RACAL INSTRUMENTS™

1260-132

HIGH VOLTAGE PLUG-IN

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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.

EC Declaration of Conformity

We

Astronics Test Systems
4 Goodyear
Irvine, CA 92618

declare under sole responsibility that the

1260-132, 1x23 Two Wire HV Multiplexer Module, P/N 407822

They conform to the following Product Specifications:

Safety: EN61010-1:1993+A2:1995

EMC: EN61326:1997+A1:1998

Supplementary Information:

The above specifications are met when the product is installed in an Astronics Test Systems certified mainframe with faceplates installed over all unused slots, as applicable

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (modified by 93/68/EEC).

Irvine, CA, August 5, 2002 Karen L Wenstrom
Engineering Director

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DOCUMENT CHANGE HISTORY

Revision	Date	Description of Change
A	09/28/09	Revised per EO 29877 Revised format to current standards. Company name revised throughout manual. Manual now revision letter controlled. Added Document Change History Page v. Back of cover sheet. Revised Warranty Statement, Return of Product, Proprietary Notice and Disclaimer to current standards. (Chap2-1) Unpacking and inspection. Revise to current stds. Removed Reshipment Instructions in (Chap. 2-1) and removed (Chap 5). Information. Now appears in first 2 sheets behind cover sheet. Updated table of contents to reflect changes made. . Added to logo to lower corner opposite of Page no's i thru vi.

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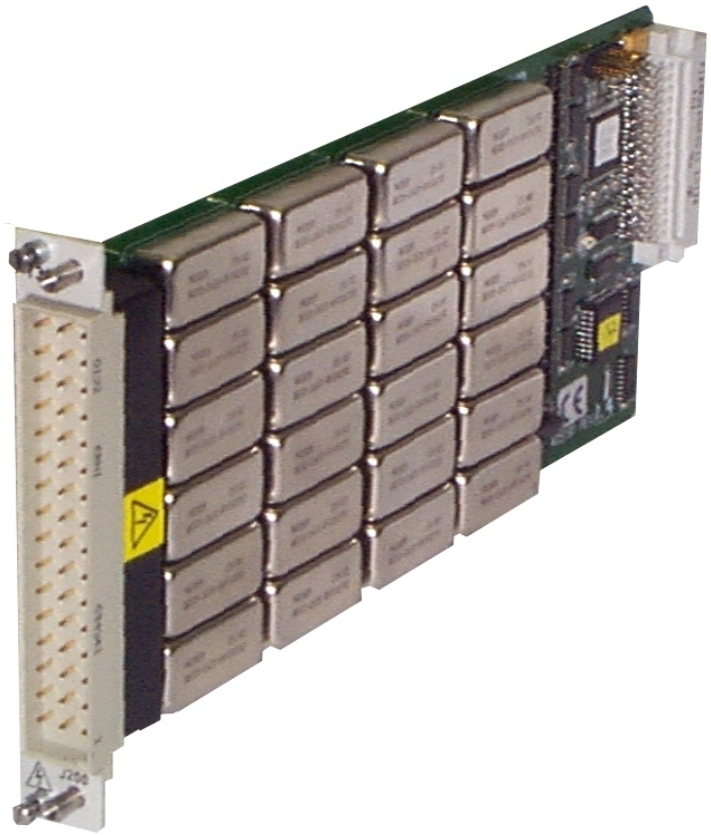
Chapter 1
SPECIFICATIONS

Introduction

The 1260-132 is a plug-in switch module developed for the 1260-100 Adapt-a-Switch Carrier and the 1256 Switch Controller. The 1260-132 includes the following features:

- Standard plug-in design, providing for ease of replacement.
- Data-Driven embedded descriptor, allowing immediate use with any Option-01T or 1256 switch controller, regardless of firmware revision level.
- 1x23 Isolated Two Wire, High-Voltage Multiplexer.



