Cognex MVS-8000 Series

MVS-8100C Hardware Manual

October 2006

Contents

Preface

This manual describes the Cognex MVS-8100C frame grabber, and has the following chapters:

Chapter 1, *Installing the MVS-8100C*, describes how you configure and install the Cognex MVS-8100C.

Chapter 2, *Installing Light Control Hardware*, describes the connection of dynamic light control modules.

Chapter 3, *Cognex MVS-8100C Hardware*, describes the Cognex MVS-8100C in detail, including environmental and power requirements, and mechanical and electrical specifications. This chapter also describes the electrical interface to the Cognex MVS-8100C.

Throughout this manual and in Cognex software documentation, the name of the Cognex MVS-8100C may be abbreviated to 8100C.

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Style Conventions Used in This Manual

This manual uses the following style conventions:

boldface	Used for C/C++ keywords, function names, class names, structures, enumerations, types, and macros. Also used for user interface elements such as button names, dialog box names, and menu choices.
italic	Used for names of variables, data members, arguments, enumerations, constants, program names, file names. Used for names of books, chapters, and sections. Occasionally used for emphasis.
courier	Used for C/C++ code examples and for examples of program output.
bold courier	Used in illustrations of command sessions to show the commands that you would type.
<italic>	When enclosed in angle brackets, used to indicate keyboard keys such as *<Tab>* or *<Enter>*.

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Cognex MVS-8100C Hardware Manual

Installing the MVS-8100C

1

This chapter describes how to install an MVS-8100C into your PC, and how you connect peripheral equipment such as triggers, strobes, external sync sources, and light modules.

Host PC Requirements

To install the MVS-8100C, the host PC should meet the following minimum requirements:

- The motherboard's chip set must be fully compliant with the PCI 2.1 specifications or later. Motherboards with Intel chip sets that support Intel Pentium MMX, Celeron, Pentium II, Pentium III, Pentium 4, and Xeon CPUs are known to be compliant. Motherboards with VIA chip sets that support the AMD K6-2 and Athlon CPUs are known to be compliant.

- One available two-thirds length PCI slot for the MVS-8100C.

- A CD-ROM drive, or access to one over a network, to install the Cognex software.

Additional requirements may be imposed by your Cognex software package. Check the Cognex software's release notes for the software's requirements, if any, on:

- Minimum recommended CPU speed

- Host operating system, including the supported service pack release level

- Supported video cards

- Desktop color depth (the number of colors displayable)

- Desktop size (the number of pixels displayable in width and height on your screen)

- The presence of a mouse or other pointing device

Installing the MVS-8100C

Caution   *Electrostatic discharge (ESD) can damage your Cognex hardware. We recommend the use of a grounded anti-static wrist strap when handling any electronic components.*

To install the MVS-8100C frame grabber, follow these steps:

1. Before you install the MVS-8100C, study the jumper settings described in Table 2 on page 14 and Table 20 on page 48. Make all required jumper changes.

2. Turn off the PC.

3. Remove the cover of the host PC and select a PCI slot for the MVS-8100C. The MVS-8100C requires a PCI slot that supports 5 V signalling. The MVS-8100C's PCI bus connector is slotted to allow placement only in a 5 V slot (which are the most commonly found PCI slot types).

Motherboard PCI slots are keyed to allow acceptance of boards that use either 5 V or 3.3 V signalling, or both. The bus connectors on all PCI boards are slotted to disallow placement of the board in the wrong type of slot. PCI slot keys are described in the following table and diagram.

PCI Slot Type	Key in PCI Slot
Supports 3.3 volt boards	Key is towards the back of the PC
Supports 5 volt boards	Key is towards the front of the PC

Table 1.   PCI slot types
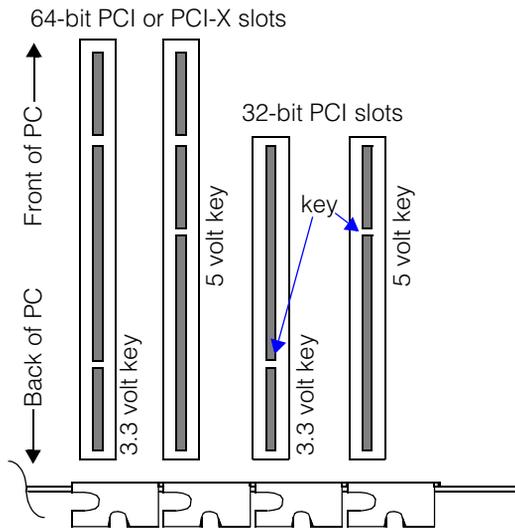
Figure 1.   PCI slot types

Caution   *Failure to properly attach and configure the external power cord to your MVS-8100C as described in the following steps may result in damage to your frame grabber, motherboard, or both.*

4. Verify that a jumper covers pins 2 and 3 on connector J3 in the upper-left corner of the MVS-8100C, as shown in Figure 2.
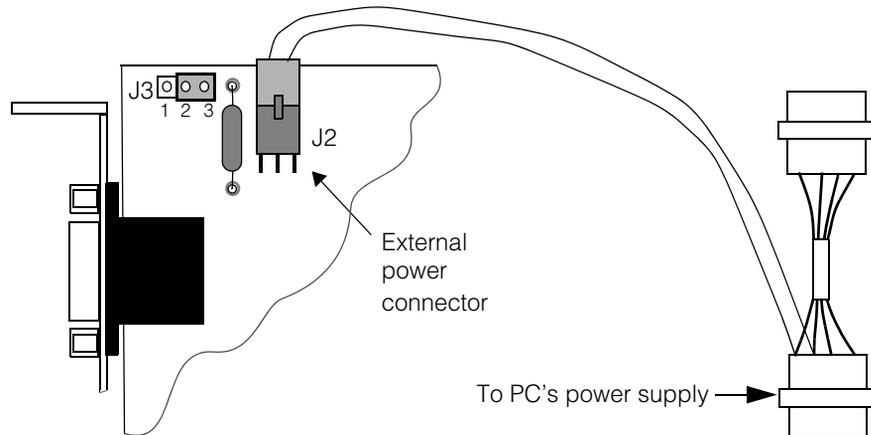
Figure 2.   External power connector and jumper setting

5. Press the card into its slot until it is seated firmly, and replace the slot cover screw.

6. Locate the MVS-8100C's external +12 V power connector at J2, as shown in Figure 2. Connect the 12 V power cable adapter (P/N 300-0175) to your PC's power supply and to the connector at J2. This cable provides additional power when multiple cameras are used. Both connectors are keyed, and can only be inserted one way.

Caution   *Before you attach cameras, be sure the PC's power is OFF.*
                 Attaching live equipment to the MVS-8100C can result in electrical
                 damage.

7. If you are using a second color camera, or monochrome cameras 2 and 3, attach the camera port expansion panel (P/N 300-0245) to the PC's back panel in an unused bus slot position. Connect the expansion panel's 40-pin cable to the MVS-8100C. The 40-pin cable plugs into two connectors on the MVS-8100C, J12 and J5, and straddles the gap between them. Take care to match up the red edge of the 40-wire ribbon cable with pin 1 on the J12 connector.
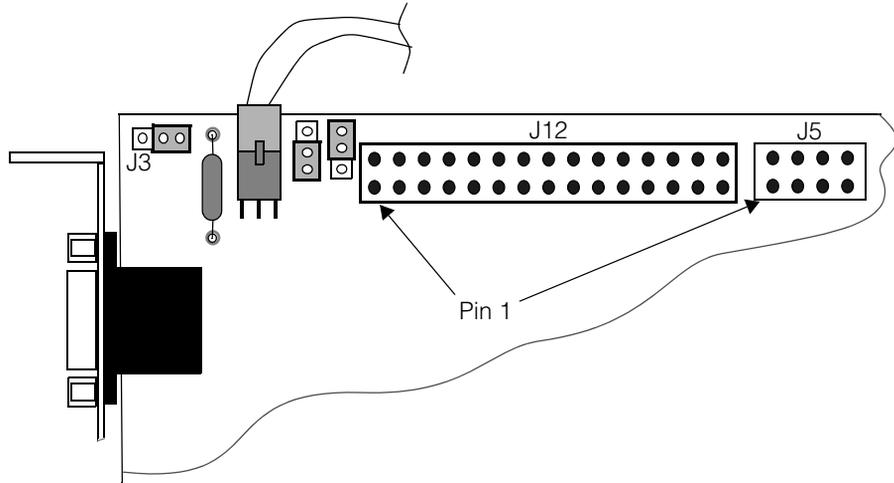
Figure 3.   Location of pin 1 on camera expansion header (J12) and light port expansion header (J5)

8. Connect cameras to the MVS-8100C using the appropriate Cognex camera cable as listed in Table 21 on page 50. Figure 4 shows the numbering of the camera connectors on the MVS-8100C's back panel and on the camera port expansion panel. See *Installing Cameras* on page 14 for more on connecting cameras.

