Cognex MVS-8000 Series

MVS-8100M Hardware Manual

April 2009

Contents

Preface

This manual describes the Cognex MVS-8100, MVS-8100M, and MVS-8100M+ frame grabber boards, and has the following sections:

- *Installing the MVS-8100M* on page 9 describes how you configure and install the 8100.
- *Installing Light Control Hardware* on page 23 describes the connection of dynamic light control modules.
- *MVS-8100 Hardware Description* on page 31 describes the 8100 in detail, including environmental and power requirements, and mechanical and electrical specifications. This chapter also describes the electrical interface to the 8100.

The MVS-8100 has been released in several versions. See *Identifying Your MVS-8100* on page 9 for version information.

Throughout this manual, the term *8100* refers to the 8100, 8100M, and 8100M+, unless discussing features specific to one version.

The term *8100M* refers to all released styles of the 8100M, unless discussing features specific to one style.

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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Installing the MVS-8100M

1

This chapter describes how to install a Cognex MVS-8100M frame grabber board into your PC.

Host PC Requirements

To install the MVS-8100M, the host PC must 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, and Pentium 4 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-8100M.
- 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

Identifying Your MVS-8100

The MVS-8100 has been released in several versions. Identify your MVS-8100 using the hardware ID number on the barcode label on the back of the 8100, as listed in Table 1.

MVS-8100M Version	Features	Barcode label number
8100	Original 8100 design	801-8101-01 through 801-8119-01
8100M, style A	Updated version of 8100 with support for rapid reset cameras	801-8120-01

Table 1. Identifying your 8100M version (= obsolete)

MVS-8100M Version	Features	Barcode label number
8100M, style B	Updated version of the 8100M with optional video filtering for improved image acquisition.	801-8139-xx
8100M+	Updated version of the 8100M with additional video filtering for improved image acquisition and support for a variable scan timing generator.	801-8137-xx

Table 1. Identifying your 8100M version (= obsolete)

Note As of the time of publication (April 2009), Cognex is no longer shipping the MVS-8100 and MVS-8100M+. The MVS-8100M Style B is scheduled to end production during 2009.

Throughout this manual, the term *8100* refers to the 8100, and 8100M, and 8100M+ except where discussing features specific to one model.

The term *8100M* refers to all styles of the 8100M, except where discussing features specific to one 8100M style.

Installing the MVS-8100

This section describes the steps to install an MVS-8100, describes special case switch settings, and discusses the connection of external I/O equipment to the 8100.

Steps to Install the MVS-8100

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

1. Before installing your 8100, identify which 8100 you have, using the information in Table 1. Then configure the on-board jumpers as described in one of the following sections:
   - *Jumper Settings for the 8100* on page 48
   - *Jumper Settings for the 8100M and 8100M+* on page 48
2. Turn off the host PC.
3. Remove the cover of the host PC and select a PCI slot for the 8100. The 8100 requires a PCI slot that supports 5 V signalling. The 8100'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 2. PCI slot types

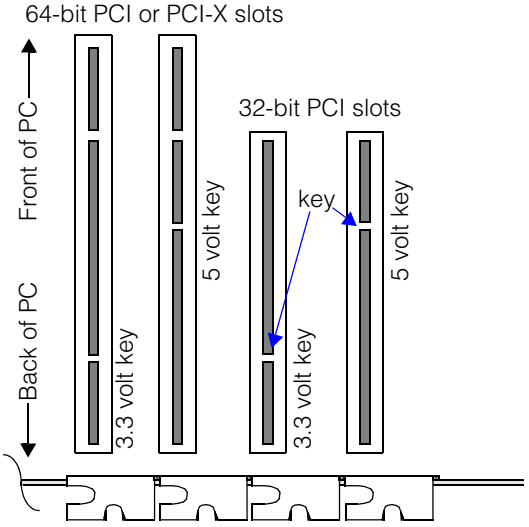

Figure 1. PCI slot types

4. Select the source of +12 V power for the cameras and board by positioning jumper J3.

   Figure 2 shows the J3 jumper position for internal power from the PCI bus. Use this setting only if you are sure you will connect no more than one camera to the 8100 and will not add cameras later, and you are not using a light control module. The total available draw for all cameras and light modules with J3 in the 1-2 position is about 750 mA.

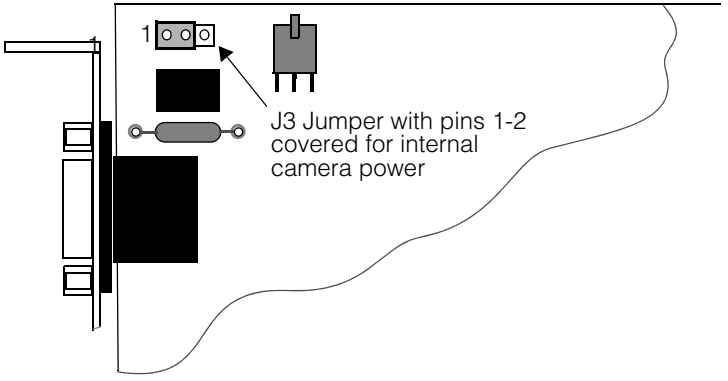

Figure 2. J3 jumper position for internal camera power

Note If you later change or add cameras or light modules after initial installation, with the board still configured for internal camera power, you may exceed the power limitations. For this reason, Cognex strongly recommends using J3 in the 2-3 position and using cable 300-0175, even when connecting a single camera to your 8100.

Figure 3 shows the J3 jumper position for external 12 V power. The total available power with the jumper in the 2-3 position is 750 ma for *each* installed camera and 3.5 A total for all cameras and light modules.

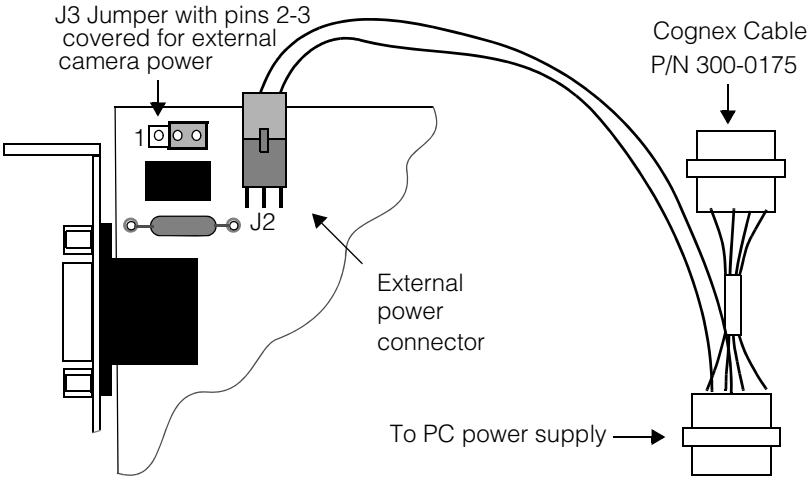

Figure 3. JP1 jumper position and power cable for external camera power

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

5. Press the card into its slot until it is seated firmly, and replace the slot cover screw.
6. Locate the 8100's external +12 V power connector at J2, as shown in Figure 3 on page 13. Connect the +12 V power cable adapter (P/N 300-0175) to your PC's power supply and to the connector at J2. 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 8100 can result in electrical damage.*

7. Connect your camera(s) to the 8100 using the appropriate camera cable, as listed in Table 20 on page 51. Figure 4 shows the location of the camera ports on the back panel of the 8100.

