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1260 VXI SWITCHING CARD
1x4 MULTIPLEXER PLUG-IN

MODEL 1260-X133

PUBLICATION NO. 980914-X133

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FOR YOUR SAFETY

Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.



This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.



If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.



Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.



Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid “live” circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.

2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until, performance is checked by qualified personnel.

Table of Contents

Chapter 1 1-1

SPECIFICATIONS 1-1

Introduction 1-1

Specifications 1-2

Power Dissipation 1-3

About MTBF 1-4

Ordering Information 1-5

Chapter 2 2-1

INSTALLATION INSTRUCTIONS 2-1

Unpacking and Inspection 2-1

Reshipment Instructions 2-1

Installation 2-2

Module Configuration 2-2

Connector Pin Assignments 2-6

Front Panel Connector 2-10

Mating Connectors 2-12

Chapter 3 3-1

MODULE OPERATION 3-1

Setting the Module Address 3-1

Operating Modes 3-2

Operating In Message-Based Mode 3-4

Channel Descriptors For The 1260-X133 3-4

Reply To The MOD:LIST? Command....3-5
Operating The 1260-X133 in Register-Based Mode....3-5
Configuring Larger Multiplexers....3-8

Chapter 4....4-1
PRODUCT SUPPORT....4-1
Product Support....4-1
Reshipment Instructions....4-1
Support Offices....4-2

List of Figures

Figure 1-1 The 1260-X133 1-1

Figure 2-1 Single 1x4 Multiplexer Example (Channels 50 through 53) 2-3

Figure 2-2 Single 2x8 Matrix Example 2-3

Figure 2-3 Single 1x2 Multiplexer Example (Channels 250 through 251) 2-4

Figure 2-4 Single 1x4 Configurable Multiplexer Example (Channels 420 through 431) 2-4

Figure 2-5 1260-X133 Block Diagram 2-5

Figure 2-6 Front-Panel Connector Pin Numbering 2-11

Figure 3-1 Front View – Module Addresses for 1 through 6 3-1

Figure 3-2 Front View – Module Addresses for 7 through 12 3-2

Figure 3-3 Message-Based Mode of Operation 3-3

Figure 3-4 Register-Based Mode of Operation 3-3

List of Tables

Table 2-1 1260-X133 Front-Panel Connections for J200 2-6

Table 3-1 Control Register Channel Assignments 3-7

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Chapter 1
SPECIFICATIONS

Introduction

The 1260-X133 is a plug-in switch module developed for the Racal Instruments 1260-100X Adapt-a-Switch Platform. The 1260-X133 includes the following features:

- Standard Adapt-a-Switch plug-in design, providing for ease of replacement.
- Data-driven embedded descriptor, allowing immediate use with any Option-01T switch controller, regardless of firmware revision level.
- Capability of combining multiple multiplexers on-board to form large matrix.

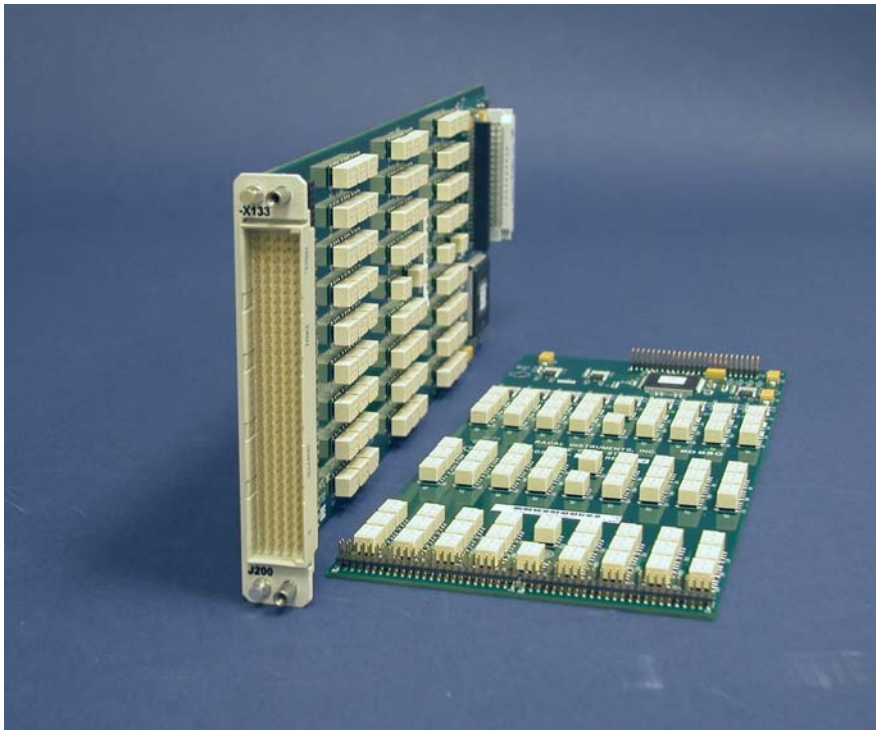


Figure 1-1 The 1260-X133

Specifications

Bandwidth (-3 dB)	
1 x 4	30 MHz
2 x 8	30 MHz
1 x 2	60 MHz
Insertion Loss	
1MHz:	< 0.2 dB
10MHz:	< 0.5 dB
Isolation	
1MHz:	> 60 dB
10MHz:	> 45 dB
Crosstalk	
1MHz:	< -60 dB
10MHz:	< -50 dB
Switching Voltage	
AC	250 V, Max (Pollution Class 2)
DC	220 V, Max (Pollution Class 2)
AC/DC	300V, (Pollution Class 1)
Switching Current	
AC	2 A, Max
DC	2 A, Max
Switching Power	
AC	62.5 VA, Max
DC	60 W, Max
Path resistance	
@ 1mA:	< 700 mΩ
@ 1A:	< 1 Ω
Capacitance	
Channel to Chassis	< 200 pF
Open Channel	< 5 pF
Insulation resistance	> 10^9 Ω
Relay Settling Time	< 15 ms
Noise Floor	< -100dBm at quiescent
Maximum Power Dissipation	
	60W
Cooling (25% Relays energized operating at full rated current)	
	2.00 Liters/sec @ 0.15 mmH_2O
Shock	30g, 11 ms, ½ sine wave

