Instruction Sheet
for the PASCO
Model CI-7500

SCIENCE WORKSHOP® *750 INTERFACE*

ventilation louvres

OUTPUT (~5V / 300mA)

ScienceWorkshop® 750

ANALOG CHANNELS (~10V MAX INPUT)

DIGITAL CHANNELS

POWER

analog output jacks

power light   digital channels   analog channels
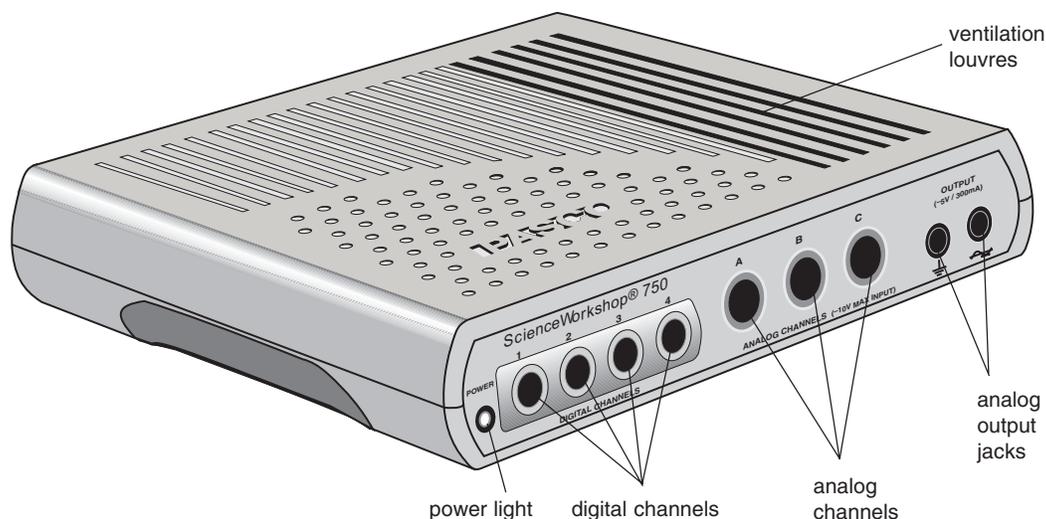
Introduction

The PASCO CI-7500 *Science Workshop*® *750* Interface, a data acquisition computer interface, is an upgrade of the *Science Workshop 700* Interface. It is designed to be used with the *DataStudio* and *Scienceworkshop*® software. It performs all of the functions of the *700* Interface, and includes the following improvements:

- analog samples up to 250,000 samples/second;
- rates through the SCSI port up to 4 times faster than the 700;
- identical analog input channels—all differential inputs, each with three gain settings: 1, 10, and 100;
- internal power amplifier for DC supply and wave function generation up to 300 mA;
- 12 bits of AC amplitude precision, allowing amplitude adjustments in steps of 2.4 mV;

- access to the analog output signal through banana jacks, allowing output voltage and current monitoring without occupying one of the analog input channels or requiring an external power amplifer.
- greater accuracy with motion sensing events;
- AC wave frequency generation up to 50 KHz (10 times faster than the 700);
- automatic readjustments of analog input offset to zero;
- upgradable firmware via flash ROM;
- option to operate through a serial port connection when a SCSI port is not available.

Instructions for operating the *Science Workshop 700* are also in the DataStudio online help and *User's Guide for Science Workshop.*

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Equipment Included:

- *Science Workshop 750* Interface box (1)
- 12 V, 2 A power supply (1)
- Connecting cable with a DB25 connector for the computer SCSI port (1) and a MDB50 connector (high density 50-pin) for the 750 interface box (1)
- Adaptec SCSI card (1) for some configurations (i.e. PCs with a PCI Bus, ISA Bus, or PCMCIA card)

Optional Equipment: (not included)

An optional cable for connecting the *750* Interface to a serial port is available. Note that the maximum data rate through a serial port is much less than that through a SCSI port.

- Cable with an 8-pin MDIN on each end for the Macintosh (part no. 514-002)
- Cable with an 8-pin MDIN connector for connecting with the 750 interface and a DB9 for connecting with a Windows serial port (part no. 514-07159.)

Description of Operation

Operation with DataStudio or *Science Workshop* on a Windows computer: *The 750 Interface must be turned on before the computer is powered up—Windows will only recognize SCSI devices during the boot process.*

Power Supply

The *750* derives its main power from an external table top power supply. All of the operating voltages are generated inside the *750* Interface.

