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1260 VXI X-Series SWITCHING CARD

1x8 MULTIPLEXER PLUG-IN

MODEL 1260-X138

PUBLICATION NO. 980914-X138

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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.

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Chapter 1
SPECIFICATIONS

Introduction

The 1260-X138 is a plug-in switch module developed for the Racal Instruments 1260-100X X-series Adapt-a-Switch carrier. Please note that 1260-X138 can be used in 1260-100X carrier only. The X-series plug-in switch modules offer more than 3.3" longer space for relays than the standard 1260-100 carrier modules.

In addition, the 1260-X138 includes the following features:

- X-series Adapt-a-Switch plug-in design, providing for ease of replacement.
- Functionally compatible with the 1260-100X X-series Adapt-a-Switch carrier.
- 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 multiplexers.
- Analog bus for combining multiple 1260-X138 plug-ins, to form very large multiplexers.

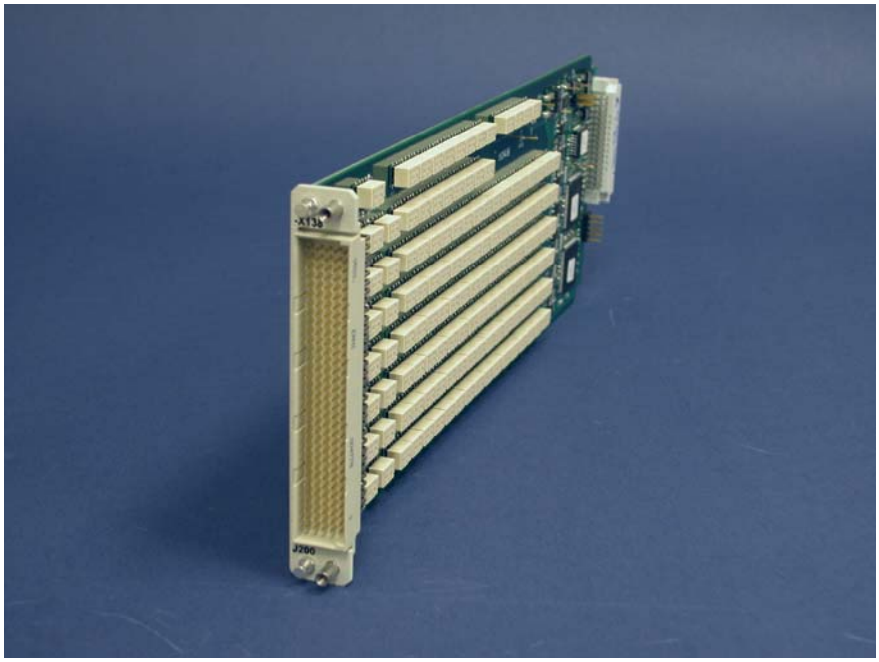


Figure 1-1 The 1260-X138

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Specifications

Bandwidth (-3 dB):

MUX Channels:

1x8: From DC to 40MHz

1x24: From DC to 16MHz

Analog Channels:

From DC to 10MHz

Insertion Loss (From DC to 10MHz):

MUX Channels:

1x8: 0.6dB

1x16: 1.3dB

1x24: 2dB

1x32: 2.2dB

1x48: 4.5dB

1x64: 5.2dB

Analog Channels:

0.2dB @ 1MHz

2 dB @ 10MHz

Channel Crosstalk:

MUX Channels:

>64dB @ 1MHz

>50dB @ 10MHz

Analog Channels:

<-50dB @ 1MHz

<-45dB @ 10MHz

Channel Isolation:

MUX Channels:

>64dB @ 1MHz

>45dB @10 MHz

Analog Channels:

>80dB @ 1MHz

>45dB @ 10MHz

Noise Floor (MUX or Analog Channels):

< -100dB from DC to 10MHz

Switching Voltage:

250VAC, Max

220VDC, Max

300V (Pollution Class 1)

Switching Current:

2A 25% relays activated with 20°C temperature rise

Switching Power:

60W below 10,000 feet

Path resistance (Differential or 2-Wire Mode):

MUX Channels:

1x8: 1Ω (Initial)

2.25Ω (End of life)

1x64: 1.7 Ω (Initial)

5.20Ω (End of Life)

Analog Channels:

<0.50Ω

Capacitance:

High to Low MUX Channels:

1x8: 80pF

1x16: 100pF

1x24: 160pF

1x32: 180pF

1x48: 270pF

1x64: 290pF

High to Low Analog Channels:

<120pF

High or Low MUX Channel to Chassis Ground:

<180pF

High or Low Analog Channel to Chassis Ground:

<170 pF

Open Switch Insulation resistance:

$> 10^9$ Ω

Relay Switch Settling Time:

< 20 ms

Maximum Power Dissipation:

60W below 10,000 feet*

Cooling (25% Relays energized operating at full rated current):

2.00 Liters/sec @ 0.15 mmH_2O

Shock, Functional:

30g, 11 ms, ½ sine wave

Vibration, Non-operating:

0.013 in. P-P, 5-55 Hz

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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*

Power Requirements:

+5 VDC 900mA + 30mA per energized relay (2A Max.)

