

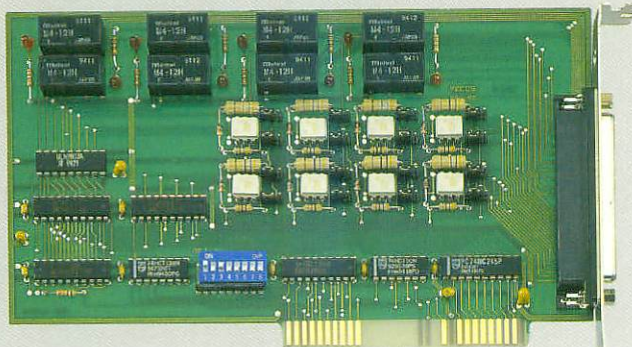
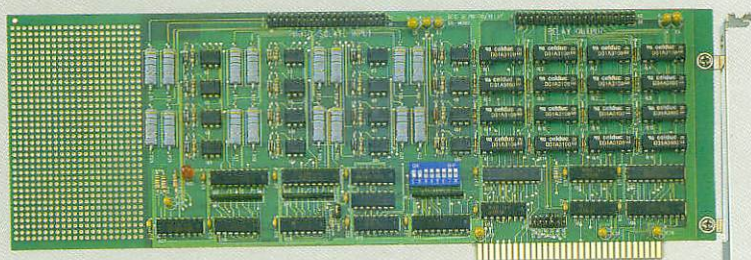
# SMARTLAB

16 CHANNELS RELAY OUTPUT/16 CHANNELS  
PHOTO ISOLATOR INPUT ADAPTER.

8 CHANNELS RELAY OUTPUT/8 CHANNELS  
PHOTO ISOLATOR INPUT ADAPTER.

OPERATION MANUAL

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# SMARTLAB

## PART 1:

**16 CHANNELS RELAY OUTPUT/  
16 CHANNELS PHOTO ISOLATOR  
INPUT ADAPTER**

## PART 2:

**8 CHANNELS RELAY OUTPUT/  
8 CHANNELS PHOTO ISOLATOR  
INPUT ADAPTER**

## **16 CHANNELS RELAY OUTPUT/ 16 CHANNELS PHOTO ISOLATOR INPUT ADAPTER OPERATION MANUAL**

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## CHAPTER 1 INTRODUCTION

The 16 channels relay output / photo isolator input adapter provides relay output functions and photo isolator input functions. The relay output part provides 16 relays to drive 16 different output channels. Each relay channel can be used to control ON / OFF of external devices, to drive external high power relays, to activate alarms ... etc.

The photo isolator input part provides 16 photo couple digital input channels, which allow the input signals to be completely floated and prevent the ground loop.

The features of 16 channels relay output / 16 channels photo isolator input adapter are:

- \* Support 16 relay output channels and 16 photo couple input channels.
- \* Max contact rating for relay: 150V/DC 1AMP.
- \* Response time for relay: 1 ms minimum.
- \* Contact resistance for relay: 0.2 OHM maximum.

- \* Life expectancy for relay: 100 million operation at signal level load.
- \* Allow the photo input signals to be completely floated and prevent the ground loops.
- \* Input response time: 100us minimum.
- \* Input voltage: 45VDC maximum for each isolated input.

The package contains:

- \* 16 channels relay output / 16 channels photo couple input adapter.
- \* User's manual.

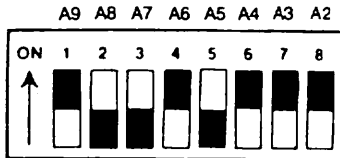
## CHAPTER 2. HARDWARE CONFIGURATION

Before you use the 16 channels relay output / 16 channels photo couple input adapter, you must ensure that the I/O address is set correctly, and set IRQ that you need. Observe the figure in the follows, the proper settings for the 16 channels relay output / 16 channels photo couple input adapter is described in the following.



## 2.1 Switch and Jumper Settings

### 1. I/O address



DIP switch is used to set base I/O address, you may set I/O address ranges from 000H to 3FCH increments of 4. Observe figure above, to set the switch ON means 0 and set the switch OFF means 1. SW1 corresponds to address A9, SW2 corresponds to address A8, etc. The figure above is set to 1A0H.

Base Address + 0 :  
Relay output channel 1 to 8.

Base Address + 1 :  
Relay output channel 9 to 16.

Base Address + 0 :  
Photo input channel 1 to 8.

Base Address + 1 :  
Photo input channel 9 to 16.

## 2. IRQ setting

.	.	.	.	.	.
.	.	.	.	.	.
I	I	I	I	I	I
R	R	R	R	R	R
Q	Q	Q	Q	Q	Q
2	3	4	5	6	7

The jumper is used to set IRQ for photo couple input, if you need not use IRQ, please do not short the jumper.

### 2.2 Hardware Installation

Your 16 channels relay output / 16 channels photo couple input adapter is designed to inserted in any available slot in your computer. In order to gain access to the expansion slots, follow the steps listed in the followings.

1. Set the switch and jumper.
2. Connect the expansion flat cable to 40 pin connector.
3. Turn off all power of your computer and all peripheral devices before

installing your adapter.

4. Remove the cover of the computer.
5. Insert your preconfigured adapter into any available slot. Make sure your I/O card is firmly seated in the chosen slot.
6. Replace the cover of the computer.

## 2.3 Function Description

### 1. Relay output

(Base address + 0) is used to control channel 1 to 8, (Base address + 1) is used to control channel 9 to 16. When set the correspond bit to 1, it turns on the relay, this means relay is set to close state, when set the correspond bit to 0, it turns off the relay, this means relay is set to open state.

### 2. Photo couple input

(Base address + 0) is used to control channel 1 to 8, (Base address + 1) is used to control channel 9 to 16. When input voltage range from 0 to 2 VDC, then input circuit turns off and its correspond bit will be set

to 0, when input voltage range from 3 to 45 VDC, then input circuit turns on and its correspond bit will be set to 1. Do not input signal more than 50 VDC, otherwise the circuit will overload.

