RACAL INSTRUMENTS™

1260-117 52 CHANNEL SPDT

1260-117A 20 CHANNEL

SPDT PLUG-IN

Publication No. 980824-117 Rev. A

Astronics Test Systems Inc.
4 Goodyear, Irvine, CA 92618
Tel: (800) 722-2528, (949) 859-8999; Fax: (949) 859-7139

atsinfo@astronics.com atssales@astronics.com
atshelpdesk@astronics.com http://www.astronicstestsystems.com

THANK YOU FOR PURCHASING THIS ASTRONICS TEST SYSTEMS PRODUCT

For this product, or any other Astronics Test Systems product that incorporates software drivers, you may access our web site to verify and/or download the latest driver versions. The web address for driver downloads is:

http://www.astronicstestsystems.com/support/downloads

If you have any questions about software driver downloads or our privacy policy, please contact us at:

atsinfo@astronics.com

WARRANTY STATEMENT

All Astronics Test Systems products are designed to exacting standards and manufactured in full compliance to our AS9100 Quality Management System processes.

This warranty does not apply to defects resulting from any modification(s) of any product or part without Astronics Test Systems express written consent, or misuse of any product or part. The warranty also does not apply to fuses, software, non-rechargeable batteries, damage from battery leakage, or problems arising from normal wear, such as mechanical relay life, or failure to follow instructions.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. The remedies provided herein are buyer's sole and exclusive remedies.

For the specific terms of your standard warranty, contact Customer Support. Please have the following information available to facilitate service.

1. Product serial number
2. Product model number
3. Your company and contact information

You may contact Customer Support by:

E-Mail:	atshelpdesk@astronics.com	
Telephone:	+1 800 722 3262	(USA)
Fax:	+1 949 859 7139	(USA)

RETURN OF PRODUCT

Authorization is required from Astronics Test Systems before you send us your product or sub-assembly for service or calibration. Call or contact Customer Support at 1-800-722-3262 or 1-949-859-8999 or via fax at 1-949-859-7139. We can also be reached at: atshelpdesk@astronics.com.

If the original packing material is unavailable, ship the product or sub-assembly in an ESD shielding bag and use appropriate packing materials to surround and protect the product.

PROPRIETARY NOTICE

TRADEMARKS AND SERVICE MARKS

DISCLAIMER

Buyer acknowledges and agrees that it is responsible for the operation of the goods purchased and should ensure that they are used properly and in accordance with this document and any other instructions provided by Seller. Astronics Test Systems products are not specifically designed, manufactured or intended to be used as parts, assemblies or components in planning, construction, maintenance or operation of a nuclear facility, or in life support or safety critical applications in which the failure of the Astronics Test Systems product could create a situation where personal injury or death could occur. Should Buyer purchase Astronics Test Systems product for such unintended application, Buyer shall indemnify and hold Astronics Test Systems, its officers, employees, subsidiaries, affiliates and distributors harmless against all claims arising out of a claim for personal injury or death associated with such unintended use.

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.

EC Declaration of Conformity

We

Astronics Test Systems
4 Goodyear
Irvine, CA

declare under sole responsibility that the

1260-117 Switch Plug In Module
P/N 407658

conforms 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.

Irvine, CA, April 10, 2002 Karen L Evensen
Karen Evensen, Engineering Director

EC Declaration of Conformity

We

Astronics Test Systems
4 Goodyear
Irvine, CA 92618

declare under sole responsibility that the

1260-117A Switch Plug In Module
P/N 407658-001

conforms to the following Product Specifications:

Safety: EN61010-1:1993+A2:1995

EMC: EN61326:1997+A1:1998, Class A

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.