Specifications

Maximum Switching Voltage	
AC	1000 VAC pk-pk
DC	1000 VDC
Switching Current	
AC	2.0 AACrms
DC	2.0 A
Switching Power	
AC	60 VA
DC	60 W
Minimum Breakdown	≥ 1.5 KV
Initial Path resistance	≤ .5 Ω
Insulation resistance	≥ 10^9 Ω
Thermal EMF	≤ 40 uV
Bandwidth (-3dB)	≥ 5 MHz
Insertion Loss	
1 MHz	≤ 0.2 dB
5 MHz	< 0.5 dB
Isolation	
1 MHz	≥ 60 dB
10 MHz	≥ 30 dB
Capacitance	
Channel-Ground	≤ 150 pF
Open-Channel	≤ 10 pF
Relay Settling Time	≤ 2 ms
Shock	30g, 11 ms, ½ sine wave
Vibration	0.013 in. P_k-P_k, 5-55 Hz
Bench Handling	4 in., 45°
Cooling	See 1260-100 or 1256 cooling data
Temperature	
Operating	0°C to +55°C
Non-operating	-40°C to +75°C

Relative Humidity	85% ± 5% non-condensing at ≤ 35°C
Altitude	
Operating	10,000 feet
Non-operating	15,000 feet
Power Requirements	
+5 VDC	≤ 1.5 amps max
Weight	14.75 oz. (0.42 kg)
MTBF	≥ 300,000 hours (MIL-HDBK-217E)
Dimensions	4.5”H X 0.75”W X 9.5”D

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 100 W. 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 1260-132 module typically has two relays closed, passing a current of 2.0A, then:

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

By substituting the actual values:

Total power dissipation =
$[(2.0\ A)^2 * (0.5\ \Omega) * 2] + (\ 8.0\ W) = 12\ W$ at 55°C

This is acceptable power dissipation for an individual plug-in module. If five additional modules are likewise loaded, then the overall carrier dissipation is approximately 70 W, which is well within the cooling available in any commercial VXIbus chassis or the 1256 Switching System. In practice, rarely are more than two relays are 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. Consult the Power Dissipation Section of any other 1260 Adapt-a-Switch card manuals for additional information.

Most users of a signal-type switch, such as the 1260-132, switch no more than a few hundred milliamperes and are able to energize all relays simultaneously, should they so desire.

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 1261B, almost any configuration may be realized.

About MTBF

The 1260-132 MTBF is >300,000 hours, calculated in accordance with MIL-HDBK-217E. Relays are included in this calculation but be aware that relay life is strongly dependent upon operating conditions. 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)
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.

For more details about the above life expectancy factors, refer to the data sheet for the switch plug-in module.

The relays used on the 1260-132 plug-in are Astronics Test Systems P/N 310303. The manufacturer's specifications for this relay are:

Life Expectancy

Mechanical	100,000,000 operations
Electrical	1,000,000 operations at full rated load (resistive)

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

Ordering Information

Listed below are part numbers for the 1260-132 switch module and available mating connector accessories. Each 1260-132 uses a single 48 pin mating connector.

ITEM	DESCRIPTION	PART #
1260-132	1x23 Two Wire HV Mux Module	407822
Mating Connector Kit	48 Pin Connector Housing / Strain Relief	407664-001
Spare Connector Pins	Crimp Connector Pins	602258-900
Additional Manual	1260-132 Users Manual	980824-132

Chapter 2
INSTALLATION INSTRUCTIONS

Unpacking and Inspection

1. Remove the 1260-132 module and inspect it for damage. If any damage is apparent, inform the carrier immediately. Retain shipping carton and packing material for the carrier's inspection.

2. Verify that the pieces in the package you received contain the correct 1260-132 module option and the 1260-132 Users Manual. Notify Customer Support if the module appears damaged in any way. Do not attempt to install a damaged module into a VXI chassis.

3. The 1260-132 module is shipped in an anti-static bag to prevent electrostatic damage to the module. Do not remove the module from the anti-static bag unless it is in a static-controlled area

Installation

Installation of the 1260-132 Switching Module into a 1260-100 Carrier assembly is described in the Installation section of the 1260-100 Adapt-a-Switch Carrier Manual and the 1256 Switch System Manual.

Module Configurations

The 1260-132 is a 1 x 23, two wire,high voltage reed switch multiplexer module The 1260-132 uses an isolation relay to disconnect the 1x23 multiplexer when cascading multiple 1260-132 modules to build larger multiplexers . This additional relay reduces the capacitance and increases the insulation resistance for large multiplexer configurations

Front Panel Connectors

The 1260-132 has a 48-pin front-panel connector, labeled J200. It is a 48-pin, DIN style. See **Figure 2-1** for pin numbering. **Table 2-1** shows the mapping of channel numbers to connector pins. Information about available mating connectors is provided immediately after **Table 2-1**. See **Figure 2-2** for a detail of the actual relay diagram. See **Figure 2-3** for a block diagram of the 1260-132.

