Remote Control Unit Configurations

The Remote Control Unit, (RCU), is available in wired and wireless models to support the entire high speed imaging work-flow. The RCU connects to a Phantom v-Series camera via our Break-out-Box, gets power and a video signal, (NTSC or PAL), from the v-Series camera, and can display an SDI signals by using a separate SDI cable connection.

Some Phantom cameras allow the RCU to connect straight to the Remote port on the camera, there is no need for the Break-out-Box, or connect wirelessly using a Bluetooth™ dongle that plugs directly into the camera. This optional industrial Bluetooth connectivity provides the freedom to control the camera wirelessly.

This topic describes the following RCU configurations:

- Older Phantom v-Series Cameras without an External Mechanical Shutter

- Older Phantom v-Series Cameras with an External Mechanical Shutter

- Newer Phantom v-Series Cmaeras

- Wireless Control of Phantom v-Series Cameras without an External Mechanical Shutter

- Wireless Control of Phantom v-Series Cameras with an External Mechanical Shutter

- Wired Control of Phantom HD or Phantom 65 Camera Models

- Wireless Control of Phantom HD or Phantom 65 Camera Models

1.4.1   Older Phantom v-Series Cameras without an External Mechanical Shutter

2 meters

2 or 5 meter
RCU to BOB Cable

Break-Out Box
w/o Bluetooth®

Phantom v-Series Camera
w/o External Shutter

Remote Control
Unit

Kit Part Number w/Component Descriptions

VRI-RCU-KIT-VSERIES-2 or
VRI-RCU-KIT-VSERIES-5 includes:

- VRI-RCU Remote control unit

- VRI-BOB-RCU-2 Break-out-box with RCU port, 2 meter long cable to camera.

- VRI-RCU-TO-BOB-2 Cable for connecting the RCU to the BOB, 2 meters long, or

- VRI-RCU-TO-BOB-5 Cable for connecting the RCU to the BOB, 5 meters long.

1.4.2   Older Phantom v-Series Cameras with an External Mechanical Shutter

2 meters

2 or 5 meter
RCU to BOB Cable

Phantom v-Series Camera
w/ External Shutter

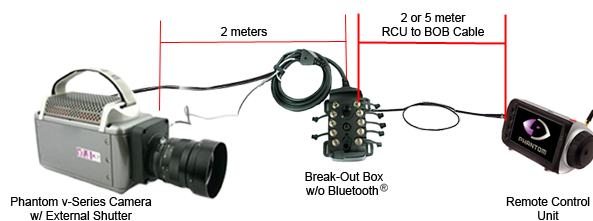Break-Out Box
w/o Bluetooth ®

Remote Control
Unit

Kit Part Number w/Component Descriptions

VRI-RCU-KIT-VSERIES-MS-2 or
VRI-RCU-KIT-VSERIES-MS-5 includes:

- VRI-RCU Remote control unit
- VRI-BOB-RCU-2-MS Break-out-box with RCU port, 2 meters long cable to camera, has "pig tail" for connecting to external mechanical shutter.
- VRI-RCU-TO-BOB-2 Cable for connecting the RCU to the BOB, 2 meters long, or
- VRI-RCU-TO-BOB-5 Cable for connecting the RCU to the BOB, 5 meters long.

1.4.3   Newer Phantom v-Series Cameras

2 or 5 meter RCU to Remote Port Cable, and

2 or 5 meter RCU to HD-SDI Cable

Phantom v-Series Camera
w/ External Shutter

Remote Control
Unit

Component Descriptions

- VRI-RCU Remote control unit
  - VRI-RCU-TO-BOB-2 Cable for connecting the RCU to the camera, 2 meters long, or
  - VRI-RCU-TO-BOB-5 Cable for connecting the RCU to the camera, 5 meters long

1.4.4   Wireless Control of Phantom v-Series Cameras without an External Mechanical Shutter

Phantom v-Series Camera
w/o External Shutter

2 meters

100 meters

Break-Out Box
w/ Bluetooth®

Remote Control
Unit

Kit Part Number w/Component Descriptions

VRI-RCU-BT-KIT-VSERIES includes:

- VRI-RCU-BT Remote control unit with Bluetooth™ transceiver.
- VRI-BOB-RCU-BT-2 Break-out-box with RCU port and Bluetooth transceiver, 2 meters long.
- VRI-RCU-TO-BOB-2 Cable for connecting the RCU to the BOB, 2 meters long, to support wired applications.

Phantom v-Series Camera
w/ Bluetooth® Dongle

100 meters

Remote Control
Unit

Component Descriptions

- VRI-RCU-BT Remote control unit with Bluetooth™ transceiver.

NOTE

Wireless mode does not provide a video display on the Remote Control Unit.

1.4.5   Wireless Control of Phantom v-Series Cameras with an External Mechanical Shutter

Phantom v-Series Camera
w/ External Shutter

2 meters

100 meters

Break-Out Box
w/ Bluetooth®

Remote Control
Unit

Kit Part Number w/Component Descriptions

VRI-RCU-BT-KIT-VSERIES-MS includes:

- VRI-RCU-BT Remote control unit with Bluetooth™ transceiver.
- VRI-BOB-RCU-BT-MS-2 Break-out-box with RCU port and Bluetooth transceiver, 2 meters long, has "pig tail" for connecting to mechanical shutter.
- VRI-RCU-TO-BOB-2 Cable for connecting the RCU to the BOB, 2 meters long, to support wired applications.

NOTE

Wireless mode does not provide a video display on the Remote Control Unit.

1.4.6   Wired Control of Phantom HD or Phantom 65 Camera Models

2 or 5 meter RCU to Remote Port Cable, or

2 or 5 meter RCU to HD-SDI Cable

Phantom HD or Phantom 65
w/o Bluetooth ® Dongle

Remote Control
Unit

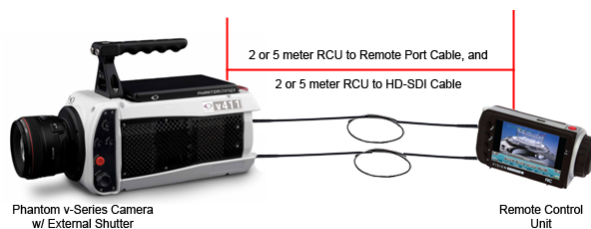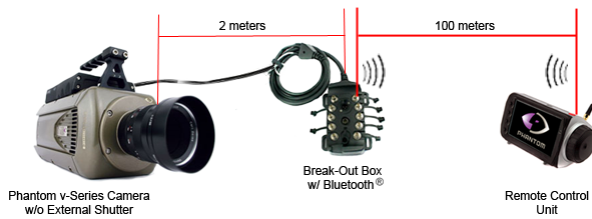*Kit Part Number w/Component Descriptions*

VRI-RCU-KIT-REMOTE-2, or VRI-RCU-KIT-REMOTE-5 includes:

- VRI-RCU Remote control unit.

- VRI-RCU-TO-REMOTE-2 Cable for connecting the RCU to the remote port on the camera, 2 meters long, and VRI-BNC-HDSDI-TO-RCU-2 for connecting the HD-SDI on the camera to the RCU, or

- VRI-RCU-TO-REMOTE-5 Cable for connecting the RCU to the remote port on the camera, 5 meters long, and VRI-BNC-HDSDI-TO-RCU-5 for connecting the HD-SDI on the camera to the RCU.

1.4.7   Wireless Control of Phantom HD or Phantom 65 Camera Models

100 meters

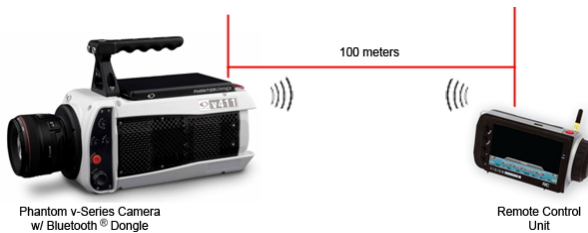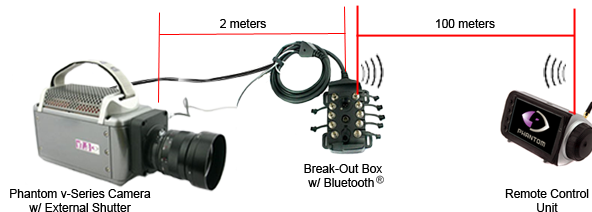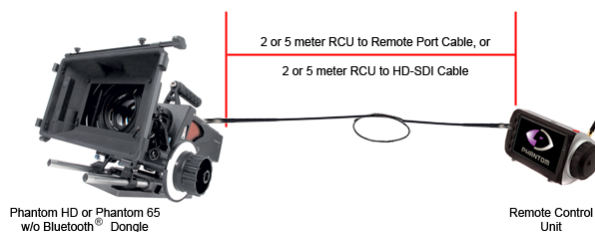Phantom HD or Phantom 65
w/ Bluetooth ® Dongle

Remote Control
Unit
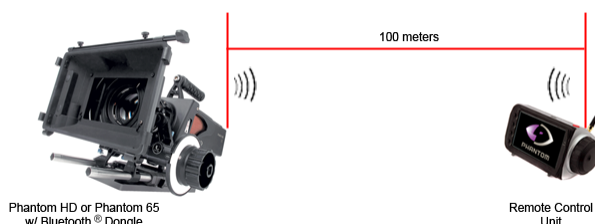
Kit Part Number w/Component Descriptions

VRI-RCU-BT-KIT-REMOTE includes:

- VRI-RCU-BT Remote control unit with Bluetooth™ transceiver.

- VRI-BT-DONGLE Bluetooth™ transceiver dongle for connecting to the remote port on Phantom HD or Phantom 65.

- VRI-RCU-TO-REMOTE-2 Cable for connecting the RCU to the remote port on the camera, 2 meters long.

- VRI-BNC-HDSDI-TO-RCU-2 BNC cable for connecting the RCU to the HD-SDI on the camera, 2 meters long.

NOTE

Wireless mode does not provide a video display on the Remote Control Unit.

1.5 Remote Control Unit Display Menu Tree

Status

- Camera
  - Model
  - Serial
  - Name
- Acquisition
  - Resolution
  - Frame Rate
  - Exposure
  - EDR
  - Bit Depth
- Multi Cine
  - Number Cines
  - Active Cines
  - Frames/Cines
- Trigger
  - Status
  - Post Trigger
  - Trigger Edge
  - Filter Time
- Temperature
  - Camera
  - Sensor
- Mode
- Sync
- Auto Lens
- Bluetooth

Setup

- Mode
  - Loop
  - Loop / Burst
  - Run / Stop
  - Auto Save
- Acq (Acquisition)
  - Cine
  - Resolution
    - Any
    - 16 x 9
    - 4 x 3
    - 1 x 1
  - Width x Height
  - Frame Rate
  - Exposure
  - Post Trigger
- CineMgt (Cine Management)
  - Number Cines
  - Frames / Cine
  - Time / Cine
  - CineMag Erase
- Tools
  - About (Camera)
    - Model
    - Serial
    - Name
    - Firmware
      - PH7
      - FPGA
      - Kernel
      - Flash
    - Dedicated IP Address
    - Secondary IP Address
    - Memory
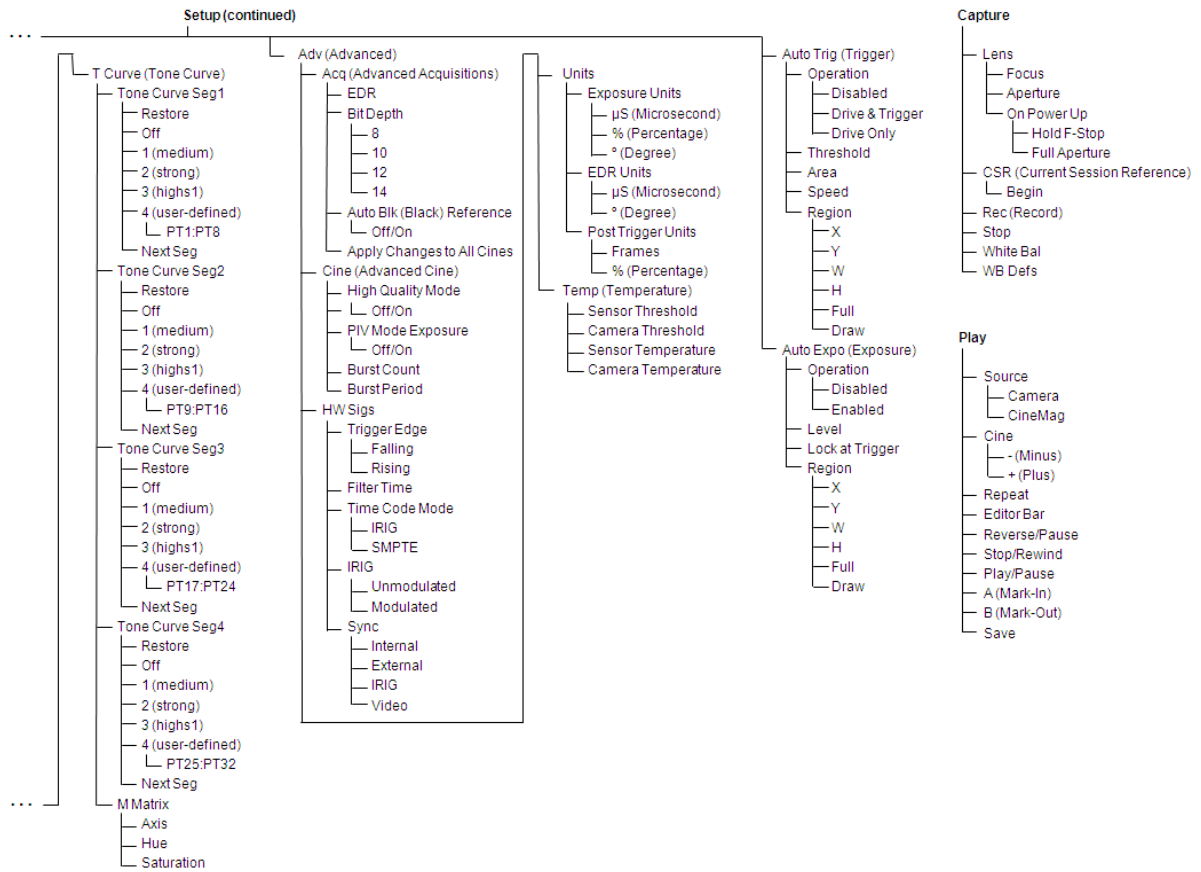   - Max Bit Depth
    - Flash
    - Features
  - Program (Buttons)
    - A
    - B
    - Edit (Programs)
      - Program List
      - Program Name
      - Delete
      - Learn