Back panel of MVS-8100C　　　　　　　**Camera port expansion panel**
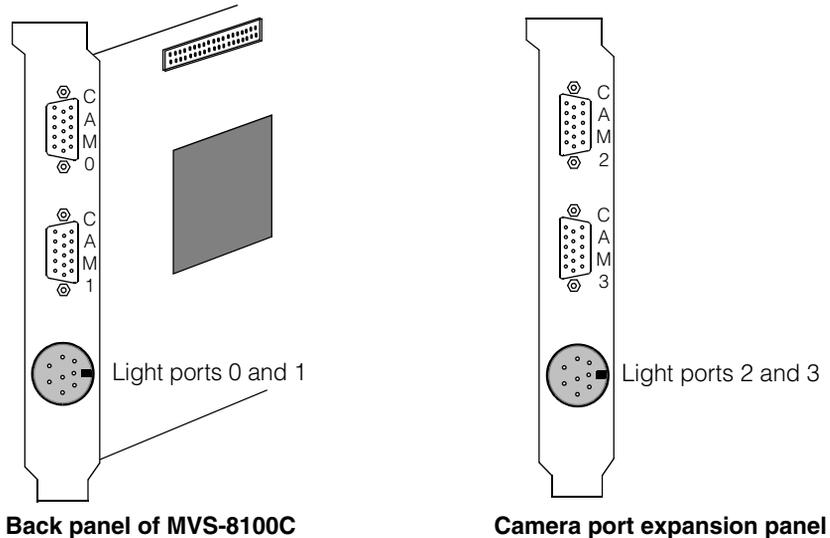
Figure 4.　Port locations on MVS-8100C back panel and expansion panel

Caution　　　*The MVS-8100C's camera connectors are similar to the connector for a standard VGA monitor. Attaching a VGA monitor to a camera connector can cause the MVS-8100C to malfunction. However, the PolySwitch resettable fuse on the camera port should protect the board from permanent damage. Normal operation is restored after the incorrect connection is removed.*

9. Replace the PC's cover.

10. Connect light modules and external I/O equipment to the MVS-8100C *before* applying power to the PC.

Installing Cameras

You can connect from one to four monochrome cameras (EIA or CCIR) *or* up to two RGB color cameras. Jumper settings on the MVS-8100C select color or monochrome mode. You cannot combine color and monochrome cameras at the same time.

When you set the jumpers for color mode, camera ports 0 and 2 are disconnected and should not be used. Connect color cameras only to camera ports 1 or 3.

Table 2 shows the MVS-8100C's camera connection options. See Table 21 on page 50 to determine the Cognex cable part number for your camera.

Mode	Jumper	Pins	Use camera ports	Requires Camera Expansion Panel?
One color camera	JP10	Cover pins 2-3 *	1	No
	J1	Cover pins 1-2 *		
Two color cameras	JP10, JP11	Cover pins 2-3 *	1 and 3	Yes
	J1, J7	Cover pins 1-2 *		
One or two monochrome cameras	JP10	Cover pins 1-2	0 and 1	No
	J1	Sets rapid reset mode. See Table 3 on page 21.		
One to four monochrome cameras	JP10, JP11	Cover pins 1-2	0, 1, 2, and 3	Yes
	J1, J7	Sets rapid reset mode. See Table 3 on page 21.		
		* Factory default setting		

Table 2.   MVS-8100C camera connection options

On all vertically-oriented MVS-8100C jumpers, pin 1 is at the top of the board. On all horizontally-oriented jumpers, pin 1 is at the left of the board. Figure 5 shows the factory default settings of the color/monochrome selection jumpers.

Figure 5.   MVS-8100C jumper orientation

Connecting Pulnix TM-6CN Cameras

The Pulnix TM-6CN camera supplies synchronization signals to the MVS-8100C. The MVS-8100C needs no special hardware settings when using camera-supplied sync signals from monochrome cameras. As long as the Cognex vision processing software is set up to use a Pulnix TM-6CN, the sync signals will be handled correctly. The only hardware setting required to use the TM-6CN is to set the MVS-8100C for use with monochrome cameras, as shown in Table 2 on page 14.

Configuring Sony DXC-390 Color Cameras

The MVS-8100C supports the use of the Sony DXC-390 color camera. If you purchase your DXC-390 camera from Cognex, it arrives ready to use with Cognex software.

Note   Sony DXC-390 cameras purchased from Cognex may be labeled DXC-390/C on the camera body or on the shipping box or both. The /C designation applies to cameras that have been set up as described in the following steps.

If you purchase your DXC-390 from a third party, you must configure the camera as shown in the following steps.

The following procedure expands the effective horizontal imaging area of the DXC-390 by 200 ns per line, and reduces the video noise level.

1. Remove and carefully set aside the seven small screws that fasten the top cover of the DXC-390. Remove the top cover.

2. Locate switch S102 as shown in Figure 6.
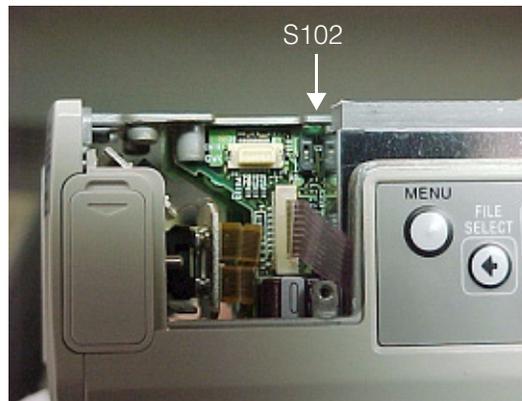
Figure 6.   Sony DXC-390 with cover removed

3. Use a small screwdriver to move switch S102 to the down position, labeled ADJ.

4. Connect an NTSC monitor to the camera's composite video connector labeled VIDEO OUT.

5. Provide power to the camera through the Hirose connector labeled DC IN/VBS . Live video now displays on the monitor.

    To provide +12 V power to the camera, you can connect the Hirose branch of the Cognex camera cable from an MVS-8100C in a powered-on PC, or you can provide power from a bench power supply.

6. Press the MENU button and observe the video monitor. With switch S102 in its normal up position, the MENU button displays a setup menu. With switch S102 in the down position, pressing MENU displays numeric registers plus one setup line of text at the bottom of the screen.

    The bottom setup line reads "DSPAdj No. 00 Data 00" This is DSP adjustment number 00, containing the data value 00.

7. Press the ← and → buttons at the same time. This resets the setup line to its middle position, where the DSP adjustment number is 240, and data value is 8C.

8. Press the → button until the DSP adjustment number is 336. You can hold in the → button to fast forward the change in adjustment numbers.

9. At DSP adjustment number 336, press the ↑ or ↓ buttons as required to change the data value from 32 to 3C.

10. Press the ← and → buttons at the same time to return the setup line to DSP adjustment number 240 and data value 8C.

11. Press the ← button until the DSP adjustment number is 207. Hold the button in to fast forward.

12. At DSP adjustment number 207, press the ↑ or ↓ buttons as required to change the data value from F9 to 40.

13. Carefully slide switch S102 to its up position, labeled OPE. Press the MENU button to make sure the standard SETUP menu displays, and not the DSPAdj line.

14. Power off the camera by removing the Hirose cable from the DC IN/VBS connector. Then remove the video out cable, and replace and refasten the top cover on the DXC-390.

Connecting Sony XC-003 Color Cameras

Follow these steps to connect a Sony XC-003 to the MVS-8100C, using Cognex camera cable 300-0243.

1. Use the XC-003 in its default configuration. There is no need to set jumpers or switches, or to use the XC-003's menu configuration system to prepare the camera for use with the MVS-8100C.

2. Power off the PC containing the MVS-8100C. Do *not* connect cameras or peripheral equipment to the MVS-8100C when powered on.

3. Connect cable 300-0243's 15-pin port to camera port 1 or 3 on the MVS-8100C. Do not connect a color camera to ports 0 or 2.

