

EX – 9940

8 Channel Relay Actuator

PC/104 Module

OPERATING GUIDE

CHECK LIST

Before getting started, check if your EX-9940/EX-9940-16 8 Ch. Relay Actuator PC/104 Module package includes the following items:

- **EX-9940/EX-9940 – 16 board**
- **Screw 3mm(x 4)**
- **Bronze stick 6mm(x 4)**
- **EX-9940 user's manual**

If anything missing, please contact your dealer.

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GENERAL DESCRIPTION

The EX-9940 relay actuator PC/104 module is designed for control applications. It contains 8 channels electromechanical single-pole double throw relays which can be set or reset directly by I/O write instructions. Each relay is rated at 1.5A at 125VAC. The normal open, normal close and common contacts of each relay are brought out through a 50-pin mating connectors. A LED, adjacent to each relay, lights up when the relay is activated. The relay is activated when a logic high is written to the controlling bit.

Features

- 8 single-pole, double-throw relays
- 125VAC/1.5A maximum contact rating
- Isolation upto 1000 Vrms
- NC, NO and COM contacts output
- LED indicators to show activated relays

Specifications

Relay Output

Number of Channels	8
Type	Electromechanical DIP Relay,Normal Open
Form	DPDT(wired as SPDT)
Contact Rating	
Maximum Switching Power	30W/60VA
Maximum Switching Voltage	125VDC/125VAC
Maximum Switching Current	1.5ADC/1.5AAC
Contact Resistance	100mΩ maximum
Indication Mode	Logic “1”=LED Light on and relay set Logic “0”=LED Light off and relay reset
Life Expectancy	10x10⁶ operations (rated)
Operate/Release	8/8ms
Break down Voltage	
Coil to contact	1500 Vrms
Across contact	1000Vrms
<u>Power Requirements</u>	
+5VDC	200mA typ.
+12VDC	100mA typ.