Weight :

0.70 lb. (0.35 kg.)

Dimensions :

4.4”Hx0.75”Wx12.6”D

MTBF (50% rated load, 0.1 cycle/hour):

With relays	159,021 hours at 25°C
With relays	142,422 hours at 30°C

Safety Standard:

EN61010-1

Pollution Class 2

Impulse Withstand 1000V

*Operation at between 10,000 feet and 15,000 feet requires de-rating of maximum overall power dissipation to 49W

Ordering Information

Listed below are part numbers for both the 1260-X138 switch module and available mating connector accessories. Each 1260-X138 uses a single mating connector.

ITEM	DESCRIPTION	PART #
1260-X138 X-series Switch Module	Switch Module, 8 (1X8) 2 Wire MUX, 2 A Consists of: P/N 980914-X138 Manual	408010
160-pin Mating Connector	160 Pin Conn. Kit with pins	407664
Additional Manual	1260-X138 Manual	980914-X138

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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 instruments 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-X138 X-series Switching Module into a 1260-100X X-series Adapt-a-Switch Carrier assembly is described in the “Installation” section of the 1260-100X X-series Adapt-a-Switch Carrier manual (P/N 980914-100X).

Module Configuration

The 1260-X138 contains eight 1x8 multiplexers, numbered from 0 through 7. Each multiplexer (mux) is made up of eight relays, referred to as channels. **Figure 2-1** shows an example of one of these multiplexers (multiplexer 7). In this example, the inputs are channels 70 through 77. The user may close one or more relays to connect the inputs to the common output.

Configuration relays on 1260-X138 allow for formation of different multiplexers.

The 1x8 multiplexers are the building blocks of various multiplexer. Figure 2-2 and Figure 2-3 show the complete block diagram of the 1260-X138 relays.

Possible multiplexer configurations are:

Eight 1x8s, four 1x16s, two 1x32s, or one 1x64. In addition Multiplexer groups 0, 1, 2 and groups 3, 4, 5 can be configured to form three 2x8s, two 2x16s, or one 2x24.

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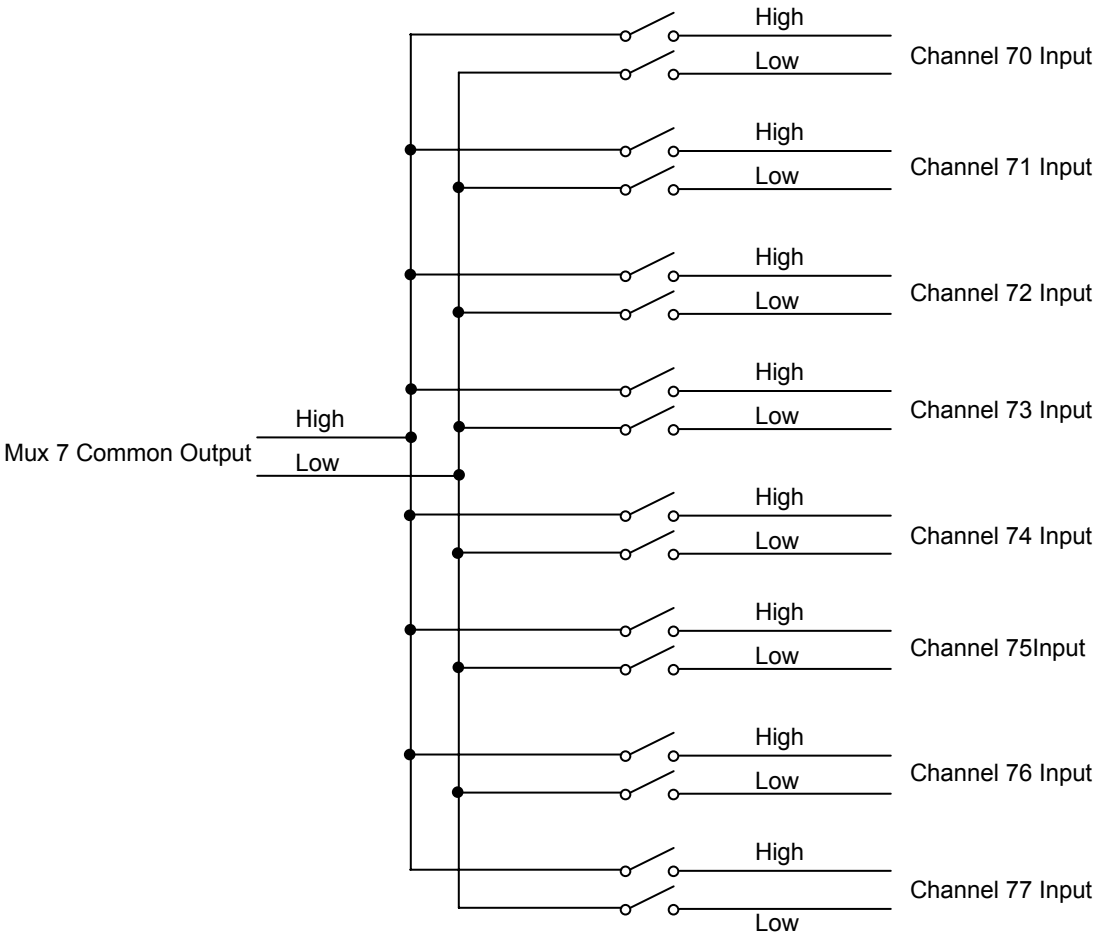


Figure 2-1 Single Multiplexer Example (Channels 70 through 77)

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

For example, referring to **Figure 2-1**, the user may connect the channel 71 and channel 73 inputs to the common output by closing the channel 71 and channel 73 relays at the same time. Taking this concept further, the user could even close the relays for channels 70 through 77 all at the same time, connecting all of this multiplexer's inputs to its common output.

