RACAL INSTRUMENTS
1260-115
MULTIPLEXER PLUG-IN

PUBLICATION NO. 980824-115

EADS North America Defense Test and Services, Inc.
4 Goodyear, Irvine, CA 92618
Tel: (800) 722-2528, (949) 859-8999; Fax: (949) 859-7139

info@eads-nadefense.com
sales@eads-nadefense.com
helpdesk@eads-nadefense.com
http://www.eads-nadefense.com

PUBLICATION DATE: February 19, 2004

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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.

Racal Instruments

EC Declaration of Conformity

We

Racal Instruments Inc.
4 Goodyear Street
Irvine, CA 92718

declare under sole responsibility that the

1260-115A, 96CH Relay Driver Module P/N 407924-001
1260-115B, 48CH Relay Driver Module, P/N 407924-002

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 a Racal Instruments 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, February 25, 2004 Karen L Evensen
Engineering Director

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Chapter 1

SPECIFICATIONS

Introduction - Standard Open-Collector Version

The 1260-115A is a plug-in switch module developed for the 1260-100 Adapt-a-Switch Carrier. It switches 96 open-collector channels at 200 mA per channel. The 1260-115A 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.

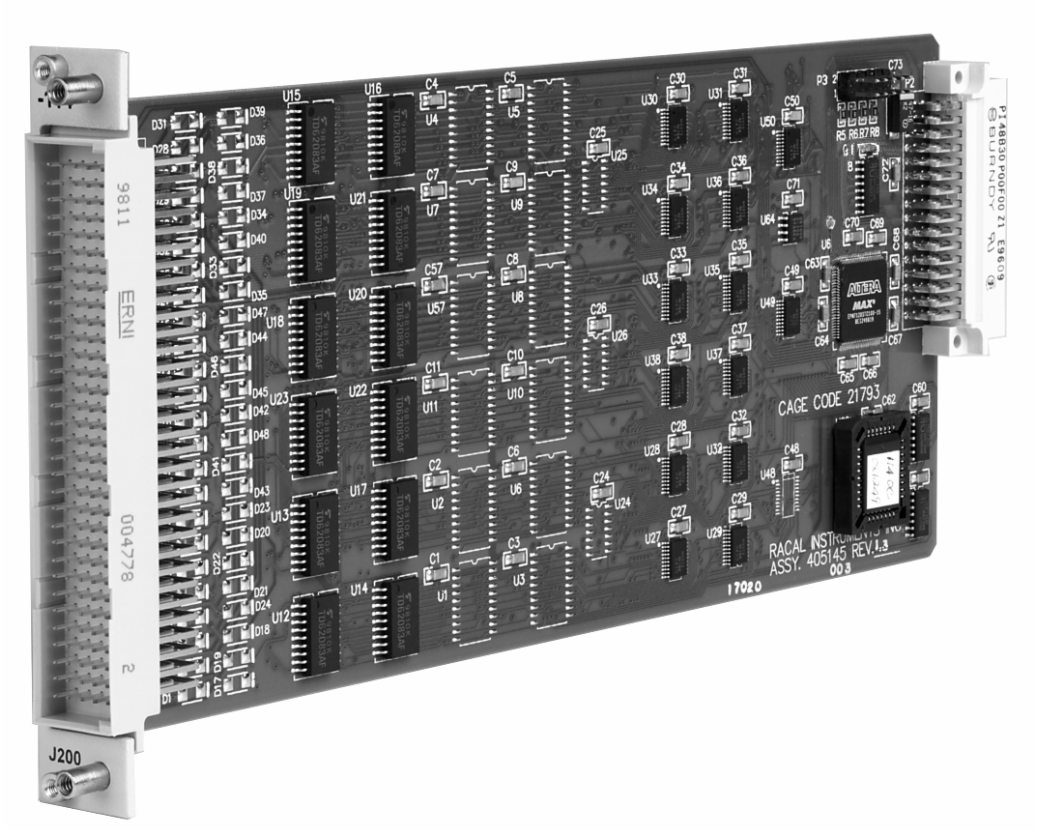

Figure 1-1, The 1260-115A

Specifications - Standard Open Collector

Max. Chan. Input Voltage	32 VDC
Chan. Output Current	200 mA maximum
High Output Voltage	5 ≤ Voh ≤ 32 VDC
Max. Low Output Voltage	≤ 1.5 VDC @ 200 mA
Available I/O Channels	96 open-collector channels
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	85% + 5% non-condensing at < 30°C
Altitude	
Operating	10,000 feet
Non-operating	15,000 feet
Power Requirements	
+5 VDC	0.5 A maximum
Weight	6 oz. (0.21 kg.)
Mean Time Between Failures (MTBF)	>100,000 hours (MIL-HDBK-217E)
Mean Time to Repair	< 5 minutes (MTTR)

Power Dissipation - Standard Open-Collector

The cooling of the Adapt-a-Switch carrier is dependent upon the chassis into which it is installed. The carrier can nominally dissipate approximately 100 W. Even with all channels driven to maximum outputs, up to six 1260-115A plug-ins may be used together in a 1260-100 without exceeding the maximum allowable power dissipation of the carrier.