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Vibration	0.013 in. P-P, 5-55 Hz
Bench Handling	4 in., 45°
Temperature	
Operating	0°C to +55°C
Non-operating	-40°C to +75°C
Relative Humidity	85% + 5% non-condensing at < 30°C
Altitude	
Operating	10,000 feet*
Non-operating	15,000 feet
Power Requirements	
+5 VDC	500mA + 30mA per energized relay (2A Max.)
Weight	1.0 lb. (0.45 kg.)
Dimensions	4.4”Hx0.75”Wx12.6”D
MTBF (50% rated load, 0.1 cycle/hour))	
With relays	130,226 hours at 25°C
With relays	117,034 hours at 30°C
Safety Standard	EN61010-1 Pollution Class 2 Impulse Withstand 1000V

* Operation at 15,000 feet requires de-rating of maximum overall power dissipation to 49W

Power Dissipation

While the cooling of the Adapt-a-Switch carrier is dependent upon the chassis into which it is installed, the carrier can normally dissipate approximately 160W. The maximum power dissipation for an individual module is 60W. Care must be taken, then, in the selection and loading of the plug-in modules used in the carrier. It is not possible to fully load the carrier, energize every relay, and run full power through every set of contacts, all at the same time. In practice this situation would never occur.

To properly evaluate the power dissipation of the plug-in modules, examine the path resistance, the current passing through the relay contacts, the ambient temperature, and the number of relays closed at any one time.

For example, if a 1260-X133 module has 8 relays closed, passing a current of 2A, then:

Total power dissipation =
$[(\text{current})^2 * (\text{path resistance}) * 8] + (\text{quiescent power})$

By substituting the actual values:

Total power dissipation =
$[(2\ A)^2 * (0.7\ \Omega) * 8] + (\ 2.5\ W) = 24.9\ W$ at 55°C

This is acceptable power dissipation for an individual plug-in module. In practice, rarely are more than 25% of the module's relays energized simultaneously, and rarely is full rated current run through every path. In addition, the actual contact resistance is typically one-half to one-fourth the specified maximum, and temperatures are normally not at the rated maximum. The power dissipated by each plug-in should be no more than 15 W if all six slots are used simultaneously. This yields the following guideline:

0.5 A	Max. 71 channels closed
1 A	Max. 17 channels closed
2 A	Max. 4 channels closed

The numbers in the above table represent worst-case, elevated-temperature, end-of-life conditions.

Additionally, if fewer plug-in modules are used, more power may be dissipated by the remaining cards. By using a chassis with high cooling capacity, such as the Racal Instruments 1261B, almost any configuration may be realized.

About MTBF

The 1260-X133 MTBF is 130,226 hours at 25°C and 117,034 hours at 30°C, calculated in accordance with MIL-HDBK-217E, with the electromechanical relays set at 50% rated load at 85°C. Factors affecting relay life expectancy are:

1. Switched voltage
2. Switched current
3. Switched power
4. Maximum switching capacity
5. Maximum rated carrying current
6. Load type (resistive, inductive, capacitive)

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7. Switching repetition rate

8. Ambient temperature

The most important factor is the maximum switching capacity, which is an interrelationship of maximum switching power, maximum switching voltage and maximum switching current. When a relay operates at a lower percentage of its maximum switching capacity, its life expectancy is longer. The maximum switching capacity specification is based on a resistive load, and must be further de-rated for inductive and capacitive loads.

The relay used on the 1260-X133 plug-in is Racal part no. 310346. The relay manufacturer's specifications for this relay are:

Life Expectancy

Mechanical	100,000,000 operations
Electrical	100,000 operations at full rated load 500,000 operations at 30VDC/1A resistive, 125VDC/0.24A resistive

For additional relay specifications, refer to the relay manufacturer's data sheet.

Ordering Information

Listed below are part numbers for both the 1260-X133 switch module and available mating connector accessories. Each 1260-X133 uses a single mating connector.

ITEM	DESCRIPTION	PART #
1260-X133 Switch Module	Switch Module, 20 (1x4), 12(1x2) Single Wire SW, 2 A Consists of: P/N 980914-X133 Manual	408009
160-pin Mating Connector	160 Pin Conn. Kit with pins	407664
Cable Assy. 6ft, Sleeved	160 Pin Cable Assy, 6 Ft, 24 AWG	407408-001
Additional Manual	1260-X133 Manual	980914-X133

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Chapter 2

INSTALLATION INSTRUCTIONS

Unpacking and Inspection

1. Before unpacking the switching module, check the exterior of the shipping carton for any signs of damage. All irregularities should be noted on the shipping bill and reported.

2. Remove the instrument from its carton, preserving the factory packaging as much as possible.

3. Inspect the switching module for any defects or damage. Immediately notify the carrier if any damage is apparent.

4. Have a qualified person check the instrument for safety before use.



CAUTION

The instrument contains ESD-sensitive devices. Open the package at an ESD-safe work station.

Reshipment Instructions

1. Use the original packing material when returning the switching module to Racal Instruments for servicing. The original shipping carton and the instrument's plastic foam will provide the necessary support for safe reshipment.

2. If the original packing material is unavailable, wrap the switching module in an ESD shielding bag and use plastic spray foam to surround and protect the instrument.

3. Reship in either the original or a new shipping carton.

Installation

Installation of the 1260-X133 Switching Module into a 1260-100X Adapt-a-Switch Carrier assembly is described in the “Installation” section of the 1260-100X Adapt-a-Switch Carrier manual.

For installation of the 1260-X133 into a 1256 Switching System, refer to the 1256 User Manual.

Module Configuration

The 1260-X133 contains 20 configurable 1x4 multiplexers, 6 1x2 multiplexers and 6 configurable 1x2 multiplexers. On-board configuration relays allow four 1x4 multiplexers to be configured in to a 2x8 matrix, two 1x2 multiplexers to be configured into a 1x4 multiplexer.