Irvine, CA, February 24, 2003

Karen L Evensen

Karen Evensen, Engineering Director

Table of Contents

List of Figures

List of Tables

DOCUMENT CHANGE HISTORY

Revision	Date	Description of Change
A	5/20/09	Revised per EO 29733 Revised format to current standards. Company name revised throughout manual. Manual now revision letter controlled. Added Document Change History Page iii. Back of cover sheet. Revised Warranty Statement, Return of Product, Proprietary Notice and Disclaimer to current standards. Removed Reshipment Instructions in (Chap. 2-1) and removed (Chap 4). Information. Now appears in first 2 sheets behind cover sheet. Updated table of contents to reflect changes made. . Added company name to footer opposite of Page no’s i thru iv
		.

This page was left intentionally blank.

Chapter 1

SPECIFICATIONS

Introduction

The 1260-117, (52-channels), and the 1260-117A, (20-channels), are SPDT (Form C), relay plug-in switch modules for the 1260-100 VXI Adapt-a-Switch Carrier or 1256 GPIB/Ethernet Switching System Mainframe. The 1260-117/-117A 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.

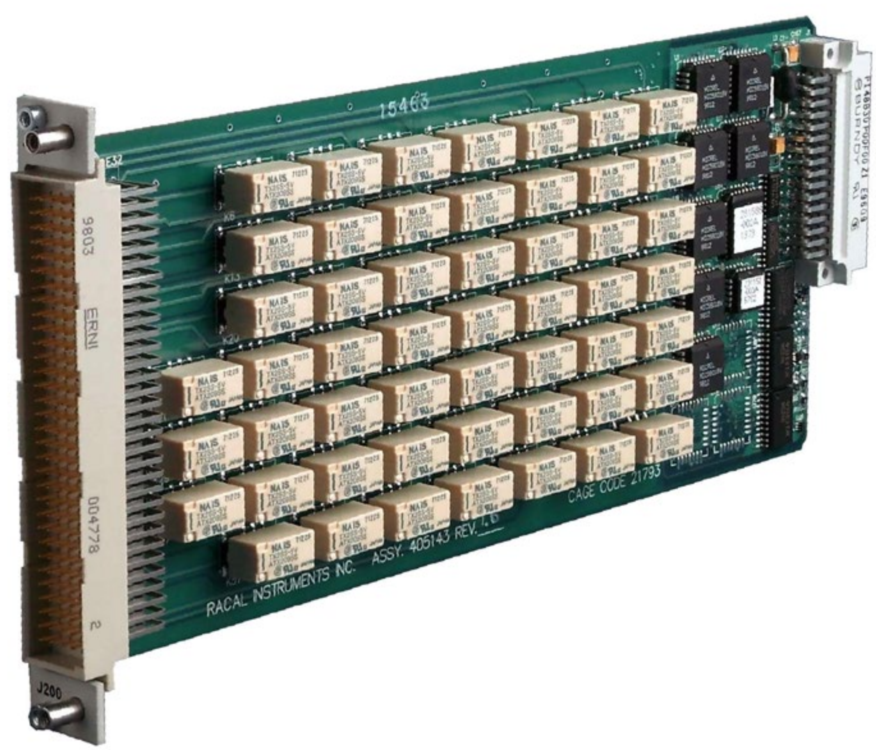


Figure 1-1, The 1260-117

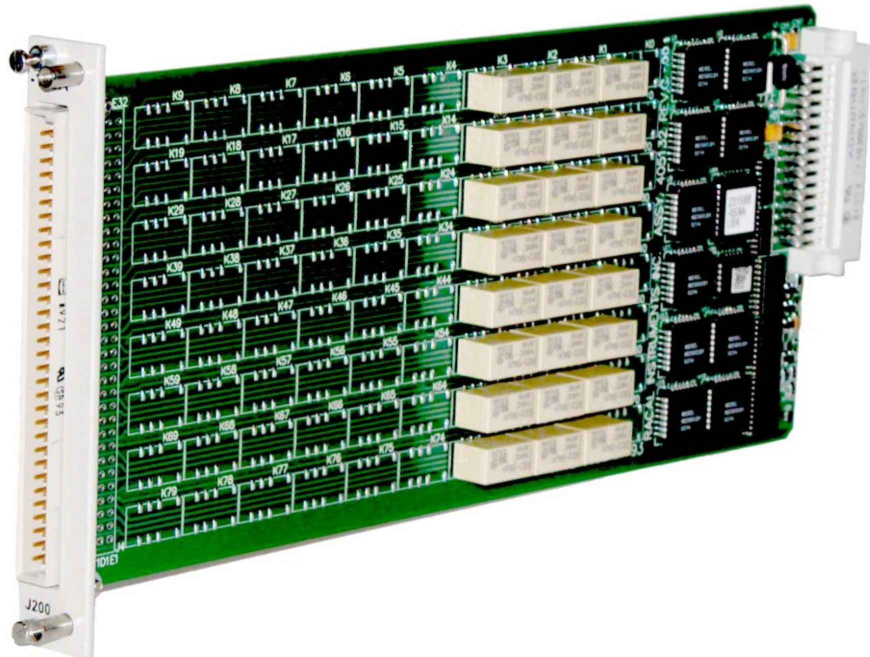


Figure 1-2, The 1260-117A

Specifications

Unless otherwise stated the specifications for the 1260-117 and the 1260-117A are the same.

Bandwidth (-3dB, 50Ω)	60 MHz	
Insertion Loss (50Ω)		
300 KHz	< 0.1 dB	
10 MHz	< 0.5 dB	
Return Loss		
10 MHz	< 20 dB	
Isolation (50Ω)		
10 MHz	> 40 dB	
Crosstalk (50Ω)		
10 MHz	< -30 dB	
Switching Voltage		
AC	250 V, Max	
DC	220 V, Max	
Switching Current	-117	-117A
AC	2 A, Max	2 A, Max*
DC	2 A, Max	2 A, Max*

*1 A AC/DC with IDC mating connector

Switching Power	
AC	125 VA, Max
DC	60 W, Max
Path resistance	< 500 mΩ
Thermal EMF	< 10 uV
Capacitance	
Channel-Chassis	< 150 pF
Open-Channel	< 10 pF
Insulation resistance	> 100 MΩ
Relay Settling Time	< 10 ms
Shock	30g, 11 ms, ½ sine wave
Vibration	0.013 in. P-P, 5-55 Hz
Bench Handling	4 in., 45°
Cooling	See 1260-100 cooling data
Temperature	
Operating	0°C to +55°C
