RACAL INSTRUMENTS
1260-67M
MODULAR MICROWAVE
SWITCH MODULE

PUBLICATION NO. 980673-063

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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.

Racal Instruments

EC Declaration of Conformity

We

Racal Instruments Inc.
4 Goodyear Street
Irvine, CA 92718

declare under sole responsibility that the

1260-67M Modular Microwave Switch Module, P/N 407879

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 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, June 22, 2004 C. Fang for Karen Evensen
Engineering Director

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Chapter 1
MODULE SPECIFICATION

Overview

The 1260-67M consists of a universal 1-slot VXI microwave relay carrier and up to six microwave switch plug-ins. All microwave switches are front pluggable to facilitate ease of replacement and repair. The 1260-67M also includes 32 SPST relays configured as two 1 X 16 banks intended to drive external RF relays, although other applications are possible.

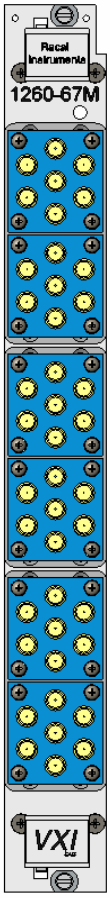

Figure 1-1, 1260-67M

Standard RF Specifications

Quantity of RF Switches
6 plug-in locations, up to 2 - 1 X 2 per plug-in (configuration dependent)

User Connectors: SMA, K-Type – Caution - Mating Connector engagement should not exceed 9-in. lbs. torque maximum.

Recommended Torque Wrench: Wiltron Model 01-201, 8in. lbs.

Frequency Range	DC to 40GHz (switch dependent)
RF Impedance	50Ω, nominal
Insertion Loss, dB Max	0.2 DC –3GHz 0.3 3GHz-8GHz 0.4 8GHz – 12GHz 0.5 12GHz-18GHz 18GHz-40GHz (switch dependent)
Isolation, dB Min	80 DC-3GHz 70 3GHz-8GHz 60 8GHz – 18GHz 18GHz-40GHz (switch dependent)
VSWR, Max	1.2:1 DC-3GHz 1.3:1 3GHz-8GHz 1.4:1 8GHz-12GHz 1.5:1 12GHz-18GHz 18GHz-40GHz (switch dependent)
Switching Sequence	Break-before-make
Minimum Option 01T	405108 Rev. E, or later Hardware Revision
Minimum Option 01T	231559-001,Rev. H or later Firmware Revision

1x16 Switch Arrays Specifications

User Connector	50-Pin Connector. Body Part #601855-050, Solder Type Pins #601857.
Number of Banks	2
Number of Switches per Bank	16, 1-wire
Relay Driver Configurations (User Configurable)	Source Driver, External Supply Source Driver, VXI +5*V* Supply Source Driver, VXI +12V Supply Source Driver, VXI +24V Supply Sink Driver, External Supply Sink Driver, VXI +5V Supply Sink Driver, VXI +12V Supply Sink Driver, VXI +24V Supply

(External flyback-suppression diodes are required when switching inductive loads.)

Maximum Total VXI Current Available to Drive External Loads

+24V	1A (May be further limited by mainframe capability).
+12V	1A (May be further limited by mainframe capability)
+5V	6A (May be further limited by mainframe capability)

Maximum Current per Bank	4A (Internal or External Supply)
Maximum Current per Switch	.5Amp
Maximum Switchable Voltage	30V, DC Only
Maximum Switchable Power Per Channel	30W, 62.5 VA (Resistive Load)

Path Resistance:

Worst Case	<1.8Ω (Initial)
End of Life	<3.5Ω

Operating Mode	Normally Open

General

Power Requirements (Ipm)		
	+5V	0.6A (1.6A with Option 01T installed + 0.03A per energized relay [1 X 16 bank] if any)
	+12V	320mA per RF relay (energized) plus current drawn by external loads on 1x16 relay banks.
	+24V	Includes only current drawn by external loads from 1 X 16 bank (if any)
Cooling Requirements		
Airflow		1.0 L/S at 0.05 mm H_2O 2.0 L/S at 0.1m H_2O w/Option 01T
Weight		5.0lbs (2.27Kg) 5.25lbs (2.38Kg) with Option 01T

Ordering Information

	Spares Ordering Information	
Model/Option	**Description**	**Part Number**
1260-67M	Carrier Assembly	407879
VXI plug&play software	Installation Disk (Rev. Y or later)	921534
Labview Driver	Installation Disk (Rev. P or later)	921398-061
Option 01T	Message/Register Based Switch Controller (spare)	407531-001
Option 01T (installed)	Message/Register Based Switch Controller (installed)	Opt-405108-001
1260-67M	User Manual (included in Ship Kit)	980673-063
1260-67M Plug-in	2X2 @ 18GHz, Non Latching	407882-101
1260-67M Plug-in	2-1X2 @ 18GHz, Non Latching	407882-302
1260-67M Plug-in	1-1X4 @ 18GHz, Non Latching	407882-104
1260-67M Plug-in	1-1X6 @ 18GHz, Non Latching	407882-106
1260-67M Plug-in	2X2 @ 26.5GHz, Non Latching	407882-201
1260-67M Plug-in	2-1X2 @ 26.5GHz, Non Latching	407882-402
1260-67M Plug-in	1-1X4 @ 26.5GHz, Non Latching	407882-204
1260-67M Plug-in	1-1X6 @ 26.5GHz, Non Latching	407882-206
1260-67M Plug-in	2-1x16 Channel Driver	407881-032
1260-67M Plug-in	Blank Plate	457093

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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.
2. Remove the instrument from its carton, preserving the factory packaging as much as possible.
3. Inspect the switching module for any defect or damage. Notify the carrier immediately if any damage is apparent.
4. Have a qualified person check the instrument for safety before use.

