MetraByte Compatibles

CyREL Series

Relay Output Boards

CyREL 08: 8 Mechanical Relays, 50-pin
CyREL 16: 16 Mechanical Relays, 50-pin
CyREL 16M: 16 Mercury-wetted Board
CyREL 24: 24 Mechanical Relays, 50-pin
CyREL 32: 32 Mechanical Relays, 50-pin

USER'S MANUAL

VER. 6• AUG 2001

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1 INTRODUCTION

The CYREL 16 is a 16-channel relay interface board for ISA bus computers. The board provides 16, Form-C (SPDT) relays. The CYREL 08 board is identical to the CYREL 16 board except that only eight relays are installed. The CYREL 32 is two CYREL 16s on a single board while the CYREL 24 is a CYREL 32 with only 24 relays installed.

The CYREL 16M version is similar to the standard version, but uses form A mercury-wetted relays (SPST). It offers quicker switching times, less contact bounce and lower on-resistance than the standard models. The CYREL 16 family has been designed for control applications where a few points of high voltage (or current) need to be controlled.

WARNING!

High voltages will be present on the CYREL 16 family boards when high voltage is connected to the CYREL 16 connector. Use extreme caution! Never handle the CYREL 16 when signals are connected to the board through the connector.

DO NOT REMOVE THE PROTECTIVE PLATES FROM THE CYREL 16!

The CYREL 16 family are digital I/O boards with relay-based signal conditioning installed. Most accessory boards are intended to provide signal conditioning or easy to access signal termination. In general, the CYREL 16 will not require additional signal conditioning.

WARNING

We STRONGLY recommend that under no circumstance should a screw terminal board be used to connect high voltages to the CYREL 16 series board. The CYREL 16 is intended to control high voltages. If you use a screw terminal board you will expose yourself and others to those high voltage signals.

We recommend that you construct a safe cable to carry your signals directly from your equipment to the CYREL 16 connector.

NOTE: The Mercury-wetted boards must be mounted in the computer such that they will remain within 30 degrees of vertical.

Installation of these boards in most tower computer cases will require the tower be rested on its side for proper operation of the mercury relays.

2 INSTALLATION

The installation and operation of all four CYREL series boards is very similar. Throughout this manual we use CYREL as a generic designation for the CYREL 08, CYREL 16, CYREL 24, and CYREL 32. When required, due to the differences in the boards, the specific board name is used. The CYREL boards are easy to use. These procedure will help you quickly and easily set up, install and test your board. We assume you already know how to open the PC and install expansion boards. If you are unfamiliar or uncomfortable with board installation, please refer to your computer's documentation.

We recommend you perform the software installation described in the following sections prior to installing the board in your computer. The ***Insta*Cal**™ operations below will show you how to properly set the switches and jumpers on the board prior to physically installing the board in your computer.

2.1 SOFTWARE INSTALLATION

The board has a variety of switches and jumpers to set before installing the board in your computer. The simplest way to configure your board is to use the *Insta*Cal™ program provided on the CD (or floppy disk) **.**

*Insta*Cal will show you all available options, how to configure the various switches and jumpers (as applicable) to match your application requirements. It will create a configuration file that your application software (and the Universal Library) will refer to so the software you use will automatically have access to the exact configuration of the board.

3 HARDWARE INSTALLATION

3.1 MERCURY (16M) BOARD SPECIAL CONSIDERATIONS

The Mercury-wetted board must be mounted in the computer such that it will remain within 30 degrees of vertical.

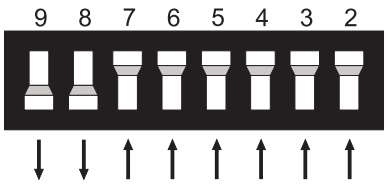
NOTE: Installation of these boards in most tower computer cases will require the tower be rested on its side for proper operation of the mercury relays.