Non-operating	-40°C to +75°C

Relative Humidity	5% to 95% RH non-condensing $\leq$ 30°C 5% to 75% RH non-condensing > 30°C 5% to 45% RH non-condensing > 40°C	
Altitude		
Operating	10,000 feet	
Non-operating	15,000 feet	
Power Requirements		
+5 VDC	150 mA plus 30 mA per energized relay, max.	
Weight	-117	-117A
	9 oz. (260 g)	7 oz. (200 g)
MTBF	822,885 hours	(MIL-HDBK-217E)
Mean Time to Repair (MTTR)	< 5 minutes	

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 1260-117 module (containing 52 relays) has 25 relays closed, passing a current of 0.5 A, then:

Total power dissipation =

[(current)^2 * (path resistance) * 25] + (quiescent power)

By substituting the actual values:

Total power dissipation =

[(0.5 A)^2 * (1 Ω) * 25] + (0.75 W) = 7 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 36 W, which is well within the cooling available in any commercial VXIbus chassis. 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. 52 relays closed
1.0 A	Max. 14 relays closed
2.0 A	Max. 4 relays closed

Most users of a signal-type switch, such as the 1260-117, switch no more than a few hundred milliamperes and are able to energize all relays simultaneously, should they so desire. 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 1261B, almost any configuration may be realized.

About MTBF

The 1260-117 MTBF is 822,885 hours, calculated in accordance with MIL-HDBK-217E, with the exception of the electromechanical relays. The MTBF for the 1260-117A will be the same or better depending on the number af relays engaged. Relays are excluded from this calculation because 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 1260-117/-117A plug-ins are part no. 310256-001. The relay manufacturer’s specifications for this relay are:

Life Expectancy

Mechanical	100,000,000 operations
Electrical	100,000 operations at 60 W / 62.5 VA

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

Ordering Information

Listed below are part numbers for the 1260-117and –117A switch modules and available mating connector accessories. Each 1260-117 uses a single mating connector.