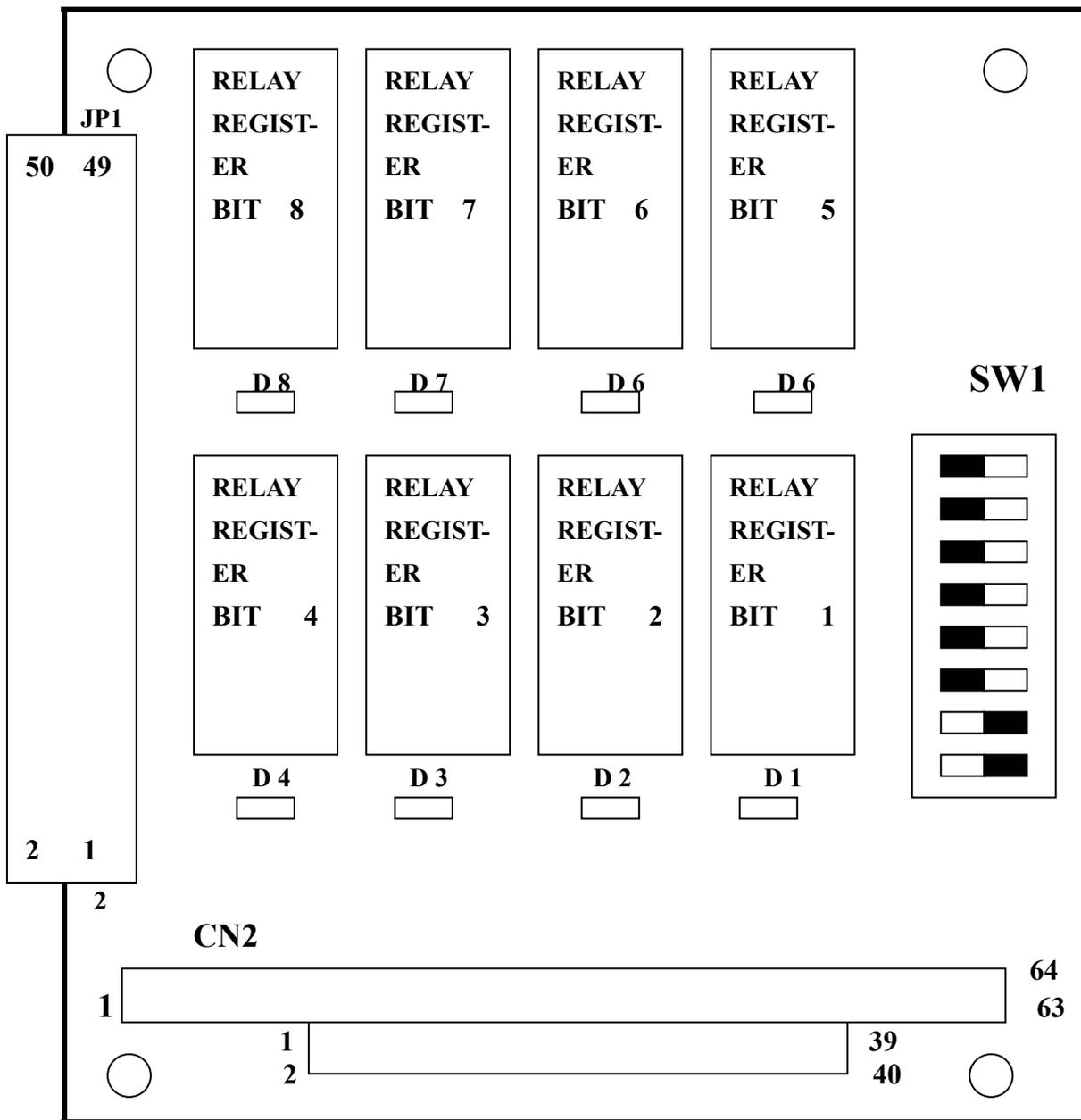
Physical/Environmental

Dimension	95mm x 90mm
Weight	230g
Operating Temperature Range	0 to 50°C
Storage Temperature Range	- 20 to 70°C
Relative Humidity	0 to 90%, non-condensing

MODULE CONFIGURATION AND INSTALLATION

Location Diagram

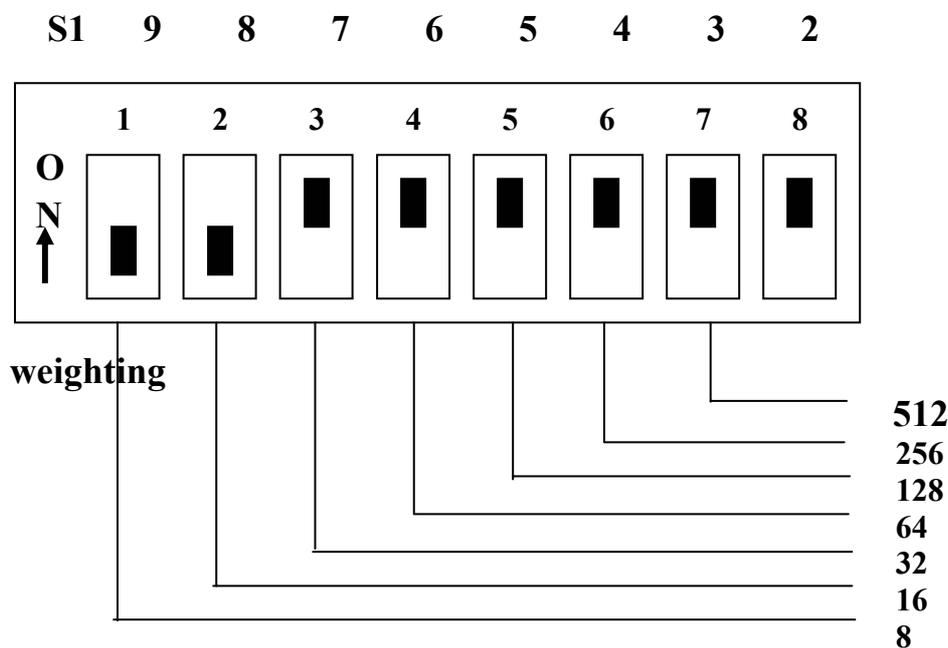
Refer to the following location diagram for help locating components needed during configuration and installation of the EX-9940 module.



