

MICROSCAN[®]

Visionscape[®] 0740 Framegrabber Board Guide

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Contents

PREFACE	Welcome! ix
	Purpose of This Manual ix
	Manual Conventions ix
CHAPTER 1	Introduction 1-1
	Overview 1-1
	Camera I/O 0740 Card 1-1
	Fuses 1-3
	Field I/O Signal Specification 1-4
	Strobe/Sensors Signal Specification 1-4
	I/O Connector 1-4
	Basic Components 1-5
	Multiple Resolution 1-7
	Port Access Panel & Connectors 1-8
	System Configuration 1-9
	Other System Components 1-11
	Cameras 1-11
	Strobe & Sensor 1-11

CHAPTER 2 Hardware Specifications 2-1

Rear Port Connectors 2-1

Camera Connector 2-1

I/O Connector 2-3

Mini Opto I/O Board 2-5

Overview 2-5

Digital I/O 2-7

General Purpose I/O 2-8

Connector Pinouts — I/O Connector 2-9

Digital I/O Filter Board 2-11

Combination I/O Board 2-13

Overview 2-13

Connector Pinouts 2-14

I/O Connector 2-14

Sensor/Strobe Connector 2-15

Analog Output Connector 2-16

VREF Connector 2-17

Cameras 2-17

Sentech STC-A33A 2-19

Connector & Adjustments 2-20

Dip Switch Settings - Full Scan (640x494) 2-22

Sentech STC-A152A 2-22

Connector & Adjustments 2-24

Dip Switch Settings - Full Scan (1360x1040) 2-26

Dip Switch Settings - Full Scan Binned (1360x514) 2-26

Dip Switch Settings - Half Partial Scan (1360x487) 2-27

Dip Switch Settings - Half Partial Scan Binned (1360x243) 2-27

Dip Switch Settings - Quarter Partial Scan (1360x199) 2-28

Dip Switch Settings - Quarter Partial Scan Binned (1360x99) 2-28

Strobe & Sensor 2-29

Power Requirements 2-32

Cooling Requirements 2-32

CHAPTER 3 Cable Specifications 3-1

030-158800 — Internal 12V Camera Power Cable **3-2**

030-159106 — Digital I/O Interface Cable **3-4**

030-161700 — Cable, Direct Breakout, 4 Cameras — D-Sub **3-7**

A1-20371-1 — Internal Digital I/O Interface Cable **3-10**

A1-20846-1 — Camera Cable **3-13**

98-VS03-1XC0 — Camera Cable **3-15**

APPENDIX A Certifications and Specifications A-1

CE Compliance **A-1**

FCC Statement **A-2**

Specifications **A-2**

Index Index-1

Contents

Welcome!

Purpose of This Manual

This manual contains detailed information about the Camera I/O 0740 Card, available options, and cabling.

Manual Conventions

The following typographical conventions are used throughout this manual.

- Items emphasizing important information are **bolded**.
- Menu selections, menu items and entries in screen images are indicated as: Run (triggered), Modify..., etc.

Introduction

Overview

The Camera I/O 0740 Card is an analog video digitizer that plugs directly into any 5V PCI slot. The Camera I/O 0740 Card is a Visionscape® framegrabber board with:

- Flexible video front-end for up to four analog cameras. Both interlaced and progressive scan cameras are supported
- Control of digital I/O sensors and strobes

Camera I/O 0740 Card

Figure 1–1 and Figure 1–2 show a Camera I/O 0740 Card.

FIGURE 1-1. Camera I/O 0740 Card (Side 1)

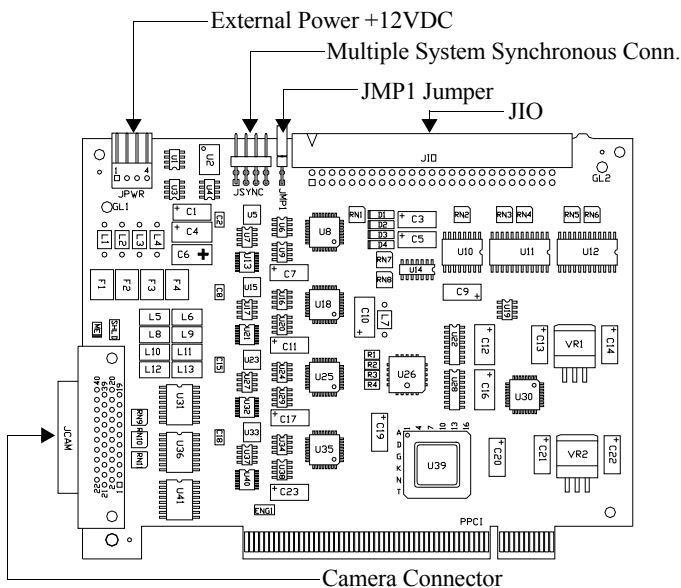
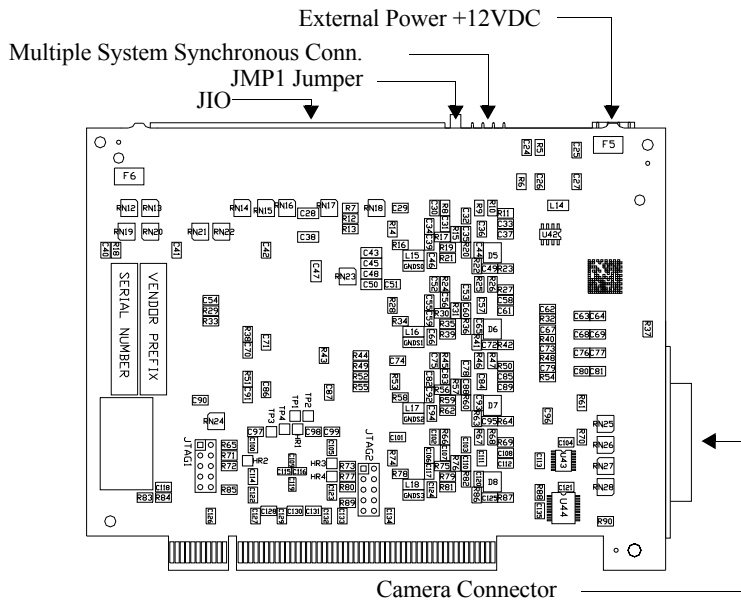


FIGURE 1-2. Camera I/O 0740 Card (Side 2)



- Camera Connector — Connects up to 4 cameras to the Camera I/O 0740 Card. The camera connector connects to a Camera Distribution Cable. This Camera Distribution Cable allows you to connect up to 4 RS-170 or CCIR or progressive scan cameras. Each camera and cable is ordered separately.
- JIO — This connector provides 16 discrete I/O points, 4 Sensor Inputs, 4 Strobe Outputs and a VREF Input that sets Sensor operating and threshold voltages. It gets connected to I/O boards in one of two ways:
 - A 50-pin ribbon cable connects JIO to the internally mounted Mini Opto I/O board that's mounted to the I/O Port, as shown in Figure 1-3, "Rear Port Access with Mini Opto I/O Board," on page 1-8.
 - A 50-pin ribbon cable connects JIO to the internally mounted I/O filter board that's mounted to the I/O port, as shown in Figure 1-4, "Rear Port Access with I/O Port Connector," on page 1-8. In turn, the I/O Port is connected to the Combination I/O Board via a 50-pin ribbon cable.
- JMP1 Jumper — 12V Sensor Power Jumper.

Caution: All Visionscape® Camera I/O boards ship with the JMP1 jumper installed. This is only compatible with Visionscape® Combo I/O and Mini Opto I/O boards. If you are using other I/O equipment, see Chapter 2.

- External Power — Supplies +12V to the attached cameras.

Fuses

- +5V for Discrete I/O is fused with an auto-resetting 0.5A fuse, located on the Camera I/O Card, which requires no maintenance.
- +12V for Sensor Inputs is fused with an auto-resetting 0.5A fuse, located on the Camera I/O Card, which requires no maintenance.
- +12V for Camera Power is fused with auto-resetting 1A fuses, one per camera, located on the Camera I/O Card, which require no maintenance.

Caution: These fuses protect against momentary short circuits only, and are not intended to sustain continuous short circuit conditions. Continuous short circuit conditions will damage the Camera I/O 0740 Card.

Field I/O Signal Specification

- Inputs — TTL levels
- Outputs — TTL levels; outputs 15 and 16 can be optionally switched to control 8 analog outputs through a Combination I/O board
- Quantity — 16, each programmable as an input or output

Strobe/Sensors Signal Specification

- Sensor
 - Quantity — 4
 - Inputs — Differential Comparators
 - Input Range — $0V < v_{in} < 24V$
 - Input Impedance — $>10k$ ohms
 - Ext. Threshold Range — Up to +24V; defaults to 1.4V (TTL) when unconnected; threshold voltage is $V_{in}/2$ when $V_{in} > 5V$
 - Ext. Threshold Source Impedance — <100 ohms
- Strobe
 - Quantity — 4
 - Outputs — TTL levels
 - Output Impedance — <100 ohms
 - Strobe Rate — $<1kHz$

I/O Connector

Connector mate of JIO — 3M P/N 3425-6650, as shown in Figure 1-1, “Camera I/O 0740 Card (Side 1),” on page 1-2. Refer to Figure 2-2, “I/O Connector - Camera I/O Card & Combination I/O Board,” on page 2-4 for I/O connector pinout.

Basic Components

The module-level Camera I/O 0740 Card is configured and contains the cabling that connects your PC to the Camera I/O 0740 Card.

TABLE 1-1. Typical Camera I/O 0740 Card Components

Number	Component	Description
Main Board Set		
GMV-VS74-0FP0	PCI-20020 045-220810 003-161700 A1-20266-1 A1-20298-1 030-158800 A1-20846-1	Visionscape® 0740 Analog Board Set w/Internal Cables - Includes: 0740 Analog Framegrabber 4 Camera Distribution Cable, Analog, D-Sub Digital I/O Filter Board Internal Digital I/O Interface Cable Internal 12V Camera Power Cable Internal 12V Camera Power “Slim-Line” Cable
Option for I/O Controls		
98-VS10-0SM0	A1-20394-1 98-A1203701 A1-20371-1	Mini Opto I/O Board with Internal Cable - Includes: Mini Opto I/O Board Internal Digital I/O Interface Cable
98-VS24-0SM0	003-203000 030-159106	Combination I/O Control Board - Includes: 6 Ft Digital I/O Interface Cable
Multi Camera Distribution Cables		
	030-161700 030-162000	4 Camera Distribution Cable, Analog, D-Sub 4 Camera Distribution Cable, Analog, Hirose
Analog Camera Cables		
98-VS03-0XC0	98-VS03-1XC0 98-VS07-1XC0 98-VS15-1XC0	Progressive Scan Camera Cable, 10ft, D-Sub to 12pin Progressive Scan Camera Cable, 25ft, D-Sub to 12pin Progressive Scan Camera Cable, 50ft, D-Sub to 12pin

Table 1-2 lists the support cameras:

TABLE 1-2. 0740 Supported Cameras/Modes

Number	Camera Model	FPS	Notes
98-VS01-0CX0	Sentech STC-A33A 24MHz	240	640x104 Progressive scan camera
98-VS01-0CX0	Sentech STC-A33A 24MHz	60	640x494 Progressive scan camera
98-VS01-0CX0	Sentech STC-A33A 36MHz	90	640x494 Progressive scan camera
98-VS31-0CX0	Sentech STC-A152A	16	1352x1040 Progressive scan camera

Table 1–3 lists the allowable camera combinations:

TABLE 1–3. Allowable Camera Combinations

Camera 1	Camera 2	PCI Bandwidth	Remarks
Single Resolution			
1-4 x A33 24MHz		96 MB/sec	640 x 494 24 MHz or
			640 x 104 24 MHz
1-2 x A33A 36MHz		72 MB/sec	640 x 494 36 MHz
1-3 x A152A 30.68MHz		92 MB/sec	1352 x 1040
Mixed Resolution			
A33A/24 MHz	A33A/24 MHz	96 MB/sec	Any combination
640x494	640x104		
1 up to 3	1 up to 3		
A152A/30.68 MHz	A33A/24MHz	<= 96 MB/sec	N152 x 30.68 + N33 x 24 <= 96
1352x1040	640x494		
1 up to 2	1 up to 2		2 A152A / 1 A33A or 1 A152A/ 2 A33A
A152A/30.68 MHz	A33A/24MHz	<= 96 MB/sec	N152 x 30.68 + N33 x 24 <= 96
1352x1040	640x140		
1 up to 2	1 up to 2		2 A152A/ 1 A33A or 1 A152A/ 2 A33A
A152A/30.68 MHz	A33A/36MHz	<= 96 MB/sec	N152 x 30.68 + N33 x 24 <= 96
1352x1040	640x494		
1 max	1 max		1 A152A/ 1 A33A

Note: When using synchronous acquisition across multiple channels (i.e., when using a single sensor trigger to acquire all the images at once), a single strobe light source is ONLY supported for Single Resolution camera configurations. With Multiple Resolution camera configurations you MUST use a separate strobe per camera channel.