Twenty 1x4 multiplexers are numbered from 0 through 19. Each multiplexer (mux) is made up of four relays, referred to as channels. **Figure 2-1** shows an example of one of these multiplexers (multiplexer 5). In this example, the inputs are channels 50 through 53. The user may close one or more relays to connect the inputs to the common output.

Five 2x8 matrix cells are named from X1 to X5, and numbered from 0 to 4. Each matrix cell contains four 1x4 multiplexers which are named from 4M1 to 4M3. Beside the 1x4 muxes, each cell also contains 8 input configuration relays and two output configuration relays which are number from 8x0 to 8x9 (x is from 0 to 4) as the channels, 8x0 to 8x7 are inputs channels, 8x8 and 8x9 are outputs. **Figure 2-2** shows an example of one of 2x8 matrix cells (X3).

Six 1x2 multiplexers are named as Y cell, and numbered from 0 through 5 with 200 offset. Each multiplexer (mux) is made up of two relays, referred to as channels. **Figure 2-3** shows an example of one of these multiplexers (multiplexer 5). In this example, the inputs are channels 250 through 251. The user may close one or both relays to connect the inputs to the common output.

Six configurable 1x2 multiplexers are numbered from 0 through 5 with 400 offset. Each 1x2 multiplexer (mux) is made up of two relays, referred to as channels. Three 1x4 mux can be configured from these six 1x2 mux and three output configuration relays. They are named from Z1 to Z3. The output configuration relays for three 1x4 muxs are numbered 501, 503 and 505 as channels. **Figure 2-4** shows an example of one of these 1x4 multiplexers (multiplexer 2&3). In this example, the inputs are channels 420 through 421 and 430 through 431. The user may close one or more relays to connect the inputs to the common output.

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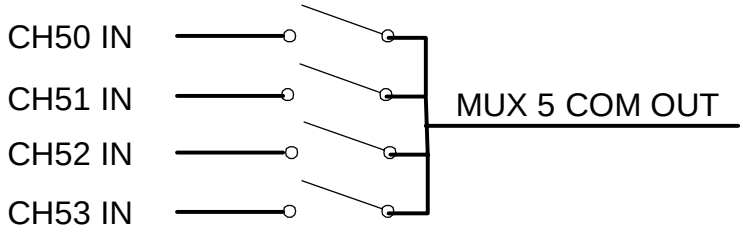


Figure 2-1 Single 1x4 Multiplexer Example (Channels 50 through 53)

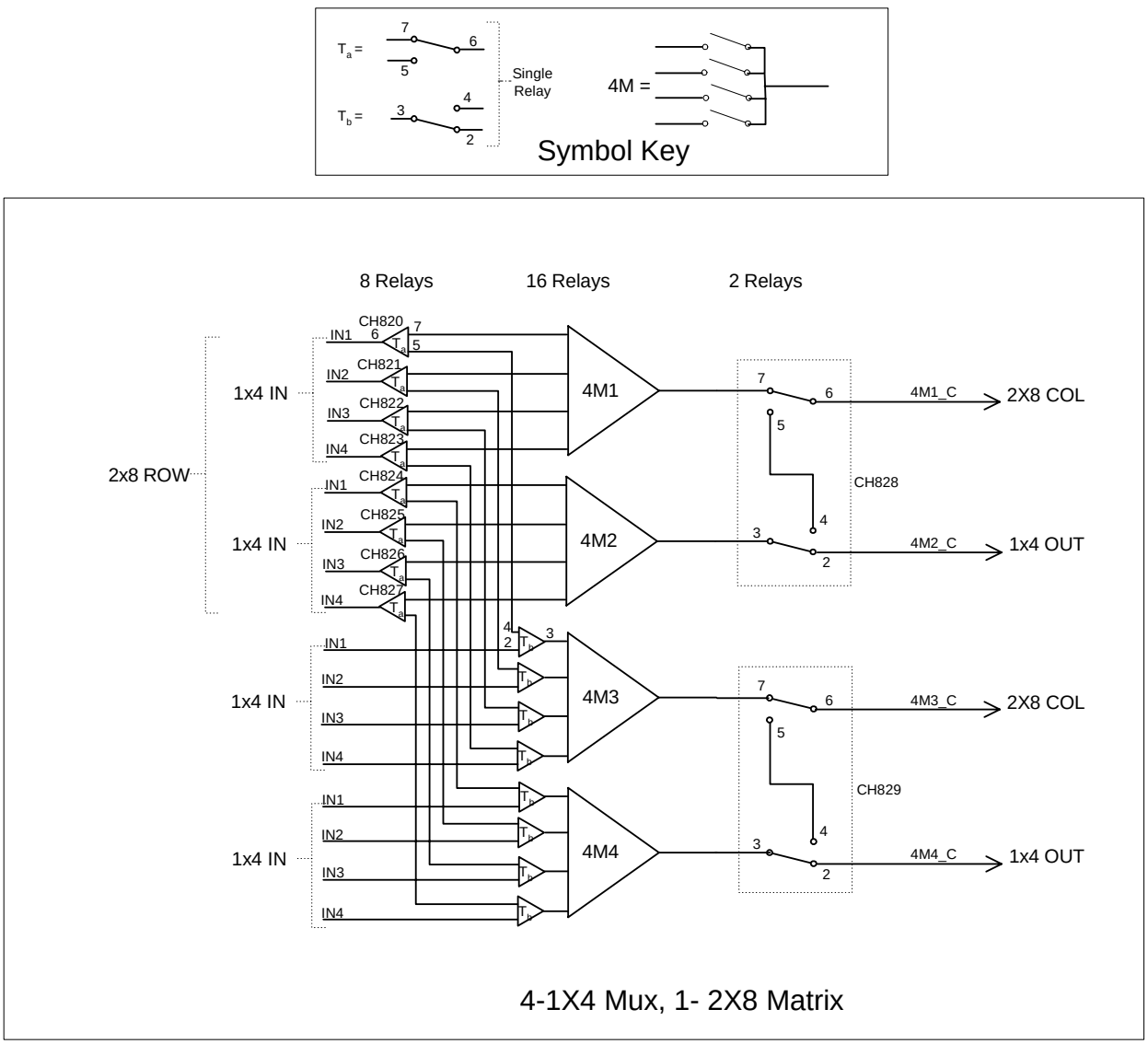


Figure 2-2 Single 2x8 Matrix Example

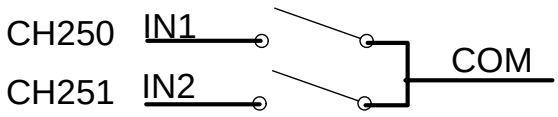


Figure 2-3 Single 1x2 Multiplexer Example (Channels 250 through 251)