4. Connect the cable's round Hirose connector to the XC-003's DC IN/VBS port.
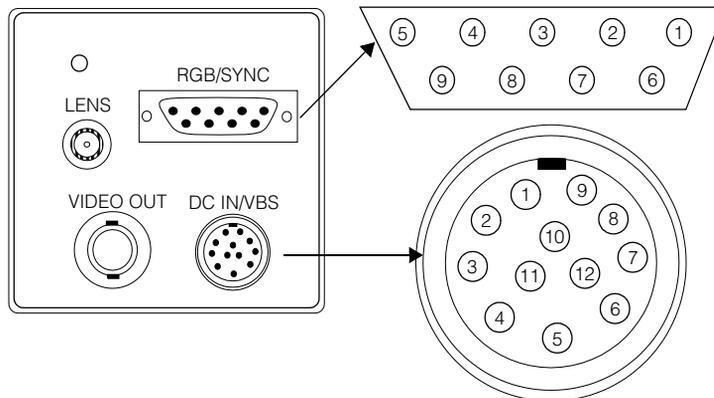
Figure 7.   Rear connections on Sony XC-003 camera

5. Connect the cable's DB-9 connector to the RGB/SYNC port on the XC-003.

The MVS-8100C supports one or two XC-003 cameras. When using an XC-003, set up your MVS-8100C for use with color cameras, as shown in Table 2 on page 14.

Configuring Sony XC-55 Cameras

The MVS-8100C supports the use of the Sony XC-55 and XC-55BB cameras. If you purchase your XC-55 cameras from Cognex, they arrive ready to use with the MVS-8100C. If you purchase your XC-55 from a third party, you must configure the camera as shown in this section.

The XC-55/55BB, as shipped from Sony, is configured to emulate the Sony XC-75 camera. Cognex recommends instead using the XC-55/55BB in its E-DONPISHA II trigger shutter mode for best performance. Two switch settings convert the XC-55/55BB to trigger shutter mode; one switch is external, while the other is internal. Follow this procedure:

1. On the rear panel of the XC-55/55BB, locate the 1N/1I switch. Place this switch in the **1N** position.

2. Remove the cover of the camera control module. Inside the camera control module, locate the circuit board labeled SG-257.

    On the SG-257 circuit board, locate rotary switch S2, which is in the upper right of a set of four rotary switches as you hold the camera with its top cover up and the lens mount on the right. Set this switch to the **E** position.

When used with the MVS-8100C, the Sony XC-55/55BB must be connected with Cognex camera cable 300-0239.

The MVS-8100C supports up to four XC-55/55BB cameras. When using an XC-55/55BB, set up your MVS-8100C as follows:

•   Set the MVS-8100C for use with monochrome cameras, as shown in Table 2 on page 14.

•   When using camera ports 1 or 3, set the MVS-8100C to use rapid reset mode, as described in *Using Rapid Reset Mode* on page 21.

Configuring Sony XC-ES50 Cameras

The MVS-8100C supports the use of the Sony XC-ES50 family of cameras, including the XC-ES50 and XC-ES50CE. If you purchase your XC-ES50 cameras from Cognex, they arrive ready to use. If you purchase your XC-ES50 from a third party, you must configure the camera as shown in this section.

Figure 8 shows the back panel of the Sony XC-ES50 camera with the switches in their factory default position.
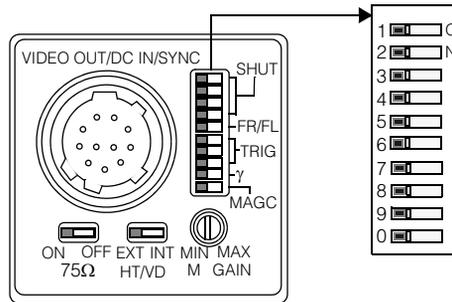
Figure 8.   Sony XC-ES50 camera back panel

To configure the switches for the Sony XC-ES50 camera:

1. Configure the 10-position DIP switch as shown in Figure 8.

Note   You can set switch 5 to ON in factory default mode to use field integration rather than frame integration (single field and half-resolution video formats only).

2. Set the manual gain switch in the fully vertical position.

3. Set the HD/VD switch to external (EXT).

Set the 75Ω switch to ON.

Configuring Sony XC-ST50 Cameras

The MVS-8100C supports the use of the Sony XC-ST50 cameras. If you purchase your XC-ST50 cameras from Cognex, they arrive ready to use with the MVS-8100C. If you purchase your XC-ST50 from a third party, you must configure the camera as shown in this section.

Figure 9 shows the back panel of the Sony XC-ST50 camera with the switches in their default positions.
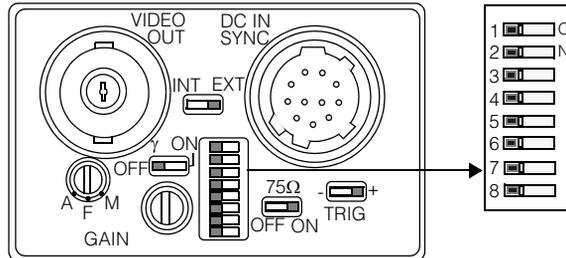
Figure 9.   Sony XC-ST50 camera back panel

To configure the switch for the Sony XC-ST50 camera:

1. Configure the 8-position DIP switch as shown in Figure 9.

Note   Set switch 5 to ON in free-running mode to use field integration rather than frame integration (single field and half-resolution video formats only).

2. Set gain to the "F" position.

3. Set the INT EXT switch to external (EXT).

4. Set TRIG to +.

5. Set gamma (γ) to off.

6. Set the 75Ω switch to ON.

Using Rapid Reset Mode

No special hardware settings are required to use an electronically shuttered (rapid reset) monochrome camera, such as the Sony XC-55, on the MVS-8100C's camera ports 0 or 2. However, for camera ports 1 and 3, the factory default configuration is to support color cameras. To use a rapid reset camera on camera ports 1 or 3, set jumpers on the MVS-8100C as shown in Table 3.

MVS-8100C Camera Port	Factory Default Setting	Rapid Reset (XC-55) Setting
0	None	No jumper changes required
1	J1, pins 1-2 covered	Cover pins 2-3 on J1
2	None	No jumper changes required
3	J7, pins 1-2 covered	Cover pins 2-3 on J7

Table 3.   Jumper settings for rapid reset mode

Using Genlock Mode

In genlock mode, the MVS-8100C synchronizes to the composite sync (CSYNC) signal from the camera. When a camera runs in this mode, it generates H and V sync signals and mixes them with the video signal to produce composite video. The MVS-8100C strips the composite sync signal from the composite video and locks onto it.

No special hardware settings are required to use genlock mode on monochrome cameras connected to any camera port. However, you must set jumpers on the MVS-8100C to use genlock mode for color cameras connected to camera ports 1 or 3, as shown in Table 4.

MVS-8100C Color Camera Port	Factory Default Setting	Setting for Genlock Mode for Color Cameras
1	J8, pins 1-2 covered	Cover pins 2-3 on J8
3	J13, pins 1-2 covered	Cover pins 2-3 on J13

Table 4.   Jumper settings for Genlock mode for color cameras

Note   The Sony XC-003 color camera does not support genlock mode.

Using an External Sync Source

The MVS-8100C supports the use of an external source for HDRIVE and VDRIVE signals. You can synchronize one to four cameras to the external drive signals.

Note the following points when using an external sync source on the MVS-8100C:

- Your cameras must be set in software to use genlock mode in order to synchronize with the external source. If you're using a color camera in genlock mode, see *Using Genlock Mode* for more information.

- Connect the external HDRIVE signal to pin 22, and the external VDRIVE signal to pin 18, of jack J6 on the MVS-8100C. Use pins 20 and 24 as ground returns. See Table 19 on page 44 for the translation between the pins on J6 and the external DB-25 port.

- Set jumpers JP6 and JP7 as shown in Table 5.

Jumper	Factory Default Setting	Setting for External Sync Mode
JP6	Pins 2-3 covered. Routes the VDRIVE signal from the MVS-8100C to the camera.	Pins 1-2 covered. Routes the VDRIVE signal to the MVS-8100C from an external source connected to jack J6.
JP7	Pins 2-3 covered. Routes the HDRIVE signal from the MVS-8100C to the camera.	Pins 1-2 covered. Routes the HDRIVE signal to the MVS-8100C from an external source connected to jack J6.

Table 5.   Jumper settings for external sync mode

Note   The settings for jumpers JP6 and JP7 affect all four camera ports. If you set these jumpers to use an external sync source, then you must use the external sync source on all cameras connected to the MVS-8100C.

