MODEL 4990A
RACK FOR 400 SERIES AMPLIFIERS

INSTRUCTION
MANUAL

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San Juan Capistrano, California, USA

IM4990A

REVISION A
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ENDEVCO MODEL 4990A RACK
INSTRUCTION MANUAL

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1.   INTRODUCTION

ENDEVCO®, a leader in the vibration measurement field since 1951, has contributed many firsts in vibration sensor design.   These include: the first piezoelectric accelerometer capable of continuous operation from cryogenic temperatures up to +750°F, the first shear design accelerometer and the world's smallest piezoelectric accelerometer. To support a broad family of vibration transducers, ENDEVCO has provided a wide variety of signal conditioners, including the first transistorized charge amplifier, the first computer-programmable charge amplifier and the first airborne vibration monitoring system that is based on a true digital tracking filter.

Other support systems includes the introduction of the first Laser Interferometer absolute calibration system. Endevco is a pioneer in the science of Micro-Electro-Mechanical Systems (MEMS) design and manufacturing various sensor technologies to include Gyro, Variable Capacitance and silicone Pressure Transducers.

1.1   SIGNAL CONDITIONERS

To support the use of its sensors in large scale testing, ENDEVCO has developed several generations of signal conditioner systems. Until recently, a state-of-the-art vibration laboratory set up consisted of a rack of manually controlled signal conditioners. These signal conditioners have manually controlled switches and knobs, to set full scale ranges, sensitivity and filter corners and the set up information is recorded by hand.

1.2   COMPUTER CONTROLLED SIGNAL CONDITIONERS

To support the use of its sensors in large scale testing, and to eliminate the risk of incorrect amplifier settings, ENDEVCO has developed several generations of computer controlled signal conditioning systems.   The first generation was the Multi-channel Amplifier Control system (MAC). The second generation was the Computer Controlled Amplifier Systems (CCAS). The CCAS family consists of five different systems that use the same rack and digital interface assemblies with different analog boards. These units receive their setup commands over an IEEE-488 interface bus from a computer/controller so that tests can be pre-programmed. In addition, these units provide comprehensive self-test and self-calibration capabilities, which greatly improves the reliability of the test data. User feedback indicates these units pay for themselves by shortening test cycles, preventing re-tests and eliminating over-testing.

ENDEVCO is pleased to announce the third generation of computer controlled signal conditioners: the OASIS 2000 (Optimal Architecture Sensor Interface System). Utilizing Ethernet or EIA232 bus control, SMART Transducer technology, and a wide variety of signal conditioning modules, the OASIS 2000 will meet all the requirements of multi-channel testing.

1.3   OASIS 2000 Hardware

The OASIS 2000 allows for configuration of a flexible modular multi-channel measurement system that can interface to multiple sensor types (charge, voltage, full, half, quarter bridge PR, VC, Isotron, IEEE 1451.4 compatible Smart Isotron) by using any combination of the 400 family of signal conditioner cards housed in a 16 slot, 19" rack (ENDEVCO part No. 4990A).

The OASIS 2000 system can be customized to meet most requirements and is adaptable to the developing needs of the user.

Bar Code Labels
Measurement Position
Sensor Serial No.
Cable ID

Charge PE
Isotron
Quarter Bridge PR
Half Bridge PR
Acceleration Velocity Pressure Force Strain Temperature
Full Bridge PR
AC
DC
Smart Isotron
Smart Sensors

Up to 48 Analog Outputs
Combined in 4 connectors

Ethernet

Up to 16 Racks

RS-232

16 4XX Cards
Up to 128 Channels per Rack

Amplifier Channel No.
Cable ID
Sensor Serial Number
Measurement Position

System Configuration Information

e2000 Software
System Configuration Control

Measurement Position		
Cable ID		
Sensor Serial No.		
Sensor Sensitivity		
Amplifier Channel No.		
Full Scale Input Range		
Output Scaling		
Amplifier's Gain		

Customizable Reports
Electronic or Paper

Sensor Database
Electronic File
Created Manually
or Automatically by
Endevco Calibration System

1.4   OASIS 2000 Software

The OASIS 2000 Configuration Editor software (SW2000 or SW400) was developed to configure Model 400 series signal conditioners and amplifiers installed in a Model 4990A rack.

The SW2000 software is a full featured software package designed to simplify system configuration and amplifier setup.

- Intuitive, simple to use, graphical interface provides both table view and matrix view windows for quick configuration for up to 2048 channels.

- Ethernet (one or more 4990A racks) or serial (single 4990A rack) communications.

- Reads 1451.4 Transducer Electronic Data Sheet (TEDS) information from sensors with a TEDS capability. Writes 1451.4 'User Data' (up to 8 characters) to TEDS capable sensors.

- Automatic Sensor Calibration due warnings.

- Customizes easily to user defined row definitions allowing for consolidation of all relevant information in a single file.

- Configuration table data imports easily into MS Excel spreadsheets.

- Convenient 'Online', 'Offline' modes to facilitate setup prior to hardware installation or to configure different setups without affecting the hardware.

- GoTo and Find operations for quickly accessing specific table view data.

The SW400 software is a subset of the SW2000 software that provides a basic set of tools for controlling the amplifiers. This version provides only the matrix view window and it's associated amplifier functions.

2.   DESCRIPTION

The Endevco Model 4990A is a 19 inch rack that houses up to 16 of the Endevco Model 400 series signal conditioning modules in any combination. Signal conditioning modules supported by the Model 4990A are:

- 3-channel PE/Isotron® Signal Conditioner Model 433

- 3-channel DC Differential Voltage Amplifier Model 436

- 2-channel PE/Isotron® High Performance Signal Conditioner Model 428

- 8-Channel Smart Transducer/Isotron® Signal Conditioner Model 482

The Model 4990A provides power, input and output connections, and computer interface for the signal conditioning modules. Any combination of the 400 family of signal conditioning cards may be used. The address of each signal conditioning module is automatically determined by the position of the module in the rack.