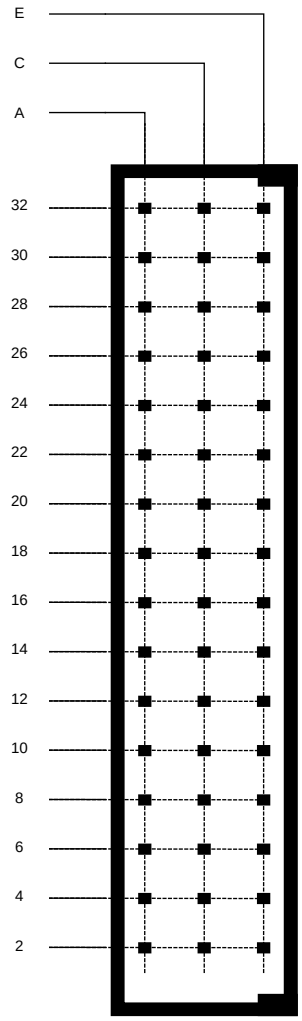


Figure 2-1, Front-Panel Connector Pin Numbering

Table 2-1, 1260-132 Front-Panel Connections

CHANNEL	HI	LO	RELAY
00	J200-E32	J200-E30	K1
01	J200-A28	J200-C28	K2
02	J200-A30	J200-C30	K3
03	J200-A32	J200-C32	K4
04	J200-E28	J200-E26	K5
05	J200-E24	J200-E22	K6
06	J200-A24	J200-C24	K7
07	J200-A26	J200-C26	K8
08	J200-E20	J200-E18	K9
09	J200-A18	J200-C18	K10
10	J200-A20	J200-C20	K11
11	J200-A22	J200-C22	K12
12	J200-E16	J200-E14	K13
13	J200-A12	J200-C12	K14
14	J200-A14	J200-C14	K15
15	J200-A16	J200-C16	K16
16	J200-E12	J200-E10	K17
17	J200-E8	J200-E6	K18
18	J200-A8	J200-C8	K19
19	J200-A10	J200-C10	K20
20	J200-E4	J200-E2	K21
21	J200-A2	J200-C2	K22
22	J200-A4	J200-C4	K23
23	J200-A6	J200-C6	K24