DIP Switch setting

EX-9940 occupies four consecutive I/O port spaces. The first address or base address is set via a DIP switch labeled SW1. If more than one modules are to be installed to one PC, each module must be given its own distinct base address. No more than one module may use the same base address. When you are selecting the base address, it would be better if you check with APPENDIX A to avoid conflicting with other installed devices. Valid addresses are from 200 Hex to 3F8 Hex. Following figure is the default setting where the base address is set to 300 Hex.

BASE ADDRESS WSITCH SETTING



$$\text{Base Address} = 512 + 256 = 768 \text{ (Decimal)}$$
$$= 300 \text{ (Hexadecimal)}$$

I/O PORT RANGE	DIP SWITCH POSITION							
HEXADECIMAL	1	2	3	4	5	6	7	8
	A9	A8	A7	A6	A5	A4	A3	A2
200 – 203	1	0						
204 – 207	1	0	0	0	0	0	0	1
208 – 20B	1	0	0	0	0	0	1	0
20C – 20F	1	0	0	0	0	0	1	1
·	·			·			·	
·	·			·			·	
220 – 223	1	0	0	0	1	0	0	0
·	·			·			·	
·	·			·			·	
*300 – 303	1	1	0	0	0	0	0	0
·	·			·			·	
·	·			·			·	
3F8 – 3FB	1	1	1	1	1	1	1	0
3FC – 3FF	1	1	1	1	1	1	1	1

0 = ON, 1 = OFF
(*) : Factory default setting

Connector Pin Assignments

All outputs of EX-9940 are brought out through an 50-pin connectors labeled JP1. The following figure and descriptions give the necessary data for wiring.

JP1:

NAME	PIN	PIN	NAME
R1COM	1	2	R1COM
R1NC	3	4	R1NC
R1NO	5	6	R1NO
R2COM	7	8	R2COM
R2NC	9	10	R2NC
R2NO	11	12	R2NO
R3COM	13	14	R3COM
R3NC	15	16	R3NC
R3NO	17	18	R3NO
R4COM	19	20	R4COM
R4NC	21	22	R4NC
R4NO	23	24	R4NO
R5COM	25	26	R5COM
R5NC	27	28	R5NC
R5NO	29	30	R5NO
R6COM	31	32	R6COM
R6NC	33	34	R6NC
R6NO	35	36	R6NO
R7COM	37	38	R7COM
R7NC	39	40	R7NC
R7NO	41	42	R7NO
R8COM	43	44	R8COM
R8NC	45	46	R8NC
R8NO	47	48	R8NO
N/C	49	50	N/C

JP1 connector pin description

SIGNAL NAME	DESCRIPTION
R1COM – R8COM	The common contact pins of relays 1 through 8.
R1NC – R8NC	The normally close contacts of relays 1 through 8.
R1NO – R8NO	The normally open contacts of relays 1 through 8.
N/C	No connect.

MODULE INSTALLATION

The EX-9940 PC/104 module is shipped with protective electrostatic cover. When unpacking, touching the module electrostatically shielded packaging with the metal frame of your computer to discharge the accumulated static electricity prior to touching the module.

Following description summarizes the procedures for installing the EX-9940:

WARNING !!!

TURN OFF the PC and all accessories connected to the PC whenever installing or removing any peripheral board including the EX-9940 module.

Installation procedures;

- 1. Turn off the system power.**
- 2. Unplug all power cords.**
- 3. Remove the case cover if necessary.**
- 4. Remove the top module if it is a non-stackthrough module.**
- 5. Put the EX-9940 module in line with the top present module as described in APPENDIX B.**
- 6. Install four spacers if necessary.**
- 7. Connect cable if necessary.**
- 8. Crush between the module until inside distance is SPACER's height (0.6") Restore all the screws.**
- 9. Repeat step 6 until all module are set into position.**
- 10. Connect cable to EX- 9940 if necessary.**
- 11. Replace the case cover and connect all the necessary cables.**
- 12. Turn on the system power.**

REGISTER DESCRIPTION

The EX-9940 occupies 4 consecutive addresses in I/O address space, but only one address is used. During installation, properly set Sw1 switch to select the correct base address.