SCSI Connection

The main connection to the computer is through the SCSI port. The *750* has an improved SCSI data transfer rate which can be about 4 times that of the 700 interface, depending on the computer speed. The SCSI cable has a DB25 connector for the computer and a MDB50 connector (high density 50-pin) for the *750* interface. The *750* has only one connector on the back panel, and therefore ***it must be the last SCSI device in the chain***. The SCSI bus is actively terminated inside the *750*; there is no need for external termination of the SCSI bus. All devices in the SCSI chain (CD-ROMs, scanners, etc.) must be powered up during operation of the 750 Interface.

The SCSI ID number is preset to 2 at the factory. To change the ID number, simply change the switch setting on the back panel and cycle the power. The interface reads the switch only at powerup.

➤ *Note*: To avoid conflicting with other SCSI devices on your system, be sure to check for free ID numbers before changing the SCSI ID number.

Optional Serial Port Connection

When a SCSI port is not available, the *750* can be connected via the serial (COM) port. However, the maximum data transfer rate is much less than for the SCSI port. For the part number for the connecting cable, refer to the optional equipment list.

Flash Memory

The *750* stores its operating system (also waveform patterns) in flash memory. Therefore, shortly after powerup, the interface is running the operating system (OS) without requiring initialization from DataStudio or *Science Workshop*. *Science Workshop* can upgrade the resident OS and waveforms in flash memory when a new revision is available.

Analog Input Channels

The *750* has three identical analog input channels.

⚠ During operation, do not block the louvres on the top and bottom of the interface box.
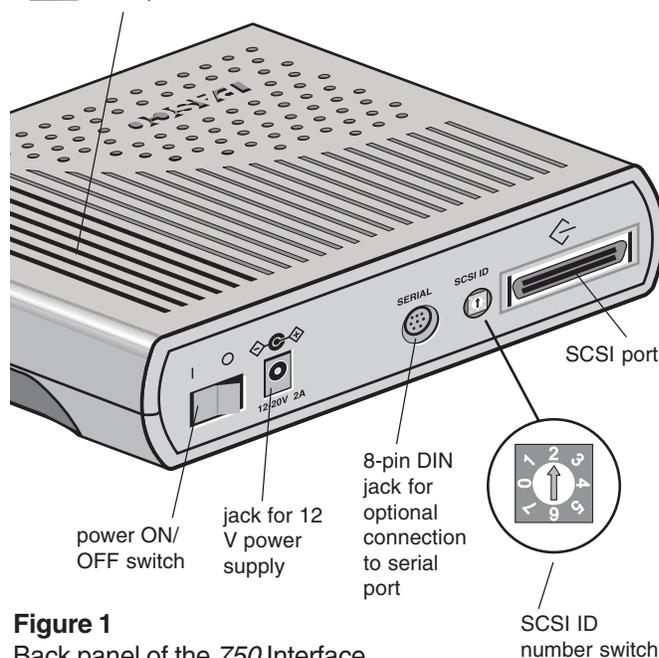
Figure 1
Back panel of the *750* Interface

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Each has differential inputs; in other words, they are like the inputs to a volt meter where neither lead is connected to ground. The voltage measured is the voltage difference between the inputs. Each channel has three software-accessible gain settings: 1, 10, and 100.

The maximum sample rate depends on which channels are selected for measurement. For the higher rates, *Science Workshop* samples a block of 2000 bytes and then transfers the block. Once transfer of bytes to the host has begun, the interface starts sampling a new block. This is called *burst mode,* since there is a small time interval when data is not being sampled. The main use for this mode is for the virtual oscilloscope. Table 1 shows the sampling constraints while using a fast computer to record the data.

Table 1. Sampling Rate Constraints

Sample Rate	# of Channels	Comment
250 KHz	1 analog	Burst mode
100 KHz	3 analog	Burst mode
50 KHz	5 analog	Burst mode
20 KHz	1 analog (5 analog)	Continuous* (burst)
10 KHz	1 analog + digital (5 analog)	Continuous* (burst)
$\leq$ 100 Hz	5 analog	Continuous 8x oversample (improved accuracy at $\leq$ 100 Hz)

*Note: Continuous sampling with 5 channels selected is not possible to sustain for more than a few seconds.