Reshipment Instructions

1. Use the original packing if it is necessary to return the switching module to Eads North America Defense Test and Service, 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 is unavailable, wrap the switching module in plastic sheeting and use plastic spray foam to surround and protect the instrument.
3. Reship in either the original or a new, sturdy shipping carton.

Option 01T Installation

Installation of the Option 01T into the 1260-67M is described in the Installation section of the 1260-Series VXI Switching Cards Manual. Note that lockout keying for the double-wide 1260-67M module differs from that described in the 1260 manual section.

Lockout Keys

Lockout keying is not available for the 1260-67M. The system integrator must ensure that the module installed to the left and right of the 1260-67M has no conflict with the Local Bus implementation.

Module Installation

Installation of the 1260-67M Switching Module into a VXI mainframe, including the setting of DIP switches, is described in the Installation section of the 1260-Series VXI Switching Cards Manual. The ID byte DIP switches should be set as follows:

1260-67M 5=OFF 6=OFF (factory setting)

Relay Bank Configuration

If either of the two banks of DC relays are to be used, various internal jumpers must be installed. Examples of four possible configurations are shown in **Figures 4-3 through 4-6**. The card is shipped from the factory without any jumpers installed.

To access the jumpers, remove the right side cover from the module. The jumpers are located on the large PCB Assembly. There are two banks of relays. Each bank is configured independently, and the two configurations do not have to match. The banks are designated Bank A and Bank B.

The first consideration when configuring the relay banks is whether the bank is to act as a source driver or a sink driver. (A sink driver connects its output to ground to energize a load; a source connects its output to B+ to energize a load.) Eight push on jumpers are to be installed as shown below:

Bank A Source Driver:	W5.
Bank A Sink Driver:	W6.
Bank B Source Driver:	W11.
Bank B Sink Driver:	W12.

The next consideration is the source of power for the external loads on Bank A. If an external supply is to be used, the jumpers at locations W3 and W4 are to be removed. If the VXI *+5V* supply is to be used, eight jumpers are to be installed at location W3. (1-2, 3-4, 5-6, etc.) If the VXI +12V supply is to be used, three jumpers are to be installed at location W4 (1-2, 34, and 5-6) If the VXI +24V supply is to be used, the three jumpers are to be installed at location W4 (11-12, 13-14, 15-16).

The final consideration is the source of power for the external loads on Bank B. If an external supply is to be used, the jumpers at locations W8 and W9 are to be removed. If the VXI +5V supply is to be used, eight jumpers are to be installed at location W8. (1-2, 3-4, 5-6, etc.) If the VXI +12V supply is to be used, three jumpers are to be installed at location W9 (1-2, 3-4, and 5-6) If the VXI +24V supply is to be used, the three jumpers are to be installed at location W9 (11-12, 13-14, 15-16).

The right cover can now be reinstalled on the module.

Torque Specifications

Minimum: 2 inch pounds (22 N.cm) Recommended: 7-10 inch pounds (80-110 N.cm) Maximum: 15 inch pounds (170 N.cm)

Microwave Plug-In Installation

Microwave plug-in modules typically are installed at the factory prior to shipment. Follow the instructions below to install a microwave plug-in into the carrier assembly (407879).

Each microwave plug-in consists of a connectorized relay and a unique cable assembly. Remove the right side cover (14 mounting screws) and feed the “P2” end of the cable assembly through the opening in the front panel of the carrier. Mate the “P2” connector (and “P3” if necessary) within the appropriate header as indicated in **Table 2-1**. Then feed the other end of the cable assembly through the opening in the bracket and mate with the connector on the back of the relay.

The figure below illustrates the plug-in installation for a transfer switch, dual 1x2, 1x4 or 1x6 relays (part numbers 407882-101, 302, 104, 106, 201, 402, 204, 206). Use the four flat screws provided to secure the bracket to the carrier front panel. Then use the four pan head screws with the washers provided to secure the relay to the bracket. Two relays (transfer switch, 1x4, 1x6) can be mounted on this bracket.

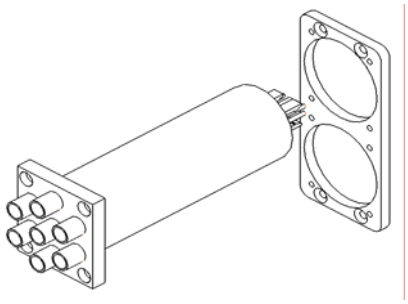

Table 2-1, Plug-in Connections

Plug-In	P2 Connects To
1	J10
2	J20
3	J30
4	J40
5	J31
6	J41

Module Address Switches

Since 1260-Series switch modules do not communicate directly with the slot 0 controller, they do not use logical addresses. Instead, they use module addresses. Each 1260-Series module has its own unique module address from 1 to 12, inclusive. The Option-01T uses the module addresses to distinguish one switch module from others in the same group, in much the same manner as the slot 0 controller uses logical addresses for modules it communicates with.

1. Decide on a unique module address, from 1 to 12, inclusive, for each 1260-Series switch module.

2. Set the module address by using the DIP switch on the switch module (see **Figure 1-3**). If the module is a 1260-40, remove the module covers. For other modules, you may access the DIP switches through the openings in the bottom cover. Referring to **Figure 1-3**, set the switch module DIP switches to correspond with the desired module address. Each segment of the DIP switch represents a number, as shown in **Figure 1-3**. The module address equals the sum of the values of all switches that are set to the ON position. For example, to set the module address to 5, set switch segments 2 and 4 to ON, and set all others to OFF (switch 4 represents 1 and switch 2 represents 4, for a sum of 5). Switch 4 is the least significant bit.

3. Repeat step (2) for each 1260-Series switch module. Make sure you assign a unique module address for each module.

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Chapter 3
MODULE OPERATION

Operating Modes

The 1260-67M may be operated either in *message-based* mode or in *register-based* mode.

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 1260-67M module.