## 2.4 Pin Assignments

### 1. connector 1 (J1)

Pin	Description
1, 2	relay channel 1
3, 4	relay channel 2
5, 6	relay channel 3
7, 8	relay channel 4
9,10	relay channel 5
11,12	relay channel 6
13,14	relay channel 7
15,16	relay channel 8
17,18	relay channel 9
19,20	relay channel 10
21,22	relay channel 11
23,24	relay channel 12
25,26	relay channel 13
27,28	relay channel 14
29,30	relay channel 15
31,32	relay channel 16
33,34	GND
35,36	DC +5V
37,38	DC +12V
39,40	GND

2. connector 2 (J2)

Pin	Description
1	Input channel 1-
2	Input channel 1+
3	Input channel 2-
4	Input channel 2+
5	Input channel 3-
6	Input channel 3+
7	Input channel 4-
8	Input channel 4+
9	Input channel 5-
10	Input channel 5+
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11	Input channel 6-
12	Input channel 6+
13	Input channel 7-
14	Input channel 7+
15	Input channel 8-
16	Input channel 8+
17	Input channel 9-
18	Input channel 9+
19	Input channel 10-
20	Input channel 10+
<hr style="border-top: 1px dashed black;"/>	
21	Input channel 11-
22	Input channel 11+
23	Input channel 12-
24	Input channel 12+
25	Input channel 13-
26	Input channel 13+
27	Input channel 14-
28	Input channel 14+
29	Input channel 15-
30	Input channel 15+

31	Input channel 16-
32	Input channel 16+
33	GND
34	GND
35	DC +5V
36	DC +5V
37	DC +12V
38	DC +12V
39	GND
40	GND

## APPENDIX A WARRANTY INFORMATION

### A.1 Copyright

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Each piece of SmartLab package permits user to use SmartLab only on a single computer, a registered user may use the program on a different computer, but may not use the program on more than one computer at the same time.

Corporate licensing agreements allow duplication and distribution of specific number of copies within the licensed institution. Duplication of multiple copies is not allowed except through execution of a licensing agreement. Welcome call for details.

## A.2 Warranty Information

SmartLab warrants that for a period of one year from the date of purchase (unless otherwise specified in the warranty card) that the goods supplied will perform according to the specifications defined in the user manual. Furthermore that the SmartLab product will be supplied free from defects in materials and workmanship and be fully functional under normal usage.

In the event of the failure of a SmartLab product within the specified warranty period, SmartLab will, at its option, replace or repair the item at no additional charge. This limited warranty does not cover damage resulting from incorrect use, electrical interference, accident, or modification of the product.

All goods returned for warranty repair must have the serial number intact. Goods without serial numbers attached will not be covered by the warranty.

Transportation costs for goods returned must be paid by the purchaser. Repaired goods will be dispatched at the expense of SmartLab.

To ensure that your SmartLab product is covered by the warranty provisions, it is necessary that you return the Warranty card.

Under this Limited Warranty, SmartLab's obligations will be limited to repair or replacement only, of goods found to be defective as specified above during the warranty period. SmartLab is not liable to the purchaser for any damages or losses of any kind, through the use of, or inability to use, the SmartLab product.



SmartLab reserves the right to determine what constitutes warranty repair or replacement.

Return Authorization: It is necessary that any returned goods are clearly marked with an RA number that has been issued by SmartLab. Goods returned without this authorization will not be attended to.

# APPENDIX B DATA SHEET

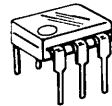
## 6-Pin DIP Optoisolators Transistor Output

These devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Convenient Plastic Dual-In-Line Package
- High Current Transfer Ratio — 100% Minimum at Spec Conditions
- Guaranteed Switching Speeds
- High Input-Output Isolation Guaranteed — 7500 Volts Peak
- UL Recognized, File Number E54915 
- VDE approved per standard 0883/6.80 (Certificate number 41853), with additional approval to DIN IEC380/VDE0806, IEC435/VDE0805, IEC65/VDE0860, VDE0110b, covering all other standards with equal or less stringent requirements, including IEC204/VDE0113, VDE0160, VDE0832, VDE0833, etc. 
- Meets or Exceeds All JEDEC Registered Specifications
- Special lead form available (add suffix "T" to part number) which satisfies VDE0883/6.80 requirement for 8 mm minimum creepage distance between input and output solder pads.
- Various lead form options available. Consult "Optoisolator Lead Form Options" data sheet for details.

**4N35**  
**4N36**  
**4N37**

**6-PIN DIP  
OPTOISOLATORS  
TRANSISTOR  
OUTPUT**



**CASE 730A-02  
PLASTIC**

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

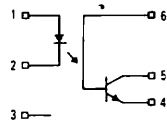
Rating	Symbol	Value	Unit
<b>INPUT LED</b>			
Reverse Voltage	$V_R$	6	Volts
Forward Current — Continuous	$I_F$	60	mA
LED Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Output Detector Derate above $25^\circ\text{C}$	$P_D$	120	mW
		1.41	mW/ $^\circ\text{C}$
<b>OUTPUT TRANSISTOR</b>			
Collector-Emitter Voltage	$V_{CEO}$	30	Volts
Emitter-Base Voltage	$V_{EBO}$	7	Volts
Collector-Base Voltage	$V_{CBO}$	70	Volts
Collector Current — Continuous	$I_C$	150	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above $25^\circ\text{C}$	$P_D$	150	mW
		1.76	mW/ $^\circ\text{C}$

### TOTAL DEVICE

Isolation Source Voltage (1) (Peak ac Voltage, 60 Hz, 1 sec. Duration)	$V_{ISO}$	7500	Vac
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250	mW
		2.94	mW/ $^\circ\text{C}$
Ambient Operating Temperature Range	$T_A$	-55 to +100	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to -150	$^\circ\text{C}$
Soldering Temperature (10 seconds, 1/16" from case)	—	260	$^\circ\text{C}$

(1) Isolation surge voltage is an internal device dielectric breakdown rating.  
For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

### SCHEMATIC



1. LED ANODE
2. LED CATHODE
3. N.C.
4. EMITTER
5. COLLECTOR
6. BASE

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>INPUT LED</b>					
Forward Voltage ( $I_F = 10\text{ mA}$ )	$V_F$	0.8 0.9 0.7	1.15 1.3 1.05	1.5 1.7 1.4	V
Reverse Leakage Current ( $V_R = 6\text{ V}$ )	$I_R$	—	—	10	$\mu\text{A}$
Capacitance ( $V = 0\text{ V}, f = 1\text{ MHz}$ )	$C_J$	—	18	—	pF