Installing External I/O Equipment

You can connect the following peripheral equipment to the MVS-8100C:

- One to four trigger pulse generators to trigger image acquisitions on monochrome cameras

- One to four strobe lights to allow MVS-8100C-controlled illumination of the scene under one to four monochrome cameras

- One status output line that can be used by your vision processing application, for example, to control a parts reject switch.

- External camera synchronization signals.

- One to four light modules, which allow software-controlled dynamic light adjustment of the scene under a camera lens.

Trigger and I/O Expansion Panel

To connect trigger, strobe, status, or external sync lines, use the trigger and I/O expansion panel (P/N 300-0240) included with your MVS-8100C. Secure the expansion panel to an unused bus slot position on the PC's back panel. A 25-line ribbon cable extends from the trigger and I/O expansion panel to the pin block at position J6, in the upper right corner of the MVS-8100C.
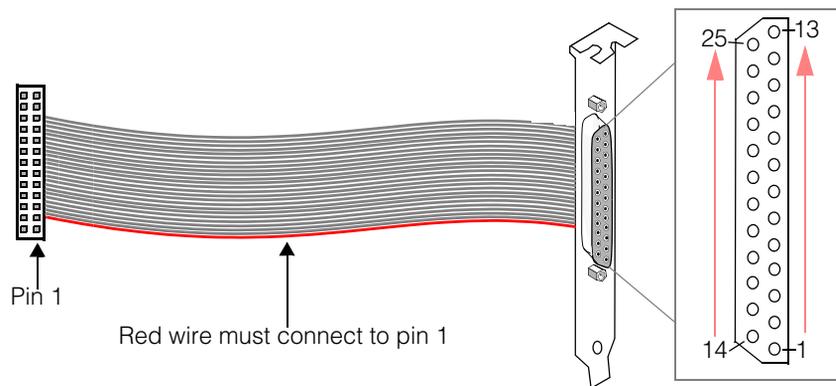
Figure 10.   Trigger and I/O expansion panel (P/N 300-0240)

Connect wires from trigger, strobe, or external synchronization equipment to appropriate positions of the trigger and I/O expansion panel's DB-25F port, using the pinout in Table 19 on page 44 as a guide.

Connecting Light Modules

Connect light modules such as the Cognex acuLight and Ultralight as described in *Chapter 2*, *Installing Light Control Hardware* on page 25.

Installing Light Control Hardware

2

This chapter describes how to connect the acuLight and UltraLight light modules to the MVS-8100C frame grabber.

Dynamic Light Control Overview

The term *light module* refers to any of the following Cognex products: acuLight, acuLight II, UltraLight, or UltraLight II. A light module provides dynamic software-controllable illumination to a camera's field of view. A light module can be attached around the camera lens or mounted separately.

Cognex frame grabber hardware and Cognex software can be used together to control Cognex light modules dynamically. This means that power to the LED arrays in the light module can be adjusted up or down in mode and intensity to obtain the best image to capture for vision processing. Dynamic control of lighting is especially important in chip wafer manufacturing, where light shining onto the reflective surface of the wafer can make images hard to capture.

Figure 11 shows two sets of wafer scribe images, each with and without light module illumination.

Before	After

Figure 11.   Examples of image improvement with dynamic light control

The light module works with Cognex software to achieve the optimal contrast between a wafer scribe mark and the background.

Bright Field and Dark Field Illumination

Cognex light modules provide two sets of LED arrays, for both bright field and dark field illumination. The two sets of LED arrays are shown in Figure 12.
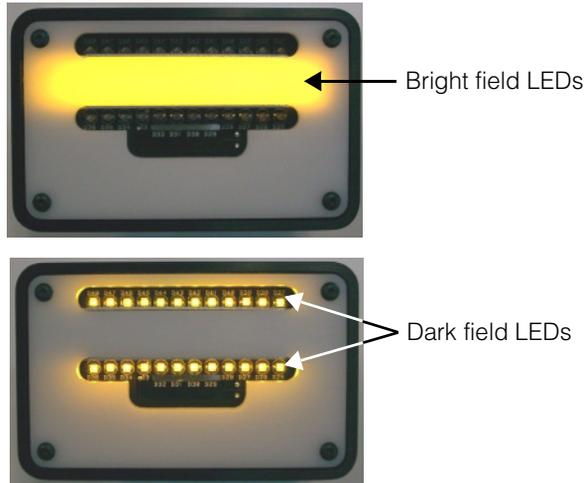
Figure 12.   Bright and dark field LEDs on light modules

The light module's bright field LEDs produce nearly on-axis diffuse illumination. The bright field LEDs direct the light so that it hits the object at almost the same direction as the camera lens. Bright field illumination allows the camera to capture the intensity of the light reflected from the surface of the object.

Dark field illumination directs light at the object from an angle, providing off-axis diffuse illumination. Dark field illumination is used to inspect the roughness of surfaces that normally reflect light, such as metal. If illumination in one direction does not produce a clear image, you can use dark field illumination in multiple directions.

Cognex software is used to vary the ratio of bright field to dark field illumination to obtain the best image for vision processing.

Light Module Electrical Control

The light control circuitry associated with each camera input port on the MVS-8100C can provide up to 250 mA at 12 volts (3 watts) to each light module. Power for each port is fused with a 500 mA PolySwitch resettable fuse.

Each light module will sink up to 125 mA of current. The amount of current is software selectable in 256 steps from 0 to 125 mA.

When using one or more light control modules, Cognex strongly recommends setting jumper J3 with pins 2-3 covered, and using the external 12 V power cable, P/N 300-0175. This is because PCI slots are limited by the PCI standard to providing no more than 750 mA per slot. See installation step 4 on page 11 for instructions.

Connecting a Light Module

This section describes how to connect light modules to your Cognex frame grabber

Primary and Auxiliary Light Modules

Light ports are numbered the same as their associated camera port, from 0 to 3.

One Primary Per Camera

Your Cognex frame grabber supports one primary light module per camera port, for one to four cameras. When using one light module per camera, connect the light module to the light port numbered the same as the camera port. Thus, for example, connect a light module to light port 2 to illuminate the scene under the camera attached to camera port 2. The case of one primary light module per camera port is summarized in Table 6.

Camera port	Lights per camera	Light module purpose	Connect to light port
Camera 0	1	Primary for camera 0	0
Camera 1	1	Primary for camera 1	1
Camera 2	1	Primary for camera 2	2
Camera 3	1	Primary for camera 3	3

Table 6.   Case 1, standard configuration of one light module per camera port

One Primary, One Auxiliary per Camera

Your Cognex software package may also support the use of two light modules each for one or two camera ports. When there are two light modules per camera port, one light module is primary and one auxiliary. Two light modules per camera can be used, for example, to simultaneously illuminate the camera's field of view from the top and from the side.

If your Cognex software package supports primary and auxiliary light modules, the primary light port is always the one with the same number as the camera port. For the auxiliary light port, you can select any one of the other three light ports, as long as it is not used for another camera's primary light port. For example, if you connect a primary light module for camera 0 to light port 0, you can connect an auxiliary light module to any unused light port among 1, 2, or 3.

Table 7 illustrates the case of using the adjacent unused light port to connect the auxiliary light module for two cameras.

Camera port	Lights per camera	Light module purpose	Connect to light port
Camera 0	2	Primary for camera 0	0
Not used		Auxiliary for camera 0	1
Camera 2	2	Primary for camera 2	2
Not used		Auxiliary for camera 2	3

Table 7.   Case 2, using adjacent light ports for auxiliary

Table 8 illustrates the case of grouping the camera and primary light ports together on the lower numbered ports, and grouping the auxiliary light ports together on the higher numbered ports.

Camera port	Lights per camera	Light module purpose	Connect to light port
Camera 0	2	Primary for camera 0	0
Camera 1	2	Primary for camera 1	1
Not used		Auxiliary for camera 0	2
Not used		Auxiliary for camera 1	3

Table 8.   Case 3, pairing cameras together and auxiliaries together

Your Cognex software package may also support *borrowing* a light port from another camera port that has a camera connected but no light module. In this case, you can connect up to four cameras, of which two cameras have two light modules each and two cameras have no light modules. This rare configuration is illustrated in Table 9.

Camera port	Lights per camera	Light module purpose	Connect to light port
Camera 0	2	Primary for camera 0	0
Camera 1	0	Auxiliary for camera 0	1
Camera 2	2	Primary for camera 2	2
Camera 3	0	Auxiliary for camera 2	3

Table 9.   Case 4, rare configuration of borrowed light ports

Note that case 4 is the same as case 2, but with two extra cameras attached and usable.