Table 2-1 shows the group number and relays designators for the particular groups.

Table 2-1 Relay Groups

Group Number	Group Relay Designators
0	K7-K14
1	K14-K22
2	K23-K30
3	K85-K92
4	K93-K100
5	K101-K108
6	K116-K123
7	K124-K131

Figure 2-1 shows just one of the eight multiplexers on the 1260-X138. All eight multiplexers can operate independently.

The block diagram for the 1260-X138 is shown in Figure 2-2. Only the high input and output sides of the Groups 0, 1, 2, 3, 4, and 5 are displayed. Please refer to Table 2-3 listed in page 2-18 for complete input/output pin designators. Figure 2-2 also shows that Group 0 along with Group 3, Group 1 with Group 4, and Group 2 and Group 5 can be configured to form three 2x8 2-wire mode multiplexers.

Table 2-2 lists the relays responsible for forming the 2x8 mode.

For example, by activating K31-K38, Group 0 and Group 3 can form a 2x8 2-wire multiplexer by switching common input of MUX Group 0 (E3, E2) and MUX Group 3 (E7, E6).

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Table 2-2 2x8 Formation Relays

Group Number	Group Relay Designators
0, 3	K31 - K38
1, 4	K39 - K46
2, 5	K47 – K54

Using formation relays and connecting relays, Group 0, 1, and 2 together with Group 3, 4, and 5 can be also configured to form a 2x24 2-wire mode multiplexer.

Table 2-2 lists the relays responsible for forming the 2x24 2-wire mode multiplexer.

Table 2-3 2x8 Formation Relays

Group Number	Mode	2x24 Relay Designators	Link Relays	In	Out
0, 1, 2	Default	K7 – K30	K1, K2	MUX2 _COM	CH00-CH07 CH10-CH17 CH20-CH27
3, 4, 5	Default	K85 – K108	K79, K80	MUX5 _COM	CH30-CH37 CH41-CH47 CH51-CH57
3, 4, 5 * *Group 0, 1, 2 Disconnected	2x24 Energized	K85 – K108, K31- K54	K79, K80	MUX5 _COM	CH00-CH07 CH10-CH17 CH20-CH27