3.2 BASE ADDRESS

The base address switch controls the I/O location where the CPU can access the registers of the CYREL board. The factory default is 300h (768D). If you have a board installed at address 300h, you will have to choose a new address from those available on your computer. You may use the list of PC I/O address assignments found on the following page and add notes about the boards you have installed in your computer. Choose a new base address from those available and set the switch using the guide below.

NOTE: The switch shown below in Figure 3-1 is for the CYREL 08 and CYREL 16 boards. Since the CYREL 32 and CYREL 24 board require four I/O addresses, their base address switch does not provide switch #2. All other settings are identical.

If address 300h is available on your computer, we recommend that you select it for your board. The software examples are written for base = 300h.



SW	HEX
A9	200
A8	100
A7	80
A6	40
A5	20
A4	10
A3	08
A2	04

BASE ADDRESS SWITCH - Address 300H shown here.

Figure 3-1. Base Address Switches -

Table 3-1. PC I/O Addresses

HEX RANGE	FUNCTION	HEX RANGE	FUNCTION
000-00F	8237 DMA #1	2C0-2CF	EGA
020-021	8259 PIC #1	2D0-2DF	EGA
040-043	8253 TIMER	2E0-2E7	GPIB (AT)
060-063	8255 PPI (XT)	2E8-2EF	SERIAL PORT
060-064	8742 CONTROLLER (AT)	2F8-2FF	SERIAL PORT
070-071	CMOS RAM & NMI MASK (AT)	300-30F	PROTOTYPE CARD
080-08F	DMA PAGE REGISTERS	310-31F	PROTOTYPE CARD
0A0-0A1	8259 PIC #2 (AT)	320-32F	HARD DISK (XT)
0A0-0AF	NMI MASK (XT)	378-37F	PARALLEL PRINTER
0C0-0DF	8237 #2 (AT)	380-38F	SDLC
0F0-0FF	80287 NUMERIC CO-P (AT)	3A0-3AF	SDLC
1F0-1FF	HARD DISK (AT)	3B0-3BB	MDA
200-20F	GAME CONTROL	3BC-3BF	PARALLEL PRINTER
210-21F	EXPANSION UNIT (XT)	3C0-3CF	EGA
238-23B	BUS MOUSE	3D0-3DF	CGA
23C-23F	ALT BUS MOUSE	3E8-3EF	SERIAL PORT
270-27F	PARALLEL PRINTER	3F0-3F7	FLOPPY DISK
2B0-2BF	EGA	3F8-3FF	SERIAL PORT

3.3 WAIT STATE

There is a wait state jumper on CYREL series boards. The factory default is wait state disabled. You will probably never need the wait state because PC expansion slot busses are limited to 8 or 10 MHz.

If you were to get intermittent operation from your CYREL board, you can try enabling the wait state to see if that solves the problem.

4 PROGRAMMING

The CYREL boards are easy to program. From one to four eight-bit registers are written to control relays or can be read to determine the state of relays.

In addition to direct I/O programming, the boards are fully supported by the powerful Universal Library program as well as most third-party application programs.

4.1 DIRECT I/O REGISTER PROGRAMMING

The CYREL family uses between one and four I/O addresses. Each address controls eight relays. Relays are controlled by writing to these register(s). The address map of the CYREL boards is shown below.

BASE ADDRESS	Relays 0-7	Read/Write (All CYREL boards
BASE + 1	Relays 8-15	Read/Write (CYREL 16, 24, 32)
BASE + 2	Relays 16-23	Read/Write (CYREL 24, 32)
BASE + 3	Relays 24-31	Read/Write (CYREL 32 only)

The registers are written to and read from as a single, 8-bit byte. Each bit controls an output to a relay (write) or represents the state of a relay (read).

All registers are read left to right. The leftmost bit (the eighth bit) being the most significant bit. Following this format, bit seven (OP7) of BASE + 0 corresponds to relay number 7 and bit 0 to relay number 0.

To construct a control word, use Table 4.1 for bit weights.