The Model 4990A has four 25-pin "D" connectors on the front panel for access to the signal conditioner outputs. Each connector contains the outputs of 4 modules for a maximum of 12 outputs. The outputs of the 8-Channel Smart Transducer Signal Conditioner Model 482 are accessible only on its front panel, or through the optional Model 36020 output breakout panel.

The connection of the 4990A-1 rack to the controlling PC is a standard TCP/IP Ethernet Network bus RJ-45 connector.

The connection of the 4990A-2 rack to the controlling PC is a standard EIA-232 bus through a 9 pin "D" connector.

Both computer interface connectors, 9 pin "D" connector and RJ-45 connector, are available on the Model 4990A-1 and Model 4990A-2.

The Model 4990A-1 rack contains an Ethernet to EIA-232 bus converter (EDAS) that can be accessed through the TCP/IP Ethernet Network bus. This allows for multiple rack applications where up to sixteen (16) 4990A-1 racks (total of up to 256 signal conditioning modules) can be interconnected and controlled by a single computer. Each Model 4990A-1 rack contains an RJ-45 Ethernet connector and is assigned a unique IP address. The address of each individual card is automatically determined by the rack address and the position of the card in the rack.

SW2000 configuration editor software and SW400 matrix view software is available to control the Model 4990A rack and Model 400 series modules.

2.1   KEY FEATURES

- 19 inch rack to support up to 16 Endevco Series 400 Signal conditioning modules in cabinet installations or stand alone operation.

- Computer interface via TCP/IP Ethernet or serial EIA-232.

- Flexible design to accommodate any combination of the 400 family of signal conditioning modules.

- Signal conditioner outputs easily accessible through four 25 pin "D" connectors.

- External Calibration input

3.   FUNCTIONAL CHARACTERISTICS

3.1   General

The Endevco Model 4990A-1 performs bi-directional communication with a computer through a 10 Mbps Ethernet bus. Each rack and module is assigned a unique address. The 4990A-2 rack communicates with the 400 family of signal conditioning cards through a half-duplex multi-drop EIA-232 bus running at 9.6 or 19.2 kbps in a Master/Slave mode.

The Model 4990A only activates the communication bus as required by software polling or fault reporting. This feature insures low noise operation.

3.2   Mechanical Characteristics

The Model 4990A consists of:

- CE certified 19" rack per IEC-297

- Power supply

- Power entry module with on/off switch

- Fuse

- Fan

- Computer interface port

- Module interconnect/power distribution PCB

- Four 25 pin "D" signal output connectors

- Calibration input BNC

- Card guides for installation of 16 signal conditioning cards

- Two 8 position DIP switches to set computer interface parameters.

The front side of the rack provides access to the front panels of the signal conditioning modules, the signal output connectors, the computer interface port, and the calibration input BNC connector. The rear side has the power entry module with on/off switch, fuse and fan.

The brackets for mounting the rack into a standard 19" cabinet and the handles are mounted on the front side. The handles and brackets can be mounted on the rear side at the factory if required.

The rack is designed to be used in 19" cabinets or stand-alone on the bench top. For bench top applications the unit can be mounted in an optional Endevco Model EHM1616 powder-coated shell. This option offers the following features:

- Light gray powder coat finish (RAL 7035).

- Tilt feet in the front, static feet in the rear.

- Integrated folding carrying handles on the sides.

3.3   Model 4990A-1: Ethernet Option

In the Model 4990A-1 the EDAS monitors 32 discrete hardware lines that provide status on the presence, absence and fault condition of each card, speeding up all control operations issued via the Ethernet.

3.4   Model 4990A-2: RS-232 Option

The Model 4990A-2 uses the EIA-232 interface with a baud rate of 9.6 or 19.2 kbps to communicate with the controlling PC. The communication function in the rack is simply an extension of the EIA-232 connection between the controlling PC and the rack.

Card faults are detected in the Model 4990A-2 by polling the addresses corresponding to each slot.

4.   INSTALLATION AND COMMUNICATION

To help you get started using your OASIS 2000 with the fewest manuals in front of you as possible, we've put all the basic information needed in this section.   Once the system is unpacked, setup, and running, refer to the following instruction manuals for detailed information and specifications:

IMSW2000   Instruction Manual for the OASIS configuration software

IM428   Instruction Manual for the two channel PE/ISOTRON amplifier

IM433   Instruction Manual for the three channel PE/ISOTRON amplifier

IM436   Instruction Manual for the three channel DC amplifier

IM482   Instruction Manual for the eight channel SMART MODAL/ISOTRON amplifier

You will only receive the Instruction Manuals for the units you purchased. If you do not have these documents contact Endevco before proceeding

4.1   Unpacking

CAUTION

OBSERVE SOUND ESD PRACTICES WHEN HANDLING THE SIGNAL CONDITIONING MODULES TO PREVENT DAMAGE.

The Endevco Model 4990A rack is shipped with its instruction manual, accessories and power cord in one package. The Model 400 series signal conditioning modules are shipped together with their instruction manual and accessories, and the OASIS 2000 software is shipped individually with its instruction manual. Carefully unpack and check all items for shipping damage. Report any damage to the carrier immediately. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. Save the original packing materials for future shipments of the hardware. Check each item of the shipment against the packing list. Verify that all ordered optional accessories are included. Notify Endevco of any discrepancy.

4.2   Installation

Set the Model 4990A on a level, firmly supported surface. The weight of an empty 4990A is approximately 24 pounds (35 pounds with the optional powder coated shell assembly). Add 12 ounces (340 grams) per amplifier card.

