

ERA-01 Electromechanical 8-Channel SPDT Relay Output Accessory Board

Description

Mounted in a covered plastic box, the ERA-01 board provides eight Form C electromechanical relays driven by the "PB" port of a digital I/O board or a DASCON-1 board. The relays can be used for general switching purposes, setting up test configurations, power switching, etc. The NO (normally open), NC (normally closed) and C (common) relay contacts are connected to screw terminals. Each relay is energized when the associated "PB" port bit is a logic "1." A red LED adjacent to each relay lights when the relay is energized.

Additionally, the ERA-01 provides screw terminals connected directly to the lower four bits of the digital I/O "PC" port bits, PC0 through PC3 (and to 10 K Ω pull-ups as well). These bits, which can be configured as either inputs or outputs, are therefore available for additional digital I/O. When the ERA-01 is used with a PIO-12, PIO-24, DAS-1200, or DAS-1600 card, the upper four bits of the digital I/O "PC" port (bits PC4 through PC7) are also connected directly to screw terminals.

The ERA-01 may be powered by the 5 VDC supply of the computer. Alternatively, the ERA-01 may be powered externally from a regulated +5 VDC supply or a Keithley OPA-01 10 VAC adapter. The ERA-01 converts external AC to regulated +5 VDC.

A user-circuit area is provided, consisting of a matrix of 8 x 13 solder pads, on 0.1" centers, and adjacent solder pads supplied with +5 VDC power.

The ERA-01 layout is shown in Figure 1. Screw terminal connections are defined in Table 1.