If the 1260-115A will be used in conjunction with other cards, the 1260-115A dissipation should be computed and summed with the total worst-case dissipation of the remaining modules.

For example, a 1260-115A module would dissipate the following energy:

Quiescent power dissipation = 0.75W maximum

Channel dissipation =
[(Vol) * current * 96(# channels energized)] +
[(current)^2 * (path resistance) * 96(# channels energized)]

Total Power Dissipation = Quiescent + Channel

Assuming all 96 channels are sinking a maximum current of 200 mA and a path resistance of 0.5 Ω:

Total power dissipation =
[(1.5) * 0.200 A * 96] + [(0.200 A)^2 * (0.5 Ω) * 96]
+ (0.75 W) = 31.5 W at 55°C

This exceeds the acceptable power dissipation for an individual plug-in module. If five additional modules are likewise loaded, then the overall carrier dissipation is approximately 188 W, which is above the typical cooling capabilities of the carrier and most chassises in a two slot configuration. Therefore using a fully loaded Adapt-a-Switch carrier with these cards operating at the maximum extreme is not permissible. In practice, however, rarely are more than 25% of the module's channels energized simultaneously, and rarely is full rated current run through every path. In addition, temperatures are typically not run at the rated maximum. Using the 25% rule, the power dissipated by each plug-in should be no more than 8 W. If all six slots are used simultaneously, this would amount to a total dissipation of 48Watts.

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.

Introduction - High Current/Voltage Open-Collector Version

The 1260-115B is a plug-in switch module developed for the 1260-100 Adapt-a-Switch Carrier. It switches 48 open-collector channels at 50V and 1.5 A per channel. The 1260-115B 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.