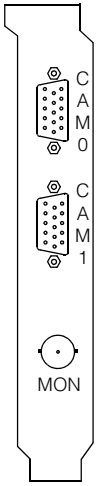

Figure 4. MVS-8100 external connector location

Note The 8100's camera connectors are similar to the connector for a standard VGA monitor. Attaching a VGA monitor cable to a camera connector can cause the board 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.

8. If you are installing one of the following cameras with the MVS-8100M or MVS-8100M+, see the additional instructions in *Using Rapid Reset Cameras* on page 17.
   - Sony XC-55 or XC-55 BB camera
   - Sony XC-ST50 or XC-ES50 camera with switch settings in rapid reset mode
   - Pulnix TM-9701 with CCF video format (MVS-8100M+ only)

Some of these cameras also have switch settings on the cameras themselves to support rapid reset mode. See the appropriate section from the following list:

- *Configuring Sony XC-55 Cameras* on page 19
- *Configuring Sony XC-ES50 Cameras* on page 19
- *Configuring Sony XC-55 Cameras* on page 19

9. If you are using a third and fourth camera, attach the camera port expansion panel (P/N 300-0177) to the PC's back panel in an unused bus slot position. Figure 5 shows the camera port expansion panel.

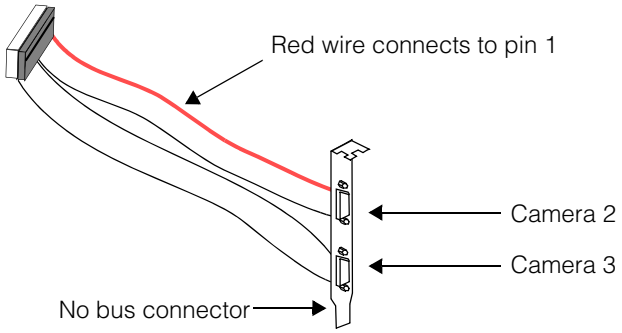

Figure 5. 8100 camera port expansion panel (P/N 300-0177)

Connect the expansion panel's 30-pin IDC connector to the camera expansion header on the board (J12), taking care to match up the red edge of the expansion panel's ribbon cable with pin 1 on the connector.

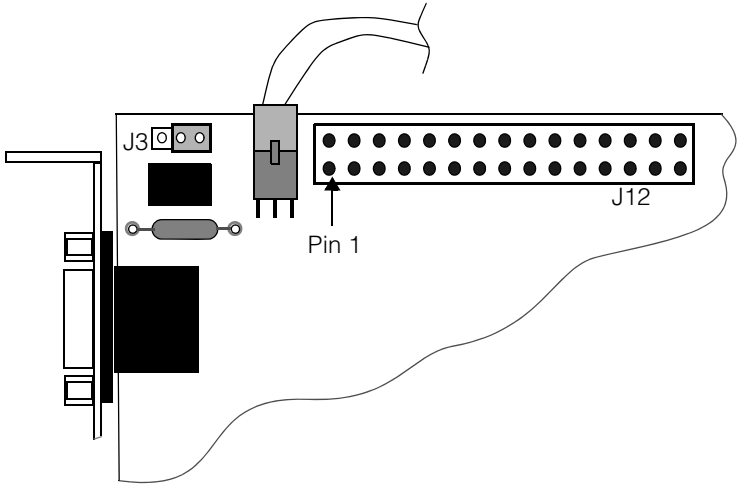

Figure 6. Location of pin 1 on camera expansion header (J12)

Caution *Failure to match up the ribbon cable's red wire with pin 1 may result in damage to a camera, the frame grabber, or both.*

10. Replace the PC's cover and reconnect the power cord.
11. Connect light modules, triggers, strobes, and other parallel I/O equipment to the 8100 *before* applying power to the PC.

Jumper Settings for 8100M or 8100M+ Only

This section discusses additional jumper settings that may be required if you are using the 8100M or 8100M+.

Using an External Sync Source

The 8100M and 8100M+ support 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 8100:

- Your cameras must be set in software to use genlock mode in order to synchronize with the external source.
- Connect the external HDRIVE signal to pin 1, and the external VDRIVE signal to pin 3, of jack J13 on the 8100M. Use pins 2 and 4 as ground returns. See Table 17 on page 47 for the pinout of jack J13.
- Set jumpers JP6 and JP7 as shown in Table 3.

Jumper	Factory Default Setting	Setting for External Sync Mode
JP6	Pins 2-3 covered. Routes the VDRIVE signal from the 8100M to the camera.	Pins 1-2 covered. Routes the VDRIVE signal to the 8100M from an external source connected to jack J13.
JP7	Pins 2-3 covered. Routes the HDRIVE signal from the 8100M to the camera.	Pins 1-2 covered. Routes the HDRIVE signal to the 8100M from an external source connected to jack J13.

Table 3. 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 8100M or 8100M+.

Using Rapid Reset Cameras

Cognex uses the term rapid reset to describe electronic shutter control or trigger shutter control. Cameras that can be used in rapid reset mode include:

- Sony XC-55 or XC-55 BB camera
- Sony XC-ST50 or XC-ES50 camera with switch settings in rapid reset mode
- Pulnix TM-9701 with CCF video format (MVS-8100M+ only)

To use one of these cameras in rapid reset mode with the 8100M or 8100M+, you must set a jumper for the camera port to which the camera is attached. Table 4 shows the jumper settings for each camera port. Jumper locations are found in the following locations:

- For the 8100M, Style A, see in Figure 15 on page 34
- For the 8100M, Style B, see Figure 16 on page 35
- For the 8100M+, see Figure 17 on page 36

Camera port	Jumper	Cover these pins for rapid reset support
0	JP13	2-3
1	JP12	2-3
2	JP11	2-3
3	JP10	2-3

Table 4. Jumper settings for Sony XC-55 support

Note Setting jumpers JP10 through JP13 for rapid reset support disables the use of a light module on that camera port. You cannot use rapid reset cameras and light modules on the same 8100M or 8100M+ camera port at the same time. However, each camera port can be set individually, so you can mix rapid reset cameras with other types.

Installing External I/O Equipment

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

- One high-speed optically isolated trigger pulse generator to trigger image acquisitions on one to four monochrome cameras.
- One high-speed open collector strobe light to allow 8100-controlled illumination of the scene under one to four monochrome cameras.

- One status output line that can be used by your vision processing application.
- External camera synchronization signals (8100M and 8100M+ only).
- One to four light modules, such as the Cognex acuLight and UltraLight products, that allow software-controlled dynamic light adjustment of the scene under a camera lens. See *Installing Light Control Hardware* on page 23.

Trigger and Strobe Expansion Panel

To connect trigger, strobe, and status lines, use the trigger and strobe expansion panel, P/N 800-0062. Secure the expansion panel to an unused bus slot position on the PC's back panel. A 10-line ribbon cable extends from the expansion panel to the header at position J1, in the upper right corner of the 8100.

The brown wire in the multi-colored ribbon cable must align with pin 1 on the 8100's J1 header. Figure 7 shows the expansion panel and the pin numbering of the panel's DB-9F connector.