- Firmware
  - Serial #
  - Firmware Version
  - FPGA Version
  - Bluetooth Version
  - ABOB Firmware Version
  - RCU/ABOB Upgrade
- Settings
  - User Selectors
  - Save
  - Load
  - Erase
  - Factory Reset
- Power (Save)
  - Always On
  - Sleep After Timeout
  - Sleep When On Battery
  - Timeout
- Bluetooth
  - BT Device
    - Off/On
    - Address (Camera List)
    - Search
- Msgs (Messages)
  - Show Warnings & Errors
- Shutter (Control)
  - Shutter
    - Open/Closed
- Presets
  - Preset Info
  - More Info
  - Camera User
    - Save
    - Load
  - USB
    - Import
    - Export
- Display
  - Backlight
  - Menu Color
    - Blue
    - Gray
    - Load Now
    - Load at Power On

- Language
  - English
  - Spanish
  - French
  - Japanese
  - Chinese
- Video
  - OSD
    - OSD Details
      - Off
      - Name, Status
      - + Acq Params
      - + Time, Playback
      - + Range Data
    - Digital OSD
    - Universal Time Code
    - Opaque OSD
  - Format (Video Format)
    - NTSC
    - PAL
    - SDI
    - Color Bars
    - Res
      - 480
      - 576
      - 720
      - 1080
    - Format
      - I
      - P
      - PSF
    - Rate
      - 60
      - 59.9
      - 50
      - 30
      - 29.9
      - 25
      - 24
      - 23.9

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- Adjust (Video Adjust)
  - Image (Adjust)
    - Brightness
    - Gain
    - Gamma
    - Hue
    - Saturation
  - Pedestal (Adjust)
    - R Pedestal
    - G Pedestal
    - B Pedestal
  - Flare (Adjust)
  - Defaults
- C Matrix (Color Matrix)
  - Restore
    - Presets
      - Off
      - 1 (Daylight)
      - 2, 3, 4 (userMatrix)
        - R-R
        - G-R
        - B-R
        - R-G
        - G-G
        - B-G
        - R-B
        - G-B
        - B-B
- SDI
  - Minimum
  - Maximum
- Dual SDI
  - Two Identical 4:2:2
  - Dual Link HD-SDI 4:4:4
  - Live 4:2:2 Play 4:2:2
  - Dual Link 4:4:4 YPbPr
- GenLock
  - Gen Lock
    - Off/On
  - Status

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1.5.1 Menu Tree Structure

1.5.2   Menu Tree Component Descriptions

This topic briefly describes the options and commands incorporated under the following Remote Control Unit display categories:

- Status Components

- Setup Components

- Capture Components

- Play Components

1.5.2.1   Status Components

The Status display screen provides the following status information:

- Camera Status

- Acquisition Status

- Multi Cine Status

- Trigger Status

- Mode Status

- Sync Status

- Auto Lens Status

- Bluetooth Status

1.5.2.1.1 Camera Status

The Camera Status displays the Phantom camera:

Model

The Model field indicates the type of connected to Phantom camera.

Serial Number

Serial Number field indicates the 4-digit serial number of the connected to Phantom camera.

Name

The Name field indicates the user-specified name of the connected to Phantom camera.

1.5.2.1.2 Acquisition Status

The Acquisition Status displays the following Phantom camera capture settings:

Resolution

The Resolution field indicates the present resolution setting of the connected Phantom camera.

The Resolution is the width to the height ratio of the image to be recorded. Each type of camera has a specific maximum resolution. Changing the Resolution settings to match the dimensions of the subject of interest allows the user the option of recording at higher sample rates, or longer

recording times at the same sample rate.

Phantom cameras can be mounted in any position allowing great flexibility in matching the shape of the subject of interest.

Using the CAR (Continuous Adjustable Resolution) feature, provides for resolution adjustments between minimum and maximum drop-down list values, in increments as follows:

- Phantom Phantom 65 in 4096 x 8 pixel increments.

- Phantom Flex, v641, and v341 in 256 x 8 pixel increments.

- Phantom HD Gold, HD in 2048 x 8 pixel increments.

- Phantom v1610, and v1210 in 128 x 16 increments

- Phantom Miro M310, M120, M110, v710, v640, v310, v210, and v12 Series in 128 x 8 pixel increments.

- Phantom v10 and v9.1 in 96 x 8 pixel increments.

- Phantom v7.3 in 32 x 8 pixel increments.

Frame Rate

The Frame Rate field indicates the present frame rate setting for the connected Phantom camera.

The Frame Rate specifies the rate at which images are to be recorded. The frame rate is depended upon the defined Resolution, (width x height), of the images being captured.

Exposure

The Exposure field indicates the present exposure setting for the connected Phantom camera.

Fast shutter speeds equal short exposure times. The faster the shutter, the less motion blur in the images. Shorter exposure times require more light for effective recording than longer ones. This setting is entirely independent of recording speed. Very fast (short) shutter speeds can be used in combination with slow recording speeds, but slow exposure times can never be longer than the recording speed. For example, 1/100 of a second would be the slowest possible shutter speed when recording at 100 pictures per second. The default setting is nominally, the reciprocal of the sample rate less 20 microseconds of overhead.

EDR

The EDR (Extreme Dynamic Range™) exposure field indicates the present EDR exposure setting for the connected Phantom camera.

EDR - Extreme Dynamic Range™ exposure, or "dual-slope integration," within a single frame, is an extremely useful feature when the subject of interest contains very bright areas as well as darker areas, and both must be exposed properly throughout the cine file recording. The EDR function permits the end-user to expose for darker areas in the subject via the sample rate and exposure time settings, then set a separate and independent pixel level, EDR exposure, for all the portions of the image that might become saturated. The option is automatically enabled when any value, other than zero, is entered in the EDR exposure field.

NOTE

EDR exposure times should be set at approximately 1/2 of the Exposure time as a starting point. By setting the EDR exposure to 1/2 of the Exposure time the brightest pixels in the images will be exposed for one stop less than the darker pixels.

Bit Depth

The Bit Depth field indicates the present bit depth setting of the connected Phantom camera.

Pixel bit depth is expressed as the number of "bits" of data used to report each pixel's

information. The higher the number the more accurate, or "faithful," the recorded image as in comparison to the original scene. This fidelity is expressed as the number of shades of grey from white to black that can be reproduced. At 8-bits of depth, each pixel can represent one of 255 levels. With 12-bit depth, each pixel can take on one of 4096 levels. For many applications, anything over 8-bits is not needed, but having the option of a higher image quality is nice when it is needed. However, the price of the higher bit rates is increased memory requirements and larger file sizes.

1.5.2.1.3 MultiCine Status

The MultiCine Status displays the following information:

Number of Cines

The Number of Cine field displays the number of memory segments the connected to Phantom camera's DRAM has been partitioned into.

Using the MultiCine feature allows multiple short recordings to be stored in DRAM. With MultiCine, you can rapidly record a repetitive test sequence, or even different subjects with distinct camera settings in camera memory before downloading the image data, (cine file), to an external storage device or internal flash memory.

Each MultiCine partition can have its own acquisition parameter profile assigned to it. By default, each MultiCine segment will be allocated an equal amount of the total memory buffer.

Active Cine

The Active Cine field indicates the functioning MultiCine memory partition.

Frames/Cine

The Frames/Cine field indicates the maximum number of images, or frames, that can be recorded to the active cine memory partition.

The maximum number of recordable frames is determined by the amount of memory allocated to the active memory segment, and how its acquisition parameters have set.

1.5.2.1.4 Trigger Status

The Trigger Status displays the following information:

Operational State

The Operation State field indicates the present operational status or state of the connected to Phantom camera. The various operational states include:

- Waiting for Pre-Trigger
- Waiting for Trigger
- Cine Stored

Post Trigger

The Post Trigger value represents how many pictures will be recorded after the trigger signal is detected by the Phantom camera.

When a Post Trigger value is defined, the camera will continue to record and store, to the camera's DRAM buffer, image data after a trigger signal is detected for n fames, where n is the number of post trigger frames specified. After the trigger, signal is detected by the camera, recording continues for an exact number of frames, n, and stored in the image buffer, then recording stops; n will depend on the Resolution, Sample Rate, Image Bit Depth settings, and the buffer, (amount of DRAM memory), size. It's important to note that the camera can only store a finite number of images into the memory buffer based on the resolution, sample rate, image bit

depth settings, and the memory size. When a post trigger value has been defined the camera will store the maximum image count allowed, for the particular capture settings. The camera will only display the frames stored in the memory buffer, the last x images, where x is the total number of images recorded or stored in the image buffer. At this point, the recorded images can be viewed or saved into a file on the Phantom Control Unit or, optionally saved to built-in non-volatile flash memory.

Trigger Edge

The Trigger Edge status indicates whether the connected to Phantom camera is to trigger on the leading, (rising), edge or trailing, (falling), edge of the externally supplied TTL trigger input signal.

When a trigger signal is detected by a Phantom camera, it instructs the camera to mark the next available frame as Frame 0, record the number of post trigger frames set by the user, and stop recording images. The trigger signal can be an external TTL pulse (hardware produced), contact closure or open, or via command (software produced). An example of trigger flexibility: You have a bottling machine and occasionally certain part malfunctions setting off an alarm, and that brings the line to an abrupt and messy halt. You decide your Phantom camera will solve the problem, but how do you proceed? The first is to set a simple switch closure that is activated by the failure (you mentioned that you had an alarm). Set up the camera with the desired settings and then note that you are able to specify the number of "pre trigger" images that will be saved before the trigger arrives. Depending on the recording speed you have set, and the size of your available memory, choose a number, for example, 500 for before trigger frames that will be retained in memory when the signal is received. Make sure the camera is powered-up and waiting for a trigger, and then take a break. When the next failure occurs, your high speed recording will retain 500 images before the trigger signal, of the machine operating as it should, then events leading up to the failure. The triggered moment of failure will follow, the damage and the ensuing events caused by the failure. This effective use of trigger settings is why high-speed cameras do not usually need recording durations beyond a few seconds.

Filter Time

The Filter Time status indicates the user-specified trigger signal filter time.

The Filter Time instructs the connected to Phantom camera to ignore a trigger signal if it is detected before the specified Filter Time. It also specifies the length of time the trigger signal must be held in the user-specified state, (pulled-low or held high), for to be a valid trigger signal.

1.5.2.1.5 Mode Status

The Mode Status indicates the user defined operational mode. Phantom cameras that support a Phantom CineMag can operate in one of three operational modes, including:

Loop

In the Loop Mode, the camera stores the recorded image data into the camera's DRAM buffer. In this mode, the Phantom CineMag operates like any other Flash card, after a cine file is recorded into the camera's DRAM frame buffer, you can manually save it into the CineMag using the "Flash Memory" dialogue window which can be accessed in either the Setup and Recording or ViewCine dialogue windows.

NOTE

Loop mode supports recording up to the maximum frame rate.

Loop/Burst

In the Loop/Burst Mode, the camera initially stores the recorded image data into the camera's DRAM buffer. Once the entire cine has been recorded to the camera's DRAM it will automatically save the image data from the camera's DRAM into the attached Phantom CineMag.

R/S (Run/Stop)

In Run/Stop Mode, the image data is recorded directly into the Phantom CineMag at a reduced s rate, for example, a Phantom HD up to 450fps at HD resolution (2048 x 1080). This reduction in recording speed is due to speed at which data can be written into Flash memory.

1.5.2.1.6 Sync Status

The Sync Status indicates the defined frame rate clock source setting for the connected to Phantom camera.

The camera's frames can be synchronized to the internal camera clock, an external clock source, IRIG-B time code, or IRIG-B with a phase shift. When set to Internal the camera is controlled by the camera's own crystal frequency oscillator. External is controlled by an F-Sync signal from a second Phantom camera or any source that produces a +5V, TTL Low-going, 4µs wide pulse, including function generators or pulsed lasers, and IRIG-B is controlled IRIG-B Time Code signal input.

1.5.2.1.7 Lens Control Status

The Lens Control Status indicates if Len Control is On or Off. The Lens Control option allows the end-user to control an attached lens when used with the Automatic Lens Control Mount remotely.

1.5.2.1.8 Blue Tooth Status

The Bluetooth Status indicates if Bluetooth Control is On or Off.