<b>OUTPUT TRANSISTOR</b>					
Collector-Emitter Dark Current ( $V_{CE} = 10\text{ V}, T_A = 25^\circ\text{C}$ ) ( $V_{CE} = 30\text{ V}, T_A = 100^\circ\text{C}$ )	$I_{CEO}$	— —	1 —	50 500	nA $\mu\text{A}$
Collector-Base Dark Current ( $V_{CB} = 10\text{ V}$ )	$I_{CBO}$	—	0.2 100	20 —	nA
Collector-Emitter Breakdown Voltage ( $I_C = 1\text{ mA}$ )	$V_{(BR)CEO}$	30	45	—	V
Collector-Base Breakdown Voltage ( $I_C = 100\text{ }\mu\text{A}$ )	$V_{(BR)CBO}$	70	100	—	V
Emitter-Base Breakdown Voltage ( $I_E = 100\text{ }\mu\text{A}$ )	$V_{(BR)EBO}$	7	7.8	—	V
DC Current Gain ( $I_C = 2\text{ mA}, V_{CE} = 5\text{ V}$ )	$h_{FE}$	—	400	—	—
Collector-Emitter Capacitance ( $f = 1\text{ MHz}, V_{CE} = 0$ )	$C_{CE}$	—	7	—	pF
Collector-Base Capacitance ( $f = 1\text{ MHz}, V_{CB} = 0$ )	$C_{CB}$	—	19	—	pF
Emitter-Base Capacitance ( $f = 1\text{ MHz}, V_{EB} = 0$ )	$C_{EB}$	—	9	—	pF

<b>COUPLED</b>					
Output Collector Current ( $I_F = 10\text{ mA}, V_{CE} = 10\text{ V}$ )	$I_C$	10 4 4	30 — —	— — —	mA
Collector-Emitter Saturation Voltage ( $I_C = 5\text{ mA}, I_F = 10\text{ mA}$ )	$V_{CE(sat)}$	—	0.14	0.3	V
Turn-On Time	$(I_C = 2\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\text{ }\Omega, \text{Figure 11})$	$t_{on}$	—	7.5	$\mu\text{s}$
Turn-Off Time		$t_{off}$	—	10	
Rise Time		$t_r$	—	3.2	
Fall Time		$t_f$	—	4.7	
Isolation Voltage ( $f = 60\text{ Hz}, t = 1\text{ sec}$ )	$V_{ISO}$	7500	—	—	Vac(pk)
Isolation Current ( $V_{I-O} = 3550\text{ Vpk}$ )	4N35	—	—	100	$\mu\text{A}$
( $V_{I-O} = 2500\text{ Vpk}$ )	4N36	—	—	100	
( $V_{I-O} = 1500\text{ Vpk}$ )	4N37	—	8	100	
Isolation Resistance ( $V = 500\text{ V}$ )	$R_{ISO}$	$10^{11}$	—	—	$\Omega$
Isolation Capacitance ( $V = 0\text{ V}, f = 1\text{ MHz}$ )	$C_{ISO}$	—	0.2	2	pF

**TYPICAL CHARACTERISTICS**

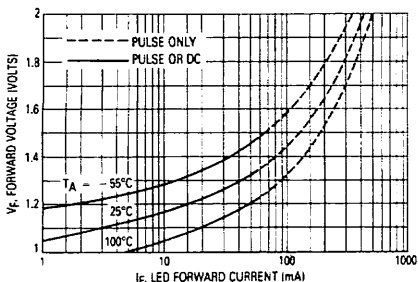


Figure 1. LED Forward Voltage versus Forward Current

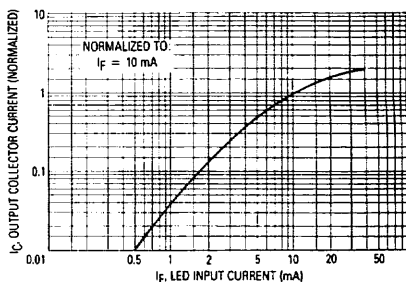


Figure 2. Output Current versus Input Current

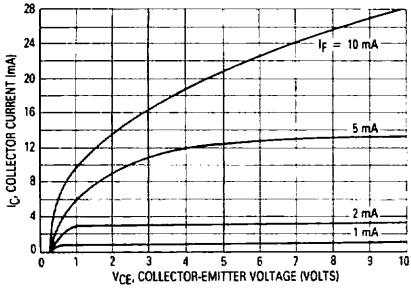


Figure 3. Collector Current versus Collector-Emitter Voltage

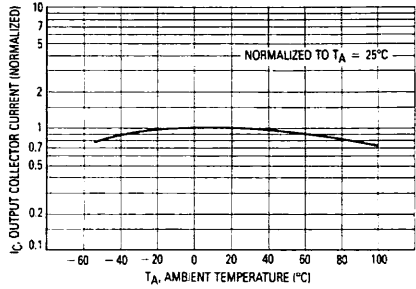


Figure 4. Output Current versus Ambient Temperature

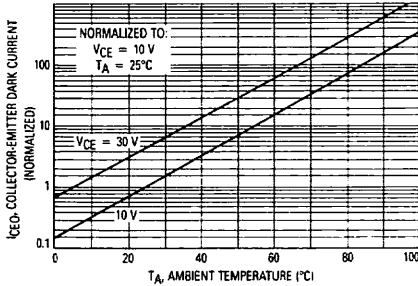


Figure 5. Dark Current versus Ambient Temperature

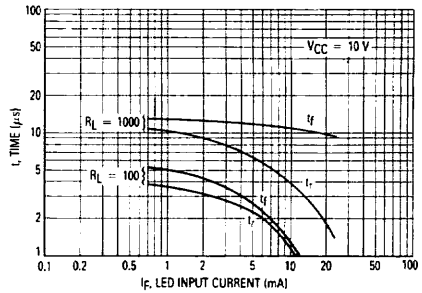


Figure 6. Rise and Fall Times

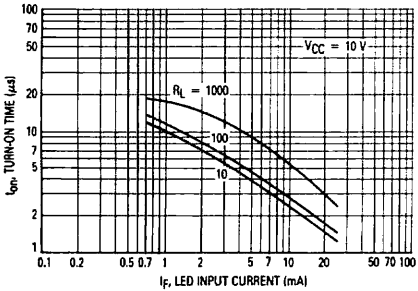


Figure 7. Turn-On Switching Times

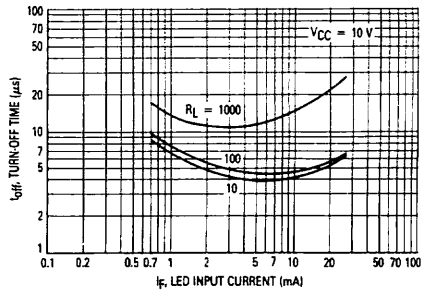
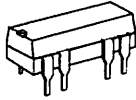