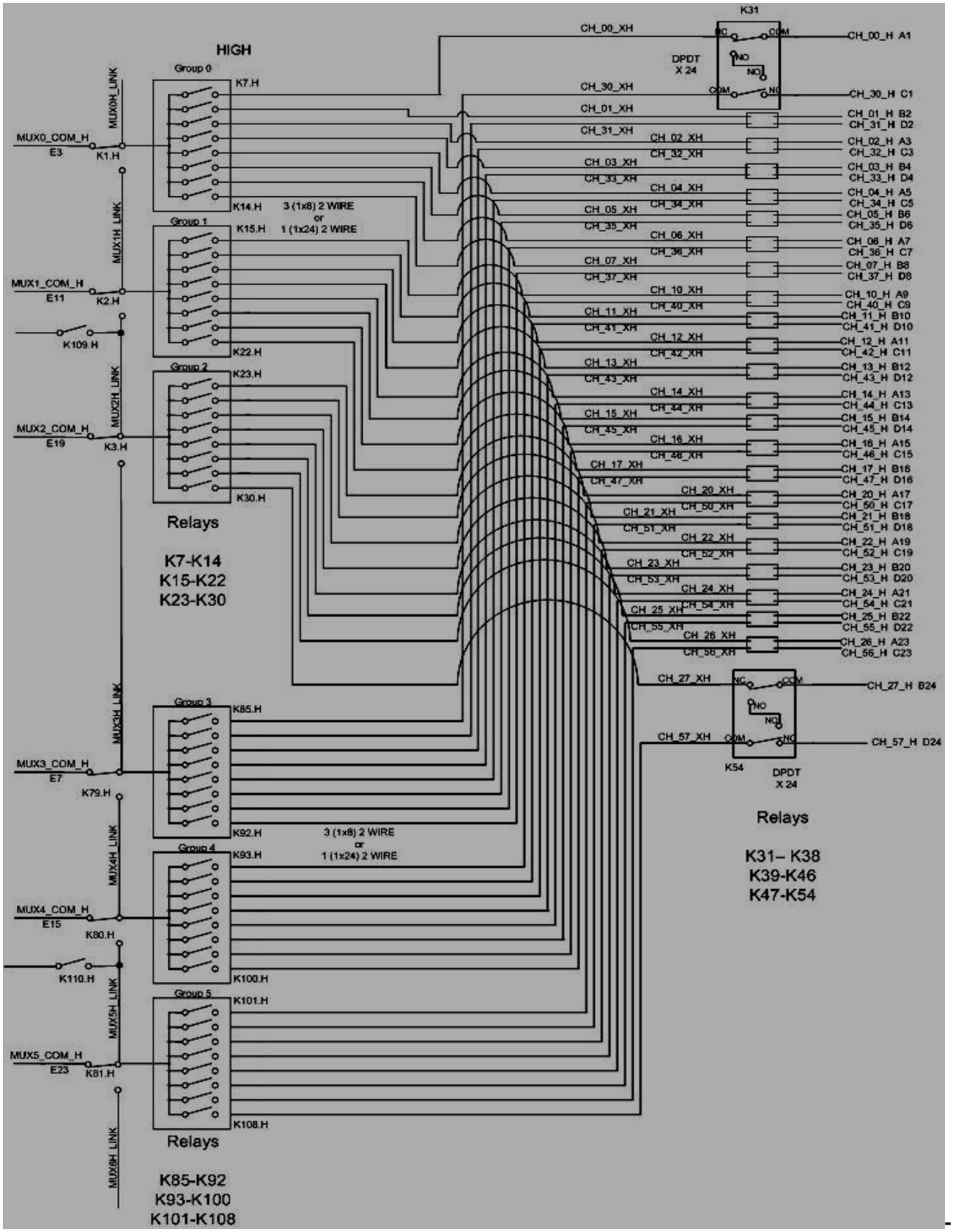


Figure 2-2 1260-X138 Block Diagram 1x8 High Side Groups 0, 1, 2, 3, 4, and 5

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1260-X138 also contains two independent 1x8 2-wire mode multiplexers Groups 6 and 7.

Figure 2-3 shows two independent 1x8 2-wire mode multiplexers Groups 6 and 7.

These two groups can be connected to the six groups shown in Figure 2-2.

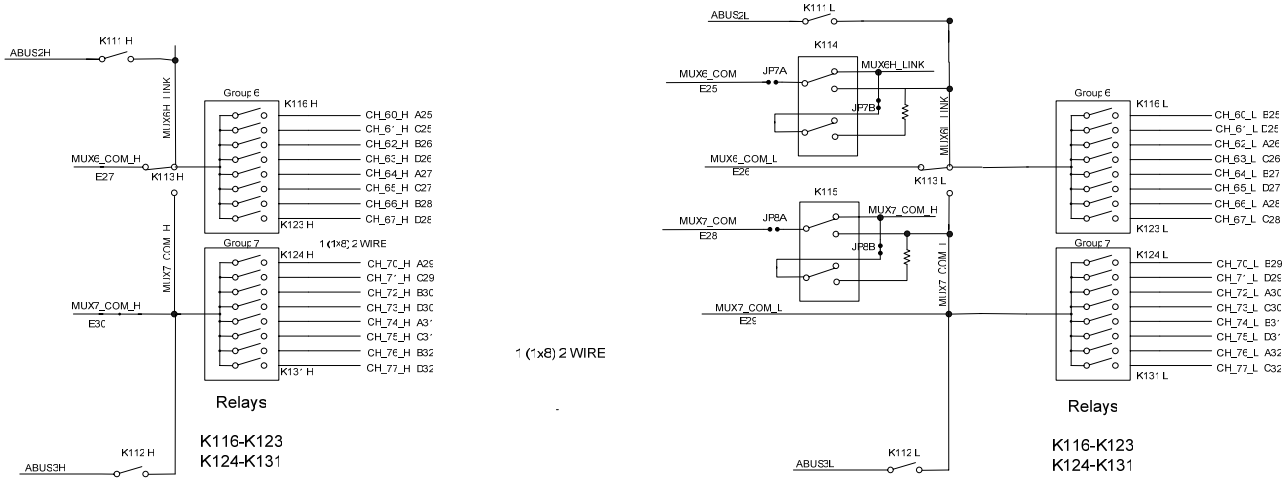


Figure 2-3 1260-X138 1x8 Relay Groups 6 and 7

Configuration Relays

Multiplexers Groups 0, 1, 2, 3, 4, 5, 6, and 7 can be configured to form a 1x64 2-wire mode multiplexer.

Group 0 common input can be connected to Group 1 common input via relay K2. All other groups common input connections are shown in Table 2-2.

Table 2-4 1x8 MUX Group Configuration Relays

From Group Common Input	To Group Common Input	Configuration Relay Designator
0	1	K1
1	2	K2
2	3	K3
3	4	K79
4	5	K80
5	6	K81
6	7	K113

For a block diagram of the entire 1260-X138, refer to **Figure 2-2 and Figure 2-3**.