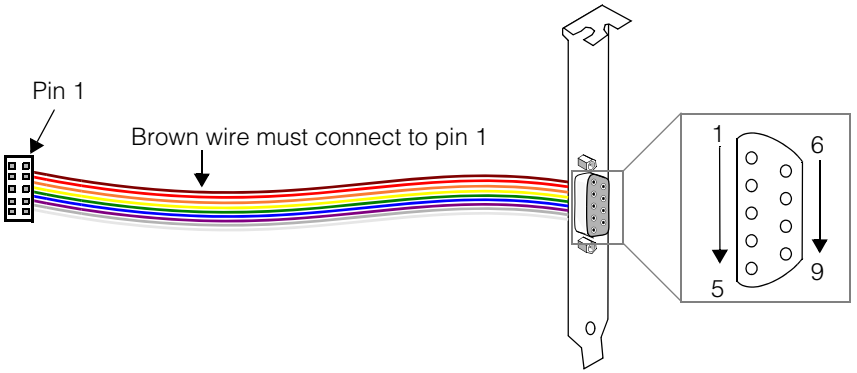

Figure 7. Expansion panel for 8100's trigger and strobe connector (P/N 800-0062)

Configuring Cameras

Some of the cameras supported for use with the MVS-8100M require switch settings to work best with Cognex software, as described in the following sections.

Configuring Sony XC-55 Cameras

The 8100M and 8100M+ support 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 8100. 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 8100M or 8100M+, the Sony XC-55/55BB must be connected with Cognex camera cable 300-0239, and the 8100M or 8100M+ must have its rapid reset jumper set for the camera port used, as described in *Using Rapid Reset Cameras* on page 17.

Configuring Sony XC-ES50 Cameras

The MVS-8100M 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 and rapid reset modes. Note that if you set the XC-ST50 for rapid reset mode, you must also set a jumper on the MVS-8100, as described in *Using Rapid Reset Cameras* on page 17.

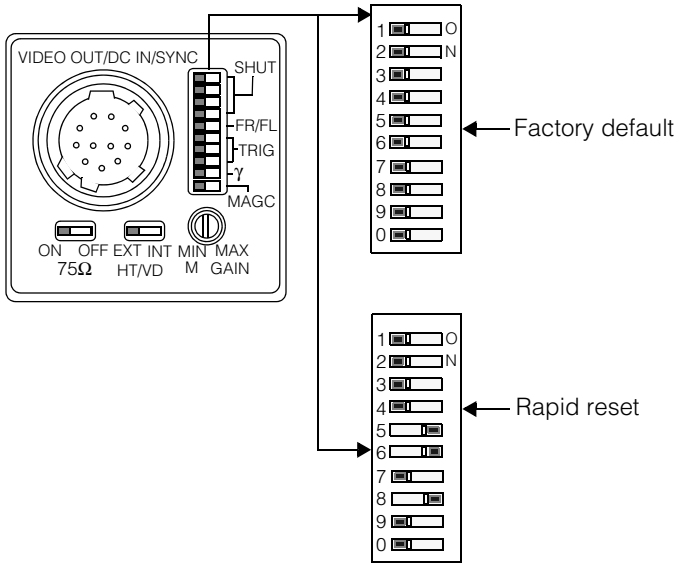

Figure 8. Sony XC-ES50 camera back panel

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).
4. Set the 75Ω switch to ON.

Configuring Sony XC-ST50 Cameras

The 8100 supports the use of the Sony XC-ST50 family of cameras, including the XC-ST50CE. If you purchase your XC-ST50 cameras from Cognex, they arrive ready to use with the 8100. 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 factory default and rapid reset modes (8100M+ only). Note that if you set the XC-ST50 for rapid reset mode, you must also set a jumper on the MVS-8100, as described in *Using Rapid Reset Cameras* on page 17.

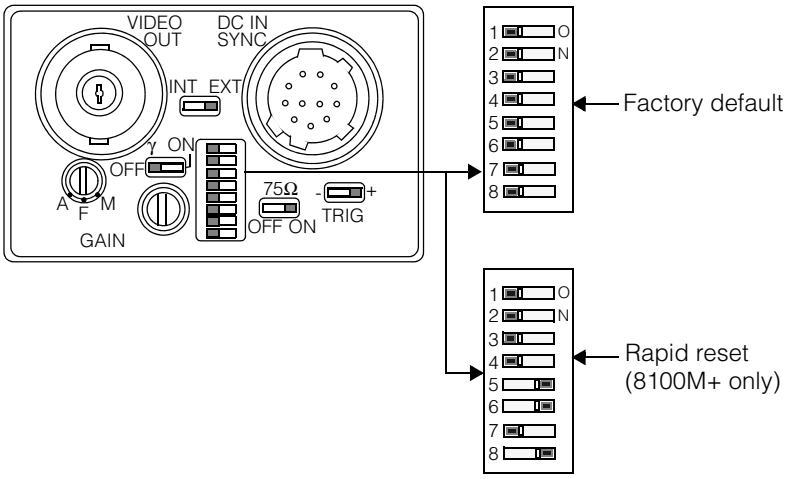

Figure 9. Sony XC-ST50 camera back panel

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.

Installing the MVS-8100M 1

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

Figure 10. 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 11.

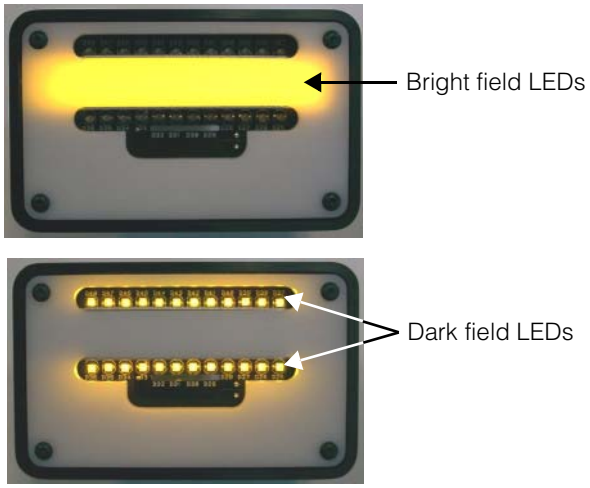

Figure 11. Bright and dark field LEDs on light modules

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 5.

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 5. 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 6 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 6. Case 2, using adjacent light ports for auxiliary

Table 7 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 7. 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 8.

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 8. 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 12 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 5 on page 26).

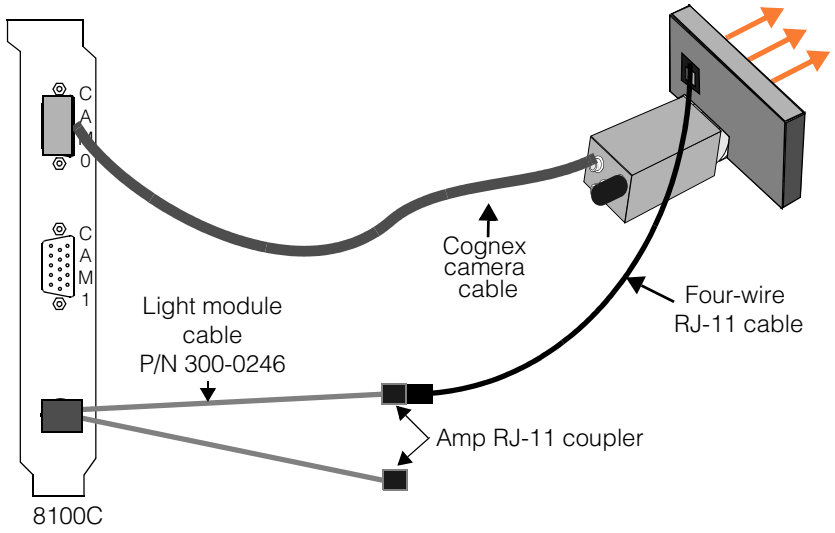

Figure 12. Connecting one primary light module

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 13 illustrates the top two lines, highlighted in green, of case 2 (Table 6 on page 27).