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

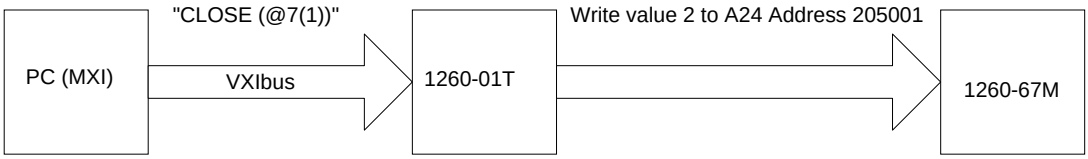

Figure 3-1, Message-Based Mode of Operation

In the *register-based* mode, the user writes directly to the control registers on the 1260-67M module. The 1260-01T command module does not monitor these operations, and does not keep track of the relay states on the 1260-67M module in this mode.

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

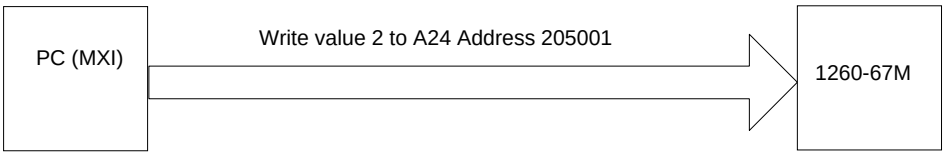

Figure 3-2, Register-Based Mode of Operation

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 Message-Based Mode

Firmware Revision Required for Operating the 1260-67M

In order to operate the 1260-67M using the message-based control, version 10.1 (or later) of the 1260-01T firmware must be installed in the 1260-01T controller.

You may send the "*IDN?" query to the 1260-01T to read the firmware revision installed in the 1260-01T. The reply to the "*IDN?" query will be in the format:

```
"Racal Instruments,1260A Option-01T, <SN>, <FW revision>"
```

The <SN> represents the serial number. The <FW revision> is the firmware revision that is installed in the 1260-01T. This should be at a revision of 10.1 or later for proper operation of the 1260-67M in message-based mode.

Channel Descriptors For The 1260-67M

The standard 1260-01T commands are used to operate the 1260-67M 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 1260-67M module. This is a number is in the range from 1 through 12, inclusive. Consult the "Setting the Module Address" paragraph in chapter 2 for a description of how to set the 1260-67M's module address.

- <channel> is the 1260-67M channel to operate. The valid channel numbers are determined by the type of plug-ins installed into the 1260-67M.

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 1260-67M:

`OPEN (@8(0))`	Open channel 0 on the 1260-67M that has module address 8.
`CLOSE (@8(0,203))`	Close channels 0 and 203 on the 1260-67M that has module address 8.
`CLOSE (@2(400:413))`	Close channels 400 through 413 inclusive on the 1260-67M that has module address 2.

Channel Values For The 1260-67M

The <channel> values that are valid for the 1260-67M are based on the type of plug-in modules installed. The 1260-67M provides 5 plug-in positions. The channel values used to close and open relays are based on both the plug-in position and the type of plug-in installed.

In general, the range of values accepted for a plug-in are shown below:

Position 1 => Channels 0 through 11

Position 2 => Channels 100 through 111

Position 3 => Channels 200 through 211

Position 4 => Channels 300 through 311

Position 5 => Channels 400 through 411

Position 6 => Channels 500 through 511

Position 7 => Channels 600 through 631

The absolute maximum values for channels in each position is shown. However, depending on the type of plug-in module installed, the channel value accepted for a position may be less than that which is shown above.

Position 7, when populated, will ALWAYS contain the 32-channel driver. Thus, the valid range of channels for this position will ALWAYS be 600 through 631 when the 32-channel driver is present.

If a position is not populated with a plug-in module, then there is no channel numbers accepted for the empty position.

For each of the positions 1 through 6, the maximum value accepted for the position is based on the type of plug-in module installed at the position:

Double 1x2 MUX	Channel X00 and X01
2x2 Transfer Switch	Channel X00 only
1x4 MUX	Channel X00 through X03
1x6 MUX	Channel X00 through X05

In the table above, the X is the leading digit (0 to 3) that corresponds to the position of the plug-in (1 to 6). Note that the leading digit is always 1 less than the position for the plug-in.

The least significant 2 digits of a <channel> indicate which relay is being operated. For the MUX plug-ins, the least significant 2 digits of the <channel> indicate which pole will be connected to the COM output.

For example, a 1x6 MUX installed in position 3 will be addressed using channels 200 through 205. By closing channel 200, the first pole is connected to the COM output. By closing channel 205, the last pole is connected to the COM output.

Each 1x2 MUX is selected by a single channel. When a 1x2 MUX is closed, the COM output is connected to the “Normally Open” (NO) input. When a 1x2 MUX is open, the COM output is connected to the “Normally Closed” (NC) input.

When a multi- 1x2 MUX plug-in is installed, the channels identify which of the MUXes are being selected.

The 2x2 Transfer Switch may either be “opened” or “closed” as well. When the 2x2 Transfer Switch is “open”, the inputs are passed straight through to the outputs. When the switch is “closed”, the inputs are swapped to the alternate output. That is, input 1 is connected to output 2, and input 2 is connected to output 1.

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 1260-67M is:

```
1260-67M UNIVERSAL VXI MICROWAVE RELAY CARRIER
```

So, for a 1260-67M whose <module address> is set to 8, the reply to this query would be:

```
8: 1260-67M UNIVERSAL VXI MICROWAVE RELAY
CARRIER
```

Reply To The MOD:CONF? Command

The 1260-01T returns a reply to the "MOD:CONF?" command. This command is supported only in 1260-01T firmware at revision 10.1 or later. The reply to this command indicates the type of plug-ins that have been detected at each position within the 1260-67M.