ITEM	DESCRIPTION	PART #
1260-117 Switch Module 1260-117A Switch Module	Switch Module, 52-Channel SPST, 2 A Switch Module, 20-Channel SPST, 2 A with Crimp Connector 1 A with IDC Connector	407658 407658-001
1260-117 160-pin Mating Connector	160 Pin Conn. Kit w/strain relief & pins	407664
1260-117 Cable Assy. 6ft, Sleeved	160 Pin Cable Assy, 6 Ft, 24 AWG	407408-001
1260-117A IDC Connector	64 Pin DIN Connector, IDC (-117A)	602004
1260-117A Crimp Connector	64 Pin DIN Crimp Body (-117A)	602159-064
1260-117A Crimp Pin	64 Pin DIN crimp Pin (-117A)	602159-900
Additional Manual		980824-117

This page was left intentionally blank.

Chapter 2

INSTALLATION INSTRUCTIONS

Unpacking and Inspection

1. Remove the 1260-117/117A 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 1260-117/117A module option and the 1260-117/117A 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 1260-117/117A 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 1260-117/-117A Switching Module into a 1260-100 Carrier assembly is described in the Installation section of the 1260-100 Adapt-a-Switch Carrier Manual.

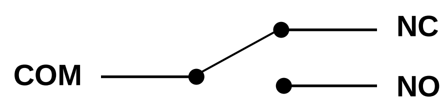
Module Configuration

The 1260-117 is a 52-channel, SPDT plug-in for the Adapt-a-Switch Series.

The 1260-117A is a 20-channel, SPDT plug-in for the Adapt-a-Switch Series.

Figure 2-1 shows a typical block diagram of a single switch.

Figure 2-1, 1260-117/-117A Block Diagram



One channel shown

Front Panel Connectors

The 1260-117 has one 160-pin front-panel connector, labeled J200. It is a 160-pin, modified DIN style, with 0.025” square posts. See **Figure 2-2** for a diagram of the front panel connector pin numbering.

The 1260-117A has one 160-pin front-panel connector, labeled J200. It is a 63-pin, modified DIN style, with 0.025” square posts. See **Figure 2-3** for a diagram of the front panel connector pin numbering.

For connector pin assignments, refer to **Table 2-1** and **Table 2-2** for 1260-117 and 1260-117A respectively.