Discharge Relays

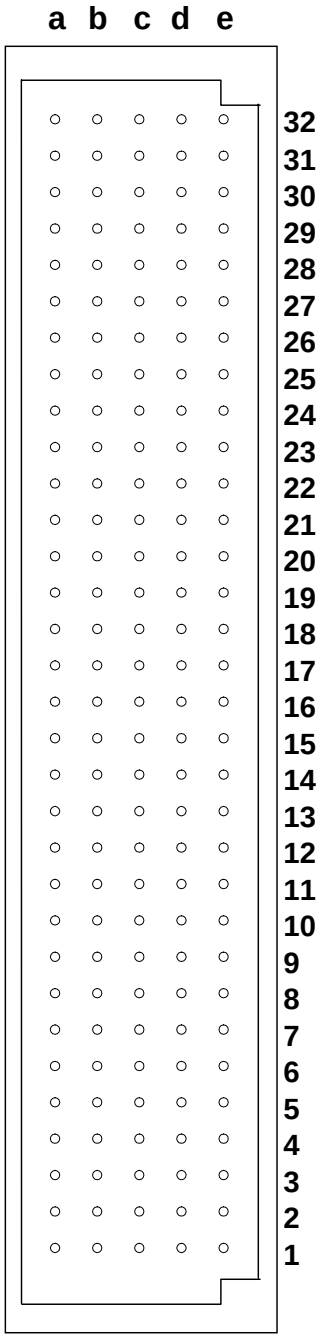
There are eight discharge relays in the system. They are K4, K5, K6, K82, K83, K84, K114, and K115. When closed individually, they are used to discharge any residual charge build-up for the each individual relay group via 91KΩ resistors.

Analog Bus Relays

For even greater flexibility, Model 1260-X138 takes full advantage of the analog bus found in the 1260-100X X-Series Adapt-a-Switch Carrier Switching System. Four analog bus relays, K109, K110, K111, and K112 in Figure 2-3 connect the output of multiplexers Group 2, Group 5, Group 6, and Group 7, respectively to analog bus pairs ABUS0, ABUS1, ABUS2, and ABUS3, respectively. For details on using the analog bus, refer to the section “Creating Very Large Multiplexers with the Analog Bus” in Chapter 3.

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Figure 2-4 Front-Panel Connector Pin Numbering



Front Panel Connector

The 1260-X138 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 2-4** for the physical pin arrangement. **Table 2-3** 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.

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Connector Pin Assignments

Table 2-5 provides the pin assignments for the front panel connector.

Table 2-5 1260-X138 Front-Panel Connections for J200

Mux	Channel	Pin	
		High	Low
0	Mux 0 Common	E3	E2
0	0	A1	B1
0	1	B2	A2
0	2	A3	B3
0	3	B4	A4
0	4	A5	B5
0	5	B6	A6
0	6	A7	B7
0	7	B8	A8
1	Mux 1 Common	E11	E10
1	10	A9	B9
1	11	B10	A10
1	12	A11	B11
1	13	B12	A12
1	14	A13	B13
1	15	B14	A14
1	16	A15	B15
1	17	B16	A16
2	Mux 2 Common	E19	E18
2	20	A17	B17
2	21	B18	A18
2	22	A19	B19
2	23	B20	A20
2	24	A21	B21
2	25	B22	A22
2	26	A23	B23
2	27	B24	A24
3	Mux 3 Common	E7	E6
3	30	C1	D1
3	31	D2	C2
3	32	C3	D3
3	33	D4	C4

Mux	Channel	Pin	
		High	Low
3	34	C5	D5
3	35	D6	C6
3	36	C7	D7
3	37	D8	C8
4	Mux 4 Common	E15	E14
4	40	C9	D9
4	41	D10	C10
4	42	C11	D11
4	43	D12	C12
4	44	C13	D13
4	45	D14	C14
4	46	C15	D15
4	47	D16	C16
5	Mux 5 Common	E23	E22
5	50	C17	D17
5	51	D18	C18
5	52	C19	D19
5	53	D20	C20
5	54	C21	D21
5	55	D22	C22
5	56	C23	D23
5	57	D24	C24
6	Mux 6 Common	E27	E26
6	60	A25	B25
6	61	C25	D25
6	62	B26	A26
6	63	D26	C26
6	64	A27	B27
6	65	C27	D27
6	66	B28	A28
6	67	D28	C28
7	Mux 7 Common	E30	E29
7	70	A29	B29
7	71	C29	D29
7	72	B30	A30
7	73	D30	C30
7	74	A31	B31
7	75	C31	D31
7	76	B32	A32
7	77	D32	C32

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Mux	Channel	Pin	
		High	Low
N/A*	Reserved #0 COM	E1	---
N/A*	Reserved #1 COM	E9	---
N/A*	Reserved #2 COM	E17	---
N/A*	Reserved #3 COM	E5	---
N/A*	Reserved #4 COM	E13	---
N/A*	Reserved #5 COM	E21	---
N/A*	Reserved #6 COM	E25	---
N/A*	Reserved #7 COM	E28	---
---	AFGND	E4	---
---	AFGND	E8	---
---	AFGND	E12	---
---	AFGND	E16	---
---	AFGND	E20	---
---	AFGND	E24	---
---	CHASSIS GND**	E31	---
---	CHASSIS GND**	E32	---

Notes:

AFGND provides three ground planes used to shield all MUX signals on PCB.

AFGND pins shall be used as CHASSIS GND if it used as the primary shielding for the MUX signals.

CHASSIS GND pins shall be used if AFGND is used as the primary shielding and is tied to the customer's ground.