The following table shows the register configuration:

Base Address + 0

Bit No.	7	6	5	4	3	2	1	0
Bit Name	R8	R7	R6	R5	R4	R3	R2	R1

Only base address +0 is used for 8-bit wide relay output register. This register is a read/write register for controlling relays. The controlling bit R1 through R8 is corresponding to the onboard relay 1 through relay 8. To activate a relay, set the corresponding controlling bit to “1”. To turn off a relay, set the corresponding controlling bit to “0”

The data written to the register can be read back as a data for comparison and confirmation purpose. Base address +1, +2, +3 are all reserved.

PROGRAMMING

Programming the EX-9940 is very simple. It can be easily accomplished using direct I/O instructions of whatever application language. In this section an example in BASIC is given.

Example

This example shows how to control the eight relays on module.

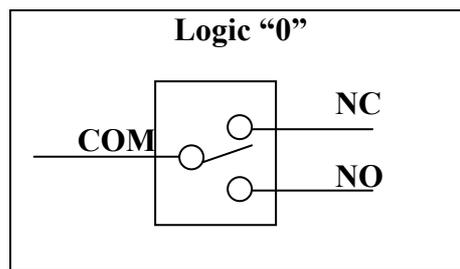
Assume the base address is 300Hex.

BASE = &H300	
out BASE, 0	'All relays are off
out BASE, 1	'Only relay 1 is actuated
out BASE, &H80	'Only relay 8 is actuated
out BASE, &H55	'Relay 1,3,5,7 are actuated
inp (BASE)	'Read back relay status: 55 Hex