1.5.2.2   Setup Components

The Setup display screen provides the following setup options:

- Mode

- Acquisition

- Cine Management

- Tools

- Video

- Advance Acquisition

- Auto Trigger

- Auto Exposure

1.5.2.2.1 Mode Options

The Mode display allows the end-user to choose one of three operational modes when a Phantom CineMag is attached to the camera. These operational modes, include:

Loop

In the Loop Mode, the camera stores the recorded image data into the camera's DRAM buffer. In this mode, the Phantom CineMag operates like any other Flash card, after a cine file is recorded into the camera's DRAM frame buffer, you can manually save it into the CineMag using the "Flash Memory" dialogue window which can be accessed in either the Setup and Recording or ViewCine dialogue windows.

NOTE

This mode supports recording up to the maximum frame rate.

Loop/Burst

In the Loop/Burst Mode, the camera initially stores the recorded image data into the camera's DRAM buffer. Once the entire cine has been recorded to the camera's DRAM it will automatically save the image data from the camera's DRAM into the attached Phantom CineMag.

R/S (Run/Stop)

In Run/Stop Mode, the image data is recorded directly into the Phantom CineMag at a reduced s rate, for example, a Phantom HD up to 450fps at HD resolution (2048 x 1080). This reduction in recording speed is due to speed at which data can be written into Flash memory.

Auto Save

The Auto Save feature when selected allows the end user to define an image range (first to last) that will be edited from the full range of images recorded in the camera's memory buffer and automatically saved to an attached Phantom CineMag when the camera is in Loop/Burst Mode.

1.5.2.2.2 Acquisition Options

The Acquisition display allows the end-user to define various capture parameters, including:

Cine

Signifies the memory cine partition, when in MultiCine, being configured via the Acquisition menu.

Resolution

The Resolution parameter is used to instruct the Phantom camera to restrict the resolution parameter to meet the aspect ratio requirements or allow the end-user to specify any resolution. Selected option include:

- 16 x 9
- 4 x 3
- 1 x 1
- Any

Width x Height

The width to height ratio is the size of the image to be recorded. Each type of camera has a specific maximum width x height. Changing these settings to match the dimensions of the subject of interest allows the user the option of recording at higher sample rates, or longer recording times at the same sample rate. Phantom cameras can be mounted in any position allowing great flexibility in matching the shape of the subject of interest.

When a specific "Resolution" has been selected, (16 x 9, 4 x 3, or 1 x 1), and the end-user attempts to define the width x height parameters that do not meet the specified resolution dimensions, the system will automatically change to the nearest width x height that meets the resolution requirement.

When the resolution parameter is set to Any, the end-user can define the width x height parameters to change the dimensions of the images using the CAR (Continuous Adjustable Resolution) feature, which provides for adjustments between the minimum and maximum drop-down list values in the following increments:

- Phantom Phantom 65 in 4096 x 8 pixel increments.
- Phantom Flex, v641, and v341 in 256 x 8 pixel increments.
- Phantom HD Gold, HD in 2048 x 8 pixel increments.
- Phantom v1610, and v1210 in 128 x 16 increments
- Phantom Miro M310, M120, M110, v710, v640, v310, v210, and v12 Series in 128 x 8 pixel increments.
- Phantom v10 and v9.1 in 96 x 8 pixel increments.
- Phantom v7.3 in 32 x 8 pixel increments.

Frame Rate

The Frame Rate specifies the rate at which images are to be recorded. The sample rate is depended upon the defined Resolution (width x height) of the images being captured.

Exposure

The default Exposure setting is nominally, the reciprocal of the sample rate less 20 microseconds of overhead. The Remote Control Unit allows the user to enter exposure times in one-microsecond increments between the minimum and maximum exposure time within the drop-down list.

Post Trigger

The Post Trigger value represents how many frames will be recorded after the trigger signal has been detected by the Phantom camera. Since the memory is a scrolling memory, the Post Trigger value also sets the reciprocal number of pre-trigger images captured.

When a Post Trigger value is defined via the Remote Control Unit, the camera will continue to record and store, to the camera's DRAM buffer, image data after a trigger signal is detected for n fames, where n is the number of post trigger frames specified.

After the trigger signal is detected by the camera, recording continues for an exact number of frames, n, and stored in the image buffer, then recording stops; n will depend on the Resolution, Sample Rate, Image Bit Depth settings, and the buffer, (amount of DRAM memory), size.

It's important to note that the camera can only store a finite number of images into the memory buffer based on the resolution, sample rate, image bit depth settings, and the memory size.

When a post trigger value has been defined the camera will only store the maximum image count allowed, for the particular capture settings. The camera will only display the frames stored in the memory buffer, the last x images, where x is the total number of images recorded or stored in the image buffer.

At this point, the recorded images can be viewed or saved into a file on the Remote Control Unit, Phantom Control Unit or, optionally saved to built-in non-volatile flash memory of the camera.

1.5.2.2.3 CineMgt (Cine Magement) Options

The Multi Cine display allows the end-user to segment a Phantom camera's DRAM and view the number of frames that can be stored in each MultiCine memory partition and its maximum recording duration.

Number Cines

Specifies the number of memory segments, or partitions, a Phantom camera's DRAM memory will be evenly divided into.

Frame/Cine

Displays the number of frames that can be stored in each MultiCine memory partition.

Time/Cine

Displays the maximum recording duration, in seconds, for each MultiCine memory partition.

Cine/CineMag/Erase Button

The Cine and CineMag fields along with an Erase button used in conjunction with each other to specify which cine is to be erased. Cines saved on a computer hard-drive or a camera's Phantom CineFlash can be selected individually. However, when erasing cines stored on a Phantom CineMag is still an all-or-nothing proposition.

1.5.2.2.4 Tools Options

The Tools display allows the end-user to view and define various camera options, including:

About

The About option provide information about the connected to Phantom camera, including:

Model

The Model field indicates the type of connected to Phantom camera.

Serial

The Serial field indicates the serial number of the connected to Phantom camera.

Name

The Name field indicates the user-specified camera name of the connected to Phantom camera.

Firmware

The Firmware field indicates the version of Firmware, FPGA, Kernel, etc. loaded into the connected to Phantom camera.

IP Address

The IP Address field displays the Vision Research assigned IP Address, along with the Secondary user-assigned IP Address of the connected to camera.

Memory

The Memory field displays the size of the DRAM image buffer installed in the connected to Phantom camera.

Maximum Bit Depth

The Bit Depth field displays the user-defined image pixel bit depth.

Flash

The Flash field displays the size of the non-volatile Flash image buffer installed in the connected to Phantom camera.

Features

For Use by Vision Research Engineering Group Only.

Program Button

The Program Button option enables the end-user to specify the use of the displays A/B buttons.

A/B Program Selection Pull-Down Lists

The A and B Program selection pull-down lists allows you to select from a list of stored programs to be run when the A or B buttons are pressed.

A/B Enable Pull-Down Selection List

The A and B Enable pull-down selection list allows you to enable or disable the use of the selected program that is associated with the A and B buttons.

Edit

The Edit button, when selected, displays the Edit Programs display window, including:

Program Name Field

The Program Name field is used to create or edit the name of the program associated with the A and B buttons.

Program List Selection Pull-Down List

The Program List field is used to create a list of programs that are associated with the A and B buttons.

Learn Enable Box

The Learn enable box, when checked, allows the creation of the operations that the A and B buttons will perform when pressed.

Delete

The Delete button, when selected deletes programs from the list. To toggle through four (4) user-defined camera setup configurations, defined via the Presets option described

later in this topic.

Firmware

The Firmware option displays the Serial Number, Firmware Version, FPGA Version, Bluetooth Model Version and ABOB Firmware Version loaded into the Remote Control Unit. It also provides an:

Upgrade Selection List

This list allows the end-user to choose whether the RCU or the Break-out-Box firmware is to be upgrade. Once selected the upgrade process will be initiated using the Upgrade button.

Upgrade Button

This button is used to initiate the firmware upgrade process to a RCU or Break-out-Box.

NOTE:

When performing an update, beyond Version 4.4 an I2C communication issue can arise failing to update the kernel that would make the RCU unrecoverable by the end-user. It would have to be sent back to Vision Research to be recovered.

Settings

The Settings options mimic the User Settings of cameras that support the On Camera Control display, (requires >689 firmware).

User

The User pull-down selection list is used to select one of six settings slots.

Save

The Save button, when selected, saves the camera's current settings into the selected user setting slot number.

Load

The Load button, when selected, loads the contents of the user settings' slot into the camera's current settings.

Erase

The Erase button, when selected, erases the contents of the selected user setting slot.

Factory Reset

The Factory Resets button, when selected, resets the camera's settings to factory defaults.

Power Save

The Power options include:

Always On

Always On is an option that instructs the Remote Control Unit to be on until the end user powers it down.

Sleep After Time Out

The Sleep After Time Out instructs the Remote Control Unit to go into sleep mode after a user-specified period of time of inactivity. When in this mode, the battery life of the unit will be extended to approximately 2-hours. When the unit is in sleep mode, the Remote Control Unit can be placed back into the active state by moving the RCU, touching the screen, pushing on any of the hardware buttons or moving the jog/shuttle.

Sleep When On Battery

The Sleep When On Battery instructs the Remote Control Unit to go into sleep mode after a

user-specified period of time of inactivity. When in this mode, the battery life of the unit will be extended to approximately 2-hours. When the unit is in sleep mode, the Remote Control Unit can be placed back into the active state by moving the RCU, touching the screen, pushing on any of the hardware buttons or moving the jog/shuttle.

Timeout

Timeout specifies the amount of time the Remote Control Unit must be inactive to place the unit into sleep mode.

Bluetooth

The Bluetooth option allow the end-user to:

- Enable/Disable an attached Bluetooth device, and
- Set the Bluetooth Address.

Messages

The Messages option allows the end-user to enable/disable warning and error popup messages.

Shutter Control

The Shutter Control option allows the end-user to set the shutter, of an automatic mechanical shutter, to one of the following:

Open

The Open option forces the shutter of an automatic mechanical shutter mechanism to remain open, then close when a CSR, (Current Session Reference), is performed, and re-open when the CSR process has been completed.

Closed

The Closes option forces the shutter of an automatic mechanical shutter mechanism to remain closed until instructed, by the end-user, to re-open the shutter.

NOTE

The Shutter Control option can only be used with a Phantom camera that is equipped with either an internal mechanical auto-shutter or an automatic external mechanical shutter.

Presets

The presets menu has been redesigned for compatibility with the user-settings slots within the cameras, (requires >730 firmware).

Preset

The Preset pull-down selection list allows you to select one of six preset files on the Remote Control Unit. The slots are labeled A through F.

Preset Info Indicator

When selected, the Preset Info Indicator displays basic information about the stored preset: model, serial, name, timestamp.

More Info

If the selected preset is stored, the More Info button will display more detailed information about the settings the preset contains.

Camera User

The Camera User pull-down selection list is used to select a user-settings slot within the camera.

Save

Pressing the Save button will save the user settings in the camera from the selected slot (1-6) into the selected preset (A-F).

Load

Pressing the Load button will load the contents of the selected preset (A-F) into the selected user-settings slot (1-6) of the camera. These settings will also be applied to the current settings of the camera simultaneously.

USB

Camera settings stored in the Remote Control Unit's presets can be imported/exported to a USB flash drive to exchange with another Remote Control Unit. In the future, these file may also be generated via the Phantom (PCC) Camera Control application.

Each preset (A-F) is made up of two files preset#.cfg and preset#.b64, (where # is the letter of the preset). These files are both necessary. The user may change the letter of the preset (A-F) if he wishes to store it in another slot.

USB Import

The USB Import button, when selected, will import the selected preset (A-F) from a USB flash drive into the Remote Control Unit.

USB Export

The USB Export button, when selected, will export the selected preset (A-F) from the Remote Control Unit onto an attached USB flash drive.

Display

The Display option allows the end-user to:

- Adjust the back light intensity of the Remote Control Unit.

- Change the display screen template to blue or gray immediately, otherwise the change will occur upon reboot of the Remote Control Unit.

- Change the display menus to one of the following languages, English, Japanese, Chinese, Spanish, or French.

1.5.2.2.5 Video Options

The Video display allows the end-user to define various video output options. The Video Out parameters only need to be configured when a Phantom camera is connected to an external monitor. Setting these parameters will just affect what is displayed on the attached monitor. The Video options include:

OSD

The OSD, (On-Screen Display), option allows the end-user to define the following:

OSD Detail

The OSD Detail parameter allows the end-user to specify what camera information is to be displayed on the screen of the attached monitor from a pull-down selection list. The list is a logical ANDing of the options in the list as described below:

Off

No information.

Name, Status

Displays the name and current status of the camera.

Acqui params

Displays the setting specified via the Acquisition menu, along with the name and current status of the camera.

Time, Playback

Displays the absolute time and the playback rate, along with the name and current status of the camera, and specified via the Acquisition menu.

Range data

Displays the camera name, current status of the camera, the acquisition parameters, and all range data information.

Digital OSD

When the Digital OSD is enabled, (checked), the OSD fields will be displayed on an attached monitor or viewfinder.

Universal Time OSD

When enabled, (checked), the OSD time reference will be adjusted and displayed to utc (GMT) Universal Time Code (Greenwich Means Time).

Opaque OSD

When the Opaque OSD field is disabled, unchecked, it removes the background color (black) from the OSD informational fields when disabled, not checked.

Format

The Format option allows the end-user to define the output video format from the selected camera. The user can define the following:

NTSC

When selected the camera will transmit the NTSC (National Television System Committee) video signal format; 59.94 half frames (called fields) per second and 525 lines per field, (480 lines in each field are the image, and the last 45 are the "vertical blanking interval" (VBI), designed to give the electron gun time to reposition itself from the bottom of the last field to the top of the next), to an attached compatible monitor.