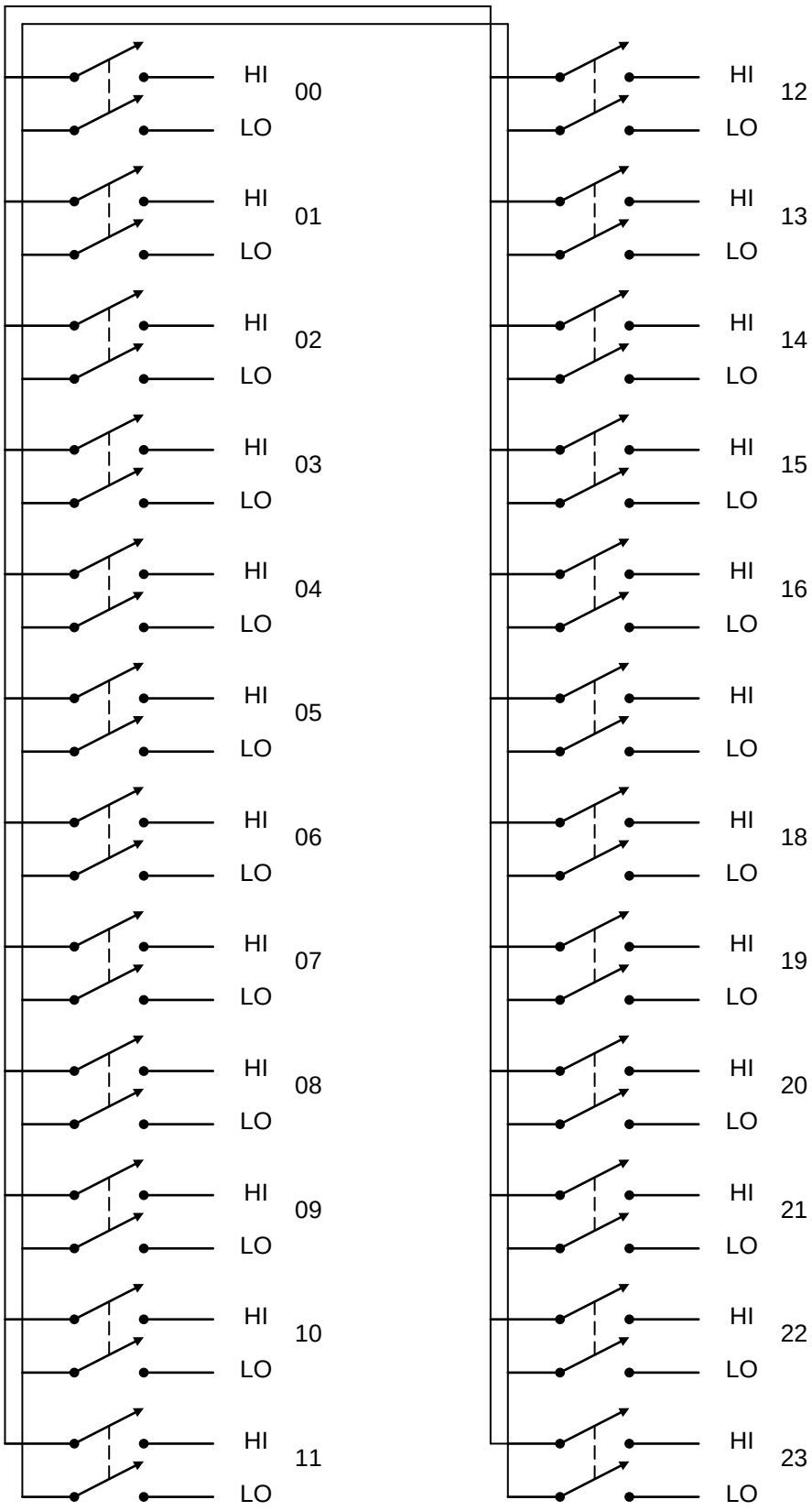


Figure 2-2 Relay Diagram

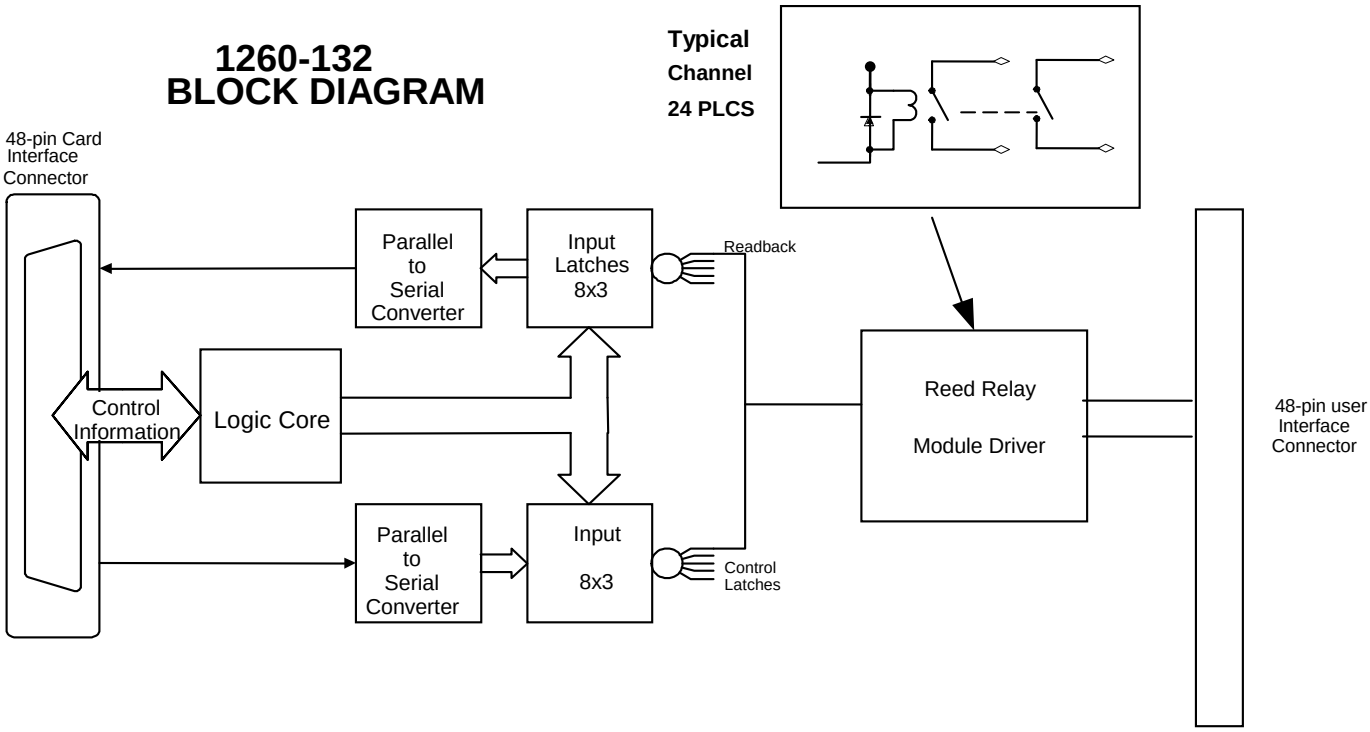


Figure 2-3, Block Diagram

Mating Connectors

Mating connector accessories are available:

160-Pin Connector Kit with backshell and pins,
P/N 407664-001

The 48-Pin Connector Kit consists of a connector housing and 60 crimp pins. After wire attachment, the pin is inserted into the housing and will snap into place, providing positive retention.

The suggested hand tool for the crimp pins is Astronics Test Systems P/N 990898. The corresponding pin removal tool is Astronics Test Systems P/N 990899.

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Chapter 3
MODULE OPERATION

Setting the Module Address

Both the Option-01T and 1256 switch controllers identify each Adapt-a-Switch plug-in by a *module address* that is unique to that module.

For setting the module address of the 1260-132 refer to one of the following manuals.

- 1260-100 Adapt-a-Switch Manual – Publication No. 980824-100 (“Module Address Switch” section in Chapter 2)
- 1256 User Manual – Publication No. 980855 (“Numbering of Plug-In Slots” section in Chapter 2)

1256 Operation