*Pins E1, E5, E9, E13, E17, E21, E25, and E28 are reserved for future use.

**CHASSIS GND pins are connected to the AFGND via a 1500pf 2KV capacitor.

Mating Connectors

The following mating connectors and accessories are available:

P/N 407664: 160-Pin Connector Kit with Pins. This kit provides the mating connector for the 1260-X138, 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-X138 is determined by the carrier slot into which the 1260-X138 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 a 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:

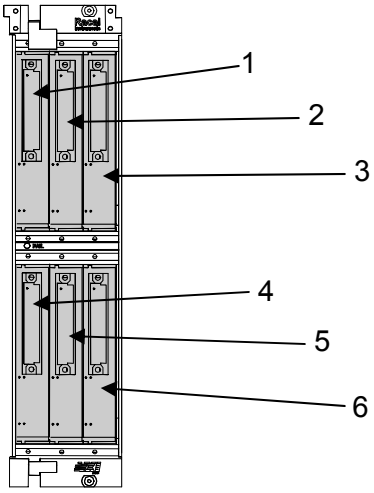


Figure 3-1 Front View – Module Addresses for 1 through 6

- 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:

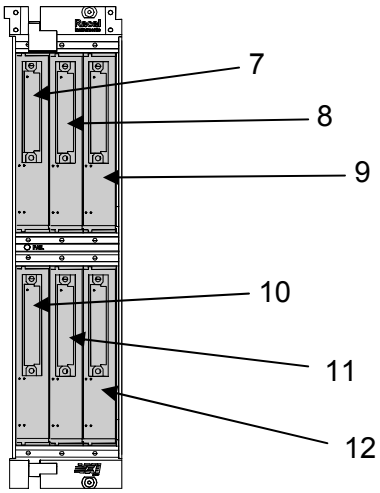


Figure 3-2 Front View – Module Addresses for 7 through 12

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-X138 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-X138 module.

A conceptual view of the message-based mode of operation is shown in **Figure 3-3** below. It sends “1” to bit 5 while maintaining the other bits to “0” thus closing only channel 5 and keeping other channels open.

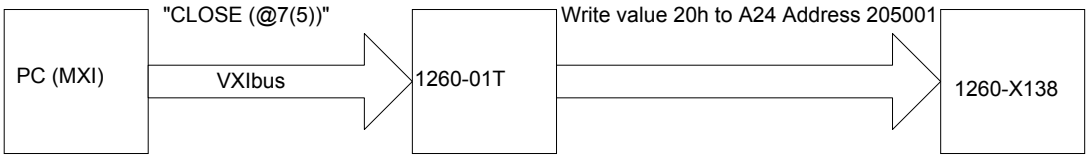


Figure 3-3 Message-Based Mode of Operation

In the *register-based* mode, the user writes directly to the control registers on the 1260-X138 module. The 1260-01T command module does not monitor these operations, and does not keep track of the relay states on the 1260-X138 module in this mode.

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

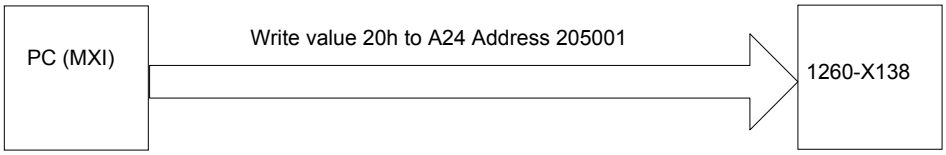


Figure 3-4 Register-Based Mode of Operation

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-X138

The standard 1260-01T commands are used to operate the 1260-X138 module. These commands are described in the 1260-01T User's Manual. Appendix A shows the channel number corresponding to each relay channel for operating in the message based mode.

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-X138 module. This is a number is in the range from 1 through 12, inclusive.
- <channel> is the 1260-X138 channel to operate. They are numbers from 0-7, 10-17, 20-27, 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

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descriptors for the 1260-X138:

`OPEN (@8(0))`	Open channel 0 on the 1260-X138 that has module address 8.
`CLOSE (@8(0,3))`	Close channels 0 and 3 on the 1260-X138 that has module address 8.
`CLOSE (@2(10:13))`	Close channels 10 through 13 inclusive on the 1260-X138 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-X138 is:

```
1260-X138 8 1X8 MUX
```

So, for a 1260-X138 whose <module address> is set to 8, the reply to this query would be:

```
8: 1260-X138 8 1X8 MUX
```

Operating The 1260-X138 in Register-Based Mode

In register-based mode, the 1260-X138 is operated by directly writing and reading control registers on the 1260-X138 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-X138 module. This is a value in the range from 1 and 12 inclusive.

3. The 1260-X138 control register to be written to or read from. Each control register on the 1260-X138 has a unique address.

The base A24 address for the 1260-X138 module may be calculated by:

(A24 Offset of the 1260-01T) + (1024 x Module Address of 1260-X138).