NTSC is the analog television system in use in Canada, Japan, South Korea, the United States, and some other places, mostly in the Americas.

PAL

When selected the camera will transmit the PAL (Phase Alternating Line) video signal format; 25 fields per second and 625 lines per field, to an attached compatible monitor.

PAL is the analog television system used in most of Western Europe, Australia and other countries.

SDI

When selected the camera will transmit a user-specified HD-SDI signal format to an attached compatible monitor. The end-user will be able to specify the Resolution, Format, and Rate.

Resolution

The Resolution field is used to specify the number vertical resolution line to an attached HD compatible monitor. The supported resolutions include:

720

When selected the camera will transmit 720 lines of vertical resolution, with a horizontal resolution of 1280 pixels and an aspect ratio of 16:9, implying a horizontal (display) resolution of 1of 1280 lines and a frame resolution of 1280 × 720 or about 0.92 million pixels.

1080

When selected the camera will transmit 1080 lines of vertical resolution, with a horizontal resolution of 1280 pixels and an aspect ratio of 16:9, implying a horizontal (display) resolution of 1920 dots across and a frame resolution of 1920 × 1080 or over two million pixels.

Format

The Format field is used to specify the lines of resolution are to be scanned by the attached HD compatible monitor. The supported format types include:

I

When selected the lines of resolution will be interlaced scanned.

P

When selected the lines of resolution will be progressively scanned, non-interlaced. 1080p is currently the digital standard for filming digital motion pictures.

PSF

PSF, (Progressive Segmented Frame), is a high-definition video format used to store progressive content on interlaced media. Each progressive frame is segmented into two interlaced fields without inter-field motion, or "combing." PSF is an alternative to 3:2 pull-down, wherein certain frames are "pulled down" across multiple fields, resulting in output with an irregular frame rate.

Motion picture film cameras produce progressive images, usually at 24 frames per second. In order to display those images on NTSC television, whose frame rate is 29.97 frames per second interlaced, (59.94 fields per second), each frame must be split into alternating groups of 3 and 2 fields. This is known as 3:2 pull-down.

Certain high-definition tape formats, such as HDCAM allow frame rates other than 29.97. It is therefore, possible, using PSF, to store "true" 24 frames per second progressive images without pull-down, which then play back at the original frame rate. Thus, the 24psf and 23.976psf, (for compatibility with NTSC), formats were devised, which exist on tape as 48, (or 47.952), fields per second interlaced. When set up correctly, a progressive-scan monitor will read these interlaced fields two at a time, and display each pair as a single progressive frame, temporally identical to the source. PSF content can also be played back on interlaced displays, but the image will flicker.

Rate

The Rate field is used to specify the frame rate cycle, (Hz), of the attached HD compatible monitor.

For cameras connected to a 720p compatible monitor the following rates are supported:

- 60Hz.
- 59.9Hz. (59.94Hz.actual rate)
- 50Hz.

For cameras connected to a 1080p, 1080i, or 1080psf compatible monitors the following rates are supported:

- 30Hz.
- 29.9Hz. (29.97Hz. actual rate)
- 25Hz.

For cameras connected to a 1080p compatible monitor the following rates are supported:

- 24Hz.
- 23.9Hz. (23.976Hz.)

Color Bars

When the Color Bars option is enabled, (selected), the color bar test pattern will be displayed on the attached monitor.

Adjust

The Adjust option allows the end-user to define the following:

Image

The Image Adjust option allows the end user to adjust the:

- Brightness
- Gain
- Gamma
- Hue
- Saturation

Pedestal

The Pedestal option allows the end user to adjust the:

- Red Pedestal
- Green Pedestal
- Blue Pedestal

NOTE

Adjusting the pedestal values redefines separate video monitor (R)ed, (G)reen, (B)lue brightness adjustments.

Flare

A Flare slider can be used to adjust the Flare video adjustment.

Defaults

The Defaults option, when selected, resets all the Image Adjustment settings back to factory defaults.

C-Matrix (Color Matrix)

There are four color matrices, that match the On-Camera Control matrix values, that can be created or edited via the Remote Control Unit. The matrix name drop-down is used to select a matrix. Matrix 2 has been pre-defined.

The associated G-R, B-R, R-G, B-G, R-B, and G-B fields, below the matrix number field, are the specific color matrix variables. G-R represents green with red; B-R represents blue into red and so forth.

These setting only affect the video out. It may take some experimentation to get a feel for what the right adjustments are.

SDI

The SDI options are used to increase or decrease the video out black and white levels.

Dual SDI

The Dual HD-SDI option is used to define the video feed mode from supporting Phantom cameras. Presently, there are four modes supported, including:

- Two Identical 4:2:2
- Dual Link HD-SDI 4:4:4
- Live 4:2:2 Play 4:2:2
- Dual-Feed 4:4:4 YPbPr

This Versatile Dual HD feature allows maintaining a live video feed while simultaneously playing back recorded images from the camera memory. The feature has also improved the handling of active metadata, or video image adjustments, to allow proper handling during pipelined recording/ playback operations.

NOTE

Not all Phantom cameras support Dual HD-SDI Interface capabilities.

Previously, when changing any of the values, they would apply to the video image, both live and playback. Now, changing a video adjustment value will only apply to the live image out of the camera, in either single-feed or dual-feed mode. For playback, the values that were active when the cine was recorded will be used.

Important System Interactions

Various interactions between the functional block depicted in the video feed operational modes descriptions require the following rules to be put into place:

- All outputs are set to the same video format.
- Test bars are sent on all outputs at the same time.
- OSD, (On-Screen Display), information can be inserted only on the analog/component out and SDI-2, (Serial Digital Interface-2)
- In dual-feed modes, only one of the following operations can take place at any given time:
  - A Playback from RAM
  - A playback from the Phantom CineMag
  - Recording or Saving to the Phantom CineMag
  - Downloading from the Phantom CineMag via Ethernet

Following are descriptions of each of the video operational modes:

Two Identical 4:2:2

This mode provides both the live and playback feed, from the RAM, over the video memory channel. This is exactly how the video feeds were handled previously. The high-speed channel is used as the recording source for the Phantom CineMag, if fitted.
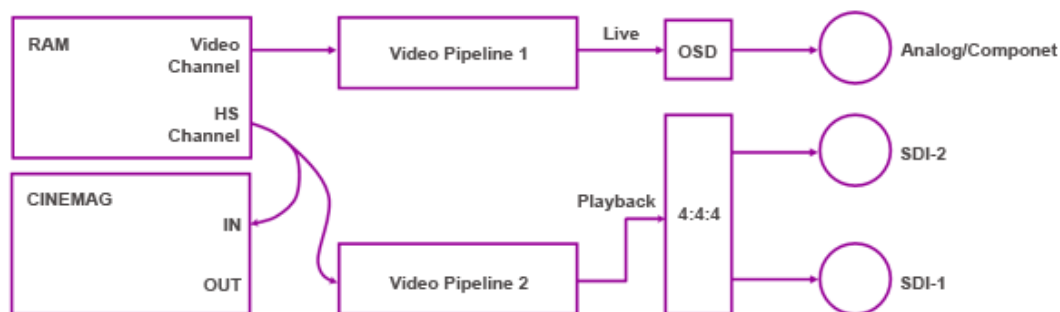
Only one video pipeline is used at a time.
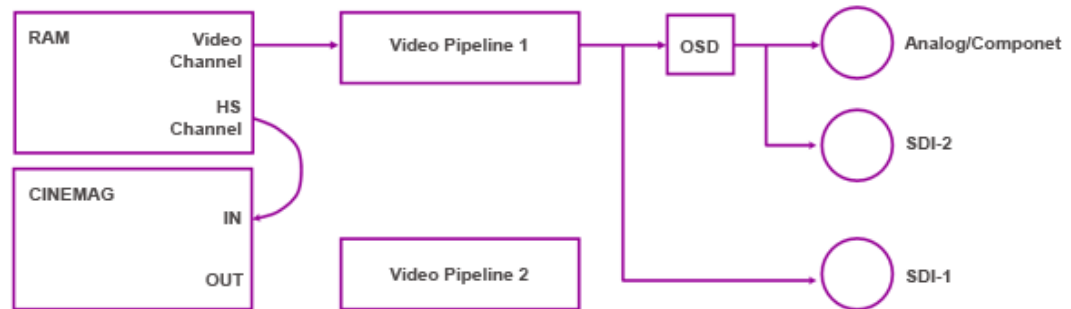
Routing of image data when outputting images from the camera's RAM
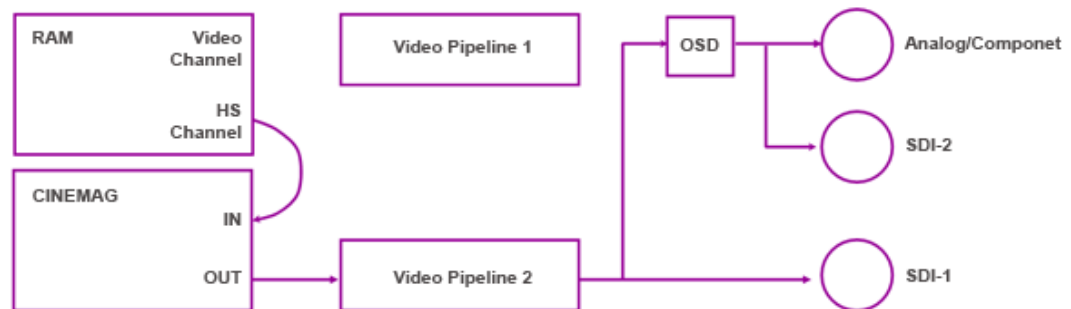
Routing of image data when outputting images from Phantom CineMag

When the camera is placed into the Two Identical, 4:2:2 Mode images can be read from the camera's RAM over two totally independent channels, the:

- Video Memory Channel
- High-Speed Memory Channel

The camera has two identical video pipelines used to handle image debayering, and all color adjustments. The video output of these pipelines can be routed to three outputs:

- One analog/component
- SDI-1, (Serial Digital Interface)
- SDI-2, (Serial Digital Interface)

On-screen annotations can be inserted into the signal going to the analog/component output and/or SDI-2. There is no OSD, (On-Screen Display), for SDI-1.

Dual Link HD-SDI 4:4:4

In this mode, the SDI, (Serial Digital Interface), Outputs are used together as a dual-link output, allowing 4:4:4 image sampling.
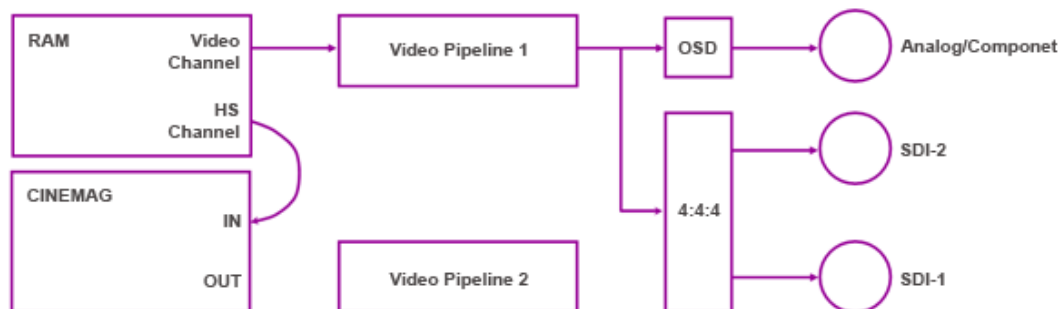
Routing of image data when outputting images from the camera's RAM
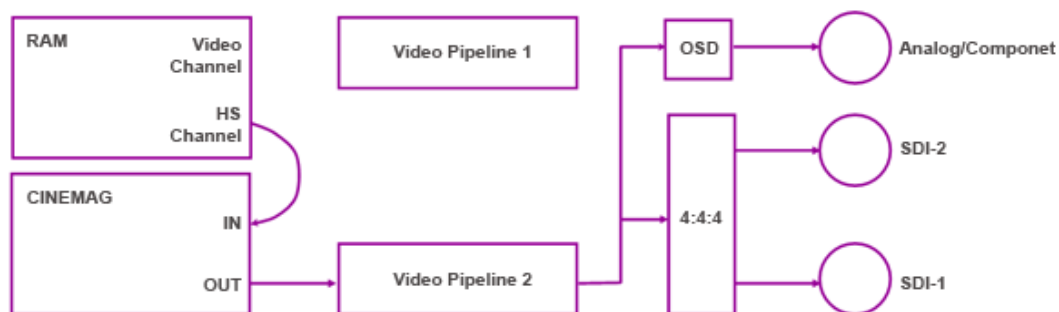
Routing of image data when outputting images from Phantom CineMag

When the camera is placed into the Single-Feed with Dual Link HD-SDI, 4:4:4 Mode images can be read from the camera's RAM over two totally independent channels, the:

- Video Memory Channel
- High-Speed Memory Channel

The camera has two identical video pipelines used to handle image debayering, and all color adjustments. The video output of these pipelines can be routed to three outputs:

- One analog/component
- SDI-1, (Serial Digital Interface)
- SDI-2, (Serial Digital Interface)

On-screen, (OSD - On-Screen Display), annotations can only be inserted into the analog/component signal.

Live 4:2:2 Play 4:2:2

When the camera is placed into the Live 4:2:2 Play 4:2:2 Mode the two video pipelines are used simultaneously. The video memory channel is used to source a live video feed, while either the high-speed memory channel or the Phantom CineMag is used to source the playback feed.