Light Module Wiring

To connect light modules, use the MVS-8100C light module cable P/N 300-0246. This cable splits the 8-pin DIN light port on the MVS-8100C (or on the camera port expansion panel) into two RJ-11 jacks, labeled *Light 0/2* and *Light 1/3*. Cable 300-0246 ships with two RJ-11 modular couplers.

Note   Always use the modular coupler (Amp part number 555050-1) provided with this cable. Other RJ-11 couplers, especially those provided for home telephone wiring, may look the same but do not provide the same wiring configuration internally, and may reverse the bright and dark field light control lines.

The light port number is the same as that of the associated camera port. For example, light port 0 is associated with camera port 0, light port 1 with camera port 1, and so on.

For the MVS-8100C, light port numbering depends on where cable 300-0246 is used:

•   When plugged into the DIN-8 port on the MVS-8100C, it supplies connections to light ports 0 and 1.

•   When plugged in the DIN-8 port on the camera port expansion panel, it supplies connections to light ports 2 and 3.

The light module package includes a length of standard four-wire North American RJ-11 telephone cable to connect between the light module and the couplers on the end of the light module cable.

Connecting A Light Module

1. Connect the light module cable to the DIN port on the back panel of the MVS-8100C (or to the DIN port on the camera port expansion panel).

2. Connect a modular coupler to each RJ-11 end on the two branches of the light module cable.

3. Connect the provided RJ-11 cable between the modular coupler and the light module's RJ-11 input port.

Figure 13 shows the connection of one camera with one primary light module to camera port 0. This figure illustrates the top line of case 1 (Table 6 on page 28).
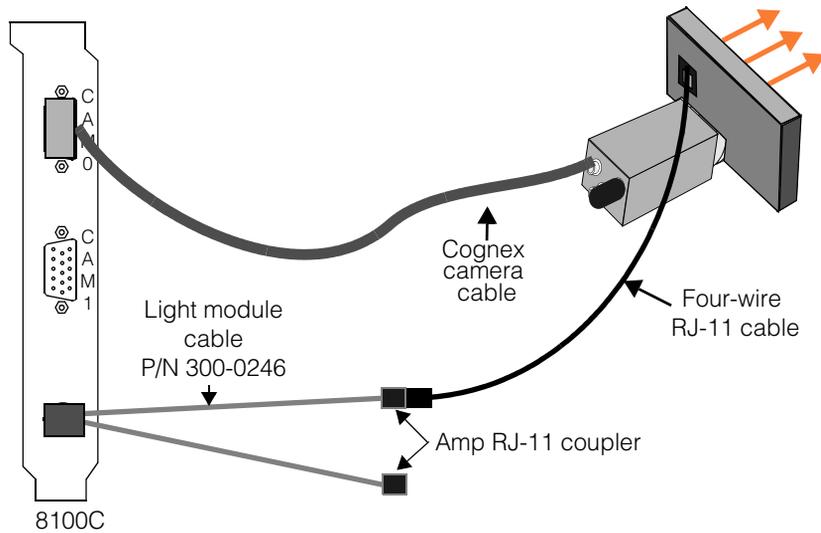
*Figure 13.   Connecting one primary light module*

Connecting One Camera, Two Light Modules

To connect a primary and an auxiliary light module for use with one camera, connect the auxiliary light module to the other branch of the light module cable.

Figure 14 illustrates the top two lines, highlighted in green, of case 2 (Table 7 on page 29).
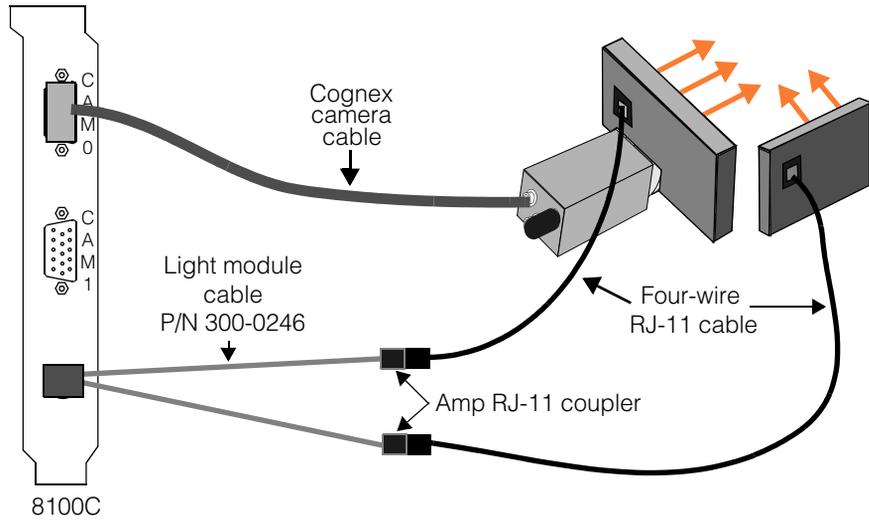

Figure 14.   Connecting two light modules to one camera

Cognex MVS-8100C Hardware

3

This chapter describes the Cognex MVS-8100C image acquisition board that can be used with Cognex 8000 series software.

The MVS-8100C is a 32-bit PCI bus frame grabber that fits into a single slot in your PC. The 8100C can:

- Acquire images from monochrome or color cameras

- Support up to four monochrome camera inputs, or up to two color camera inputs

- Transfer acquired images over the PCI bus to memory on the host PC

Table 10 summarizes the capabilities of the MVS-8100C. More detail about each feature is provided later in this chapter.

Frame Grabber Feature	Cognex MVS-8100C
Image acquisition timing supported	RS-170, CCIR, NTSC, PAL, RGB
Acquired image size with Cognex software	640x480 (RS-170 and NTSC) 768x570 (CCIR and PAL) 640x480 (asynchronous reset)
Acquired monochrome image resolution	8 bits per pixel
Acquired color image resolution	24 bits per pixel
Camera input ports	2 monochrome or 1 color 4 monochrome or 2 color with expansion panel
Camera power supplied by board	Yes
Source of synchronization signals	From the MVS-8100C, from the currently selected camera (in Genlock mode), or from an external H and V drive sync source
Overlapped image acquisition and processing	Yes
External trigger support	Four high-speed optically isolated trigger inputs
Strobe support	Four high-speed open-collector strobe outputs
Output signal line	Optically isolated accept/reject control

Table 10. MVS-8100C features

Frame Grabber Feature	Cognex MVS-8100C
External light control	Dynamic light intensity control for up to two external camera lights (up to four with expansion panel)
Board power requirements	The PCI connector is slotted only for 5 V signaling and must be placed in 5 V PCI slot.

Table 10. MVS-8100C features

Mechanical Specifications

The Cognex MVS-8100C is 107 mm (4.2 inches) high by 194 mm (7.6 inches) long and occupies a single PCI bus slot. Figure 15 shows the major components and jumper locations on the MVS-8100C. All jumpers are shown in their factory default positions. The effect of various jumper settings is described in Table 20 on page 48.