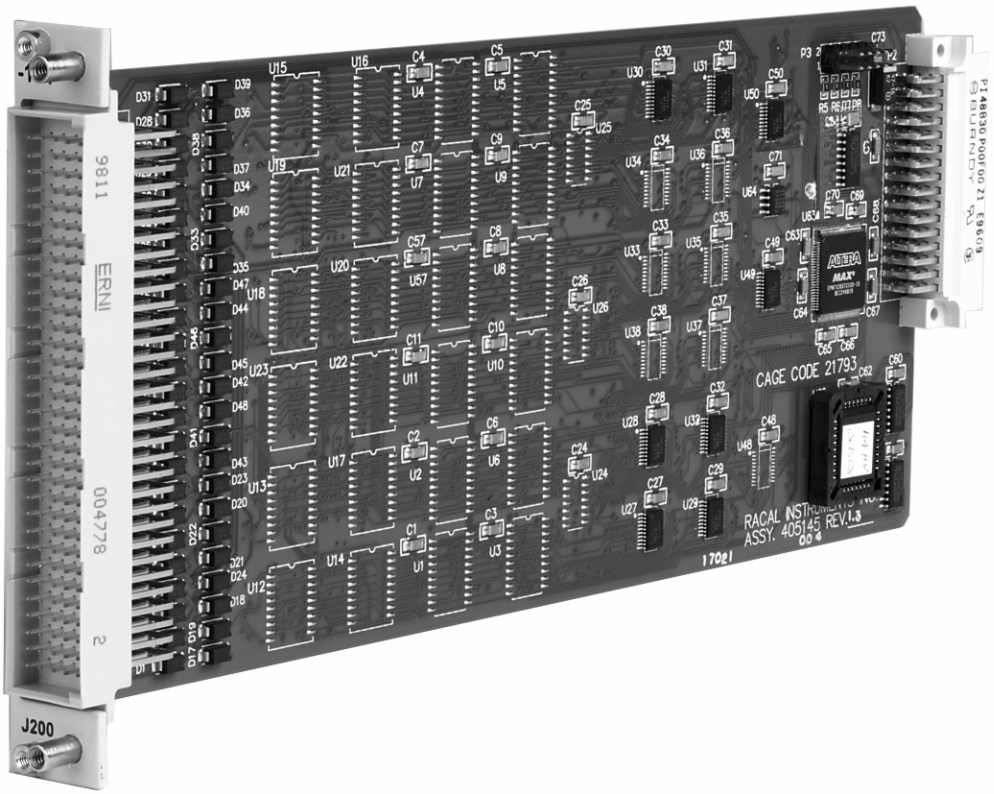

Figure 1-2, The 1260-115B

Specifications - High Current/Voltage Open-Collector

Max. Chan. Input Voltage	50 VDC
Chan. Output Current	1.5 A maximum
High Output Voltage	2 ≤ Voh ≤ 50 VDC
Max. Low Output Voltage	≤ 0.5 VDC @ 1.5 A
Available I/O Channels	48 open-collector channels
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	85% + 5% non-condensing at < 30°C
Altitude	
Operating	10,000 feet
Non-operating	15,000 feet
Power Requirements	
+5 VDC	0.5 A maximum
Weight	6 oz. (0.21 kg.)
Mean Time Between Failures (MTBF)	>100,000 hours (MIL-HDBK-217E)
Mean Time to Repair	< 5 minutes (MTTR)

Power Dissipation - High Current/Voltage Open-Collector

The cooling of the Adapt-a-Switch carrier is dependent upon the chassis into which it is installed. The carrier can nominally dissipate approximately 100 W. Even with all channels driven to maximum outputs, up to six 1260-115B plug-ins may be used together in a 1260-100 without exceeding the maximum allowable power dissipation of the carrier.

If the 1260-115B will be used in conjunction with other cards, the 1260-115B dissipation should be computed and summed with the total worst-case dissipation of the remaining modules.

For example, a 1260-115B module would dissipate the following energy:

Quiescent power dissipation = 0.75W maximum

Channel dissipation =
[(Rds) * (current)^2 * 48(# channels energized)] +
[(current)^2 * (path resistance) * 48(# channels energized)]

Total Power Dissipation = Quiescent + Channel

Assuming all 48 channels are sinking a maximum current of 1.5 A and a path resistance of 0.030 Ω:

Total power dissipation =
[(1.5 A)^2 * (0.060 Ω) * 48]+ [(1.5 A)^2 * (0.070 Ω) * 48]
+ (0.75 W) = 15 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 89 W, which is well within the cooling available in most commercial VXIbus chassis. In practice, rarely are more than 25% of the module's channels energized simultaneously, and rarely is full rated current run through every path. Using the 25% rule, the power dissipated by each plug-in should be no more than 3.75 W. If all six slots are used simultaneously, this would amount to a total dissipation of about 23Watts.

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 1260-115 MTBF is 783,668 hours, calculated in accordance with MIL-HDBK-217E.

Ordering Information

Listed below are part numbers for both the 1260-115A/B switch module and available mating connector accessories. Each 1260-115 uses a single mating connector.

ITEM	DESCRIPTION	PART #
1260-115A Switch Module	Switch Module, 96-Channel Standard Open-Collector Output Consists of: P/N 405145-003 PCB Assy P/N 980824-115 Manual	407924-001
1260-115B Switch Module	Switch Module, 48-Channel High Current/Voltage Open-Collector Output Consists of: P/N 405145-004 PCB Assy P/N 980824-115 Manual	407924-002
160-pin Mating Connector	160 Pin Conn. Kit with pins	407664
Cable Assy. 6ft, Sleeved	160 Pin Cable Assy, 6 Ft, 24 AWG	407408-001
Connector Bracket	Bracket, Strain Relief	456673
Additional Manual		980824-115

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Chapter 2

INSTALLATION INSTRUCTIONS

Unpacking and Inspection

1. Remove the 1260-115 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 1260-115 module option and the 1260-115 Users Manual. Notify EADS North America Defense Test and Services, Inc. if the module appears damaged in any way. Do not attempt to install a damaged module into a VXI chassis.

3. The 1260-115 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.

Reshipment Instructions

1. Use the original packing when returning the switching module to EADS North America Defense Test and Services, Inc. for calibration or 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 1260-115A/B 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 1260-115A is a 96-channel standard relay driver. The 1260-115B is a 48 channel high-current relay driver.

Front Panel Connectors

The 1260-115A/B has one front-panel connector, labeled J200. It is a 160-pin, modified DIN style, with 0.025" square posts as pins. It has one pin for each input and one for each output. See **Figure 2-1** for 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**.