Both the analog/component output and the SDI-2, (Serial Digital Interface-2), outputs always carry the uninterrupted live feed. OSD, (On-Screen Display), information can be inserted on either of these outputs. SDI-1 is reserved for the playback feed.

NOTE

If no playback is taking place, a black image is outputted.
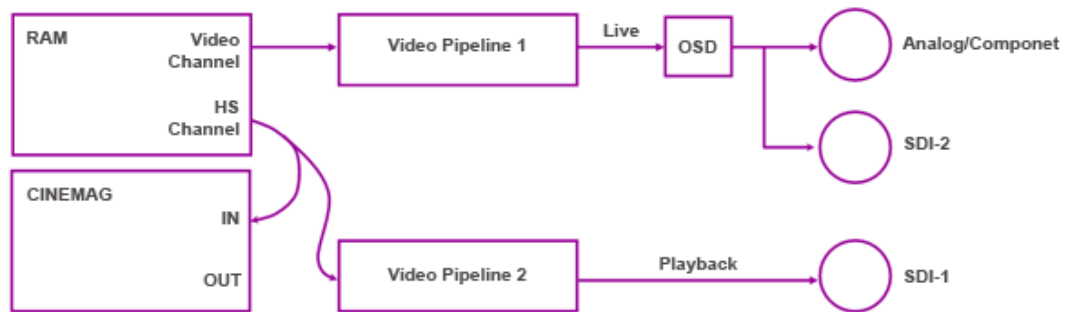
Routing of image data when outputting images from the camera's RAM
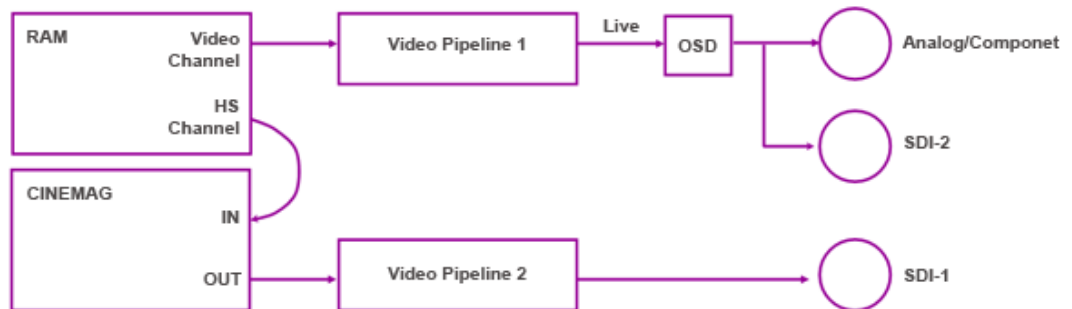
Routing of image data when outputting images from Phantom CineMag

Dual Link 4:4:4 YPbPr

In the Dual Link 4:4:4 YPbPr the two SDI, (Serial Digital Interface), outputs are used together as a dual-link output, allowing 4:4:4 image sampling. The live feed, and optional On-screen Display, (OSD), annotations are sent to the analog/component output, while the playback feed uses the dual-SDI outputs.

Routing of image data when outputting images from the camera's RAM
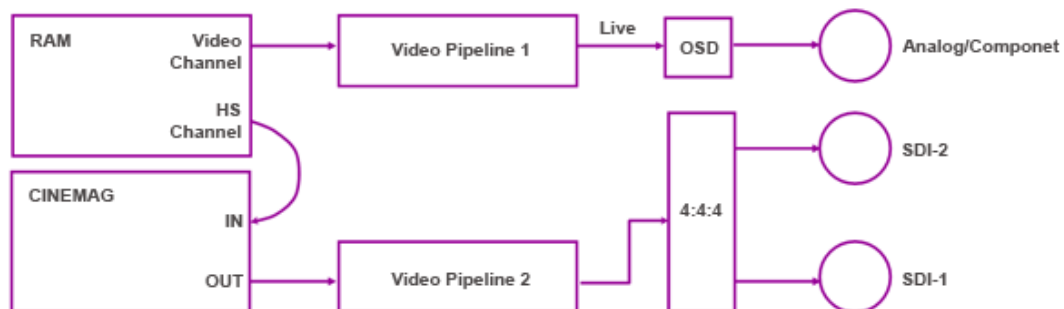
Routing of image data when outputting images from Phantom CineMag

GenLock

GenLock is used to synchronize the playback to a video signal, utilizing a composite video inbound signal. This video input signal should be a properly terminated, (75-ohm), and the signal must not exceed +1.56V maximum. For anything but the shortest cable runs, quality 75-ohm coax, (e.g. RG59/U), must be used.

It will also synch live video, by synchronizing the SDI outputs to the GenLock signal.

T Curve (Tone Curve Segment)

The Tone Curve interface is very similar to the Color Matrix interface except that there are up to 32 entries in a tone curve which span four entry screens. Each subsequent entry screen is entered by touching the button labeled "Next Seg". Repeatedly touching "Next Seg" will loop back to the 1st segment entry screen.

M Matrix

The M Matrix (Multi Matrix) feature allows independent adjustments of the saturation and hue of each of 16 axes of the Cr/Cb color circle.

There are three user-definable variable associated with the M Matrix feature, including"

Axis

Axes are 22.5 deg apart, and are identified by their angle. Angle measurements start from the positive Cb direction (right horizontal on the vector scope), and proceed

---

counterclockwise, with the 90 deg axis pointing up, 180 deg axis pointing left, and 270 deg axis pointing down. Colors that fall in-between two successive axes receive a transformation that is a linear interpolation between the transformations of the two nearby axes.

Hue

Hue changes the hue of the specified axis by the number of hue degrees clockwise.

Saturation

Sets the saturation for the degree axis.

1.5.2.2.6 Advanced Acquisition Options

The Advanced Acquisition display allows the end-user to define the following options:

Acquisition Options

The Acquisition options allow the end-user to define the following:

EDR

The EDR, (Extreme Dynamic Range), exposure time feature is extremely useful when the subject contains very bright areas as well as darker areas and both must be exposed properly throughout the cine file. The EDR function permits the end-user to expose for darker areas in the subject via the Sample Rate and Exposure time settings and then set a separate and independent pixel level EDR exposure for all the portions of the image that might become over exposed, (saturated).

NOTE

The EDR feature is automatically enabled when any value, other than zero, is entered in the EDR field. The EDR feature cannot be used in conjunction with the Auto Exposure feature and should not be enabled while performing a CSR, (Current Session Reference), or Black Reference calibration adjustment.

EDR Exposure times should be set at approximately 1/2 of the Exposure Time as a starting point. By setting the EDR Exposure to 1/2 of the Exposure Time the brightest pixels in the images will be exposed for one stop less than the darker pixels.

Bit Depth

A variety of the Phantom camera sensors have the ability to record and save 8-, 10-, 12-, or 14-bit values, (gray scale level images), that are transferred to the computer as either 16-bit or 8-bit words. By default, these Phantom cameras display 8-bit, (256 gray scale level), images. The 8-bits used to display these images are the most significant, or high order, bits of 14-bit values.

The Pixel Depth feature makes it possible to increase contrast and see images with less light simply by selecting which region of the total dynamic range of the image to display on-screen. The display outputs 8-bits even though the image has up to 14-bits. This is because each of the 8-bits of data selected, by the user, is split into 16-bits where the high-order bits are used with well lit subjects and the low-order bits for dimly illuminated subjects.

NOTE

Both 8-bit to 14-bit images need exactly the same amount of light to saturate the sensor. What differs is the fineness in number of levels recorded.

Auto Blk (Black) Reference

When enabled, On, the Auto Black Reference parameter eliminates the need to cover the lens prior to performing a Current Session Reference with Phantom cameras having the

Internal or External Automatic Mechanical Shutter option.

Apply Changes to All Cines

Selecting this checkbox will copy all future changes in acquisition parameters to all cines.

Cine Options

The Cine options allow the end-user to define the following:

High Quality Mode

The High Quality Image Mode feature instructs a Phantom Flex camera to use a proprietary multi-sampling technology to enhance each frame. Each frame is analyzed for noise and image artifacts that can occur under continuously changing shooting environments.

Using High Quality Image Mode ensures the best images possible will be recorded even when changing frame rates, exposure settings, resolution, or if ambient and camera temperatures are changing.

NOTE

High Quality Image Mode reduces maximum frame rates by ½ and each frame requires twice the internal camera memory. However, saved cine files are the same size as in Standard Mode and recording directly to a Phantom CineMag has the identical speed and size specifications as Standard Mode.

PIV Mode Exposure

This feature has been designed for use in PIV (Particle Imaging Velocimetry) applications. When enabled the Phantom v710 and v12.1 will be instructed to reduce the Frame Straddle Time to 500 nano-seconds, the Phantom v310 is instructed to reduce the Frame Straddle Time to 660 nano-seconds, the Phantom v210 to 700 nano-seconds, a Phantom v640 to 1.2 micro-seconds, and the Phantom v10, v9.1, v7.3, and v5.2 to 1.5 micro-seconds.

Burst Count

The Burst Count is one of two parameters use to define Burst Mode Acquisition designed for use in PIV (Particle Imaging Velocimetry) applications. The other parameter is the Burst Period described below. The Burst Count sets the number of frames in a burst, (a value of zero disables Burst Mode Acquisition completely).

Burst Period

The Burst Period is one of two parameters use to define Burst Mode Acquisition designed for use in PIV (Particle Imaging Velocimetry) applications. The other parameter is the Burst Count described above. It sets the interval between two frames in a burst, in microseconds.

NOTE

The Burst Count and Burst Period parameters will be validated by the camera and clamped to ensure valid values. When clamping occurs, the Burst Count has priority over Burst Period, and both will have priority over the exposure time.

Behavior of the camera will be modified in the following way, when viewing live images, with a Burst Count larger than one the camera will retrieve images from the most-recent burst, starting with the first frame in the burst.

HW Sigs (Hardware Signals) Option

The HW Sigs, (Hardware Signals) options allows the end-user to define the following:

Trigger Edge

The Trigger Edge parameter defines whether the leading edge or trailing edge of a TTL

supplied input trigger signal is to be used to trigger the camera. To select the leading or falling edge select the Rising Edge or Falling Edge respectively.

An unmodulated (TTL) signal uses specific voltage levels to represent the rising and falling edges of a signal. Depending on the end point device either the rising edge or falling edge of the signal may be used as the clock source for the device. Phantom camera users can specify either the rising or falling edge, of the signal, to clock the camera.

Filter Time

The Filter Time instructs the Phantom camera to ignore a trigger signal if it is detected before the specified Filter value. It also specifies the length of time the trigger signal must be held for to be a valid trigger signal.

Time Code Mode

The Time Code Mode option allows the end-user to select the type of timing system that is to be used to generate a time code. A time code is a sequence of numeric codes generated at regular intervals by a timing system. Time codes are used extensively for synchronization. The end-user can choose either:

IRIG

IRIG (Inter-range Instrumentation Group) time codes are often used to set/synchronize the date and time on other devices. The formats of IRIG time codes are many, but the most common format is IRIG-B (a 1 KHz signal), which sends day of year, hour, minute, and second data on a 1 kHz carrier frequency, with an update rate of once per second.

All data is encoded as Binary Coded Decimal (BCD) and the "frames" of data are 1 second long for IRIG-B, 100 ms long. All variants are continuous and contiguous ... no gaps or 'packeting'.

SMPTE

SMPTE time codes contain binary coded decimal hour:minute:second:frame identification and 32 bits for use by users. There are also drop-frame and color framing flags and three extra 'binary group flag' bits used for defining the use of the user bits. The formats of other varieties of SMPTE time codes are derived from that of the longitudinal time code.

Time codes may use a number of frame rates. Common ones are:

- 24 frame/sec (film, ATSC, 2k, 4k, 6k)

- 25 frame/sec (PAL (Europe, Argentina), SECAM, DVB, ATSC)

- 29.97 (30 ÷ 1.001) frame/sec (NTSC American System (US, Canada, Mexico, Colombia, etc.), ATSC, PAL-M (Brazil))

- 30 frame/sec (ATSC)

In general, SMPTE time code frame rate information is implicit, known from the rate of arrival of the time code from the medium, or other metadata encoded in the medium. The interpretation of several bits, including the "colour framing" and "drop frame" bits, depends on the underlying data rate. In particular, the drop frame bit is only valid for a nominal frame rate of 30 frame/s: see below for details.

More complex time codes such as vertical interval time code can also include extra information in a variety of encoding.

IRIG

The IRIG parameter specifies if the supplied IRIG (Inter Range Instrumentation Group) standard is the IRIG time code standard used to time stamp video, film, telemetry, radar, and other data collected at test ranges.

The type of IRIG input signals expected by a Phantom camera can be an either an

unmodulated (TTL) or modulated IRIG-B signal.

Sync

The Sync parameters, listed below, are used to define the frame sync clock source, specify the master camera supplying the frame sync clock source to other Phantom cameras, and define how much to delay the recording of image data from the frame sync clock pulse. This entry field instructs the selected camera to utilize one of the following three frame sync clock sources:

Internal

This mode instructs the camera to utilize its' internal crystal oscillator to drive the camera's sample rate.

External

This mode should be selected when an externally supplied frame sync clock pulse is supplied to drive the camera's sample rate. The external input must be a TTL pulse, with a frequency up to the maximum sample rate. (Example: 1000Hz @ 512 x 512 resolution, 2000Hz @ 256 x 512 resolution.) The TTL input pulse must be connected to the BNC, (Bayonet Neill-Concelman), connector marked Sync on the Capture breakout-cable/box.

