

GPIB TO RELAY INTERFACE

DESCRIPTION

The Model 4864 is an IEEE 488.2/GPIB/HP-IB to Relay Interface that provides 16 form 'A' contacts or 16 relay drivers for switching signals or for driving external relays. The 4864's versatile commands let the user control the relays individually, step them as a single or multi-pole scanner, or step in a programmed sequence. The 4864 also includes eight isolated digital inputs that can be used to read external signals or contact closures. In control applications, these signals can be used to verify the response of the external system to the control outputs. The 4864 can also monitor the digital inputs and generate an SRQ and when the signals change state.

The Model 4864 is a member of ICS's Mini-Box family of IEEE 488.2 interfaces which provide many new features while using less than one third the space of earlier designs. All Mini-Box interfaces are IEEE 488.2 compatible and use SCPI and short-form commands for ease of programming. All Mini-Box interfaces are packaged in a CE compliant metal case that is less than 1.6 inches (39 mm) high and 7.3 inches (186 mm) wide and can be rack mounted in a 1U high space.

Relays and Driver Outputs

Models with relays contain 16 floating form 'A' (SPST) relays with both sides of each relay contact brought out to the rear panel connector. The connector pin assignments are arranged to minimize signal cross talk. The relay contacts in the Model 4864-11 are for switching low level signals up to 0.5 amperes. The relay contacts in the 4864-12 are rated for switching currents up to 1.0 amperes. The 4864-14 has 16 relay driver outputs that sink 300mA to activate external relays or solenoids. The relays and drivers are on a plug-in relay PCB which simplifies relay maintenance and contact type changes.



4864 GPIB Relay Interface

Digital Inputs

Each 4864 also provides eight isolated digital inputs for TTL/CMOS signals or contact closures. Each input has a pullup resistor to a common line that can be connected to the 4864's internal 5 Vdc power or to an external voltage source. The signals have >500 volts of isolation from the 4864 when driven by an external source.

Programmability

The 4864 includes commands for direct relay actuation, for signal scanning and for random relay sequences. The user has his choice of using SCPI commands for easy program documentation or short-form commands for reduced typing when controlling the unit from a keyboard. The 4864 also responds to all of the IEEE-488.2 required common commands.

All of the relay setup values, digital input enabling, operating mode and GPIB Bus address are programmable from the GPIB Bus. These configuration values can be saved in the 4864's Flash memory and are automatically recalled as the default settings at power turn-on time.

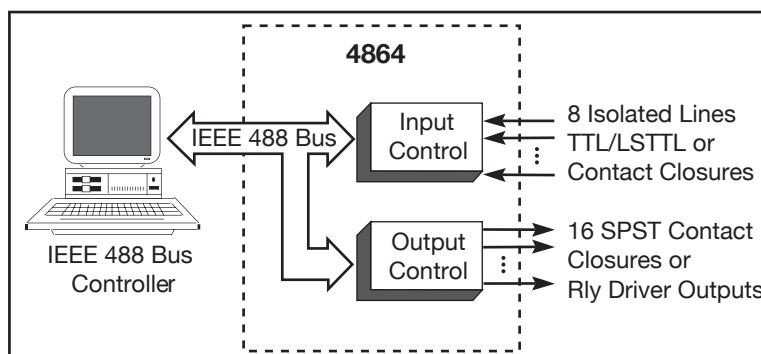


Figure 1 4864 Block Diagram

GPIB Controlled relays and isolated digital inputs

- Multiple relay configurations:
 - 16 low-level SPST relays
 - 16 hi-power SPST relays
 - 16 relay drivers*Choose the right contact or relay driver for your application.*
- Multiple relay programming modes:
 - individual relays
 - single or multipole scanning*Flexible relay programming.*
- Isolated digital inputs accept contact closures and CMOS/TTL logic levels.
 Eliminates ground loops.
- IEEE-488.2 compatible unit uses SCPI commands.
 Meets the latest GPIB specifications.
- Includes a menu-driven configuration program.
 Steps user through configuration choices.
- Metal case provides full EMI/RFI protection.
 Proven EMI/RFI Compliance.