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

A 1260-X138 with a module address of 7 would have the base A24 address computed as follows:

Base A24 Address of 1260-X138 = 204000_{16} + (400_{16} x 7_{10}) = $205C00_{16}$

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-X138 reside at the first three odd-numbered A24 addresses for the module:

(Base A24 Address of 1260-X138) + 1 = Control Register Group 0

(Base A24 Address of 1260-X138) + 3 = Control Register Group 1

(Base A24 Address of 1260-X138) + 5 = Control Register Group 2

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

205C01 Control Register Group 0, controls relay channels K7 to K14.

205C03 Control Register Group 1, controls channels K15 to K22.

205C05 Control Register Group 2, controls channels K23 to K30.

Table 3-2 shows the channel assignments for each control register.

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Table 3-1 Control Register Channel Assignments

Mem Addr	Group	Channels	Relays	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0x001	0	CH_07 TO CH_00	K14 -- K7	K14	K13	K12	K11	K10	K9	K8	K7
0x003	1	CH_17 TO CH_10	K22 -- K15	K22	K21	K20	K19	K18	K17	K16	K15
0x005	2	CH_27 TO CH_20	K30--K23	K30	K29	K28	K27	K26	K25	K24	K23
0x007	3	CH_37 TO CH_30	K92 -- K85	K92	K91	K90	K89	K88	K87	K86	K85
0x009	4	CH_47 TO CH_40	K100 -- K93	K100	K99	K98	K97	K96	K95	K94	K93
0x00B	5	CH_57 TO CH_50	K108 -- K101	K108	K107	K106	K105	K104	K103	K102	K101
0x00D	6	CH_67 TO CH_60	K123 -- K116	K123	K122	K121	K120	K119	K118	K117	K116
0x00F	7	CH_77 TO CH_70	K131 -- K124	K131	K130	K129	K128	K127	K126	K125	K124
		2 WIRE CONFIGURATION									
0x011	0XH	37XH - 07XH TO 30XH - 00XH	K38 -- K31	K38	K37	K36	K35	K34	K33	K32	K31
0x013	1XH	47XH - 17XH TO 40XH - 10XH	K46 -- K39	K46	K45	K44	K43	K42	K41	K40	K39
0x015	2XH	57XH - 27XH TO 50XH - 20XH	K54 -- K47	K54	K53	K52	K51	K50	K49	K48	K47
0x017	0XL	37XL - 07XL TO 30XL - 00XL	K62 -- K55	K62	K61	K60	K59	K58	K57	K56	K55
0x019	1XL	47XL - 17XL TO 40XL - 10XL	K70 -- K63	K70	K69	K68	K67	K66	K65	K64	K63
0x01B	2XL	57XL - 27XL TO 50XL - 20XL	K78 -- K71	K78	K77	K76	K75	K74	K73	K72	K71
		MUX LINK									
0x01D	GROUP	MUX6_LINK TO MUX0_LINK	K113	N/A	K113	K81	K80	K79	K3	K2	K1
	INTERLINKS		K81- K79								
			K3 - K1								
		1 WIRE CONFIGURATION									
0x01F*	1 WIRE COMS	MUX7_COM TO MUX0_COM	K115-K114	K115	K114	K84	K83	K82	K6	K5	K4
			K84 - K82								
			K6 - K4								
		ANALOG BUS									
0x021	Analog Bus	XXXX, ABUS3 TO ABUS0	K112-K109	N/A	N/A	N/A	N/A	K112	K111	K110	K109
		N/A => READ <= '1'									
		WRITE <= '0'.									

Notes:

*Memory Address 0x01F is reserved. Do not write to these registers.

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 1000 0101 binary = 133 decimal = 85 hexadecimal to Control Register Group 0, relays K7, K9, and K14 will close, while relays K8, K10, K11, K12, and K13 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 relay K90:

1. Read Control Register Group 3 (this register controls K85 – K92 with K85 represented by the LSB)
2. Invert the bits in the value read in step 1
3. AND with 1101 1111 binary (the zero is in the position corresponding to channel 63)
4. OR with 0010 0000 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-X138 module.

Configuring Larger Multiplexers

The 1260-X138 is normally configured as eight 1x8 multiplexers. However, the plug-in contains seven special configuration relays that interconnect two or more multiplexers to form larger multiplexers. **Figure 2-1** shows these relays, identified as K64 through K70. **Table 3-1** provides the control register access information for these relays. Each configuration relay connects the commons of two multiplexers together.

Configuration may be done "on-the-fly" if desired.

As a configuration example, suppose you require two 1x16 multiplexes and one 1x24 multiplexer. You may form these multiplexers from a 1260-X138 by configuring it as follows:

1. Combine muxes 0 and 1 to form a 1x16 multiplexer. To do

this, we must close the relay shown as “K1” in **Figure 2-2**. Referring to **Table 3-1**, we see that bit 0 of control register 0x01D controls this configuration relay. To combine the multiplexers, write to the register to set this bit (leave the other bits unchanged).

2. Combine multiplexers 2, 3 and 4 to form a 1x24 multiplexer. To do this, close the “K3” and “K79” configuration relays (in **Figure 2-1**). From **Table 3-1** we see that the “K3” relay is controlled by bit 2 of control register 0x01D. Also, bit 3 of control register 0x01D controls the “K39” relay. Set both of these bits (without changing any other bits).