IRIG

This mode is should be selected when an IRIG-B signal is supplied through the marked IRIG Input BNC, (Bayonet Neill-Concelman), connector on the Capture breakout-cable/box.

NOTE

When set to External the Sample Rate option will be disabled. When IRIG sync imaging is selected the Sample Rate will be limited to increments of 100fps.

Video

The Video option allows the camera to capture frames at a rate that is a multiple of the video frame rate, with a defined phase relationship to the video signal.

It brings the following benefits:

- When both recording and play-back need to be synchronized (such as in stereoscopy applications), a FSYNC connection between cameras is no longer needed - GenLock will suffice.
- The cameras can capture at the "fractional" frame rates of 23.98, 29.97 and their multiples.
- The live output of the camera maintains a stable phase in relation to frame capture.

Units Options

The Units options allows the end-user to define the following:

Exposure Units

The Exposure Unit field allows the end-user to choose how the exposure units are to be displayed:

µs (Microseconds)

The values of Exposure will be specified in microseconds. The maximum value of the Exposure Time depends on the period of the images, that is 1/Sample Rate value.

% (Percent)

The Exposure value will be specified as a percentage of the maximum value.

⁰ (Degrees) - Angle (common in cinematography)

The value of Exposure will be specified in degrees. It represents the degree of the open segment of the shutter, (shutter angle). A value of 360° corresponds to a full period of the frame.

EDR Units

The EDR, (Extreme Dynamic Range), Unit field allows the end-user to choose how the EDR units are to be displayed:

µs (Microseconds)

The value of EDR Exposure is in microseconds.

% (Percent)

The value of EDR Exposure is a percentage of the specified Exposure value.

Post Trigger Units

The Post Trigger Units field allows the end-user to choose how the post trigger units are to be displayed:

Frames

The PTF, (Post Trigger Frames), value is the number of frames, after a trigger signal has been detected by, the selected Phantom camera continues to capture before the recording process stops.

The maximum value of Post Trigger Frames in the drop-down list depends on the resolution and bit depth set, and on the memory capacity. If PTF value is set to the maximum value in the list, all images in camera's memory will be post trigger frames. If a value greater than the maximum in the list is specified, the recording will be delayed by as many images as the difference between that value and the maximum in the list, up to ten times the maximum.

% (Percent)

The PTF, (Post Trigger Frames), value is a percentage of the maximum value described in the Frames description.

Temp Options

The Temperature threshold settings and informational fields are used to help regulate the operating temperatures of the selected camera and its' sensor.

Sensor Threshold

The (Sensor) Threshold parameter defines a starting point operating temperature of the sensor.

Camera Threshold

The (Camera) Threshold parameter defines a starting point operating temperature for the camera.

Sensor Temperature

This informational field displays the operating temperature of the sensor.

Camera Temperature

This informational field displays the operating temperature of the camera.

NOTE

If the temperature of the Cam:, exceeds the camera's threshold setting the camera's cooling system will work harder to reduce the camera's operating temperature. If the Sensors temperature rise above the sensor's Threshold setting, the sensor's thermal expansion diodes will reduce the temperature of the sensor. If the sensor temperature dips below the (sensor) Threshold setting, the sensor's thermal expansion diodes will increase the temperature of it.

1.5.2.2.7 Auto Trigger Options

WARNING:

The Image-Based Auto-Trigger feature should never be used in applications where missed or false triggers cannot be tolerated or where a false trigger could cause harm to people or property. The hardware signaling available in some Image-Based Auto-Trigger modes should be used only to synchronize multiple Phantom cameras together and should never be used to trigger or control any other external device or event.

CONSEQUENCES RESULTING FROM SYSTEM FAILURE, FALSE TRIGGERING OR MISUSE OF THIS FEATURE ARE THE SOLE RESPONSIBILITY OF THE USER.

At the time of this writing, the Image-Based Auto-Trigger feature allows selected Phantom camera models to trigger themselves when the image changes in a selectable region of the frame. For the v-Series implementation, there is a mode which allows this feature to generate a hardware trigger signal for multi-camera installations.

A few user-definable parameters allow the auto-trigger behavior to be adjusted to operating conditions, filtering out unintended triggers due to vibration, changes in illumination, slow-moving shadows, etc.

The Auto-Trigger operation begins by the user specifying a rectangular area within the image, similar to the region used for auto-exposure, the Auto-Trigger region. As each frame is captured, the image in, the image in the Auto-Trigger region is compared to an earlier copy of the same region that has been stored in a dedicated memory. After the comparison is made, the image in memory is updated to the current image, to be used in the future. The result of the comparison determines if a trigger is generated. A pixel being compared is considered "active" if its level has changed, (brightened or darkened), by more than a preset threshold. The number of active pixels for a given frame is counted, and if it exceeds a set number, a trigger is generated. The required number of active pixels is specified as a percentage of the area of the Auto-Trigger region. When an Auto-Trigger condition is detected, the Auto-Trigger signal of the camera is pulled low. The Auto-Trigger signal is available on Pin-N of the Capture connector.

The Auto Trigger display allows the end-user to define the following options:

Operation

Several operating modes are possible for the Image-Based Auto-Trigger system, including:

Disabled

Image-Based Auto-Trigger is disabled.

Drive & Trigger

The camera will drive both the auto-trigger and trigger itself when an auto-trigger is detected. If the auto-trigger signal is pulled low by an external device, the camera will be triggered.

Drive Only

With Drive Only mode the image changes are analyzed, and when an auto-trigger condition has been detected, the auto-trigger signal will be pulled low, as in Drive & Trigger, however, the camera will not trigger itself. An external device pulling the auto-trigger signal low will not trigger the camera either.

Drive Only is useful when external control of the auto-trigger is desired, for instance, it is required that the auto-trigger feature is disabled for some known transient event. The auto-trigger signal from the camera will be routed through some exterior device and back into the trigger input of the camera.

Threshold

The Threshold specifies the amount a pixel value must change in order to be counted as an active pixel for auto-trigger purposes. A value of 100 would require a change of approximately half of the full swing of the camera. A typical threshold setting would be 10.

Area

The Area specifies the percentage of the auto-trigger region that must be active in order for an auto-trigger event to be generated. A typical percentage value is 10.
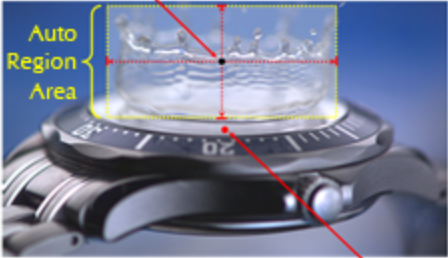
Speed

The Speed specifies the check interval, in microseconds, for updates, within the auto-trigger region.

Region

The Region parameters specify the auto-trigger area, limited to a one mega pixel area, used to compare each captured frame to an earlier copy of the same region that has been stored in a dedicated memory to determine if the auto-trigger user specified conditions have been met to trigger the camera.

The auto-trigger region parameters include:

	VARIABLE	DEFINITION
Auto Trigger Region Example	X	Defines the x-coordinate of the pixel, in the center of the auto-trigger region in respect to the center of the frame, (origin point).
	Y	Defines the y-coordinate of the pixel, in the center of the auto-trigger region in respect to the center of the frame, (origin point).
	Width	Defines the width of the auto-trigger region starting with the pixel coordinated defined via the X parameter.
	Height	Defines the height of the auto-trigger region starting with the pixel coordinated defined via the Y parameter.

Full

The Full parameter, when selected, instructs the camera to use the entire frame as the auto-trigger region, except if it is greater than one mega pixel.

Draw

The Draw parameter, when selected, allows the end-user to draw, in multiple directions, a rectangle around the desired auto-trigger region up to one mega pixel in size.

1.5.2.2.8 Auto Exposure Options

The Auto Exposure feature is extremely useful when conditions adversely affect setting the camera's exposure to a fixed variable, such as capturing outdoors where clouds may change the light conditions. The system will automatically adjust the exposure setting using the information from a user-defined area. This defined pixel area should be the focus of interest, or the area of interest; in other words, the subject matter.

NOTE

The Auto Exposure feature cannot be used in conjunction with the EDR, (Extreme Dynamic Range), feature. Once the Auto Exposure feature is enabled EDR setting will automatically be disabled. Furthermore, the Auto Exposure feature should not be enabled while performing a CSR, (Current Session Reference), or Black Reference calibration adjustment.

The Auto Exposure display allows the end-user to define the following options:

Operation

The Operation field is used to enable/disable the auto-shutter feature.

Level
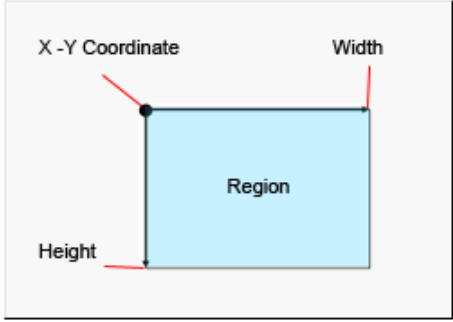
The Level parameter specifies the desired average gray scale level for the specified area, to be realized by the automatic exposure process, (i.e, for an 8-bit pixel image depth a mid gray level is 128, black is 0, and saturation is 255).

Lock at Trigger

When enabled, (checked), auto exposure locks in the exposure setting the moment the camera detects a trigger signal.

Region

The Region parameters specify the user-defined auto-exposure area of interest. The auto-exposure region parameters include:

Auto Exposure Region Example

VARIABLE	DEFINITION
X	Defines the x-coordinate of the upper-left pixel of the auto-exposure region.
Y	Defines the y-coordinate of the upper-left pixel of the auto-exposure region.
Width	Defines the width of the auto-exposure region starting with the pixel coordinated defined via the X parameter.
Height	Defines the height of the auto-exposure region starting with the pixel coordinated defined via the Y parameter.

Full

The Full parameter, when selected, instructs the camera to use the entire frame as the auto-exposure region.

Draw

The Draw parameter, when selected, allows the end-user to draw, in multiple directions, a rectangle around the desired auto-exposure region.

1.5.2.3 Capture Components

The Capture display screen provides the following options:

- Lens Control

- CSR (Current Session Reference)

- Record

- Stop/Preview

- White Balance

- White Balance Defaults

1.5.2.3.1 Lens Option

The Lens Control option allows the end-user to control an attached lens when used with the Automatic Lens Control Mount remotely. The end user can adjust/set:

Focus

Moving the slider to right will adjust the focus toward infinity.

Aperture (f-stop)

Moving the slider to the left instructs the aperture, of the attached lens, to open. Adjusting the slider to the right instructs aperture, of the lens, to stop down.

1.5.2.3.2 CSR (Current Session Reference)

Current Session Reference" is a calibration procedure that computes the pixel offsets only on the part of the sensor that is the next greater value after the resolution set in acquisition parameters.

This way, the offsets can be computed for any frame rate, exposure or resolution, giving a more precise compensation of the pixel errors, dependent on the acquiring parameters and on temperature. Of course, if the acquisition parameters change, you may get worse results. The CSR is applied correctly only for the set of acquisition parameters used when this reference was calculated.

This CSR black reference is available for any image resolution. When the acquisition parameters, (resolution, frame rate, exposure time), have certain values, (for example, the frame rate is high or the set of values' forces the camera performances), it is recommended to do a CSR for that specific set of parameters in order to obtain a better image.

After executing a CSR, if you change the acquisition parameters, the calibration calculated during the Current Session Reference will apply partially correct on the new setup. For example, if you use a bigger resolution than the one used when the CSR was calculated, the CSR adjustments will be applied only on that part of image and for the rest of the image the black reference calibration calculated in the Options window will be used.

The CSR calibration can be saved in a .STG file, for example: 1009_res256x256_rate80_exp12000_edr0..STG.

Thus, you can easily choose a .STG according to the acquisition you are currently using. This .STG file will be opened automatically at the program restart if you rename it by the serial number of the camera: 1009.STG in this example.

1.5.2.3.3 Record Option

The Record option is used to place the selected Phantom camera into the recording mode. When the Record option is selected, images will be continuously recorded to a user-specified storage area.

If there are no more available cine files left to record into the camera's DRAM memory, a warning dialogue window will appear. By selecting the Record option, you choose to delete these cine files in the camera's memory and start recording a new one.

1.5.2.3.4 Stop Option

The Stop option, when selected, instructs the selected camera to stop recording image data and place the camera into the waiting for pre-trigger state.

1.5.2.3.5 White Balance

Because of the different "colors" of various types of light sources, a color camera' preview images may have a color tint that may not appear quite right during setup. The Phantom camera has several adjustment methods to assist in correcting image color. Using the fast and easy to use White Balance control should be the first step in color adjustment.

1.5.2.3.6 White Balance Defaults

The WB Defs (White Balance Defaults) option, when selected, resets all the White Balance settings back to factory defaults.

1.5.2.4 Play Components

The Play display screen provides the following options:

- Source

- Cine

- Repeat

- Editor Bar

- Playback Buttons

- Mark In/Mark Out Buttons

- Save Button

1.5.2.4.1 Source Option

The Source option allows the end-user to select, from a pull-down selection list, the location of the cine file to be reviewed, edited, or saved. This list includes the following options:

Camera

When selected the end-user can select a cine file stored in the Phantom camera's DRAM to view, edit, or save.

CineMag

When selected the end-user can select a cine file stored in the attached Phantom CineMag to view, edit, or save.

1.5.2.4.2 Cine Option

The Cine Option is used to select a specific cine memory segment to be reviewed when recording in MultiCine mode.