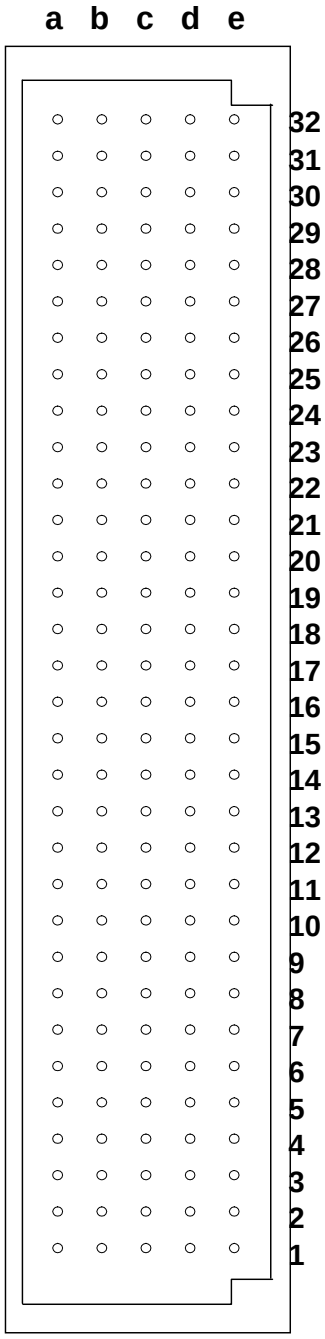

Figure 2-1, Front-Panel Connector Pin Numbering

Table 2-1, 1260-115A/B Front-Panel Connections

	Channel Pin Mapping				
	Row A	**Row B**	**Row C**	**Row D**	**Row E**
Pin #	**Port (Channel #)**	**Port (Channel #)**	**Port (Channel #)**		
1	Port A (100)	Port C (300)	Port E (500)	Flyback A	Flyback B
2	Port A (101)	Port C (301)	Port E (501)	GND	GND
3	Port A (102)	Port C (302)	Port E (502)	GND	GND
4	Port A (103)	Port C (303)	Port E (503)	GND	GND
5	Port A (104)	Port C (304)	Port E (504)	Flyback C	Flyback D
6	Port A (105)	Port C (305)	Port E (505)	GND	GND
7	Port A (106)	Port C (306)	Port E (506)	GND	GND
8	Port A (107)	Port C (307)	Port E (507)	GND	GND
9	Port B (200)	Port D (400)	Port F (600)	Flyback E	Flyback F
10	Port B (201)	Port D (401)	Port F (601)	GND	GND
11	Port B (202)	Port D (402)	Port F (602)	GND	GND
12	Port B (203)	Port D (403)	Port F (603)	GND	GND
13	Port B (204)	Port D (404)	Port F (604)	Flyback G‡	Flyback H‡
14	Port B (205)	Port D (405)	Port F (603)	GND	GND
15	Port B (206)	Port D (406)	Port F (606)	GND	GND
16	Port B (207)	Port D (407)	Port F (607)	GND	GND
17	Port G (700)†	Port I (900)†	Port K (1100)†	Flyback I‡	Flyback J‡
18	Port G (701)†	Port I (901)†	Port K (1101)†	GND	GND
19	Port G (702)†	Port I (902)†	Port K (1102)†	GND	GND
20	Port G (703)†	Port I (903)†	Port K (1103)†	GND	GND
21	Port G (704)†	Port I (904)†	Port K (1104)†	Flyback K‡	Flyback L‡
22	Port G (705)†	Port I (905)†	Port K (1105)†	GND	GND
23	Port G (706)†	Port I (906)†	Port K (1106)†	GND	GND
24	Port G (707)†	Port I (907)†	Port K (1107)†	GND	GND
25	Port H (800)†	Port J (1000)†	Port L (1200)†	N/C	N/C
26	Port H (801)†	Port J (1001)†	Port L (1201)†	GND	GND
27	Port H (802)†	Port J (1002)†	Port L (1202)†	GND	GND
28	Port H (803)†	Port J (1003)†	Port L (1203)†	GND	GND
29	Port H (804)†	Port J (1004)†	Port L (1204)†	GND	GND
30	Port H (805)†	Port J (1005)†	Port L (1205)†	GND	GND
31	Port H (806)†	Port J (1006)†	Port L (1206)†	GND	GND
32	Port H (807)†	Port J (1007)†	Port L (1207)†	GND	GND

† For the 1260-115B version these pins are unused and tied to ground.

‡ For the 1260-115B version these pins are unused and are not connected.