Insure sufficient clearance of the top and rear of the rack for proper operation of the ventilation system. Insure the fan and chassis vents are not blocked. The internal temperature should not exceed 28° C.   Observe the environmental limitations of temperature and humidity when installing the rack.
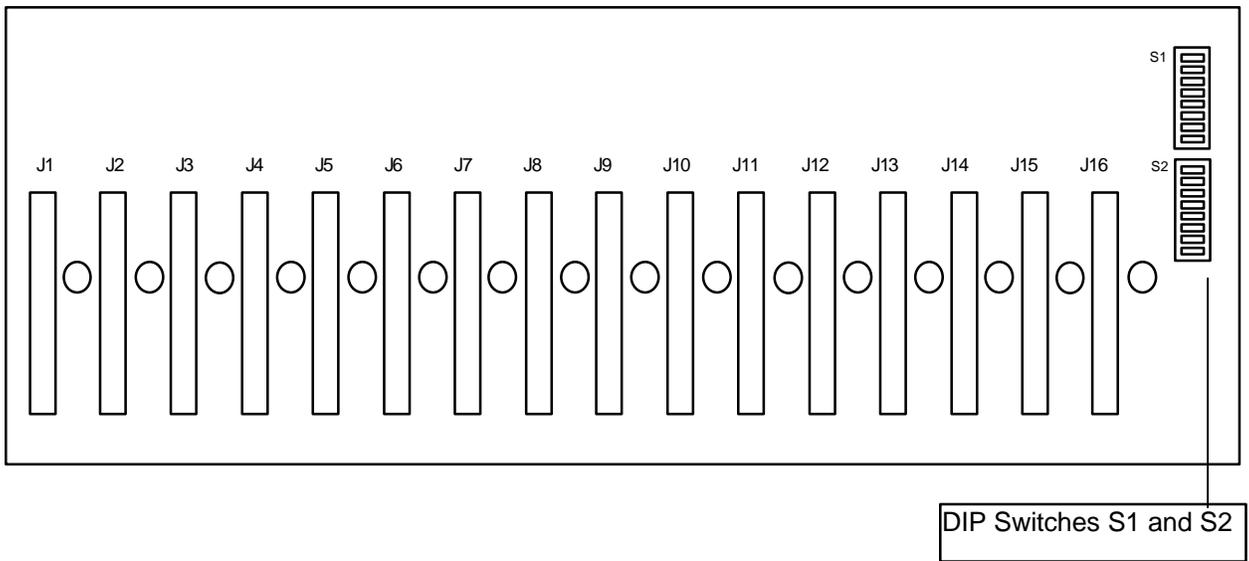
- Operating Temperature: 32° F to 122° F (0° C to 28° C)

- Storage Temperature: -40° F to 185° F (-40° C to 85° C)

- Operating Humidity: 0 % to 90 % non condensing

With no cards installed, look inside the 4990A rack from the front. On the backplane, above and to the right of card slot 16 you will see two 8 position DIP switches. Verify the DIP switches are set for the type of Model 4990A you have. Refer to the model number label on the rear of the
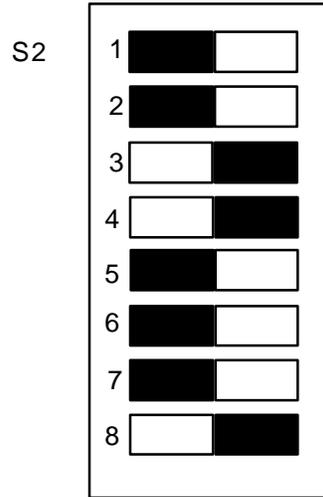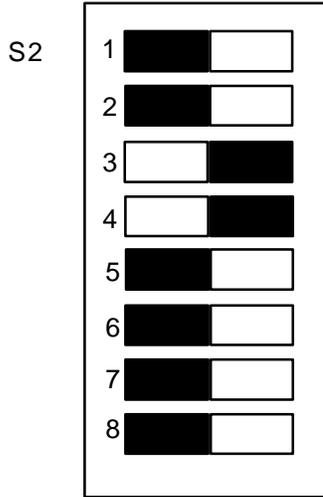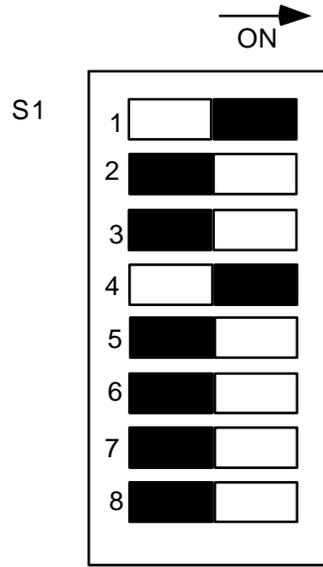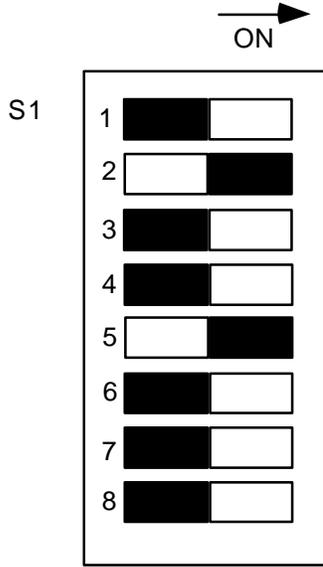
unit and the default switch settings shown in paragraphs 4.3 and 4.4. You either have a Model 4990A-1 (Ethernet and RS232 control) or a Model 4990A-2 (RS232 control only).

Once the DIP switches are set to the appropriate position, install the Model 400 series signal conditioning modules into the front side of the 4990A. Carefully align the modules with the card guides, push the modules into the rack and secure them with the attached mounting screws. Install the narrow blank panel to the right of slot 16. If your rack has less than 16 cards, install the optional blank panels. Check that all modules and blank panels are secure in the rack.