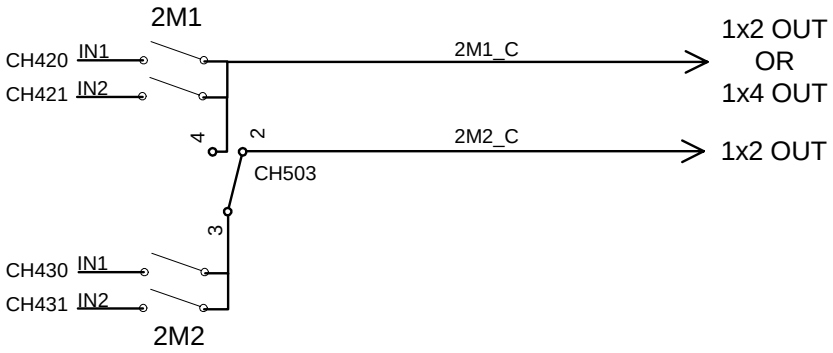
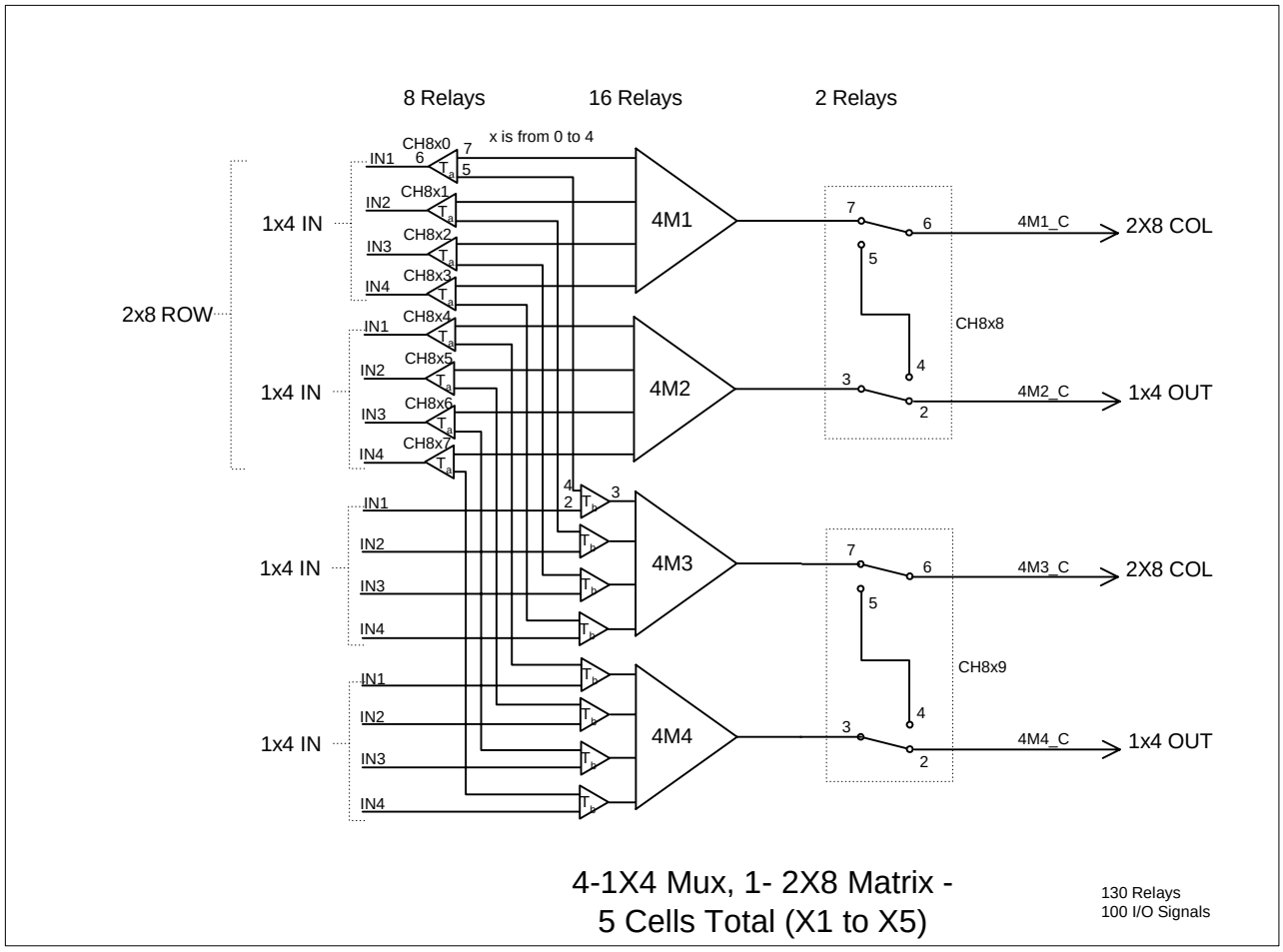


Figure 2-4 Single 1x4 Configurable Multiplexer Example (Channels 420 through 431)

Since each channel is independently controlled, the user can simultaneously connect any combination of mux inputs to the common output of the same multiplexer.

For example, referring to **Figure 2-1**, the user may connect the channel 51 and channel 53 inputs to the common output by closing the channel 51 and channel 53 relays at the same time. Taking this concept further, the user could even close the relays for channels 50 through 53 all at the same time, connecting all of this multiplexer's inputs to its common output.

From **Figure 2-1** to **Figure 2-4** are just showing the single examples for different configurations on 1260-X133. For an entire block diagram of 1260-X133, refer to **Figure 2-5**.