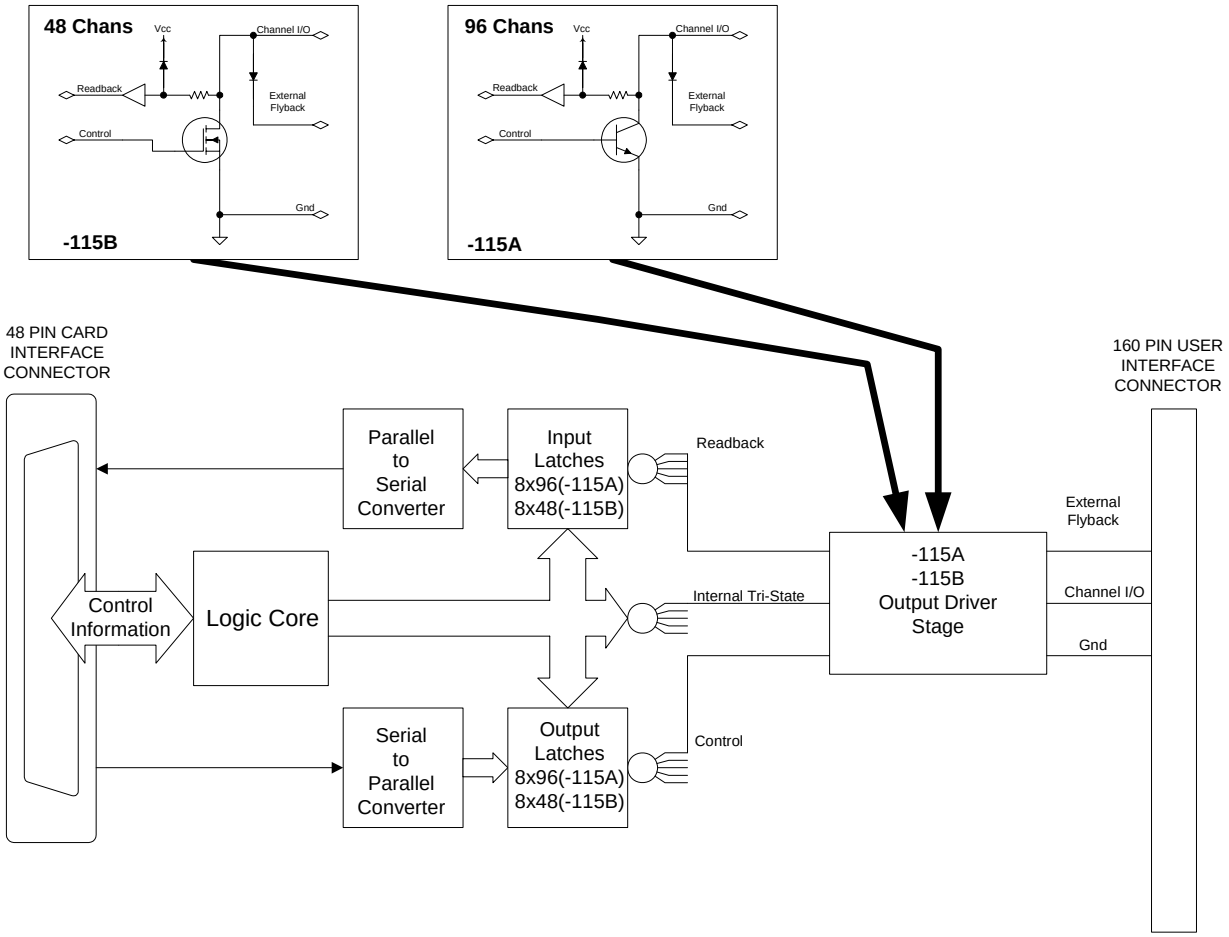

Figure 2-2, Block Diagram

Mating Connectors

Mating connector accessories are available:

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

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

The 160-Pin Connector Kit consists of a connector housing, and 170 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 P/N 990898. The corresponding pin removal tool is P/N 990899.

The 160-Pin Cable Assembly uses 24 AWG cable with crimp pins to mate with the 1260-115A/B. The other cable end is un-terminated. Refer to **Table 2-1** for channel-to-pin mapping information.

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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 1260-115A/B is determined by the carrier slot into which the 1260-115A/B is inserted, and by the position of the logical address DIP switch on the carrier side panel. The logical address switch has two settings:

- 1-6: When the switch is set to this position, the module addresses of the plug-ins in the 1260-100 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:

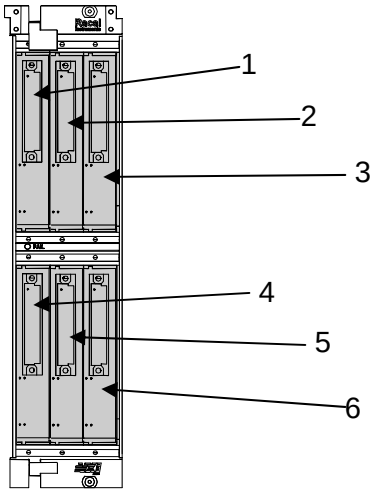

Figure 3-1, Front View - Module Addresses for 1 through 6

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

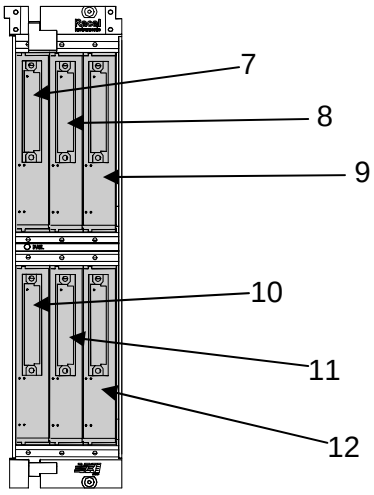

Figure 3-2, Front View - Module Addresses for 7 through 12

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 1260-115A/B 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 1260-115A/B module.