CE Approved

RoHS



7034 Commerce Circle
Pleasanton, CA 94588
Phone: 925.416.1000
Fax: 925.416.0105
Web: www.icselect.com

4864 SCPI Command Advantages

Table 1 shows the 4864's SCPI Commands and their short-form command equivalents. SCPI commands are a tree and branch structure that start from the main command and work out to a value, action or query at the end of the branch. Because SCPI commands are so easy to read, they are self documenting and make program maintenance easier. An example of a SCPI command is one which sets a relay:

```
ROUT:CLOSE 4      'Closes relay 4
```

Many of the 4864 SCPI commands have short-form equivalents that minimize typing and GPIB bus traffic. The short-form relay command is:

```
C 4                'Closes relay 4
```

Controlling the Relays

The simplest way to control the 4864's relays (or relay driver outputs) is individually using the relay's CLOSE or OPEN commands. Unspecified relays remain in their current state. This satisfies most users who are controlling other device(s) or are switching signals. Multiple relays can be opened and closed at the same time by entering the relay numbers in the list form. List are in parenthesis and are identified with the ASCII AT '@' character. Examples are:

```
ROUT:CLOS (@1,3,4)  'Closes relays 1,3 and 4
ROUT:OPEN (@11:13) 'Opens relays 11 through 13
```

Scanning Options

For data acquisition applications, groups of the relays can be configured to operate as a single or multi-pole scanner. The relays are selected as a list with the ROUT:SCAN command. The INIT:IMMEDIATE command sets the relays to the first position and enables the scanner. The INIT:CONT command enables or disables the scanner. The scanner can be advanced with either the IEEE-488.1 GET command or with a 488.2 *TRG command. The scanner operates as a break-before-make scanner. Unused relays can be controlled individually and used for other non-scanning applications. The scan relay list is stored in the 4864's Flash memory with the *SAV 0 command. The maximum list size is 16 relays x 32 steps. Figure 2 shows the commands to setup a 2 pole, 3 position scanner.

ROUT:SCAN (@1,3,5), (@2,4,6)	'Defines scanner relays
INIT:IMM	'Closes initial pole (Relays 1 and 2)
*TRG or a GET	'Steps the scanner to the next position. Relays 1 and 2 open; relays 3 and 5 close)
*TRG or a GET	'Steps the scanner to the third position.
*TRG or a GET	'Steps the scanner to the home position.

Figure 2 4864 Scanner Command Example

TABLE 1 4864 SCPI Command Tree

SCPI Tree	Short-Form Commands
SYSTEM	System Setup and Query
:COMM	
:GPIB	
:ADDRESS	<numeric>
:ERROR?	
:VERSION?	
STATUS	
:OPERATION	not used in 4864
[:EVENT]?	
:CONDITION?	
:ENABLE	<numeric>
:ENABLE?	
:QUESTIONABLE	Digital Inputs
[:EVENT]?	E?
:CONDITION?	D?
:ENABLE	M
:ENABLE?	M?
:PTRANSITION	P
:PTRANSITION?	P?
:NTRANSITION	N
:NTRANSITION?	N?
ROUTE	Relay Control
:CLOSE	channel list
:STATE?	C
:OPEN	channel list
:ALL	Q?
:SCAN	O
	A
	Sn
INITIATE	Scan Control
[:IMMEDIATE]	
:CONTINUOUS	1(On) 0(Off) [0]
	I
	N
CALIBRATE	Calibrate
:IDN	<string>
:DATE	mm/dd/yy
:DEFAULT	
:LOCK	1(On) 0(Off) [0]

Reading and Monitoring the Digital Inputs

The 4864's eight digital inputs are read by querying the Questionable Condition register in the 4864's Status Reporting Structure. The Questionable Event register reports the bits that have changed since its last reading. Positive and negative filter masks let the Questionable Event register capture bits that go high, go low or move in either direction with a > 1 kHz sample rate.