Figure 2-2, 1260-117 Front-Panel Connector Pin Numbering

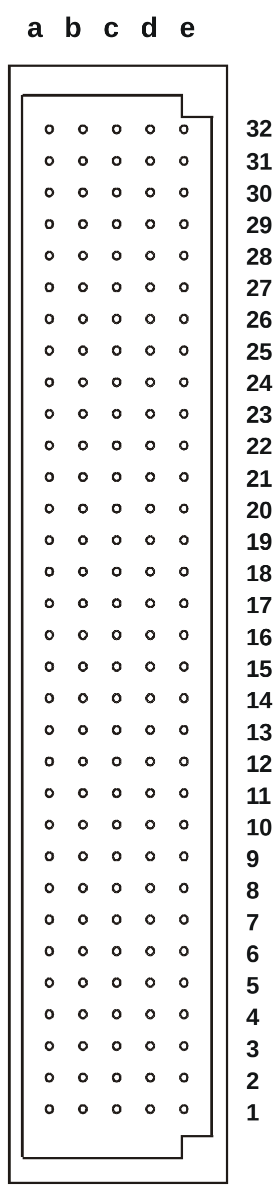


Figure 2-3, 1260-117A Front-Panel Connector Pin Numbering

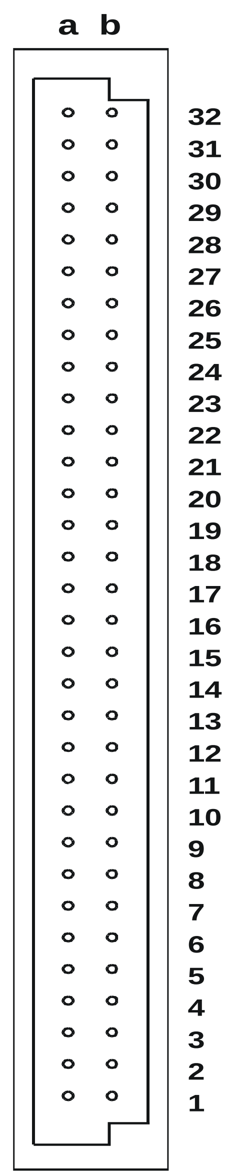


Table 2-1, 1260-117 Channel to Connector Pin Mapping

Relay	Channel Number	Common	Normally Open	Normally Closed (Default)
K0	00	J200-A32	J200-A31	J200-A30
K1	01	J200-B32	J200-B31	J200-B30
K2	02	J200-C32	J200-C31	J200-C30
K3	03	J200-D32	J200-D31	J200-D30
K4	04	J200-E32	J200-E31	J200-E30
K5	05	J200-A29	J200-A28	J200-A27
K6	06	J200-B29	J200-B28	J200-B27
K7	07	J200-C29	J200-C28	J200-C27
K8	08	J200-D29	J200-D28	J200-D27
K9	09	J200-E29	J200-E28	J200-E27
K10	10	J200-B26	J200-C26	J200-D26
K11	11	J200-A25	J200-A24	J200-A23
K12	12	J200-B25	J200-B24	J200-B23
K13	13	J200-C25	J200-C24	J200-C23
K14	14	J200-D25	J200-D24	J200-D23
K15	15	J200-E25	J200-E24	J200-E23
K16	16	J200-A22	J200-A21	J200-A20
K17	17	J200-B22	J200-B21	J200-B20
K18	18	J200-C22	J200-C21	J200-C20
K19	19	J200-D22	J200-D21	J200-D20
K20	20	J200-E22	J200-E21	J200-E20
K21	21	J200-A19	J200-A18	J200-A17
K22	22	J200-B19	J200-B18	J200-B17
K23	23	J200-C19	J200-C18	J200-C17
K24	24	J200-D19	J200-D18	J200-D17
K25	25	J200-E19	J200-E18	J200-E17
K26	26	J200-A16	J200-A15	J200-A14
K27	27	J200-B16	J200-B15	J200-B14
K28	28	J200-C16	J200-C15	J200-C14
K29	29	J200-D16	J200-D15	J200-D14
K30	30	J200-E16	J200-E15	J200-E14
K31	31	J200-A13	J200-A12	J200-A11
K32	32	J200-B13	J200-B12	J200-B11
K33	33	J200-C13	J200-C12	J200-C11
K34	34	J200-D13	J200-D12	J200-D11
K35	35	J200-E13	J200-E12	J200-E11
K36	36	J200-A10	J200-A9	J200-A8
K37	37	J200-B10	J200-B9	J200-B8
K38	38	J200-C10	J200-C9	J200-C8

Relay	Channel Number	Common	Normally Open	Normally Closed (Default)
K39	39	J200-D10	J200-D9	J200-D8
K40	40	J200-E10	J200-E9	J200-E8
K41	41	J200-B7	J200-C7	J200-D7
K42	42	J200-A6	J200-A5	J200-A4
K43	43	J200-B6	J200-B5	J200-B4
K44	44	J200-C6	J200-C5	J200-C4
K45	45	J200-D6	J200-D5	J200-D4
K46	46	J200-E6	J200-E5	J200-E4
K47	47	J200-A3	J200-A2	J200-A1
K48	48	J200-B3	J200-B2	J200-B1
K49	49	J200-C3	J200-C2	J200-C1
K50	50	J200-D3	J200-D2	J200-D1
K51	51	J200-E3	J200-E2	J200-E1