Note   The factory default position of jumper J16 is different for different MVS-8100C revisions. For revisions A, B, and C the jumper covers pins 2 and 3. For revision D, the jumper covers pins 1 and 2.
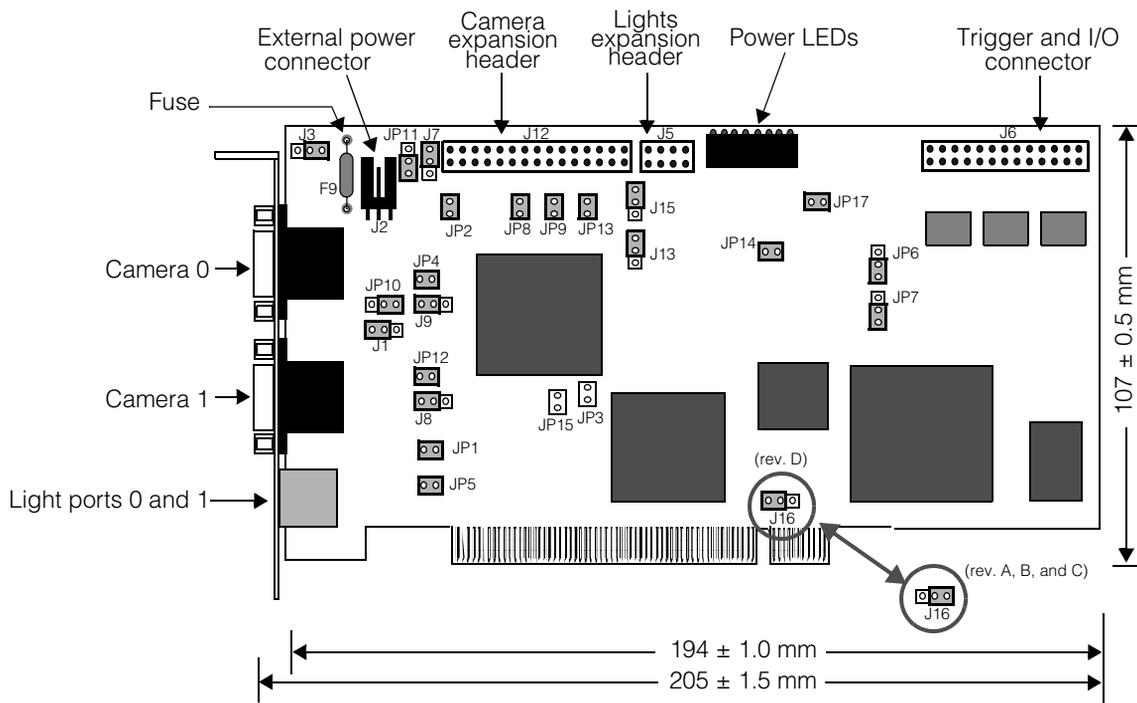

Figure 15.   8100C component location

On the 8100C, pin 1 is to the left of all horizontal jumper blocks, and is at the top of all vertical jumper blocks.

Two camera ports and a double light port are on the board's back panel. The MVS-8100C ships with a trigger and I/O expansion panel (P/N 300-0240) that provides external access to the trigger and I/O connector's signals. An optional camera port expansion panel (P/N 300-0245) is available to bring the signals from ports J12 and J5 out to two camera ports and another double light port. Both expansion panels occupy a back panel slot, but do not connect to the PCI bus.

Environmental Requirements

Table 11 lists the environmental requirements for the MVS-8100C image acquisition board. These specifications are for the environment inside the PC where the MVS-8100C is installed.

	Operating Conditions	Storage Conditions
Temperature	10° to 45° C	–40° to 65° C
Humidity (non-condensing)	10% to 90%	10% to 90%

Table 11. Environmental requirements

Electrical Specifications

This section describes the electrical specifications of the MVS-8100C including power requirements, signal descriptions, and a summary of how jumpers are used. Refer to Figure 15 on page 35 for the location of the ports, headers, and LEDs described in this section.

Power Requirements

Caution   *Failure to properly attach and configure the external power cord to your MVS-8100C (as described in Installing the MVS-8100C on page 9) may result in damage to your frame grabber, motherboard, or both. Refer to the Installation manual for details.*

Power to the board is provided through the PCI bus for +5 VDC and −12 VDC. The +12 VDC power is provided through a connection to the PC's power supply.

Voltage	Tolerance	Requirements	Ripple
+5 VDC	± 5%	1.5 A	100 mV
+12 VDC	± 10%	200 mA (See note)	100 mV
−12 VDC	± 10%	200 mA	100 mV

Table 12. MVS-8100C power requirements

Note   The 200 mA draw for +12 VDC shown in Table 12 is the power required for the MVS-8100C board itself. Additional +12 VDC power is required for each attached camera and light module. See *Fuses* for a discussion of the additional power requirements.

Fuses

Attached cameras and light modules draw from the MVS-8100C's available +12 V power. Each camera can draw up to 500 mA of current and is fused for fault currents at 1 A. Each light module can draw up to 250 mA of current and is fused for fault currents at 500 mA. All cameras and lights are collectively fused at 3.5 A by the fuse at position F9. That is, if the sum of the currents of all cameras and light modules exceeds 3.5 A, fuse F9 will blow. Note that the sum of the maximum allowable currents for each individual camera and light module totals to 3 A.

The fuse at board position F9, Cognex P/N 121-0036, is Littlefuse part number 47303.5, Pico Fuse 3.5 A Slow Blow.

Camera Ports

The MVS-8100C receives analog video signals through four video input ports referred to as cameras 0, 1, 2, and 3. Each video port is capable of supplying power and synchronization signals to its camera.

Cameras 0 and 1 connect through high-density, 15-pin, HD-15F connectors located on the MVS-8100C's back panel. Cameras 2 and 3 connect through HD-15F connectors located on the camera port expansion panel (P/N 300-0245).

When the MVS-8100C is jumpered for use with color cameras, camera ports 0 and 2 are not used. Only ports 1 and 3 are used for connecting color cameras. Consequently, the pinout for camera ports 0 and 2 differs from that of ports 1 and 3.

The pinout for camera ports 0 and 2 is shown in Table 13.

Pin	Signal Name	Pin	Signal Name
1	No connect	9	+12 VDC, camera
2	Video (Monochrome)	10	GND (+12V return)
3	Rapid reset line out	11	Shield
4	+12 VDC, camera	12	HDRIVE Ground
5	GND (+12V return)	13	HDRIVE Signal
6	No connect	14	VDRIVE Signal
7	GND, video	15	VDRIVE Ground
8	No connect		

Table 13. Pinout for camera ports 0 and 2

The pinout for camera ports 1 and 3 is shown in Table 14.

Pin	Signal when jumpered for color camera	Signal when jumpered for monochrome camera
1	Video (Red)	No connect
2	Video (Green)	Video (monochrome)
3	Video (Blue)	Rapid reset line out
4	+12 VDC, camera	+12 VDC, camera
5	GND (+12V return)	GND (+12V return)
6	GND, video	No connect
7	GND, video	GND, video
8	GND, video	No connect
9	+12 VDC, camera	+12 VDC, camera
10	GND (+12V return)	GND (+12V return)
11	Shield	Shield
12	HDRIVE Ground	HDRIVE Ground
13	HDRIVE Signal out or CSYNC in (determined by jumpers J8 and J13)	HDRIVE Signal
14	VDRIVE Signal	VDRIVE Signal
15	VDRIVE Ground	VDRIVE Ground

Table 14. Pinout for camera ports 1 and 3

The HD-15F connector used for all four camera ports is equivalent to Amp part number 748390-5. The jack screw size for connecting cables is #4-40.

Camera Port Expansion Panel

Figure 4 on page 13 shows the expansion panel that carries the camera 2 and 3 signals to the PC's back panel. When installing the expansion panel, note that the 40-pin ribbon cable straddles both J12 and J5 connectors on the MVS-8100C, and that the red edge of the ribbon cable must align with pin 1 of the J12 connector.

Camera Expansion Header

If you are creating your own cable for the camera expansion header, use the pinout information in this section.

Figure 16 shows the pin numbering for the internal camera expansion header.
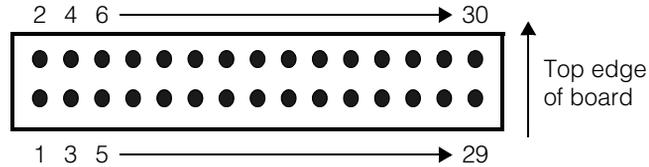
Figure 16.   Pin numbering of internal camera expansion header

Table 15 provides the pinout for the internal camera expansion header.

Pin	Signal Name	Pin	Signal Name
1	No connect	2	Video (monochrome), CAM2
3	Rapid reset out, CAM2	4	+12 VDC (CAM2 power)
5	GND (+12V return)	6	No connect
7	GND (Video)	8	No connect
9	+12 VDC (CAM2 power)	10	GND (+12V return)
11	Shield	12	HDRIVE Ground, CAM2
13	HDRIVE Signal, CAM2	14	VDRIVE Signal, CAM2
15	VDRIVE Ground, CAM2	16	Shield
17	Video (Red), CAM3	18	Video (Green or Mono), CAM3
19	Video (Blue), CAM3, or rapid reset line out, CAM3 (set by J7)	20	+12 VDC (CAM3 power)
21	GND (+12V return)	22	GND (Video)
23	GND (Video)	24	GND (Video)
25	+12 VDC (CAM3 power)	26	GND (+12V return)

Table 15. Pinout of the internal camera expansion header

Pin	Signal Name	Pin	Signal Name
27	No connect	28	HDRIVE Ground, CAM3
29	VDRIVE Signal, CAM3, or CSYNC in CAM3 (set by J13)	30	VDRIVE Signal, CAM3

Table 15. Pinout of the internal camera expansion header

Camera Port Termination Jumpers

The MVS-8100C uses eight 2-pin headers to select between 75 Ohm or high impedance termination of the video input lines. An uncovered jumper block provides a high-impedance input. To terminate a video input port with a 75-Ohm resistor, cover the jumper block in the positions shown in Table 16.