Multiple Resolution

Note: Multiple Resolution is only available using progressive scan cameras (STC-A33A and STC-A152A).

You can select up to two different camera types when using the 0740 board. You select the camera definition for the cameras connected to your 0740 board by selecting it for each channel in the Camera Definitions And Buffer Counts property of the VisionSystemStep.

You can program a maximum of two different types for the four camera channels available in any mix. For example, 1-3, 2-2, 3-1, or other combinations when less than four channels are used.

You allocate the number of buffers desired for one of the resolutions in the Camera Definitions And Buffer Counts property; the system shows how many buffers this means for the other resolutions on the other camera channels.

The memory used to store the captured images (the Buffer Pool) is common to all resolutions. In other words, you decide how many buffers the highest resolution camera requires and the system allocates enough memory for it. This allocated memory is “shared” by both camera types; there is no separate Buffer Pool for each camera resolution or camera channel. Therefore, the number of buffers available at any given time when the system is running is a function of which channels have already acquired or are acquiring an image at that particular time.

Port Access Panel & Connectors

Port access is available through the rear of your PC, as shown in Figure 1–3 and Figure 1–4.

FIGURE 1-3. Rear Port Access with Mini Opto I/O Board

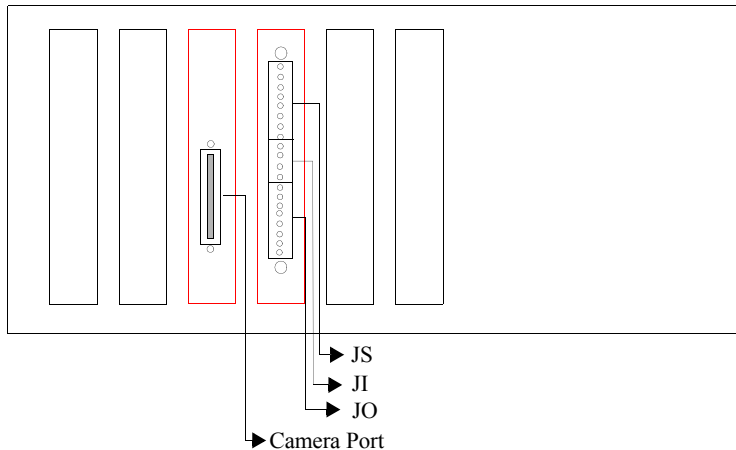
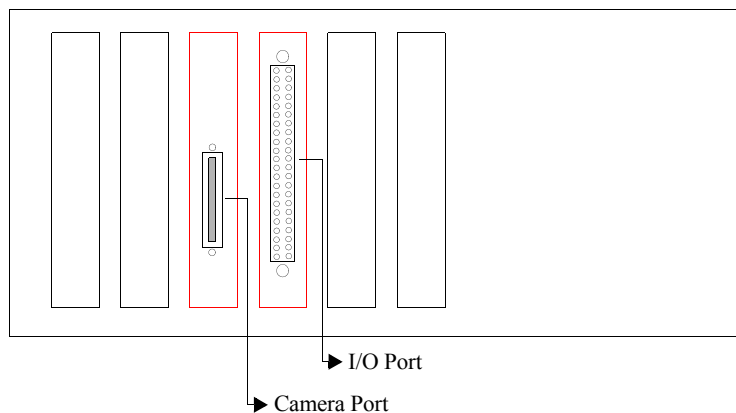


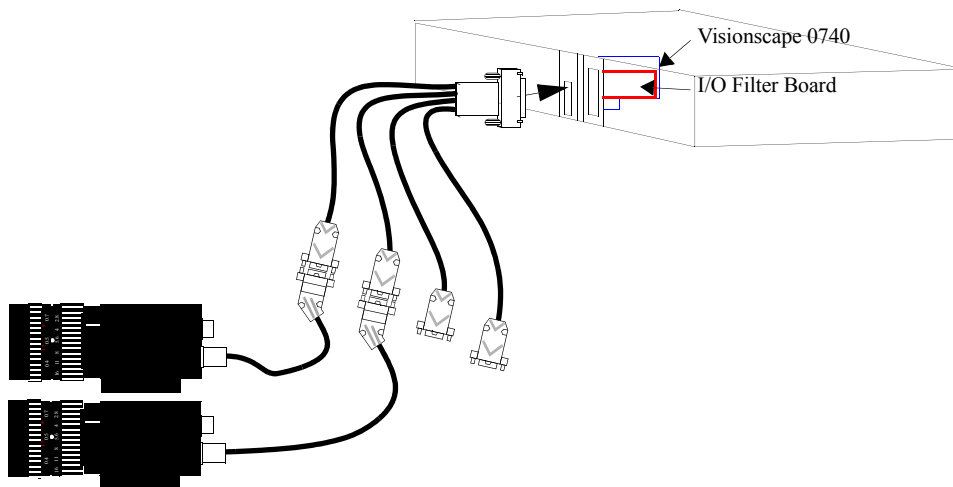
FIGURE 1-4. Rear Port Access with I/O Port Connector



System Configuration

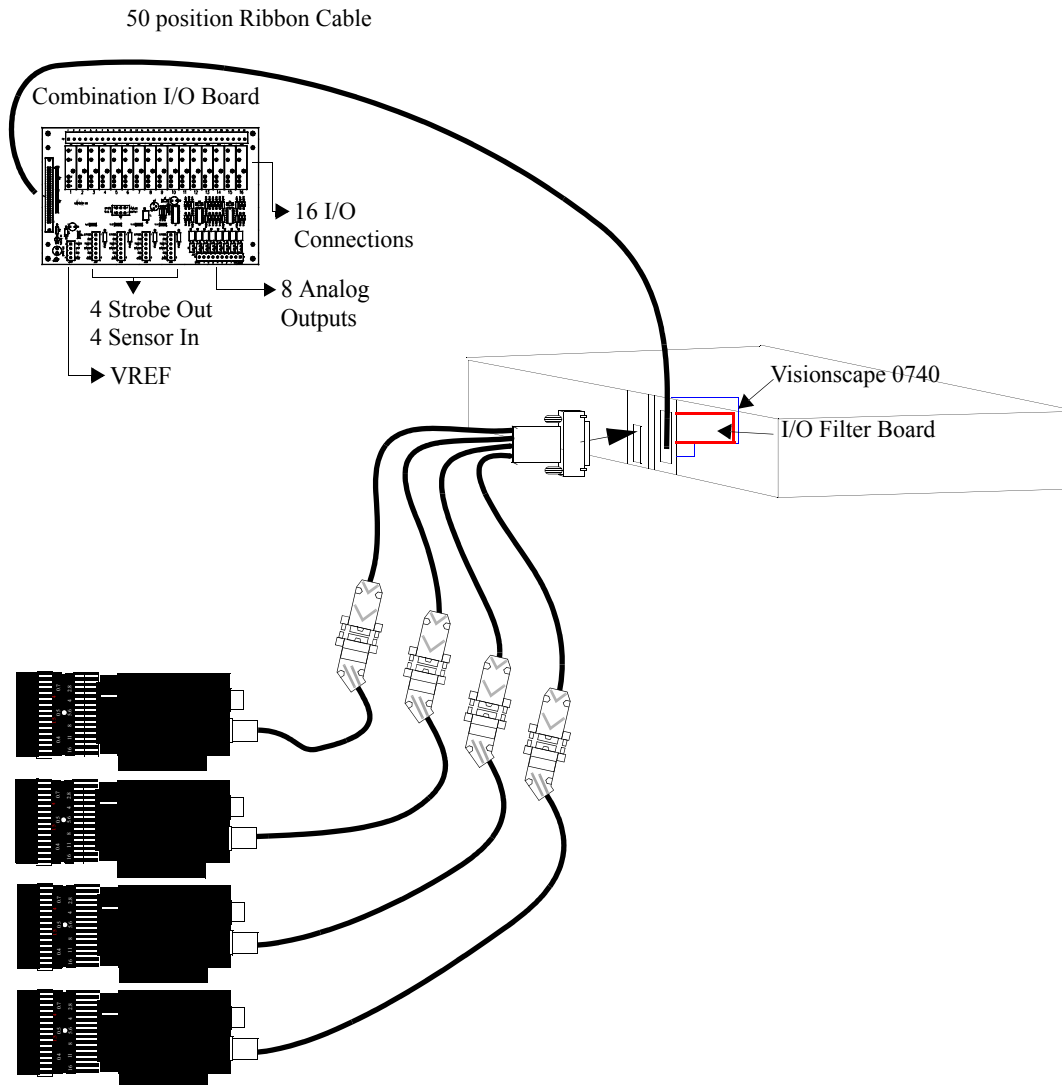
The Camera I/O 0740 Card, Camera(s), and Mini Opto I/O Board are configured as shown in Figure 1–5.

FIGURE 1–5. System Configuration with Mini Opto I/O Board



The Camera I/O 0740 Card, Camera(s), and Combination I/O Board are configured as shown in Figure 1–6.

FIGURE 1-6. System Configuration with Combination I/O Board



Other System Components

Cameras

The camera views the part to be inspected and electronically converts the image in its field of view into an analog signal. The analog signal is converted by the 0740 to digital, which can then be processed by the host PC.

Solid state cameras are used. They are powered by the Camera I/O 0740 Card and must be compatible with it. Cameras that are used for strobe lighting applications have been specially modified by Microscan.

Strobe & Sensor

For continuous motion or high-speed indexing applications, a sensor and strobe are required to freeze each part before the image can be acquired. The strobe unit may include a fiber-optic light pipe. Refer to “Strobe & Sensor” on page 2-29 for more detailed information.

Note: When using synchronous acquisition across multiple channels (i.e., when using a single sensor trigger to acquire all the images at once), a single strobe light source is **ONLY** supported for Single Resolution camera configurations. With Multiple Resolution camera configurations you **MUST** use a separate strobe per camera channel.

CHAPTER 2 Hardware Specifications

Rear Port Connectors

Camera Connector

Camera cables are connected to the camera connector via a camera breakout cable, as shown in Figure 1–3 through Figure 1–6, starting on page 1–8.