There are five analog channels from which to choose: channels A–C, analog output voltage (at banana jacks), and the analog output current. Please note that for continuous sampling, the speed of the computer is a significant factor, especially if *Science Workshop* is busy with many displays.

➤ **Note:** When a digital sensor has been selected, the sampling rate does not depend on the number of digital channels as they are sampled simultaneously at 10 KHz.

Built-in Function Generator-Amplifier

The *750* has a built-in function generator that is used to output analog signals. These can be either AC signals, such as sine and triangle waveforms, or a DC signal ranging between +/- 5 V. For the AC waveforms, of which there are 8 resident in Flash, the frequency can range from 1 mHz (0.001 Hz) to 50 KHz and the peak-to-peak amplitude can be adjusted from 0 V to +/-5 V with increments of 2.44 mV. The output voltage is calibrated at the factory to null the offset voltage and set the full scale voltage.

Accessing Analog Output

There are two different ways in which to access the analog output signal. The first (the default method in *Science Workshop)* is to connect test leads to the banana jacks. The signal produced is a power amplified (unity voltage gain) version of the signal present at the DIN connectors and can supply nearly 300 mA at +/-5 V. The output current can be monitored along with the output voltage. The second is to use a CI-6552A Power Amplifier (which has a voltage gain of 2 and delivers 10 W) and connect its DIN plug to one of the analog channels, A–C.

Digital Event Sampling

The *750* can sample digital events for photogate timing. The *750* uses hardware edge detection so that it can capture either edge or both as events, a feature that is useful for setting trigger conditions. It can count digital events from devices such as a Geiger tube or a Rotary Motion Sensor. Each channel has an independent 16-bit counter. For motion sensing, either single or dual, the internal counters and edge detectors provide improved performance with less noise in the measurement.

Operation Precautions

Do not block the ventilating louvres on the top and bottom of the interface box during operation.

Setup Procedures

Connecting the *ScienceWorkshop* 750 interface to an IBM-Compatible PC or Macintosh (with DB25 SCSI port)

The *ScienceWorkshop 750 interface* connects to the SCSI port on an adapter card installed in a PC or Mac.

PCs: If you do not have a SCSI card installed in your computer, see the documents included with the SCSI card for instructions on installing a SCSI adapter card. Do NOT install the EZ-SCSI Lite software.

SCSI port

1. With your computer turned off, locate the SCSI port on the back of your computer. This port has 25 small holes in two parallel rows. (For laptop Macintosh computers, such as the Powerbook, the port has 30 small holes in a grid pattern. For Powerbooks, you need to buy an adapter from a commercial supplier.

2. Squeeze the tabs on both sides of the HP DB 50 pin plug (at the end of the cable) and connect the plug into the SCSI port on the back of the interface box. Release the tabs on the sides of the plug to 'lock' the plug onto the interface box.

3. Connect the 25-pin end of the SCSI cable (included with the 750 interface) to the port on your computer. The cable is keyed so that you cannot plug it in incorrectly.

Back panel of the 750 Interface
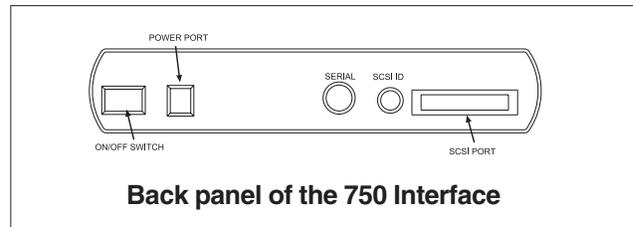
Note: You can connect the 750 interface to the serial port in the same way as described for the 500 interface, but the speed of data collection will be much slower than for the SCSI connection.

4. Connect the AC adapter plug of the interface power supply into the "Power" port on the back of the interface box. Plug the power supply cord into a grounded electrical receptacle.

5. Located on the back of your computer is a SCSI ID switch labeled 0-6. The interface is set to SCSI ID 2. You don't need to change this, unless another device is assigned to SCSI ID 2. You can use the ID selector switch on the back of the 750 interface to change the ID number. Remember, each SCSI device must have a unique SCSI ID number. The 750 interface has a built-in terminator. The 750 interface must be the last SCSI device in your "chain."