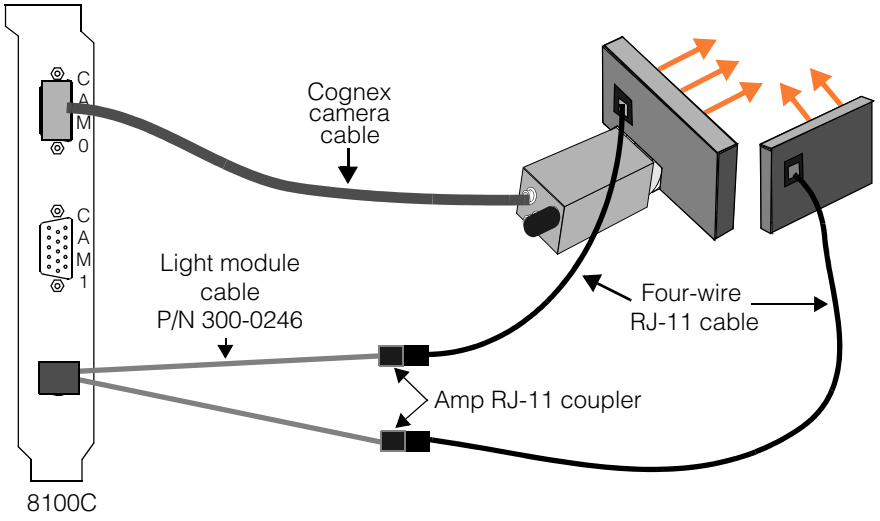

Figure 13. Connecting two light modules to one camera

MVS-8100 Hardware Description

3

This chapter describes the Cognex 8100, 8100M, and 8100M+ frame grabber boards that can be used with Cognex 8000 series software.

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

- Acquire 8-bit images from monochrome cameras
- Support up to four camera inputs
- Transfer acquired images over the PCI bus to memory on the host PC
- Display the images being acquired on the host PC

Table 9 summarizes the capabilities of the MVS-8100. More detail about each feature is provided later in this chapter.

Frame Grabber Feature	Cognex MVS-8100M
Image acquisition timing supported	CCIR or EIA RS-170
Acquired image size	640x480 (EIA RS-170) 768x570 (CCIR) 640x480 (asynchronous reset)
Acquired image resolution	8 bits per pixel (6 bits by using an input lookup table)
Camera input ports	4 (2 on baseboard, 2 with expansion panel)
Camera power supplied by board	Yes
Source of synchronization signals	Camera or 8100 (for 8100) Camera, 8100, or external source (for 8100M and 81000M+ only)
Overlapped image acquisition and processing	Yes
External trigger support	One high-speed optically isolated trigger input
Strobe support	One high-speed open-collector strobe output
Output signal line	Optically isolated accept/reject control

Table 9. MVS-8100 features

Frame Grabber Feature	Cognex MVS-8100M
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 9. MVS-8100 features

Mechanical Specifications

This section provides the mechanical specifications for the 8100. See *Identifying Your MVS-8100* on page 9 to determine which 8100 you have.

MVS-8100

The Cognex 8100 is 107 mm (4.2 inches) high by 175 mm (6.875 inches) long and occupies a single PCI bus slot. Figure 14 shows the major components of the 8100.

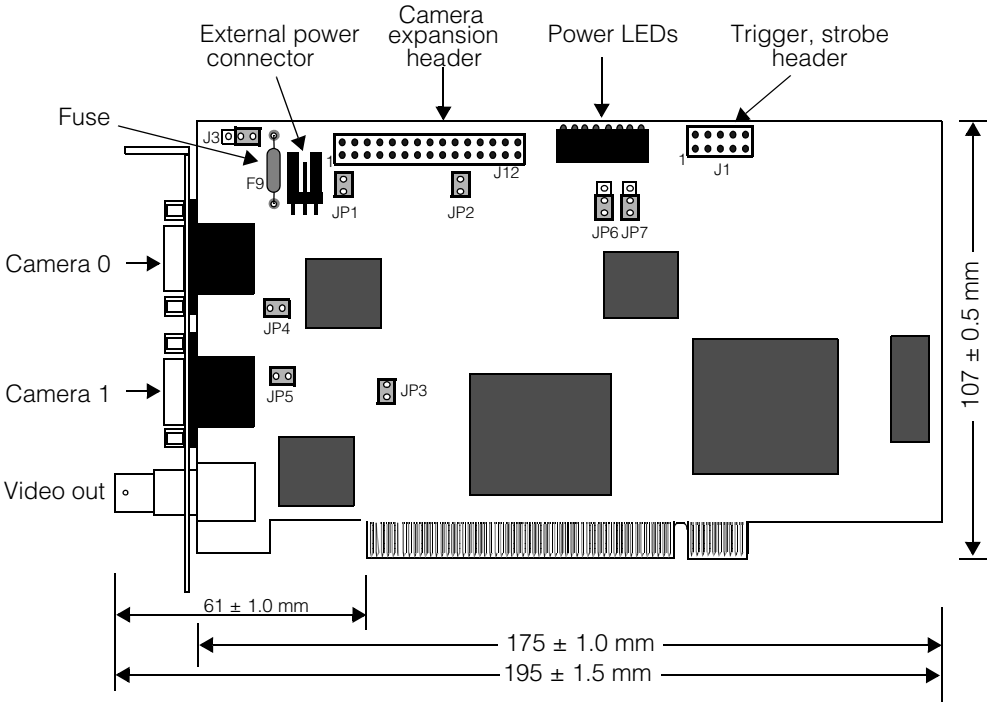

Figure 14. 8100 component location

Figure 14 shows the factory default jumper settings for the 8100. On the 8100, pin 1 is to the left of all horizontal jumper blocks, and is at the top of all vertical jumper blocks. The effects of the jumper settings for the 8100 are discussed in Table 18 on page 48.

MVS-8100M, Style A

The 8100M, style A, is the same size as the 8100, but has a different layout of components, as shown in Figure 15.