For a detailed description of the use of the 1260-132 when it is being used in a 1256 Switch Controller, refer to the 1256 User Manual (Publication No. 980855).

VXI Operating Modes

The 1260-132 may be operated either in *message-based* mode or in *register-based* mode when used with an Adapt-a-switch Carrier in a VXI chassis.

In the *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 1260-132 module.

A conceptual view of the message-based mode of operation is shown in **Figure 3-1** below.

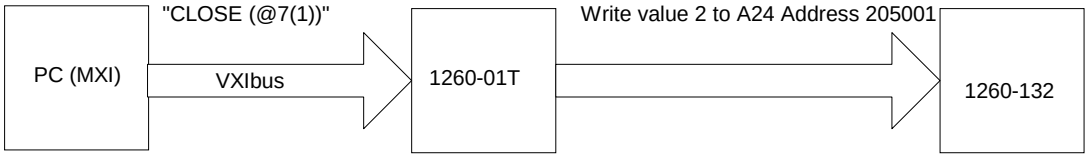


Figure 3-1, Message-Based Mode of Operation

In the *register-based* mode, the user writes directly to the control registers on the 1260-132 module. The 1260-01T command module does not monitor these operations, and does not keep track of the relay states on the 1260-132 module in this mode.

A conceptual view of the register-based mode is shown in **Figure 3-2** below.

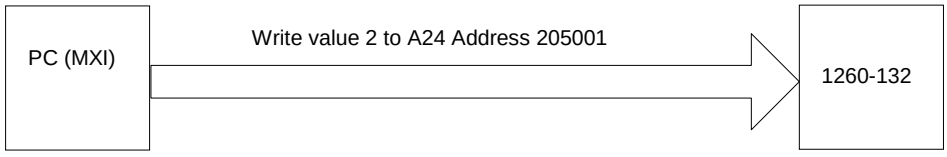


Figure 3-2, Register-Based Mode of Operation

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 VXI Message-Based Mode

Channel Descriptors for the 1260-132

The standard 1260-01T commands are used to operate the 1260-132 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 1260-132 module. This is a number is in the range from 1 through 12, inclusive.