DIP Switches S1 and S2

ON

S1

1		
2		
3		
4		
5		
6		
7		
8		

ON

S1

1		
2		
3		
4		
5		
6		
7		
8		

S2

1		
2		
3		
4		
5		
6		
7		
8		

S2

1		
2		
3		
4		
5		
6		
7		
8		

4990-1

4990-2

4.3   Default Jumper Settings for Ethernet Rack (4990A-1):

POS	S1 SWITCH SETTING	REMARK	S2 SWITCH SETTING	REMARK
1	OFF	(ON for snoop mode)	OFF	
2	ON	EDAS RX ← → back plane RX	OFF	
3	OFF		OFF	(ON for snoop mode)
4	OFF	(ON for snoop mode)	OFF	(ON for snoop mode)
5	ON	EDAS TX ← → back plane TX	X	
6	OFF		X	
7	X		X	
8	X		OFF	baud rate = 19.2 kbd

4.4   Default Jumper Settings for RS-232 Rack (4990A-2):

POS	S1 SWITCH SETTING	REMARK	S2 SWITCH SETTING	REMARK
1	ON	front panel RX ← → back plane RX	OFF	(use POS1 ON for reversed cable, TX <- -> RX)
2	OFF		OFF	(use POS2 ON for reversed cable, RX <- -> TX)
3	OFF		ON	straight cable (TX ← → TX)
4	ON	front panel TX ← → back plane TX	ON	straight cable (RX ← → RX)
5	OFF		X	
6	OFF		X	
7	X		X	
8	X		ON	baud rate = 9.6 kbd (OFF for 19.2kbd)

5.   **POWERING UP OF THE RACK ASSEMBLY AND ESTABLISHING COMMUNICATION**

CAUTION:

PRIOR TO INSERTING THE POWER CORD INTO THE POWER ENTRY MODULE, VERIFY THE FOLLOWING:

5.1   Apply Power

Power source is between 90 and 264 VAC, 47 to 440 Hz.

Check that the installed fuse is the same rating as labeled on the rack next to the power entry module. The fuse is located in the power entry module, on the outside of the rear panel

Check that the common connection (third wire) of the power source is connected to earth ground.

5.2   Computer Interface

Connect the Ethernet interface cable between the RJ45 connector on the 4990A-1 and network hub or repeater connection. If you connect the host computer's 10BASE-T network interface card (NIC) directly to the 4990A-1 you must use a crossover cable. A crossover cable is a twisted pair patch cable wired in such a way as to route the transmit signals from one piece of equipment to the receive signals of another piece of equipment, and vice versa. The maximum length of cable is 100 meters. If you plan on building your own cables see Appendix A

OR

Connect the RS-232 interface cable between the 9 pin "D" connector on the 4990A-1 or 4990A-2 and one of the host computer's COM ports. The maximum length of cable is 15.2 meters. The cable is a standard serial interface cable, straight pinning.

Power up the Model 4990A by activating the switch on the power entry module. Verify the fan is operating.

5.3   Installing the OASIS SW2000 Software. (Windows 95/98)

Insert the OASIS CD in the CD drive and run the SETUP.EXE program. If your CD's autorun capability is active the setup program will run automatically.

All files will be installed into C:\"default directory" usually:

C:\Program Files\Endevco\OASIS (for SW2000 software)

C:\Program Files\Endevco\OASIS (for SW400 software)

An OASIS Program Item will be created.

To run OASIS, click on the Windows "Start" button then Programs>>Endevco>>OASIS

5.4   Establishing Communication

The OASIS Configuration Editor screen is the main application screen. When the program is run, this screen is displayed and the mode is defaulted to OFFLINE, as evidenced by the red HARDWARE OFFLINE indicator visible below the ENDEVCO text

This spreadsheet-like table allows a user to quickly setup channels for an entire system of 400 series units.

OASIS Configuration Editor - Untitled

File Edit Amplifiers Tools Help

ENDEVCO

Hardware Offline   Operate On ▲▼ All   Selected Amplifiers

Rack	1	1	1	1	1	1	1	1	1	1		
Amplifier Address / Slot #	7	7	8	8	8	8	8	8	8	8		
Channel	1	2	1	2	3	4	5	6	7	8		
Amplifier / Card Type	428	428	482	482	482	482	482	482	482	482		
Status												
Amplifier Output												
AMPLIFIER SETTINGS												
Sensor Power (mA or V)			OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		
Output Select			Ch 1	Ch 1	Ch 1	Ch 1	Ch 1	Ch 1	Ch 1	Ch 1		
Output Scaling (V/EU)	0.013	90.91	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
FS Input Range (EU)	80.00	0.011	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000		
FS Output Range (V)	1.000	1.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000		
Gain	1.250	9091	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00		
Input Select	Volts	Volts										
Isolation	OFF	OFF										
HP Filter (Hz, -3dB)												
LP Filter (kHz, -3dB)	10.00	10.00	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		
Shunt Check												
Modes	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal		
Report Errors	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		
SENSOR DATA												
Sensitivity (mV or pC/EU)	10.00	10.00	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		
Sensor Type												
Position**												
Manufacturer												
Model Number												
Serial Number**												
Calibration Date**												
USER FIELDS												
Notes												
A/D Ch#												
Sig Cond Ch#												
Sensor Cal Due Date												
Number												

Error ☐   Modify settings by selecting within a settings row. Click on row title to move selection to that row. Enable menu Amplifier Functions by selecting within the Channel row.

Click on the red HARDWARE OFFLINE indicator to establish communication between the computer and hardware. The indicator should turn white and read HARDWARE ONLINE. This screen will immediately appear:
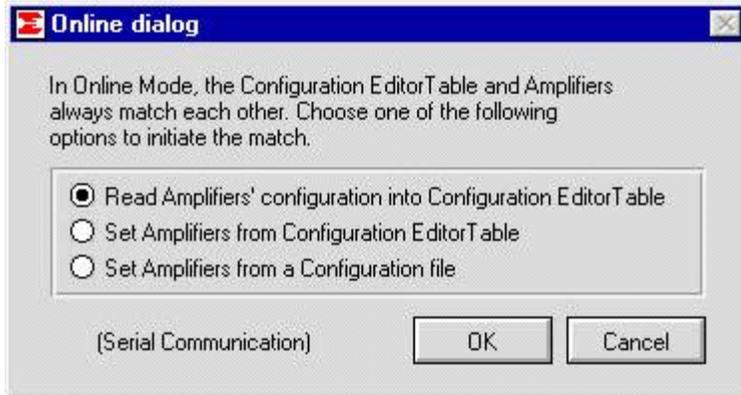
Make your selection and click OK.