FIGURE 2-1. Camera Connector - Camera I/O 0740 Card

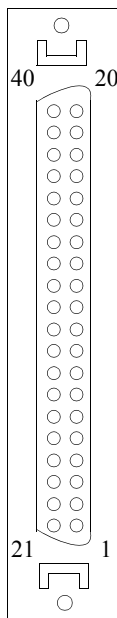


TABLE 2-1. Connector Pinouts

Pin #	Signal Name	Pin #	Signal Name
1	Cam 1 HD	21	Ground
2	Cam 1 VD	22	Ground
3	Cam 1 +12V	23	Ground
4	Cam 1 Hold	24	Ground
5	Cam 2 HD	25	Ground
6	Cam 2 VD	26	Ground
7	Cam 2 +12V	27	Ground
8	Cam 2 Hold	28	Ground
9	Cam 3 HD	29	Ground
10	Cam 3 VD	30	Ground
11	Cam 3 +12V	31	Ground
12	Cam 3 Hold	32	Ground
13	Cam 4 HD	33	Ground

TABLE 2-1. Connector Pinouts (Continued)

Pin #	Signal Name	Pin #	Signal Name
14	Cam 4 VD	34	Ground
15	Cam 4 +12V	35	Ground
16	Cam 4 Hold	36	Ground
17	Cam 4 Video	37	Ground
18	Cam 3 Video	38	Ground
19	Cam 2 Video	39	Ground
20	Cam 1 Video	40	Ground

I/O Connector

I/O signals are accessed via the Mini Opto I/O board or the I/O Port, as shown in Figure 1-3 through Figure 1-6, starting on page 1-8.

- The Mini Opto I/O board is connected to JIO, as shown in Figure 1-1 and Figure 1-2 on page 1-2, using a 50-position flat ribbon cable, which is supplied.
- The I/O Port is optionally connected to JIO via the I/O Filter Board, as shown in Figure 1-1 and Figure 1-2 on page 1-2, using a 50-position flat ribbon cable, which is supplied.

The pinout for the I/O port and I/O Filter Board is shown in Figure 2-2, “I/O Connector - Camera I/O Card & Combination I/O Board,” on page 2-4.

FIGURE 2-2. I/O Connector - Camera I/O Card & Combination I/O Board

Sensor 4	1	2	+12V
Sensor 3	3	4	YREF
Sensor 2	5	6	GND
Sensor 1	7	8	GND
Strobe 4	9	10	GND
Strobe 3	11	12	GND
Strobe 2	13	14	GND
Strobe 1	15	16	GND
IO 16	17	18	GND
IO 15	19	20	GND
IO 14	21	22	GND
IO 13	23	24	GND
IO 12	25	26	GND
IO 11	27	28	GND
IO 10	29	30	GND
IO 09	31	32	GND
IO 08	33	34	GND
IO 07	35	36	GND
IO 06	37	38	GND
IO 05	39	40	GND
IO 04	41	42	GND
IO 03	43	44	GND
IO 02	45	46	GND
IO 01	47	48	GND
+5V	49	50	GND

EVEN-NUMBERED PINS ARE GNDS (6-50)

Note: The I/O connector is linked to the Combination I/O Board via a 50-conductor (0.050 ctrs) flat cable (part number 030-159106).

Mini Opto I/O Board

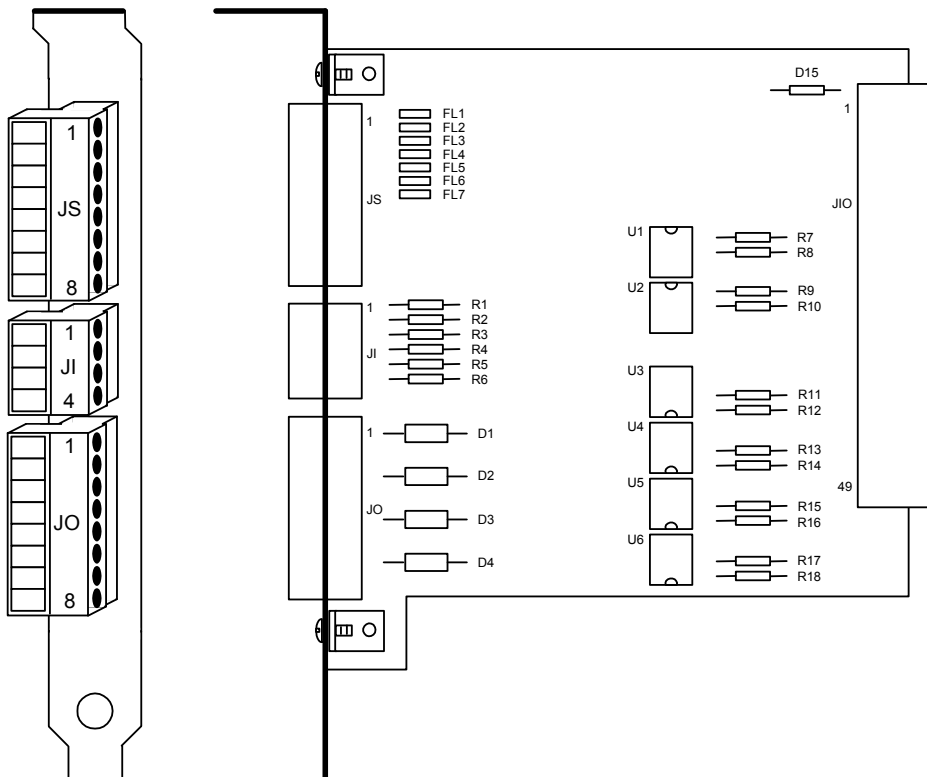
Overview

The Mini Opto I/O Board provides:

- 2 discrete input points
- 4 discrete output points
- 2 sensor inputs
- 2 strobe outputs

See Figure 2–3.

FIGURE 2–3. Mini Opto I/O Board



The Sensor/Strobe connector JS is shown in Figure 2–3. This connector is supplied with an 8-position mating screw terminal plug that provides:

TABLE 2-2. JS Inputs and Outputs

Pin	Description
Inputs	
1	+12V for sensor power (SENSOR_PWR)
2	Non-isolated sensor input SENSOR2
3	Non-isolated sensor input SENSOR1
4	A sensor return
Outputs	
5	Non-isolated TTL strobe output (STROBE2)
6	Non-isolated TTL strobe output (STROBE1)
7	A strobe return
8	CHASSIS GND

The internal voltage reference signal VREF is connected to SENSOR_PWR on the board, and is used to properly bias the sensor inputs.

For 12V sensors, supply power to your sensor using the sensor power SENSOR_PWR on pin 1 on the sensor strobe connector JS.

For 24V sensors (30 volts maximum), you must provide an external +24V power supply, which also sets the internal reference voltage VREF. Connect external +24V to sensor power SENSOR_PWR pin 1 on connector JS and supply power to your sensor using the sensor power SENSOR_PWR pin 1 on connector JS.

For TTL sensors, do not connect power to the sensor power SENSOR_PWR pin 1 on connector JS. You must remove jumper JMP1 on the Camera I/O Card. This will properly bias the sensor inputs for TTL levels. See Figure 2–3, “Mini Opto I/O Board,” on page 2-5.

Caution: Whenever the Sensor Power pin on JS is less than 12V, jumper JMP1 on the Camera I/O Card MUST be removed.

Caution: If you are using a non-Microscan I/O board, pin 2 of the 50-ribbon cable will most likely be grounded. Therefore, you must remove the 12V

sensor power jumper (JMP) from the Camera I/O Card before installing a non-Microscan I/O board. This jumper places +12V power on pin 2. Failure to remove the jumper will damage the Camera I/O Card.

Digital I/O

There are two dedicated optically-isolated input and four dedicated optically-isolated output points. The field wiring is terminated on the two screw terminal connectors JI and JO.

There is a digital input connector JI, as shown in Figure 2–3. This connector is supplied with a 4-position mating screw terminal plug. It provides two bi-directional opto inputs:

- IN1 on pins 3 and 4.
- IN2 on pins 1 and 2, corresponding to GPIO points 5 and 6 (see “General Purpose I/O” on page 2-8).

Each input can operate with non-polarized DC signals from 5 - 50 volts with DC currents from 0.5 - 5 mA.

There is a digital output connector JO, as shown in Figure 2–3. This connector is supplied with an 8-position mating screw terminal plug. It provides four non-polarized opto outputs:

- OUT1 on pins 7 and 8.
- OUT2 on pins 5 and 6.
- OUT3 on pins 3 and 4.
- OUT4 on pins 1 and 2, corresponding to GPIO points 1 through 4 (see “General Purpose I/O” on page 2-8).

Each output has a contact resistance of less than 20 ohms and can operate with AC or DC signals up to 50 volts at 100 mA. Each output is protected by a current limiting foldback circuit.

The I/O connector supplies the necessary +5 volts DC to operate the I/O board via the I/O cable. There is no external power supply connector.

Caution: Do not attempt to connect an external +5 volts DC power supply to the Mini Opto I/O Board. There is no connector provided for this function.

This board receives its power via the I/O cable. Connecting an external power supply will cause serious problems: the two power supplies will conflict with each other to produce unpredictable results and the external power supply's ground may cause ground loops to occur.

In designing your vision application, you must decide which mix of input and output ports you require.

To program your vision application, use the AppFactory/FrontRunner user interface software. Refer to your Visionscape® Tools Reference for more specific information on how to assign the I/O.

General Purpose I/O

Visionscape® provides a complement of optically-isolated I/O communications points called general purpose I/O (GPIO). You can configure the GPIO in the Vision System Step properties page by setting the GPIO Input Mask property. This mask defines which I/O points are programmed as inputs and which are defined as outputs.

For the Mini Opto I/O board, you **must** set the GPIO points as follows:

TABLE 2-3. Settings for GPIO Points

GPIO Points	Input/Output
1 - 4	Output (Not Selected)
5 - 6	Input (Selected)
7 - 16	N/A

Connector Pinouts — I/O Connector

FIGURE 2-4. Mini Opto I/O Board Sensor/Strobe Connector - JS

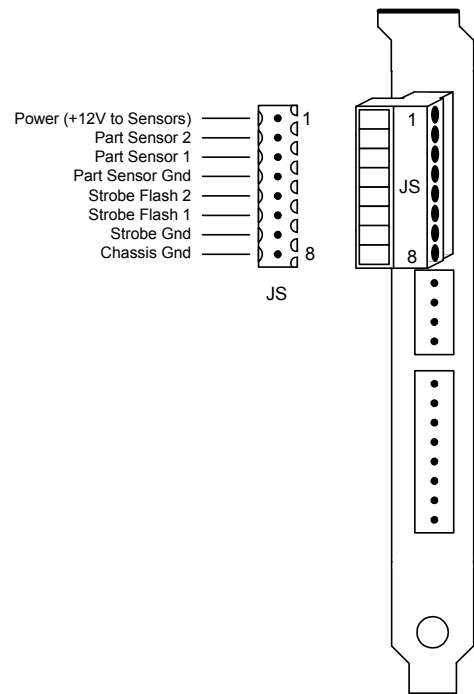
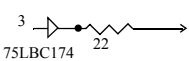
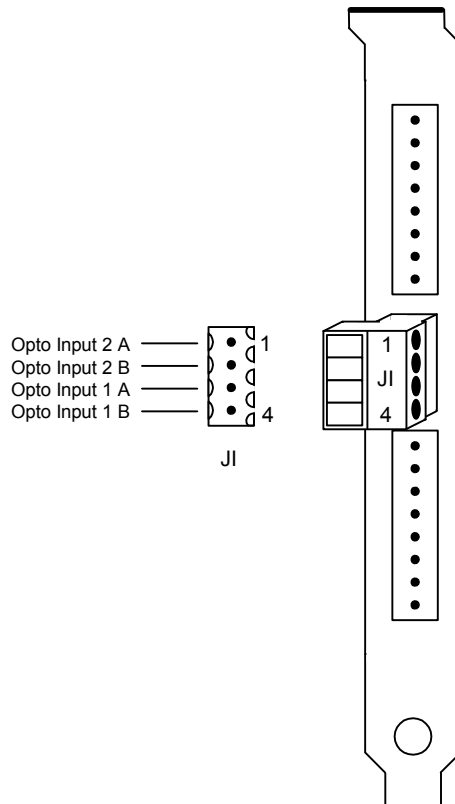


TABLE 2-4.