The format for the "MOD:CONF?" command is:

MODule:CONFiguration? (@ <module address>)

For example, the command:

```
MOD:CONF? (@2)
```

queries the 1260-01T to determine which plug-ins are installed in the 1260-67M which has module address 2.

The reply to the "MOD:CONF?" command has the format:

```
 1 : <PI1> ; 2 : <PI2> ; 3 : <PI3> ; 4 : <PI4> ;
 5 : <PI5> ; 6 : <PI6> ; 7 : <PI7>
```

where <PI1> through <PI5> will be replaced by text indicating the type of plug-in installed in the position. The text strings will be one of the following:

```
Empty
Double 1x2 Non Latching MUX
2x2 Non Latching Transfer
1x4 Non Latching MUX
1x6 Non Latching MUX
Double 1x2 Latching MUX
32 Channel Non Latching Port Driver
```

A sample reply is shown below:

```
1 : 1x4 Non Latching MUX ; 2 : Empty ; 3 :
Empty ; 4 : 1x6 Non Latching MUX ; 5 : 2x2 Non
Latching Transfer ; 6 : Double 1x4 Non Latching
MUX;  7 : 32 Channel Non Latching Port Driver
```

With this sample configuration, the valid channel numbers for the 1260-67M would be:

0 to 3	(1x4 MUX in position 1)
300 to 305	(1x6 MUX in position 4)
400	(2x2 MUX in position 5)
500 to 503	(1x4 MUX in position 6)
600 to 631	32 channel driver in position 7

Latching versus Non Latching Operation

In the list of possible replies from the “MOD:CONF?” query, you can see that the description of a plug-in module contains an indication of whether the plug-in is “Latching” or “Non Latching”.

The manner in which the 1260-01T controls latching plug-ins differs from that used to control non-latching plug-ins in four ways:

1) When the VXI chassis is powered off, the latching relays remain in the last position that was commanded. Non latching relays will return to the default state

2) When the VXI chassis is powered on, the present state of the latching relays is read back and recorded. Non-latching relays will be set by the 1260-01T to an “all open” state

3) Latching relays are operated by pulsing a control signal on and then off. Non latching relays are operated by keeping the control signal in the asserted state.

4) When a latching 1xN MUX is commanded to open all N channels of the MUX, the firmware will ensure that the first channel in the MUX is connected to the COM output of the MUX. The latching MUX cannot be set to a “no connection” position. The COM output of the MUX will always be connected to one of the inputs.

Operating in Register-Based Mode

In register-based mode, the 1260-67M is operated by directly writing and reading control registers on the 1260-67M module. For the channel assignments for each control register, see **Table 3-1**. 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 1260-67M module. This is a value in the range from 1 and 12 inclusive.

3. The 1260-67M control register to be written to or read from. Each control register on the 1260-67M has a unique address.

The base A24 address for the 1260-67M module may be calculated by:

(A24 Offset of the 1260-01T) + (1024 x Module Address of 1260-67M).

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

A 1260-67M with a module address of 7 would have the base A24 address computed as follows:

Base A24 Address of 1260-67M = 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 1260-67M reside at the first three odd-numbered A24 addresses for the module:

(Base A24 Address of 1260-67M) + 1 = Control Register 0

(Base A24 Address of 1260-67M) + 3 = Control Register 1

(Base A24 Address of 1260-67M) + 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 control registers used by the 1260-67M.

Table 3-1, Control Register Memory Map

Control Register	Offset from Base Address (hex)	Comments
0	1	Data write / read back for the 1st 8-bits of plug-in #1
1	3	Data write / read back for the 2nd 4-bits of plug-in #1
2	5	Data write / read back for the 1st 8-bits of plug-in #2
3	7	Data write / read back for the 2nd 4-bits of plug-in #2
4	9	Data write / read back for the 6-bits of plug-in #3, & 1st 2-bits of plug-in #5
5	B	Data write / read back for the 2nd 4-bits of plug-in #5
6	D	Data write / read back for the 6-bits of plug-in #4, & 1st 2-bits of plug-in #6
7	F	Data write / read back for the 2nd 4-bits of plug-in #6
8	11	Data write / read back for the 1st 8-bits of 32-bit driver (LSB)
9	13	Data write / read back for the 2nd 8-bits of 32-bit driver
10	15	Data write / read back for the 3rd 8-bits of 32-bit driver
11	17	Data write / read back for the 4th 8-bits of 32-bit driver (MSB)
12	19	Configuration ID read back for plug-in slot #1
13	1B	Configuration ID read back for plug-in slot #2
14	1D	Configuration ID read back for plug-in slot #3
15	1F	Configuration ID read back for plug-in slot #4
16	21	Configuration ID read back for plug-in slot #7 (32-bit Driver)
17	23	Configuration ID read back for plug-in slot #5
18	25	Configuration ID read back for plug-in slot #6
<break>	<break>	<break>

Plug-In Module ID Codes

Within the control register map displayed In **Table 3-1**, the configuration ID information may be read back from control registers 12 through 16. These correspond to offset addresses 19 through 21 (hexadecimal).

Each different type of plug-in module has a unique 5-bit code associated with it. By reading the configuration registers 12 through 16, the software may determine what type of plug-in modules have been installed in the 1260-67M.

The plug-in identification codes are shown in **Table 3-2** below.

Table 3-2, Plug-In Module ID Codes

ID Value (hex)	Plug-In Module Type
00	Empty
01	2x2 Transfer Non-Latching
04	1x4 Non Latching MUX
06	1x6 Non Latching MUX
09	32 Channel Driver (Non Latching)
0B	<not used – reserved>
0D	<not used – reserved>
0E	<not used – reserved>
0F	<not used – reserved>
10	Double 1x2 Latching MUXes
19	<not used – reserved>
1B	<not used – reserved>
1D	<not used – reserved>
1E	<not used – reserved>
1F	Double 1x2 Non Latching MUXes

Operating the Plug-In Modules

Each plug-in module is controlled by writing to the control registers associated with the plug-in.