The OASIS software can communicate with Model 400 units in a 4990A rack either serially or through an Ethernet connection. The Options dialog box is provided to set the appropriate communication parameters for an installation. To access the Options dialog box click on the Edit drop down menu and select Options. The following screen will appear:

5.4.1   RS-232 Serial Communication Control

If RS-232 communications is selected then the following parameters must be specified:

- Comm Port - Select the Comm port that is connected to the 4990A Rack.

- Baud Rate - Select the baud rate that matches the setting of the 4990A Rack. The 4990A Rack is limited to 9600 or 19200. The options available in this pull down menu will be determined by the Unit Type setting.

- Unit Type - Select which type of units are in the configuration. This setting not only determines the appropriate options for the baud rate selection but also informs OASIS of the unit types when it is in OFFLINE mode so it can provide the appropriate indications where unit type is displayed.

5.4.2   Ethernet Communication Control

When Ethernet is selected as the communication type, the Ethernet communication controls become active.

- Ethernet Addresses Table - This tables purpose is to assign a rack number to each physical rack in the system. Since the Oasis controller software uses rack and slot number locations to identify amplifier cards in the system, each physical rack needs to be assigned a different rack number from 1 to 16.

Every device on an Ethernet network must have a unique set of Ethernet addresses. Therefore, a rack's set of Ethernet addresses is used to identify which physical rack is assigned to which rack number in the table.

Below are the steps to assign and store Ethernet addresses for a rack:

1. Select a rack (row) in the table.

2. Enter in the table the desired Ethernet addresses for the selected rack.

3. Click on the "Write Rack" button and follow the displayed instructions for setting up the selected rack to receive and store Ethernet addresses.

4. Click on the "Test Rack" button and follow the displayed instructions for setting up the selected rack to verify Ethernet communication.

- Active Racks Checkboxes - These checkboxes to the left of the Ethernet Addresses Table, allow a user to make a rack active/inactive (start/stop communication with it) without having to re-enter/delete its Ethernet address data in the table.

- Read Rack Button - Reads the Ethernet addresses from the actual rack which is setup and connected for Ethernet addressing into the selected rack in the table. (Instructions are displayed for setting up and connecting the rack for Ethernet addressing.)

- Write Rack Button - Writes the selected rack's Ethernet addresses in the table to the actual rack which is setup and connected for Ethernet addressing. (Instructions are displayed for setting up and connecting the rack for Ethernet addressing.)

- Test Rack Button - Verifies Ethernet communication with the selected rack in the table. (Instructions are displayed for setting up and connecting the rack for Ethernet communication.)

- Move Up Button - This is a table editing aid which moves the table's selected Ethernet addresses up one row. (It exchanges the selected row's Ethernet addresses with the row above it.)

- Move Down Button - This is a table editing aid which moves the table's selected Ethernet addresses down one row. (It exchanges the selected row's Ethernet addresses with the row below it.)

- All Inactive Button - Unchecks all the active racks checkboxes.

- All Active Button - Checks all the active racks checkboxes.

5.4.3   Ethernet Addressing Guidelines

The host computer must have a 10BASE-T Ethernet Network Interface Card installed and you must know the IP address, subnet mask, and installed gateway of the host computer.

All devices on a given network must have the same Subnet Mask.

Each device on a network must have the same Network ID portion of the IP address. (The numbers in the IP Address corresponding to the 255s in the Subnet Mask)

Each device on a network must have a different Host ID portion of the IP address. (The numbers in the IP Address corresponding to the 0s in the Subnet Mask)

All devices on a given network must have the same/valid Gateway Address if they are communicating across networks.

Configuring the Model 4990A Rack

After entering the IP address, subnet mask and gateway address for all active racks, this information must be written to the 4990A racks. Prior to writing data to the 4990A, the DIP switches on the backplane, above and to the right of card slot 16 must be set to the positions in the following table:

POS	S1 SWITCH SETTING	REMARK	S2 SWITCH SETTING	REMARK
1	OFF		OFF	
2	OFF		OFF	
3	ON	EDAS RX ← → front panel RX	ON	EDAS TX ← → front panel TX
4	OFF		ON	EDAS RX ← → front panel RX
5	OFF		X	
6	ON	EDAS TX ← → front panel TX	X	
7	X		X	
8	X		X	baud rate = 9.6 or 19.2 kbd

On the Options screen click on Write Rack. The following window will appear:
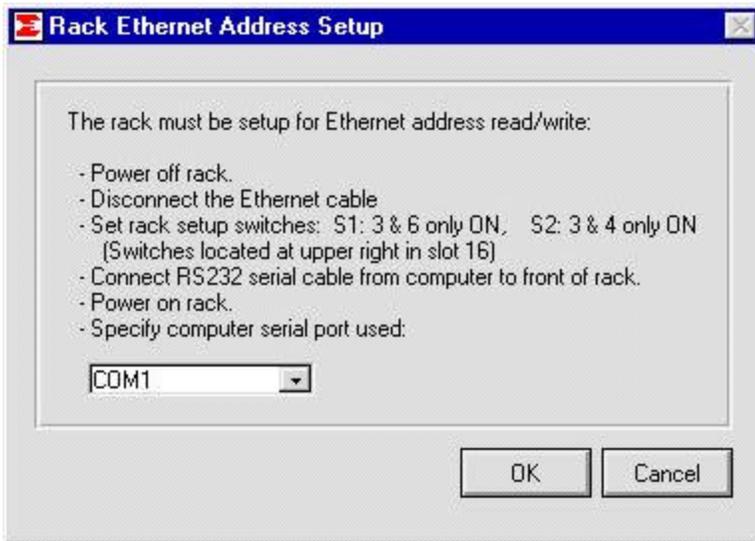
Follow the instructions and click OK. A write failure will produce the following window:

Correct the problem and click OK.