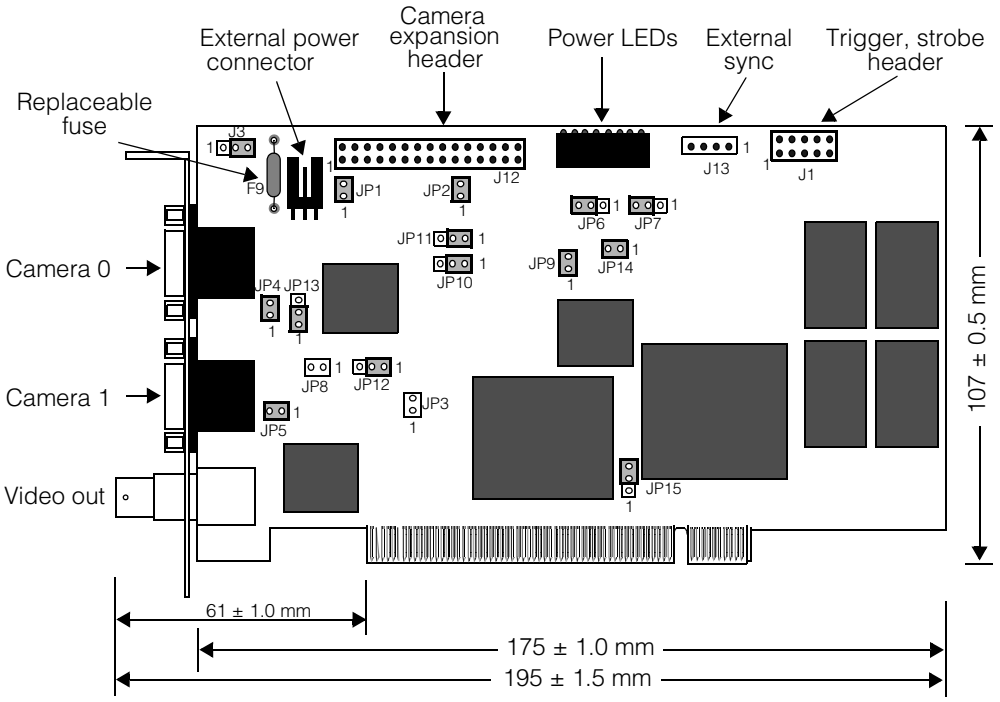

Figure 15. 8100M, style A, component location

Figure 15 shows the factory default jumper settings for the style A 8100M. On this 8100M, the location of pin 1 generally follows this rule: pin 1 is on the right for horizontal jumpers and jacks and on the bottom for vertical jumpers and jacks. The exceptions are jacks J3, J12, and J1, which have pin 1 on the left. The pin 1 locations for the 8100M are marked in Figure 15. The effects of the jumper settings for the style A 8100M are described in Table 19 on page 49.

MVS-8100M, Style B

The 8100M, style B, is the same size as the 8100, but has a different layout of components, as shown in Figure 16.

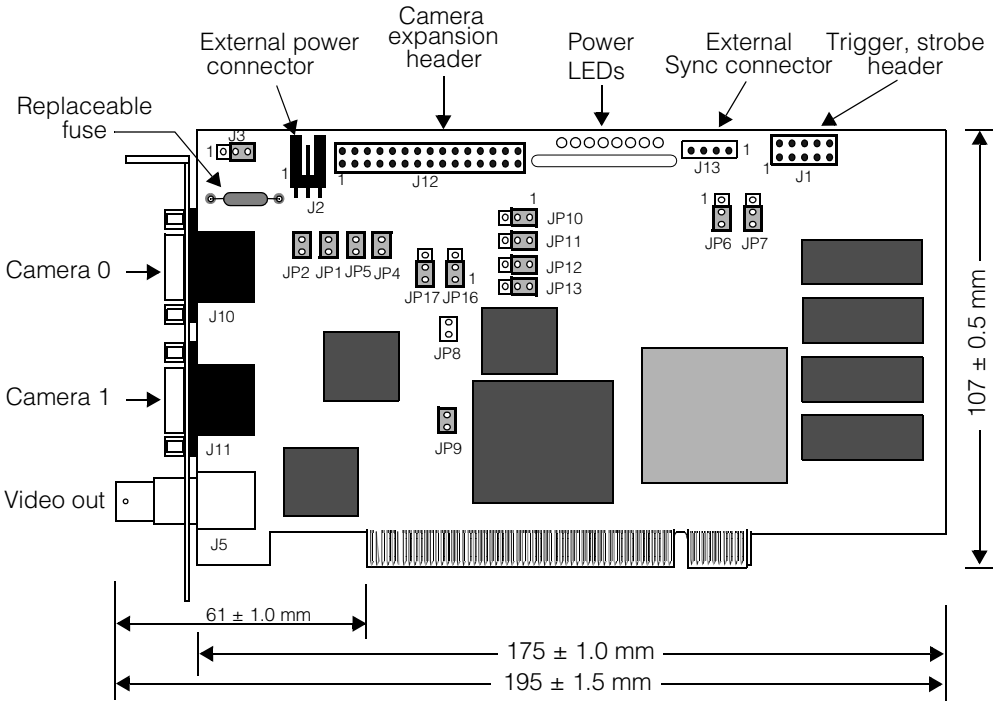

Figure 16. 8100M, style B, component location

Figure 16 shows the factory default jumper settings for the style B 8100M. On the style B 8100M, the location of pin 1 is marked with a notch in the white line surrounding the jumper's location on the board. The effects of the jumper settings for the style B 8100M are described in Table 19 on page 49.

MVS-8100M+

The 8100M+ is the same size as the 8100M, but has a different layout of components, as shown in Figure 17.

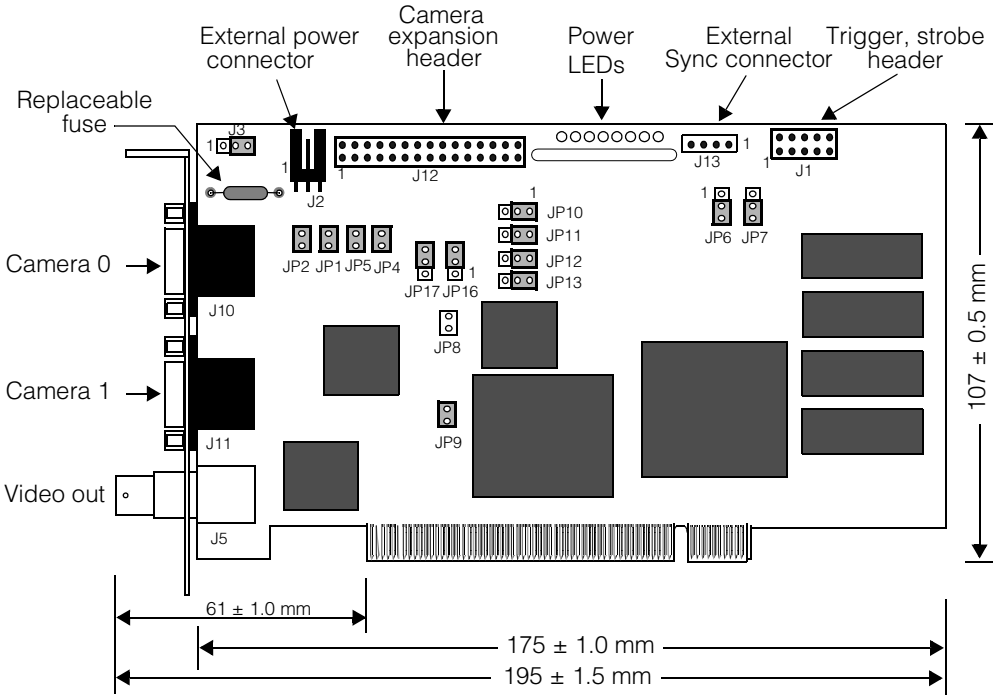

Figure 17. 8100M+ component location

Figure 17 shows the factory default jumper settings for the 8100M+. On the 8100M+, the location of pin 1 is marked with a notch in the white line surrounding the jumper's location on the board. The effects of the jumper settings for the 8100M+ are described in Table 19 on page 49.