Table 4-1. Bit Weights

BIT POSITION	DECIMAL VALUE	HEX VALUE
0	1	1
1	2	2
2	4	4
3	8	8
4	16	10
5	32	20
6	64	40
7	128	80

For example, to assemble the control byte that will turn on relays 0, 1, 3, 5, and 7, we see in Table 4-2 that we need to write HEX AB or decimal 171.

Table 4-2. Sample Coding to Turn ON Relays 0, 1, 3, 5, & 7

RELAY	HEX	ON=1	WEIGHT	DECIMAL	ON=1	WEIGHT
OP7	80	1	80	128	1	128
OP6	40	0	0	64	0	0
0P5	20	1	20	32	1	32
OP4	10	0	0	16	0	0
OP3	8	1	8	8	1	8
OP2	4	0	0	4	0	0
OP1	2	1	2	2	1	2
OP0	1	1	1	1	1	1
Totals			AB			171

4.2 PROGRAMMING NOTES

WRITE = CONTROL: Write a byte to the register to control the relays. *A one in the relay bit position turns the relay on.*

READ = STATUS: Read the status of the relay control register. A one in the relay bit position indicates the relay is on.

ON & OFF for FORM C RELAYS:

ON means that FORM C relay common terminal is in contact with the Normally Open contact.

OFF means that FORM C relay common terminal is in contact with the normally closed contact.

4.3 DETAILED RELAY CONTROL I/O MAP

The following section provides a detailed description of the register map and relay control registers.

Base Address +0 (applicable to all CYREL series boards).

RELAY	OP7	OP6	OP5	OP4	OP3	OP2	OP1	OP0
BIT No.	7	6	5	4	3	2	1	0
HEX Value	80	40	20	10	8	4	2	1
DECIMAL	128	64	32	16	8	4	2	1

Base Address + 1 (applicable to CYREL 16, 24, and 32 only).

RELAY	OP15	OP14	OP13	OP12	OP11	OP10	OP9	OP8
BIT No.	7	6	5	4	3	2	1	0
HEX Value	80	40	20	10	8	4	2	1
DECIMAL	128	64	32	16	8	4	2	1

Base Address + 2 (applicable to CYREL 24, and 32 only).

RELAY	OP23	OP22	OP21	OP20	OP19	OP18	OP17	OP16
BIT No.	7	6	5	4	3	2	1	0
HEX Value	80	40	20	10	8	4	2	1
DECIMAL	128	64	32	16	8	4	2	1

Base Address + 3 (applicable to CYREL 32 only).

RELAY	OP31	OP30	OP29	OP28	OP27	OP26	OP25	OP24
BIT No.	7	6	5	4	3	2	1	0
HEX Value	80	40	20	10	8	4	2	1
DECIMAL	128	64	32	16	8	4	2	1

5 CONNECTING TO RELAYS

5.1 I/O CONNECTOR DIAGRAMS

The CYREL 08 and CYREL 16 boards use a single 50-pin connector for signal interfacing. The CYREL 24 and CYREL 32 use two, 50-pin connectors. The pin-outs of the connectors are shown in Figures 5-1 through 5-4.