Figure 8. Turn-Off Switching Times

# SPECIFICATION



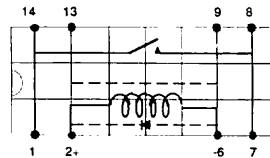
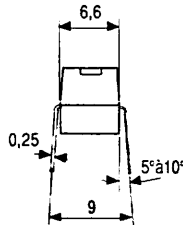
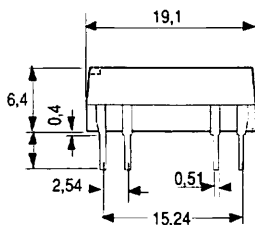
MINIATURE MOULDED RELAY FOR PCB  
 1 form A, UL File number :  
 E69913 (M) (A card)

## D31A3100

Dual in Line red relay

### main ratings

maximum switching voltage	200 VDC
maximum switching current	0,5 Amps
maximum carrying current	1 Amps
contact rating	10 W



one step = 2,54 mm

### control data

Rated voltage VDC	Coil resistance $\Omega \pm 10\%$	Must operate voltage VDC	Must drop-out voltage VDC	Maximum operating voltage	Power consumption mW
5	500	3,7	1	360% of nominal	50

### electrical data

contact material	rhodium
initial contact resistance	$\leq 200 \text{ m}\Omega$
dielectric strength -across contacts	200 VDC
-between coil and contacts	750 VAC
insulation resistance -across contacts	$10^{10} \Omega$
-between coil and contacts	$10^{10} \Omega$
max. switching-on time including bounces	0,5 ms
max. switching-off time	0,1 ms
life expectancy : mechanical	$10^8$ operations
electrical at rated load	$5 \cdot 10^6$ operation

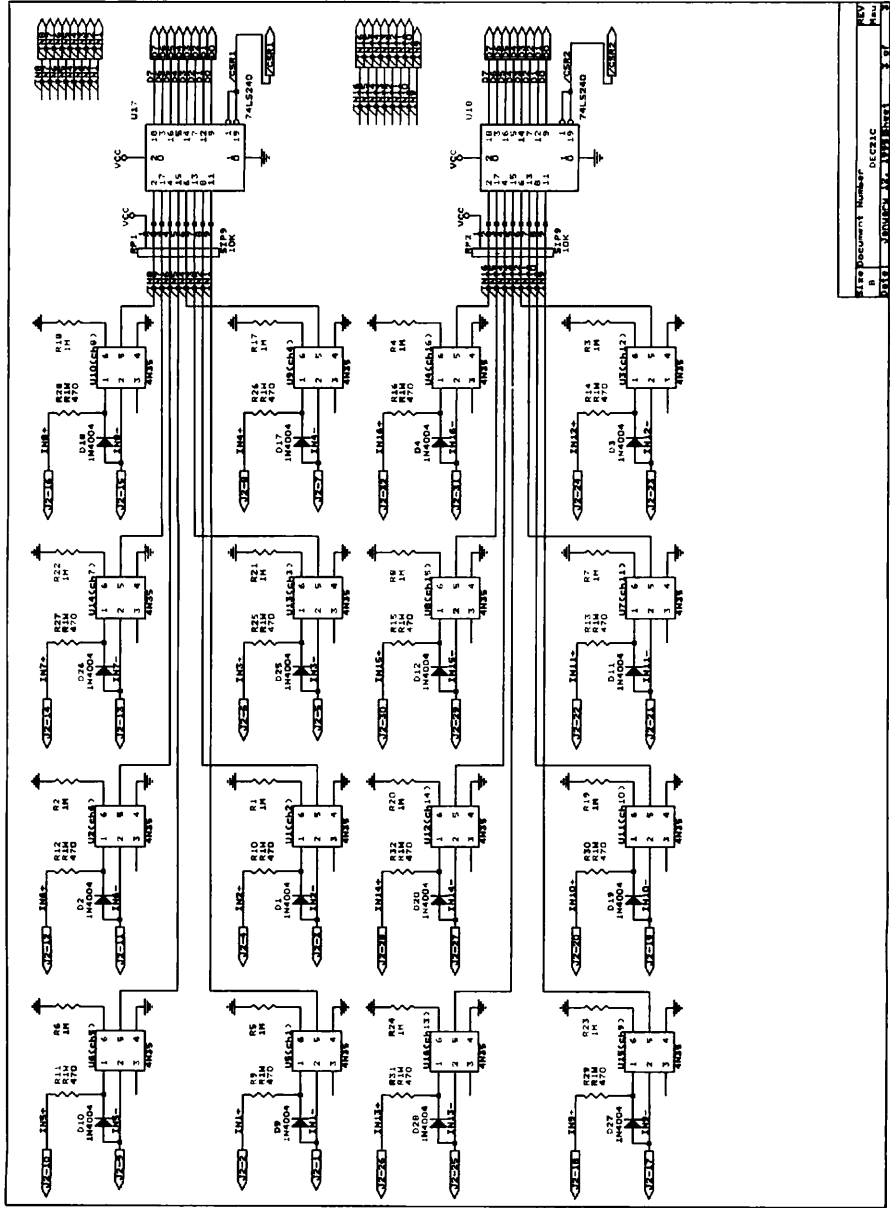
### physical data

operating temperature	-40 to +65 °C
storage temperature	-40 to +85 °C
weight	2 g
shocks	50 g
vibrations	20 g