Note: Each SCSI device connected to your computer must have its own unique ID number between 1 and 6, so the computer can distinguish it from other attached SCSI devices. The SCSI ID of an internal hard drive and computer are 0 and 7, respectively. It is always important to check for the uniqueness of the SCSI ID, if more than one SCSI device is connected. For more information about installing a SCSI adaper card, see the DataStudio online help.

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Setup Procedures (continued)

Follow the instructions below according to your computer's operating system.

Macintosh:

1. Turn on the interface (with the power switch on the back). A green light-emitting diode (LED) on the front panel will light. (If it doesn't, check the power connections.)

2. Turn on the computer and start DataStudio.

3. In the "Welcome to DataStudio™ window, select "Create Experiment."

4. When DataStudio asks you whether you want the program to scan for an interface or pick one to use for setup, click "Scan." If the program finds the interface, the Experiment Setup window opens and you have completed the installation procedure.

Windows 95/98

1. Turn on the interface (with the power switch on the back). A green light-emitting diode (LED) on the front panel should light. (If it doesn't, check the power connections.)

2. Turn on the computer and wait for Windows to start. Because the AVA-2906 SCSI card is a Plug-and-Play device, the Add New Hardware Wizard should find the card and install drivers for it. Once the Wizard has finished, it tells you there is a new device (the SCSI card) but that there is no driver for it. It will ask you to look for a driver.

3. Follow the on-screen instructions. When the Wizard says that the computer can't find the driver, click Finish.

Note: There is no driver for the interface box. If you look under 'Other Devices' in the 'Device Manager,' you'll see the interface listed with a yellow exclamation point.

Note: If the Add New Hardware Wizard can't find the card, then click Start-> Settings-> Control Panel, and double-click Add New Hardware. Follow the on-screen instructions. If you are asked to make a selection, choose Adaptec AHA-294x/AHA-2940 or AIC-78XX PCI SCSI Controller and then follow the on-screen instructions.

4. If the driver for the SCSI card is not on your computer, you will be asked to provide it. Put the Adaptec EZ-SCSI diskette for Windows 95/98 and NT into the floppy

drive. Click Browse, and find the file Aic78xx.mpd on the floppy drive. Click OK, and follow the on-screen instructions.

5. Start DataStudio. In the "Welcome to DataStudio™" window, select "Create Experiment."
Result: A DataStudio window will ask whether you want the program to scan for an interface or to pick one to use for setup.

6. Click "Scan" to continue. When the program finds the interface, the Experiment Setup window opens and you have completed the installation process.

Windows NT

1. Turn on the interface (with the power switch on the back). **Result:** A green light-emitting diode (LED) on the front panel should light. (Note: If the LED doesn't light, check the power connections.)

2. Next, turn on the computer and wait for it to start Windows NT. Click Start-> Settings-> Control Panel, and double-click SCSI Adapters.

3. In SCSI Adapters, click "Drivers" and then click "Add." Select Adaptec AHA-294x/AHA-2940 or AIC-78XX PCI SCSI Controller, click OK, and follow the on-screen instructions.

4. If the driver for the SCSI card is not on your computer, you will be asked to provide it. Put the Adaptec EZ-SCSI Standard Edition v5.0 Disk 1 for Windows 95 and NT 3.51 and 4.0 into the floppy drive. Click Browse, and find the file Aic78xx.mpd on the floppy drive. Click OK and follow the on-screen instructions.

5. When finished, ensure that the interface is turned on. Click OK to reboot the computer. After rebooting, click Start-> Settings-> Control Panel, and double-click SCSI Adapters. **Result:** If the installation was successful, an entry for the selected host adapter appears.

6. Click the selected host adapter. **Result:** An entry for the PASCO interface will appear.

7. Start DataStudio. In the "Welcome to DataStudio™" window, select "Create Experiment." **Result:** A DataStudio window will ask whether you want the program to scan for an interface or to pick one to use for setup.

8. Click **Scan** to continue. If the program finds the interface, the Experiment Setup window opens, and you have completed the installation process.

(Setup procedures continued)

Windows 2000

1. If your system does not have a SCSI card, install the SCSI card on your computer. Use the SCSI driver that Windows 2000 suggests instead of a driver on the Adaptec disk.

2. After installing the SCSI card, update the Windows ASPI communications layer by running the program ASPI32.EXE. You can download this program from the Adaptec website (http:/www.adaptec.com) On the main page, search for "ASPI." (Note that Adaptec has recently added a warning to not install this program under Windows 2000. Despite this warning, we have not encountered any problems doing this installation.)