75 Ω on monochrome video input port	75 Ω on RGB color video input port	Cover jumper at position
Camera 0 monochrome	Camera 1 Red	JP4
Camera 1 monochrome	Camera 1 Green	JP5
	Camera 1 Blue	JP1
	Camera 1 CSYNC (Genlock)	JP12
Camera 2 monochrome	Camera 3 Red	JP2
Camera 3 monochrome	Camera 3 Green	JP8
	Camera 3 Blue	JP9
	Camera 3 CSYNC (Genlock)	JP13

Table 16. Camera port termination jumpers

The MVS-8100C ships with 75 Ohm termination selected for all video input lines (all termination jumpers are installed). This setting is correct for the majority of installations.

Light Ports

The MVS-8100C uses one or two 8-pin DIN connectors for the connection of light modules, as described in *Installing Light Control Hardware* on page 25.

The light port on the MVS-8100C's back panel breaks out into light ports 0 and 1, corresponding to camera ports 0 and 1. The light port on the camera port Expansion panel breaks into light ports 2 and 3.

Figure 17 shows the pin numbering for both 8-pin DIN light ports.
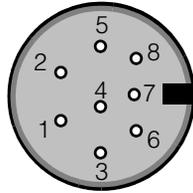

Figure 17.   Light port pin numbering

Table 17 shows the pinout of the light port on the MVS-8100C's back panel.

Pin	Signal Name	Pin	Signal Name
1	Bright field, light port 0	2	+12V (light port 0)
3	Dark field, light port 0	4	+12V (light port 0)
5	Bright field, light port 1	6	+12V (light port 1)
7	Dark field, light port 1	8	+12V (light port 1)

Table 17. Pinout of MVS-8100C's light port

Light ports for cameras 2 and 3 are available from the lights expansion header (J5) on the MVS-8100C. Figure 18 shows the pin numbering of the J5 connector.
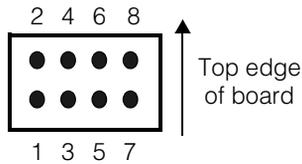
Figure 18.   Pin numbering of lights expansion header (J5)

Table 18 shows the pinout both of the J5 connector on the MVS-8100C and of the 8-pin DIN light port on the camera port expansion panel.

Pin	Signal Name	Pin	Signal Name
1	Bright field, light port 2	2	+12V (light port 2)
3	Dark field, light port 2	4	+12V (light port 2)
5	Bright field, light port 3	6	+12V (light port 3)
7	Dark field, light port 3	8	+12V (light port 3)

Table 18. Pinout of lights expansion header (J5) and light port on expansion panel

Output Power Indicator LEDs

Eight LEDs on the top edge of the MVS-8100C show the status of the resettable fuses for the camera ports and for each camera's associated light control port. The LEDs are normally illuminated when power is on. When an LED is off, it indicates an overcurrent fault on the associated device port. The ports are protected by PolySwitch resettable fuses, so removing the overcurrent condition should re-illuminate the LED.

Note   Overcurrent conditions should be corrected immediately.

If all eight indicators are out, it indicates a bad power source, or that the replaceable fuse at board position F9 is blown. Figure 19 associates each camera and light port with its indicator LED.
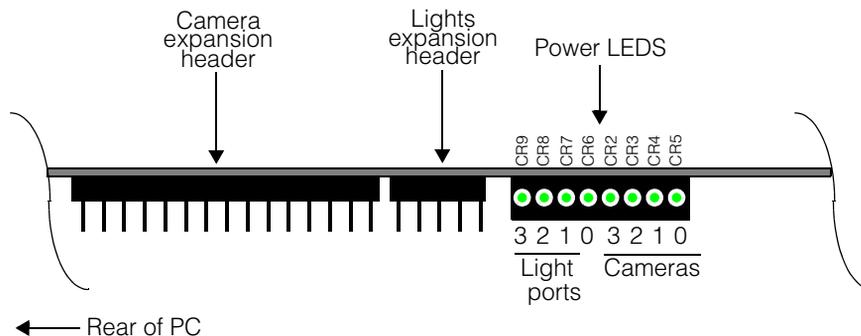
Figure 19. Top view of MVS-8100C showing power indicator LEDs

Trigger and I/O Expansion Panel

An expansion panel (P/N 300-0240) is included with your MVS-8100C to carry trigger, strobe, status, and external sync connections from the 26-pin trigger and I/O header (J6) on the MVS-8100C to the back of the PC. A 26-pin IDC connector is connected by a ribbon cable to the expansion panel's DB-25F port. The red wire in the ribbon cable must align with pin 1 on the J6 port.

The pin numbering for the J6 port is analogous to that of the J12 port shown in Figure 16 on page 40; that is, pin 1 is in the lower left corner of J6. The trigger and I/O expansion panel is shown in Figure 10 on page 23.

The pinout for the trigger and I/O expansion panel is shown in Table 19.

26-pin IDC (J6)	Pin on DB-25	Signal Name	Function
1	1	STRB3O+	Strobe output, camera 3
3	2	STRB3O−	
5	3	STRB2O+	Strobe output, camera 2
7	4	STRB2O−	
9	5	STRB1O+	Strobe output, camera 1
11	6	STRB1O−	
13	7	STRB0O+	Strobe output, camera 0
15	8	STRB0O−	
17	9	PWR (see note)	+5 V power for status signal
19	10	STSOP	Status output
21	11	STSO	
23	12	STSOR	
25	13	GND (see note)	Power return for status signal
2	14	TRIG3+	Trigger input, camera 3
4	15	TRIG3−	

Table 19. Pinout for Trigger and I/O connectors

26-pin IDC (J6)	Pin on DB-25	Signal Name	Function
6	16	TRIG2+	Trigger input, camera 2
8	17	TRIG2–	
10	18	TRIG1+	Trigger input, camera 1
12	19	TRIG1–	
14	20	TRIG0+	Trigger input, camera 0
16	21	TRIG0–	
18	22	EX_VDRIVE_IN	External VDRIVE input
20	23	Digital GND	Return for external VDRIVE
22	24	EX_HDRIVE_IN	External HDRIVE input
24	25	Digital GND	Return for external HDRIVE
26	N/A	No connect	

Table 19. Pinout for Trigger and I/O connectors

Note   The PWR (pin 9) and GND (pin 13) connections supply +5 V through current limiting resistors. This reduces the available voltage with significant current draw.

Consult your Cognex software documentation for a description of the software interface for the MVS-8100C's external I/O connections.

Trigger Input

The trigger input is used to initiate the acquisition of an image from the selected camera port. Four pairs of connections (TRIG*n*+ and TRIG*n*–) provide optically isolated trigger inputs. To activate a trigger, between 4 V and 13 V must be applied to the terminals. If your Cognex software package supports it, the trigger's active polarity state can be programmable via software.

The schematic of the external trigger input circuit is shown in Figure 20.
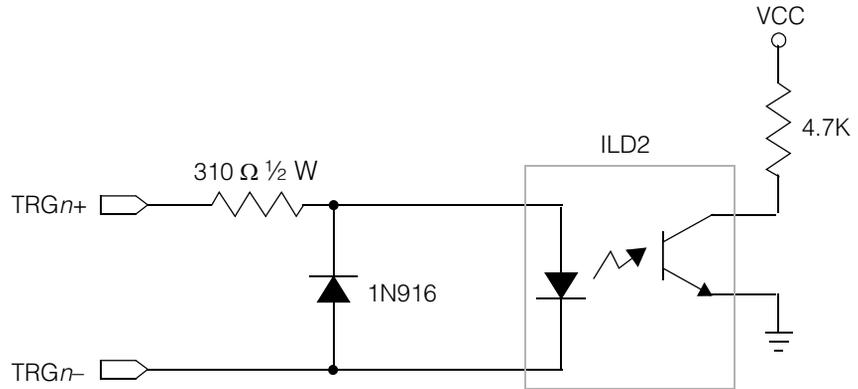
Figure 20.   Trigger input schematic

Status Output

The status output is available for use by your application. The signal connections are optically isolated. You can use the status output in one of two ways.

•   Attach the STSOP and STSOR pins to an optically isolated device.