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

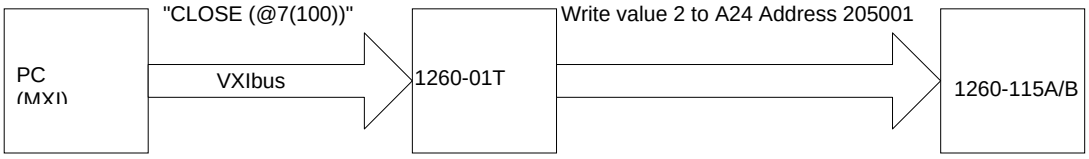

Figure 3-3, Message-Based Mode of Operation

In the *register-based* mode, the user writes directly to the control registers on the 1260-115A/B module. The 1260-01T command module does not monitor these operations, and does not keep track of the relay states on the 1260-115A/B module in this mode.

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

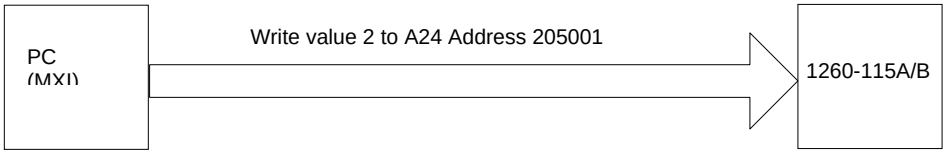

Figure 3-4, Register-Based Mode of Operation

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 1260-115A/B

The standard 1260-01T commands are used to operate the 1260-115A/B 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 1260-115A/B module. This is a number is in the range from 1 through 12, inclusive.
- <channel> is the 1260-115A/B channel to operate. They are numbers from 100-107, 200-207, 300-307, etc. See **Figure 2-1** and **Table 2-1**.

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

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

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

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

The following examples illustrate the use of the channel descriptors for the 1260-115A/B:

`OPEN (@8(100))`	Open channel 100 on the 1260-115A/B that has module address 8.
`CLOSE (@8(100,300))`	Close channels 100 and 300 on the 1260-115A/B that has module address 8.
`CLOSE (@2(100:103))`	Close channels 100 through 103

inclusive on the 1260-115A/B 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 1260-115A is:

```
1260-115A 96 CHANNEL RELAY DRIVER
```

The <module-specific identification string> for the 1260-115B is:

```
1260-115B 48 CHANNEL RELAY DRIVER
```

So, for a 1260-115A whose <module address> is set to 8, the reply to this query would be:

```
8: 1260-115A 96 CHANNEL RELAY DRIVER
```

Operating the 1260-115A/B in Register-Based Mode

In register-based mode, the 1260-115A/B is operated by directly writing and reading control registers on the 1260-115A/B 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 1260-115A/B module. This is a value in the range from 1 and 12 inclusive.

3. The 1260-115A/B control registers to be written to or read from. Each control register on the 1260-115A/B has a unique address.

The base A24 address for the 1260-115A/B module may be

calculated by:

(A24 Offset of the 1260-01T) + (1024 x Module Address of 1260-115A/B).

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

A 1260-115A/B with a module address of 7 would have the base A24 address computed as follows:

Base A24 Address of 1260-115A/B = 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 1260-115A/B reside at the first three odd-numbered A24 addresses for the module:

(Base A24 Address of 1260-115A/B) + 1 = Control Register 0

(Base A24 Address of 1260-115A/B) + 3 = Control Register 1

(Base A24 Address of 1260-115A/B) + 5 = Control Register 2

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

205C01 Control Register 0

205C03 Control Register 1

205C05 Control Register 2

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

Table 3-1, Register Offset Addresses of the 1260-115A/B Module

Register Name	Register Offsets to Add to Base Module Address	
	Write Location (hexadecimal)	Read Location (hexadecimal)
Port A (Port 0)	0x01	0x01
Port B (Port 1)	0x03	0x03
Port C (Port 2)	0x05	0x05
Port D (Port 3)	0x07	0x07
Port E (Port 4)	0x09	0x09
Port F (Port 5)	0x0B	0x0B
Port G (Port 6)	0x0D	0x0D
Port H (Port 7)	0x0F	0x0F
Port I (Port 8)	0x11	0x11
Port J (Port 9)	0x13	0x13
Port K (Port 10)	0x15	0x15
Port L (Port 11)	0x17	0x17
ID	Read Only	0x201
EPROM Descriptor	Read Only	0x203