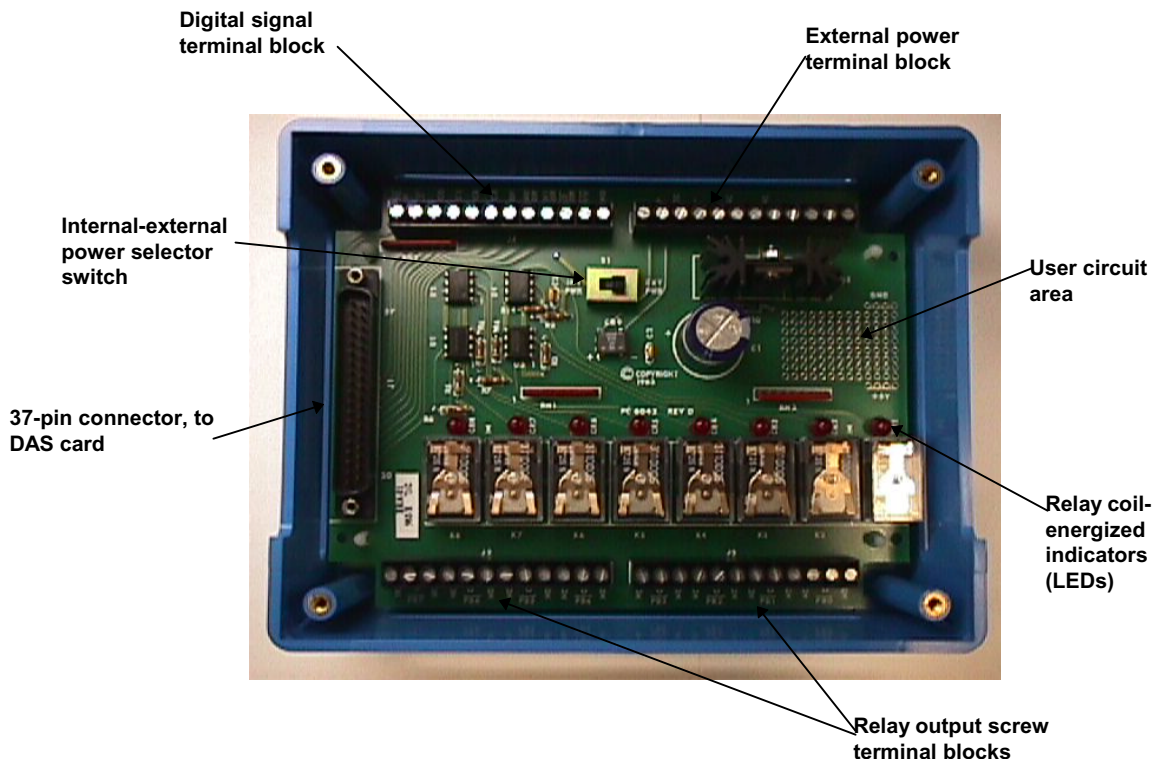


Figure 1. Layout of ERA-01 relay output accessory board

Table 1. Screw terminal definitions

Screw terminal block	Screw terminal label	Signal identity		Directly attached pin on D connector (J1)		
		When the ERA-01 is connected to DASCON-1 card	When the ERA-01 is connected to a PIO-12/PIO-24 card or to a DAS-1200/DAS-1600 card (at auxiliary connector)			
Relay outputs (J2 and J3)	PB0, PB1, PB2,...PB7 - NO (normally open) - C (common) - NC (normally closed)	Relay contacts corresponding to digital outputs PB0, PB1, PB2,... and PB7 from the digital I/O "PB" port		N/A*		
Digital signals (J5)	$\overline{\text{IRQ IN}}$	$\overline{\text{INTERRUPT INPUT}}$		1		
	$\overline{\text{CC}}$	$\overline{\text{CONV COMP}}$		2		
	PC0	PC0	Directly from lower bits of the digital I/O "PC" port. (A 10 K Ω pull-up resistor is attached to each.)	PC0	Directly from lower bits of the digital I/O "PC" port.	29
	PC1	PC1		PC1	(A 10 K Ω pull-up resistor is attached to each.)	28
	PC2	PC2		PC2		27
	PC3	PC3		PC3		26
	$\overline{\text{BSY}}$	$\overline{\text{BUSY}}$		PC4	Directly from upper bits of the digital I/O "PC" port (no pull-up resistors)	25
	CH0 ADR	CH ADDR 0		PC5		24
	CH1 ADR	CH ADDR 1		PC6		23
	$\overline{\text{LD ADR}}$	$\overline{\text{LD CH ADDR}}$		PC7		22
	$\overline{\text{R/H}}$	$\overline{\text{RUN/HOLD}}$		Digital signal common		21
GND	Digital signal common		Digital signal common		11	
External power (J4)	AC	10 VAC from Keithley external adapter, part number OPA-01		10 VAC from Keithley external adapter, part number OPA-01	N/A	
	AC				N/A	
	DC -	Regulated 5 VDC from external supply		Regulated 5 VDC from external supply	11	
	DC +				N/A	

*N/A = not applicable

Specifications

Relays

Number of relays: 8
 Relay type: Form C (SPDT)
 Contacts: Silver alloy
 Contact rating: 3A at 125 Vrms or 28 VDC (resistive), Installation Category II
 Contact life, mechanical: 10 million operations
 Contact life, electrical: 100,000 operations at full load
 Operate time: 20 ms max.
 Release time: 10 ms max.

Other hardware

Breadboard area: 0.7 in x 1.2 in (1.78 cm x 3.05 cm) (8 x 13 solder pad matrix)
 PC bus power available: +5V
 Number of LEDs: (8 red, one per relay)

Environmental

Operating temperature range: 0 to 60 °C
 Storage temperature range: -40 to +100 °C
 Humidity: 0 to 90% non-condensing

Power and Signal Requirements

+5V power: 760 mA typical, 800 mA max. (all relays energized)
 Logic level to energize relay (make): "1" logic high
 Switching load current for relay "off" (break): 0.018 mA

Physical

Dimensions, with enclosure: 6.687 in L x 5.125 in W x 2.375 in H (17 cm L x 13.0 cm W x 6 cm H)

Dimensions, without enclosure: 6.187 in L x 4.687 in W x 1.3 in H (15.7 cm L x 11.9 cm W x 3.3 cm H)

Weight, with enclosure: 17 oz (0.482 kg)

Weight, without enclosure: 9 oz (0.285 kg)

Screw terminal wire spacing: 0.197 in (5 mm)

Screw terminal wire sizes: 12 - 22 AWG

Mounting holes (without enclosure): 0.125 in (3.17 mm)

Safety precautions

The following safety precautions should be observed before using this product and any associated instrumentation. This product may be used with hazardous voltages.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

General safety definitions


The types of product users are:


Responsible body is the individual or group responsible for the use and maintenance of equipment, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

If a grounding screw  is present, connect it to safety earth ground using the wire recommended in the user documentation.