•   Attach STSOP to PWR and STSOR to GND, and use STSO as a TTL output (the current-limiting resistors on PWR and GND protect the MVS-8100C and the host computer).

The schematic of the status output circuit is shown in Figure 21.
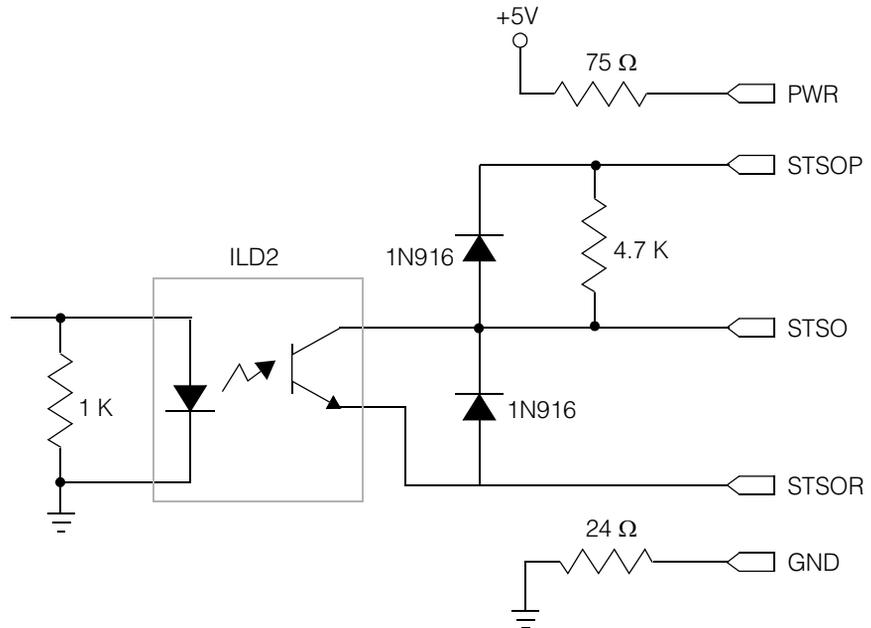
Figure 21.   Status output schematic

Strobe Output

The strobe output is used to activate a photo strobe at the instant of image acquisition. The device to be activated should have optically isolated inputs. The strobe output signal is a pulse of 20 to 30 mA, with a duration of about two horizontal line scans. The active sense (or polarity) of this output is high.

The schematic of the strobe output circuit is shown in Figure 22.
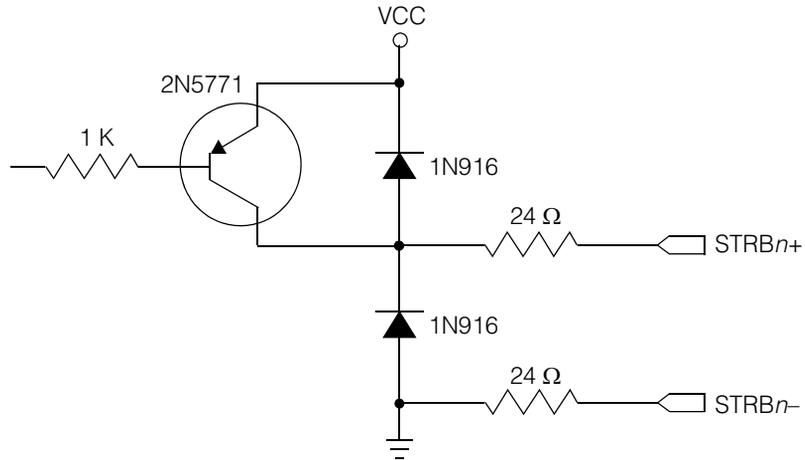
Figure 22. Strobe output schematic

Jumper Settings for the MVS-8100C

Table 20 lists the jumpers on the MVS-8100C and describes how they are used. To locate the jumpers on the board, refer to Figure 15 on page 35. On the MVS-8100C, pin 1 is to the left of all horizontal jumper blocks, and is at the top of all vertical jumper blocks.

Jumper Block	Number of Pins	Factory default	Purpose
J1	3	1-2	J1 affects camera port 1. Pins 1-2 must be covered to use a color camera on port 1. When a monochrome camera is connected to port 1, J1 determines rapid reset mode. Cover pins 1-2 for standard monochrome cameras; cover pins 2-3 to specify rapid reset mode for cameras such as the Sony XC-55.
J3	3	2-3	Jumper must cover pins 2-3. Selects source of +12V power.
J7	3	1-2	J7 has the same setting options as J1, except that it affects camera port 3.

Table 20. Jumper settings for the MVS-8100C

Jumper Block	Number of Pins	Factory default	Purpose
J8	3	1-2	Cover pins 1-2 for normal use with color or mono cameras, with HDRIVE output to camera 1. Cover pins 2-3 to specify Genlock mode for a color camera on port 1, with CSYNC input from camera 1.
J9	3	1-2	Cover pins 1-2 for normal use with color or mono cameras, with VDRIVE output to camera 1. Covering pins 2-3 is reserved.
J13	3	1-2	J13 has the same setting options as J8, except that it affects a color camera on port 3.
J15	3	1-2	Cover pins 1-2 for normal use with color or mono cameras, with VDRIVE output to camera 3. Covering pins 2-3 is reserved.
J16	3	*	For MVS-8100C revisions A, B, and C, the jumper must cover pins 2-3. For MVS-8100C revision D, the jumper must cover pins 1-2. The revision level is indicated by the last character shown on the part number labels on the MVS-8100C. This jumper is for factory diagnostic use only.
JP1, JP2, JP4, JP5, JP8, JP9, JP12, JP13	2	All covered	Jumper's presence selects 75 Ω or absence selects high impedance termination of the board's camera ports. (See *Camera Port Termination Jumpers* on page 41 for more information.)
JP3	2	Open	Reserved for internal use. Do not use.
JP6	3	2-3	Selects source of the VDRIVE signal. Covering pins 2-3 routes the VDRIVE signal from the MVS-8100C to the camera. Covering pins 1-2 routes the VDRIVE signal to the MVS-8100C from an external source connected to jack J6.
JP7	3	2-3	Same as JP6, but for the HDRIVE signal.

Table 20. Jumper settings for the MVS-8100C

Jumper Block	Number of Pins	Factory default	Purpose
JP10	3	2-3	Covering pins 1-2 specifies cameras 0 and 1 are monochrome. Covering pins 2-3 specifies camera 0 is unused, camera 1 is color.
JP11	3	2-3	Covering pins 1-2 specifies cameras 2 and 3 are monochrome. Covering pins 2-3 specifies camera 2 is unused, camera 3 is color.
JP14	2	Covered	Reserved for internal use. Do not remove this jumper.
JP15	2	Open	Reserved for internal use. Do not use.
JP16	N/A	N/A	Not present on the MVS-8100C
JP17	2	Covered	Reserved for internal use. Do not remove this jumper.

Table 20. Jumper settings for the MVS-8100C

MVS-8100C Cameras and Camera Cables

The MVS-8100C frame grabber support the RS-170 and CCIR cameras for monochrome image acquisition and NTSC cameras for color image acquisition listed in Table 21. Part numbers are shown for the Cognex cables to use with each camera.

Note Your Cognex software package may not support all the cameras in this list. Consult your software's release notes for the latest supported configurations for your software package.

Caution *Cameras must be connected using the Cognex cables shown in this table. Using non-Cognex camera cables could damage your frame grabber, your camera, or both.*

Camera	Type	Cognex Camera Cable
Sony XC-003	Color, RGB	300-0243
Sony DXC-390	Color, RGB	300-0243

Table 21. MVS-8100C supported cameras and camera cables

Camera	Type	Cognex Camera Cable
Sony XC-75 Sony XC-75CE	Monochrome, RS-170	300-0181
Sony XC-55 Sony XC-55BB	Monochrome, electronic shuttered (rapid reset)	300-0239
Sony XC-ST50 Sony XC-ES50	Monochrome, RS-170. With switches in factory default mode.	300-0181
Sony XC-ST50CE Sony XC-ES50CE	Monochrome, CCIR. With switches in factory default mode.	300-0181
Pulnix TM-9701	Monochrome, RS-170, progressive scan	300-5180 with 300-5179 adapter
Pulnix TM-7EX	Monochrome, RS-170	300-0155
Pulnix TM-6CN	Monochrome, CCIR	300-0264

Table 21. MVS-8100C supported cameras and camera cables

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