Creating Very Large Multiplexers With the Analog Bus

The 1260-X138 has access to the analog bus of the 1260-100X Carrier. The analog bus can connect multiplexer group of one 1260-X138 to multiplexer group of another 1260-X138, providing endless possibilities for creating large multiplexers from two or more plug-ins.

The analog bus consists of four two-wire paths, numbered as ABUS 0 through ABUS 3. These paths are accessible from a 1260-100X X-series Adapt-a-Switch Carrier slot. To link multiplexer group of one 1260-X138 to multiplexer group of another 1260-X138, we must connect them both to the same analog bus path.

For example, suppose you wish to create a 1x128 multiplexer. This requires two 1260-X138 plug-ins. To configure them as a single 1x128 multiplexer, proceed as follows:

1. Configure the first 1260-X138 as a 1x64 multiplexer. To do this, close the following configuration relays (shown in **Figure 2-1**):

   K1, K2, K3, K79, K80, K81 and K113.

   Table 3-1 indicates the registers and bit positions used to control these relays. Setting a bit to 1 closes the relay.

2. Configure the second 1260-X138 as a 1x64 multiplexer. Close the following configuration relays (shown in **Figure 2-1**):

3. K1, K2, K3, K79, K80, K81 and K113

4. Next, we connect both of these 1x64 multiplexers to the same analog bus path, forming a single 1x128 multiplexer. Close the “ABUS 3” relay K112 on the first plug-in. Referring to **Table 3-1**, we see that this relay is controlled by bit 3 of control register 0x021. Set the bit to 1 to close the relay.

5. In the same manner, close the “ABUS 3” relay K112 on the second plug-in.

   This connects the commons of both 1260-X138 plug-ins to ABUS 3, thereby connecting them together. This completes the formation of the 1x128 multiplexer. MUX7_COM on E30, E29 of either plug-in become the common high/low inputs of the 1x128 matrix.

   Note that, in the above example, paths ABUS 0, ABUS 1, and ABUS 2 are unused. If desired, you may use these independent paths to connect additional groups of plug-ins together.

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1260-X138
Example Code

```
#include <visa.h>

/* This example shows a 1260-01T at logical address 16 and a VXI/MXI */
/* interface */
#define RI1260_01_DESC     "VXI::16"

/* For a GPIB-VXI interface, and a logical address of 77 */
/* the descriptor would be:  "GPIB-VXI::77" */


/* this example shows a 1260-X138 with module address 7 */
#define MOD_ADDR_138  7


void example_operate_1260_X138(void)
{
     ViUInt8 creg_val;
     ViBusAddress creg0_addr;
     ViBusAddress creg1_addr;
     ViBusAddress creg2_addr;
     ViSession hdl1260;    /* VISA handle to the 1260-01T */
     ViSession hdlRM;      /* VISA handle to the resource manager */
     ViStatus error;       /* VISA error code */

     /* open the resource manager */
     /* this must be done once in application program */
     error = viOpenDefaultRM (&hdlRM);

     if (error < 0) {
          /* error handling code goes here */
     }

     /* get a handle for the 1260-01T */
     error = viOpen (hdlRM, RI1260_01_DESC, VI_NULL,VI_NULL, &hdl1260);
     if (error < 0) {
          /* error handling code goes here */
     }


     /* form the offset for control register 0 */
     /* note that the base A24 Address for the 1260-01T */
     /* is already accounted for by VISA calls viIn8() and */
```

```
/* viOut8() */

   /* module address shifted 10 places = module address x 1024 */
creg0_addr = (MOD_ADDR_138 << 10) + 1;
creg1_addr = creg0_addr + 2;
creg2_addr = creg1_addr + 2;

/* close channel 63 without affecting the state of */
/* channels 76, 62, 1000, 700, 71, 75, and 77 */
error = viIn8 (hdl1260, VI_A24_SPACE, creg1_addr, &creg_val);
if (error < 0) {
     /* error handling code goes here */
}

/* invert the bits to get the present control register value */
creg_val = ~creg_val;

/* AND to leave every channel except 63 unchanged */
creg_val &= ~ (0x20);

/* OR in the bit to close channel 63 */
creg_val |= 0x20;

/* write the updated control register value */
error = viOut8 (hdl1260, VI_A24_SPACE, creg1_addr, creg_val);
if (error < 0) {
     /* error handling code goes here */
}

/* open channel 47 without affecting channels 57, 600, 60, 51, 59, 500 */
error = viIn8 (hdl1260, VI_A24_SPACE, creg2_addr, &creg_val);
if (error < 0) {
     /* error handling code goes here */
}

/* invert the bits to get the present control register value */
creg_val = ~creg_val;

/* AND to leave every channel except 47 unchanged */
/* leave bit 0 clear to open channel 47 */
creg_val &= ~ (0x01);

/* write the updated control register value */
error = viOut8 (hdl1260, VI_A24_SPACE, creg2_addr, creg_val);
if (error < 0) {
     /* error handling code goes here */
}
```

```
      /* close the VISA session */
      error = viClose( hdl1260 );
      if (error < 0) {
            /* error handling code goes here */
      }
}
```

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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-X138 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

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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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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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