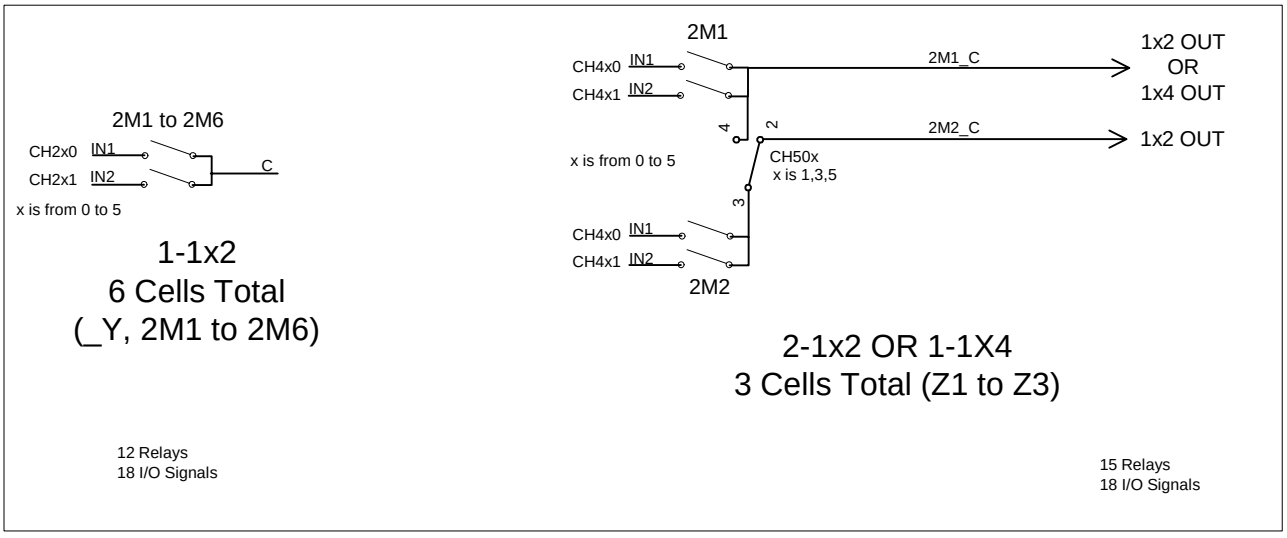


Figure 2-5 1260-X133 Block Diagram

Connector Pin Assignments

Table 2-1 provides the pin assignments for the front panel connector.

Table 2-1 1260-X133 Front-Panel Connections for J200

Cell	1x4 MUX / 1X2 MUX	Mux	Channel	Pin
X1	4M1	0	Mux 0 Common	A19
		0	0	A32
		0	1	A29
		0	2	A26
		0	3	A23
	4M2	1	Mux 1 Common	A16
		1	10	A12
		1	11	A9
		1	12	A6
		1	13	A3
	4M3	2	Mux 2 Common	A17
		2	20	A30
		2	21	A27
		2	22	A24
		2	23	A21
	4M4	3	Mux 3 Common	A14
		3	30	A10
		3	31	A7
		3	32	A4
		3	32	A1
X2	4M1	4	Mux 4 Common	B19
		4	40	B32
		4	41	B29
		4	42	B26
		4	43	B23
	4M2	5	Mux 5 Common	B16
		5	50	B12
		5	51	B9
		5	52	B6
		5	53	B3

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Cell	1x4 MUX / 1X2 MUX	Mux	Channel	Pin
	4M3	6	Mux 6 Common	B17
		6	60	B30
		6	61	B27
		6	62	B24
		6	63	B21
	4M4	7	Mux 7 Common	B14
		7	70	B10
		7	71	B7
		7	72	B4
		7	73	B1
X3	4M1	8	Mux 8 Common	C19
		8	80	C32
		8	81	C29
		8	82	C26
		8	83	C23
	4M2	9	Mux 9 Common	C16
		9	90	C12
		9	91	C9
		9	92	C6
		9	93	C3
	4M3	10	Mux 10 Common	C17
		10	100	C30
		10	101	C27
		10	102	C24
		10	103	C21
	4M4	11	Mux 11 Common	C14
		11	110	C10
		11	111	C7
		11	112	C4
		11	113	C1
X4	4M1	12	Mux 12 Common	D19
		12	120	D32
		12	121	D29
		12	122	D26
		12	123	D23
	4M2	13	Mux 13 Common	D16
		13	130	D12

Cell	1x4 MUX / 1X2 MUX	Mux	Channel	Pin
		13	131	D9
		13	132	D6
		13	133	D3
	4M3	14	Mux 14 Common	D17
		14	140	D30
		14	141	D27
		14	142	D24
		14	143	D21
	4M4	15	Mux 15 Common	D14
		15	150	D10
		15	151	D7
		15	152	D4
		15	153	D1
X5	4M1	16	Mux 16 Common	E19
		16	160	E32
		16	161	E29
		16	162	E26
		16	163	E23
	4M2	17	Mux 17 Common	E16
		17	170	E12
		17	171	E9
		17	172	E6
		17	173	E3
	4M3	18	Mux 18 Common	E17
		18	180	E30
		18	181	E27
		18	182	E24
		18	183	E21
	4M4	19	Mux 19 Common	E14
		19	190	E10
		19	191	E7
		19	192	E4
		19	193	E1
Y CELL	2M1	200	Mux 20 Common	D13
		20	200	E15
		20	201	E11
	2M2	210	Mux 21 Common	C13

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Cell	1x4 MUX / 1X2 MUX	Mux	Channel	Pin
		21	210	C15
		21	211	C11
	2M3	220	Mux 22 Common	A13
		22	220	B15
		22	221	B11
	2M4	230	Mux 23 Common	E5
		23	230	D8
		23	231	D2
	2M5	240	Mux 24 Common	C5
		24	240	D8
		24	241	D2
	2M6	250	Mux 25 Common	B5
		25	250	A8
		25	251	A2
Z1	2M1	400	Mux 40 Common	D28
		40	400	E31
		40	401	E25
	2M2	410	Mux 41 Common	E20
		41	410	D22
		41	411	D18
Z2	2M1	420	Mux 42 Common	C28
		42	420	C31
		42	421	C25
	2M2	430	Mux 43 Common	C20
		43	430	C22
		43	431	C18
Z3	2M1	440	Mux 44 Common	A28
		44	440	B31
		44	441	B25
	2M2	450	Mux 45 Common	B20
		45	450	A22
		45	451	A18
		---	Ground	A31
		---	Ground	A25
		---	Ground	A20
		---	Ground	A15