If you suspect the Ethernet NIC, cable, or hub may be the cause of the failure:

Identify a vacant serial (COM) port on the host computer

Connect a serial (RS-232) cable between this port and the 9 pin "D" connector on the 4990A.

Set the DIP switches for serial communication per paragraph 3.3

If the 4990A responds, check the hardware (NIC, cable, hub) and check for a correct IP address, subnet mask and gateway address.

Once you have the correct IP address, subnet mask and gateway address displayed in the Options window, set the DIP switches as follows:

POS	S1 SWITCH SETTING	REMARK	S2 SWITCH SETTING	REMARK
1	OFF	(ON for snoop mode)	OFF	
2	ON	EDAS RX ← → back plane RX	OFF	
3	OFF		OFF	(ON for snoop mode)
4	OFF	(ON for snoop mode)	OFF	(ON for snoop mode)
5	ON	EDAS TX ← → back plane TX	X	
6	OFF		X	
7	X		X	
8	X		OFF	baud rate = 19.2 kbd

On the Options screen click on Test Rack. The following window will appear:

Follow the instructions and click OK. The following window will be displayed while the computer is establishing communications with the rack:
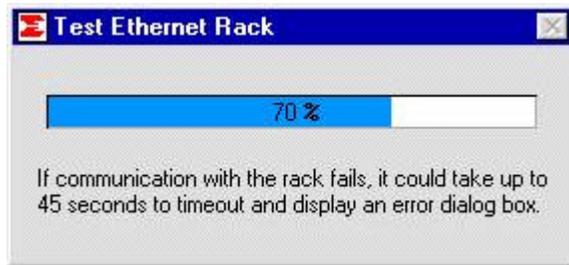
If communication with the rack fails, the following window will be displayed:
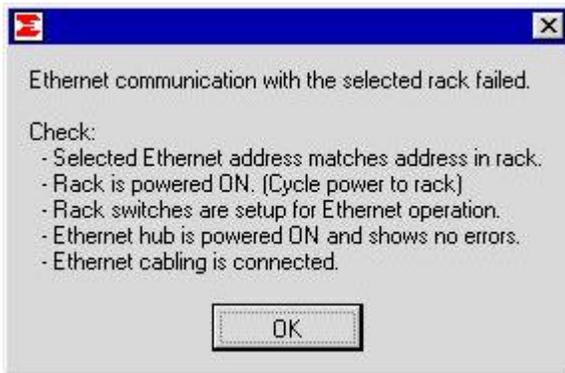
Correct the errors and click OK.

If you suspect the Ethernet NIC, cable, or hub may be the cause of the failure:

Identify a vacant serial (COM) port on the host computer

Connect a serial (RS-232) cable between this port and the 9 pin "D" connector on the 4990A.

Set the DIP switches for serial communication per paragraph 4.3

If the 4990A responds, check the hardware (NIC, cable, hub) and check for a correct IP address, subnet mask and gateway address.

6.   OPERATION

6.1   Connecting Sensors to OASIS 2000

6.1.1   Model 428 Two Channel PE/ISOTTRON Amplifier

Both channel 1 and channel 2 input connectors are BNC. If the cable termination is 10-32 Microdot, use the BNC to 10-32 Microdot adapter supplied with the Model 428 to make the connection.

The analog output signals are available at the two BNC output connectors, and also at one of the four 25-pin "D" connectors on the 4990A rack. Which connector depends on which slot the 428 board resides in. See paragraph 6.2.1 for pin assignments.

6.1.2   Model 433 Three Channel PE/ISOTRON Amplifier

All three input connectors are BNC. If the cable termination is 10-32 Microdot, use the BNC to 10-32 Microdot adapter supplied with the Model 433 to make the connection.

The analog output signals are available at the three BNC output connectors, and also at one of the four 25-pin "D" connectors on the 4990A rack. Which connector depends on which slot the 433 board resides in. See paragraph 6.2.1 for pin assignments.

6.1.3   Model 436 Three Channel DC Amplifier

The Model 436 should warm up for one hour prior to taking data.

All three input connectors are 9 pin "D". The input pin assignments are as follows:

- Pin 4:   S- Sensor Signal Input (White wire of Endevco bridge)

- Pin 5:   S+ Sensor Signal Input (Green wire of Endevco bridge)

- Pin 7:   P+ Excitation Voltage (Red wire of Endevco bridge)

- Pin 8:   P- Excitation Voltage (Black wire of Endevco bridge)

CAUTION: If remote sensing is NOT used, pin 7 and pin 1 must be shorted together and pin 8 and pin 6 must be shorted together to avoid damage to the sensor.

The analog output signals are available at one of the four 25-pin "D" connectors on the 4990A rack. Which connector depends on which slot the 436 board resides in. See paragraph 6.2.1 for pin assignments.

6.1.4   Model 482 Eight Channel SMART MODAL/ISOTRON Amplifier

The eight SMART MODAL/ISOTRON inputs are connected to a 26 pin double density "D" connector on the 482 module front panel.

The optional model 36019 Input Breakout Panel provides a one to one input connection interface for up to 32 channels of Smart ISOTRON or Non-Smart Sensors connected to a maximum of four OASIS Model 482 Smart ISOTRON Signal Conditioning Cards. This Input Breakout Panel provides a quick-interface panel to attach BNC input connectors with minimal effort. The output of this panel mates to the female double-density 26-pin subminiature input connectors of the Model 482 card.

Pin-assignments are as follows:

Pin	Function
2	Signal 1
3	Return 1
5	Signal 2
6	Return 2
8	Signal 3
9	Return 3
11	Signal 4
12	Return 4
14	Signal 5
15	Return 5
17	Signal 6
18	Return 6
20	Signal 7
21	Return 7
23	Signal 8
24	Return 8

All analog outputs are accessible via the two 9 pin "D" connectors on the 482 module front panel. One of the eight ISOTRON outputs is directed, under software control, to the BNC connector on the front panel for bank switching.