The 32-Channel driver is controlled by four 8-bit control registers. This plug-in is always operated via control registers 8, 9, 10, and 11 as shown in **Table 3-1**.

The remainder of the plug-in modules controlled by a single 8-bit control register. These plug-in modules are controlled using the lower 8-bit control port shown in **Table 3-1**. The upper 8-bit port for these plug-ins have no effect.

Table 3-1 displays the memory map used to control the plug-in modules. Note that each plug-in has its own 1- or 2-byte control register based on the position in which the plug-in resides.

Operating the Latching 1x2 MUXes

The double 1x2 latching MUX is controlled by writing to the least significant 2 bits of the control register for MUX #1. MUX #2 is controlled by the next two adjacent bits (bits 2 and 3)

The control bit assignments for the 1x2 latching MUX plug-in modules is shown below.

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
--	--	Close MUX 3	Open MUX 3	Close MUX 2	Open MUX 2	Close MUX 1	Open MUX 1

The Latching MUXes are controlled by pulsing the control bit (or bits) to achieve the desired operation. Pulsing is achieved by:

Write a '1' to the control register bit (or bits)
Wait 20 to 100 milliseconds
Write a 0 to the control register (all bits off)

The 1x2 MUX can be opened by pulsing a 1 to the "Open MUX" bit for the desired MUX. When the 1x2 MUX is "open", the COM output is connected to the "Normally Closed" (NC) input

The 1x2 MUX can be closed by pulsing a 1 to "Close MUX" bit for the desired MUX. When the 1x2 MUX is "closed", the COM output is connected to the "Normally Open" (NO) input.

The present state of the latching 1x2 MUX can be read back by reading the control register as follows:

1) Read the control register for the 1x2 MUX(es)
2) Invert the bits (swap 0's and 1's – a "one's complement")
3) If the "OPEN MUX" bit for the MUX = 1, the MUX is open
4) If the "CLOSE MUX" bit for the MUX = 1, the MUX is closed.

Operating the Non-Latching 1x2 MUXes

Each 1x2 MUX is controlled by a single control bit in the control register. If the bit is set high (1), the corresponding 1x2 MUX will be closed. If the bit is set low (0), the corresponding 1x2 MUX will be opened.

When a 1x2 MUX is closed, the COM output is connected to the Normally Open (NO) input. When the 1x2 MUX is open, the COM output is connected to the Normally Closed (NC) input.

The control bit assignments for the 1x2 non-latching MUX plug-in modules is shown below.

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
--	--	--	--	--	MUX 3	MUX 2	MUX 1

Unlike the latching 1x2 MUXes, the control bit for each MUX must remain high (1) as long as the MUX is to be closed. If the control bit is set low (0), or if the power is removed from the module, the MUX will open.

The present state of the relay coils for the MUXes may be read back from the control register. The data should be inverted (one's complement) when it is read back. The (inverted) data read back from the control register should equal the value written to the control register.

Operating the Non-Latching 2x2 Transfer Switch

The Non-Latching 2x2 Transfer Switch is controlled in the same manner as the single Non-Latching 1x2 MUX. Clearing the least significant bit (bit 0) of the control register will "open" the transfer switch. Setting the least significant bit (bit 0) of the control register will "close" the transfer switch.

When the transfer switch is "open", the outputs are connected to the corresponding inputs. That is, input 1 is connected to output 1 and input 2 is connected to output 2. When the transfer switch is "closed", the outputs are swapped, so that input 1 is connected to output 2 and input 2 is connected to output 1.

The present state of the relay coil for the 2x2 transfer switch may be read back from the control register. The data should be inverted (one's complement) after it is read back. The (inverted) value read for bit 0 should be equal to the value of bit 0 that was written to the control register.

Operating the Non-Latching 1x4, 1x6

Each of the 1x4 and 1x6 non-latching MUXes are controlled by a single control register. The control register assigned to the plug-in is based on the position within the 1260-67M as shown in **Table 3-1**.

The control bit assignments for the 1xN non-latching MUX plug-in modules is shown below:

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
Pole 8	Pole 7	Pole 6	Pole 5	Pole 4	Pole 3	Pole 2	Pole 1

Naturally, if the 1xN MUX has less than 8 poles, the additional control bits are not used and can be ignored.

A single pole may be connected to the COM output of the by setting the corresponding bit within the control register. The control bit must remain high (1) for the pole to continue to be connected to the COM output.

There should be at most 1 of the 8 control register bits set to a 1 at any one time. You should never set two or more bits of the control register high at the same time.

The present state of the relay coils for the 1xN MUX may be read back from the control register. The value read back from the control register must be inverted (one's complement). The (inverted) value read back from the control register should equal the value written to the control register.

Operating the Non-Latching 32-Channel Driver

The Non-latching 32-channel driver provides independent control of 32 channel drivers. The 32-channel driver, when installed, will always be located in position #7.

The control register assignment for the 32-channel driver is shown below:

Control Register 8

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
Chan 607	Chan 606	Chan 605	Chan 604	Chan 603	Chan 602	Chan 601	Chan 600

Control Register 9

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
Chan 615	Chan 614	Chan 613	Chan 612	Chan 611	Chan 610	Chan 609	Chan 608

Control Register 10

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
Chan 623	Chan 622	Chan 621	Chan 620	Chan 619	Chan 618	Chan 617	Chan 616

Control Register 11

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
Chan	Chan	Chan	Chan	Chan	Chan	Chan	Chan

631	630	629	628	627	626	625	624

The control registers each control 8 channels. The channels shown above indicate the channel designators used when the message-based interface is used.

Each channel is closed by writing a 1 to the corresponding control bit. Each channel is opened by writing a 0 to the corresponding control bit.

The present value for each of these control registers may be read back from the control register. The value read back from the control registers must be inverted (one's complement). The (inverted) value read from the control register should be equal to the value written to the control register.