A common ground plane is provided for RF applications and is available at the following pins:

J200-A7
J200-E7
J200-A26
J200-E26

Table 2-2, 1260-117A Channel to Connector Pin Mapping

Relay	Channel Number	Common	Normally Open	Normally Closed (Default)
K0	00	J200-A32	J200-A31	J200-A30
K1	01	J200-B32	J200-B31	J200-B30
K5	02	J200-A29	J200-A28	J200-A27
K6	03	J200-B29	J200-B28	J200-B27
K11	04	J200-A25	J200-A24	J200-A23
K12	05	J200-B25	J200-B24	J200-B23
K16	06	J200-A22	J200-A21	J200-A20
K17	07	J200-B22	J200-B21	J200-B20
K21	08	J200-A19	J200-A18	J200-A17
K22	09	J200-B19	J200-B18	J200-B17
K26	10	J200-A16	J200-A15	J200-A14
K27	11	J200-B16	J200-B15	J200-B14
K31	12	J200-A13	J200-A12	J200-A11
K32	13	J200-B13	J200-B12	J200-B11
K36	14	J200-A10	J200-A9	J200-A8
K37	15	J200-B10	J200-B9	J200-B8
K42	16	J200-A6	J200-A5	J200-A4
K43	17	J200-B6	J200-B5	J200-B4
K47	18	J200-A3	J200-A2	J200-A1
K48	19	J200-B3	J200-B2	J200-B1

A common ground plane is provided for RF applications and is available at the following pins:

J200-A7
J200-A26

Mating Connectors

The following **1260-117** mating connector accessories are available:

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

The 160 Pin Connector Kit consists of a connector housing, aluminum backshell, and 160 crimp pins. After wire attachment, the pin is inserted into the housing and will snap into place, providing positive retention.

160 Pin Cable Assembly, 6 Ft., 24 AWG, P/N 407408-001

The 160 Pin Cable Assembly uses 24 AWG cable with crimp pins to mate with the 1260-117. The other cable end is unterminated. Refer to **Table 2-1** for channel-to-pin mapping information.

The suggested crimp hand tool is PN991020. The crimp pin insertion tool is P/N 990898. The corresponding pin removal tool is P/N 990899.

The following **1260-117A** mating connector accessories are available:

64 Pin DIN, IDC Connector P/N 602004

This connector is for use with flat ribbon cable. This allows an economical means of cable assembly. Not recommended for currents greater than 1 A AC/DC per pin.

64 Pin DIN Crimp Connector Body P/N 602159-064

64 Pin DIN Crimp Pin P/N 602159-900

The crimp connector and pins allow more flexibility and better performance, 2 Amps, rather than the 1 Amp for the IDC connector. The crimp hand tool is P/N 990897. The insertion tool is P/N 990898. The extraction tool is P/N 990899.

This page was left intentionally blank.

Chapter 3

MODULE OPERATION

Command Set

The 1260-117/-117A card uses the existing 1260 and 1256 Series switch card command set. All commands supported by other relay modules (such as CLOSE, OPEN, SCAN, EXCLUDE, INCLUDE) are supported.

The OPEN, CLOSE, EXCL, INCL, and SCAN commands all use relay descriptors to specify a single relay or a range of relays to operate.

The following operational descriptions refer mostly to the 1260-117 for clarity and apply in the same manner to the 1260-117A except where indicated otherwise.

Operating In Message-Based Mode

Channel Descriptors For The 1260-117

The standard 1260-01T commands are used to operate the 1260-117 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 1260-117 module. This is a number is in the range from 1 through 12, inclusive.
- <channel> is the 1260-117 channel to operate. This is a number in the range from 0 through 51, inclusive.