1.5.2.4.3 Edit Option

The Edit options provide:

Editor Bar

The Editor Bar is used to edit unnecessary images from the beginning and the end of the recorded cine prior to saving the cine. Editing the cine will create smaller files, reduce the save time and make cine playbacks more interesting.
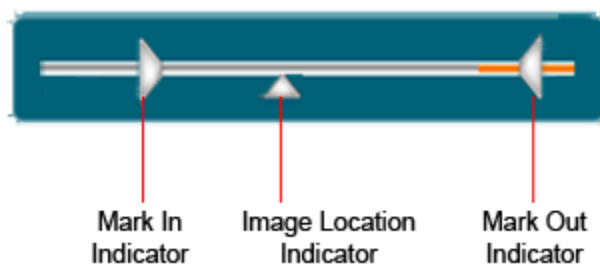
Mark-In Indicator

The Mark In Indicator represents the starting point of the cine file presently stored in the camera's DRAM buffer.

Image Location Identifier

The Image Location Indicator represents the location of the image being displayed as it relates to its position in the cine file. This indicator can also be used, by the end-user, to perform a Quick Search through the selected cine file.

Mark-Out Indicator

The Mark Out Indicator represents the end point of the cine file presently stored in the camera's DRAM buffer.

1.5.2.4.4 Playback Buttons

The Playback/Save buttons are as follows:

Reverse/Pause

The Reverse/Pause button when initially selected decrements the playback one image at a time, and changes from the Reverse button to a Pause button. When the Pause button is selected the playback will halt.

Stop (Rewind)

The Stop (Rewind) button, when selected halts the playback process and rewinds the cine file back to the first image of the cine file. Gently tapping on the Stop button a second time will jump to the trigger frame, (Image 0).

Forward/Pause

The Forward/Pause button when initially selected increments the playback one image at a time, and changes from the Forward button to a Pause button. When the Pause button is selected the playback will halt.

1.5.2.4.5 Mark In/Mark Out Buttons

The Mark In/Mark Out buttons are as follows:

Mark In

The Mark In button when selected defines the new starting point of the cine file presently stored in the camera's DRAM buffer.

Mark Out

The Mark Out button when selected defines the new end point of the cine file presently stored in the camera's DRAM buffer.

1.5.2.4.6 Save Button

> The Save button instructs the attached Phantom camera to save the selected cine file to a Phantom CineMag only. When selected the progress of the save will be displayed.

1.6 Navigation and Use

Navigation through the Remote Control Unit menu structure is accomplished primarily through the use of the "touch-sensitive" LCD display. This module describes various navigational and use processes.

1.6.1 Power Up/Down the RCU

Power Up

To power on the unit depress the hardware Menu button.

RESULTS:

1. RC LED on the unit activates white for approximately 25-second.

2. RC LED turns cyan, and the Phantom logo will appear on the display for approximately 20-seconds.

3. Camera LED activates Green, and the Home Menu displays on the LCD.

Power Down

To power off the unit hold in the hardware Menu button for approximately 6-seconds.

1.6.2 The Display Components

COMPONENT	NOMENCLATURE	DESCRIPTION
1	OSD, (On Screen Display)	The OSD, (On Screen Display), will display the user-specified camera information defined in the Setup>Video>On Screen Display Menu.
2	Preview/Playback Screen	The Preview Screen displays exactly what the Phantom camera is imaging. The Playback Screen is used to display a recorded cine file for editing and motion analysis.
3	Present Menu Tab	The Present Menu Tab indicates the present menu. To reduce the Menu Display Screen, when in full-screen mode, gently tap on the tab. The Menu Display will be displayed as shown in the image above.
4	Menu Options	The Menu Options are the selectable options, commands, or parameters associated with the menu option shown in the Present Menu Tab.
5	Previous Menu	The Previous Menu icon is used to return to the previous menu screen, up to the root or Home Menu.
6	Hide Menu	The Hide Menu icon removes the Menu Display Screen. To re-acquire the Menu Display Screen, push the Remote Control Unit's hardware Menu button one time.

COMPONENT	NOMENCLATURE	DESCRIPTION
7	Operational State Indicator	The Phantom Logo changes color for different operational states of the camera, as follows: , (Blue), LIVE PRE , (Red), LIVE WTR , (Yellow), LIVE TRG , (Green), LIVE CST or PLAY CST
8	Camera Information Bar	The Camera Information Bar provides important, user-friendly, information about the attached Phantom camera in two information bars. To toggle between the information bar displays, gently tap on the Camera Information Bar. The type information displayed varies based on the operational state of the camera, as follows: ***All Operational States*** V7.3　8607　"VRI"　01/06/10　20:03 UT • Phantom Camera Model • Camera Serial Number • Camera Name • Date and Time Reference (MM/DD/YY hh:mm TZ (TimeZone) ***LIVE PRE*** 800 x 600　1000fps　998uS　1ptf　17729f　17.729s • Resolution • Sample Rate • Exposure Time • Maximum Recordable Frames • Recording Duration ***LIVE WTR, LIVE TRG, and LIVE CST*** Capturing Cine 1 of 1 • Recording Cine Segment

COMPONENT	NOMENCLATURE	DESCRIPTION
8	Camera Information Bar *(continued)*	***PLAY CST*** Start 0, Mark In 3527, Mark Out 8299, End 17728 • First Image Number of all the Images Recorded • First Image Number of the Images Contained Within the Edited Cine File • Last Image Number of the Images Contained Within the Edited Cine File • Last Image Number of all the Images Recorded
9	Power Icon	The Power Icon indicates the power status of the camera as follows: • Green w/Plug - AC Powered - Battery Fully Charged • Green w/Bolt - AC Powered - Battery Charging • White and Green - Battery Powered - Charge Life 51 to 99% • White and Yellow - Battery Powered - Charge Life 31-50% • White and Red - Battery Powered - Charge Life Less the 30% • All Red - Faulty Battery (Battery will not charge... needs to be replaced.)

1.6.3   Manipulating a Menu

Reducing a Menu Display Screen

Gently tap on the Menu tab located at the center-top of the menu display.

Enlarging a Display Screen

Gently tap on the Menu tab located at the center-top of the menu display.

Accessing a Menu/Sub-Menu Display Screen

Gently tap on the menu/sub-menu option desired.

Return to Previous Menu Display Screen

Gently tap on the Return, ⬅, icon located in the upper-left-hand corner of the menu screen to move one level upward in the menu structure.

Closing the Menu Display Screen Completely

Gently tap on the Exit, ✕, icon in the upper-right-hand corner of the menu.

Re-Acquire the Menu Display Screen

Press the hardware Menu button on the Remote Control Unit.
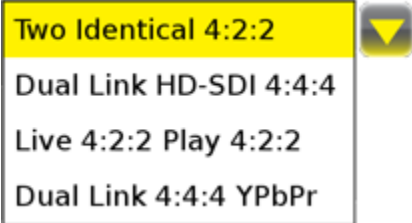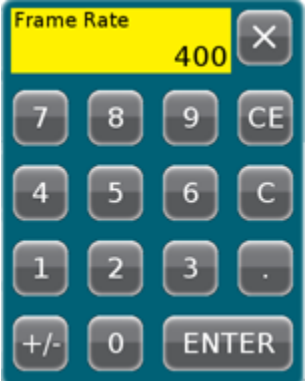
1.6.4   Moving the Preview/Playback Image Display

The Remote Control Unit allows the end-user to move the displayed image area on the LCD by:

1. Gently touching anywhere on the displayed image, then

2. Slide your finger across the display to drag the image to the desired location of the LCD.

1.6.5   Select/Define Camera Options Tools

The Remote Control Unit's user-friendly interface makes enabling, selecting or defining a camera option extremely easy by providing three distinct selection methods, including:

GRAPHICAL COMPONENT	COMPONENT TYPE	USAGE
	Radial Button	Gently tap on the radio button to enable or disable the radial button. Yellow indicates enabled, white disabled.
	Pull-Down Selection Lists	Gently tap on the down-arrow to the right of the entry field, then softly tap on the option desired to select it. The selected option will be highlighted in yellow.
	Numerical Key Pads	There are two ways to change the numerical value of the selected entry field as follows: ***Overwrite*** 1. Gently tap on the entry field once, to turn the entry field yellow, then 2. Gently tap on the numerical key pad to enter the desired value. 3. When desired value has been specified, gently tap on the Enter key to set the value. ***Append*** 1. Gently tap on the entry field twice, to turn the entry filed white, then 2. Gently tap on the numerical key pad to append the value. 3. When desired value has been specified, gently tap on the Enter key to set the value.

GRAPHICAL COMPONENT	COMPONENT TYPE	USAGE
	Sliders	There are two ways to set the desired slider setting, via: ***Touch-Sensitive Screen*** Gently hold your finger on the slider and drag your finger to the left to decrease the value, or to the right to increase it. Alternatively, you can gently double-tap anywhere on the slider bar to jump the slider to that location quickly. ***Jog/Scroll Dial*** Gently tap on the slider bar, then rotate the Jog/Scroll Dial to move the slider.
	Enable Box	Gently tap on the Enable Box to place/ remove, (enable/disable), the selected enable box.
	Minus/Plus Buttons	Gently tap on the Minus/Plus button to adjust the selected variable.

NOTE

If an invalid value is entered the Remote Control Unit will select the nearest valid parameter value and display the corrected entry in red indicating that the end-user has entered an invalid variable.

1.6.6   Performing a RCU Firmware Upgrade

1. Connect to the Internet using s web-browser application.

2. In the address field type in the Vision Research - Download web page address:

    http://www.visionresearch.com/index.cfm?sector=htm/app&page=software

3. Locate the Remote Control Unit Firmware Upgrade Software, then

4. Click on Download Now. (Be sure to note the location of the file is being saved to.)

5. Insert a USB memory stick into the computer/laptop, then

6. Copy the downloaded rcu.fw file into onto the USB memory stick.

7. Create a new text file on the USB memory stick, From the USB Drive window.

    1. Click on the File pull-down menu, then

    2. Select the New>Text Document

    3. Rename the newly crated text document, using lower-case letters only, to rcu_upgrade. Do not add the .txt file extension.

NOTE

Upon completion of the upgrade process, this rcu_upgrade file will be deleted, therefore if you need to upgrade multiple Remote Control Unit the rcu_upgrade file will need to be re-created for each Remote Control Unit being upgraded.

8. Ensure the Remote Control Unit is powered off.

9. Remove the USB memory stick from computer/laptop then

10. Insert into the USB connector of the Remote Control Unit.

11. Apply power to the remote Control Unit.

RESULT: The Remote Control Unit performs its power up routine using the new firmware stored in on the USB memory stick. The Home Menu Display Screen should now be displayed on the Remote Control Unit.

12. Verify that firmware upgrade has been successful.

   a. Navigate to the Firmware Display Screen, by

   b. Gently pressing on the Setup>Tools>Firmware buttons.

1.7   Tech Tips

The module is intended to provide the end-user with Step-by-Step Procedures of various tasks that may not be as intuitive to perform.

1.7.1   Determining a Valid Maximum Variable Value

To determine a valid maximum value, quickly, for any variable entered via the Numerical Keypad simply:

STEP-BY-STEP PROCEDURE

1. Enter all nines in the Numerical Key pad, then

2. Gently press the enter button.

RESULT: The Remote Control Unit will select the nearest valid parameter value and display the corrected entry in red indicating that the end-user has entered an invalid variable.

1.7.2   Placing a Camera Back Into Pre-Trigger Mode

To place a camera back into the LIVE PRE (Live Preview, Waiting for pre-trigger) Mode when the camera is in the:

STEP-BY-STEP PROCEDURE

LIVE WTR (Live Preview, Waiting for Trigger) Mode

1. Press the hardware Menu button to re-open the Capture Menu Display, then
2. Gently press on the Stop button.

LIVE CST (Live Preview, Cine Stored), or PLAY CST (Play Cine Stored) Modes

1. Navigate to the Capture Menu Display.
2. Gently press the Close button in the "Cine(s) are recorded in volatile memory of the camera. Select 'Record' to delete the cine(s) & start a new recording. Select 'Stop' to stop capturing and wait for pre-trigger, retaining the cine(s)." message window, then
3. Gently press the Rec(ord) button.
4. Press the hardware Menu button to re-open the Home Menu Display.
5. Gently press on the Capture button, then
6. Gently press on the Stop button.

1.7.3   Review, Edit, and/or Save a Recorded Cine File

Performing a Quick Search through a cine file will greatly reduce post-production time when editing a cine file. There are several methods to perform a Quick Search through a cine file.

Before we describe the procedure for each of these methods let's review the components that make up the editor bar.
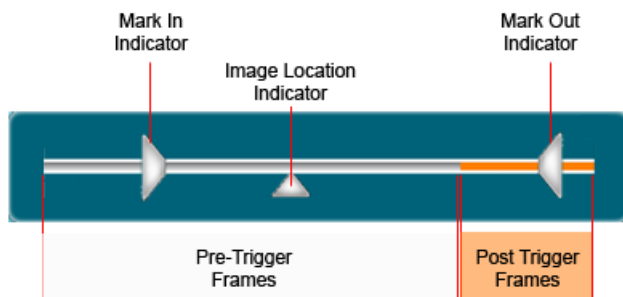
The Gray area in the Cine Editor Bar represents the clips Pre-Trigger frames, while the Orange area represents the specified Post Trigger frames. The Mark In and Mark Out Indicators represent the first and last frames, respectively, of the edited cine file. The Image Location Indicator represents the present frame, or image being displayed from the selected cine file.