Table 3-2, ID Register Functionality of the 1260-115A/B

Register Table		ID Register
Module Version	Bit	Functionality Description
-115A and -115B	0	Always Reads 0x00 (Read Only)
	1	
	2	
	3	
	4	
	5	
	6	
	7	

Table 3-3, Ports A-F Register Functionality of the 1260-115A/B Module

Register Table		Ports A-F
Module Version	**Bit**	**Functionality Description**
-115A and -115B	0	Each port is an 8-bit register where the lowest order bit corresponds to lowest order connector pin of the port group. A '1' written to any bit enables the appropriate open-collector output transistor while a '0' disables the appropriate open-collector output transistor. If a port is read, the data will appear inverted from what was written to the register, assuming the external power supply pulls up the collector output of the transistor through the external load.
	1	
	2	
	3	
	4	
	5	
	6	
	7	

Table 3-4, Ports G-L Register Functionality of the 1260-115A/B Module

Register Table		Ports G-L
Module Version	**Bit**	**Functionality Description**
-115A	0	Each port is an 8-bit register where the lowest order bit corresponds to lowest order connector pin of the port group. A '1' written to any bit enables the appropriate open-collector output transistor while a '0' disables the appropriate open-collector output transistor. If a port is read, the data will appear inverted from what was written to the register, assuming the external power supply pulls up the collector output of the transistor through the external load.
	1	
	2	
	3	
	4	
	5	
	6	
	7	
-115B	0	Not Used
	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used

Table 3-5, EPROM Descriptor Functionality

Register Table		EPROM Descriptor Register
Module Version	**Bit**	**Functionality Description**
-115A and -115B	0	This register each time read advances a memory pointer to the next memory location in an EPROM. To reset this pointer to the beginning, simply read the ID register and the memory pointer resets to zero. The descriptor register contains a long string of data, typically used by the Adapt-a-Switch carrier for configuration purposes. Additionally, this data has the card identification string for the specific type of card (i.e. 1260-115A or 1260-115B). These identification strings are located at EPROM memory locations 0x23-0x34.
	1	
	2	
	3	
	4	
	5	
	6	
	7	

Setting a control bit to 1 closes the corresponding channel, and clearing the bit to zero opens the corresponding channel.

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.

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 1260-115A/B module.

1260-115 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 1260-115 with module address 7, port 1,
and write data of 0xAA */
#define MOD_ADDR_115  7
#define PORT_NUMBER   1
#define DATA_ITEM     0xAA


void example_operate_1260_115(void)
{
      ViUInt8 creg_val;
      ViBusAddress portA_addr, offset;
      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 */
      portA_addr = (MOD_ADDR_115 << 10) + 1;
      offset = portA_addr + (PORT_NUMBER << 1);

     error = viOut8 (vi, VI_A24_SPACE, offset, DATA_ITEM);

    if (error < 0)