Features in Common

For all variations of the MVS-8100, two camera ports and a video monitor output port are on the back panel. Two expansion panels are available. One expansion panel connects to the camera expansion header and provides two additional camera ports. The other expansion panel connects to the trigger and strobe connector and provides access to external I/O signals. Each expansion panel occupies a back panel slot, but does not connect to the bus.

For the 8100M and 8100M+, external video timing signals can be connected to the external sync connector.

Environmental Requirements

Table 10 lists the environmental requirements for the 8100 image acquisition board. These specifications are for the environment inside the PC where the 8100 is installed.

	Operating Conditions	**Storage Conditions**
Temperature	10° to 50° C	–40° to 65° C
Humidity (non-condensing)	10% to 90%	10% to 90%

Table 10. Environmental requirements

Electrical Specifications

This section describes the electrical specifications of the 8100 including power requirements, signal descriptions, and a summary of how jumpers are used. Refer to Figure 14 on page 33 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 cable to your 8100 (as described in Installing the MVS-8100 on page 11) may result in damage to your frame grabber, motherboard, or both.*

Power to the board is provided through the PCI bus for +5 VDC and –12 VDC. The +12 VDC power is provided through a separate connection to the PC's power supply through jack J2, as shown in Table 11.

Voltage	Tolerance	Requirements	Max 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 11. 8100 power requirements

Note The 200 mA draw for +12 VDC shown in Table 11 is the power required for the 8100 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 8100'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 8100 receives analog video signals through four video input ports. The camera ports are numbered 0, 1, 2, and 3. Each video port is capable of supplying power and synchronization signals to its camera.

Cameras 0 and 1 connect to high-density 15-pin HD-15F ports located on the 8100's back panel. Cameras 2 and 3 connect to HD-15F ports located on the camera port expansion panel (P/N 300-0177) that connects to the 30-pin camera expansion header on the 8100. The pinout for each of the four camera ports is shown in Table 12.

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	+12 VDC (light module power)	6	Light module dark field control	11	Shield
2	Video	7	GND, video	12	HDRV ground
3	Rapid reset line out *or* light module bright field control *	8	+12 VDC (light module power)	13	HDRV signal
4	+12 VDC (camera)	9	+12 VDC (camera)	14	VDRV signal
5	GND (+12 V return)	10	GND (+12 V return)	15	VDRV ground

* For the 8100M and 8100M+, pin 3 is bright field control or a rapid reset signal line, depending on the setting of jumpers JP10 through JP13.

Table 12. Pinout of the camera ports

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 5 on page 15 shows the expansion panel, Cognex P/N 300-0177, that carries the cameras 2 and 3 signals to the PC's back panel. When installing the expansion panel, note that the red edge of its ribbon cable must align with pin 1 of the 30-pin camera expansion header on the 8100.

Camera Expansion Header

If you are creating your own cable for the camera expansion header, use the pinout information in Table 13 on page 40.

Figure 18 shows the pin numbering for the camera expansion header on the 8100.

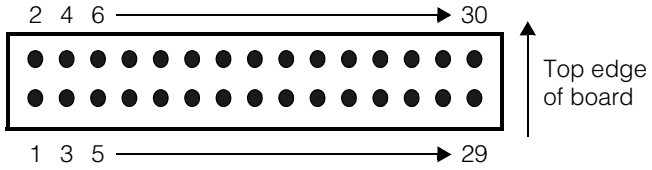

Figure 18. Pin numbering of camera expansion header

Table 13 provides the pinout for the camera expansion header on the 8100.

Pin	Signal Name	Pin	Signal Name
1	+12 VDC (CAM2 light module power)	2	Video, CAM2
3	Rapid reset line out *or* CAM2 light module bright field control *	4	+12 VDC (CAM2 power)
5	Ground	6	CAM2 light module dark field control
7	Ground	8	+12 VDC (CAM2 light module power)
9	+12 VDC (CAM2 power)	10	Ground
11	No connect	12	Ground
13	HDRV, CAM2	14	VDRV, CAM2
15	Ground	16	No connect
17	+12 VDC (CAM3 light module power)	18	Video, CAM3
19	Rapid reset line out *or* CAM3 light module bright field control *	20	+12 VDC (CAM3 power)
21	Ground	22	CAM3 light module dark field control
23	Ground	24	+12 VDC (CAM3 light module power)

Table 13. Pinout of camera expansion header

Pin	Signal Name	Pin	Signal Name
25	+12 VDC (CAM3 power)	26	Ground
27	No connect	28	Ground
29	HDRV, CAM3	30	VDRV, CAM3

* For the 8100M and 8100M+, pins 3 and 17 are bright field control or rapid reset signal lines, depending on the setting of jumpers JP11 and JP10, respectively.

Table 13. Pinout of camera expansion header

Camera Port Termination Jumpers

JP1, JP2, JP4, and JP5 are 2-pin headers used to select 75 Ohm or high impedance termination of the video inputs. An uncovered jumper provides a high-impedance input. To terminate a video input port with a 75-ohm resistor, install the jumper in the position listed in Table 14.

Video input port	Termination jumper position
Camera 0	JP4
Camera 1	JP5
Camera 2	JP1
Camera 3	JP2

Table 14. Camera port termination jumpers

The 8100 ships with all four video input termination jumpers installed.

Output Power Indicator LEDs

Eight LEDs on the top edge of the 8100 show the status of the resettable fuses for the camera ports and for each camera's associated light module port. All eight 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, this 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 for the 8100 and 8100M, style A. Figure 20 does the same for the 8100M, style B, and the 8100M+.

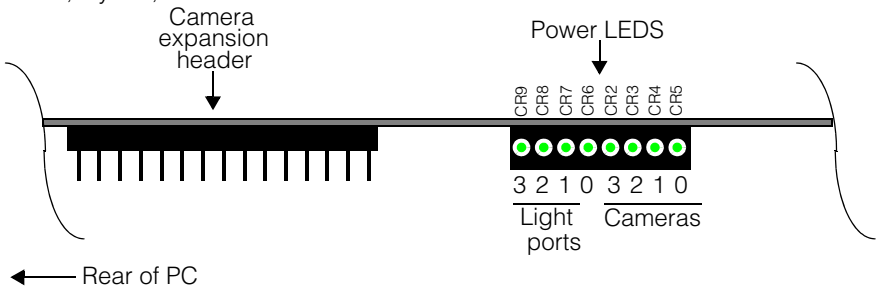

Figure 19. Top view of the 8100 and 8100M, style A, showing power indicator LEDs

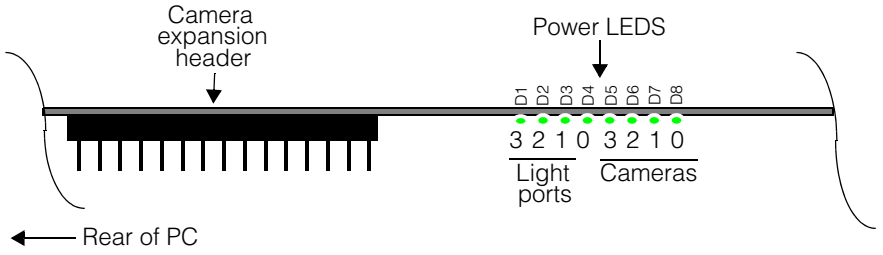

Figure 20. Top view of the 8100M, style B, and 8100M+, showing power indicator LEDs

Monochrome Monitor Output

When a video monitor is connected to the 8100, it displays whatever images are being acquired by the frame grabber. The BNC connector on the 8100's back panel provides monochrome output for a monitor with the following specifications:

- Monitor output: 1 volt peak-to-peak EIA RS-170 or CCIR signal, with video and sync information
- Monitor termination: 75-ohm termination (required for proper sync level)
- Signal: 2-to-1 interlaced with horizontal and vertical sync
- Output resolution: 768 horizontal by 570 vertical pixels, all of which are visible when the image is viewed with underscan selected on the monitor. If a progressive scan camera is used, a progressive scan monitor is needed to correctly display the image.