Cell	1x4 MUX / 1X2 MUX	Mux	Channel	Pin
		---	Ground	A11
		---	Ground	A5
		---	Ground	B28
		---	Ground	B22
		---	Ground	B18
		---	Ground	B13
		---	Ground	B8
		---	Ground	B2
		---	Ground	D31
		---	Ground	D25
		---	Ground	D20
		---	Ground	D15
		---	Ground	D11
		---	Ground	D5
		---	Ground	E28
		---	Ground	E22
		---	Ground	E18
		---	Ground	E13
		---	Ground	E8
		---	Ground	E2

Front Panel Connector

The 1260-X133 has one front-panel connector, labeled J200. It is a 160-pin, modified DIN style connector, with 0.025” square posts as pins. It has one pin for each input and one for each output. See **Figure 2-5** for the physical pin arrangement. **Table 2-1** shows the mapping of channel numbers to connector pins. For information about mating connectors and accessories, see the “Mating Connectors” section at the end of this chapter.

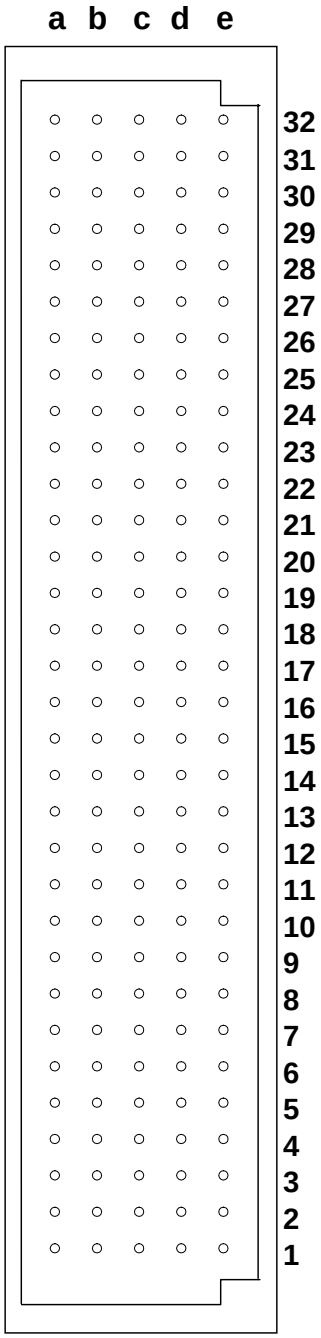


Figure 2-6 Front-Panel Connector Pin Numbering

Mating Connectors

The following mating connectors and accessories are available:

P/N 407408-001: 160-Pin Cable Assembly, 6 Ft., 24 AWG: This six-foot cable is constructed with 24 AWG stranded wire. One end has the mating connector for the 1260-X133. The other end is unterminated. Refer to **Table 2-1** for channel-to-pin mapping information.

P/N 407664: 160-Pin Connector Kit with Pins. This kit provides the mating connector for the 1260-X133, including housing, strain relief, and 170 crimp pins. After crimping, the pins snap into the connector housing, providing positive retention.

P/N 991033: ERNI Tool Kit. This kit includes the crimp tool and extractor.

P/N 990898: Insertion Hand Tool.

P/N 990899: Extraction Tool.

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Chapter 3

MODULE OPERATION

Setting the Module Address

The Option-01T switch controller identifies each Adapt-a-Switch plug-in or conventional 1260-Series module by a *module address* that is unique to that module. The module address is a number from 1 through 12, inclusive.

The module address assigned to the 1260-X133 is determined by the carrier slot into which the 1260-X133 is inserted, and by the position of the logical address DIP switch on the carrier side panel. The logical address switch has two settings:

- 1-6: When the switch is set to this position, the module addresses of the plug-ins in the 1260-100X Carrier are from 1 through 6. The module with address 1 is in the left slot of the top row. The plug-ins are addressed in the following pattern:

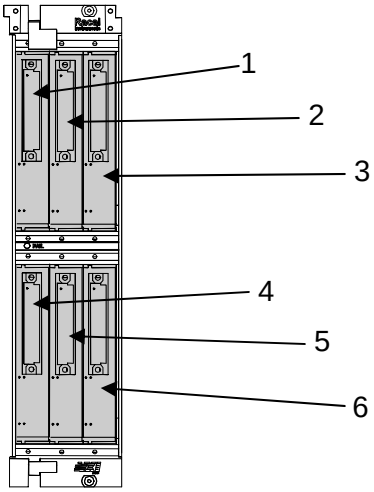


Figure 3-1 Front View – Module Addresses for 1 through 6

- 7-12: When the switch is set to this position, the module addresses of the plug-ins in the 1260-100X Carrier are from 7 through 12, in the following pattern:

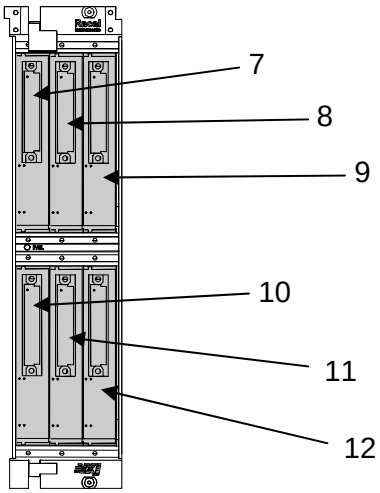


Figure 3-2 Front View – Module Addresses for 7 through 12

When setting module addresses for Adapt-a-Switch Carriers and conventional 1260-Series modules, be sure that no address is used by more than one plug-in or 1260-Series C-Size switching module.

For instructions on setting module addresses for a conventional 1260-Series module, see the label on the side panel of the module.