3. When you boot up the computer, the Windows Add New Hardware Wizard will ask for a driver for the interface. Step through the wizard, allowing windows to search for a driver. Windows does <u>not</u> find one, but gives you an option to "Disable the Device." Note: You should select "Disable the Device." Windows will place the interface under the "Other Devices" category. In most cases, Windows does not ask for a driver again.

Using a *ScienceWorkshop* 750 Interface with DataStudio

Note: Before you can use the interface with DataStudio, you must have DataStudio installed on your computer, the interface connected to a power supply, and the power supply to the interface turned on.

1. Connect a sensor to the *ScienceWorkshop*® interface.

Example: Connecting a Temperature Sensor to analog channel A.
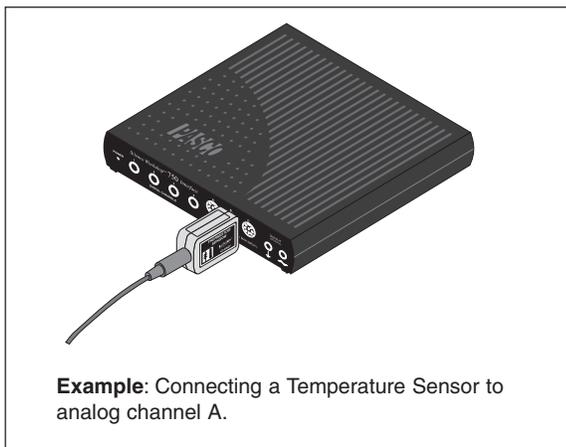
2. Start DataStudio. In the Sensors list, double-click the sensor to associate the sensor with the interface channel. **Result:** The sensor becomes associated with the analog channel on the picture of the interface box.

3. In the Displays list, double-click the display's icon to open a display window.

4. To collect some data, click the **Start** button (▶ Start) on the main toolbar. **Result:** Data appears in real-time on the Graph display.

5. To stop collecting data, go to the main toolbar and click the Stop button (■ Stop).
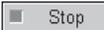
For more information about operating the interface with DataStudio, see the DataStudio online help.

New Features of the Signal Generator

• Two new wave forms: *positive-only up ramp* and *positive only down ramp*

➤ *Note:* When operated with *DataStudio software (or Science Workshop* version 2.3 or higher), the *700* Interface also generates these positive-only up and down ramp signals.

• Expanded frequency range: 0.001 Hz to 50 KHz

• Greater resolution for adjusting the AC amplitude (steps of 2.44 mV)
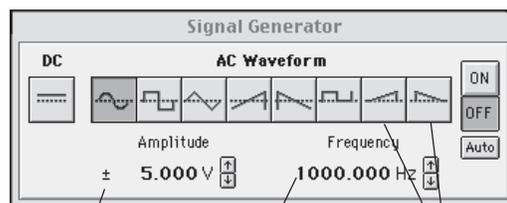
AC amplitude adjusted in 2.44 mV steps

frequency range: 0.001 Hz to 50 KHz

new wave forms: **positive only up ramp** and **positive only down ramp**

➤ **For detailed instructions concerning the Signal Generator, see the DataStudio online help or** *User's Guide for Science Workshop***.**

Specifications

Power:
- 12 VDC to 20 VDC at 2 A, 2.1 mm jack

Primary computer connection:
- SCSI, 8-bit data width and a MDB50 female connector
- Internal active termination provided

Alternate computer connection:
- Serial RS-232 with an 8-pin MDIN female connector
- 19.2K bits/s, 1 start bit, 8 data bits, 1 stop bit

Digital Channels:
- 4 identical digital input/output channels
- TTL compatible input/output levels with 8 mA maximum drive current
- Maximum input logic transition time: 500 ns
- Electrostatic Discharge (ESD) protected inputs assuming the human body model standard, Mil-Std-3015.7
- Edge sensitive and sampled at 10 KHz (100 µs). (1 µs resolution for the Motion Sensor)

Analog Input Channels:
- 3 identical channels with differential inputs and 1 M ohm impedance
- +/-10 V maximum usable input voltage range (+/-12 V absolute input voltage range)
- ESD protected input similar to that of the digital channels
- 3 voltage gain settings on each analog channel: 1, 10, and 100
- Small signal bandwidth up to the ADC: 1 MHz for a gain of 1, 800 KHz for a gain of 10, and 120 KHz for a gain of 100; input amplifier slew rate: 1.2 V/µs (The actual bandwidth is determined by the sampling rate of the ADC.)