FUNCTION DESCRIPTION

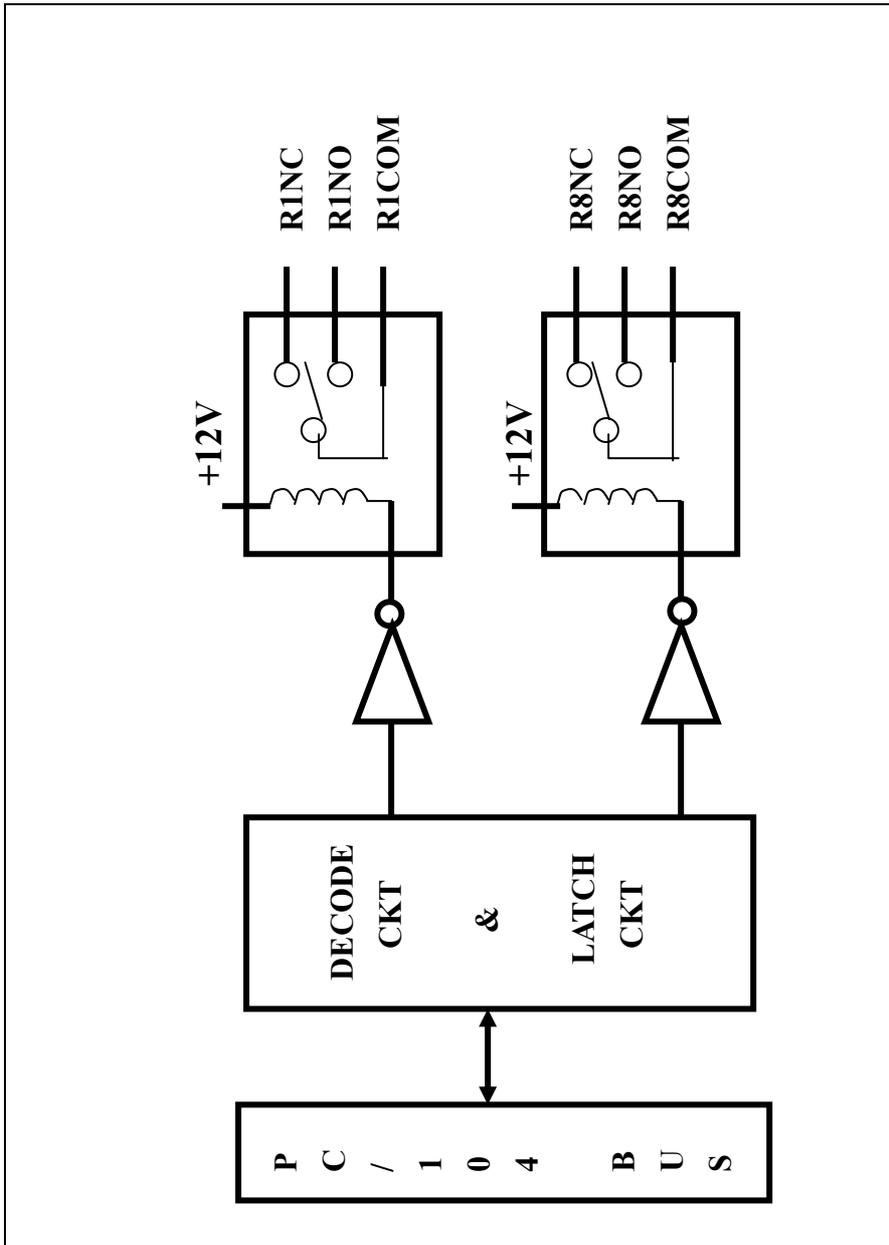
Relay Output

Each of the electromechanical relays has three contacts: COM (Common), NO (Normal Open) and NC (Normally Close). When a 0 is written to the associated controlling bit, the COM and NC posts make contact. When a 1 is written to the controlling bit, the COM and NO posts make contact. Refer to REGISTER DESCRIPTION and PROGRAMMING sections about how to control the relays.



Each relay of the EX-9940 is equipped with on LED are labeled D1 through D8, for relay 1 through 0. The LED lights when relay.

BLOCK DIAGRAM



APPENDIX A

PC I/O PORT MAPPING

I/O PORT ADDRESS RANGE	FUNCTION
000 – 1FF	PC reserved
200 – 20F	Game controller (Joystick)
278 – 27F	Second parallel printer port (LPT2)
2E1	GPIB controller
2F8 – 2FF	Second serial port (COM2)
320 – 32F	Fixed disk (XT)
378 – 37F	Primary parallel printer port (LPT1)
380 – 38F	SDLC communication port
3B0 – 3BF	Monochrome adapter/printer
3C0 – 3CF	EGA, reserved
3D0 – 3DF	Color/graphics adapter
3F0 – 3F7	Floppy disk controller
3F8 – 3FF	Primary serial port (COM1)

APPENDIX B

PC/104 MECHANICAL SPECIFICATIONS

PC/104 General Description

While the PC and PC/AT architectures have become extremely popular in both general purpose (desktop) and dedicated (non-desktop) applications its use in embedded microcomputer applications has been limited due to the large size of standard PC and PC/AT motherboards and expansion cards. PC/104 module can be of two bus types, 8 bit and 16 bit, which correspond to the PC and PC/AT buses, respectively.

Besides bus option, there are stackthrough and non-stackthrough difference. The stackthrough version provides a self-stacking PC bus. It can be placed any where in a multi-module stack. The non-stackthrough version offers minimum thickness, by omitting bus stackthrough pins. It must be positioned at one end of a stack.

For convenience . the EX-9940 is equipped with stackthrough version only. **(NOTE : For safety, you are suggested to cut bus stackthrough pins of the last module on condition; that you are sure you won't add/plug any module to the module stack in the future.)**

The following sections provide the mechanical and electrical specification for a compact version of the PC/AT bus, optimized for the unique requirements of embedded systems applications. The specification is herein referred to as "PC/104".