- <channel range> is a list of channels to operate. Each channel is a two-digit number. Thus, the valid channel numbers are:

  0 through 23

  When listing multiple channels, separate the

channels with a comma (,). To select a contiguous range of channels, specify the first and last channels, and separate them by a colon (:)

The following examples illustrate the use of the channel descriptors for the 1260-132, with a module address of 8.

`OPEN (@8(5))`	Open channel 5.
`OPEN (@8(10))`	Open channel 10.
`CLOSE (@8(0,9))`	Close channel 9 on the 1260-132. (Note that Channel 0 is used as the common output and must be closed to complete the path)
`CLOSE (@8(0,23))`	Close channel 23 on the 1260-132.
`OPEN (@8(0:23))`	Open channels 0 through 23 (all channels) on the 1260-132.
`CLOSE (@8(0,10:22))`	Close channels 0, 10, through 22 on the 1260-132.

Power Up Relay Default State

Normally, the default state for all relays for the 1260-132 is to be open on power up. The 1260-01T controller or the 1256 will set this state by default . This may or may not be what the user desires.

In the event that the user would like to change the state of the relays after power up it can be accomplished by doing the following:

1) Close each of channels on the 1260-132 that you would like to configure as closed for the power up state. For example, if the module address = 3:

CLOSE (@3(0,1))

3) Repeat step #2 for EACH 1260-132 in the system

4) Execute the "*SAV 0" command to save the present states of all relays into non-vol.

After this, whenever the Option -01T or 1256 is powered on, the specified relays will be closed (until specifically commanded to be open).

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 1260-132 are:

```
1260-132 HIGH POWER REED FORM A MUX
```

So, for a 1260-132 whose <module address> is set to 8, the reply to this query would be:

```
8 : 1260-132 HIGH POWER REED FORM A MUX
```

Operating in VXI Register-Based Mode

In register-based mode, the 1260-132 is operated by directly writing and reading control registers on the 1260-132 module. The first control register on the module operates channels 0 through 7. The second control register operates channels 8 through 15. The third control register operates channels 16 through 23, etc. When a control register is written to, all channels controlled by that register are operated simultaneously.

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 1260-132 module. This is a value in the range from 1 and 12 inclusive.

3. The 1260-132 control register to be written to or read from. Each control register on the 1260-132 has a unique address.

The base A24 address for the 1260-132 module may be calculated by:

(A24 Offset of the 1260-01T) + (1024 x Module Address of 1260-132).

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

A 1260-132 with a module address of 7 would have the base A24 address computed as follows:

Base A24 Address of 1260-132 = 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 1260-132 reside at the first three odd-numbered A24 addresses for the module:

(Base A24 Address of 1260-132) + 1 = Control Register 0

(Base A24 Address of 1260-132) + 3 = Control Register 1

(Base A24 Address of 1260-132) + 5 = Control Register 2

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

205C01 Control Register 0, controls channels 0 through 7.

205C03 Control Register 1, controls channels 8 through 15.

205C05 Control Register 2, controls channels 16 through 23.

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

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	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16

Setting a control bit to 1 closes the corresponding channels and clearing the bit to zero opens the channels. Thus, if you write the value 1000 0101 binary = 133 decimal = 85 hexadecimal to Control Register 0, channels 0, 2, and 7, will close, while channels 1,3,4,5, and 6, will be 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 from the control register .** 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**: No operation required. **To close**: OR in the bits for the relays to close.
5. Write the modified value back to the control register.

For example, to close channel 14:

1. Read Control Register 1 (this register controls channels 8 through 15, with channel 8 represented by the LSB).
2. Invert the bits in the value read in step 1.
3. AND with 1011 1111 binary (the zero is in the position corresponding to channel 14).
4. OR with 0100 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 1260-132 module.