Chapter 4

CONNECTOR PIN CONFIGURATION

RF Relays

Figure 4-1 shows the location of four plug-ins on the front panel of the 1260-67M module. The actual configuration is application dependent.

Relay Banks

Figure 4-2 shows the pin locations for the 50-pin Relay Bank connector, J1. **Table 4-1** lists the J1 pin signals. Connector J1 is EADS North America Defense Test and Services, Inc. Part Number 601856-050. The mating connectors are EADS North America Defense Test and Services, Inc. Part Number 601855-050 for the connector body, and 601857 for the pins.

Each of the two relay banks can be independently configured as a sink or a source driver. Either the VXI mainframe or an external supply can be selected.

WARNING

The user must use caution when wiring to the module to prevent damage to the relay banks.

The 1260-67M contains some internal protection circuitry. The internal current sourcing and handling capabilities of the module and the mainframe must not be exceeded. Properly interface external loads, especially if they are inductive. If an external supply is used, the external B+ and B- lines MUST be connected to the External B+ and the External Ground pins on J1. Flyback-clamping suppression diodes MUST be connected across any inductive loads. (Switching of AC inductive loads is not recommended.) **Figures 4-3 through 4-6** show correct methods interfacing to the 1260-67M relay banks.

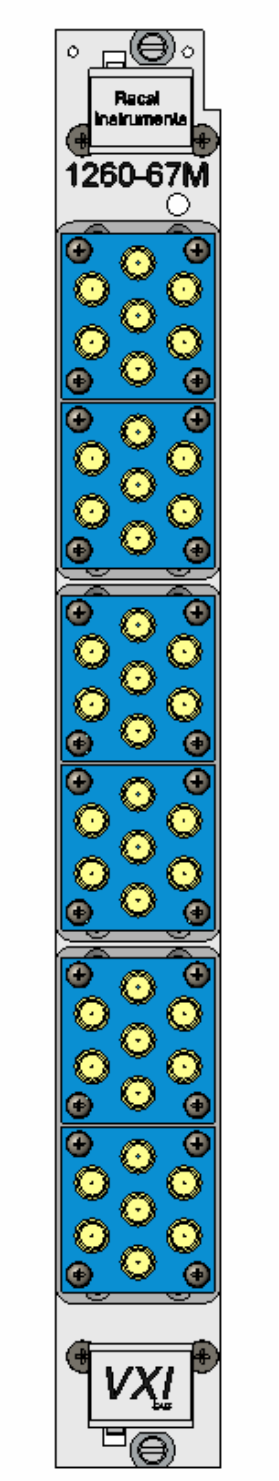

Figure 4-1, 1260-67M Front Panel

Table 4-1, 1260-67M Pin Assignments

BankA Pin	Function	BankB Pin	Function
A,C,E,H	External B+	B,D,F,J	External B+
X, y, z, AA	External Ground	CC,DD,EE	External Ground
z, AA, BB	External Ground	FF,HH	External Ground
d	Contact 0	p	Contact 0
L	Contact 1	V	Contact 1
b	Contact 2	T	Contact 2
S	Contact 3	M	Contact 3
a	Contact 4	W	Contact 4
k	Contact 5	e	Contact 5
t	Contact 6	r	Contact 6
w	Contact 7	m	Contact 7
j	Contact 8	u	Contact 8
R	Contact 9	z	Contact 9
x	Contact 10	N	Contact 10
P	Contact 11	K	Contact 11
Y	Contact 12	U	Contact 12
h	Contact 13	c	Contact 13
v	Contact 14	n	Contact 14
s	Contact 15	f	Contact 15

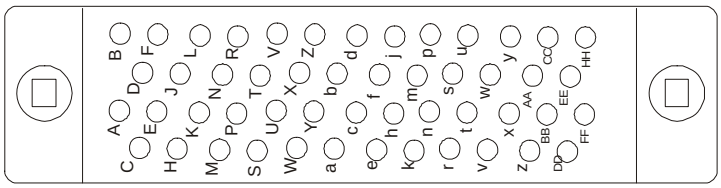

Figure 4-2, Relay Bank Pin Configuration (J1)