The  symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Installation safety

As described in the International Electrotechnical Commission (IEC) Standard IEC 664, the signal terminals are Installation Category I and must not be connected to mains, except as noted in the specifications.

When connecting to sources, install protective devices to limit current and voltage to the card.

Operators and maintainers of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

Operation safety

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

Instrumentation and accessories shall not be connected to humans.

Maintenance and service for safety

Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

Before performing any maintenance, disconnect all power sources and test cables.

Cleaning

Keep the connections free of contaminants (such as dirt, oil, etc.) in order to maintain maximum insulation resistance. If the connections become contaminated, clean them thoroughly with methanol and allow them to dry completely before use.

To clean the exterior of the plastic box, use a damp cloth or mild, water based cleaner. Clean the exterior of the box only, never the circuit board. Do not apply cleaner directly to the box or allow liquids to enter or spill on the box.

Installation

Connecting the ERA-01 to the data acquisition card

You may use an optional C1800 cable to connect the ERA-01 to a data acquisition board. See Figure 2.

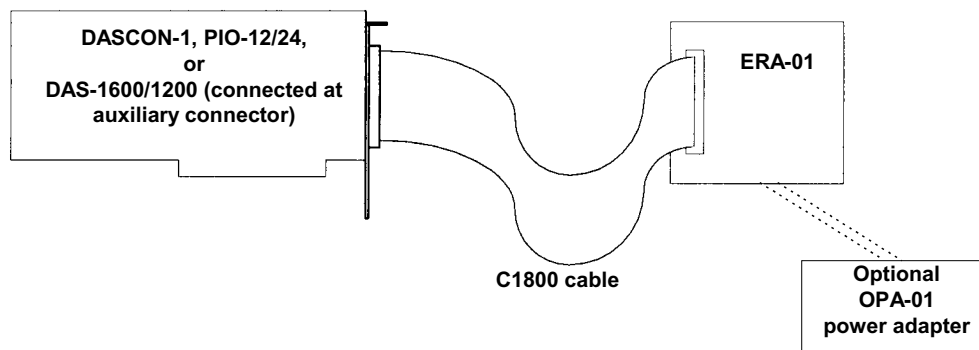


Figure 2. System configuration example

Connecting I/O signals to the screw terminals

The screw terminals and signals are identified in Figure 1 and Table 1. Logic levels and relay voltage and current limits are listed in the specifications. Refer to this information when making connections.

WARNING

Ensure that no high voltages are accidentally connected to the wrong ERA-01 screw terminals. Some of the ERA-01 screw terminals are directly connected to conductors in the digital I/O interface cable (i.e. the C1800 or equivalent cable). The maximum voltage allowed for a C1800 cable is 30V RMS, 42.4V peak, or 60VDC. Misconnected high voltages will not only damage the I/O board, and possibly the computer, but also can cause cable insulation failure and shock hazard.

Always install the cover on the plastic box when high voltages are connected to the relay terminals.

Power supply connections

The ERA-01 can be powered by the computer power bus or an external DC or AC power source. The information below will help you choose and use the best option for your situation.

Using the computer power bus

Each relay on the board consumes about 0.095 A when energized. If all relays are active, the board draws about 0.76 A from the computer +5 V power bus. The digital I/O board installed in the computer draws as much as 0.40 A. Therefore, the combined ERA-01 and I/O board can draw as much as 1.16 A from the +5 V power bus. If you know that this additional current will not overload the computer power bus, and you wish to operate the ERA-01 on internal computer power, then leave the internal-external power selector switch, S1, in the INT PWR position (toward the D connector).

Using an external power source

However, if the +5 V power bus is already connected to several accessory boards, adding the ERA-01 may cause an overload. If so, then power the ERA-01 externally. To use external power, first move the internal-external power selector switch, S1, to the EXT PWR position (toward the heat sink). Then connect ONE of the following power sources:

- Option 1: Connect a regulated +5 VDC power source to the +DC and -DC screw terminals, which are located on the external power terminal block (next to the heat sink).

CAUTION

Before turning on the DC power supply, ensure that the DC power supply is connected with correct polarity. Incorrect polarity may cause circuit damage.

- Option 2: Connect a plug-in 10 VAC adapter (Keithley part number OPA-01) to the two AC terminals, which are located on the external power terminal block (next to the heat sink). The ERA-01 includes a +5 V voltage regulation circuit that activates when external AC power is supplied.