edition 18-3-94

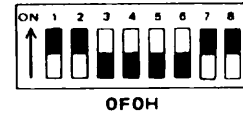
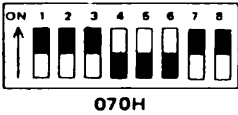
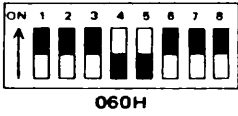
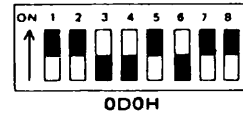
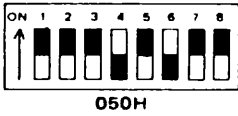
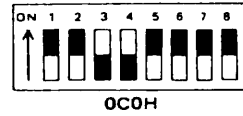
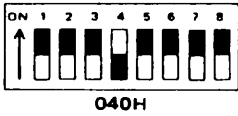
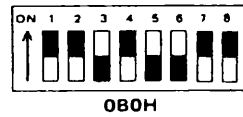
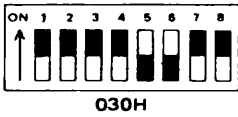
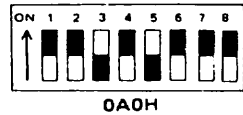
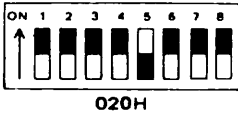
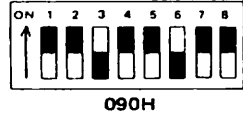
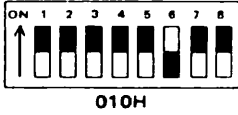
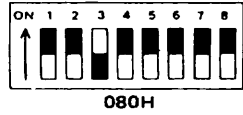
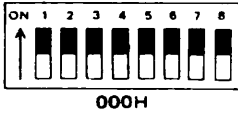




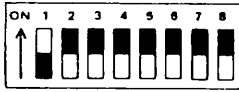


Part Number	74LS240
Manufacturer	ON
Quantity	2
Notes	
Revision	1
Drawn By	
Checked By	
Approved By	
Date	
Sheet	1 of 1

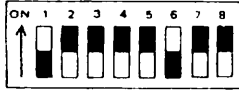
## APPENDIX C ADDRESS SETTING







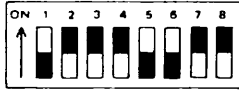
200H



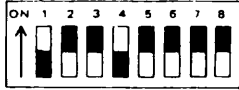
210H



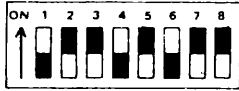
220H



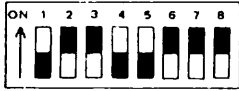
230H



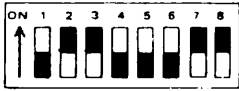
240H



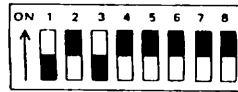
250H



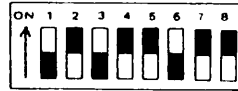
260H



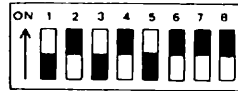
270H



280H



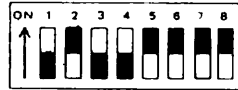
290H



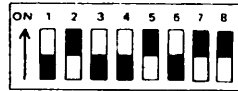
2A0H



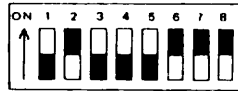
2B0H



2C0H



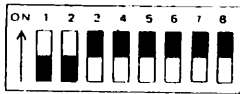
2D0H



2E0H



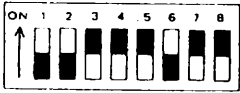
2F0H



300H



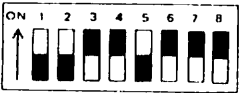
380H



310H



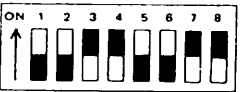
390H



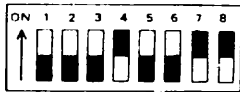
320H



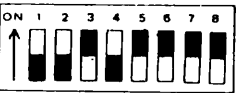
3A0H



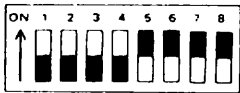
330H



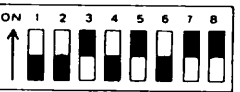
3B0H



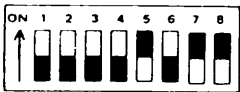
340H



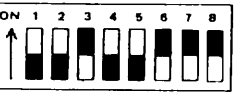
3C0H



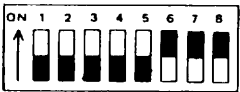
350H



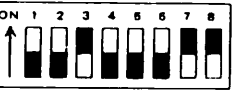
3D0H



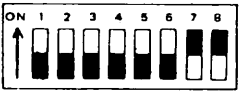
360H



3E0H



370H



3F0H

## APPENDIX D PROGRAMMING GUIDE

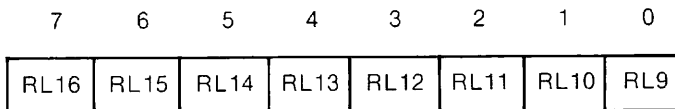
In this APPENDIX, we will define the I/O format and how to use it.

### D.1 Relay control group 1 output format

7	6	5	4	3	2	1	0
RL8	RL7	RL6	RL5	RL4	RL3	RL2	RL1

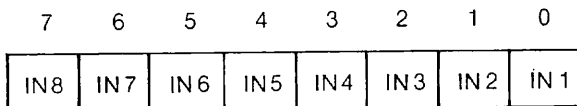
1. the address is (Base address + 0).
2. bit 0 control the relay channel 1, the pin 1 and pin 2 of J1 connector (J1-1 and J1-2) shows the output condition of channel 1.
3. when set bit 0 = "0", then J1-1 and J1-2 will be open.
4. when set bit 0 = "1", then J1-1 and J1-2 will be close.
5. bit 0 to bit 7 represents relay channel 1 to channel 8.

## D.2 Relay control group 2 output format



1. the address is (Base address + 1).
2. bit 0 control the relay channel 9, the pin 17 and pin 18 of J1 connector (J1-17 and J1-18) shows the output condition of channel 1.
3. when set bit 0 = "0", then J1-17 and J1-18 will be open.
4. when set bit 0 = "1", then J1-17 and J1-18 will be close.
5. bit 0 to bit 7 represents relay channel 9 to channel 16.

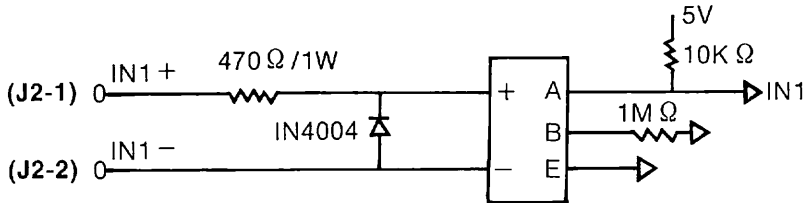
## D.3 Photo isolate group 1 input format



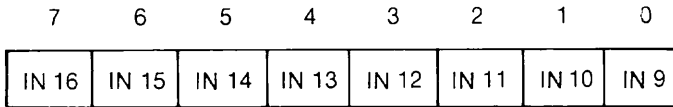
1. the address is (Base address + 0).
2. bit 0 represents input condition of pin 1 and pin 2 of J2 connector (J2-1 and J2-2).