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

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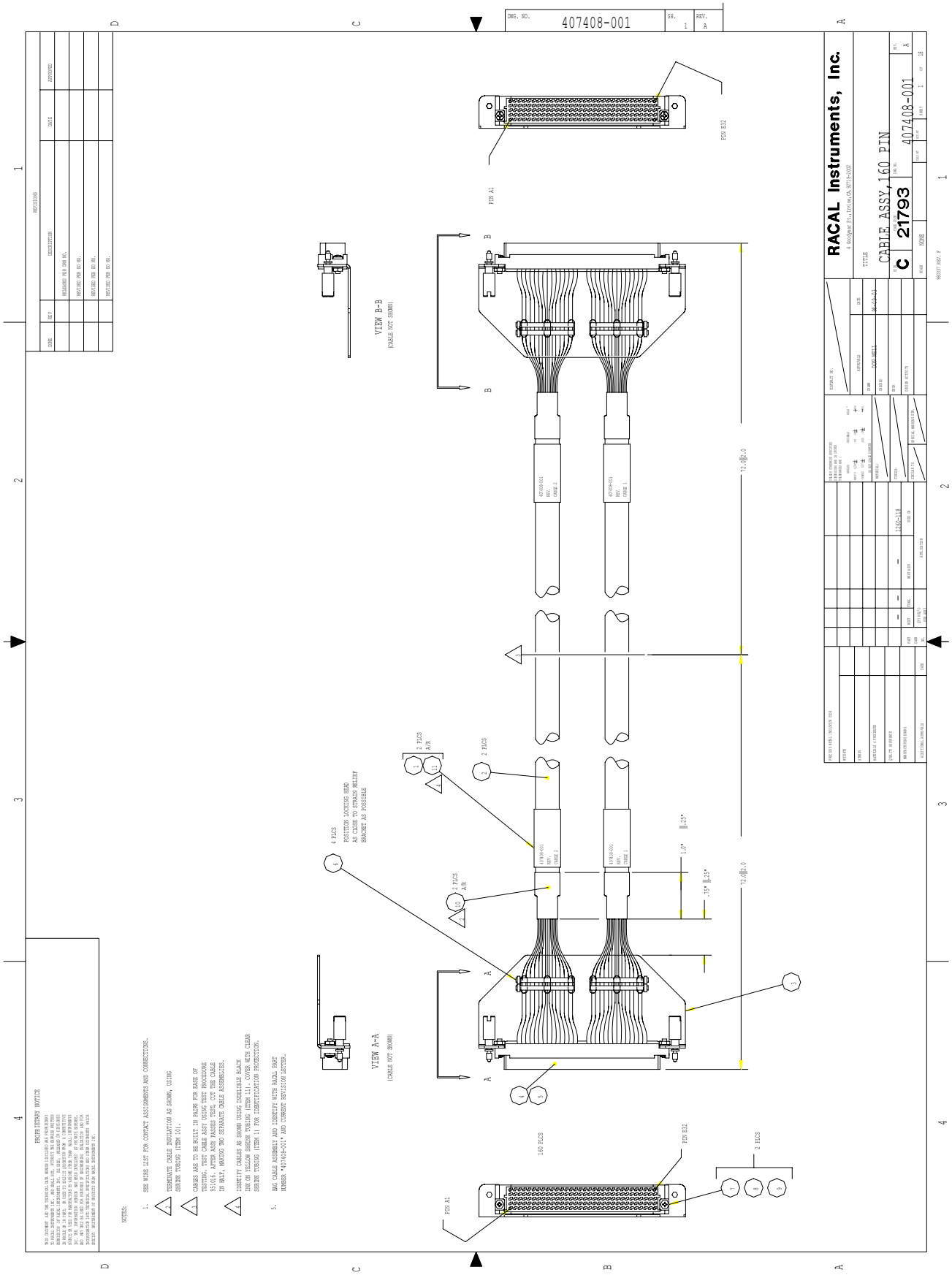
Chapter 4
OPTIONAL ASSEMBLIES

RACAL INSTRUMENTS, INC.

Assembly 407664 Revision A
Connector kit, 160 Pin, Crimp

#	Component	Description	U/M	Qty Reqd.	REF
1	602258-116	CON-CAB-RCP160C,100S	-E EA	1.000	
2	602258-900	TRMCRP-SNP-U-F26-20G	-E EA	170.000	


DWG. NO. 407408-001
SH. 1
REV. A
RACAL Instruments, Inc.
TITLE CABLE ASSY,160 PIN
C 21793 407408-001
VIEW B-B (CABLE NOT SHOWN)
VIEW A-A (CABLE NOT SHOWN)
NOTES:
1. SEE WIRE LIST FOR CONTACT ASSIGNMENTS AND CONNECTORS.
2. TERMINATE CABLE INSULATION AS SHOWN, USING SHRINK TUBING ITEM 101.
3. CABLES ARE TO BE BUILT IN PAIRS FOR EASE OF TESTING. TEST CABLE ASSY USING TEST PROCEDURE 95516. AFTER ASSY PASSES TEST, CUT THE CABLE IN HALF, MAKING TWO SEPARATE CABLE ASSEMBLIES.
4. IDENTIFY CABLES AS SHOWN USING INDELIBLE BLACK INK OR YELLOW SHRINK TUBING ITEM 111. COVER WITH CLEAR SHRINK TUBING ITEM 11 FOR IDENTIFICATION PROTECTION.
5. BAG CABLE ASSEMBLY AND IDENTIFY WITH RACAL PART NUMBER 407408-001 AND CURRENT REVISION LETTER.
160 PLCS
2 PLCS
4 PLCS
POSITION LOCKING HEAD AS CLOSE TO STRAIN RELIEF BRACKET AS POSSIBLE
PIN A1
PIN B12

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Chapter 5
PRODUCT SUPPORT

Product Support

EADS North America Defense Test and Services, Inc. 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 closest to your facility, refer to the website for the most complete information http://www.eads-nadefense.com.

Warranty

Use the original packing material when returning the 1260-115A/B to EADS North America Defense Test and Services, Inc. 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 EADS North America Defense Test and Services, Inc. Customer Service at 1-800-722-3262 for information.

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 EADS North America Defense Test and Service, Inc. Repair Facility.

Model_____ Serial No._____ Date_____

Company Name_____ Purchase Order #_____

Billing Address_____

City

State/Province Zip/Postal Code Country

Shipping Address_____

City

State/Province Zip/Postal Code Country

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

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

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

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

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

Call before shipping
Note: We do not accept "collect" shipments.

Ship instruments to nearest support office.