Operating Modes

The 1260-X133 may be operated either in *message-based* mode or in *register-based* mode.

In *message-based* mode, the 1260-01T switch controller interprets commands sent by the slot 0 controller, and determines the appropriate data to send to the control registers of the 1260-X133 module.

A conceptual view of the message-based mode of operation is shown in **Figure 3-3** below.

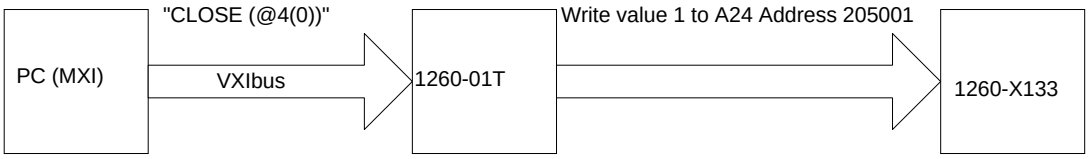


Figure 3-3 Message-Based Mode of Operation

In the *register-based* mode, the user writes directly to the control registers on the 1260-X133 module. The 1260-01T command module does not monitor these operations, and does not keep track of the relay states on the 1260-X133 module in this mode.

A conceptual view of the register-based mode is shown in **Figure 3-4** below.

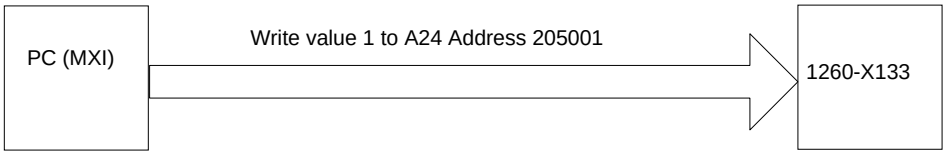


Figure 3-4 Register-Based Mode of Operation

Since the 1260-01T switch controller does not keep track of relay states during the register-based mode, it is advisable to use **either** the message-based or the register-based mode, and continue to use the same mode throughout the application program.

In general, the message-based mode of operation is easier to use with utility software such as the National Instruments VXI Interactive Control (VIC) program. The message-based mode allows the user to send ASCII text commands to the 1260-01T and to read replies from the 1260-01T. In addition, some features, such as the SCAN list, are available only in the message-based mode of operation.

The register-based mode provides faster control of relay channels.

In this mode, relay operations are processed in less than 9 microseconds, not counting relay settling time or software overhead inherent in I/O libraries such as VISA. To determine the relay settling time, refer to Relay Settling Time in the Specifications section.

Consult the 1260-01T User's Manual for a comparison of the message-based and register-based modes of operation.

Operating In Message-Based Mode

Channel Descriptors For The 1260-X133

The standard 1260-01T commands are used to operate the 1260-X133 module. These commands are described in the 1260-01T User's Manual.

Each 1260-01T relay command uses a *channel descriptor* to select the channel(s) of interest. The syntax for a channel descriptor is the same for all 1260 series modules. In general, the following syntax is used to select a single channel:

```
(@ <module address> ( <channel> ) )
```

Where:

- <module address> is the address of the 1260-X133 module. This is a number is in the range from 1 through 12, inclusive.
- <channel> is the 1260-X133 channel to operate. They are numbers from 0-3, 10-13, 20-23 etc. See Figure 2-1 and Table 2-1.

Multiple individual channels may be specified using the following channel descriptor syntax:

```
@ <module address> ( <chan1> , <chan2>
, . . ., <chanN> ))
```

A range of channels may be specified using the following channel descriptor syntax:

```
@ <module address> ( <first channel> :
<last channel> ))
```

The following examples illustrate the use of the channel descriptors for the 1260-X133:

```
OPEN (@8(0))
```
Open channel 0 on the 1260-X133

that has module address 8.

`CLOSE (@8(0,3))`	Close channels 0 and 3 on the 1260-X133 that has module address 8.
`CLOSE (@2(10:13))`	Close channels 10 through 13 inclusive on the 1260-X133 that has module address 2.

Reply To The MOD:LIST? Command

The 1260-01T returns a reply to the MOD:LIST? command. This reply is unique for each different 1260 series switch module. The syntax for the reply is:

<module address> : <module-specific identification string>

The <module-specific identification string> for the 1260-X133 is:

```
1260-X133 20 1x4 AND 12 1x2 MUX
```

So, for a 1260-X133 whose <module address> is set to 8, the reply to this query would be:

```
8: 1260-X133 20 1x4 AND 12 1x2 MUX
```

Operating The 1260-X133 in Register-Based Mode

In register-based mode, the 1260-X133 is operated by directly writing and reading control registers on the 1260-X133 module. When a control register is written to, all channels controlled by that register are operated simultaneously. For the channel assignments for each control register, see **Table 3-1**.

The control registers are located in the VXIbus A24 Address Space. The A24 address for a control register depends on:

1. The A24 Address Offset assigned to the 1260-01T module by the Resource Manager program. The Resource Manager program is provided by the VXIbus slot-0 controller vendor. The A24 Address Offset is placed into the “Offset Register” of the 1260-01T by the Resource Manager.

2. The <module address> of the 1260-X133 module. This is a value in the range from 1 and 12 inclusive.

3. The 1260-X133 control register to be written to or read from. Each control register on the 1260-X133 has a unique address.

The base A24 address for the 1260-X133 module may be

calculated by:

(A24 Offset of the 1260-01T) + (1024 x Module Address of 1260-X133).

The A24 address offset is usually expressed in hexadecimal. A typical value of 204000_{16} is used in the examples that follow.

A 1260-X133 with a module address of 4 would have the base A24 address computed as follows:

Base A24 Address of 1260-X133 = 204000_{16} + (400_{16} x 4_{10}) = 201000_{16}

The control registers for Adapt-a-Switch plug-ins and conventional 1260-Series modules are always on odd-numbered A24 addresses. The three control registers for the 1260-X133 reside at the first three odd-numbered A24 addresses for the module:

(Base A24 Address of 1260-X133) + 1 = Control Register 0

(Base A24 Address of 1260-X133) + 3 = Control Register 1

(Base A24 Address of 1260-X133) + 5 = Control Register 2

So, for our example, the first three control registers are located at:

205001	Control Register 0, controls channels 00, 800, 20, 40, 810, 60
205003	Control Register 1, controls channels 01, 801, 21, 41, 811, 61
205005	Control Register 2, controls channels 02, 802, 22, 42, 812, 62

Table 3-1 shows the channel assignments for each control register.