3. bit 0 to bit 7 represents input channel 1 to channel 8.

4. the input hardware configuration is



#### D.4 Photo isolate group 2 input format

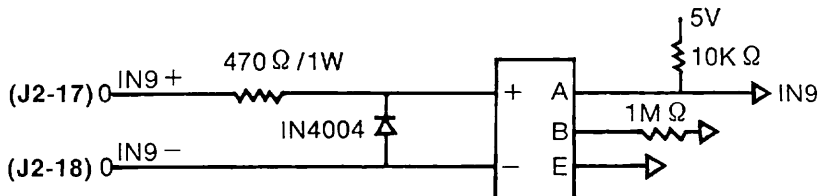


1. the address is (Base address + 1).

2. bit 0 represents input condition of pin 17 and pin 18 of J2 connector (J2-17 and J2-18).

3. bit 0 to bit 7 represents input channel 9 to channel 16.

4. the input hardware configuration is



# **8 CHANNELS RELAY OUTPUT/ 8 CHANNELS PHOTO ISOLATOR INPUT ADAPTER OPERATION MANUAL**

## **CONTENTS:**

<b>CHAPTER 1. Introduction .....</b>	<b>2-1</b>
<b>CHAPTER 2. Hardware Configuration .....</b>	<b>2-3</b>

## **APPENDIXES:**

<b>a. Warranty Information .....</b>	<b>2-11</b>
<b>b. Data Sheet .....</b>	<b>2-14</b>
<b>c. Address Setting .....</b>	<b>2-16</b>

## CHAPTER 1 INTRODUCTION

The 8 channels relay output / photo isolator input adapter provides relay output functions and photo isolator input functions. The relay output part provides 8 relays to drive 8 different output channels. Each relay channel can be used to control ON / OFF of external devices, to drive external high power relays, to activate alarms ... etc.

The photo isolator input part provides 8 photo couple digital input channels, which allow the input signals to be completely floated and prevent the ground loop.

The features of 8 channels relay output / 8 channels photo isolator input adapter are:

- \* Support 8 relay output channels and 8 photo couple input channels.
- \* Max contact rating for relay: 120V AC/DC 1AMP.
- \* Attraction time for relay: 3 ms.
- \* Fall off time for relay: 2 ms.

- \* Isolation resistance for relay: 100M OHM.
- \* Life expectancy for relay: 100 million operation at signal level load.
- \* Allow the photo input signals to be completely floated and prevent the ground loops.
- \* Activation voltage: 17 to 28V or TTL level.
- \* Address selectable.

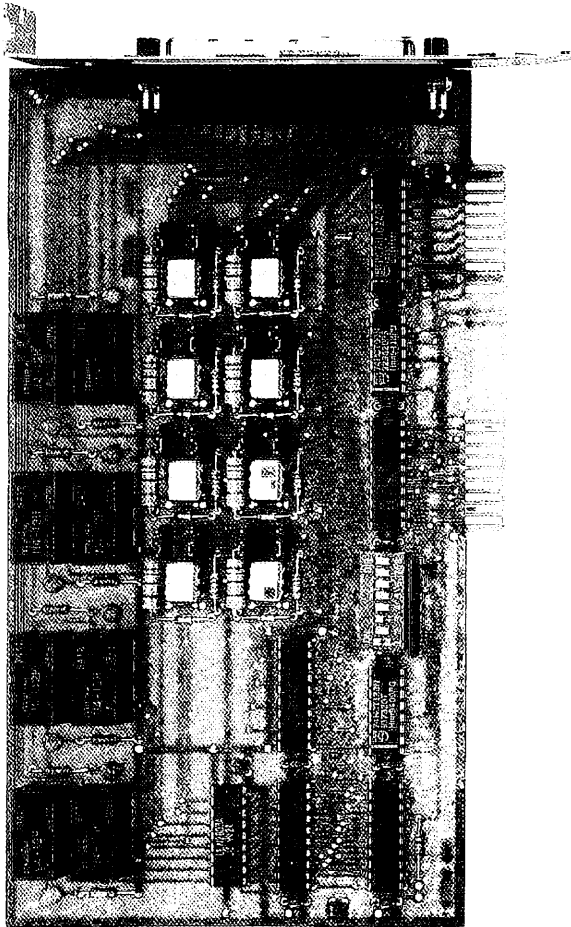
The package contains:

- \* 8 channels relay output / 8 channels photo couple input adapter.
- \* User's manual.

## CHAPTER 2 HARDWARE CONFIGURATION

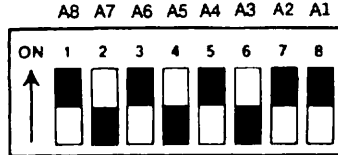
Before you use the 8 channels relay output / 8 channels photo couple input adapter, you must ensure that the I/O address is set correctly. Observe the figure in the follows, the proper settings for the 8 channels relay output / 8 channels photo couple input adapter is described in the following.

**DECISION-COMPUTER International Co., Ltd.**



## 2.1 Switch and Jumper Settings

### 1. I/O address



DIP switch is used to set base I/O address, you may set I/O address ranges from 200H to 3FEH increments of 2. Observe figure above, to set the switch ON means 0 and set the switch OFF means 1. A9 is always set to 1, SW1 corresponds to address A8, SW2 corresponds to address A7, etc. The figure above is set to 2A8H.

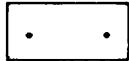
Base Address + 0 :

Relay output channel 1 to 8.

Base Address + 1 :

Photo input channel 1 to 8.

## 2. Jumper setting

 . Jumper A

 . Jumper B

jumper A	jumper B	Signal
left	right	opto +, opto -
left	left	opto +, GND
right	---	opto + = TTL mode

The jumper A and jumper B are used to set isolate signal of photo input. When set left position of jumper A and right position of jumper B, the photo inputs are isolated, and you must use opto + and opto - signals. When set left position of jumper A and left position of jumper B, opto is connected to ground (GND), you only use opto + signal. When set right position of jumper A and set any position of jumper B, the opto + signal accepts TTL level.