Signal	Characteristic
Part Sense	Sense input signals have 11k ohm pullup to +5V.
Strobe Flash	Output to strobe lamp positive +5 V pulse with 20 mA current source at +3V. 
+12 Volts	Power available for most photoelectric and proximity devices. (100 mA max.) Fused by F1 on CIOC (auto-resetting).

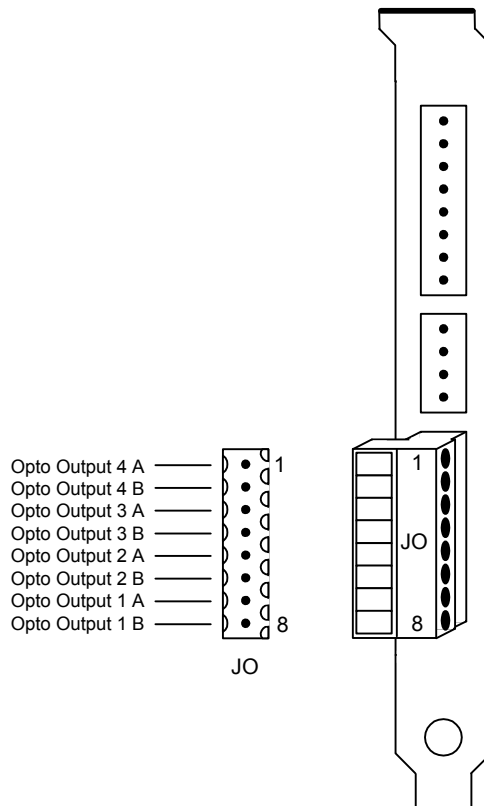
Caution: Avoid continuous shorts, as these will damage the fuse.

FIGURE 2-5. Mini Opto I/O Board Input Opto Connector - J1



Voltage	5 - 50 volts DC (Bi-directional)
Current	0.5 - 5 mA
Switching Time	1 ms maximum
Common Mode isolation rating	1500 volts

FIGURE 2-6. Mini Opto I/O Board Output Opto Connector - JO



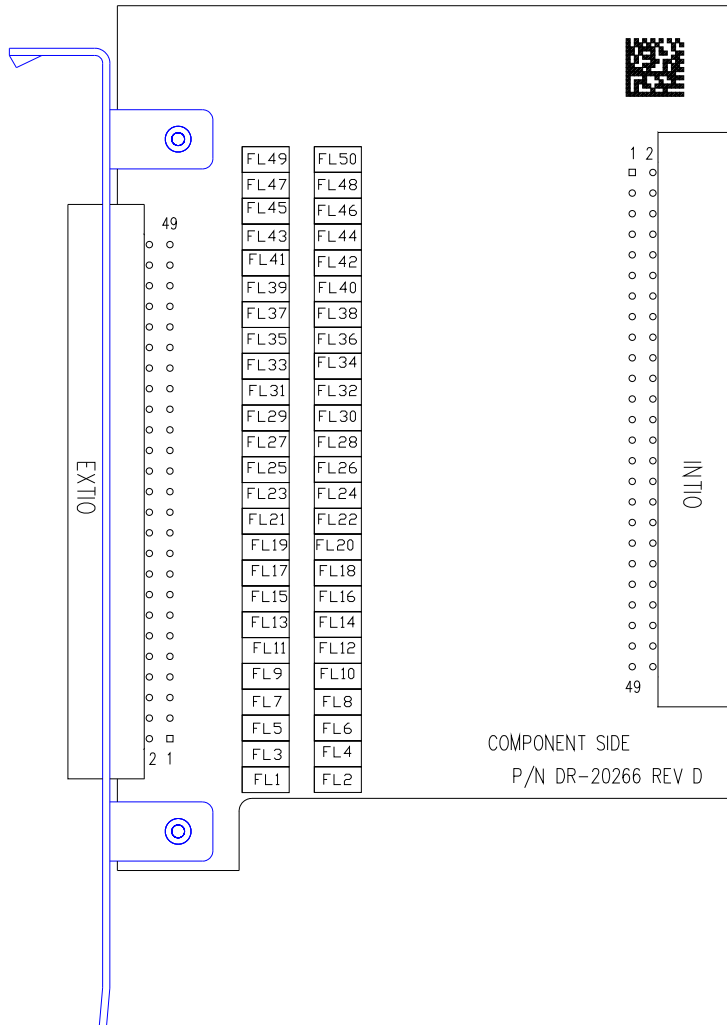
Voltage	3 - 50 volts AC/DC (Bi-directional)
Current	Up to 100 mA
Contact Resistance	Less than 20 ohms
Switching Time	1 ms maximum
Common Mode isolation rating	1500 volts

Digital I/O Filter Board

The digital I/O filter board minimizes radio frequency noise emanating from the external I/O ribbon cable and Combo I/O board that can interfere with other electronic hardware. This allows you to install the PC, I/O ribbon cable, and

Combo I/O board without the need to mount the system within a metallic enclosure. See Figure 2–7.

FIGURE 2–7. Digital I/O Filter Board



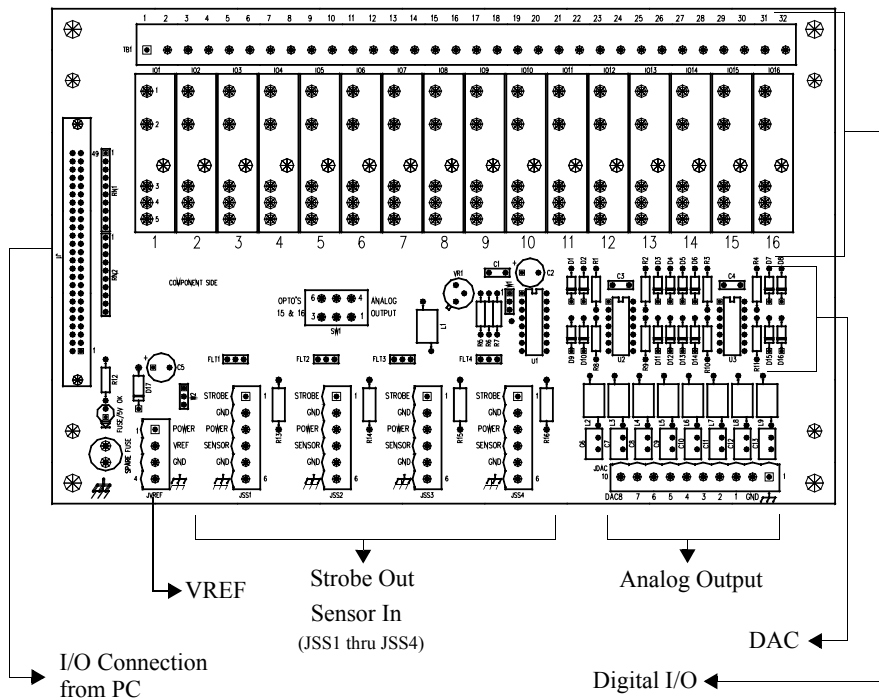
Combination I/O Board

Overview

The Combination I/O Board provides up to 16 discrete I/O points, 4 Strobe and Sensor connections, and 8 channels for analog outputs, as shown in Figure 2–8.

Using a Combination I/O Board, the Camera I/O 0740 Card can communicate with other devices. For example, you can have three input modules that provide input signals to the Camera I/O 0740 Card, and you can have four output modules that send signals to external control devices.

FIGURE 2–8. Combination I/O Board Connections



- **Digital I/O** — Connects the Combination I/O Board to the Visionscape® Vision Processor and provides 16 I/O points. Digital I/O allows you to connect to switches, lights, controls, PLC's, etc., and accepts 5-volt-logic solid-state relays (Opto 22™ G4-type isolator modules).

- Sensor In — This is used if you need to connect a parts sensor to your Camera I/O 0740 Card.
- Strobe Out — This is used if you run the Camera I/O 0740 Card in a strobed application and need to connect your strobe to the Strobe Out connector.
- Analog Output — This has 8 analog outputs that are jumper-selectable for 0-5V or 0-10V outputs with 6-bit (64 level) of resolution. The last two Digital I/O points control the analog outputs, which are typically used for controlling light sources. There are 14 Digital I/O ports available (1-14) when Analog Output is selected by SW1.
- I/O Connection from PC — Connects the Combination I/O Board to the Camera I/O Card via a 50-pin ribbon cable. You can attach your own industry standard I/O board to the I/O Connector. Only 16 bits of I/O are available. Microscan suggests that you use optically-isolated I/O, such as Opto 22™ G4-type optos.
- VREF — When disconnected, the sensor reference voltage defaults to TTL levels (1.4V). By applying a voltage between VREF and VREF_GND, the reference voltage will change to VREF/2. VREF should be greater than or equal to 5V.

Caution: If you are using a non-Microscan I/O board, pin 2 of the 50-ribbon cable will most likely be grounded. Therefore, you must remove the 12V sensor power jumper (JMP) from the Camera I/O Card before installing a non-Microscan I/O board. This jumper places +12V power on pin 2. Failure to remove the jumper will damage the Camera I/O Card.

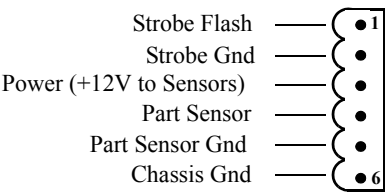
Connector Pinouts

I/O Connector

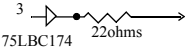
Refer to the “Rear Port Connectors” on page 2-1 for more information.

Sensor/Strobe Connector

FIGURE 2-9. Sensor/Strobe Connector



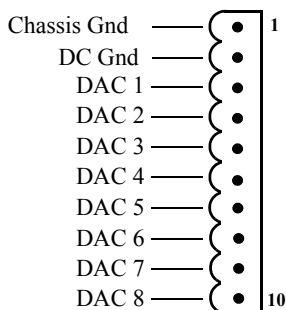
JSS1 through JSS4

Signal	Characteristic
Part Sense	Sense input signals have 11k ohm pullup to +5V.
Strobe Flash	Output to strobe lamp positive +5 V pulse with 20 mA current source at +3V. <div></div>
+12 Volts	Power available for most photoelectric and proximity devices. (100 mA max.) Fused by F1 on CIOC (auto-resetting).

Caution: Avoid continuous shorts, as these will damage the fuse.

Analog Output Connector

FIGURE 2-10. Analog Output Connector



DAC Outputs

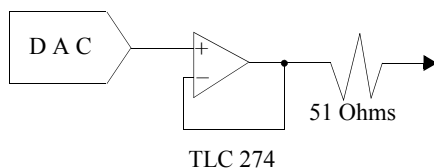
DAC Outputs are jumper selectable. For 0 - 5 volts or 0 - 10 volts operation:

Jumper W1 Voltage Range

Pins 1 + 2 0 - 10V

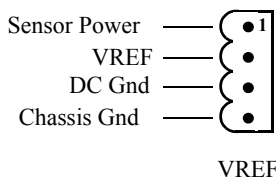
Pins 2 + 3 0 - 5V

DAC (analog) Outputs are selected by setting switch S1 to the analog position. The analog output uses a 6-bit DAC (64 levels). Its resolution is 0.078 volts per level in the 0-5V range and 0.156 volts per level in the 0-10V range.



VREF Connector

FIGURE 2–11. VREF Connector



Signal	Characteristic
VREF	Sensor input voltage reference. Used to properly bias sensor input signal. Up to 30VDC. Connect to Sensor Power, either hardware or use jumper <i>W2</i> , pins 1 + 2. Do not connect to Sensor Power when using TTL sensor signals and set jumper <i>W2</i> , pins 2 + 3.
Sensor Power +12V	Provides power to the Sensor inputs and to the VREF input. For Sensors that use a voltage other than +12V, connect an external power supply. The external power supply shall not to exceed 30VDC.

Caution: Whenever the Sensor Power pin on JS is less than 12V, jumper JMP1 on the Camera I/O Card MUST be removed.