Due to the high number of outputs, the analog output signals are not available at any of the four 25-pin "D" connectors on the 4990A rack.

The optional model 36020 provides a one to one output connection interface panel for up to four OASIS Model 482 amplifier cards. This output breakout panel provides an interface panel to quickly attach BNC connectors for DMM's, Oscilloscopes and follow-on instrumentation. The input of this panel mates to the output of the female, 9-pin "D" connectors of the Model 482 Smart ISOTRON amplifier card.

J3 Pin	Function	J4 Pin	Function
1	Signal channel 4	1	Signal channel 8
2	Return channel 4	2	Return channel 8
3	(Shield channel 4)	3	(Shield channel 8)
4	(Shield channel 3)	4	(Shield channel 7)
5	Signal channel 3	5	Signal channel 7
6	Return channel 3	6	Return channel 7
8	Signal channel 2	8	Signal channel 6
9	Return channel 2	9	Return channel 6
10	(Shield channel 2)	10	(Shield channel 6)
11	(Shield channel 1)	11	(Shield channel 5)
12	Signal channel 1	12	Signal channel 5
13	Return channel 1	13	Return channel 5

6.2   Connecting the Analog Outputs

The analog outputs are available at the front of all the Model 400 series signal conditioning modules except the Model 436. The analog outputs are available at one of the four 25 pin DB connectors on the front of the Model 4990A Rack except the Model 482.

The optional model 36021 is a 24-Channel Breakout Panel that connects to the OASIS Rack Model 4990A DB-25 output connectors, adapting them to convenient BNC connectors. This Breakout Panel can be used to connect equipment such as oscilloscopes, data acquisition systems, DMM's etc., to the Endevco OASIS system rack Model 4990A. This 24-channel Breakout Panel is an option when OASIS Model 428, 433 and 436 series cards are installed.

6.2.1   Pin assignment of the 25 pin "D" connector:

system channel	rack slot	card ch	panel connector 1 signal pin	return pin
1	1	1	16	3
2	1	2	15	2
3	1	3	14	1
4	2	1	17	4
5	2	2	18	5
6	2	3	19	6
7	3	1	22	10
8	3	2	21	9
9	3	3	20	8
10	4	1	23	11
11	4	2	24	12
12	4	3	25	13

system channel	rack slot	card ch	panel connector 2 signal pin	return pin
13	5	1	16	3
14	5	2	15	2
15	5	3	14	1
16	6	1	17	4
17	6	2	18	5
18	6	3	19	6
19	7	1	22	10
20	7	2	21	9
21	7	3	20	8
22	8	1	23	11
23	8	2	24	12
24	8	3	25	13

system channel	rack slot	card ch	panel connector 3 signal pin	return pin
25	9	1	16	3
26	9	2	15	2
27	9	3	14	1
28	10	1	17	4
29	10	2	18	5
30	10	3	19	6
31	11	1	22	10
32	11	2	21	9
33	11	3	20	8
34	12	1	23	11
35	12	2	24	12
36	12	3	25	13

system channel	rack slot	card ch	panel connector 4 signal pin	return pin
37	13	1	16	3
38	13	2	15	2
39	13	3	14	1
40	14	1	17	4
41	14	2	18	5
42	14	3	19	6
43	15	1	22	10
44	15	2	21	9
45	15	3	20	8
46	16	1	23	11
47	16	2	24	12
48	16	3	25	13

Note: Pin 7 of each DB25 connector is connected to CHASSIS GND.

Now that communication has been established between the computer and the rack you are ready to configure and operate the amplifier cards.

7. <u>SAFETY</u>

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. ENDEVCO assumes no liability for the customer's failure to comply with these requirements.

7.1 Ground The Instrument

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

7.2 Do Not Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a safety hazard.

7.3 Keep away from live circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

7.4 Do Not Service Or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

7.5 Do Not Substitute Parts Or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to ENDEVCO for service and repair to ensure that safety features are maintained.

7.6 Dangerous Procedure Warnings

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

> ## WARNING
>
> **Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.**

7.7   Safety Symbols

General Definitions of Safety Symbols Used On Equipment or In Manuals.

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument
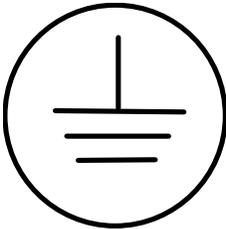
Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating the equipment.

DANGER The DANGER sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which could result in injury or death to personnel even during normal operation.

WARNING The WARNING sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.
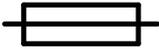
CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

7.8   Line Fuse

Verify that the correct line fuse is installed before connecting the line cord.

**100/115/230 VAC
50/60 Hz
3/3/1.5 A**

250 V, 3A, T

CE

⚠

CAUTION: For continuous protection against fire replace with same type of fuse only!

ACHTUNG: Zur Vermeidung von Brandgefahr darf die Sicherung nur durch identischen Typ ersetzt werden!

ATTENTION: Afin d'éviter tous risques de feu, n'utiliser que de fusible du même type!

PRECAUCION: Para proteccion contra fuego remplace fusible con el mismo tipo de fusible solamente!

7.9   Troubleshooting Tips

To aid in troubleshooting the rack, access to the power supply and module interconnect PCB is gained with the rear panel dropped down to the open position.

7.9.1   4990A or cards do not respond check:

Power applied to 4990A rack. Check fuse. Fan must be audible, air flow must be present.

WARNING

LETHAL VOLTAGES ARE PRESENT AT THE POWER ENTRY MODULE. USE EXTREME CAUTION WHEN PERFORMING THE NEXT STEPS

Check DC voltages inside on back plane. Jumpers W2/W4/W7/W8/W9 are labeled with their appropriate voltages.

Serial cable/Ethernet cable connected?

Type of Ethernet cable to RJ-45 connector on front panel. Must be crossover when connecting computer directly to the 4990A, straight when connecting the 4990A to hub or repeater.

Type of serial cable (straight TX = 2, RX = 3 at 4990A end), if null-modem cable is used, change DIP switch S1 position 1 to ON. (See paragraph 4.3.)