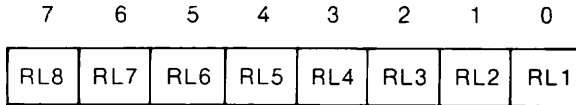
## 2.2 Hardware Installation

Your 8 channels relay output / 8 channels photo couple input adapter is designed to be inserted in any available slot in your computer. In order to gain access to the expansion slots, follow the steps listed in the followings.

1. Set the switch and jumper.
2. Connect the expansion cable to DB37 connector.
3. Turn off all power of your computer and all peripheral devices before installing your adapter.
4. Remove the cover of the computer.
5. Insert your preconfigured adapter into any available slot. Make sure your I/O card is firmly seated in the chosen slot.
6. Replace the cover of the computer.

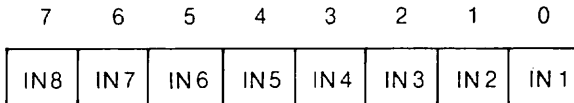
## 2.3 Function Description

### 1. Relay output



(Base address + 0) is used to control channel 1 to 8. When set the correspond bit to 1, it turns on the relay, this means relay is set to close state, when set the correspond bit to 0, it turns off the relay, this means relay is set to open state.

### 2. Photo couple input



(Base address + 1) is used to control channel 1 to 8, bit 0 to bit 7 represents input channel 1 to channel 8. Normally, when input voltage range from 17V to 28V, it means 1, otherwise below 17V is 0. When set to TTL mode, the corresponding bit will be set to 0 or 1 according to TTL level.

## 2.4 DB37 Connector Assignments

Pin	Description
1	relay channel 1, NO
2	relay channel 1, COM
3	relay channel 1, NC
4	relay channel 2, NO
5	relay channel 2, COM
6	relay channel 2, NC
7	relay channel 3, NO
8	relay channel 3, COM
9	relay channel 3, NC
10	relay channel 8, NO
11	relay channel 8, COM
12	opto channel 1, +
13	opto channel 2, +
14	opto channel 3, +
15	opto channel 4, +
16	opto channel 5, +
17	opto channel 6, +
18	opto channel 7, +
19	opto channel 8, +

Pin	Description
20	relay channel 4, NO
21	relay channel 4, COM
22	relay channel 4, NC
23	relay channel 5, NO
24	relay channel 5, COM
25	relay channel 6, NO
26	relay channel 6, COM
27	relay channel 7, NO
28	relay channel 7, COM
29	GND
30	opto channel 1, -
31	opto channel 2, -
32	opto channel 3, -
33	opto channel 4, -
34	opto channel 5, -
35	opto channel 6, -
36	opto channel 7, -
37	opto channel 8, -

## APPENDIX A WARRANTY INFORMATION

### A.1 Copyright

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Each piece of SmartLab package permits user to use SmartLab only on a single computer, a registered user may use the program on a different computer, but may not use the program on more than one computer at the same time.

Corporate licensing agreements allow duplication and distribution of specific number of copies within the licensed institution. Duplication of multiple copies is not allowed except through execution of a licensing agreement. Welcome call for details.

## A.2 Warranty Information

SmartLab warrants that for a period of one year from the date of purchase (unless otherwise specified in the warranty card) that the goods supplied will perform according to the specifications defined in the user manual. Furthermore that the SmartLab product will be supplied free from defects in materials and workmanship and be fully functional under normal usage.

In the event of the failure of a SmartLab product within the specified warranty period, SmartLab will, at its option, replace or repair the item at no additional charge. This limited warranty does not cover damage resulting from incorrect use, electrical interference, accident, or modification of the product.

All goods returned for warranty repair must have the serial number intact. Goods without serial numbers attached will not be covered by the warranty.

Transportation costs for goods returned must be paid by the purchaser. Repaired goods will be dispatched at the expense of SmartLab.

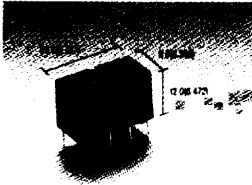
To ensure that your SmartLab product is covered by the warranty provisions, it is necessary that you return the Warranty card.

Under this Limited Warranty, SmartLab's obligations will be limited to repair or replacement only, of goods found to be defective as specified above during the warranty period. SmartLab is not liable to the purchaser for any damages or losses of any kind, through the use of, or inability to use, the SmartLab product.

SmartLab reserves the right to determine what constitutes warranty repair or replacement.

**Return Authorization:** It is necessary that any returned goods are clearly marked with an RA number that has been issued by SmartLab. Goods returned without this authorization will not be attended to.

## APPENDIX B DATA SHEET



### FEATURES

- Ultra high Sensitivity
- Conforms to FCC Part 68 1500V Surge and Dielectric Strength 1000V AC
- DIL Pitch Terminals
- Fully sealed (immersion clearable)
- UL, CSA recognized
- High Reliability bifurcated Contact

### SPECIFICATIONS

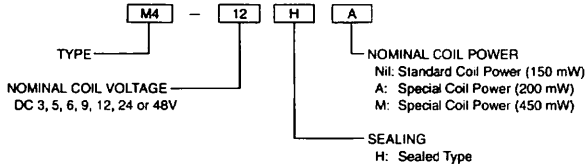
#### □ Contacts

Arrangement		2 Form C
Type		Bifurcated Crossbar
Material	Movable Contact Stationary Contact	Gold clad Silver-Palladium Alloy Gold clad Silver-Palladium Alloy
Ratings (Resistive Load)		1A 24V DC / 0.5A 120V AC
Max. Ratings (Resistive Load) Max. Switching Power Max. Switching Voltage Max. Switching Current		60W DC / 125VA AC 220V DC / 250V AC 2A DC/AC
Min. Switching Load		0.01 mA 10mV DC (Reference Value)
Expected Life (Min. Operations) Mechanical Electrical (Resistive Load)		100 million 0.5 million at 1A 24V DC 0.2 million at 0.5A 120V AC
Contact Resistance		50 mΩ Max. at initial