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 1260-117:

`OPEN (@8(0))`	Open channel 0 on the 1260-117 that has module address 8.
`CLOSE (@8(0,7))`	Close channels 0 and 7 on the 1260-117 that has module address 8.
`CLOSE (@2(7:12))`	Close channels 7 through 12 inclusive on the 1260-117 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 1260-117 is:

```
1260-117 52-CHANNEL SPDT 2A MUX
1260-117A 20-CHANNEL SPDT 2A MUX
```

So, for a 1260-117 whose <module address> is set to 8, the reply to this query would be:

```
8 : 1260-117 52-CHANNEL SPDT 2A MUX
8 : 1260-117A 20-CHANNEL SPDT 2A MUX
```

Operating The 1260-117 in Register-Based Mode

In register-based mode, the 1260-117 is operated by directly writing and reading control registers on the 1260-117 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 19, 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 1260-117 module. This is a value in the range from 1 and 12 inclusive.
3. The 1260-117 control register to be written to or read from. Each control register on the 1260-117 has a unique address.

The base A24 address for the 1260-117 module may be calculated by:

(A24 Offset of the 1260-01T) + (1024 x Module Address of 1260-117).

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

A 1260-117 with a module address of 7 would have the base A24 address computed as follows:

Base A24 Address of 1260-117 = $204000_{16} + (400_{16} \times 7_{10})$
= $205C00_{16}$

The control registers for Adapt-a-Switch plug-ins and conventional 1260-Series modules are always on odd-numbered A24 addresses. The control registers for the 1260-117 reside at sequential odd-numbered A24 addresses for the module:

(Base A24 Address of 1260-117) + 1 = Control Register 0

(Base A24 Address of 1260-117) + 3 = Control Register 1

(Base A24 Address of 1260-117) + 5 = Control Register 2

..., and so on.

So, for our example, the first control register is located at:

205C01 Control Register 0, controls channels 0 through 7

The second control register is located at:

205C03 Control Register 1, controls channels 8 through 15

Tables 3-1 and **3-2** show the channel assignments for each control register in the 1260-117 and 1260-117A.

Table 3-1, 1260-117 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
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	unused	unused	unused	unused	51	50	49	48

Table 3-2, 1260-117A 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	3	2	unused	unused	unused	1	0
1	unused	unused	unused	5	4	unused	unused	unused
2	unused	9	8	unused	unused	unused	7	6
3	12	unused	unused	unused	11	10	unused	unused
4	unused	unused	15	14	unused	unused	unused	13
5	18	unused	unused	unused	17	16	unused	unused
6	unused	unused	unused	unused	unused	unused	unused	19

For the 1260-117 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 0, channels 0, 2, and 7 will close, while channels 1, 3, 4, 5, and 6 will open.

Unlike the 1260-117, not all bits in the control registers are used. Thus, for the 1260-117A if you write the value 1000 0101 binary = 133 decimal = 85 hexadecimal to Control Register 0, only channel 0 will close, while channels 1, 2, and 3 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 an unused bit in the control register is set to 1 it will give a 0 readback.

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.

Write the modified value back to the control register.

For example, to close channel 13:

5. Read Control Register 1 (this register controls channels 8 through 15, with channel 8 represented by the LSB)
6. Invert the bits in the value read in step 1
7. AND with 1101 1111 binary (the zero is in the position corresponding to channel 13)
8. OR with 0010 0000 binary
9. 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 1260-117 module.

1260-117 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 1260-117 with module address 7 */
#define MOD_ADDR_120    7


void example_operate_1260_117(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_117 << 10) + 1;
```

```
      creg1_addr = creg0_addr + 2;
      creg2_addr = creg1_addr + 2;

      /* close relays 14 without affecting the state of */
      /* relays 9, 10, 11, 12, 13, 15, and 16 */
      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 relay except 14 unchanged */
      creg_val &= ~ (0x20);

      /* OR in the bit to close relay 14 */
      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 relay 17 without affecting channels 18 through 24 */
      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 relay except 17 unchanged */
      /* leave bit 0 clear to open relay 17 */
      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 */
      }
}
```