Note Because the 8100 lacks dedicated memory for overlay graphics, Cognex MVS-8000 software does not make customizable use of the 8100's monitor output. Images displayed out the monitor port are pass-through copies of the image from the active camera port.

Trigger and Strobe Expansion Panel

An expansion panel (P/N 800-0062) is available to carry trigger, strobe, and status signal connections from the 10-pin trigger and strobe header (jack J1) on the 8100 to the back of the PC. A 10-pin IDC connector is connected by a multi-colored ribbon cable to a connector panel with one DB-9F connector. The trigger and strobe expansion panel is shown in Figure 7 on page 18.

The pinout for the trigger and strobe connector at J1 and the corresponding DB-9F port on the expansion panel are shown in Table 15.

Jack J1	DB-9F	Signal Name
1	1	TRIG+
3	2	STRB+
5	3	PWR (see note)
7	4	STSO
9	5	GND (see note)
2	6	TRIG–
4	7	STRB–
6	8	STSOP
8	9	STSOR
10		No connect

Table 15. Pinout for the external I/O expansion panel

Note The PWR (pin 3) and GND (pin 5) 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 8100's external I/O connections.

Trigger Input

The trigger input is used to initiate the acquisition of an image from the currently selected camera port. A pair of connections (TRIG+ and TRIG–) provide an optically isolated trigger input. To activate the interrupt, between 4 and 13 volts must be applied to the terminals. If your Cognex software package allows it, the input trigger's polarity is configurable with software commands.

The schematic of the external trigger input circuit is shown in Figure 21.

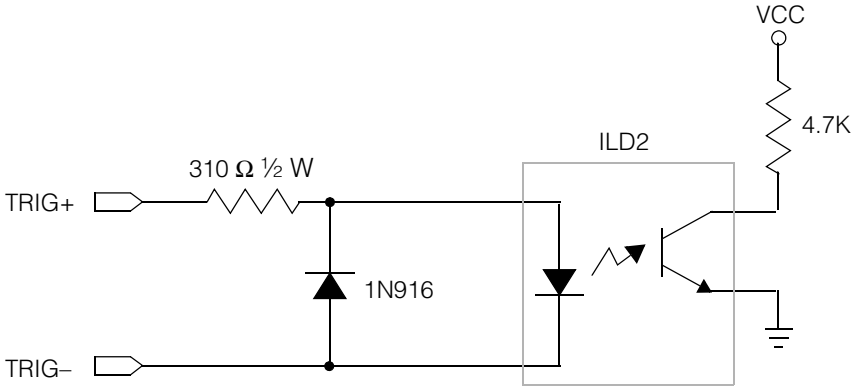

Figure 21. Trigger input schematic

Status Output

The status output applies to the currently selected camera, and 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 8100 and the host computer).

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

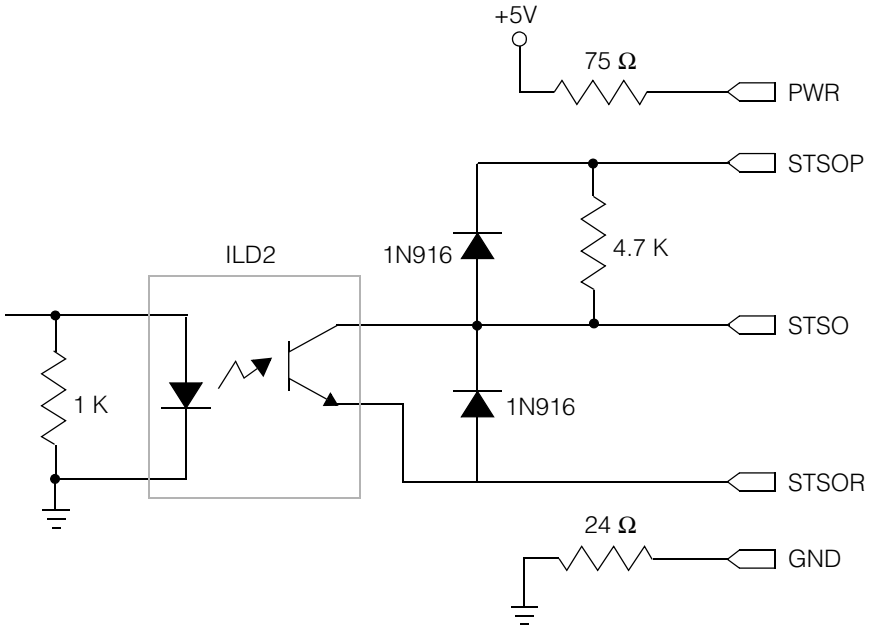

Figure 22. Status output schematic

Strobe Output

The Strobe output is used to activate a photo strobe at the time of image acquisition on the currently selected camera. The strobe device to be triggered should have optically isolated inputs.

For the original MVS-8100 and MVS-8100M (styles A and B), 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.

For the MVS-8100M+, the strobe pulse width and duration is settable with software commands.

The schematic of the strobe output circuit is shown in Figure 23.

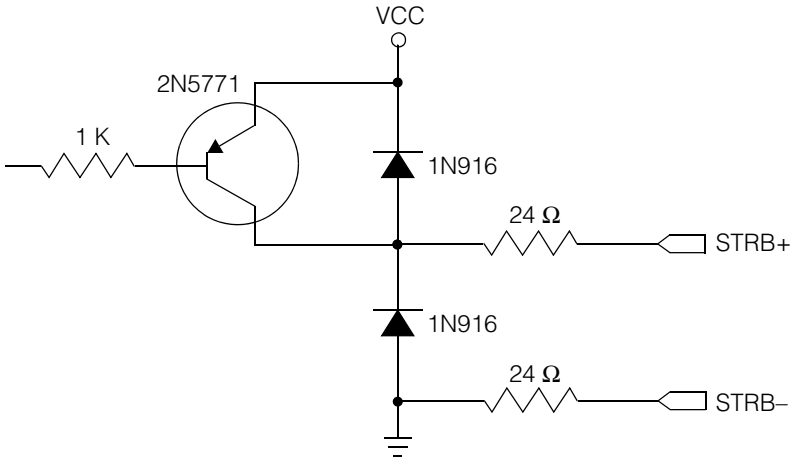

Figure 23. Strobe output schematic

Trigger and Strobe Header

If you are creating your own cable to connect to the 8100's trigger and strobe header, use the information in this section.