#### □ Characteristics at 20°C (68°F)

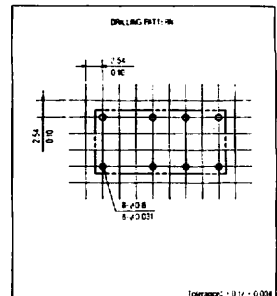
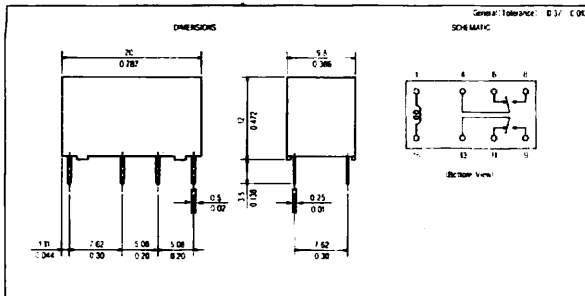
Operate Time (at nominal Voltage) Release Time (at nominal Voltage)	Approx. 4.5 ms Approx. 1.5 ms
Electrostatic Capacitance Between open Contacts Between Coil & Contacts Between Contact Poles	Approx. 0.7 pF Approx. 1.0 pF Approx. 0.9 pF
Dielectric Withstand Voltage Between open Contacts Between Coil & Contacts Between Contact Poles	1000V AC for 1 minute 1000V AC for 1 minute 1000V AC for 1 minute
Surge Withstand Voltage (FCC) Between open Contacts Between Coil & Contacts Between Contact Poles	1500V 1500V 1500V
Insulation Resistance	1000 MΩ min. at 500V DC
Vibration Resistance Functional Destructive	1.5 mm D.A. 10 to 55 Hz 5 mm D.A. 10 to 55 Hz
Shock Resistance Functional Destructive	10 G (11 ms) 100 G (6 ms)
Temperature Range	-40 to +90°C (-40 to +194°F) to +80°C for 300 mW Coil
Weight	Approx. 4.5 g

- Telecommunication Equipment
- Office Equipment
- Security Alarm Systems
- Measuring instruments
- Medical Monitoring Equipment
- Audio Visual Equipment
- Flight Simulator
- Sensor Control

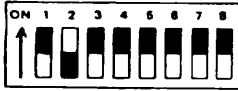


Relay Code	Nominal Voltage	Coil Resistance $\Omega \pm 10\%$	Pick-Up Voltage V DC	Drop-Out Voltage V DC	Nominal Power Consumption mW DC	Maximum Continuous Voltage V DC
	V DC					
M4-3H	3	60	2.1	0.15	150	7.5
M4-5H	5	167	3.5	0.25	150	12.5
M4-6H	6	240	4.2	0.3	150	15.0
M4-9H	9	540	6.3	0.45	150	22.5
M4-12H	12	960	8.4	0.6	150	30.0
M4-18H	18	1620	12.0	0.9	150	40.0
M4-24H	24	2880	16.8	1.2	200	52.9
M4-48H	48	7680	33.6	2.4	300	84.9
M4-3HA	3	45	2.1	0.3	200	6.5
M4-5HA	5	125	3.5	0.5	200	10.8
M4-6HA	6	180	4.2	0.6	200	13.0
M4-9HA	9	405	6.3	0.9	200	19.5
M4-12HA	12	720	8.4	1.2	200	26.5
M4-24HA	24	2880	16.8	2.4	200	52.9
M4-48HA	48	11520	33.6	4.8	200	103.9
M4-5HM	5	56	3.3	0.5	450	7.7
M4-6HM	6	80	4.0	0.6	450	9.2
M4-9HM	9	180	6.0	0.9	450	13.7
M4-12HM	12	320	8.0	1.2	450	18.3
M4-18HM	18	720	12.0	1.8	450	27.5
M4-24HM	24	1280	15.9	2.4	450	36.7
M4-48HM	48	5000	33.0	4.8	450	72.5

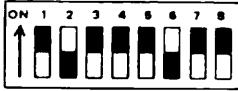
mm/inch



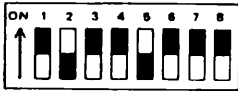




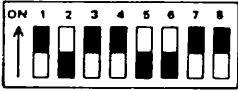
280H



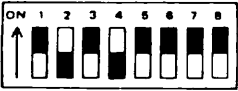
288H



290H



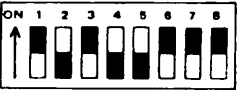
298H



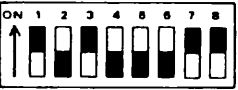
2A0H



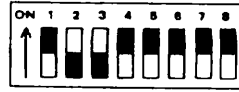
2A8H



2B0H



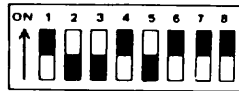
2B8H



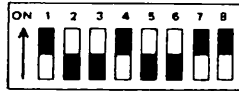
2C0H



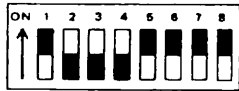
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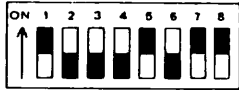
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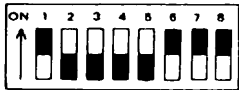
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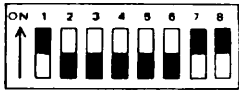
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2E8H

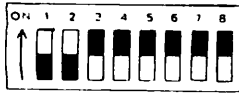


2F0H



2F8H

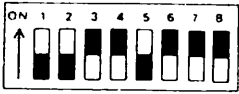




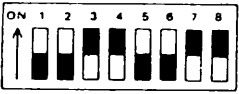
380H



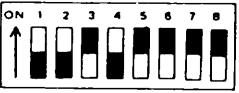
388H



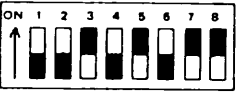
390H



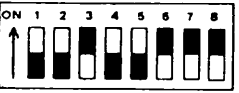
398H



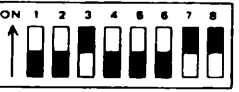
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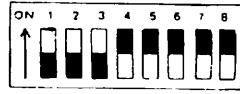
3A8H



3B0H



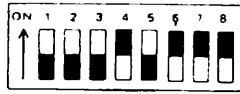
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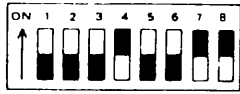
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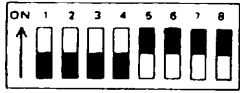
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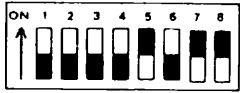
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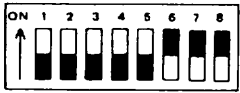
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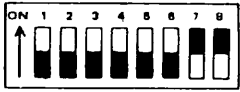
3E0H



3E8H



3F0H



3F8H

NOTE: