CYTEC VM/8-4X1

VME/VXI Bus

64 CHANNEL RELAY MODULE

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DRAWINGS

CYTEC VM/8-4X1
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1.0 GENERAL

The Cytec VM/8-4X1 Relay Module is designed for general purpose signal switching in VME or VXI Bus B sized mainframes. The module is available in standard dry reeds, low thermal EMF reeds or mercury wetted reeds.

The module is register based with VXI registers for Manufacturers ID, Model Code and Control. Relay selection is made by simple byte writes to upper registers.

Relays are organized in eight 4 X 1 matrices. Each group provides four 2 wire inputs switched to a 2 wire output. All relays are individually controlled and any number may be closed at one time.

A single pole double throw relay is also provided on the module to allow any pair of wires to be sub-multiplexed to a single wire channel. For example, by operating as a 32 channel, 2 wire multiplexer and sub-multiplexing the HI-LO bus 64 single wire channels are available.

By proper external wiring, the module can be used in many configurations. The following are just a few of the possible combinations:

Two Wire	Two Wire +	Single Wire
8 - 4 X 1's	7 - 4 X 1's	1 - 8 X 1
4 - 4 X 2's	3 - 3 X 4's	1 - 8 X 1
2 - 4 X 4's	1 - 4 X 4	1 - 32 X 1
1 - 8 X 4	1 - 7 X 4	1 - 16 X 1
4 - 8 x 1's	3 - 8 X 1's	1 - 16 X 1
2 - 16 x 1's	1 - 16 X 1	1 - 32 X 1
1 - 32 x 1		1 - 64 X 1

MODULE STYLES

VM/8-4X1-S	Standard Dry Reeds
VM/8-4X1-LT	Low Thermal EMF Reeds
VM/8-4X1-M	Mercury Wetted Reeds

2.0 SPECIFICATIONS

General

VXI Revision:	1.4.
Module Size:	'B' (6U) per VME/VXI specification.
Logical Address:	per DIP Switch setting.
Communication:	Register Based.
Bus/Address Type:	D16/A16/D08(O).
Write Cycle:	less than 500 nsec.
Read Cycle:	less than 500 nsec.

Environmental

Operating Temperature:	0 to 55° C.
Cooling:	<10° C rise with 1.5 liter/sec. air low and pressure drop 0.04mm H_2O.
Humidity:	Less than 95% RH no condensation to 30° C.
Radiated Emission:	Per VXI specification.
Conducted Emission:	Per VXI specification.
Mounting Position:	Any position with type S or LT relays. Vertical only with type M relays.
Storage Temperature:	-25 to 80° C.

Power

Power Requirements:	+5 Volts, 91mA typical, 330mA Maximum. +12 Volts, 32mA + 20mA per relay energized.

Signals

Contact Styles:	S - Standard Dry Reed. M - Mercury Wetted Reed. LT - Low Thermal EMF Reed.
Input Connections:	2 - 34 Pin 0.1" X 2 Headers.
Output Connections:	1 - 20 Pin 0.1" X 2 Header.

	Contact Style			
Contact Parameters	S	M	LT	Units
Dielectric Strength:	500	1000	350	Volts DC/Peak AC
Switching Voltage:	200	500	200	Volts DC/Peak AC
Switching Current:	0.5	1.0	0.5	Amps, Resistive
Carry Current:	2.0	2.0	1.5	Amps, Resistive
Contact Rating:	10	50	10	Watts
Operations:	10^8	10^9	10^7	Cycles
Operate Time:	1.0	2.0	0.75	msec. Max.
Contact Resistance:	0.1	0.05	0.1	ohms
Insulation Resistance:	10^{10}	10^{10}	10^{10}	ohms
Thermal EMF:	na	na	<2	µvolts @ 1 minute

Performance for one 4X1 section, 50 ohms

Bandpass:	>200MHz, -3dB
Crosstalk:	<-60dB @ 1MHz
Isolation:	<-60dB @ 1MHz

3.0 SETUP

3.1 LOGICAL ADDRESS

The VME physical and VXI logical address is set by an eight position DIP switch located near the bottom of the VXI P1 connector on the control module. The switch allows for selecting one of 256 possible base addresses in A16 address space. Switch position 1 through 8 select the address A06 through A13 respectively.

Closing a switch or setting the ON position indicates a binary 0; opening a switch or setting to the closed position indicates a binary 1.

Address(decimal) = V * 64 + 49152 where V = DIP switch setting.

Address(hex) = V * 0x40 + 0xc000

Factory Default = 7, Switches 1,2,3 = OFF, Switches 4,5,6,7,8 = ON.
49,600 decimal, C1C0 hexadecimal.

NOTE: All data transfers are done in Short Supervisory Access, Hex 2D, or Short Nonpriviledged Access, Hex 29.

3.2 INPUT SIGNAL CONNECTIONS

There are two input signal connectors, J1 and J3. The mating connector is a 34 pin header available as insulation displacement or crimp-and-poke.

J1 PIN	INPUT	J1 PIN	INPUT	OUTPUT
1	15H	2	15L	
3	14H	4	14L	
5	13H	6	13L	
7	12H	8	12L	3 H/L
9	11H	10	11L	
11	10H	12	10L	
13	9H	14	9L	
15	8H	16	8L	2 H/L
17	7H	18	7L	
19	6H	20	6L	
21	5H	22	5L	
23	4H	24	4L	1 H/L
25	3H	26	3L	
27	2H	28	2L	
29	1H	30	1L	
31	0H	32	0L	0 H/L
33	GROUND	34	GROUND	

J3 PIN	INPUT	J3 PIN	INPUT	OUTPUT
1	31H	2	31L	
3	30H	4	30L	
5	29H	6	29L	
7	28H	8	28L	7 H/L
9	27H	10	27L	
11	26H	12	26L	
13	25H	14	25L	
15	24H	16	24L	6 H/L
17	23H	18	23L	
19	22H	20	22L	
21	21H	22	21L	
23	20H	24	20L	5 H/L
25	19H	26	19L	
27	18H	28	18L	
29	17H	30	17L	
31	16H	32	16L	4 H/L
33	GROUND	34	GROUND	

NOTE: These two connections may be externally jumpered (daisy chained) together to create a 16X2 two pole matrix.

3.3 SIGNAL COMMON CONNECTIONS

Common connections to each of the 4X1 matrices is via a 20 pin header connector located on the front panel. There are 8 HI/LO pairs that may be commoned to form larger multiplexers. The Form-C contacts are also brought out this connector: NO - normally open, NC - normally closed and COM - common and may be used with any pair for sub-multiplexing.

PIN	SIGNAL	PIN	SIGNAL	SWITCHED INPUTS
1	7H	2	7L	28, 29, 30, 31 H/L
3	6H	4	6L	24, 25, 26, 27 H/L
5	5H	6	5L	20, 21, 22, 23 H/L
7	4H	8	4L	16, 17, 18, 19 H/L
9	3H	10	3L	12, 13, 14, 15 H/L
11	2H	12	2L	8, 9, 10, 11 H/L
13	1H	14	1L	4, 5, 6, 7 H/L
15	0H	16	0L	0, 1, 2, 3 H/L
17	Form-C, NC	18	Form-C, NO	
19	Form-C, COM	20	GROUND	

Commoning to Form Larger Multiplexers

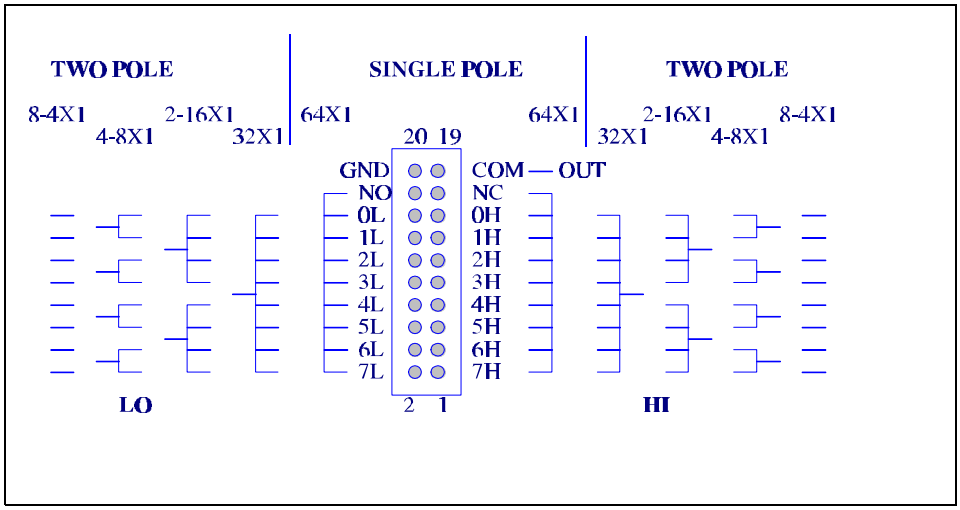
Forming larger multiplexers is done by commoning the outputs of the 4X1 sections.

SIZE	COMMON
8 - 4X1's	none
4 - 8X1's	7H-6H, 5H-4H, 3H-2H, 1H-0H 7L-6L, 5L-4L, 3L-2L, 1L-0L
2 - 16X1's	7H-6H-5H-4H, 3H-2H-1H-0H 7L-6L-5L-4L, 3L-2L-1L-0L
1 - 32X1	7H-6H-5H-4H-3H-2H-1H-0H 7L-6L-5L-4L-3L-2L-1L-0L
1 - 64X1	Common all HI's to Form-C, NC
(Single pole)	Common all LO's to Form-C, NO Output on Form-C, COM

Many other combinations are possible by commoning sections and using the Form-C relay such as:

4 - 4X1's + 1- 16X1

1 - 16X1 (two pole) + 1 - 32X1 (single pole), using form-C relay



4.0 VME/VXI COMMUNICATION

4.1 ADDRESS MODIFIER CODES

All data transfers are done in Short Supervisory Access, Hex 2D, or Short Nonpriviledged Access, Hex 29.

4.2 GENERAL REGISTERS

The Module has the following VXI required registers for Register Based operation.

Address	R/W	Register Function
base + 00	R	**ID Register**, returns the value 65354 (FF4A hex). Register Based, A16 Only, Manufacturers ID 3914 (F4A hex).
base + 02	R	**Device Type**: returns 65280 (FF00 hex).
base + 04	R	**Status**: bit 3 RDY signal. bit 2 PASSED signal.
base + 04	W	**Control Register**: bit 0 RESET signal, opens all relays.
base + 06	R/W	bit 0 Form-C Relay.
base + 08	R/W	Relays 0 through 7.
base + 10	R/W	Relays 8 through 15.
base + 12	R/W	Relays 16 through 23.
base + 14	R/W	Relays 24 through 31.

4.3 RELAY OPERATION

Relays are written or read in parallel in groups of eight through registers at offset 8, 10, 12 and 14. The Form-C relay is written and read by offset register 6. A binary 1 written to a bit position closes a relay; a binary 0 opens a relay.

Relay data is always returned low true (inverted) from the data written. This insures open or defective points are returned as a binary 1 and closed points as a binary 0.

Relay Address Table

Register	Bit	Hex	Group	Relay	Physical Relay #	
6	0	1	N/A	N/A	Form C	Normally Closed = 0 Normally Open = 1
8	0	1	0	0	K0	
8	1	2	0	1	K1	
8	2	4	0	2	K2	
8	3	8	0	3	K3	
8	4	10	1	0	K4	
8	5	20	1	1	K5	
8	6	40	1	2	K6	
8	7	80	1	3	K7	
10	0	1	2	0	K8	
10	1	2	2	1	K9	
10	2	4	2	2	K10	
10	3	8	2	3	K11	
10	4	10	3	0	K12	
10	5	20	3	1	K13	
10	6	40	3	2	K14	
10	7	80	3	3	K15	
12	0	1	4	0	K16	
12	1	2	4	1	K17	
12	2	4	4	2	K18	
12	3	8	4	3	K19	
12	4	10	5	0	K20	
12	5	20	5	1	K21	
12	6	40	5	2	K22	
12	7	80	5	3	K23	
14	0	1	6	0	K24	
14	1	2	6	1	K25	
14	2	4	6	2	K26	
14	3	8	6	3	K27	
14	4	10	7	0	K28	
14	5	20	7	1	K29	
14	6	40	7	2	K30	
14	7	80	7	3	K31	

Please refer to **Drwg.#9-200-1/3**

4.3 RELAY OPERATION (Cont'd)

Examples:

1. Writing the hex pattern 12 to offset register 10 will close relays 12 and 9; all others in that group will be opened.

```
VXIoutReg(la, 10, 0x12);      //la = logical address
```

2. Read and modify relay 28 (offset 14, bit 4)

```
VXIinReg(la, 14, &rlys);      // read current pattern
rlys = ~rlys;                 // invert
rlys |= 16;                   // OR to set bit 4
VXIoutReg(la, 14, rlys);      // write new pattern
```

4.4 CLEARING ALL RELAYS

All relays may be cleared in one of two ways: by writing 0's to each of the four registers or by setting (then resetting) the RESET bit in offset register 4.

Examples:

1. By writes:

```
for (I=8; i<16; I+=2)
    VXIoutReg(la, I, 0);
```

2. By Reset:

```
VXIoutReg(la, 4, 1);
VXIoutReg(la, 4, 0);
```

5.0 EXAMPLE PROGRAM

```
/* The program was run on a IBM-AT compatible using a National  Inst. NI-MXI Interface */
/* Build in large memory model and Link with National Inst.  Module NIVXIDOS.L  */
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#define VXIDOS
#include <nivxi.h>
/* VM/64 Logical Address and Relay Register Base */
#define VM64            7
/* Register  Function                          */
/*      0       Manuf. ID 0xFF4A                */
/*      2       Model Code 0xFF00               */
/*      4       Reset, bit0 = 1 Reset           */
/*      6       Form-C Relay, 0=NC, 1=N0        */
/*      8       Group 0 - Bits 0-3, Group 1 - Bits 4-7      */
/*      10      Group 2 - Bits 0-3, Group 3 - Bits 4-7      */
/*      12      Group 4 - Bits 0-3, Group 5 - Bits 4-7      */
/*      14      Group 6 - Bits 0-3, Group 7 - Bits 4-7      */

int main()
{
        int Group, Relay, reg, data, bitposition, err;

        if (InitVXIlibrary()) {
                printf("VXI Library error./n");
                return 1;
        }
        err = VXIinReg(VM64, 0, &data);  /* Check Manuf ID */
        if (data != 0xFF4A) {
                printf("Error not a Cytec Product at Address %d.\n", VM64);
                return 1;
        }
        err = VXIinReg(VM64, 2, &data);  /* Check Model Code */
        if (data != 0xFF00) {
                printf("Error not a VM/64 Module.\n");
                return 1;
        }
        err = VXIoutReg(VM64, 4, 1);  /* Clear */
        err = VXIoutReg(VM64, 4, 0);
        err = VXIoutReg(VM64, 6, 1);  /* Toggle Form-C Relay */
        err = VXIinReg(VM64, 6, &data);
        if ((~data & 1)!= 1)
                printf("Error Latching Form-C.\n");
        err = VXIoutReg(VM64, 6, 0);
        err = VXIinReg(VM64, 6, &data);
        if ((~data & 1) != 0)
                printf("Error Unlatching Form-C.\n");

/* 8 Groups of 4 Relays,  8 relays at each register address */
```

```
        for (Group=0; Group<8; Group++) {
                reg = (Group&6) + 8;
                for (Relay=0; Relay<4; Relay++) {
                        bitposition = 1 << (Relay + ((Group&1)<<2) );
                        err = VXIoutReg(VM64, reg, bitposition);
                        err = VXIinReg(VM64, reg, &data);
                        data = ~data & 0xff;
                        if (data != bitposition)
                                printf("Error %d, %d.\n", Group, Relay);

                }
                err = VXIoutReg(VM64, reg, 0);
        }
        CloseVXIlibrary();
        return 0;
}

/* end: VM64.C */
```

REFERENCES

The following publications are available from VITA, VME International Trade Association, 10229 N. Scottsdale Rd., Suite E, Scottsdale, AZ 85253.

VXIbus System Specification, Revision 1.4

VMEbus Specification Manual, IEEE STD 1014-1987

Information on National Instruments™ Control Modules and Language syntax may be obtained from:

National Instruments
6504 Bridge Point Parkway
Austin, TX 78730-5039

Tel: (512) 794-8248
Fax: (512) 794-5678

MAINTENANCE

VM SERIES

VXI SWITCH MODULES

GENERAL

The VM Series of Switch Modules have solid state controls and relay switching with Status feedback of the selected relays. The units are burned in to eliminate marginal solid state devices and the relays.

All reed relays have hermetically sealed contacts, are cycled thru 100,000 operations and are individually checked for contact deterioration. No maintenance should be required before 100 million operations if the switches are operated within their rated VA, Voltage and Current.

Almost all relay failures are due to excess current being switched, and this usually occurs when the signals are wired incorrectly or the wrong relay is closed by the program. To reduce the probability of this kind of fault, all wiring to the modules should be thoroughly checked, and the program should be debugged without any power applied to the relays.

TROUBLESHOOTING

The Status Feedback feature enables the module logic to be checked from computer command to the relay driver output. A program can be written (example program in this manual) so that the computer can operate each switch in turn and check, by the Status mode, whether the relay is energized. Any error can be flagged by the computer.

If only one relay is not being energized, check the driver to that relay. If one row of relays is not being energized, check the specific logic in that row. When no relays are operating, the main control is faulty and it is recommended the module be returned to the factory for repair. When the Status Mode indicates that a relay is being energized but the relay is not closing, then the relay is faulty and must be replaced.

REPAIRS

If the faulty module is under warranty, it should be returned to CYTEC for repair or replacement. Modules out of warranty can also be returned to CYTEC for repair at a reasonable price.

Relay replacements can be made by any competent technician using a solder sucker to remove solder from the relay pins, remove the relay and replace with the same type of relay. Mercury relays must be replaced in the same direction as the ones removed.

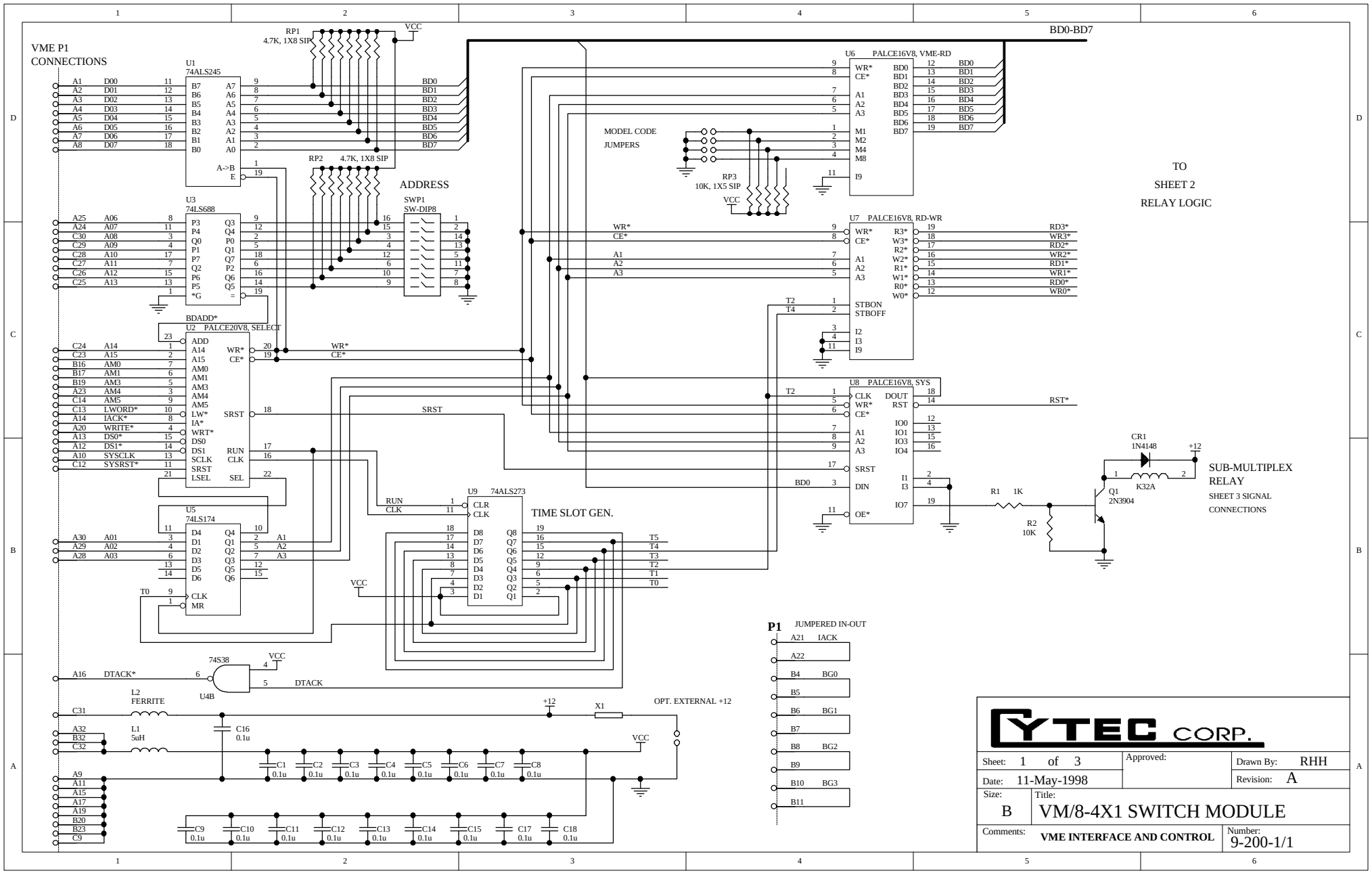
*** WARRANTY ***

CYTEC Corp. warrants that all products are free from defect in material and workmanship and perform to published specifications for five years from date of shipment. This warranty is in lieu of any other warranty expressed or implied.

The liability of CYTEC Corp. shall be limited to replacement or repair of any defective units which are returned F.O.B. to its factory. Units which have been subjected to abuse, misuse, accident, alteration, neglect, or unauthorized repair are not covered by this warranty.

No liability is assumed for expendable items such as lamps or fuses.

FOR TECHNICAL ASSISTANCE
CALL 1-800-346-3117



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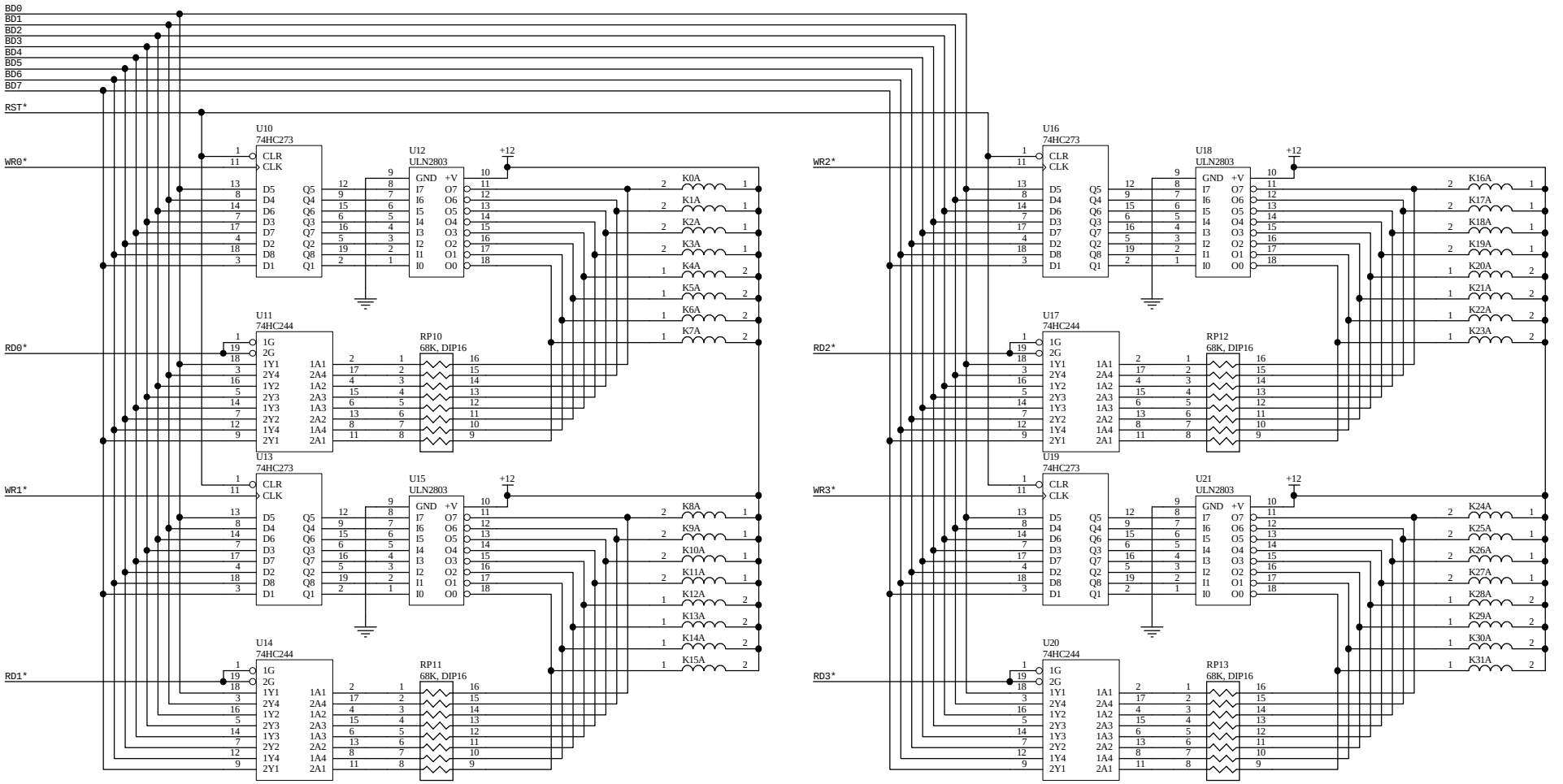
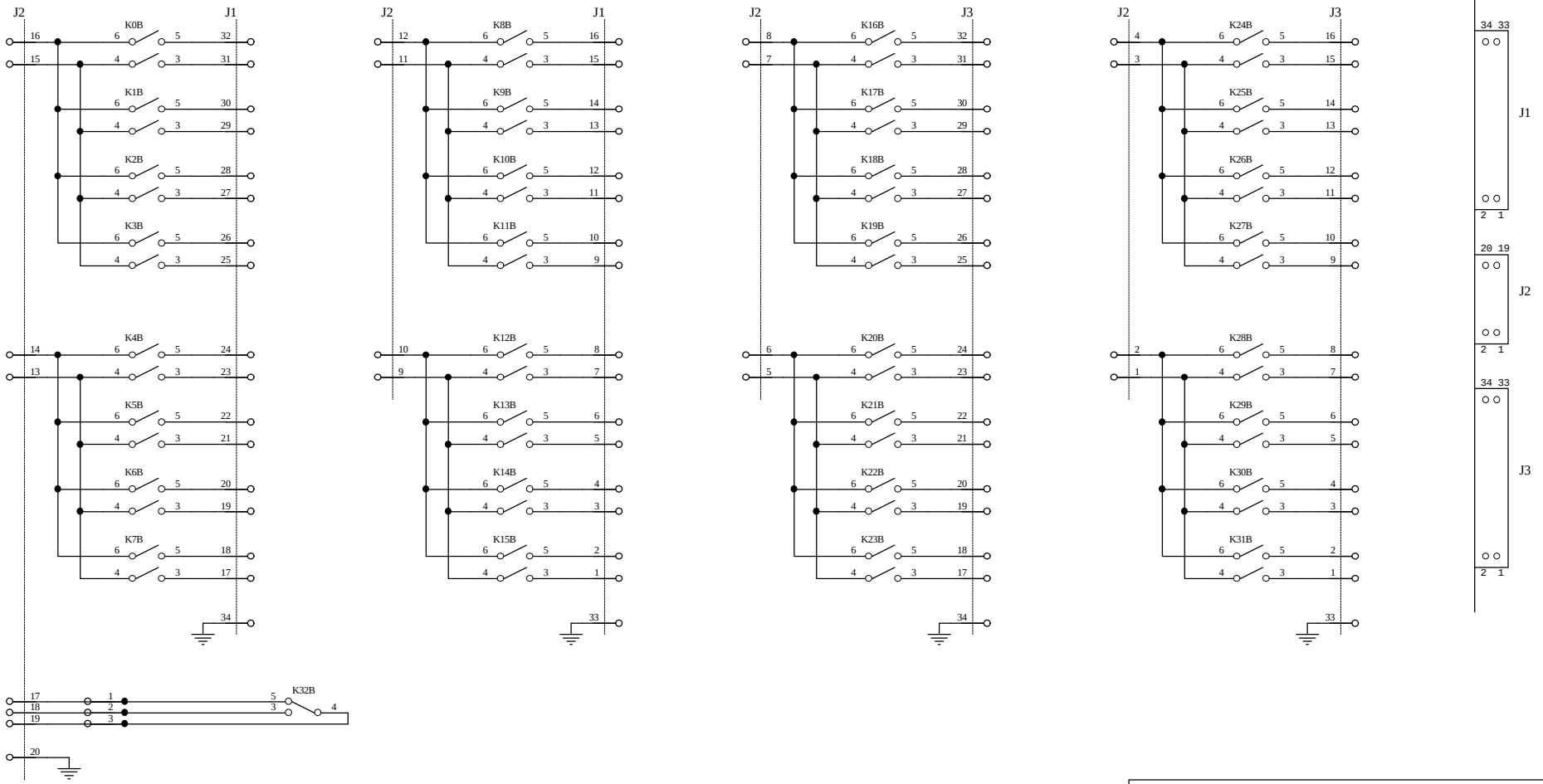
Date: 11-May-1998		Revision: A	
Size: B	Title: VM/8-4X1 SWITCH MODULE		
Comments: VME INTERFACE AND CONTROL		Number: 9-200-1/1	



CYTEC CORP.

Sheet: 2 of 3	Approved:	Drawn By: RHH	
Date: 11-May-1998		Revision: A	
Size: B	Title: VM/8-4X1 SWITCH MODULE		
Comments: **RELAY LOGIC**		Number: 9-200-1/2	

SIGNAL CONNECTIONS



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Date: 11-May-1998		Revision: A	
Size: B	Title: VM/8-4X1 SWITCH MODULE		
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