Cameras

The Camera I/O 0740 Card supports the following cameras:

TABLE 2–5. 0740 Supported Cameras

Number	Camera Model	FPS	Notes
002-CM4000	CM4000	60	320x240 Single RS170 field
002-CM4000	CM4000	30	640x480 Interlace RS170 camera
002-CM4001	CM4001	50	384x286 Single CCIR field
002-CM4001	CM4001	25	768x572 Interlace CCIR camera

TABLE 2-5. 0740 Supported Cameras

Number	Camera Model	FPS	Notes
98-VS01-0CX0	Sentech STC-A33A 24MHz	240	640x104 Progressive scan camera
98-VS01-0CX0	Sentech STC-A33A 24MHz	60	640x494 Progressive scan camera
98-VS01-0CX0	Sentech STC-A33A 36MHz	90	640x494 Progressive scan camera
98-VS31-0CX0	Sentech STC-A152A	16	1352x1040 Progressive scan camera

Note: The Camera I/O 740 supports up to 4 analog camera channels (interlaced and progressive scan cameras). This means that, when connecting more than one camera to the framegrabber board, the images are acquired simultaneously from each channel, as there are 4 A/D converters on that device. All channels must have the same camera type connected (either interlaced or progressive scan); for example, 4 CM4001 cameras. Both the CM4000 and CM4001 cameras are interlaced cameras and, as such, integrate light (exposure time) for exactly 2 fields (in Frame mode) and 1 field (in Field mode), for an exposure time of 33/16 and 40/20 msec for the CM4000 (Frame/Field) and CM4001 (Frame/Field) modes, respectively. These cameras always acquire an image on a Field boundary (next Field after the trigger) and usually are not synchronized with any external triggers like a progressive camera is. As a result, there is an uncertainty of up to 1 Field when acquiring an triggered image from a CM4000 or CM4001 camera. For example, with 4 cameras connected, all taking a picture on the same trigger, the acquisition time will be anywhere between 33 and 50 msec for a CM4000 and anywhere between 40 and 60 msec for a CM4001 in Frame mode for any channel.

Restrictions

If a camera is selected for image capture by a vision application, it must be physically connected to the Camera I/O Card. A non-existent or faulty connection to the camera will result in a dark image being captured for that camera. Selecting one camera type while connecting a different camera may result in faulty operation. Using an incorrect cable may also result in faulty operation.

Caution: Do not twist and pull the cables when connecting them to the camera.

Sentech STC-A33A

The STC-A33A is a 1/3" monochrome progressive scan cased cubic camera with 640 x 494 resolution, 60fps, analog output and variable integration shutter trigger.

TABLE 2-6. Sentech STC-A33A Specifications

Image Sensor	1/3" Monochrome IT CCD
Format	Progressive
Effective Picture Element	692 (H) x 504 (V)
Active Picture Element	648 (H) x 494 (V)
Chip Size	5.80 (H) x 4.92 (V) mm
Cell Size	7.4 (H) x 7.4 (V) μ m
Horizontal Drive Frequency	24.5454MHz (60fps) or 36.8181MHz (90fps)
Horizontal Frequency	31.4695kHz (60fps) or 47.2028kHz (90fps)
Vertical Frequency	59.9399Hz (60fps) or 89.9099Hz (90fps)
Resolution	480TVL (Horizontal and Vertical)
S/N Ratio	50dB
Sync System	Internal and External
Minimum Illumination	1 Lux @ F1.2
Scanning System	Progressive
Scanning Method	Full Scan , 1/2 Partial Scan, 1/4 Partial Scan, Variable Partial Scan, Binning
Frame Rate	60fps or 90fps (At Full Scan)
Gamma	1
Gain	9.64 to 43.3dB (Referencing CCD Output as 0dB)
Electronic Shutter	Variable, can be set at every H and clock
Trigger Shutter	Edge Preset Trigger (V Reset, Non-Reset)
Plus Width Trigger	(V Reset, Non-Reset)
Video Out:	1.0Vp-p 75W, DC coupling (0V clamp)
Lens Mount	C Mount
Power Supply	12V DC
Power Consumption	< 2.4W
Serial Communication	RS232C

TABLE 2-6. Sentech STC-A33A Specifications (Continued)

Operating Temperature	-10°C ~ 45°C (14°F ~ 113°F)
Storage Temperature	-30°C ~ 60 °C (-22°F ~ 140°F)
Weight	52g (1.8 oz.)
Dimensions	28 (W) x 28 (H) x 40 (D) mm (1.12" x 1.12" x 1.6")

Connector & Adjustments

Figure 2-12 shows the connector and adjustments for the Sentech STC-A33A camera.

FIGURE 2-12. Sentech STC-A33A Connector & Adjustments

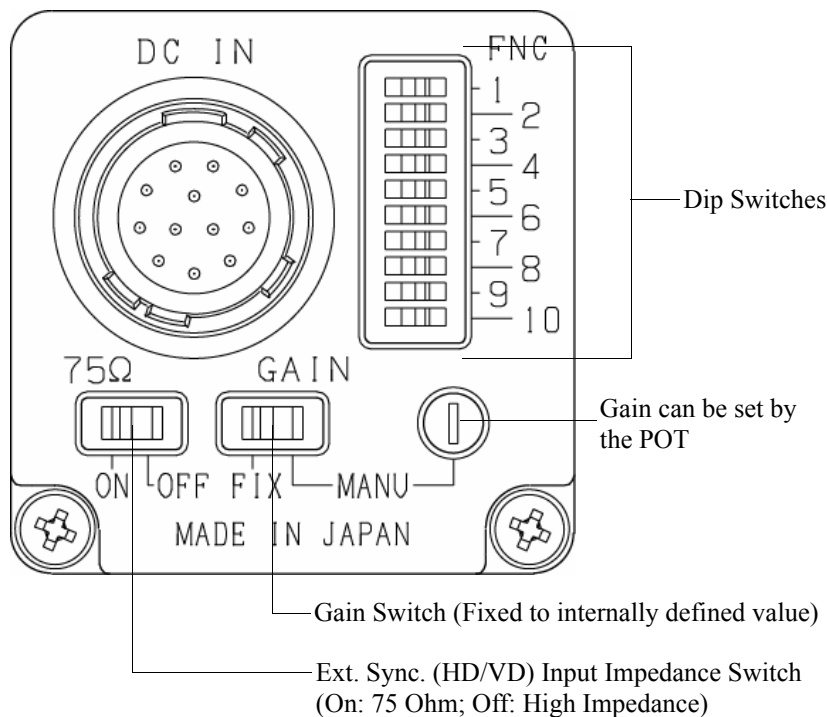
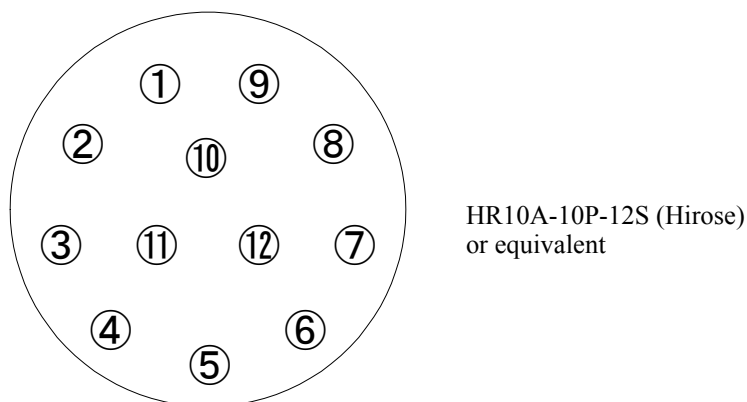


Figure 2-13 shows the connector and adjustments for the Sentech STC-A33A camera.

FIGURE 2-13. Sentech STC-A33A 12-Pin Connector**TABLE 2-7. 12-Pin Connector Pin Assignment**

Pin #	Pin Name
1	GND
2	+12V
3	VIDEO GND
4	VIDEO OUT
5	HD GND
6	HD IN
7	VD IN
8	GND
9	NC (TXD)
10	WEN OUT
11	TRG IN
12	GND (RXD)

Dip Switch Settings - Full Scan (640x494)

TABLE 2-8. Dip Switch Settings for Full Scan (640x494)

Dip Switch	Setting
1	OFF
2	OFF
3	OFF
4	ON
5	OFF
6	OFF
7	OFF
8	OFF
9	OFF
10	OFF

Sentech STC-A152A

TABLE 2-9. Sentech STC-A152A Specifications

Image Sensor	ICX205AL: 1/2 inch B&W interline CCD with square pixels
Total Picture Element	1434(H) x 1050(V)
Effective Picture Element	1392(H) x 1040(V)
Video Out Effective Picture Element	1360(H) x 1040(V)
Cell Size	4.65 μ m(H) x 4.65 μ m(V)
Scanning System	Progressive
Partial Scanning	Vertical size programmable
Frame Rate	16fps
Vertical Frequency	16.049Hz
Horizontal Frequency	17.143KHz
Pixel Clock Frequency	30.68175MHz
Resolution	--TVL (Horizontal and vertical)
S/N Ratio	--dB
Minimum scene illumination	--Lux at F1.2/Gain max.
Sync. System	Internal or External

TABLE 2-9. Sentech STC-A152A Specifications (Continued)

Video Output	1.0Vp-p/75 Ohm, DC coupling (0V clamp)
Shutter Speed	Variable, can be set at every H and clock
Gain	9.64 to 43.3dB (Referencing CCD output as 0dB)
Y correction	1 fixed
Power Input Voltage	12 \pm 1.5Vdc
Power Consumption	Less than 2.4W
Available Trigger Modes	Pulse width trigger V. reset Pulse width trigger non-reset Edge preset trigger V. reset Edge preset trigger non-reset
Serial Communication	RE232C compliance

Connector & Adjustments

Figure 2–14 shows the connector and adjustments for the Sentech STC-A152A camera.

FIGURE 2-14. Sentech STC-A152A Connector & Adjustments

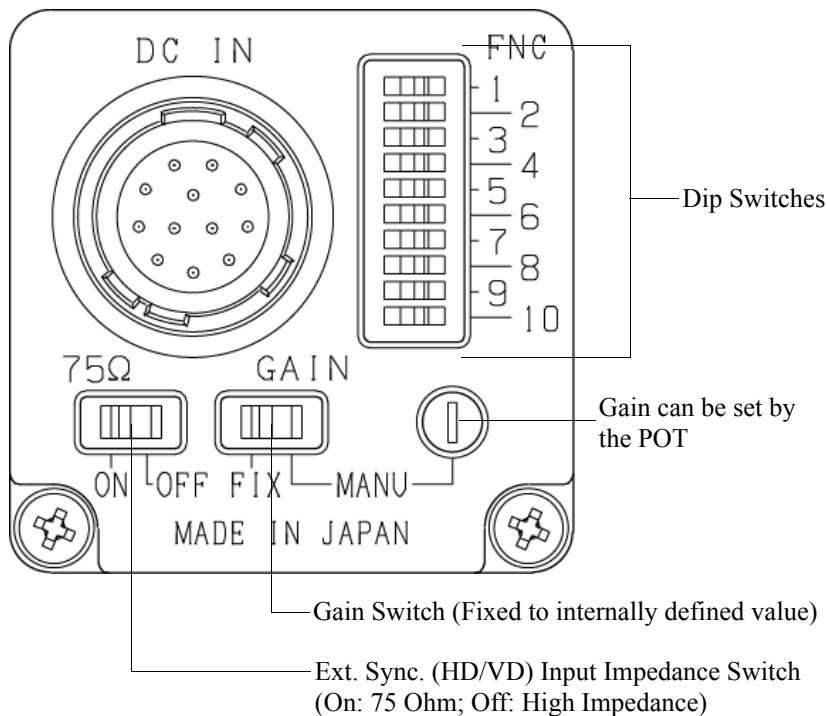
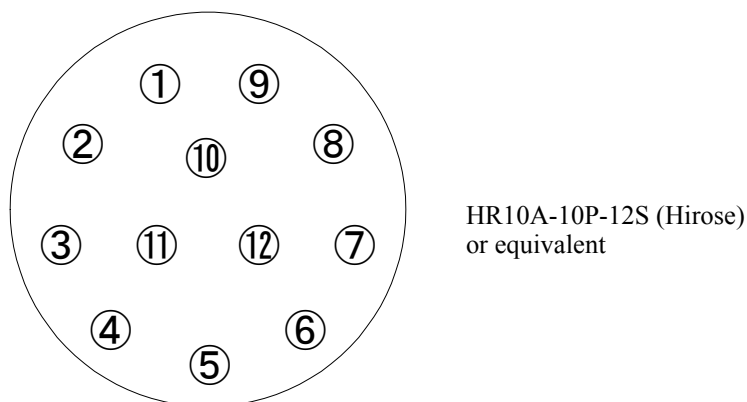


Figure 2–15 shows the connector and adjustments for the Sentech STC-A152A camera.