Figure 24 shows the pin numbering for trigger and strobe header at board position J1.

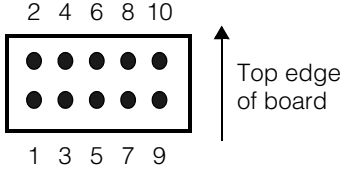

Figure 24. Pin numbering of trigger and strobe header

The pinout for the trigger and strobe header at board position J1 is shown in Table 16.

Pin	Signal Name	Pin	Signal Name
1	TRIG+	6	STSOP
2	TRIG–	7	STSO
3	STRB+	8	STSOR
4	STRB–	9	GND
5	PWR	10	(unused)

Table 16. Pinout of the trigger and strobe header

External Sync Connector (8100M and 8100M+ Only)

On the 8100M and 8100M+, video timing for all cameras can be controlled from an external source of HDRIVE and VDRIVE signals. Connect the external sync source to the 4-pin header at position J13. Table 17 shows the pinout for the external sync connector.

Pin	Signal Name
1	External HDRIVE in
2	Digital Ground
3	External VDRIVE in
4	Digital Ground

Table 17. Pinout of external sync connector

Note If you supply HDRIVE and VDRIVE from an external source, you must use the external source for all cameras connected to the 8100. You cannot mix external and internal sync cameras.

Jumper Settings for the 8100

Table 18 lists the jumpers on the original MVS-8100 and describes how they are used. To locate the jumpers on the 8100, refer to Figure 14 on page 33. On the 8100, 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	Default Setting	Purpose
J3	3	2-3	Selects source of +12 V power. On the original 8100, do not change this jumper from its default position, which requires the use of the power cable, P/N 300-0175.
JP1, JP2, JP4, JP5	2	Closed	Jumper's presence or absence selects 75 Ω or high impedance termination, respectively, of the board's four camera ports. (See *Camera Port Termination Jumpers* on page 41 for further information.)
JP3	2	Closed	Reserved for internal use. Do not remove this jumper.
JP6, JP7	3	2-3	Reserved for internal use. Jumpers must cover pins 2-3.

Table 18. Jumper settings for original 8100

Jumper Settings for the 8100M and 8100M+

Table 19 lists the jumper settings for both styles of 8100M and the 8100M+ and describes how they are used. To locate jumpers:

- on the 8100M, style A, refer to Figure 15 on page 34
- on the 8100M, style B, refer to Figure 16 on page 35
- on the 8100M+, refer to Figure 17 on page 36

.

Jumper Block	Number of Pins	Which 8100?	Default Setting	Purpose
J3	3	8100M and 8100M+	2-3	Selects source of +12 V power. Covering pins 1-2 draws power from the PCI bus. Covering pins 2-3 draws power from the host PC power supply through connector J2 and the power cable, P/N 300-0175. • On the 8100M, style A, do not change from the default setting. • On the 8100M, style B and 8100M+, Cognex strongly recommends keeping this jumper covering pins 2 and 3, and using the power cable, P/N 300-0175.
JP1, JP2, JP4, JP5	2	8100M and 8100M+	Closed	Jumper's presence or absence selects 75 Ω or high impedance termination, respectively, of the board's four camera ports. (See *Camera Port Termination Jumpers* on page 41 for more information.)
JP3	2	8100M, style A only	Open	Reserved for internal use. Jumper block must remain open.
JP6	3	8100M and 8100M+	2-3	Selects source of the VDRIVE signal. Covering pins 2-3 routes the VDRIVE signal from the 8100M to the camera. Covering pins 1-2 routes the VDRIVE signal to the 8100M from an external source connected to jack J13.
JP7	3	8100M and 8100M+	2-3	Same as JP6, but for the HDRIVE signal.
JP8	2	8100M and 8100M+	Open	Reserved for internal use. Jumper block must remain open.
JP9	2	8100M and 8100M+	Closed	Reserved for internal use. Do not remove jumper.

Table 19. Jumper settings for 8100M and 8100M+

Jumper Block	Number of Pins	Which 8100?	Default Setting	Purpose
JP10	3	8100M and 8100M+	1-2	Selects the use for pin 3 on camera port 3. Cover pins 1-2 for normal use with standard cameras. (In this state, camera port 3's pin 3 carries the associated light port's brightfield control signal). Cover pins 2-3 for use with shutter control cameras such as those listed in *Using Rapid Reset Cameras* on page 17. (In this state, camera port 3's pin 3 carries the rapid reset trigger signal).
JP11	3	8100M and 8100M+	1-2	Same setting options as JP10, but applies to camera port 2.
JP12	3	8100M and 8100M+	1-2	Same setting options as JP10, but applies to camera port 1.
JP13	3	8100M and 8100M+	1-2	Same setting options as JP10, but applies to camera port 0.
JP14	2	8100M, style A only	Closed	Reserved for internal use. Do not remove jumper.
JP15	3	8100M, style A only	2-3	***For revisions A through E:*** Reserved for internal use. Jumpers must cover pins 2-3. ***For revision F:*** Reserved for internal use. Soldered link covers pins 1 and 2. The board revision is the last character ('X') on the barcode label that reads **801-8120-01-*X***.
JP16, JP17	3	8100M, style B	1-2	Select the video input filter. Covering pins 1-2 selects a filter that is compatible with the 8100M, style A. Covering pins 2-3 selects a low pass filter that improves image quality.
		8100M+	2-3	

Table 19. Jumper settings for 8100M and 8100M+

MVS-8100 Cameras and Camera Cables

The MVS-8100 frame grabbers support the EIA RS-170 and CCIR cameras for monochrome image acquisition listed in Table 20. Part numbers for the Cognex cables to use with each camera are shown.

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	8100	8100M	8100M+	Cognex Camera Cable	Notes
Sony XC-75	√	√	√	300-0181	RS-170 interlaced
Sony XC-75CE	√	√	√	300-0181	CCIR interlaced
Sony XC-55 Sony XC-55BB		√	√	300-0239	Progressive scan. Set switches in rapid reset mode (see page 19)
Sony XC-ST50 Sony XC-ES50	√	√	√	300-0181	RS-170 interlaced, with switches in factory default mode (see pages 19 and 21)
Sony XC-ST50CE Sony XC-ES50CE	√	√	√	300-0181	CCIR interlaced, with switches in factory default mode (see pages 19 and 21)
Sony XC-ST50 Sony XC-ES50			√	300-0317	half-resolution, with switches in rapid reset mode (see pages 19 and 21)
Sony XC-ST50CE Sony XC-ES50CE			√	300-0317	half-resolution, with switches in rapid reset mode (see pages 19 and 21)
Pulnix TM-9701	√	√		300-5180 with 300-5179 adapter	Progressive scan, rapid reset; used with a static video format

Table 20. MVS-8100 cameras and cables

Camera	8100	8100M	8100M+	Cognex Camera Cable	Notes
Pulnix TM-9701			√	300-0351	Progressive scan, rapid reset; used with a CCF video format
Pulnix TM-7EX	√	√	√	300-0155	RS-170 interlaced
Pulnix TM-6CN	√	√	√	300-0264	CCR interlaced

Table 20. MVS-8100 cameras and cables

Index

Symbols

Numerics

A

B

C

D

E

M

O

P

R

S

T

U

V

W

X