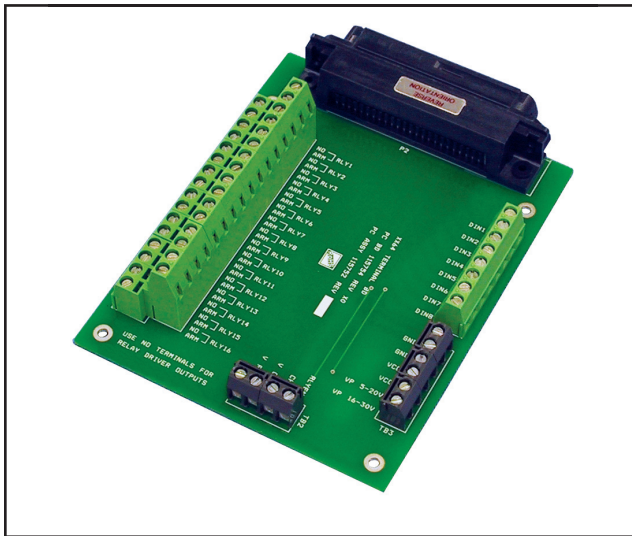
Enable bits allow the corresponding bits in the Questionable Event Register to be summarized in the 4864's Status Byte Register and to generate a Service Request message (SRQ) to alert the Application to the event. The user's Application program can query the 4864's Questionable Condition Register to determine the input signal states and/or the Event Register to learn which signal changed state.

Signal Connections

All 4864 relay and digital connections are brought out on a 50-pin blue-ribbon connector on the 4864's rear panel. Table 2 lists the signals. The relay outputs are floating form 'A' (normally open) contacts. Relay driver signals are brought out on the NO contact pins. The 4864's relays and drivers are not enabled after a power turn-on until the user's saved configuration has been loaded into their driving latches. This prevents erroneous switching while the 4864 is performing its power-on selftest. A Relay Enable signal is provided to control external devices that may need to be held off.

4864 Terminal Board

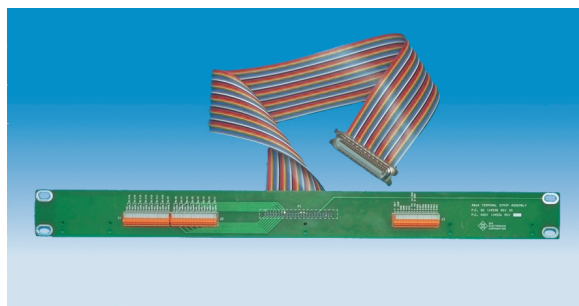
The 4864 Terminal Board is a small board with screw terminals that plugs into the 4864's rear panel connector. It has terminals for the relay contacts, the digital inputs and for the miscellaneous signals. The 115750 Terminal Board includes the hardware to fasten it to the 4864.



4864 Terminal Board

Rack Mounted Terminal Strip

A rack mounted Terminal Board is available for the 4864. The 114534-60 Terminal Strip mounts across the rear rails of an DIN/RETMA equipment rack and provides the user with lever actuated terminals for the 4864 signals. A 60 cm (24 inch) long flat-ribbon cable connects the Terminal Board to the 4864.