FIGURE 2-15. Sentech STC-A152A 12-Pin Connector**TABLE 2-10. 12-Pin Connector Pin Assignment**

Pin #	Pin Name
1	GND
2	+12V
3	VIDEO GND
4	VIDEO OUT
5	HD GND
6	HD IN
7	VD IN
8	GND
9	NC (TXD)
10	WEN OUT
11	TRG IN
12	GND (RXD)

Dip Switch Settings - Full Scan (1360x1040)**TABLE 2-11. Dip Switch Settings for Full Scan (1360x1040)**

Dip Switch	Setting
1	OFF
2	OFF
3	OFF
4	ON
5	OFF
6	OFF
7	OFF
8	OFF
9	OFF
10	OFF

Dip Switch Settings - Full Scan Binned (1360x514)**TABLE 2-12. Dip Switch Settings for Full Scan Binned (1360x514)**

Dip Switch	Setting
1	OFF
2	OFF
3	OFF
4	ON
5	OFF
6	OFF
7	OFF
8	OFF
9	OFF
10	ON

Dip Switch Settings - Half Partial Scan (1360x487)

TABLE 2-13. Dip Switch Settings for Half Partial Scan (1360x487)

Dip Switch	Setting
1	OFF
2	OFF
3	OFF
4	ON
5	OFF
6	OFF
7	OFF
8	ON
9	OFF
10	OFF

Dip Switch Settings - Half Partial Scan Binned (1360x243)

TABLE 2-14. Dip Switch Settings for Half Partial Scan Binned (1360x243)

Dip Switch	Setting
1	OFF
2	OFF
3	OFF
4	ON
5	OFF
6	OFF
7	OFF
8	ON
9	OFF
10	ON

Dip Switch Settings - Quarter Partial Scan (1360x199)

TABLE 2-15. Dip Switch Settings for Quarter Partial Scan (1360x199)

Dip Switch	Setting
1	OFF
2	OFF
3	OFF
4	ON
5	OFF
6	OFF
7	ON
8	ON
9	OFF
10	OFF

Dip Switch Settings - Quarter Partial Scan Binned (1360x99)

TABLE 2-16. Dip Switch Settings for Quarter Partial Scan Binned (1360x99)

Dip Switch	Setting
1	OFF
2	OFF
3	OFF
4	ON
5	OFF
6	OFF
7	ON
8	ON
9	OFF
10	ON

Strobe & Sensor

When choosing your part sensor, you must consider the time interval between the part passing into the sensing zone and an electrical signal being generated. When there is a large variation in process speed, considerable apparent motion of the part within the FOV may result. The Camera I/O 0740 Card can compensate for this motion over a considerable range. However, the sensor should be fast enough to minimize this apparent shift. To connect your sensor and strobe, refer to Figure 2–16 through Figure 2–18.

FIGURE 2–16. Mini Opto I/O High Speed Sensor and Strobe Connections

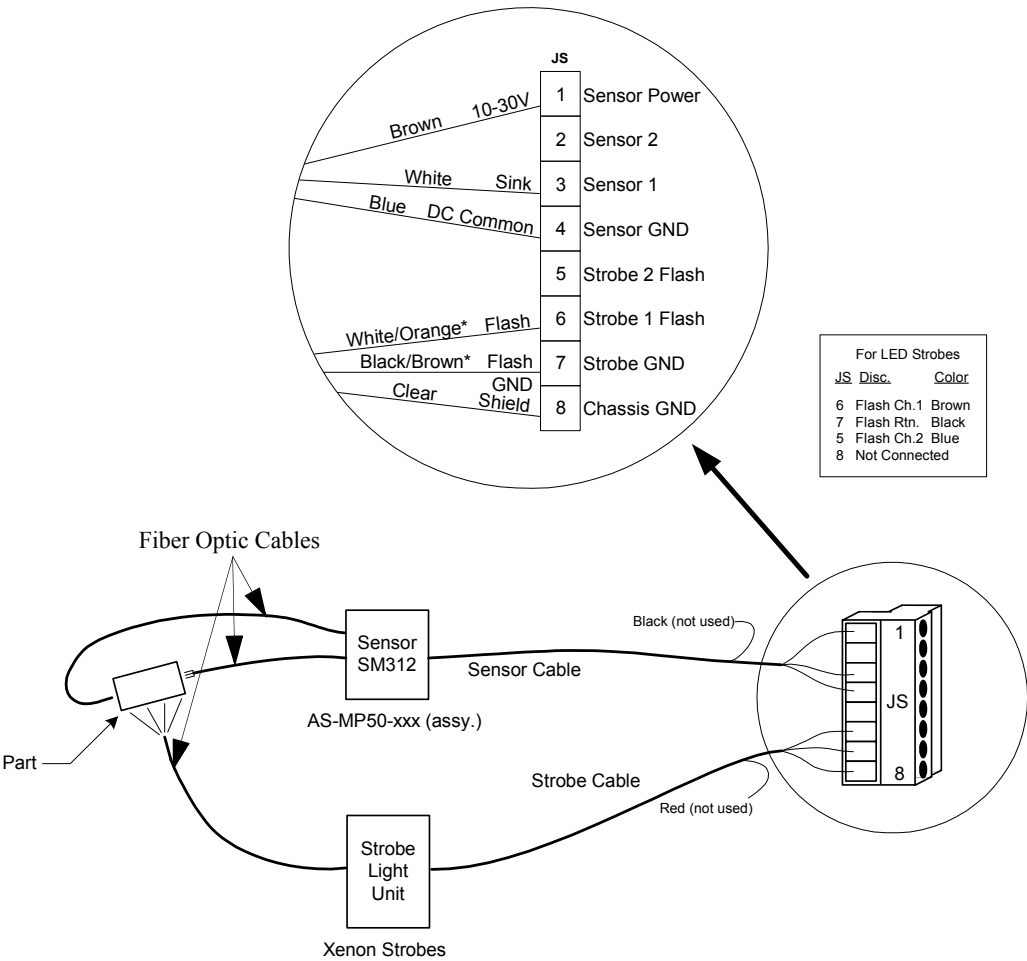


FIGURE 2-17. Combination I/O High Speed Sensor and Strobe Connections

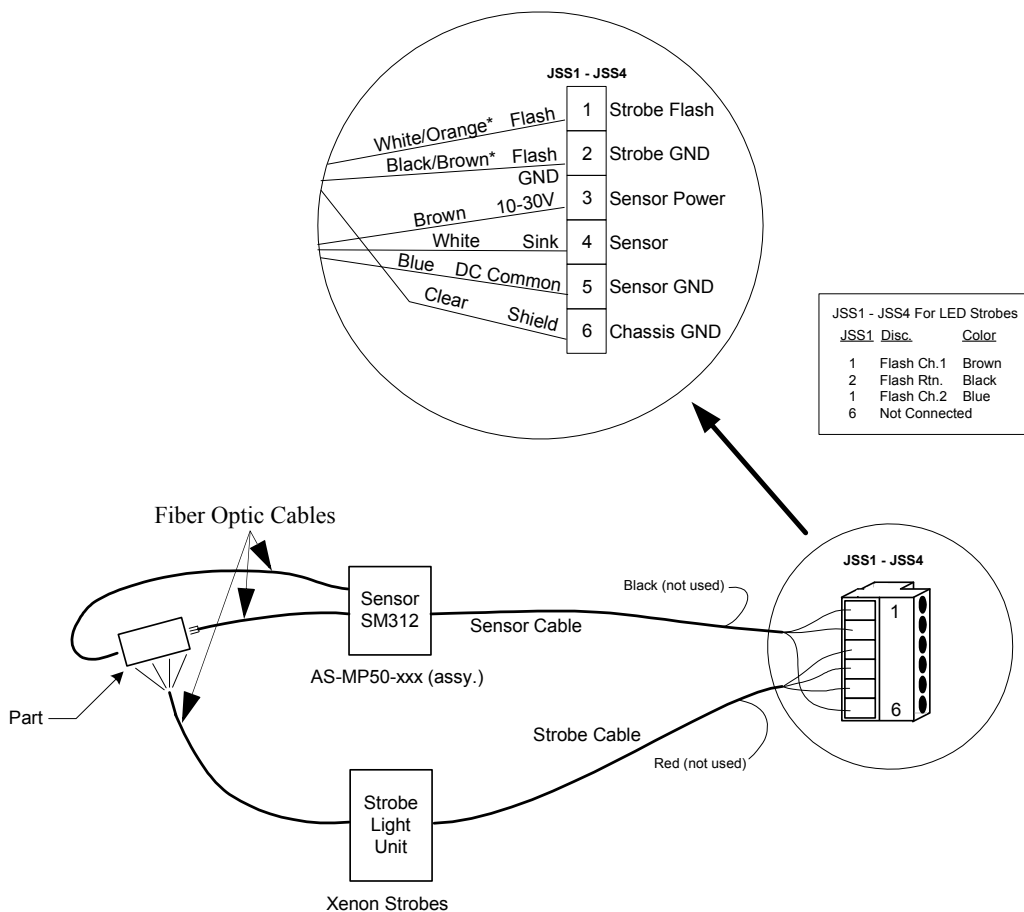
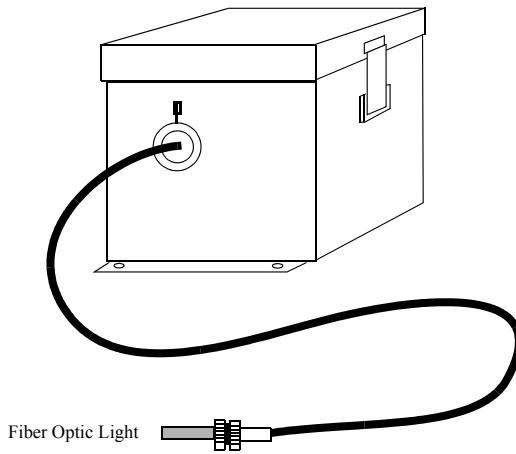


FIGURE 2-18. Strobe Unit



Power Requirements

The Visionscape® 0740 Board is powered from the PCI bus in your PC. Refer to Table 2–17 when determining the power supply requirements for your Visionscape® 0740 Board. There is a separate +12V power interface for the cameras and I/O board.

TABLE 2–17. Visionscape® 0740 Board Power Requirements

Component	+5Vdc	+12Vdc
Camera I/O 0740 Card	1.5A	
Per typical photoelectric sensor		0.1A

TABLE 2–18. PCI Bus Voltage Specification¹

Description	Allowed Variation
+5 Vdc	±5%
+12 Vdc power	±5%
Ground	REFERENCE

¹PCI Local Bus Specification (REV 2.1, June 1995)

Caution: Make sure no part of the system is plugged into live current before connecting any cables or components. Failure to do so may result in damage to your system.