Analog-to-Digital Conversion:
- 5 input sources for the 12-bit ADC: channels A–C and analog output voltage and current.
- Voltage resolution at the ADC input: 4.88 mV (.488 mV at a gain of 10; 0.049 mV at a gain of 100)
- Current measurement resolution: 244 µA, where each volt measured represents 50 mA
- Offset voltage accuracy < +/-3 mV. (For measuring full-scale voltages (or 1 V with a gain of 10, etc.) the total error will be less than +/-15 mV, accounting for the gain error in the input amplifier.)
- Sample rate range: once every 3600 seconds – 250 KHz (The conversion time between consecutive channels in a burst is 2.9 µs.)
- 8X oversampling for improved accuracy for sample rates $\leq$ 100 Hz.

Analog Output:
- DC value ranges: -4.9976 V to +5.0000 V in steps of 2.44 mV
- Accuracy at the DIN connector: (+/-3.6 mV +/-0.1% full scale)
- Peak-to peak amplitude adjustment ranges for AC waveform: 0 V to +/-5 V in steps of 2.44 mV
- AC waveform frequency ranges: 1 mHz (0.001 Hz)– 50 KHz, +/-0.01%
- Maximum amplified output at the banana jacks: about 300 mA at +/-5 V, current limited at 300 mA +/-12 mA

Limited Warranty

PASCO scientific warrants the product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. PASCO will repair or replace, at its option, any part of the product which is deemed to be defective in material or workmanship. The warranty does not cover damage to the product caused by abuse or improper use. Determination of whether a product failure is the result of a manufacturing defect or improper use by the customer shall be made solely by PASCO scientific. Responsibility for the return of equipment for warranty repair belongs to the customer. Equipment must be properly packed to prevent damage and shipped postage or freight prepaid. (Damage caused by improper packing of the equipment for return shipment will not be covered by the warranty.) Shipping costs for returning the equipment after repair will be paid by PASCO scientific.

Address: PASCO scientific
             10101 Foothills Blvd.
             Roseville, CA 95747-7100

Phone: (916) 786-3800
             Or 1-800-772-8700 (toll free in U.S.)

Electromagnetic Complianceof the ScienceWorkshop 750 Interface.

➤ **Note:** 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 the user will be required to correct the interference at his own expense.

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750 Interface   CI-7500

FC   **Tested To Comply With FCC Standards**

FOR HOME OR OFFICE USE

The PASCO Model CI-7500 *750 Science Workshop* Computer Interface has been tested and complies with the essential protection requirements of Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Assessment of compliance of the product with the requirements relating to electromagnetic compatibility was based on the following Directives and Standards:

- EN 50081-1 Electromagnetic compatibility generic emission standard

- EN 55022, CISPR 22 Class A Limits and methods of measurements of radio interference characteristics of information technology equipment.

- EN 50082-1 Electromagnetic compatibility generic immunity standard.

- IEC 801-2 Electrostatic discharge requirements

- IEC 801-3 Radiated electromagnetic field requirements

- IEC 801-4 Electrical fast transient/burst

DIGITAL CHANNELS   **ANALOG CHANNELS**
1, 2, 3, 4   A, B, C

GND   SIGNAL

+5V
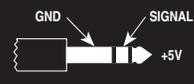
+ 5 V	POWER 300 mA Total
+12 V	POWER 75 mA Total
- 12 V	POWER 75 mA Total

PIN	FUNCTION
1	ANALOG INPUT +
2	ANALOG INPUT -
3	N/C
4	+5 V POWER
5	POWER GROUND
6	+12 V POWER
7	-12 V POWER
8	ANALOG OUTPUT

RECEPTACLE

750 INTERFACE
Model CI-7500

PASCO ®
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10101 Foothills Blvd.
Roseville, CA 95747-7100
(916) 786-3800 U.S.: (800) 772-8700
http://www.pasco.com

The label on the bottom of the interface box details the channel power specifications.

The exclamation point within an equilateral triangle is intended to alert the user of important operating and safety instructions that will help prevent damage to the equipment or injury to the user.