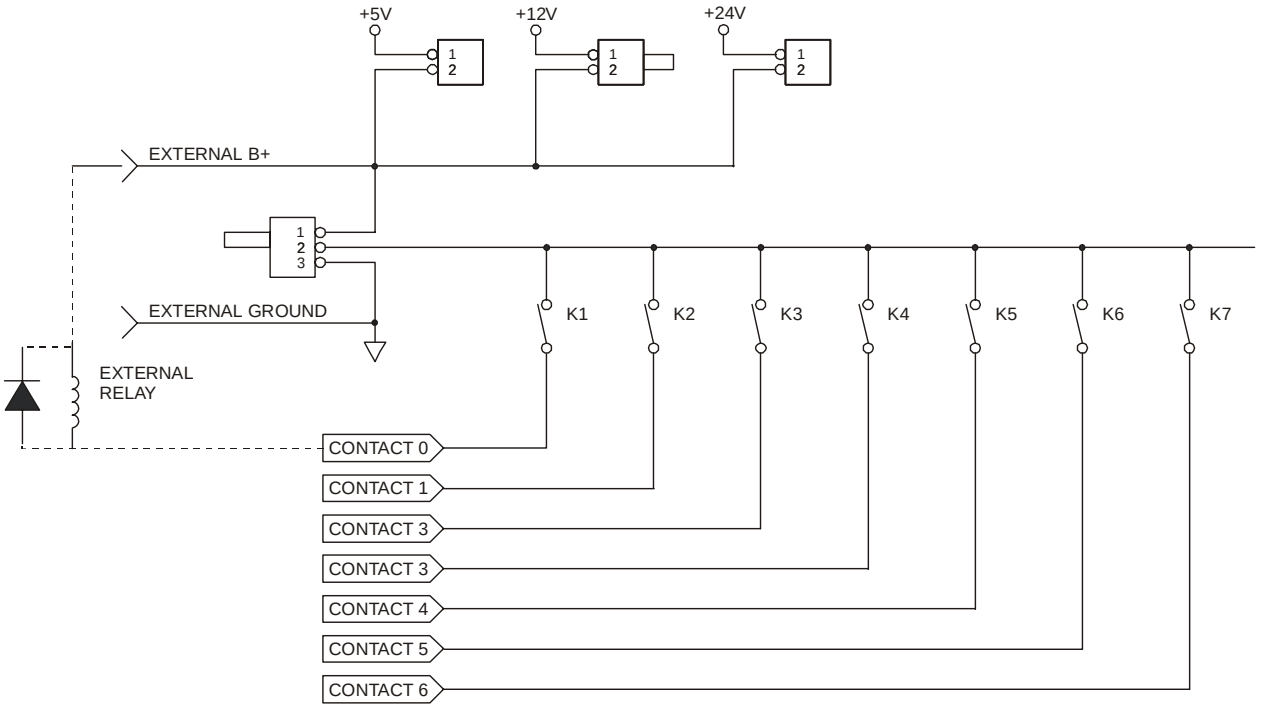

Figure 4-3, Internal Supply Sink Driver Example

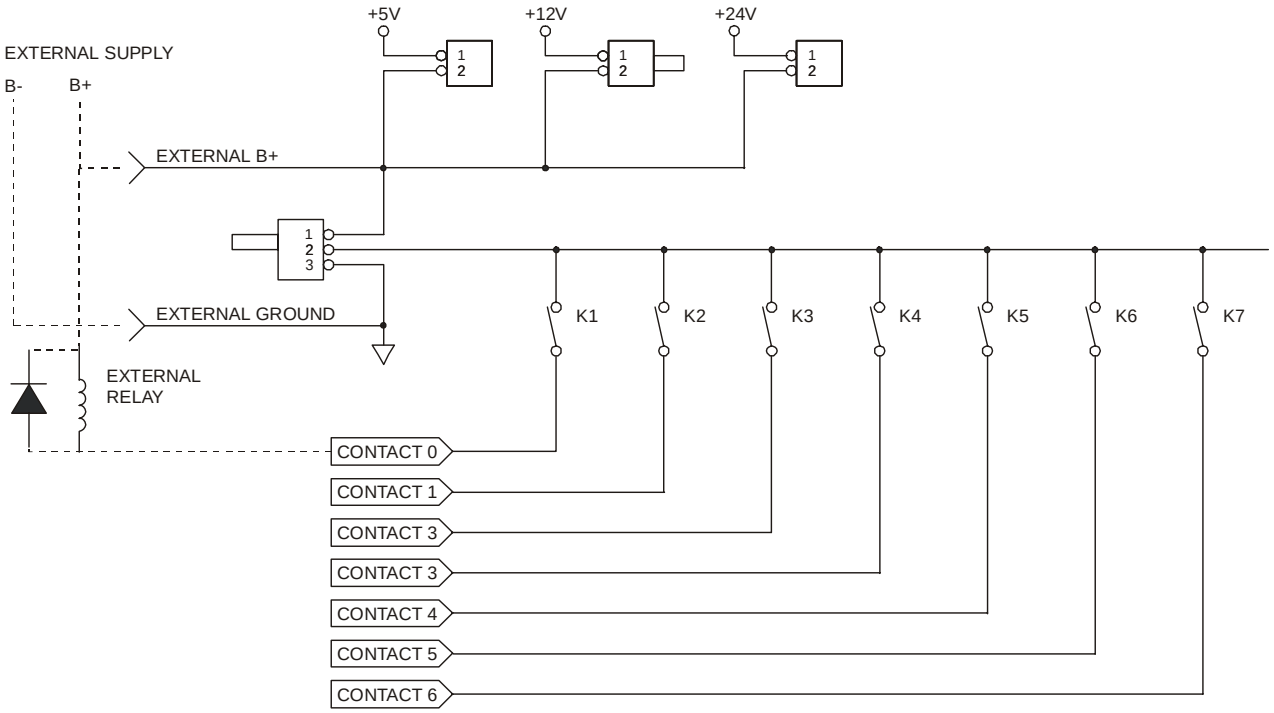

Figure 4-4, External Supply Sink Driver Example

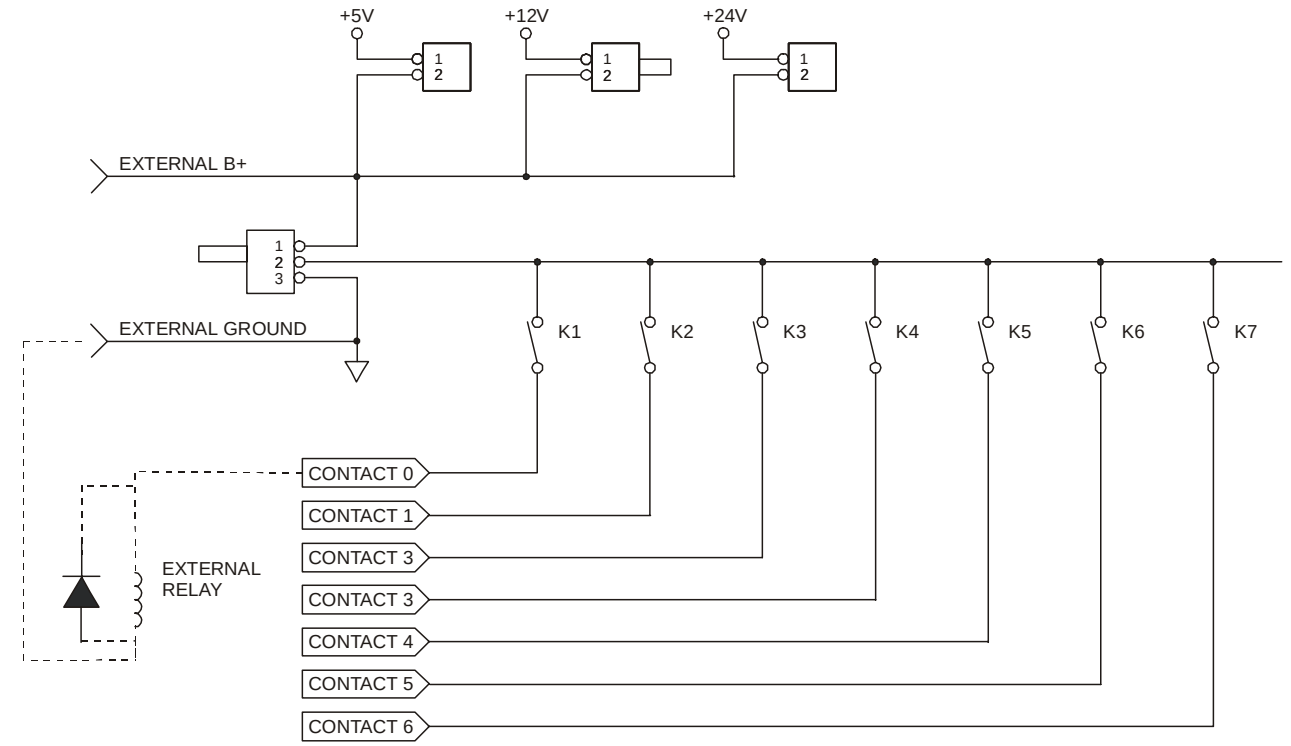

Figure 4-5, Internal Supply Source Driver Example

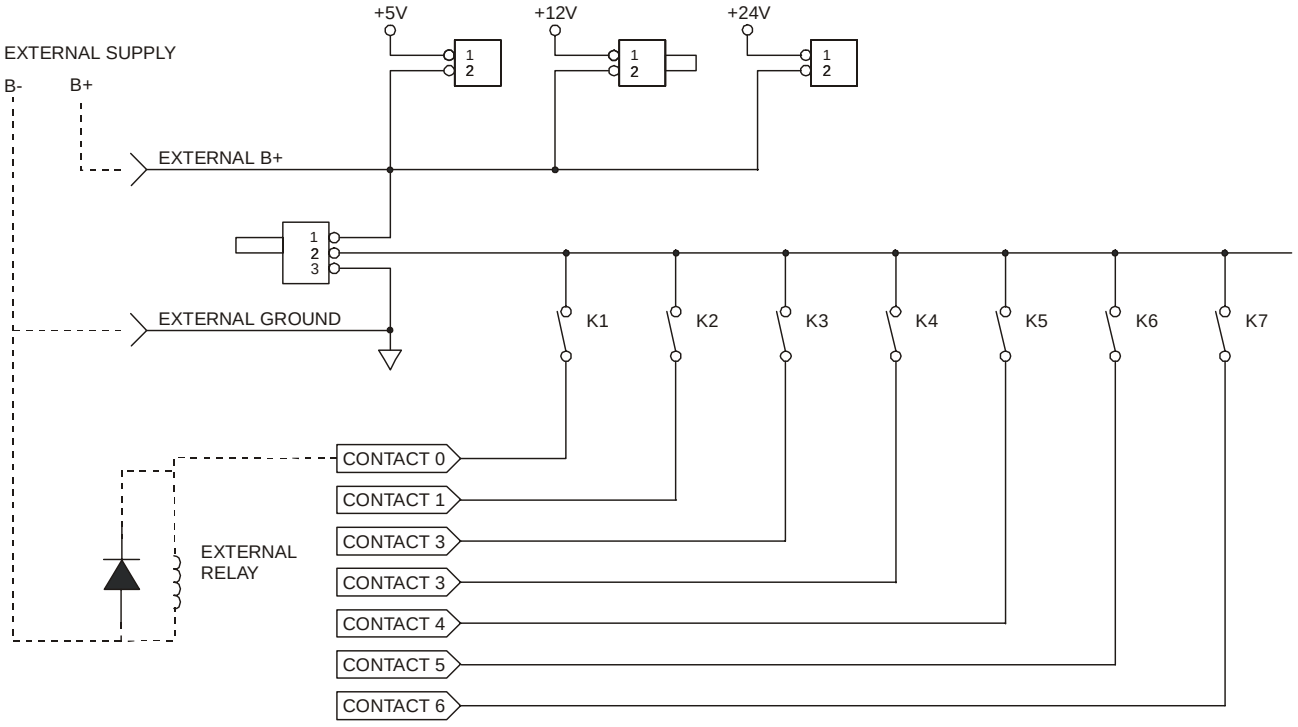

Figure 4-6, External Supply Source Driver Example

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Chapter 5

THEORY OF OPERATION

PCB Assemblies

The PCB assembly contains DC relay banks, 1260 Local Bus interface circuitry, and drivers for both the relay bank and the RF relays. The VXI interface is described in the Theory of Operation section of the 1260 Series VXI Switching Cards Manual. The relay driver circuitry is contained in monolithic IC driver chips. The relay banks are shown in **Figures 4-3 through 4-6**. Not shown in these figures are internal clamp diodes. These diodes will clamp minor inductance effects, such as those caused by wiring; but they are not intended to replace suppression diodes across the solenoid coils of external relays, or other inductive loads. Referring to the schematic diagram, the diodes between the Contact lines and ground clamp switch-to-open transients when the bank is used as a source driver. The diodes between the Contact lines and the External B+ clamp switch-to-open transients when the bank is used as a sink driver.

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Chapter 6

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.

Reshipment Instructions

Use the original packing material when returning the 1260-67M 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.