Baud rate identical for OASIS 2000 software and for 4990A rack?

Check if card is plugged in properly. Connector must latch, LED must be on.

Check card function. When powered on, LED must go from OFF --> red --> green/red (depending on fault status).

Cards will blink upon receiving serial data in the proper format.

7.9.2   Cards display/report fault status check:

Is a channel fault enabled for an unused channel?

Are all inputs of enabled channels connected to a sensor?

Check break-out box connected to input connector!

Check sensor cable

Check voltage across ISOTRON sensor, must be 10VDC to 14VDC. (Models 482, 433, and 428 in ISOTRON mode)

Obtain fault status in OASIS 2000 software menu

7.9.3   No signal on output check:

If BNC output is used, check if proper channel is selected in OASIS 2000 menu. (Model 482)

Is the output cable connected to the proper 25 pin "D" output connector?

If card has just been powered on, exposed to extreme signal, or gain has just been switched, or cable/sensor has just been connected wait 2 minutes for signal to settle down (ISOTRON sensors)

8.   ROUTINE MAINTENANCE AND HANDLING

8.1   Introduction

The OASIS 2000 is a self-contained electronic instrument that requires minimal maintenance.

The OASIS 2000 is designed to require no component-level repair by the user. However, detailed schematics are available upon request.

The periodic maintenance function performed by the user is quality calibration. Any component failures simply require the user to return the failed 4990A rack or 400 series amplifier to ENDEVCO for repair/replacement.

Should a faulty unit be returned to Endevco, it is suggested that the original or equivalent packaging be used. This will reduce damage to the equipment during shipment.

8.2   Factory Service

ENDEVCO maintains factory service repair for all ENDEVCO instruments. To obtain repair or replacement of a defective instrument, place a call to ENDEVCO to obtain a return material authorization number (RMA), then return the instrument to the factory at the following address:

ENDEVCO

30700 Rancho Viejo Road

San Juan Capistrano, CA 92675

TEL: 949-493-8181

FAX: 949-661-7231

Email: applications@endevco.com

Web Site: http://www.endevco.com

To return an instrument, please:

Ensure proper packaging, preferably the original shipping cartons.

Prepay shipping and insurance charges.

Attach the Return Material Authorization (RMA) number from ENDEVCO and include any information that may be pertinent to the description of the failure/problem.

8.3   WARRANTY

ENDEVCO warrants each new electronic instrument to be free from defects in material and workmanship. Please refer to the appropriate Warranty Policies for the terms and warranty period. Instruments returned under warranty will be repaired or replaced at no charge, if the failure is due to defective material or workmanship; and the unit is returned within the time period and conditions of Endevco's warranty policy.

8.4   OUT-OF-WARRANTY RETURNS

Enclose a purchase order not to exceed $300.00, authorizing repair/calibration along with a full explanation of the failure or symptoms observed to help in fixing the problem.   The instrument will be repaired/calibrated, returned and invoiced for the actual repair charges. If the instrument

cannot be repaired for $300.00 or less, ENDEVCO will submit a written quotation for the cost of the repair and/or replacement of the unit.

9.   ORDERING INFORMATION & ACCESSORIES

ENDEVCO Model 4990A must be specified in the following manner: 4990A-X

- 4990A-1 for Ethernet and RS232

- 4990A-2 for RS-232 only

Description	Endevco Part No.	Quantity Supplied
IEC 320 AC Power Cord	EW599	1
Instruction Manual	IM4990A	1

9.1   OASIS Part Numbers

428	2 Channel PE/ISOTRON Board
433	3 Channel PE/ISOTRON Board
436	3 Channel DC Amplifier Board
482	8 Channel Smart MODAL/ISOTRON Board

9.2   Model 400 Series Accessories

For a complete list of accessories and options refer to the following documents:

IMSW2000   Instruction Manual for the OASIS configuration software

IM428   Instruction Manual for the two channel PE/ISOTRON amplifier

IM433   Instruction Manual for the three channel PE/ISOTRON amplifier

IM436   Instruction Manual for the three channel DC amplifier

IM482   Instruction Manual for the eight channel SMART MODAL/ISOTRON amplifier

You will only receive the Instruction Manuals for the units you purchased. If you did not receive these manuals please contact Endevco.

APPENDIX A
Making Ethernet Twisted-Pair Patch Cables

The 10BASE-T media system uses two pairs of wires, which are terminated in an eight pin RJ-45 connector. A male RJ-45 plug is mounted on each end of the twisted pair cable. A female RJ-45 jack is integrated into the Ethernet hub or NIC. The transmit and receive data signals on each pair of a 10BASE-T segment are polarized, with one wire of each signal pair carrying the positive (+) signal, and the other carrying the negative (-) signal. A common error when connecting the computer to a Model 4990A is to make the connection with the widely available "silver satin" patch cable typically used to connect telephones to a telephone jack. The problem is that the typical silver satin cable used for telephones does not have twisted wire pairs in it. This lack of twisted pairs results in excessive signal crosstalk and can cause "phantom collisions." This occurs because collisions are detected in twisted-pair Ethernet by the simultaneous occurrence of signals on the transmit and receive wire pairs. Excessive crosstalk signals can look like simultaneous traffic and can falsely trigger the collision detect circuit.

This can result in "late collisions," which are collisions that occur too late in the transmission of an Ethernet frame. A normal collision results in the immediate retransmission of a frame by the Ethernet interface. However, a late collision results in a lost frame that must be detected and retransmitted by the application software. Retransmission by the application is a lot slower and can lead to a severe loss of application performance over the network. This problem can be avoided by using only twisted-pair patch cables rated for use in twisted-pair Ethernet systems.

The following table shows the RJ-45 connector pin assignments

Contact	10Base-T Signal
1	TD+ (Transmit Data)
2	TD- (Transmit Data)
3	RD+ (Receive Data)
4	Not used
5	Not used
6	RD- (Receive Data)
7	Not Used
8	Not Used