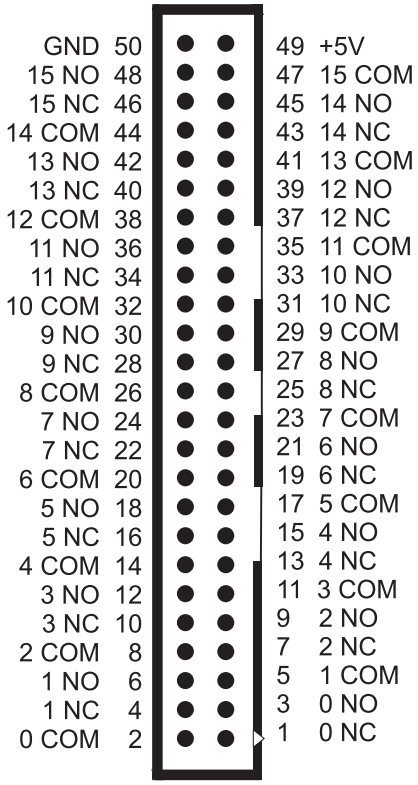


Figure 5-1. CYREL 08 & 16 Connector

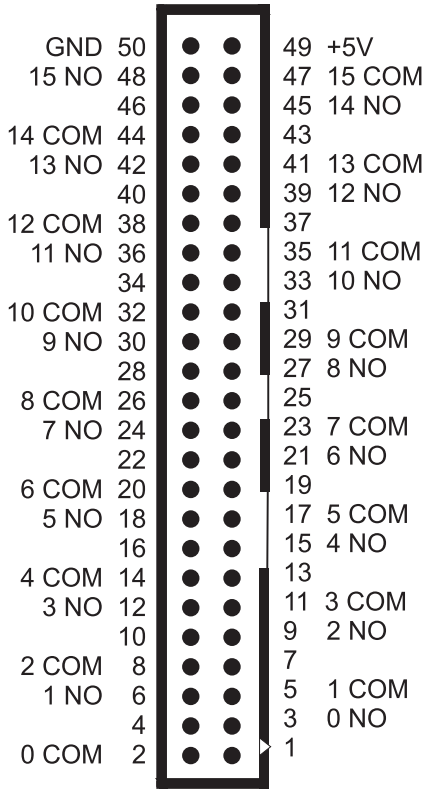


Figure 5-2. CYREL 16M Connector

Note that the form A relays used on the 16M version have *NO* and *COM* connections only (Figure 5-2).

WARNING!

High voltages will be present on the CYREL boards when you have connected high voltage inputs or outputs to the CYREL connector. Use extreme caution! Never handle the CYREL board when high voltage signals are connected to it.

DO NOT REMOVE THE PROTECTIVE PLATES FROM THE BOARD.

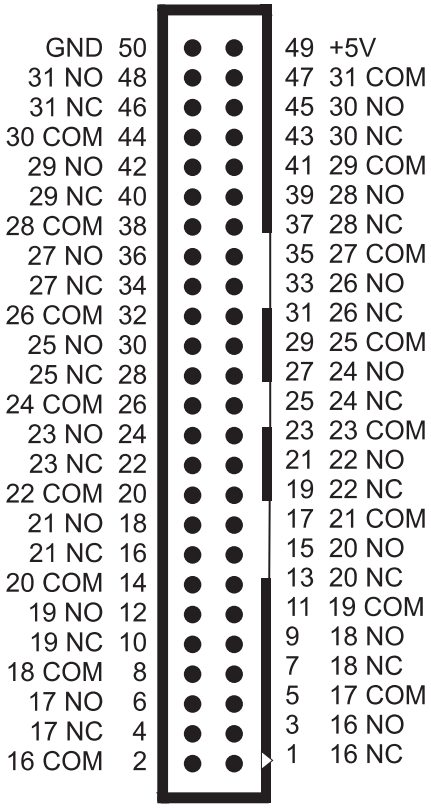


Figure 5-3. CYREL 24 & 32 Connector

The CYREL 24 & 32 connector (Figure 5-3) is the center of the board.

The connector for relays 0 through 15 is closest to the computer back-plate.

NOTE: Pins for relays 24 through 31 are open on the CYREL 24 version.

WARNING!

High voltages will be present on the CYREL boards when you have connected high voltage inputs or outputs to the CYREL connector. Use extreme caution! Never handle the CYREL board when HV signals are connected to the board.

DO NOT REMOVE THE PROTECTIVE PLATES FROM THE BOARD.

5.2 FORM C RELAYS (STANDARD VERSIONS)

Figure 5-4 is the schematic for a Form-C relay as used on the standard CYREL 08, 16, 24 and 32 boards.

The Form-C relay has a COMMON (COM), a normally open (NO), and a normally closed (NC) contact. When a 0 is written to an output (OPn), the common and NC are in contact. When a "1" is written to an output (OPn), the common and NO are in contact.