Cooling Requirements

- Fan Performance — 38 CFM minimum.
- Typical Temperature Rise — 6.0°C, on every component.

Cable Specifications

This chapter contains complete cable specifications.

Note: Cable specifications are published for information only. Microscan does not guarantee the performance or quality of cables that are not provided by Microscan.

TABLE 3-1. Cable Part Numbers & Descriptions

Number	Component	Description
	030-158800	Internal 12V Camera Power Cable
	030-159106	6Ft Digital I/O Interface Cable
	030-161700	4 Camera Distribution Cable, Analog, D-Sub
	A1-20371-1	Internal Digital I/O Interface Cable
	A1-20846-1	Internal 12V Camera Power "Slim-Line" Cable
98-VS03-0XC0	98-VS03-1XC0	Progressive Scan Camera Cable, 10ft, D-Sub to 12pin
	98-VS07-1XC0	Progressive Scan Camera Cable, 25ft, D-Sub to 12pin
	98-VS15-1XC0	Progressive Scan Camera Cable, 50ft, D-Sub to 12pin

030-158800 — Internal 12V Camera Power Cable

TABLE 3-2. Connector Type

Connector Type	Reference	Mfg. P/N
AMP	J1	1-480424-0 socket housing with 60619-4 socket pin.
AMP	J2	1-480426 pin housing with 350639-1 pin.
AMP	J3	171822-4 receptacle housing with 170204-1 receptacle pin.

Cable Type

20 AWG 10/30 strand 80°C, 300 Volt, UL Style 1007.

16 AWG 26/30 strand 80°C, 300 Volt, UL Style 1007.

Connections

TABLE 3-3. Connection Run List

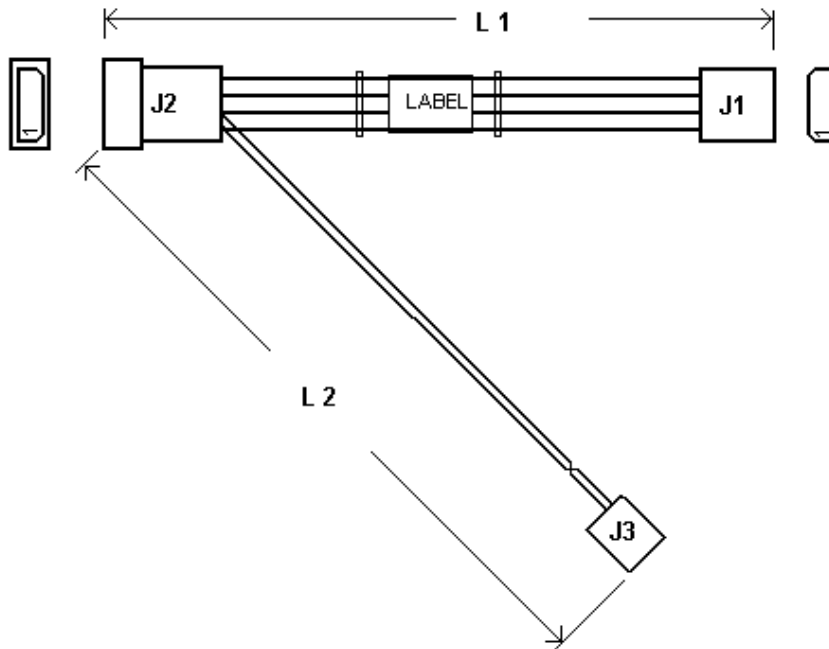
J2 - Pin #	Wire Color	J1 - Pin #	Signal Name	AWG
1	Yellow	1	12 VDC	16
2	Black	2	GND	16
3	Black	3	GND	16
4	Red	4	5 VDC	16
J2 - Pin #	Wire Color	J3 - Pin #	Signal Name	AWG
1	Yellow	4	12 VDC	20
2	Black	3	GND	20

Lengths

L1 = 4"

L2 = 10" (wires from J2 to J3 to be twisted approximately 3 twists per inch).

FIGURE 3-1. Cable Assembly



030-159106 — Digital I/O Interface Cable

TABLE 3-4. Connector Type

Connector Type	Reference	Mfg. P/N
3M .100 x .100 Center Flat Ribbon Cable w/Strain Relief w/Pull Tab 50 pos.	JIO / PIO	P/N 3425-6650, Pull Tab P/N 3490-5.

Cable Type

28 AWG Stranded

50 Conductor Ribbon Spectra Strip P/N 455-240-50.

Connections**TABLE 3-5. Connection Run List**

JIO - Pin #	PIO - Pin #	Signal Name
1	1	SENSOR4_IN
2	2	SENSOR_PWR
3	3	SENSOR3_IN
4	4	VREF
5	5	SENSOR2_IN
6	6	SENSOR2_GND
7	7	SENSOR1_IN
8	8	SENSOR1_GND
9	9	STROBE4_OUT
10	10	STROBE4_GND
11	11	STROBE3_OUT
12	12	STROBE3_GND
13	13	STROBE2_OUT
14	14	STROBE2_GND
15	15	STROBE1_OUT
16	16	STROBE1_GND
17	17	FIO15
18	18	FIO15_GND

TABLE 3-5. Connection Run List (Continued)

JIO - Pin #	PIO - Pin #	Signal Name
19	19	FIO14
20	20	FIO14_GND
21	21	FIO13
22	22	FIO13_GND
23	23	FIO12
24	24	FIO12_GND
25	25	FIO11
26	26	FIO11_GND
27	27	FIO10
28	28	FIO10_GND
29	29	FIO9
30	30	FIO9_GND
31	31	FIO8
32	32	FIO8_GND
33	33	FIO7
34	34	FIO7_GND
35	35	FIO6
36	36	FIO6_GND
37	37	FIO5
38	38	FIO5_GND
39	39	FIO4
40	40	FIO4_GND
41	41	FIO3
42	42	FIO3_GND
43	43	FIO2
44	44	FIO2_GND
45	45	FIO1
46	46	FIO1_GND

TABLE 3-5. Connection Run List (Continued)

JIO - Pin #	PIO - Pin #	Signal Name
47	47	FIO0
48	48	FIO0_GND
49	49	+5 Volts
50	50	GND

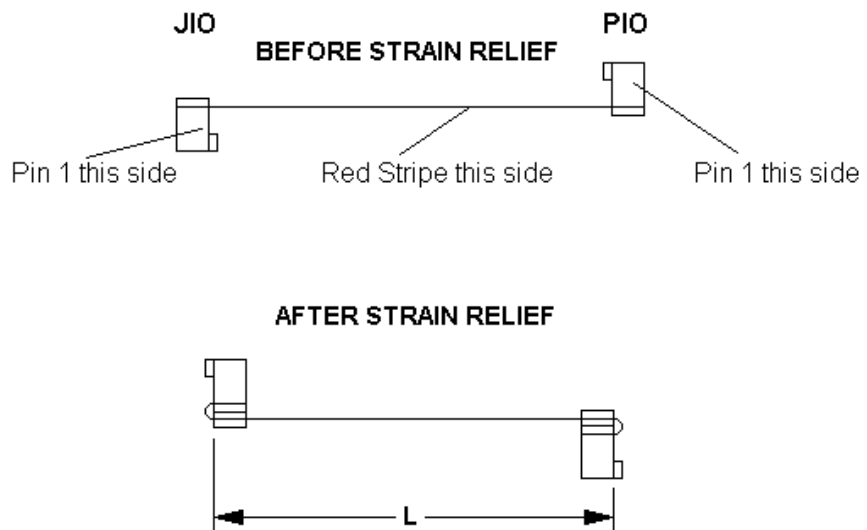
Length

6 feet

Part Numbering — Complete cable assemblies will be ordered under the following numbering system description:

- 6 feet — 030-159106

FIGURE 3-2. Cable Assembly



030-161700 — Cable, Direct Breakout, 4 Cameras — D-Sub**TABLE 3-6. Connector Type**

Connector Type	Reference	Mfg. P/N
3M, Plug Connector, Fine Pitch Integral solder, male pins	J1	10140-3000VE Series and proprietary molded hood with thumbscrews 156-IN-101S.
AMP, Female pins	CAM1 - CAM4	HDP-22 Series. Use Northern Technologies Hood P/N C88301000 (straight) W/Female Screwlocks.

Cable Type

Microscan Specification #SP-0007 Rev B. or Intercon 1 cable #89238A. 4 pieces approximately 8” each.

Connections**TABLE 3-7. Connection Run List**

J1 - Pin #	CAM1 - Pin #	Signal Name
3	15	+12VD
23	5	12VD Gnd
4	13	Video 0 Hold
24	12	Video 0 Hold Gnd
2	3	Video 0 VDr.
22	8	Video 0 VDr. Gnd
1	4	Video 0 HDr.
21	9	Video 0 HDr. Gnd
20	1	Video 0 In
40	6	Video 0 In Gnd
J1 - Pin #	CAM2 - Pin #	Signal Name
7	15	+12VC
27	5	12VC Gnd
8	13	Video 1 Hold
28	12	Video 1 Hold Gnd

TABLE 3-7. Connection Run List (Continued)

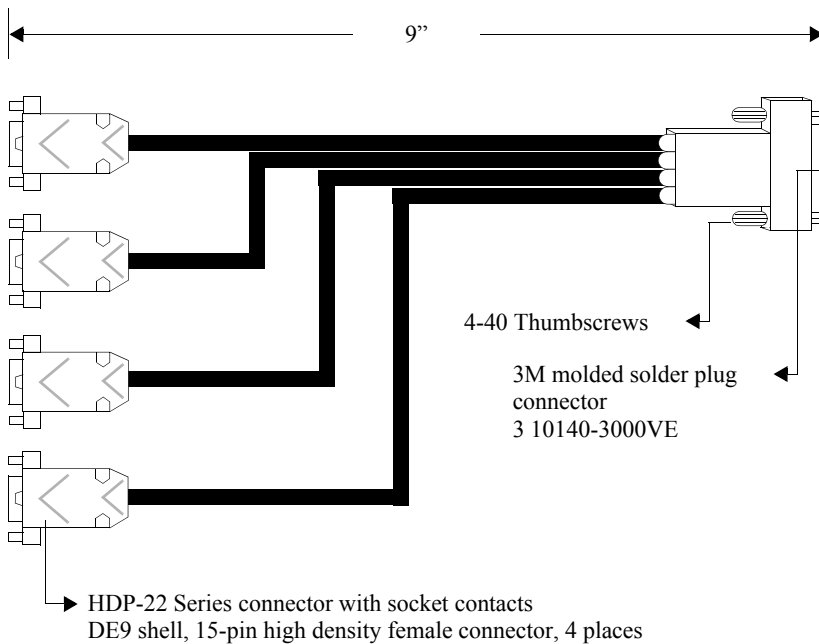
6	3	Video 1 VDr.
26	8	Video 1 VDr. Gnd
5	4	Video 1 HDr.
25	9	Video 1 HDr. Gnd
19	1	Video 1 In
39	6	Video 1 In Gnd
J1 - Pin #	CAM3 - Pin #	Signal Name
11	15	+12VB
31	5	12VB Gnd
12	13	Video 2 Hold
32	12	Video 2 Hold Gnd
10	3	Video 2 VDr.
30	8	Video 2 VDr. Gnd
9	4	Video 2 HDr.
29	9	Video 2 HDr. Gnd
18	1	Video 2 In
38	6	Video 2 In Gnd
J1 - Pin #	CAM4 - Pin #	Signal Name
15	15	+12VA
35	5	12VA Gnd
16	13	Video 3 Hold
36	12	Video 3 Hold Gnd
14	3	Video 3 VDr.
34	8	Video 3 VDr. Gnd
13	4	Video 3 HDr.
33	9	Video 3 HDr. Gnd
17	1	Video 3 In
37	6	Video 3 In Gnd

Note: The outer braid, J1 Shell and CAM1 through CAM4 shells will be connected at J1. The outer braid will encompass the inner cables by 360° completely inside the conductive shell of J1 and CAM1 through CAM4.