1260-132 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 1260-132 with module address 7 */
#define MOD_ADDR_132 7


void example_operate_1260_132(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() */
```

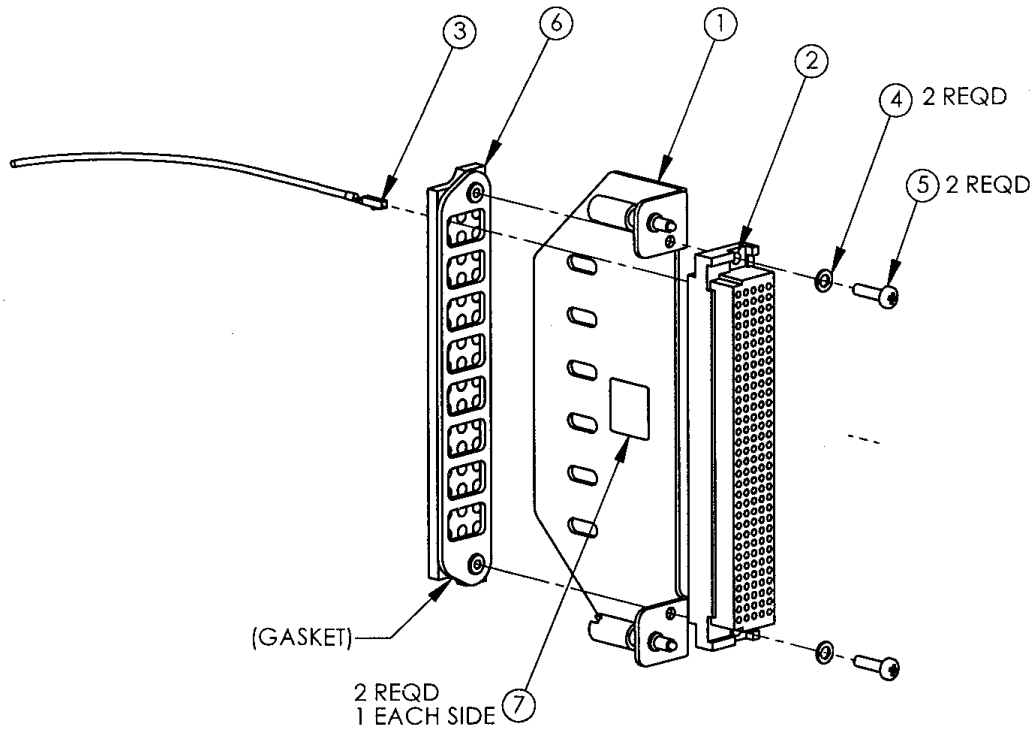
```
   /* module address shifted 10 places = module address x 1024 */
creg0_addr = (MOD_ADDR_132 << 10) + 1;
creg1_addr = creg0_addr + 2;
creg2_addr = creg1_addr + 2;

/* close channel 14 without affecting the state of */
/* channels 8, 9, 10, 11, 12, 13, and 15 */
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 14 unchanged */
creg_val &= ~ (0x40);

/* OR in the bit to close channel 14 */
creg_val |= 0x40;

/* 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 16 without affecting channels 17 through 23 */
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 16 unchanged */
/* leave bit 0 clear to open channel 16 */
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 */
      }
}
```

Chapter 4
OPTIONAL ASSEMBLIES

Publication 980851 Rev A
Assembly Procedure
Racal Instruments Assembly 407664-001

Publication Date 22 June 1999



INSTRUCTIONS

1. AFFIX LABEL (ITEM 7) TO BRACKET (ITEM 1) APPROX WHERE SHOWN.
2. CRIMP TERMINAL (ITEM 3) TO WIRE (NOT SUPPLIED).
3. PASS CRIMPED WIRES THROUGH INSULATOR ASSEMBLY (ITEM 6).
4. INSERT CRIMPED TERMINALS INTO CONNECTOR BODY (ITEM 2).
5. ATTACH INSULATOR ASSEMBLY (ITEM 6) TO STRAIN RELIEF BRACKET (ITEM 1) AND CONNECTOR BODY (ITEM 2) WITH SCREWS AND WASHERS (ITEMS 4&5). GASKET MUST SEAT SNUGLY AND EVENLY AGAINST CONNECTOR BODY.

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	456673	BRACKET, STRAIN RELIEF
2	1	602258-116	CONNECTOR, 160 PIN
3	1	602258-900	TERMINAL, CRIMP
4	2	617127	WASHER, #4 SPLIT LOCK
5	2	616304	SCREW,M2.5X10MM
6	1	407714	INSULATOR ASSEMBLY
7	2	921592	WARNING LABEL, SHOCK