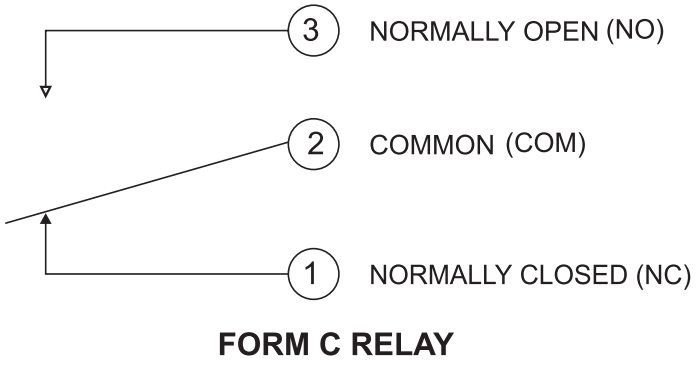


Figure 5-4. Form C Relay

5.3 FORM A RELAYS (/M VERSIONS)

Figure 5-5 is the schematic for a Form-A relay as used on mercury-wetted (16M) model.

A Form-A relay has COMMON (COM) and normally open (NO) connections. When a "0" is written to the output, the common and NO are disconnected. When a "1" is written to the output (OPn), the common and NO are in contact.

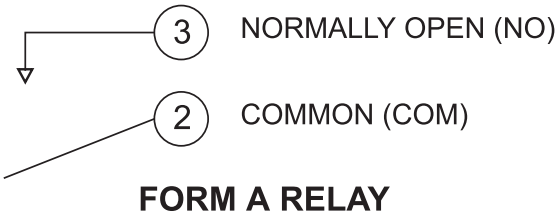


Figure 5-5. Form A Relay

6 SPECIFICATIONS

6.1.1 CYREL 08, 16, 24 and 32 (standard versions)

POWER CONSUMPTION

+5V supply	510 mA typical plus 22 mA per active (on) relay

GENERAL SPECIFICATIONS

Number	8, 16, 24, or 32
Contact arrangement	Form C (SPDT)
Contact rating	3A @ 120VAC or 28VDC resistive
Contact type	Gold-overlayed silver
Contact resistance	100 milliohms max.
Operate time	20 milliseconds
Release time	10 milliseconds max.
Life expectancy	10 million mechanical operations minimum

ENVIRONMENTAL

Vibration	10 to 55 Hz (Dual amplitude 1.5mm)
Shock	10g (11 milliseconds)
Dielectric isolation	500V (1 minute)
Life expectancy	1 Million Operations Electrical 100,000 Operations @ Full Load

6.1.2 MERCURY WETTED (16M) VERSIONS

POWER CONSUMPTION

CYREL	510 mA + (22 mA per activated relay max)

GENERAL SPECIFICATIONS

Number	8 /16
Contact arrangement	Form A (SPST)
Contact rating	50 watts @ 1 Amp or 500VDC resistive
Contact type	Mercury-wetted
Contact resistance	50 milliohms max.
Operate time	2 milliseconds
Release time	2 milliseconds max.
Dielectric isolation	500V (1 minute)
Life expectancy	10^7 Operations (Full Load)

ENVIRONMENTAL

Operating temperature	0 to 70 °C
Storage temperature	-40 to 100 °C
Humidity	0 to 90% non-condensing
Weight	8 oz.

NOTE: The Mercury-wetted boards must be mounted in the computer such that they will remain within 30 degrees of vertical.

Installation of these boards in most tower computer cases will require the tower be rested on its side for proper operation of the mercury relays.

EC Declaration of Conformity

We declare under sole responsibility that the product:

Part Number	Description
CYREL ##	8, 16, 24 or 32 channel relay board

to which this declaration relates, meets the essential requirements, is in conformity with, and CE marking has been applied according to the relevant EC Directives listed below using the relevant section of the following EC standards and other normative documents:

EU EMC Directive 89/336/EEC: Essential requirements relating to electromagnetic compatibility.