The following describes each of the methods, including:

STEP-BY-STEP PROCEDURE

Select the Cine File to be Reviewed, Edited, or Saved

1. Gently press on the down-arrow to the right of the Source field, then
2. Select the appropriate source, (Volatile Memory, or attached Phantom CineMag).
3. Gently press on the minus or plus buttons to search for the desired cine partition, when more than one cine as been stored in the cine source, then
4. Select the appropriate cine segment to be reviewed, edited, and/or saved.

Perform a Quick Search

1. Gently press the Frame radial button, then
2. Gently press and hold down on the Image Location ▲ Identifier Up-Arrow, located just below the Cine Editor Bar.

NOTE

The present image number will be displayed above the Cine Editor Bar.

3. Slide your finger to the right to move forward in the stored cine file quickly,
4. Alternately, slide your finger to the left to move backwards quickly in the stored cine file.

NOTE

You can also perform a quick search using the Jog/Scroll Dial by gently tapping on the slide bar one time, then rotate the dial until the desired point is achieved.

Edit the Cine File

1. Gently press the Mark In radial button.

2. Advance the cine file to the first image you desire to save for the cine clip via the:

   a. Mark In Indicator.

      1) Gently press and hold down on the Mark In Indicator, then

      2) Slide your finger to the right to move forward quickly in the stored cine file, alternately

      3) Slide your finger to the left to move backwards quickly in the stored cine file.

   b. Playback buttons:

      1) Gently press on the Play Forward button or Play Reverse button.

      2) Press the Pause button when the first image you desire to save for the cine clip as been located.

3. Gently press the Mark Out radial button.

4. Advance the cine file to the last image you desire to save for the cine clip via the:

   a. Mark Out Indicator.

      1) Gently press and hold down on the Mark Out Indicator, then

      2) Slide your finger to the right to move forward quickly in the stored cine file, alternately

      3) Slide your finger to the left to move backwards quickly in the stored cine file.

   b. Playback buttons.

      1) Gently press on the Play Forward button or Play Reverse button.

      2) Press the Pause button when the first image you desire to save for the cine clip as been located.

Save the Cine File

1. Gently press the Save button to save the selected cine file to an attached Phantom CineMag.

1.7.4   MultiCine Operations

This section describes how some of the Remote Control Units functions differ when used in a MultiCine application, along with Step-by-Step Procedures to perform various MultiCine operation tasks including:

- Deleting MultiCine Image Data

- Defining a Unique Configuration Profile for MultiCine Memory Segments

- Placing a Camera Back into Pre-Trigger Mode

1.7.4.1   Deleting MultiCine Files

MultiCine files can only be deleted, from the camera or attached Phantom CineMag, once all the user-defined MultiCine memory partitions have been used to store image data.

NOTE

The deletion of a specific MultiCine file is impossible via the Remote Control Unit. Performing the following process will delete all the recorded MultiCine files. Be sure to save any cine files you wish to retain before proceeding.

Deletion of MultiCine files is accomplished by performing the following steps:

STEP-BY-STEP PROCEDURE

Once all the MultiCine files have been recoded ands stored into each of the memory partitions:

1. Navigate back to the Capture Display Screen.

2. Gently press on the Close button in the "Cine(s) are recorded in volatile memory of the camera. Select 'Record' to delete the cine(s) & start a new recording. Select 'Stop' to stop capturing and wait for pre-trigger, retaining the cine(s)." message window, then

3. Gently press the Rec(ord) button.

RESULT: The camera or attached Phantom CineMag deletes all of the recorded cine files, and the camera is placed back into the capture, (LIVE WTR), mode.

1.7.4.2   Placing a Camera Back into Pre-Trigger Mode

A Phantom camera can be placed into the LIVE PRE, (Live Preview, Wafting for pre-trigger), mode at any time when controlled via a Remote Control Unit.

The following describes the various steps when the camera has:

- Been placed into the capture, or recording, mode but has not yet saved a cine file into any of the MultiCine partitions, (Capture Mode, No MultiCine Files Saved).

- Recorded to one or more of the MultiCine partitions but not all, (Capture Mode with One or More Recorded MultiCine Files).

- Completed the recoding, reviewing, editing, and saving process of all MultiCine files, (All MultiCine Segments Fill).

STEP-BY-STEP PROCEDURE

Capture Mode, No MultiCine Files Saved

1. With the camera already in the recording mode, from the LIVE WTR Display Screen,
2. Press the hardware Menu button on the Remote Control Unit.

RESULT: The Remote Control Unit will display the Capture Display Screen.

3. On the Capture Display Screen:
4. Gently press on the Stop button.

RESULT: Camera had been placed into the LIVE PRE mode.

Capture Mode with One or More Recorded MultiCine Files

1. With the camera already in the recording mode and one or more MultiCine files stored into a camera or Phantom CineMag, from the LIVE WTR Display Screen,
5. Press the hardware Menu button on the Remote Control Unit.
6. RESULT: The Remote Control Unit will display the Capture Display Screen.
7. On the Capture Display Screen:
8. Gently press on the Stop button.

RESULT: Camera had been placed into the LIVE PRE mode.

NOTE

When the camera is placed back into the recording mode, the camera will automatically record to the next available MultiCine partition, retaining all previously recorded MultiCines.

All MultiCine Segments Fill

1. Upon the completion of the final MultiCine file being written into the attached camera's or Phantom CineMag's last MultiCine partition, the Play display screen will appear on the Remote Control Unit.
2. After reviewing, editing, and/or saving the MultiCine files desired:
   a. Navigate to the Capture Display Screen.
   b. Gently press on the Rec(ord) button.
   c. Gently press on the Close button in the "Cine(s) are recorded in volatile memory of the camera. Select 'Record' to delete the cine(s) & start a new recording. Select 'Stop' to stop capturing and wait for pre-trigger, retaining the cine(s)." message window, then
   d. Gently press the Rec(ord) button.

RESULT: The camera or attached Phantom CineMag deletes all of the recorded MultiCine files, and the camera is placed back into the capture, (LIVE WTR), mode.

   e. Press the hardware Menu button to re-open the Home Menu Display.
   f. Gently press on the Capture button, and
   g. Gently press on the Stop button.

1.8   Connectors

CAUTION

The connector references in this module are not intended, nor should they be used, as a cable schematic to build connection cables. Building your own cables can cause serious damage to the camera. Only connector cables provided by Vision Research should be used.

1.8.1   Phantom Remote Control Unit

Click the link below for detail description:

- Phantom RCU Battery Compartment
- Phantom RCU HD-SDI Video-In Connector (BNC)
- Phantom RCU HD-SDI Video-In Connector (BNC)
- Phantom RCU Optional Bluetooth
- Phantom RCU Power, Control, Analog Video Connector
- Phantom RCU Type A USB Receptacle
- Phantom RCU Control Buttons
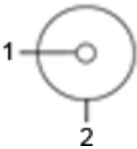- Phantom RCU Indicators

1.8.2 Phantom RCU Battery Compartment

The Battery Compartment contains a BP-511 battery, providing up to 2 hours of battery operation, and doubles as the hand grip for the Remote Control Unit.

1.8.3 Phantom RCU HD-SDI Video-In Connector (BNC)

CAUTION

The connector references in this topic are not intended, nor should they be used, as a cable schematic to build connection cables. Building your own cables can cause serious damage to the camera. Only connector cables provided by Vision Research should be used.

	PIN	NAME	DESCRIPTION
HD-SDI Video-In	1	SDI-IN	The serial digital interface coaxial cable with BNC connector has a nominal impedance of 75 ohms. This is the same type of cable used in analog video setups, which potentially makes for easier upgrades (though higher quality cables may be necessary for long runs at the higher bit rates). The specified signal amplitude at the source is 800 mV (±10%) peak-to-peak for lower voltages may be measured at the receiver owing to attenuation. Using equalization at the receiver, it is possible to send 270 Mbit/s SDI over 300 meters without the use of repeaters, but shorter lengths are preferred. The HD bit rates have a shorter maximum run length, typically 100 meters.
	2	GND	Ground

1.8.4 Phantom RCU Optional Bluetooth

The Optional Industrial Bluetooth provides wireless control of a user specified camera.

1.8.5   Phantom RCU Power, Control, Analog Video Connector

CAUTION

The connector references in this topic are not intended, nor should they be used, as a cable schematic to build connection cables. Building your own cables can cause serious damage to the camera. Only connector cables provided by Vision Research should be used.

	PIN	NAME	DESCRIPTION
Power, Control, Analog Video	1	VCC	+24VDC - The Remote Control Unit uses DC, (Direct Current), power. The nominal power supply voltage is +24VDC. The acceptable power supply range is +12VDC to +36VDC. Power supply inputs are protected against polarity reversal, (with a shunt diode fused by a 1.25A PTC reset able fuse). The Remote Control Unit is also protected to under voltage and will shut down when the DC input is below circa 17VDC. The power supply input terminals are isolated from the case and system ground. This is usually achieved by using a properly isolated power supply.
	2	GND	Ground
	3	AVGND	Analog Video Ground
	4	AVIN	Analog Video In - The analog video input of the Remote Control Unit is a standard level, 75-ohm input. It is not isolated. The video input is properly terminated, (75-ohm), to drive the analog, (NTSC or PAL) video output from the attached Phantom camera properly.
	5	TX1	RS-232 Transmit Data
	6	RX1	RS-232 Receive Data
	7	GND	Ground
	8	TX2	RS-232 Transmit Data - For Engineering Use Only
	9	RX2	RS-232 Receive Data - For Engineering Use Only

1.8.6   Phantom RCU Type A USB Receptacle

CAUTION

The connector references in this topic are not intended, nor should they be used, as a cable schematic to build connection cables. Building your own cables can cause serious damage to the camera. Only connector cables provided by Vision Research should be used.

	PIN	NAME	DESCRIPTION
Type A USB Receptacle	1	V Bus	+5 VDC
	2	D-	Data Negative
	3	D+	Data Positive
	4	GND	Ground

1.9   Control Buttons

Buttons

NAME	USAGE
Trigger	Once the camera is powered up and in the Live PRE mode, pressing the Trigger button will put the camera into Live WTR more and begin recording the first cine. While in Live WTR mode, the Trigger button will apply a trigger signal to the camera. When the camera is configured to directly record into the attached Phantom CineMag in "Run / Stop" mode, the Trigger button is re-purposed as a "Run / Stop" button. Pressing the Trigger button will start and stop the recording at any time.
Menu	The Menu button is used to: • Power On the Remote Control Unit • Provide a quick return to the Home Menu • Power Off the Remote Control Unit • Return to last menu when menus have been dismissed from the screen

Video	This button is used to toggle through the following display modes:
	
	1. Live Preview
	
	   Places the camera into its default preview mode provides a live image.
	
	2. Zoom
	
	   Zoom mode instructs the camera to zoom in on the subject area with a 1:1 pixel view to help in the focusing process when the camera is attached to a monitor or viewfinder. Zoom and Unzoom may appear to look the same depending on the camera resolution settings.

	3. Threshold The Threshold mode is used to display the areas of the image that are overexposed. The Remote Control Unit will reduce the saturation of any pixel that below 90% saturated by 50%, and double the saturation level of any pixel that is saturated by more than 90% to exaggerate the over-exposed area of an image. In addition the Video button can also be used to control the scaling of the video image from 1:1 to 1:7. To do so, hold the Video button and simultaneously rotate the inner Jog wheel forwards to increase the size of the video, or backwards to decrease it.
A	Press the A button to activate the user-defined Program assigned to the button. Mark In (Only active when Play Display Screen is active.)
B	Press the B button to activate the user-defined Program assigned to the button. Mark Out (Only active when Play Display Screen is active.)

Other Hardware Components

Touchscreen Display

The 5" diagonal, 800 x 480, Active Touchscreen TFT, (Thin Film Transistor- Liquid Crystal Display), LCD allows the end-user to control a Phantom camera.

Jog/Scroll Dial

The Jog/Scroll Dial provides an alternate way to change many settings or scrub through a recorded cine file.

1.10 Indicators

The LED indicators below provide you with a visual representation of the camera's operational state, and communication status when in the following states:

OPERATIONAL STATE	RC (REMOTE CONTROL) INDICATOR	CAM(ERA) INDICATOR
Power Up Diagnostics	White for approx 10s, then Flashes red/green for approx 13s, then Cyan for approx 25s	Off
Live Preview, Waiting for Pre-Trigger Mode	Cyan	Dark Blue
Live Preview, Recording, Waiting for Trigger	Cyan	Red
Live Preview, Recording, Camera Triggered	Cyan	Yellow/Green
Live Preview, Cine Stored	Cyan	Green
Playback, Cine Stored	Cyan	Green

1.11 Technical Specifications

Weight:	26 oz. w/battery
Size:	Approximate dimensions without BlueTooth™ antenna 90mm x 180 mm x 90mm
Voltage:	12-36 VDC
Power:	Approximately 7 watt. When charging battery 12.6 maximum
Battery Life w/Full Charge:	Screen backlight at 70%: 1.85 hours
Battery Charge Time Max:	2.63 hours
Temperature Range:	Operational -10 C to 40 C Storage -20 C to 50 C
Humidity:	Operational 85/85 non-condensing
Shock:	Non-Operational 33G 11 msec half-sine 10 shocks all axis Operational 5.5G 11 mecs half-sine 10 shocks all axis
Vibration:	Non-Operational 1.2 G, .5-500 Hz, 1.0 Octave/min 10 sweeps Operational .25 G, .5-500 Hz, 1.0 Octave/min 10 sweeps
Natural Frequencies:	No natural frequency between 5 and 200 Hz
EMI:	Pass Class A

Part

II

2 Vision Research Service Centers

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