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Troubleshooting

Routine checks on the 750 Interface box

1. Is the green LED on the front of the interface lit when the power is turned on? If not try one or all of the following:

   Check the AC adapter. Is it providing the proper voltage for your interface?

2. Make sure that all your cable connections are secure. Verify that there are no bent pins at either end of the cable. Check the SCSI termination. Remember, the termination on the 750, which is built into the interface, is active while the box is powered (it must be the last device in the SCSI chain).

3. Located on the back of your interface is a SCSI switch labeled 0-6. By default, the SCSI ID of this interface is 2. You don't need to change this unless another device is assigned SCSI ID 2. If a second device is connected to your computer, please check for a SCSI ID conflict.

IRQ Conflict (Windows)

Note: The Adaptec AVA 2906 SCSI card must have a free IRQ between 9 – 15. Do not allow the 2906 SCSI card to share the same IRQ with another card.

To check IRQ settings in Windows 95/98

1. Click Start-> Settings-> Control Panel, and double-click System.

2. Click the Device Manager tab and double-click Computer. In the 'Computer Properties' window under 'View Resources' is a list of all of your devices with their IRQ settings.

To check for an available IRQ in Windows NT 4.0

1. Select Start-> Programs-> Administrative Tools-> Windows NT Diagnostics.

2. Click the **Resources** tab. You will see a list of the drivers and the IRQ settings for your devices.

3. Check that the Adaptec AVA-2906 SCSI card is recognized under Device Manager. If there is a resource conflict (indicated by a yellow exclamation point next to the SCSI driver listed under SCSI Controllers in the Device Manager), you have to resolve the resource conflict.

To resolve a resource conflict:

1. Remove the driver, and turn off the computer.

2. Remove the SCSI card, and turn on the computer.

3. Allocate resources for the card, and turn the computer off again.

4. Reinstall the card into the PCI slot, and turn on the computer,

5. Reinstall the driver.

To remove a driver in Windows 95/98:

1. Select Start->Settings->Control Panel, and double-click System.

2. Double-click SCSI Controllers, click the driver for the SCSI card, and click Remove.

To remove a driver in Windows NT:

1. Select Start->Setting->Control Panel, and double-click SCSI Adapters.

2. Click the Drivers tab, click the selected driver for the AVA-2906 card, and click Remove.

To remove a driver in Windows 2000:

1. Select Start>Settings>Control Panel>Add/Remove Hardware.

2. When the Add/Remove Hardware Wizard opens, click the **Next** button and choose "Uninstall/Unplug a device."

3. Click the **Next** button. Select the Adaptec SCSI controller.

4. Click the **Next** button again. At the prompt to uninstall the SCSI device, click "yes."

SCSI Driver (Windows)

If the program can't find the *Science Workshop 750 Interface* in Windows, you may need to update the SCSI driver.

The names of the driver files for the Adaptec AVA-2906 Adapter card are:
• 7800W95.EXE (for the AVA-2906 on Windows 95 or 98)
• 7800WNT.EXE (for the AVA-2906 on Windows NT)

Download these files from the Adaptec Web site at http://www.adaptec.com   [To update the ASPI layer, download and run ASPI32.EXE from the Adaptec web site (http://www.adaptec.com/support/faqs/aspilayer.html)].

Technical Support

Feedback

If you have any comments about this product or this manual, please let us know. If you have any suggestions on alternate experiments or find a problem in the manual, please tell us. PASCO appreciates any customer feedback. Your input helps us evaluate and improve our product.

To reach PASCO

For Technical Support:

Fax:(916) 786-3292

E-Mail: techsupp@pasco.com

Web: www.pasco.com

Phone: 1-800-772-8700 (toll-free in U.S.)
                    or (916)786-3800

Contacting Technical Support

Before you call the PASCO Technical Support staff, prepare the following information:

• If your problem is computer/software related, note:

-Title and revision date of software

-Type of computer (Make, Model, Speed)

-Type of external cables/peripherals

If your problem is with the PASCO apparatus, note:

-Title and Model number (usually listed on the label)

-Approximate age of apparatus

-A detailed description of the problem/sequence of events. (In case you can't call PASCO right away, you won't lose valuable data.)

-If possible, have the apparatus within reach when calling. This makes descriptions of individual parts much easier.

• If your problem relates to the instruction manual, note:

-Part number and revision (listed by month and year on the front cover)

-Have the manual at hand to discuss your questions.