EU 55022 Class B: Limits and methods of measurements of radio interference characteristics of information technology equipment.

EN 50082-1: EC generic immunity requirements.

IEC 801-2: Electrostatic discharge requirements for industrial process measurement and control equipment.

IEC 801-3: Radiated electromagnetic field requirements for industrial process measurements and control equipment.

IEC 801-4: Electrically fast transients for industrial process measurement and control equipment.

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Product Service

Diagnosis and Debug

CyberResearch, Inc. maintains technical support lines staffed by experienced Applications Engineers and Technicians. There is no charge to call and we will return your call promptly if it is received while our lines are busy. Most problems encountered with data acquisition products can be solved over the phone. Signal connections and programming are the two most common sources of difficulty. CyberResearch support personnel can help you solve these problems, especially if you are prepared for the call.

To ensure your call's overall success and expediency:

1) Have the phone close to the PC so you can conveniently and quickly take action that the Applications Engineer might suggest.
2) Be prepared to open your PC, remove boards, report back-switch or jumper settings, and possibly change settings before reinstalling the modules.
3) Have a volt meter handy to take measurements of the signals you are trying to measure as well as the signals on the board, module, or power supply.
4) Isolate problem areas that are not working as you expected.
5) Have the source code to the program you are having trouble with available so that preceding and prerequisite modes can be referenced and discussed.
6) Have the manual at hand. Also have the product's utility disks and any other relevant disks nearby so programs and version numbers can be checked.

Preparation will facilitate the diagnosis procedure, save you time, and avoid repeated calls. Here are a few preliminary actions you can take before you call which may solve some of the more common problems:

1) Check the PC-bus power and any power supply signals.
2) Check the voltage level of the signal between SIGNAL HIGH and SIGNAL LOW, or SIGNAL+ and SIGNAL– . It CANNOT exceed the full scale range of the board.
3) Check the other boards in your PC or modules on the network for address and interrupt conflicts.
4) Refer to the example programs as a baseline for comparing code.

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Warranty Notice

CyberResearch, Inc. warrants that this equipment as furnished will be free from defects in material and workmanship for a period of one year from the confirmed date of purchase by the original buyer and that upon written notice of any such defect, CyberResearch, Inc. will, at its option, repair or replace the defective item under the terms of this warranty, subject to the provisions and specific exclusions listed herein.

This warranty shall not apply to equipment that has been previously repaired or altered outside our plant in any way which may, in the judgment of the manufacturer, affect its reliability. Nor will it apply if the equipment has been used in a manner exceeding or inconsistent with its specifications or if the serial number has been removed.

CyberResearch, Inc. does not assume any liability for consequential damages as a result from our products uses, and in any event our liability shall not exceed the original selling price of the equipment.

The equipment warranty shall constitute the sole and exclusive remedy of any Buyer of Seller equipment and the sole and exclusive liability of the Seller, its successors or assigns, in connection with equipment purchased and in lieu of all other warranties expressed implied or statutory, including, but not limited to, any implied warranty of merchant ability or fitness and all other obligations or liabilities of seller, its successors or assigns.

The equipment must be returned postage prepaid. Package it securely and insure it. You will be charged for parts and labor if the warranty period has expired.

Returns and RMAs

If a CyberResearch product has been diagnosed as being non-functional, is visibly damaged, or must be returned for any other reason, please call for an assigned RMA number. The RMA number is a key piece of information that lets us track and process returned merchandise with the fastest possible turnaround time.

PLEASE CALL FOR AN RMA NUMBER!

Packages returned without an RMA number will be refused!

In most cases, a returned package will be refused at the receiving dock if its contents are not known. The RMA number allows us to reference the history of returned products and determine if they are meeting your application's requirements. When you call customer service for your RMA number, you will be asked to provide information about the product you are returning, your address, and a contact person at your organization.

Please make sure that the RMA number is prominently displayed on the outside of the box.

• Thank You •

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