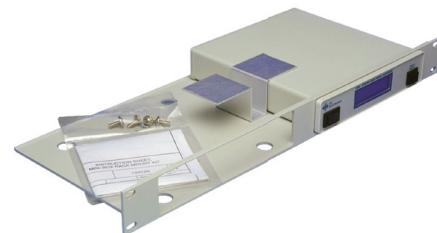


Rack Mounted 4864 Terminal Strip

TABLE 2 4864 Signal-Pin Assignments

Signal	Pin	Description
Relay 1 NO	1	Relay Contact or Driver 1 Output
Relay 1 Arm	26	
Relay 2 NO	2	Relay Contact or Driver 2 Output
Relay 2 Arm	27	
Relay 3 NO	3	Relay Contact or Driver 3 Output
Relay 3 Arm	28	
Relay 4 NO	4	Relay Contact or Driver 4 Output
Relay 4 Arm	29	
Relay 5 NO	5	Relay Contact or Driver 5 Output
Relay 5 Arm	30	
Relay 6 NO	6	Relay Contact or Driver 6 Output
Relay 6 Arm	31	
Relay 7 NO	7	Relay Contact or Driver 7 Output
Relay 7 Arm	32	
Relay 8 NO	8	Relay Contact or Driver 8 Output
Relay 8 Arm	33	
Relay 9 NO	9	Relay Contact or Driver 9 Output
Relay 9 Arm	34	
Relay 10 NO	10	Relay Contact or Driver 10 Output
Relay 10 Arm	35	
Relay 11 NO	11	Relay Contact or Driver 11 Output
Relay 11 Arm	36	
Relay 12 NO	12	Relay Contact or Driver 12 Output
Relay 12 Arm	37	
Relay 13 NO	13	Relay Contact or Driver 13 Output
Relay 13 Arm	38	
Relay 14 NO	14	Relay Contact or Driver 14 Output
Relay 14 Arm	39	
Relay 15 NO	15	Relay Contact or Driver 15 Output
Relay 15 Arm	40	
Relay 16 NO	16	Relay Contact or Driver 16 Output
Relay 16 Arm	41	
V Return	17	External Relay Ground Return
V Common	42	External Relay + Voltage Input
Logic Gnd	18	Relay Enable and 5 V Ground
Logic Gnd	43	
+ 5 Vdc	19	5 V power output
+ 5 Vdc	44	
Shield Gnd	20	
Relay Enable	45	Output Signal
V Pullup High	21	External 16-30 Vdc Input
V Pullup Low	46	External 5-20 Vdc Input
Digital In 8	22	
Digital In 7	47	
Digital In 6	23	
Digital In 5	48	
Digital In 4	24	
Digital In 3	49	
Digital In 2	25	
Digital In 1	50	

The rack mounting kits are available for mounting one or two 4864s in a 'U' high space. Order P/N 114212 for mounting one unit, P/N 114213 for mounting two units.



114213 Dual Rack Mount Kit

Description continued

OEM Board Versions

The Relay Interfaces are available in board versions for OEMs or for any user who wants to mount the 4864 or 2364 Board Assembly in a chassis. Power can be supplied from the host's 12 V to 24 V power supply. The boards are available with GPIB and Serial interface configurations listed in Table 3. On the OEM boards, the interface headers are mounted vertically to minimize the board footprint. The relay I/O connector is the same right angle 50-pin connector with lock bails.

External GPIB Address Capability

Standard 4864's store their GPIB address in Flash memory and use a SCPI command to change it. On 4864 OEM boards, extra digital input lines are provided in the GPIB header to read the GPIB address from an external address switch at power turn-on. The external address function is enabled with a SCPI command.

GPIB Header

On 4864 OEM boards, the 4864's GPIB connector is replaced with a 26-pin vertical header for remoting the GPIB bus and address switch signals to the rear panel. The 26 pin header mates with a flat ribbon cable from one of ICS's GPIB Connector / Address switch assemblies. These compact, business card size assemblies provide a convenient way to mount a GPIB Connector and an address switch on the rear panel.

RS-232/RS-485 Interfaces

On 2364 OEM boards, the RS-232 / RS-485 serial interface is on a 10-pin header at the front of the board. The serial interface operates at rates up to 115,200 baud and provides all of the functionality of the GPIB interface but over an RS-232 link or over an RS-485 network. Up to sixteen 2364s can be placed on a single RS-485 network. The 2364s are addressed by a two character address sequence prefixed to the normal 4864 command. The unit address and network capability are controlled by SCPI commands.

Boards with both GPIB and serial interfaces, default to using the serial interface at power turn-on time until the GPIB interface enters the Remote state. Refer to the 2364 data sheet for more information about the serial interface.

LED Header

An 8-pin header on the OEM boards allows easy extension of the LED drive signals to the user's front panel.