Length

9 inches

FIGURE 3-3. Cable Assembly



A1-20371-1 — Internal Digital I/O Interface Cable

TABLE 3-8. Connector Type

Connector Type	Reference	Mfg. P/N
.100x.100 Center Flat Ribbon Cable w/Strain Relief w/Pull Tab 50 pos.	FG I/O	3M #3425-6650 Pull Tab 3M #3490-5 or equivalent

Cable Type

28 AWG Stranded

50 Conductor Ribbon Cable. SPECTRA STRIP #455-240-50 or equivalent.

Connections

TABLE 3-9. Connection Run List

FG - Pin#	I/O - Pin#	Signal Name
1	1	SENSOR4_IN
2	2	SENSOR_PWR
3	3	SENSOR3_IN
4	4	VREF
5	5	SENSOR2_IN
6	6	SENSOR2_GND
7	7	SENSOR1_IN
8	8	SENSOR1_GND
9	9	STROBE4_OUT
10	10	STROBE4_GND
11	11	STROBE3_OUT
12	12	STROBE3_GND
13	13	STROBE2_OUT
14	14	STROBE2_GND
15	15	STROBE1_OUT
16	16	STROBE1_GND
17	17	FIO15
18	18	FIO15_GND

TABLE 3-9. Connection Run List (Continued)

FG - Pin#	I/O - Pin#	Signal Name
19	19	FIO14
20	20	FIO14_GND
21	21	FIO13
22	22	FIO13_GND
23	23	FIO12
24	24	FIO12_GND
25	25	FIO11
26	26	FIO11_GND
27	27	FIO10
28	28	FIO10_GND
29	29	FIO9
30	30	FIO9_GND
31	31	FIO8
32	32	FIO8_GND
33	33	FIO7
34	34	FIO7_GND
35	35	FIO6
36	36	FIO6_GND
37	37	FIO5
39	38	FIO5_GND
39	39	FIO4
40	40	FIO4_GND
41	41	FIO3
42	42	FIO3_GND
43	43	FIO2
44	44	FIO2_GND
45	45	FIO1
46	46	FIO1_GND

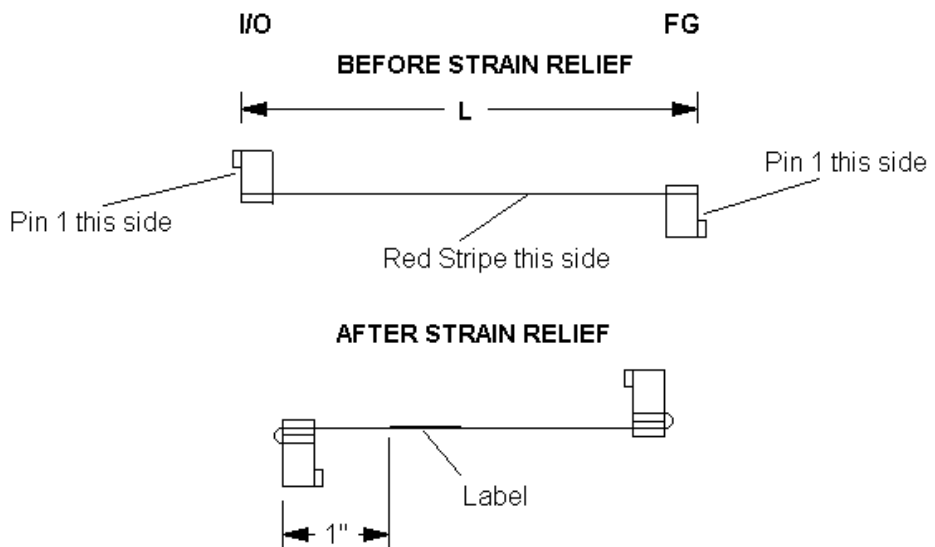
TABLE 3-9. Connection Run List (Continued)

FG - Pin#	I/O - Pin#	Signal Name
47	47	FIO0
48	48	FIO0_GND
49	49	+5 Volts
50	50	GND

Length

- 7 inches

FIGURE 3-4. Cable Assembly



A1-20846-1 — Camera Cable

TABLE 3–10. Connector Type

Connector Type	Reference	Mfg. P/N
Pin & Socket Commercial JST (4 Pos)	J1	PHR-4 Housing with SPH-002T-P0.5S receptacle pin
Amp (4 Pos)	J2	171822-4 receptacle housing with 170204-1 receptacle pin

Cable Type

RoHS Compliant. 24 AWG. 10/30 Strand 80°C 300 volt UL STYLE 1007 or equivalent.

Connections

TABLE 3–11. Connection Run List

PIN# J1	PIN# J2	CONDUCTOR	COLOR	SIGNAL
1	4	24 AWG	YELLOW	+12 VDC
2	3	24 AWG	BLACK	GND

Length

10"

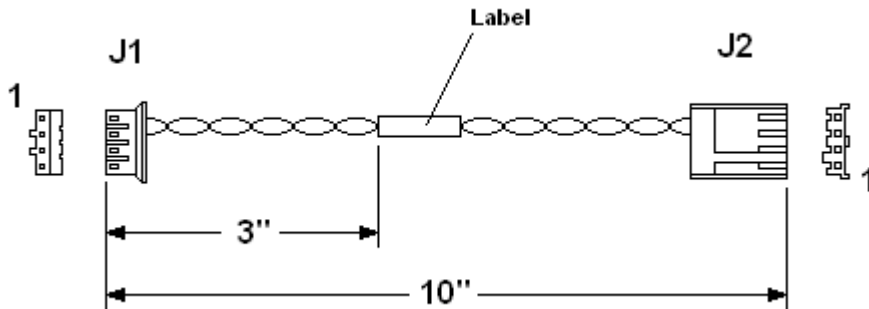
Part Numbering — Complete cable assemblies will be ordered under the following numbering system description:

- A1-20846-1 (10")

Cable Assembly Specifics

Wires from J1 to J2 are to be twisted approximately 3 twists per inch.

FIGURE 3-5. Cable Assembly



98-VS03-1XC0 — Camera Cable

TABLE 3-12. Connector Type

Connector Type	Reference	Mfg. P/N
Keyed Circular(12pin): Hirose Electric	J2	HR10A-10P-12S(73) [110-0402-0 73]
D-subminiature: (15 pin double density) AMP (Male Pins)	J1	HDP-22 Series or approved equivalent. Use Northern Technologies 45° Hood Part Number C88E201000

Cable Type

INTERCON 1 Cable #89238A or approved equivalent.

Connections

TABLE 3-13. Connection Run List

Processor End J1	Camera End J2	Signal Name
1	4 center	75 ohm coax
6	3 shield	(video)
5	1 24 AWG	GND
15	2 24 AWG	+12V
75 ohm coax		
4	6 center	H drive
9	5 shield	H drive Gnd
13	11 center or 24 AWG*	Ext Trig
12	8 shield or 24 AWG*	Ext Trig Rtn
75 ohm coax		
3	7 center	V drive
8	12 shield	V drive Gnd

*Coaxial cable may be substituted for 24 AWG with this signal.

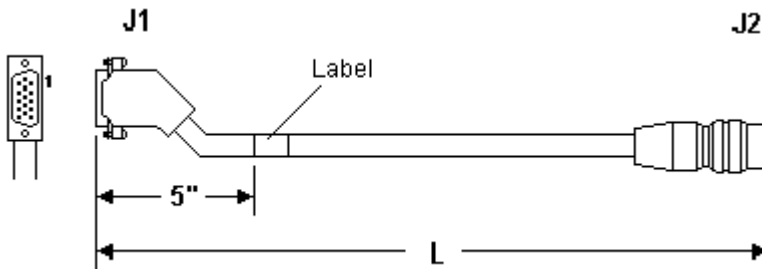
Lengths

- 10, 25, 50 Feet

Part Numbering — Complete cable assemblies will be ordered under the following numbering system description:

- 10 feet — 98-VS03-0XC0
- 25 feet — 98-VS03-0XC0
- 50 feet — 98-VS15-0XC0

FIGURE 3-6. Cable Assembly



Certifications and Specifications

CE Compliance

The Visionscape® 0740 framegrabber board has been certified to conform to the requirements of Council Directives 2004/108/EC and 73/23/EEC to comply with the following European Standards:

- EN61326:1997 A3:2003 Class A
- EM61000-6-2:2001
- EM61000-6-4:2001

This is a Class A product: in a domestic environment, this product may cause radio interference in which case, the user may be required to make adequate measures.

All Microscan products bearing the CE mark have been declared to be in conformance with the applicable EEC Council Directives. However, certain factory installed options or customer requested modifications may compromise electromagnetic compatibility and prohibit use of the CE mark. Note that the use of interconnect cables that are not properly grounded and shielded may affect CE compliance.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

Specifications

Configuration:	Single-slot half-length 5V PCI 2.2 compliant bus board; 5.5" x 4.2" (140 mm x 107 mm)
Video Input:	Up to 4 independent analog interlaced or progressive scan cameras RS170: up to 640 x 480, 60 Hz; CCIR: up to 768 x 576, 50 Hz interlaced 8 bit ADC quantization Flexible chained bus master DMA Simultaneous asynchronous capture on all channels Analog progressive scan up to 2k x 2k Supports acquisition from two different camera types at a time via two independent pixel clock generators, allowing mixing of high and low resolution cameras on any of the four channels Support for shuttered, frame reset & partial scan, double speed & quad speed cameras External camera sync
Video Control:	Master/slave interface for multi-board synchronization and triggering

	4 Hsync; 4 Vsync/Vinit
	4 Camera control in or out
Host Based Display:	PCI bus master
	Color graphics overlay
On-Board Digital I/O:	4 sensor inputs with user-supplied reference voltage thresholds and 5 to 24 V input range
	4 strobe outputs
	16 programmable bi-directional I/O
	Standard 50 pin I/O connection to external termination/isolation board (Visionscape® Combo I/O Board)
Analog Output:	On-board I2C serial bus capability; 8 channels of analog output through external termination/isolation board (Visionscape® Combo I/O Board)
Power Consumption:	+12 V @ 1.0A maximum
	+5 V @ 1.5 A maximum
	Dissipates approx. 9 W
Environmental:	Operating temperature: 0 °C to 50 °C
	Humidity: 10-90%, non-condensing
Host PC Requirements:	Pentium 4, 2.4 GHz or higher with minimum of 256 MB memory (Recommended)
	One open +5 V/32 bit PCI expansion slot
	VGA display adapter – 64K or true color
	Microsoft Windows 2000 SP4 or later

Index

A

Analog Signal
camera image 1-11

B

Buffer Pool 1-7

C

Cable Specifications
030-158800 3-2
030-159106 3-4
030-161700 3-7
98-VS03-1XC0 3-15
A1-20371-1 3-10
A1-20846-1 3-13
Camera 1-11
strobe lighting application 1-11
Camera Connector 1-3
Camera Definitions And Buffer Counts 1-7
Cameras
Sentech STC-A152A 2-22
Sentech STC-A33A 2-19

D

Discrete I/O 2-13

E

External Power 1-3

F

Field I/O Signal Specification 1-4

Fuses 1-3

G

General Purpose I/O 2-8
GPIO 2-8

I

I/O
connector 2-14
optically-isolated 2-14

J

JIO 1-3
JMP1 Jumper 1-3

M

Mini Opto I/O Board 2-5, 2-12
Multiple Resolution 1-7

O

Optically Isolated I/O 2-14

R

Rear Port
access
camera connector 1-3
i/o connector 1-3
connectors 2-1

S

Sensor 2-29
Sentech
a152a 2-22
a33a 2-19
Specifications
cable 3-1
Speed
process part 2-29
Strobe 2-29
Strobe/Sensors Signal Specification 1-4