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Table 3-1 Control Register Channel Assignments

Control Register	Channels							
	Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
0	Unused	Unused	60	810	40	20	800	00
1	Unused	Unused	61	811	41	21	801	01
2	Unused	Unused	62	812	42	22	802	02
3	809	808	63	813	43	23	803	03
4	819	818	70	814	50	30	804	10
5	Unused	Unused	71	815	51	31	805	11
6	Unused	Unused	72	816	52	32	806	12
7	Unused	Unused	73	817	53	33	807	13
8	Unused	Unused	101	821	81	100	820	80
9	829	828	103	823	83	102	822	82
10	Unused	Unused	111	825	91	110	824	90
11	Unused	Unused	113	827	93	112	826	92
12	Unused	Unused	180	840	160	140	830	120
13	Unused	Unused	181	841	161	141	831	121
14	Unused	Unused	182	842	162	142	832	122
15	839	838	183	843	163	143	833	123
16	849	848	190	844	170	150	834	130
17	Unused	Unused	191	845	171	151	835	131
18	Unused	Unused	192	846	172	152	836	132
19	Unused	Unused	193	847	173	153	837	133
20	Unused	Unused	221	220	211	210	201	200
21	Unused	Unused	251	250	241	240	231	230
22	503	501	441	440	421	420	401	400
23	Unused	505	451	450	431	430	411	410

Setting a control bit to 1 closes the corresponding channel, and clearing the bit to zero opens the corresponding channel. Thus, if you write the value 0010 0101 binary = 37 decimal = 25 hexadecimal to Control Register 0, channels 00, 20, and 60 will close, while channels 800, 40 and 810 will open.

The present control register value may be read back by reading an 8-bit value from the control register address. **The value is inverted.** In other words, the eight-bit value read back is the one's complement of the value written.

If you want to change the state of a single relay without affecting the present state of the other relays controlled by the control register, you must:

1. Read the control register
2. Invert the bits (perform a one's complement on the register data)
3. Perform a bit-wise AND operation, leaving all but the specific control register bit for the relay to change
4. **To open**: continue to step 5. **To close**: OR in the bit for the relay to close.
5. Write the modified value back to the control register.

For example, to close channel 20:

1. Read Control Register 1 (this register controls 00, 800, 20, 40, 810 and 60 with channel 00 represented by the LSB)
2. Invert the bits in the value read in step 1
3. AND with 1111 1011 binary (the zero is in the position corresponding to channel 20)
4. OR with 0000 0100 binary
5. Write the value to Control Register 1

The VISA I/O library may be used to control the module. The VISA function viOut8() is used to write a single 8-bit byte to a control register, while viIn8() is used to read a single 8-bit byte from the control register. The following code example shows the use of viOut8() to update the 1260-X133 module.

Configuring Larger Multiplexers

The 1260-X133 is normally configured as twenty 1x4 multiplexers and twelve 1x2 multiplexers. However, the plug-in contains special configuration relays that interconnect four 1x4 multiplexers to form a 2x8 matrix, and interconnect two 1x2 multiplexers to form a 1x4 multiplexer. **Figure 2-2 and Figure 2-4** shows these relays. **Table 3-1** provides the control register access information for these relays.

As a configuration example, suppose you require the 2x8 matrix X3, and a connection from input 2 of 4M2 to output of 4M3 (the second 2x8 COL in **Figure 2-2**). You may form this path from a 1260-X133 by configuring it as follows:

1. Combine muxes 8, 9, 10 and 11 to form the 2x8 matrix X3.

2. Close the configuration relay CH825 and CH829 (see Figure 2-2), close CH111 in MUX11. From table 3-1, we can see that the CH825 is controlled by bit 4 of control register 10, and CH 829 is controlled by bit 7 of control register 9. The Bit 4 of control register 10 controls the CH111. Set all these three bits will make the connection between input 2 of 4M2 and output of 4M3 in Matrix X3.

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Chapter 4
PRODUCT SUPPORT

Product Support

Racal Instruments has a complete Service and Parts Department. If you need technical assistance or should it be necessary to return your product for repair or calibration, call 1-800-722-3262. If parts are required to repair the product at your facility, call 1-949-859-8999 and ask for the Parts Department.

When sending your instrument in for repair, complete the form in the back of this manual.

For worldwide support and the office closes to your facility, refer to the Support Offices section on the following page.

Reshipment Instructions

Use the original packing material when returning the 1260-X133 to Racal Instruments for calibration or servicing. The original shipping container and associated packaging material will provide the necessary protection for safe reshipment.

If the original packing material is unavailable, contact Racal Instruments Customer Service for information.

Support Offices

RACAL INSTRUMENTS

United States

(Corporate Headquarters and Service Center)
4 Goodyear Street, Irvine, CA 92618
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Tel: (210) 699-6799; Fax: (210) 699-8857

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REPAIR AND CALIBRATION REQUEST FORM

To allow us to better understand your repair requests, we suggest you use the following outline when calling and include a copy with your instrument to be sent to the Racal Instrument Repair Facility.

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Company Name_____ Purchase Order #_____

Billing Address_____
City

State/Province Zip/Postal Code Country

Shipping Address_____
City

State/Province Zip/Postal Code Country

Technical Contact_____ Phone Number ( )_____
Purchasing Contact_____ Phone Number ( )_____

1. Describe, in detail, the problem and symptoms you are having. Please include all set up details, such as input/output levels, frequencies, waveform details, etc.

2. If problem is occurring when unit is in remote, please list the program strings used and the controller type.

3. Please give any additional information you feel would be beneficial in facilitating a faster repair time (i.e., modifications, etc.)

4. Is calibration data required? Yes No (please circle one)

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