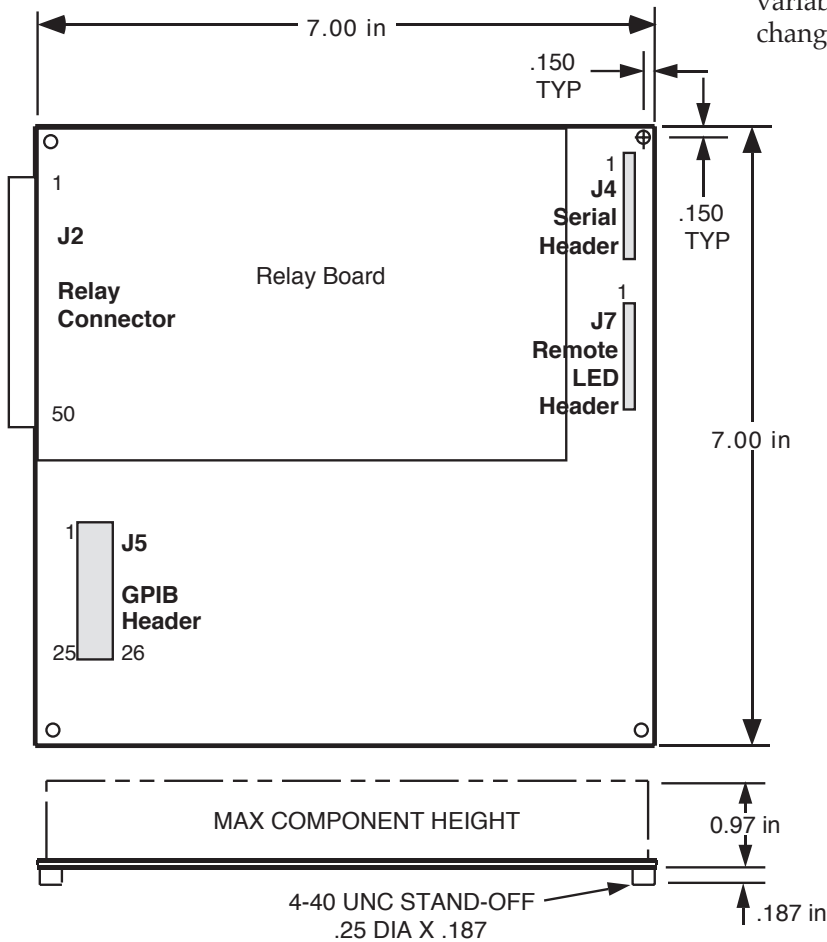
OEM Firmware Customization

The 4864 and 2364's firmware allows the user to store a custom IDN message and other setup parameters in Flash memory. This effectively integrates the board into the user's system and makes the OEM board appear as part of the end product. A lock function hides the setup variables from the end user and prevents accidental changes to the setup.

TABLE 3 OEM BOARD CONFIGURATIONS

Part Number	Same As	Interfaces		
		GPIB	RS-232	RS-485
114521-11	4864-11	Yes	Yes	Yes
114521-12	4864-12	Yes	Yes	Yes
114521-14	4864-14	Yes	Yes	Yes
114681-11	2364-11	No	Yes	Yes
114681-12	2364-12	No	Yes	Yes
114681-14	2364-14	No	Yes	Yes

OEM Boards have the same specifications as the 'same as' model number. OEM boards include the Instruction Manual, Configuration disk and Mating connector. GPIB Connector/Switch Assemblies, serial cables or serial cable kits must be ordered separately.



4864 OEM Board Dimensions

Select the 4864 version and then pick your accessory items.

Part Selection	Qty	Part Number
Standard 4864 Relay Interface Minibox. Includes a 50-pin mating connector and hood -		
with 16 form 'A' low level contacts	(1)	4864-11
with 16 form 'A' heavy duty contacts	(1)	4864-12
with 16 sink type relay drivers	(1)	4864-14
— Select an extra mating digital I/O connector, 50-pin ribbon connector and hood	(1)	902002
— Select an Open end, 50 conductor, 28 AWG wire cable assembly, 5 feet long	(1)	112829-01
or		
Select the 4864 Terminal Board	(1)	115750
or		
Select the 4864 I/O terminal Strip with 60 cm long flat-ribbon cable	(1)	114534-60 (Note 1)

4864 OEM Relay Interface Board. Includes a 50-pin mating connector and hood -		
with 16 form 'A' low level contacts	(1)	114521-11
with 16 form 'A' heavy duty contacts	(1)	114521-12
with 16 sink type relay drivers	(1)	114521-14
— Select a GPIB Connector/Address Switch Assembly -		
Horizontal style	(1)	113640-L (Note 2)
Vertical style	(1)	113642-L (Note 2)
— Select an extra mating digital I/O connector, 50-pin ribbon connector and hood	(1)	902002
— Select an Open end, 50 conductor, 28 AWG wire cable assembly, 5 feet long	(1)	112829-01
or		
Select the 4864 Terminal Board	(1)	115750
or		
Select the 4864 I/O terminal Strip with 60 cm long flat-ribbon cable	(1)	114534-60 (Note 1)

Notes:

1. The dash number is the cable length in cm.
2. -L is the cable length in cm. You can order any length from 10 to 90 cm. Standard stocked lengths are: 30, 45, 60 and 90 cm. Select an appropriate length as it is best to not have extra cable coiled up in the chassis to minimize EMI pickup. See the GPIB Connector/Address Switch Assembly data sheet for more details.

4864: SPECIFICATIONS

IEEE 488 Bus Interface

The 4864's 488 Bus interface meets IEEE STD 488.1-1987 and has the following capabilities.
SH1, AH1, T6, L4, SR1, PP0, DC1, RL0, DT1, C0 and E2 drivers.

Address Capability
Primary addresses 0-30

SRQ Generation
SRQs are generated if the unit is not a talker, if SRQs are enabled and if an Enabled Event Status Register bit or an monitored digital input change occurs. Digital inputs are monitored by the Questionable register.

488.2 Common Commands
*CLS, *ESE, *ESE?, *ESR?, *IDN?, *OPC, *OPC?, *PSC, *RCL, *RST, *SAV, *SRE, *SRE?, *STB, TST? and *WAI

SCPI Commands
Used to set and query all programmable functions. The 4864 conforms to the SCPI 1994.0 Specification.

Digital Inputs

Eight isolated inputs that can be queried and/or monitored for selected bit changes. Detected changes are saved and can be used to generate a Service Request (SRQ).

Data lines	8
Input signals	TTL/CMOS or contact closure to ground
Input Levels	Low = 0±0.5 V @ 2 mA High =>2.4 V or open
Pullups	1.5 Kohm to +5 Vdc or to user furnished external voltage
External Voltage	5 to 32 Vdc
Isolation	500 Vdc to internal logic with external pullup voltage.
Monitoring	1,000 samples/sec

Relay Contacts

All relay contacts are brought out to individual pins on the relay connector. Guard lines are provided between adjacent relay contacts

Model No.	4864-11	4864-12
Usage	Lo level	Hi Power
Relays	16	16
Contact form	Form A (SPST)	Form A (SPST)
Contact mat'l	Ruthenium	-
Contact ratings: (Restive load)	0.5 A	1.0 A
Switching V	200 Vdc	200 Vdc
Power	10 W	50 W
Breakdown V	300 Vac	300 Vac
Resistance	0.15 Ω	0.2 Ω
Life at 100μA	20 x 10 ⁶ cycles	
at 500mA	2 x 10 ⁶ cycles	

Relay/Solenoid Driver Outputs

In -14 version, the relays are omitted and the relay drivers are brought directly out to the connector. Drivers are open collector type with an internal snubber diode. User supplies the external voltage for the diodes.

Model No.	4864-14
Usage	External relays
No. of Drivers	16
Current	300 mA sink max
Switching V	48 Vdc max

Scanner-Sequence Memory

16 relays x 32 steps

Front Panel Indicators

PWR	Indicates power on
RDY	Unit has passed self test
TALK	Unit is addressed to talk
LSTN	Unit is addressed to listen
SRQ	Unit is asserting SRQ
ERR	Unit sensed a command error

Physical

Size W x H x D
7.29 x 1.52 x 7.45 inches
(118.52 x 38.6 x 189.2 mm)

Weight 3 lbs (1.4 kg)

Temperature
-10°C to +55°C Operating
-40°C to +70°C Storage

Humidity 0-90% RH, no condensation

Construction All metal case

Connectors
IEEE bus-Std 24 pin w/metric studs
I/O-Amphenol 57-30500 50-pin connector w/spring locks

Power 12 to 24 Vdc @ 100 mA
plus 10 mA per closed relay

Included Accessories

Instruction Manual
Mating Connector
Support CD ROM with Configuration and example programs
UL/CSA/VDE approved AC power adapters provided for:
US - 115±10% Vac, 60 Hz (std)
Europe - 230±10% Vac, 50/60 Hz
UK - 230±10% Vac, 60 Hz
Japan - 100±10% Vac, 50/60 Hz



4864 Rear Panel

ORDERING INFORMATION

	Part Number
Relay Interface with 16 SPST low-level relays	4864-11
Relay Interface with 16 SPST high-power relays	4864-12
Relay Interface with 16 relay/solenoid drivers	4864-14
4864 Terminal Board	115750
Rack Mounted Terminal Strip Assembly with 60 cm cable (See separate data sheet)	114534-60